Experimental Systems Guidance

COMMONWEALTH OF PENNSYLVANIA
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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY AND WASTEWATER MANAGEMENT

DOCUMENT NUMBER:	362-0300-008
TITLE:	Experimental Systems Guidance
EFFECTIVE DATE:	January 4, 2003
AUTHORITY:	Pennsylvania Sewage Facilities Act; Title 25, Section 73.71
POLICY:	The Department of Environmental Protection (DEP) will develop, release for public comment and publish technical guidance for the siting, design and construction of experimental on-lot sewage treatment systems.
PURPOSE:	The purpose of this document is to provide current technical standards for experimental onlot systems and to update these standards periodically through amendments to this document.
APPLICABILITY:	This guidance document applies to the siting, design and construction of experimental onlot sewage treatment systems proposed under the requirements of Chapter 73, Section 73.71.
DISCLAIMER:	The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements. The policies and procedures herein are not an adjudication or a regulation. There is no intention on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.
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EXPERIMENTAL SYSTEMS - Chapter 73, Section 73.72

Experimental sewage systems are systems and methods that are proposed solely for the purpose of testing and evaluation. This guidance lists the systems and methods that have currently been determined to be experimental technologies and that may be permitted under Chapter 73, Sections 73.3 and 73.71. These systems and methods have been determined to be experimental since they have not yet submitted data indicating a consistent level of performance sufficient to allow them to be moved to the *Alternate Systems Guidance*. When DEP has determined that sufficient performance data has been submitted to allow reclassification of these systems as alternate, upon concurrence of the Sewage Advisory Committee, these systems will be moved to the *Alternate Systems Guidance*.

This guidance will be amended to remove systems or methods from the list when a number of systems sufficient for evaluation purposes have been installed. The guidance will also be amended when enough information has been obtained to reclassify a particular system or method from experimental to alternate, or to remove an experimental system or method from the inventory should the technology be deemed unsuccessful. A system or method is declared unsuccessful if monitoring and performance evaluations have demonstrated that the system or technology is inconsistent with the regulatory policy regarding experimental and alternate technology assessment (Chapter 73, Section 73.3, Policy) "Systems shall be permitted only where it is demonstrated that the proposed system will protect the public health and prevent pollution of the waters of this Commonwealth."

Experimental onlot systems require proper operation and maintenance to assure adequate sewage treatment over the life of the system. Municipalities are required to assure proper operation and maintenance of the systems proposed for use within their borders in accordance with the provisions of Chapter 71, Subchapter E, titled "Sewage Management Programs". All proposals submitted as experimental under Chapter 73, Section 73.71 of the regulations must document compliance with the appropriate regulatory requirements relating to sewage management.

This inventory of experimental technologies is not intended to be an all-inclusive list, nor is it to be construed as a final statement on any or all experimental systems or methods described here, now or in the future. It is intended as a guidance document that outlines the minimum site and design standards required for those experimental onlot sewage disposal technologies that are currently in use and being monitored for their performance. Where ranges are specified in the guidance, such as for slopes or percolation rates, these ranges are inclusive.

The systems and methods described herein may be considered for use in repair situations when the requirements of Section 73.3(b) are met, or to serve new construction on existing lots when all of the requirements of Section 73.71 are met. However, these systems and methods require DEP regional and central office review and comment on the proposed design prior to permitting. In addition, DEP must be contacted prior to scheduled site evaluation work to allow DEP soil scientists or water quality specialists the option to confirm the site characteristics and assure proper installation of monitoring equipment. The SEO is required to consider these comments before issuing a permit for an experimental system.

1. Experimental Peat Based System Options

Experimental peat based system configurations consist of an aerobic or septic tank followed by a peat filter and an absorption area as described in this listing. The septic tank used may be either a two-compartment rectangular tank or two rectangular septic tanks in series and must meet the requirements of Chapter 73, Section 73.31. All peat systems must also include a Zabel A-300 solids retainer or equivalent on the preceding septic or aerobic tank.

A. General Requirements for All Peat Based Systems

1. System Requirements

a. All Ecoflo installations are required to have a minimum of 195 cubic feet of peat evenly distributed in the filter unit (nominally 31 inches deep). The SEO shall confirm the volume of peat prior to final approval of the system. Note: New compressed packaging for peat requires multiplication of the volume printed on the packaging by 1.75 (the compression ratio).

b. The Puraflo system is sized at one preassembled peat filter module per bedroom (each module contains approximately 60 cubic feet of peat media). The depth of peat in the Puraflo system is 30 inches. No compression ratio is specified because these are pre-engineered, preassembled filter units.

2. Distribution of effluent from the septic tank or aerobic tank to the peat filter may be by gravity flow. If a pump is required to lift effluent to the peat filter, a timed dose is required.

3. Except where an open-bottom filter is proposed under Experimental Peat System Option 2, the peat filter must be watertight and all outlets properly sealed against liquid and solid infiltration and exfiltration. Where inlets are not above the liquid depth of the filter or are at or below a water table limiting zone, the inlet must also be sealed. Where a liner is used, the liner must be 20 mil thick hyplon, polyvinyl chloride or polyethylene sheeting placed on 2 inches of sand or a layer of 10 ounce porous textile material to prevent punctures and tears. The liner must be extended to the surface and any inlets or outlets at or below the water table or at or below the water level in the unit must have an anti-seep collar, bentonite clay plug or leak-proof boot sealed to the liner material.

