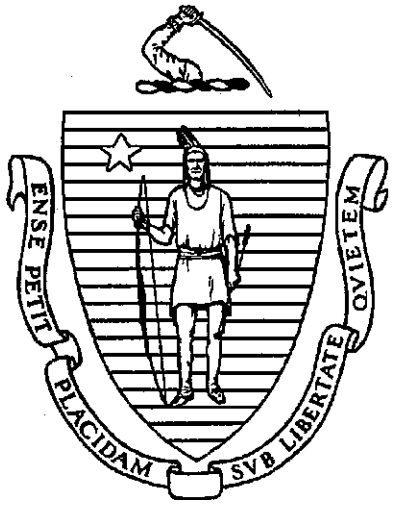


BID PACKAGE
PART IV
PROJECT SPECIFICATIONS

DMH PROJECT #2021-080A
SEPTIC SYSTEM REPLACEMENT, DRIVEWAY,
AND RELATED SITE WORK

#739 PALMER AVE,
FALMOUTH, MA

PART 4: Special Conditions of the Contract:

The existing occupants will be removed from the group home between May 1st and to Saturday, June 24th. The contractor must have the new septic tank in place and all plumbing connections to the house completed by the June 24th deadline. The clients and staff will return for occupancy on June 25th. The contractor will responsible for pumping the septic tank on a daily basis to allow the clients and staff to fully utilize the house. Any cost for pumping or disposal will be at the contractor's expense.

At the awarding authorities' discretion, the contract may be extended with no additional cost increase from the contractor. Contract dates may be adjusted from May 1st to September 15th and June 25th to Saturday October 28th.

The contractor shall be aware that there may be other building related projects either interior or exterior at the same time. The contractor shall maintain daily access to the house for other contractors to the building for vehicles and personnel.

The contractor we'll need to be a licensed septic installer by the Falmouth Board of Health. This does not need to be at the time of bidding. The contractor will have two weeks from the intent to award letter from the agency to the low bidder to obtain this license.

The project is subject to the town of Falmouth Conservation Commission order of conditions / request with determination conditions. This will include installation of the erosion control barrier, Conditions as noted in the attach RDA / what are of conditions.

This project is subject to department of mental protection approval conditions attached here within. It should be the contractor's responsibility to maintain compliance with the conditions as noted in DEP approval letter. Attached.

<u>Attachments Included in Part 4:</u>

- Town of Falmouth Request for Determination (RDA) Approval dated April 22, 2022
- Department of Environmental Protection WP63 Disposal System Construction Plan Approval dated November 12, 2022
- Presby Wastewater Treatment System, Massachusetts Enviro-Septic Design and Installation Manual, dated September 2019.
- Original Septic System: Plot Plan of Proposed Sewage Disposal System Lot 8, Falmouth, MA, prepared by RAS Associates, date August 28, 1985.
- Design Plans: Proposed Septic System, prepared for Department of Mental Health, #739 Palmer Ave, Falmouth, MA, prepared by Woods Hole Group / CLS Company, plan date January 28, 2022, 2 sheets.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Bethany A. Card
Secretary

Martin Suuberg
Commissioner

November 10, 2022

Commonwealth of Massachusetts, Department of Mental Health
Attn: Paul Truax – Director of Engineering and Facilities Management
167 Lyman St.
Westboro, MA 01581

RE: **FALMOUTH – BWR WM**
22-WP63-0002-APP
WP63 Disposal System Construction for State/Federal Facility
PLAN APPROVAL

Dear Mr. Truax:

The Massachusetts Department of Environmental Protection (MassDEP or the Department) has completed its review of the application for the above-referenced disposal system construction permit for the Massachusetts Department of Mental Health at 739 Palmer Avenue, Falmouth, Massachusetts.

As part of the application submitted by Woods Hole Group, MassDEP received one (1) set of engineering plans consisting of 2 sheets titled:

"PROPOSED SEPTIC SYSTEM
PREPARED FOR:
MASSACHUSETTS DEPARTMENT OF MENTAL HEALTH
#739 PALMER AVENUE, FALMOUTH, MA
January 28, 2022

The proposed system will serve a residence designed with eight (8) bedrooms and will consist of one (1) 2,500-gallon septic tank discharging into one (1) 1,500-gallon septic tank followed by one (1) distribution box with final discharge via a PRESBY ADVANCED ENVIRO™ gravity soil absorption system (SAS). The facility will generate a daily design sewage flow of 1,200 gallons per day (gpd).

MassDEP hereby approves the plan for the proposed upgrade subject to the following:

1. Construction shall be in strict conformance with the submitted application materials, engineering plans cited above, proposed flow volume and provisions of this approval. No changes shall be made without approval from the Department. All system components shall be marked with magnetic tape or equivalent.

2. The applicant or engineer shall notify MassDEP at this office of the following construction events to allow the opportunity for a MassDEP construction inspection:

    a. At bottom of bed excavation milestone to verify the elevation of the leaching field.

    b. After installation of the Presby Advanced Enviro Gravity SAS.

    c. Before final back fill of distribution box and tanks.

3. MassDEP shall issue a Certificate of Compliance prior to operation of the system. An inspection and operational test of the entire system must be performed prior to the system being put on-line and prior to backfilling. The inspection and operational test shall be scheduled at least seven (7) days in advance so that Department and Falmouth Board of Health personnel can be present.

4. The facility served by the system and the system itself shall be open to inspection by MassDEP and the Falmouth Board of Health.

5. Prior to installation of the system, the owner shall obtain a Disposal System Construction Permit (Form 2A) issued to the System Installer licensed by the Falmouth Board of Health once under contract and identified to MassDEP.

6. A written certification that the system was constructed in accordance with the submitted designs cited above shall be submitted by a Professional Engineer registered in the Commonwealth of Massachusetts.

Copies of the approved plans cited above must be kept on-site and used for construction purposes.

The issuance of this approval does not relieve the involved parties from complying with any applicable Massachusetts and local, laws and regulations.

If you have any questions or require additional information, please contact Ian Jarvis at Ian.Jarvis@mass.gov.

Sincerely,

Gerard M.R. Martin
Deputy Regional Director
Bureau of Water Resources

ecc: Falmouth BOH
Attn: Scott McGann - scott.mcgann@falmouthma.gov

Wood Hole Group
Attn: Joel Kubic - jkubick@woodsholegroup.com

MassDEP Watershed Permitting Program, Title 5 Section, Boston

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. General Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

From:

Falmouth
Conservation Commission

To: Applicant

Commonwealth of MA Dept of Mental Health
Name
167 Lyman St
Mailing Address
Westboro | MA | 01581
City/Town | State | Zip Code

Property Owner (if different from applicant):

Name
Mailing Address
City/Town | State | Zip Code

1. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Title	Date
Proposed Septic System Repair	1/28/22
USGS Locus Map	11/23/2021
Falmouth GIS Map	11/23/2021

2. Date Request Filed:

3/1/2022

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

Proposed project isto remove an existing septic system, install a new septic system, and repave the existing driveway.

Project Location:

739 Palmer Ave
Street Address

Falmouth
City/Town

35 03
Assessors Map/Plat Number

004 008
Parcel/Lot Number

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination
Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) or Order of Resource Area Delineation (issued following submittal of Simplified Review ANRAD) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

☐ 1. The area described on the referenced plan(s) is an area subject to protection under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

☐ 2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

☒ 2b. The boundaries of resource areas listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

☐ 3. The work described on referenced plan(s) and document(s) is within an area subject to protection under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

☐ 4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to protection under the Act. Therefore, said work requires the filing of a Notice of Intent or ANRAD Simplified Review (if work is limited to the Buffer Zone).

☐ 5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Name | Ordinance or Bylaw Citation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

☐ 6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

☐ 7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)c. for more information about the scope of alternatives requirements):

- ☐ Alternatives limited to the lot on which the project is located.
- ☐ Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- ☐ Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- ☐ Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination
Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

☐ 1. The area described in the Request is not an area subject to protection under the Act or the Buffer Zone.

☒ 2. The work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent. * under the bylaw

☒ 3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any). * under the State

☐ 4. The work described in the Request is not within an Area subject to protection under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to protection under the Act.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

☐ 5. The area described in the Request is subject to protection under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

Exempt Activity (site applicable statuatory/regulatory provisions)

☐ 6. The area and/or work described in the Request is not subject to review and approval by:

Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Name | Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

☐ by hand delivery on

☒ by certified mail, return receipt requested on

4/12/2022

Date | Date # 7020 2450 0000 8972 7355

This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community) and the property owner (if different from the applicant).

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

C. Authorization (cont.)

Signatures:	
Signature	Jennifer Lincoln, Conservation Administrator Printed Name
Signature	Jaime Mathews, Chair Printed Name
Signature	Peter Walsh Printed Name
Signature	Courtney Bird Printed Name
Signature	Marie Harlow Hawkes Printed Name
Signature	Printed Name
Signature	Printed Name
Signature	Printed Name

D. Appeals

The applicant, owner, any person aggrieved by this Determination, any owner of land abutting the land upon which the proposed work is to be done, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate Department of Environmental Protection Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community) to issue a Superseding Determination of Applicability. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and Fee Transmittal Form (see Request for Departmental Action Fee Transmittal Form) as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Determination. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant if he/she is not the appellant. The request shall state clearly and concisely the objections to the Determination which is being appealed. To the extent that the Determination is based on a municipal ordinance or bylaw and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

For Signature Authorization see
Doc: 1,393,706
BARNSTABLE LAND COURT REGISTRY

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

DEP File Number:

Provided by DEP

A. Request Information

1. Location of Project

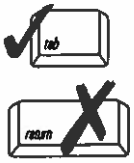
a. Street Address

b. City/Town, Zip

c. Check number

d. Fee amount

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)

☐ Superseding Determination of Applicability – Fee: $120

☐ Superseding Order of Resource Area Delineation – Fee: $120

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

B. Instructions (cont.)

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

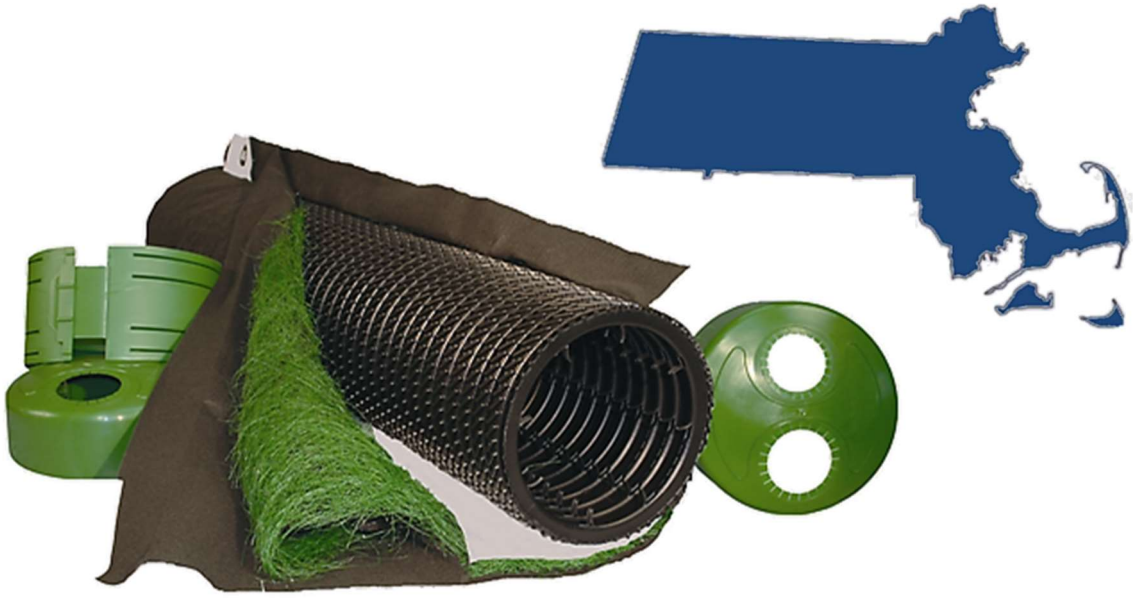
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

The Presby Wastewater Treatment System

Massachusetts

Enviro-Septic®

Design and Installation Manual



✔ Minimizes the Expense ✔ Protects the Environment ✔ Preserves the Site

Presby Environmental, Inc.

An Infiltrator Water Technologies Company

The Next Generation of Wastewater Treatment Technology

143 Airport Rd., Whitefield, NH 03598

Tel: 800-473-5298 Fax: 603-837-9864

info@presbyeco.com

www.PresbyEnvironmental.com

The information in this manual is subject to change without notice. We recommend that you check your state's page on our website on a regular basis for updated information. Your suggestions and comments are welcome. Please contact us at:

Presby Environmental, Inc.
143 Airport Road
Whitefield, NH 03598
Phone: 1-800-473-5298 Fax: (603) 837-9864
Website: www.presbyenvironmental.com

The products and methods depicted in this manual are protected by one or more patents. For more information: Pat. www.presbyeco.com/patents.

Enviro-Septic® is a registered trademark of Presby Environmental Inc.

IMPORTANT NOTICE: This Manual is intended ONLY for use in designing and installing Presby Environmental's Enviro-Septic® Wastewater Treatment Systems. The use of this Manual with any other product is prohibited. The processes and design criteria contained herein are based solely on our experience with and testing of Enviro-Septic®. Substitution of any other large diameter gravelless pipe will result in compromised treatment of wastewater and other adverse effects.

This manual refers to the **Certification for General Use** (Transmittal Number **X233394**) and the **Certification for Remedial Use** (Transmittal Number **X233395**) for use under Title 5 Innovative / Alternative Technology Approval issued by the State of Massachusetts Department of Environmental Protection.

All designers must provide the above approval letter to each landowner who is a prospective purchaser of a System prior to the sale of the system and prior to the filing of any application for a site-specific approval.

To access the approval letters and the Standard Conditions for Alternative SAS Systems, please go to Massachusetts Department of Environmental Protection web page at: https://www.mass.gov/guides/approved-title-5-innovativealternative-technologies.

Enviro-Septic® Wastewater Treatment System Massachusetts Design and Installation Manual

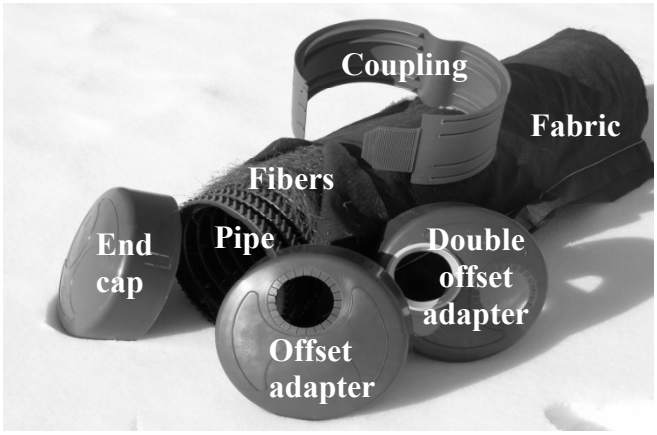
Preview

Background

Liquid that exits from a septic tank (effluent) contains suspended solids that cause other types of leaching systems to fail. Solids overload bacteria, cut off aeration required for bacterial activity, and seal the underlying soil.

System components

Here's a picture of the Enviro-Septic® system components.



What our system does

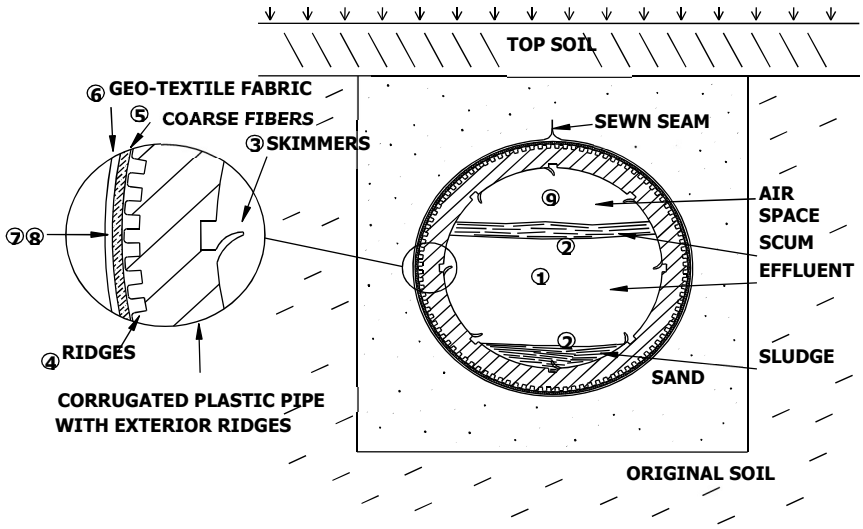
By utilizing simple, yet effective natural processes, the Enviro-Septic® wastewater treatment system treats septic tank effluent in a manner that prevents solids from entering surrounding soils, increases system aeration, and provides a greater bacterial area (biomat) than traditional systems.

Why our system excels

The Enviro-Septic® wastewater treatment system retains solids in its pipe and provides multiple bacterial surfaces to treat effluent prior to its contact with the soil. The continual cycling of effluent (the rising and falling of liquid inside the pipe) enhances bacterial growth. No other design offers this functionality. Our systems excel because they are more efficient, last longer, and have a minimal environmental impact.

Pipe section diagram

Here's a cross section diagram of Enviro-Septic® pipe.



Continued

Preview Continued

How it works

These are the nine stages in the Enviro-Septic® Wastewater Treatment System.

Stage	What Happens
1	Warm effluent enters the pipe and is cooled to ground temperature.
2	Suspended solids separate from the cooled liquid effluent.
3	Skimmers further capture grease and suspended solids from the effluent as it exits through perforations in the pipe.
4	Pipe ridges allow the effluent to flow uninterrupted around the circumference of the pipe and aid in cooling.
5	A mat of random, coarse fibers separates more suspended solids from the effluent.
6	Effluent passes into the geo-textile fabric and grows a protected bacterial surface.
7	Sand wicks the liquid from the geo-textile fabric and enables air to transfer to the bacterial surface.
8	Fabric and fibers provide a large bacterial surface to break down solids.
9	An ample air supply and fluctuating liquid levels increase bacterial efficiency.

System advantages

An Enviro-Septic® (ES) wastewater treatment system

- costs less than traditional installation products and materials
- requires a smaller area
- blends into sloping terrain
- adapts to difficult sites
- installs more easily and quickly than traditional systems
- eliminates the need for expensive washed stone
- adapts easily to both commercial and residential sites
- uses a protected receiving surface
- increases system performance and longevity
- tests environmentally safer than conventional systems
- recharges groundwater more safely than conventional systems

In this manual

This manual contains the following sections.

Section A
Introduction

Purpose	The purpose of this manual is to provide guidance in the design and installation of the Presby Environmental, Inc., Enviro-Septic® (ES) wastewater treatment system products.
Presby Environmental, Inc., standards	All systems using Presby Environmental, Inc., ES wastewater treatment system products must be designed and installed in compliance with the procedures and specifications described in this manual.
State standards	Title 5, 310 CMR 15.000, the State Environmental Code for Massachusetts covers issues not addressed in this manual. Title 5 requirements take precedence unless specifically changed by the General Use or Remedial Use approvals issued for the ES system.
Certification required	MassDEP and Presby Environmental, Inc., require all designers and installers to be certified. Certification is obtained by attending the "Enviro-Septic® Designer and Installer Certification Course" presented by Presby Environmental, Inc., or its sanctioned representatives. Until designers and installers are certified, designs and installations must be approved/inspected by Presby Environmental, Inc., or its sanctioned representatives. Special Note: Presby Environmental, Inc., recommends that all individuals involved in the approval or permitting process also attend these sessions.
"System Installation Form" required	Installers of ES systems shall provide Presby Environmental, Inc., and the local approving authority with a copy of a completed "System Installation Form" for each new or remedial system installed. Reference: See "Appendix A – System Installation Form."
Technical support	Presby Environmental, Inc., provides technical support to all individuals using our products. For questions about the information contained in this manual, please review our website at www.presbyenvironmental.com or contact us at 1-800-473-5298.

