

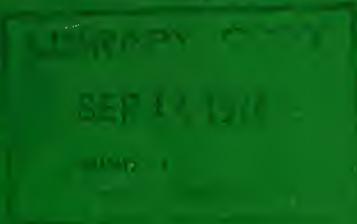
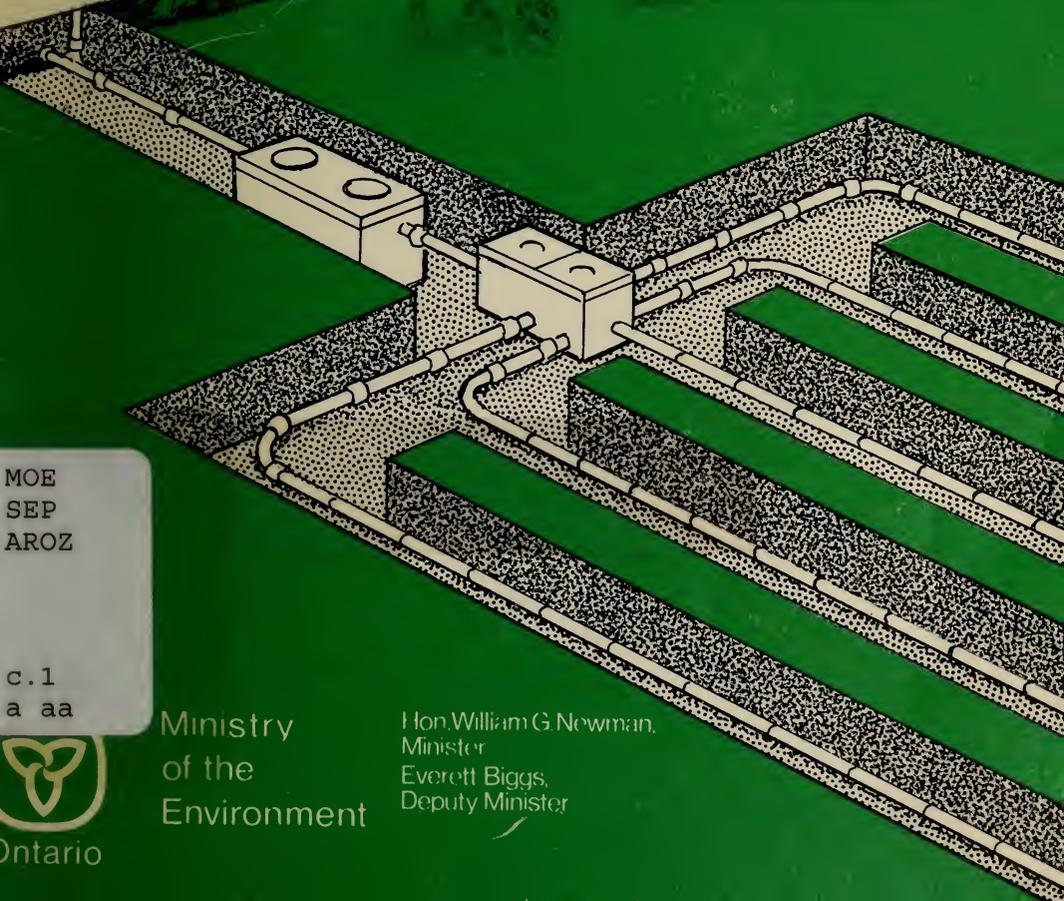
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Septic Tank Systems

ONTARIO MINISTRY OF ENVIRONMENT



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Ministry
of the
Environment

Hon. William G. Newman,
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Everett Biggs,
Deputy Minister

SEPTIC TANK SYSTEMS



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FOREWORD

Ontario continues to grow rapidly, not only in urban areas where central sewage is available, but also in rural areas where individual sewage systems must be used. In 1971, there were over 470,000 occupied dwellings using septic tank systems as a means of sewage disposal. This figure does not take into account seasonally occupied cottages or the many small commercial establishments which have systems of this type. The need for development exerts a continuing demand for private sewage systems despite the construction of new municipal systems and the expansion of existing ones. In 1970, for example, about 44,000 new lots were approved for residential or other development in unsewered areas of the Province. Most of the dwellings, cottages and small business establishments to be built on these lots will have a piped water supply with various plumbing fixtures carrying away the used water.

The sewage system for any of these establishments will be required to dispose of all the water piped into the building. After water is used and discharged into a plumbing fixture it becomes sewage. It may even contain dangerous bacteria or viruses if there is illness among persons using the plumbing system.

In a dwelling many substances are in use which get into the waste from fixtures such as kitchen sinks, shower baths, laundry tubs, dishwashing machines, and toilets. These substances become contaminants in the waste water. They may include detergents, soaps, greases, food particles, cleaners, bleaches, ammonia, polishes, solvents, insect sprays, toothpaste, various body fluids, feces, and other offensive, dangerous or putrescible substances. All of these substances require careful disposal to protect human health and the natural environment. Inadequately treated sewage should not be permitted to appear on the surface of the ground, to flow in open ditches, or to drain directly into streams, ponds, lakes or marshy areas.

One of the most satisfactory systems for individual sewage treatment is the septic tank system. This booklet describes how it is installed and how it works.

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PART I – INTRODUCTION

1. The Disposal of Sewage

People who live in an urban community seldom have to give much thought to the disposal of wastes from their homes. A public sewerage system and sewage treatment plant, usually operated and maintained by the municipality, removes such wastes and disposes of them after proper treatment and disinfection. In unsewered areas, however, sewage disposal becomes the responsibility of each householder. Similarly, the owner of an apartment block or commercial premises, the school board and in fact everyone in an unsewered area who owns or operates premises in which liquid wastes are produced is responsible for their disposal.

This booklet is mainly concerned with the septic tank and soil absorption method which is only one of a number of ways of dealing with the problem of sewage disposal. It was originally developed for isolated households in rural areas. A typical instance would be a farm home having a well water supply with perhaps less water being used and hence smaller waste flows resulting than in a modern urban home connected to the public water system providing an ample supply. Other methods of sewage treatment and disposal such as proprietary aerobic treatment plants are also available but are not covered in this booklet.

A correctly designed and constructed sewage disposal system will function effectively and safely, but a system which is badly designed and located, or badly constructed, can lead to considerable nuisance and expense, and may seriously endanger health. In particular, the installation must be so planned and built that surface and ground water supplies do not become contaminated and that sewage does not pond on the surface thereby creating the hazard of communicable disease transmission by flies or by direct contact. If this hazard is not avoided, diseases such as typhoid fever, paratyphoid fever, dysentery and some of the virus diseases including infectious hepatitis can be spread. In addition to this health hazard problems are caused if the chemical nutrients in sewage, such as phosphates and nitrates, are allowed to enter the lakes and streams in amounts that will promote or accelerate the growth of aquatic plants and algae. When such growth is excessive the waters lose their attractiveness for recreational purposes and, on the death and decay of the plant life, the dissolved oxygen in the water is depleted to the detriment of fish life. Properly designed and constructed systems will keep contamination of waters from nutrients to a minimum.

For a septic tank system to function effectively, consideration must be given to several factors. Some of these are the visible conditions such as slopes, outcropping of rock, vegetation and tree cover, proximity to wells, lakes, streams and other water courses and the surface drainage pattern.