4. Peat filters require maintenance, including the periodic replacement of peat. The company's warranty must be attached to the permit application, permit and purchase agreement. This warranty must clearly notify the property owner of the need to replace the peat within the life expectancy period established by the company and provide access for the annual inspection.

SYSTEMS APPROVED UNDER THIS LISTING:

Ecoflo Pennsylvania system - distributed in Pennsylvania by Falling Spring Technologies, P.O. Box 410, Newburg, PA 17240.

Puraflo peat biofilter - manufactured by Bord na Mona, P.O. Box 77457, Greensboro, NC 27417, distributed in Pennsylvania by Environmental Solutions and Equipment, L.L.C., 4 Park Plaza, Suite 331, Wyomissing, PA 19610.

B. Experimental Peat System Option 1:

This option involves pretreatment of septic or aerobic effluent using a self-contained peat filter with final treatment and disposal using an at-grade absorption area. The percolation rate must range between 3 and 120 minutes per inch and there must be greater than or equal to 20 inches of suitable soil between the bottom of the proposed absorption area and the limiting zone (48 inches of suitable soil or sand/soil not required) on slopes greater than or equal to 12 and less than or equal to 15 percent. The maximum reduction in absorption area sizing for this experiment is up to 40% using an at-grade system.

1. Basis for listing:

   The purpose of this experiment is to test the theory that the pretreatment of sewage effluent through the peat filtration system prior to treatment and disposal in the soil absorption area will allow a reduced size absorption area. The nominal depth of peat at 31 inches in the self-contained filter unit provides treatment at levels capable of receiving final treatment and disposal with as little as 20 inches of suitable soil. This system uses the demonstrated treatment and buffering capabilities of peat as a soil replacement when used in conjunction with an at-grade system.

2. Use of this system:

   The use of this system may be approved in accordance with Chapter 73, Section 73.71 and may be approved as an alternative to an elevated sand mound. The advantage of using this system is that the height of the mound may be reduced.

3. The following criteria apply to Experimental Peat System Option 1:

   a. Sufficient soil profiles must be conducted to assure that a minimum of 20 inches of suitable soil is present under the entire area proposed for the at-grade absorption area.

   b. The design of the at-grade system must meet the standards for these systems described in Part #9 of the *Alternate Systems Guidance* and Appendix 2, except that the soil profile must indicate that there is a minimum of 20 inches of suitable soils (instead of 48 to 60 inches).

   c. A report must be submitted to the DEP regional and central offices describing the results of a surface inspection of the at-grade absorption area at six-month intervals for the presence of a surface malfunction.

C. Experimental Peat System Option 2:

Pretreatment of septic or aerobic effluent using a self-contained peat filter with final treatment and disposal using an at-grade absorption area on a site with the minimum distance between the bottom of the absorption area and the limiting zone at 10 inches or more to water table and 16 inches or more to rock.

OR

Pretreatment of septic or aerobic effluent using an open bottom peat filter placed directly on aggregate, with no distribution system, on a site with a limiting zone at 10 inches or more to water table and 16 inches or more to rock.

1. Basis for listing:

   The purpose of this experiment is to evaluate the capabilities of shallow soils to treat and dispose of pretreated effluent, and to test the theory that shallow soils can treat and dispose of pretreated effluent from a peat filter without a traditional distribution system.

2. Use of this system:

   The applicability of this system may be limited because the hydrology of the site may inhibit treated effluent from moving out from beneath the absorption area at a sufficient rate to prevent groundwater mounding.

3. The following rules apply to Experimental Peat System Option 2:

   a. System monitoring is required by the system supplier. A zero tension lysimeter must be placed in the system at the depth of the limiting zone in a location at or under a distribution line hole. In addition, a capped PVC monitoring port of at least 3" diameter must be installed with the slotted open end at the depth of the aggregate soil interface. Sampling and monitoring is required at 3-month intervals for a period of 3 years. Parameters to be evaluated will include, at a minimum, fecal coliform, BOD, suspended solids, nitrate nitrogen, chlorides and the depth of liquid in the monitoring port. The sampling period may be shortened by DEP based on the results of initial samples. Results are to be submitted to both the regional and central offices of DEP and must include a description of the location of the system.

   b. Sufficient soil profiles must be conducted to assure that 10 or more inches of suitable soil is present under the entire area proposed for the at-grade absorption area or filter.

   c. Notching into existing suitable soils is not permitted unless DEP agrees to this as part of the experiment.

   d. Full-sized systems must be used unless site constraints limit the size of the absorption area and DEP concurrence on the proposed reduction is obtained.

   e. For system designs that include at-grade absorption areas, provision for future addition of a disinfection device must be included in the plans and specifications. A condition must be included in the permit that such a device may have to be installed should the experimental system fail to adequately remove fecal coliform bacteria as determined by DEP, based on the averages of samples collected in the zero tension lysimeter.

   f. The system must be designed to take full advantage of the slope to move effluent out from under the absorption area and downgradient, with the long side of the bed parallel to contours. This is a site-specific determination that must be made in consultation with a soil scientist and will be based upon the type and depth of limiting zone, textural class of soil, and topography.

