

9. ELECTRIC HOT WATER HEATER

a. Furnish and install an A.O. Smith Permaques 80 gallon electric hot water heater or equal. Heater shall be complete with glass lining, 4500W. upper and lower electric heating elements, safety controls, insulation and enameled jacket. Installation shall be complete in every detail including a Watts #40XL pressure temperature relief valve. Heating elements shall operate on 208 volt current with circuit A-7. See Elec. drawings for connection.

10. FIRE PROTECTION

a. Provide extinguishers, cabinets, hoses, racks, etc., as manufactured by W.D. Allen, Elkhart, Kidde, Pyrene, C-O Two, Seco, Buffalo or Wirt and Knox equal to Elkhart numbers specified below.

- (1) Cabinet in Corc: C914 recessed with flat bevel trim, stand. Finish. Fitted and equipped with full plate glass door; U-20-2 1/2" angle valve. S-41 hose rack with 2 1/2" steel nipple, 75 feet 1 1/2" UL labelled unlined linen hose fitted with No. 335-2 1/2" x 1 1/2" reducing coupling, No. 35 pressure restricting disc and nozzle coupling, No. L-205 1 1/2" fog nozzle and No. EASS-2 1/2" gallon stainless steel pressurized fire extinguisher.
(2) Sprinklers: Where indicated provide standard spray type sprinklers, valves and piping. Securely affix to valves an NBFU style "A" sign warning that sprinkler valves must be kept open.
(3) CO2 Fire Extinguishers: Lower parking area where indicated, model 5CDS in surface mounted cabinet with lock and glass front. Penthouse, model 15CD with wall bracket for surface mounting.
(4) Siamese Connection: No. 15 chromium plated, complete with check valve, automatic ball drip and connections to fire protection and domestic water systems.

11. WATER METER

a. Application for water meter will be made by the Owner, however the Contractor shall include an allowance of \$5,000.00 for the installation of the water meter indicated on the drawings.

SECTION M-7

HEATING, VENTILATING & AIR CONDITIONING

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

1. BOILER

- a. Provide an electric fired hot water boiler as manufactured by Precision Parts Corporation, Model W-1 having the capacity listed on the drawings. Construct boiler for 30# working pressure and bear ASME stamp and Underwriters Laboratories listing. Boiler suitable for 480V, 3 phase service.
b. Heating elements to be flanged-type. Unit shall be complete with ASME approved relief valve, combination P/T gauge, contactors, terminal blocks with solderless terminals, safety overload fuse protection, sequencing type step controllers of 14 stages at 30 KW per stage, with modulating motor, high limit safety cut-off and flush mounted electrical cabinet.
c. Provide 14 gauge steel housing around boiler shell filled with minimum of 4" thickness batt-type spin-glass insulation. Finish with two coats of enamel.
d. Heating boiler shell to be guaranteed for 20 years, electrical equipment one year, and supply boiler shall ten years.
e. Provide 120V. relay with normally closed contacts wired to override temp. control to de-activate 50% of heating elements whenever relay is energized.

2. HOT AND CHILLED WATER SPECIALTIES:

- a. Specialties, Bell & Gossett or Taco, equal to numbers specified.
b. Compression tanks, size as indicated, built for 125 psig working pressure, bear ASME stamp, have protected gauge glass, connection for Airtrol fitting and hose end drain.
c. Provide automatic air vents where indicated or required to facilitate water flow. Generally use Taco-Vents on pipe nipple air chambers. High capacity, Taco "Hy-Vent" pipe overflow to nearest drain.
d. Provide Bell & Gossett "Air-Trol" system of venting. Comply exactly with manufacturer's installation requirements for this system. Full compliance will be rigidly enforced.
e. Where indicated in radiation piping, provide Fulton-Sylphon No.1-1290 packless expansion joints.
f. Pressure reducing valve, Bell & Gossett No.12 - 3/4" set for 12 psig.

3. WALL FIN RADIATION:

- a. Provide Trane, Modine, Nesbitt or Herman Nelson wall fin radiation equal to Trane wall fin specified below. Provide hangers to support wall fin piping only. 1" Copper - Aluminum series 44, 1-row element
b. Enclosures specified under Architectural section of the specification.
c. Capacities based on 190° entering water and 20°F temperature drop.
d. Drawings indicate Btu requirements and length of fin tube required, allowances being made for temperature drop on series loop.

4. COOLING TOWER:

- a. Provide Baltimore Air Coil Model TMA-200AL complete with motor, centrifugal fans, belt guards, hardware, removable hot dipped galvanized steel strainer, bleed line, float valve and accessories. Fan motors (2) 15 HP each. Provide fan discharge dampers on all fans.
b. Capacity is scheduled on drawings.