Others not apparent but equally important are the subsurface soil conditions including the depth to rock or impervious soils, the infiltrative and percolative capacity of

the soil, the high ground water table and seasonal or periodic conditions such as ponding or area flooding. Existing subsurface land drainage must also be considered.

The successful operation of a septic tank system also depends on the conservative use of water, especially in areas where the soil conditions or other circumstances mentioned above are marginally acceptable. Owners could consider the use of spring loaded taps and low volume flush equipment. Household plumbing should be inspected for leaking taps and the septic tank system periodically inspected to determine whether it is operating properly.

2. How to Use This Booklet

The basic requirements involved in the design and operation of domestic septic tank systems, how such systems work, and guidance on the selection of a suitable location for a system are outlined in this booklet. Drawings and tables are included to assist in selecting the required size of the septic tank and the leaching bed. This detail is given for dwellings of up to 6 bedrooms.

For larger homes, and for all non-domestic purposes, refer to Part III for instructions. Details are not included although the principles of design and operation of the components of a septic tank system outlined in this booklet will apply to systems of any size.

3. The Law Relating to Private Sewage Disposal

Part VII of The Environmental Protection Act, 1971, as amended, and the Regulations relating to this part of the Act, state the measures which must be followed for the protection and conservation of the natural environment against contamination by private sewage disposal systems. Authority to enforce the Act is vested in the Minister of the Environment. Activities related to this task may be undertaken by Provincial Officers directly or may be delegated by the Minister to Regional Governments or selected Municipalities or Health Units. Those carrying out these responsibilities will do so in accordance with provincially approved Regulations and Guidelines.

Section 57 of The Environmental Protection Act is specific with respect to the approval which it is necessary to obtain for the construction of a private sewage disposal system or its alteration or enlargement. It applies to all property in Ontario and states:

- “No person shall construct, install, enlarge, extend or alter,
- (a) any building or structure in connection with which a sewage system will be used if the use of the building or structure so constructed, installed, established, enlarged, extended or altered will or is likely to affect the operation or effectiveness of the sewage system; or
 - (b) any sewage system, unless a certificate of approval for the construction, installation, establishment, enlargement, extension or alteration of the sewage system has first been issued by the Director.”

In addition the Regulations prescribe the following for the operation and maintenance of all sewage systems:

- Except for the disposal of hauled sewage by means of irrigation, a sewage system or any part thereof shall not emit, discharge or deposit sewage onto the surface of the ground
- Sewage from a sewage system shall not emit, discharge, seep, leak or otherwise escape into a piped water supply, well water supply, a watercourse, ground water or surface water
- sewage in a sewage system or any part thereof shall not emit, discharge, seep, leak or otherwise escape from the sewage system or any part thereof other than from a place or part of the sewage system where the system is designed or intended to discharge sewage
- Insects and animal life shall be prevented from gaining access to sewage contained in a sewage system
- A sewage system or any part thereof shall not emit, discharge, deposit or allow the emission, discharge or deposit of micro organisms of intestinal origin into the natural environment in such a manner as may be a hazard to health
- No gas shall emit, discharge, or otherwise escape from the sewage system into any building or structure except in the manner in which the sewage system was designed or constructed to emit or discharge gas.

Aside from this legal requirement, it is in your best interest to get advice before you start to build, because the sewage disposal system may be the determining factor in establishing the location and ground floor elevation of your house or other building. Information concerning the Environmental Protection Act, 1971, or the Ministry's Regulations can be obtained from the local offices of the Ministry or the agency holding the delegated authority. Application forms and general information can be obtained from these sources.

PART II – DOMESTIC SYSTEMS

4. How a Septic Tank System Works

The purpose of a septic tank system is to return to the soil the sewage and other liquid wastes from the household in such a manner that ground water does not become polluted and no sewage appears at the ground surface. The system consists essentially of two main parts:

- (a) The septic tank, which by settling out solids, prepares the sewage for absorption by the soil.
- (b) The leaching bed where the liquid is treated and dispersed into the soil.

The purpose of the septic tank is frequently misunderstood. Its main function is to remove from the waste, solids which would otherwise plug the leaching bed. Bacterial action breaks down much of the solid matter to liquids and gases, and in an efficiently operating tank, only a liquid is discharged to the leaching bed. This liquid is still highly charged with bacteria and nutrients. Sufficient capacity is provided in the tank for the retention of insoluble matter. The removal, when necessary, of sludge and scum from the tank should ensure its continued efficient operation. This work should be carried out by persons operating a septic tank maintenance service.

The second part of the system is the leaching bed. It consists of lines of perforated or open jointed pipe, or of clay tile laid with open joints, located in trenches so that the liquid waste from the tank can pass into the soil where further treatment occurs, helping to purify the effluent so as not to contaminate ground or surface water. The perforated pipe or open jointed pipe or tile is referred to as the “distribution pipe” elsewhere in this booklet and is distinct from the solid pipe used in the system to transport the sewage to the leaching bed or as headers or connecting lines within the bed. The bacterial action in the leaching bed is aerobic, meaning that the presence of oxygen is necessary in the soil as the liquid filters downward through it. This important point is one of the principal considerations in establishing the depth of the soil filter required above high water table, rock or impervious soils.

5. General Considerations

It will be seen that the design of a septic tank system depends mainly on three factors:

- (a) The strength, nature and quantity of sewage
- (b) The ability of the soil to absorb and treat the liquid waste
- (c) The space occupied by the system and the clearance required to provide protection to the ground and surface waters against contamination due to this method of disposal.

6. Composition of Sewage

The wastes to be disposed of by the septic tank system includes discharge from toilets, waste water from kitchens, and the waste from baths, washbasins, showers, sinks and washing machines. Where garbage grinders are used, the waste from these units should also be discharged to the septic tank, but the system must be sized accordingly. Surface water from roofs and yards and foundation drainage must be excluded from the septic tank and the leaching bed area.

7. Soils – Assessment of Suitability

The suitability of the soil for absorbing the liquid waste depends on such characteristics of the soil as its grain size and gradation, the presence of organic compounds, and its structure, density, moisture content, “plastic” properties and chemical composition. These characteristics must be assessed and a judgement made as to the percolative capacity of the soil for handling septic tank effluent. For this assessment, inspectors may use an assortment of techniques such as visual inspection and field and laboratory soil tests and analysis. In marginal cases more extensive testing will be required to confirm the suitability or unsuitability of the soil. The result of the inspection and testing is a selection of a percolation rate, “t” time, expressed in minutes, which will be used in various tables in this booklet. This is a measure of the time taken for the water level in a hole in the soil to lower 1 inch due to absorption of the water into the surrounding soil and it can be measured directly by the standard percolation test described in detail in Section 8.

Many factors affect the consistency and therefore the accuracy of the results obtained by the percolation test, and a person conducting the test must understand its limitations and the need for care in its execution. Other soil tests taken in the field only, or combined with laboratory tests, are necessary as a basis for assessment. In most cases a trained inspector will be able to estimate the percolation rate by the visual examination of test pits and of the soil layers so exposed combined with hand tests to determine the consistency of the soils encountered.

8. Percolation Test

- (a) The standard percolation test shall be conducted as follows:
 - (i) An excavation shall be made in the soil which shall have the following dimensions:
 - A diameter between 4 and 12 inches
 - A depth equal to the distance between the ground level and the bottom of the proposed absorption trenches.
 - (ii) All loose material or smeared clay shall be removed from the sides and bottom of the excavation and the bottom of the excavation shall be covered by 2 inches of coarse sand or fine gravel.

