Draft

SECTION 12.0

Part IV

CUSTOM
SLAUGHTERHOUSES

Part IV

CUSTOM SLAUGHTERHOUSES

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CUSTOM SLAUGHTERHOUSES

1.0 GENERAL--These design requirements apply only to custom slaughterhouses (generally less than ten animals slaughtered per week). Prior to applying to the Sewage Disposal Division, an application must be made to the Meat Inspection Division of the West Virginia Department of Agriculture.

2.0 DESIGN--The treatment facility shall be designed on 8.0 lb. BOD_5 per 1,000 lb. live animal weight per day, and/or 150 gallons per 1,000 lb. live animal weight per day. This figure can only be used if all blood, offal, hair, feathers, paunch manure and fecal matter is removed from the sewage collection and treatment facilities.

2.1 Blood--Blood should be hauled off by a rendering company. If this is not possible, then land disposal may be considered.

2.2 Offal--Offal must be hauled off by a rendering company. Land disposal is not permitted.

2.3 Paunch Manure--Paunch manure and fecal matter can be land disposed.

3.0 TREATMENT--The following types of treatment are recommended:

3.1 Septic Tank--Soil Absorption System (recommended for a maximum of seven animals slaughtered per day operations). As a minimum, multiple septic tanks in series shall be required.

3.2 Aerated Lagoons--(See Part III, Section 11).

3.3 Stabilization Ponds--(See Part III, Section 11).

3.4 Extended Aeration Sewage Treatment Plants--(See Part III).

3.4.1 Will require flow equalization.

3.4.2 Will require aerated sludge holding tank.

4.0 ADDITIONAL TREATMENT--Additional treatment may be required depending upon health considerations or Discharge Load Allocation requirements (See Part III).

SECTION 12.0

Part V

INDIVIDUAL SEWAGE SYSTEMS

Part V

INDIVIDUAL SEWAGE SYSTEMS

INDEX

1.0 GENERAL--These design standards apply to the site requirements, design, construction, and maintenance of individual sewage treatment systems including septic tanks, home aeration units, soil absorption fields, serial distribution fields, absorption beds, mounds, small lagoons, land application systems, composting toilets, grey water systems, holding tanks, privies, recycle systems or any other systems which provide waste treatment and disposal for individual dwellings and commercial establishments.

Application forms and design data sheets may be obtained from the local health department.

1.1 For systems utilizing subsurface or on-site effluent disposal, one (1) copy of the completed application design data sheet and plan shall be submitted to the Director.

1.2 For systems utilizing other methods of effluent disposal, six (6) copies of the completed application, design data sheet and plans shall be submitted to the Director.

2.0 GENERAL SITE REQUIREMENTS

2.1 An individual sewage system shall not be located in a swampy or filled area, or in any area where ponding or flooding is likely to occur, without the prior written approval of the Director. Exceptions may be made if the fill area has been constructed in accordance with directions of the Director or evidence has been provided to the Director that the fill area is suitable and of acceptable composition.

2.2 No part of an individual sewage system shall be located within 10 feet of a building or foundation or property line.

2.3 No part of an individual sewage system shall be located within 10 feet of a water supply line.

2.4 A septic tank, home aeration unit, privy, or other sewage tank shall be located at least 50 feet from a well or groundwater supply.

2.5 Septic tanks, home aeration units, privies, sewage tanks, trench fields, serial distribution systems, beds, mound systems, and other soil absorption systems shall not be located uphill from a water supply well or ground water source unless the system is 200 feet from the source.

2.6 Trench fields, serial distribution systems, beds, mound systems, and other soil absorption systems shall be located to comply with the following distances:

MINIMUM SEPARATION DISTANCES BETWEEN SOIL ABSORPTION SYSTEMS AND NATURAL AND MANMADE FEATURES

Distance	Feature
20 feet	Foundation drain upslope from disposal area.
25 feet	Stream banks and open drainage features, whether manmade or natural.
25 feet	Manmade cuts in soil and curtain drains.
50 feet	Foundation drains downslope from disposal area.
50 feet	Manmade cuts which intersect rock or shale.
100 feet	Water supply springs and water supply wells.
200 feet	Water supply springs, and water supply wells downslope from the disposal area.

2.7 Roof drains, foundation drains, sump pumps, surface drains, or similar drains shall not be connected to an individual sewage system.

2.8 The Director may require installation of a grease interceptor or grease trap on an individual sewage system serving a dwelling or establishment discharging a large amount of grease.

2.9 No portion of a treatment unit or disposal system shall be located under area to be paved, parking lots, driving surfaces, or any type of structure.

2.10 There shall be a minimum of 3 feet between any portion of a subsurface disposal system and seasonal groundwater or rock, shale or any other impermeable layer.

2.11 A subsurface disposal system shall not be installed in soils where percolation test results show an average percolation time less than 5 minutes per inch except where all surrounding dwellings or establishments are served by a public water supply.

2.12 The evaluation of a site for the installation of an absorption system (trench fields, serial systems, absorption beds, etc.) shall be based upon percolation test results and evaluation of a 6-foot excavation. Percolation tests shall be performed in the following manner:

2.12.1 Location: At least four test holes shall be placed at equal distances over the proposed absorption field site. If the results of the tests are reasonably close, an average test result can be assumed. If the tests show extreme variations, it may be necessary to relocate the field in a more suitable area.

2.12.2 Dig or bore holes from six to eight inches in diameter at the site where the soil-absorption field is to be installed. The holes shall be dug or bored to the depth of the proposed soil absorption field (24 inch minimum).

2.12.3 Scratch the bottom and sides of the hole with a sharp pointed instrument or wire brush to remove any smeared soil surfaces which interfere with the absorption of water into the soil.

2.12.4 Remove the loose dirt from the bottom of the test holes and place two inches of coarse sand or fine gravel into the holes to prevent sealing.

2.12.5 Place an eight or ten penny nail in the wall of each hole exactly six inches above the level of sand or gravel.

2.12.6 Completely fill the test hole with water to ground level. Keep water in the hole to a depth of at least twelve inches for a minimum period of four hours before beginning the percolation rate measurement.

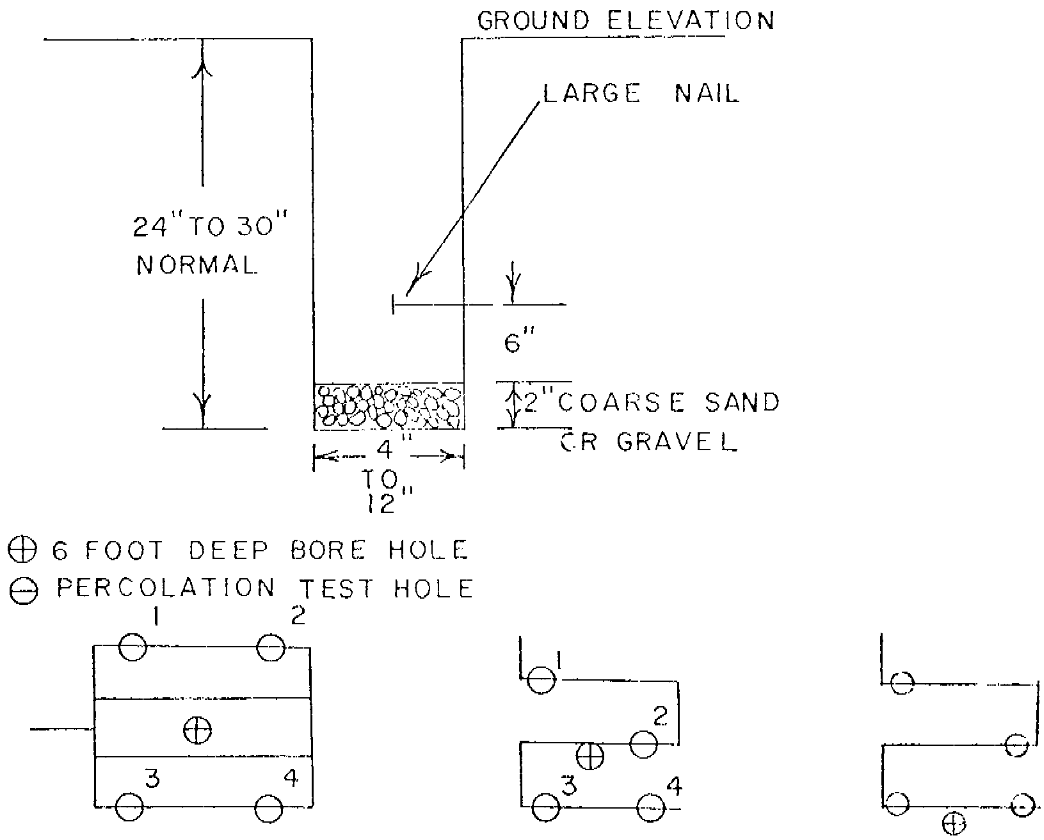
2.12.7 Percolation Rate Measurement

2.12.7.1 Upon completion of the above, adjust the water depth in the holes to the level of the nail. Accurately determine how many minutes it takes for this six inches of water (all the water) to be absorbed into the soil. This time in minutes divided by 6 gives the rate of fall (or absorption) per inch and is used to calculate the amount of absorption field required.

2.12.7.2 Average the rate of fall for all test holes. (Add the rate of fall for each test hole together and divide by the number of test holes.) This figure is the average rate of fall per inch for the absorption field and is the rate used in calculating the size of the soil absorption field required. (See Section 5.1, Part V)

2.12.8 If desired, an alternate method of measurement may be utilized such as a marked measuring stick and batter board if approved by the local health department.

SOIL PERCOLATION TEST



TYPICAL SPACING OF PERCOLATION TEST HOLES ON PROPOSED ABSORPTION FIELDS

2.12.9 <u>Six-Foot Hole</u>--A six-foot hole shall be excavated in the center of the proposed soil absorption system area to evaluate soil depth to rock table and seasonal water table. If slopes at the proposed site exceed 15%, the six-foot hole shall be excavated at the location of the lowest proposed trench of the serial system.

3.0 SEPTIC TANKS

3.1 Septic tank capacities shall be in accordance with the following table:

No. of Bedrooms	Minimum Tank Capacity (gallons)
2 or less	750
3 and 4	1000
Each additional bedroom	250 gallons each

The liquid capacity for tanks serving other than individual residences shall be determined by the following:

Up to 1500 gallons per day - Capacity = 1.5 times Daily flow.

1500 gallons per day to 4000 gallons per day - Capacity = 1000 + 75% of Daily flow

4000 gallons per day to 5000 gallons per day - Capacity = Daily flow.

Commercial establishments utilizing garbage grinders shall have tank volume increased 20%.

The volume given is liquid capacity. Liquid capacity will be measured from the bottom of the tank to the elevation of the invert of the discharge pipe.

3.2 It is recommended that dual compartment tanks or dual tanks be used. If a dual compartment tank or dual tanks are used, the volume ratio of the first compartment or tank to the second compartment or tank shall approximate 2 to 1. In a dual compartment tank, the connection between compartments shall be an elbow with a minimum diameter of 4 inches, placed so that the invert at the partition is approximately 16 inches below the liquid level.

3.3 Septic tanks may be constructed of reinforced concrete, steel, fiber glass, or other watertight and durable material approved by the Director. Septic tank construction shall comply with the following:

3.3.1 Concrete Tanks-- Top shall be reinforced concrete, 4 inches thick with 3/8-inch reinforcing bars, 6 inches on centers.

Bottom shall be of reinforced concrete, 4 inches thick, reinforcement as above, or plain poured concrete 6 inches thick.

Walls shall be a minimum of 3½ inches thick with 3/8 inch rods running both horizontally and vertically on 6 inch centers or of equivalent strength.

3.3.2 Brick and Block Tanks--Walls may be of 8-inch brick masonry with 1-inch cement plaster inside finish; or 8-inch concrete blocks with 1-inch cement plaster inside finish and cells filled with mortar.

Top shall meet the requirements for concrete tanks. Bottom shall meet the requirements for concrete tanks.

3.3.3 Metal Tanks--Tanks shall bear the Underwriters Laboratories, Inc., label or the Kentucky Code Approved designation, or be approved by the Director.

3.4 General requirements for tanks shall be as follows:

3.4.1 The invert of the inlet knockout holes shall be a minimum of 3 inches above the invert of the outlet knockout hole.

3.4.2 Knockouts must be a minimum of 4 inches in diameter.

3.4.3 The inlet, shall be provided with a cast-in-place or inserted baffle, located eight inches to twelve inches from the inlet, or with a sanitary tee. The inlet baffle or sanitary tee shall extend to a minimum depth of 12 inches but no more than the depth of the effluent baffle or sanitary tee.

3.4.4 Septic tank design and construction details shall meet the following requirements:

3.4.4.1 Minimum liquid depth shall be 30 inches.

3.4.4.2 Minimum surface area shall be 25 square feet.

3.4.4.3 There shall be a minimum of 12 inches clearance above the liquid level.

3.4.4.4 Liquid depth should not exceed 5 feet for tanks less than 3000 gallons and should not exceed 6 feet for larger tanks.

3.4.5 The outlet shall be provided with a cast-in-place or inserted baffle or sanitary tee. The effluent baffle shall be located approximately 8 inches to 12 inches from the outlet and extend up to 40% of liquid depth for all tanks with the exception of horizontal, cylindrical tanks for which the baffle shall be extended to only 35% of liquid depth.

RECOMMENDED SEPTIC TANK DIMENSIONS

Size in Gallons G	Inside Length L	Inside Width W	Inside Depth D	Sewage Depth S
750	6'-8"	3'-4"	5'-4"	4'-6"
1000	8'-0"	3'-4"	6'-0"	5'-2"
1250	8'-8"	4'-0"	6'-0"	5'-0"
1500	10'-0"	4'-0"	6'-6"	5'-0"
2000	12'-0"	4'-6"	6'-6"	5'-0"
2500	13'-6"	5'-0"	6'-6"	5'-0"

3.4.6 Access--Adequate access must be provided to each compartment of the tank for inspection and cleaning. Both the inlet and outlet devices shall be accessible; therefore, each tank shall have a minimum of one manhole and one cleanout to cover the inlet and outlet respectively.

4.0 INDIVIDUAL HOME AERATION UNITS

4.1 Individual home aeration units shall only be used where additional treatment is provided, such as subsurface absorption or other means of effluent disposal approved by the Director. (The Director may require ownership, operation, and maintenance of a home aeration unit to be under the control of a public or private utility regulated by the Public Service Commission.)

4.2 Individual home aeration units must bear the NSF seal demonstrating conformance with NSF Standard 40. In order to obtain approval, design specifications and operational data must be submitted for evaluation.

5.0 THE STANDARD SOIL ABSORPTION FIELD

5.1 The design of standard soil absorption systems shall be based upon percolation tests and sized in accordance with the chart below.

(SOIL ABSORPTION SYSTEM SIZING CHART ON NEXT PAGE)

SOIL ABSORPTION SYSTEM SIZING FOR SINGLE RESIDENCES

Percolation Test Results (Average Time in Minutes Required for Water to Fall One Inch)	Minimum Area of Soil Absorption System (Square Feet per Bedroom)
Less than 5 minutes	Consult with local health department
5 - 10 minutes	200
11 - 30 minutes	250
31 - 45 minutes	300
46 - 60 minutes	400
over 60 minutes	Consult with local health department

SINGLE ABSORPTION SYSTEM SIZING FOR ESTABLISHMENTS OTHER THAN SINGLE RESIDENCES

Percolation Test Results	Square Feet Per 1000 Gallons Sewage Per Day
Less than 5 minutes	Consult with local health department
5 - 10 minutes	1650
11 - 30 minutes	2500
31 - 45	2950
46 - 60	3300
Over 60 minutes	Consult with local health department

5.2 Construction Materials

5.2.1 Pipe for gravity distribution systems shall have a minimum diameter of 4 inches. Smaller size pipe may be utilized for pressure distribution systems.

5.2.2 Pipe utilized in the construction of soil absorption fields shall conform to the following standards;

5.2.2.1 Plastic pipe ASTM - 405 rigid, D 2729, D 2852, D 3350, D 2751, D 2836.

5.2.2.2 Asbestos cement - Class 1500 or 2400.

5.2.3 Perforated pipe utilized in the construction of soil absorption fields shall have a minimum of 2 rows of downward facing holes approximately 90^{o} apart.

5.2.4 Aggregate utilized in the construction of a soil absorption field shall be washed gravel, crushed stone, or slag, ½ to 2 inches in size with a hardness of 3 on the Moh scale of hardness. Crushed limestone shall be dolomitic. (Field test for hardness--aggregate shall scratch a copper penny without leaving a residue.)

5.2.5 Straw, hay, untreated building paper or newspaper may be utilized to cover the trenches following construction of the absorption fields.

5.3 The construction of the standard soil absorption field with either level or sloping topography shall be in accordance with the following specifications:

5.3.1 The trenches shall be 1 to 3 feet wide with a maximum depth of 36 inches and a minimum depth of 18 inches.

5.3.2 The maximum length of trench shall not exceed 100 feet. If distribution lines of greater than 100 feet are necessary, the solid sewer pipe from the septic tank shall be connected to the center of the distribution line so that the lengths on either side of the connection will be equal and not exceed 100 feet each. Absorption fields dosed by a pump may utilize trenches of greater length, but such designs must receive approval from the Director.

5.3.3 A minimum of 6 inches of aggregate shall be placed in the bottom of the trench beneath the pipe, and a minimum of 2 inches shall be placed above the pipe.

5.3.4 Trenches shall be constructed level, consistent with the topography and in such a manner so as to minimize the compaction and/or smearing of the sides and bottoms. Construction of the trenches is not to be done if the soil forms a "wire" instead of breaking apart when rolled between the hands.

5.3.5 The surface of the aggregate shall be covered with either 2 inches of straw or hay, one layer of untreated building paper or a thickness of at least 4 sheets of newspaper prior to backfilling.

5.3.6 There shall be a minimum of 6 feet of undisturbed earth between the sidewalls of each trench. Additional separation may be required in areas of severe topography and poor soil characteristics to avoid interaction between the trenches.

5.3.7 Soil absorption fields constructed in flat areas shall be designed to provide a closed continuous system or closed circuit design.

5.3.8 The backfilling of the absorption field shall be performed in such a manner to minimize the movement of heavy equipment upon the absorption field. Backfill shall be mounded over the system to allow for settling and to promote run-off from the system. The area where the absorption field has been constructed shall not be graded after backfilling.

5.3.9 The sewer line from the structure to the septic tank shall be laid on a grade of not less than 1/8 of an inch per foot (1%).

5.3.10 Soil absorption fields with greater than 1500 square feet of area shall include a distribution box. In some cases a siphon chamber or pump chamber may be required to insure even distribution of effluent.

5.4 The construction of the standard soil absorption field in areas of sloping topography shall be in accordance with the following specifications in addition to the requirements of Section 5.3; Part V.

5.4.1 Soil absorption fields constructed on sloping ground shall use a serial distribution system.

5.4.2 Soil absorption systems shall not be constructed on ground with a slope in excess of 25%.

5.4.3 The bottom of each trench and its distribution line shall be level.

5.4.4 There should be a minimum of 6 inches of ground cover over the gravel fill in each trench.

5.4.5 The absorption trenches shall follow the approximate ground surface contours so that variation in trench depth will be minimized.

5.4.6 Adjacent trenches shall be connected with a relief line, cross over, or drop box arrangement--in such a manner that each trench is completely filled with septic tank effluent to the full depth of the gravel before effluent flows to succeeding trenches. The construction of the relief line, cross-over, or drop box arrangement shall incorporate the following requirements:

5.4.6.1 The relief line or crossover shall be solid 4-inch sewer line with tight joints and with direct connection to the distribution lines or a drop box installation.

5.4.6.2 Relief lines, cross-overs, or drop boxes shall not be constructed in any location or manner where they will be subject to damage during and/or following construction. The location of these relief lines, cross-overs, or drop boxes must be marked prior to backfilling to avoid damage from heavy equipment.

5.4.6.3 The trench for the relief pipe or cross-over shall be no deeper than the top of the gravel of the trenches being connected. The line should rest on undisturbed earth and backfill shall be carefully tamped. Care must be exercised in construction of the relief or cross-over line to insure that an undisturbed block of earth remains between the trenches.

5.4.6.4 The invert of the overflow pipe in the first relief or cross-over line must be at least 4 inches lower than the invert of the septic tank outlet.

5.4.6.5 All other construction features of the disposal field shall comply with the specifications for the construction of a standard absorption field.

6.0 ABSORPTION BEDS

6.1 Absorption beds shall only be constructed when topography or space limitations prevent installation of a standard absorption field.

6.2 Absorption beds shall be sized to provide an area 30% greater than that calculated for a standard absorption field to make up for sidewall loss.

6.3 The piping distribution network within the bed shall be installed in such a manner that the pipes are located 18 inches from the sides of the bed with a minimum of 3 feet between pipes and in a continuous or closed circuit design. Construction of the bed shall be in accordance with the general design and construction requirements of the standard absorption field.

6.4 Maximum depth of a bed shall be 36 inches, minimum depth shall be 18 inches.

7.0 SHALLOW AND ELEVATED SOIL ABSORPTION SYSTEMS--Due to the shallowness of many West Virginia soils, a soil absorption system will often have to be shallow or elevated in fill to maintain the minimum distance above the seasonal high water table, rock table, or impermeable soil layer. The construction of a shallow or elevated system is permissible where there is a suitable layer of soil, sufficient room, and the natural slope is not excessive. Shallow and elevated soil absorption systems presently approved for use are: shallow fields, elevated beds, soil absorption mounds, and specifically designed systems for individual cases. Due to their complex construction and limited operational history, elevated systems should only be considered when intended to serve existing residences, to correct health hazards, or in other special cases. Shallow fields are similar to the standard absorption field, more easily constructed than elevated systems, and may be considered for new residences.

7.1 Shallow fields and elevated beds may be utilized under conditions where pervious rock table, an impermeable layer of any type, or seasonal water table is within 3½ feet of the ground surface. An elevated bed may be constructed on either level topography or sites of up to approximately 15% slope. Construction of the bed is such that the bottom of the trenches are 3 feet above the rock, any impermeable layer, or seasonal high water table.

Design of shallow fields and elevated beds shall correspond to the following examples dependent upon site conditions:

7.1.1 Shallow Field for Level Topography

7.1.1.1 Shallow fields shall in general be constructed in accordance with the procedures and requirements for standard absorption fields; however, the depth of the trenches in natural ground may vary from 6 to 18 inches. The space between trenches will vary from 6 to 12 feet depending on the trench depth. (See 5-E Diagram)

7.1.1.2 The site shall be filled prior to the construction of the trench system. The site shall be filled in accordance with requirements of Appendix B.