Section B
Definitions of Terms

Introduction	This section defines terms as they are used in this manual.
Basic serial system	A basic serial system is a system consisting of one bed of ES pipe in serial configuration.
Bed	A bed is 2 or more lines of ES pipe located within a contiguous inground or raised system sand bed area.
Bottom drain	A bottom drain is a sealed pipe connecting the end of a basic serial system, the ends of all distribution box system lines, or the end of each section of a combination serial system to a sealed drain.
Center-to-center spacing	Center-to-center spacing is the horizontal distance from the center of one line to the center of the adjacent line.
Combination serial system	A combination serial system is a system incorporating two or more sections of ES pipe in serial configuration, each section receiving effluent from a distribution box.
Coupling	A coupling is a fitting that joins two pieces of ES pipe.
D-box	D-box is an abbreviation for distribution box.
Design flow	Design flow is the assigned peak daily flow of sewage, in gallons per day, from a residence or commercial facility.
Differential venting	Differential venting is a method of venting an ES system using high and low vents.
Distribution box	A distribution box is a device used to divide and/or control effluent flow.
Distribution box manifold	A distribution box manifold is a method of joining any number of distribution box outlets to a single pipe.
Distribution box system	A distribution box system is a number of ES lines of equal length, each supplied evenly with effluent through a distribution box.
Double offset adapter	A double offset adapter is an end cap with a two 4 in. offset holes. Double offset adapters are used in bottom drain installations.
Drain sump	A drain sump is a watertight chamber connected to the end of a bottom drain line. Reference: See Section L, “Bottom Drains and Requirements,” p. 29.
EHGW	EHGW is an abbreviation for estimated high ground-water elevations.
End cap	An end cap is a cap used at the end of an ES line or section.

Continued

Definitions of Terms, Continued

Enviro-Septic® (ES) pipe	An Enviro-Septic® (ES) pipe is a single unit of pipe, 10 ft. in length with an outside diameter of 12 in. and a storage capacity of approximately 58 gallons.
Flow equalizer	A flow equalizer is an insert installed in each outlet of a distribution box to equalize the effluent distribution for multiple outlets.
GPD	GPD is an abbreviation for gallons per day.
High and low vents	High and low vents are pipe components used in all systems to ensure that air is drawn completely through the entire ES system.
High flow	High flow is a "design daily flow" greater than 500 GPD. High flows require combination or distribution box system designs or multiple serial beds.
Inground system	An inground system is a system installed with the bottom of the system sand bed below the existing grade.
Level system	A level system is a system in which lines of ES are installed at the same elevation.
Line	A line is a number of ES pipes connected by couplings with an offset adapter on the inlet end and an offset adapter on the opposite end.
Low flow	Low flow is a "design daily flow" of 500 GPD or less. Basic serial system configuration is preferred for low flow systems.
Multiple bed System	A multiple bed system incorporates two or more beds, each bed with basic serial or combination serial distribution and receiving effluent from a distribution box.
Offset adapter	An offset adapter is an end cap with a 4 in. offset hole. Offset adapters are used for raised connections, venting and system inlets.
Raised connection	A raised connection is an arrangement of sewer and drain PVC pipe used to connect lines of ES pipe to maintain the correct liquid level inside each line.
Raised system	A raised system is a system installed with the bottom of the system sand bed at or above the existing grade.
Section	A section is a group of ES lines in serial distribution receiving effluent from a distribution box in a combination system.
Serial distribution	A serial distribution is a group of ES lines connected with a raised connection. Reference: See "line", above.
Slope	Slope is the ratio of the difference in elevation and the difference in horizontal distance between two points on the surface of a landform expressed as a percent, and commonly stated as rise over run. Example: A slope of one percent is the difference in elevation of one foot (rise) over a horizontal distance of one hundred feet (run).

Continued

Sloping system	A sloping system is a system in which lines of ES are installed in decreasing elevations.
Smear	To smear is to mechanically seal the natural pores of soil along an excavated or tilled surface.
Surrounding sand	Surrounding sand is the sand/soil material adjacent to the system sand. Reference: See specifications, "Section F – System Sand Requirements," p. 14.
System Sand	System sand is the sand immediately surrounding the pipe and is required in all ES installations. Reference: See specifications, "Section F – System Sand Requirements," p. 14.

Section C
Design Criteria, Requirements, and Restrictions

Introduction

This section contains a variety of criteria, requirements, and restrictions for designing ES wastewater treatment systems.

Subjects covered

This table contains the subjects covered and the page location of each.

Access recommended

Installations under paved or inaccessible locations are recommended to be designed with access to one end of all lines or designed and installed with bottom drains. Such features facilitate system rejuvenation.

D-box requirements

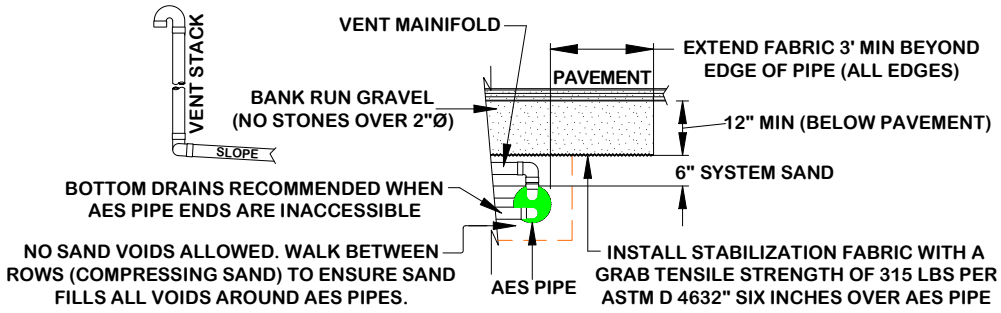
All systems shall be designed and installed using distribution boxes. The outlet of the distribution box shall be at least 2 in. above the inlet of the highest ES line with the connecting pipe slope not less than 2%.

Continued

Design Criteria, Requirements, and Restrictions, Continued

Depth of cover H-10 / H-20 loading requirements

The minimum total depth of cover on Enviro-Septic® lines is 7 inches: 3 in. of system sand plus 4 in. of topsoil. For H-10 and H-20 loading, a minimum of 6 in. of system sand is required over the ES pipes. 12 in. of structural cover over the pipes is designed for H-10 loading and ES pipe with 18 in. of structural cover is designed for H-20 loading* (see illustration below).



**ES pipe with 18 in. of structural cover is designed for H-20 loading by Presby Environmental Inc. The Mass DEP makes no determination that this design meets the H-20 loading requirement.*

Design flow

Design flow is defined in Title 5, 310 CMR 15.002. Design flow criteria are presented in 310 CMR 15.203. When design flow is not established in 310 CMR 15.203, water meter readings can be used in accordance with 310 CMR 15.203 (6). For residential systems, design flows below 330 gallons per day require a variance.

Designer documentation required

The designer must provide the system owner with copies of the State's Certification for General Use and/or Approval for Remedial Use and an "Enviro-Septic® Wastewater Treatment Operating Manual," and a "Technology Checklist."

Reference: See "Appendix B, Technology Checklist."

High flow system configurations

High flow is a "design flow" greater than 500 GPD. High flows in soils with perc rates of up to 60 min/inch require combination or distribution box system configurations or multiple serial beds. All high flow systems in soils with perc rates of 61-90 min/inch require multiple serial beds.

Inspection Port required

All systems require an inspection port.

Reference: See Section K , Inspection Port Requirements, p. 28.

Line elevations

For sloping systems, it is helpful to provide elevations on the design for each line of the system.

Line orientation

ES lines must be laid level and should run parallel to contours (perpendicular to sloping terrain).

Loading limits

Each basic serial bed, line of a distribution box system, and section of a combination system has a maximum limit design daily flow of 500 GPD.

Longer lines preferable

All systems should be designed and installed as long and narrow as possible for the site, with the system length perpendicular to the slope of the natural soil, which is usually parallel to the existing site contour.

Low flow system configuration

Low flow is a "design flow" of 500 GPD or less. Basic serial system configuration is preferred for low flow systems.

Continued

Design Criteria, Requirements, and Restrictions, Continued

Maximum / minimum line lengths	No single line of any system may exceed 100 ft. or be less than 30 ft. in length, but the multiple lines of a basic serial system or section of a combination system may total more than 100 ft. in length when connected in series using raised connections. Reference: See "Section H – Non-Standard System Configurations," p. 23. Note: In some instances, site conditions may require lines shorter than 30 ft. or systems longer than 100 ft.. These are non-standard system configurations.
Minimum separation distances	Setback distances are measured from the outer edge of the required system sand. The distances to the estimated high groundwater elevation (EHGW) and other restrictive features are measured from the bottom of the 6 in. of system sand below the bottom of the ES pipe. Reference: See "Section D – Title 5 and Aggregate Systems Exceptions," p.11
New construction sizing	For new construction, the system owner initially shall size a soil absorption system in accordance with 310 CMR 15.242 to demonstrate that a conventional Title 5 soil absorption system using aggregate, including a reserve area, can be installed on the site. The system owner may then size the soil absorption system for the ES system.
Non-standard design requirements	Designers shall include on all non-standard system configuration plans, a statement that Presby Environmental, Inc., will not be responsible for systems designed or installed that do not meet the standards established by these procedures and specifications.
Percolation rate restriction	General use systems are limited to sites with a percolation rate of up to 60 min/inch. Remedial systems can be constructed where the percolation rate is up to 90 min/inch.
Pressure distribution lines	**The use of pressure distribution lines in ES Wastewater Treatment Systems is prohibited.**
Pumps used to gain elevation	Systems incorporating pumps to gain elevation must use differential venting and velocity reduction to control liquid flow. Velocity reduction may be accomplished through the use of a distribution box with a tee or 90° elbow at the force main outlet. References: See "Section I - Pump System Requirements" p. 25 and "Section J – Venting Requirements," p. 26. Special Note: **The use of pressure distribution lines in ES Wastewater Treatment Systems is prohibited.**
Raised (Mounds) systems minimum fill extensions	**All mounded systems shall be designed and constructed in accordance with 310 CMR 15.255.** Raised ES systems are designed for sites with soil or depth constraints that do not allow inground configurations. Topsoil is required around the fill perimeter of raised systems. Reference: See detailed diagrams, p.22. Note: All mounded systems shall be designed and constructed in accordance with 310 CMR 15.255.
Remedial bed design restrictions – 61-90 percolation rates	Remedial systems in soils with percolation rates greater than 60 and up to 90 minutes per inch must be designed as basic serial systems. A multiple bed system uses a distribution box with flow equalizers. No bed in a multiple bed system can have a design flow of more than 500 GPD. Beds shall be separated by at least six feet of naturally occurring undisturbed soil. To accommodate construction access, additional separation distance may be necessary.

Continued

Design Criteria, Requirements, and Restrictions, Continued

Reserve area	For new construction a system must contain a reserve area the size of a conventional Title 5 soil absorption system using aggregate. For Remedial systems the system owner must demonstrate that sufficient reserve is not available so that the system can be designed without a reserve area.
Soil moisture construction limitation	If a fragment of soil from about 9 in. below the surface can easily be rolled into a wire, the soil moisture content is too high for construction.
System Installation Form	Installers of ES systems shall provide Presby Environmental, Inc., and the approving authority with a copy of a completed "System Installation Form" for each new or replacement system installed. Reference: See "Appendix A – System Installation Form."
System size limitation	To meet Massachusetts' requirements, at no time may an ES system be designed to have a sand bed area less than 60% of a conventional Title 5 aggregate system designed in accordance with 310 CMR 15.252 for the same site. In addition, the minimum area for a system installed for new construction shall be 400 square feet.
Ten foot increments work best	It is easier if line lengths are designed in exact 10 ft. increments since ES pipe is 10 ft. in length. However, if necessary, the pipe is easily cut to meet site constraints.
Venting requirements	Each ES system must be installed with venting at the end of each distribution box line, section, or serial bed. Vent manifolds may be used to connect multiple vents to one vent outlet.
Wastewater strength	Where wastewater strength exceeds typical human sewage waste, additional ES pipe is required. In some cases additional sand bed area will be required to accommodate the additional pipe. Should designers identify high wastewater strength and need assistance, they may consult Presby Environmental, Inc.

Section D
Title 5 and Aggregate Systems Exceptions

Introduction

Due to the unique capabilities of ES systems, some Title 5 and other requirements commonly associated with aggregate systems do not apply. This page presents some of the more common exceptions.

No septic tank tee filters

Effluent tee filters will not be required for septic tanks used in ES systems.

Serial distribution allowed

Lines of ES pipe may be installed in serial configuration for flows of up to 500 GPD per basic serial bed or combination section.

No pressure distribution

Pressure distribution may not be used with any ES system, including systems that are designed for over 2000 GPD.

Restaurants/ grease traps

ES systems may be used for restaurants and other facilities that use grease traps.

New construction provisions

These are provisions for new construction.

Reduced area size
ES systems may be installed in an area up to 40% smaller than a conventional Title 5 bed designed in accordance with 310 CMR 15.252.

Note: The system sizing tables used in this manual identify minimum ES requirements reflecting this reduction.

Reduction Limitation: Massachusetts limits all systems to a minimum bed size of 400 sq. ft.

Minimum vertical separation distances to EHGW
In soils with percolation rates of 2 min/in or less the minimum vertical separation distance to the EHGW is 5 ft. measured from the required 6 in. of system sand at the bottom of the ES pipe.

In soils with percolation rates greater than 2-60 min/in the minimum vertical separation distance to the EHGW is 4 ft. measured from the required 6 in. of system sand at the bottom of the ES pipe.

Minimum naturally occurring pervious soil depth
In soils with percolation rates to 60 min/in, the minimum depth of naturally occurring pervious material under a bed is 4 ft., measured from the required 6 in. of system sand at the bottom of the ES pipe.

Remedial use provisions

Minimum vertical separation distances to EHGW
For remedial systems in soils with percolation rates of 2 min/in or less, the minimum vertical separation distance to the EHGW, measured from the bottom of the 6 in. of system sand below the ES pipe, may be reduced to 3 ft. if allowed by the local approving authority.

In soils with percolation rates greater than 2 to 90 min/in, the minimum vertical separation distance to the EHGW, measured from the bottom of the 6 in. of system sand below the ES pipe, may be reduced to 2 ft. if allowed by the local approving authority.

Minimum naturally occurring pervious soil depth
In soils with percolation rates to 90 min/in the depth of naturally occurring pervious material under a bed, measured from the bottom of the 6 in. of system sand below the ES pipe, may be reduced to no less than 2 ft. if allowed by the local approving authority.

Section E
Installation, Handling, and Storage Guidelines

Introduction

These guidelines must be observed while installing, handling, and storing ES products.

Site preparation

- Remove stumps and organic matter under the required sand bed area of a proposed system, including the slope extensions of raised systems.
  Note: In soils with percolation rates of up to 60 minutes per inch also remove the A Horizon (topsoil).
- Maintain the existing characteristics of the underlying soil as much as possible.
- Add the system sand and/or surrounding sand on the same day that the leach area is excavated.
- Do not allow water to run into or over the system during construction.
- Do not work wet or frozen soils.
  Do not smear or compact soils while preparing the site.
  Reference: See "smear," p. 6.
  Note: Excavation irregularities shall be filled with system sand or Title 5 fill.

Soil moisture construction limitation

If a fragment of soil from about 9 in below the surface can easily be rolled into a wire, the soil moisture content is too high for construction.

Soil compaction

Minimize machine movement to avoid soil compaction and destruction of the soil structure under and around the system. Be careful not to compact soil on the down slope side of the system.

Level line tolerances

Use a laser level or transit to install lines level. Variations beyond ¼ in. may affect system performance.

Backfilling lines

Spread system sand between the lines; carefully walk between the lines to insure system sand fills all void spaces beneath the ES pipe. Finish spreading system sand to the top of the lines.

Backfilling and final grading

Spread a minimum of 3 in. of system sand over the pipe. Spread the remaining surrounding sand and a minimum of 4 in. of topsoil. Final grading should shed water away from the system.
Note: A tracked vehicle may be used to spread the system sand and topsoil as long as it maintains at least 12 in. of cover over the pipe.

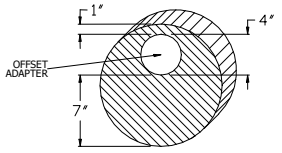
Erosion control

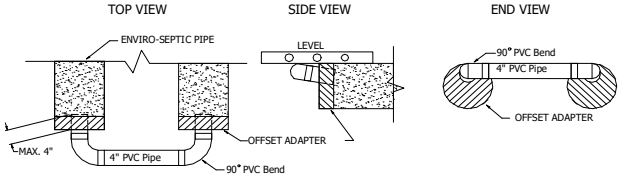
Protect the site from erosion by proper grading, mulching, seeding, and control of runoff.

Use raised connections

Raised connections consist of offset adapters, 4 in. PVC sewer and drainpipe, and 90° elbows. Use raised connections to connect lines of ES pipe. They enable greater liquid storage capacity and increase the bacterial surfaces being developed.

Installation Notes:
1. Insert PVC pipe no more than 4 in. into the offset adapter to prevent air locking.
2. Install the raised connection so that the top of the 90° bend is level with the top of the offset adapter.
3. Pack sand under and around the raised connection to prevent movement.



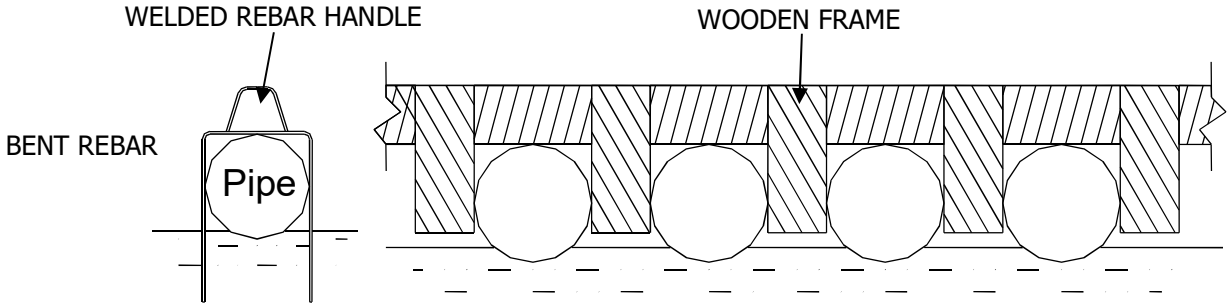


Continued

Installation, Handling, and Storage Guidelines, Continued

Line spacers

Sand may be used to keep pipe in place while covering, but simple tools may also be constructed for this purpose. Here are two examples. One is made from rebar, the other from wood.



Caution: Remove all tools used as line spacers before final covering.

Storage

The outer fabric of the ES pipe is ultra-violet stabilized. However, the protection breaks down after a period of time in direct sunlight. To prevent damage to the fabric,

- Cover the pipe with an opaque tarp;
- Store pipe on high and dry areas to prevent surface water and soil from entering the pipes or contaminating the fabric prior to installation;
- Keep mud, grease, oil, etc., from all system components;
- Avoid dragging pipe through wet or muddy areas.

Section F
System Sand Requirements

Introduction

This page describes the system sand requirements for the ES wastewater treatment system.

System sand

All configurations of ES require system sand to be placed a minimum of 6 in. below and between the pipe rows, a minimum 3 in. over the pipes and a minimum of 12 in. of system sand is placed horizontally around the perimeter of all pipe rows. When constructing for H-10 / H-20 loading, place a minimum of 6 in. of system sand over all pipes before adding additional fill (see "Depth of Cover H-10 / H-20 Loading Requirements" on pg. 10)

Percentage Restrictions
35% **or less** of the total sand may be gravel.
40%-90% of the total sand is to be coarse and very coarse sand.