- (iii) Clear water shall be poured into the excavation to a depth of at least 12 inches.
 - (iv) Additional clear water shall be added as necessary to maintain a depth of water of at least 12 inches until the soil has swollen and become saturated so that the water being added seeps away at a constant rate.
 - (v) Thereafter, the time required for the water to drop 1 inch shall be observed. This time expressed in minutes is the percolation rate "t".
- (b) The need to saturate the soil as described is to simulate the conditions to be found in the soil surrounding the trenches in a leaching bed. The time required for this saturation depends not only on the type of soil but also on such factors as its density and on the moisture content when the test is commenced. For example, clay soils, if dry, will absorb considerable moisture before saturation is reached and overnight soaking or longer will be required. In coarse sands and gravels, if it is impractical to saturate the soil, a "t" of 5 minutes may be taken.

9. Septic Tanks – Construction

Septic tanks must be completely watertight. Tanks shall be constructed of reinforced concrete, coated steel or such other material as may be approved by the Minister.

Reinforced concrete tanks are preferably rectangular in cross-section with the long axis horizontal and shall conform to the requirements of the current applicable C.S.A. Standards. Tanks that are cast-in-place shall have, as minimum requirements, top and bottom slabs 4 inches thick for 2,000 gallon tanks and smaller with sides and ends 6 inches thick, with balanced design of steel reinforcing. Special design for precast concrete tanks of equal strength, density, and workmanship may be approved by the Minister.

Steel tanks used above ground shall have their exterior surface painted with a corrosion resistant paint and their interior surfaces treated with bitumen, epoxy, polyvinylchloride or rubber as protection against corrosion. These latter forms of coating are to be used on both the interior and exterior surfaces of steel tanks used underground. Steel tanks are to be constructed of sheet of good welding quality which conforms to such standards as are prescribed in the Regulations of the Ministry. For cylindrical tanks installed horizontally the thickness of steel in the shell shall be in accordance with Table No. 1.

TABLE NO. 1

STEEL TANKS

Working Capacity of Tank Imperial Gallons	Wall Thickness
For Uses Underground 500 to 1000 1001 to 3000	10 gauge 7 gauge
For Use Above Ground 500 to 1000 1001 to 7500	10 gauge 7 gauge

All septic tanks are required to have at least two compartments. It is recommended for the most efficient operation that the volume of the first and second compartments be in the ratio of 2 to 1. Their combined volumes with liquid depth to the invert of the outlet pipe is referred to as the working capacity of the tank. If a rectangular tank is used, best results are obtained if the length is between two and three times the width. The depth of the liquid from the tank bottom to the outlet must be a minimum of 4 feet. This may be increased in larger tanks but desirably should not exceed 5 feet. An additional 9 inches of depth above the water surface is required for ventilation purposes and for floating scum storage. Refer to Drawing No. 2 for typical construction details.

10. Siphons and Pumps

A septic tank may be fitted with a pump or siphon as a device to dose the leaching bed. This has a distinct advantage as it permits a uniform distribution of liquid to the entire leaching bed, which is not otherwise achieved, and also permits the bed to “rest” between doses. A dosing device has the further advantage that it assists in preventing the system from freezing up in extremely cold weather in localities where this might otherwise occur. The siphon or pump chamber must be a separate compartment and the second compartment of the tank must not be used for this purpose.

A 3-inch siphon is adequate for a domestic septic tank. The manufacturer’s installation instructions should be rigidly followed, particularly in regard to the correct drawing depth to be provided in the siphon chamber to operate the particular make of siphon to be installed. The discharge from the siphon depends on the size of the siphon chamber, and the amount of liquid discharged should be equal to approximately three-quarters of the volumetric capacity of the distribution pipes in the leaching bed.

For this capacity, refer to Note 3 below Table No. 3. The use of a siphon involves special considerations in the design and location of the septic tank system as a siphon will require an increase in the minimum difference in elevation or fall which must be available from the building to the leaching bed. This extra fall depends on the size and make of siphon and can be obtained from the manufacturer.

If a pump is used as an alternative to a siphon, or where elevations require that sewage be lifted to the level of the distribution system serving the leaching bed, the tank effluent is collected in a pump chamber. Pump controls are set to control the dose delivered to the leaching bed. (See Note 3, Table No. 3.) The siphon or pump chamber is to be sized so that the dose delivered will be approximately equal to three-quarters of the volume of the distribution pipes in the leaching bed. The siphon or the pump should be sized to deliver this dose in a time not exceeding 15 minutes.

11. Design of Leaching Beds

(a) Normal Conditions

The ideal location for a leaching bed is in a well-drained, sandy loam soil, remote from any wells or surface water. For the leaching bed to work satisfactorily the maximum elevation of the ground water table, or of any rock formation or layer of impervious material shall be at least 3 feet below the elevation of the bottom of the absorption trenches.

Where water table is the limiting factor it is the highest water table that is of concern rather than the average or that found at the time of site investigation. Any flooding within the 3 foot zone will restrict the access of oxygen to the soil and inhibit proper treatment. If the design is based on a water table elevation other than the maximum then the higher the water rises in the 3 foot zone the greater the risk of pollution to the ground water.

The normal leaching bed uses the trench method of installing the weeping tile or perforated pipe. When the sewage leaves the septic tank it must be divided equally amongst the weeping tile or perforated pipe in the leaching bed. This is accomplished either by use of a distribution box or by use of a solid header pipeline with watertight connections to individual weeping tile or perforated pipe lines. For both types of distribution, it is essential that the distribution box or the header pipeline is level and that it is installed on a solid foundation. An interconnection of the ends will provide a relief connection between runs so that an excess of effluent distributed to any one run from the header or distribution box can be redistributed to the remaining runs before pressures build up that could lead to a breakout to the surface. Interconnection is only possible if tile or pipe runs are at the same elevations. A typical installation is illustrated in Drawing No. 4.

Gravity flow is permitted for leaching beds with up to 500 lineal feet of tile or perforated pipe. If required by topography a pump may be used to lift the effluent to a point where gravity flow will resume. Three-inch diameter perforated pipe may be used in

beds up to 500 feet. If a pump or siphon is used for dosing a bed of this size, 4 inch diameter pipe is required. For leaching beds having more than 500 feet of distribution pipe the minimum diameter of tile or pipe is 4 inches and dosing of the bed by siphon or pump is mandatory.

The maximum length of any single absorption trench in a leaching bed is 60 feet for gravity fed beds and 100 feet for beds dosed by a siphon or pump. The centre to centre spacing of absorption trenches, the slope of tile or pipe runs and other construction details are shown in Drawing No. 4.

The area of a leaching bed should be generally free of trees and bushes so that the bed is well aired and sunlight is able to reach the surface. Trees will only be permitted within the area of the bed if it is judged that no damage will occur from the roots considering the size and type of the tree and the arrangement of the tile or pipe runs.

Normal leaching beds are not generally subject to damage by frost, providing construction details outlined herein are followed and there is continuous occupancy. However, certain conditions can cause such damage. For example, if the snow cover over a leaching bed is packed down either by foot traffic or by such causes as driving over the bed area in snowmobiles, the insulating quality of the snow will be lost and frost can penetrate deeper. If this is combined with periodic occupancy in winter, such as only on weekends, damage can occur either in the form of heaving which upsets the levelling of distribution boxes or pipes or of cracking of clay drain tiles which are particularly susceptible to damage in this manner.