7.1.1.3 Topography of the site must be level, less than 3 percent slope.

7.1.1.4 The percolation rate for design considerations shall be the slower of the rates recorded for the natural soil at installation depth or for the fill material.

7.1.2 Elevated Bed for Sloping Topography

7.1.2.1 Elevated beds of this design may be utilized in areas of sloping topography where the pervious rock table, seasonal high water table, or other impermeable layer is at a minimum depth of 2 feet.

7.1.2.2 Slope of the site may vary from 3 to a maximum of 15 percent.

7.1.2.3 The foundation of the building to be served must be constructed high enough for gravity feed if a pump is not utilized.

7.1.2.4 The site shall be filled prior to the construction of the trench system. The site shall be filled in accordance with the requirements of Appendix B with the following exceptions:

A. A clay barrier or dam shall be constructed around the fill as shown in Diagram 5-F.

B. The finished grade of the fill over the bed must extend for a full ten feet beyond the bed before tapering off to a 3 to 1 slope as shown.

C. The extension of the fill shall be placed before the trench system is installed.

7.1.2.5 The absorption system shall in other respects be constructed in accordance with the requirements and procedures for absorption beds.

7.2 Soil Absorption Mounds

7.2.1 Soil and Site Requirments

7.2.1.1 Soil and site factors that restrict mound system are listed in the following tables:

(See Next Page for Table)

Restricting Factors	Soil Group	
	Slowly Permeable	Permeable Soils with High Water Tables
Percolation rate	60-120 min/in	3-60 min/in
Depth to pervious Rock	24 inches	24 inches
Depth to high water Tables	24 inches	24 inches

7.2.1.2 Minimum separation distances, as listed in Section 2.6, shall be measured from the toe of the fill to the respective feature.

7.2.2 Fill Material

7.2.2.1 Below Absorption Area--Fill material below the absorption area shall be of a medium sand texture. The sand does not have to be washed. (A medium texture sand is defined as 25% or more very coarse, coarse and medium sand and less than 50% fine and very fine sand. The design infiltration rate for medium sand texture is 1.2 gallons per square foot per day.)

7.2.2.2 Above the Absorption Area--The area above the bed or trenches (cap) should be a finer textured soil than the medium texture sand below, to allow plant growth. The soil should have a higher water holding capacity and promote increased runoff due to a more dense nature. A good quality top soil should be placed to a depth of 6 inches over the entire mound.

7.2.3 Mound Design

7.2.3.1 Daily waste water load for design purposes will be 150 gallons per day per bedroom.

7.2.3.2 Absorption Area

A. Sizing--The methods for sizing absorption area vary with the restricting factors. Examples of these methods are provided in Appendix C.

B. Configuration

1. For sites with slowly permeable soils with a seasonally high water table the absorption area shall be in the form of trenches.

2. For sites with permeable soils with a seasonally high water table the absorption area shall be in the form of a bed.

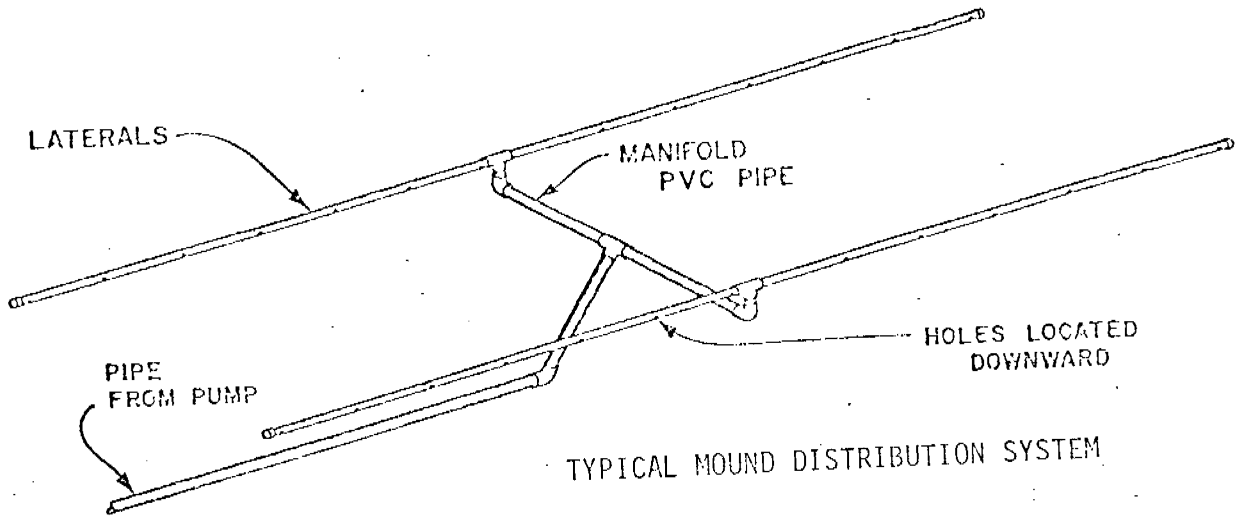
3. For sites with permeable soils over shallow pervious rock the absorption area may be either in the form of a bed or trenches.

4. The mound length runs perpendicular to the slope.

7.2.3.3 Mound Dimensions--Tables listing mound dimensions are provided in Appendix C.

7.2.4 Distribution System--Example of a typical distribution system is shown below. Pipe diameters will vary depending on the length of bed or trenches, as shown in the following table:

Perforation Spacing (inches)	Perforation Diameter (inches)	Pipe Diameter (1 inch)	(1-¼ inches)	(1-½ inches)
		Allowable Pipe Lengths (feet)		
30	3/16	34	52	70
	7/32	30	45	57
	¼	25	38	50
36	3/16	36	60	75
	7/32	33	51	63
	¼	27	42	54



TYPICAL MOUND DISTRIBUTION SYSTEM

7.2.5 Pumping System

7.2.5.1 Recommended dosign frequency is four times daily. The following table gives recommended dosing quantities for various sized systems. The dosing volume shall be the dosing quantity recommended in the table or at least ten times the lateral pipe volume, whichever is greater.

Recommended Dosing Quantity for Various Sized Homes

Home Size No. Bedrooms	Dosing Quantity Gallons Per Dose
1	50
2	75
3	115
4	150
5	200

Void Volume for Various Diameter Pipes

Diameter inches	Volume gallons per foot
1	.041
1¼	.064
1½	.092
2	.164
3	.368
4	.655
6	1.47

7.2.5.2 Specifications for design of the pump chamber are provided in Appendix A.

8.0 DUAL SOIL ABSORPTION FIELDS

8.1 Dual absorption fields may be utilized if percolation rates are between 60 minutes an inch and 90 minutes per inch.

8.2 Area reserved for absorption shall be increased to provide sufficient area for the installation of dual soil absorption fields.

8.3 Construction of the dual absorption fields shall be in accordance with the dosing requirements of the standard soil absorption system, with a junction box or valving arrangement to provide for alternation of the fields. Each of the fields shall be sized in accordance with the percolation test results. Both fields shall be of the maximum sizing required at a 60 minutes per inch rate.

9.0 INDIVIDUAL SEWAGE SYSTEMS WITH SURFACE DISCHARGE--Individual systems with surface discharge require a lengthy approval process and, if approved, regular operational supervision and maintenance. For these reasons they should only be considered for existing residences or establishments when all other means of treatment and disposal have proven ineffective and a real or potential public health hazard exists.

9.1 Individual Sewage System Effluent Disposal Ponds

9.1.1 Effluent from an individual sewage treatment system may be discharged into a stabilization pond system.

9.1.2 Individual sewage system effluent disposal ponds shall be designed on the basis of no more than 34 pounds of 5 day BOD per surface acre. For the purposes of pond sizing, it shall be assumed that there is a 25% reduction in 5 day BOD from a septic tank system and that there is a 70% reduction in 5 day BOD from a home aeration unit. However, an individual sewage system effluent pond shall be a minimum of 1800 square feet in surface area.

9.1.3 Effluent from an individual sewage system effluent disposal pond may be discharged to either an approved land treatment system, or may be discharged to a stream following disinfection, upon approval by the Director.

9.1.4 An individual sewage system effluent pond shall be constructed in accordance with Part III, Section 11, of the Design Standards.

9.2 Intermittent Surface Sand Filters

9.2.1 Effluent from an individual sewage treatment system may be discharged to intermittent surface sand filters.

9.2.2 Effluent from a surface sand filter may be discharged to a stream after chlorination in accordance with the regulations and requirements pertaining to surface discharge of waste water.

9.2.3 Intermittent surface sand filters preceded by a septic tank shall be designed on a filtration rate of 5 gallons per day, per square foot. There shall be two filters of design size to provide for alternation of operation.

9.2.4 Intermittent surface sand filters preceded by an individual aerobic treatment system shall be designed on a filtration rate of 5 gallons per day per square foot. There shall be one filter.

9.2.5 Intermittent surface sand filters serving individual sewage systems shall be provided with an insulated cover to maintain operation during inclement weather.

9.2.6 The intermittent surface sand filter must be dosed by either a pump or sewage siphon.

9.2.7 The design and construction of an intermittent surface sand filter shall be in accordance with the design and specifications provided in figure 5-G.

10.0 COMPOSTING TOILETS

10.1 Composting toilets may be utilized only in conjunction with an approved grey water treatment and disposal system.

10.2 The design and construction of a composting toilet must meet the requirements of NSF Standard 41.

11.0 INCINERATING AND CHEMICAL TOILETS

11.1 Incinerating and Chemical toilets may be utilized only in conjunction with an approved grey water disposal system.

11.2 The design, construction, and application of incinerating or chemical toilets shall be approved by the Director. The use of chemical or incinerating toilets may be approved by the Director in emergency situations, temporary usage situations, or for recreational residences, and/or isolated residences.

12.0 GREY WATER DISPOSAL SYSTEMS

12.1 Those houses served by a grey water disposal system must have a house sewer of not more than 2 inches in diameter.

12.2 Houses served by grey water disposal systems shall not have garbage disposal units.

12.3 Manufactured grey water disposal systems must be approved by the Director.

12.4 Non-commercial grey water disposal systems shall consist of the following:

12.4.1 A soil absorption field designed on the basis of a 30% reduction in water usage, and constructed in accordance with the design requirements for the standard soil absorption fields.

12.4.2 A septic tank sized according to the following:

Number of Bedrooms	Minimum Capacity
2 or less	500
3 - 4	750
5 or more	Add 210 gallons for each additional bedroom

13.0 PRIVIES

13.1 Every privy shall be provided with:

13.1.1 An earthen bottom pit with water-tight walls, or a water tight vault or other water tight receptacle with walls extending at least 6 inches above ground level.

13.1.2 A crowned curb constructed of compacted earth or other suitable material, at least 6 inches thick, extending from the walls of the pit, vault, or receptacle, in all directions for a distance of 18 inches.

13.1.3 A riser that is flytight when not in use.

13.1.4 A vent pipe extending from the pit, vault, or receptacle to a point at least 24 inches above the roof of the superstructure or through the wall of the superstructure. The vent shall be screened to prevent the entrance of flies and other insects.

13.2 Privy pits may have an earthen bottom if:

13.2.1 The privy is located in an impervious soil.

13.2.2 The privy is located below and 100 feet or more from a groundwater supply or individual well, and is so located that any leaching therefrom is disposed of in a manner that does not create a nuisance or insanitary condition.

13.2.3 The pit is 4 feet or less in depth, and it has been determined by the excavation of a 7 foot hole that rock or water table does not exist within 3 feet of the bottom of the pit.

13.3 No privy shall be located within 20 feet of any dwelling or establishment or within 10 feet of any property line.

13.4 The construction and design of the privy superstructure, vault, pit or other type receptacle shall be such as to prevent access to the vault or receptacle and the contents thereof, by flies, rats, and wild or domestic animals.

13.5 Privy vaults, pits or receptacles shall have the contents removed as often as necessary to prevent creating a nuisance or unsanitary condition.

13.6 An approved grey water disposal system shall be installed to serve those residences with indoor plumbing or running water for sinks and showers. For those residences without indoor plumbing, a shallow leach trench or pit may be installed for disposal of grey water.

14.0 RECIRCULATING TOILETS

14.1 Recirculating toilets and the piping for such toilets shall be separated from and not connected to the potable water system of any residence or other structure under any circumstances. Color coded pipe shall be used to facilitate inspection and maintenance of such installations.

14.2 Recirculating toilets shall:

14.2.1 Be installed and operated in accordance with the manufacturer's instructions.

14.2.2 Be approved by the Director before installation.

15.0 SELF CONTAINED EXCRETA DISPOSAL SYSTEMS

15.1 Self-contained excreta disposal systems shall be designed so as to prevent flies, rats, and wild or domestic animals from having access to the contents thereof.

15.2 All fixtures, tanks, or receptacles shall be constructed of impervious, easily cleanable material.

15.3 Tanks and receptacles shall:

15.3.1 Be watertight and vented to the outside air.

15.3.2 Be constantly supplied with sufficient amounts of an approved chemical agent to process and deodorize the contents thereof.

15.3.3 Have the contents removed and the tank or receptacle thoroughly cleaned as often as necessary to prevent creating a nuisance, or an unsanitary condition.

16.0 HOLDING TANKS

16.1 Holding tanks are considered a temporary means of sewage disposal to be used for periods of time not in excess of six months. Long term use of a holding tank, in excess of six months, must receive prior approval from the Director.

16.2 A holding tank must be watertight and constructed of the same materials and by the same procedures as a watertight septic tank. No openings or pipes through which the contents of the tank may be discharged will be permitted.

16.3 The liquid capacity of the holding tank shall be sufficient to contain one week design flow from the facility to be served.

16.4 Holding tanks shall be located in an area readily accessible for pumping under all weather conditions and where accidental spillage during pumping provides the least hazard to public health.

16.5 Holding tanks shall be located in accordance with the distance requirements established for septic tanks in Part V, Section 3 of the Design Standards.

16.6 Construction and installation of the holding tank shall provide adequate access to the tank for pumping, cleaning, and maintenance through manhole and cleanouts.

16.7 A holding tank installation shall be provided with an audio visual high level alarm to indicate when the tank is full and requires pumping.

16.8 A contract with a licensed sewage tank cleaner for pumping and maintenance of the tank on a regular schedule shall be required.

APPENDIX A:

Effluent Pumping for Individual Sewage Systems:

A. Pumps

1. Types of Pumps--Non-clog submersible centrifugal effluent pumps or progressing cavity positive displacement pumps.

2. Pumps shall be readily removable and replaceable without dewatering the wet well.

3. Pump should be sized to dose a soil absorption system one to four times a day. The recomended dosing cycle is twice a day, however, the dose shall be no more than 75% of the distribution pipe volume for all soil absorption systems utilizing four inch pipe.

4. The pump shall be located six to eight inches off the tank bottom to provide additional volume for sludge settlement.

B. Pump Controls

1. Relays, and electrical plug-ins or sockets shall not be located inside the wet well or access manhole. These devices must be located above-ground in a weatherproof box or in the residence.

2. A high water alarm shall be placed within the residence.

C. Distribution System

1. Pipe used for the distribution system (force main) shall be PVC SDR 21, PVC SDR 26 or Schedule 40 of 1¼" to 2" diameter.

2. All parts of the distribution system (manifold and laterals) shall be sloped slightly toward the inlet to avoid freezing and ponding of water in the system between dosing.

3. Piping shall be installed below the frost line.

D. Wet Well

1. The wet well shall be watertight and constructed of materials that will not corrode.

2. An access manhole of 24 inches or greater shall be provided to the wet well. The manhole shall be installed level with or above the ground surface and the cover secured.

3. A wet well shall be sized to provide adequate volume not only for one day reserve capacity, but also for single dose capacity plus additional capacity to maintain minimum depth for operation.

4. The wet well tank should be set lower than the septic tank to provide usage of maximum capacity of the wet well.

APPENDIX B:

Procedures for the construction of soil absorption systems in fill areas.

A. Scarify the area, removing all vegetation prior to preparing for filling. Be careful to minimize the amount of soil removed in this step.

B. Plow the area to be filled using a mold board plow, plowing perpendicular to the direction of surface slope with plow throwing soil up slope. Plow to the maximum possible depth (7 to 8 inches). Use as large a plow as possible to reduce the number of driven in furrows which result in compaction of the subsoil. (Plow soil only when the moisture content is low to avoid compaction and puddling. If a fragment of soil occurring approximately 9 inches below the surface can be easily rolled into a wire, the soil should not be plowed since the moisture content is too high. If the soil is friable or dry and falls apart when rolling it into a wire, the soil can be plowed.) Once plowing is completed, keep all vehicular traffic off the plowed area. Minimize time lag between plowing and filling. If it rains after plowing is completed, wait until the soil dries out before the start of construction. Immediate filling after plowing is highly preferable.

C. Suitable fill material shall consist of soil with a natural permeability of less than thirty minutes per inch, and should contain no large coarse fragments or debris.

D. Place the fill around the edge of the plowed area by dumping it on the plowed area, keeping the wheels of the dump truck off the plowed area. Wheel tracks in the plowed area will lead to compaction and ruts. This will allow the effluent to flow in the ruts, eventually resulting in seepage.

E. The plowed area shall be filled in 8 to 12 inch lifts, each lift being compacted to not less than 95% of the maximum density (AASHO). Initially, try to keep at least 6 inches of fill under the tracks to minimize sealing of the plowed layer.

F. Place all the fill needed in the plowed area until this area is at the desired elevation.

G. Using a bucket on the crawler tractor, dig the trenches in the filled area. Trenches should be 12 to 36 inches wide and 12 inches deep.

H. Using a bucket on the crawler, dump the gravel in the trench, leveling the gravel off to the desired elevation (6 inches above trench bottom).

I. Lay the distribution pipe in the center of the trenches, taking care to lay it level with holes downward. Using the bucket, dump gravel in the trench, taking care to disturb the pipe as little as possible. Level the gravel at the desired elevation (two inches above the top of the pipe).

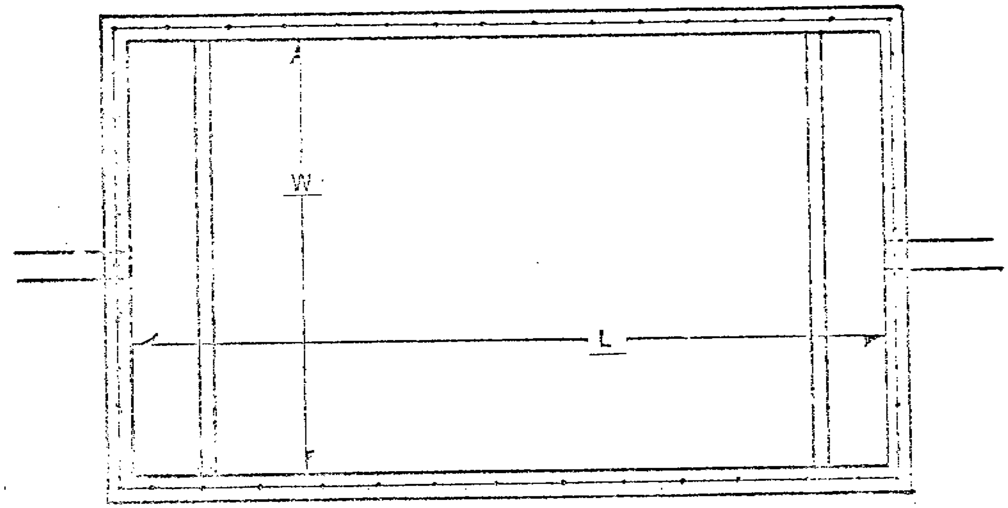
J. Place straw or hay 3 to 4 inches deep (uncompacted) over the top of the trenches.

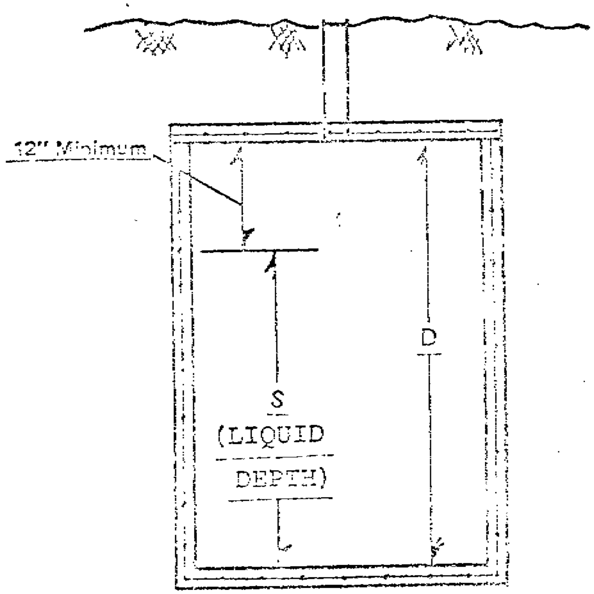
K. Place soil on top of the filled area to a depth of 1.5 feet above the top of the trenches in the center of the filled area and to a depth of 1 foot at the outside edge of the filled area. (Do not drive on the tops of the trenches as you will damage the distribution system.) The upper 6 inches of the soil should be a good top soil, equivalent to, or of a better grade than the soil used as fill material.

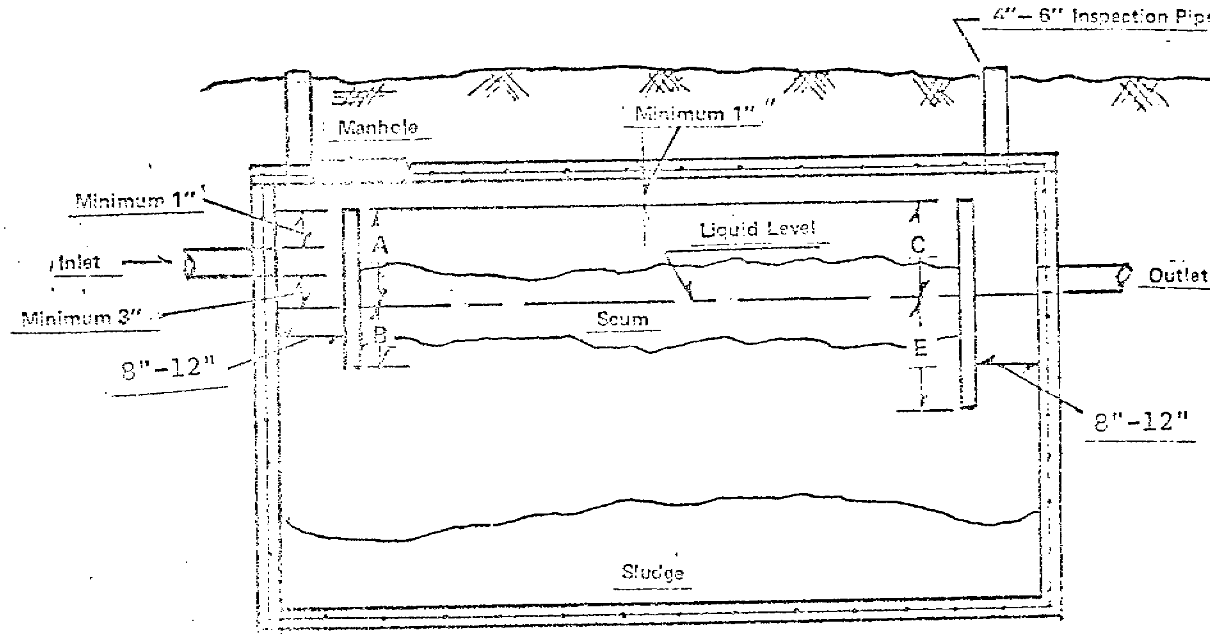
L. Landscape the filled area by planting grasses on the surface.