D. Experimental Peat System Option 3:

This option is intended to evaluate the combination of pretreatment of septic or aerobic effluent using a self-contained peat filter with final treatment and disposal using an experimental modified elevated sand mound. Where a site has been determined to have greater than or equal to 16 and less than or equal to 20 inches of suitable soil as described in Chapter 73, Section 73.14, the following standards apply:

1. A peat filter may be used to provide treatment equal to 24 inches of sand.
2. The depth of sand required in the elevated sand mound may be reduced by 24 inches (example: Depth to limiting zone is 18 inches. Normal sand depth is 30 inches to make up for lack of suitable soils. Normal depth of 30 inches may be reduced by 24 inches if a peat filter is used. Depth of sand required is 6 inches.)
3. A soil scientist evaluation of the site is required.
4. Notching into existing suitable soils is not permitted unless DEP agrees to this as part of the experiment.
5. System monitoring is required by the system supplier. A zero tension lysimeter must be placed in the system at the depth of the limiting zone in a location at or under a distribution line hole. In addition, a capped PVC monitoring port of at least 3" diameter must be installed with the slotted open end at the depth of the aggregate soil interface. Sampling and monitoring is required at 3-month intervals for a period of 3 years. Parameters to be evaluated will include, at a minimum, fecal coliform, BOD, suspended solids, nitrate nitrogen, chlorides and the depth of liquid in the monitoring port. The sampling period may be shortened by DEP based on the results of initial samples. Results are to be submitted to both the regional and central offices of DEP and must include a description of the location of the system.
6. If the required depth of sand is not used, or if this system is proposed on a site with less than 16 inches to a limiting zone, Experimental Peat System Option 2 applies and all requirements under that option must be met.

2. The Floating Outlet ("Flout") Siphon

The purpose of this experiment is to test the theory that Flout siphons function in an equivalent manner to the bell siphons that are currently in use in Pennsylvania. This technology consists of an alternative siphon design to the bell siphon. The design consists of one or more lengths of PVC pipe (the Flout body) that are attached to the dosing tank discharge pipes by a flexible coupling. The PVC pipes are equipped with floats that cause the Flout body to rise off the dosing tank floor as the tank fills. The location of the discharge hole(s) in the Flout body allows the pipe(s) to rise rather than flood. When the effluent level rises high enough, the water overflows into the Flout body, causing the Flout to lose buoyancy and sink to the tank bottom. This action opens a direct path for the effluent to flow out of the tank and into the absorption area. When the effluent level falls below the discharge hole of the Flout body, the effluent remaining inside the body drains into the absorption area, and the cycle begins again.

The requirements for use of this technology are as follows:

A. Use of this technology is limited to single-family residential applications.

B. Design and installation must follow the manufacturer's specifications.

C. Septic tank installations must consist of either a two-compartment rectangular tank or two rectangular tanks in series and must be in conformance with Chapter 73, Section 73.31. Aerobic tanks must be in compliance with Chapter 73, Section 73.32.

D. These systems require regularly scheduled maintenance and monitoring to insure the long-term reliability of their performance. DEP recommends that the property owner perform an annual visual inspection of the mechanism immediately following a dose cycle to determine if all components of the mechanism are intact and operating properly. Results of the visual inspection are to be reported to the SEO and to DEP's regional office within 30 days of the inspection. The SEO must include all operation and maintenance requirements on the permit application.

E. It is the responsibility of the SEO to ensure that all components of the systems have been installed in compliance with the above conditions.

SYSTEMS APPROVED UNDER THIS LISTING:

The Flout, produced by Rissy Plastics and distributed by L.I.Z. Electric, 1189 Rt. 9 South, Keeseville, NY 12944.

3. Eljen Type B In-Drain

The Type B In-Drain System is intended as a replacement for aggregate in a conventional absorption area installation and is designed to create multiple vertical infiltration layers. The intention is to promote the growth of a biomat on the biofabric within the In-Drain unit. This is designed to help prevent the formation of a biomat at the system-soil interface, therefore prolonging the functional life of the system and allowing for an absorption area reduction.

A. Site considerations

1. The slope of the proposed absorption area may not exceed 8%.
2. All siting conditions under Chapter 73, Sections 73.12, 73.13, 73.14 and 73.15 apply.
3. The percolation test range is limited to rates between 3-60 min/in.
4. All absorption area calculations must be performed in compliance with Chapter 73, Sections 73.16(a) and (c). The absorption area reductions are determined by the manufacturer's specifications that specify the amount of In-Drain biofabric needed to replace conventional sand and aggregate. This reduction may not exceed 60%.

B. System design characteristics and considerations

1. All design specifications must be followed in accordance with the manufacturer's specifications.
2. If a septic tank is used, it must meet the requirements of Chapter 73, Section 73.31 and be either a two-compartment rectangular tank or two rectangular septic tanks in series. Aerobic tanks must meet the requirements of Chapter 73, Section 73.32.

C. Administrative Criteria

1. All installations must include an observation port and a groundwater sampling well.
2. Each installation must have one sampling device directly below the In-Drain unit.
3. Each installation must have one sampling device directly below the 6-inch layer of concrete sand.
4. Influent and effluent samples must be collected and analyzed for fecal coliform, BOD, suspended solids, nitrate nitrogen and chlorides. Two copies of the results must be sent to DEP's regional and central offices. The results must also be reported to the SEO. The Eljen Corporation will be responsible for the cost of system monitoring and maintenance.
5. Monitoring will continue for a period of 2 to 3 years, depending on the results of an annual DEP performance evaluation.

Eljen must also provide the permitting SEO with Eljen Corporation's "In-Drain Passive Treatment System Reference Manual" and provide installation consultation to the SEO as well as the property owner and installer.

SYSTEMS APPROVED UNDER THIS LISTING:

Eljen Type B In-Drain, manufactured by Eljen Corporation, 15 Westwood Road, Storrs, CT 06268.

