



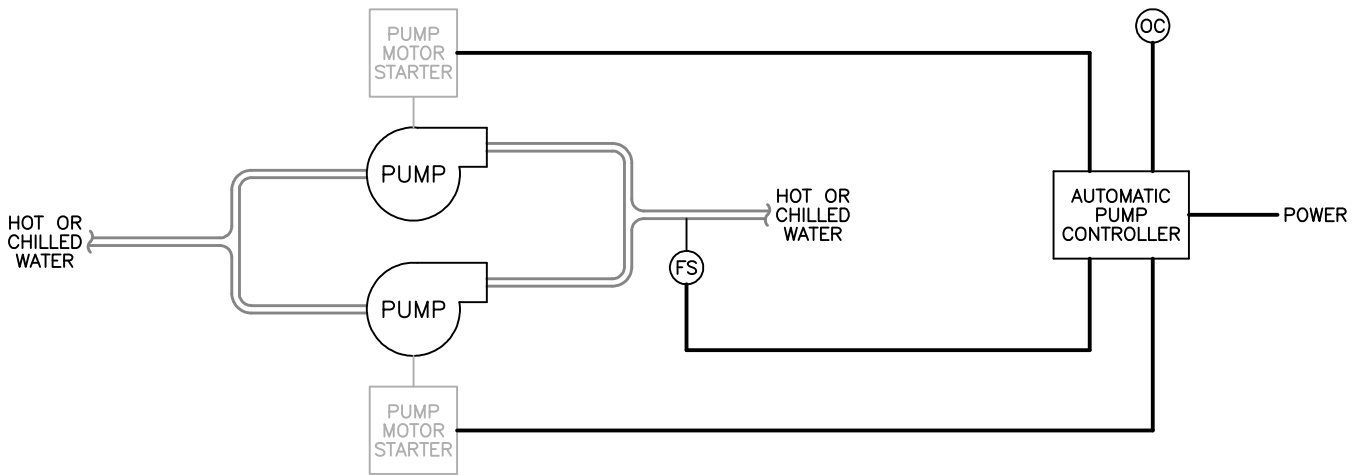
**CONTROLS  
ESTIMATING  
AND  
DESIGN  
GUIDELINE**

**APPLICATION EXAMPLE #5**

**Two Hot Water Pumps**

- 5 HP pumps @ 230/3/60
- Each sized for full system capacity
- One primary, one standby
- Specifications call for automatic backup and automatic alternation
- Starters provided by mechanical contractor for installation by electrical contractor

# PUMPING SYSTEMS – TWO PUMPS WITH AUTOMATIC CONTROLS



## DESCRIPTION

Pumping system for hot or chilled water applications. Only one pump runs at a time, with the other being a backup in case of primary pump failure. Several different methods of control exist for the application; refer to the notes for a description of each method. Pump motors are either three phase or single phase. Refer to starter sheet for starter descriptions, selections, and pricing. If pump motors are single phase, then delete the starters.

