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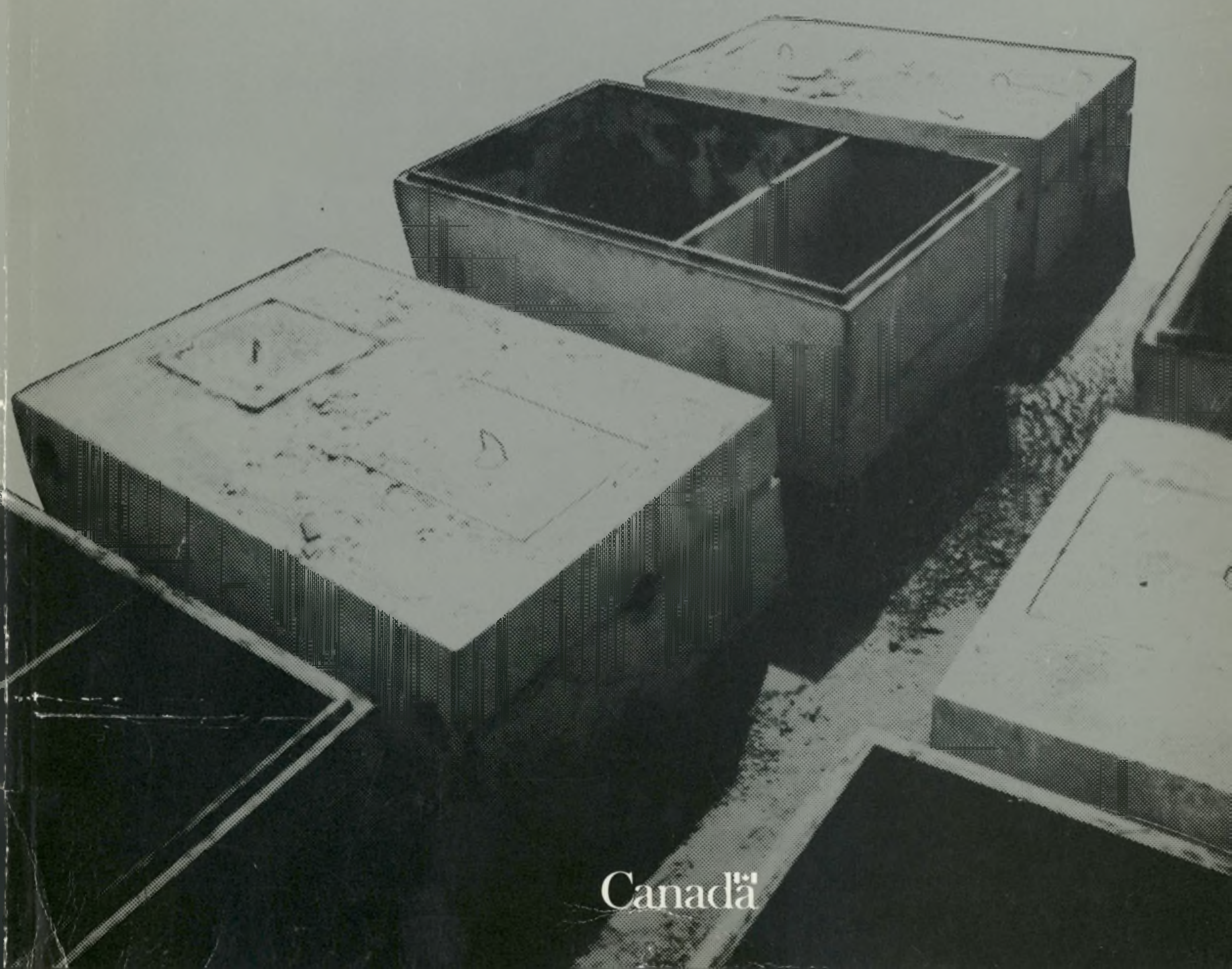
CMHC SCHL
Canada Mortgage and Housing Corporation
Société canadienne d'hypothèques et de logement

CMHC Septic Tank Standards



Canada

Canada Mortgage and Housing Corporation, the Federal Government's housing agency, is responsible for administering the National Housing Act.

This legislation is designed to aid in the improvement of housing and living conditions in Canada. As a result, the Corporation has interests in all aspects of housing and urban growth and development.

Under Part V of this Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research. CMHC therefore has a statutory responsibility to make widely available, information which may be useful in the improvement of housing and living conditions.

This publication is one of the many items of information published by CMHC with the assistance of federal funds.

CMHC
Canada's Housing Agency

CMHC Septic Tank Standards

Canada Mortgage and Housing Corporation
Société canadienne d'hypothèques et de logement

First edition 1977
Metric edition 1978
Reprinted 1982
Reprinted 1984
Reprinted 1985

Cat. No.: NH18-1/2
ISBN 0-662-50084-9

Printed in Canada

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Introduction

Improper disposal of sewage may create both health and environmental problems. Typhoid fever, paratyphoid fever, dysentery and viral diseases are some of the health hazards that may be present in sewage. The nutrients in sewage, such as phosphorous and nitrogen will promote accelerated growth of aquatic plants and algae in lakes and streams. Nitrogen may also accumulate in the ground water to such an extent that the water may be unfit for consumption.

In sparsely developed areas lacking community sewerage, dwellings are serviced by individual sewage disposal systems. Even the simplest of sewage treatment plants employs mechanical devices requiring periodic maintenance. Hence, while other methods may be appropriate to multi-family or large institutional facilities, the septic tank and disposal field remains the most common sewage disposal system for individual households and small establishments in outlying areas. It is the simplest and most convenient method of sewage disposal within the confines of a small individual lot, and when constructed and maintained properly, performs satisfactorily, at least for the limited effective life of the disposal field.

Septic tank disposal systems *shall not* be installed under the following conditions:

- Where soil conditions or topography are such that a septic tank system cannot be expected to perform satisfactorily.

- Where installation of a septic tank system would constitute a hazard to a ground water supply.

This booklet is divided into five sections consisting of definitions, process description, site appraisal, design and construction, and operation and maintenance.

Definitions

Septic Tank — a water-tight, covered receptacle designed and constructed to receive the discharge of sewage from a building sewer, separate solids from the liquid, digest organic matter and store digested solid through a period of detention, and allow the clarified liquids (septic tank effluent) to discharge for final disposal.

Absorption Trench — a trench in which clean coarse aggregate and distribution pipe are placed and then covered with earth.

Sludge — the accumulated settled solids deposited from sewage which, due to the high water content, form a semi-liquid mass.

Scum — a mass of sewage matter which floats on the surface of sewage.

Disposal Field (Leaching Bed, Soil Absorption Field or Drainfield) — a system of absorption trenches that use the soil for absorption of the septic tank effluent.

Distribution Pipe — a line or lines of perforated or open joint pipe or tile installed in a disposal field for the purpose of dispersing septic tank effluent to the soil.

Process Description

The septic tank system consists of two main parts; the septic tank which conditions sewage so it may be more readily percolated into the ground, and the disposal field which distributes the septic tank effluent to the soil.

The Septic Tank
Contrary to popular belief, apart from settling, little or no purification takes place in the septic tank. Indeed, the tank effluent is in some respects more objectionable than the sewage influent; the effluent is septic (without oxygen) and malodorous. The tank's prime purpose is to render most of the sewage soluble so that the effluent will cause less clogging of the disposal field. Three functions take place within the tank which provide a measure of protection for the disposal field.

- Removal of Solids — The rate at which soil clogs, varies with the amount of solids suspended in the liquid. The velocity of the sewage is reduced on entering a septic tank. Heavier solids settle to the bottom of the tank forming a blanket of sludge. Lighter solids including fats and greases, rise to the surface to form a layer of scum. The sludge and the scum are retained in the tank and a somewhat clarified effluent is discharged.

- Bacterial Action — Suspended solids in the tank are subjected to decomposition by bacterial and natural processes. Sludge, and scum to a lesser degree, are digested and compacted into a smaller volume.

- Sludge and Scum Storage — No matter how efficient the biological action is, sludge and scum will remain in the tank. Sufficient space must be provided in the tank to store these impurities between cleanings; otherwise they will be discharged from the tank and may clog the disposal field.

Effluent Disposal
The most common method of sub-surface effluent disposal uses a disposal field which consists of perforated or open jointed pipes laid in trenches below the surface of the ground so that the effluent can pass into the soil where further treatment occurs. The microbial activity in the trench is aerobic, meaning that the presence of oxygen is required 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 mantle required above high water table, rock or impervious soils.

In proposed installations where 900 mm of acceptable soil is not available under the absorption trenches a conventional disposal field shall not be permitted. The acceptability of the soil is governed by the depth to high water table, rock or impervious soil. In such instances a raised absorption field as described in Raised Fields p. 10 may be considered.

Where distribution pipe is installed close to the ground surface, evaporation from the surface and transpiration through vegetation are significant during the warm months of the year. In most parts of Canada, where the growing season rarely extends beyond May to September, evapo-transpiration is a limited factor in the performance of the disposal field. If evapo-transpiration is to provide a significant contribution the design must be carried out by experts.

Composition of Sewage
The wastes to be disposed of by the septic tank system include 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 disposal field. Drainage from garage floors or other sources of oily wastes should also be excluded.

Site Appraisal

Before commencing the detailed design of a septic tank system, the site must be judged suitable for such an installation. Factors which must be considered include the size and slope of the lot; the location in relation to streams, wells and structures, the character and depth of the soil mantle, the depth to ground water and climatic conditions. Many characteristics affecting the suitability of a site are not amenable to precise analysis. This does not diminish their importance but rather emphasizes the need for competent judgement in the assessment of site suitability.