4. Drip Irrigation on Sites not Suitable for Use Under the Alternate Drip Irrigation Listing

A. Siting Requirements

1. The siting and system design shall be based upon Table 1 (below) of this guidance. Any 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 Chapter 73 is qualified to conduct the morphological evaluation necessary to site a drip irrigation system. A report regarding the soil drainage classification determination and confirmation that the appropriate loading rate and horizontal linear load from Table 1 are met must be signed by the soil scientist and must be attached to the permit application. The soil scientist who signs the soils report shall determine the number and placement of soil profiles required to conduct the morphological evaluation of soils in the proposed drip zones. The profiles should 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. Requirements for a minimum number of soil profiles as specified in the Department's regulations, guidance or policy regarding other on-lot systems are not applicable to drip irrigation systems.

2. The slope over the basal area must be consistent with Table 1 (below.)

3. 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.

4. The site location requirements of Chapter 73, Section 73.12 and minimum isolation distances of Chapter 73, Section 73.13 apply. Isolation distances must be measured from a perimeter extending two feet beyond the outermost drip tubing in a drip irrigation zone.

B. Design Requirements

1. Treatment/filtration

a. Treatment tanks: Sewage must be treated using either a two-compartment rectangular septic tank or two rectangular septic tanks in series that meets the standards of Chapter 73, Section 73.31(Standards for Septic Tanks) or an aerobic tank that meets the standards of 73.32 (Standards for Aerobic Treatment Tanks).

b. Final filtration must be provided by a hydraulic unit fitted with in-line disk filters meeting or exceeding the filtration achieved by the "American Septic Drip" system disc filters manufactured by the American Manufacturing Company Incorporated. The filters must have an automatic backwash system. The disc filters must automatically backwash before each dose and each zone must be automatically forward flushed a minimum of each 50 cycles to clean drip tubing, maintaining a scouring velocity of 2 feet per second at the distal end of each lateral connection. Backwash from the disc filters must be returned to the first compartment of the septic tank or to the inlet of an aerobic treatment tank. The system must be equipped with a dosing tank alarm to alert the property owner of problems with the system, and a flow meter. The hydraulic unit must be protected from temperatures below freezing in accordance with the manufacturer's specifications.

2. Drip Irrigation Micromound:

   a. The mound must follow the contour of the land.

   b. The basal loading rate must be consistent with Table 1 (below). The basal area is the plowed absorption area interface.

   c. The tubing must have pressure-compensating emitters every 2 feet with spacing between tubing between 0.5 and .75 feet over the sand bed. All emitters within the zone shall provide equal distribution between plus or minus 10 percent. This standard has been met by the American Septic Drip System only. No substitution of other drip tubing is permitted.

   d. The site plan for the drip irrigation zones must be developed by or in consultation with the manufacturer or a representative of the manufacturer of the drip irrigation system being installed.

Table 1
American Septic Drip
Micro Mound

<table>
<tr><th>USDA Texture Group</th><th>Texture</th><th>Basal Loading (gal/ ft^2/day)[a]</th><th>Limitation Depth (inches)[b]</th><th>Horizontal Linear Load in gal/linear ft./day (g/lf/d)[c]</th></tr>
<tr><td>I
Sands</td><td>Sand, Loamy Sand</td><td rowspan="3">≤ .6</td><td rowspan="5">≥ 10” to seasonal high water table

≥16” to rock</td><td rowspan="3">Slope
15 - 25% <5 g/lf/d
8 - 15% <6 g/lf/d
0 - 8% <8 g/lf/d</td></tr>
<tr><td>II
Coarse Loams</td><td>IIa
Sandy Loam</td></tr>
<tr><td></td><td>IIb
Loam</td></tr>
<tr><td>III
Fine Loams</td><td>IIIa
Sandy Clay Loam, Silt Loam</td><td rowspan="2">≤ .4</td><td rowspan="2">≤ 4 g/lf/d

Slope ≤ 15%</td></tr>
<tr><td></td><td>IIIb
Clay Loam, Silty Clay Loam</td></tr>
<tr><td>IV
Clays</td><td>IVa
Sandy Clay, Silty Clay, Clay</td><td>≤ .2</td><td>≤ 3 g/lf/d

Slope ≤ 15%</td></tr>
<tr><td></td><td>IVb</td><td colspan="2">Special Considerations [d]</td><td>≤ 2 - 3 g/lf/d

Slope ≤ 15%
Slope ≥ 5%</td></tr>
</table>

NOTE: Sandbed tubing area loading rate at .75 gallons per ft^2 per day.

Sandbed depth 12", tapered / incorporated into toe of berm area. Sand used must meet the requirements specified by Chapter 73, Section 73.55(c) of DEP's regulations.
Tubing separation .5 to .75 feet over sandbed only.
Minimum 3:1 berm.

All accepted mound site protection / construction practices to be adhered to.

[a] Based on most limiting condition from ground surface to limitation. Basal area to be protected from all activity.

[b] Evaluate conditions 12" below limitations if possible.

[c] Maximize 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 to obtain the landscape linear loading rate.

[d] IVb soils may have other infiltration considerations other than texture including density, consistence, plasticity, structure and mixed clay mineralogy.

C. Construction

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

2. The basal area surface across the slope must be chisel plowed.

3. The manufacturer's representative must be present to oversee the installation of the system. As an alternative, contractors may attend a training course approved by the Department before installing drip tubing independent of oversight by the manufacturer.

