SECTION 23 09 00 – AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 AUTOMATIC TEMPERATURE CONTROLS

A. Provide an extension to an existing DDC control system. The extension shall be Apogee product installed by Siemens Industry, Inc.

B. This contractor shall review all specifications of Division 15000 and 16000 or the mechanical and electrical drawings. This contractor shall include in his price miscellaneous control wiring for mechanical systems installed as part of this project that require field control wiring.

C. This contractor shall provide power to DDC controls if it is not shown on Division 16000 drawings or from locations shown on Division 16000 drawings.

D. Items of work included are as follows:
   1. Provide all necessary direct digital control hardware and software to meet the system's functional specifications.
   2. Update graphics on the existing Operator Workstation.
   3. Prepare a complete submittal for approval including control wiring diagrams, network wiring riser diagram, product cut sheets, sequences of operations and start-up sheets.
   4. Install and wire all DDC controls and associated devices or coordinate factory mounting and wiring with equipment vendors as specified.
   5. Provide static testing of control devices after they are installed. Provide dynamic commissioning of the control systems based upon the sequences of operations. Provide a working demonstration of the systems to the Owner, Engineer and Contractor.
   6. Provide operator and technician orientation and training consisting of 4-hours of on-site instruction.
   7. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

E. The controls vendor shall install all equipment in a neat and quality manner. All electrical equipment and enclosures shall have UL listings. The electrical installation shall adhere to national, state, and local codes. All workmanship shall be subject to inspection by the Architect, Engineer, and Building staff.

F. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours. This warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

A. Controller Networking
   1. This contractor shall evaluate the capacity of the existing network and subnetworks before bidding. If additional is needed to handle the new controllers, or if there is not a controller within a reasonable distance from the new controllers, then a new field panel with subnetwork capacity shall be added as part of this project.
      a. Provide mounting, powering and network wiring. Wire the primary Ethernet network to the nearest connection point of the building BAS network. Provide subnetworking to all new DDC controllers.
   2. If a field panel exists with enough capacity, tie-in the new DDC controllers to the existing.
      a. DDC controllers (Field Panels)
   3. Provide programmable controllers for any sequences that do not fit a standard terminal unit sequence.
   4. Controllers shall be Siemens Apogee PXC model.

B. Terminal Unit Controllers
   1. Provide programmable controllers for any sequences that do not fit a standard terminal unit sequence.
   2. Provide Siemens Apogee TEC model for terminal unit controls.

C. Zone graphics
   1. Tie-in any new controllers to the existing Apogee Insight Server. Distribute all new graphics and software to the existing Operator Workstations.
   2. If a fitout is a portion of a floor, follow the existing format of graphics and interface for the terminal units on that floor.
   3. If a fitout covers an entire floor, the BAS contractor shall request an office layout floor plan, such as the furniture layout or space usage layout, to be used as a background for a floor graphic.
   4. Floor Graphics:
      a. As floors are retrofitted, floor plan graphics shall be added. The floor plan graphic shall represent the terminal unit zones. The operator shall be able to see the zone setpoint and temperature for each zone. The zones shall change color as the zone temperature moves from acceptable comfort to near comfort to out of comfort zone. Provide a key on the graphics to instruct the operator on the color conventions.
      b. If the floor plan to too big for the Graphical screen, provide a zoom feature or breakdown the floor into areas.
   5. If the tenant wishes to have an operator interface, they have option to :
      a. Purchase a package to set up an Operator Workstation as an extension of the Siemens Apogee system. The package shall include PC hardware (optional for owner to provide), software license, and graphic creation and user setup programming.
      b. Purchase an App that is compatible with an Android device. Graphic creation and user setup programming shall be provided by the BAS contractor.

D. ELECTRONIC ACTUATOR SPECIFICATION
   1. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return as indicated in the control sequences. Specified failsafe actuators shall require mechanical spring return. Modulating actuators shall be positive positioning, responding

to a 2-10VDC or 4-20mA signal. There shall be a visual position indicator on the actuator. Provide position end switches on actuators used for 2-position isolation. Provide Siemens actuators.

E. SENSORS
1. Space temperature sensors shall intelligent sensing and display modules. The module shall include a 10,000-ohm thermister sensor and an LCD display. push buttons shall allow occupancy override and limited setpoint adjustment.
2. Temperature sensors used in the duct at the fan discharge, in the return duct or in the outdoor air intake shall be probe sensors. All sensors shall come with an electrical utility box.
3. Humidity sensors shall be 4-20mA transmitters. Provide bulk polymer type sensors that can read from 5% to 95%. The sensor shall be housed in a probe that can be mounted through the wall of the duct. Use duct probe sensors for the return air and at the outdoor air intake.
4. Provide CO2 sensors where called for in the sequences or shown on the drawings. Provide a Siemens series 2200 sensor.
   a. Include a compatible controller and sensor network wiring to meet the application.

