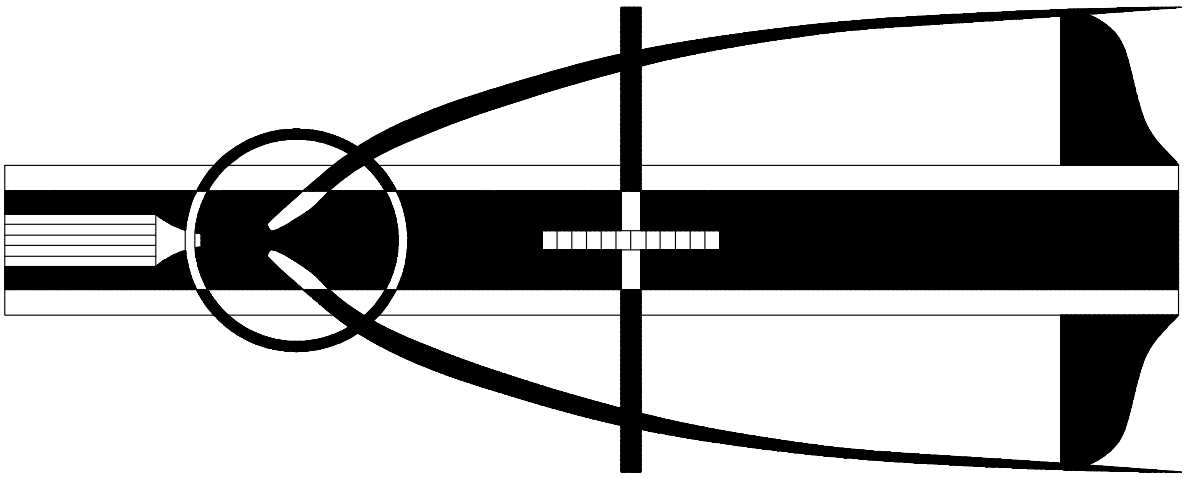
norweco®

SUBSURFACE DRIP
DISPOSAL SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete subsurface drip disposal system with all necessary parts and equipment as described in the following specifications. The drip disposal system shall be designed to receive treated effluent from the Singulair Bio-Kinetic wastewater treatment system and effectively distribute the effluent into the subsurface soil in a controlled manner. The design of the drip disposal system shall allow effluent to be evenly dispersed throughout the entire area of the drip field. Effluent disposal shall be accomplished through evapotranspiration, nutrient uptake by vegetation and uniform dispersal into the shallow subsurface soil. The system shall be used only for disposal of treated effluent and shall be installed immediately downstream of the Singulair Bio-Kinetic wastewater treatment system. Floor drains, foundation drains, downspouts and other storm water sources shall not be connected to the drip disposal system.



The drip disposal system shall be specifically designed for use in wastewater applications. Principal items of equipment supplied shall include an effluent pump chamber, high head effluent pump, integrated system controls, mechanical float switches, headworks assembly, optional zone indexing valve, supply lines, pressure compensating drip tubing, air/vacuum relief valves and return lines. Primary, secondary and tertiary treatment of the domestic wastewater shall be performed by the Singulair Bio-Kinetic wastewater treatment system incorporating non-mechanical flow equalization, pretreatment, secondary treatment and effluent filtration. Wastewater treatment systems that do not include non-mechanical flow equalization, pretreatment, secondary treatment and effluent filtration are subject to washout of solids and shall not be considered for this application. All design criteria for individual applications, including design flow volume, soil evaluation characteristics, soil texture, effluent application rate, pump chamber sizing, drip field size and layout, shall be governed by state and local regulations.

