

**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 primary effluent)

**Classification Type:** Alternate technology (Listing #A2012-0009-0001)

**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 primary effluent) 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 primary effluent drip irrigation as components used for the specific purposes of distributing primary effluent septic wastewater for discharge to an absorption area.

**I. Technology Description**

Drip irrigation is the technology by which effluent at the primary 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 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.

**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, and 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

backwashing, 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:

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.

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 forward flushing. The filters are to be backwashed at the manufacturer specified minimum psi requirement.
- (3) The hydraulic headworks and control systems 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 wash 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 flush return volume shall not exceed the hydraulic capacity of the treatment 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 soils must be classified morphologically as either well drained or moderately well 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 tubing linear loading rate derived from Table 1, the soil morphological analysis, and the Hydraulic Linear Loading Rate (HLLR) in accordance with Section II.f.
- (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 two 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 bracketing the proposed absorption area as determined by the soil scientist. The soil profiles may be supplemented with the use of a 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 the assigning the appropriate tubing linear loading rate consistent with Table 1 and horizontal linear load in

accordance with Section II.f 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 on-contour spacing of the soil profile evaluations shall not exceed 100 feet in length.
  - vi. In cases where the calculated aggregate area length exceeds 100 feet, additional soil profile evaluations are required to verify the soil morphology of the absorption 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 the recommended tubing depth and 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 distribution zone must be between 0 and 25%.
  - (6) The minimum depth to limiting zone from the mineral soil surface must be greater than or equal to 24 inches. A minimum vertical isolation distance of 18 inches must be maintained between the depth of installation of the drip distribution tubing and the shallowest indication of any limiting zone. The maximum tubing installation depth is 12 inches.
- 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 within the network (less than 10% variability) including network pressurization and gravity redistribution at pump shut off.

- (3) A minimum of two zones are required for each system, with adequate flow equalization provided to accommodate time dosing of the zones.
- (4) The drip tubing must follow the contour of the land and maintain a uniform installation depth.
- (5) Each zone must automatically flush a minimum of 25 cycles to clean the drip tubing, maintaining a scouring velocity of 2 feet per second at the distal end of each lateral connection. Field network flush residuals must be returned back to the head of the treatment train or, if the site design requires, to a separate settling tank prior to the dosing tank. The flush return volume is not to exceed the hydraulic capacity of the pretreatment unit.
- (6) The sizing of the drip tubing network shall be based on the site evaluation, in accordance with Table 1. The maximum loading rate must be no more than 0.34 gallons per day per linear foot of tubing. The total linear feet of drip tubing required is the maximum design flow in gpd divided by this loading rate.
- (7) The tubing must have continuous self-cleaning pressure-compensating emitters every 2 feet with spacing between tubing. All emitters within the zone shall provide equal distribution between plus or minus 10%, including network pressurization and redistribution at pump shut off. Only tubing manufactured by Netafim has been shown to meet these requirements. Tubing is to be installed between 1 and 3 feet unless justification for different spacing is provided due to site conditions (i.e. trees, irregular topography, etc.). Tubing separations less than 2 feet require recommendation of the soil scientist.
- (8) The maximum horizontal linear load (the gallons per foot along the topographic contour) is 4.6 gallons per day as calculated on the average daily flow of the onlot system. The average daily flow is 50% of the maximum design flow as listed in 73.17 (relating to sewage flows).
- (9) The horizontal linear load equals the average daily gallons per day divided by the length of the system.
- (10) The minimum horizontal length required is the average daily flow divided by 4.6.
- (11) The sewage enforcement officer may require the site plan for the drip distribution zones to be developed by or in consultation with the manufacturer or a representative of the manufacturer of the drip distribution system being installed.
- (12) All drip distribution systems shall be equipped with devices or methods to prevent the gravity redistribution of effluent in the absorption area and minimize redistribution of the effluent remaining in the tubing after the end of a dose cycle to lower portions of the drip zone. On slopes greater than 5%, top-feed supply and return manifolds shall be used.

g. Construction:

- (1) Drip lines are typically installed below the soil surface using a vibratory plow, a standard trencher 4 to 6 inches wide, or by manual or hand installation to a

maximum depth of 12 inches from the soil surface, with 6 inches being the optimum installation depth. Cable pullers shall not be used where the tubing installation depth is within 3 inches of clay loam and clay texture or the soil is stony. Tubing must not be installed into backhoe trenches. Other methods of installation may be considered in consultation with the manufacturer or a representative of the manufacturer of the drip distribution system being installed. Where installation depths less than 6 inches from the soil surface are necessary due to stoniness, additional cover shall be required to provide 6 to 12 inches of cover. Cover may be either clean mineral soil or native soil of a texture no heavier than Loam. Imported mulch or compost is permissible in wooded areas of passive activity with established forest litter. For installation less than 6 inches, the tubing may not be installed on the ground surface unless the surface is first scarified to create adequate soil and tubing interface.

- (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 individual manufacturer.
- (4) Drip tubing is susceptible to freezing when sufficient turf cover is not established in non-wooded areas prior to winter operation. When turf cover will not be established prior to winter operation, other measures, such as a temporary cover of mulch or straw, should be used to insulate over the tubing, manifolds, force mains, valve boxes, and other components of the drip installation subject to freezing.
- (5) 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 the construction of an elevated sand mound.

### 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 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 distribution 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.
- (2) Inspection of the area around the soil absorption area every six 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 at least annually to ensure 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) The 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 (#321 Drip Irrigation) 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

Texture	Structure							
	Shape						Structureless	
	Platy			Prismatic/Blocky/Granular			Single Grain	Massive
	Strong	Moderate	Weak	Strong	Moderate	Weak		
Gravelly Coarse Sand	NOT APPLICABLE (N/A)							N/A
Coarse Sand							.34	
Sand								
Fine Sand							.34 -.25	
Very Fine Sand								
Loamy Coarse Sand							.34	
Loamy Sand								
Loamy Fine Sand								
Loamy Very Fine Sand							.34 -.25	
Coarse Sandy Loam				.34 - .25	.34	.34 -.25	N/A	≤.25
Sandy Loam				≤.25				
Fine Sandy Loam					.34 -.25	≤.25		
Very Fine Sandy Loam								
Loam					.34	.34-.25		
Silt Loam								
Sandy Clay Loam								
Clay Loam					.34 -.25	≤.25		
Silty Clay Loam								
Sandy Clay								
Silty Clay					.25 - ≤.15			
Clay								

Notes:

- All values in gallons per day per linear foot of tubing