A good growth of grass should be encouraged and maintained over the entire leaching bed area. The roots of grass and plants absorb liquid in the soil and transpire it to the atmosphere through the leaves. Sunlight should be allowed to reach the bed to promote evaporation.

(b) Beds on Sloping Sites

Leaching beds constructed in the conventional manner (Drawing 1 and 4) require sites that are level, or only slightly sloped. The economies and other problems of levelling the required area will generally limit conventional construction methods to slopes of not greater than 1 foot rise in each 10 feet horizontal distance (10%). Special methods of installation are required where more steeply sloped sites are encountered. The special methods described in this section may be used in slopes from 10% up to 25% (1 foot rise in 4 feet horizontal). Leaching beds are not to be constructed on areas where the slope exceeds 25% in any direction.

The runs of distribution pipe in beds constructed according to the special methods recommended for sloping sites should be located with their axis transverse to the slope in the manner of contour lines. Two methods of construction used on slopes of 10-25% are shown on Drawings 6 and 7. These are:

(i) Serial Distribution Method

In serial distribution each trench or pair of trenches is connected to the next by a tightly jointed relief line laid on an undisturbed section of ground as shown on Drawing No. 6. The arrangement is such that all effluent is discharged to the first trench until it is filled. Excess liquid is then carried by means of a tightly jointed relief line to the succeeding or lower trench. In that manner each portion of absorption trench is used in succession. When serial distribution is used the following design and construction procedures should be followed:

- The amount of absorption trench required shall be the same as shown in Table No. 2 of this booklet.
- The bottom of each trench and its distribution pipe should have a relatively level grade.
- The direction of the absorption trenches should follow approximately the ground surface contour lines so that variations in trench depth will be minimized.
- There should be a minimum of 12 inches of ground cover over the gravel fill in the trenches.
- Adjacent trenches will be connected with a relief line, in such a manner that each trench is filled with septic tank effluent until the pipes are approximately three-quarters full before the effluent flows to the next trench. Relief lines connecting trenches should be 4 inches tightly jointed sewer pipe with direct connections to the distribution pipes in adjacent trenches. Care must be exercised in constructing relief lines to ensure an undisturbed block of earth between trenches. The relief lines should rest on undisturbed earth and backfill should be carefully tamped. The relief lines connecting individual trenches should be as far from each other as is necessary in order to prevent short circuiting.
- The level of the overflow pipe in the first relief line must be at least 4 inches lower than that of the septic tank outlet.
- All other construction features of the disposal field should be as detailed in this booklet.

(ii) Distribution Box Method

In this method a distribution box is used to load all the absorption trenches evenly. The ends of each run are capped. Care must be taken to ensure that the distribution box is firmly supported in a manner to avoid settlement or frost heaving and an even invert level maintained on all pipes. If one run becomes overloaded due to uneven distribution it can result in a breakout of effluent from the bed. Drawing No. 7 refers.

(c) Raised Leaching Bed

In cases where 3 feet of acceptable soil is not available under the pipe trenches and above high water table, rock or impervious soil, a solution may be found by constructing a leaching bed of selected material to form a mound in which the absorption trenches can be set so that the desired 3 foot clearance below the trenches is obtained. An impervious soil is one having a percolation rate "t" in excess of 60 minutes.

Where rock or impervious soil is the reason for the raised leaching bed design there is a requirement to ensure that the effluent passing through the fill material will not run over the surface of the ground. It is important that this effluent be absorbed into the soil under the area covered by the fill or that, in any direction in which effluent will trickle away from the bed, there is a sufficient depth of natural permeable soil to prevent any breakout of effluent to the surface. If a natural mantle is not present in these areas, or is inadequate to ensure against breakout, sufficient permeable soil should be added to form a mantle for a distance of 50 feet down grade from the bed in the direction of trickle flow and its surface planted for stability and to promote evapotranspiration.

The presence of prominent solution channels or fissures in the rock beneath a leaching bed may cause "piping" or short-circuiting of the effluent within the leaching bed so that it does not receive proper treatment. Generally this does not occur when the leaching bed is constructed in soil which is in place naturally over fissured rock or where a partially raised bed is required over an existing but shallow soil cover. However, when a leaching bed is to be constructed on exposed rock which contains fissures or is fractured, the area beneath the bed should be sealed with a minimum of 12 inches of clay. In the case of very prominent channels, it will be necessary to seal these individually or to move the location of the leaching bed.

The surface and sloped sides and any man-made mantle of a raised bed should be grassed to prevent erosion and encourage evapotranspiration. The sloped edges should ensure stability under adverse conditions and in extreme cases may require retaining walls to provide adequate support. Clearance distances outlined in Section 12 must be increased by an amount equal to 2 feet horizontal for each 1 foot vertical height of the surface of the leaching bed above the natural grade.

Details of a typical raised leaching bed are illustrated in Drawing No. 8 and are suited to beds constructed on sites where the maximum slope in any direction does not exceed 10% (1 vertical in 10 horizontal).

Raised beds are more subject to frost penetration than normal beds particularly where the winter use is intermittent and where the natural insulating quality of snow has been destroyed by driving of snowmobiles over the beds. This leads to deeper frost penetration. Tiles subject to frost damage should not be used in such circumstances.

12. Locating a Septic Tank System (all clearances are to be measured horizontally).

A septic tank should not be closer than:

- 50 feet to any well, lake, river, stream, water course, pond, spring or reservoir

- 5 feet to any building or structure
- 10 feet to any property boundary.

The **distribution pipe** in a leaching bed shall not be closer than:

- 100 feet to the nearest dug well. This includes bored wells with non-watertight casings
- 50 feet to a drilled well which has a solid watertight casing to 25 feet below ground
- 25 feet to any building or structure where the bottom of the perforated or open jointed pipe or tile is equal in level with or above the level of the lowest floor
- 10 feet to any building or structure where the bottom of the perforated or open jointed pipe or tile is below the level of the lowest floor.
- 10 feet to any property boundary
- 50 feet to any lake, river, stream, watercourse, pond, spring or reservoir.

The above distances are minimum according to the Regulations. A typical layout of a septic tank system illustrating some of the clearances outlined above is shown in Drawing No. 1.

13. Planning and Approval of a Septic Tank System

Steps in planning and obtaining approval of a system are:

- (a) Consult the appropriate official and obtain the instructions and forms necessary to complete an application for approval of a septic tank system.
- (b) On the basis of the number of bedrooms proposed, or persons in occupancy, select the septic tank size from Table No. 3. Note that no septic tank can be of less than 500 Imperial Gallons working capacity.
- (c) complete the application form including a detailed sketch or survey plan showing the lot dimensions, the location of existing and proposed buildings and water supply, any features of the lot such as knolls, rock outcrops or steep banks and the location of any surface water or watercourse. Locate the septic tank and leaching bed in outline only. Remember the need for a reasonably level area and suitable soil depth for the site of the bed. To show the leaching bed outline in proper relationship, and to determine if there is sufficient space available in the location selected, an approximation of the area of the bed and its shape is required. For this purpose it is necessary to assess the length of absorption trench required (Table No. 2) and this necessitates an estimate of the percolation rate. The shape of the bed would then depend on the number and length of the trenches and the 6 foot

minimum spacing. For purposes of the submission the owner should estimate the percolation rate of the soil bearing in mind that the judgement on which the application will be approved will be made by the inspector reviewing the application on site.

