

Job #N-182  
January 31, 1958OUTLINE SPECIFICATIONS

for

HEATING, VENTILATING AND AIR CONDITIONING WORK

## H-01 SCOPE OF WORK

a. All required labor, materials, equipment, and Contractor's services necessary for complete installation of Heating, Ventilating and Air Conditioning Work in full conformity with requirements of all Authorities having jurisdiction; all as indicated on drawings and/or herein specified, including in general the following:

1. Central Boiler Plant (Located as indicated):

(a) Boilers shall generate steam at 110 psig. Steam shall be supplied to the following:

- |     |  |          |
|-----|--|----------|
| (1) | Underground distribution system,         | 100 psig |
| (2) | Boiler plant turbine driven auxiliaries, | 100 psig |
| (3) | Fuel oil heaters,                        | 100 psig |
| (4) | Plant ventilation heaters,               | 10 psig  |
| (5) | Deaerating heater and H.W. converters,   | 10 psig  |
| (6) | Domestic hot water heater,               | 10 psig  |
| (7) | Water storage tank heating,              | 45 psig  |

(b) Underground distribution system to Main Building shall supply steam at reduced pressures to the several direct heating systems, ventilating and air conditioning system converters, domestic hot water heaters, cafeteria and kitchen equipment, and miscellaneous equipment.

- |     |                                      |              |
|-----|--------------------------------------|--------------|
| (1) | Direct heating systems,              | 10 psi.      |
| (2) | Preheaters and reheaters,            | 10 psi.      |
| (3) | Domestic hot water heaters,          | 10 psi.      |
| (4) | Cafeteria and kitchen equipment,     | 45 psi.      |
| (5) | Miscellaneous equipment,             | As required. |
| (6) | Hot Water & Snow Melting Converters, | 45 psi.      |

MS, MC, VAB-MC

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2. Central Refrigeration Plant (Located as indicated): Electric driven centrifugal refrigeration compressors supplying chilled water to Main Building. Central cooling tower to provide condenser water for refrigeration machines.

3. Air Conditioning: Year-round automatic control of temperature and humidity. No winter humidification except "special" rooms. All systems, provide 100% outside air when outdoor conditions permit.

4. Mechanical Ventilation.

5. Heating:

- (a) Entrance Lobbies: Forced warm air.
- (b) Fire tower stairs: Direct radiation.
- (c) Truck Docks and Loading Platforms: Steam unit heaters.
- (d) Mechanical Equipment Rooms including Power-house: Steam unit heaters.
- (e) Ground Floor: Direct radiation forced hot water.
- (f) Auditorium: Direct radiation forced hot water.
- (g) Nitrate Film Storage Building: Electric-steam radiators.
- (h) Gatehouses: Electric radiant panels.

6. Steam Systems:

- (a) Service: Underground from Boiler Plant at 100 psig.
- (b) Reduced pressure steam to heating stacks, direct heating, hot water heating system converters, domestic water heaters, and as indicated.

7. Automatic Temperature Control Systems.

8. Alarms.

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9. Water Treatment.
10. Snow Melting System.
11. Excavation and backfill for steam and return conduits and buried chilled water mains.
12. Mechanical services and auxiliary piping for emergency diesel-electric generators.
13. Product Refrigeration.
14. Twenty-four Hour Air Conditioning Systems, as indicated.

b. Except where otherwise indicated or noted, all work covered by these specifications is located in a new central power plant, a new 8 story office building, cafeteria and auditorium building, nitrate film storage building, and gatehouses, to be erected in accordance with architectural diagrammatic sketches.

c. Material and equipment shall be as required by Standards of General Services Administration, Public Buildings Service, Construction Division.

H-02 WORK NOT INCLUDED

- a. Electrical wiring and mounting of starting equipment.
- b. Motor controllers, except for refrigeration compressors.
- c. Water supply and drain connections to within approximately 10 feet of equipment requiring same.
- d. Cutting and patching, except for correcting Contractor's mistakes.
- e. Louvres in doors and undercutting of doors.
- f. Louvres and screens set in masonry work.
- g. Setting of access doors.
- h. Concrete for foundations.
- i. Finished painting of piping and equipment.
- j. Flashing except cap flashing.

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- k. Domestic hot water heater.
- l. Emergency diesel-electric generators under Electrical Specifications.
- m. Cranes, monorails and hoists.
- n. Miscellaneous steelwork, platforms and ladders, access gratings in Power house, unless otherwise noted.

