

8. DUCT HEATER :

- a. Provide duct heater equal to Chromalox type PTD capacity as indicated on drawings. Heater supplied shall be listed by Underwriters Laboratories, Inc. and bear UL label.
- b. Heater shall be provided with an approved temperature limiting control to deenergize the circuit. In addition, a supplementary independent control shall also be provided in duct heater to prevent overheating. This device shall be manually resettable or replaceable.

9. FANS :

- a. Provide utility sets, etc. as indicated. Fan type, capacity, resistance, speed, etc. are scheduled on drawings.
- b. Provide all utility sets with screw fastened cleanout doors. All other centrifugal fans shall have cleanout doors fastened with quick opening lever nuts and bar clamps.
- c. Unless otherwise noted, all fans complete with adjustable pitch drive, belts, belt guard one spare set of belts and motor as follows:
 - (1) Type "a" - American Standard series 116 with Airfoil blades, Class I, single inlet, single width, bearing and drive arrangement 3, with vortex dampers where noted on drawings. Optional manufacturers: Buffalo Forge, Trane, Carrier, and Westinghouse.
 - (2) Type "b" - American Standard Multiblade Utility set forward curved blade centrifugal fan, steel housing. * Optional manufacturers: Buffalo Forge, Trane, Westinghouse, and American Standard.
* Motorized shutter on fan outlet.
 - (3) Type "c" - Joy Axivane Series 1000 with straightening vanes, internal direct drive motor and individually adjustable pitch blades. Optional Manufacturer : Buffalo Forge
 - (4) Type "d" - Zephyr Model Z-80 by Penn Ventilator Co. with integral neoprene backdraft damper, less inlet grille. Provide Model WC-10 wall cap.

SECTION M-8

AUTOMATIC CONTROL

The requirements of Section ME-1 apply to all work hereunder.

1. GENERAL

- a. Unless otherwise directed, provide all pneumatic and electric control equipment required for proper operation of heating, ventilating and air conditioning systems.
- b. Unless otherwise directed, entire system of automatic control shall consist of standard products of a single manufacturer, either Johnson Service Company, Powers Regulator Co., Honeywell or Robertshaw.
- c. Temperature control of unit heaters is specified under the "Electrical" Section of the specifications.
- d. The temperature control manufacturer shall supervise the installation and operation of entire control system specified herein and shall furnish all wiring diagrams and piping diagrams required.
- e. Only mechanics who are regularly employed by the temperature control manufacturer shall install pneumatic piping and control equipment.
- f. On a 4" concrete base provide a duplex, high pressure air compressor consisting of two compressors and two motors with belt guards. Mount on a single base with one integral air receiver. At Contractor's option, in lieu of two compressors with one air receiver, duplicate compressors, each with its own air receiver may be furnished.

Construct air receiver for 100 psig working pressure in accordance with ASME code and mark with ASME stamp. Each compressor shall be of ample size to provide the necessary compressed air for the control system while operating not more than one-half of the time. Provide an air inlet filter, discharge stop valve, pressure relief valve, strainer with water and sediment trap, pressure reducing valve and two pressure gauges. Pipe receiver to convenient floor drain. Provide line circuit breaker combination duplex controller with electric alternator and on off selector switch for each motor. Provide pressure stats to operate one compressor and to cut in standby if necessary to provide adequate pressure. Provide vibration eliminating equipment as required. Provide an automatic self-contained refrigerated air dryer with capacity to produce -12°F atmospheric dew point of the required control air quantity.

- g. Except as noted, pneumatic tubing seamless copper, hard drawn where exposed, soft drawn where concealed. Conceal tubing in finished areas. Short connections to equipment, soft drawn copper or properly reinforced "Dekorin" polyethylene plastic tubing. Install all tubing, exposed and concealed, in a neat, workmanlike manner. At regular intervals secure tubing to supporting members with copper clips. In all cases, use lead shields to prevent contact between copper tubing and dissimilar metals. Connections to equipment, compression fittings; all others sweat type soldered with non-corrosive fluxes.
- h. Mount all relays, EP switches, PE switches, etc., on 16 gauge steel panels located adjacent to respective units and either mounted flush with the wall or extended from wall on legs. Provide panels with Manufacturer's Standard smooth gray or green finish.

On panel adjacent to air compressor provide 2-1/2" minimum diameter flush mounted gauges to indicate each main zone supply air pressure. On this panel or adjacent wall, mount a framed and glazed control diagram complete with operating instructions.

