ZonexCommander (Plus)

Automatic Temperature Control Specification

Section 15950 - Controls and Automation

PART 1: General

1.1 The automatic temperature controls (ATC) under this section will be supplied and installed in accordance with the General Conditions, Supplementary Conditions, and all Division I General Requirements and Referenced Documents.

1.2 The installation of the ATC shall be in accordance with all National, State and Local codes pertaining to this type of work.

1.3 All work must comply with Section 15050 - Basic Materials and Methods - and all other Division 15 Sections, as applicable.

1.4 The scope shall include furnishing and installing a temperature control system to include remote control panels, temperature control devices, appurtenances, etc. to accomplish specific control sequences specified herein, to provide overheating and freeze protection for HVAC units, sensing and indicating devices, temperature indicating instruments, supporting structures and other required components.

1.5 The scope shall include all thermostats, sensors, dampers, actuators, microprocessor central controllers, VAV diffusers, static pressure sensors, fan powered boxes, re-heat products and all other new components of the system requiring connections.

PART 2: General Instructions

2.1 The Building Automation System/Automatic Temperature Control (BAS/ATC) Systems as specified herein shall be provided in their entirety by the BAS/ATC Contractor. The BAS/ATC Contractor shall base his Bid on the system as specified and on the sequence of operations.

2.2 As part of his Bid, the BAS/ATC Contractor shall submit for review by the owner's authorized representatives a written description of his BAS/ATC systems, including block diagrams, showing all major components and control panels and required cabling between each.
The BAS/ATC contractor shall include manufacturer's literature for each type of panel, controller, or device that may be shown on the Riser Diagram.

2.3 The Riser Diagram shall show schematically the entire building system with all major components identified.

PART 3: Scope of Work

3.1 The BAS/ATC systems shall be supplied and installed completely under the BAS/ATC Contract. Control components shall be mounted and wired by the BAS/ATC Contractor.

3.2 The BAS/ATC Contractor shall provide the engineering, installation, calibration, software programming and checkout necessary for complete and fully operational BAS/ATC systems, as specified hereafter.

3.3 Wiring in exposed areas and in mechanical rooms shall be in EMT. Wiring in accessible, concealed areas shall be plenum rated cable.

PART 4: Submittals

4.1 The following data/information shall be submitted for approval:

4.2 Complete sequence of operation.

4.3 Control system drawings, including all pertinent data, to provide a functional operating system.

4.4 Damper schedules showing size, configuration, capacity and location of all equipment.

4.5 Data sheets for all hardware control components.

4.6 A description of the installation materials including conduit, wire, flex, etc.
4.7 Thermostat/Sensor locations.
4.8 Control panel locations.
4.9 Provide as part of the submittal five copies of all data and control drawings.

PART 5: Qualifications

5.1 The BAS/ATC Contractor shall have an office within a 100-mile radius of the job site, staffed with factory trained personnel capable of providing instruction, routine maintenance and 24-hour emergency maintenance service for all system components.
5.2 The BAS/ATC Contractor shall have a minimum of three years' experience installing and servicing similar microprocessor based control systems.
5.3 The Contractor shall be prepared to provide evidence of this history as a condition of acceptance and approval prior to bidding.

PART 6: System Description

6.1 The system shall be DDC based to centralize communications with multiple zoned HVAC systems, Stand-alone HVAC units and other HVAC mechanical devices. Relay Modules with onboard capacity control shall be capable of controlling each zoned unit while Stand-alone equipment shall be controlled via two-stage communicating thermostats. Each controller shall communicate with up to 20 devices. Each controller shall also include a complete set of air temperature sensors, displaying Outside Air Temperature along with SA/RA from each unit in the system. The system control devices shall be capable of a stand-alone application or as a multiple zone system networked by a communication bus. The system components shall provide the capability to be accessed locally and remotely through use of a Windows based computer either on site or via a TCIP device over the Internet.

PART 7: Control Manufacturer

7.1 The control system will be the ZonexCommander (PLUS) Thermal Management System, as manufactured by Zonex Systems, Huntington Beach, CA. Any substitution of the above specified control system will require a 10-day prior approval by the engineer.
7.2 For pricing, contact the factory at 800-228-2966 or visit www.zonexcontrols.com
7.3 For substitution, submit a complete description, engineering data, and names of existing installations of substitute products.
7.4 Be prepared to provide a field inspection by the engineer, if he chooses to observe the actual installation of proposed substitution.

