2. The type of drainage fabric used shall be specified in the engineering design and shall have adequate tensile strength to prevent ripping during installation and backfilling, adequate permeability to allow unimpeded passage of water, and adequate particle retention to prevent migration of soil particles into the filter material.

(h) Drainage pipe shall be laid throughout the entire length of the excavation and shall be placed immediately above the barrier material at the bottom of the excavation and midway between the sides. The type of drainage pipe used shall be as follows:

1. Upslope of the downslope side of the disposal field, where the excavation is filled with filter material, the pipe shall be perforated or laid with open joints.

2. Downslope of the downslope edge of the disposal field, and beyond the extent of the filter material, the pipe shall be non-perforated and laid with tight joints.

3. The size of the pipe shall be large enough to handle the expected amount of flow and in no case shall the pipe diameter be less than four inches.

4. Materials used for drainage pipe shall be as allowed in N.J.A.C. 7:9A-9.5(b).

(i) Free-flowing outlets shall be provided downslope of the drain, on each end of the disposal field. Outlets shall meet the following requirements:

1. Outlets may empty into a surface water body, a drainage swale discharging to a surface water body, a storm sewer, a groundwater recharge basin, a gravel bed, dedicated seepage pit, or dry well.

2. Outlets shall be designed, constructed, located and maintained in a manner which does not cause soil erosion, surface flooding or damage to adjacent properties, does not create a public nuisance, and does not violate any applicable Federal, State or local laws or regulations.

3. Adequate measures shall be taken to protect each outlet from entry of rodents or other small animals.

(j) Backfill over the drain and the drain discharge pipes shall be of earth similar to that found at the site and free of large stones, broken masonry, stumps or other waste construction material.

(k) Where an interceptor drain is proposed to divert laterally moving perched ground water away from the area of the disposal field, the drain shall be installed and its satisfactory performance confirmed prior to granting of final approval, as follows.

1. After installation of the drain has been completed, borings or pits shall be excavated to the top of (but not penetrating) the hydraulically restrictive horizon, hydraulically restrictive substratum or massive rock substratum above which the perched zone of saturation is located. This shall be done on the upslope and downslope sides of the drain and during a time of year when the presence of the perched zone of saturation is anticipated. Piezometers may also be used for this purpose provided that they do not penetrate through the hydraulically restrictive horizon and provided that the requirements of N.J.A.C. 7:9A-5.9(e) are met.

2. The drain shall be considered to be performing adequately if no perched zone of saturation is observed on the downslope side of the drain at the same time that a perched zone of saturation is observed on the upslope side of the drain. This test shall be witnessed by the administrative authority or its authorized agent.

7:9A-10.8 Specific requirements for drip dispersal

(a) The Department shall maintain a list of system integrators that may offer drip dispersal systems that may be used in lieu of the disposal field installation options identified in N.J.A.C. 7:9A-10.1. The following are the requirements for system integrators of systems that wish to be listed by the Department for the incorporation of their drip dispersal designs:

1. All drip tubing and drip emitters shall be wastewater rated, designed to prevent root intrusion, include biologic barriers, and be used in a manner consistent with all manufacturer requirements and recommendations for systems designed, constructed and operated in accordance with this chapter.

2. Any drip dispersal technology system integrator that wishes to be listed shall submit to the Department a written request and copies of their pre-engineered designs, including advanced wastewater pretreatment, that have been certified by the system integrator to be appropriate for drip dispersal systems designed, constructed, operated and maintained in accordance with this chapter.

3. Listed system integrators shall make available up-to-date training, design, installation and maintenance manuals and materials to any administrative authority or the Department upon request.

4. All drip dispersal technology manufacturers and system integrators must comply with all applicable requirements of this chapter.

(b) Drip dispersal systems must be designed by a septic system designer sufficiently knowledgeable of the drip dispersal system they are proposing to include in the design. The system designer shall certify on the plans that they are sufficiently knowledgeable of the technologies to design the system being proposed. The septic system designer shall provide for the following minimum general design requirements:

1. Drip dispersal systems must be preceded by an advanced wastewater pretreatment device that meets the criteria specified at N.J.A.C. 7:9A-8.3. Septic tank effluent shall not be discharged to a drip dispersal system.