4. Installation of the drip irrigation system shall meet the specifications provided by the manufacturer.

5. The sandbed tubing area is to be located in the upslope portion of the basal area.

D. Operation and Maintenance

The following operation and maintenance conditions must be attached to the permit issued by the local agency:

1. The manufacturer's representative must meet with the property owner within one month of system start-up and/or occupancy of the dwelling and with the local agency SEO upon request, to explain the operation and maintenance of the system and provide written instructions to the property owner that include:

   a. Instructions on the operation and maintenance of the system.

   b. The locations of all parts of the system.

   c. A caution notice regarding any disturbance of the drip zones that may cause damage to the system (i.e., excavation for trees, fencing, etc.)

   d. An explanation of the automatic alarm system.

   e. A statement requiring that the manufacturer's representative be contacted if the alarm system is activated.

f. Notification that system monitoring is required by the system supplier. A zero tension lysimeter must be placed in the system at the depth of the limiting zone in a location at or under a distribution line hole. In addition, a capped PVC monitoring port of at least 3" diameter must be installed with the slotted open end at the depth of the aggregate soil interface. Sampling and monitoring is required at 3-month intervals for a period of 3 years. Parameters to be evaluated will include, at a minimum, fecal coliform, BOD, suspended solids, nitrate nitrogen, chlorides and the depth of liquid in the monitoring port. The sampling period may be shortened by DEP based on the results of initial samples. Results are to be submitted to both the regional and central offices of DEP and must include a description of the location of the system. A form for this purpose will be provided by DEP.

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

SYSTEMS APPROVED UNDER THIS LISTING:

The only drip irrigation system that has currently met the requirements for this experimental system listing is the American Septic Drip System, manufactured by the American Manufacturing Company, Incorporated, 5517 Wellington Road, Gainesville, Virginia 20155.

5. Elevated Sand Mound Bed Systems on Slopes Between 12 and 15 Percent and with Percolation Rates Between 31 and 90 Minutes per Inch.

The purpose of this experiment is to test the elevated sand mound bed system on sites with steeper slopes and moderate percolation rates.

A. Site considerations:

1. The slopes at the site must be measured as greater than or equal to 12 and less than or equal to 15 percent.
2. The percolation rate must not exceed 90 minutes per inch.
3. The depth to limiting zone of suitable soil in the soil profile must be greater than or equal to 20 inches as described in Chapter 73, Section 73.14.
4. This system may not be installed where a well-developed fragipan is present.
5. The installation must comply with Chapter 73, Section 73.51(a).
6. The percolation tests must be conducted in accordance with Chapter 73, Section 73.15(3)(ii) or (iii). The absorption area must be sized in accordance with the requirements of Section 73.16(c), Table A, Subsurface Sand Filters and Elevated Sand Mounds. No size reductions are permitted for use of aerobic tanks or other system components.

B. System design characteristics and considerations:

1. These systems are to be used for single-family residential proposals that do not exceed 600 gpd or commercial facilities with residential flow characteristics that do not exceed 600 gallons per day.
2. Sand used in these beds must meet the requirements of 73.55(c). The downslope sand shall be extended to a 2:1 ratio.
3. The width shall not exceed 10 feet. The overall bed dimension, length to width, must be 6:1 or greater.
4. The downslope berm must be extended to a 4:1 ratio to improve stability.
5. Pressure distribution is required.
6. Lateral end cleanouts are required.
7. The surface must be chisel plowed (including the area under the berm) as described in Chapter 73, Section 73.55(b)(2).

C. Administrative criteria:

1. Department staff must supervise the system installation. Because this is an experimental system design, an acceptable onlot sewage disposal system (non-experimental) replacement area must be designated and reserved. Small flow treatment facilities are acceptable as replacement systems where all requirements of Chapter 71, Section 71.64 can be met.

2. A monitoring program is required. Data must be collected by a responsible agent who has access to the site. The sample results must be forwarded to DEP's regional and central offices. The applicant or applicant's agent must meet with department staff to establish the type, frequency and duration of monitoring for inclusion in the permit application**.** The permit application must specify the type of monitoring, frequency and duration. The application must also grant permission for DEP to access the system.

5. The permit application must establish a septic tank pumping schedule. The pumping shall be performed on intervals of three to five years.

6. Elevated Sand Mound on Shallow Limiting Zone Sites (<20")

This option involves the treatment of septic or aerobic effluent using a modified elevated sand mound. It may be used as a repair or replacement on a site with an existing, malfunctioning system, if the soil at the site has greater than or equal to 17 and less than or equal to 20 inches to a limiting zone, the slope of the site is less than or equal to 15 percent, and the site would otherwise be suitable for repair using an elevated sand mound under Chapter 73, Section 73.55. The following standards are required:

A. This option is available for repair/replacements only.

B. The depth of sand required must be increased to make up for the lack of suitable natural soil.

C. A soil scientist evaluation of the site is required.

D. System monitoring is required. The sewage enforcement officer should contact DEP to determine monitoring requirements and responsibility for collecting samples. A zero tension lysimeter must be placed in the system at the depth of the limiting zone in a location at or under a distribution line hole. In addition, a capped PVC monitoring port of at least 3" diameter must be installed with the slotted open end at the depth of the aggregate soil interface. Sampling and monitoring is required every 3 months for a period of 3 years. Parameters to be evaluated will include, as a minimum, fecal coliform, BOD, suspended solids, nitrate nitrogen, chlorides and the depth of liquid in the monitoring port. The sampling period may be shortened by DEP based on the results of initial samples. Results are to be submitted to DEP's regional and central offices, and must include a description of the location of the system.

E. Enough soil profiles must be conducted to assure that a minimum of 17 inches of suitable soil is present under the entire proposed absorption area.