#### H-03 GENERAL ITEMS

a. Motor Controllers: Except for refrigeration compressors, furnished under Electrical Specifications.

b. Motors: NEMA; 1/2 hp and smaller, 120 volt, 1 phase, 60 cycle, AC; 3/4 hp to 125 hp, 460 volt, 3 phase, 60 cycle, AC; 150 hp and larger, including refrigeration compressor motors, 4160 volts, 3 phase, 60 cycle, AC, unless otherwise specified.

c. Foundations: Except for refrigeration compressors, concrete block enclosed in #18 ga galv welded steel form for all rotating machinery. Foundations, equal to weight of machinery.

d. Vibration Isolation Bases for each piece of rotating machinery, unless otherwise specified.

e. As-Built Drawings: Record all deviations from contract drawings and deliver to Owner cloth tracings showing work as actually installed.

f. Valve Tags and Charts: 2" diam aluminum numbered tags on all valves and controls, except radiator valves and valves at equipment. Approved metal framed charts, diagrams and lists showing operation of each system, and location and purpose of all valves and controls.

g. Access Doors: Provide concealed valves, controls, dampers and equipment requiring access with adequate sized access doors.

#### h. Painting:

1. Hangers and supports, and exposed piping and black steel and iron work: One coat zinc chromate primer.

2. Interior of all ductwork as far back as visible from outside: Flat black.

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3. All fans, motors, machinery, etc.: Factory prime coat.

#### H-04 BOILER PLANT AND STEAM DISTRIBUTION

a. Equipment: Boiler plant shall be complete including following:

1. Boilers: Three (3) boilers, 50,000 lbs per hour continuous rating at 110 psig with 212°F boiler feed and No. 6 fuel oil firing, 55,000 lbs per hour, two-hour peak rating. Boilers, two drum, cross drum, water tube type with integral water-cooled furnace and air cooled furnace floor, steel insulated casing, with setting for oil firing, arranged for easy conversion to coal firing with spreader stoker.

2. Burners: Mechanical pressure-steam atomizing type suitable for No. 6 fuel oil for normal operation and No. 2 fuel oil in cold starting, with forced draft air registers. Three (3) burners per boiler, each burner capable of 8 to 1 turndown without changing burner tip.

3. Induced Draft Centrifugal Fans with Stub Stacks: 2 boilers equipped with electric motor driven I.D. fans, 20 hp motor suitable for oil firing; 1 boiler equipped with back pressure turbine driven I.D. fan, complete with reducing gears. Fans and turbine, suitable for future coal firing by increasing fan speed.

4. Forced Draft Fans: Centrifugal type, with inlet vanes, located behind the boilers. Two F.D. fans equipped with 30 hp electric motor drives, one F.D. fan equipped with back-pressure turbine drive. Fans suitable for future coal firing, initially arranged for oil firing.

5. Spray or Tray Type Deaerating Feedwater Heater: Capacity shall be 150,000 lb per hour of feedwater at 228°F, with 1-5 psig steam to heater, 10 minutes storage capacity to overflow level. Design Working Pressure: 30 psig, ASME. Complete with accessories.

6. Condensate Receiver shall be 7'-0" dia x 14'-0" long with dished heads, 15 psig, ASME. Complete with accessories.

7. Condensate Transfer Pumps: Two pumps, capacity each: 350 gpm of 160°F water at 60 ft T.D.H. Pumps, single stage, centrifugal type, C.I. case, one driven by 7-1/2 hp electric motor, other driven by boiler-pressure steam turbine.

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8. Boiler Feed Pumps: Three (3) single stage, vertically split, centrifugal valve pumps, cast iron case, with mechanical seals. Capacities:

(a) 2 pumps, 350 gpm, 380' T.D.H. of 228°F feedwater, one pump electric motor drive, 60 hp, one pump back-pressure steam turbine.

(b) 1 pump: 115 gpm, 380' T.D.H. of 228°F feedwater with 40 hp electric motor drive.

(c) Furnish at discharge of each motor driven boiler feed pump, an excess pressure feedwater valve, and at steam line to turbine driven boiler feed pump, an excess pressure steam pump governor. Valves, set to maintain 30 psi excess of boiler feed pressure over boiler drum pressure.

9. Blow-Off Tank: 3'-0" dia. x 6'-6" high, 3/8" black steel, ASME stamp.

10. Boiler Feedwater Control: Single element type feedwater regulating valve. Capacity to pass 55,000 lbs per hour of feedwater, with pressure drop not to exceed 30 psi.