(d) Calculate the size of the dosing chamber, if one is to be used. See Note 3, Table No. 3.

(e) In addition, a detailed sketch of the system showing the tank, distribution system and tile or pipe runs, pumps or siphons, etc. and all clearances, should be prepared to support the application. This may be completed by the owner or his contractor. Standard Ministry drawings may be used if applicable.

(f) For the inspection of the proposal the owner will normally be required to dig one or more holes in the proposed area of the leaching bed so that the nature of the soil to a depth of 5 feet can be determined and any rock, impervious soil or ground water in that zone disclosed.

(g) The inspector will confirm all requirements to be met for the complete system. Unless the property is unsuitable, a certificate of approval to proceed with construction will then be issued and this certificate will support the application for a building permit.

(h) A further inspection will take place when the bed is constructed to the stage where the tile or pipe is in place but not covered over.

(i) When construction is completed, and providing all the requirements have been met, a Use Permit will be issued.

TABLE NO. 2
LENGTH IN FEET OF DISTRIBUTION PIPE
HOUSEHOLD SYSTEMS

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
Number of Bedrooms	Where the percolation time is from 1 minute to 5 minutes inclusive	Where the percolation time is greater than 5 minutes but not greater than 10 minutes	Where the percolation time is greater than 10 minutes but not greater than 20 minutes	Where the percolation time is greater than 20 minutes but not greater than 30 minutes	Where the percolation time is greater than 30 minutes but not greater than 40 minutes	Where the percolation time is greater than 40 minutes but not greater than 50 minutes	Where the percolation time is greater than 50 minutes but not greater than 60 minutes
2 or less	150	150	180	220	250	300	350
3 " "	150	200	300	350	400	450	500
4 " "	180	250	350	450	500	550	650
5 " "	220	300	430	530	610	680	750
6 " "	260	360	520	630	730	820	890

- Notes:**
1. This table is for domestic systems only. It does not apply to schools, motels, hospitals or other such public or commercial premises.
 2. The length of distribution pipe shown in this table must be increased by 20% if a garbage grinder is installed.

TABLE NO. 3
SEPTIC TANKS – WORKING CAPACITY
HOUSEHOLD SYSTEMS

(Imperial Gallons)

SMALL DOMESTIC SYSTEMS (1)

		RECOMMENDED INTERNAL DIMENSIONS RECTANGULAR TANKS		
Number of Bedrooms (2 persons per bedroom) (Note 6)	Minimum Total Working Capacity Imperial Gallons	Length A $A = a_1 + a_2$ Drawing No. 2	Width B	Water Depth C Min. 4' – 0"
2 or less	500	6' – 9"	3' – 0"	4' – 0"
3 " "	600	8' – 0"	3' – 0"	4' – 0"
4 " "	750	9' – 0"	3' – 6"	4' – 0"
5 " "	900	9' – 0"	4' – 0"	4' – 0"
6 " "	1080	9' – 6"	4' – 0"	4' – 6"

Notes:

1. The above dimensions are calculated for households having an automatic washer but no garbage grinder. If a garbage grinder is used, tank capacity should be increased by 20%. Probable future usage of these machines should be taken into account when tank is designed.
2. Tank dimensions and capacity in relation to sewage flows are recommended to control the velocity of flow and provide good conditions for the settling of suspended solids. Several small tanks connected in series with a combined volume equal to the total required daily flow are not equivalent to the single tanks shown as the flow characteristics will not be the same. Such connections in series should not be installed.
3. Where a siphon or pump chamber is used, either as a structural extension of the tank as shown in Drawing No. 2 or as a separate chamber it is to be sized so that the dose delivered to the leaching bed

will be equal in volume to approximately 3/4 of the internal volume of the distribution pipe required in the bed (See Table No. 2). The volume of 100 feet of 4" diameter tile is 55 gallons or 8 3/4 cubic feet. Therefore the siphon or pump chamber should be designed to deliver a dose of approximately 40 Imperial Gallons per 100 feet of 4" distribution pipe.

4. The depth of water in a siphon chamber depends on the siphon used. Consult the supplier for installation details.

5. Where effluent is pumped to a leaching bed the pump or pumps selected should be capable of delivering the required dose of the bed against the combined static and friction heads in a period of not greater than 15 minutes.

6. Where the number of occupants exceeds two times the number of bedrooms then the size of tank selected should be that which relates to the equivalent number of bedrooms (eliminating half numbers) determined by dividing the number of occupants by two.

14. Operation and Maintenance of Septic Tank Systems

People often ask whether certain types of waste may be discharged safely to a septic tank system and whether a grease trap is necessary. For normal domestic systems, to which this booklet refers, no grease trap will be necessary for the small amount of grease coming from the kitchen. Similarly, detergents, lye, or other household cleansers or disinfectants in the recommended quantities should not hinder the bacterial action in the septic tank. Care should be taken, however, to ensure that excessive quantities of these materials do not enter the system. Some researchers have concluded that waste discharges from household water softener units appear to have no adverse effect on the action of the septic tank, but will cause a slight shortening of the life of a leaching bed installed in some clay type soils. When installing a water softener extreme care should be taken in connecting these units to the disposal system to preclude any danger of cross connection between the water supply and the waste plumbing system.

Various preparations are on the market which are said to start, accelerate or improve the action in the septic tank. Apart from these proprietary products it is often suggested that yeast would help the action. There appears to be no necessity for the addition of any such product to the septic tank system. All bacteria necessary for the operation are already contained in the sewage entering the system.

With good design and careful construction, a septic tank system will need very little maintenance provided it is used properly. With the tank capacities previously given, it should not be necessary to pump out the tank more than once every three years. It should, however, be inspected at least once a year and pumped out when necessary. Failure to pump out a septic tank when required will result in sludge or scum being carried into the leaching bed which in turn may clog and cease to function. In this event not only will the tank have to be pumped out but the leaching bed will have to be replaced.

Trouble is sometimes experienced with septic tank systems after large house parties have been held. During such periods abnormal quantities of liquid reach the system, which results in overloading. This may also occur because of flooding of the surface of the leaching bed area due to lawn watering, surface or roof drainage or because of faulty valve closures. These should be avoided.

Inspection of the sludge and scum accumulation is the only way to determine when a tank should be pumped out. This is indicated if either:

- (a) the bottom of the scum mat is within approximately 3 inches of the bottom of the outlet fitting, or
- (b) the surface of the sludge accumulation comes within 18 inches of the outlet fitting.

In most localities there are contractors who will pump out septic tanks. Tanks should not be washed or disinfected after pumping. The means and place of disposal of the contents of the tank must be approved by the appropriate authority.