Gravel Quality Restrictions
No gravel is to exceed ¾ in. in diameter.
No gravel is smaller than 2mm/.0787 in. in diameter. (It must **not** pass through a #10 sieve.)

Coarse Sand Quality Restrictions
No coarse sand is smaller than 0.5mm/.0196 in. in diameter. (It must **not** pass through a #35 sieve.)

Fines Quality Restrictions
No more than 3% of the total sand may pass through a #200 sieve.

ASTM Standard C-33 is an alternate acceptable material for use as system sand.

Surrounding sand

Surrounding sand should be either system sand or Title 5 fill, 310 CMR 15.255 (3). Only surrounding sand may be placed under raised systems or where topsoil and soil horizons with organic matter have been removed.

Raised systems extensions

Raised systems require extensions.

References: See "Raised (Mounds) systems minimum fill extensions," p. 9 and 310 CMR 15.255.

Perimeter sand bed requirements

Sand beds sloping 10% or less require the system sand area to extend a minimum of 1 ft. around the perimeter of the ES pipe.

Sand beds sloping greater than 10% require the system sand area to extend a minimum of 1 ft. around the perimeter of the ES pipe, and an additional 6 in. of system sand, measured from the bottom of the ES pipe, must extend 3 ft. on the downslope side.

References: See "Inground System Sections" diagrams, p. 21 and "Raised (Mounds) System Sections" diagrams, p. 22.

Section G
Standard System Configurations

Preview

Introduction

This section presents the standard system configurations in which ES systems may be installed.

Low flow systems

Low flow systems in soils with perc rates up to 60 min/inch may use any of the configurations described in this section. Percolation rates of 61-90 min/inch require basic serial or multiple basic serial bed designs.

Reference: See "Low flow," p. 5.

High flow systems

High flow systems in soils with perc rates up to 60 min/inch must be designed as combination or distribution box systems or as multiple bed systems. Percolation rates of 61-90 min/inch require basic serial or multiple basic serial bed designs.

Reference: See "High flow," p. 5.

Line configurations

ES systems may be designed in three line configurations.

1. Basic serial
2. Combination
3. Distribution box

Elevation and slope configurations

These line configurations may be designed as inground or raised (mounds) systems on level or sloping terrain.

Sloping systems

The percentage of slope refers to the slope of the ES system, not the existing terrain. The maximum sand bed slope for all systems is 25%. The maximum site slope is 3:1 (33%). A sloping system can be designed with more than one distinct slope and/or center-to-center pipe spacing in the same system.

Line orientation

ES lines must be laid level and should run parallel to contours (perpendicular to sloping terrain).

Velocity reduction

If the slope of piping from the septic tank to the ES is 10% or more up to a length of 50', or 5% or more for lengths over 50 ft., a velocity reducer is necessary in the D-box. A baffle or an inlet tee may be an adequate velocity reducer.

Pump system definition

A pump system uses a pump to elevate effluent to a D-box which is required for velocity reduction in a basic serial system and also equally distributes effluent in combination, distribution box, or multiple bed systems.

In this section

This section contains the following subjects.

Basic Serial Systems

Introduction

Basic serial distribution is preferred for single beds of 500 GPD or less and multiple bed systems where each bed receives 500 GPD or less. Basic serial distribution is quick to develop a strong biomat in the first line, providing improved effluent treatment. Basic serial distribution provides a longer flow route to allow decomposition of solids and greases, providing improved long term treatment.

Definition

A basic serial system is a single bed with a series of ES lines connected at the ends with raised connections, using offset adapters and PVC pipe. One offset adapter is installed at the single inlet, and one offset adapter installed at the end of the system is connected to a single vent.

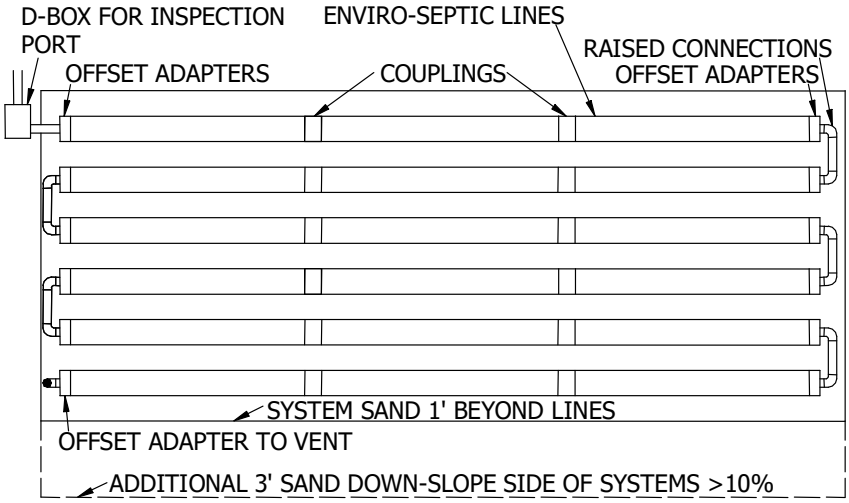
Line length

Each line of a basic serial system has a maximum length of 100 ft.

Basic serial system diagram

Here's a plan view of an ES Basic Serial System.

Note: All systems require an inspection port (not shown). See Section K.



Combination Systems

Introduction

Combination distribution is required for systems with greater than 500 GPD and for multiple bed systems where each section receives no greater than 500 GPD. Combination distribution is quick to develop a strong biomat in the first line of each section providing improved effluent treatment. All systems require a distribution box for use as an observation port. Combination systems also use the same distribution box for dividing flow to multiple serial sections to provide longer flow routes to allow decomposition of solids and greases, providing improved long term treatment.

Definition

A combination system is a bed of two or more sections of ES lines in serial configuration supplied equally through a distribution box. Each section of a combination system is a series of ES lines connected at the ends with raised connections, using offset adapters and PVC sewer and drainpipe. An offset adapter is installed at each section inlet, and at the end of each section where it is connected to a vent or vent manifold.

Loading

Each section of a combination system has a maximum design flow of 500 GPD.

Flow equalizers required

All distribution boxes that divide effluent flow in pump or gravity systems require flow equalizers in their outlets. Most flow equalizers are limited to a maximum of 10 gallons/minute in gravity systems and 20 gallons/minute in pumped systems.

Note: To prevent movement, be sure distribution boxes are placed on a stable soil base or concrete pad.

Line length

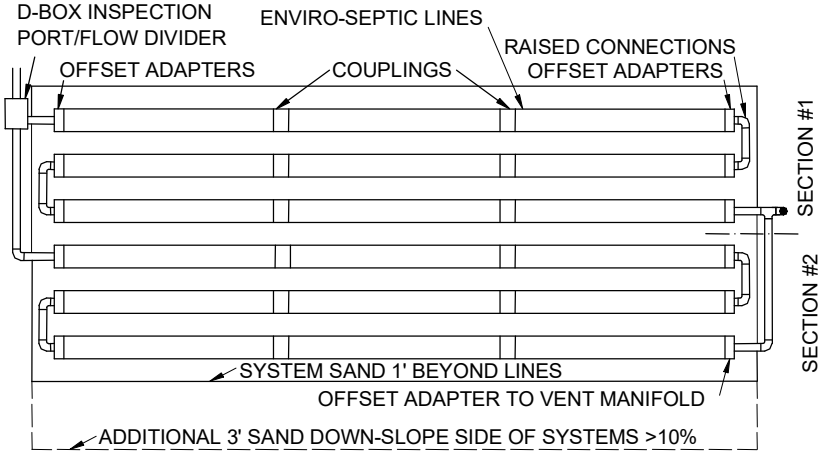
Each line of a combination system has a maximum length of 100 ft.

Section length requirement

Each section of a combination system must have at least the same minimum linear feet of pipe. The minimum linear feet of pipe per section is determined by dividing the total linear feet required by the number of sections. A section may exceed the minimum linear length. Lines within a section may vary in length to accommodate site constraints.

Combination system diagram

Here's a plan view of an ES combination system.
Note: Inspection Port required (not shown). Refer to Section K.



Distribution Box Systems

Introduction

Distribution box systems are the least preferred configuration and should only be used where site constraints do not allow the use of basic serial or combination systems. Distribution box systems disperse effluent in small amounts into several lines and take a longer time to reach maximum environmental efficiency.

Definition

A distribution box system is a bed with each ES line supplied equally through a distribution box. Each ES line of a distribution box system has one offset adapter at each line inlet and one offset adapter at the end of each line connected to a vent or vent manifold.

Flow equalizers required

All distribution boxes that divide effluent flow in pump or gravity systems require flow equalizers in their outlets. Most flow equalizers are limited to a maximum of 10 gallons/minute in gravity systems and 20 gallons/minute in pumped systems.

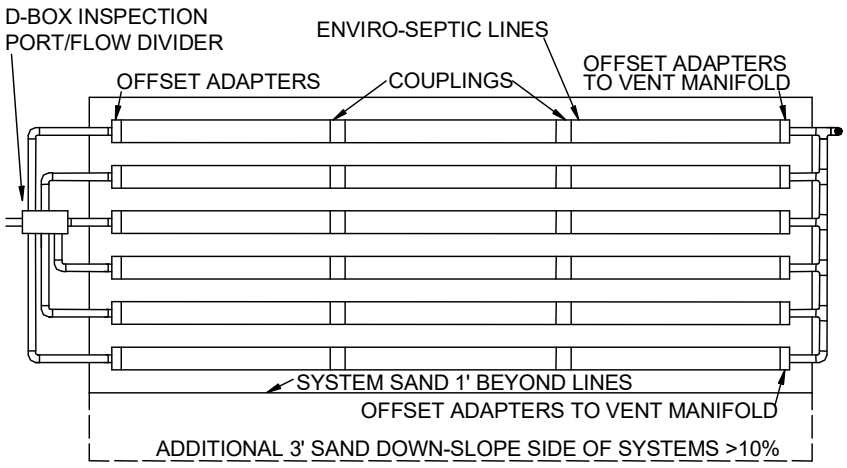
Note: To prevent movement, be sure distribution boxes are placed on a stable soil base or concrete pad.

Line length requirement

Each line of a distribution box system has a maximum length of 100 ft. Each line of a distribution box system must have the same minimum linear feet of pipe. The minimum linear feet of each line is determined by dividing the total linear feet required by the number of lines.

Distribution box system diagram

Here's a plan view of an ES Distribution Box System.
Note: Inspection Port required (not shown). Refer to Section K.



Multiple Bed Systems

Introduction

A multiple bed system may be used to accommodate site configuration constraints in soils with percolation rates up to 60 min/inch and is required for systems in soils with percolation rates of 61-90 min/inch when the total bed length required is greater than 102 ft.

Definition

Multiple bed systems incorporate two or more beds, each bed with basic serial, combination serial, or distribution box configuration receiving effluent from a distribution box.

Flow equalizers required

All distribution boxes used to divide effluent flow require flow equalizers in their outlets. Flow equalizers are limited to a maximum of 10 gallons/minute in gravity systems and 20 gallons/minute in flood dosed systems.

Note: To prevent movement, be sure distribution boxes are placed on undisturbed soil, sand or pea gravel base, or concrete pad.

Loading

Each basic serial bed, section of a combination system, or line of a distribution box system has a maximum flow of 500 GPD.

Bed length requirement

Each bed must have the same minimum linear feet of pipe. The minimum linear feet of pipe per bed is determined by dividing the total linear feet required in the ES system by the number of beds. A bed may exceed the minimum linear length. Lines within a bed may vary in length to accommodate site constraints only in soils with percolation rate up to 60 min/inch.

Reference: See “Ten foot increments work best,” p. 10.

Separation distances

For remedial systems, multiple beds in soils with percolation rates of 1-90 minutes per inch must be separated by a minimum of six feet of undisturbed natural soil.

For general use systems, multiple beds in soils with percolation rates of 1-60 minutes per inch must be separated by a minimum of ten feet of undisturbed natural soil.

Multiple bed orientation

Multiple beds should be oriented along the contour of the site.

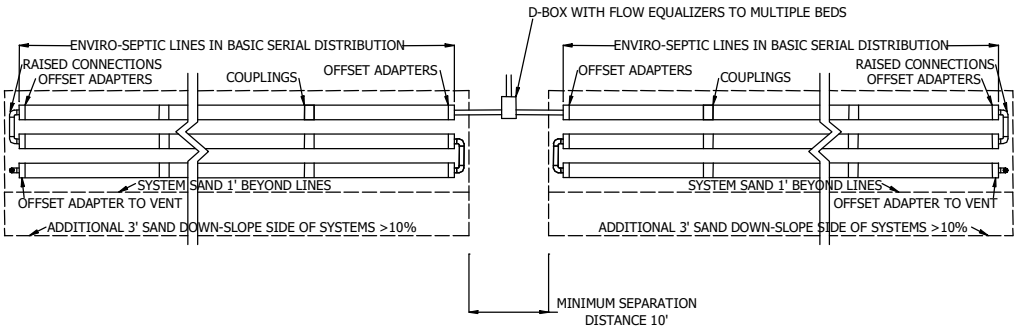
Note: All ES systems are recommended to be designed and installed as long and narrow as possible for the site.

Reference: See “Longer lines preferable,” p. 8.

Diagrams

These multiple bed plan views show a minimum horizontal separation distance of ten feet, as required in general use systems. If used in remedial use systems, the minimum horizontal separation distance is reduced to six feet. Note: Inspection Ports required (not shown). Refer to Section K.

Basic Serial



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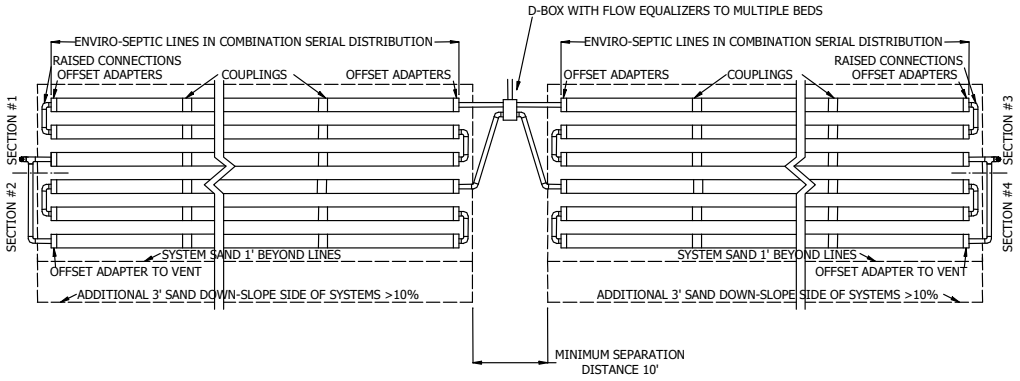
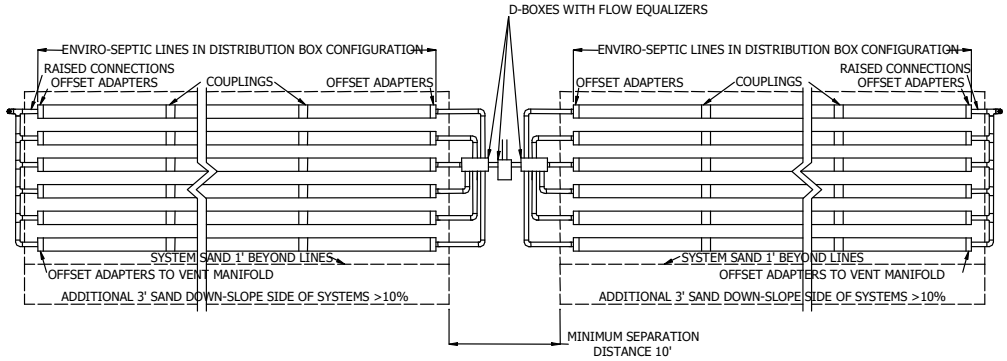
Diagrams Continued

Combination Serial



Distribution Box



Inground System Sections

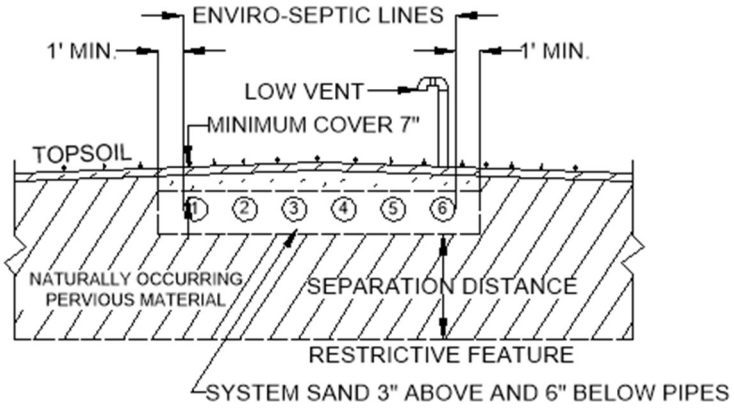
Introduction

Inground ES systems are the preferred configuration for sites with no soil constraints to limit placement.

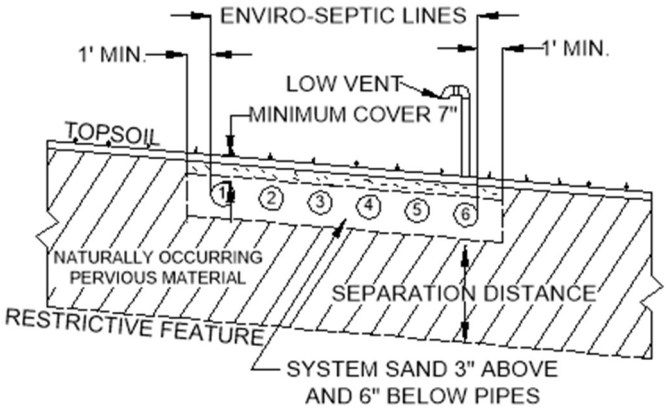
Definition

Inground systems are configurations where the bottom of the system sand bed is below the existing grade. Note: Inspection Ports required (not shown). Refer to Section K.

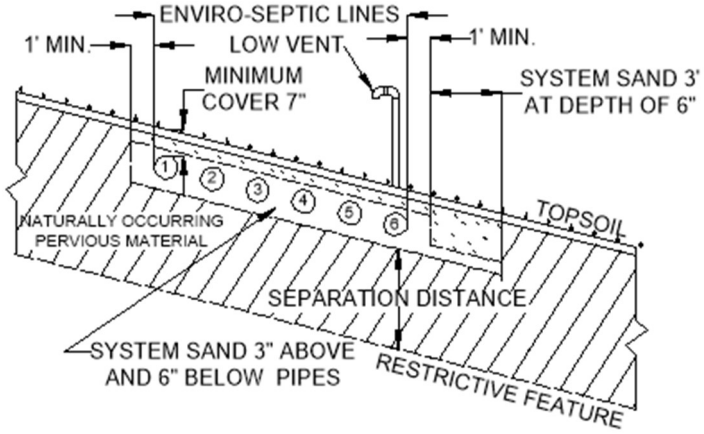
Inground level section



Inground sloping to 10%



Inground sloping >10%



Raised (Mounds) System Sections

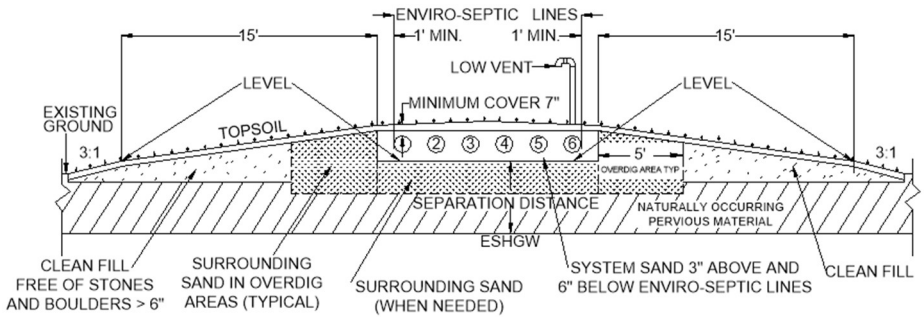
Introduction

All mounded systems shall be designed and constructed in accordance with 310 CMR 15.255. Raised ES systems are designed for sites with soil or depth constraints that do not allow inground configurations.