2. Only drip tubing that is warranted fully by the manufacturer for protection against root intrusion for a minimum period of 10 years from installation shall be specified in the design. The warranty must be fully transferable but may be limited to provide requirements for operation and maintenance of the system in conformance with manufacturer requirements.

3. Drip dispersal system designs shall specify that the system shall be installed by an authorized installer in accordance with all requirements of this chapter. The specifications shall include that the authorized installer shall provide the property owner with a copy of all operation and maintenance manuals and the service contract. The specifications shall also instruct the authorized installer to obtain the property ownerôs written acknowledgement of the need to comply with the provisions of these documents and N.J.A.C. 7:9A-12.3 prior to initiating the installation of any drip dispersal system. Copies of these documents shall be submitted to the administrative authority or the Department upon request.

4. Permeability testing for systems including drip dispersal shall be completed in the soil horizon in which the drip tubing will be installed and shall include percolation tests in accordance with N.J.A.C. 7:9A-6 whenever possible.

5. Drip dispersal systems shall have a minimum vertical separation distance of 24 inches from the point of infiltration (tubing installation depth) to a limiting zone. An additional zone of disposal is not required for drip dispersal systems.

6. Drip dispersal systems shall not be installed in areas where the existing ground surface contains slopes of more than 25 percent. Where the existing ground surface contains slopes greater than 10 percent, drip tubing installations must be hand dug unless the septic system designer certifies a method of installation that provides for measures to protect human health and safety, meets dripperline manufacturer and system integrator requirements and satisfies all concerns of the administrative authority.

7. Drip dispersal systems shall not be installed in areas where the depth to any limiting zone below the existing ground surface is less than 24 inches. Dripperlines shall be located and maintained between a minimum of six inches to a maximum of 12 inches below final grade.

8. The entire system is to be configured as a complete pre-engineered package from a system integrator consisting of, at minimum, an advanced wastewater pretreatment device identified in N.J.A.C. 7:9A-8.3, drip tubing, specialized field fittings, pump/pump chamber components, a filtration unit, headworks, and a control panel as specified in this chapter. All piping, valves, fittings, level control switches, and other components shall be designed and manufactured to resist the corrosive effects of wastewater and common household chemicals.

9. Minimum required separation distances from drip dispersal areas shall be the same as those specified for disposal fields in N.J.A.C. 7:9A-4.3.

10. Permanent corner markers shall be installed at or above grade to identify the extent of the drip dispersal area.

11. The design shall note that the drip dispersal system shall be maintained according to the maintenance requirements at N.J.A.C. 7:9A-12.3.

(c) The septic system designer shall provide for the following minimum design requirements for the drip tubing layout:

1. All drip dispersal systems shall be equipped with pressure compensating emitters rated for use with wastewater. The discharge rate of any two emitters shall not vary by more than 10 percent in order to ensure that the effluent is uniformly distributed over the entire drip field or zone. Emitter separation along the tubing length shall be placed in the dripperlines on two-foot intervals.

2. The distance between dripperlines shall not exceed two feet, except to preserve existing vegetation such as large trees. The dripperlines shall be laid level as possible and shall run with the contour. The maximum lateral length of a dripperline, measured from supply to return manifolds, shall be specified by the septic system designer in accordance with dripperline manufacturer and/or system integrator recommendations.

3. The field shall be sized according to the area loading rate given in Table 10.8 below. The minimum amount of tubing required is the area divided by two (based on a two-foot center). For example, based on 60 minutes per inch (mpi), 500 gpd / 0.154 gal/ft2/day = 3,247 ft2 of area, 3,247 ft2 of area /two-foot center = 1,624 feet of tubing, an area approximately 102 feet by 32 feet would be required. Septic system designers may specify lesser or greater tubing separation depending on the specific site conditions such as to account for vegetation. However, the minimum tubing length must be provided. A minimum of two zones is recommended. In the case of smaller drip dispersal areas, and in consideration of a system integratorôs minimum zone size, single zone systems, and/or closer drip tubing and/or drip emitter spacing may be permissible.

