GEN V Control System
Using
Programmable Wired Thermostats
and/or
Wireless Zone Sensors (TAP)

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, and reheat 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.

2.3 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.

2.4 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 a commercial modulating Auto Changeover Building Automation System with modulating Bypass that controls a single HVAC unit and supports 2 - 20 modulating zones per RTU or split system. Zones shall be controlled via wired programmable thermostats or a wireless zone sensor. The *GEN V* control panel shall be Universal and support Gas/Electric or Heat Pump applications with two cooling stages and three stages of Heat.
6.2 The "HUB" thermostat shall be central control point for the system to configure, manage, and monitor system operation.
6.3 Zone dampers shall be fully modulating with elliptical dampers. The system shall poll each thermostat every 60 seconds to evaluate the number of heating and cooling calls in the System. Control decisions shall be Vote based. A priority selection device shall be available to weight or add priority to one or more zones from the HUB thermostat. Priority selections shall be 0, 1, 2, or 3 votes selectable for each thermostat or wireless sensor independently. System shall also provide an Opposed Call feature to address maverick or rouge zones in the system.
6.4 The HUB thermostat shall display outside air temperature and Leaving and Return Air Temperatures at all times from the unit and provide for an adjustable setting for cooling and heating cut out set points. Occupied and unoccupied set up and set back capability shall also be available with 2 – 8-hour override capability. An individual or global thermostat locking function shall be available from the HUB providing minimum local control at each thermostat in the system.
6.5 The System shall provide full control of HVAC heating and cooling equipment in multiple zone applications. System shall also support non zoned RTU or split systems networked into the system and all systems and zones shall be accessible to view, monitor and control from the HUB thermostat.

PART 7: Control Manufacturer

7.1 The control system will be the *GEN V – Control* 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.zonexproducts.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 they choose to observe the actual installation of proposed substitution.

PART 8: Stand Alone System Controller

8.1 Each zoned HVAC unit shall contain a stand-alone microprocessor controller capable of supporting up to 20 modulating zones, to be controlled with wired thermostats or wireless zone sensors on site directly from the HUB thermostat. A computer, mobile device, or internet connection is not required for system operation.

8.2 The system controller shall be universal and equipped to handle Gas / Electric or Heat Pump units and will communicate and power all zones with one twisted 3 wire data link and 24-volt AC power daisy chained stat to stat, System controller shall power all modulating or 2-wire zone dampers in the system with no more than 1 – 24V 100 VA transformer.

8.3 The system controller will be automatic changeover logic. The system utilizes first call priority and majority rule operation. System must address or have the ability to address opposing calls. 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 GEN V system controller will poll all zones every 60 seconds to determine that the majority of zones are being satisfied and not requiring opposite mode operation.

8.4 If the majority of the zones want the opposite mode during the polling, the changeover to the opposite mode will start after a maximum of five minutes in the existing mode to attempt to satisfy all calls in this mode. After five minutes, the existing mode of operation 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 is energized. If the system has satisfied all calls, all dampers shall modulate to approximately 40% position for ventilation.

8.5 The system controller will communicate to the zone thermostats the mode the system is in, and the zone thermostats will notify the damper of which position to meet that zone's needs.

8.6 The system controller shall include an onboard capacity controller and algorithm to protect the HVAC equipment.

8.7 GEN V controller shall support ADR functions and provide FDD alerts to meet California Title 24 and other states energy requirements.

PART 9: (Communications Hub)

9.1 Any Thermostat in the system shall be capable of communicating with the *GEN V* Controller to initiate control sequences.

9.2 System schedules i.e. set up and set back times along with days of operation shall be established at the HUB thermostat.

9.3 Set points shall be lockable, either individually or globally, from the HUB thermostat, allowing for minimum temperature adjustment at each local thermostat.

9.4 The HUB thermostat shall monitor temperatures, both occupied and unoccupied set points, shall be established either individually or globally from the HUB thermostat.

9.5 Second Stage delay operation shall be initiated by time or temperature selection from the HUB.

9.6 The HUB shall provide adjustable override hours for system thermostats for 2 – 8 hours.

9.7 The HUB thermostat shall provide a selectable fan option for continuous or intermittent operation.

9.8 The system shall include an onboard capacity controller and algorithm based on time and discharge air temperature to protect the HVAC equipment. High and low limit protections to protect the coil from freeze up or premature heat exchanger failure shall be built in to allow adjustment and calibration from the HUB thermostat.

9.9 System shall be vote based and the HUB thermostat shall provide the ability to establish system priority with 1, 2 or 3 additional votes on one or all thermostats in the system, establishing priority votes to accelerate changeover operation. A "0" or null option shall also be available.

9.10 Unit type Gas, Electric, Heat Pump OBO or OBB shall be established from the HUB thermostat.

9.11 The system controller shall be equipped with an onboard diagnostic accessed via the HUB thermostat to ensure the installing contractor's control wiring and communication wiring are operational.

9.12 The HUB thermostat shall provide the air balance contractor with the ability to open all zone dampers and energize the fan from the HUB thermostat.

9.13 The system controller shall allow the contractor to provide default occupied and unoccupied set points for every thermostat or sensor in the system directly from the HUB thermostat.