SUBSURFACE DRIP

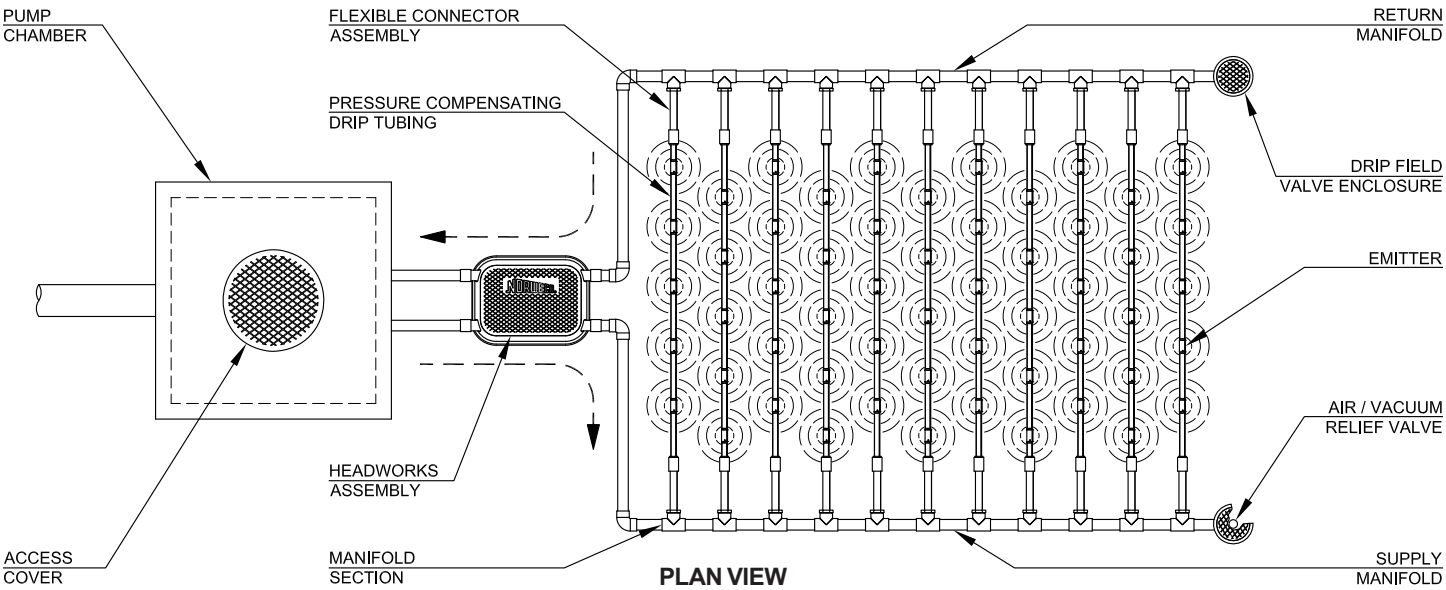
OPERATING CONDITIONS

The effluent disposal system shall provide even distribution of the daily wastewater flow into the subsurface soil over a 24 hour period. The disposal field shall be designed to accept effluent meeting USEPA secondary treatment requirements. Monthly average 5 day carbonaceous biochemical oxygen demand ($CBOD_5$) shall not exceed 25 mg/L and monthly average total suspended solids (TSS) shall not exceed 30 mg/L. Additional disposal field design factors shall include soil class, soil type, percolation rate, hydraulic conductivity and state and local regulations. Subsurface drip disposal of unfiltered effluent containing monthly averages exceeding 25 mg/L $CBOD_5$ or 30 mg/L TSS requires alternative design considerations, additional equipment and increased service frequency to prevent field failure. Consult state and local regulations for these requirements.

Treated effluent shall be retained in the pump chamber and be distributed throughout the entire day to the disposal field in programmable, low volume doses. The pump chamber shall contain a submersible high head pump for delivery of the treated effluent to the headworks assembly. Within the headworks assembly, flow shall pass through a 100 micron disc filter before continuing to the pressurized supply line manifold. The supply manifold shall extend the length of the disposal field. Flexible connector assemblies shall be used to attach individual lengths of drip tubing to the supply line manifold at 24" intervals. Along each length of drip tubing, pressure compensating emitters shall be located at 24" intervals for even effluent distribution in the disposal field. The downstream end of each individual length of drip tubing shall be connected to the effluent return line manifold with flexible connector assemblies.

The return line piping shall be routed back through the headworks assembly. Inside the headworks assembly, the flush valve shall maintain constant back pressure in the upstream drip tubing and all other piping. The flush valve shall maintain a constant low volume flow during pump operation. The valve shall be fully opened during system service to create a high volume flush of the field piping back to the pump chamber. A flexible tube connection shall allow the 100 micron filter reservoir to constantly direct filtered solids to the return line downstream of the flush valve.

Air/vacuum relief valves shall be located at the high points of the supply line and the return line. The valves shall prevent soil from being drawn into the drip tubing as effluent drains to the pump chamber during the “off” cycle. The air/vacuum relief valves shall also permit rapid filling of the supply lines, return lines and drip tubing by purging air from the lines during the pump “run” cycle. The rapid filling and draining of the lines and tubing shall minimize the chances of freezing in cold climates. Applications needing a pump delivery rate in excess of 20 gallons per minute (GPM) shall require the use of an automatic zone indexing valve. The valve shall allow the total disposal field area to be divided into independent zones. Each of the zones shall be dosed sequentially by automatic indexing of the valve.

