PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 220500 - Basic Plumbing Materials and Methods, and other Sections in Division 22 specified herein.

1.2 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
1. Domestic hot water recirculating system with pump, automatic time clock control, temperature sensor, and air venting.
2. Connection to hot water piping and electrical service.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 220500: Basic Plumbing Materials and Methods

B. Section 223400: Domestic Hot Water Heating Equipment

C. Division 26: Electrical

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products and engaged in pump business for more than ten years.

B. Codes and Standards: Provide pumps which conform to the requirements of:
1. Hydraulic Institute (HI): Manufacturer pumps in accordance with "Standards for Centrifugal Rotary and Reciprocating Pumps."
2. National Electrical Manufacturers Association (NEMA): Provide electrical components which comply with NEMA Standards.
3. ASTM International (ASTM)
   a. B271: Standard Specification for Copper-Base Alloy Centrifugal Castings
   b. B505/B505M: Standard Specification for Copper-Base Alloy Continuous Castings
4. National Fire Protection Association (NFPA):
   a. CEC: California Electrical Code
5. Underwriters Laboratories (UL):
   a. UL-778: Motor Operated Water Pumps

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for units showing dimensions, weights (shipping, installed, and operating), capacities, efficiency,

ratings, performance with operating point clearly indicated, motor electrical characteristics, finishes of materials, and installation instructions.
1. Pump
2. Time clock controller with remote temperature sensor

B. Shop Drawings: Submit manufacturer's shop drawings indicating dimensions, weight (shipping, operating), required clearances, methods of assembly of components, and location and size of each field connection.

C. Maintenance Data:
1. Submit maintenance instructions, including instructions for lubrication, tube replacement, motor and drive replacement, and spare parts lists.
2. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals.

D. Wiring Diagrams:
1. Submit manufacturer's ladder-type wiring diagrams for power and control wiring required.
2. Differentiate between factory-installed and field-installed wiring.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver units to the site in containers with manufacturer's stamp or label affixed.

B. Store and protect products and units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.

C. Rigging: Comply with the manufacturer's rigging and installation instructions.

1.7 WARRANTY

A. Provide general one year (12 months) warranty from date of occupancy to include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service. Provide pump manufacturer’s five year warranty providing coverage against defective materials.

PART 2 - PRODUCTS

2.1 HOT WATER RECIRCULATING PUMPS

A. Furnish and install pumps with capacities as shown on plans.
1. Pumps shall be in-line type for installation in vertical or horizontal piping.
2. Pump must be capable of being serviced without disturbing piping connections.

B. Pump body shall be lead-free bronze or stainless steel construction and rated for 150 psi working pressure and 225^0F.

C. Impeller shall be lead-free bronze or stainless steel.

D. The pump shall have water-tight seals.

E. The motor shall be non-overloading at any point on the pump performance curve.

F. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

G. Manufacturers: Bell and Gossett Series NBF or ecocirc, TACO, Grundfos or equal.

2.2 CONTROLLER

A. Electronic programmable controller with 7-day or 365-day programming feature to operate the recirculating pump during occupied periods. Controller shall have a minimum of four start/stop periods per day. Minimum mode switching intervals of 15 minutes.

B. The aquastat shall connect to the controller and override the ON time conditions whenever the temperature conditions are met to disengage the pump.

C. Thermostat (aquastat) switching modes: The pump shall engage (ON mode) whenever the return water temperature drops below 95^0F (adjustable) and shall disengage (OFF) whenever the return water temperature exceeds 105^0F (adjustable).

D. Temperature sensor shall be rated for temperature monitoring between -20^0F and $+284^0$F with response times less than 5 seconds and accuracy or +/- 1%. Adjustable well length and stainless steel body. Cable length and sensitivity as required for application.

E. Power supply: 115-120 VAC, 60 Hz, single phase.

F. Manufacturers: Honeywell, Kele, Mamac, Bell and Gossett or equal.

2.3 AIR ELIMINATION VALVE (AUTOMATIC)

A. The air elimination valve shall have a high removal rate at low pressure differentials and shall be fully open for the removal of air at all pressures in the operating range from 2 to 150 psig. It shall be tightly sealed against loss of system water and prevent entrance of air in negative pressure situations.

B. The air elimination valve shall be constructed of metal and all working parts shall be non-corrosive.

C. Manufacturers: Amtrol, Hoffman or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment, unless otherwise shown or noted on the Drawings, is to be installed in accordance with industry standards and manufacturer's recommended installation instructions.

B. Install hot water recirculation piping to maintain required minimum hot water temperature to all plumbing fixtures. Hot water service piping to each fixture shall be minimized to provide hot water, minimum temperature of 95^0F, Minimum recirculation piping shall not be less than 3/4” diameter.

C. Install hot water recirculation pump and accessories in accordance with Plumbing Code, manufacturer's instructions, and approved Shop Drawings.

D. Provide isolation shutoff valves on inlet and outlet sides of hot water recirculation pump, sensors and fittings.

E. Provide swing check valve at discharge side of the pump.

F. Provide a boiler drain valve with hose bibb threads and brass cap downstream of the check valve to allow for startup air bleeding and maintenance draining of the system.

G. Provide aquastat temperature controller and remote temperature sensor to disengage the recirculation pump when the return hot water temperature is greater than setpoint of 95^0F (adjustable).

H. Coordinate with electrical installer to connect power and control wiring.

I. Contractor to assist testing and balancing contractor in verifying correct pump rotation and system operation.

J. Flush and clean equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls.

3.2 ADJUSTING

A. Test and adjust flows, setpoints, and valves for proper operation.

END OF SECTION