

**Commonwealth of Pennsylvania**  
**Department of Environmental Protection (DEP)**  
**Bureau of Point and Non-Point Source Management**  
**Harrisburg, PA**

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**Technology:** JNM-ACT Soil Absorption System (JNM-ACT SAS mound drip)

**Classification Type:** Alternate technology (Listing #A2012-0010-0001)

**Classification Date:** March 1, 2012

In accordance with Title 25, Chapter 73, Section 73.72, DEP has classified the JNM-ACT Soil Absorption System (JNM-ACT SAS mound drip) drip irrigation system for use as an alternate onlot sewage treatment system in the Commonwealth of Pennsylvania. This classification permits the use of the JNM-ACT SAS mound drip as components used for the specific purposes of distributing sewage for discharge to a mound drip absorption area.

**I. Technology Description**

Drip irrigation (JNM-ACT SAS mound drip) is the technology by which effluent at either the primary treatment level or the secondary treatment level is distributed to the drip dispersal field using a configuration of components that consists of an automated controller, a septic tank(s), a pump tank(s), a hydraulic unit(s), and a network of flexible drip emitter tubing. Distribution of sewage to the drip dispersal field, network forward flushing, and for backflushing of filter wash solids to the pretreatment train are activated by a controller. Through drip irrigation, wastewater is distributed in small dose volumes over an infiltration field to aid in maintaining the aerobic environment in the soil for biochemical treatment of the wastewater. Final discharge for distributing sewage will be to a drip irrigation mound drip absorption area.

**II. Design Requirements:** The minimum specifications in this section may not be sufficient to design a complete system for all applications.

**a. General System Requirements:**

- (1) The system is to be configured as a complete package from a single source consisting of drip tubing, specialized field fittings, pump and pump chamber components, filtration units (headworks) and control panels at a minimum. All components shall be designed and manufactured to resist the corrosive effects of wastewater and common household chemicals.
- (2) The system manufacturer shall make available head loss charts, tables, formulas for various drip tubing lateral lengths during a dosing and flushing cycle, other pertinent information such as minimum/maximum zone size, and filter flushing requirements.

- (3) Pump selection shall take account of the operating flow and pressure for the drip dispersal field when calculating the total dynamic head required for filter back washing, field dosing, and dripline flushing. All disposal and flushing parameters must meet the listed manufacturer's requirements and fall within the operational range of the pump selected.
- (4) The drip irrigation system shall provide the means, at minimum, to accurately calculate flows, pump cycle counter, pump elapsed time, counts of automated flushing events and alarm events. This requirement is to be accomplished by having a flow meter and a control unit that performs these functions. These functions are necessary to provide proper operation and maintenance and to verify and monitor emitter performance, scouring or flushing performance, and water use.
- (5) A programmable timer control panel shall be employed to regulate dosing frequency, volume, and other pertinent information. The control panel is to provide manual capability to operationally verify filter flushing, dosing, and flushing.
- (6) Components shall be UL Listed. Schematic and manual to be provided with control. The panel is to provide accommodation for optional remote alarm. Installation is to be according to all local codes. The electrical control equipment shall be mounted within a NEMA 4X rated enclosure with a rigid latching door. All switches shall be clearly identified, and all internal wiring shall be factory installed.
- (7) The system must be equipped with a dosing tank alarm to alert the operator of problems with the system.

**b. Treatment Tank Requirements:**

- (1) For systems designed to treat primary effluent, concrete septic tanks used must be either two-compartment rectangular tanks or two rectangular tanks in series, and/or otherwise conform to meet the requirements of Section 73.31. Cylindrical tanks meeting the requirements of Section 73.31 may also be used. Vertically aligned circular (round) tanks are not permitted.
- (2) If an aerobic treatment unit or any other secondary treatment technology is proposed as an initial treatment, the application must include a letter from the drip system manufacturer recommending both its use and as a component compatible with JNM-ACT SAS mound drip.

**c. Dosing Chamber Requirements:**

- (1) A dosing chamber shall be employed after the treatment tank and before the drip dispersal system, and shall be sized and equipped so as to permit flow equalized timed dosing of the daily sewage flow with adequate reserve storage capacity for those times when the system is inoperable.
- (2) The dosing chamber working volume (surge storage) shall be at a minimum 60% of the peak design flow volume. This volume may be calculated from the timer enable to the high water alarm floats. In no case shall a pump tank volume be less than what is typically required for a standard septic tank for the system. Flow equalization volume utilized to time dose an upstream pretreatment component, may be used as a portion of the drip dose equalization volume requirements.
- (3) 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% of the peak

daily flow. 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).