DIMENSIONS

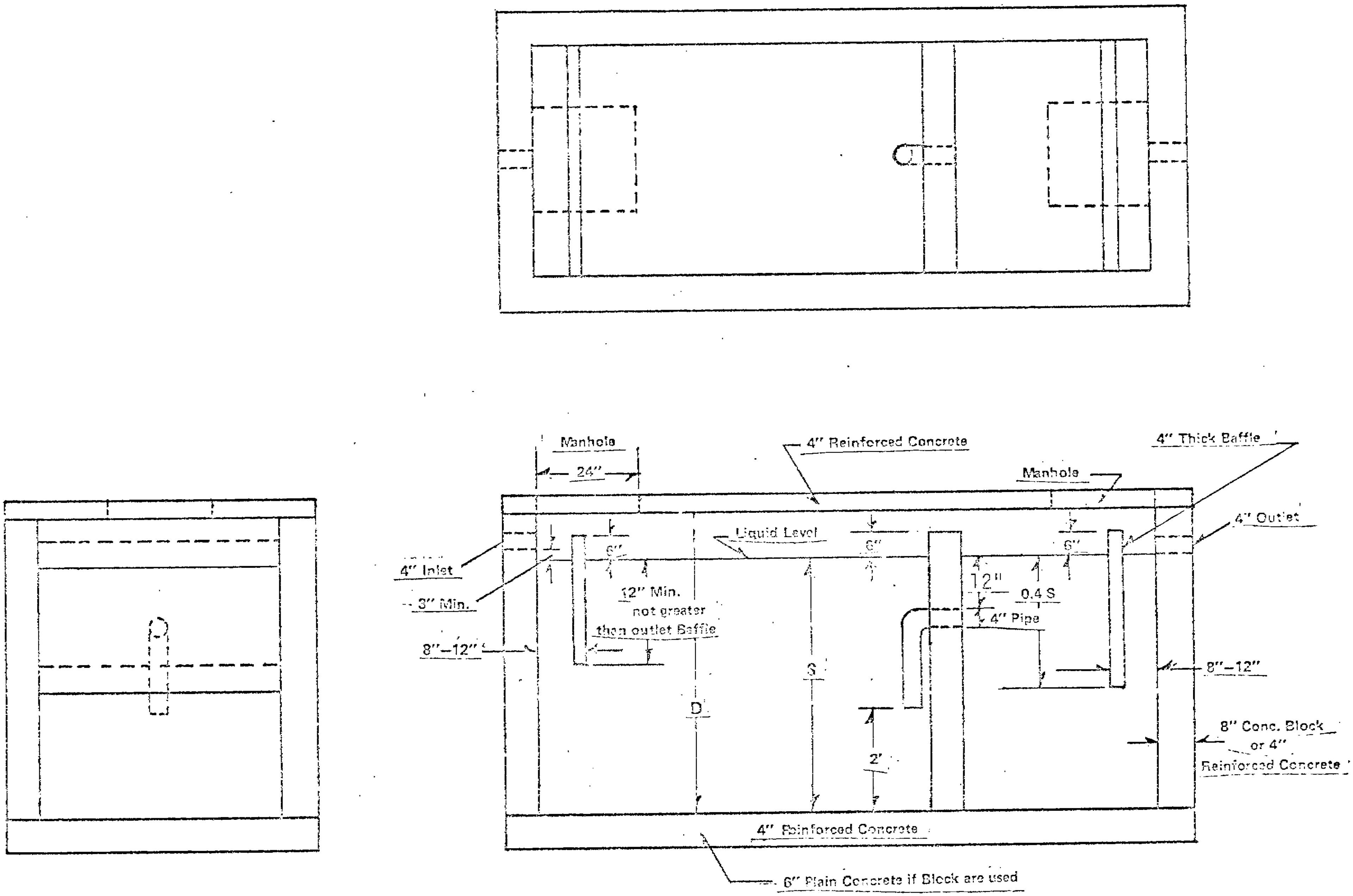
A	0.2S
B	6" Min., 0.25 Max.
C	0.2S
E	0.4 S
D	See Text Of
S	Design Standards
L	For
W	Recommendations



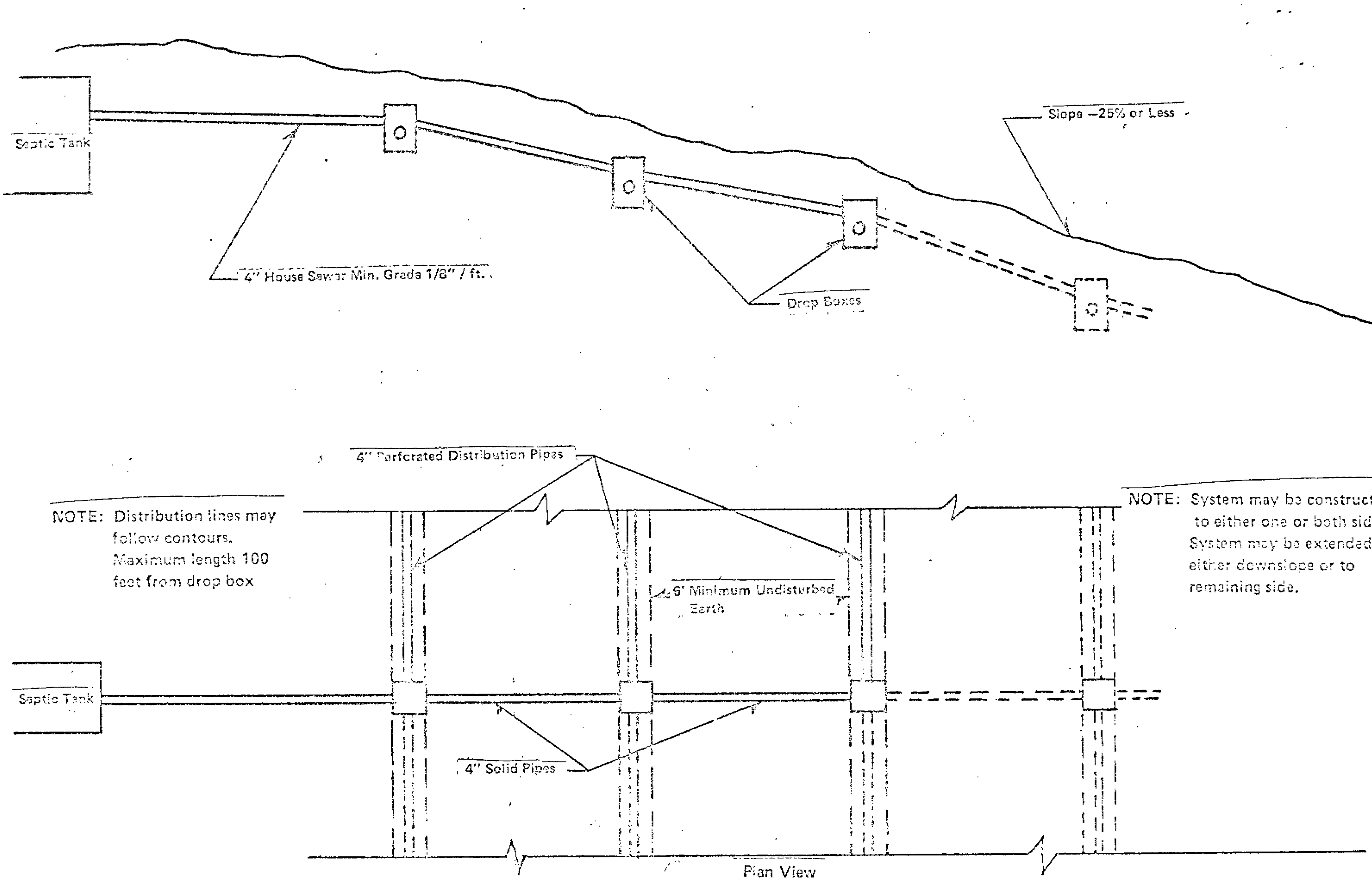




TYPICAL SINGLE COMPARTMENT SEPTIC TANK

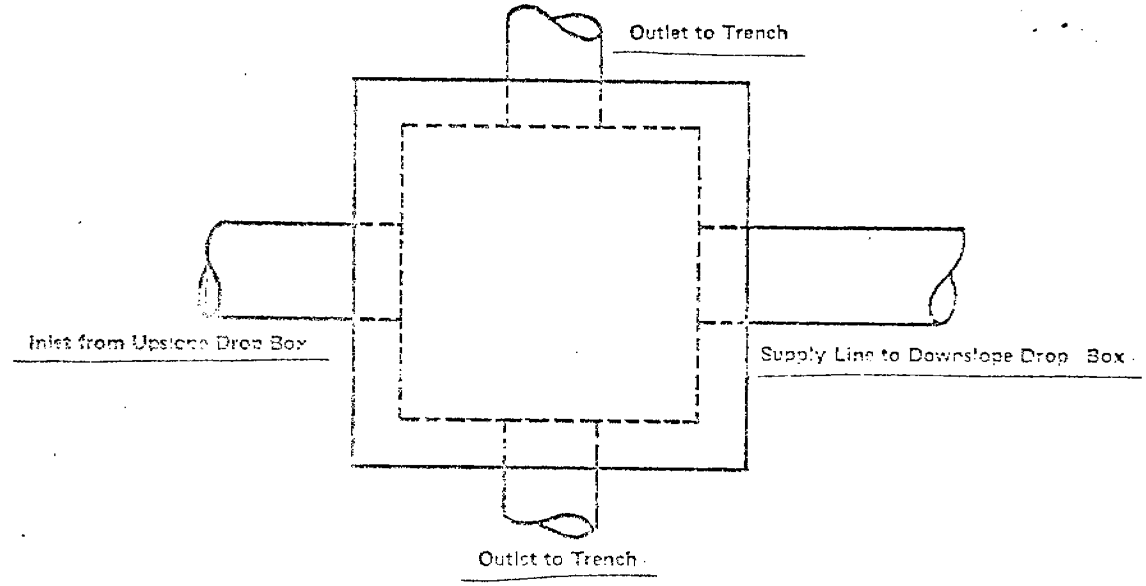


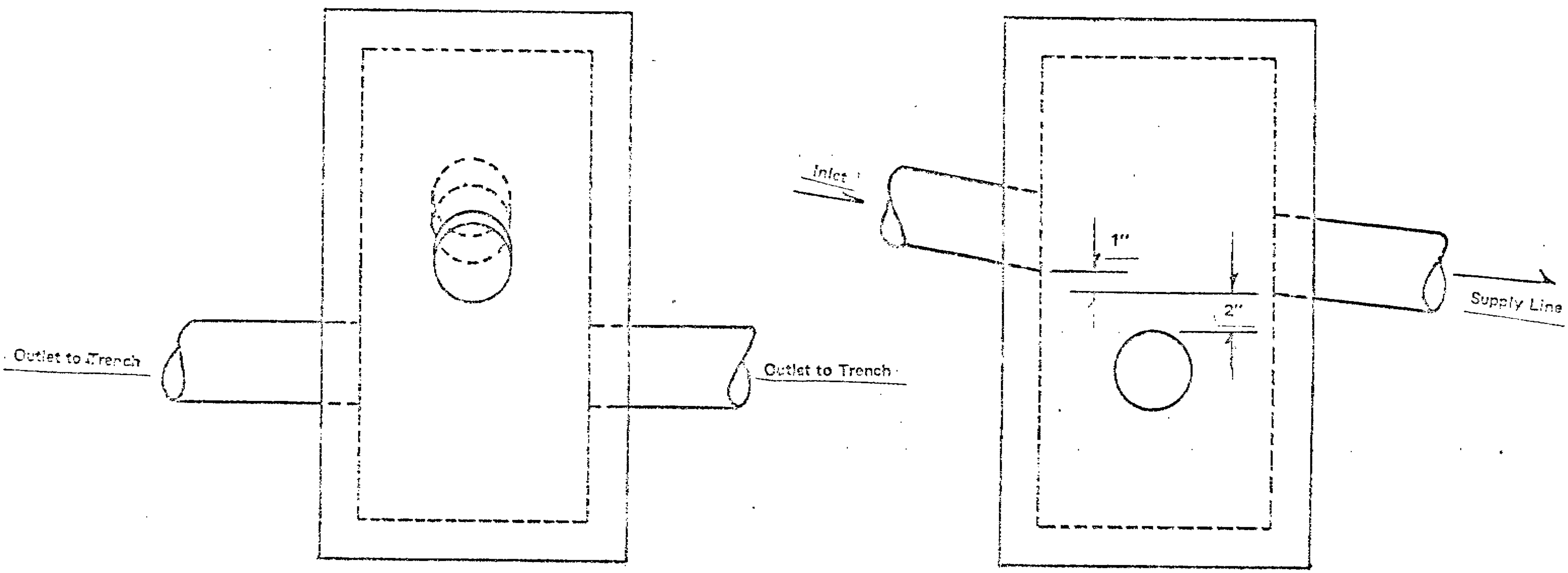
TYPICAL DUAL COMPARTMENT SEPTIC TANK



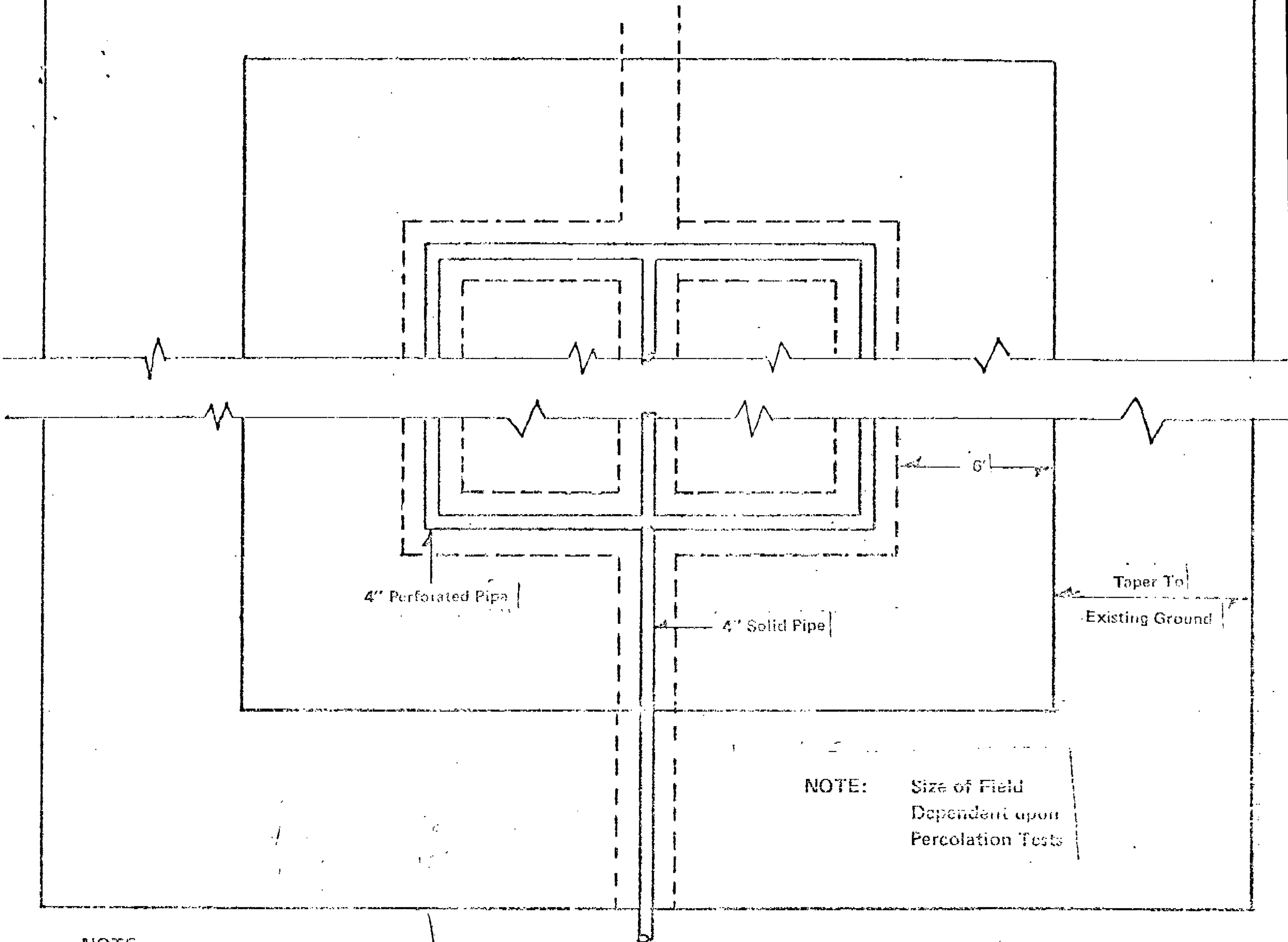
TYPICAL DROP BOX INSTALLATION
FOR
SERIAL DISTRIBUTION SYSTEMS

NOTES:
1. All pipe 4" in diameter
2. Invert of inlet 1" higher than invent of supply line to downslope Drop Box
3. Trenches may outlet to one side or both sides of Drop Box
4. Drop Boxes may be square, rectangular or cylindrical in shape and of plastic or concrete construction
5. Drop Boxes may be completely buried or placed so that the top of the box is flush with the surface of the ground



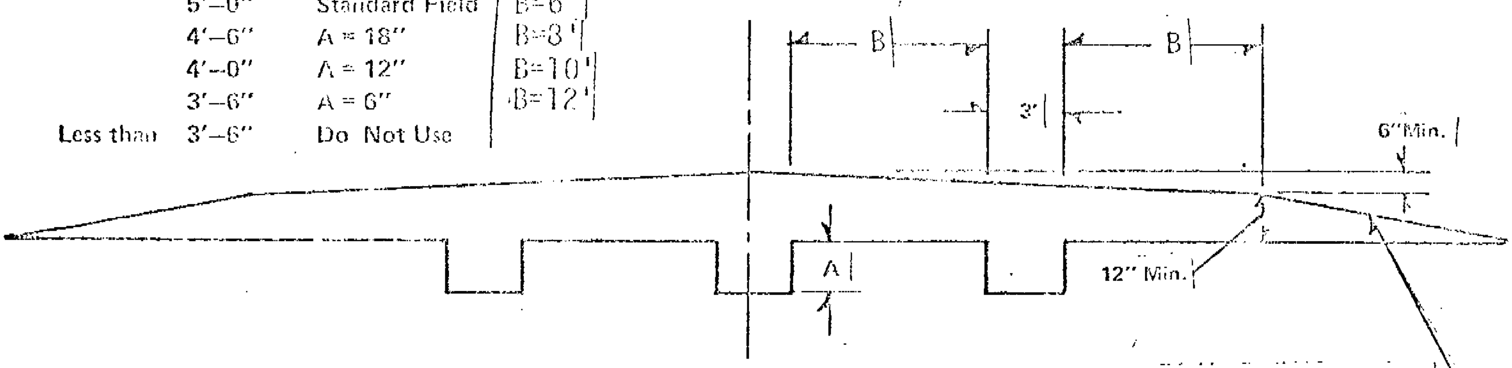


TYPICAL DROP BOX DETAIL



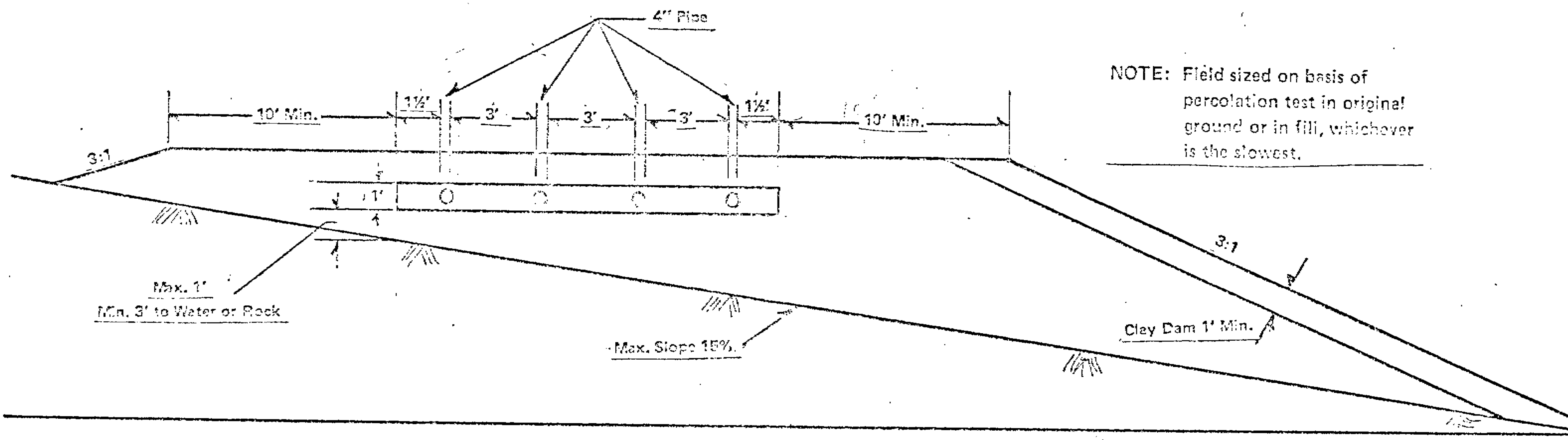
NOTE:
Depth to Ground Water or Rock

	5'–0"	Standard Field	B=6'
	4'–6"	A = 18"	B=8'
	4'–0"	A = 12"	B=10'
	3'–6"	A = 6"	B=12'
Less than	3'–6"	Do Not Use	