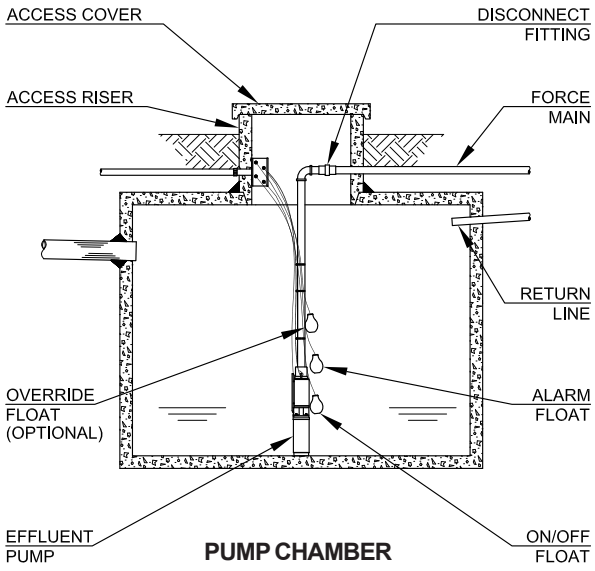


PLAN VIEW

EFFLUENT PUMP CHAMBER

Treated effluent produced by the Singulair Bio-Kinetic wastewater treatment system shall be stored in the effluent pump chamber. Delivery of the treated effluent to the subsurface drip disposal system shall be metered over the course of the entire day. The effluent pump chamber shall be of watertight construction and shall provide access from grade to all internal components and piping. To prevent unauthorized access, the cover shall have a minimum weight of 65 pounds or shall be secured with a padlock or fasteners that require specialized tools for removal.

The pump chamber shall contain a high head effluent pump, mechanical float switches, discharge piping for connection to the supply line and return line piping from the headworks assembly. The pump chamber shall be designed to provide a minimum of 18 hour retention of the design daily flow from the facility being served. The chamber capacity shall provide 12 hour retention below the high water alarm level and an additional 6 hour retention above the alarm level. State and local regulations may specify additional capacity requirements. The return line from the disposal field shall recirculate a low rate of flow to the chamber during normal pump operation and a high rate of flow during system service.



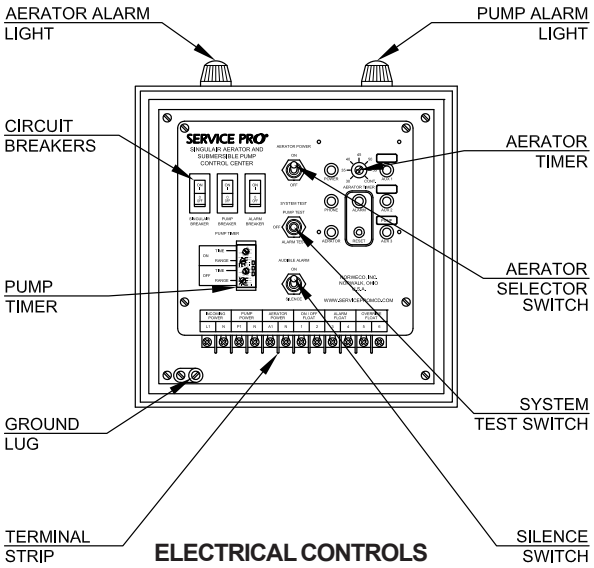
PUMP CHAMBER

HIGH HEAD EFFLUENT PUMP

The high head effluent pump shall be a Norweco Model HB105 designed for use with filtered effluent and be capable of passing $^{1}/_{16}$" spherical solids. The pump motor shall be $^{1}/_{2}$ horsepower rated and operate at 3450 RPM. The power cord shall be 10 feet long and carry an SJOW designation as recognized by CSA and UL for use in wastewater applications. The motor assembly shall have corrosion resistant stainless steel exterior construction and incorporate a dual action starting switch to provide automatic torque reversal. The pump shall be designed to deliver 20 GPM at 30 pounds per square inch (psi) and shall incorporate a 115 volt, single phase, 60 Hertz motor with built-in electrical surge protection and overload protection. To facilitate disposal field draining between pump cycles, the pump or discharge piping shall not contain a check valve. The pump discharge line shall include a disconnect union in order to remove the pump for service.