Lot Size

Many disposal fields constructed in the past have failed within a period of 15 years. Since the effective life of the field is limited, provision shall be made for future replacement of the disposal field. For this purpose an area equivalent to 100% of the initial field shall be set aside for a replacement field. This area shall be as equally suited for the purpose as the initial disposal field area, and incompatible use of the area set aside shall be prohibited. The lot then shall be sufficient in size to allow construction of the initial disposal field and its replacement, and shall leave space for the minimum setbacks shown in Table 2. Generally, the necessary lot sizes will be 2000 m^2 where water is drawn from a well and 1300 m^2 where piped water is supplied. When the slope of the lot exceeds 5% the minimum lot size must be increased as shown below to allow for additional construction difficulties and to take precautions against slides or downhill surfacing of the effluent.

Table 1
Minimum Lot Size in relation to Slope

Disposal Field Slope	Minimum Lot Size
less than 5%	2000 m^2
5% to 10%	3000 m^2
10% to 20%	4000 m^2

Soil Suitability

The suitability of the soil absorbing the liquid waste as well as the area required is determined by various soil characteristics. The depth of soil available must be a minimum of 900 mm from the bottom of the absorption trench to rock or high water table. The number and type of tests to be carried out to verify acceptable conditions and determine design parameters will generally be a minimum of three percolation tests (described later). In some locations soil grain size analyses may be required to either replace the percolation test or to provide additional information.

Setback from Wells, Streams, etc.

Even when the septic tank disposal field is performing adequately the purification function of the system is not completed when the waste has passed through the infiltrative surface and percolated into the soil. The final removal of bacteria and dissolved organic matter is accomplished as the effluent travels through the soil. The distance travelled by pollutants is therefore an important consideration in the design of septic tank systems. Fine-grained soils will remove bacteria in a shorter distance than will coarse-grained soils. If the soil particle size is too small, bacteria removal will be excellent but percolation rates will be unacceptably slow. If the particle size is too coarse, percolation rates will be excellent, but the distance of pollutant travel may be unacceptable. Minimum setback requirements for septic tanks and disposal field shall be as shown in Table 2 below.

Table 2
Minimum Setback Requirements
for Septic Tank Systems (Distance in metres)

	to septic tank	to disposal field
Building	1.5	7.5
Property Boundary	3.0	3.0
Wells	15.0	30.0
Surface Water	15.0	15.0
Cut or Embankment	7.5	15.0
Cut, Embankment or Surface Water on Water Supply Watershed	30.0	60.0
Swimming Pool	3.0	7.5
Water Service Pipes	3.0	7.5
Walks and Drives	1.5	1.5
Large Trees	3.0	3.0

Density
If it is planned to install a number of septic tank systems for a community or subdivision, a detailed ground water and geological study must be carried out for that area and the site appraisal factors listed on page 5 must be considered to assure such a density of septic tanks will not cause any problems.

Site Suitability
If all factors mentioned in Lot Size, Soil Suitability and Setback from Wells, Streams p. 5 cannot be met the conventional disposal system shall not be permitted. However, raised tile beds as described in Raised Fields p. 10 may be considered.

Percolation Test
The percolative characteristics of a soil are generally used to predict the ability of a soil to perform as a disposal field. The number of tests required depends upon the uniformity of soil conditions. A minimum of three percolation tests shall be carried out in three holes spaced uniformly over the disposal site. If test results are not consistent, additional tests in different locations may be required by the local authorities. If all test results are less than five minutes per 25 mm or greater than 60 minutes per 25 mm, the described procedure in Disposal Field-Size p. 8 must be followed.

The percolation test shall be performed as described below.

- Dig or bore a hole, with horizontal dimensions of from 100 to 300 mm and vertical sides to the level of the proposed trench bottom.
- Roughen all smeared areas and remove all loose material from the sides and bottom.
- Add 50 mm of coarse sand or fine gravel to protect the bottom from scour and sediment.
- Fill the test hole with clear water to a minimum depth of 300 mm over the gravel.
- Maintain this water level in the hole for at least four hours and preferably overnight. This allows any clay particles to swell and to approach the conditions that can be expected during the wettest season. It may be necessary to hook up a siphon as shown in Drawing 1 to replenish the hole. In sandy soils in which the first 150 mm of water seeps away in less than 30 minutes the above procedure is not necessary and the test as described below may be made after the water from one filling of the hole has completely seeped away.
- Percolation rate measurements are carried out as follows:

  If water remains in the test hole after the overnight swelling period, adjust the depth to approximately 150 mm over the gravel level and measure the drop in water level over a 30 minute period. Use this value to calculate the percolation rate.

  If no water remains in the hole after the overnight swelling period, refill the hole to 150 mm over the gravel and maintain that level for four hours. Measure the drop in water level of the last 30 minute period and use this value to calculate the percolation rate.

  In sandy soils, the hole should be replenished at the 150 mm level for one hour and the drop that occurs during the final 10 minutes should be measured. Use this value to calculate the percolation rate.

Soil Grain Size Analyses
The locations to be sampled are as described in the section on percolation tests. The samples shall be taken from a depth of approximately 300 mm below the proposed trench bottom. At least three well marked samples shall be submitted to a laboratory for grain size analyses.

A typical arrangement of a septic tank system is shown in Drawing 2 and typical layouts in Drawing 12.

Septic Tank

- Compartments — All septic tanks shall be two compartment tanks of standard proportions (Drawings 3 and 4).

- Capacity — The minimum septic tank capacity shall be determined by the number of bedrooms proposed as indicated in Table 3 below. However, where the number of occupants per bedroom exceeds two or when space for future construction is provided, additional capacity should be provided.

- Access — Access manholes shall be provided for each compartment including the dosing chamber. Manholes shall extend to within 150 mm of the ground surface while tanks should have a minimum of 200 mm of soil cover for frost protection.

- Materials — Septic tanks shall be completely watertight, structurally sound and resistant to excessive corrosion and decay. Properly constructed precast or cast in situ reinforced concrete is an acceptable material. Coated steel or fiberglass tanks may be used. Construction of septic tanks shall meet the materials requirements of CSA Standard B66 entitled "Prefabricated Septic Tanks and Sewage Holding Tanks".

- Foundation — Before the septic tank is filled with sewage, it should be level and resting on undisturbed soil.

- Location — A permanent record of the location of the septic tank must be provided. Acceptable methods include a small plaque firmly attached to the foundation, a metal tag fastened to the piping inside the house, and a capped pipe that could also serve as access for pump-out.

Dosing Chamber

- General — Since effluent from a septic tank is often in the form of a continuous dribble, most of the effluent is directed to a small area of the disposal field which may cause a small portion of the field to be constantly inundated. The resulting anaerobic conditions promote the growth of slimes which rapidly clog the soil. In this manner a series of failures is promoted. Hence, when the required absorption trench exceeds 150 m in length a dosing tank shall be provided in addition to the septic tank to obtain proper distribution of effluent throughout the disposal area and to give the disposal field an opportunity to dry out between dosings. Automatic operation of the dosing tank shall be provided by means of a siphon, motorized valve or pumping units. The siphon or other dosing device shall have a discharge rate at least 50% greater than the estimated maximum rate of sewage entry to the tank.

Although siphons are not mandatory when the trench is less than 150 m, they should be considered in all instances since they will result in better operation.

Table 3

Septic Tanks — Working Capacity and Internal Dimensions for Household Systems

Minimum Tank Capacity Requirements		Recommended internal dimensions in millimetres rectangular tanks		
Number of Bedrooms (2 persons per bedroom)	Minimum Total Working Capacity in litres	Length A $A = a_1 + a_2$ (Drawing 3)	Width B	Water Depth C 1200
2 or less	2300	2060	910	1220
3 or less	2700	2440	910	1220
4 or less	3400	2740	1070	1220
5 or less	4100	2740	1220	1220
6 or less	5000	2900	1220	1370

Note: Increase tank capacities by 20% if garbage grinder is used.

A dosing chamber should always be used in conjunction with all septic tank installations in areas with extremely cold climates. The form of discharge from such a device assists in preventing the system from freezing up.

- Capacity — The dosing tank shall have a liquid discharge equal to 50 to 75% of the capacity of the piping in the disposal field. The siphon tank-disposal field shall be designed so that the field is dosed a maximum of six times per day.

Septic Tank Effluent Pipe
A watertight pipe shall be provided between the septic tank and the disposal field, and the outlet of the septic tank shall be a minimum of 100 mm above the invert of any distribution pipe in the disposal field.

Distribution of the septic tank effluent to the drain-field pipes shall be provided either by means of a distribution box or a solid header pipe.

Distribution boxes (Drawing 5) shall be supported on a 300 mm bed of well compacted gravel to reduce settling and have a means of adjusting the flow to each pipe should settling occur. A well marked access must be provided.

Watertight header pipes shall be sloped between 1:400 and 1:200 to ensure even distribution.

Disposal Field
- Layout — Many different layouts for disposal fields may be used, some of which are shown in Drawings 6, 7, 8, 9, 10 and 11.

An interconnection of the ends will provide a relief connection between runs so that an excess of effluent distributed to any one run can be redistributed to the remaining runs before pressures build up that could lead to a break-out to the surface. If a dosing chamber is provided the ends of the laterals shall be interconnected so that clogging or breaking of a pipe does not eliminate the whole trench concerned. For the same reason pipe laterals shall not exceed 18 m in length, except where a dosing chamber is used in which case they may be extended to 30 m. The minimum distance between pipe laterals shall be 1.8 m. In sloping ground, trenches shall follow contour lines.