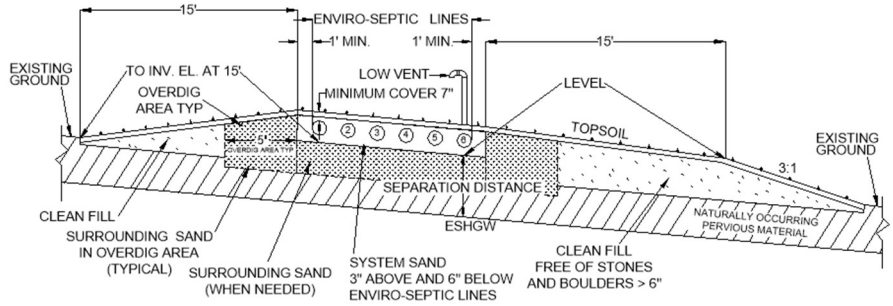
Definition

Raised systems are configurations where the bottom of the system sand bed is at or above the existing ground. Breakout elevation is the bottom of the system sand bed/soil interface. Note: Inspection Ports required (not shown). Refer to Section K.

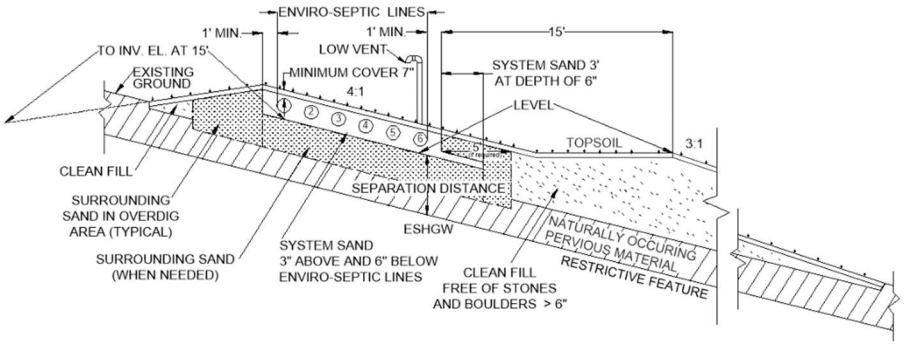
Raised level section



Raised sloping to 10%



Raised sloping >10%



Raised (Mounds) Sections with Impervious Barriers

Application

To be used in conjunction with MassDEP's Guidelines for Design and Installation of Impervious Barriers and Slope Stabilization for Title 5 Systems, which supplements **Title 5, 310 CMR 15.255**, Systems Constructed in Fill.

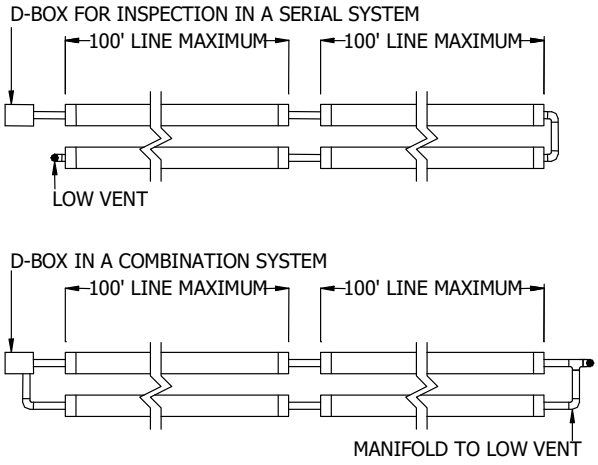
Note

Use of an impermeable barrier in accordance with DEP rules can reduce the 15 ft fill extension to 5 ft before beginning the Side Slope Tapers of 3:1. Title 5 fill (surrounding sand) goes to top of barrier. Breakout elevation is bottom of the system sand bed/soil interface (6 inches below the bottom of the ES pipes).

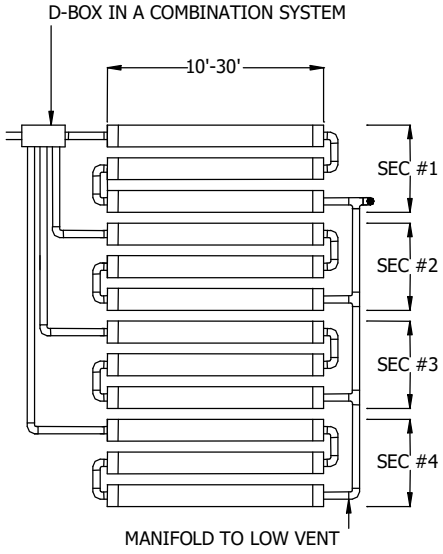
Section H
Non-Standard System Configurations

Introduction	Non-standard configurations may accommodate system lengths longer than 100 ft. and pipe lines shorter than 30 ft..
Restriction	No onsite system may be located on concave slopes that concentrate surface flows.
Total linear feet requirement	Each line of a distribution box system and each section of a combination system must have the same minimum linear feet of pipe. A section or line may exceed the minimum linear length. Lines within a section may vary in length to accommodate site constraints.
Non-standard designation	Non-standard system configurations are not allowed for soils with percolation rates of 61-90 min/inch.
Examples	Here are some examples using offset adapters and distribution boxes. Note: Inspection Port required (not shown). Refer to Section K.

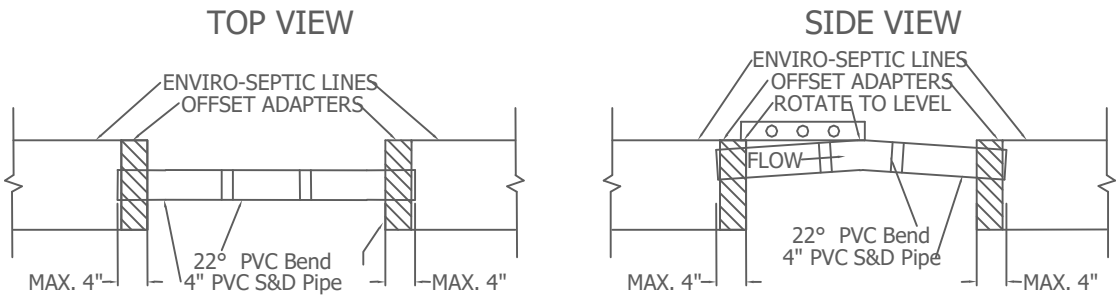
Offset adapters with raised straight connections allow systems to exceed 100 ft. in length



Combination configuration with pipe lengths less than 30 ft.



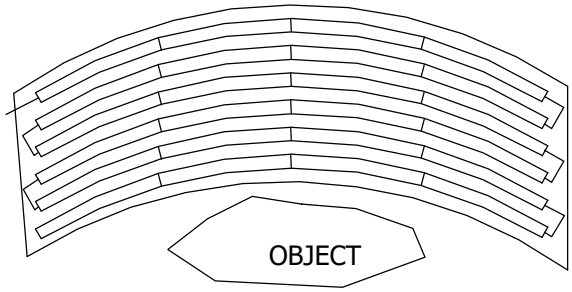
RAISED STRAIGHT CONNECTION (DETAIL BELOW)



Non-Standard System Configurations, Continued

Curves

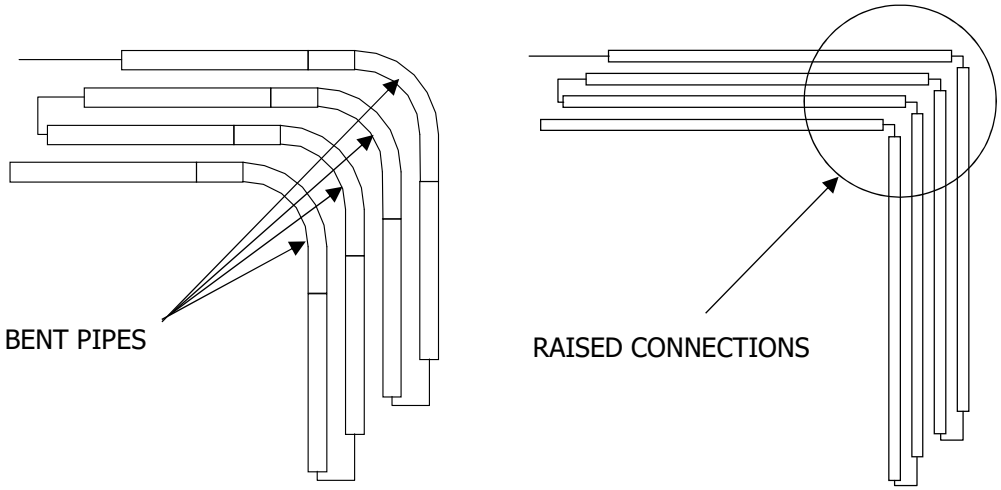
Curved configurations work well around objects, setbacks, and slopes.



Note: Multiple curves can also be used.

Angles

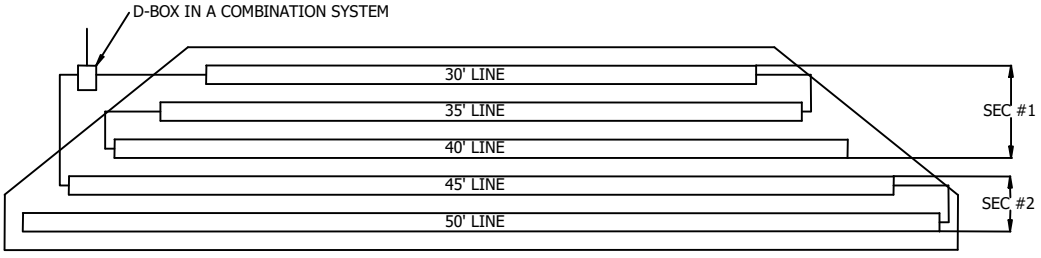
Angled configurations generally have one or more specific bends. Lines are angled by bending pipes or through the use of raised connections.



Note: A 10 ft. length of pipe may take a 90° bend.

Trapezoids

This combination system shows a trapezoidal configuration. A secondary purpose of this drawing is to illustrate two sections meeting minimum lengths.



Example: Assume 180 linear feet of pipe is required within a trapezoidal area. Each section requires a minimum of 90 linear feet of pipe. Section #1 consists of 30, 35, and 40 ft. lines for a total of 105 ft. Section #2 consists of 45 and 50 ft. lines for a total of 95 ft. Each section contains at least the minimum 90 ft. of pipe.

Section I
Pump System Requirements

Introduction	Pump systems typically supply effluent to ES pipe using a pressured line and a distribution box as a velocity reducer when site conditions do not permit a gravity system. Pumps and chambers shall be designed in accordance with 310 CMR 15.231.
Differential venting	All pump systems must use differential venting. Reference: See Section J, "Venting Requirements," p. 26.
Velocity control	It is important to control the rate at which effluent enters ES pipe. Excessive effluent velocity can disrupt suspended solids that have settled out in the pipes.
Velocity reduction	Never pump effluent directly into ES pipes. Pressurized lines must discharge into a velocity reducing distribution box with a baffle, a 90-degree elbow, or a tee fitting. If the design already incorporates a distribution box to divide effluent flow, an additional distribution box may not be necessary.
Pipe length per pumped gallon	Each gallon of effluent pumped per cycle requires a minimum of 1.0 ft. of ES pipe.
Basic System GPM Limit	A maximum of 40 GPM is permitted for each basic serial bed.
GPM per flow equalizer limit	A flow equalizer used in a pump system is limited to a maximum of 20 gallons per minute.
Section or line GPM limit	Each line of a pumped D-box system or each section of a pumped combination system is limited to a maximum of 20 GPM. Each basic serial bed without a flow equalizer can have a maximum flow of 40 GPM.
Pump cycling	Pump cycling is recommended to be six or more cycles per day.

Section J
Venting Requirements

General rule

Low and high vents are required of all systems to ensure that air is drawn completely through the entire ES system. No additional vents may be located between the high vent and low vent. The opening of the high vent must be at least 10 feet above the opening of the low vent. High vents must provide at least the same flow capacity as low vents. Connections within the system must also have similar flow capacities.

Purpose: Venting design, installation, and maintenance must ensure that every linear foot of ES pipe in all serial beds, sections, or lines receives oxygen to accommodate natural biologic activity.

Low vent locations

Low vents are installed through an offset adapter at the end of each

- serial system or bed
- section of a combination system
- line of a distribution box system.

High vent locations

High vents are installed in a variety of locations based on the system design.

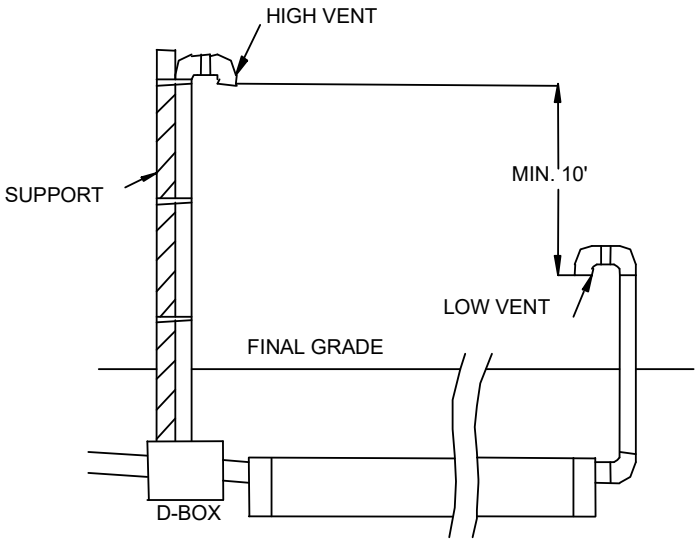
- **The roof vent will function as the high vent** if there are no pumps, restrictions, or other vents between the low vent and the roof vent.
- If a restriction is placed between the low vent and the roof vent, a high vent is required through an unused distribution box outlet.
- In pumped systems a high vent is required through an unused distribution box outlet.

High vent on D-box

This diagram shows a high vent installed in a D-box. This configuration is required in pumped systems or when other restrictions or vents are installed between the low vent and the roof vent.

DIFFERENTIAL VENTING

(TYPICAL - NOT TO SCALE)

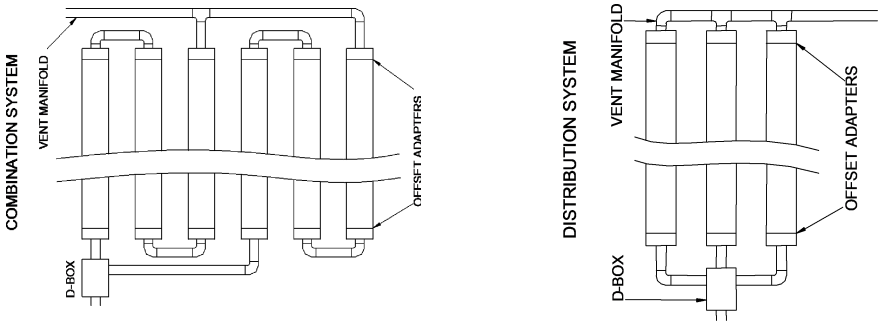


Continued

Venting Requirements, Continued

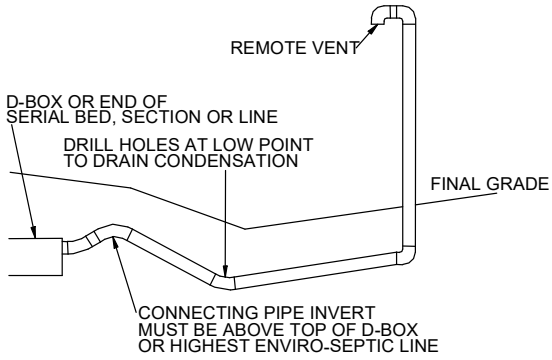
Vent manifolds

A vent manifold can be incorporated to connect the ends of a number of sections or lines of ES pipe to a single vent opening. One 4 in vent is required for every 1,000 ft. of pipe. A 6 in. manifold and vent stack may vent up to 3,000 ft. of pipe.



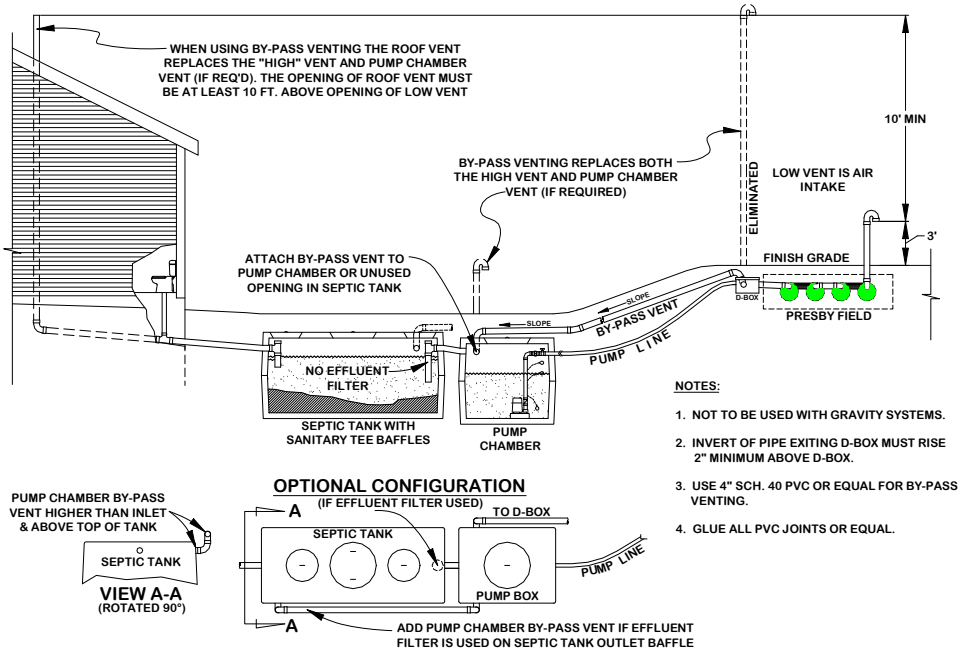
Remote vent piping slope

Remote vent piping should slope downward toward the system to prevent moisture from collecting in the piping and blocking air passage. If site conditions do not allow the pipe to the vent to slope back toward the system, the low point of the connecting pipe should be drilled to allow drainage provided that the connecting pipe invert is above the highest point of the D-box and all of the ES lines.



By-Pass Venting

By-Pass venting is used to eliminate the need for a High vent at the field and can also replace the need for a pump chamber vent. There must be at least 10 ft. of elevation between the roof stack and low vent openings.



Section K
Inspection Port Requirements

Massachusetts requires inspection ports

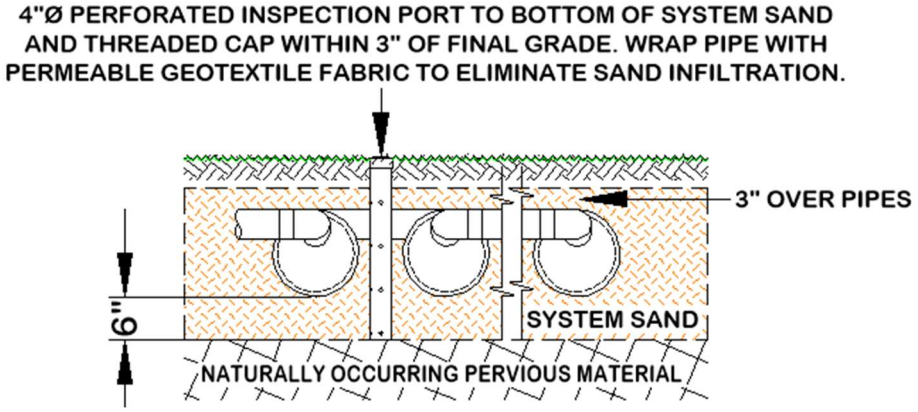
All soil absorption systems shall have a minimum of one inspection port consisting of a perforated four inch pipe placed vertically down to the naturally occurring soil or sand fill below the system sand. The pipe shall be capped with a screw type cap and accessible to within three inches of final grade. See Title 5, 310 CMR 15.240 (13).

