

PART 1 – GENERAL

Section includes design and installation requirement for pressure booster pumps, submersible sewage ejectors, sump pumps, submersible sump pumps, in-line circulators, vertical in-line pumps, close-coupled pumps, base mounted pumps and domestic hot water re-circulation.

1.01 REFERENCES

- A. ASME (American Society of Mechanical Engineers) - Boiler and Pressure Vessel Codes, SEC VIII: Rules for Construction of Pressure Vessels.
- B. UL 778 (Underwriters Laboratories, Inc.) - Motor Operated Water Pumps.
- C. HI-01 (Hydraulic Institute) - Standards for Centrifugal, Rotary, and Reciprocating Pumps.

1.02 DESIGN CRITERIA

A. Drawings and Specifications:

- 1. Provide unit dimensions, weight loading, required clearances, electrical characteristics, connection requirements and pumped fluid properties.
- 2. Provide equipment schedules: Identification tag, pump flow and head capacities, balancing requirements, electrical requirements, weights, etc. Indicate future and installed operating parameters on mechanical equipment schedule.
- 3. Indicate service access requirements on plans. Calculations pump materials must be reviewed and adjusted to accommodate specific liquid conditions for pumping system with fluid significantly different than water, such as liquids that are viscous, flammable, volatile, corrosive or carrying solids in suspension.
- 4. Submit pump sizing calculations. At the minimum the calculations shall include general system equation for head consisting of total maximum system friction head at maximum flow and net system static head (for open systems).
- 5. Plot the system curve on the manufacturer's pump curves to determine maximum system operating head and flow.

6. Provide low limit pressure switch, low pressure alarm indicator, running indicator, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gages.
7. Pump Switch: Permit manual or automatic operation.
8. Provide butterfly valves on suction and discharge of each pump.
9. Provide non-slam check valve on each pump discharge.
10. Pressure gauges shall be provided on inlet and discharge side of all pumps.
11. At a minimum providing lifting eyes for all pumps with unobstructed path for removing pumps and associated motors.
12. For lift stations located within a building provide ventilation as required to keep air quality at the level prescribed by all applicable codes and regulations (OSHA, ASHRAE, IMC, etc.).

B. Design:

1. Main Pumping Capacity: Main pumping system should be sized with 15 to 20 percent extra (flow and head) capacity. Pumps shall be with impeller sizes in the middle range of those available. Do not select an impeller size at the maximum or minimum limits for the pump. Select motor HP to meet future capacity. Provide pumps that operate at 1800 RPM.
2. Submersible pumps shall be duplex type with automatic alternating lead pump controls with manual override.
3. Lift stations shall have external switch for easy connection to mobile emergency generator. The external switch shall be clearly labeled "EMERGENCY GENERATOR CONNECTION."
4. Select pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve. Pump seals shall be selected for operating conditions and shall be NI-Resist or Tungsten Carbide.
5. Main hydronic hot water heating and chilled water pumps shall be provided with a 100 percent standby unit.
6. Provide duplex pumps with standby power for steam condensate pumps, sewer lift stations, or storm lift stations.

7. Provide Variable Frequency Drives (VFD) for variable volume applications for pumps 7.5 HP and larger in accordance with Washington State Energy Code.
8. Direct Digital Controls shall be utilized for monitoring and controls.
9. Vibration Isolation and Seismic Restraints: Provide vibration isolation with seismic restraints. Secure unit, components and accessories in accordance with seismic requirements per code. Base mounted pump, motor and shaft shall be mounted and isolated on the same integral steel frame with inertia base, with seismically restrained integral steel isolators.
10. All sumps shall be sized to have holding capacity of minimum 6 hr at design load to allow time for connecting pumps to a portable generator.
11. Provide certification from pump manufacturer that mechanical pumps seals are suitable for maximum expected temperature and chemical treatment used.

1.03 OPERATIONS AND MAINTENANCE MANUALS

- A. Include a copy of each pump curve with plotted design conditions plotted in the Operations and Maintenance Manual.

PART 2 - PRODUCTS

2.01 PUMPS

A. Pressure Booster Pumps:

1. Manufacturer: Grundfos, Armstrong, Peerless.
2. Engineered (Packaged skid mount not allowed) with multiple pumps.
3. Sequence: Operate continuously with lag pump operating on system demand.
4. Should lead pump fail to operate, next pump in sequence shall start automatically. System to alternate the pumps for equal operating time. Pump switch for manual or automatic operation.
5. Low Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.

