1. General Information

1.1 Summary

.1 Section Contents

.1 Control/regulating devices for heating and cooling appliances and systems, and related methods of installation.

1.2 References

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Data Sheets (DS).

1.3 Documents/samples to be submitted

.1 Data sheets

.1 Submit the required data sheets, in addition to the manufacturers' specifications and documentation for products in accordance with Section 21 05 01. Specify product characteristics, performance criteria and constraints.

.1 Submit two (2) examples of the MSDS required, in accordance with the Workplace Hazardous Materials Information System (WHMIS).

.2 Quality Assurance: Submit the following documents in accordance with Section 21 05 01.

.1 Certificates: Submit the documents signed by the manufacturer, certifying that the products, materials and equipment meet the requirements regarding physical characteristics and performance criteria.

.2 Instructions: Submit installation instructions provided by the manufacturer.

.1 The Contractor will make available to the applicable staff, one (1) copy of the installation instructions prepared by the system supplier.

1.4 Quality assurance

.1 Health and Safety: Take the necessary health and safety measures in accordance with the general requirements.

1.5 Transportation, storage and handling

.1 Packing, shipping, handling and unloading

.1 Transport, store and handle materials and equipment in accordance with the general requirements.

.2 Transport and store the materials and equipment in accordance with the manufacturer's written instructions.

1.6 General conditions

.1 The general conditions of section 21 05 01 form an integral part of this division.

.2 The contractor of this division will have to supply and install all of the systems, equipment, and accessories required and / or prescribed in this specification division to form a complete system.

.3 Only the following contractors are authorized to bid:

.1 Authorized manufacturers or distributors of original equipment offering the full range of equipment required for the structure.

.2 Have qualified installation staff or subcontractor of a certified contractor that answers to the contractor for the means of warranties.

.3 Have qualified service personnel able to respond to a call 24 hours a day, 365 days per year.

.4 The Building Systems Regulation (BSR) will be installed by the supplier of the automatic control system without being subcontracted. The work will be done by electricians; all of whom are adequately trained and experienced in this type of work and employed on a regular basis by the supplier.

.5 In this project, only the contractor assigned by the client to the building of this project will be able to offer their products.

1.7 Work included

.1 The BSR must be an integral part of this section. Any company whose system does not meet all the requirements of section 23 09 33, will not be able to bid on this project.

.2 Provide a complete building mechanical control system including:

.1 General application controller (GAC) BACnet, 32 bits

.2 Specific application controller (SAC), 16 bits

.3 Local application controller (LAC)

.4 BACnet operator interface.

.5 Regulation elements.

.6 Workforce.

1.8 System description

.1 Description of the system's minimum requirements.

The BSR must meet the specifications of this specification to ensure compatibility with the hardware and future software. If a BSR handles particular aspects of this specification in a different way, the regulator shall inform the ministerial Representative within 7 days of the date of submission.

However, the following requirements are considered to be absolute and essential:

.1 BACnet compliance

.1 Operator interfaces and general application controllers must be connected via a BACnet communications network. All communications on this network must comply with the BACnet protocol, Ashrae Standard 135.

.2 The BACnet communications network must meet the ISO 8802-3 (Ethernet) standards for operator interfaces and general purpose controllers. If the suggested general system controller does not meet the data link / physical layer minimum speed requirements, a BACnet independent network router or BACnet general purpose controller that meets these requirements must be provided to route each individual controller of the system to the high-speed local area network.

.2 Communication mechanisms

.1 Communication services that take place on the BACnet communications network will need to provide value transfer and operator interface that is transparent in the architecture of the inter-network:

.1 The connection of an operator interface unit to any controller in the BACnet communications network must allow the operator to interface with all other controllers as if this interface were directly connected to the other controllers. Operators must be able to view and edit data, status information, reports, operating software, custom programs, etc. of all controllers from any controller in the BACnet communications network.

.2 All database values (objects, software variables, custom program variables) of any controller must be readable from any other controller on the BACnet communications network. This value transfer must be automatically performed by a controller if a reference to an object that does not belong to this controller is entered in the controller database. The establishment of communication services for the transfer of value over the inter-network should not have to be carried out by an operator / installer.