11. Combustion Controls:

(a) Semi-automatic gas-electric ignition for each burner.

(b) Flame safeguard system for each boiler, complete with limit controls, interlocks and panel located adjacent to each boiler.

(c) Automatic metered combustion control system, either electric or pneumatically operated, with provision for remote manual operation of any single actuator or valve on any boiler from central Boiler Control Board.

12. Central Boiler Control Board complete with following mounted thereon:

(a) Combustion controllers.

(b) Indicators for each boiler: Furnace draft, boiler outlet draft, windbox air pressure, boiler water level, smoke density.

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(c) Indicators for plant: Main steam header pressure, feedwater header pressure, fuel oil supply header pressure, liquid level for each No. 6 oil storage tank.

(d) Boiler meter recorders for each boiler: Steam flow and totalizer, air flow, and flue gas temperature.

(e) Recorders for plant: Steam flow and pressure to site distribution with totalizer, boiler feedwater temperature.

(f) Annunciator Alarms: 8 active alarms and 4 spare.

(g) Push button and pilot light for each:

(1) Motor driven I.D. and F.D. fan.

(2) Motor driven B.F. pump.

(3) Motor driven condensate transfer pumps.

(4) F.O. pump.

(5) Hot water pump.

(6) Roof fan.

(7) Supply ventilation fan.

13. Fuel Oil System consisting of following:

(a) Three (3) 60,000 gal. underground storage tanks, each with 560 lineal feet of 2" pipe hot water heating coil.

(b) Fuel pumps located in pit adjacent to storage tanks:

(1) Two (2) rotary screw pumps, each 25 gpm of No. 6 fuel oil, 150 psi T.D.H., 7-1/2 hp motors.

(2) One (1) rotary screw pump, 9 gpm of No. 6 fuel oil, 150 psi T.D.H., 3 hp motor.

(3) One (1) rotary screw pump, 3 gpm, of No. 2 fuel oil, 150 psi T.D.H., 1 hp motor.

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(c) Two (2) tubular fuel oil heaters, capacity each 25 gpm of No. 6 fuel oil from 100° F to 200° F with 100 psi steam.

(d) Complete fuel oil piping system, including fuel oil fill, vent, suction, return for each tank, and fuel oil supply and return from pump pit to boilers.

14. Fuel Oil Tank Hot Water Preheating System:

(a) Two (2) hot water converters, capacity each 40 gpm of water from 160 to 180° F with 5 psig steam.

(b) Two (2) vertically split, single stage, centrifugal volute pumps, bronze impeller, C.I. casing; capacity each 40 gpm, 70' T.D.H., 1-1/2 hp motor.

(c) Open expansion tank, 18" dia x 5'-0", complete with gauge glass and makeup water feeder, 30 psi D.W.P.

15. Air Compressors for Tube Cleaning and Pneumatic Controls:

(a) Two (2) single stage, water cooled air compressors, each 120 cfm piston displacement, 80 psig discharge, 20 hp motor.

(b) Water cooled after-cooler and moisture trap.

(c) Air receiver, 24" dia x 6'-0", 150 psi ASME.

(d) Pneumatic tube cleaners, complete with all accessories and wrenches.

16. Boiler Water Treatment:

(a) 50 gal. sodium sulphite tank with 1/4 hp chemical feeder complete with alarms and piping to deaerating heater.

(b) 100 gal phosphate tank with 1/4 hp chemical feeder, complete with alarm and piping to each boiler.

b. Steam Distribution System:

1. Complete steam, return and drip systems from boiler plant to mechanical equipment rooms in Main building.

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2. Steam: 100 psi.
3. Return: Pumped return from condensate or vacuum return pumps in mechanical equipment rooms.
4. Piping: Generally run at Basement ceiling or in tunnels below ground floor. Where underground, in presealed steel or tile conduit.
5. Necessary drip traps shall be furnished.
6. Pressure reducing valve stations located in each mechanical equipment room.

