

DRIP EMITTER SYSTEM STUDY GUIDE

Minimum Criteria for Pressurized Subsurface Absorption Fields Utilizing Emitters.

Subsurface systems utilizing emitters may be used in lieu of conventional or other alternative absorption fields. The number of subsurface land disposal systems continues to increase as sites are developed with conditions unsuitable for many other wastewater treatment systems. This document provides guidelines and criteria for the planning, design and operation of pressurized subsurface absorption fields utilizing emitters, commonly referred to as drip irrigation.

The term drip irrigation as used in this document refers to the treatment of wastewater by pressurized, timed, irrigation below the land's surface. These systems are designed and operated so that there is no direct discharge of wastewater to the land's surface. The irrigated wastewater transpires to the atmosphere and enters the groundwater through infiltration and percolation (evapo-transpiration). Organic constituents in the wastewater are consumed or stabilized by soil bacteria. Organic and ammonia nitrogen are taken up by plants, nitrified by soil bacteria, lost to the atmosphere through denitrification, leached into the groundwater or stored as soil nitrogen in the site biota. Phosphorous and many metal constituents are absorbed into soil particles and taken up by plants. Properly designed and operated wastewater irrigation systems produce a percolate water of high quality and thus protect ground and surface waters.

The criterion in this document only applies to domestic wastewater. The drip irrigation technology is based on maintaining aerobic conditions in the soil. Therefore dosing and resting cycles must be established as part of the plan of operation and management. In order for systems to maximize nitrogen removal and prevent nitrate nitrogen from contaminating the groundwater, the installation of the subsurface dripper lines should be within the root zone of the cover vegetation. The on site waste water system will consist of aerobic pretreatment followed by a subsurface distribution system utilizing emitters to distribute a controlled flow of wastewater to the soil. Drip irrigation systems must be capable of providing an equal flow distribution of wastewater effluent applied through out the application field(s)/zone(s) at a predetermined application rate. It is imperative that all drip irrigation systems maintain uniform and accurate control of the effluent emission rates. Equipment must be provided that will identify and record any fluctuations in the wastewater flow through the system. All equipment proposed for use must be certified and warranted by the manufacturer that it has been tested for use with wastewater. The manufacturer of the drip irrigation system should have a history of usage of emitters with a wastewater application. A drip irrigation system may be sold as a complete package. All prepackaged systems must be approved by the Department prior to sale in the state of Georgia. A state of Georgia registered engineer must design drip irrigation systems designed on a site-specific basis.

Design Criteria

A. Pretreatment

1. Aerobic: The drip emitter system shall be preceded by a pretreatment process designed to reduce the wastewater biological oxygen demand (BOD5) to maximum concentration of 25 milligrams per liter (mg/l) and total suspended solids (TSS) concentration to a maximum of 30 milligrams per liter (mg/l). The aerobic pretreatment process must be reviewed by the Technical Review Committee and approved by the Department. This process must be able to treat a 24-hour flow for the design.

B. Dosing Tanks

1. The dosing chamber shall meet all requirements established in the Departments Manual for On-Site Sewage Management Systems, 290-5-26-.06, and have a minimum capacity equal to the 24 hour waste flow from the facility served. The dosing chamber shall be equipped with

- an audible and visible alarm that indicates a high water level or loss of power to the pump or controls.
2. Time dosing shall be utilized to dose the absorption field or zones. The frequency of dosing shall be based on the soil's hydraulic loading rate and the design flow. Fields or zones shall be time dosed to insure the total 24-hour wastewater effluent flow is applied in a 24-hour period.
 3. All new systems must be equipped to detect a + or - 10% change in flow rate in the disposal field due to clogging of the filters, a force main break, emitter clogging, leaks in the field lines or a flush valve failure. Such system shall include an audible alarm.

