SECTION 23 09 43

PNEUMATIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes signal selectors, multi-purpose positioning relays, transmitters, receiver-
controllers, control panels, alarm systems, control valves and operators, control air
 dampers and operators, miscellaneous accessories and a complete air supply system.

1.2 REFERENCES

A. AMCA 500 (Air Movement and Control Association) - Test Methods for Louvers,
Dampers and Shutters.

B. ASME B16.22 (American Society of Mechanical Engineers) - Wrought Copper and
Copper Alloy Solder Joint Pressure Fittings.

C. ASME MC85.1 (American Society of Mechanical Engineers) - Terminology for
Automatic Control.

D. ASTM B32 - Solder Metal.

E. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field
Service.

F. ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

G. NEMA EMC1 (National Electrical Manufacturers Association) - Energy Management
Systems Definitions.

H. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and
Ventilation Systems.
1.3 SYSTEM DESCRIPTION

A. Provide pneumatic control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate all operating data, system drawings, piping and wiring diagrams, and written detailed operational description of sequences. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system. For automatic valves indicate size, flow, and pressure drop for each valve. Terminology in submittals in conformance with ASME MC85.1 and NEMA EMC1.

C. Product Data: Submit Provide description and engineering data for each control system component. Include sizing as requested.

D. Samples: TP 970 Series - Submit two of each type of room thermostat and cover and each exposed control component.

E. Design Data: Indicate sizing and selection of compressor and sizing of air tubing.

F. Manufacturer's Installation Instructions: Submit.

G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

H. Manufacturer's Field Report: Indicate operating conditions after detailed check of systems at Date of Substantial Completion.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Closeout procedures.

B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Revise shop drawings to reflect actual installation and operating sequences.

C. Operation and Maintenance Data: Submit systems descriptions, set points, and controls settings and adjustments. Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
1.6 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes and laws as well as the Stanford University Facilities Design Guidelines and all Stanford University Contracts documents.

B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Section 01 77 00 – Closeout Procedures: Product warranties and product bonds.

B. Provide five year manufacturer warranty for control air compressor.

1.10 MAINTENANCE SERVICE

A. Section 01 77 00 – Closeout Procedures: Requirements for maintenance service.

B. Provide service and maintenance of control system for one year from Date of Substantial Completion.

C. Provide complete service of controls systems, including callbacks. Make normal inspections in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.11 EXTRA MATERIALS

A. Section 01 77 00 – Closeout Procedures: Spare parts and maintenance products.
PART 2 - PRODUCTS

2.1 PNEUMATIC CONTROLS

A. Provide materials in accordance with applicable codes and laws as well as the Stanford University Facilities Design Guidelines and all Stanford University Contract documents.

2.2 WATER TEMPERATURE CONTROLLERS

A. Operate on adjustable differential over adjustable temperature range and suitable for operating control valve provided.

2.3 RECEIVER CONTROLLERS

A. Single or dual input models with control point adjustment direct or reverse acting with mechanical set point adjustment with locking device, proportional band adjustment, and authority adjustment. Provide proportional plus integral control mode.

B. Proportional band shall extend from 2-1/2 to 40 percent of primary sensor span, authority from 10 to 200 percent of primary sensor span and integral time 0.5 to 20 min.

C. Suitable for supply air pressure of 20 psig with input signals of 3 to 15 psig and output signal 0 to 15 psig.

2.4 PNEUMATIC SYSTEMS ACCESSORIES

A. Pressure Gages: Manufacturer's standard, black letters on white background, 3-1/2 inch diameter, flush or surface mounted, with front calibration screw suitable dial range calibrated to match sensor, in appropriate units.

B. Instrument Pressure Gages: Manufacturer's standard, black letters on white background, 1-1/2 inch diameter, stem mounted with suitable dial range.

C. Diaphragm Control and Instrument Valves: ½ inch, 3/8 inch forged brass body with reinforced teflon diaphragm, stainless steel spring, and color coded phenolic handle.

D. Gage Cocks: Tee or level handle, bronze, rated for 125 psig.

E. Relays: For summing, reversing, amplifying, highest or lowest pressure selection, with fixed 1:1 or adjustable input/output ratio.

F. Switches: With indicating plates, accessible adjustment, calibrated and marked.
2.5 AIR SUPPLY

A. Control and Instrumentation Tubing - Refer to Specialty Piping Systems Section.

B. Refrigerated Air Dryer - ZEK

2.6 CONTROL VALVES

A. Provide materials in accordance with applicable codes and laws as well as the Stanford University Facilities Design Guidelines and all Stanford University Contract documents.

2.7 CONTROL AIR DAMPERS

A. Provide materials in accordance with applicable codes and laws as well as the Stanford University Facilities Design Guidelines and all Stanford University Contract documents.

2.8 PNEUMATIC DAMPER OPERATORS

A. Provide materials in accordance with applicable codes and laws as well as the Stanford University Facilities Design Guidelines and all Stanford University Contract documents.

2.9 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Disconnect Switch: Factory-mount in control panel or on equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building systems to be controlled are ready to operate.

3.2 EXISTING WORK

A. Remove exposed abandoned tubing, including abandoned control devices above accessible ceiling finishes. Cut tubing flush with walls and floors, and patch surfaces.

B. Ensure access to existing controls and other installations which remain active and which require access. Modify installation or provide access panel as appropriate.
C. Extend existing control installations using materials and methods compatible with existing installations, or as specified.

3.3 INSTALLATION

A. Mount compressor and tank unit in compliance with the Facilities Design Guidelines.

B. Use copper tubing in mechanical rooms, where subject to damage or temperatures in excess of 200 degrees F, where adjacent to heating pipes passing through common sleeve, and where not readily accessible. In mechanical rooms bundled plastic tubing with suitable junction boxes or single plastic tubing with tray or raceway may be used.

C. Solder, Braze copper tubing except at instruments or equipment where compression fittings may be used.

D. Conceal tubing. Run exposed only in mechanical rooms, storage rooms and like, in neat manner and properly supported.

E. Mechanically attach tubing to supporting surfaces. Sleeve through concrete surfaces in minimum one inch sleeves, extended 6 inches above floors and one inch below bottom surface of slabs.

F. Purge tubing with dry, oil-free compressed air before connecting control instruments.

G. Check and verify location of thermostats and humidistats and other exposed control sensors with plans and room details before installation. Locate above floor per design. Align with lighting switches and humidistats.

H. Mount freeze-protection thermostats using flanges and element holders.

I. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

J. Provide separable sockets for liquids and flanges for air bulb elements.

K. Provide thermostats in aspirating boxes in front entrances and where indicated.

L. Provide guards on thermostats in entrances and other public areas and where indicated.

M. Provide valves with position indicators and with pilot positioners where sequenced with other controls.
N. Provide pilot positioners on pneumatic damper operators sequenced with other controls.

O. Install pressure gages or test plugs on branch lines at each receiver controller and signal lines at each transmitter excepting individual room controllers.

P. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

Q. Mount control panels adjacent to associated equipment on vibration free walls or freestanding angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

3.4 FIELD QUALITY CONTROL

A. 01 77 00 - Execution Requirements: Testing, adjusting, and balancing.

B. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

C. Test pneumatic systems to system pressure maximum of 30 psig. Check calibration of instruments. Recalibrate or replace.

3.5 DEMONSTRATION AND TRAINING

A. Demonstrate complete operation of systems, including sequence of operation after Date of Substantial Completion.

B. Demonstrate complete and operating system to Owner.

END OF SECTION