7. Controlled Fill

A. Intent

The intent of a controlled fill experiment is to test the controlled fill concept only. The onlot sewage disposal system that is proposed to be installed on the controlled fill site *may not* be an experimental system. DEP will select the soil conditions necessary for fill proposals, choose the sites that are the most conducive to a fill proposal, and limit the number of fill placements by region as described in Chapter 73, Section 73.3(c).

Since DEP experience indicates that many controlled fill experiments fail, DEP will consider proposals only on existing lots of record. Under no circumstances will the installation of an experimental fill proposal be considered evidence of adequate sewage disposal facilities to gain planning module approval. Additionally, DEP may reject the placement of fill on a site that exhibits soil conditions similar to those of a controlled fill experiment already in progress.

DEP experience also indicates that the controlled fill concept is not a viable option for sites that exhibit a seasonal high water table as demonstrated by the presence of soil mottling within 20 inches of the soil surface. It has been shown that fill placed on such sites will "wick" water within the fill, causing the seasonal high water table to rise and re-establish itself near the surface of the fill. Fill that is placed in soils exhibiting seasonal high water table characteristics has a tendency to stabilize into structural and textural conditions similar to the native soil due to the presence of water rather than to eliminate the natural hydric limitations of the site. Additionally, subsurface erosion due to shallow water tables and "sliding" of fill (also caused by excessive slope) have occurred where fill was placed in an area exhibiting high water table (mottled) conditions. Therefore, controlled fill will only be considered where bedrock or excessive coarse fragments constitute the limiting zone, where slopes are less than or equal to 12 percent, and where percolation rates range between 3-180 minutes per inch in the test zone.

Controlled fill is not to be considered for repair situations. The waiting periods inherent in this experimental method render it impractical as a timely and effective corrective measure for the repair of malfunctions. There also can be no guarantee that the fill site will be suitable at the end of the waiting period.

B. Requirements:

Before a property owner or designer proposes an experimental fill site, he/she should be aware that:

1. Because controlled fill is experimental in nature, identification of a replacement system or alternate site is required prior to submission of the proposal (Chapter 73, Section 73.71(d)). The replacement area requirement may be met using small flow treatment technology, or conventional onlot sewage disposal technology. A duplicate fill site or other form of experimental system or technology is not acceptable as a method of replacement for controlled fill proposals.
2. Controlled fill proposals may be evaluated prior to the four-year minimum when the local agency and DEP have received notification of the proposal and have given notice of concurrence. Additionally, early evaluation of a controlled fill site requires that a DEP representative, the SEO and a consulting soil scientist re-evaluate the site.

3. A controlled fill proposal does not constitute an application for a permit. The proposal serves as a notification to the SEO, the local agency and DEP that an early evaluation may be requested for the fill site. Application for a permit may be made only after DEP's soil scientist, the local SEO and the consulting soil scientist agree that the fill placed on the site has stabilized and that all other experimental site requirements have been met.

4. A consulting soil scientist must be available to evaluate the proposed fill site and the soil from the supply site, supervise the fill process, and evaluate the site after the required stabilization period has elapsed.

C. Soil Requirements

The textural quality of the fill material to be placed on the site is important, since it can determine the amount of time necessary to re-establish homogenous conditions and dictate whether or not a textural discontinuity will be present. The fill must be compatible with the topsoil on the site to be filled. Soils with a high clay content typically require a longer re-establishment period. In any case, a maximum depth of 12 inches will be required for an early evaluation.

D. Site Requirements

DEP's staff representative and the SEO in charge of the project must give DEP's soil scientist opportunity to observe the soil testing at the supply and fill sites by providing notification at least 5 days in advance of the soil probe evaluations. At the time of the evaluations, the consulting soil scientist must record a detailed description of the soil characteristics of both the supply and fill sites. These descriptions must be included with the written proposal.

In addition to evaluating the supply and fill sites, the consulting soil scientist must supervise the placement of the fill on the site and will control the time and manner of placement in order to preserve the natural condition of the soil. The fill site must encompass approximately two times the total area necessary for the absorption field. The size of the absorption field will be determined by conducting a standard 6-hole percolation test at the proposed fill site to a depth of 8 inches above the defined limiting zone or no less than 6 inches below the existing ground surface.

E. Evaluation

Evaluation of fill material may not be conducted earlier than July 1 of the year following a fill placement. Further, to be evaluated in the next calendar year (after July 1) the fill material must be placed by October 1 of the preceding year. This is done to ensure that at least one freeze-thaw and one wet-dry cycle has elapsed.

The re-evaluation of the filled site must consist of a complete soil analysis that includes a soil profile evaluation and a complete percolation test.

If the re-evaluation of the controlled fill site indicates that the fill has not stabilized properly, subsequent evaluations may not be considered on less than 365-day intervals. Further, the DEP staff person, the SEO, and the consulting soil scientist must be present to observe any additional evaluations and must concur with the site suitability prior to onlot sewage disposal permit issuance.

F. Submission

A typical submission must include the following items:

1. A narrative description of the project, including:
    a. Site description and ultimate proposed use.
    b. Proposed date of controlled fill placement and re-evaluation date.
    c. Type of onlot sewage disposal system proposed if the site stabilizes.
    d. Physical description of the fill placement method and equipment used.
    e. Description of the replacement system or other alternative.
2. A diagram of the site, including the tested area, percolation test locations, fill site location, property lines, water supplies (proposed and existing), water courses or water bodies.
3. A soil description from both the supply and fill areas which details the textural and structural characteristics of the soil.
4. Percolation test data.
5. Proposed dimensions of the fill area.

