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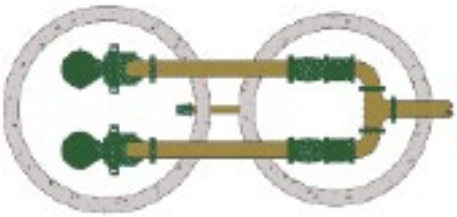
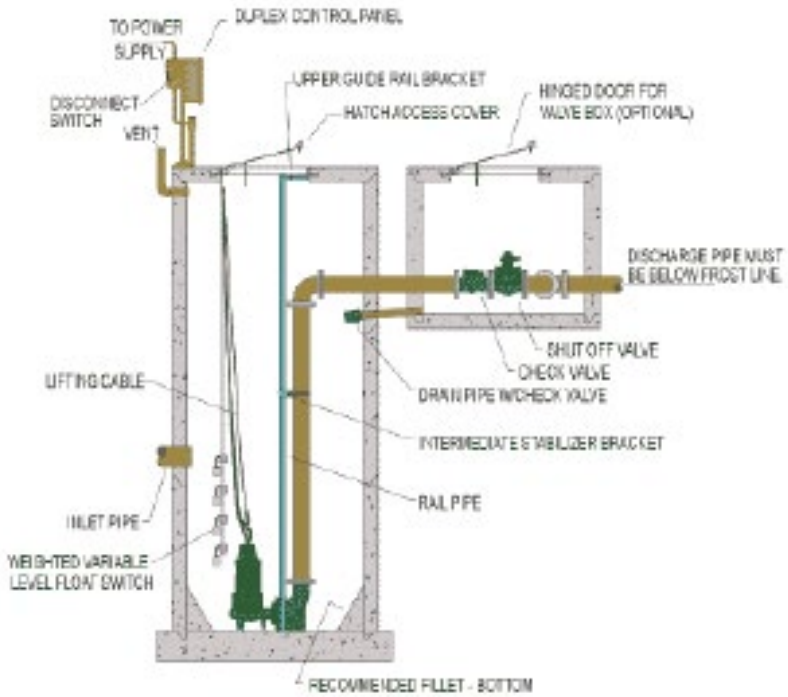
Submersible Pumps in Wastewater Collection Systems

Contributed by Steve Doolittle

A wastewater collection system is a network of pipes, containment basins, pumps, valves and manholes that are used to collect and move the liquid to a treatment facility. Ideally, a system is designed so that the wastewater flows by gravity. But, soil conditions and topography are factors that may impede gravity flow. Rocky soil or a high-water table may be an impediment to the installation of a gravity sewer. Long pipe runs through flat surface areas or hilly contours will prohibit gravity flow. Where gravity flow is not practical, a Lift Station may be required. A Lift Station, also called a Pump Station, is a below grade basin that collects the wastewater and pumps it up to a higher elevation. Pump Station will be found in Gravity Sewers, Pressure Sewers and at the Headworks of a Wastewater Treatment Facility.

Submersibles are a popular type of pump used in these stations. Submersible Pumping Systems are compact and often less costly to install than other system types. Being a below grade installation, these systems do not obstruct sight lines and are virtually silent during operation.





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The components used in the Submersible Pump System are designed for dependable service in the harsh environment they operate in. The pumps are made of robust iron castings, often protected with powdered coated epoxy. The pumps are available with abrasive resistant mechanical seals, long life bearings and a special cord entry system designed to prevent the liquid from penetrating into the motor. Since these pumps are submerged in a liquid whose temperature is usually below 100 degrees F., the motor will have a favorable heat dissipation rate, enabling the motor to remain cool, even during continuous operation.

The most common basin materials are concrete and fiberglass, with the smaller systems usually being fiberglass. Most systems are provided with Rail Systems, which simplify the installation and removal of the pumps from the basin when servicing is required. The discharge piping is usually PVC or SS. Brackets and lifting cables or chains are typically constructed from SS. Check Valves, Shut-Off Valves and Air Relief Valves will be installed in most systems. The basin will have a cover that can be made from a variety of materials; fiberglass, steel and aluminum, with a rated aluminum cover with access hatch being the most common on larger systems.

Pump operation is controlled by liquid level sensors that are connected to a control panel. The most common liquid level sensor is a float switch, while transducers and other pressure sensing devices are often used. The control panel will contain the motor contactors, overloads, pump protection features and alarm functions. The control panel is located in a ventilated area outside the basin, either mounted on a stand near the cover or on a nearby wall surface.

There are two types of pumps used in Submersible Pump Stations. Solids Handling Pumps are used in larger systems that have a high flow rate requirement. Grinder Pumps are used in smaller systems, used in Pressure Sewers, and are low flow-high head pumps.

Pump stations are a major investment and are expensive to operate and maintain. As technology improves, operation and maintenance will require special skills. These factors along with increasingly stringent regulatory requirements highlight the need for a properly designed Pump Station.

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