.3 All objects and all object characteristics will be able to be easily visualized and shared across the entire system.

.3 Only one GUI level will be installed on this project. This level of GUI must be available for all current or future workstations including laptops. The minimum amount of graphics licenses for this project will be three.

.4 The GUI should include an optional NET DDE (NETWORK DIRECT DATA EXCHANGE) client-server as well as the OPC (OLE FOR PROCESS CONTROL) client-server.

2. Products

2.1 Accepted products

.1 The controls must be from the same supplier as the existing ones of the building.

.2 The systems must be designed, installed and programmed by the manufacturer or one of their authorized distributors.

.3 The contractor must have at least 10 years of experience in installing this type of system

.4 The contractor must have resource persons who can fluently speak French in order to perform the following tasks:

.1 Design

.2 Project management

.3 Supervision

.4 Programming

.5 Start-up

.5 The drawings, data sheets and operation manuals must be provided in **French and English.**

.6 The contractor must submit the following items:

.1 Proposed system architecture detailing communication networks, operator station, printers, panel quantities and communication speed.

.2 Data sheets for digital controllers.

.3 French interface for the demo software.

.4 Contractors who do not manufacture the products that they offer, must submit a letter from the manufacturer stating that they have been authorized distributors for at least five (5) years.

2.2 Digital controllers

.1 General application controller (GAC)

.1 BACnet compliance

.1 Every general application controller will need to be connected to the BACnet network and leverage the ISO8802-3 data link / physical layer protocol (Ethernet). Every building controller will have to communicate directly with the BACnet devices via the Ethernet network using the Read and Write services as defined in clauses 15.5 and 15.8 of the Ashrae Standard 135.

.2 The building controller must at least meet the requirements of a BACnet class 3 device.

.3 Standard BACnet object types that must be supported:

.4 Analog input, analog output, analog value, binary input, binary output, binary value, calendar, time, PID loop, controller, history log and alarms.

.2 Autonomous operation:

.1 Every GAC will have an Intel 386 32-bit processor. Every GAC will have an integrated battery with a minimum capacity of 72 hours to keep the clock in real time. The life of the battery will be 10 years minimum.

.2 Each GAC will have 4 MB of RAM, expandable to 16 MB using conventional memory modules.

.3 Each GAC will use 1 MB of FLASH memory to support the operating system. The operating system's version can be changed without having to change any EPROM or EEPROM.

.3 Communication ports:

.1 RS232: The GAC must support at least 2 RS232 communication ports at 19200 baud that can operate simultaneously (multi-use). Each port can support the composition and automatic response, BACnet protocol.

.2 RS485: The GAC shall support an RS485 port for communicating with subnet specific application controllers at a 39200 baud rate.

.3 Echelon LonWorks: The GAC will need to support a standardized Echelon FTT port to communicate with Echelon controllers from different manufacturers.

.4 IntelliNet: The GAC will support a 1 megabaud communication port to communicate with other GACs from any previous generation.

.5 Ethernet: The GAC will support a standard 8802.3 Ethernet communication port at 10 megabaud. Connections can be coax, thinnet or thicknet. This network will communicate with other GAC or PCs, BACnet protocol

.4 Network Communication:

.1 Each GAC will be addressable by DIP SWITCH. The network type can be LOCAL AREA NETWORK (LAN) or WIDE AREA NETWORK (WAN). The amount of GAC connected to the network can be 1024. It will be an ETHERNET network.

.2 Each GAC will be equipped with an indicator light to indicate the network status.

.3 If the GAC does not meet the minimum requirements for data link speed / physical layer, an independent BACnet network router that meets these requirements may be provided. In this alternative there must be 1 router per GAC.

.5 Inputs and Outputs:

.1 The GAC must be compatible with standard devices. Analog converters must have a minimum resolution of 12 bits for inputs and 10 bits for outputs. All input and output connections from the general application controller must be made using plug-in screw terminals that can be unplugged for quick and easy

maintenance.

.2 Each GAC must be able to support one or more of the following point types:

.1 Universal input:

- RTD or platinum 100
- RTD or platinum 1000
- Balco 500
- Thermistor 10K
- 4-20 MA
- 0-5 VCC
- 0-10 VCC.
- Dry contact.

