



- NOTES
- This valve is controlled to maintain a leaving water temperature of 120 degrees F when the domestic hot water side of the heat exchanger when the heat recovery system is in operation (pump 11-HP-D is operational).
  - Pump speed for heat recovery pump 11-HP-D is controlled to maintain an 18 psi pressure differential between the heat recovery secondary circuit piping between the suction side of the pump and the heat to control valve (11-CV-1), 11-CV-2 and/or 11-CV-3, when differential pressure will drop and the pump speed will increase. As the valves close, the differential pressure will rise and the pump speed will decrease.
  - This valve is controlled in sequence with the steam heat exchanger control valves to maintain the desired control point leaving water temperature. The sequencing will be accomplished in the DDC control system software. If the outdoor air temperature is above 60 degrees F, the steam valves on the back-up/primary heat exchangers will be forced closed unless the system is placed in the back up mode by operator command. The system would be placed in back up mode if the heat recovery circuit was not in operation for any reason such as equipment failure or a shut down (see Note 1). As the plant leaving water temperature drops below set point, the valve modulated open allowing return water to be moved through the heat recovery circuit by pump 11-HP-D and heated by condenser water through plate heat exchanger 11-PHX-A (if the chilled water system is in operation) and/or via the heat rejection from the heat pump. A further drop in plant leaving water temperature below set point causes the heat exchanger steam valves to modulate from fully closed to fully open (See Note 6 for additional details regarding the control of the heat exchanger steam valves). As the plant leaving water temperature rises above set point, the sequence is reversed. The central condenser water plant is in operation and the condenser water system is being used as a source of recovered heat. 11-CV-1 is forced closed one time the return water temperature to the central plant is above 90 degrees F. If the central chilled water plant is not in operation, valve 11-CV-1 is forced closed any time the return water temperature to the central plant is less than the current loop condenser water temperature set point for the heat pump.
  - The system is designed so that only two of the three system pumps installed will be required for operation under design conditions with the third pump acting as a standby pump. The speed of the lead pump and the dropping of the lag pump will be controlled to maintain the desired differential pressure set point across the motor when they drop. The set point of the control loop drops and is restored to maintain differential pressure at 7.5 feet of water. The control system will maintain differential pressure drops. The speed of the lag pump will be increased from minimum to maximum, a further drop in differential pressure will cause the lag pump to be cycled on. A rise in differential pressure above set point will reverse the sequence. If the DDC system detects a failure of either the lead pump or the lag pump, it will sound an alarm and automatically start the back up pump and operate it as the new lead pump.
  - In the renovated system, the heat pump can operate in two different modes. If electric rates are favorable during the winter, it will be operated in the heat recovery mode. In this mode, it will load and unload as required to maintain a leaving condenser water temperature of 140 degrees F. This water will then be used to heat domestic hot water via heat exchanger 11-PHX-A and/or as a source of heat for the central heating hot water system. The primary function in this mode is the production of heated water. Chilled water is a by-product. The unit will also be capable of operating in a heat rejection mode. When operated in this mode, heat is rejected to produce chilled water. When operated in this mode, heat is rejected to preheat domestic hot water to 100 degrees F and is also rejected to the central heating hot water system. If neither of these systems need heat,

then heat is stored in the flywheel tanks and finally rejected to the condenser water system via heat exchanger 11-PHX-A. The DDC control system will place the heat pump in this mode of operation to use as an emergency backup chiller and/or as a cooling chiller if necessary in the summer months. Otherwise the heat pump will not normally operate during the summer. When operating in this mode, the condenser temperature is lowered from 140 degrees F to improve the machine efficiency. Heat rejection is capable of producing more than 100 tons of refrigeration at 140 degree F condenser water temperatures.

6. These heat exchangers can see very large load fluctuations (i.e. they have large, high down ratios). The load on them will be at a minimum when they are leaving the heat recovery system to what is required leaving the central plant. The load on them will be at a maximum when the heat recovery system is not in operation due to maintenance requirements and/or equipment failure. For this reason, the heat exchangers are equipped with two steam valves and a special control sequence as follows to allow them to achieve stable operation under all load conditions. The valve is sized for 20% of the heat exchanger capacity on the steam side and 70% of the heat exchanger capacity on the water side. At low load conditions, the smaller valve is modulated to function as the load control leaving water temperature. Then the control system switches to a different sequence in which the large valve is modulated. First in sequence with the small valve. If the large valve can maintain the desired set point for a given period of time with the output to the unit 25% of maximum set point, then the large valve is closed and the small valve is modulated until it is required to maintain the desired central plant leaving water temperature.