- (4) The dosing chamber shall be fitted with watertight access risers to grade to secure against unauthorized entry.

**d. Hydraulic Unit Filtration Requirements:**

- (1) Final filtration must be provided by a hydraulic headworks unit fitted with disc filters to remove suspended solids. The filtration must conform to either II.d.(1).i or II.d.(1).ii.
  - i. Systems using Arkal disc filters components (not greater than 115 microns) that are capable of expanding through high pressure spray nozzles may use one (1) 1" diameter inlet single filter with other sources of flush water provided that the minimum filtration level for spray nozzle protection is utilized.
  - ii. A minimum of two ¾" diameter inlet Arkal disc filters (no greater than 115 microns) are required in systems not equipped with spray nozzles.
- (2) The in-line filters shall achieve the drip tubing manufacturer's minimum specified filtration at a rate equal to or greater than the peak discharge rate during flushing.
- (3) The hydraulic headworks and control system must include a mechanism to automatically backflush the filters independently before each dose. The filters are to be backwashed at the manufacturer specified minimum psi requirement.
- (4) Filter flush residuals must be returned to the head of the pretreatment train or, if the design requires, to a settling tank, to allow for primary settling prior to entering the drip dose pump chamber. The filter flush return volume shall not to exceed the hydraulic capacity of the pretreatment unit.
- (5) The hydraulic unit must be protected from temperatures below freezing in accordance with the manufacturer's specifications.

**e. Use of the Component/System and Siting Requirements:**

- (1) The minimum soils drainage class morphology must be at minimum somewhat poorly drained as determined by a soil scientist who is a professional member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a qualified soil scientist as defined in Section 73.1.
- (2) On these sites, the treatment and disposal distribution configuration is based on the basal loading rate and the horizontal linear loading rate derived from the soil morphological analysis and the Hydraulic Linear Loading Rate (HLLR) described by Table 1.
- (3) Preparation of a soils report which includes the following at a minimum:
  - i. Inclusion of project name, project location, date of investigation, soils series, and slope.
  - ii. A minimum of four soil profile test pits shall be evaluated to verify the morphology of the proposed absorption site. These soil profiles shall include two soil profile evaluations on contour, bracketing the proposed absorption area, and two soil profile evaluations downgradient with the distance determined by the soil scientist. The soil profiles may be supplemented with the use of hand auger to confirm soil conditions between profiles. Excessive disturbance of soils within the proposed drip zone must be avoided.

- iii. Determination of the depth to the seasonal high water table limiting zone and/or the depth to the rock limiting zone.
  - iv. Determination of the soil drainage classification and assigning the appropriate loading rate and horizontal linear load consistent with Table 1 by using the most restrictive results from the soil profile evaluations conducted. The shape and grade of structure, as well as textural classification of the mineral soil from the profile horizon above the seasonal high water table or restrictive horizon, is used to determine these rates. Note this information is to be attached to the permit application.
  - v. The spacing of the soil profile evaluations shall not exceed 100 feet in length.
  - vi. In cases where the calculated area length exceeds 100 feet, additional soil profile evaluations are required to verify the soil morphology of both the absorption area and the downgradient area.
  - vii. Overall site suitability will be limited by the most restrictive depth to the seasonal high water table, depth to rock formation and soil morphology from all of the soil test pits evaluated.
  - viii. The soils report must provide the designer with site-specific details of the delineated area, including a preliminary design (dimensions of the area, slope of site, etc.) meeting the specifications of Section II.e. The report should identify and offer recommendations to address site conditions (i.e. soil quality, slope, stoniness, vegetation, surface drainage, site preparation, depth of installation, etc.) that could affect the design and/or field installation.
  - ix. Signature of the qualified soil scientist (a professional member of the Pennsylvania Association of Professional Soil Scientists (PAPSS) or is a qualified soil scientist as defined in Section 73.1) certifying the contents of the soils report which includes the items in Section II.e.
- (4) The site must meet the minimum horizontal isolation distances described in Section 73.13 plus an additional two (2) feet beyond the outermost drip tubing in a drip distribution zone.
  - (5) The slope in each drip irrigation zone must be between 0 percent and 15 percent. Table 1 details slope limitations for specific USDA texture groups.
  - (6) This system may be used on sites where soils range between greater than or equal to 10 inches to evidence of high water table and greater than or equal to 16 inches to rock.
  - (7) The site must meet the requirements described in Section 73.12.
- f. Drip Distribution Requirements:
- (1) Each drip dispersal field or zone shall be time-dosed at regular intervals throughout the day at an average design flow dose regime, as specified by the manufacturer and designer. The absorption area is sized on peak daily design flow. The system controller shall provide for a zone to be rested or manually removed from service. 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. Mechanical indexing valves to control zone dosing shall not be used.