Distribution Box not to be used for inspection port

An observation port through the distribution box does **not** qualify as an inspection port in the bed.

Inspection Port Installation

The bottom of the inspection port is located 6 in. below the bottom of the ES pipe. The proper placement and installation of the required inspection port is shown in the diagram below.



Section L
Bottom Drains and Requirements

Purpose

Bottom drains aid in the rejuvenation of overloaded or abused systems and are recommended for commercial systems at risk of misuse, under pavement, or in inaccessible areas. Bottom drains allow effluent to be pumped from systems without requiring excavation. Once pumped, systems may be rejuvenated instead of replaced.

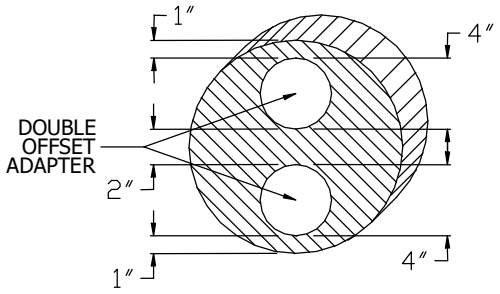
Requirements

Bottom drains connect to sealed drain sumps. Here are some drain requirements.

- The top of the drain sump should be a minimum of 12 in. above the top of the highest ES pipe.
- The bottom drain inlet must be a minimum of 18 in. above the drain sump floor.
- Level systems may use single drain sumps.
- Sloping systems may require multiple drain sumps.
- All bottom drain connections and drain sumps must be sealed.
- Connect bottom drain to every row, even when system is configured in Basic or Combination Serial configuration. This will allow the entire field to drain when the sump is pumped out.

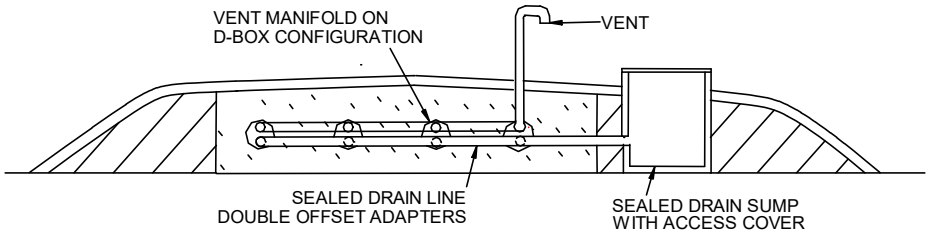
Double offset adapter

Bottom drains require a double offset adapter at the end of each basic serial bed, combination serial section, or distribution system line.



End view

Here's an end view of a system with a bottom drain and drain sump connecting each line on a distribution box system.



Section M
System Rejuvenation and Expansion

Introduction

This section covers procedures for rejuvenating systems installed according to this manual but failing because of misuse. It also explains how to expand existing systems.

Why systems fail

System failures related to misuse or lack of oxygen, almost without exception, are related to the conversion of bacteria from an aerobic to an anaerobic state. Flooding, improper venting, alteration or lack of oxygen, sudden use changes, introduction of chemicals or medicines, and a variety of other conditions can contribute to this problem.

Rejuvenating failing systems

Failing systems need to be returned from an anaerobic to an aerobic state.
Most ES systems can be put back on line and not require costly removal and replacement by using the following procedure.

1. Determine the problem causing system failure and repair.
2. Drain the system by pumping out the sump of a bottom drain or by excavating one end of all the lines and removing the end cap or offset adapter.
3. Drain the lines.
4. If foreign matter has entered the system, flush the pipes.
5. Safeguard the open excavation.
6. Guarantee a passage of air through the system.
7. Allow all lines to dry for a minimum of 72 hours.
8. Manually excavate a small area of system sand adjacent to the pipe.
   Note: System sand in failed systems is blackened by anaerobic bacteria. Rejuvenation returns the sand to nearly its original color.
9. When the system sand color has returned, re-assemble the system to its original design configuration.

System expansion

ES systems are easily expanded by adding equal lengths of pipe to each line of the original design or by adding additional equal sections.

Note: All system expansions need to meet State and/or local regulations.

Re-usable pipe

ES components are not biodegradable and may be reused. In cases of improper installation, it may be possible to excavate, clean, and reinstall all ES system components.

System replacement

If system components are damaged, remove and replace.

Section N
Quick Reference Guide for Percolation Rates Up to 60 Minutes/Inch

Purpose

The unique ES design provides an infinite number of system configurations that vary in length, width, slope, and shape. The purpose of this guide is to help designers compare layouts for any site quickly and easily. We recommend designers read this entire manual before using this Quick Reference Guide.

Exceptions require variance

Exceptions to any requirements used in this quick reference guide require a variance from the local approving authority.

Minimum separation distances

Title 5, 310 CMR 15.000 of the State Environmental Code establishes rules for minimum vertical and horizontal separation distances. Setback distances are measured from the outer edge of the required system sand. The distances to EHGW and other restrictive features are measured from the bottom of the 6 in. of system sand below the ES pipe.

System configuration

Basic serial configuration is recommended for low flow systems. High flow systems are preferably designed as combination systems or multiple serial bed systems, but distribution box systems may also be used.

Procedure

Complete these tasks to size a single level ES system.

Task 1: Determine the linear feet of ES pipe required.

Use the percolation rate and the number of bedrooms or the commercial GPD in Table A below to determine the linear feet of ES pipe required.

Table A: Linear Footage

Perc rate Min/Inch	Number of Bedrooms						Commercial Per 100 GPD
	2	3	4	5	6	Add'l Room	
1-9	140	210	280	350	420	70	50
10-13	140	210	280	350	420	70	55
14-19	140	**210**	280	350	420	70	60
20-30	140	210	280	350	420	70	65
31-40	140	210	280	350	420	70	70
41-50	150	225	300	375	450	75	75
51-60	160	240	320	400	480	80	80

Example: A three-bedroom home with an 18 min/inch percolation rate requires 210 feet of pipe.
Note: Each bedroom has a design flow of 110 GPD.

Task 2: Determine the percentage of slope on the proposed system.

Note: The maximum slope for a system is 25%. However, the site slope may be greater if fill or excavation is used to keep the system slope within the maximum. Do you know the percentage of slope on the proposed system?

If **yes**, go to Task 3.
If **no**, follow this procedure to determine the percentage of system slope.

Step	Action
1	Identify the highest elevation of the proposed system site.
2	Identify the lowest elevation of the proposed system site.
3	Subtract the lowest elevation from the highest elevation = elevation change.
4	Measure the horizontal distance between the two elevations = horizontal length.
5	Divide the elevation change by the horizontal length = percentage of site slope.
6	Choose a percentage of slope to be used for the system. Note: The system slope does not need to be the same as the site slope.
7	Go to Task 3.

Continued

Task 3: Determine the minimum center-to-center pipe spacing.

Use the percolation rate and the percentage of system slope in Table B below to determine the required minimum center-to-center pipe spacing.

Table B: Pipe Spacing (ft.)

Percentage of System Slope	Percolation Rate Min/Inch					
	1-10	**11-20**	**21-30**	**31-40**	**41-50**	**51-60**
0-10%	1.5	**1.5**	1.75	2.0	2.5	3.0
11-15%	1.5	1.75	2.0	2.25	2.75	3.25
16-20%	1.75	2.0	2.25	2.5	3.0	3.5
21-25%	2.0	2.25	2.5	2.75	3.25	3.75

Example: A slope of ten percent or less with an 18 min/inch percolation rate requires pipe spacing of 1.5 ft.

Task 4: Determine pipe line layout.

IF...	THEN use Table C below to...
system length is not a limiting factor (preferred)	• find the pipe "Line Length/Ft." in the left column • follow that row across to a number ≥ the required "Linear Feet of ES" • follow that column down through the "# of Lines" row and left to the required "Ctr to Ctr Spacing."
system length is a limiting factor	• find the "Ctr to Ctr Spacing" in the bottom left hand column and follow that row across to the desired layout width • follow that column up through the "# of Lines" row to the required linear feet of ES • follow that row left to determine the pipe line length.

Table C: Length and Width

Line Length/Ft.	Linear Feet of ES													
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450
35	70	105	140	175	210	245	280	315	350	385	420	455	490	525
40	80	120	160	200	240	280	320	360	400	440	480	520	560	600
45	90	135	180	225	270	315	360	405	450	495	540	585	630	675
50	100	150	200	250	300	350	400	450	500	550	600	650	700	750
55	110	165	220	275	330	385	440	495	550	605	660	715	770	825
60	120	180	240	300	360	420	480	540	600	660	720	780	840	900
65	130	190	260	325	390	455	520	585	650	715	780	845	910	975
70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050
75	150	225	300	375	450	525	600	675	750	825	900	975	1050	1125
80	160	240	320	400	480	560	640	720	800	880	960	1040	1120	1200
85	170	255	340	425	510	595	680	765	850	935	1020	1105	1190	1275
90	180	270	360	450	540	630	720	810	900	990	1080	1170	1260	1350
95	190	285	380	475	570	665	760	855	950	1045	1140	1235	1330	1425
100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
# of Lines	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ctr. to Ctr. Spacing														
1.50	2.50	4.00	5.50	7.00	8.50	10.00	11.50	13.00	14.50	16.00	17.50	19.00	20.50	22.00
1.75	2.75	4.50	6.25	8.00	9.75	11.50	13.25	15.00	16.75	18.50	20.25	22.00	23.75	25.50
2.00	3.00	5.00	7.00	9.00	11.00	13.00	15.00	17.00	19.00	21.00	23.00	25.00	27.00	29.00
2.25	3.25	5.50	7.75	10.00	12.25	14.50	16.75	19.00	21.25	23.50	25.75	28.00	30.25	32.50
2.50	3.50	6.00	8.50	11.00	13.50	16.00	18.50	21.00	23.50	26.00	28.50	31.00	33.50	36.00
2.75	3.75	6.50	9.25	12.00	14.75	17.50	20.25	23.00	25.75	28.50	31.25	34.00	36.76	39.50
3.00	4.00	7.00	10.00	13.00	16.00	19.00	22.00	25.00	28.00	31.00	34.00	37.00	40.00	43.00
3.25	4.25	7.50	10.75	14.00	17.25	20.50	23.75	27.00	30.25	33.50	36.75	40.00	43.25	46.50
3.50	4.50	8.00	11.50	15.00	18.50	22.00	25.50	29.00	32.50	36.00	39.50	43.00	46.50	50.00
3.75	4.75	8.50	12.25	16.00	19.75	23.50	27.25	31.00	34.75	38.50	42.25	46.00	49.75	53.50
4.00	5.00	9.00	13.00	17.00	21.00	25.00	29.00	33.00	37.00	41.00	45.00	49.00	53.00	57.00
4.25	5.25	9.50	13.75	18.00	22.25	26.50	30.75	35.00	39.25	43.50	47.75	52.00	56.25	60.50
4.50	5.50	10.00	14.50	19.00	23.50	28.00	32.50	37.00	41.50	46.00	50.50	55.00	59.50	64.00
4.75	5.75	10.50	15.25	20.00	24.75	29.50	34.25	39.00	43.75	48.50	53.25	58.00	62.75	67.50
5.00	6.00	11.00	16.00	21.00	26.00	31.00	36.00	41.00	46.00	51.00	56.00	61.00	66.00	71.00

Layout Width/Ft.

Continued

Quick Reference Guide for Percolation Rates Up to 60 Minutes/Inch, Continued

Task 5: Calculate the total system sand bed area.
Massachusetts requires that ES systems be no less than 60% of the area of a pipe and aggregate system and no less than 400 square feet. Complete this task to determine area size.

Add two feet to the layout width and line length from Table C and multiply them together to obtain the sand bed area in sq. ft. For sloping systems greater than 10%, add 5 ft. to the system width and two feet to the pipe length and multiply them together. (The 5 ft. width accounts for the 4 ft. sand bed extension required on slopes of 10% or more.)

If the area calculated above is less than the minimum sand bed area size required by Massachusetts in Table D, see "Increasing sand bed area footage", next page.

Table D – Minimum Sand bed Area Size (sq. ft.)

PERC	2 BEDROOM 220 GPD				3 BEDROOM 330 GPD				4 BEDROOM 440 GPD				5 BEDROOM 550 GPD			
RATE*	SOIL CLASS				SOIL CLASS				SOIL CLASS				SOIL CLASS			
Min/Inch	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1-5	400	400			400	400			400	440			446	550		
6	400	400			400	400			400	440			471	550		
7	400	400			400	400			400	440			485	550		
8	400	400			400	400			400	440			500	550		
10		400				400				440				550		
15		400	400			400	535			471	714			589	892	
20		400	400			400	582			498	776			623	971	
25		400	400			495	600			660	800			825	1000	
30		400	455			600	683			800	910			1000	1138	
40			528				792				1056				1320	
50			660	660			990	990			1320	1320			1650	1650
60			880	880			1320	1320			1760	1760			2200	2200

PERC	6 BEDROOM 660 GPD				ADD'L. BEDROOM 110 GPD				COMMERCIAL PER 100 GPD			
RATE*	SOIL CLASS				SOIL CLASS				SOIL CLASS			
Min/Inch	I	II	III	IV	I	II	III	IV	I	II	III	IV
1-5	535	660			89	110			81	100		
6	566	660			94	110			86	100		
7	582	660			97	110			88	100		
8	600	660			100	110			91	100		
10		660				110				100		
15		707	1070			117	178			107	162	
20		747	1165			124	194			113	176	
25		990	1200			165	200			150	182	
30		1200	1366			200	227			182	207	
40			1584				264				240	
50			1980	1980			330	330			300	300
60			2640	2640			440	440			400	400

*When percolation rate is between those listed in Table D, the next slower rate shall be used for design purposes.

Increasing sand bed area footage

Our 3-bedroom home requires 210 linear feet of pipe at 1.5 ft. on center. Using Table C, with 7-30 ft. lines the system width is 10 ft. with a sand bed area of 32 ft. x 12 ft. for a total of 384 sq. ft. of sand bed. To meet the Massachusetts minimum bed area requirement of 400 sq. ft. for soil class II from Table D, our sand bed area must be increased. Our sand bed area may be increased by adding width and/or length to the system.

Adding width: To meet the minimum sand bed area size required, the minimum pipe spacing may be increased. Add 2 ft. to the pipe length and divide the minimum sand bed area size by that amount to obtain the minimum sand bed width. Subtract 2 ft. from the minimum sand bed width and find the line spacing that provides at least that layout width in Table C. For slopes greater than 10%, subtract 5 ft. from the minimum sand bed width before referring to Table C for line spacing.

Adding width example: To increase the sand bed area footage in our example by adding width, divide 400 ft. by 32 ft. to obtain a minimum sand bed width of 12.5 ft. Subtract 2 ft. from that to obtain the minimum layout width of 10.5 ft. Table C indicates that a line spacing of 1.75 ft. on center provides a layout width of 10.5 ft. for a 7-line system, providing a sand bed width of 12.5 ft. to meet the required 12.5 ft. minimum sand bed width. This now gives us a sand bed area of 400 sq. ft. (12. ft. x 32 ft.) and a system configuration of 7-30 ft. lines spaced 1.75 ft. on center.

Adding length: Add 2 ft. to the system width (5 ft. for slopes over 10%) and divide the minimum sand bed area size by that amount to obtain the minimum sand bed length required. Subtract 2 ft. from the minimum sand bed length to obtain the pipe line length.

Adding length example: To increase the sand bed area footage in our example by adding length, divide 400 ft. by 12 ft. to obtain a sand bed length of 33.5 ft. Subtract 2 ft. from that to obtain a line length of 31.5 ft. 33.5 ft. x 12 ft. equals 402 sq. ft. of sand bed area. The system configuration would be 7-31.5 ft. lines spaced 1.5 ft. on center.

Note: This example uses 7-31.5 ft. line lengths. Limiting pipe to 5 ft. and 10 ft. lengths makes systems simpler to construct. This system would be more easily installed as 7-35 ft. lines, eliminating the need to cut the pipe.

Section O
Quick Reference Guide for Percolation Rates of 61-90 Minutes/Inch

Introduction

Systems in high-density soils or soils with slow percolation rates are limited in configuration to adequately disperse and treat effluent and minimize groundwater mounding.

Purpose

The purpose of this guide is to help designers choose system layouts for percolation rates in the 61-90 minutes/inch range. We recommend designers read this entire manual before using this Quick Reference Guide.

Restriction

Installations in soils with percolation rates of 61-90 minutes/inch are restricted to remedial use systems only.

Exceptions require variance

Exceptions to any requirements used in this quick reference guide require a variance from the local approving authority.

Minimum separation distances

Title 5, 310 CMR 15.000 of the State Environmental Code for Massachusetts establishes rules for minimum vertical and horizontal separation distances. Setback distances are measured from the outer edge of the required system sand. The distances to EHGW and other restrictive features are measured from the bottom of the 6 in. of system sand below the ES pipe.

Slope percentages allowed

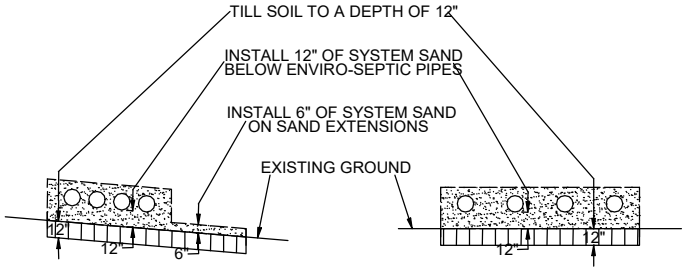
Use Table E below to determine the maximum slope percentages allowed.

Table E – Maximum Slopes for Perc. Rates 61-90 Min./Inch

Perc. Rate	% Slope
61-70	15%
71-90	10%

Additional site preparation requirement

For these dense soil systems, plow the system bed and sand extension area to a depth of 12 in. traveling parallel to the contour of the site. Place 12 in. of system sand (as measured from existing ground) on the bed area and 6 in. on sand extensions immediately to protect the site from damage by precipitation.



This additional requirement must be included on the system plan.

Continued

Quick Reference Guide for Percolation Rates of 61-90 Minutes/Inch, Continued

Procedure Complete these tasks to design a single level ES leaching system with percolation rates between 61-90 minutes/inch.

Task 1: Determine the percentage of slope on the proposed system.

Note: The maximum system slope is limited to 15% depending on percolation rates. However, the site slope may be greater if fill or excavation is used to keep the system slope within the maximum.

Do you know the percentage of slope on the proposed system? If yes, go to Task 2.

If no, follow this procedure to determine the percentage of system slope.

Step	Action
1	Identify the highest elevation of the proposed system site.
2	Identify the lowest elevation of the proposed system site.
3	Subtract the lowest elevation from the highest elevation = elevation change.
4	Measure the horizontal distance between the two elevations = horizontal length.
5	Divide the elevation change by the horizontal length = percentage of site slope.
6	Choose a percentage of slope to be used for the system. Note: The system slope does not need to be the same as the site slope.
7	Go to Task 2.

Task 2: Choose the proper sizing table.

Sizing tables use the number of bedrooms for homes or the GPD flow in commercial installations to determine system size. System size is the total square footage of sand bed area required for a system. Sand bed area is designed as one or more individual sand beds. Sand bed widths are pre-established at 12, 9, and 6 ft. Sand bed lengths vary according to percolation rates and slope percentages.

Reference: See Level and Sloping Bed Diagrams, pp. 42-43.

