

15130 PUMPS

Part 1: General

- 1.01 The following guidelines apply to the selection of pumps primarily for circulating water. It is the goal of NC State to purchase pumps that are selected to provide a long service life, minimal maintenance, styles that allow for ease of maintenance, and operate efficiently for the condition of operation.
- 1.02 Pump selection is limited to the following styles of pumps: end suction, double suction pumps, and in-line pumps.
- 1.03 Double suction styles of pumps are limited to (HSC) horizontal split case style only.

Part 2: Design Guidelines

- 2.01 Pumps to be selected with a reasonable safety factor for conditions such as pipe roughness and partial loading of strainers.
- 2.02 Pumps should be selected near the midpoints of their curves. The final selection shall place the operating point on the selected impeller curve at or to the left of the point of maximum efficiency. The final selection shall not deviate more than 5% below the point of maximum efficiency. Pump selections shall be based on minimum operating efficiency of 75%. The maximum impeller size shall not be used in any of the pump selections.
- 2.03 End suction and in-line pumps shall be limited to 500 GPM maximum.
- 2.04 End suction, double suction, and in-line pumps shall be selected to operate at speeds not greater than 1800 RPM.
- 2.05 Double suction pumps shall be used at flow rates above 500 GPM.
- 2.06 The style of double suction pump must allow for servicing without disturbing piping, motor, or requiring pump realignment.
- 2.07 Double suction pumps shall be selected to operate at speeds not greater than 1200 RPM, unless the head requirements are greater than 175 feet.
- 2.08 Bearings shall be selected for a minimum life of 200,000 hours. The bearing housings on double suction pumps shall be removable.
- 2.09 Data submitted for pump approval from the contractors shall include pump speed and characteristic curves for performance of the impeller selected for each pump. Curves shall indicate capacity vs. head, efficiency, and brake horsepower for the full range, from shut-off head to free delivery. NPSH margins shall be included. Submittal data shall include the selected impeller size and the maximum impeller size available. The motor shall be sized to handle the full range, from shut-off head to free delivery for the selected impeller.
- 2.10 Pump nameplates shall be stainless steel, suitably secured to the pump.
- 2.11 Motors shall not be sized larger than to meet the requirements listed in these design guidelines. Motors shall be designed to NEMA Premium motor efficiency.
- 2.12 Base plates shall be cast iron with drip rim and grouted in place.

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- 2.13 Proper pump installation by the Contractor shall include preliminary alignment before any grouting or piping takes place. Base plate shall be set flat and level and bolted. A preliminary check shall be made of the motor alignment before grouting takes place. This shall be done to prevent the need of rolling or twisting the base plate to obtain the alignment for the motor. When the contractor is satisfied that the preliminary alignment is satisfactory the grouting shall be completed. The Contractor shall then provide shimming for motor and coupling alignment within tolerance and the bolts tightened.
- 2.14 Negligible weight from piping is to be supported by the pump. Piping is to be supported to prevent transmission of significant weight on to the pump. Flexible connectors shall be placed in the suction and discharge piping. These flexible connectors shall be placed within 5 feet of the pump.
- 2.15 Pump shafts shall be high strength S.A.E. 1045 carbon steel sized to provide minimum deflection, not over .002 inches, at the design operating point. Shaft shall be protected in the stuffing box area by a replaceable 316 stainless shaft sleeve.
- 2.16 In-line and double suction pumps shall be equipped with balanced mechanical seals for leak-less operation. End suction pumps shall be equipped with unbalanced seals. A suitable arrangement shall be provided to furnish a portion of the pumped liquid to lubricate and cool the seal faces. Seals shall be suitable for conditions encountered with the specific application of the pumps. An internal seal system consisting of tubing that connects the volute to the stuffing box shall be provided. A tap shall be provided over the mechanical seal to introduce clear liquid from an external source, if desired.
- 2.17 Pump casings shall be made of Class 30 cast iron, rated at 250 psig, and bronze fitted for pumping water. If water has been de-mineralized, use 316 SS casings, shafts, impellers, wear rings, etc.
- 2.18 For central plants or large mechanical rooms containing many pumps, bearings shall be oil lubricated. A constant level bottle oiler connected to the oil reservoir shall provide lubrication. For non-central plants pumps and small mechanical rooms pumps shall be grease lubricated.
- 2.19 Pump to be equipped with vent valve.
- 2.20 Where multiple pumps are installed in mechanical rooms, sufficient space shall be provided between pumps (include pipe and valves) to allow for ease of maintenance dealing with pump lubrication, replacement of components such as pump seals, motors, etc. Provide straight sections of piping, 5 diameters minimum, on the suction and discharge of pumps. Use long radius elbows within 10 diameters of the suction side of pumps.
- 2.21 Where in-line pumps are used, the maximum installed height shall be limited to 60" from the floor.
- 2.22 Casings shall have tapped and plugged openings for vent, drain, and suction and discharge gauge connections. Provide a gage, with valves, for suction and discharge pressure.