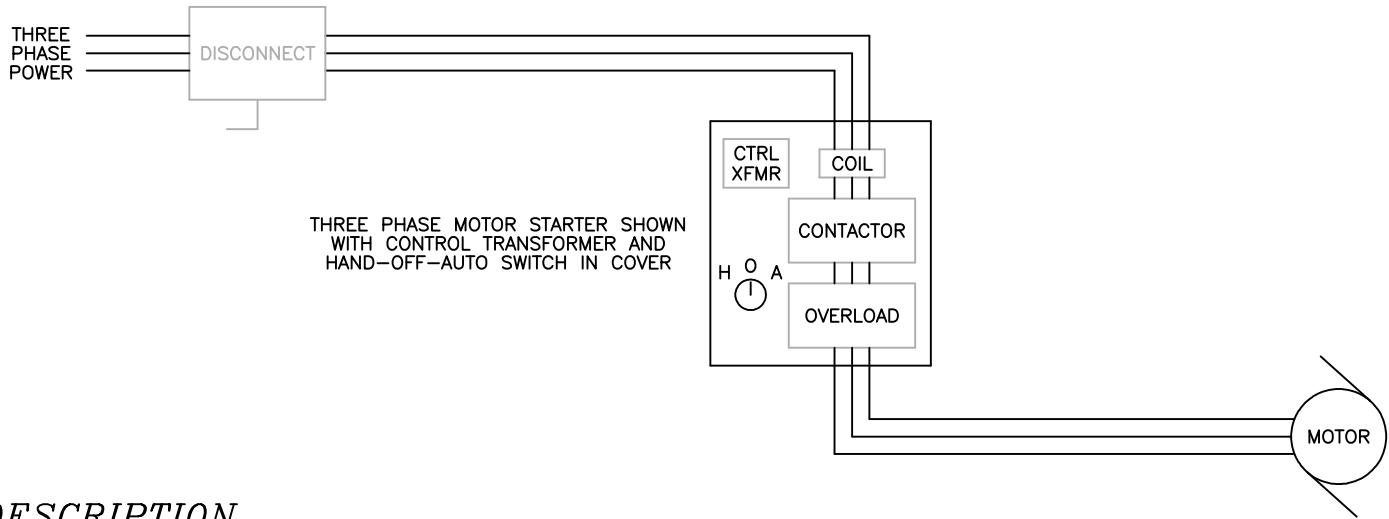
## COMPONENTS

	NOTES	LABOR (hours)	MATERIAL (cost)
Ⓞ OUTSIDE AIR TEMPERATURE CONTROLLER	1	2.0	35.00
ⓕ FLOW SWITCH OR DIFFERENTIAL PRESSURE SWITCH	2	4.0	85.00
<del>METHOD #1: AUTOMATIC BACKUP / NO MEANS OF ALTERNATION</del>	<del>3 8</del>	<del>4.0</del>	<del>45.00</del>
<del>METHOD #2: AUTOMATIC BACKUP / MANUAL ALTERNATION</del>	<del>4 8</del>	<del>10.0</del>	<del>275.00</del>
<del>METHOD #2a: AUTOMATIC BACKUP / MANUAL ALTERNATION</del>	<del>5 8</del>	<del>4.0</del>	<del>650.00</del>
<del>METHOD #3: AUTOMATIC BACKUP / AUTOMATIC ALTERNATION</del>	<del>6 8</del>	<del>8.0</del>	<del>700.00</del>
METHOD #3a: AUTOMATIC BACKUP / AUTOMATIC ALTERNATION	7 8	4.0	330.00
<b>STARTUP AND COMMISSIONING:</b>	2 hours	TOTALS:	10.0
<b>ENGINEERING TIME:</b>	9 4, 8 hours		
			\$450.00

## NOTES

- 1 Outside air temperature controller is necessary if it is desired to enable and disable pump operation based on outside air conditions. Delete if not needed. DO NOT USE with METHOD #1; it will not work.
- 2 Flow switch labor includes installation in the supply piping.
- 3 METHOD #1: selection of the primary pump is done upon electrical installation of the pumps, and must operate continuously. In the event of primary pump failure, the standby pump will automatically start. Do not use this method if the application calls for intermittent pump operation, or if it is desired to alternate the primary pump.
- 4 METHOD #2: selection of the primary pump is done manually, via a primary pump selector switch. In the event of primary pump failure, the standby pump will automatically start.
- 5 METHOD #2a: identical to METHOD #2, except using a manufactured product (Johnson Controls model S7300 Pump Sequencer) in lieu of a custom built pump controller.
- 6 METHOD #3: selection of the primary pump is done automatically on a daily or semi-weekly basis by the controller. In the event of primary pump failure, the standby pump will automatically start.
- 7 METHOD #3a: identical to METHOD #3, except using a manufactured product (Tekmar model D132 Pump Sequencer) in lieu of a custom built pump controller.
- 8 Controller labor includes required fabrication, mounting, and power, and interlock wiring to the pump starters. All other wiring associated with the controller is included in the labor factors of the devices wired to the controller.
- 9 Use the first number for methods using manufactured products (METHODs #2a and #3a).

# MOTOR STARTERS – THREE PHASE



## DESCRIPTION

Three phase motor starter consisting of a coil/contactor and a solid state overload block, housed in a general purpose NEMA 1 or weatherproof NEMA 3R enclosure. Options include control transformer, selector switch or start/stop pushbuttons, pilot lights, and auxiliary contacts.

## STARTER PRICING TABLE

MAXIMUM HORSEPOWER AT			NEMA SIZE	HOUSED IN NEMA 1 ENCLOSURE	HOUSED IN NEMA 3R ENCLOSURE	ADD FOR CONTROL XFMR	ADD FOR SELECTOR SWITCH	ADD FOR PILOT LIGHT	ADD FOR AUXILIARY CONTACT
200 VOLTS	230 VOLTS	460 VOLTS							
3	3	5	0	213.00	277.00	142.00	42.00	80.00	32.00
7.5	7.5	10	1	240.00	303.00	142.00			
10	15	25	2	451.00	567.00	142.00			
25	30	50	3	736.00	873.00	295.00			
40	50	100	4	1634.00	2088.00	360.00			
75	100	200	5	3822.00	4984.00	406.00			
150	200	400	6	10728.00	12154.00	517.00			

TOTAL: \$424.00 X (2) STARTERS = \$848.00

## NOTES

- 1 Starter pricing based on Furnas brand class 14 magnetic motor starters with solid state overload.
- 2 Pricing shown for starter only. Price disconnect separately if necessary. Combination starter/disconnects are available, though disconnects are normally the responsibility of the electrical contractor.
- 3 Addition of a control transformer, though often required for interlock type applications, drives the price up considerably because of the need for a larger size enclosure.
- 4 For hazardous locations, a NEMA 7 & 9 enclosure is required. Pricing for this type of enclosure not shown here.
- 5 In applications requiring remote control of starter or interlock to other devices, inclusion of a control transformer and a selector switch will cover most scenarios.
- 6 In applications requiring nothing more than start/stop control at the starter, include start/stop pushbuttons (same price as selector switch).