5. CENTRIFUGAL REFRIGERATION MACHINE:

- a. Carrier, Model 19D of capacity as indicated on drawings.
b. The compressor motor shall be 3-phase, 480 volt, 60 cycle, 3600 rpm with maximum running current of 252 amps at full load. Motor shall be suitable for star-delta starting, and maximum line current during starting cycle shall not exceed three times full load running current. Motor shall be of brake hp as required by compressor drive and of manufacture as approved.
c. Evaporator and condenser shall conform to ASME Code requirements. Evaporatory shall be factory insulated with 3/4" foamed plastic, or field insulated as specified under "Insulation".
d. The machine shall consist of a compressor-motor, cooler, condenser, purge unit, control console and all necessary control instruments ready for final connection and shall be capable of operating automatically at reduced loads down to 10%. Initial charges of refrigerant and lubricating oil shall also be furnished. Provide control console and all other items required for a complete installation including all control wiring.

Water boxes shall be designed for 150 psig maximum working pressure in conformance with the ASME Code and ASA B9.1, 1964.

- e. Provide flanged elbows if tube removal requires breaking pipe connections.
f. Provide demand limiter which may be set to limit maximum current flow to any value between 40 and 100% of full load amperes.
g. Provide motor overload control to limit current drawn to 105% of demand limiter setting.

- h. Provide lubrication system consisting of pump, heater, cooler water solenoids, filter and temperature controls.
i. Provide thermal purge system consisting of pump, oil separator, heater, condenser and relief valve.
j. Starters and disconnects for purge pump and oil pump motors shall be provided under this section. Starter for oil pump shall be circuit breaker combination starter mounted in enclosure adjacent to compressor starter and connected on load side of starter disconnect.
k. Provide time delay relay to prevent compressor from starting until 30 minutes have elapsed since last start regardless of reason for compressor shut down.

1. Compressor Starter:

- (1) Furnish to Electrical Contractor a star-delta closed transition starter in a NEMA-1 enclosure designed for use with the compressor motor and provided by the manufacturer of the chiller. Starter shall have built-in disconnect switch. Provide normally open auxiliary contact on starting contactors for interlock with boiler control.
(2) Starter shall have time limit acceleration to switch to second step when current inrush reaches a low value; be complete with current transformers and all accessories.
(3) Equip starter with 120 volt holding coils, three manual reset overload relays and auxiliary contacts as required by automatic control sequence.
(4) Provide control power transformer with 120 volt, fused secondary. Connect primary to line side of compressor starter through a circuit breaker of appropriate size mounted in the starter. Label breaker switch "Control Power". Size transformer to supply load of compressor motor starter holding coils, oil heaters, oil pump, purge pump and all accessory items required by this compressor.
(5) Submit shop drawings and certification that ampere rating is NEMA Standard 8-hour enclosed rating.

m. Located on control console, or appropriately elsewhere on machine, provide gauges, indicating condenser, evaporator, oil and purge pressures; pushbuttons for oil and purge pumps; and following controls for compressor operation:

- (1) Evaporator low refrigerant temperature cutout with manual reset button and pilot light.
(2) Condenser high pressure cutout with manual reset button and pilot light.
(3) Low water temperature cutout with pilot light.
(4) Oil pressure control with pilot light.
(5) Pushbutton with pilot light.
(6) Motor high temperature cutout.
(7) Chilled water flow switch.
(8) Condenser water flow switch.
(9) High bearing temperature.
(10) Motor temperature switch to actuate motor coolant pump.

n. If requested by Engineer, test refrigeration equipment under his direction to demonstrate specification compliance. Furnish all labor and instruments.

o. Furnish services of manufacturer's trained representative to supervise:

- (1) Testing machine under pressure for leaks.
(2) Evacuation and dehydration of machine using manufacturer's high vacuum pump.
(3) Charging machine with refrigerant.
(4) Starting machine.
(5) If machines are leak tested in factory and shipped to the job site under vacuum, steps (1) and (2) above do not apply, provided vacuum has not been broken. If vacuum has been broken, steps (1) and (2) must be completed before charging and starting machine. Machines must be tested with pressure gauge to determine whether or not vacuum has been broken.

p. In addition to executing above requirements, representative shall instruct Owner's designee for a total of five eight-hour days of which at least one day will occur after thirty days' operation by the designee. At conclusion of instruction, representative shall advise Owner in writing that designee is qualified to have charge of installation.

q. During guarantee period, furnish without cost to Owner all required oil and refrigerant and service machine using only manufacturer's service personnel.

r. Wiring diagram:

- (1) Before executing any work the Contractor shall submit a complete composite wiring diagram showing connection of the water chilling unit, the chilled and condenser water pumps, the cooling tower fan (s) and any and all auxiliary devices associated with the chilled water system. Diagram shall be complete showing both power and control wiring, all interlocks, all safety devices, all controls, etc.
(2) Do no work until diagram has been approved in writing by Engineer
(3) Incorporate a copy of the diagram in the operating and maintenance manual specified in Section ME-1.