When the system is for...	THEN use the following table to complete Task 3.
2-bedrooms	2-Bedroom Sizing, page 38
3-bedrooms	3-Bedroom Sizing, page 38
4-bedrooms	4-Bedroom Sizing, page 39
5-bedrooms	5-Bedroom Sizing, page 39
6-bedrooms	6-Bedroom Sizing, page 40
more than 6 bedrooms	Additional Bedroom Sizing, page 40
commercial use	Commercial System Sizing, page 41

Task 3: Determine bed(s) widths and lengths.

To determine the number and sizes of beds required, use the proper sizing table identified in task 2.

1. Find your percolation rate and slope in the left hand column.
   Note: Percolation rates/slopes limit system widths to 12 ft., 9 ft., or 6 ft. No other system widths are allowed without approval by the local approval authority.
2. Follow the row(s) across to the "Min. Bed Length" column and choose the longest bed length your site will accommodate.
   Note: Beds must be 32 ft. - 102 ft. in length.
3. If the minimum bed length exceeds 102 ft., divide the system into multiple beds of equal length
   Example: A minimum bed length of 288 ft. could be designed as 3 beds of 96 ft. each.
   Note: This example supports using the longest beds possible. Four beds of 72 ft., five beds of 58 ft., etc., are other alternatives. Remember that 32 ft. is the minimum bed length allowable.

Task 4: Design beds.

1. Design as many beds as required, inserting 4, 3, or 2 lines of ES pipe in each as dictated by the bed width.
   Note: Pipe is designed 1 ft. from the end of the sand bed.
   Example: A line of pipe in a 96 ft. bed would be 94 ft. long.
   Reference: See pipe lengths in Table F on the following page.
2. Use the bed diagrams on pp. 42-43 to aid in the design of each bed.

Continued

Pipe line and total footage lengths

Based on the bed width and length, this table lists pipe line lengths and total pipe footage in 5 ft. increments.

Table F – Pipe Line and Total Footage Lengths

Bed Width (ft)	Number of pipe lines	Bed Length / Pipe Length	32 / 30	37 / 35	42 / 40	47 / 45	52 / 50	57 / 55	62 / 60	67 / 65
6	2	Total Pipe Ftg.	60	70	80	90	100	110	120	130
9	3	Total Pipe Ftg.	90	105	120	135	150	165	180	195
12	4	Total Pipe Ftg.	120	140	160	180	200	220	240	260

Table F – Pipe Line and Total Footage Lengths

Bed Width (ft)	Number of pipe lines	Bed Length / Pipe Length	72 / 70	77 / 75	82 / 80	87 / 85	92 / 90	97 / 95	102 / 100
6	2	Total Pipe Ftg.	140	150	160	170	180	190	200
9	3	Total Pipe Ftg.	210	225	240	255	270	285	300
12	4	Total Pipe Ftg.	280	300	320	340	360	380	400

Avoiding cutting ES pipe

It is possible to keep pipe line lengths as multiples of 10 ft. and avoid cutting a 10ft. pipe section.

Example: Let's say we have a 12 ft. x 88 ft. bed (4-lines of pipe) requiring a total pipe footage of 344 ft. Dividing 344 ft. by 4 would suggest 4 lines of 86 ft. each. Extending the bed 4 ft. would allow 4 lines of 90 ft. each and eliminate cutting a section of pipe.

Task 5: Increase system size to meet Massachusetts' requirements.

Massachusetts requires that ES systems be no less than 60% of the area of a pipe and aggregate system. Complete this task to determine the area size required by Massachusetts. Use Table G below to find the appropriate minimum sand bed area size required by the State of Massachusetts.

Table G – Minimum Sand Bed Area Size (sq. ft.)

Perc Rate Min/Inch	2-Bedroom	3-Bedroom	4-Bedroom	5-Bedroom	6-Bedroom	Add'l Bedroom	Commercial Per 100 GPD
61-90	880	1320	1760	2200	2640	440	400

Example: Let's say we have a 4-bedroom system in soil with a perc rate of 66 min/inch on a 4% slope. Our 4-bedroom sizing table requires a minimum bed length of 88 ft. with 4 lines and a sand bed width of 12 ft.

To meet Massachusetts' requirements in Table G, our 4-bedroom house requires a minimum sand bed area size of 1760 sq. ft. The 88 ft. x 12 ft. bed would use 86 ft. line lengths to provide a total of 1056 sq. ft. Instead of cutting the last pipe of each line to 6 ft., the full 10 ft. should be used to provide 4-90 ft. lines. The 90 ft. lines will provide a bed length of 92 ft. Divide the needed 1760 sq. ft. by the 92 ft. bed to obtain a width of 20 ft. The 4-90 ft. lines spaced 3 ft. apart should be centered in the 20 ft. by 92 ft. bed.

Note 1: Sand bed extensions at the pipe ends are limited to 1 ft. from the offset adapter for purposes of calculating the effective bed size.

Note 2: Sand bed extensions on systems sloping 5-15% are limited to 1 ft. from the upslope side of the highest pipe for purposes of calculating bed size. Additional bed width must be made on the down slope side.

Quick Reference Guide for Percolation Rates of 61-90 Minutes/Inch, Continued

System configuration requirement

Basic serial configuration is required for systems in soils with perc rates of 61-90 min/inch. Systems with a design flow greater than 500 GPD must be divided into multiple beds. No bed in a multiple bed system can accept more than 500 GPD.

Sizing Tables (percolation rates 61-90 min/inch)

2-Bedroom

Perc. Rate/Slope	Sand Bed Area(sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	523	12	4	3	44
61-70 / 0%-<5%	523	9	3	3	58
61-70 / 0%-<5%	523	6	2	3	87
61-70 / 5%-<10%	601	12	4	1.5	50
61-70 / 5%-<10%	601	9	3	1.5	67
61-70 / 5%-<10%	601	6	2	1.5	100
61-70 / 10%-15%	628	12	4	1.5	53
61-70 / 10%-15%	628	9	3	1.5	73
71-80 / 0%-<5%	559	12	4	3	47
71-80 / 0%-<5%	559	9	3	3	62
71-80 / 0%-<5%	559	6	2	3	93
71-80 / 5-10%	643	12	4	1.5	54
71-80 / 5%-10%	643	9	3	1.5	71
71-80 / 5%-10%	643	6	2	1.5	107
81-90 / 0%-<5%	602	9	3	3	67
81-90 / 0%-<5%	602	6	2	3	100
81-90 / 5%-10%	692	9	3	1.5	77
81-90 / 5%-10%	692	6	2	1.5	115

3-Bedroom

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ftt)	Number of Lines	Ctr. to Ctr. Spacing	Min. Bed Length (ft.)
61-70 / 0%-<5%	784	12	4	3	65
61-70 / 0%-<5%	784	9	3	3	87
61-70 / 0%-<5%	784	6	2	3	131
61-70 / 5%-<10%	902	12	4	1.5	75
61-70 / 5%-<10%	902	9	3	1.5	100
61-70 / 5%-<10%	902	6	2	1.5	150
61-70 / 10%-15%	941	12	4	1.5	78
61-70 / 10%-15%	941	9	3	1.5	105
71-80 / 0%-<5%	839	12	4	3	70
71-80 / 0%-<5%	839	9	3	3	93
71-80 / 0%-<5%	839	6	2	3	140
71-80 / 5-10%	965	12	4	1.5	80
71-80 / 5%-10%	965	9	3	1.5	107
71-80 / 5%-10%	965	6	2	1.5	161
81-90 / 0%-<5%	902	9	3	3	100
81-90 / 0%-<5%	902	6	2	3	150
81-90 / 5%-10%	1038	9	3	1.5	115
81-90 / 5%-10%	1038	6	2	1.5	173

Continued

Sizing Tables (percolation rates 61-90 min/inch), Continued

4-Bedroom

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	1046	12	4	3	88
61-70 / 0%-<5%	1046	9	3	3	116
61-70 / 0%-<5%	1046	6	2	3	174
61-70 / 5%-<10%	1203	12	4	1.5	101
61-70 / 5%-<10%	1203	9	3	1.5	134
61-70 / 5%-<10%	1203	6	2	1.5	201
61-70 / 10%-15%	1255	12	4	1.5	105
61-70 / 10%-15%	1255	9	3	1.5	139
71-80 / 0%-<5%	1118	12	4	3	94
71-80 / 0%-<5%	1118	9	3	3	124
71-80 / 0%-<5%	1118	6	2	3	186
71-80 / 5-10%	1286	12	4	1.5	108
71-80 / 5%-10%	1286	9	3	1.5	143
71-80 / 5%-10%	1286	6	2	1.5	214
81-90 / 0%-<5%	1203	9	3	3	134
81-90 / 0%-<5%	1203	6	2	3	201
81-90 / 5%-10%	1383	9	3	1.5	154
81-90 / 5%-10%	1383	6	2	1.5	231

5-Bedroom

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	1307	12	4	3	109
61-70 / 0%-<5%	1307	9	3	3	145
61-70 / 0%-<5%	1307	6	2	3	218
61-70 / 5%-<10%	1503	12	4	1.5	126
61-70 / 5%-<10%	1503	9	3	1.5	167
61-70 / 5%-<10%	1503	6	2	1.5	251
61-70 / 10%-15%	1568	12	4	1.5	131
61-70 / 10%-15%	1568	9	3	1.5	174
71-80 / 0%-<5%	1398	12	4	3	117
71-80 / 0%-<5%	1398	9	3	3	155
71-80 / 0%-<5%	1398	6	2	3	233
71-80 / 5-10%	1608	12	4	1.5	134
71-80 / 5%-10%	1608	9	3	1.5	179
71-80 / 5%-10%	1608	6	2	1.5	268
81-90 / 0%-<5%	1504	9	3	3	168
81-90 / 0%-<5%	1504	6	2	3	251
81-90 / 5%-10%	1730	9	3	1.5	193
81-90 / 5%-10%	1730	6	2	1.5	288

Continued

Sizing Tables (percolation rates 61-90 min/inch), Continued

6-Bedroom

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	1569	12	4	3	131
61-70 / 0%-<5%	1569	9	3	3	174
61-70 / 0%-<5%	1569	6	2	3	262
61-70 / 5%-<10%	1804	12	4	1.5	150
61-70 / 5%-<10%	1804	9	3	1.5	200
61-70 / 5%-<10%	1804	6	2	1.5	301
61-70 / 10%-15%	1883	12	4	1.5	157
61-70 / 10%-15%	1883	9	3	1.5	209
71-80 / 0%-<5%	1677	12	4	3	140
71-80 / 0%-<5%	1677	9	3	3	186
71-80 / 0%-<5%	1677	6	2	3	280
71-80 / 5-10%	1929	12	4	1.5	161
71-80 / 5%-10%	1929	9	3	1.5	214
71-80 / 5%-10%	1929	6	2	1.5	322
81-90 / 0%-<5%	1805	9	3	3	201
81-90 / 0%-<5%	1805	6	2	3	301
81-90 / 5%-10%	2076	9	3	1.5	231
81-90 / 5%-10%	2076	6	2	1.5	346

Additional bedroom

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	261	12	4	3	22
61-70 / 0%-<5%	261	9	3	3	29
61-70 / 0%-<5%	261	6	2	3	44
61-70 / 5%-<10%	300	12	4	1.5	25
61-70 / 5%-<10%	300	9	3	1.5	33
61-70 / 5%-<10%	300	6	2	1.5	50
61-70 / 10%-15%	313	12	4	1.5	26
61-70 / 10%-15%	313	9	3	1.5	35
71-80 / 0%-<5%	280	12	4	3	24
71-80 / 0%-<5%	280	9	3	3	31
71-80 / 0%-<5%	280	6	2	3	47
71-80 / 5-10%	322	12	4	1.5	27
71-80 / 5%-10%	322	9	3	1.5	36
71-80 / 5%-10%	322	6	2	1.5	54
81-90 / 0%-<5%	301	9	3	3	34
81-90 / 0%-<5%	301	6	2	3	50
81-90 / 5%-10%	346	9	3	1.5	39
81-90 / 5%-10%	346	6	2	1.5	58

Continued

Sizing Tables (percolation rates 61-90 min/inch), Continued

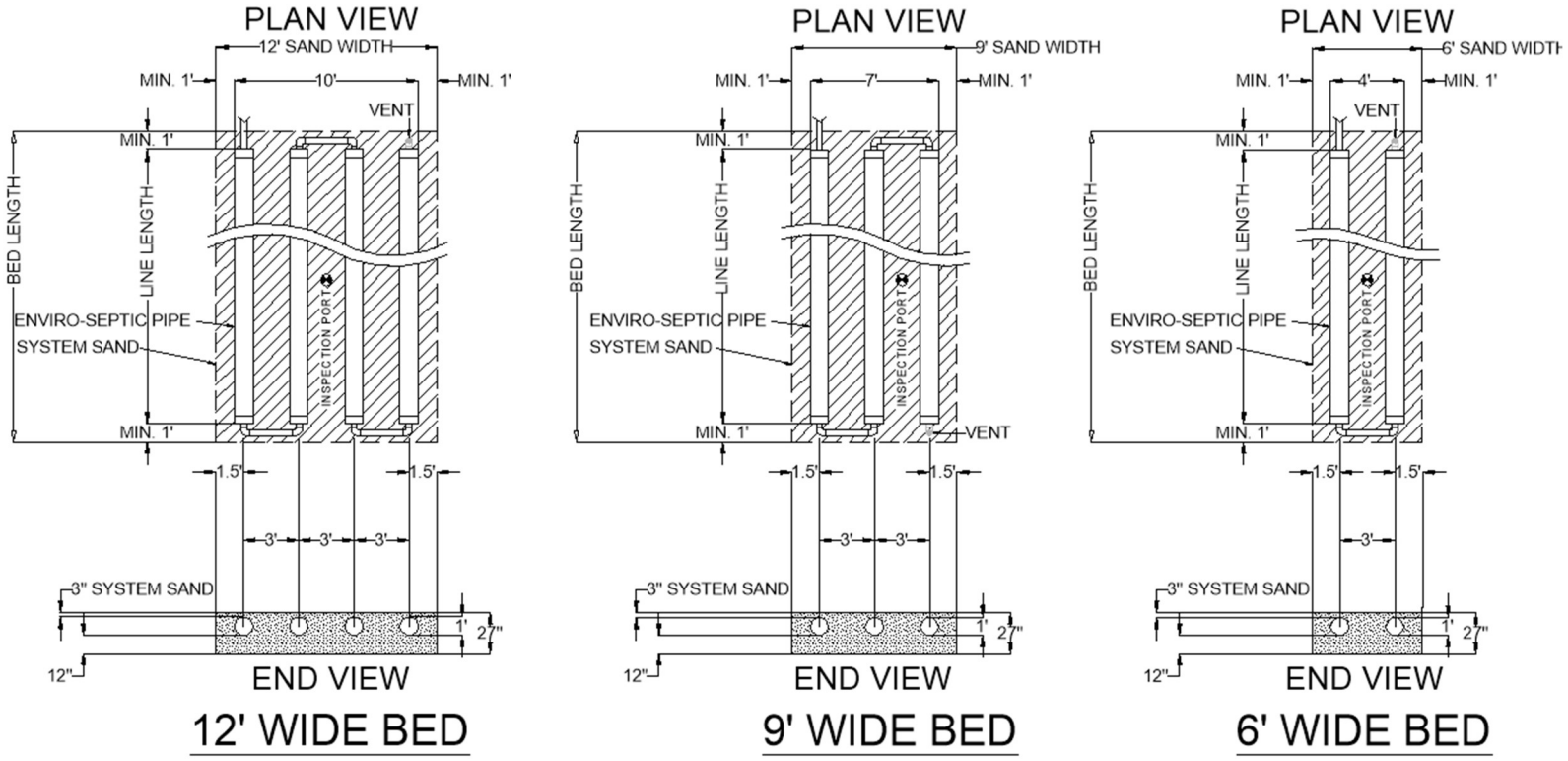
Commercial (per 100 GPD)

Perc. Rate/Slope	Sand Bed Area (sq. ft.)	Sand Bed Width (ft.)	Number of Lines	Ctr. to Ctr. Spacing (ft.)	Min. Bed Length (ft.)
61-70 / 0%-<5%	261	12	4	3	22
61-70 / 0%-<5%	261	9	3	3	29
61-70 / 0%-<5%	261	6	2	3	44
61-70 / 5%-<10%	300	12	4	1.5	25
61-70 / 5%-<10%	300	9	3	1.5	33
61-70 / 5%-<10%	300	6	2	1.5	50
61-70 / 10%-15%	313	12	4	1.5	26
61-70 / 10%-15%	313	9	3	1.5	35
71-80 / 0%-<5%	280	12	4	3	24
71-80 / 0%-<5%	280	9	3	3	31
71-80 / 0%-<5%	280	6	2	3	47
71-80 / 5-10%	322	12	4	1.5	27
71-80 / 5%-10%	322	9	3	1.5	36
71-80 / 5%-10%	322	6	2	1.5	54
81-90 / 0%-<5%	301	9	3	3	34
81-90 / 0%-<5%	301	6	2	3	50
81-90 / 5%-10%	346	9	3	1.5	39
81-90 / 5%-10%	346	6	2	1.5	58

Level Bed Diagrams (percolation rates 61-90 min/inch)

Introduction

Level beds for percolation rates 61-90 min/inch installations are designed in 12, 9, or 6 ft. widths. Here are three diagrams.

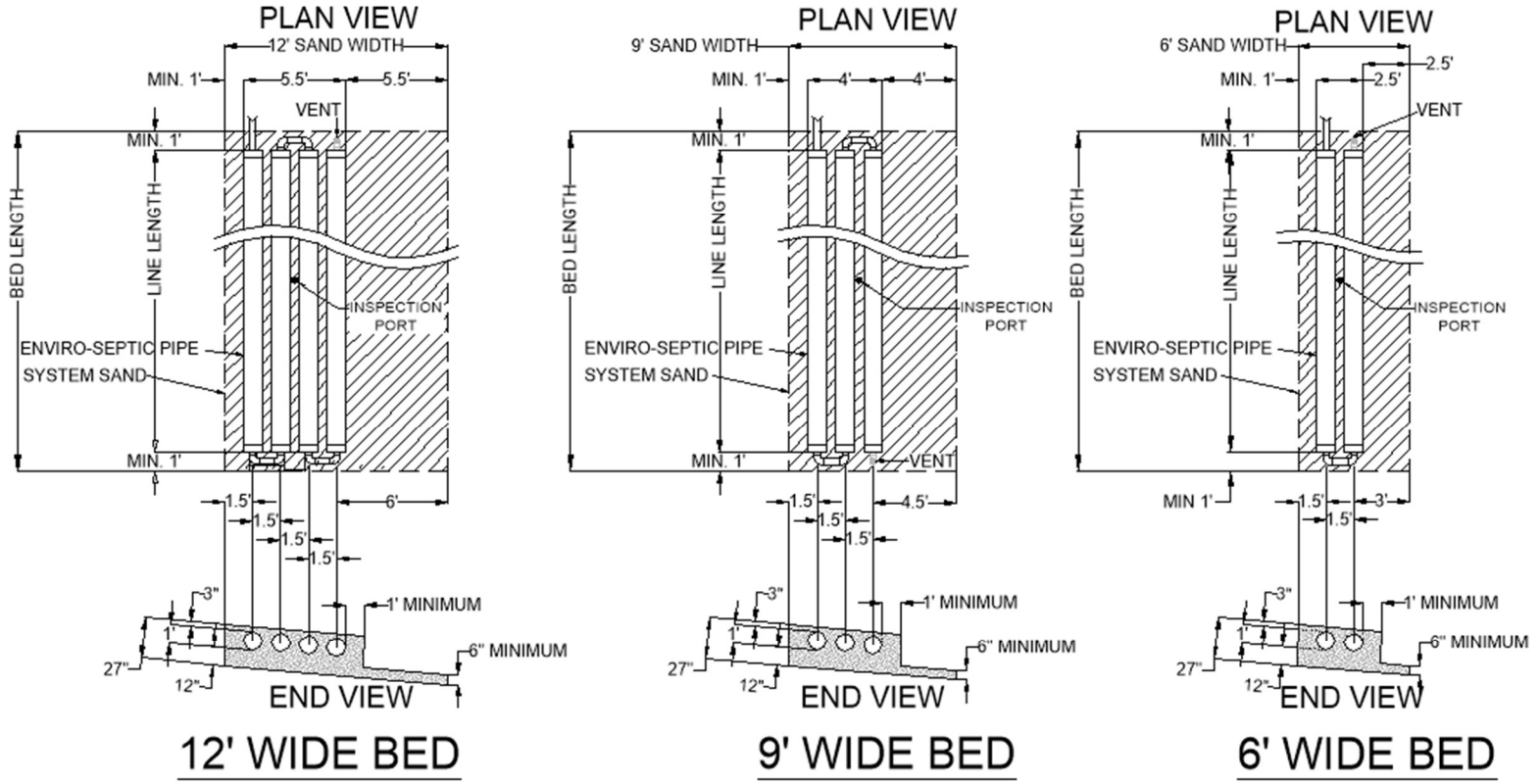


ENVIRO-SEPTIC PIPE CONSTANT 3.0 FEET ON CENTER AT <5% SLOPE IN RESTRICTIVE SOILS
NOTE: SYSTEM MUST ALWAYS INLET TO THE HIGHEST PIPE

Sloping Bed Diagrams (percolation rates 61-90 min/inch)

Introduction

Sloping beds for percolation rates 61-90 min/inch installations are designed in 12, 9, or 6 ft. widths. Here are three diagrams.



