

DRAFT GUYANA STANDARD

Code of Practice for

The design and construction of septic tanks and associated secondary treatment and disposal systems



Guyana National Bureau of Standards

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Draft Standard

Guyana National Bureau of Standards (GNBS)

Flat 15, Sophia Exhibition Complex,

Sophia

Georgetown, Guyana.

Telephone: 592-219-0064 – 66

Fax: 592-219-0070

Email: standards@gnbsgy.org

Website: www.gnbsgy.org

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Foreword

This Guyana Standard was adapted by the Guyana National Bureau of Standards in 2007, after the draft was finalised by the **Sub-Committee – Septic tanks sewerage systems** and the **National Building Code Committee** and approved by the National Standards Council.

In the formulation of this standard, assistance was derived from the following publication: **Trinidad and Tobago Standard, TTS 1680 400:1991, “Code of Practice for the design and construction of septic tanks and associated secondary treatment and disposal systems”**.

This standard was developed as a result of the need for a comprehensive document on the design and construction of septic tanks and associated secondary treatment and disposal systems.

In the development of this standard, particular attention was given to the philosophy of preventative maintenance. Strong emphasis was also placed on the need to relate effluent disposal to site conditions and to the absorptive capacity of the soil. It was also felt that where soil conditions permit, kitchen and bathroom wastes should be discharged into the system to minimise health hazard and to reduce the risk of the spread of communicable diseases.

Members of the Sub-Committee – Septic tank sewerage systems

Name	Affiliation
Ms. Fayola Azore(Chairperson)	Central Housing and Planning Authority
Dr. Mariano Bonet	Pan American Health Organisation, Guyana
Mr. Maurice Veacock	University of Guyana
Mr. Rensforde Joseph	Guyana Water Incorporated
Mr. Arshad Yacoub	Guyana Water Incorporated
Mr. Wayne Langford	Guyana Water Incorporated
Mr. Shafeek Alli	Ministry of Communities
Mr. Kenson Boston	Mayor & City Council
Mr. Steve Chichester	Ministry of Public Health
Ms. Malicia Hall	Environmental Protection Agency
Mr. Delon Earle	Environmental Protection Agency
Mr. Hemraj Sanichara (Technical Secretary)	Guyana National Bureau of Standards

Code of Practice for The design and construction of septic tanks and associated secondary treatment and disposal systems

1 Scope

This standard gives recommendations for the design, location, construction, and maintenance of septic tanks. It includes methods of treatment and disposal of septic tank effluent from domestic sewage.

This standard is applicable to individual housing units and institutions where the number of users does not exceed 20 persons.

For buildings with more than 20 users an alternative treatment method should be considered with approval from the relevant authorities.

2 Definitions

For the purpose of this standard the following definitions shall apply:

2.1

absorption trench: A trench in which open-jointed or perforated pipes are laid and surrounded by coarse aggregate and overlaid by fine aggregate; the effluent seeps through the open joints or perforations and is dispersed into the surrounding soil.

2.2

authority: The relevant statutory authority such as the local authority.

2.3

cleaning eye (clean-out): A pipe fitting with a removable plug which provides access for inspection or cleaning of the pipe run.

2.4

distribution box: A chamber which ensures an even distribution of septic tank effluent to the subsurface drainage field through drain pipes.

2.5

effluent:

(a) **tank effluent:** The supernatant liquid discharged from a septic tank.

(b) **filter effluent:** The liquid discharged from a sand filter.

2.6

invert: The lowest point of the interior of a drain or sewer at any cross-section.

2.7

sand filter trench: excavated trench in which coarse sand (equivalent particle size ranging from 0.6 to 2.0 mm) is used as the filtering medium.

2.8

scum: The floating mass on the surface of sewage in the septic tank buoyed up by entrained gas, grease or other substances.

2.9

seepage pit (soak away): Pit through which effluent is allowed to seep or leach into the surrounding soil.

2.10

septic tank: A one-storey chamber or chambers through which sewage flows slowly, thus permitting matter to settle, be retained, and decomposed by anaerobic respiration. (See Figure 1).

2.11

sewage: The liquid wastes of a household, including human faeces, urine, kitchen, bath and laundry wastes.

2.12

sludge: The settled solid matter from sewage in a semi-solid condition.