4. Drip lines may be installed below the soil surface using a vibratory plow, a standard trencher (maximum six-inch width), or by manual or hand installation to a maximum depth of 12 inches from the soil surface, with six to eight inches being the optimum installation depth. Cable pullers must not be used where the tubing installation depth is within three inches of clay loam and clay texture or the soil contains particles that exceed 75 mm in diameter. Other methods of installation may be considered by the administrative authority. Drip tubing is prohibited in standard backhoe trenches, except for systems designed as provided in (c)7 below. Installations of drip dispersal systems are additionally subject to the following:

i. The dripperline shall be installed by a method that will prevent pulling, stretching, or crimping of the dripperline, and smearing, compaction, or altering of the soil texture. The method shall be acceptable to the dripperline manufacturer, system integrator and specified in the proposed design.

ii. Drip tubing shall not be installed during unsuitable soil moisture conditions. In soil textures other than sands or loamy sands, drip tubing installation shall not be carried out when the soil moisture content is above the lower plastic limit from the surface of the ground to 12 inches below the proposed tubing installation depth. To identify this limitation, when a small lump of soil, taken within the above depth, can be rolled out with the fingers to form a wire or rod, one-eighth of an inch in thickness, and does not crumble when handled, the soil is too wet to proceed with the installation.

iii. On sites where vegetation will be removed, methods to minimize soil disturbance must be used. Any soil disturbance below four inches from the ground surface shall be backfilled with fill material meeting the specifications of N.J.A.C. 7:9A-10.1(f)4. Additional fill material and/or topsoil may be used, provided the drip tubing will be installed with at least two inches of specified fill above the drip tubing. The fill material must be applied in shallow layers no greater than six inches in thickness and installed in a manner

established by the manufacturer and/or system integrator to prevent an abrupt textural interface with the native soil.

iv. All system control units, valve boxes, drip dispersal lines, conveyance lines and other system appurtenances shall be designed and installed to prevent freezing in accordance with the system integrator and dripperline manufacturer recommendations.

v. Both the septic system designer and/or a system integratorôs representative may be required by the administrative authority to conduct a final construction inspection and/or certify that as-built conditions are in conformance with the approved system design and/or submit as-built plans.

5. All drip dispersal systems shall be designed with devices such as check valves, piping configurations, or methods such as elevated loops to prevent the redistribution of effluent at pump shut off by gravity in the dispersal area. The device shall additionally minimize the effluent remaining in the lines after the end of a dose cycle from redistribution to lower portions of the drip zone. Variability in distribution shall never exceed 10 percent.

6. The system integrator shall make available in their pre-engineered design head loss charts, tables and/or formulas, for the filtration headworks and for various drip tubing lateral lengths, during a dosing and flushing cycle, and other pertinent information such as minimum/maximum zone size for the proper dosing and flushing of the drip dispersal system. The minimum scouring/flushing velocity (no less than two feet per second) for the distal end of the drip tubing lateral and minimum and maximum operating pressures shall be provided.

7. The following are the requirements for mounded soil replacement drip dispersal designs:

i. In addition to the applicable requirements of this section, mounded soil replacement drip dispersal systems shall require a minimum soil depth of 24 inches from the existing ground surface to any limiting condition and shall not be used at sites where there is a 36-inch or more depth to a limiting zone where a non-mounded drip dispersal system can be designed, as described in this section.

ii. Undisturbed soil and the depth of dispersal are to be maximized below the bed bottom but in no case are to be less than 12 inches in thickness. The minimum depth of soil excavation for fill material depth is to be four inches. In all cases, the fill material is to be mounded, extending a minimum of six inches above grade to provide a minimum of 24 inches of separation, fill material and soil, to a limiting zone. Fill material must extend above the dripperlines by at least two inches. Fill material must be installed in accordance with the system integrator and dripperline manufacturer requirements and recommendations to prevent an abrupt textural interface with native soil.

iii. The bed bottom is to be installed level. The length to width ratio of the bed(s) is to be maximized as the site allows. In no case shall the length to width ratio be less than 3:1. The use of two or more narrow beds to maintain the required minimum depth to a limiting condition and geometry may be necessary. One bed may be possible on sites where the existing ground surface is flat across the entire area required for the bed however, re-grading shall not be allowed in any case. The minimum separation between beds (sidewall to sidewall) is to be six feet of native soil material.

iv. Permeability testing must be conducted in the most hydraulically restrictive zone within the 24 inches of native soil below the proposed bottom of the fill material. The permeability of the fill material shall not be used to size the drip dispersal area.