INTEGRATED SYSTEM CONTROLS

The integrated system controls shall be designed to operate the high head effluent pump as well as the Singulair wastewater treatment system. The controls shall be contained within a single, UL Listed, NEMA 4X electrical enclosure with dead front. The controls shall include a 15 amp Singulair circuit breaker, adjustable aerator timer, auxiliary alarm inputs, Service Pro telemetry system, 15 amp pump circuit breaker, adjustable electronic pump timer, 15 amp alarm circuit breaker, system test switch for alarm and pump tests, alarm silence switch, terminal strip, ground lug and all necessary wiring and components. The controls shall be equipped with red and amber warning lights and audible alarms. The external alarm lights shall be conspicuous at a distance of 50 feet and the audible alarms shall deliver a signal that is in excess of 70 dbA at a distance of 5 feet. Incoming power and all external component wiring, including mechanical float switches, shall connect to a single terminal strip. The integrated system controls shall allow low volume doses to be delivered to the disposal field over the entire day. The programmable interval timer shall allow for adjustable pump “run” cycles and “off” cycles between 5 seconds and 30 hours.

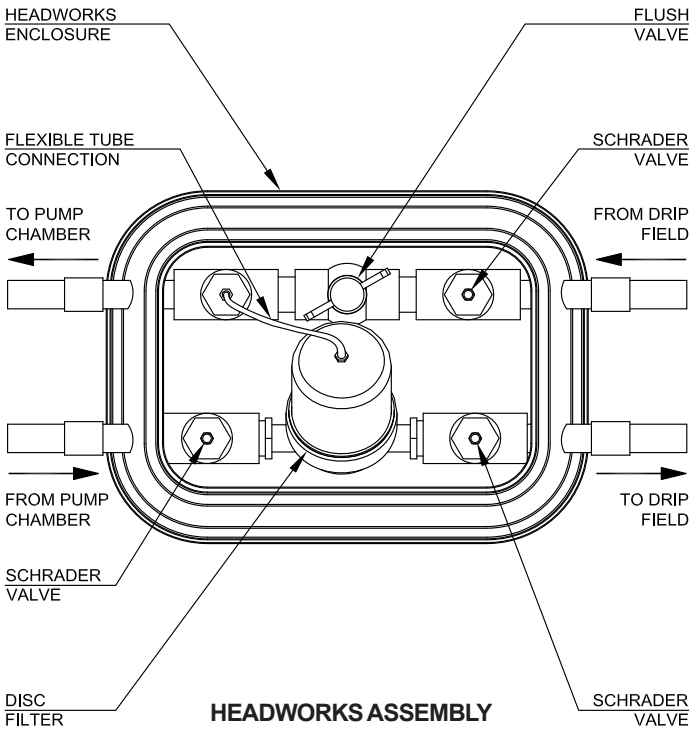


ELECTRICAL CONTROLS

A low level on/off mechanical float switch shall prevent pump operation when pump chamber volume is below the level of the pump intake. In the event of a hydraulic surge, a second float switch shall activate the high water alarm. A third float switch (optional) shall override the adjustable pump timer and activate the pump.

DISPOSAL SYSTEM

HEADWORKS ASSEMBLY



HEADWORKS ASSEMBLY

The headworks assembly shall contain supply and return line connections, 100 micron disc filter, supply line to the drip disposal field, return line from the disposal field, Schrader valves for pressure monitoring, flush valve, filter flush line and return line to the pump chamber. All of the headworks components shall be contained within a single, open bottom enclosure manufactured from synthetic polymer, suitable for burial at grade. If required, the enclosure shall have a purple lid designating non-potable water. All equipment in the headworks assembly shall be arranged and located to allow access to each component during service.

The disc filter shall provide continuous removal of effluent suspended solids larger than 100 micron. Both surface filtration and depth filtration shall be provided by the disc filter for decreased service frequency and increased filter life. The filter shall include a disc cartridge that can be easily removed and reinstalled during service. During pump operation, the filter shall continuously direct accumulated solids to the return line piping.

Schrader valves shall be installed immediately upstream and downstream of the disc filter to monitor pressure loss through the filter. An additional Schrader valve shall be installed upstream of the flush valve to allow monitoring of the system operating pressure during the pump run cycle. The valve shall allow a portable liquid pressure gauge to be connected to the return line for calibrating the system operating pressure at start-up and after each field flush procedure.

