Table 25-4. Continued

Advantages	Disadvantages
Vertical frame-mounted centrifugal pumps in dry well with long shafts for motors on floor above	
Same as vertical frame-mounted pumps (see also Table 25-3).	Highest cost; shafting adds 5–7% to pump cost. Must analyze the shaft for torsional vibration. Impractical for large (1.3 m^3/s or 20,000 gal/min) pumps.
Wet well submersible pump and motors	
Wide range of sizes and characteristics—up to 5 m^3/s (80,000 gal/min) for a vertical propeller pump. Conditions favoring use Need for low first cost. Many other units in same system. See also Table 25-3.	V/S control limited to AFD. Pump and motor are more expensive than dry well types. Maintenance requires removal (a messy operation) from wet well and disassembly by trained workers, so factory service may be required at substantial expense.
Dry well submersible pumps	
Excellent reliability. Maximum protection against dry well flooding. No seal water. No intermediate shafting to disassemble for work on pumps and no steady bearings nor structure to support or gain access to them. Eliminates maintenance of such bearings. No daily maintenance. No oiling, greasing, or leaking packing glands. Reduced housekeeping. Air fin or water jacket cooling permits much greater pump-cycling frequency. Above advantages may make submersibles the most cost effective. Minimal or no vibration. Quieter than ordinary dry pit pumps. No long shafts to interfere with cranes. Becoming popular. Conditions favoring use High risk of dry well flooding. Deep stations. Reduced maintenance requirements.	More costly than pump and separate motor, although elimination of seal water systems and reduction of wet well size because of more frequent allowable starts may make price competitive. Water jackets require frequent flushing, occasional disassembly, and they are often clogged with solids in pumped fluid at low speeds. Fresh water cooling expensive. Repairs in place may void manufacturer's guarantee. If delays are likely for shop repairs, must have uninstalled spare unit. Air cooling is inadequate for many models (requires cooling water jacket, fins, or large fan on motor). Variable-speed control limited to AFD, which may increase cooling problems especially at lower speeds (see Section 15-11). Access to the pump (the part of the unit requiring the most maintenance) is costlier than with a conventional pump.
Propeller pumps	
High efficiency. Large discharge, up to 57 m^3/s (2000 ft^3/s). Low cost, low maintenance. Available with variable pitch blades, which reduces motor horsepower and starting torque. Conditions favoring use Large discharge at low head (9 m or 30 ft) per stage for axial flow and up to 24 m (80 ft) per stage for mixed flow. Screened sewage or storm water.	Unsuited for raw sewage flows smaller than 1 m^3/s (15,000 gal/min) and unsuitable for high heads. Sewage should be screened for small pumps. Variable pitch blades may not be reliable. Check with users.
Vertical column, wet well pumps	
Axial- or mixed-flow pumps permit high capacity and, with multiple stages, reach high head. Avoid centrifugal volute-type pumps for wet well applications and use submersible or vertical turbine, solids-handling pumps instead. Conditions favoring use Large flows following primary treatment or screening. Propeller pumps for intermittent service on screened storm water.	Non-clog volute pumps limited to small capacities. Radial loads on submerged bearings limit bearing life. Diffusion vaned pumps cannot pass stringy solids, not useful for raw sewage in smaller sizes. Limited stable capacity range. Entire pump with column must be removed for service.

(Continues on next page)