

CHAPTER 7

PUMPING STATION COMPONENTS

7-1. Construction requirements.

a. Station configuration. The space requirements of pumps, piping, and equipment, along with the storage volume required in the wet well, will be carefully determined so that the proper size, shape, and configuration of the pumping station can be selected. The size and shape of the station will often be dictated by equipment other than pumps, such as bar racks or screens. Rectangular or square structures normally have more usable interior space than circular ones and will be employed wherever possible in the design of medium to large sized pumping facilities. The below ground portion of the station must sometimes be made deep to accommodate incoming sewers. Where deep stations are required and where foundation conditions are poor, circular caisson type structures will be required if lateral earth pressures are excessively high. Factory assembled or package type stations will generally be circular in design and will be anchored to base slabs where warranted by subsurface conditions. All stations will be designed to avoid flotation when empty.

b. Designing for operation and maintenance. The design of medium to large sized, conventional type pumping facilities will include adequate floor openings, doorways, or access hatches for the installation, removal, and replacement of the largest items of equipment. Interior dimensions in the dry well will provide a minimum clearance of 4 feet between adjacent pump casings and a minimum of 3 feet from each outboard pump to the closest wall. Other major items of equipment will be provided similar spacing. Smaller package type stations will be furnished with necessary access openings for removal of pumps and equipment; however, interior dimensions and clearances will generally be less than for field erected stations. Wet wells for medium to large sized stations will be divided into two or more compartments to facilitate cleaning and repairs. Wet wells for all stations will have no length, width, or diameter smaller than 4 feet. Eye bolts or trolley beams will be provided in smaller stations and overhead bridge cranes in large stations, for hoisting and removing equipment from mountings. Stairs will be provided in medium to large sized stations so that personnel may inspect and maintain equipment. Smaller stations, except those utilizing submersible pumps, will require the use of vertical safety ladders. A suitable means will be provided to service and maintain all equipment. A floor drainage system will be provided in the dry well, and throughout the superstructure, for collection of wash down, seepage, and stuffing box leakage. These wastes will be piped or conveyed to the wet well, either by gravity or by sump pump. Openings to the wet well and dry well through the main floor of the station will be above the maximum flood level, or will otherwise be protected from flooding.

9 Apr 84

c. Personnel safety. Metal protective guards will be placed on and around all equipment where operators may come in contact with moving parts. Railings will be required around all floor openings and along platforms or walkways, where there is a danger that personnel may fall. Warning signs will be placed at all hazardous locations. Rubber mats will be provided in front of all electrical equipment where the potential exists for electrical shock. Adequate lighting and ventilation will be provided as required in paragraphs 7-2 and 7-3.

7-2. Heating and ventilation.

a. Heating. All pumping stations subject to possible freezing will be supplied with automatically controlled heaters in the equipment areas. For unattended stations, temperatures will be maintained at 40 degrees F. Attended stations will be heated at 65 degrees F. Although wet wells are generally unheated, thermostatically controlled heaters may be used to prevent condensation on walls and floors during cool weather providing that the ventilation system is shut off.

b. Ventilation.

(1) Wet wells will be provided with a positive ventilation capacity of 30 air changes per hour during occupancy, based on the wet well volume below grade and above the minimum waste level.

(2) Unattended dry wells will be provided with positive ventilation capacity of 30 air changes per hour. Attended dry wells will be provided with continuously-operated ventilation consisting of 6 air changes per hour, supplemented with additional ventilation in warm climates to remove pump motor heat to within 5 degrees F. of the outside air temperature. Supply intakes and exhaust outlets must be located properly to introduce fresh air and remove hazardous gases or fumes. The wet and dry well sides of the station will be provided with separate ventilation systems.

7-3. Electrical equipment and lighting. Pumping station equipment will be suitable for operation at 208 volt, 230 volt, or 480 volt, 60 Hz, three-phase power supplies. However, equipment with motors smaller than 0.5 hp including meters, switches, timers, clocks, and similar equipment will be suitable for operation at a 125 volt, 60 Hz, single-phase power source.

a. Service transformers. Service transformer installations will conform to requirements of EM 1110-3-190.

b. Motor starters and controls. Motor starters and controls will be provided and housed in a factory assembled free-standing control center located on the ground floor. The center will include motor starters, switches or circuit breakers, instrumentation, and controls.

9 Apr 84

A pumping station requiring a few small size starters is an exception and will employ wall mounted or angle iron stand mounted equipment.

c. Control for submersible pumps. Enclosures for submersible pump controls will be installed above grade.

d. Trouble alarms. Local trouble alarms will be provided at all pumping stations. Alarms will be annunciated remotely from unattended locations. Alarm systems will be provided with manual silencing.

7-4. Standby power. The requirement for standby power at wastewater pumping stations will depend upon the type, location, and critical nature of each facility. For stations situated in low-lying areas or in areas remote from a treatment plant, standby capability will be provided if a power outage would result in flooding of the station, overflows at sewer manholes, or backup of wastes into buildings. Pumping stations located at, or in conjunction with, treatment facilities will require standby power if the pumping is essential to critical treatment processes or plant flow control. Paragraph 4-2 contains design criteria for selecting pump drive units and describes various arrangements to be used in providing standby power capability at wastewater pumping stations.

7-5. Paints and protective coatings. The use of paints and protective coatings at wastewater pumping stations will be directed at providing protection of surfaces for periods compatible with the 5-year life expectancy of mobilization construction. Paint materials selected will be appropriate for the types of surfaces being protected, both submerged and nonsubmerged. Coating systems will be designed to resist corrosion from the wastes being handled and from gases and vapors present. Coating systems will consist of adequate surface preparation, prime coats, and finish coats using compatible materials as recommended by the coatings manufacturer. Particular care will be taken to protect welds and threads at connections. All pumps and equipment will receive protective coatings in conformance with the manufacturer's recommendations. Package type stations will be shipped to the construction site with factory applied paints and coatings sufficient for the required use and duration of service.