B. Submersible Sewage Ejectors:

1. Manufacturer: Hydromatic with "Hydr-O-Rail.", Weil, Goulds, or approved equal.

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2. Type: Model S4S duplex submersible, vertical, centrifugal.
 3. The pump discharge shall be fitted with a standard ANSI 125 lb flange, faced and drilled. All mating surfaces shall be flame proof joints with special labyrinth joint to prevent a flame or spark to travel to the media being pumped. All fasteners exposed to the pumped liquid shall be 316 stainless steel.
 - a. Casing: Cast iron pump body.
 - b. Impeller: Two-vane, cast iron, semi-enclosed, non-clog, with stainless steel shaft.
 4. Servicing: Slide-away coupling consisting of discharge elbow secure to sump floor, movable bracket, guide pipe system, lifting chain and chain hooks.
 5. Controls by Siemens: Pump Control sequencing shall be through the Siemens DDC System and contain: duplex control panel containing across-the-line electric motor starters with ambient compensated quick trip overloads in each phase with manual trip button and reset button, circuit breaker, control transformer, electro-mechanical alternator, hand-off-automatic selector switches, pilot lights, high water alarm pilot light, reset button and alarm horn, Disconnect in Type 316 Stainless Steel enclosure. System shall be "Intrinsically Safe" Explosion Proof rating shall be for NEC Class 1, division 1, group C & D hazardous locations.
 6. Level Controls: Milltronics XPS/XCT, Flowline Echotouch LU20-50 or approved equal. Ultrasonic connected to Siemens DDC control panel to start and stop pumps, to disable pump on low level and to signal high and low level alarm.
- C. Sump Pumps:
1. Manufacturer: Hydromatic or approved equal.
 2. Pump Type: Vertical centrifugal, direct connected, duplex arrangement.
 - a. Casing: Cast iron volute with radial clearance around impeller inlet strainer slide away couplings.
 - b. Impeller: Cast iron open non-clog keyed to stainless steel shaft.
 3. Level Controls: Milltronics XPS/XCT, Flowline Echotouch LU20-50 or approved equal. Ultrasonic connected to controls to start and stop pumps, to disable pump on low level and to signal high and low level alarm.

4. Pump Control sequencing shall be through the Siemens DDC System and contain: Electric motor starters, alternator, selector switches, high/low alarms and indicator lights.

D. Submersible Sump Pumps:

1. Manufacturer: Hydromatic, Weil, Goulds, or approved equal.
2. Pump Type: Model “S” duplex submersible, vertical, centrifugal.
 - a. Casing: Cast iron pump body.
 - b. Impeller: Two vanes, bronze enclosed, stainless steel shaft.
3. Servicing: Slide-away coupling consisting of discharge elbow secure to sump floor, movable bracket, guide pipe system, lifting chain and chain hooks.
4. Level Controls: Milltronics XPS/XCT or Flowline Echotouch LU20-50 or approved equal. Ultrasonic connected to Siemens DDC control panel to start and stop pumps, to disable pump on low level and to signal high-level and low-level alarm.
5. Pump Control sequencing shall be through the Siemens DDC System and contain: Electric motor starters, alternator, selector switches, high/low alarms and indicator lights.

E. In-Line Circulators:

1. Manufacturers: Bell & Gossett, Armstrong, Grundfos, or approved equal.
2. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psig maximum working pressure.
 - a. Casing: Cast iron, with flanged pump connections.
 - b. Impeller brass or cast bronze keyed to shaft.

F. Vertical In-Line Pumps:

1. Manufacturers: Mepco, Armstrong, Peerless, or approved equal.
2. Type: Vertical, single stage, close coupled, radial split casing, for in-line mounting.
 - a. Casing: Cast iron, flanged suction and discharge.
 - b. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

G. Close Coupled Pumps:

1. Manufacturers: Mepco, Armstrong, Peerless, or approved equal.

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2. Type: Horizontal shaft, single stage, close coupled, radial split casing.
 - a. Casing: Cast iron flanged suction and discharge.
 - b. Impeller: Bronze, fully enclosed, keyed to motor shaft extension.
 - H. Base Mounted Pumps:
 1. Manufacturers: Mepco, Armstrong, Peerless, or approved equal.
 2. Type: Horizontal shaft, single stage, direct connected, radial split casing.
 - a. Casing: Cast iron, flanged suction and discharge.
 - b. Impeller: Bronze, fully enclosed, keyed to shaft.
 - c. Baseplate: Rigid baseplate with cross members (cast iron baseplate assembly preferred).
 - I. Hot Water Circulation Pumps (Domestic):
 1. Manufacturers: Mepco, Armstrong, Grundfos, or approved equal.
 2. Bronze construction with replaceable stainless steel cartridge assembly, non-ferrous material impeller and ethylene gaskets.
 - J. Specialties:

See Section 200300 “Basic Materials and Methods.”
 - K. Condensate Pumping:

See Section 232200 “Steam and Condensate Systems.”

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide each pump with isolating valves, inlet strainer, check valve, pressure gauges upstream and downstream of pump, and unions or flanges for easy service removal.
- B. Provide an air vent in the casing of pumps sized 1-hp and larger.
- C. Verify alignment and submit alignment data.

3.02 LEVEL CONTROLS

- A. Level Controls: Milltronics XPS/XCT or Flowline Echotouch LU20-50 or approved equal. Ultrasonic connected to Siemens DDC controls system to start

and stop pumps, to disable pump on low level and to signal high and low level alarm.

B. Level Sequence: Submersible Pumps.

Low Low Level – Disable Pumps Manual or Auto operation.

Low Level – Send “Low Level Alarm” Shut off Pumps.

Pump Off – Shut off Pumps.

Pump On – Start Pumps.

High Level – Send “High Level Alarm” Start Pumps.

END OF SECTION