Each input will have a light-emitting diode whose intensity will vary with the signal and will be electrically protected against short-circuit connections.

The selection of the signal type will be done by changing the jumper settings. No external resistance or interface of any kind will be acceptable.

.2 Universal output:

- 0-5 VCC
- 0-10 VCC
- 4-20 MA
- All or nothing.

Each output is equipped with a light-emitting diode. The analog outputs will be equipped with a manual adjustment potentiometer. The binary outputs will be equipped with a manual bypass selector and a solid relay with indicator and fuse. All bypass selectors can be monitored for a dynamic indication of the switch status.

.3 Pulse Input:

- A 250 Hz pulse input.

.3 The GAC must be configured as follows:

.1 32 universal inputs

.2 16 universal outputs

.3 3 expansions of the following type:

8 universal inputs / 8 outputs

8 universal inputs/16 binary outputs

32 universal inputs.

.4 For a maximum of 144 points.

.2 Specific application controller (SAC)

.1 General information:

.1 SAC must be digital controllers with a field programmable microprocessor, i.e. control sequences will be fully programmable in the same way as in GAC. No SAC will have a preprogrammed sequence. Digital controllers that are programmed at the manufacturer and which cannot be modified will be refused. The SAC will be required to perform their energy monitoring and management functions independently.

.2 Autonomous operation:

.1 Each SAC will have a processor of at least 16 bits to handle global routines with a program run time of 10 times per second. Each SAC must have a non-volatile EEPROM or FLASH memory in order to save the programming data.

.2 Each SAC will have 128 KB of RAM, 128 KB of EEPROM and 32 KB of FLASH memory.

.3 Network Communication:

.1 The SAC must be connected to each other and to the GAC via a dedicated RS-485 local area network. Each controller must have an indicator light to display the status of the communication.

.2 They must be equipped with an RS-485 / ISTAT communication port for the connection of a CAT sub-network or addressable probes.

.4 Inputs and Outputs:

.1 The SAC must use standard peripherals such as probes, transmitters, servomotor and others. Analog to digital and digital to analog converters must have a minimum resolution of 12 bits for inputs and 8 bits for outputs.

.2 The SAC must have a liquid crystal display of at least 20 characters to display all points, change of setpoints and times.

.3 Local application controller (LAC):

.1 General information:

.1 The LAC must be digital controllers with a field programmable microprocessor, i.e. control sequences will be fully programmable in the same way as in GAC. No LAC will have a preprogrammed sequence. Digital controllers that are programmed at the manufacturer and which cannot be modified will be refused. The LAC will be required to perform their energy monitoring and management functions independently.

.2 The LAC will have a 20-character liquid crystal display, in addition to 4 or 16-key keypad for interactive access to programming parameters.

.2 Autonomous operation:

.1 Each LAC will have a processor of at least 16 bits to handle global routines with a program run time of 10 times per second. Each LAC must have a non-volatile FLASH memory in order to save the programming data.

.2 Each LAC will have 128 KB of RAM and 512 KB of FLASH memory.

.3 Network Communication:

.1 The LAC must be connected to each other and to the GAC via a dedicated RS-485 local area network. Each controller must have an indicator light to display the status of the communication.

.2 They must be equipped with an RS-485 communication port for the connection of a controller application terminal sub-network.

.3 When used alone as a master panel, the LAC will have an RS232 port and a real-time clock, as well as a battery that can sustain the clock for 72 hours.

.4 Inputs and Outputs:

.1 The LAC must use standard peripherals such as probes, transmitters, servomotor and others. Analog to digital and digital to analog converters must have a minimum resolution of 12 bits for inputs and 8 bits for outputs.

3. Execution

3.1 Manufacturer's instructions

.1 Compliance: Comply with manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins, instructions for handling, storing, and installing products, and data sheet instructions.

3.2 Installation

.1 Install the control/regulation devices.

.2 On external walls, mount the 25 mm protruding thermostats on a plate or insulated support.

