

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating units not supplied with factory-wired controls.
- B. Reference and Industry Standards
 - Enterprise Green Communities Criteria
 - 1. Mandatory Requirements: See the current edition of NYC overlay of EGC reference standard for full specifications.
 - a. NYC New Construction projects must achieve at least 60 optional points, and Substantial and Moderate Rehab projects must also achieve at least 55 optional points.
 - b. Building Performance Standard Criterion 5.1b
- C. Comply with the current edition of the New York City Energy Conservation Code.
- D. Comply with HPD-NYSERDA Retrofit electrification pilot technical requirements-Split system heat pump for space heating.
- E. Comply with HPD electric heating policy, if applicable.
- F. Comply with HPD resident paid heat pump policy, if applicable.
- G. Comply with relevant HPD design guidelines section or appendix.
- H. Project will elevate new HVAC and critical equipment above 2050's SLR-adjusted DFE or <https://www.nyc.gov/site/hpd/services-and-information/sustainability.page>
- I. <https://www.nyc.gov/site/hpd/services-and-information/blds.page>

1.2 ACTION SUBMITTALS

- A. Product Data: For each control device indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CONTROL SYSTEM

- A. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

2.3 DDC EQUIPMENT

- A. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
 - 1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
 - 2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Global communications.
 - b. Discrete/digital, analog, and I/O.
 - c. Monitoring, controlling, or addressing data points.
- B. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
 - 1. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
 - 2. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
 - 3. Universal I/Os: Provide software selectable binary or analog outputs.

- C. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
 - 1. Output ripple of 5.0 mV maximum peak to peak.
 - 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
 - 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

2.4 UNITARY CONTROLLERS

- A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.
 - 1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
 - 2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
 - 3. Enclosure: Dustproof rated for operation at 32 to 120 deg F (0 to 50 deg C).

2.5 TIME CLOCKS

- A. Solid-state, programmable time control with separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm.
- B. Time Clock shall be an integral part of the controller.

2.6 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for immersion, or direct pipe mounting as required.
- B. Thermistor Temperature Sensors:
 - 1. Accuracy: Plus or minus 0.5 deg F (0.3 deg C) at calibration point.
 - 2. Wire: Twisted, shielded-pair cable.
 - 3. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches (64 mm).
 - 4. Direct Piping Strap On Sensors: Brass or stainless-steel with temperature rating of -20deg to 250deg.
 - 5. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

2.7 THERMOSTATIC CONTROL VALVES

- A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
- B. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.
 - 1. Rating: Class 125 for service at **125 psig (860 kPa)** and **250 deg F (121 deg C)** operating conditions.
 - 2. Thermostatic Operator: Wax -filled integral sensor with integral adjustable dial.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify location of devices and other exposed control sensors with Drawings and room details before installation.
- B. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."
- C. Install hydronic instrument wells, valves, and other accessories according to Section 232113 "Hydronic Piping."
- D. Install Thermostatic Control Valves on inlet to apartment baseboard/convectors or where indicated on drawings.

3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Install building wire and cable according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Install signal and communication cable according to Section 271500 "Communications Horizontal Cabling."
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway.
 - 3. Install concealed cable in raceway.
 - 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
 - 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 - 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- D. Connect manual-reset limit controls independent of manual-control switch positions. b
- E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 2. Test and adjust controls and safeties.
 3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
 6. Test each system for compliance with sequence of operation.
 7. Test software and hardware interlocks.
- C. DDC Verification:
 1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
 2. Check instruments for proper location and accessibility.
 3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
 4. Check instrument tubing for proper fittings, slope, material, and support.
 5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
 6. Check temperature instruments and material and length of sensing elements.
 7. Check control valves. Verify that they are in correct direction.
- D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 230900