C. Subsurface Absorption Field

All components of the subsurface absorption system must be reviewed by the Technical Review Committee and approved by the Department for use in the State of Georgia. Any component changes will require a review and approval prior to use. The emitter subsurface absorption field system must meet the following requirements:

1. Dose the entire absorption field or zone equally. The length of each distribution line shall not exceed the manufacturer's specifications to insure equal application of wastewater effluent from each emitter. No more than a 10 percent variation in flow between individual emitters anywhere within a separately dosed zone, including drain back is acceptable.
2. Drain back - When slopes exceed five (5%) percent, check valves or other approved means shall be used in the supply and return manifolds to minimize drainage into the lowest area of the zone.
3. Emitter line and emitters must be warranted by the manufacturer for wastewater application and approved by the Department. Emitter lines must be identified with manufacturer's name and product number. Emitters shall be pressure or non-pressure compensating emitters. Emitters shall be spaced either one foot or two feet apart within the emitter line.
4. The wastewater effluent must be filtered to emitter manufacturer's specifications to insure the proper operation of the distribution system.
5. Filtration system shall be automatically self-cleaning and the filter residue and backwash returned to the treatment unit, with provisions made to minimize disturbance of any solids settling chamber (ex. Provide baffles or comparable intake structure in septic tank to minimize solids re-suspension in the inlet compartment).
6. Typically, separation between emitter line laterals shall be at least two feet. Lateral spacing of three feet or greater is required on slopes exceeding 20%.
7. Individual emitter lines shall be designed and installed level, following the naturally occurring ground contour, with a maximum allowable variance of plus (+) or minus (-) six inches within any linear one hundred foot (100') segment.
8. Emitter lines shall be installed in the root zone of the cover vegetation, a depth of 8 to 12 inches from the original undisturbed ground surface, and /or shall be a minimum of eight (8) inches from the ground surface.
9. A system for automatic flushing of distribution lines should be provided and performed according to manufacturer's recommendations, at a minimum on a bi-monthly basis. Velocities must be a minimum of two (2) feet per second at the distal end of each drip irrigation line or return line during the flushing operation.
10. All materials shall meet applicable ASTM standards, be chemical resistant, and be approved for wastewater usage.
11. Equipment susceptible to freezing must be adequately protected to prevent freezing.
12. There must be a totally separate drainfield replacement area equivalent in size to 100% of the emitter field installed.

D. Siting Criteria

1. The minimum horizontal setback requirements established in the Department's Rules and Regulations for On-Site Sewage Management Systems section 290-5-26-.07 shall be met.
 - a. Emitter absorption field lines must be located 50' from a stream, tributary, or other body of water including wetlands.
 - b. Emitter absorption field lines must be 5' from property lines.
 - c. Emitter absorption field lines must be located 100' from existing or proposed wells, springs or sinkholes.
2. Required vertical separation requirements shall be measured from the bottom of the drip tubing or trench bottom, whichever is greater.
 - a. Aerobic pretreatment shall require a minimum vertical separation of 12 inches between the bottom of the absorption field and any seasonal groundwater table, rock or impervious soil strata. Greater vertical separation may be required if a site is hydraulically limited as determined by soil investigations by the soil classifier or design engineer.
3. Areas subject to surface water ponding shall not be considered for installation.

E. Absorption Field Sizing

1. The following table FT-6 shall be used in determining the hydraulic loading rate for subsurface absorption fields utilizing emitters. The design hydraulic loading rate shall be based on the most hydraulically limiting, naturally occurring soil horizon within one (1) foot of the drip line or trench bottom, which ever is greater.

<u>Soil Group</u>	<u>Soil Textural Classes (USDA classification)</u>	<u>Maximum Hydraulic Loading Rate (gpd/sq.ft.)</u>
I.	Sands Sand Loamy Sand	0.4 to 0.3
II.	Coarse Loams Sandy Loam Loam	0.3 to 0.15
III.	Fine Loams Sandy Clay Loam Silt Loam Clay Loam Silty Clay Loam Silt	0.15 to 0.10
IV.	Clays Sandy Clay Silty Clay Clay	0.1 to 0.04