- (2) To maintain uniform distribution, the minimum dose volume in a drip dispersal network is calculated using 80% of the dose being dispersed during times of equal distribution, accounting for pressurization time and redistribution of pump shut off and no less than three times the volume of pipe (plus the volume of supply, return lines, and field manifolds, where applicable). These conditions are intended to provide equal distribution with the network (less than 10% variability) including network pressurization and gravity redistribution at pump shut off.
- (3) The system shall be capable of forward flushing each drip field or zone at a minimum fluid velocity, as required by the listed manufacturer. The velocity is to be no less than 2 feet per second. The residuals are to be returned back to the head of the pre-treatment train as or if the specific design requires, to a separate settling tank to allow for primary settling prior to a dosing station. Field flushing velocity shall be designed at the distal end of each lateral connection. Each zone must be automatically flushed a minimum of 25 cycles. The flush return volume is not to exceed the hydraulic capacity of the pretreatment unit.

g. Mound Drip Absorption Area:

- (1) The mound drip must follow the contour of the land.
- (2) A minimum of 2 inches of sand must be placed over the tubing.
- (3) The minimum sand depth below the tubing is 12 inches for primary pretreatment and 8 inches with secondary pretreatment with the sand tapered or incorporated into the toe of berm (basal) area.
- (4) The tubing must have continuous self cleaning pressure-compensating emitters spaced every 2 feet with spacing between tubing between 0.5 and 0.75 feet over the sand bed. All emitters within the zone shall provide equal distribution between plus or minus 10 percent including network pressurization and redistribution at pump shut off. Only tubing manufactured by Netafim has been shown to meet these requirements. No substitutions of other drip tubing is permitted.
- (5) The maximum possible sand bed tubing area loading rate is 0.75 gpd/ft<sup>2</sup>.
- (6) Sand used must meet the requirements specified by Section 73.55(c). Material passing through #200 sieve should be <5%. Cement Concrete Sand TYPE "A" or ASTM C-33 concrete sand preferred.
- (7) The basal loading rate must be consistent with Table 1. The basal area is the scarified absorption area interface which includes the drip tubing sandbed and the sanded downslope toe of berm. Peak flows in accordance with Section 73.17 shall be used in the design.
- (8) All mounds must be constructed with a minimum of 3:1 berm.
- (9) All accepted mound site protection and construction practices must be adhered.
- (10) The sewage enforcement officer may require additional information from the soil scientist and/or require the site plan for the micromound to be developed by or in consultation with the manufacturer or a representative of the manufacturer of the drip distribution system being installed.

h. Construction:

- (1) Soil moisture conditions are to be at or below field capacity during construction. These conditions must be determined in the manner that soil moisture conditions are determined prior to construction of an elevated sand mound.

- (2) The manufacturer's representative must be present to oversee the installation of the system. The current list of representatives is available from the manufacturer. As an alternative, contractors who have completed a training course provided by the manufacturer and have successfully installed a sufficient number of drip systems under the direct supervision of the manufacturer's representative may install the system independently of oversight by the manufacturer only after receiving written verification of their status as a qualified installer by the manufacturer's representatives.
- (3) Installation of the drip distribution system shall meet the specifications provided by the manufacturer.
- (4) The sand bed tubing area is to be located in the upslope portion of the basal area.
- (5) The area surrounding the tanks and the absorption areas shall be constructed to divert surface water.

### III. Minimum Maintenance Standards:

- a. The manufacturer's representative must meet with the property owner within one (1) month of system start-up and/or occupancy of the dwelling and with the local agency's SEO upon request, to explain the operation and maintenance of the system and to provide written instructions to the property owner that includes:
  - (1) Instructions on the operation and maintenance of the system;
  - (2) The locations of all parts of the system;
  - (3) A caution notice regarding disturbance of the drip zones that may cause system damage (i.e. excavation for trees, fencing, etc.);
  - (4) An explanation of the automatic alarm system;
  - (5) A statement requiring that the manufacturer's representative be contacted if the alarm system is activated.