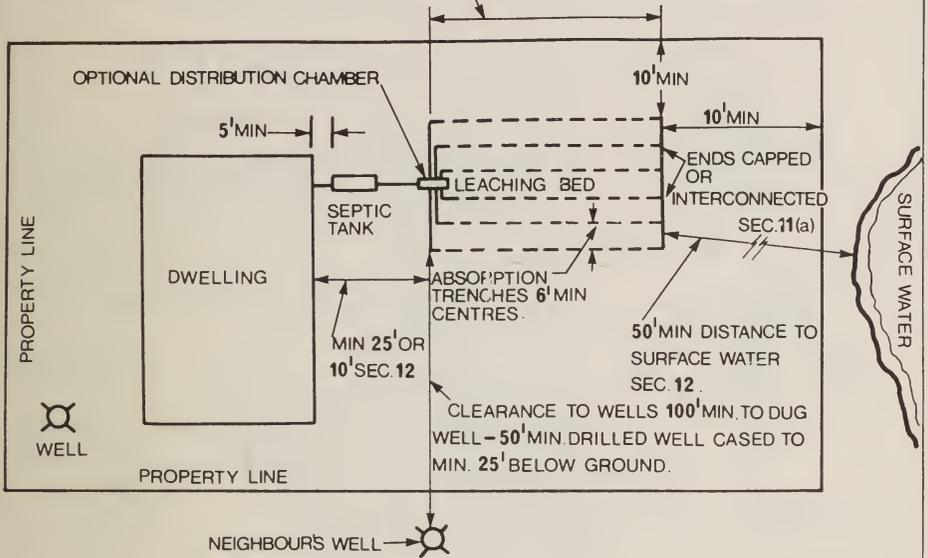
A leaching bed can be damaged by vehicular traffic, blocking by excessive root growth, and freezing. As previously mentioned, snowmobiles driven over leaching beds destroy the natural insulation provided by the snow cover and allow frost to penetrate the bed especially where it is used intermittently (e.g. on weekends only) during the winter. Local pump out contractors or your local authority can advise on the need to pump out septic tanks which will not be used in the winter. Above ground tanks should normally be emptied but buried tanks are frequently left full. In cases where ground water in the spring may rise around a buried tank it can be "floated" out of the ground if it has been emptied.

PART III – NON-DOMESTIC SYSTEMS

For all non-domestic systems, individuals should obtain information from the local office having authority for septic tank systems. This would include systems for condominiums, apartments, schools, institutions, motels, tent and trailer parks, mobile home parks, camp ground and recreational areas and a variety of commercial uses. Homes of more than 6 bedrooms are included in this category.

It is important to establish the applicable daily rate of sewage flow and other data on which to base a proposal prior to its submission for approval. Some types of sewage cannot be treated in a septic tank system. Information on such matters can be provided in discussions with representatives in the local office. Also the larger systems become more complex in the design of leaching beds and pumping systems to ensure best distribution and design of such systems should only be undertaken by persons with experience in this field.

MAX. LENGTH ABSORPTION TRENCH 60' GRAVITY FED — 100' DOSED BED — SEC.11(a)

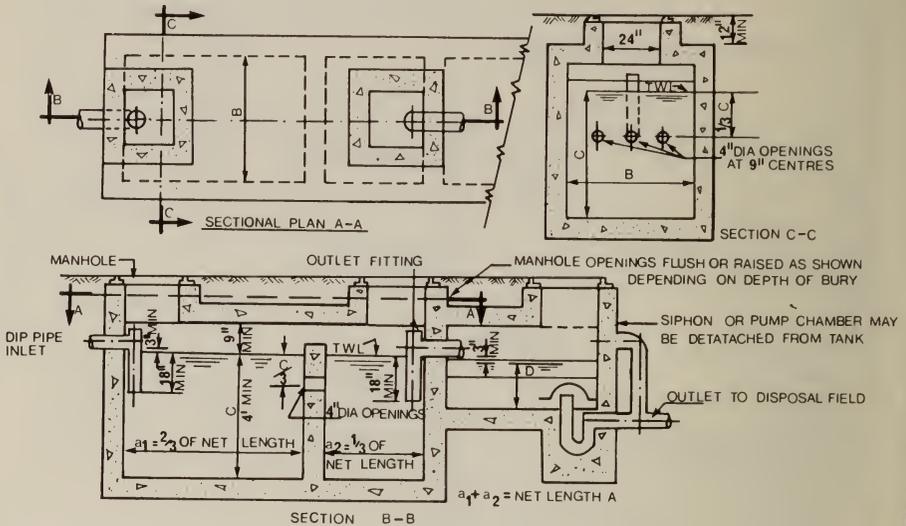


TYPICAL ARRANGEMENT OF A SEPTIC TANK SYSTEM

NOTES:

1. The above layout is suitable for a leaching bed using normal construction methods.
2. Location of tank and leaching bed to be on lower ground than adjacent wells or springs, if possible.
3. Internal plumbing and main drainage outlet should be designed with a view to connecting to possible future sanitary sewers.
4. Roof water, surface water, discharge from footing drains, etc. must be excluded from entry to septic tank.
5. Leaching beds NOT to be located in swampy ground or in ground liable to flooding.

septic tank systems general layout
NOT TO SCALE



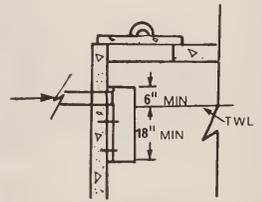
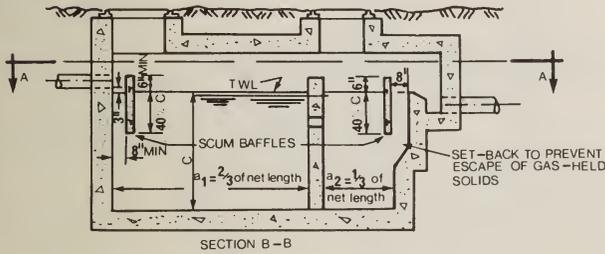
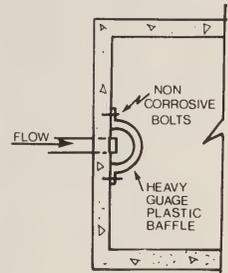
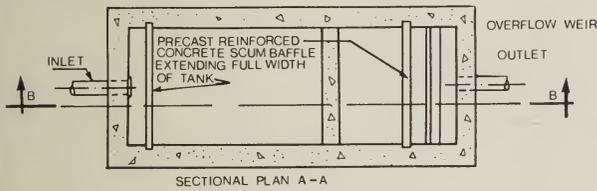
NOTES:

1. Manhole access shall be provided to each compartment located to facilitate servicing of the inlet and outlet.
2. Baffles may be used at inlet and outlet of tank instead of dip-pipes. The top edge should be not less than 6" above T.W.L. and bottom edge not less than 18" below T.W.L. See alternative details on Drawing No. 3.
3. Inlet pipe may enter side wall of tank if convenient, but centre-line of pipe must not be more than 6" from inlet end wall.
4. The slope of the inlet pipe should be such that inlet velocity does not exceed 3 feet per second (1" in 6 ft. for 4" dia. pipe; 1" in 12 ft. for 6" dia. pipe).
5. Provision should be made for not less than 12" of cover to tank (this may be raised above general ground level when available fall to distribution system is limited).
6. A siphon or pump shall be used to dose the leaching bed when more than 500 feet of distribution pipe is required. For size of siphon or pump chamber see Note 3, Table 3.
7. Dimension E should be according to siphon manufacturer's requirements.
8. Add 9" to dimension C for total internal depth.
9. For dimensions A, B, C, see Table No. 2.
10. Inspect tanks annually. Tank to be cleaned when the level of the bottom of the scum is within 3", or the surface of the sludge is within 18", of the bottom of the outlet fitting.