6. PUMPS:

- a. Provide Buffalo, Ingersoll-Rand, Taco, Worthington or Goulds equal to Models specified below:
Type "a": Taco series 300-1 in line circulators bronze fitted with mechanical seals.
Type "b": Taco series 300-4 based mounted flexible coupled pump with enclosed impeller, end suction; two renewable casing wearing rings, stainless steel shaft sleeve keyed to shaft with impeller and fitted with mechanical seals.
b. Capacity of pumps as scheduled on drawings.

7. AIR HANDLING UNITS:

- a. Provide cabinet or "built-up" type air handling units as indicated and/or as hereinafter specified. Fan capacity, cooling coil capacity, heating coil capacity, filter data, etc., are listed on the drawings.
b. Cabinet units shall be complete with insulation, motors, accessories, adjustable pitch V-belt drive, belt guard, coils, fans, dampers and full size drain tanks under the fan section with a sloping drain pan extending under the coils. Units shall have 1" insulation. Furnish one spare set of belts.
c. All coils shall be water service.
d. For all air handling units, including "built-up" and factory assembled types, provide baffles as required to prevent stratification of air over coils.
e. AHU No.1 (Built-up unit)

- (1) Fan shall be American Standard series 116 (Airfoil Bladed) Class II as required, SISW with vortex damper on inlet and access door on scroll. Provide motor, adjustable pitch drive, belts and belt guard. In addition, furnish one spare set of belts. Optional manufacturers: Buffalo-Forge, Carrier, Trane, and Westinghouse.

AHU No.1 shall be provided with factory fabricated automatic motor bases. Motor bases shall be self-adjusting belt tension type, constructed so that fan belts and pulleys are held in alignment with automatically applied positive belt tension; under all normal operating conditions. Belt tension control shall be manually readjustable, by resetting position of movable parts of motor base, without changing belt and pulley alignment. Motor bases shall be mounted on the same integral steel frames as fans, hereinbefore specified and shall be selected and installed in accordance with manufacturers' latest published instructions.

- (2) Chilled water coils shall be American Standard type W, aluminum fin on copper tube. Fin spacing shall be as required for the indicated cooling capacities. Optional manufacturers: Aerofin, Nesbitt, Trane.
(3) Heating coils shall be as specified for chilled water coils.
(4) Preheat coils shall be American Standard type W, aluminum fin on copper tube. Fin spacing shall be 4 fins per inch maximum unless otherwise indicated on drawings. Optional manufacturers: Aerofin, Nesbitt, Trane.

- (5) Filter shall be Hi-Cap air filters as manufactured by Cambridge Filter Corp. Filters shall have an initial resistance of not more than .25" w.g. when operating at a rated velocity of 500 fpm. Minimum average efficiency by the N.B.S. atmospheric discoloration method shall be 30%. Each filter shall have N.B.S. dustholding capacity of 190 grams per sq. ft. of media area when operated to a final pressure drop of 0.6" w.g. Each filter shall consist of the following three elements: (1) A permanent frame complete with sealing rods; (2) A media retainer; (3) A media cartridge. Provide Air Filter Gauge equal to Dwyer Model No.2001-AF to indicate pressure drop across filter section. Gauge shall have a range from 0" to 2" water and be furnished complete with static pressure taps. Mount gauge to AHU casing.

The permanent frame shall be made of 16 gauge galvanized steel with predrilled rivet holes on all four sides. The media retainer shall consist of 5/32" diameter continuous fastener support to which shall be welded a 10 gauge wire assembly designed to keep the media cartridge in a fully open position to achieve full medial effectiveness with minimum pressure drop. The media cartridge shall be performed and shall consist of two layers of modified acrylic fiber treated to make it fire resistant. The downstream layer shall be treated with adhesive to minimize dust blow-off.

Furnish to Owner initial set and replacement set of media cartridges for each air conditioning unit. Optional manufacturers: Farr (2F2A), Continental.

f. AHU No.2 (Cabinet Unit)

- (1) The fan shall be an American Standard Unit size 29A arranged for horizontal airflow as shown on the plans. Optional manufacturers: Buffalo-Forge, Carrier, Trane, and Westinghouse.
(2) Chilled water coil shall be as specified for AHU No.1.
(3) Heating coils shall be as specified for AHU No.1.
(4) Filter shall be as specified for AHU No.1 except filter frames to be of type suitable for side loading.

REVISIONS

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Professional Engineer seal for H.A. INC. with signature of Kenneth J. Bell.

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