#### b. Warranty:

The manufacturer of the drip irrigation system must provide a minimum 2-year warranty on all defects due to materials or workmanship.

#### c. Inspection:

- (1) A maintenance agreement must be established between the property owner and the service provider experienced in the operation and maintenance of the JNM-ACT SAS mound drip.
- (2) Inspection of the area around the soil absorption area every 6 months by the homeowner and annually by the service provider to ensure that there is no ponding of effluent or downgradient seepage.
- (3) Inspection by the maintenance provider every at least annually to assure that:
  - i. The dosing flows in each drip zone are consistent with the design;
  - ii. The system tubing network is flushing properly;
  - iii. The in-line filters are in good working order;
  - iv. The system is backwashing the in-line filters to remove debris.
  - v. Septic tanks and dosing tanks shall be inspected for structural integrity of the tank, inlet and outlet baffles, solids retainer, pumps, and electrical connections by the maintenance provider.

- (4) A manufacturer's authorized service provider may make operational adjustments (i.e. dose volume, dose frequency), based on system performance, in consultation with the manufacturer and/or designer.
- (5) The inspection and concurrent pumping of excess solids shall be conducted in accordance with the manufacturer's requirements.
- (6) In the event that the drip dispersal is found to be out of compliance, the manufacturer or the manufacturer's representative will assist in developing an action plan to bring the system into compliance.

#### IV. Permitting Requirements

- a. An SEO who has successfully completed an appropriate Department sponsored training course that included this specific technology or has received review delegation in writing from the Department may independently review the design and issue the permit for systems including components designed under this listing. All other system proposals under this listing must be submitted to the Department for review and comment.
- b. The soil drainage classification and the appropriate loading rate and horizontal linear loading rate consistent with Table 1 must be attached to the permit application.
- c. The operation and maintenance conditions specified in Section III must be attached to the permit issued by the local agency.

#### V. Planning Requirements

Not applicable.

**Table 1**

<b>USDA Texture Group</b>	<b>Texture</b>	<b>Basal Loading (gal/ ft<sup>2</sup>/day)<sup>a</sup></b>	<b>Limitation Depth (inches)<sup>b</sup></b>	<b>Horizontal Linear Load in gal/linear ft./day (g/lf/d)<sup>c</sup> SLOPES</b>
I Sands	Sand, Loamy Sand	≤ .6		≤ 5 g/lf/d Slope ≤ 15%
II Coarse Loams	IIa Sandy Loam IIb Loam			
III Fine Loams	IIIa Sandy Clay Loam, Silt Loam IIIb Clay Loam, Silty Clay Loam	≤ .4	≥ 10" to seasonal high water table ≥ 16" to rock	≤ 4 g/lf/d Slope ≤ 15%
IV Clays	IVa Sandy Clay, Silty Clay, Clay	≤ .2		≤ 3 g/lf/d Slope ≤ 15%
	IVb	Special Considerations <sup>d</sup>		≤ 2 - 3 g/lf/d Slope ≤ 15% Slope ≥ 5%

**NOTES:**

- <sup>a</sup> Based on most limiting condition from ground surface to limitation. Basal area to be protected from all activity.
- <sup>b</sup> Evaluate conditions 12 inches below limitations if possible.
- <sup>c</sup> Based on peak daily design flow. Maximize Horizontal Linear Load at all times. May vary with slope, texture and depth to limitation. Based on site/soil determination (estimation) of vertical and horizontal subsurface water movement over limitation. Multi-zoned systems allow for staggering and separation of uneven sized mounds if necessary, with justification to obtain the landscape linear loading rate.
- <sup>d</sup> IVb soils may have other infiltration considerations other than texture including density, consistence, plasticity, structure and mixed clay mineralogy.

(1) Basal Loading determines the sand/soil interface absorption area

$$Basal\ Loading,\ ft^2 = \frac{Peak\ gpd}{\left( Basal\ Loading\ value\ \frac{gal}{ft^2\ day} \right)}$$



(2) Horizontal Linear Load determines the minimum system length.

$$\text{Horizontal Linear Load, ft} = \frac{\text{peak gpd}}{\left( \text{Horizontal Linear Load value} \frac{\text{gal}}{\text{ft d}} \right)}$$

(3) Sand Bed loading determines the sand area where the tubing will be placed.

$$\text{Sand Bed Loading, ft}^2 = \frac{\text{peak gpd}}{\left( \text{Sand Bed Tubing Loading Rate} \frac{\text{gal}}{\text{ft}^2} \right)}$$