- Size — The required length of distribution pipe may be determined in one of two ways. If grain size analyses have been carried out refer to Table 5 to find the soil that best matches the test results to determine a percolation rate. With this percolation rate refer to Table 4 to find the required length of 450 mm wide distribution trench per bedroom. The requirements set out are intended to provide a reasonable life span of the distribution field, in the order of 15 years. If no grain size analyses have been determined, the first step can be omitted.

If the percolation rate is less than 5 minutes per 25 mm, a conventional system shall not be installed unless ground water studies are carried out. At percolation rates greater than 60 minutes per 25 mm, the soil is considered impermeable and a conventional system shall not be used. In both the above cases raised beds may be considered.

Table 4
Minimum Distribution Pipe Requirements

Percolation Rate (minutes/25 millimetres)	Required length of Distribution Pipe per bedroom (in metres)
Less than 5	Detailed ground water study required
5	26
10	34
15	38
20	44
30	50
45	61
60	67

NOTE: No disposal field shall have less than 45 m of distribution pipe.

- Design — The minimum absorption trench width required is 450 mm and the depth may vary between 600 and 900 mm. The pipe shall be surrounded by coarse clean aggregate varying in size from 20 to 65 mm and extending from 50 mm above to at least 150 mm below the 100 mm diameter pipe (Drawing 6). In locations where trees are close to the drainfield the depth of granular material under the pipe should be increased to 300 mm in order to decrease the possibility of root growth into the pipes.

The top of the coarse aggregate shall be covered with untreated building paper (breather type), a 50 mm layer of hay or straw, or similar pervious material, to prevent the stone from becoming clogged by the earth backfill. A permanent impervious covering shall not be used as this interferes with evapo-transpiration at the surface. For the same reason the trench depth shall be designed so that the top of the coarse material is as close to the surface as climatic conditions permit. The depth of backfill shall be between 300 and 600 mm.

The failure of a disposal field through clogging is inevitable as solids which are converted into stable elements by aerobic bacteria remain near the soil-liquid interface. For fine grained soils this interface will be thin while for coarse grained soils some of the solids will penetrate the natural soil thus increasing the interface. Therefore, fine grained soils will clog more quickly than coarse grained ones. This however, can be alleviated by placing a certain amount of coarse grain material next to the native soil to act as a filter. For example, if the native soil is silty material, a layer of sand may be placed between the gravel and trench bottom.

- Slopes — The slopes of the perforated pipe or drain tiles shall be between 1:400 and 1:200. However, when a siphon is used the slope should be reduced to approximately 1:600 for the perforated pipe or drain tiles.

- Construction — During construction the natural soil is generally smeared thus reducing the infiltrative capacity of the soil. To remedy this, all surfaces shall be raked to a depth of 25 mm and loose material carefully removed before the trench is backfilled.

Open trenches shall be protected from surface run-off to prevent the entrance of debris and silt.

The material used to backfill on top of the pipe and coarse granular material shall be a sandy loam or topsoil to permit the passage of air. The fill material should not be finer in grain size than the "silt-sand, some loam" mixture (0.09 mm) described in Table 5.

This material shall be hand tamped and over-filled in such a manner that a 100 to 150 mm mound is formed to provide for settling. The use of any clay material for backfilling is prohibited as it will seal the pores and help to create a tile bed that is lacking oxygen.

Table 5
Average Particle Sizes and Percolation Rates for Various Soil Types

Soil Type	**Average Particle Sizes in mm**	**Percolation Time in minutes/ 25 mm**
gritty medium sized sand	0.50	5
fine sand, some medium sand	0.30	10
fine sand and silt, some loam	0.15	15
silt-sand mixture, some loam	0.09	20
silt with some loam and sand	0.05	30
loam-silt mixture; heavy fertile soil	0.02	45
loam, with some clay and silt	0.01	60

- Fields on Sloping Sites — Disposal fields constructed in the conventional manner require sites that are level or only slightly sloped (Drawing 6).

The system shown in Drawing 7 is suitable for a slightly sloping site as an alternative to levelling.

A system of serial distribution whereby one trench is loaded until it has ponded to its full depth before liquid flows to the succeeding trench has been used in the past where steeply sloped sites are encountered (Drawing 8). This method has the disadvantage that the inundated trench eventually develops anaerobic conditions and clogs. After this occurs the trench will be permanently filled and provide no useful function. Therefore the serial distribution arrangement should not be used.

Alternative disposal systems for fields on sloping sites are given in Drawings 9 and 10.
These distribution systems must ensure that the trenches are evenly loaded (Drawing 9). The system shown in Drawing 10 is somewhat more elaborate and is recommended for disposal fields on sloped areas. The sewage is distributed by the watertight pipes to all but the lowest trench; but because of the unreliability of equal flow distribution the serial distribution mechanism is included so that if one trench does receive more sewage and ponds the lower one will receive the overflow. As a safeguard the lowest trench can only be loaded by the serial distribution mechanism.

It is recommended that disposal fields should not be constructed on sites where the ground slope exceeds 20% in any direction.

- Raised Fields — (Drawing 11) Raised tile beds should be considered in cases where 900 mm of acceptable soil is not available under the absorption trenches and above high water table, rock or impervious soil (percolation rate greater than 60 minutes per 25 mm). Sufficient suitable fill material must be imported so that a disposal field can be constructed with the desired 900 mm clearance below the bottom of the trenches. A suitable fill material for this purpose is defined as soil somewhere between the "fine sand, some medium sand" and the "loam, with some clay and silt" mixture of Table 5.

Where rock or impervious soil is the reason for the raised disposal field 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 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 15 m down grade from the bed in the direction of trickle flow and its surface planted for stability and to promote evapo-transpiration.

The presence of prominent solution channels or fissures in the rock beneath a disposal field may cause "piping" or short-circuiting of the effluent within the disposal field so that it does not receive proper treatment. Generally this does not occur when the disposal field is constructed in soil which is in place naturally over fissured rock or where a partially raised field is required over an existing but shallow soil cover. However, when a disposal field is to be constructed on exposed rock which contains fissures or is fractured, the area beneath the field should be sealed with a minimum of 300 mm of clay. In the case of very prominent channels, it will be necessary to seal these individually or to move the location of the disposal field.

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

A typical raised disposal field is illustrated on Drawing 11 and is suited to beds constructed on sites where the maximum slope in any direction does not exceed 10%. (1 vertical in 10 horizontal).

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

Operation and Maintenance

Septic Tank
Proper maintenance of a septic tank is the best insurance for satisfactory operation of a sub-surface sewage disposal or treatment system and prevention of replacement expenses. Some requirements are listed below.

- Inspection — Tanks should be inspected once a year, and depth of scum and sludge measured in the vicinity of the outlet device.
- Cleaning — Tanks should be cleaned when the bottom of the scum mat is within 75 mm of the bottom of the outlet device or if the depth of the sludge exceeds 600 mm.
- Sludge disposal — Sludge and scum should be disposed of as directed by the local health authority. Septic tank cleaning firms should be employed.
- Chemicals — Appreciable amounts of lye, strong caustics, acids, disinfectants and other materials which are likely to adversely affect the development of bacteria should not be admitted to the septic tank. Small amounts of cleaning agents or household bleaches such as those used to disinfect water supplies or to sterilize dishes will not significantly reduce bacterial action but habitual admission of large amounts may be detrimental.

Disposal Fields
Some of the causes of disposal field failure are discussed below:

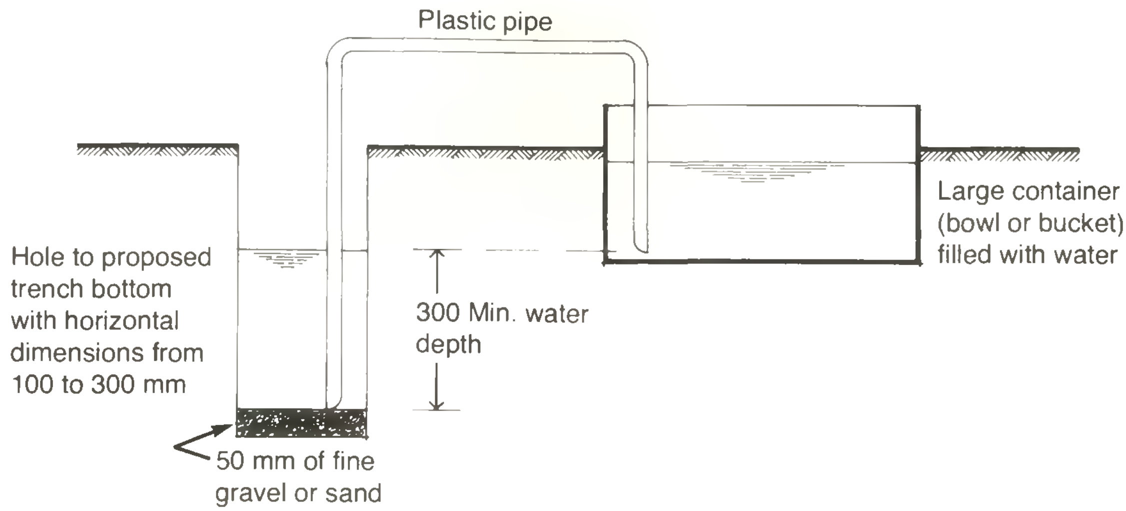
- Increased waste loads, above that for which the system was designed, may cause disposal field failures either by inundation or clogging of the soil pores. Some of the more common causes for increased water consumption are building additions, increased use of washing machines, plumbing deficiencies and children playing with toilets.
- Failure to clean the septic tank at regular intervals will cause solids to be carried into the disposal field thus clogging the pores.
- Surface water from roofs, yards and foundation drains must be excluded since the extra load would inundate disposal fields, and the lower temperature in the winter would inhibit bacterial activity.
- Non-compatible land use may damage disposal fields and must be avoided. Examples of non-compatible land use include pavement, snow cleared areas such as skating rinks, planting of trees or shrubs with an extensive root system, heavy loads such as trucks delivering topsoil, etc.
- Periodic occupancy, such as only on weekends, may cause freezing problems in the disposal field. In such instances, the disposal field should be covered with leaves or straw in the fall.