#### H-05 CENTRAL REFRIGERATION PLANT AND DISTRIBUTION

##### a. Equipment:

1. Compressors: Four (4) centrifugal type F-12 refrigeration compressors, complete including coolers and condensers, automatic suction damper and manual hot gas by-pass. Capacity each, to cool 2690 gpm chilled water from 54° F to 41.5° F with 4200 gpm of condenser water at 88° F. Compressor brake horsepower not to exceed 1500, including gear loss. Drive: 1500 hp, 1200 rpm synchronous motor, 0.8 p.f., 4160 volt, 60 cycle, AC, with direct connected exciter complete with controllers. Motors, shrouded with suitable ventilation duct connections.
2. Cooling Tower: 4 cells, induced draft type, transite casing, galvanized steel framing, redwood fill and eliminators; capacity each cell, 4200 gpm from 98° F to 88° F at 80° W.B., with 60 hp fan motor and gear. Tower to be erected on concrete basin, furnished under General Construction Work. Fan motors on 2 cells to be 2 speed type.
3. Condenser Water Pumps: Five (5) turbine type vertical centrifugal pumps, capacity each 4200 gpm, 100' T.D.H., 150 hp motors. Four (4) pump motors, 4160 volt, 3 phase, 60 cycle, AC; one (1) pump motor, 440 volt, 3 phase, 60 cycle, AC.
4. Chilled Water Pumps: Five (5) horizontally split, single stage, centrifugal volute pumps, bronze impellers, CI casing, capacity each, 2690 gpm; 250' T.D.H., 300 hp, 4160 volt, 60 cycle, 3 phase, AC.
5. Pump Out Units: Two (2) units, each complete with receiver, 36" dia x 16'-0" long, condensing unit, 10 hp, reciprocating, water cooled safety controls and refrigerant piping from each unit to 2 centrifugal refrigeration units.

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6. Water Treatment for chilled water and condenser water systems, complete with feeder tanks and one year's supply of chemicals.

7. Central Refrigeration Control Board complete with following mounted thereon:

(a) Start-stop push buttons and pilot lights for each:

- (1) Centrifugal refrigeration unit.
- (2) Chilled water pump.
- (3) Condenser water pump.
- (4) Cooling tower fans with hi-lo speed buttons for 2 speed motors.
- (5) Refrigeration room supply and exhaust ventilation fans.

(b) Open-Close push buttons and pilot lights for each of four (4) cooling tower inlet motorized 14" valves and each of two (2) cooling tower spray by-pass motorized 12" valves.

(c) Temperature indicators for:

- (1) Chilled water return to plant from distribution system.
- (2) Chilled water from each refrigeration unit.
- (3) Condenser water supply from cooling towers.
- (4) Condenser water from each refrigeration unit.

(d) Recorder for:

- (1) Chilled water supply and return temperature from plant to distribution system.
- (2) Chilled water flow to distribution system.

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(3) Tons of refrigeration to distribution system and totalize.

8. Cooling Tower and Condenser Water Winterizing System:

(a) Furnish steel pipe hot water heating coil set at bottom of entire cooling tower concrete flow channel and trace condenser water piping exposed to weather with circulating hot water piping; insulate traced piping.

(b) System shall be complete with hot water converter, hot water circulating pumps in duplicate, open expansion tank, and all interconnecting piping. Thermostat set in cooling tower flow channel shall control pump operation to prevent condenser water temperature from falling below 50° F.

9. Appurtenances: Air vents, drains, fill and makeup water piping, relief valves, and complete chilled water, condenser water, and refrigerant relief piping.

10. Chilled Water Distribution:

(a) From refrigeration plant to various chilled water coils and secondary chilled water systems in mechanical equipment rooms.

(b) Piping, generally run at Basement ceilings, in pipe tunnel under ground floor of main building and underground from refrigeration plant to main building. Where underground, black steel pipe, coated and wrapped.

(c) Provide air vents and drains as required.

H-06 AIR CONDITIONING

a. Conditions to be Maintained:

1. Summer: Inside, 78 F, 45% RH.  
Outside, 95 F DBT, 78 F WBT.
2. Winter: Inside, 70 F.  
Outside, 0 F.
3. As required for "special" rooms.

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b. Outside Air:

1. In general, 2 air changes per hour, except in Auditorium and Cafeteria 10 cfm per person.

2. 100% when outdoor conditions permit without use of refrigeration.

c. Systems:

1. Exterior Zones (1st to 7th Floors):

(a) Approximately 15 ft from exterior walls.

(b) Primary air induction type window unit systems, employing secondary air combination hot and chilled water coil.

(c) Units under each window as indicated.

(d) Primary air and combination hot and chilled water piping zoned according to exposure.

(e) Vertical air and water distribution.

(f) Manual chilled water valve at each unit.