9.14 Maverick or rogue system calls shall be recognized and, if not addressed with a field selectable 15 – 30-minute period, system shall purge and satisfy the maverick call. This feature may be enabled or disabled from the HUB thermostat.

9.15 Temperature format F Fahrenheit or C Celsius shall be selectable at the HUB thermostat and, when selected, any and all temperature or sensing devices shall be displayed in that temperature format.

9.16 HUB thermostat shall provide all time clock functions for the system.

9.17 HUB thermostat shall enable / disable vacation scheduling.

9.18 Morning warm-up shall be enabled from the HUB thermostat.

9.19 HUB thermostat shall provide password capability to protect the system and to ensure only authorized operators interact and control the system functions.

9.20 GEN V controller shall retain all set points in non-volatile memory.

9.21 All Thermostat functions shall be available for review from each system thermostat to streamline service and system trouble shooting.

9.22 Manufacturer's Default settings may be established or reset from the HUB thermostat.

Part 10: Capacity Controller (HVAC Equipment Protection)

10.1 The capacity control receives the heating or cooling signal from the system controller and the cut in and cut out set points established at the HUB to regulate the equipment (on and off) to meet the building requirements.

10.2 The *GEN V* controller shall be equipped with a Leaving Air Temperature sensor to constantly monitor and display the discharge air temperature along with Return Air Temperature. Outside air temperatures shall be displayed at the HUB's system diagnostics screen.

10.3 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 temperatures. The system shall provide protection from short cycling and protect the unit from coil freeze up or overheating the heat exchanger.

10.4 Capacity control shall also provide second stage heating or cooling operation based on a fully adjustable timer with a range of 3 – 30 minutes in increments of 1 minute. Second stage operation shall be initiated based on time and leaving air temperature selectable options on the HUB.

PART 11: Zone Temperature Sensors (Zone Thermostats)

11.1 The typical Zone Temperature Sensor is a wired thermostat (EzTouchX) or wireless zone sensor (TAP) and will contain all of the electronics to:

11.2 Control fully modulating or two position zone dampers to provide for proper temperature control.

11.3 Thermostats shall include color LCD touch screen control to set independent heating and cooling set points and to contain a minimum two-degree dead band.

11.4 Thermostats shall include touch screen that allows the operator to change or review the thermostat set points along with multiple and selectable thermostat control functions, display options and diagnostic capabilities.

11.5 The thermostat, if remotely locked from the HUB shall provide local control of +/- 2 degrees from the locked heating or cooling set point or "0" degrees if required. The adjustable temperature range is from 55 to 95 degrees F. Celsius display shall also be available.

11.6 Each zone thermostat shall contain one microprocessor that receives the current temperature from the space, which communicates to the central *GEN V* control microprocessor via a 3-wire RS 485 data communications link.

11.7 The zone thermostat shall have a large digital display showing current space temperature, time, day, current mode of operation, and the heating & cooling set points established for that zone.

11.8 Each zone thermostat shall have the ability to be switched to the OFF mode; when initiated, its zone damper will drive to the fully closed position.

11.9 Each zone thermostat can control up to three slaved modulating dampers. Two or more slaved two position dampers shall require an additional transformer and relay(s).

11.10 Thermostat shall be available with Remote sensor capability.

11.11 Temperature Access Point or a TAP is available and shall communicate wirelessly to its specific zone damper equipped with a Damper Control Board. Each TAP operates like a zone thermostat and shall be managed and controlled from the HUB.

11.12 When utilizing perimeter electric or hot water baseboard heating for supplemental heating, the thermostat or TAP with Damper Control Board 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. Heat range shall be adjustable at the HUB thermostat from 2-4 degrees.

11.13 When utilizing reheat feature, the thermostat shall energize reheat and modulate damper 40% to provide space temperature heating.

11.14 System shall support control and network one or multiple standalone units using the SATouch X LCD color touch screen thermostat integrated into same system, all accessible locally from the HUB.

PART 12: Bypass Dampers and Controls

12.1 The modulating bypass damper(s) with integrated static pressure control 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.

12.2 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.

12.3 Each round bypass damper (Model STBP) 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.

12.4 Each rectangular bypass damper (Model STCDBP) 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.

12.5 The bypass damper shall be controlled by an electronic integrated static pressure control. This bypass sensor 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.

12.6 Bypass may be slaved with additional dampers, if required, to provide additional bypass; or consider utilizing one larger rectangular bypass.

12.7 The independent 24V transformer powering the bypass damper shall only be energized when the HVAC indoor blower is operating.

PART 13: Zone Dampers

13.1 Each round zone damper (Model STMPD) used with wired thermostats, 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. A damper board to accommodate 24 V power shall reside on each damper.

13.2 Each rectangular zone 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; 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. A damper board to accommodate 24 V power shall reside on each damper.

13.3 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 40% position for ventilation.

13.4 If wireless Temperature Access Point (TAP) is utilized to replace or substitute for a wired zone thermostat each TAP shall communicate to and sync with its respective Damper Control Board.

PART 14: Transformers and Wiring

14.1 An independent 24-volt transformer sized at 5 VA per zone damper shall power the *GEN V* System Controller and all dampers in the system.

14.2 The bypass dampers shall be served by an independent 40 VA / 24-volt transformer. The load side of the blower motor starter shall power this transformer.

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

END OF SECTION 15950

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