TYPICAL SHALLOW FIELD

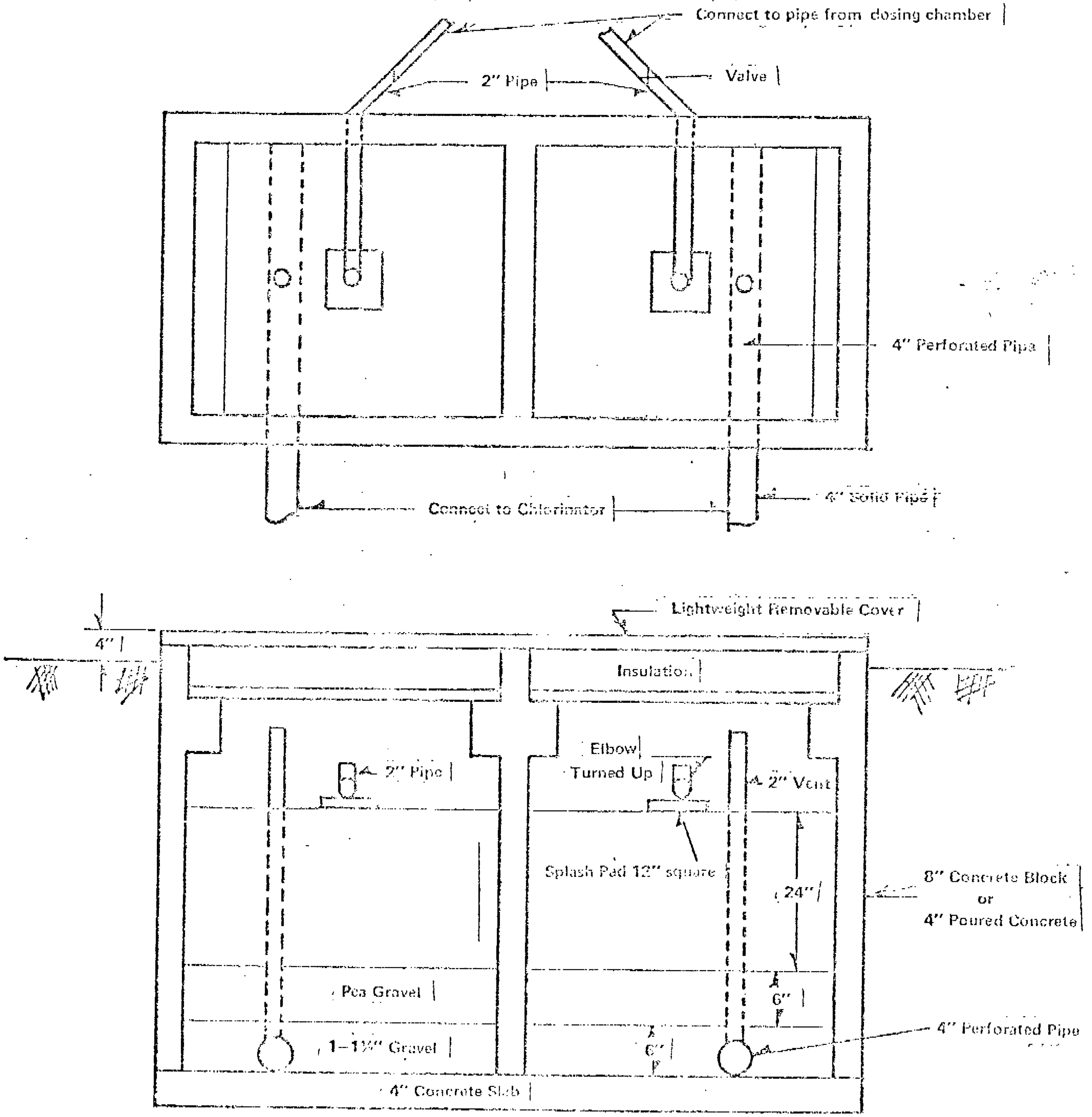
Ground Water or Rock 3½ to 5 Feet



NOTE: Field sized on basis of percolation test in original ground or in fill, whichever is the slowest.

TYPICAL ELEVATED BED
SLOPING GROUND

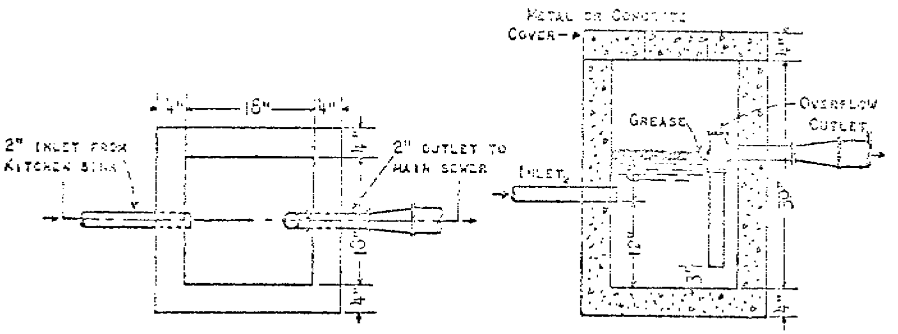
NOTES:
1. Septic tank effluent systems require dual filters
2. Individual home aeration unit effluent systems require single filters
3. Size of filters based upon 5 gal./ft^2/day



TYPICAL SURFACE SAND FILTERS

NO SCALE

Locate grease trap so that cover is easily accessible for removing and cleaning out of grease



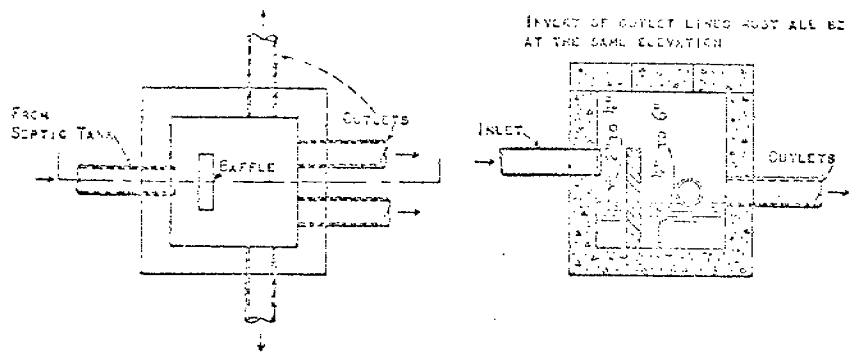
PLAN - COVER REMOVED

SECTION

GREASE TRAP

Baffle required with siphon or when an outlet is directly opposite the inlet

Invert of outlet lines must all be at the same elevation



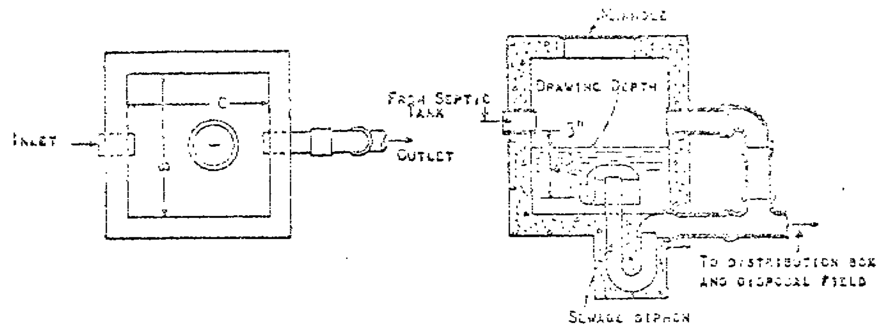
PLAN - COVER REMOVED

SECTION

DISTRIBUTION BOX

TYPICAL GREASE TRAP

TYPICAL DISTRIBUTION BOX



PLAN

SECTION

A dosing chamber and siphon should be included on all septic tanks greater than 2500 gallons capacity so that large quantities of the liquid, after passing through the tank, may be quickly and uniformly flushed into the absorption system, allowing alternate rest periods for the tile drainage system. The working capacity of the dosing chamber should be equal to one-half the volume of the tile drainage system.

DIMENSIONS OF SIPHON CHAMBER FOR SEVERAL DISPOSAL FIELD LAYOUTS

Siphon		Dosing Chamber Area	Length of Tile (feet) in Tile Absorption
Size (inches)	Drawing Depth* "A" (inches)	Width x Length "B" x "C" (sq. ft.)	Trench, Stone Filter Trench, Sand Filter Trench, or Subsurface Stone Filter
3	12	[illegible]	[illegible]
3	[illegible]	12.5	[illegible]
3	12	[illegible]	[illegible]
3	[illegible]	20.0	[illegible]
4	17	18.5	[illegible]
4	17	21.[illegible]	[illegible]
4	17	24.75	[illegible]
4	17	27.75	[illegible]
[illegible]	17	[illegible]	[illegible]
5	23	27.5	[illegible]
5	[illegible]	[illegible]	[illegible]
5	23	[illegible]	[illegible]
5	23	[illegible]	[illegible]
5	23	[illegible]	[illegible]
6	23	56.[illegible]	[illegible]

* Use drawing depth as given by manufacturer for your particular siphon.

TYPICAL
DOSING CHAMBER AND SIPHON
SEPTIC TANK

Appendix C

Design Examples and Plans for Mound Systems

Reprinted from "Design and Construction Manual for Wisconsin Mounds"
Prepared by James C. Converse, Agricultural Engineering Department,
University of Wisconsin-Madison

C-1

DESIGN EXAMPLE AND PLANS

for

MOUND

on

SLOWLY PERMEABLE SOIL

DESIGN EXAMPLE
for
MOUND
on
SLOWLY PERMEABLE SOIL

An example is used to illustrate the design procedure. The method outlined in the text is followed step by step for a situation commonly found in practice. Example plans have also been prepared for most site conditions encountered and are included following the design example. These prepared plans may be used where similar site conditions exist. In cases where these plans cannot be adapted to the site, a mound may be designed as illustrated below.

Design a mound system for a 3 bedroom home with the following site conditions. Several small trees are on the site. Rock fragments, impermeable layer, and bedrock are not a factor. (Letter Notation on Fig. A.3 and A.4 are used as references in this example).

Slope	6%
Percolation Rate	120 min/in. at 24 inches*
Ground Water	24 in.

Step 1. Select the Site

The mound site should be selected prior to house location and road building. Consider all criteria listed in Table 1 and the discussion under the "Soil and Site Requirement" section for all possible locations on the lot. Consider the difficulties in construction of the mound at the various locations. Evaluate all criteria, weigh one site against the other, then pick the best site.

Step 2. Waste Water Load

Design loading is 150 gal/day/bedroom, so with 3 bedrooms the design loading is 450 gal/day.

Step 3. Select the Fill Material

Select a medium sand texture. Use Table 2 as a guide. Sometimes it is necessary to make a judgement on the quality of sand versus the transportation costs, but there are sands which are too coarse or too fine that are not acceptable. A medium sand texture will have a design infiltration rate of 1.2 gal/ft^2/day.

Step 4. Size the Absorption Area

Since the medium textured sand is being used, the infiltration rate is 1.2 gal/ft^2/day.

*Unless there is a more restrictive horizon above.

Absorption area required = 450 gal/day ÷ 1.2 gal/ft^2/day = 375 ft^2

Since this is a slowly permeable soil with high ground water, a trench system must be used. This will spread the liquid out along the slope and minimize the encroachment of the ground water into the mound. Trench width of 2-4 ft is permissible.

Use a trench width of 3 ft. (A) then:

trench length = 375 ft^2 ÷ 3 ft. = 125 ft.

This is too long for a trench system. Use 2 or 3 parallel trenches of equal length, preferably 2 trenches. More than 3 trenches may concentrate the liquid into a small area and also result in higher mounds on sloping sites.

For a 2 trench system:

Trench length = 125 ft. ÷ 2 ft. = 62.5 ft. (B)

Trench spacing is determined by the design loading rate of the natural soil. For a soil with percolation rate of 120 min/in., the design infiltration rate is 0.24 ft^2/day. All of the effluent from the upslope trench must be absorbed by the natural soil before it reaches the downslope trench through lateral movement. Assume one-half of effluent in each trench.

Trench spacing = 225 gal/day ÷ 0.24 gal/ft^2 ÷62.5 ft.
= 15 ft. (C) from center to center

Step 5. Mound Height

Fill depth (D) = 1 ft. (min. fill depth beneath absorption area)

Fill depth (E) = D + slope (C+A)
= 1 ft. + .06 (15+3) ft.
= 1 ft. + 1.1
= 2.1 ft. (this is approximate as trenches must be at same elevation)

Trench depth (F) = 0.75 ft. minimum depth with a min. of 0.5 ft. of aggregate below distribution system.

Cap and top soil depth (H) = 1.5 ft. which include 1 ft. of subsoil and 0.5 ft. of top soil.

Cap and top soil depth (G) = 1.0 ft. which include 0.5 ft. of subsoil and 0.5 ft. of top soil.

Step 6. Mound Length and Width

End Slopes (K) = mound depth at center x 3:1 slope.
= ((D+E)÷2+F+H) x 3
= 3.8 ft. x 3
= 11.4 ft.

Upslope Width (J) = mound depth at upslope edge x 3:1 slope
x slope correction (Table 3)
= (D+F+G) x 3 x 0.85
= 2.8 ft. x 3 x 0.85
= 7 ft.

Downslope Width (I) = mound depth at downslope edge x 3:1
slope x slope correction (Table 3)
(E+F+G) x 3 x 1.22
= 3.9 ft. x 3 x 1.22
= 14 ft.

Mound Length (L) = B + 2 K
= 62.5 ft. + 2 x 11.4 ft.
= 85 ft.

Mound Width (W) = J + $A/2$ + C + $A/2$ + I
= 7 ft. + 1.5 ft. + 15 ft. + 1.5 ft. + 14.1 ft.
(C is center to center of trenches)
= 39 ft.

Step 7. Basal Area

On sloping sites the basal area is that area under and downslope of the trenches (B x (C+A+I). On level sites it is the total area under the mound (BxW) except for end areas. The design loading rate of the soil with percolation rate of 120 min/in. is 0.24 gal/ft^2/day.

Basal Area Required = daily flow ÷ infiltrative capacity of
soil
= 450 gal/day ÷ 0.24 gal/ft^2/day
= 1875 ft^2

Basal Area Available = B x (C+A+I)
= 62.5 ft. x (15 ft. + 3 ft. + 14.ft.)
= 2006 ft^2

Sufficient area is available. If it were not, then the downslope width (I) would be increased until sufficient area is available.

Step 8. Distribution System

Fig. 11 and A. 7 shows typical examples of a distribution system. Design requires selection of hole spacing and diameter, lateral diameter and spacing, manifold length and diameter. Lateral length is defined as the distance from manifold (supply end) to far (distal) end. Tee to Tee construction is preferred. For systems larger than 5 bedroom residential, procedure outlined by Otis et al. (1978) must be used.

Hole spacing = 30 in.
Hole diameter = 1/4 in.

Lateral length -

Lateral lengths normally are about 0.5 feet shorter than one-half the length of trench. In this example, lateral length would be 30.5 ft. (62.5 ft. ÷ 2 -.5 ft.).

Hole Spacing -

Holes are spaced 30 in. apart.

The following are hole spacing distances in inches from the manifold to distal end of lateral. There are 13 holes per lateral.

15, 45, 75, 105, 135, 165, 195, 225, 255, 285, 315, 345, 366*

*If the last hole, based on 30 in. spacing, is equal to or greater than 15 in. from the end of the lateral, put another hole in the end cap of the pipe or close to it.

Lateral Diameter

Lateral diameters are dependent upon lateral length, hole size and spacing. Table 4 gives the maximum allowable length for various hole diameters and hole spacing. For the 30 in. spacing and 1/4 in. hole, allowable lateral lengths for 1 in. diameter is 25 ft. and for 1 1/4 in. diameter is 38 feet. Since lateral lengths required is 30.5 ft., the lateral diameter must be 1 1/4 in.

Lateral Spacing

For trench systems, lateral spacing is from center to center of trenches. For this example, it is 15 ft.

Manifold Length

Manifold length is distance between the outside laterals or summation of all lateral spacings. For this example, it would be 15 ft.

Manifold Diameter

For these mound systems, the manifold diameter is normally 2 or 3-in., depending on the size of the pipe from the pumping chamber to the mound and the inlet location. The inlet can be in the side of the manifold between the laterals (Fig. 11 or A.7), or it can be in the end of the manifold, preferably on the upslope edge. In either case, the manifold must slope toward the inlet so it will drain. For either inlet location, the manifold can be 2-in. diameter if the pipe is 2-in. diameter. If the pipe from the pump is 3-in. diameter, and the inlet is in the end, then the manifold must be 3-in. If the inlet is in the side, then the manifold can be 2-in. diameter. For larger systems, (greater than 5 bedroom size), friction losses in manifold must be considered.

Step 9. Pumping Chamber Size

Table 7 gives the recommended pumping chamber size which is 500-750 gal. capacity. The features shown in Fig. 12 should be incorporated into it.

Step 10. Pump Size

Assume the pumping chamber is located 75 ft. from the mound center and the elevation difference is 9 ft. from the pump to the lateral invert.

Pump Capacity

Using the recommended pressure of 2 ft. at the distal end of the lateral, Table 8 gives the pump capacity of 54 gpm for 1/4-in. diameter holes for a 3 bedroom sized mound. Fig. 13 can be used to determine flow rate for other pressures.

Pump Head

The total head consists of (1) elevation difference, (2) friction loss, and (3) desired pressure at end of laterals.

(1) elevation head = 9 ft.

(2) friction loss --

Friction loss is dependent upon flow rate and pipe diameter.

Table 9 gives the friction loss/100 ft. of pipe for various diameter pipes and flow rates. For flow rate of 54 gpm, the friction loss for:

(a) 2-in. diameter is 3.98 ft/$_{100}$ ft. x 75 ft. = 3.0 ft.

(b) 3-in. diameter is .67 ft/$_{100}$ ft. x 75 ft. = .5 ft.

Either pipe can be used. Ignore friction losses for fittings. Manifold friction loss can be estimated by adding its length to the pipe length when figuring friction loss.

(3) Pressure at distal end of lateral

Fig. 13 can be used to determine pressure at supply end of lateral. For a 2 ft. pressure at distal end for 1/4-in. diameter holes, the pressure at supply end is 2.5 ft.

Total Head = 9 ft. + 3 ft. + 2.5 ft. = 14.5 ft. for 2-in. diameter pipe.
= 9 ft. + .5 ft. + 2.5 ft. = 12 ft. for 3-in. diameter pipe.

Pump size

Select a pump which would pump at least 54 gpm at 14.5 ft. of head. This given head loss is based on using a 2 in. pipe. The pump opening will be smaller.

or

Select a pump which would pump at least 54 gpm at 12 ft. of head. This given head loss is based on using a 3 in. pipe. The pump opening will be smaller.

Step 11 Dosing Quantity

From Table 5, the net recommended dosing quantity is 115 gal/dose. The void volume of the laterals needs to be checked to see if the dosing quantity is 10 times the void volume. From Table 6, the void volume of 1-1/4 in. diameter pipe is .064 gal/ft. For 122 feet of lateral, the void volume is 7.7 gal which, when multiplied by 10, is less quantity given in Table 5. Therefore, the volume is 115 gal/dose. Adjustments need to be made for flow back so 115 gal is actually dosed. For a 5-ft. diameter pumping chamber, the net liquid level differential per dose cycle is 9.4 in.

Step 12. Select the controls which will give the flexibility necessary for the proper quantity per dose (Fig. 14).

TABLE A-1. DESIGN CRITERIA FOR A MOUND FOR A 1 BEDROOM HOME ON 0 TO 6% SLOPE WITH LOADING RATES UP TO 150 GAL/DAY FOR SLOWLY PERMEABLE SOIL Fig. A.1 and A.2.

PARAMETER	SYMBOL	UNITS	SLOPE %			
			0	2	4	6
Trench Width	A	Ft	3	3	3	3
Trench Length	B	Ft	42	42	42	42
No. of Trenches	--	--	1	1	1	1
Mound Height	D	Ft	1	1	1	1
	F	Ft	0.75	0.75	0.75	0.75
	G	Ft	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5
Mound Width	J	Ft	11*	8	8	8
	I*	Ft	11	15	15	15
	W	Ft	25	26	26	26
Mound Length	K	Ft	10	10	10	10
	L	Ft	62	62	62	62
Lateral Length	P	Ft	20.	20.	20.	20.
Lateral Diameter	--	In	1	1	1	1
No. of Holes per Lateral**	--	--	9	9	9	9
Hole Spacing	--	In	30	30	30	30
Hole Diameter**	--	In	1/4	1/4	1/4	1/4

* Additional width to obtain required basal area

** Last hole is located at end of lateral which is 15" from other hole

TABLE A-2. DESIGN CRITERIA FOR A MOUND FOR A 2 BEDROOM HOME ON 0 TO 6% SLOPE WITH LOADING RATES TO 300 GAL/DAY FOR SLOWLY PERMEABLE SOIL Fig. A.3 and A.4

PARAMETER	SYMBOL	UNITS	SLOPE %			
			0	2	4	6
Trench Width	A	Ft	3	3	3	3
Trench Length	B	Ft	42	42	42	42
No. of Trenches	-	-	2	2	2	2
Trench Spacing	C	Ft	15	15	15	15
Mound Height	D	Ft	1	1	1	1
	E	Ft	1	1.4	1.7	2.1
	F	Ft	0.75	0.75	0.75	0.75
	G	Ft	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12	8	8	8
	I*	Ft	12	20	20	20
	W	Ft	42	46	46	46
Mound Length	K	Ft	10	10	10	10
	L	Ft	62	62	62	62
Lateral Length	P	Ft	20	20	20	20
Lateral Diameter	-	In	1	1	1	1
No. of Holes per Lateral**	-	-	9	9	9	9
Hole Spacing**	-	In	30	30	30	30
Hole Diameter	-	In	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	15	15	15	15
Manifold Diameter***	-	In	2	2	2	2

* Additional Width to obtain required basal area

** Last hole is located at end of lateral which is 15" from other hole

*** Diameter dependent upon size of pipe from pump and inlet position

TABLE A-3. DESIGN CRITERIA FOR A MOUND FOR A 3 BEDROOM HOME ON A 0 TO 6% SLOPE WITH LOADING RATES OF 450 GAL/DAY FOR SLOWLY PERMEABLE SOILS. Fig. A.3 and A.4.

PARAMETER	SYMBOL	UNITS	SLOPE %			
			0	2	4	6
Trench Width	A	Ft	3	3	3	3
Trench Length	B	Ft	63	63	63	63
No. of Trenches	--	--	2	2	2	2
Trench Spacing	C	Ft	15	15	15	15
Mound Height	D	Ft	1	1	1	1
	E	Ft	1	1.4	1.7	2.1
	F	Ft	.75	.75	.75	.75
	G	Ft	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12*	8	8	8
	I*	Ft	12	20	20	20
	W	Ft	42	46	46	46
Mound Length	K	Ft	10	10	10	10
	L	Ft	83	83	83	83
Lateral Length	P	Ft	31	31	31	31
Lateral Diameter	--	In	1-1/4	1-1/4	1-1/4	1-1/4
No. of Hole per Lateral**	--	--	14	14	14	14
Hole Spacing**	--	In	30	30	30	30
Hole Diameter	--	In	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	15	15	15	15
Manifold Diameter***	--	In	2	2	2	2

* Additional width to obtain required basal area.