2. Exterior Zone (Ground Floor):

(a) Approximately 15 ft from exterior walls.

(b) Conventional duct system with separate reheat coils for each exposure.

(c) Overhead distribution by means of straight-line type of diffuser discharging air along perimeter of wall.

3. Interior Zones (Ground to 7th Floors):

(a) Conventional single duct central systems, risers in shafts, conventional velocity horizontal ceiling distribution, ceiling diffusers or sidewall supply grilles.

(b) Centrally located return grilles where possible. Supply air diffusers and grilles, suitable for operation at 25% in excess and 25% less than indicated capacity.

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(c) Conference rooms: Separate supply ducts from fan rooms to each conference room containing (30) thirty or more people. Thermostat in conference room shall control individual reheaters. (Approximately twenty rooms of this type).

(d) Individual branch ducts, or diffusers or grilles to be provided with manual control (Young Regulator).

(e) In general, not less than six air changes per hour of supply air.

4. Lobbies and Public Areas: Single duct, conventional velocity individual steam reheat coils for each space.

5. Return Air (Ground thru 7th Floors): Conventional velocity risers in shafts and ceiling returns.

#### H-07 MECHANICAL VENTILATION

- |    |  |   |
|----|--|---|
| a. | Kitchen, toilet rooms, locker rooms, slop sink closets, electric closets, telephone closets:                   | Exhaust - conventional velocity shaft risers. |
| b. | Elevator machine rooms:  | Supply and exhaust.                           |
| c. | Switchgear rooms:  | Supply and exhaust.                           |
| d. | Garage:  | Supply and exhaust.                           |
| e. | Steam room:  | Supply and exhaust.                           |
| f. | Storage areas:   | Supply and exhaust.                           |
| g. | Mechanical equipment rooms:  | Supply and exhaust.                           |
| h. | Special rooms - Ozalid, Multi-lith, Projection, Hydro-cyanic, Sterilizers, General Medical, Laboratories, etc. | Supply and exhaust.                           |
| i. | Tunnels  | Exhaust.                                      |

#### H-08 DIRECT HEATING SYSTEMS

a. Entrance vestibules and non-air conditioned spaces shall be provided with forced flow convectors, unit heaters, or direct radiation of fin-tube type as required.

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b. Forced flow convectors and unit heater motors shall be thermostatically controlled.

c. Direct radiation, where applicable, shall be zone controlled from outdoor temperature.

#### H-09 DOMESTIC HOT WATER HEATERS

Furnished under Plumbing Work. Automatic steam valves installed by HVAC Contractor.

#### H-10 AIR HANDLING EQUIPMENT AND DISTRIBUTION

a. Location:

1. For 2nd to 7th Floors: Located in Penthouse fan rooms.
2. For Ground to 1st Floor: Located in Basement fan rooms.
3. For Cafeteria and Kitchen: Kitchen fan room.
4. For Auditorium: Auditorium fan room.
5. For Twenty-Four Hour Areas: Located as indicated.

b. Equipment:

1. In general, site erected.
2. Primary air (Exterior) system dehumidifiers: Dry chilled water coil type.
3. Conventional (Interior) system dehumidifiers: Dry chilled water coil type.
4. Filters:
  - (a) Outside and recirculated air: Renewable dry medium type for less than 10,000 cfm. For above 10,000 cfm, continuous automatic type.
5. Fans: Centrifugal, backward curved blading. Airfoil blading for systems with static pressure 5" and above. Inlet vane control, and access door in scroll. Sturtevant, American Blower, Buffalo Forge.

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6. Cooling Coils: Copper fin, copper tube, drainable, galv steel casing. Similar to Nesbitt.

7. Heating Coils: Construction, same as cooling coils. Similar to Nesbitt "Trombone".

8. Eliminators: After cooling coils; easily removable; coated steel.

9. Humidifiers: Pan type, copper float. Only for "special" systems.

10. Drain Pans: Coated steel.

11. Casings: High velocity systems, heavy construction; conventional systems, conventional construction.

12. Draft Gauges: At each filter bank and fan inlet vane control damper.

13. Window Units:

(a) Induction type, secondary coil, including discharge grille in window stool. Discharge grille similar to Barber Colman type ST.

(b) Enclosures: Continuous enclosure by others.

(c) One unit per window; unit length such that stop valves are contained within individual module width.

(d) Primary air per unit: As indicated.

(e) Carrier, York, Worthington.