G. Permitting

Once the DEP staff person, the SEO, and the consulting soil scientist agree that the fill material has properly stabilized, the applicant will submit plans and specifications to the SEO proposing installation of the appropriate onlot sewage disposal system on the filled site. If these plans and specifications are in order, the SEO may issue a permit under the provisions of Chapter 73.

APPENDIX 1

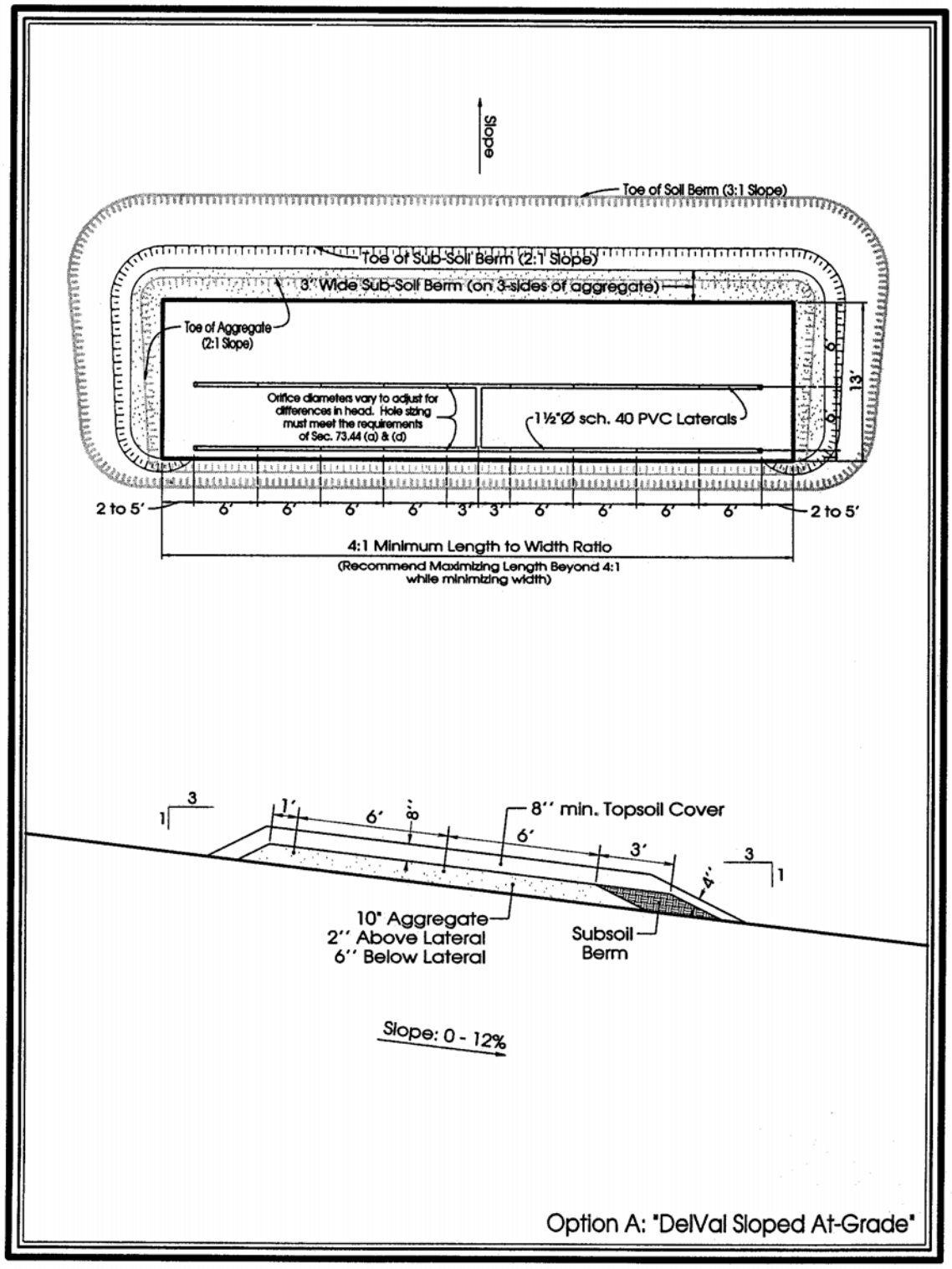
Experimental Systems

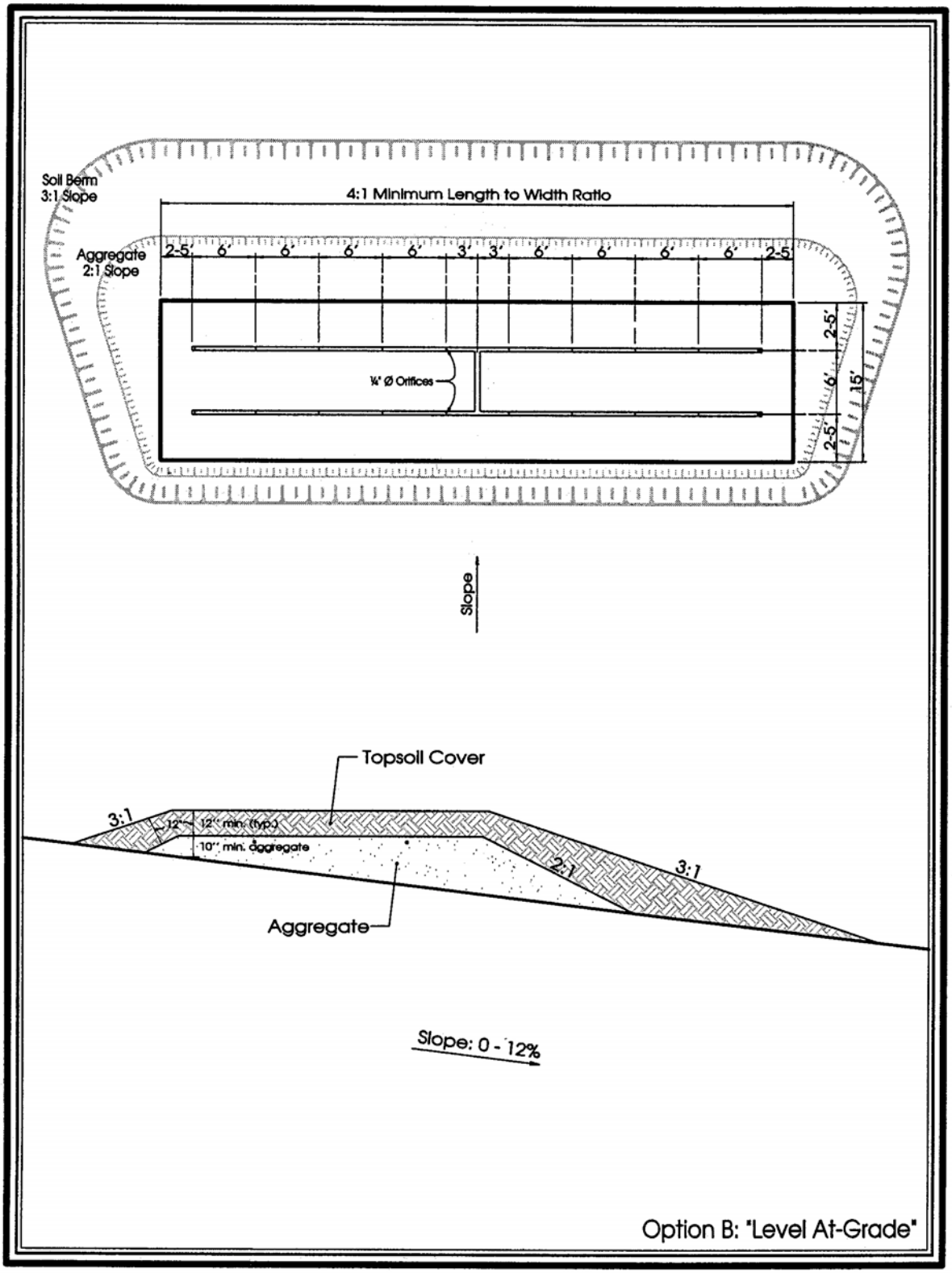
SYSTEM	SITING CRITERIA	
Peat Based Systems		
Option 1	**Soil Depth**	≥ 20 inches
	Slope	12 – 15%
	Percolation Rates	3 – 120 min/in
	Other	May reduce size of absorption area by up to 40%
Option 2	**Soil Depth**	≥ 10 inches to water table ≥ 16 inches to rock
	Slope	0 – 15%
	Percolation Rates	3 – 180 min/in (with sealed filter) 3 – 75 min/in (with open bottom filter)
	Other	Need soil scientist to evaluate soils
Option 3	**Soil Depth**	≥ 16 inches, ≤ 20 inches
	Slope	0 – 15%
	Other	Replaces 24 inches of sand in ESM
Eljen Type B In-Drain	**Soil Depth**	≥ 20 inches
	Slope	0 – 8%
	Percolation rates	3 – 60 min/in
	Other	May reduce size of absorption area by up to 60%