Metric Conversion
1 inch = 25.4 mm (millimetres)
1 foot = 0.3048 m (metres)
1 gallon = 4.546 L (litres)

Drawings

Drawing 1.

Percolation test

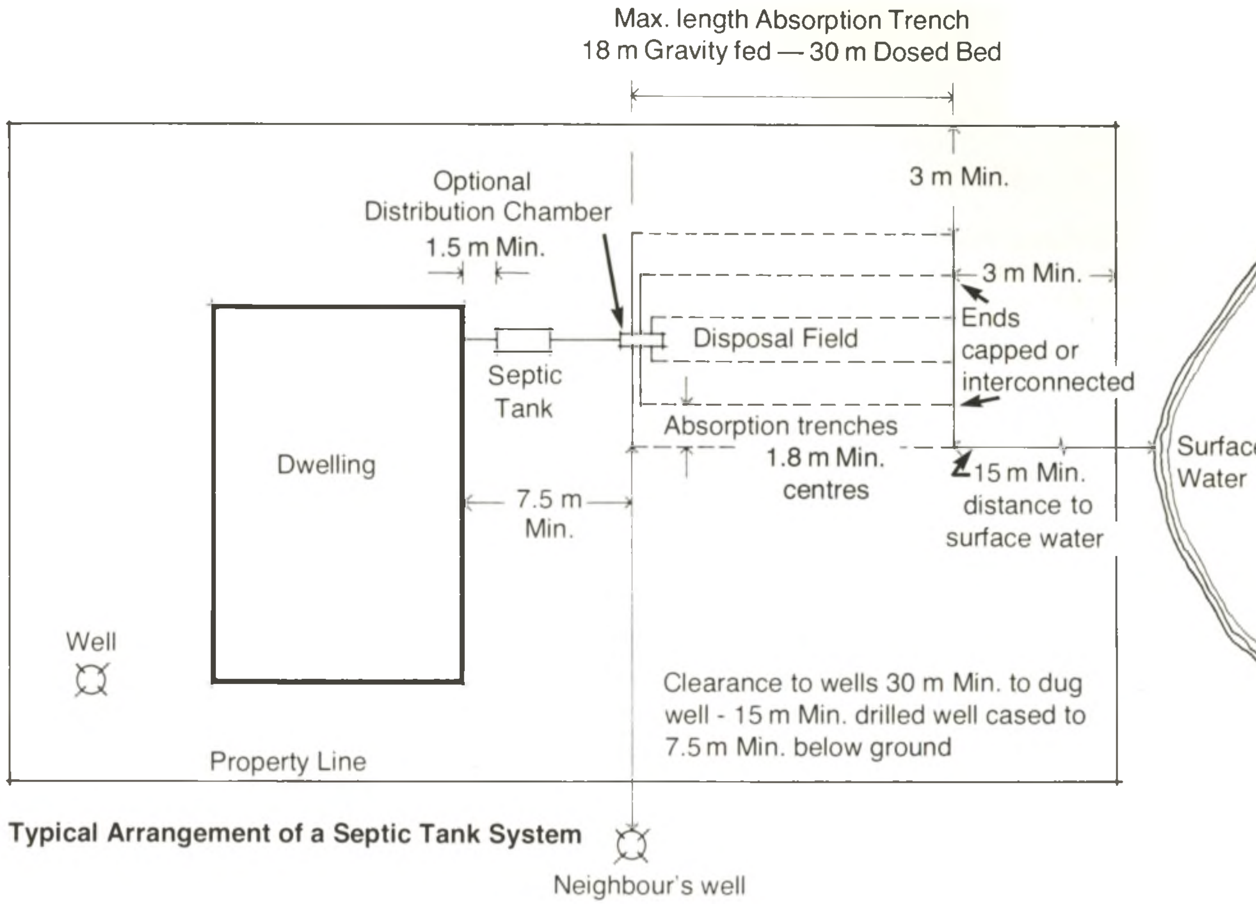


NB: All dimensions in millimetres

Not to scale

Drawing 2

General Layout



Typical Arrangement of a Septic Tank System

Not to scale

Notes:

1. The above layout is suitable for a disposal field using normal construction methods.

2. Location of tank and disposal field to be on lower ground than adjacent wells or springs, if possible.

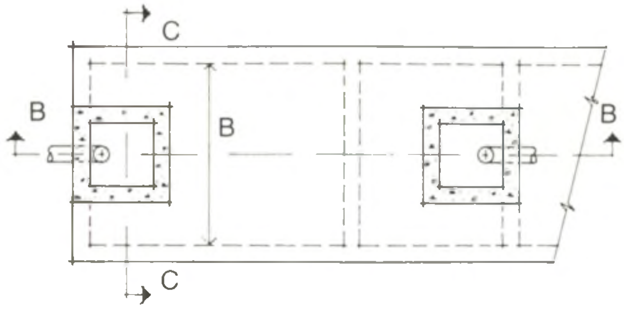
3. Internal plumbing and main drainage outlet should be designed with a view to connecting to possible future sanitary sewers.

4. Roof water, surface water, discharge from footing drains, etc. must be excluded from entry to septic tank.

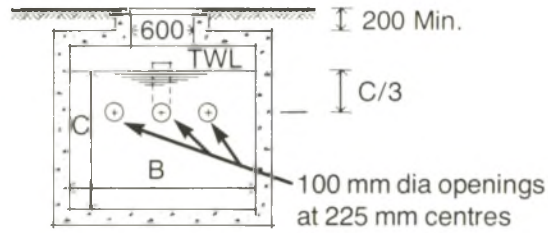
5. Disposal fields NOT to be located in swampy ground or in ground liable to flooding.

Drawing 3

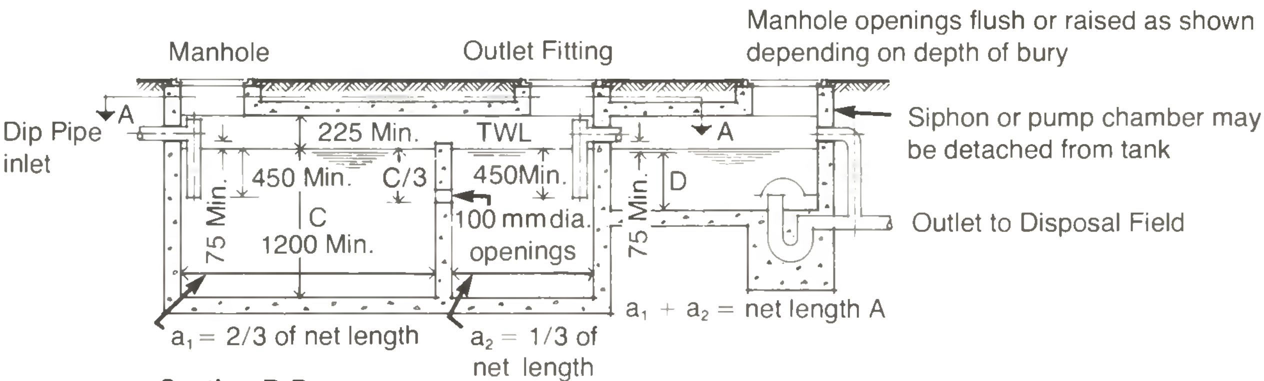
Septic Tank Construction



Sectional Plan A-A



Section C-C



Section B-B

NB: All dimensions in millimetres

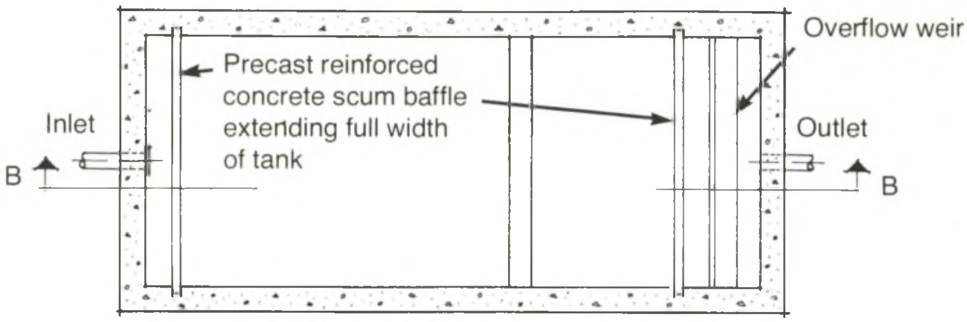
Not to scale

Notes:

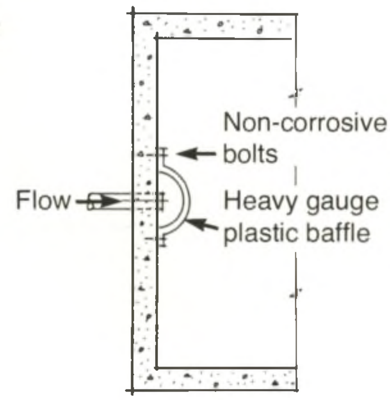
1. Manhole access shall be provided to each compartment located to facilitate servicing of the inlet and outlet.
2. Baffles may be used at inlet and outlet of tank instead of dip-pipes. The top edge should be not less than 150 mm above T.W.L. and bottom edge not less than 450 mm below T.W.L.
3. Inlet pipe may enter side wall of tank if convenient, but centre-line of pipe must not be more than 150 mm from inlet end wall.
4. The slope of the inlet pipe should be such that inlet velocity does not exceed 900 mm/s (25 mm in 1800 mm for 100 mm dia. pipe: 25 mm in 3650 mm for 150 mm dia. pipe).
5. Provision should be made for not less than 200 mm 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 disposal field when 150 m or more of distribution pipe is required.
7. Dimension D should be according to siphon manufacturer's requirements.
8. Add 225 mm to dimension C for total internal depth.
9. For dimensions A,B,C see Table 3, page 7.
10. Inspect tanks annually. Tank to be cleaned when the level of the bottom of the scum is within 75 mm, or the surface of the sludge is within 450 mm of the bottom of the outlet fitting.

