

SECTION 23 09 10 – BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Work under this Section shall consist of the labor, materials and equipment required for installation of the building automation system and automatic temperature control system (BAS/ATC).

1.2 SUBMITTALS

- A. Submit complete BAS/ATC shop drawings for Engineer's approval prior to installation or fabrication of any equipment. Submittal data shall include a schedule of all devices to be installed, including proposed locations. Devices shall be properly sized and selected for optimum system operation.
- B. Deviations from the sequence of control specified herein shall be clearly noted in the sequence of control furnished with shop drawing submittals.
- C. Submittals shall include software, control equipment, control valves, motor-operated dampers, damper actuators, sequence of operations, points list, complete system drawings, etc.

1.3 QUALITY ASSURANCE

- A. The BAS/ATC system shall be designed, installed, commissioned and serviced by factory trained personnel.

1.4 SERVICE AND GUARANTEE

- A. At completion of system installation, BAS/ATC system manufacturer shall adjust all thermostats, control valves, motors and other equipment provided under this contract with trained personnel in the direct employ of BAS/ATC system manufacturer. He shall place said equipment in complete operating condition subject to approval of Engineer, and instruct Owner's operating personnel in the operation of the system.
- B. BAS/ATC system, as shown on Drawings and specified herein, shall be guaranteed free from defects in workmanship and material under normal use and service for a period of 1 year after acceptance by Owner.
- C. Equipment herein described proven to be defective in workmanship or material during the guarantee period shall be adjusted, repaired, or replaced by BAS/ATC system manufacturer at no charge to Owner.
- D. BAS/ATC system manufacturer shall maintain an up to date software program to provide Owner with backup in the event of system failure at any future date.

1.5 WIRING

- A. All power and wiring required by the BAS/ATC system, controllers and required appurtenances shall be provided by BAS/ATC system supplier.
- B. Detailed wiring diagrams and complete field supervision shall be provided by system installer.
- C. System installer shall furnish and install control devices specified in this Section unless specifically stated otherwise.
- D. Maximum allowable voltage for wiring inside control panels shall be 120V.
- E. All wiring shall conform to the National Electrical Code and requirements of Division 26.
- F. Control wiring penetrations at wall-mounted sensors shall be calked and sealed to prevent air leakage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design, to match existing system: Siemens.
- B. Substitutions: None.

2.2 GENERAL

- A. BAS/ATC system shall include, but not be limited to, the following components:
 - 1. System application controllers shall manage the energy and building management capacities of the automation system, as well as, facilitate remote communications and central monitoring.
 - 2. Application specific controllers shall provide distributed, pre engineered control, specific to the mechanical equipment specified.
 - 3. Custom application controllers with distributed custom programming capability shall provide control for nonstandard control sequences.
 - 4. Data communications capability shall allow data to be shared between the various controllers in the architecture.
 - 5. System software shall include system software for global application functions, application software for distributed controllers, and operator interface software.
 - 6. End devices such as sensors, actuators, dampers, valves, and relays.
 - 7. Update software graphics for added and modified systems.
- B. The failure of any single component shall not interrupt the control strategies of other operational devices. System expansion shall be through the addition of end devices, controllers, and other device specified herein.

2.3 SYSTEM APPLICATION CONTROLLERS

- A. BAS/ATC system shall be composed of one independent, stand alone, microprocessor based system application controller to manage the global strategies described in application software section.
- B. System application controller shall have ample memory to support its operating system, database, and programming requirements.
- C. Operating system of the system application controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
- D. Data shall automatically be shared between system application controllers when they are networked together.
- E. Database and custom programming routines of remote system application controllers shall be editable from single operator station.
- F. System applications controllers shall have the capability of being remotely monitored over telephone modem. Additional capabilities shall include automatically dialing out alarms, gathering alarms, reports and logs, programming and downloading databases.
- G. Controller shall continually check status of all processor and memory circuits. If a failure is detected, controller shall:
 - 1. Assume a predetermined failure mode.
 - 2. Emit an alarm.
 - 3. Display card failure identification.

2.4 APPLICATION SPECIFIC CONTROLLERS

- A. Application specific controllers shall be stand alone, microprocessor based direct digital controllers with sufficient memory to handle its operating system, database and programming requirements.
- B. Application specific controller shall be pre programmed, tested, and factory mounted on mechanical equipment to ensure reliability.
 - 1. Where factory mounting is not possible, controllers shall be factory programmed and tested prior to shipment to jobsite. Controllers shall be clearly labeled as to controller type, where installed, and software address (if applicable). Controller shall be fully tested upon installation to ensure that it is properly matched to the equipment it is controlling.
- C. Controller shall communicate with other devices on communication network and be fully integrated with other system components.
- D. Hardware shall be suitable for anticipated ambient conditions.
 - 1. Controllers used outdoors and/or in wet ambient shall be mounted within waterproof enclosures, and shall be rated for operation at minus 40 degrees F to 155 degrees F.

2. Controller used in conditioned ambient shall be mounted in dust proof enclosures, and shall be rated for operation at 32 degrees F to 120 degrees F.