v. The bed bottom loading rate for mounded soil replacement drip dispersal designs shall be sized in accordance with the area loading rate in Table 10.8 below multiplied by three. For example, based on 60 mpi, Table 10.8 provides for a 0.154 gal/ft2/day area loading rate x 3 = 0.462 gal/ft2/day for the bed loading rate. For a three -bedroom home, 500 gpd /0.462 = 1,083 ft2 of bed bottom required. If there is 45 feet of available length (contour) the bed would be approximately 45 feet by 24 feet (1,083 ft2 of bed bottom /45 feet) representing a ratio of approximately 2:1. Two beds, each 45 feet by 12 feet, and

separated by a minimum of six feet, would be required, representing a ratio of 3.75:1 per bed. In the case of these smaller dispersal areas, and in consideration of a system providerôs minimum zone size, single zone systems, and/or closer tubing spacing (typically twelve inches or less) may be indicated. In no case shall the total area of the drip dispersal bed(s) be less than 400 square feet.

vi. An additional lateral fill extension is not required. The minimum distance from the edge of the fill bed to any drip line is to be one foot. Tubing separation over the soil replacement bed may be less (with a minimum separation of 0.5 feet) to accommodate minimum zone sizes in accordance with manufacturerôs recommendations. The drip tubing is to be covered with a minimum two inches of additional fill material. Drainage fabric, in accordance with the requirements of N.J.A.C. 7:9A-10.3(e)3, shall then be placed over the additional fill material covering the drip tubing.

vii. If the permeability of the zone of disposal for a soil replacement system is greater than 20 inches per hour, the septic system designer shall use a design value of six inches per hour for the purposes of designing the drip dispersal field. For areas where only a basin flood test is possible, permeability shall be established pursuant to N.J.A.C. 7:9A-6.7(f) provided percolation testing or tube permeameter testing is completed in the fill material after emplacement and compaction of the material and the testing demonstrates a permeability greater than six inches per hour.

viii. All other considerations regarding the design of a mounded soil replacement drip dispersal system shall be in conformance with N.J.A.C. 7:9A-10.6.

(d) The septic system designer shall provide for the following minimum dosing design requirements:

1. Each drip dispersal field or zone shall be time-dosed at regular intervals, throughout the day, at an average flow/peak design flow dose regime, as specified by the system integrator or the septic system designer if a dosing regime is not specified by the system integrator, in a manner that avoids soil saturation. The system control panel shall include a controller that shall provide for a zone to be ñrestedò or taken ñout of serviceò manually. The controller shall have the capability to bypass the zone(s) that have been taken out of service and dose the next available zone with normal sequence continuation. The following requirements are additionally applicable to the dosing of a drip dispersal system:

i. Mechanical indexing valves to control zone dosing are prohibited.

ii. To maintain uniform distribution, the minimum drip dose volume in a drip dispersal network is calculated using 80 percent of the dose being dispersed during times of equal distribution, accounting for pressurization time and redistribution at pump shut off. In no case shall the minimum drip dose volume be less than three times the volume of the pipe (plus the volume of supply/return lines and field manifolds where applicable).

2. A dosing chamber shall be employed after the advanced wastewater pretreatment device and before the drip dispersal system, and shall be sized and equipped so as to permit timed dosing of the daily sanitary sewage flow with adequate reserve storage capacity for those times when the system is inoperable. The system design shall comply with the following:

i. The dosing chamber working volume (surge storage) shall be a minimum 60 percent of the design volume. This volume may be calculated from the timer enable to the high water alarm floats. These dosing tanks may be less than 1,000 gallons.

ii. The dosing chamber shall be equipped with an audible and visual high-water alarm set to provide reserve capacity to allow for the prompt repair of the system. The minimum amount of reserve volume above the high water alarm is 25 percent of the design volume. A low-water separate cutoff device (float) shall be provided to prevent damage to the pump during low-water conditions and shall be separate from the timer enable device (float).

iii. The dosing chamber shall be fitted with watertight access risers to grade that are secured against unauthorized entry.

iv. All other aspects of the dosing chambers shall meet the minimum requirements for dosing tanks specified in N.J.A.C. 7:9A-9.2.