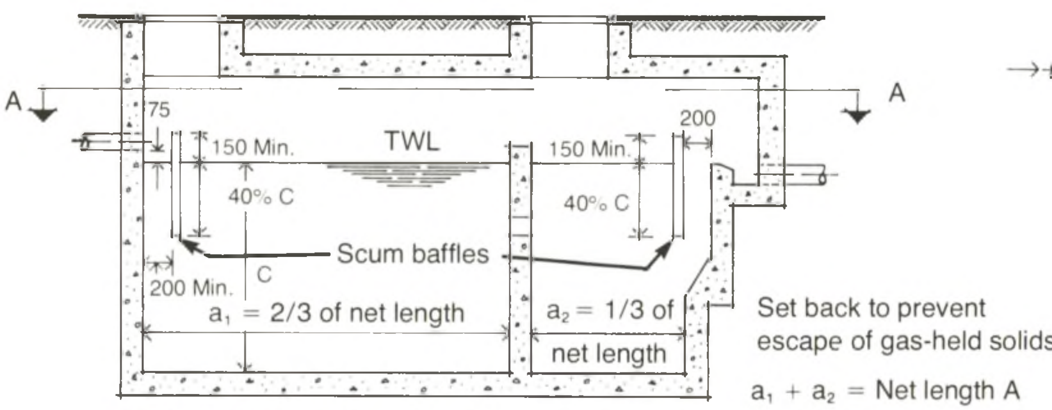
Drawing 4

Septic Tank
Alternative construction

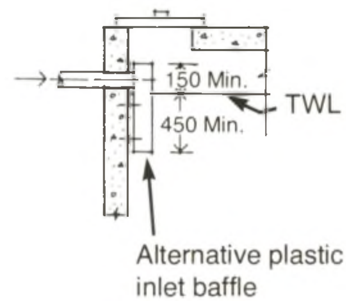


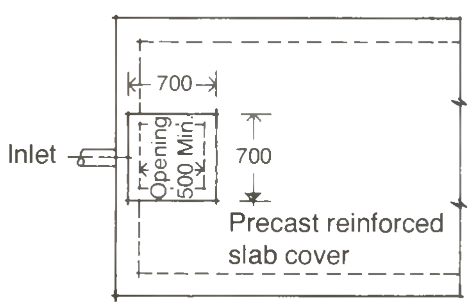
Sectional Plan A-A



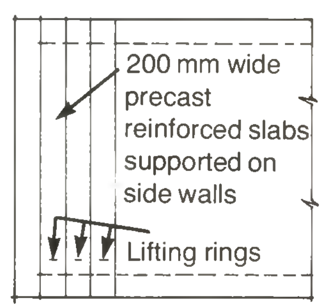


Section B-B





Plan



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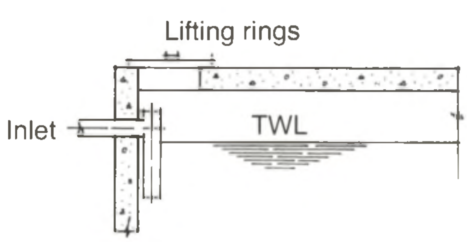
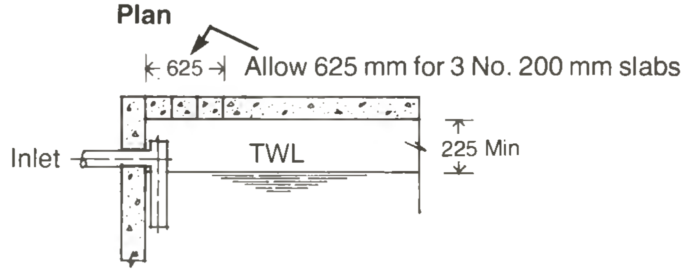


Section



Section

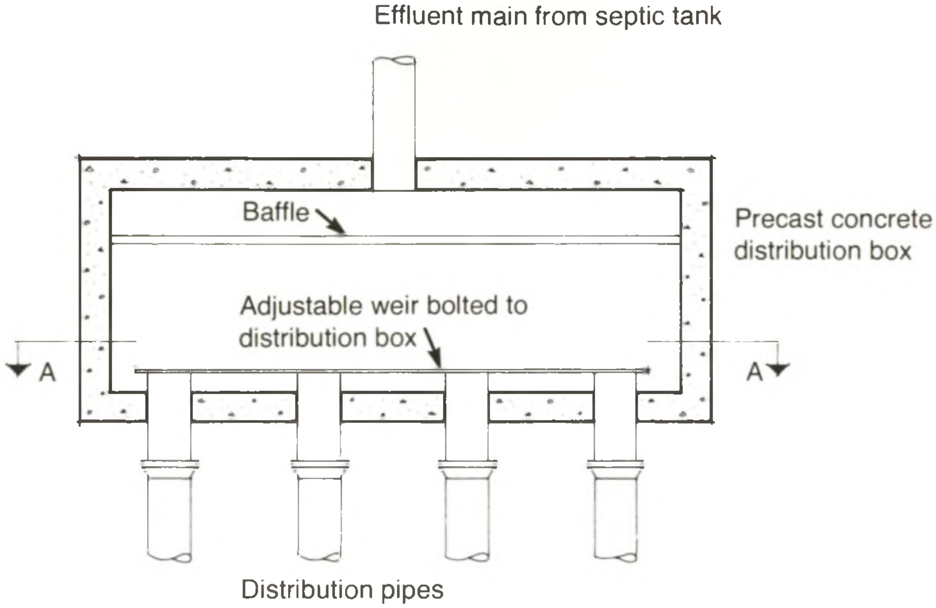
NB: All dimensions in millimetres
Not to scale

Notes:

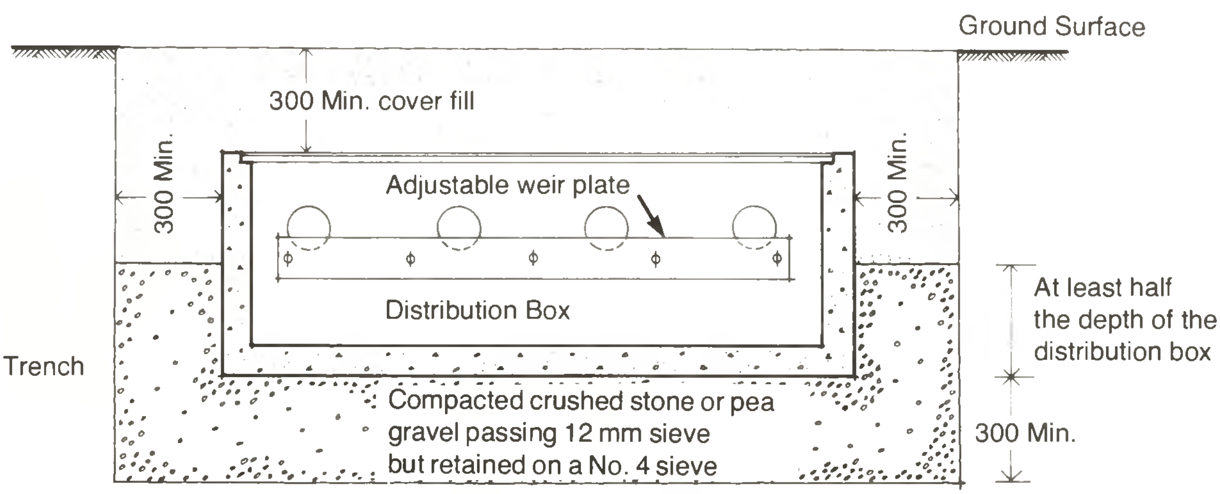
1. For dimensions A,B,C see Table 3.