** Last hole is located 27" from previous one.

*** Diameter dependent upon size of pipe from pump and inlet position.

TABLE A-4. DESIGN CRITERIA FOR A MOUND FOR A 4 BEDROOM HOME ON A 0 TO 6% SLOPE WITH LOADING RATES OF 600 GAL/DAY FOR SLOWLY PERMEABLE SOILS. Fig. A.5 and A.6.

PARAMETER	SYMBOL	UNITS	SLOPE %			
			0	2	4	6
Trench Width	A	Ft	3	3	3	3
Trench Length	B	Ft	56	56	56	56
No. of Trenches	--	--	3	3	3	3
Trench Spacing	C	Ft	15	15	15	15
Mound Height	D	Ft	1	1	1	1
	E	Ft	1	1.7	2.3	3.0
	F	Ft	.75	.75	.75	.75
	G	Ft	1	1	1	1
	H	Ft	2	2	2	2
Mound Width	J	Ft	12*	8	8	8
	I*	Ft	12	20	20	20
	W	Ft	57	61	61	61
Mound Length	K	Ft	12	12	12	14
	L	Ft	80	80	80	84
Lateral Length	P	Ft	27.5	27.5	27.5	27.5
Lateral Diameter	--	In	1-1/4	1-1/4	1-1/4	1-1/4
No. of Holes per Lateral**	--	--	12	12	12	12
Hole Spacing**	--	In	30	30	30	30
Hole Diameter	--	In	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	30	30	30	30
Manifold Diameter***	--	In	2	2	2	2

* Additional width to obtain required basal area

** Last hole is located at end of lateral which is 15" from previous hole.

*** Diameter dependent upon size of pipe from pump and inlet position.

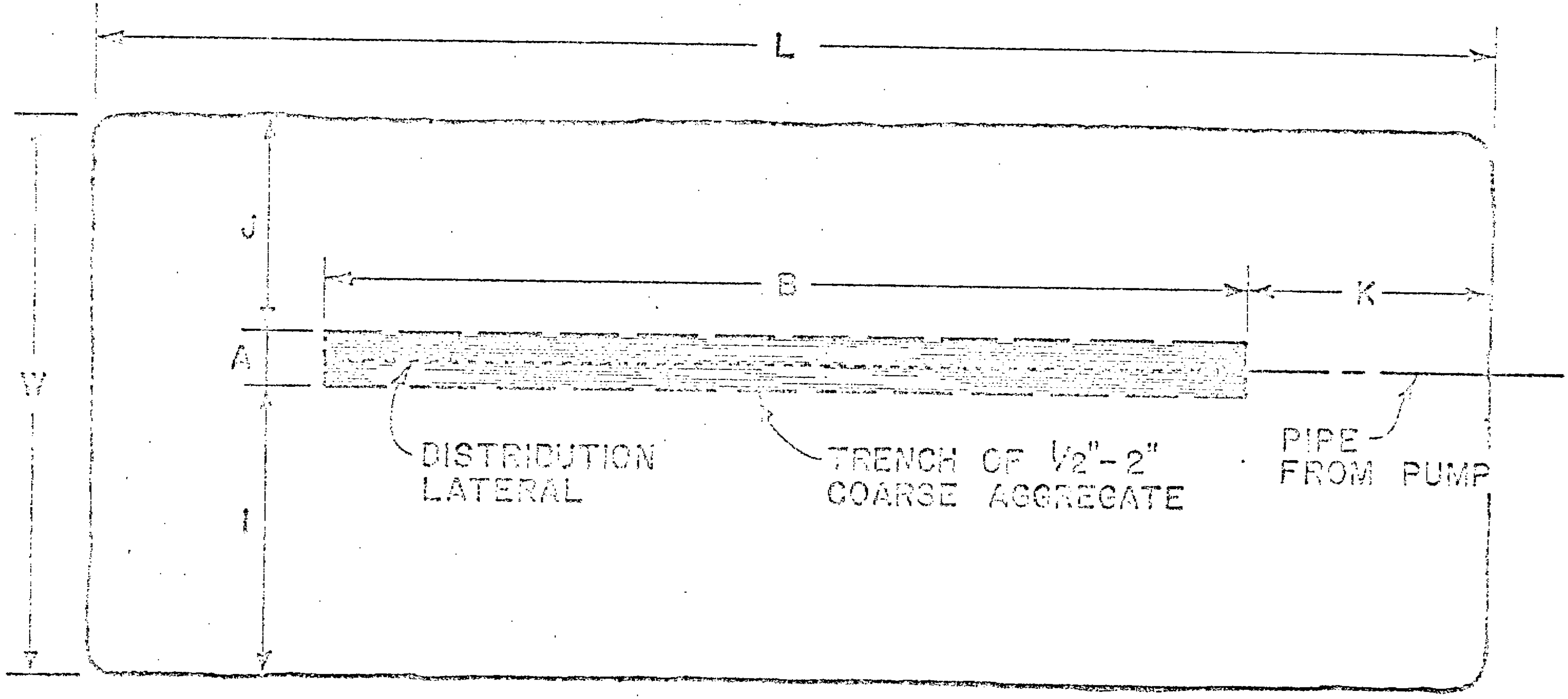


Fig. A.1 Plan view of a mound using 1 trench for absorption area.

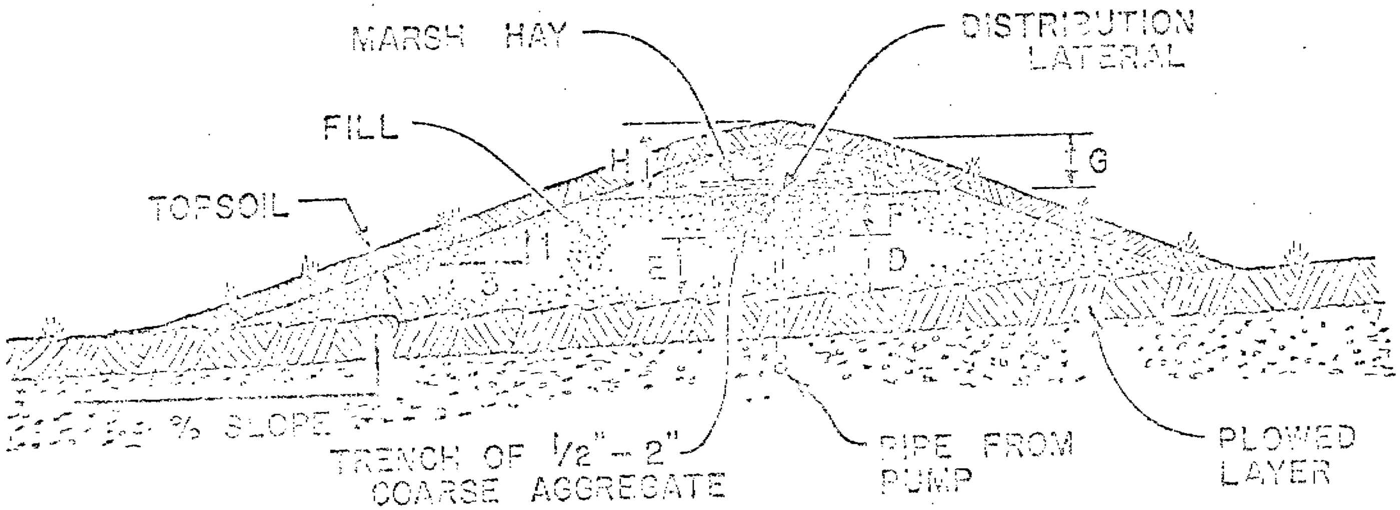


Fig. A.2 Cross section of a mound using 1 trench for absorption area.

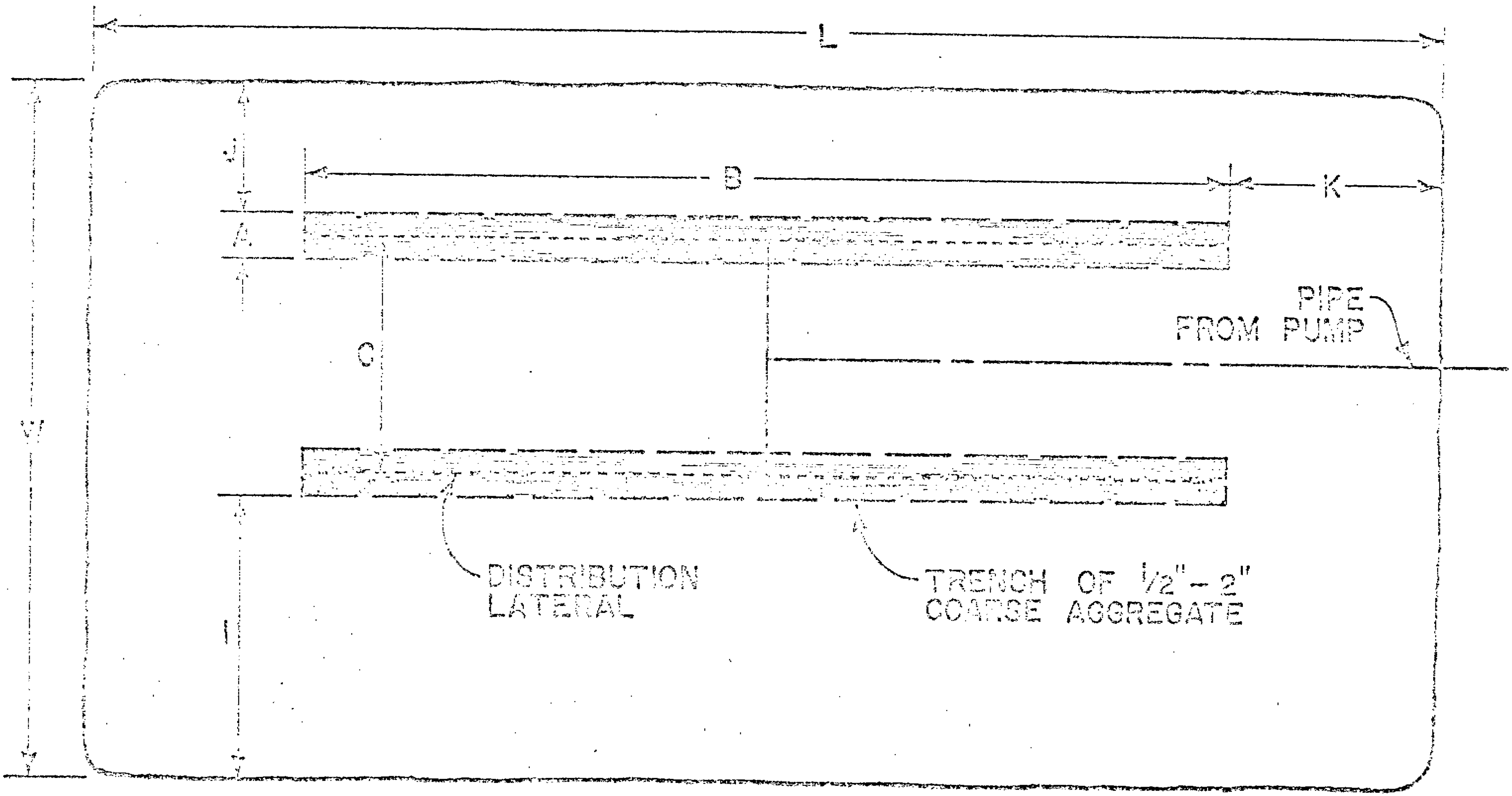


Fig. A. 3 Plan view of a mound system using 2 trenches for the absorption area.

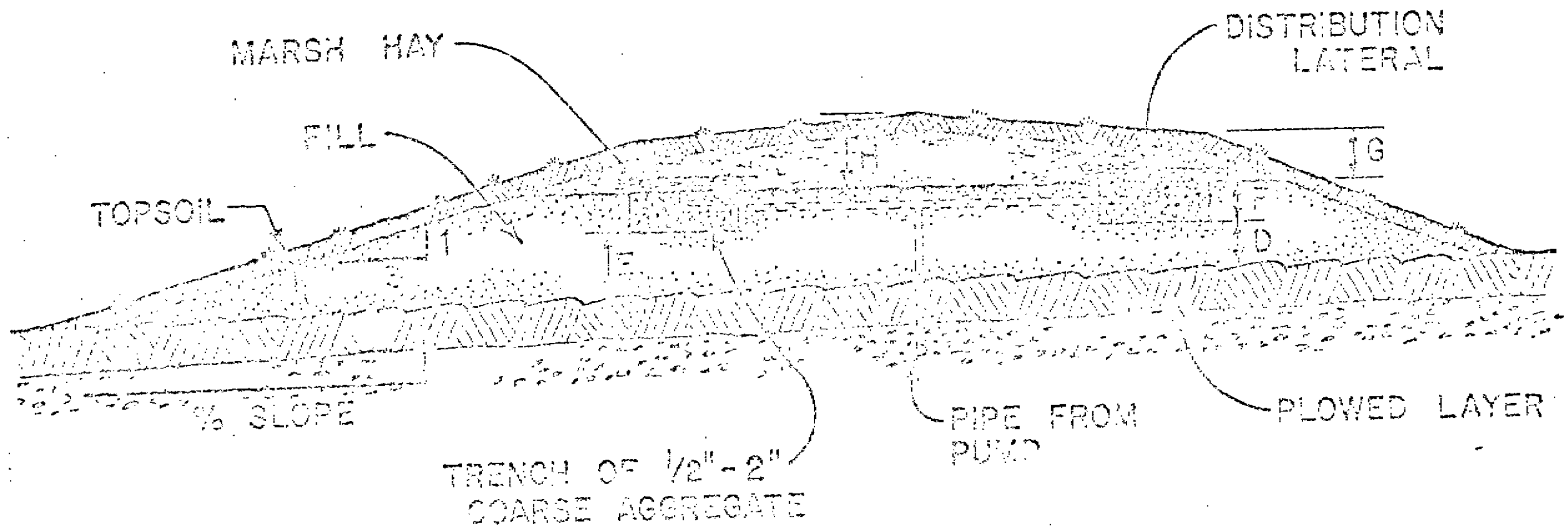


Fig. A. 4 Cross section of a mound system using 2 trenches for the absorption area.

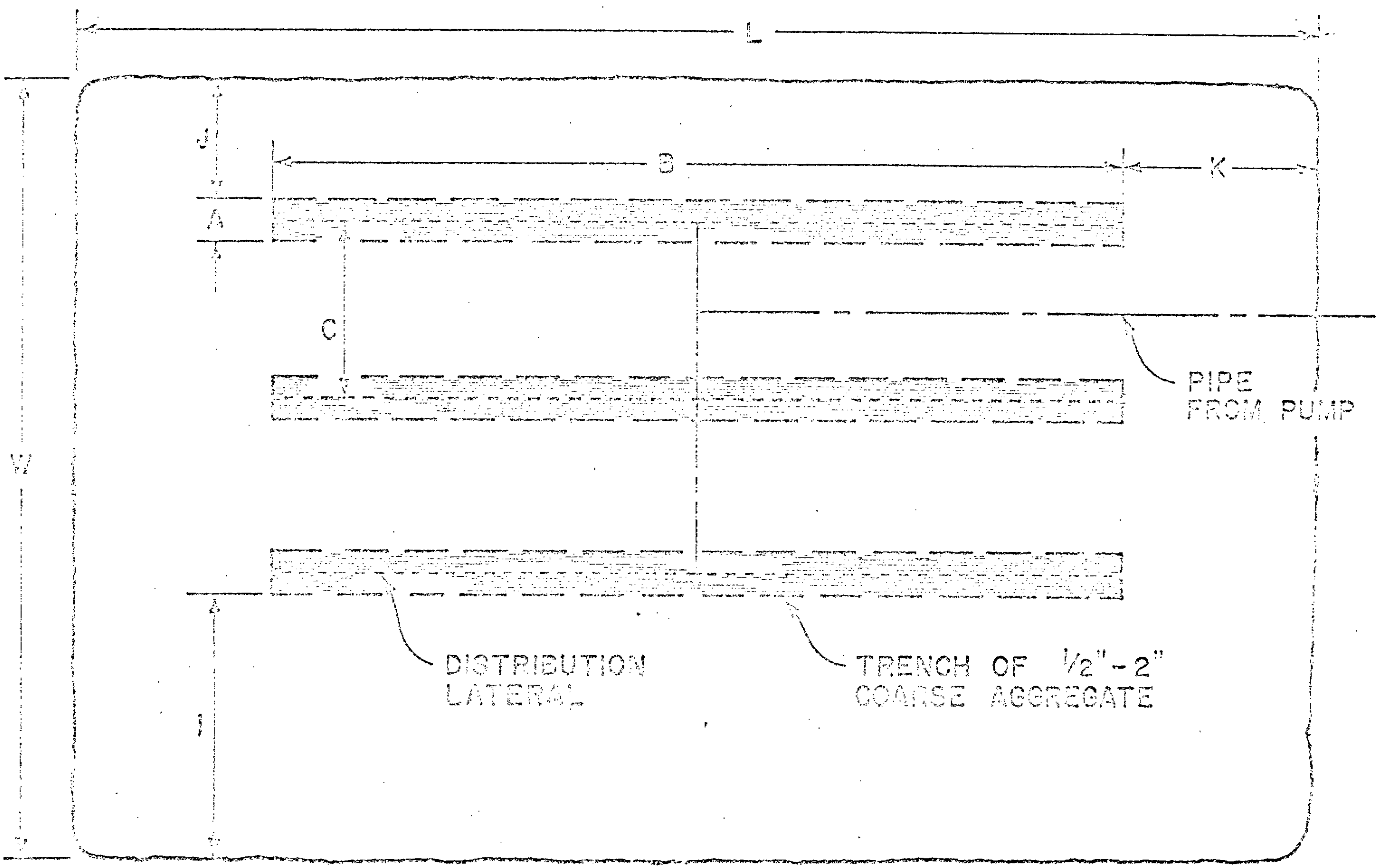


Fig. A. 5 Plan view of a mound system using 3 trenches for the absorption area.

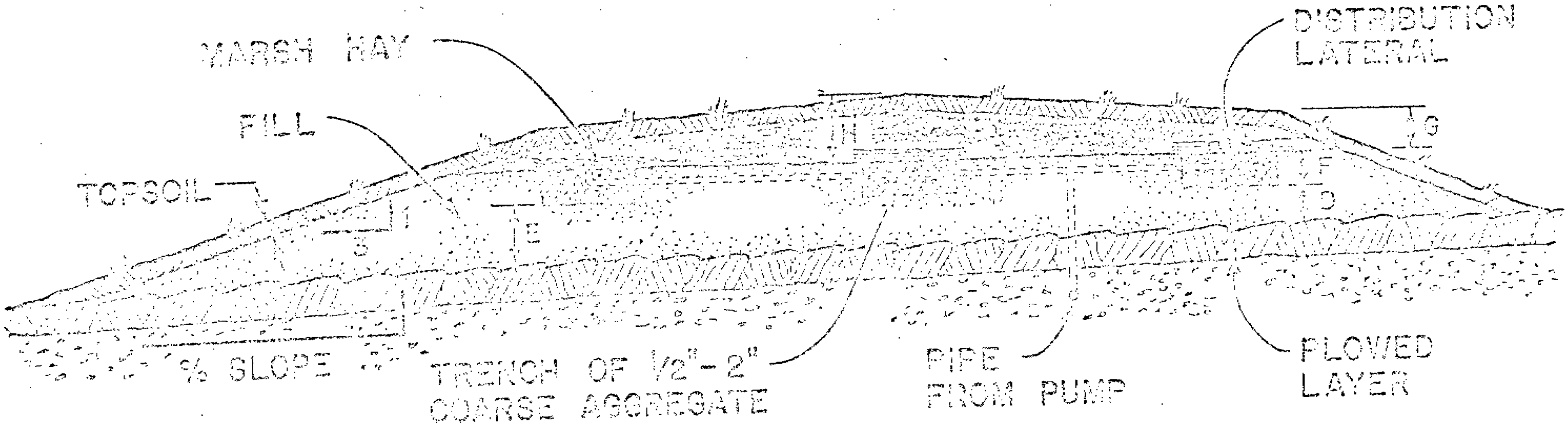


Fig. A. 6 Cross section view of a mound system using 3 trenches for the absorption area.

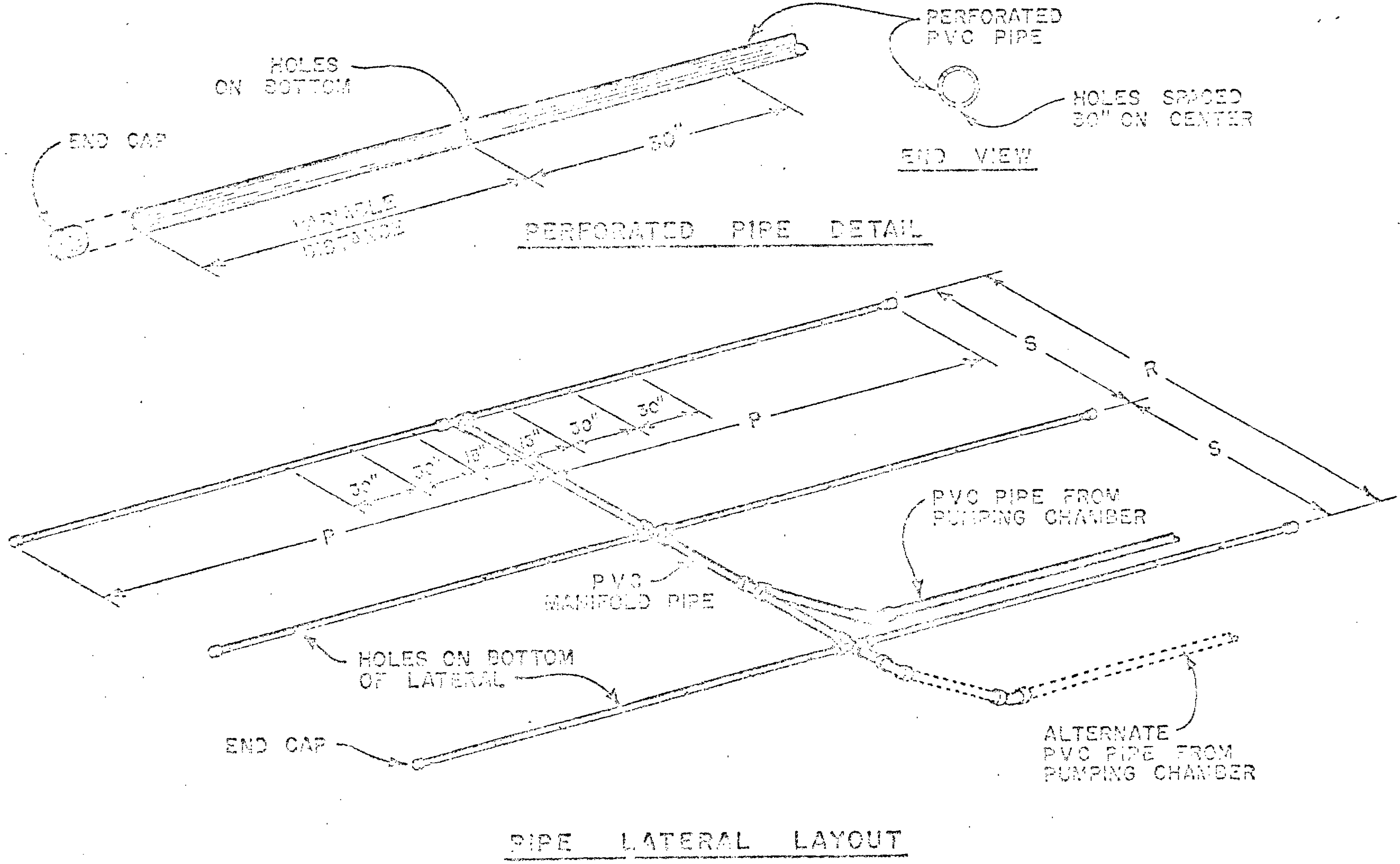


Fig. A. 7 The distribution system for a mound. One lateral is placed down the center of each trench as shown on plan views. Note alternate inlet positions. The variable distance between the last hole and the next to last hole will range between 15 and 30 in., depending upon the length of trench. Distribution system must be arranged so manifold and laterals drain after each dose.