14. Diffusers and Grilles:

(a) Diffusers: Induction type, in general similar to Tuttle and Bailey type DE-DRF.

(b) Supply grilles: Double deflection type with multi-shutter opposed blade damper. Titus, Barber-Colman. Grilles for Cafeteria perimeter and balcony, similar to Barber-Colman type AA continuous wall to wall as indicated.

(c) Return grilles: Fixed deflection type with multi-shutter opposed blade damper. Titus, Barber-Colman.

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#### H-11 EQUIPMENT - STEAM SYSTEMS

- a. Boiler Plant.
- b. Approximately 100 psi to Steam Service Room.
- c. Reduced to serve heating stacks for air conditioning and ventilating systems, direct heating, panel heating, domestic hot water, converters, kitchen and cafeteria equipment.
- d. Pressure Reducing Valves: 3-valve by-pass for each PRV. Foster, Kieley-Muller.
- e. Stop Valves: Jenkins, Crane, Walworth.
- f. Heating Specialties: Dunham, Sarco, Warren Webster.
- g. Vacuum and Return Pumps: Dunham or Nash.
- h. Converters: Patterson-Kelley, Alberger.

#### H-12 MATERIALS AND WORKMANSHIP - PIPING SYSTEMS

- a. Piping: Furnish all pipe, fittings, valves, flanges, controls, hangers, traps, drains, vents, insulation and items necessary or required to make systems complete. In general, unless otherwise specified, piping 3" and larger shall be welded, 1-1/4" and smaller shall be screwed, 1-1/2" to 2-1/2" may be screwed or welded at Contractor's option. Welding fittings to match pipe. All drip and pump return piping in underground distribution conduits shall be extra heavy weight.
- b. Pipe and Accessories:
  1. Chilled water (except Window Unit system): Black steel pipe, standard weight to 12" and 0.50" wall thickness for larger sizes. All valves and fittings, 250 psi standard except in penthouse fan rooms which will be 125 psi standard.
  2. Condenser water and jacket water system for diesels: Standard weight black steel pipe and 125 psi standard valves.
  3. Steam and drip piping, 100 psi or over: Standard weight black steel pipe and 250 psi standard valves and fittings. Screwed piping, extra heavy.

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4. Steam, return and drip piping, under 100 psi: Standard weight black steel and 125 psi standard valves and fitting. Screwed piping, extra heavy.
5. Boiler blow-off: Extra heavy weight black steel pipe and 250 psi standard valves and steel fittings.
6. Boiler feed and chemical feed: Standard weight black steel pipe and 250 psi standard valves and fittings.
7. Refrigerant relief: Standard weight black steel pipe.
8. Hot water heating system: Standard weight black steel pipe and 125 psi standard valves and fittings.
9. Panel heating and snow melting piping and coils: Standard weight wrought iron and 125 psi standard valves and fittings.
10. Drain and overflow: Standard weight galv steel pipe, valves and fittings to match systems in which installed. No condensate drain piping from window unit systems.
11. Fuel oil for boilers: Standard weight steel pipe, butt welded joints for piping 2" and larger; schedule 80 weight black steel pipe, socket welded joint for piping 1-1/2" and smaller. Valves, 125 psi standard for all piping, except on fuel oil pump discharge and fuel oil return piping which shall be 250 psi standard. All fittings, steel. All pipe black except for fuel oil vent which shall be galvanized with galvanized cast iron screwed fittings.
12. Fuel and lube oil for diesels: Same as fuel oil for boilers, except all piping standard weight and all valves 125 psi standard.
13. Compressed air for tube cleaning: Standard weight black steel pipe and 125 psi standard valves and fittings.
14. Compressed air for diesels: Extra heavy weight black steel pipe and 250 psi standard valves and malleable iron fittings.
15. Secondary water window unit system: Standard weight black steel pipe, including horizontal branches to window units. Individual connections, between branch and window unit, soft copper tubing. Valves and fittings for systems fed from Basement and Auditorium equipment rooms, 250 psi standard. All others, 125 psi standard.

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16. City water makeup: Standard weight red brass and 125 psi standard valves and fittings.