Drawing 5

Distribution box
Adjustable effluent weir



Plan



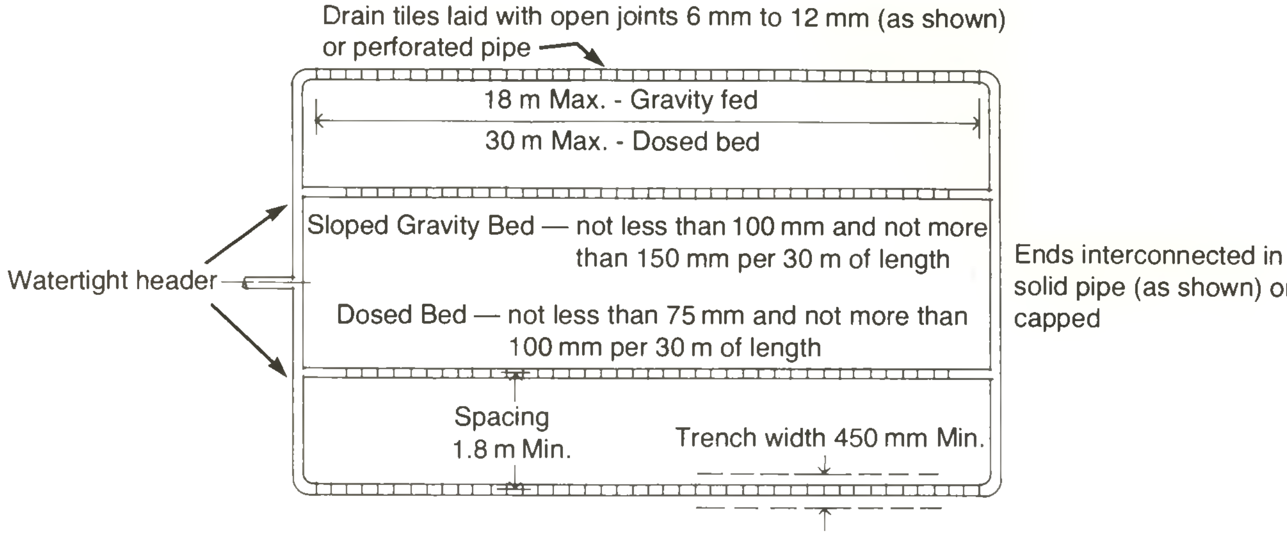
Section A-A

NB: All dimensions in millimetres

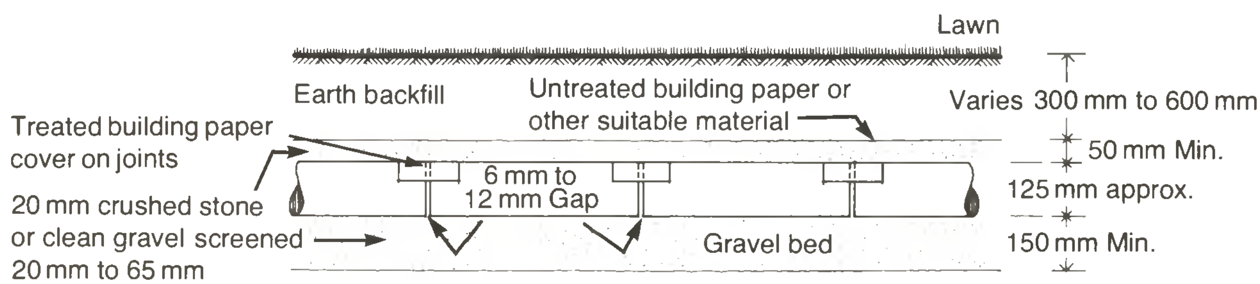
Not to scale

Drawing 6

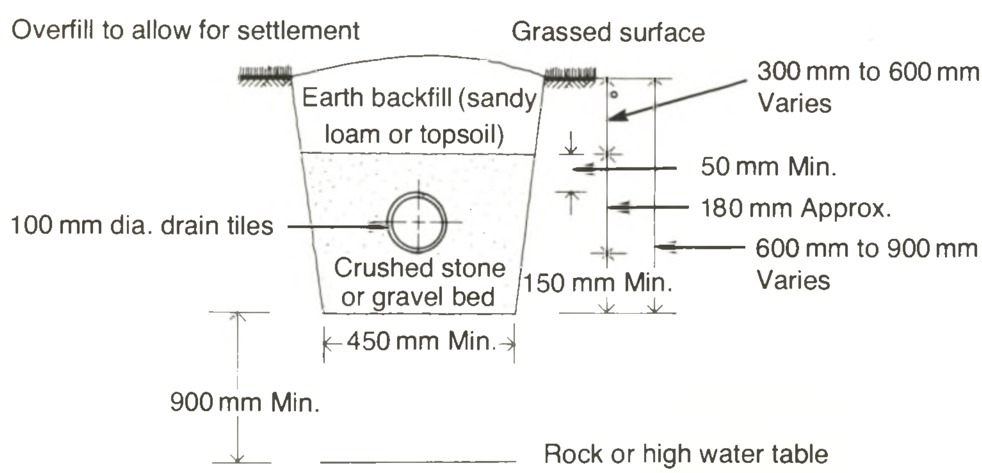
Disposal Field and Absorption Trench



Disposal Field-Plan



Absorption Trench - Longitudinal Section

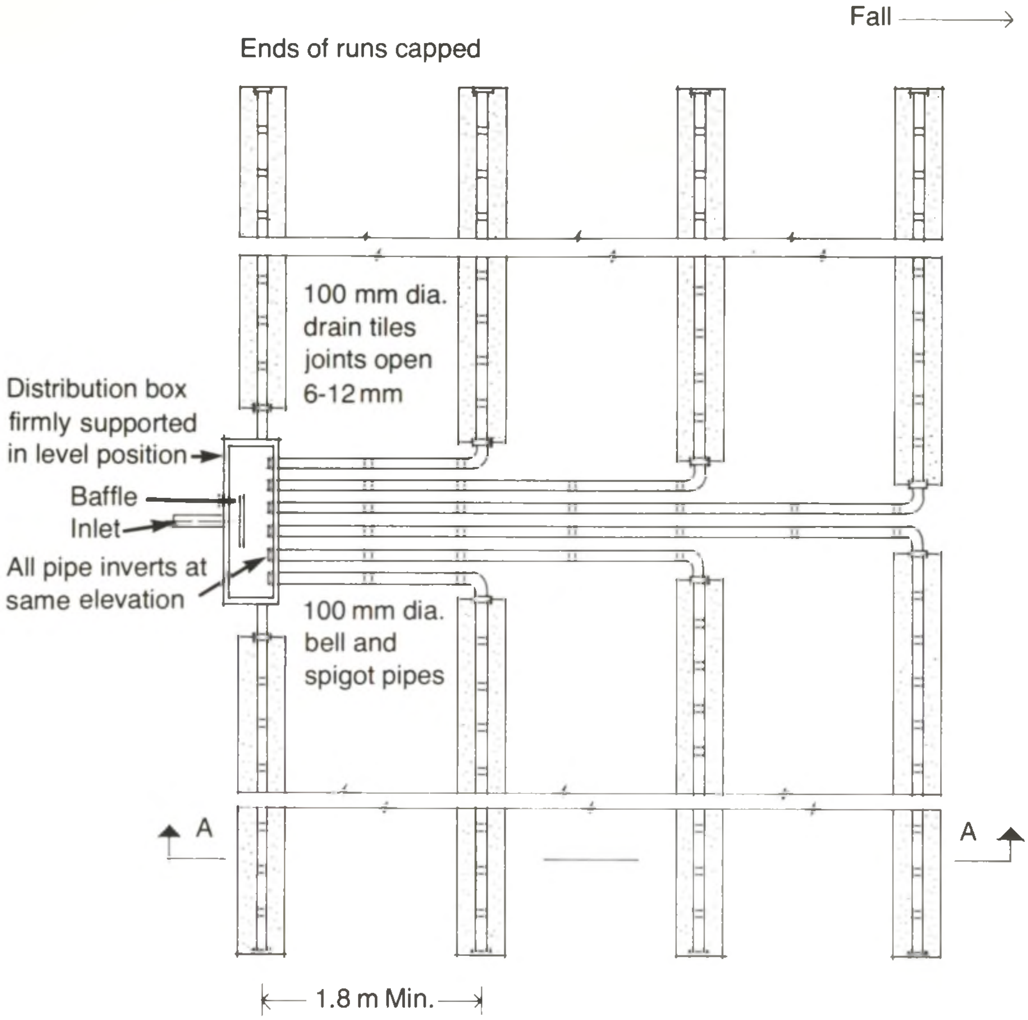


Absorption Trench — Cross Section

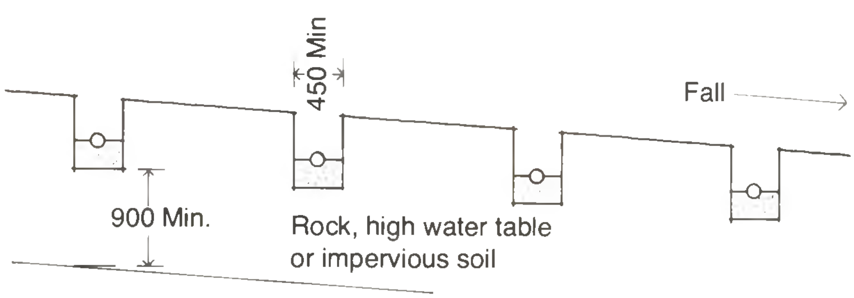
Not to scale

Drawing 7

Disposal Field
Layout for sloping sites



Plan



Cross section A-A
Disposal Field Open for Inspection

NB: All dimensions in millimetres unless otherwise noted

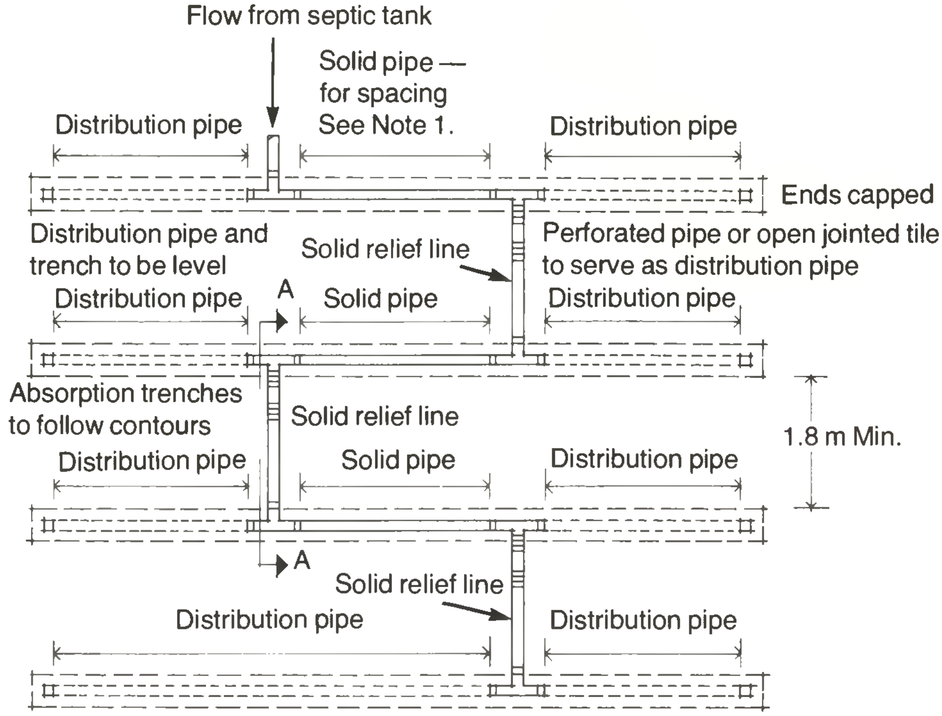
Not to scale

Notes:

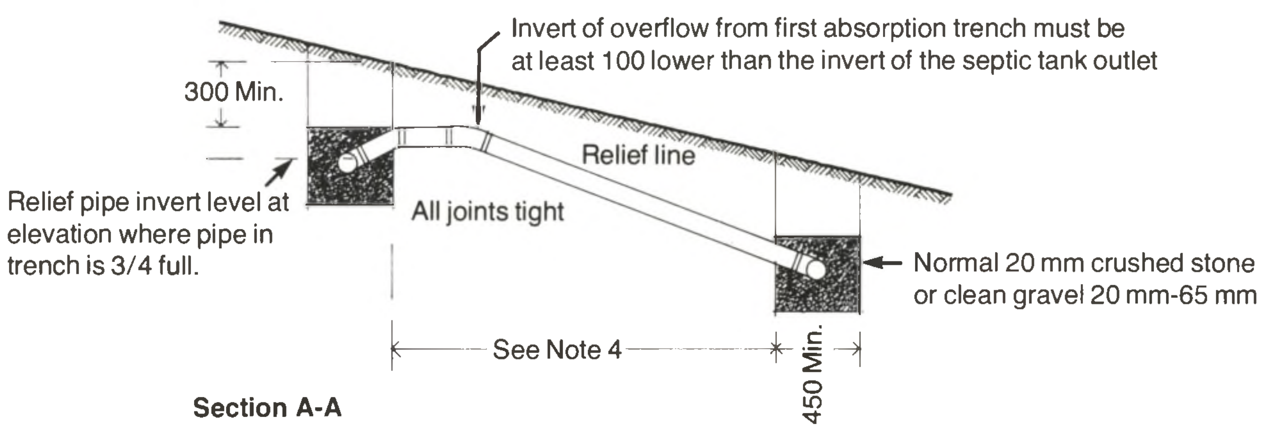
1. Perforated plastic pipe may be used as an alternative to the drain tile shown. Solid pipe as alternative to bell and spigot.
2. This arrangement is suited to slightly sloping sites as an alternative to levelling.

Drawing 8

Disposal Field
Serial distribution for sloping sites.



Plan



Section A-A

NB: All dimensions in millimetres unless otherwise noted