PART 8: Products - General

8.1 The control system shall be available as a complete package, with the required software, input sensors, communicating thermostats and optional relay modules. It shall provide complete control of the communicating thermostats in stand-alone, zoning or VAV applications through a single communication bus. The control system shall support not less than 20 individual thermostats or devices with expansion capability. Stand-alone thermostats shall provide not less than two heat and two cool stages with independent fan control.

PART 9: ZNXPLUS Controller

9.1 The Controller shall be a microprocessor based digital communicating controller, providing a source of communication and control with zoned damper systems or stand-alone HVAC equipment along with various communicating devices.
9.2 Controller shall manage 1 – 4 HVAC systems with up to 20 modulating zones. Thermostats shall be allocated to 1-4 RMODs each supporting a zoned HVAC unit.
9.3 Expansion capability shall be available by adding additional Controllers and respective RMODs.

9.4 Controller shall communicate through a two-conductor twisted pair RS-485 data link and shall be daisy chained between all system communicating components.

9.5 The controller shall be capable of establishing, adjusting and storing both an occupied and unoccupied schedule in a seven-day format. Scheduling increments shall be in one-minute intervals, with four program periods available per day.

9.6 The controller shall schedule individual or global thermostat set points for each mode.

9.7 The controller shall provide individual thermostat name assignments up to 20 characters each.

9.8 The controller shall display up to twenty thermostats or devices concurrently. Each thermostat or device listing shall display a numerical and descriptive identification, occupied and unoccupied heating and cooling set points with additional diagnostic information. Diagnostic information shall include set point lock status, mode of operation, space temperature, date and time of day.

9.9 The controller shall provide the ability to monitor and display at the operating computer: outside air, return air and mixed air temperatures for each HVAC unit or zoned system. Calibration of the system sensors shall be adjustable from the controller without requiring the sensor to be taken out of service.

9.10 The controller and system software shall provide print capability of all occupied and unoccupied heating and cooling set points, thermostat schedules and diagnostic information.

9.11 The controller shall provide individual or global temporary mode overrides (Occupied or Unoccupied) of the thermostat schedule. Upon the next event time, the thermostat will revert to its programmed schedule.

9.12 The controller shall provide up to 20 holiday schedules with up to 31 days per schedule. Additionally, an override feature shall be available to temporarily revise one or more schedules.

9.13 The controller shall provide a remote or on-site Trend Logging function with data storage to review a minimum 30 days of temperature and RA/SA temperatures from every unit and thermostat in the system.

9.14 Controller operation shall be based on a poll of each thermostat or communicating device in the control system every 60 seconds, providing operating conditions and updates to the Controller.

9.15 Controller shall maintain communication with each RMOD and its respective thermostats in the system. If communications are interrupted or lost, the controller and each RMOD will operate in a communication failure mode to maintain 70 degree Heat and 75 degree Cool temperatures in the facility.

9.16 The system components shall operate without use of an external time clock. In the event of power loss, all program schedules shall be retained indefinitely in non-volatile memory. The calendar date and time shall remain uninterrupted during power loss. The system shall restart and resume normal operation upon power restoration.

PART 10: RMOD Controller

10.1 Each zoned HVAC unit shall contain a stand-alone controller (RMOD), a microprocessor based digital HVAC Relay Module.

10.2 RMOD shall have the ability to communicate with up to 20 thermostats.

10.3 RMOD shall be universal, having the ability to control Gas / Electric 2-stage heat and cool, as well as Heat Pump systems, 2C / 3H.

10.4 RMOD shall include an onboard capacity controller and algorithm capable of providing high and low limits to protect the HVAC equipment.

10.5 The RMOD controller will be automatic changeover logic. The system utilizes first call priority and majority rule operation. When a call is made to the system, the HVAC system will be turned on to the proper mode. During the operation of the HVAC unit, the RMOD controller will poll all zones every 60 seconds to determine that the majority of zones are being satisfied and not requesting or calling for the opposite mode.

10.6 If the RMOD recognizes a majority of the zones are calling for the opposite mode during the poll, the changeover to the opposite mode will commence after a maximum of four minutes in the existing mode to attempt to satisfy all existing calls. After four minutes, the existing mode

equipment is terminated with the blower continuing to purge the system for 240 seconds. After the purge cycle is completed, the dampers will take 90 seconds to reposition themselves for the opposite mode. After the dampers reposition themselves, the opposite mode equipment is energized. If the system has satisfied all calls, all dampers shall modulate to the 50% position for ventilation.

10.7 The RMOD controller will communicate to its assigned zone dampers the mode the system is in, and the zone thermostats will notify the damper of which position to modulate to meet that zone's temperature requirement.