#### H-13 MATERIALS AND WORKMANSHIP - SHEET METAL WORK

a. Ductwork: Ducts, dampers, access doors, joints, hangers, stiffeners, fire dampers, and fire retarding material in accordance with PBS requirements.

b. Circular High Velocity Ductwork:

1. To 8" diam: #24 ga duct, #22 ga fittings.
2. Over 8" diam: #22 ga duct, #20 ga fittings.
3. Locked seams, taped and sealed; joints taped and sealed.

c. Connection to Window Units: Approximately #30 ga zinc coated steel flexible tubing, lock seam construction, similar to Wiremold. Collars on branch ducts: Joints made up with sealing compound.

d. Conventional Velocity Ductwork: Galvanized sheet steel, ASHAE gauges, joints and stiffening.

e. Access Openings: Sufficient to permit cleaning of entire interior of ductwork. On underside of duct, 1/8" thickness neoprene gaskets.

f. Cleaning: Entire installation dust-free after completion of installation.

#### H-14 MATERIALS - INSULATION

a. Boiler Pressure Steam and 100 psi Steam and Drip Piping: Calcium silicate, 1-1/2" thickness for piping 4" and smaller, 2" thickness for piping 5" to 8", 2-1/2" thickness for piping 10" and larger. For steam in tunnels or underground distribution, insulation thickness 1/2" greater than above specified.

b. Medium Pressure Steam and Drip Piping: Calcium silicate, 1" thickness for piping 3" and smaller, 1-1/2" thickness for piping 4" to 8", 2" thickness for piping 10" and larger.

c. All Other Steam, Drip and Pumped Return Boiler Feed and Fuel Oil Piping: Calcium silicate, 1" thickness for piping 6" and smaller, 1-1/2" thickness for piping 8" and larger.

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d. Chilled Water Piping in all Buildings: Fiberglas equivalent to light duty thickness cork. Piping conveying chilled and hot water: Fiberglas, dual-temp. Copper connections to window units: Sponge rubber. Fiberglas covering with vapor barrier jacket.

e. Hot Water and Panel Heating Piping: Standard thickness Fiberglas.

f. Condensate and Vacuum Return Piping: Standard thickness Fiberglas.

g. Refrigerant Suction and Air Conditioner Drain Piping: 1" thickness sectional wool felt.

h. Induced Draft Fan, Breeching and Stack up to Roof: 3" thickness calcium silicate block, applied with 1" air space between insulation and surfaces covered.

1. Makeup Water: 1/2" thickness sectional wool felt.

j. 1" Thickness Fiberglas (Vapor-Seal type):

1. Conditioned air supply ducts and fans, where not provided with sound-absorptive duct lining.

2. Return air ducts in roof spaces and equipment rooms, other than fan rooms.

3. Air conditioner casings and supply fans.

4. Fresh air intake chambers and ducts.

k. Air Conditioner Drain Pans: 2" thickness cork.

1. Water Chillers: 2" thickness cork, wired on.

m. Chilled Water Pumps: Copper encased with Fiberglas fill.

n. Hot Water Converters, Deaerating Heater, Condensate Receiver, Flash Tanks, and Heating System Expansion Tanks: 1" thickness calcium silicate block covering, wired on.

o. Fuel Oil Heaters and Steel Blow-off Tank: 1-1/2" thickness calcium silicate block covering wired on.

p. Recanvassing: Exposed pipe insulation in Mechanical Rooms, and all exposed piping in Power Plant and Main Building.

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q. Plaster Finish:

1. Expansion tanks, flash tanks, condensate receivers.
2. Converters, fuel oil heaters, and blow-off tank.
3. Water chillers.
4. Air conditioners including supply fan, and supply ventilation units, from fresh air intake duct and chambers to fan.
5. Deaerating heater.
6. Boiler breeching and I.D. fan and stack.

r. Exposed Insulated Ductwork: Flood coat similar to Insulcolor, 8-oz canvas with metal corner angles, finish coat Insulcolor.

H-15 MATERIALS - SOUNDPROOFING

a. Furnish complete sound-absorptive duct lining.

1. For approximately 25 feet from each conventional velocity supply fan discharge and return fan inlet. Also provide sound lining at required places in interior duct systems to prevent sound transmission between "secure" offices.

2. Sound-Absorptive Duct Lining: 1" thickness, similar to 3# density coated Ultralite, applied as recommended by manufacturer to 4 walls of ducts and interior panels.

3. Omit exterior insulation on ducts acoustically lined.

b. Sound Traps: In discharge of each high velocity supply fan; manufactured or site-fabricated type.