2.5 CUSTOM APPLICATION CONTROLLERS

- A. Custom application controllers shall provide stand alone control and require no additional system components for complete operation. It shall have sufficient memory to support its operating system, database, and programming requirements.
- B. All programming required for operation shall be memory resident and shall be retained in permanent memory. Battery backup for a minimum of 72 hours is also permissible.
- C. Custom application controller shall be configured such that portable operator interface can be plugged directly into it or within sight for programming, editing, and other operator functions.
- D. Controller hardware shall be suitable for the anticipated ambient conditions.
- E. Controllers used outdoors and/or in wet ambient shall be mounted within waterproof enclosures, and shall be rated for operation at minus 40 degrees F to 155 degrees F.
- F. Controller used in conditioned ambient shall be mounted in dust proof enclosures, and shall be rated for operation at 32 degrees F to 120 degrees F.

2.6 INPUT/OUTPUT INTERFACE

- A. Hardwired inputs and outputs may tie into system through system application, or application specific controllers. Slave devices are also acceptable. Any critical points requiring immediate reaction shall be tied directly into controller hosting control software algorithm for critical function.
- B. Binary inputs shall allow monitoring of on off signals from remote devices. Binary inputs shall provide a wetting current of 12MA at 12VDC to be compatible with commonly available control devices.
 1. All status points shown on point list shall be positive proof differential pressure or current sensing binary switches.
- C. Analog inputs shall allow the monitoring of low voltage, current, or resistance signals and shall have a minimum resolution of 0.1 percent of sensing range. Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.
- D. Binary outputs shall provide a continuous low voltage signal for on off control of remote devices. Where specified in sequence of operations or indicated on points list, binary outputs shall have 3 position on off auto override switches, status lights, and shall be selectable for either normally open or normally closed position.
- E. Analog outputs shall provide a modulating signal for control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 milliampere signal as required to provide proper control of output device.
- F. System architecture shall allow for point expansion in one of the following ways:
 1. Addition of input/output cards to an existing system application controller.

2. A slave controller may be used to expand point capacity.
3. 10 percent expansion capacity for all point types in all DDC panels.

2.7 TEMPERATURE SENSORS

- A. Temperature sensors shall be integrated circuit temperature detector sensors (RTD) or thermistor as dictated by requirements herein.
- B. Immersion sensors shall be provided with a separable stainless steel well.
- C. Space sensors shall be equipped with setpoint adjustment and/or override switch as specified on the Drawings or in the sequence of operations.
- D. Accuracies shall be plus or minus 1 degree F for standard applications. Where high accuracy is required, accuracies shall be plus or minus .2 degrees F.

PART 3 - EXECUTION

3.1 MOUNTING HEIGHTS

- A. Mounting height for space sensors and thermostats shall be 44 inches from the finished floor to the centerline of the device. If the designated location of a device places it partially between two finishes, the actual location shall be adjusted to set the device entirely on one finished surface only, but actual height shall not exceed mounting heights indicated or required by codes.

PART 4 - SEQUENCE OF OPERATION

4.1 ENERGY RECOVERY VENTILATOR AND ASSOCIATED ELECTRIC DUCT COIL

- A. The system shall consist of the following components: supply fan, electric heating coil, outside air damper, exhaust fan, enthalpy wheel, exhaust damper, and recirculation/return damper.
- B. A signal from the BAS/ATC system shall index the unit to occupied/unoccupied, heating and cooling, cycles from commands from the building automation system via the communications network. In the event of loss of communication with the building automation system, the unit controller shall automatically transfer control setpoints for heating, cooling and night setback to the default values programmed at the controller
- C. Occupied Mode: Unit shall energize during occupied mode. Fans shall be energized, outside air and exhaust air dampers shall open, wheel shall rotate.
 1. Cooling Mode: Fan shall operate to maintain space temperature setpoint (75 Degrees F Adjustable). When space temperature is met, the fan shall be de-energized.
 2. Heating Mode: On a drop in space temperature below heat setpoint (70 Degrees F Adjustable). The units fan be energized and electric duct coil shall be staged to maintain space temperature. When space temperature rises above setpoint the unit fan and electric duct coil shall be de-energized.

- a. Alarm on low space temperature below setpoint for more than 15 minutes (Adjustable).
 - D. Unoccupied Mode: Unit fans shall be off and system de-energized until the space temperature setpoints are no longer satisfied. Upon space temperature outside of the unoccupied setpoint, the unit outside air and exhaust dampers shall open, fans shall run and system shall be energized to maintain setpoint. Upon meeting space temperature setpoint, the system shall de-energize.
 - E. Monitor and trend unit discharge air temperature.
 - F. Safeties: BAS/ATC shall turn off the unit and an alarm shall be reported to the operator interface if any of the following conditions occurs:
 - 1. Fan status for the outside air fan, exhaust air fan and enthalpy wheel motor shall be provided by a current sensing relay. An alarm shall be generated at the BAS/ATC Operator Interface when fan is commanded on, but status indicates fan is off.
 - 2. Detection of supply air temperature below 40 degrees F (adjustable).
 - G. Factory Frost Control: shall modulate the energy wheel speed to control frost occurring on the energy wheel.
- 4.2 FAN (F-1)
- A. Controlled by line voltage thermostat maintain space temperature.
- 4.3 ELECTRIC UNIT HEATERS (UH-1 through UH-4)
- A. Operate to maintain space temperature. No work for BAS contractor.

END OF SECTION