C-2

DESIGN EXAMPLE AND PLANS

for

MOUND

on

SHALLOW PERMEABLE SOIL OVER CREVICED BEDROCK

DESIGN EXAMPLE
for
MOUND
on
PERMEABLE SHALLOW SOIL OVER CREVICED BEDROCK

An example is used to illustrate the design procedure. The method outlined in the text is followed step by step for a situation commonly found in practice. Example plans have also been prepared for most site conditions encountered and are included following the design example. These prepared plans may be used where similar site conditions exist. In cases where these plans cannot be adapted to the site, a mound may be designed as illustrated below.

Design a mound system for a 3 bedroom home with the following site conditions. Several small trees are on the site. Rock fragments, impermeable layer, and bedrock are not a factor. (Letter Notation on Fig. B.1, B.2 and B.3.

Slope	6%
Percolation Rate	50 min/in. at 12 in.
Creviced bedrock	24 in.

Step 1. Select the Site

The mound site should be selected prior to house location and road building. Consider all criteria listed in Table 1 and the discussion under the "Soil and Site Requirement" section for all possible locations on the lot. Consider the difficulties in construction of the mound at the various locations. Evaluate all criteria, weigh one site against the other, then pick the best site.

Step 2. Waste Water Load

Design loading is 150 gal/day/bedroom, so with 3 bedrooms the design loading is 450 gal/day.

Step 3. Select the Fill Material

Select a medium sand texture. Use Table 2 as a guide. Sometimes it is necessary to make a judgement on the quality of sand versus the transportation costs, but there are sands which are too coarse or too fine that are not acceptable. A medium sand texture will have a design infiltration rate of 1.2 gal/ft^2/day.

Step 4. Size the Absorption Area

Since the medium sand texture is being used, the infiltration rate is 1.2 gal/ft^2/day.

Absorption area required = 450 gal/day 1.2 gal/ft^2/day = 375 ft^2

Since high ground water isn't a problem, the bed can be square or rectangular. On sloping sites with heavier soils where there is a possibility of some lateral movement before the effluent reaches the creviced bedrock, a rectangular shape mound may be desirable. This example will use a rectangular design.

Use a bed width of 12 ft. then:

bed length = 375 ft^2 ÷ 12 ft. = 32 ft.

Step 5. Mound Height

Fill depth (D) = 2 ft. (min. fill depth beneath absorption area.

Fill depth (E) = D + slope (A)
= 2 ft. + .06 (12) ft.
= 2 ft. + .7
= 2.7 ft. (this is approximate as bed must be at same elevation)

Bed depth (F) = 0.75 ft. minimum depth with a min. of 0.5 ft. of aggregate below distribution system.

Cap and top soil depth (H) = 1.5 ft. which include 1 ft. of subsoil and 0.5 ft. of top soil.

Cap and top soil depth (G) = 1.0 ft. which include 0.5 ft. of subsoil and 0.5 ft. of top soil.

Step 6. Mound Length and Width

End Slopes (K) = mound depth at center x 3:1 slope.
= (D+E÷2+F+H) x 3
= 4.6 ft. x 3
= 14 ft.

Upslope Width (J) = mound depth at upslope edge x 3:1 slope x slope correction (Table 3).
= (D+F+G) x 3 x 0.85
= 3.8 ft.
= 10 ft.

Downslope Width (I) = mound depth at downslope edge x 3:1 slope x slope correction (Table 3)
(E+F+G) x 3 x 1.22
= 4.45 ft. x 3 x 1.22
= 16 ft.

Mound Length (L) = B + 2 K
= 32 ft. +(2 x 14)ft.
= 60 ft.

Mound Width (W) = I + A + J
= 16 + 12 + 10
= 38 ft.

Step 7. Basal Area

On sloping sites the basal area is that area under and downslope of the trenches (B x (A+I)). On level sites it is the total area under the mound (BxW) except for end areas. The design loading rate of the soil with percolation rate of 50 min/in. is 0.74 gal/ft^2/day.

Basal Area Required = daily flow ÷ infiltrative capacity of soil
= 450 gal/day ÷ 0.74 gal/ft^2/day
= 608 ft^2

Basal Area Available = B x (A+I)
= 32 ft. x(12 ft. + 16 ft.)
= 896 ft^2

Sufficient area is available. If it were not, then the downslope width (I) would be increased until sufficient area is available.

Step 8. Distribution System

Fig. 11 & B.3 show typical examples of a distribution system. Design requires selection of hole spacing and diameter, lateral diameter and spacing, manifold length and diameter. Lateral length is defined as the distance from manifold (supply end) to far (distal) end. Tee to Tee construction is preferred. For systems larger than 5 bedroom residential, procedure outlined by Otis et al. (1978) must be used.

Hole spacing = 30 in.
Hole diameter = 1/4 in.

Lateral Length –

Lateral lengths normally are about 0.5 feet shorter than one-half the length of trench. In this example lateral length would be 15.5 ft. (32 ft. ÷2 - .5 ft.)

Hole spacing –

Holes are spaced 30 in. apart.

The following are hole spacing distances in inches from the manifold to distal end of lateral. There are 7 holes per lateral.

15, 45, 75, 105, 135, 165, 186

*If the last hole, based on 30 in. spacing, is equal to or greater than 15 in. from the end of the lateral, put another hole in the end cap of the pipe or close to it.

Lateral Diameter

Lateral diameters are dependent upon lateral length, hole size and spacing. Table 4 gives the maximum allowable length for various hold diameters and hold spacing. For the 30 in. spacing and 1/4 in. hole, allowable lateral lengths for 1 in. diameter is 25 ft. and for 1 1/4 in. is 38 ft. Since lateral lengths required is 15.5 ft. the lateral diameter can be 1 in.

Lateral Spacing

Bed is 12 ft. wide, using a maximum spacing of 3 ft. between laterals. Beds will require 4 parallel laterals on each side of manifold.

Manifold Length

Manifold length is distance between the outside laterals or summation of all lateral spacings. For this example, it would be 9 ft.

Manifold Diameter

For these mound systems, the manifold diameter is normally 2 or 3 in. depending on the size of the pipe from the pumping chamber to the mound and the inlet location. The inlet can be in the side of the manifold between the laterals, (Fig. 11 or F. 3) or it can be in the end of the manifold, preferably on the upslope edge. In either case, the manifold must slope toward the inlet so it will drain. For either inlet location, the manifold can be 2 in. diameter if the pipe is 2 in. diameter. If the pipe from the pump is 3 in. diameter, and the inlet is in the end, then the manifold must be 3 in. If the inlet is in the side, then the manifold can be 2 in. diameter. For larger systems (greater than 5 bedroom size), friction losses in manifold must be considered.

Step 9. Pumping Chamber Size

Table 7 gives the recommended pumping chamber size which is 500-750 gal. capacity. The features shown in Fig. 12 should be incorporated into it.

Step 10. Pump Size

Assume the pumping chamber is located 75 ft. from the mound center and the elevation difference is 9 ft. from the pump to the lateral invert.

Pump Capacity

Using the recommended pressure of 2 ft. at the distal end of the lateral, Table 8 gives the pump capacity of 54 gpm for 1/4 in. diameter holes for a 3 bedroom sized mound. Fig. 13 can be used to determine flow rate for other pressures.

Pump Head

The total head consists of (1) elevation difference, (2) friction loss, and (3) desired pressure at end of laterals.

(1) elevation head = 9 ft.

(2) friction loss --

Friction loss is dependent upon flow rate and pipe diameter.

Table 9 gives the friction loss/100 ft. of pipe for various diameter pipes and flow rates. For flow rate of 54 gpm the friction loss is:

(a) 2 in. dia. is 3.98 ft/100 ft. x 75 ft. = 3.0 ft.

(b) 3 in. dia. is .67 ft/100 ft. x 75 ft. = .5 ft.

Either pipe can be used. Ignore friction losses for fittings. Manifold friction loss can be estimated by adding its length to the pipe length when figuring friction loss.

(3) Pressure at distal end of lateral

Fig. 13 can be used to determine pressure at supply end of lateral. For a 2 ft. pressure at distal end for 1/4 in. diameter holes, the pressure at supply end is 2.5 ft.

Total Head = 9 ft. + 3 ft. + 2.5 ft. = 14.5 ft. for 2 in. dia. pipe.
= 9 ft. + .5 ft. + 2.5 ft. = 12 ft. for 3 in. dia. pipe.

Pump Size

Select a pump which would pump at least 54 gpm at 14.5 ft. of head. This given head loss is based on using a 2 in. pipe. The pump opening will be smaller.

or

Select a pump which would pump at least 54 gpm at 12 ft. of head. This given head loss is based on using a 3 in. pipe. The pump opening will be smaller.

Step 11. Dosing Quantity

From Table 5 the net recommended dosing quantity is 115 gal/dose. The void volume of the laterals needs to be checked to see if the dosing quantity is 10 times the void volume. From Table 6 the void volume of 1 1/4" diameter pipe is .041 gal/ft. For 12e feet of lateral, the void volume is 5.1 gal which, when multiplied by 10, is less quantity given in Table 5. Therefore, the volume is 115 gal/dose.
Adjustments need to be made for flow back so 115 gal is actually dosed. For a 5 ft. dia. pumping chamber, the net liquid level differential per dose cycle is 9.4 in.

Step 12. Select the controls which will give the flexibility necessary for the proper quantity per dose (Fig. 14).

TABLE B-1. DESIGN CRITERIA FOR A 3 BEDROOM HOME FOR A MOUND ON 0 TO 12% SLOPE WITH LOADING RATES UP TO 350 GAL/DAY FOR SHALLOW PERMEABLE SOIL OVER CREVICED BEDROCK. B.1, 2, 3 and 4.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	--	%	0	2	4	6	8	10[3]	12[3]
Bed Width	A[5]	Ft	10	10	10	10	10	10	10
Bed Length	B	Ft	13	13	13	13	13	13	13
Mound Height	D	Ft	2	2	2	2	2	2	2
	E	Ft	2	2.2	2.4	2.6	2.8	3.0	3.2
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12	11	10	10	9	9	9
	I	Ft	12	13	14	17	18	21	26
	W	Ft	34	34	34	37	37	41	45
Mound Length	K	Ft	12	12	12	13	13	13	15
	L	Ft	37	37	37	39	39	39	43
Lateral Length	P[4]	Ft	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Lateral Diameter	--	In	1	1	1	1	1	1	1
No. of Holes per Lateral	--	--	6	6	6	6	6	6	6
Lateral Spacing	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral[1]	--	Ft	6	6	6	6	6	6	6
Hole Spacing[1]	--	In	30	30	30	30	30	30	30
Hole Diameter	--	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	6	6	6	6	6	6	6
Manifold Diameter[2]	--	In	2	2	2	2	2	2	2

1 Last hole is located at end of lateral which is 15" from previous hole

2 Diameter dependent upon size of pipe from pump and inlet position.

3 On steep sloping sites of 10-12% it may be desirable to reduce depth D to 1.5 ft as E isn't so great or reduce the width of bed.

4 For a manifold with laterals only on one side.

5 Beds can be any desired width.

TABLE B-2. DESIGN CRITERIA FOR A 2 BEDROOM HOME FOR A MOUND ON 0 TO 12% SLOPE WITH LOADING RATES UP TO 300 GAL/DAY FOR SHALLOW PERMEABLE SOIL OVER CREVICED BEDROCK.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	--	%	0	2	4	6	8	10[3]	12[3]
Bed Width	A[5]	Ft	10	10	10	10	10	10	10
Bed Length	B	Ft	25	25	25	25	25	25	25
Mound Height	D	Ft	2	2	2	2	2	2	2
	E	Ft	2	2.2	2.4	2.6	2.8	3.0	3.2
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12	11	10	10	9	9	9
	I	Ft	12	13	14	17	18	21	26
	W	Ft	34	34	34	37	37	41	45
Mound Length	K	Ft	12	12	12	13	13	13	15
	L	Ft	49	49	49	51	53	51	55
Lateral Length	P[4]	Ft	12	12	12	12	12	12	12
Lateral Diameter	--	In	1	1	1	1	1	1	1
No. of Laterals	--	--	6	6	6	6	6	6	6
Lateral Spacing	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral[1]	--	--	5	5	5	5	5	5	5
Hole Spacing[1]	--	In	30	30	30	30	30	30	30
Hole Diameter	--	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	6	6	6	6	6	6	6
Manifold Diameter[2]	--	In	2	2	2	2	2	2	2

1 End of lateral is 9" from last hole; since it isn't equal to or greater than 15 no hole is placed at end of lateral.

2 Diameter dependent upon size of pipe from pump and inlet position.

3 On steep sloping sites of 10-12% it may be desirable to reduce depth D to 1.5 ft so F isn't so great or reduce the width of bed.

4 This design is based on a manifold with laterals on both sides. It could be designed using 24 ft laterals with manifold at end.

5 Bed can be any desired width.

TABLE B-3. DESIGN CRITERIA FOR A 3 BEDROOM HOME FOR A MOUND ON 0 TO 12% SLOPE WITH LOADING RATES UP TO 450 GAL/DAY FOR SHALLOW PERMEABLE SOIL OVER CREVICED BEDROCK.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	-	%	0	2	4	6	8	10[3]	12[3]
Bed Width	A[5]	Ft	10	10	10	10	10	10	10
Bed Length	B	Ft	38	38	38	38	38	38	38
Mound Height	D	Ft	2	2	2	2	2	2	2
	E	Ft	2	2.2	2.4	2.6	2.8	3.0	3.2
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12	11	10	10	9	9	9
	I	Ft	12	13	14	17	18	21	26
	W	Ft	34	34	34	37	37	41	45
Mound Length	K	Ft	12	12	12	13	13	13	15
	L	Ft	62	62	62	64	64	64	68
Lateral Length	P	Ft	18.5	18.5	18.5	18.5	18.5	18.5	18.5
Lateral Diameter	-	In	1	1	1	1	1	1	1
No. of Laterals	-	-	6	6	6	6	6	6	6
Lateral Spacing	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral[1]	-	-	8	8	8	8	8	8	8
Hole Spacing[1]	-	In	30	30	30	30	30	30	30
Hole Diameter	-	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	6	6	6	6	6	6	6
Manifold Diameter[2]	-	In	2	2	2	2	2	2	2

1 Last hole is located at end of lateral which is 27" from previous hole.

2 Diameter dependent upon size of pipe from pump and inlet position.

3 On steep sloping sites of 10-12% it may be desirable to reduce depth D to 1.5 ft so I isn't so great or reduce the width of bed.

4 Use a manifold with lateral only on one side.

5 Beds can be any desired width.

TABLE B-4. DESIGN CRITERIA FOR A 4 BEDROOM HOME FOR A MOUND ON 0 TO 12% SLOPE WITH LOADING RATES UP TO 600 GAL/DAY FOR SHALLOW PERMEABLE SOIL OVER CREVICED BEDROCK.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	–	%	0	2	4	6	8	10[3]	12[3]
Bed Width	A[5]	Ft	10	10	10	10	10	10	10
Bed Length	B	Ft	50	50	50	50	50	50	50
Mound Height	D	Ft	2	2	2	2	2	2	2
	E	Ft	2	2.2	2.4	2.6	2.8	3.0	3.2
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	12	11	10	10	9	9	9
	I	Ft	12	13	14	17	18	21	26
	W	Ft	34	34	34	37	37	41	45
Mound Length	K	Ft	12	12	12	13	13	13	15
	L	Ft	74	74	74	76	76	76	78
Lateral Length	P[2]	Ft	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Lateral Diameter	–	In	1	1	1	1	1	1	1
No. of Laterals	–	–	6	6	6	6	6	6	6
Lateral Spacing	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral[1]	–	–	10	10	10	10	10	10	10
Hole Spacing[1]	–	In	30	30	30	30	30	30	30
Hole Diameter	–	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	F	Ft	6	6	6	6	6	6	6
Manifold Diameter[2]	–	In	2	2	2	2	2	2	2

1 End of lateral is 9" from last hole; since it isn't equal to or greater than 15, no hole is placed at end of lateral.

2 Diameter dependent upon size of pipe from pump and inlet position.

3 On steep slopes of 10-12% it may be desirable to reduce depth D to 1.5 ft so L isn't so great or reduce the width of bed.

4 Use a manifold with lateral only on one side.

5 Beds can be any desired width

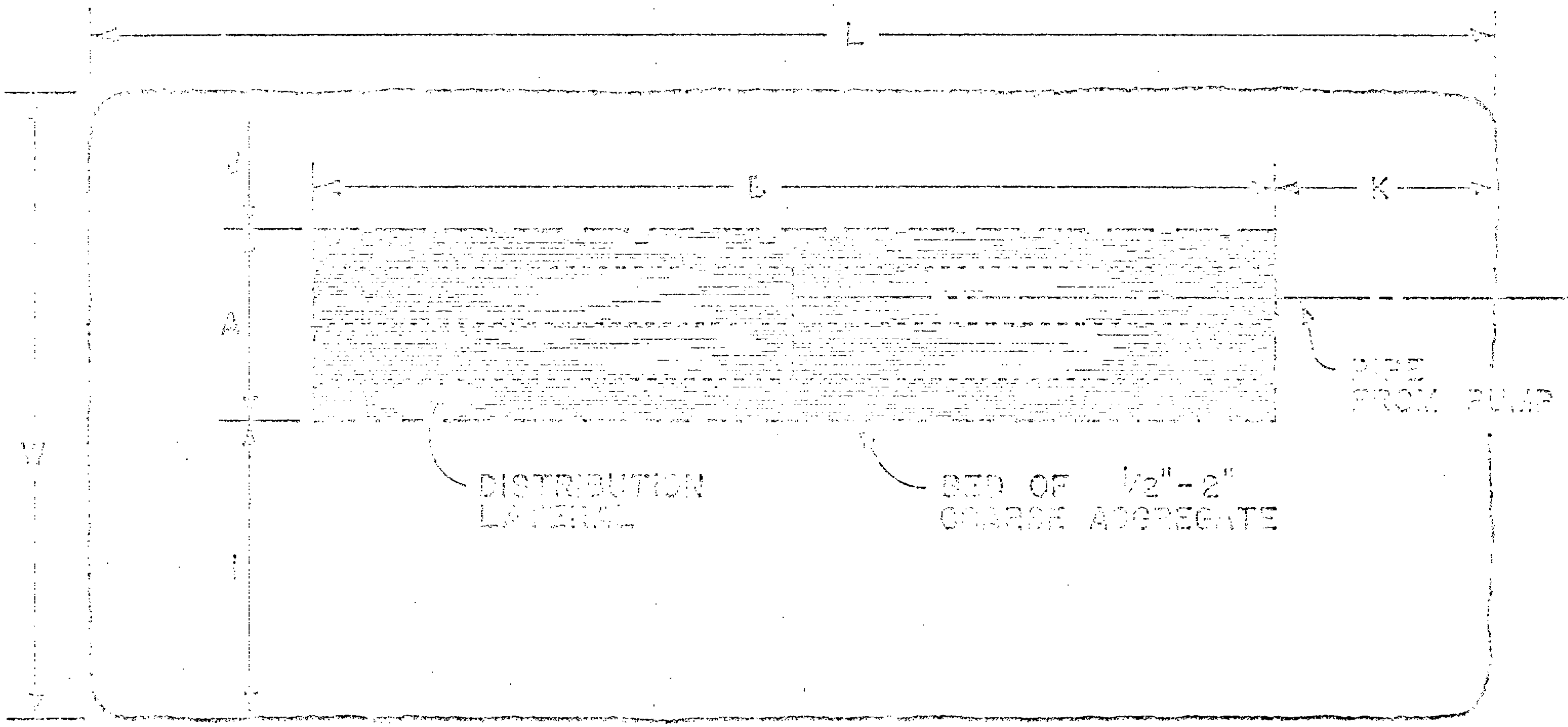


Fig. D. 1 Plan view of a mound using a bed for the absorption area. For the creviced bedrock site, the bed slope can be rectangular or square.