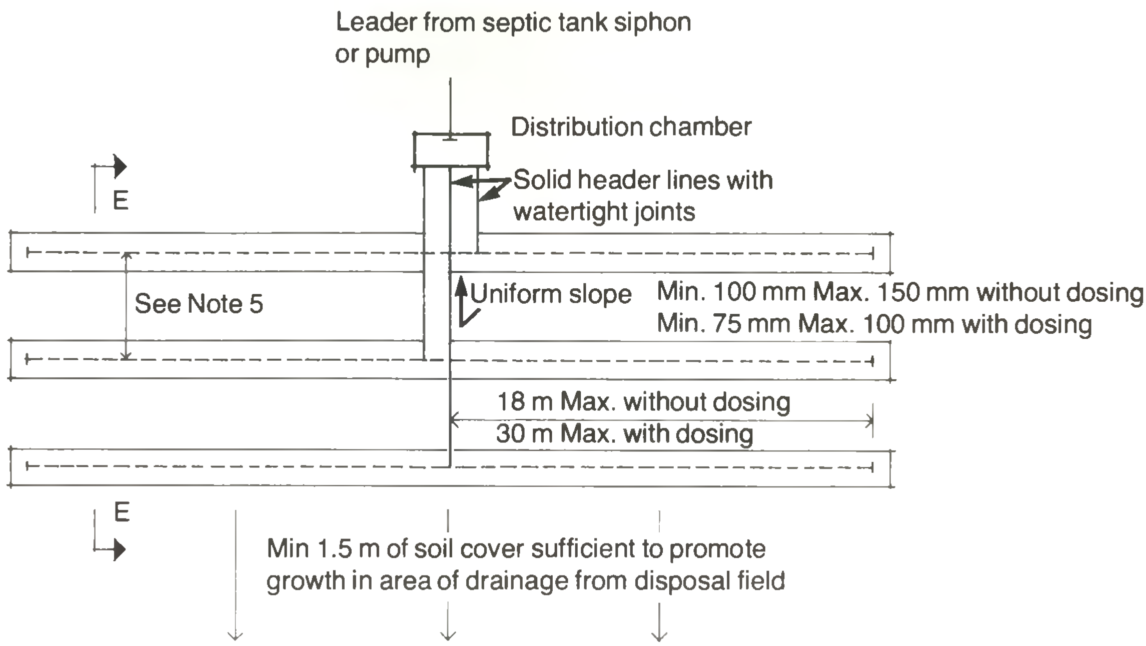
Not to scale

Notes:

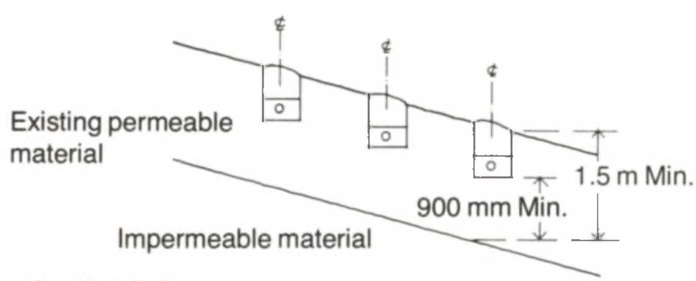
1. Relief lines to be spaced far enough apart to prevent short circuit (1.2 m to 2.4 m is recommended).
2. Pipe in trenches between relief lines to be solid.
3. Pipe fittings for relief lines to be selected to suit slope.
4. A minimum of 1.8 m (horizontal) of undisturbed earth is recommended between absorption trenches.
5. Distribution pipe in absorption trenches to extend an equal distance (approximately) both directions from the solid interconnection and relief pipes. Distribution pipes and trenches to be level and normally follow contour of slope.

Drawing 9

Disposal Field
Alternative layouts for sloping sites



Plan View — (See Note 3)



Cross Section E-E

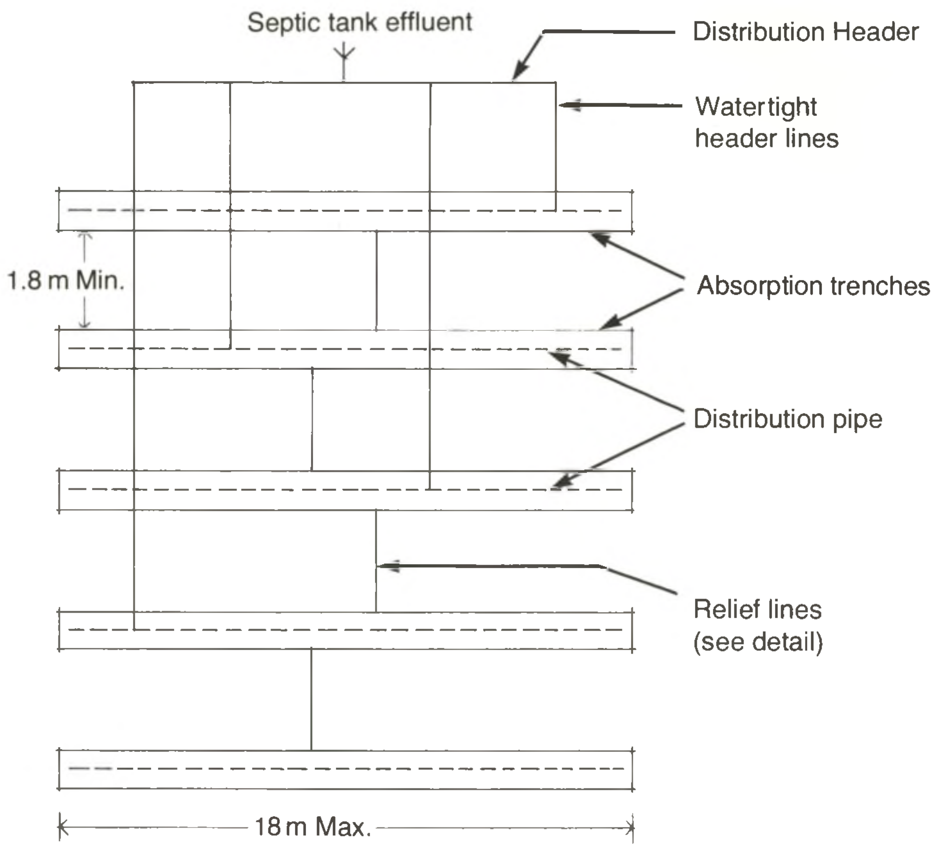
Not to scale

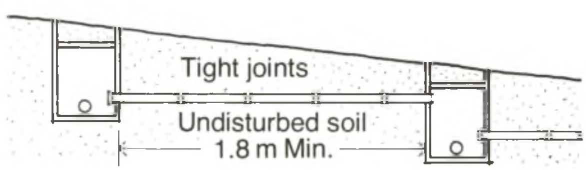
Notes:

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 disposal field.
4. Details for absorption trench, crushed stone, cover, etc., as per Drawing 6.
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 625 mm to 900 mm. 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.