3. The system design shall provide the means, at minimum, to accurately calculate flows, count pump cycles, determine pump elapsed time, count automated flushing events and report alarm events. This requirement may be accomplished by having a flow meter and a control panel that performs these functions. These functions are necessary to provide proper operation and maintenance and to determine and monitor emitter performance, scouring or flushing performance, and water use. The system control panel and associated controllers shall also include:

i. A programmable timer to regulate dosing frequency/volume and record dosing information.

ii. Manual capability to operationally determine filter flushing, dosing, and flushing.

iii. Components that are restricted to those that are UL Listed.

iv. A schematic and manual shall be provided to the homeowner with control panel.

v. Telemetry or an auto dialer for alarm conditions related to the drip dispersal components in addition to those required at N.J.A.C. 7:9A-8.3(b)6.

vi. Electrical control equipment shall be mounted within a NEMA 4X rated enclosure with a rigid latching door.

vii. Switches shall be clearly identified, and all internal wiring shall be factory installed.

(e) The septic system designer shall provide for the following minimum filtration and field flushing design requirements:

1. Final filtration must be provided by a hydraulic unit fitted with in-line screen or disk filter(s) to remove suspended solids to prevent clogging of the emitters.

i. The filter(s) shall achieve the drip tubing manufacturerôs minimum specified filtration at a rate equal to or greater than the peak discharge rate, typically during network forward flushing.

ii. The filter(s) shall be washed automatically on a routine basis as specified by the system integrator, normally at the beginning of each dose event.

iii. The system shall be designed to return filter and drip tubing flush residuals to the head of the pretreatment train or a settling tank to allow for primary settling prior to the dosing station.

iv. The filter and drip tubing flush return volume shall not exceed the hydraulic capacity of the pretreatment device.

v. The hydraulic unit (and other components) must be protected from temperatures below freezing in accordance with the manufacturerôs specifications.

2. The system shall be capable of forward flushing each drip field or zone at a minimum fluid velocity, as required by the manufacturer of the dripperline and the system integrator.

i. The fluid velocity shall be no less than two feet per second.

ii. The residuals shall be returned back to the head of the pre-treatment train or if site design allows, a separate settling tank to allow for primary settling prior to a dosing station.

iii. Field flushing velocity shall be designed to be met at the distal end of each lateral connection.

iv. Each zone shall be automatically flushed a minimum of once every 50 cycles. However, the flush return volume shall not exceed the hydraulic capacity of the advanced wastewater pretreatment device.

3. Pump selection shall take account of the operating volume and pressure for the drip dispersal field when calculating the total dynamic head required for filter flushing and/or back flushing, field dosing, and

dripperline flushing. All disposal and flushing parameters shall meet the listed system integratorôs requirements and fall within the operational range of the pump selected.

TABLE 10.8 DRIP DISPERSAL AREA LOADING RATES

Percolation Rate	**Area Loading Rate**
Mpi	**gal/ft2/day**
5	0.303
10	0.278
15	0.253
20	0.228
25	0.211
30	0.203
35	0.196
40	0.189
45	0.180
50	0.173
55	0.162
60	0.154

Subchapter 11. Seepage Pits

7:9A-11.1 Site/soil requirements

(a) Seepage pits shall not be approved except as specified in N.J.A.C. 7:9A-7.6. When a seepage pit is approved, the following site/soil requirements shall be met:

1. The bottom of any seepage pit shall be a minimum of eight feet above any hydraulically restrictive horizon or substratum not fully penetrated or any massive rock substratum.

2. The bottom of any seepage pit shall be a minimum of four feet above any fractured rock substratum.

3. The bottom of any seepage pit shall be a minimum of four feet above the level of the seasonally high water table.

7:9A-11.2 Design requirements

(a) The percolating area shall be considered to be the total outside surface of the seepage pit lining below the inlet and exclusive of any soil horizons with a percolation rate slower than 40 minutes per inch. The bottom of the seepage pit shall not be counted as part of the percolating area.

(b) The minimum required percolating area for dwelling units shall be determined from the following table, based upon a weighted average, of the percolation rates of all the soil layers exposed in the sidewalls, determined as prescribed in N.J.A.C. 7:9A-6.4(f)4. In no case, however, shall the percolating area be less than 110 square feet per dwelling unit.