The flush valve shall be installed in the return line, upstream of the filter discharge connection. The valve shall be used to establish the system operating pressure and to permit a continuous flow through the drip disposal field during pump operation. While the pump is operating, the valve shall be used to throttle the return line flow rate, inducing back pressure in all upstream components. During routine maintenance, the valve shall be fully open while the pump is operating to allow a field flush of accumulated solids from the supply lines, drip lines and return lines. Following the field flush, the valve shall be adjusted to achieve a system operating pressure of 25 psi.

SUPPLY AND RETURN LINES

The supply and return lines shall be constructed of rigid PVC piping, suitable for subsurface use with treated wastewater. The piping shall be configured to provide a manifold at the end of each drip line to equalize system pressure in all areas of the disposal field. The lines shall be 1" to 1½" nominal diameter in order to provide a flow velocity of 2 feet to 5 feet per second to minimize deposition of solids. To purge the lines at the end of each pump cycle and minimize freezing in cold climates, the supply and return lines shall be installed with ⅛" of fall per foot of length and drain back to the pump chamber.

Supply and return line manifolds shall each contain branches at 24" intervals to allow connection to individual drip lines via flexible connector assemblies. The assemblies shall allow the supply and return lines to be installed with fall for drainage while allowing the individual drip lines to be installed at a consistent depth. The assemblies shall also provide lateral separation between the supply and return line trenches and the drip tubing emitters. The separation shall be adequate to prohibit the flow of effluent to the supply or return line trenches. The connector assemblies shall be manufactured from flexible PVC pipe and fittings. Flexible pipe shall be solvent welded to each branch of the supply and return line manifolds. The flexible assemblies shall also provide a slip connection to each length of drip tubing. Assemblies that do not contain flexible PVC pipe prohibit the drip lines from being installed level and shall not be considered for this application.

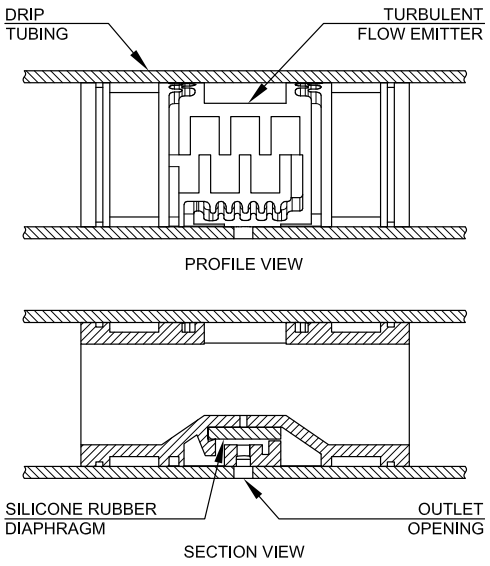
SPECIFICATIONS

PRESSURE COMPENSATING DRIP TUBING

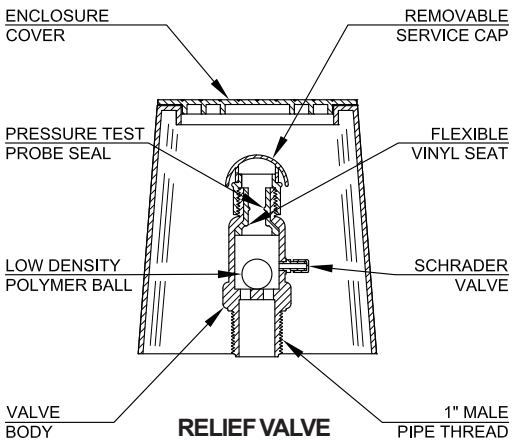
The pressure compensating drip tubing shall evenly distribute the treated effluent into the subsurface soil layer. The tubing shall be of linear low density polyethylene construction and shall contain a purple stripe on the outside designating non-potable water. To insure continual flushing of solids, the inner lining of the tubing shall contain an antimicrobial agent to prevent the adhesion of biological material.

The drip tubing shall have pressure compensating turbulent flow emitters bonded to the inside wall to insure consistent, uniform delivery throughout the disposal field, regardless of field geometry or topography. The emitters shall be regularly spaced 24" apart along the length of the drip tubing. Each emitter shall be constructed of virgin polyethylene resin with a silicone rubber diaphragm to control the discharge rate. The pressure compensating emitters shall have a nominal discharge rate of 1.0 gallons per hour per emitter. The emitter shall be infused with a root growth inhibitor to prevent root intrusion for a minimum of ten years.