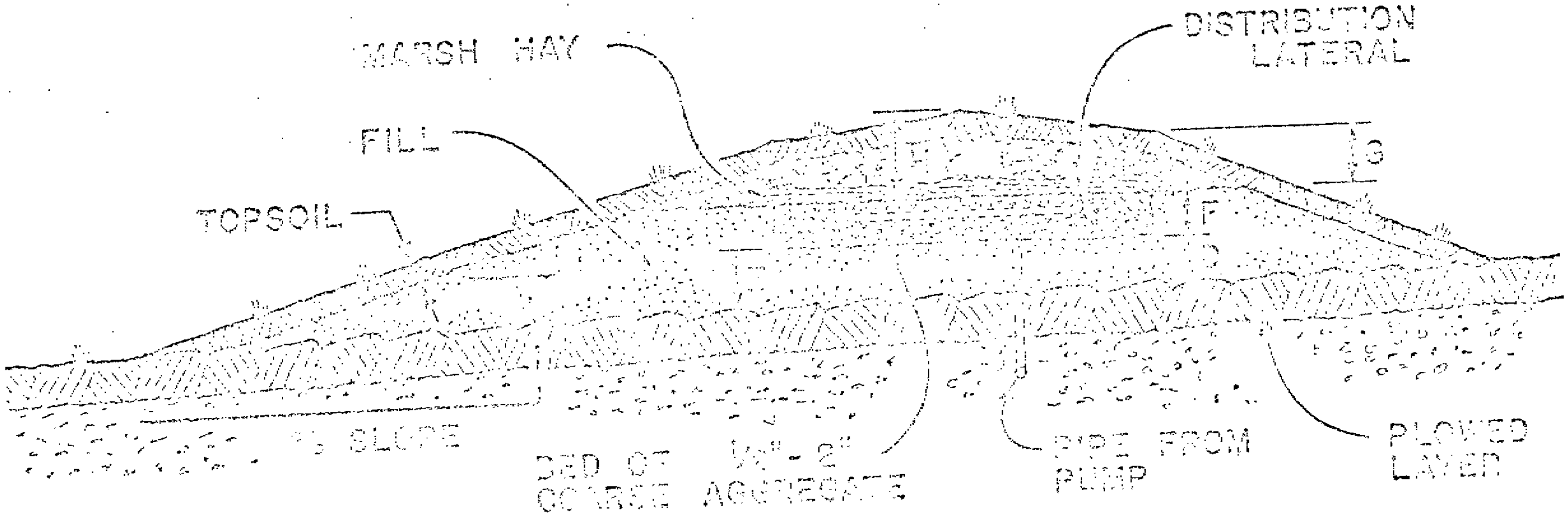


Fig. B. 2 Cross section of a mound using a bed as the absorption area.

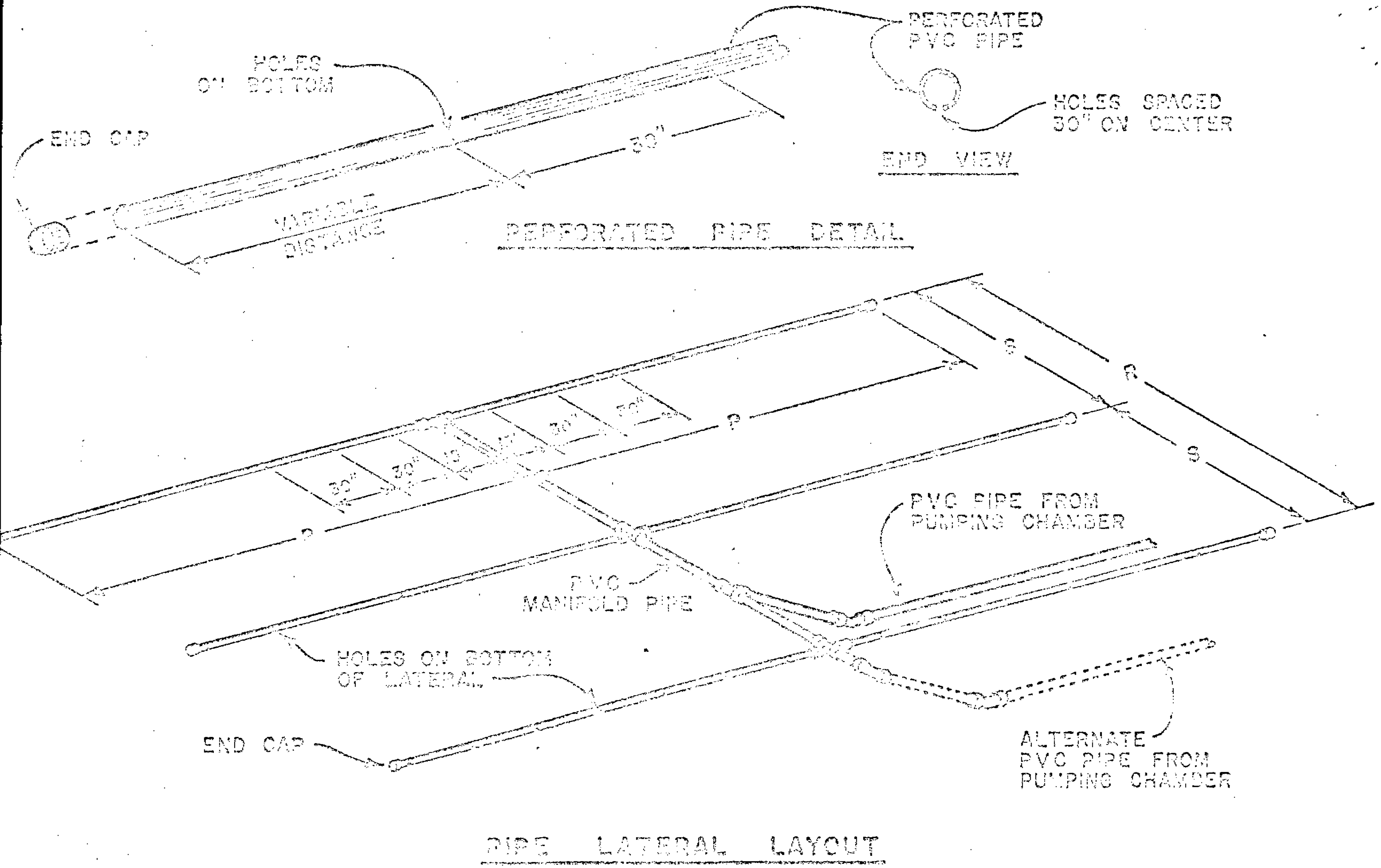


Fig. B. 3 The distribution system for a mound. One lateral is placed down the center of each trench as shown on plan views. Note alternate inlet positions. The variable distance between the last hole and the next to last hole will range between 15 and 30 in., depending upon the length of trench. Distribution system must be arranged so manifold and laterals drain after each dose.

C-3

DESIGN EXAMPLE AND PLANS

for

MOUND

on

PERMEABLE SOIL WITH HIGH WATER TABLE

DESIGN EXAMPLE
for
MOUND
on
PERMEABLE SOIL WITH HIGH WATER TABLE

An example is used to illustrate the design procedure. The method outlined in the text is followed step by step for a situation commonly found in practice. Example plans have also been prepared for most site conditions encountered and are included following the design example. These prepared plans may be used where similar site conditions exist. In cases where these plans cannot be adapted to the site, a mound may be designed as illustrated below.

Design a mound system for a 3 bedroom home with the following site conditions. Several small trees are on the site. Rock fragments, impermeable layer and bedrock are not a factor. (Letter Notation on Fig. C.1 and C.2 are used as references in this example).

Slope	6%
Percolation Rate	50 min/in. at 24 in.
Ground Water	24 in.

Step 1. Select the Site

The mound site should be selected prior to house location and road building. Consider all criteria listed in Table 1 and the discussion under the "Soil and Site Requirement" section for all possible locations on the lot. Consider the difficulties in construction of the mound at the various locations. Evaluate all criteria, weigh one site against the other, then pick the best site.

Step 2. Waste Water Load

Design loading is 150 gal/day/bedroom, so with 3 bedrooms the design loading is 450 gal/day.

Step 3. Select the Fill Material

Select a medium sand texture. Use Table 2 as a guide. Sometimes it is necessary to make a judgement on the quality of sand versus the transportation costs, but there are sands which are too coarse or too fine that are not acceptable. A medium sand texture will have a design infiltration rate of 1.2 gal/ft^2/day.

Step 4. Size the Absorption Area

Since the medium sand texture is being used, the infiltration rate is 1.2 gal/ft^2/day.

Absorption area required = 450 gal/day÷1.2 gal/ft^2/day = 375 ft^2.

Since this is a permeable soil with high ground water, a bed system can be used. Maximum bed widths are 10 ft. Since the soil percolation rate is 50 min/in. (indicating heavier soil) and situated on a slope, it is desirable to make the bed longer and narrower. This will spread the liquid along the slope. Some lateral movement of liquid will occur, since it is a heavier soil. By making it longer and narrower, it will reduce the possibility of seepage out the toe.

Use a bed width of 8 ft. (A) then:

bed length (B) = 375 ft^2 ÷ 8 ft. = 47 ft.

Step 5. Mound Height

Fill depth (D) = 1 ft. (min. fill depth beneath absorption area)

Fill depth (E) = D + slope (C×A)
= 1 ft. + .06 (8) ft.
= 1 ft. + .5
= 1.5 ft. (this is approximate as bed must be at same elevation)

Bed depth (F) = 0.75 ft. minimum depth with a minimum of 0.5 ft. of aggregate below distribution system.

Cap and top soil depth (H) = 1.5 ft. which include 1 ft. of subsoil and 0.5 ft. of top soil

Cap and top soil depth (G) = 1.0 ft. which include 0.5 ft. of subsoil and 0.5 ft. of top soil.

Step 6. Mound Length and Width

End Slopes (K) = mound depth at center x 3:1 slope.
= ((D+E)÷2+H+F)x3
= 3.5 ft. x 3
= 10 ft.

Upslope Width (J) = mound depth at upslope edge x 3:1 slope x slope correction (Table 3).
= (D+F+G) x 3 x 0.85
= 2.8 ft. x 3 x 0.85
= 8 ft.

Downslope Width (I) = mound depth at downslope edge x 3:1 slope x slope correction (Table 3).
(E+F+G) x 3 x 1.22
= 3.3 ft. x 3 x 1.22
= 13 ft.

Mound Length (L) = B + 2 K
= 47 ft. + 2 x 10 ft.
= 67 ft.

Mound Width (W) = I + A + K
= 13 + 8 + 8
= 29 ft.

Step 7. Basal Area

On sloping sites the basal area is that area under and downslope of the bed (B x (A+I)). On level sites it is the total area under the mound (LxW) except for end areas. The design loading rate of the soil with percolation rate of 50 min/in. is 0.74 gal/ft^2/day.

Basal Area Required = daily flow ÷ infiltrative capacity of soil
= 450 gal/day ÷ 0.74 gal/ft^{2}day
= 608 ft^2

Basal Area Available = B x (A+I)
= 47 ft. x (6 + 13)ft.
= [illegible] ft^2

Sufficient area is available. If it were not, then the downslope width (I) would be increased until sufficient area is available.

Step 8. Distribution System

Fig. 11 and C. 3 shows typical examples of a distribution system. Design requires selection of hole spacing and diameter, lateral diameter and spacing, manifold length and diameter. Lateral length is defined as the distance from manifold (supply end) to far (distal) end. Tee to Tee construction is preferred. For systems larger than 5 bedroom residential, procedure outlined by Otis et al. (1978) must be used.

Hole spacing = 30 in.
Hole diameter = 1/4-in.

Lateral Length -

Lateral lengths normally are about 0.5 feet shorter than one-half the length of bed. In this example, lateral length would be 23 ft. (47 ÷ 2 - .5)

Hole spacing -

Holes are spaced 30 in. apart.

The following are hole spacing distances in inches from the manifold to distal end of lateral. There are 10 holes per lateral.

15, 45, 75, 105, 135, 165, 195, 225, 255, 276*

*If the last hole, based on 30 in. spacing, is equal to or greater than 15 in. from the end of the lateral, put another hole in the end cap or close to it.

Lateral Diameter

Lateral diameters are dependent upon lateral length, hole size and spacing. Table 4 gives maximum allowable length for various hole diameters and hole spacings. For the 30 in. spacing and 1/4 in. hole, allowable lateral lengths for 1 in. diameter is 25 ft. and for 1 1/4 in. diameter is 38 ft. Since lateral length required is 23 ft., lateral diameter of 1 in. is satisfactory.

Lateral Spacing

Bed width is 8 ft. For 3 laterals on each side of manifold, the lateral spacing is 32 in. This gives 16 in. from lateral to edge of bed.

Manifold Length

Manifold length is distance between the outside laterals or summation of all lateral spacings. For this example, it would be 64 in.

Manifold Diameter

For these mound systems, the manifold diameter is normally 2 or 3-in., depending on the size of the pipe from the pumping chamber to the mound and the inlet location. The inlet can be in the side of the manifold between the laterals, (Fig. 11 or C.5), or it can be in the end of the manifold, preferably on the upslope edge. In either case, the manifold must slope toward the inlet so it will drain. For either inlet location the manifold can be 2-in. diameter if the pipe is 2-in. diameter. If the pipe from the pump is 3-in. diameter, and the inlet is in the end, then the manifold must be 3-in. If the inlet is in the side, then the manifold can be 2-in. diameter. For larger systems (greater than 5 bedroom), friction losses in manifold must be considered.

Step 9. Pumping Chamber Size

Table 7 gives the recommended pumping chamber size which is 750 gal. capacity. The features shown in Fig.12 should be incorporated into it.

Step 10. Pump Size

Assume the pumping chamber is located 75 ft. from the mound center and the elevation difference is 9 ft. from the pump to the lateral invert.

Pump Capacity

Using the recommended pressure of 2 ft. at the distal end of the lateral, Table 8 gives the pump capacity of 54 gpm for 1/4-in. diameter holes for a 3 bedroom sized mound. Fig.13 can be used to determine flow rate for other pressures.

Pump Head

The total head consists of (1) elevation difference, (2) friction loss, and (3) desired pressure at end of laterals.

(1) elevation head = 9 ft.

(2) friction loss -

Friction loss is dependent upon flow rate and pipe diameter.

Table 9 gives the friction loss/100 ft. of pipe for various diameter pipes and flow rates. For flow rate of 54 gpm, the friction loss for:

(a) 2-in. diameter is 3.98 ft/100 ft. x 75 ft. = 3.0 ft.

(b) 3-in. diameter is .67 ft/100 ft. x 75 ft. = .5 ft.

Either pipe can be used. Ignore friction losses for fittings. Manifold friction loss can be estimated by adding its length to the pipe length when figuring friction loss.

(3) Pressure at distal end of lateral

Fig. 13 can be used to determine pressure at supply end of lateral. For a 2 ft. pressure at distal end for 1/4-in. diameter holes, the pressure at supply end is 2.5 ft.

Total Head = 9 ft. + 3 ft. + 2.5 ft. = 14.5 ft. for 2 in. diameter pipe.
= 9 ft. + .5 ft. + 2.5 ft. = 12 ft. for 3-in. diameter pipe.

Pump size

Select a pump which would pump at least 54 gpm at 14.5 ft. of head. This given head loss is based on using 2 in. pipe. The pump opening will be smaller

or

Select a pump which would pump at least 54 gpm at 12 ft. of head. This given head loss is based on using a 3 in. pipe. The pump opening will be smaller.

Step 11. Dosing Quantity

From Table 5 the net recommended dosing quantity is 115 gal/ dose. The void volume of the laterals needs to be checked to see if the dosing quantity is 10 times the void volume. From Table 6 the void volume of 1 in. diameter pipe is .041 gal/ft. For 138 feet of lateral, the void volume is 5.6 gal. which, when multiplied by 10, is less quantity given in Table 5. Therefore, the volume is 115 gal/dose. Adjustments need to be made for flow-back, so 115 gal. is actually dosed. For a 5-ft. diameter pumping chamber, the net liquid level differential per dose cycle is 9.4 in.

Step 12. Select the controls which will give the flexibility necessary for the proper quantity per dose (Fig. 14).

TABLE C-1. DESIGN CRITERIA FOR A MOUND FOR A 3 BEDROOM HOME ON 0-12% SLOPE FOR LOADING RATES OF 150 GAL/DAY FOR PERMEABLE SOIL WITH HIGH WATER TABLE. FIG. C.1 and C.2.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	–	%	0	2	4	6	8	10	12
Bed Width	A	Ft	4	4	4	4	4	4	4
Bed Length	B	Ft	32	32	32	32	32	32	32
Mound Height	D	Ft	1	1	1	1	1	1	1
	E	Ft	1	1.1	1.2	1.2	1.3	1.4	1.5
	F	Ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	9	9	8	8	7	7	6
	I	Ft	9	10	11	12	13	14	15
	W	Ft	22	23	23	24	24	25	25
Mound Length	K	Ft	10	10	10	10	10	11	11
	L	Ft	52	52	52	52	52	53	53
Lateral Length	P	Ft	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Lateral Diameter	–	In	1	1	1	1	1	1	1
No. of Laterals	–	–	2	2	2	2	2	2	2
No. of Holes per Lateral*	–	–	7	7	7	7	7	7	7
Hole Spacing*	–	In	30	30	30	30	30	30	30
Hole Diameter	–	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4

* Last hole is located at end of lateral which is 21" from previous hole.

TABLE C-2. DESIGN CRITERIA FOR A MOUND FOR A 2 BEDROOM HOME ON 0-12% SLOPE FOR LOADING RATES OF 300 GAL/DAY FOR PERMEABLE SOIL WITH HIGH WATER TABLE. FIG. C.1 and C.2.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE MIN/IN						
			3-60				3-29		
Slope	-	%	0	2	4	6	8	10	12
Bed Width	A	Ft	6	6	6	6	6	6	6
Bed Length	B	Ft	42	42	42	42	42	42	42
Mound Height	D	Ft	1	1	1	1	1	1	1
	E	Ft	1	1.1	1.2	1.4	1.5	1.6	1.8
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	9	9	8	8	7	7	6
	I	Ft	9	10	11	12	13	15	17
	W	Ft	60	61	61	62	62	64	65
Mound Length	K	Ft	10	10	10	10	10	11	11
	L	Ft	62	62	62	62	62	64	64
Lateral Length	P	Ft	20	20	20	20	20	20	20
Lateral Diameter	-	In	1	1	1	1	1	1	1
No. of Laterals	-	-	4	4	4	4	4	4	4
Lateral Spacings	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral*	-	-	8	8	8	8	8	8	8
Hole Spacing*	-	In	30	30	30	30	30	30	30
Hole Diameter	-	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	3	3	3	3	3	3	3
Manifold Diameter**	-	In	2	2	2	2	2	2	2

* Last hole is located at end of lateral which is 15" from previous hole.

** Diameter dependent upon size of pipe from pump and inlet position.

TABLE C-3. DESIGN CRITERIA FOR A MOUND FOR A 3 BEDROOM HOME ON 0-12% SLOPE FOR LOADING RATE OF 450 GAL/DAY FOR PERMEABLE SOIL WITH HIGH WATER TABLE. FIG. C. 1 and C.2.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE						
			0-60				3-29		
Slope			0	2	4	6	8	10	12
Bed Width	A	Ft	8	8	8	8	8	8	8
Bed Length	B	Ft	47	47	47	47	47	47	47
Mound Height	D	Ft	1	1	1	1	1	1	1
	E	Ft	1	1.2	1.3	1.5	1.6	1.8	2.0
	F	Ft	.75	.75	.75	.75	.75	.75	.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	9	9	8	8	7	7	6
	I	Ft	9	11	12	13	15	17	18
	W	Ft	26	28	28	29	30	32	32
Mound Length	K	Ft	10	10	10	10	11	11	12
	L	Ft	67	67	67	67	69	69	71
Lateral Length	P	Ft	23	23	23	23	23	23	23
Lateral Diameter	-	In	1	1	1	1	1	1	1
No. of Laterals	-	-	6	6	6	6	6	6	6
Lateral Spacing	S	In	32	32	32	32	32	32	32
No. of Holes per Lateral*	-	-	10	10	10	10	10	10	10
Hole Spacing *	-	In	30	30	30	30	30	30	30
Hole Diameter	-	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	In	64	64	64	64	64	64	64
Manifold Diameter**	-	In	2	2	2	2	2	2	2

* Last hole is located at end of lateral which is 21" from previous hole.

** Diameter dependent upon size of pipe from pump to inlet position.

TABLE C-4. DESIGN CRITERIA FOR A MOUND FOR A 4 BEDROOM HOME ON 0-12% SLOPE FOR LOADING RATE OF 600 GAL/DAY FOR PERMEABLE SOIL WITH HIGH WATER TABLE. FIG. C. 1 and C.2.

PARAMETER	SYMBOL	UNITS	PERCOLATION RATE						
			0-60				3-29		
Slope	-	%	0	2	4	6	8	10	12
Bed Width	A	Ft	10	10	10	10	10	10	10
Bed Length	B	Ft	50	50	50	50	50	50	50
Mound Height	D	Ft	1	1	1	1	1	1	1
	E	Ft	1	1.2	1.4	1.6	1.8	2	2.2
	F	Ft	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	G	Ft	1	1	1	1	1	1	1
	H	Ft	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Mound Width	J	Ft	9	8	8	8	7	7	6
	I	Ft	9	11	13	14	17	18	19
	W	Ft	28	29	31	32	34	35	35
Mound Length	K	Ft	10	10	10	10	11	11	12
	L	Ft	70	70	70	70	72	72	74
Lateral Length	P	Ft	24.5	24.5	24.5	24.5	24.5	24.5	24.5
Lateral Diameter	-	In	1	1	1	1	1	1	1
No. of Laterals	-	-	6	6	6	6	6	6	6
Lateral Spacing	S	Ft	3	3	3	3	3	3	3
No. of Holes per Lateral*	-	-	10	10	10	10	10	10	10
Hole Spacing	-	In	30	30	30	30	30	30	30
Hole Diameter	-	In	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Manifold Length	R	Ft	6	6	6	6	6	6	6
Manifold Diameter*	-	In	2	2	2	2	2	2	2

* End of lateral is 9 in. from last hole, since it isn't equal to or greater than 15, no hole is placed at end of lateral.