H-16 AUTOMATIC TEMPERATURE CONTROL

a. General:

1. Pneumatic type.

2. Automatic Dampers: In each fan system intake and discharge. Open when fan starts, close when fan stops.

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3. Preheat Coils: In each Ventilating and Air Conditioning Supply System; under control of thermostat on leaving air side of coil.

b. Hot Water and Panel Heating Systems: Outdoor master thermostat reset respective immersion thermostats in hot water supply line leaving converters.

c. Mechanical Supply Ventilating Systems: Thermostat in fan discharge to maintain adjustable predetermined temperature.

d. Unit Heaters: Electric thermostat stops and starts fan motor. Shut-off control for cold return pipe.

e. Warm Air Systems: Day operation, return air thermostat controls steam valve; night operation, steam valve open, thermostat controls motor operation.

f. Air Conditioning Systems:

1. Summer Cooling Conditions: Peak, 78 F DB, 45% RH max, at 95 F DB, 78 F WB. Off-peak, 76 F, 45% RH max. Winter, 72 F with humidification control to prevent condensation, in "special" areas only.

2. Exterior Systems:

(a) Secondary Water:

(1) Summer: Outdoor master zone thermostat controls mixture of primary water supply and secondary water return to maintain adjustable zone water temperature. Individual manual control valves on induction units throttle water supply to maintain required space temperature.

(2) Other than Summer: Outdoor master zone thermostat controls submaster thermostat and converter steam valve to maintain adjustable zone water temperature. Individual control same as summer.

(b) Primary Air:

(1) Summer: Outdoor master zone thermostat controls chilled water valve to cooling coil, and zone reheater steam valve to maintain adjustable discharge temperature.

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(2) Other than Summer: Thermostat in fan discharge shall operate in sequence maximum outdoor air, relief and return air damper and preheater steam valve to maintain adjustable supply air temperature. Maximum outdoor air dampers shall remain fully open when outdoor temperature is above 40 F. Thermostat on leaving side of preheater shall operate steam valve to maintain leaving air temperature of approximately 40 F.

3. Interior Systems:

(a) Summer: Return air thermostat shall control cooling coil water valve, and reheater steam valve to maintain adjustable discharge temperature.

(b) Other than Summer: Return air thermostat and thermostat in fan discharge shall control fresh air, return air, relief dampers, and reheater and preheater steam valves, to maintain adjustable supply air temperature. Pan humidifier steam valve controlled by submaster humidistat controlled by outdoor master, in "special" areas only.

H-17 SMOKE ALARM SYSTEM

Furnish in each return and exhaust fan inlet and common fresh air intake plenums, smoke detecting devices similar to Acme Fire Alarm Co. Passage of smoke at predetermined density shall give alarm indication on main control and alarm panel in basement and shall cause both air conditioning supply and exhaust fans and refrigeration cycle to stop, in accordance with PBS requirements. Electrical wiring, by Electrical Contractor.

H-18 SNOW MELTING SYSTEM

a. Complete for Main Entrance, Parking Garage Entrance Ramp, all Entrance steps to Auditorium Passage, First Floor south side Entrance steps, and ground floor north side Entrance steps.

b. Grid type, 1" pipe, 12" on centers, top of pipe 2-1/2" below sidewalk. Pipe protected from ground by polyethylene waterproof membrane.

c. Oil as heating medium, approximately 170 F average temperature, 200 Btu per square foot heating effect.

d. Converter: Suitable for heat transfer oil similar to Socony Mobil.

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H-19 DIESEL-ELECTRIC GENERATORS SYSTEMS

- a. Emergency Diesel-Electric Generator furnished under Electrical specifications.
- b. Diesel Fuel System - No. 2 Fuel Oil:
  1. Two (2) 20,000 gal underground storage tanks.
  2. Two (2) 275 gal day tanks, one per diesel.
  3. Two (2) transfer oil pumps in pit, rotary type, 25 gpm, 20 psig, 1-1/2 hp motor.
  4. Piping system complete from underground storage tank, to pump pit, to day tanks, to diesels.
- c. Start-up Compressed Air System: Provide piping for equipment supplied under Electrical Specifications.
- d. Jacket Water Cooling System: Provide piping for equipment supplied under Electrical Specifications.
- e. Diesel Air Intakes and Exhaust: Provide piping for equipment supplied under Electrical Specifications.
- f. Provide condenser water piping to jacket water heat exchanger supplied under Electrical Specifications.
- g. Exhaust Ventilation for Diesel room, by roof fans, gravity makeup, provide unit heaters for room heating.

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