Appendix A - System Installation Form

For each new or replacement installation, Massachusetts installers of Enviro-Septic® systems must complete and fax, email to info@presbyeco.com or mail a copy of this form to the local approving authority and to:

Presby Environmental, Inc.
143 Airport Road
Whitefield, NH 03598
Fax: (603) 837-9864

Installer's Name:		
Company Name:		
Street Address:		
City:	State:	Zip:
Property Owner:		
Site Street Address:		
City:	State:	Zip:
System Type *(circle one)*: General Use or Remedial Use	Design Flow:	
Installation Date:	System Startup Date:	
Permit Number:		
Comments:		

This form may also be downloaded from our website at
www.PresbyEnvironmental.com

Appendix B
Enviro-Septic® Wastewater Treatment System Technology Checklist

Purpose This technology checklist is to be completed by an operator trained by Presby Environmental, Inc., to inspect Enviro-Septic® Wastewater Treatment Systems.

1. Facility Owner: _____
2. Facility Address: _____
3. Installation Date: _____ Previous Inspection Date: _____
4. Date of Inspection: _____
5. Residential Number of Bedrooms: _____ /Commercial Design Flow _____ GPD
6. Inspection Port Location(s): _____
7. Other (Explain): _____

Inspection data (Complete all fields)

8. Is daily flow within the system design flow? ☐ Yes ☐ No If no, explain: _____
9. Does the owner verify the system use as described above? ☐ Yes ☐ No
   If no, explain: _____
10. Septic tank last inspection date: _____ Inspected by: _____
11. Septic tank last pumped date: _____ Is pumping recommended? ☐ Yes ☐ No
12. Condition of the soil absorption system: (wet/dry/firm/soft/vegetative/other) _____
13. Is there evidence of storm water flows or erosion over the septic system? ☐ Yes ☐ No
    If yes, explain: _____
14. Is there evidence of soil slump or compaction by traffic or other means in the vicinity of the soil absorption system? ☐ Yes ☐ No If yes, describe: _____
15. Is effluent visible through the inspection port? ☐ Yes ☐ No If yes, describe the condition and the fluid level: _____

Continued on next page.

16. Are solids visible through the inspection port? ☐ Yes ☐ No If yes, describe the condition and depth of solids: _____

_____

17. Is there evidence of surcharging or effluent ponding in the D-Box? ☐ Yes ☐ No

If yes, describe and measure: _____

_____

18. Are the system vents in place? ☐ Yes ☐ No If no, describe: _____

_____

19. Describe any other pertinent issues: _____

_____

System Pump Inspection data (If applicable)

20. Pump Chamber? ☐ Yes ☐ No Condition: _____

21. Pumps Inspected? ☐ Yes ☐ No Number of Pumps: _____

Condition of Pumps: _____

23. System Alarms? ☐ Yes ☐ No ☐ N/A

24. Condition of Alarms: _____

25. Date of Last Alarm Test: _____

Inspected by:

_____

Date:

_____

Time:

_____

Signature of Inspector:

_____

I certify that by signing above: I have inspected the sewage treatment and disposal system at the address above, have completed this report, and the information reported is true, accurate, and complete as of the time of the inspection.

Appendix C
Enviro-Septic® Wastewater Treatment System Operating Manual

Introduction

ES wastewater treatment systems are virtually maintenance free. However, an awareness of system abuse and simple easy maintenance will guarantee system longevity.

System abuse conditions

The following conditions constitute system abuse.

- Liquid in high volume (excessive number of occupants, leaking fixtures, water beds, or whirlpool tubs, hot tubs, or water softeners if not specified in system design)
- Solids in high volume (excessive number of occupants, paper products, personal hygiene products, or garbage disposals or water softeners if not specified in system design)
- Antibiotic medicines in high concentrations
- Cleaning products in high concentrations
- Fertilizers or other caustic chemicals in any amount
- Petroleum products in any amount

System maintenance

These simple procedures will guarantee system longevity.

- Inspect the septic tank at least once every two years under normal usage. Have the tank emptied when surface scum and bottom sludge occupy one-fourth or more of tank capacity.
- After pumping, inspect the septic tank for integrity to ensure than no groundwater flow is entering septic tank. Also check the integrity of the tank inlet and outlet baffles.
- Inspect the system for proper venting through either the roof or distribution box vent.

No. 2159-N

FEE $25.00

THE COMMONWEALTH OF MASSACHUSETTS

BOARD OF HEALTH

TOWN OF FALMOUTH

Application for Disposal Works Construction Permit

Application is hereby made for a Permit to Construct (XX) or Repair ( ) an Individual Sewage Disposal System at:

~~Lot No. 8 Palmer Avenue~~ #739 ~~Lot No 8~~
Location - Address or Lot No.

~~Shirley Tepper~~ 73 Althea Road, Falmouth
Owner Address

John J Gavin 48 Atwater Drive , Falmouth,MA
Installer Address

Type of Building Size Lot 30,050 Sq. feet

Dwelling — No. of Bedrooms 4 Expansion Attic ( ) Garbage Grinder (NO)

Other — Type of Building .... No. of persons .... Showers ( ) — Cafeteria ( )

Other fixtures ....

Design Flow 55 gallons per person per day. Total daily flow 440 gallons.

Septic Tank — Liquid capacity 1000 gallons Length 8'6" Width 4'10" Diameter .... Depth 4' Liquid.

Disposal Trench — No. .... Width .... Total Length .... Total leaching area .... sq. ft.

Seepage Pit No. 1 Diameter 12.5' Depth below inlet 6' Total leaching area 358.3 sq. ft.

Other Distribution box (X) Dosing tank ( )

Percolation Test Results Performed by R.A.S. associates Date 7/29/85

Test Pit No. 1 2 minutes per inch Depth of Test Pit 13' Depth to ground water Not Enctrd.

Test Pit No. 2 .... minutes per inch Depth of Test Pit .... Depth to ground water ....

Description of Soil 0.0'-0.8' woodloam roots,0.8'-2.6' tan-orange fine SAND few cobbles2.6'-7.2' tan, fine SAND & GRAVEL,few cobbles 7.2'-13.0' tan,losse,med.-coarse SAND & GRAVEL, few cobbles

Nature of Repairs or Alterations — Answer when applicable NO WATER FOUND

(Stamp: COMMONWEALTH OF MASSACHUSETTS — ...EN M. BRAKS — CIVIL — No. 30497 — REGISTERED PROFESSIONAL ENGINEER) [signature]

Agreement:

The undersigned agrees to install the aforedescribed Individual Sewage Disposal System in accordance with the provisions of TITLE 5 of the State Sanitary Code — The undersigned further agrees not to place the system in operation until a Certificate of Compliance has been issued by the board of health.

Signed John J. Gavin Date 30 Aug 85

Application Approved By David Carignan Date 3 Oct 85

Application Disapproved for the following reasons: ....

.... Date

Permit No. 2159N Issued 10/3/85 Date

THE COMMONWEALTH OF MASSACHUSETTS

BOARD OF HEALTH

TOWN OF FALMOUTH

Certificate of Compliance

THIS IS TO CERTIFY, That the Individual Sewage Disposal System constructed (X) or Repaired ( )

by JOHN GAVIN
Installer

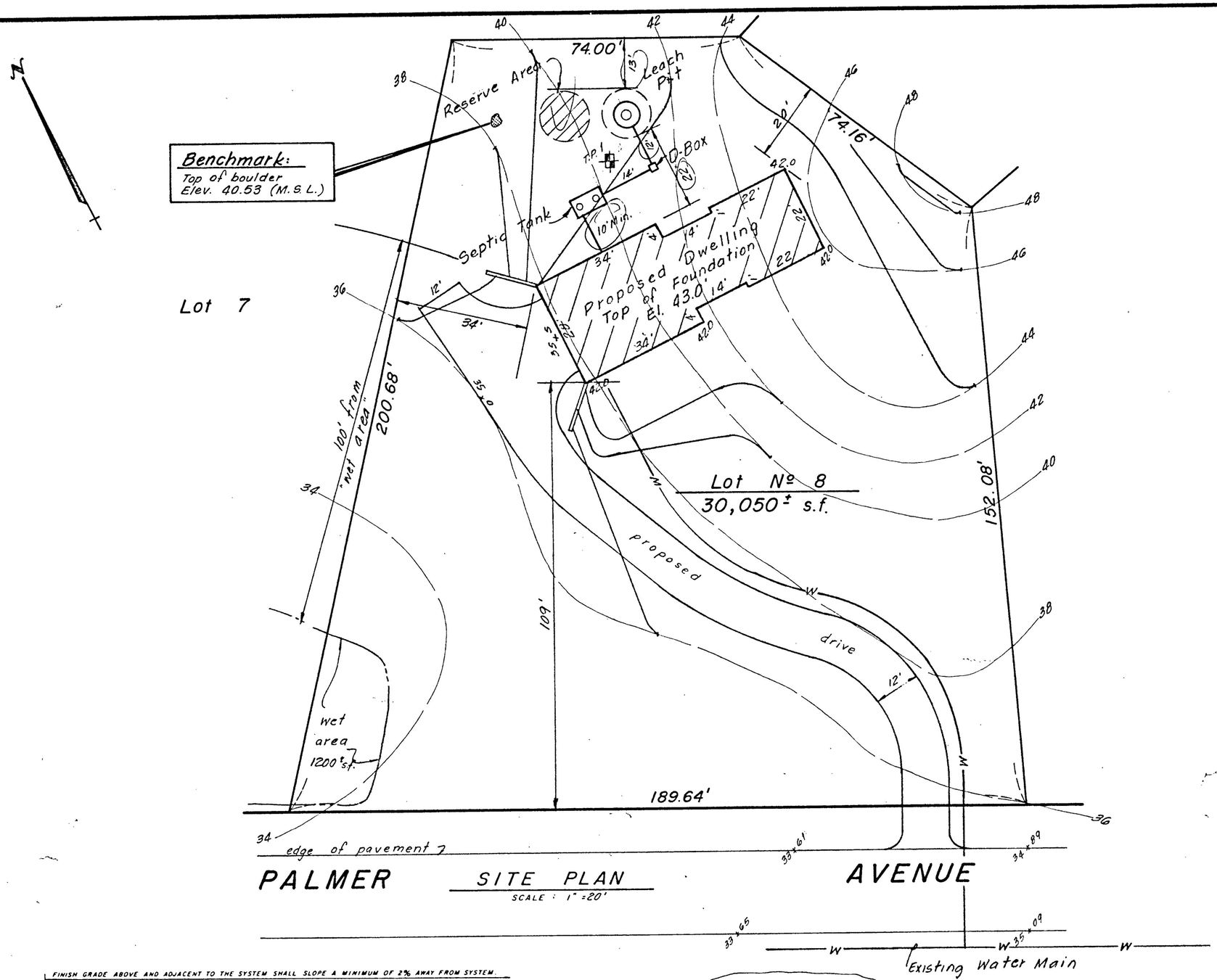
at #739, LOT 8 PALMER AVENUE

has been installed in accordance with the provisions of TITLE 5 of The State Sanitary Code as described in the application for Disposal Works Construction Permit No. 2159N dated 10/3/85

THE ISSUANCE OF THIS CERTIFICATE SHALL NOT BE CONSTRUED AS A GUARANTEE THAT THE SYSTEM WILL FUNCTION SATISFACTORY.

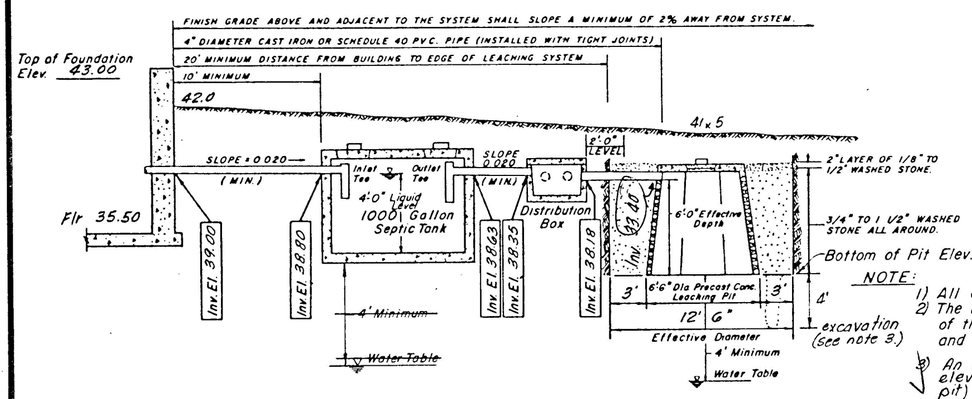
DATE 10/24/85 Inspector [signature]

CHECK OR FILL IN WHERE APPLICABLE



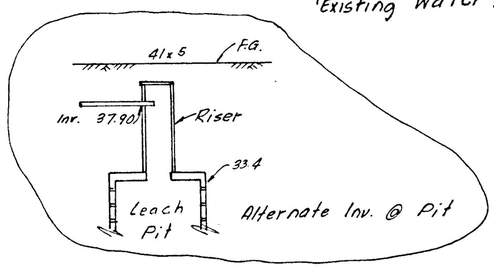
SITE PLAN

SCALE : 1" = 20'



SYSTEM PROFILE

not to scale



NOTE:

1) All covers shall be brought to within 12" of finish grade.
2) The Engineer shall approve both the location and limits of the excavation prior to the installation of the pit and the stone. (48 hours advance notice required)
3) An exploratory excavation shall be made to elevation 23.4 (4' below the bottom of the pit) to insure the absence of water.

BASIS OF DESIGN

1. Number of Bedrooms 4 (Design Daily Flow 440 G.P.D.).
2. Garbage Disposal Unit NO
3. Leaching Capacity Required 440 G.P.D.
4. Side Area Proposed 235.6 Square Feet.
5. Bottom Area Proposed 122.7 Square Feet.
6. Proposed Leaching Capacity 711 G.P.D.
7. Water Supply Municipal
8. Precast Reinforced Concrete Units H-10 Loading

LEGEND

94.3	Existing Spot Elevations
94.0	Proposed Spot Grades
~94~	Existing Contours
—94—	Proposed Contours
—W—	Proposed Water Service

GENERAL NOTES

1. Property Line information from a Plan of Land by Holmes & McGrath, Falmouth, MA.
2. Topographic Survey by the transit-stadia method. Elevations refer to Mean Sea Level.
3. Percolation Tests performed in accordance with "Title 5" of the Massachusetts State Environmental Code.
4. All construction to conform to the State Environmental Code and the Board of Health requirements for the Town of Falmouth which are part of this plan whether or not specifically indicated herein.
5. The Contractor shall, prior to backfilling the system, notify both the Design Engineer and the Board of Health Agent to inspect the system as constructed.
6. R.A.S. Associates will not be responsible for the performance or operation of the proposed system. Any deviations from this design shall be approved in writing by R.A.S. Associates prior to their incorporation into the system.
7. The NORTH ARROW indicated on this plan was taken from the above mentioned Plan of Land and may not indicate TRUE NORTH and should not be used for locating SOLAR PANELS and/or STRUCTURES.
8. Flood Hazard Zone "C", Community Map № 255211.

TEST PIT LOG

T.P № 1.
Date: 7/29/85
Ground Surface Elev = 40.4

0.0	Woodloam, roots
0.8	tan - orange, fine SAND, few cobbles
2.6	tan - fine SAND & GRAVEL few cobbles
7.2	tan, loose, med. - coarse SAND & GRAVEL few cobbles
13.0	Bottom of Hole
	No Water Found

T.P № 2.
Date:
Ground Surface Elev =

Record Owners: Ms. Shirley Tepper

#739 Palmer, AVE

Zoning District: RB

Percolation Rate: ∠2 min./inch. Witnessed By: David Carignan B.O.H. Agent

PLOT PLAN
OF
PROPOSED SEWAGE DISPOSAL SYSTEM
FOR
SHIRLEY TEPPER
IN
FALMOUTH, MASSACHUSETTS

Scale: As Noted Date: 8/26/85

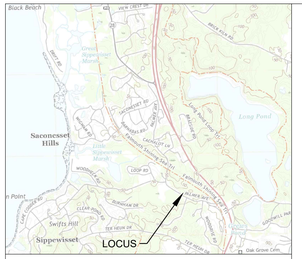
Oct 30 '85 David Carignan

COMMONWEALTH OF MASSACHUSETTS STEPHEN M. BRAS CIVIL No. 30497 REGISTERED PROFESSIONAL ENGINEER

R A S associates. Registered Professional Engineers and Land Surveyors
30 Carolyn Drive
Plymouth, Massachusetts
224-3758