10.8 The RMOD controller shall have a selectable fan option for continuous or intermittent operation.

PART 11: Capacity Controller (HVAC Equipment Protection)

11.1 The RMOD shall contain a capacity control that receives the heating or cooling signal from the system controller and regulates the equipment (on and off) to meet the building requirements.

11.2 The RMOD controller shall be equipped with a Leaving Air Temperature sensor constantly monitoring discharge temperature at the RMOD.

11.3 The capacity control shall have the capability to shut down stages based on a rise or fall in leaving air temperature above or below a fully adjustable range of temperature. The system shall provide protection from short cycling and protect the unit from coil freeze up or overheating the heat exchanger.

11.4 Staging operations shall be incorporated into the RMOD capacity control function based on time and leaving air temperature strategy.

PART 12: Zone Temperature Sensors

12.1 ZonexCommander (Plus) shall utilize Modulating Thermostats (ModStat), Stand-Alone 2H / 2C thermostats (DIGICOM), and Heat Pump thermostats (DIGIHP) to address demands of individual systems, modulating zone dampers or VAV terminal units.

12.2 The typical Zone Temperature Sensor (Model ModStat) will contain all of the electronics to:

12.3 Control fully modulating zone dampers and to provide for proper temperature requirement.

12.4 Include push buttons on the face of control to set independent heating and cooling set points and to maintain a minimum two-degree dead band.

12.5 The push buttons allow the operator to change or review the ModStat set points.

12.6 The ModStat, if remotely locked from the System controller, shall provide local control of +/- 2 degrees from the locked heating or cooling set point. The adjustable temperature range is from 55 to 95 degrees F. Celsius display shall also be available.

12.7 The ModStat shall contain one microprocessor that receives the current temperature from the space, which communicates this information to the central control microprocessor via a 2-wire unshielded data link.

12.8 The ModStat shall have a large digital display showing current space temperature, the current mode of operation and the heating and cooling set points established for that zone.

12.9 The ModStat shall also be equipped with an off switch; when initiated, its zone damper will go fully closed.

12.10 Each ModStat can control up to three slaved dampers. The ModStat shall be available with Remote sensor capability.

12.11 When utilizing perimeter electric or hot water baseboard heating for supplemental heating, the thermostat operates a zone damper only for airflow and energizes the supplemental heat when the temperature drops two degrees below set point. At one degree below set point, it signals the system of a heating call.

PART 13: DIGICOM and DIGIHP Thermostat

13.1 Each thermostat shall support stand-alone unit.

13.2 Each thermostat shall be capable of controlling two heat and two cool stages with independent fan operation.
13.3 Each thermostat shall provide a cooling minimum run time of 120 seconds upon stage initiation.
13.4 Each thermostat shall provide time and temperature conditions to inhibit second stage operation.
13.5 Each thermostat shall provide a 2-minute minimum off delay to prevent cooling equipment short cycling.
13.6 Each thermostat shall provide a continuous fan function during the occupied mode of operation.
13.7 Each thermostat shall have the ability to automatically change over between heat and cool modes.
13.8 Each thermostat shall receive command to lock set points and all thermostat functions through the operating software without use of manual jumpers or dip switches.
13.9 Each thermostat shall provide a continuous illuminated temperature display.

PART 14: SENDCOM SENSOR - Remote Communicating Duct Temperature Sensor

14.1 The duct sensor shall be capable of broadcasting two duct air temperatures for each stand-alone thermostat application.
14.2 The duct sensor shall be capable of broadcasting two duct air temperatures for each additional RMOD installation.
14.3 The duct sensor shall provide a selectable address to coincide with its respective stand-alone thermostat address.
14.4 The duct sensor shall integrate with the system without any software editing.
14.5 The SENDCOM remote duct temperature sensor shall connect into the communications bus at any point within the link.
14.6 Zoned systems will incorporate the SENDCOM function via their respective Relay Module (RMOD).

PART 15: RLYCOM Communicating Relay Module

15.1 Each relay module shall provide generic device scheduling using on/off logic, up to four events per day.
15.2 All event schedules shall be available to be entered in one-minute increments.
15.3 Each relay module shall provide 2- SPDT dry relay contacts for pilot duty switching applications.
15.4 Each relay module shall be capable of broadcasting operating modes (Occupied and Unoccupied) locally and at the operating computer.
15.5 Each relay module shall provide a local mode override function to alternate between operating modes without use of a computer.
15.6 Each relay module shall provide a unique address to identify the device when queried by the controller.