Drawing 10

Disposal Field
Alternative layouts
for sloping sites





Relief Line Detail

Not to scale

Notes:

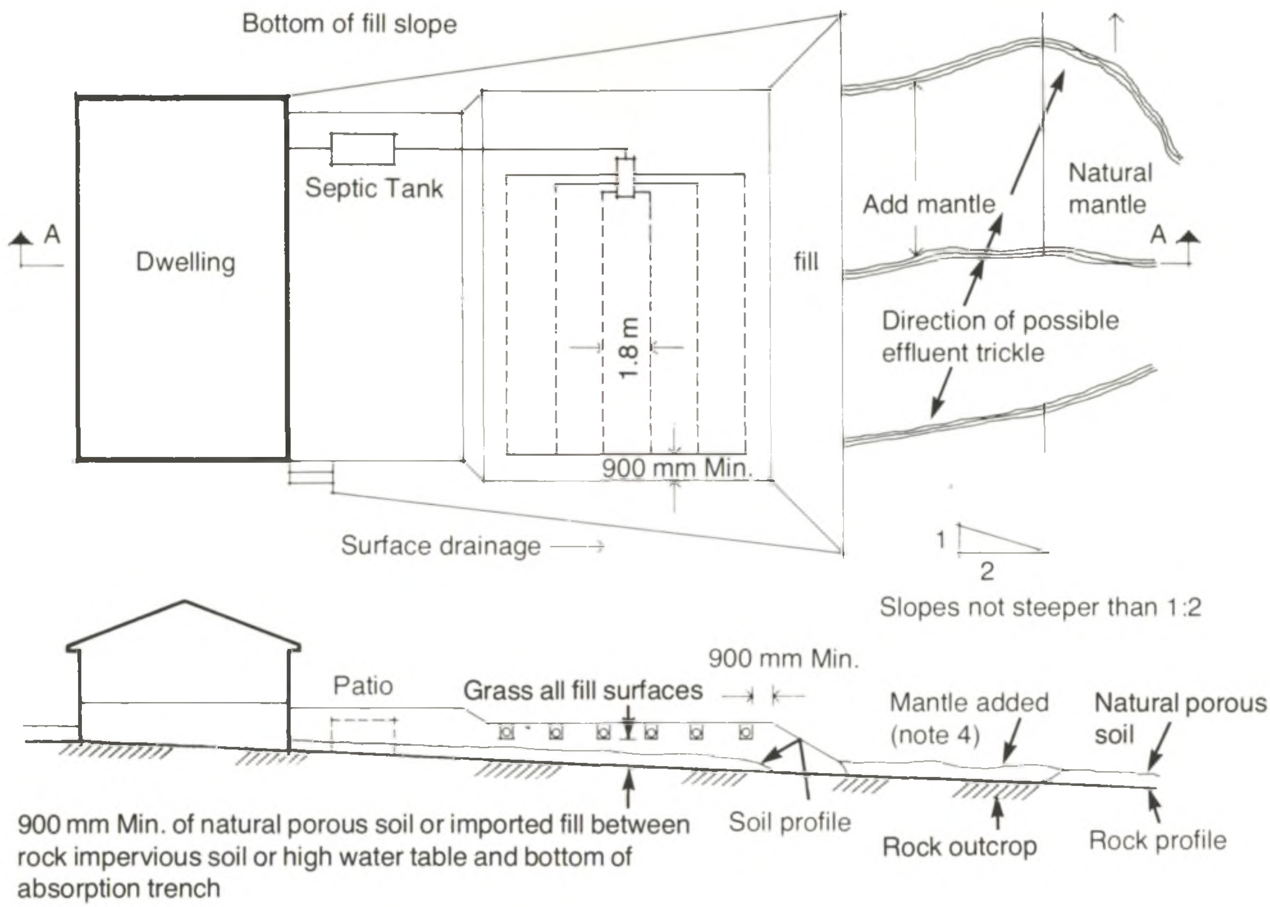
1. Ends of tile on pipe runs to be capped.

2. Surface run-off must be diverted around disposal field.

3. Details for absorption trench, crushed stone, cover, etc., as per Drawing 6.

Drawing 11

Disposal Field
Layout for raised bed



Section A-A

Plan and Profile - Typical Raised Bed

Not to scale

Notes:

1. Clearances from buildings, lot lines, wells, etc., as for normal disposal fields (Table 1 and Drawing 2) plus 600 mm horizontal for each 300 mm vertical that surface of bed is above grade.

2. Fill slope must be stable for the material used, but not steeper than 600 mm horizontal to 300 mm vertical.

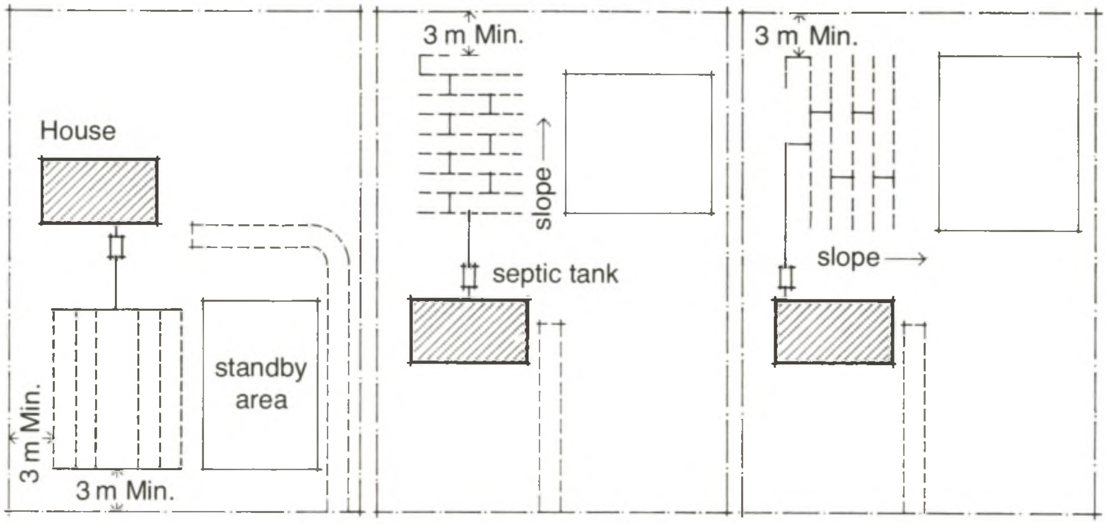
3. Percolation rate to suit imported material but not less than 5 mins. Select length of absorption trench from Table 4.

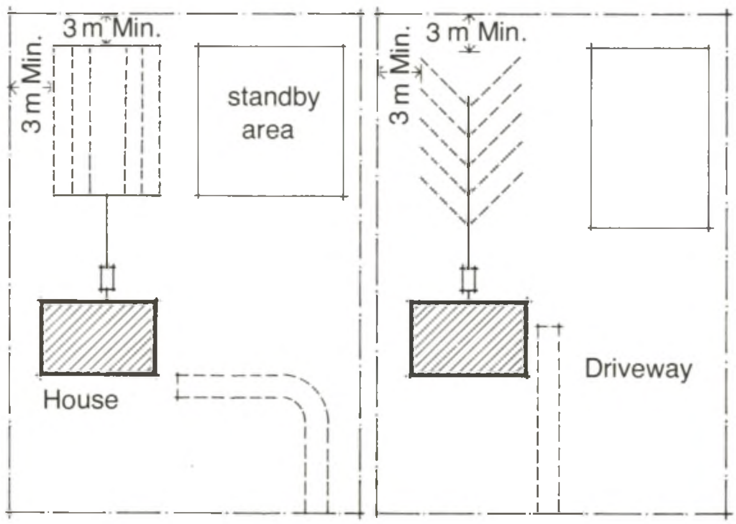
4. Effluent passing through fill must be absorbed into natural soil beneath the fill or into the surrounding permeable soil without ponding or breakout to surface. Where the natural soil cover is inadequate for this purpose for a distance of 15 m from the bed in any direction in which effluent will trickle, adequate fill must be added.

5. Details of absorption trench construction same as in Drawing 6.

Drawing 12

Typical layouts





Not to scale