Sheet 1 of 1

Design By: S.W.C. | Checked By: S.M.B. | Drawn By: S.W.C | File № 85-298

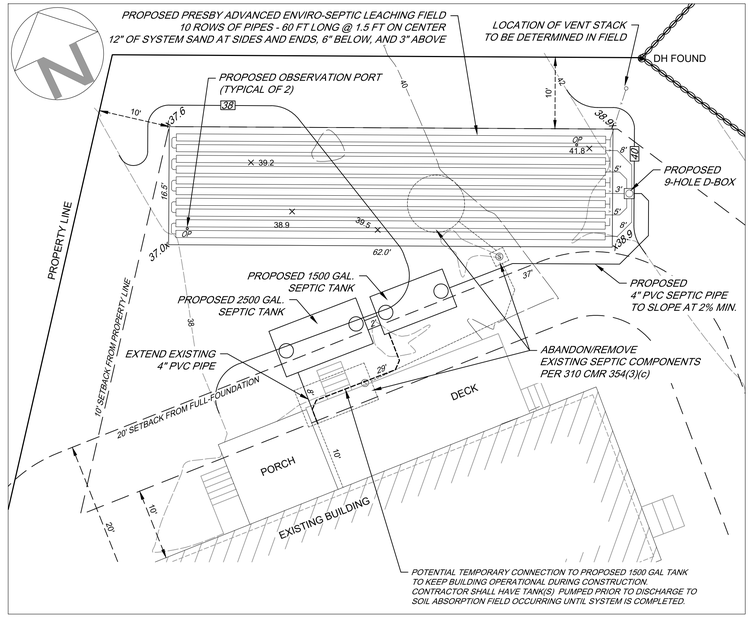


Location Map Not to Scale

SEPTIC SYSTEM DESIGN CRITERIA

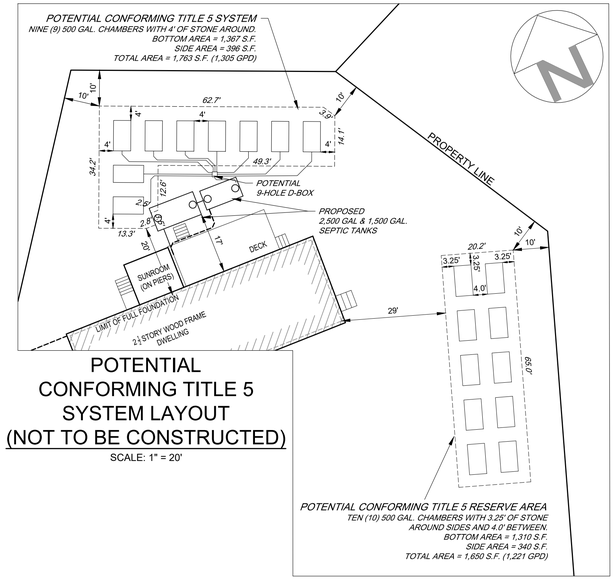
MADEP TITLE 5 FLOW CRITERIA	Assisted Living Facility
NUMBER OF BEDS	8
DAILY DESIGN FLOW RATE (GALLONS PER DAY PER BED)	150
TOTAL DAILY DESIGN FLOW (GPD)	1,200
GARBAGE DISPOSAL	NO
TITLE 5 LEACHING AREA REQUIRED (SQ.FT.)	1,622
REDUCED LEACHING AREA ALLOWED (60% FOR PRESBY)	974
SIDE AREA PROPOSED (FT)	N/A
BOTTOM AREA PROPOSED (FT)	1,023
TOTAL AREA PROPOSED (SQ.FT.)	1,023
PROPOSED LEACHING CAPACITY (GPD)	1261
WATER SUPPLY	MUNICIPAL
AVERAGE DAILY WATER USE FROM METER READINGS (GPD)	361
PRECAST CONCRETE UNITS LOADING DESIGN	H10 & H20
TWO COMPARTMENT OR SEPARATE SEPTIC TANKS REQUIRED	YES
FIRST COMPARTMENT VOLUME REQUIRED 48 HOUR FLOW (GAL.)	2,400
FIRST SEPTIC TANK PROVIDED (GAL)	2,500
SECOND COMPARTMENT VOLUME REQUIRED 24 HR FLOW (GAL.)	1,200
SECOND SEPTIC TANK PROVIDED (GAL)	1,500

DESIGNER:	WOODS HOLE GROUP
BY:	JOEL R. KUBICK
ENVIRO-SEPTIC CERTIFICATION NO:	7217MAES



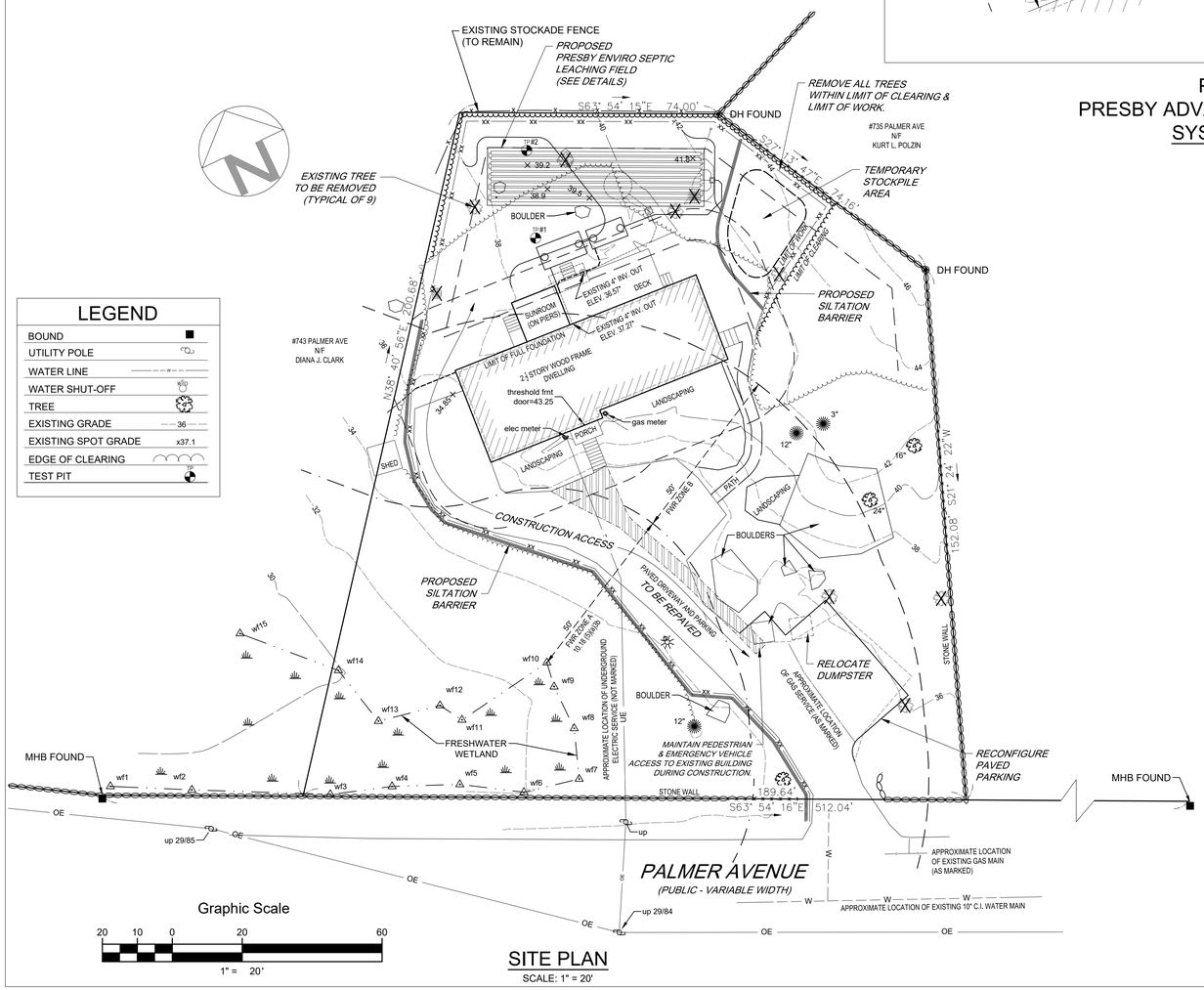
PROPOSED PRESBY ADVANCED ENVIRO-SEPTIC SYSTEM LAYOUT

SCALE: 1" = 10'



POTENTIAL CONFORMING TITLE 5 SYSTEM LAYOUT (NOT TO BE CONSTRUCTED)

SCALE: 1" = 20'



SITE PLAN

SCALE: 1" = 20'

GENERAL NOTES

1. THIS PLAN IS FOR THE DESIGN AND CONSTRUCTION OF THE SEWAGE DISPOSAL FACILITY ONLY.
2. NO CHANGE TO THIS SYSTEM SHALL BE MADE UNLESS APPROVED IN WRITING BY WOODS HOLE GROUP INC. SUBJECT TO INSPECTION DURING CONSTRUCTION BY MASSACHUSETTS DEP AND WOODS HOLE GROUP INC.
3. HEAVY CONSTRUCTION EQUIPMENT SHALL NOT TRAVEL OVER DISPOSAL SYSTEM DURING OR AFTER CONSTRUCTION.
4. THE DISPOSAL SYSTEM SHALL BE CONSTRUCTED IN ACCORDANCE WITH TITLE 5 OF THE STATE ENVIRONMENTAL CODE (WHERE APPROPRIATE) AND THE MOST CURRENT PRESBY ENVIRO-SEPTIC MANUAL AND GENERAL USE CERTIFICATION.
5. A COPY OF THESE PLANS SHALL BE FURNISHED TO THE CONTRACTOR CONSTRUCTING THE DISPOSAL SYSTEM AND SHALL BE KEPT ON THE SITE DURING THE TIME OF CONSTRUCTION.
6. THE SYSTEM SHALL BE CONSTRUCTED BY A PRESBY CERTIFIED INSTALLER.
7. THE CONTRACTOR SHALL NOTIFY MASSACHUSETTS DEP AND WOODS HOLE GROUP 72 HOURS BEFORE INSPECTION. INSPECTIONS REQUIRED ARE AS FOLLOWS:
   - 7.1. PREPARED SITE EXCAVATION BEFORE PLACEMENT OF SYSTEM SAND.
   - 7.2. PRIOR TO BACKFILLING.
   - 7.3. DURING BACKFILLING.
   - 7.4. ADDITIONAL INSPECTIONS AS REQUIRED BY MASS. DEP.
8. IF THE CONTRACTOR ENCOUNTERS ANY VARIATION BETWEEN THE EXISTING CONDITIONS SHOWN ON THE PLAN AND THE CONDITIONS ENCOUNTERED ON THE SITE, OR ANY SOIL CONDITION DIFFERENT THAN SHOWN ON THE SOIL LOG, OR ANY ADVERSE SOIL, THE CONTRACTOR SHALL IMMEDIATELY CONTACT WOODS HOLE GROUP, INC. WOODS HOLE GROUP, INC. WILL EXAMINE THE SOIL CONDITION AND REPORT TO THE OWNER ANY SUGGESTED REVISIONS.
9. SYSTEM SAND SHALL CONFORM WITH ASTM C-33 SPECIFICATIONS AS MODIFIED BY PRESBY. GRAIN SIZE ANALYSIS FROM THE SAND SUPPLIER SHALL BE PROVIDED TO THE ENGINEER FOR APPROVAL PRIOR TO PLACEMENT.
10. EXISTING UTILITIES SHOWN ON THIS PLAN ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING THE PROPOSED CONSTRUCTION ACTIVITIES WITH DIG-SAFE AND THE APPLICABLE UTILITY COMPANIES AS REQUIRED AND MAINTAINING THE EXISTING UTILITY SYSTEMS IN SERVICE DURING CONSTRUCTION.
11. THE EXISTING DWELLING SHALL REMAIN IN USE FOR OCCUPANTS DURING CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR PUMPING SEWAGE DURING THE CONSTRUCTION. A TEMPORARY CONNECTION TO THE NEW 1,500 GALLON SEPTIC TANK MAY BE NEEDED DURING CONSTRUCTION TO MAINTAIN DWELLING USE.

SOIL TEST

DATE OF SOIL TESTING:	9/15/2021
SITE EVALUATOR:	JOEL KUBICK
WITNESS:	BRIAN DUDLEY (DEP) & IAN JARVIS (DEP)
PERCOLATION RATE:	<5 MIN/INCH
GROUND WATER:	NONE ENCOUNTERED

DEEP OBSERVATION HOLE LOG NO. 1

DEPTH	ELEV.	SOIL HORIZON	SOIL TEXTURE (USDA)	SOIL COLOR (Munsell)	SOIL MOTTLING	OTHER (STRUCTURES, STONES, BOULDERS, CONSISTENCY, % GRAVEL)
0"	38.4					
0"-24"	36.4	Ap	LOAMY SAND	10 YR 4/3	NONE	SURFACE BOULDERS ROOTS
24"-38"	35.2	B	LOAMY SAND	10 YR 5/8	NONE	
38"-126"	27.9	C	FINE SAND	2.5 Y 7/4	NONE	30% GRAVEL 10% COBBLES
NO GROUNDWATER ENCOUNTERED						

DEEP OBSERVATION HOLE LOG NO. 2

DEPTH	ELEV.	SOIL HORIZON	SOIL TEXTURE (USDA)	SOIL COLOR (Munsell)	SOIL MOTTLING	OTHER (STRUCTURES, STONES, BOULDERS, CONSISTENCY, % GRAVEL)
0"	38.9					
0"-24"	36.9	Ap	LOAMY SAND	10 YR 4/3	NONE	SURFACE BOULDERS ROOTS
24"-38"	35.7	B	LOAMY SAND	10 YR 5/8	NONE	
38"-96"	30.9	C	FINE SAND	2.5 Y 7/4	NONE	30% GRAVEL 10% COBBLES
NO GROUNDWATER ENCOUNTERED						

PROGRESS

WOODS HOLE GROUP
A CLS COMPANY
107 WATERHOUSE ROAD, BOURNE, MA 02532
TELEPHONE: (508) 540-8080 FAX: (508) 540-1001

Date

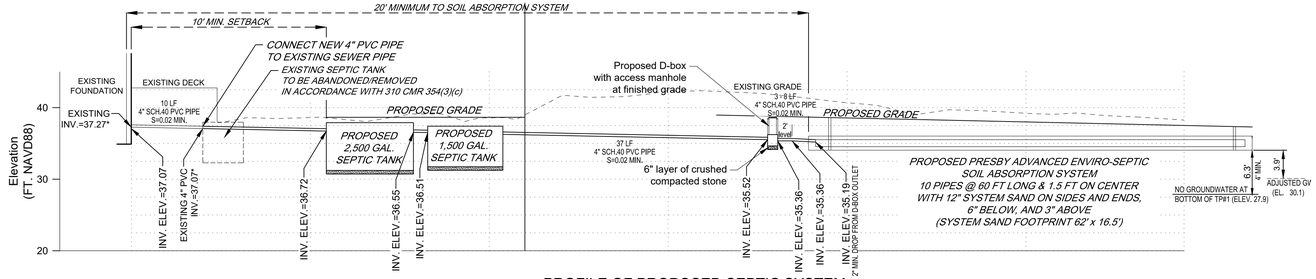
Revisions

1. 2. 3. 4. 5. 6. 7.

Surveyed By:
WOODS HOLE GROUP, INC.
107 WATERHOUSE ROAD
BOURNE, MA 02532
508-540-8080

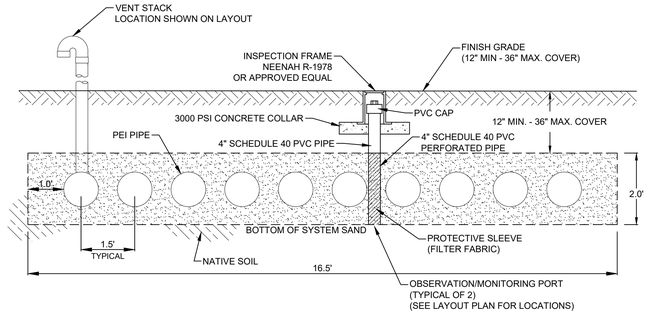
Title:
PROPOSED SEPTIC SYSTEM
PREPARED FOR:
MASSACHUSETTS DEPARTMENT OF MENTAL HEALTH
#739 PALMER AVENUE, FALMOUTH, MA

Project Number: 21-0023
Dwg File: 21-0023_SP.DWG
Scale: AS SHOWN
Date: 1/28/2022
Approved:
Drawn: JRK



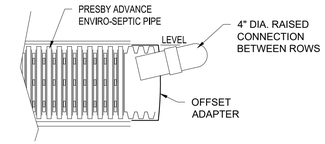
PROFILE OF PROPOSED SEPTIC SYSTEM

SCALE: 1" = 10'



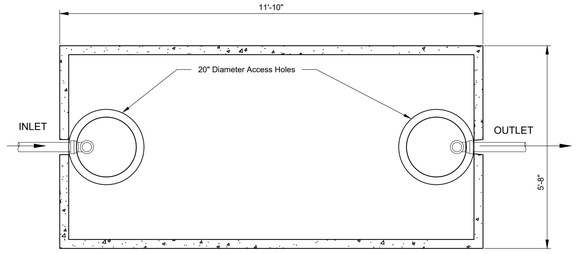
PRESBY ADVANCED ENVIRO-SEPTIC LEACHING FIELD - SECTION VIEW

SCALE: 1" = 2'

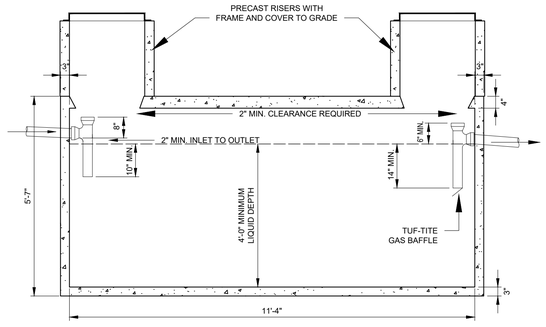


PRESBY RAISED CONNECTION DETAIL

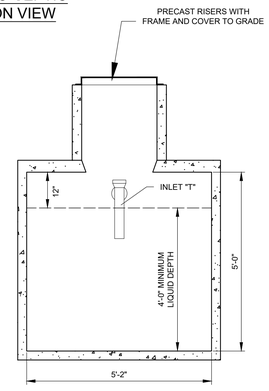
SCALE: 1" = 1'



PLAN VIEW



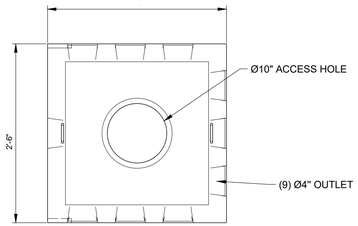
CROSS-SECTION



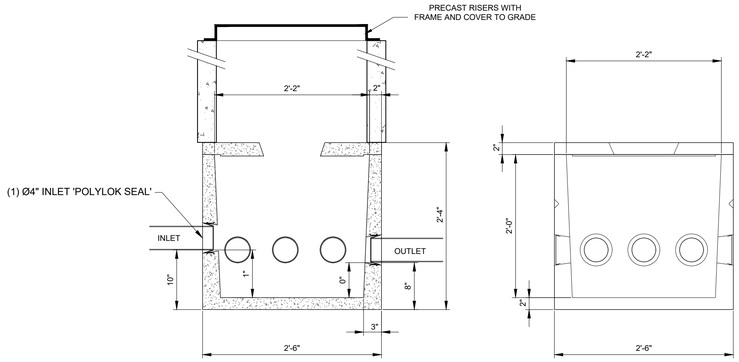
END-SECTION

TYPICAL 2,500 GALLON SEPTIC TANK

SCALE: 1" = 2'
(H-10 LOADING)



PLAN SECTION

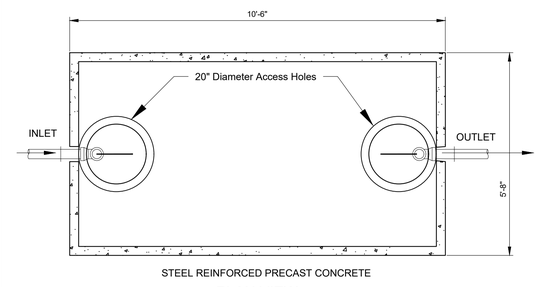


CROSS-SECTION

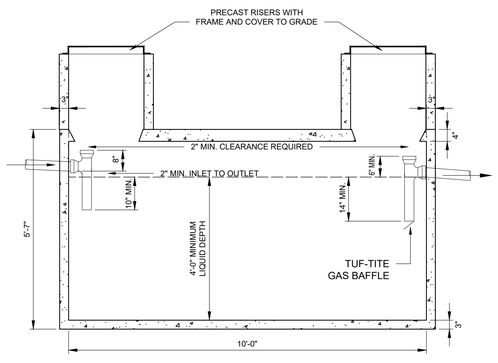
END-SECTION

9 HOLE DISTRIBUTION BOX

SCALE: 1" = 1'



PLAN VIEW



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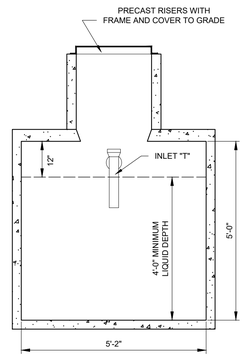

END-SECTION

TYPICAL 1,500 GALLON SEPTIC TANK

SCALE: 1" = 1'
(H-10 LOADING)

PROGRESS

WOODS HOLE GROUP
A CLS COMPANY
107 WATERHOUSE ROAD, BOURNE, MA 02532
TELEPHONE: (508) 540-8080 FAX: (508) 540-1001

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