.3 Install remote sensors and capillary tubes in metal conduits as indicated. The conduits that house the capillary tubes must not touch a radiator or heating cable.

3.3 Operation sequences

.1 See the descriptions in the plans.

3.4 Programming

.1 General information

.1 Program the system in accordance with the control drawings and operating sequences.

.2 Obtain operation schedules, alarms and other transaction specific data from the ministerial representative.

.3 Program the graphics in accordance with the control drawings and operating sequences.

.4 Obtain the symbol and colour legends from the ministerial representative.

.5 Establish an architecture of the graphical diagrams and have it approved by the ministerial representative.

.6 Copy all of the Engineer's electromechanical plans into the software.

.2 Documents to submit

.1 Provide a copy of the programmed software on CD in each panel at the end of the work.

.2 Provide a CD copy of the libraries containing the programmed graphical

diagrams.

.3 Provide all necessary documentation for the reinsertion of programs into the system by the ministerial representative.

.4 Provide the library on computer files of all the equipment provided as part of the project (catalog data sheets, troubleshooting, spare parts, etc.).

3.5 Installation of the final elements

.1 No joint on the control wiring is accepted between the final element and the control panel.

.2 If the element is installed on a thermally insulated conduit, it must be lifted by means of spacers on the surface of the insulation.

.3 Wherever there is vibration, the connection between the element and the electrical pipe must be made using sealed conduits for a maximum length of 12 inches.

.4 Sealed conduits must be used with the appropriate connectors.

.5 The location of the final items must be approved by the client's manager.

.6 Bare electrical conductors without their sheath should not be seen on the terminals of the elements.

.7 All final elements must be securely installed using brackets.

.8 Each item must be identified according to the customer's code using adhesive tape such as IDPal.

.9 Final elements must be with a galvanized steel or painted steel case. Any other box must be accepted by the client.

.10 Controls of all relocated items will need to be reinstalled for proper equipment operation.

3.6 Control panel

.1 The locations of the control panels in the plan are for information only and must be accepted by the owner.

.2 Each element powered by the source must have a clearly identified fuse.

.3 Transformers must be installed outside control panels (closed type).

.4 The size and layout of the control panels must be approved by the owner's manager prior to installation.

.5 All panel wiring must pass through a wire guide.

3.7 Control wiring.

.1 The control contractor must provide all the wiring required for proper operation to the full satisfaction of the client.

.2 The cable used for the control must be FT4 type (shielded) and between 18 and 20 in size according to application.

.3 The control Contractor must provide all necessary connections between components and controllers in the mechanical room.

.4 All control wiring must be in EMT conduits.

.5 No BX conduits will be accepted.

3.8 Drive motor

.1 Provide motors with sufficient torque to operate the accessories.

.2 Adjust the external stops, limiting the course in both directions.

.3 The shutter motors must be equipped with return springs which, in the event of a power failure, return the dampers to their original position.

3.9 Programmable controller (PLC)

.1 Allow 25% free space for each point type and for each PLC.

.2 The installed products must be compatible with BACnet centralized installations.

.3 The mnemonic of the programmed points must be accepted by the ministerial Representative.

.4 Communication between the centralization and the local controller must be in BACnet.

.5 The power supply of the PLCs must be ensured in case of failure by a UPS.

.6 The contractor must provide the software version required to operate if the ministerial Representative's version is not adequate.

.7 The contractor will be required to provide all up-to-date programming files to the ministerial Representative.

.8 All costs for licenses, software and other products are included.

3.10 Drawing with centralization

.1 The contractor will have to request confirmation of the part or equipment numbers from the ministerial Representative prior to drawing pages of centralization.

.2 All PLC points must be drawn at the centralization to the satisfaction of the ministerial Representative.

3.11 Start-up

.1 Once the installation is complete and in continuous operation for 48 hours, test, modify and adjust all installed control and regulation devices or safety devices.

.2 Perform a simulation of the operation sequence in the presence of the ministerial Representative and the engineer.

.3 The programming of the management system is planned for a period of one year.

3.12 Start-up

.1 Schedule four (4) visits for the start-up.

.2 For additional requirements, refer to the start-up plan attached to the specifications.

END OF SECTION