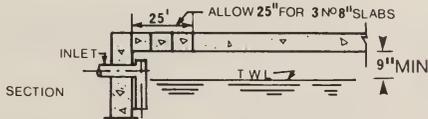
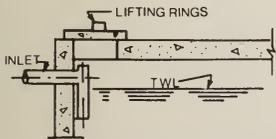
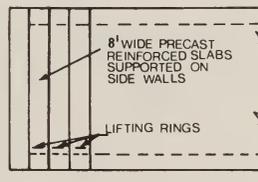
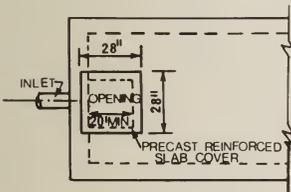
septic tank systems

septic tank
construction details
NOT TO SCALE

Drawing 2



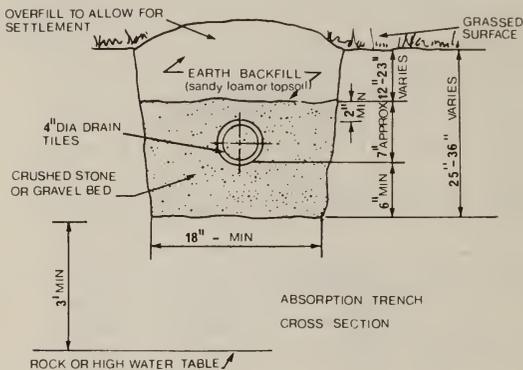
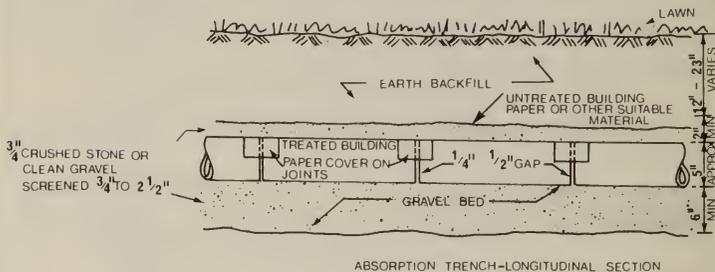
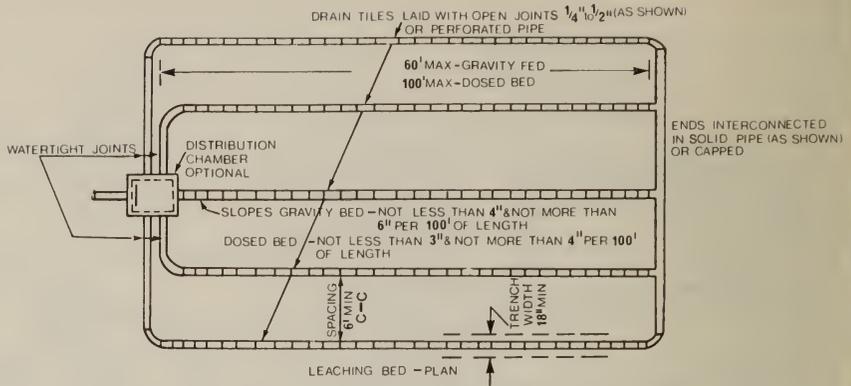
ALTERNATIVE PLASTIC INLET BAFFLE



septic tank systems

septic tank
 alternative construction
 details
 not to scale

Drawing 3

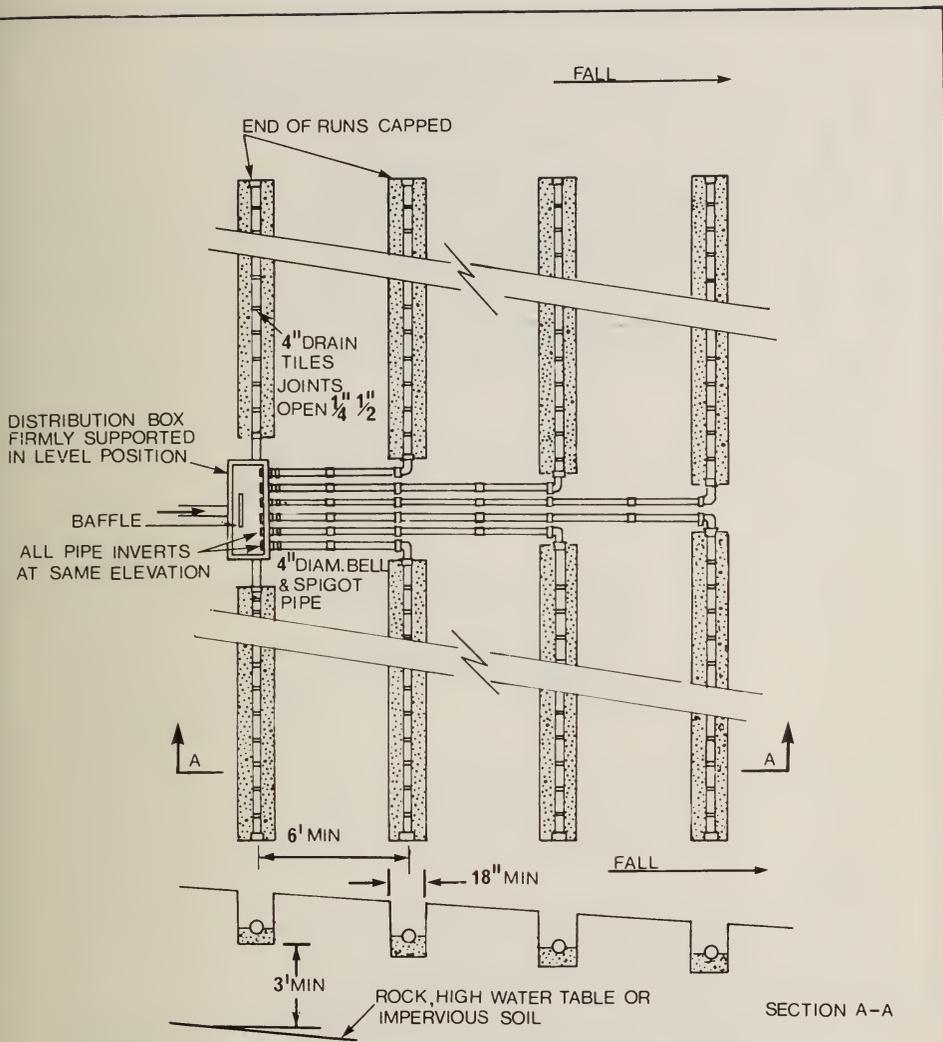


NOTE:

As alternative to the drain tiles shown use 3" perforated pipe in gravity fed leaching beds of up to 500 lineal feet of absorption trench and 4" perforated pipe in all leaching beds dosed by a siphon or pump.

septic tank systems
leaching bed & absorption trench
details
not to scale

Drawing 4



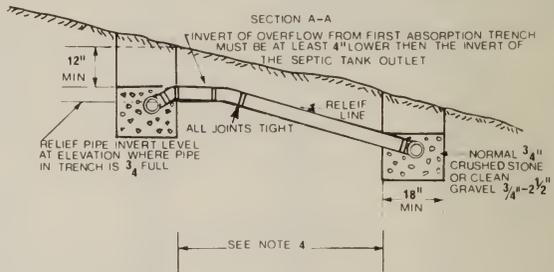
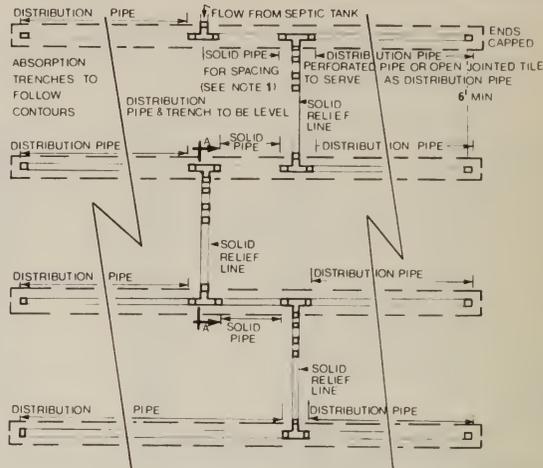
**PLAN AND CROSS-SECTION
LEACHING BED OPEN FOR INSPECTION**

NOTES:

1. Perforated plastic pipe may be used as an alternative to the drain tile shown. Solid pipe as alternative to bell and spigot.
2. This arrangement is suited to slightly sloping sites as an alternative to levelling.