** Diameter dependent upon size of pipe from pump and inlet position

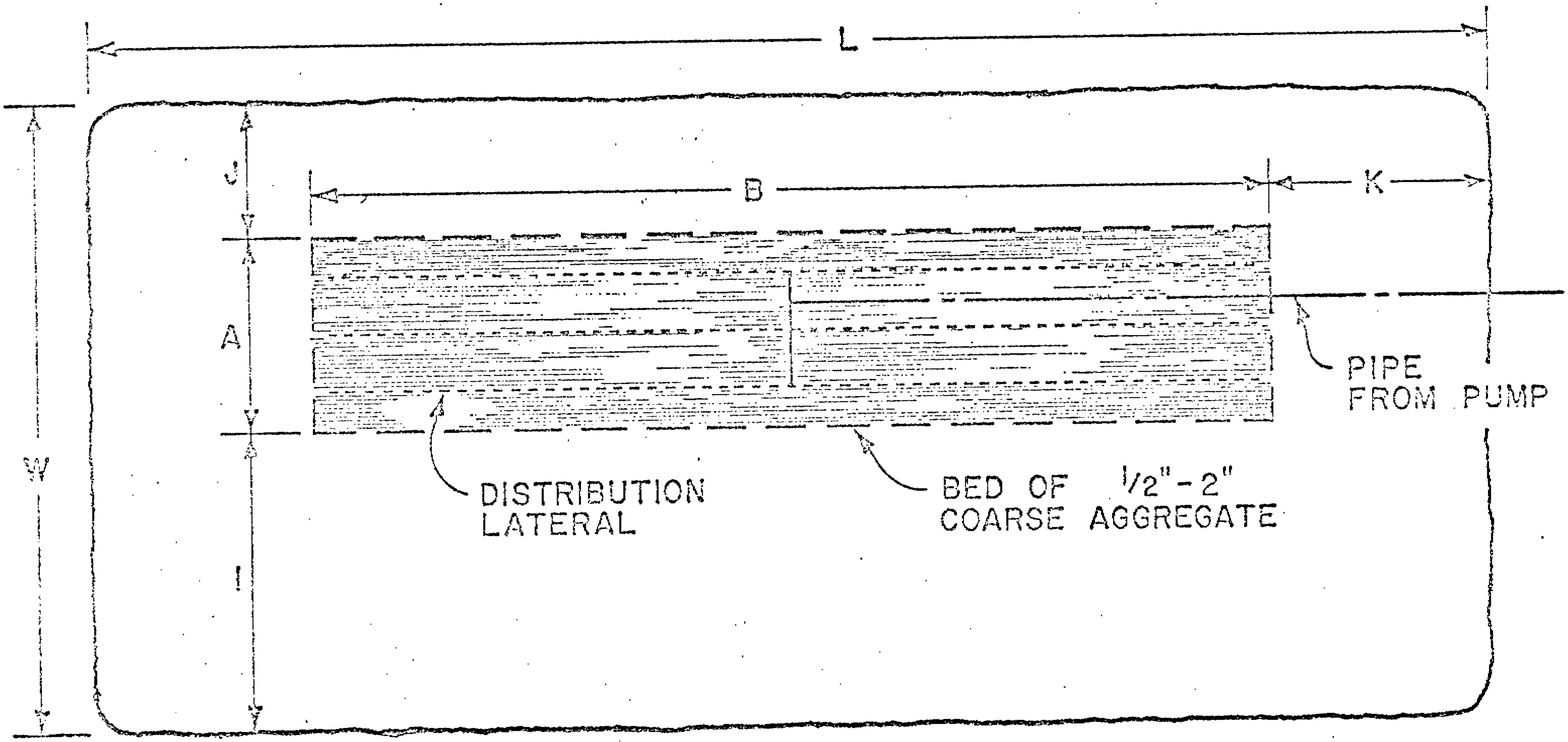


Fig. C.1 Plan view of mound using a bed for the absorption area. For the creviced bedrock site the bed slope can be rectangular or square.

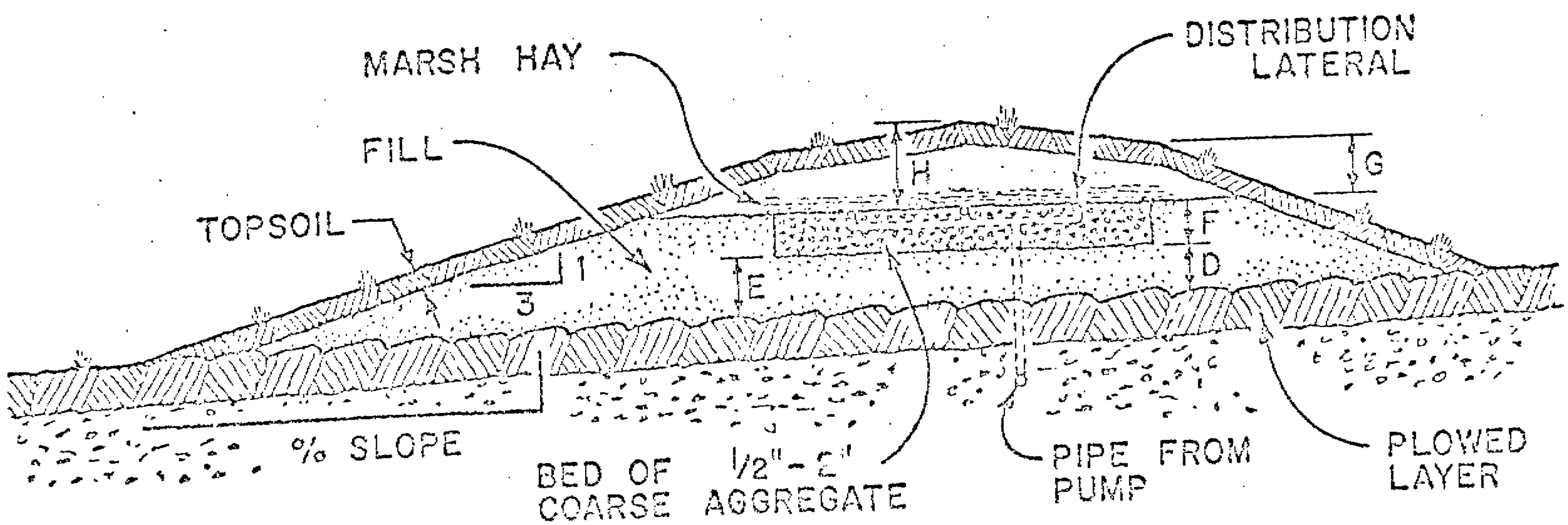
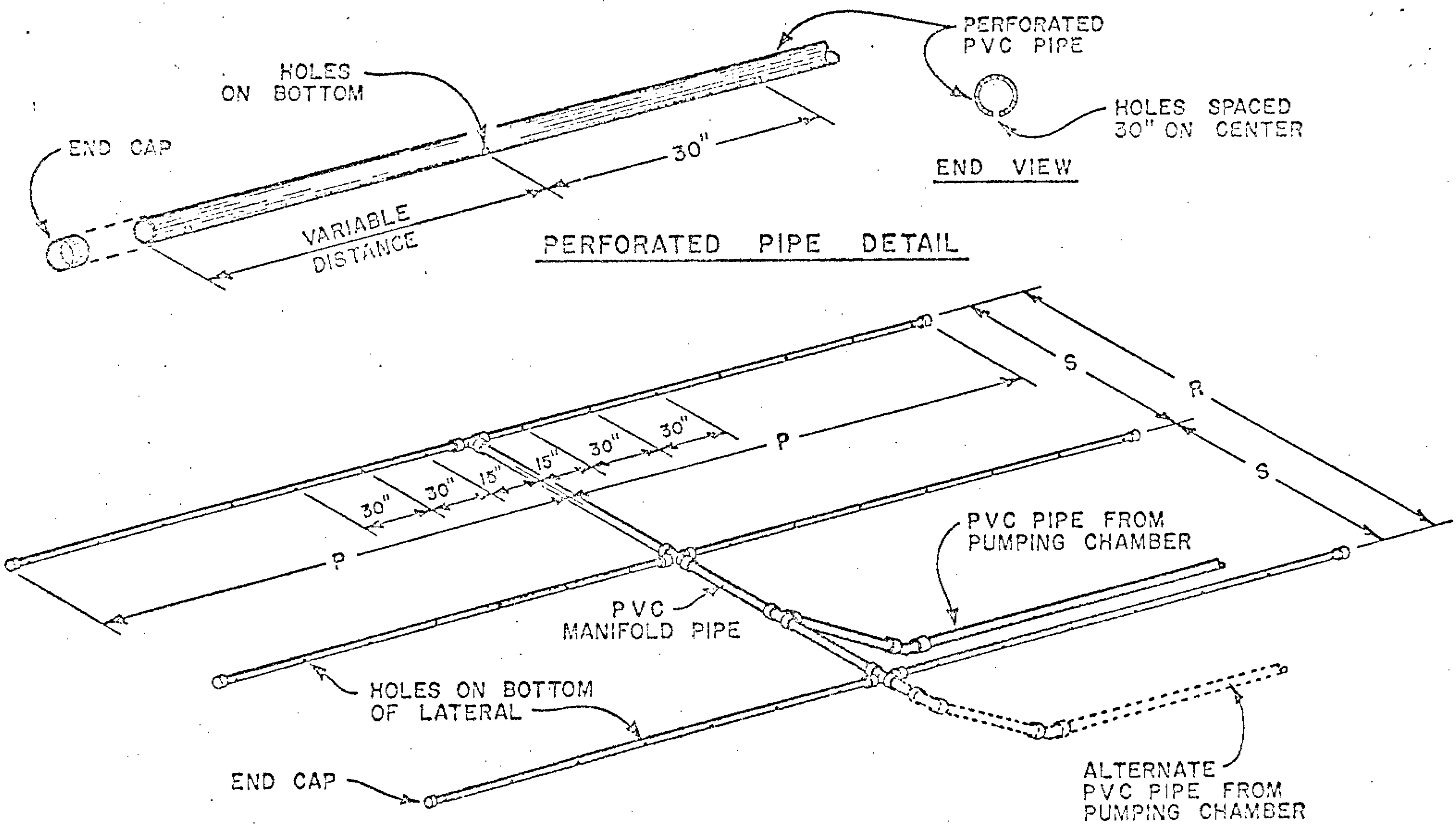


Fig. C. 2 Cross section of a mound using a bed as the absorption area.



PIPE LATERAL LAYOUT

Fig. C. 3 The distribution system for a mound system. For a mound with trenches, one lateral is placed down the center of each trench as shown on plan view. Note alternate inlet positions. The variable distance between the last hole and the next to last hole will range between 15 and 30 inches. This will vary depending upon the length of the trench. Distribution system must be arranged so manifold and laterals drain after each dose.

SECTION 12.0

Part VI

SEWAGE TANK CLEANING

Part VI

Sewage Tank Cleaning

INDEX

1.0 GENERAL

1.1 The cleaning of sewage tanks by bailing or dipping and emptying the bailing or dipping container into a carrier tank is prohibited.

1.2 Precaution shall be taken by the sewage tank cleaner to prevent the leaking, spilling, or dripping of the sewage tank contents during collection, removal, transportation and disposal.

1.2.1 Any leakage, spillage, or drippings shall be cleaned up immediately.

1.2.2 Provisions shall be made by the sewage tank cleaner to carry chlorinated lime or similar satisfactory disinfectant for immediately treating the areas where leakage, spillage, or dripping has occurred.

1.3 Necessary hand tools such as picks and shovels, and other items such as sand and cement for repairing concrete sewage tanks shall be carried on the sewage tank cleaning vehicle.

1.4 The contents of sewage tanks shall not be transported in an open bed motor carrier vehicle, or any other type vehicle, unless said sewage contents are contained within approved portable receptacles.

1.5 All portable receptacles used for transporting the contents of sewage tanks shall be of approved construction, metal or equivalent, easily cleanable, good repair, equipped with tightfitting lids and shall be cleaned, deodorized and disinfected daily or more often if needed.

1.6 All facilities used for the cleaning of sewage tank cleaning equipment shall, prior to use, be inspected and approved by the Director.

2.0 MOTOR VEHICLE AND CHASSIS

2.1 The motor vehicle and its chassis shall be of sufficient capacity to haul all equipment necessary for transporting, pumping, tank filling, emptying and cleaning of sewage tanks.

2.2 Sewage tank cleaning motor vehicles may be of one unit or of the tractor-trailer type, but regardless of the type, said motor vehicles shall be in compliance with all applicable provisions of these standards.

2.3 All vehicles used in these operations shall carry in a conspicous place the name and address of the firm or operator under which business is conducted. All lettering shall be at least 2 inches in height.

3.0 CARRIER TANK

3.1 Carrier tanks shall be fully enclosed, leakproof, fly-proof, and operated in such manner as to prevent spillage during the collection, removal, transportation, and disposal of the sewage tank contents.

3.2 Carrier tank shall be of heavy gauge metal, preferably 10-12 gauge or equivalent, to withstand the treatment to which it will be subjected.

3.2.1 The carrier tank shall have a capacity of at least 500 gallons, preferably 750 gallons, to readily hold the accumulation of the average size sewage tank serving a one-family dwelling.

3.2.2 The capacity of the carrier tank, in gallons, shall be conspicuously painted on the side of said tank.

3.3 Carrier tanks shall be constructed so as to permit proper cleaning of the interior and exterior of the tank.

3.4 The exterior of the carrier tank shall be painted and said tank and appurtenances kept clean and in a state of good repair.

3.5 Carrier tanks shall be conspicuously and permanently labeled near the outlet valve in letters at least two inches high, "FOR SEWAGE ONLY," and said carrier tank shall not be used for any other purpose.

3.6 The Health Department permit number for the sewage tank cleaner shall be prominently displayed on the carrier tank.

3.7 Carrier tanks shall have a manhole in the top to provide for easy access to the tank interior for flushing and cleaning purposes. The manhole may be in combination with, or separate from, the filling connection.

3.8 The carrier tank shall have an outlet valve so located that the entire contents of the tank can be drained.

3.8.1 The outlet valve opening shall be at least three inches in diameter and shall have a non-leaking, non-clog type valve for draining the tank.

3.8.2 The outlet valve shall be adapted for a standard hose connection to the pump for recirculating the contents of the tank if required prior to emptying or for pumping to the disposal site if gravity draining is not feasible.

3.8.3 In pumping from the carrier tank, an air inlet is recommended to prevent collapsing the tank.

3.8.4 Outlet valves shall be capped when not in actual use to prevent leaking or spilling of the carrier tank contents. Caps shall be secured by chain to outlet valve or tank.

3.9 Facilities shall be available for the flushing, cleaning and deodorizing of sewage tanks, carrier tanks, and sewage tank cleaning implements or equipment.

3.9.1 A direct connection to a water distribution system for such flushing and/or cleaning action shall only be used when the water distribution system is protected by one or more approved and properly located back-siphonage prevention devices.

3.9.2 Wastes resulting from the flushing and/or cleaning operation shall be disposed of in accordance with applicable provisions of these Design Standards.

3.9.3 Odor controlling substances may be left in the sewage tank, carrier tank or other sewage tank cleaning implement or equipment, but in no case shall such substances be used in lieu of proper cleaning.

4.0 PUMPS AND HOSES

4.1 All pumps used for sewage tank cleaning purposes shall be of the non-clog, self-priming type and shall be capable of handling the contents of sewage tanks.

4.2 The use of potable water under pressure to prime pumps or to operate aspirators is prohibited.

4.3 Pumps and pump bases shall be of such construction that they can be easily handled and used for the purpose intended.

4.4 Hoses shall be of sufficient length for recirculating the contents of the sewage tank or carrier tank and to reach the point of discharge at the disposal site readily.

4.5 Hoses shall be flexible and so constructed that they can be readily cleaned.

4.5.1 Hoses shall be kept clean and in a good state of repair.

4.5.2 Hoses shall be used and stored in such manner as to prevent leaking, spilling, and dripping of any sewage tank contents.

4.5.3 When not in actual use hoses shall be tightly capped.

5.0 RECORDS

5.1 All sewage tank cleaners shall keep a written record of all jobs accomplished.

5.2 Such record shall contain, but not be limited to:

5.2.1 Name and address of the person for whom the sewage tank was cleaned.

5.2.2 Date and time the job was completed.

5.2.3 Size of sewage tank and the amount, in gallons, of the contents removed from said sewage tank.

5.2.4 Location and type disposal site utilized for the disposal of the sewage tank contents.

5.3 Said records shall be preserved for at least 12 months and upon request such records shall be readily available to the State Director of Health.

6.0 DISPOSAL

6.1 The contents of sewage tanks shall be disposed of in a manner that will prevent the spread of disease and avoid nuisance conditions, and said contents shall be disposed of by one or a combination of the following methods:

6.1.1 By incinerating in an approved high temperature incinerator.

6.1.2 By burial, provided prior written approval is received from the Director regarding the manner and the conditions under which said burial of sewage tank contents can take place. Sewage tank contents shall not be buried on public or private property without the written permission of the property owner or his authorized agent.

6.1.3 By discharging the contents into a public sewer manhole or at an acceptable point in a sewage treatment plant, provided, the written approval of a responsible official of the governmental entity or other entity owning or operating the public sewer system or sewage treatment plant is received prior to the use of such disposal facilities.

6.2 Special written permission from the Director must be obtained for any method of disposal not specifically mentioned in these Design Standards.

SECTION 12.0

Part VII

SUBDIVISIONS

Part VII

SUBDIVISIONS

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Subsection — Page

1.0 GENERAL--A central sewage collection and treatment system to serve a subdivision shall be designed in accordance with Sections II and III of the "Design Standards for Sewage Collection and Treatment Systems". A permit shall be obtained prior to construction of the sewage system in accordance with Chapter 16, Article 1, Section 9 of the State Code and Section 4.0 of the Sewage Regulations. Application for the permit shall be made in accordance with the procedures outlined in Section I of the "Design Standards for Sewage Collection and Treatment Systems".

There are no limitations relative to lot size for subdivisions served by a central sewage collection and treatment system.

2.0 DESIGN--Design of a subdivision to utilize individual sewage disposal systems shall follow the procedures and requirements outlined in Section 3.0 and Section 4.0 of this part. Written approval of the proposed subdivision shall be obtained prior to initiation of construction in accordance with Section 8.0 of the Sewage Regulations.

3.0 APPLICATION

3.1 Complete Application

3.1.1 Four (4) copies of the application forms, design data, reports, plans, plats, and documentation shall be submitted to the Housing Division of the State Health Department.

3.2 Application Forms--Application forms may be obtained from the local Health Departments, State Health Department District Offices, or the Housing Division, State Health Department, 1800 Washington Street, East, Charleston, West Virginia 25305. Assistance in filling out application forms and in preparing the application will be given by the local Health Departments or District Offices when requested.

3.3 Required Application Forms and Design Information

3.3.1 Completed application form ES-69.

3.3.2 U.S. Geological Survey Topographic Map showing property lines.

3.3.3 Plat of the proposed subdivision, drawn to a scale of not more than 50 feet per inch, showing:

3.3.3.1 Number, size, and location of lots.

3.3.3.2 Lot dimensions and lot number or letter designation.

3.3.3.3 Location of roads, driveways, easements, rights-of-way, proposed rsidences and other physical features of the subdivisions.

3.3.3.4 Location of wells and/or public water lines.

3.3.3.5 Location of reserve area for the installation of two approved individual sewage disposal systems, as described in Section 4.0.

3.3.3.6 Location of percolation testholes and a six foot observation hole on each lot in the area reserved for the proposed individual on-site sewage system.

3.3.3.7 Topography of the subdivision showing five foot contour intervals for subdivisions of more than fifteen lots.

3.3.4 Soils report from the Soil Conservation Service detailing soil classifications and characteristics determined from on-site investigation of the area to be developed.

4.0 LOT SIZE

4.1 All lots shall contain a minimum on-site disposal area of 10,000 square feet, which shall be set aside for the installation of septic tank-soil absorption systems(s). Each such area shall have a minimum width of 80 feet, and no development or structures shall be permitted on this on-site disposal area other than those comprising the septic tank-soil absorption system(s).

4.2 Area consisting of land sloping in excess of 25%, land in an existing or proposed public road, or land within a 25 year flood plain shall not be utilized in establishing the minimum area for lots in accordance with the requirements of Section 4.1.

4.3 Area consisting of land containing rock strata or seasonal high water table within five feet of the ground surface shall not be utilized in establishing the minimum area for lots in accordance with the requirements of Section 4.1.

4.4 Area consisting of land not in compliance with the minimum separation distances listed in Section 2.6 of Part V, Individual Sewage Systems, shall not be utilized in establishing the minimum area for lots in accordance with the requirements of Section 4.1.

4.5 Area consisting of land which has been determined through testing to have a percolation rate slower than 60 minutes per inch shall not be utilized in establishing the minimum area for lots in accordance with the requirements of Section 4.1.

SECTION 12.0

Part VIII

ABANDONING SEWAGE SYSTEMS

Part VIII

ABANDONING SEWAGE SYSTEMS

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1.0 GENERAL--The contents of the sewage tank shall be removed by a licensed septic tank cleaner, or by means approved by the Director, the tank filled with earth or a similar inert material, and the excavation, if any, filled to eliminate any physical hazard. If the tank is in useable condition it may be removed and the excavation filled to eliminate any physical hazard.

2.0 ELECTRICAL SERVICE--Any electrical service to the system shall be terminated, and electrical service boxes, switches, meters, and similar equipment, removed or rendered harmless.

3.0 WATER SERVICE--Any water service to the system shall be disconnected.

4.0 HAZARDOUS EQUIPMENT--Any other potentially hazardous equipment associated with the system shall be removed or rendered harmless.

SECTION 12.0

Part IX

VARIANCE FROM

DESIGN STANDARDS

Part IX

VARIANCE FROM DESIGN STANDARDS

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VARIANCE FROM DESIGN STANDARDS

1.0 General--Section 15.0 of the regulations sets forth general criteria and minimum design parameters for the design and construction of sewage systems. Variance from the requirements set forth in this section may be obtained in accordance with the provisions of s 29A-4-1 of the Code and the following procedure.

2.0 APPLICATION PROCEDURE--The application procedure shall include submittal of the following items:

2.1 **Petition** for a Declaratory Ruling granting a variance from the provisions of Section 15, Design Standards.

2.2 Required information to accompany the petition shall include a report and specifications setting forth:

2.2.1 General description of variance desired.

2.2.2 Detailed technical information as may be necessary to justify the variance requested.

SECTION 13.0 REPEAL OF FORMER REGULATIONS

13.1 All regulations previously adopted by the West Virginia State Board of Health which are in conflict with the provisions of these regulations are hereby repealed.

SECTION 14.0 SEVERABILITY

14.1 If any provision of these regulations or the application thereof to any person or circumstance shall be held invalid, such invalidity shall not affect the provisions or applications of these regulations which can be given effect without the invalid provisions or application, and to this end the provisions of these regulations are declared to be severable.

SECTION 15.0 PENALTIES FOR VIOLATING PROVISIONS OF REGULATIONS

15.1 Any person who violates any provision of these regulations or any regulation adopted by the West Virginia State Board of Health pursuant to authority granted by these regulations shall be guilty of a misdemeanor and shall, upon conviction, be punished by a fine of not more than two hundred dollars ($200) and/or thirty (30) days imprisonment as provided in Chapter 16, Article 1, Section 18 of the Public Health Laws of West Virginia, Code of West Virginia.

15.2 Each day's failure to comply with any applicable provision of these regulations shall constitute a separate offense.

SECTION 16.0 CERTIFICATION AND FILING OF THE REGULATION

I hereby certify that the foregoing regulations constitute the official regulations promulgated by the State Board of Health on , and filed pursuant to law in the Office of Secretary of State.

George E. Pickett, M.D.

Secretary

State Board of Health

Acknowledgement, that the above regulations were filed with the Office of Secretary of State on

A. James Manchin

Secretary