PART 16: Bypass Dampers and Controls

16.1 The modulating bypass damper(s) are to be installed as shown on accompanying drawings. When utilizing a ceiling return, there must be a short return plenum with the bypass directly connected to the supply and return plenum.
16.2 When the HVAC unit utilizes an economizer section, the return air inlet to the return air plenum must contain counter balanced dampers to prevent air pressurization of the return air system.
16.3 Each round bypass damper (Model STMPD) shall consist of 20-22 gauge galvanized metal duct fitted with an elliptical damper to provide linear airflow. The damper shall contain a foam seal to prevent leakage when fully closed. Each damper will contain a full stall 24-volt modulating actuator, which shall not draw more than 2 VA on one drive assembly. The damper shell will be crimped on one end and beaded on both ends for damper rigidity.

16.4 Each rectangular bypass damper (Model STCD) shall be constructed of a 20-gauge "snap-lock" steel frame with S & Drive connections. The total length of the damper will be 16". Dampers 10" and smaller in height will utilize single blade construction; dampers larger than 10" in height will utilize opposed blade construction. The damper blades are of formed steel design with gasketed stops to provide quiet operation and structural integrity.

16.5 The bypass damper shall be controlled by a static pressure sensing air switch with a dead band. This device shall be located downstream of the bypass connection from the supply plenum and upstream from the first zone damper. This device continually senses the discharge air static pressure and signals the bypass damper to modulate open or close.

16.6 Up to three bypass dampers can be slaved together with one static pressure sensor and transformer.

16.7 The transformer powering the bypass damper shall only be energized when the HVAC indoor blower is operating

PART 17: Zone Dampers

17.1 Each round zone damper shall consist of 20-22 gauge galvanized metal duct fitted with an elliptical damper to provide linear airflow. The damper shall contain a foam seal to prevent leakage when fully closed. Each damper will contain a full stall 24-volt modulating actuator, which shall not draw more than 2 VA on one drive assembly. The damper shell will be crimped on one end and beaded on both ends for damper rigidity. Dampers shall be equipped with min/max position stops and indicators.

17.2 Each rectangular zone damper shall be constructed of a 20-gauge "snap-lock" steel frame with S & Drive connections. The total length of the damper will be 16". Dampers 10" and smaller in height will utilize single blade construction; those dampers larger than 10" in height will utilize opposed blade construction. The damper blades are of formed steel design with gasketed stops to provide quiet operation and structural integrity. Dampers shall be equipped with min/max position stops and indicators.

17.3 Zone dampers shall be fully modulating in operation based on input received from each zone thermostat. Modulation shall be predicated on variance from set point. If the system has satisfied all calls, all dampers shall modulate to the 50% position for ventilation.

17.4 All zone dampers shall be connected to its zone thermostat by 3-wire, 18-gauge copper wiring. The zone thermostat shall continuously monitor room temperature and modulate damper position based on variance from its set point to provide effective temperature control as required.

PART 18: Transformers and Wiring

18.1 An independent 24-volt transformer sized at 2 VA per zone damper or D-Fuser shall power the RMOD and be sized appropriately to support all zone dampers in the system.

18.2 The ZNXPLUS controller and bypass dampers shall be served by independent 40 VA/ 24-volt transformers.

18.3 All power wiring of this system shall be 24-volt AC.

18.4 All communications wire shall be two-wire unshielded or shielded twisted pair.

PART 19: Software

19.1 Access to the system, whether local or remote, shall be accomplished using the Zonex Systems ZonexCommander (PLUS) Software.

19.2 The software shall be capable of, but not limited to: listing all thermostat numerical and descriptive identification, occupied and unoccupied operational modes, heating and cooling set points and current room temperatures to include diagnostic information. Diagnostic information for each communicating thermostat shall include set point lock status, thermostat mode and space temperature indication. Diagnostic information for each system shall include supply air, return air and mixed air temperatures, date and time of day reference.

19.3 The software shall be capable of providing monitoring and modifying system configurations for all components.

19.4 System software shall be nonproprietary, unlicensed and fully copyable to enhance user access and interaction with the system.

PART 20: Service and Warranty

20.1 Upon completion of installation, the system shall be started up and initial programming completed. The equipment being operated by the specified control system shall be in operation and fully checked. The entire system must be in operation for a period of 24 hours prior to seeking acceptance from the owner/engineer.

20.2 The control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within 24 months from date of acceptance by owner/engineer, any of the control equipment herein described is proved to be defective in workmanship or material, the control equipment manufacturer shall provide a replacement component.

20.3 Assist with the installation and setup of owner provided computers, phone connections and startup, including loading of software and operator use of system.

20.4 Program all applicable fields for thermostat scheduling as required to suit building owner's requirements.

20.5 Coordinate with owner the addressing and naming of all thermostats and devices in the system.

End of Section 15950