Drip Irrigation on Sites Not Suitable for Use under the Alternate Listing	**Soil Depth**	≥ 10 inches to water table ≥ 16 inches to rock
	Slope	0 – 25% (see Table 1)
	Percolation Rates	None unless soil scientist requests
	Other	Need soil scientist to evaluate soils and provide design criteria
ESM Bed Systems on Slopes 12-15% and Perc rates 31 – 90 min/in	**Soil Depth**	≥ 20 inches
	Slope	≥ 12% ≤15%
	Percolation Rate	31 – 90 min/in
	Other	May not be placed on sites with well-developed fragipan

SYSTEM	SITING CRITERIA	
		Up to 400 gpd domestic wastewater flows
ESM on Shallow Limiting Zone Sites (<20 inches)	**Soil Depth**	≥ 17 inches - ≤20 inches
	Slope	0 – 15%
	Percolation Rates	3 – 180 min/in
	Other	Only used as repair Need soil scientist to evaluate soils
Controlled Fill	**Soil Depth**	Selected by DEP
	Depth to Water Table	≥ 20 inches
	Slope	≤ 12%
	Percolation Rates	3 – 180 min/in
	Other	Soil scientist, DEP and SEO must evaluate site and provide design criteria

APPENDIX 2

At-Grade Bed System Diagrams




Soil Berm
3:1 Slope
4:1 Minimum Length to Width Ratio
Aggregate
2:1 Slope
2-5'
6'
6'
6'
6'
3'
3'
6'
6'
6'
6'
2-5'
¼" Ø Orifices
2-5'
6'
2-5'
15'
Slope
Topsoil Cover
3:1
12"
12" min. (typ.)
10" min. aggregate
2:1
3:1
Aggregate
Slope: 0 - 12%
Option B: "Level At-Grade"