<p>septic tank systems leaching bed alternative layout ped sites to 25% not to scale</p>

Drawing 5

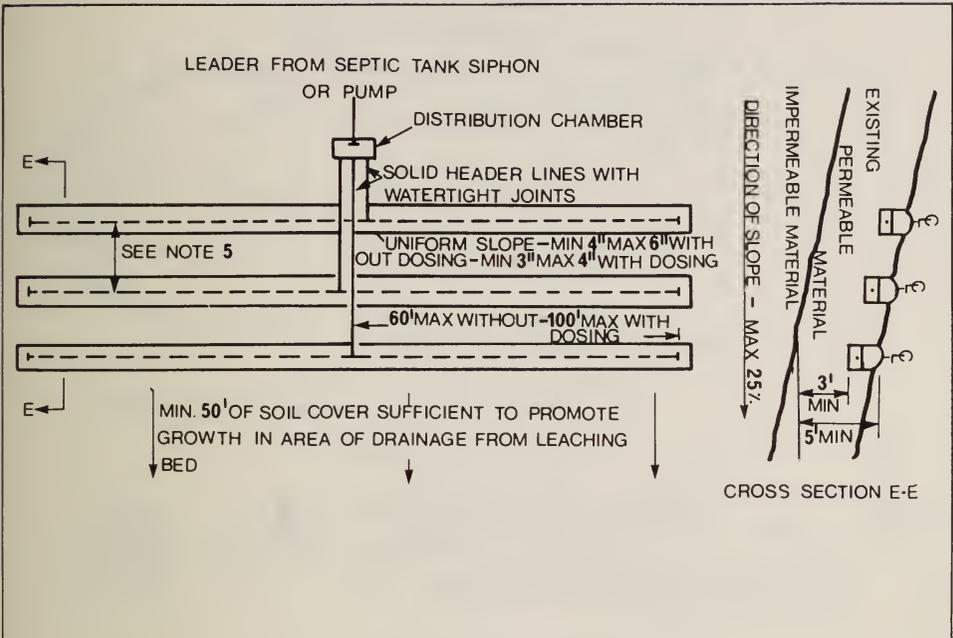


NOTES:

1. Relief lines to be spaced far enough apart to prevent short circuit (4' to 8' is recommended).
2. Pipe in trenches between relief lines to be solid.
3. Pipe fittings for relief lines to be selected to suit slope.
4. A minimum of 6 feet (horizontal) of undisturbed earth is recommended between absorption trenches.
5. Distribution pipe in absorption trenches to extend an equal distance (approximately) both directions from the solid interconnecting and relief pipes. Distribution pipes and trenches to be level and normally follow contour of slope.

septic tank systems
serial distribution
leaching bed for sloping
ground
NOT TO SCALE

Drawing 6



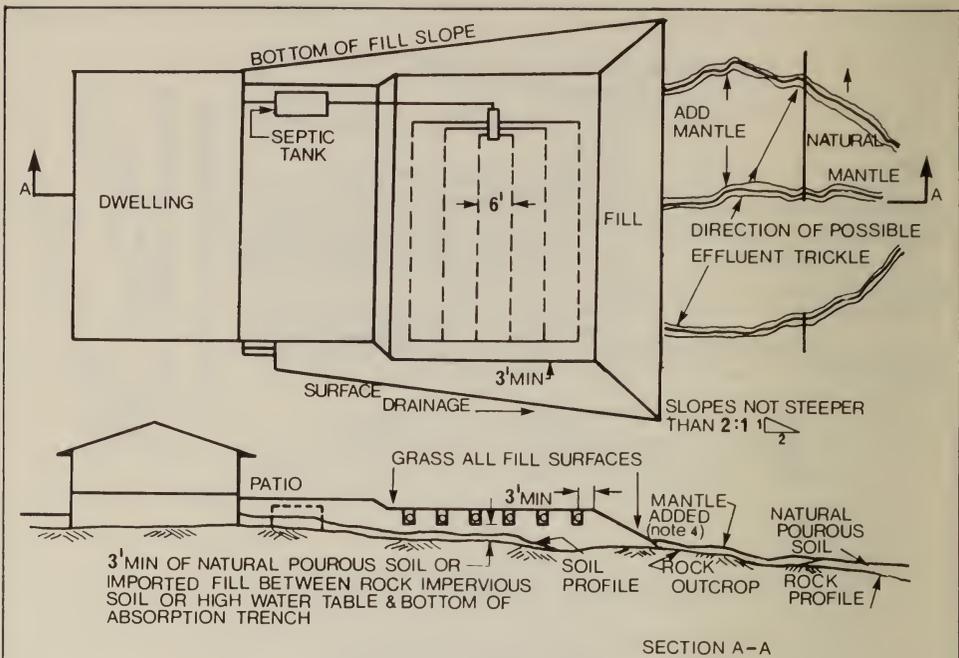
PLAN VIEW - (SEE NOTE 5)

NOTES:

1. Ends of tile or pipe runs to be capped and not interconnected.
2. All outlets in the distribution chamber must be at the same elevation.
3. Surface run-off must be diverted around the leaching bed.
4. Details for absorption trench, crushed stone, cover, etc., as per Drawing No. 4.
5. In this alternative, the header lines from the distribution box to each tile or perforated pipe run must pass over or under the run or runs higher on the slope. Problems will result if the distribution box is too close to the first absorption trench. The plan should be checked to ensure clearance of header lines without prejudice to adequate cover of soil over any header or to the trench depth of 25' to 36'. The alternative, therefore, does not suit sites which are only slightly sloped.
6. Pipe headers should leave the distribution box level and assume the desired slope subsequently using an appropriate fitting.

septic tank system
alternative layout
sloped - sites up to 25%
not to scale

Drawing 7



PLAN AND PROFILE - TYPICAL RAISED BED

NOTES:

1. Clearances from buildings, lot lines, wells, etc., as for normal leaching beds - Sec. 4 and drawing No. 1 - plus 2 feet horizontal for each 1 foot vertical that surface of bed is above grade.
2. Fill slope must be stable for the material used, but not steeper than 2 feet horizontal to 1 foot vertical.
3. Percolation rate "t" to suite imported material but not less than 5 mins. Select length of absorption trench from Table 2.
4. Effluent passing through fill must be absorbed into natural soil beneath the fill or into the surrounding permeable soil without ponding or breakout to surface. Where the natural soil cover is inadequate for this purpose for a distance of 50 feet from the bed in any direction in which effluent will trickle adequate fill must be added.
5. Details of absorption trench construction same as in drawing No. 4.

septic tank systems
raised leaching bed
typical layout
NOT TO SCALE

NOTES

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MAR 21 1979	G. Roszler ^{PHL}
MAY 28 1979	Eric Conway ^{W7}
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