F. INDUCED CURRENT TRANSMITTER: Provide split core analog current transmitters for contactors as specified in the sequence of operations. Provide adjustable ranging to monitor continuous loads up to 60 amperes. Transmitter shall have a 4 to 20 mA output. Limit off state leakage to 2 mA or less.

G. PANELS, RELAYS, AND TRANSFORMERS: Panels shall be steel Nema 1 rated enclosures with a swing door cover. Panels with loose doors are not acceptable. Provide a separate removable back plate to mount all the devices on. Relays and transformers shall be UL listed and shall be sized appropriately for the application.

PART 3 - EXECUTION

A. EXAMINATION
1. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.
2. Notify the owners representative in writing of conditions detrimental to the proper and timely completion of the work.
3. Do not begin work until all unsatisfactory conditions are resolved.

B. INSTALLATION
1. Install in accordance with manufacturer’s instructions.
2. Provide all miscellaneous devices, hardware, software, interconnection installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.
3. Furnish controls to the VAV box manufacturer for mounting at the factory. Coordinate delivery and schedule with Mechanical Contractor. Furnish a detailed installation and wiring guide to the factory. Furnish controller, flow sensor, and damper actuator. Provide control relay outputs of the box has electric heat.

C. LOCATION AND INSTALLATION OF COMPONENTS

1. Locate and install components for easy accessibility; in general, mount 60 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from owner's representative prior to installation.
2. Identify all equipment and panels. Provide permanently mounted tags for all panels.
3. Temperature Sensors – Provide temperature sensors in locations to sense the appropriate condition. Provide sensor where they are easy to access and service without special tools. Calibrate sensors to accuracy specified.

D. CONTROL WIRING
1. Provide all interlocks and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 16 and all national, state and local electrical codes.
2. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions.
3. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.
4. Provide power for all control components, including VAV controllers, from nearest electrical control panel or as indicated on the electrical drawings—coordinate with electrical contractor.
5. All control wiring shall be installed in raceways.

E. STARTUP AND COMMISSIONING
1. Provide a static checkout of all sensors, switches, actuators and relays. Document the checkout on startup sheets to be included in the M&O manuals.
2. Provide a dynamic startup of the AC units and VAV boxes when the mechanical system is full installed. Run through the cycles of operation to meet the sequence of operation. All modes of operation shall be checked.
3. Install the graphics on the existing Operator Workstation. Check all the points on the graphics to make sure the read true. Adjustable points shall be tested to verify that they command the program correctly. Test all alarm conditions to make sure the alarms annunciate properly.

F. TRAINING: Provide application engineer to instruct owner in operation of systems and equipment for a minimum of 4-hours. Instruction shall be given to the maintenance personnel and shall include but not limited to the operation, programming, maintenance and calibration of the DDC System.

G. DEMONSTRATION AND TURNOVER
1. Provide a dynamic demonstration of the system to the Owner, Engineer and Contractor after commissioning the system. Demonstrate the different modes of operation. Demonstrate what the user can monitor and adjust at the thermostats.
2. Demonstrate that the graphics operate correctly at the Operator Workstation.
3. Turnover the maintenance & operating manuals with as built drawings and updated sequences of operations.
4. Provide certificate stating that control system has been tested and adjusted for proper operation.

PART 4 - SEQUENCE OF OPERATION

A. SEQUENCE FOR AC UNITS
   1. Provide DDC control of packaged supplemental ac units.
   2. Provide a terminal unit controllers or programmable controller to be tied in to the BAS per the specification above.
   3. Program a generic schedule, that can be modified during commissioning, to change the AC unit mode from occupied to setback.
   4. Cycle the cooling to meet the space temperature setpoint. Cycle the fan with the call for cooling.
   5. Provide a leak detector for each ac unit. Install it in the leak pan or in the condensate pan with a setting above the normal condensate level. Monitor it at the BAS
   6. CONTROLS BY UNIT MANUFACTURER: The unit shall have its own minimum run times on the compressors. The unit shall cycle the condenser fan off its own controls.
   7. Wire the interlock between the evaporator and remote condenser.

B. SEQUENCE FOR VAV BOXES
   1. Boxes shall be cooling only pressure independent. Modulate the CFM of the box to maintain space temperature setpoint. The CFM on the box shall ramp from minimum to maximum based upon the VAV schedule.
   2. If the VAV boxes have heating, control the heating from the VAV box controller.
   3. Close the boxes when the base building air handling unit is unoccupied. Open the boxes when the unit goes to setback override or when warmup is started.

END OF SECTION