

STANDARD HEAT PUMP SYSTEM CONTROL PANEL

- A. Provide DDC heat pump system loop control panel by heat pump manufacturer with the following accessories and programmed features for communication with BAS. Installation of field controls and wiring by control contractor.
1. Panel mounted operator interface,
 2. Return water temperature sensor,
 3. Supply water temperature sensor,
 4. Outside air temperature sensor,
 5. Fluid flow monitoring pressure differential switch,
 6. Non-Volatile flash memory backup in the event of power loss.
 7. Heat injection and heat rejection ramp parameter to be operator adjustable. Loop control panel to display outside air, return water, supply water temperature, pump status, heat injection status, and heat rejection status for system monitoring.
- B. Basic Construction: System loop control and monitoring panel shall be supplied with dirt and dust resistant enclosure finished with polyester thermoset enamel.
1. Temperature sensors to be sealed thermistor element suitable for immersion or surface mount installation and complete with 6 feet of cable. Temperature sensor connection to be 2 spade terminal block located inside a metal box with knockouts suitable for conduit.
 2. Outside air temperature sensor to be enclosed in protective casing suitable for mounting on outside north facing wall approximately, away from exhaust vents, at least 6 ft. (1.8m) above ground level.
 3. Fluid flow monitoring pressure differential switch to have adjustable setting and shall be suitable to monitor flow on system pump.
 4. Control panel shall be supplied with individual 24VAC control transformer for control board and for required relay outputs. Control relays to have 24VAC coil voltage and shall be mounted to facilitate wiring and installation. Control panel to be supplied with 115/1/60 power with earth ground.
 5. Temperature sensors to be installed with shielded pair wiring to be earth grounded in one location only at main control panel.
- C. Control Sequence: The control sequences are to be full DDC control logic for heat addition, heat rejection, and control of main loop pumps. Loop base setpoint temperature to be not less than 30°C (85°F) and shall increase on a ramp based on outside air to a maximum of 51°C (125°F). The ramp slope to be field adjustable via operator panel. The loop setpoint temperature to be based on proportional PI (Proportional Integral) control with deadband and staged digital heat addition and heat rejection. PI signal to ensure that cycling of heat addition and rejection operation stages does not occur.
1. Heat addition: Heating is enabled only if the outside air temperature is below 18°C. Stages of heating are enabled from the PID controller output. Where applicable, analog boilers will also have their 0-10VDC control signal dictated by the PID output.

2. **Heat rejection:** Cooling Stages are enabled only if the outside air temperature is above 10°C. Stages of cooling are enabled from the PID controller output.
 3. A 0-10VDC VFD control signal for evaporative coolers equipped with a variable frequency drive fan motor will ramp up from 0→10VDC as the PID signal changes.
 4. **Pumps:** The main loop pumps will be alternated each day between primary/secondary (duty/back up). A pressure differential switch, installed across the main pump set, will be monitored by the loop control panel. If the pressure differential switch is open for longer than 15 seconds a pump alarm indication will appear on the panel mounted display. Upon a pump alarm, all automatic primary pump operation will be disabled and the secondary pump will be enabled. This setting will remain regardless of any change of state by the pressure differential switch. Normal operation will only resume when the switch is closed and the pump alarm is reset through the panel mounted display.
 5. **Alarms:** System panel to indicate an alarm via the panel mounted display in the event of a high or low building loop fluid temperature, or in the event of a main system pump failure. Alarms can be reset via the panel mounted display. Low temperature alarm to be set for 20°F (11°C) below loop base set point on return fluid temperature. High temperature alarm to be set for 20°F (11°C) above loop base set point on return fluid temperature.
- D. Supplier shall program and adjust panel for project control scenario.