2. Maximum Hydraulic Loading Rates for anaerobic pretreatment is based on a waste stream with a BOD5 and TSS of 200 mg/l, or less, and a Fats, Oil and Grease content not to exceed 25 mg/l. Facilities with waste streams that exceed these limits shall not be approved unless additional treatment methods are utilized to reduce the waste stream BOD5, TSS, fats, oil and grease to acceptable limits. Facilities utilizing approved aerobic pretreatment shall not have a waste stream that exceeds a Fat, Oil and Grease content of 25mg/l prior to soil application.
3. In calculating the number of square feet for the absorption field, the design daily sewage flow shall be divided by the maximum hydraulic loading rate determined by table FT-6 above. In calculating the minimum linear length of drip emitter line required, the total square footage of the absorption field shall be divided by two (2) feet.
4. There shall be area available for 100% replacement of the emitter drainfield.

F. Application Requirements

1. The following information shall be submitted to the local county health department for evaluation and approval in order to obtain a construction permit for on-site sewage management system utilizing pressurized subsurface absorption fields with emitters:
 - a. A level IV soil report including detail with soil horizons identified and hydraulic loading rates determined for each horizon.
 - b. A site plan at a 1 inch to 40 feet scale including; topography with two (2) feet contour changes and soil types overlaid; house or facility location scaled with driveways, sidewalks, parking, and other structures shown; location of utilities, wells, water bodies or courses and easements.
 - c. Sewage system must be scaled on site plan including: septic tank or other pretreatment, dripline (wastewater approved), force main, return line, manifolds, location of check valves and air vents.
 - d. System Design Criteria including: type of pretreatment, sewage flow rate, drainline calculation, pump size (Make and model #), and pipe sizes identified (Schedule 40).
 - e. Type of emitter tubing (Manufacturer and product # - wastewater approved).
 - f. A manufacturer certified system design approved by the Department or a state of Georgia registered engineer is required. Systems with a design sewage flow in excess of 2,000 gallons per day shall be designed by a registered engineer.
 - g. Site plans shall bear the registration number and signature of the registered Engineer or Surveyor and the following statement: I certify this sewage system design meets the minimum design requirements established by the Georgia Department of Human Resources Manual for On-Site Sewage Management Systems.

G. Operation and Maintenance

Satisfactory operation and maintenance of pressurized subsurface absorption fields are necessary to safeguard the health of the user and the public.

1. A three-year initial service policy shall be furnished to the user by the manufacturer or licensed distributor, and shall be included in the original purchase price. This policy shall provide:
 - a. All necessary service calls over the three-year period including inspections, adjustments, servicing, and replacement of mechanical, electrical, and other

- components (minimum of 6 inspection/service visits, scheduled once every six months).
- b. Emergency service shall be available within no more than two days following a request. The owner and local county health authority shall be notified immediately in writing of any improper operation observed which can not be corrected at the time of the service call and the estimated date of correction.
 - c. A clearly visible, permanently attached label or plate, giving instructions for obtaining service, shall be placed at the visual alarm signal.
2. A user's manual shall be provided by the manufacturer or licensed distributor to the facility owner.
 3. Facility owners shall be required to obtain a continuing service contract and systems utilizing aerobic pretreatment shall submit to the local health authority on an annual basis aerobic pre-treatment waste stream test results.
 4. Facilities with a design flow in excess of 2,000 gallons per day shall submit to the local health authority a Plan of Operation and Management. The plan must address wastewater application rates, drip field cycling, monitoring requirements, maintenance schedules, and all other information necessary for successful operation.

H. Pumps and Electrical Components

1. All wiring and electrical components of the whole system shall conform to the National Electrical Code.
2. The high water alarm switch must be placed on a circuit separate from the pump switches.
3. Pumps used in subsurface pressurized drip emitter absorption fields shall be submersible, constructed of corrosive resistant materials, and be approved for sewage effluent. Pumps must be capable of delivering the required flow at the design total dynamic head.
4. A quick disconnect device shall be included in the discharge piping to facilitate removal of the pump for inspection, repair or replacement.