To assure uniform effluent distribution, drip tubing shall be installed 6" to 12" below the surface of the ground, with lateral lines installed on 24" centers. For minimum disturbance to the existing landscape, a vibratory plow or special tubing insertion tool shall be used for the installation. If an open excavation or narrow trench is necessary, native soil shall be used as backfill material around and above the drip tubing to promote even absorption of the treated effluent.



DRIP TUBING EMITTER



RELIEF VALVE

AIR/VACUUM RELIEF VALVES

An air/vacuum relief valve shall be installed at the high point of the supply line. The valve shall permit rapid filling of the supply line and drip tubing by allowing air to be evacuated through the relief chamber until effluent flow causes the valve ball to automatically close. An air/vacuum relief valve shall also be installed at the high point of the return line. The valve shall allow rapid evacuation of the effluent at the end of each pump operating cycle by allowing ambient air to enter the air relief chamber. Each valve shall contain a removable cap for service. The valve body and removable cap shall be constructed of molded plastic and shall be attached with a $^{3}/_{4}$" hose thread. The valve ball shall be constructed of low density polymer and the internal ball seat shall be of flexible vinyl construction. Each air/vacuum relief valve shall be installed in a single, open bottom enclosure manufactured from synthetic polymer suitable for burial at grade. If required, the enclosure shall have a purple lid designating non-potable water.

ZONE INDEXING VALVE (OPTIONAL)

Applications requiring more than 1800 lineal feet of pressure compensating drip tubing, or more than 20 gallons per minute of pump delivery, shall be constructed to have two or more independent zones. Multiple drip field zones shall require the use of an automatic zone indexing valve installed in a separate enclosure immediately downstream of the headworks assembly. In order to automatically distribute the daily flow evenly over independent disposal field zones, the indexing valve shall be equipped with a single inlet and four outlets. The valve shall be furnished with three individual cams for use with two zone, three zone or four zone applications. The valve shall utilize hydro-mechanical actuation and shall automatically index to the next sequential zone at the end of each pump operating cycle. The zone indexing valve shall be installed in a single, open bottom enclosure manufactured from synthetic polymer suitable for burial at grade. If required, the enclosure shall have a purple lid designating non-potable water.

TWO YEAR LIMITED WARRANTY

The manufacturer shall provide a limited warranty against defects in material and workmanship under normal use and service for a period of two years. The limited warranty shall cover all components of the effluent drip disposal system purchased from the manufacturer, including high head effluent pump, integrated system controls, headworks assembly, pressure compensating drip tubing, flexible connectors, air/vacuum relief valves and optional zone indexing valve. A detailed copy of the warranty shall be provided to the regulatory agency, contractor or customer as required.

EQUIPMENT MANUFACTURER

The equipment specified herein shall be the product of a manufacturer having a minimum of seven years experience in the construction of prefabricated wastewater treatment systems and effluent disposal equipment. Bids shall be prepared on the basis of the equipment and materials specified herein for purposes of determining the low bid. This is not done, however, to eliminate other products of equal quality and efficiency. If equipment is to be substituted, approval of such substitution must be made prior to the execution of any order. It is assumed that substitution will result in a reduction of cost to the contractor and that if accepted, these savings will be passed along by a reduction in the base bid.

DRIP DISPOSAL SYSTEM DATA CHART

RECOMMENDED MINIMUM SURFACE AREA GUIDELINES

		Soil Absorption Rates			
Soil Class	Soil Type	Estimated Soil Percolation Rate (minutes/inch)	Hydraulic Conductivity (inches/hour)	Hydraulic Loading Rate (gallon/square foot/day)	Disposal Field Area Required (square foot/gallon/day)
I	Coarse Sand	<5	>2	1.400	0.715*
I	Fine Sand	5–10	1.5 – 2.0	1.200	0.833*
II	Sandy Loam	10–20	1.0 – 1.5	1.000	1.000*
II	Loam	20–30	0.75 – 1.0	0.700	1.430*
III	Clay Loam	30–45	0.5 – 0.75	0.600	1.670*
III	Silt-Clay Loam	45–60	0.3 – 0.5	0.400	2.500*
IV	Clay Non-Swell	60–90	0.2 – 0.3	0.200	5.000*
IV	Clay-Swell	90–120	0.1 – 0.2	0.100	10.000*
IV	Poor Clay	>120	<0.1	0.075	13.340*

*Total Minimum Disposal Field Surface Area = System Daily Design Flow (GPD) x Disposal Field Area Required.
NOTE: Check state and local regulations for specific application requirements.

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