7. Close the bypass balance valve and then crack it open on all loads equipped with 3 way valves to convert them to two way operation.

8. Heat exchanger 11-PHX-A performs two functions. If the central chilled water plant is in operation, it allows heat to be recovered from the condenser water system for use in the central heating hot water system when water is pumped through it by heat recovery pump 11-HP-D. In this mode, flow would be from the side of the heat exchanger connected to control valve 11-CV-1 and 11-CV-2. If the heat pump is placed in operation in the chilled water mode, and the heat it is rejected is not required by the central heating hot water system, then heat will reject through 11-PHX-A and it will reject heat to the condenser water system. During the winter months when the central chilled water plant is in operation, the heat exchanger performs no heat transfer because the pump on the condenser water side will not start.

Connect existing Nursing Wing reheat leads to the new plant piping system. Design flow - 37 gpm, 60 gpm with future 5th and 6th floor. Diversified flow - 38 gpm, 65 gpm with future 5th and 6th floor. This is the riser at the North end of Nursing Wing (runs through mechanical rooms #4 and #5).

Typical 2 way reheat coil  
Typical of 2 reheat coils associated with 4-AHU-4 (surgery) and 1 reheat coil associated with 4-AHU-5 (2nd floor core area). See Note 7

Typical of 3 reheat coils associated with 5-AHU-4 (4th floor core area)

Located in mechanical room 4. Close completely.

NOTE: Connections shown are schematic. See the equipment shop drawings for actual inlet and outlet connections. NOTE: Connections shown are schematic. See the equipment shop drawings for actual inlet and outlet connections.

11-CV-C See Note 1  
Domestic hot water heat recovery  
Maximum pressure drop - 14 Ft. w.c.  
Nominal size - See spec  
Cv range - 62-75  
Position on loss of air pressure - Normally Open  
Nominal spring range - As req'd. by the control sequence

11-CV-B (See Note 3)  
Heating Hot Water System Heat Recovery  
Maximum pressure drop - 24 Ft. w.c.  
Nominal size - See spec  
Cv range - 239-274  
Position on loss of air pressure - Normally Open  
Nominal spring range - As req'd. by the control sequence

Connection for hot water pump. Pumps to be added when the 5th & 6th floors are added to Nursing Wing or when the Medical office building is connected to this system (identical to pumps A, B, ACP).

11-HW-A Heating hot water system primary pump  
Design flow - 447 gpm  
94 Ft. w.c. (estimate)  
See Note 4  
11CPS00088  
11CPS00088

11-HW-B Heating hot water system primary pump  
Design flow - 467 gpm  
94 Ft. w.c. (estimate)  
See Note 4  
11CPS00088  
11CPS00088

11-HW-C Heating hot water system primary pump  
Design flow - 467 gpm  
94 Ft. w.c. (estimate)  
See Note 4  
11CPS00088  
11CPS00088

Nursing Wing fan coil units and cabinet unit heaters (includes 5th & 6th floor provision)  
Design flow - 193 gpm, 267 gpm with future 5th and 6th floor  
Diversified flow - 193 gpm, 267 gpm with future 5th and 6th floor

NOTE: This connection is typical for 2 fan coil units per piping branch for the units installed originally in the 1968 Nursing Wing addition. See Nursing Wing drawing HIACIT.

By-pass valve opens as coil valve closes.

NOTE: Balance valve located in the piping chase at the 4th floor level. open fully.

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New flow venturi for trouble shooting purposes. Extend sensing lines to floor level and label.

11-CV-K  
Nursing Wing fan coil unit hot water shut down  
Maximum pressure drop - XXX Ft. w.c.  
Nominal size - Full line size  
Cv range - XX  
Position on loss of air pressure - N.O.  
Nominal spring range - As req'd. by the control sequence

MATCH LINE - For continuation see this sheet.

MATCH LINE - For continuation see TCI0