- i. At all thermostats, relays, EP switches, PE switches and other points throughout system where visual indications of air pressure is required for operating purposes provide 1-1/2" minimum diameter air pressure gauges. Room thermostats will not require gauges.
- j. Provide all controllers and associated equipment with fully proportional or two-position control action as required. All thermostats shall have adjustable set points and throttling ranges or differentials and generally shall have a sensitivity of one degree plus or minus. Master and/or sub-master thermostats shall have adjustable sensitivity ranges. Master thermostat shall have pneumatic follow-up or feed back to insure accurate and continuous calibration. All immersion thermostats shall be provided with wells of material recommended by the temperature control manufacturer for the particular service. Averaging bulbs shall be serpentine in ducts for average temperature measurement.
- k. Unless otherwise directed, provide all room thermostats with covers without thermometers and adjustable only by means of a removable key. Room thermostats shall be single temperature, day-night or summer-winter as required. Day-night thermostats shall have provision for manually re-setting to day temperature.
- l. Provide pilot positioners for all damper motors operated in sequence with other equipment. Where valves are operated in sequence with other equipment, the valve operator shall provide smooth, proportioning control over the desired range as specified. Operating ranges shall be adjustable to facilitate field changes. If required to obtain these results, provide pilot positioners.
- m. All operators shall fail safe in either normally open or normally closed position as required, and shall have ample power to provide smooth, proportioning control under design temperature and pressure conditions.
- n. All modulating valves shall have modulating plugs, V-port skirts or the equivalent. Single seal valves shall have renewable seats or discs. On water service, maximum pressure drop for two way valves shall not exceed 25% of the total system pressure drop and for three way valves shall not exceed 10 feet.

- o. All automatic valves globe or angle pattern with bodies, discs stems and stuffing boxes designed for not less than 125 psig working pressure. Valves 2" or smaller, all brass or bronze with screwed or union ends. Valves 2-1/2" and larger, IBBM with flanged ends. Stem packing either graphite type or Teflon. Packless designs will be acceptable.

- p. Unless otherwise directed, where used for modulating control dampers shall be balanced, multi-louver, opposed blade type; all others shall have parallel blades. Construct blades of 16 gauge galvanized steel, adequately reinforced to prevent distortion and vibration.

All blades interlocking, maximum blade width 8". Maximum blade length 48" without intermediate bearing and frame stiffener. Mount horizontally in a heavy gauge welded channel, angle or flat steel frame, fitted with solid air stops to prevent air leakage between frame and all blade edges. Provide corner braces on all frames measuring more than 24" x 24". Finish frame with two coats black enamel. Provide blades with brass trunnions operating in Oilite bearings securely mounted in damper frame. Hardware and operating linkages, brass or cadmium plated steel. Linkage adjustable in length, joints pin and clevis or ball and socket free of excessive play. Dampers shall be capable of being positioned accurately from 100% open to 100% closed and of maintaining any given position indefinitely. This requirement will be rigidly enforced. Dampers for use in high pressure and high velocity systems shall be of special design to minimize noise. Dampers behind all exterior louvers shall be Arrow or Proportionate.

- q. Provide manual reset freeze and fire protection thermostats where called for on control diagrams.

2. ATC PANEL

- a. Provide a cabinet type central control panel where shown in which shall be mounted EP, PE and other relays, timers, minimum positioners and pneumatic receiver controllers. Temperature and pressure indication gauges shall be flush mounted on the panel and grouped logically according to systems and identify with name plates.


3. CONTROL SEQUENCE

- a. See control diagram on drawings.

REVISIONS

NO.	DATE	ITEM	REF.

FIRM H.A. INC.
DESIGNED BY
DRAWN BY
CHECKED BY A E W
APPROVED BY KVB



SEAL H. A. J. NO. N-16
STATE OF MARYLAND
REGISTERED PROFESSIONAL ENGINEER
Henry I. Belli

STRUCTURAL ENGINEERING
VAN RENSSELAER P. SAXE
1701 ST. PAUL ST. BALTO, MD. 21202

MECHANICAL-ELECTRICAL ENGINEERING
HENRY ADAMS, INC.

CHRISTIE, NILES & ANDREWS ARCHITECTS
22 N. Pennsylvania Ave. Towson, Maryland 21286
1901 829-7810
202 742-1162

OFFICE BUILDING FOR NOTTINGHAM FARMS INC.
102 W. PENNSYLVANIA AVE.
TOWSON, MARYLAND 21204

SPECIFICATIONS

JOB NO.	6522	ME 7
SCALE	---	
DATE	SEPT. 27, 1966	
LAST REV.		

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