2.13

Greywater: is composed of all domestic household wastewater that does not come from toilets or does not include human excrement. This includes wastewater that flows from baths/showers, clothes washing, and dishwashers and kitchen sinks.

2.14

Blackwater: is composed of toilet wastewater, which includes sewage.

3 Preliminary data for design

3.1 In order to design a septic tank and the associated secondary treatment and disposal system, the following information should be obtained:

3.1.1 Site conditions

The fullest possible information on the nature of the soil and subsoil conditions should be obtained, as well as the approximate water-table and any available record of flood levels or information as to the variation, seasonal or otherwise, in the water-table. Guidance should be sought from the relevant authorities for information on water table and flood levels.

3.1.1.1 The soil shall be explored to a sufficient depth to determine the soil horizons and soil types, grading, structure and permeability.

3.1.1.2 The external drainage factors such as slope of ground and the position and nature of surface water drains should be ascertained.

3.1.2 Percolation test

To determine the type of secondary treatment and disposal system the soil absorption test described in **Appendix A** shall be conducted.

3.1.3 Number of users

The number of full-time and part-time users shall be determined in order to determine the capacities and sizes of septic tanks and their associated secondary treatment and disposal systems.

3.1.4 Other information

Other information that shall be taken into account in the design of septic tanks include the following:

- (a) the position and nature of outfall ditches and small streams;
- (b) the position of any boreholes, wells, or water storage tanks at or below ground levels;
- (c) the invert level of the drain at the point of entry of effluent from the septic tank;
- (d) the effect of seepage and surface water from surrounding areas at levels higher than the proposed absorption area; and
- (e) the effect of seepage from the proposed absorption area on surrounding areas.

3.1.5 Information to be given to the authority

Before the commencement of any work, plans, elevation and detailed drawings of the proposed sewerage and disposal system in such form as may be prescribed by the authority, shall be deposited with the authority for approval.

4 Septic tanks

All septic tanks shall be rectangular in shape with the first compartment being $\frac{2}{3}$ the Length of the tank and the second chamber being $\frac{1}{3}$ the Length of the tank.

4.1 Calculations

4.1.1 The capacity of one chamber septic tanks shall be calculated according to the following equation:

Equation 1: $V = 1000 + N (C \cdot T + K \cdot L_f)$

Where: V = Chamber volume, in liters

N = Number of people or contribution units

C = Contribution of disposessions, in liter/person x day or in liter/unit x day (**See Table 1**);

T = Detention period, on days (**See Table 2**);

K = Rate of accumulation of sludge digested on days, equivalent in addition to accumulation of sludge (**See Table 2**); and

L_f = contribution of sludge fresh, in liter/person x day or in liter/unit x day or in liter/unit x day (**See Table 3**).

See Table 4 for examples of calculation for nominal capacity.

4.1.2 The length of a septic tank shall be calculated according to the following equation:

Equation 2: $L = \frac{V \times 0.001}{W \times H_D}$

Where: V = Chamber volume, in liters

L = Length of Chamber, in metres

W = Width, in meters;

H_D = Liquid depth, in meters; and

W and H_D , according to **Clause 4.4**.

Table 1
Rate of total sludge accumulation (K), days, per interval between cleanings and temperature

Interval between cleanings (Years)	Value of K by band (t), in C ⁰		
	t ≤ 10	10 ≤ t ≤ 20	t > 20
1	94	65	57
2	134	105	97
3	174	145	137
4	214	185	177
5	254	225	217

Source: ABNT-NBR n^o 7.229/1993

Table 2
Period of detention (T) of the disposessions, by daily contribution band

Daily contribution in litres	Detention (T)/Days	Time/Hours
Even 1,500	1.0	24
From 1,501 to 3,000	0.92	22
From 3,001 to 4,500	0.83	20
From 4,501 to 6,000	0.75	18
From 6,001 to 7,500	0.67	16
From 7,501 to 9,000	0.58	14
More than 9,000	0.5	12

Source: ABNT-NBR n° 7.229/1993

Table 3

Daily contribution of cool sewer (C) and of sludge (L_f) by type of property and of occupant

Property	Unit	Sewer contribution (C)	Contribution of sludge fresh (L _f)
1. Permanent occupants			
Residents:	person/liters	160	1
- High standard:	person/liters	130	1
- Average standard;	person/liters	100	1
- Low standard;	person/liters	80	1
- Provisional lodging.			
2. Temporary occupants			
Factory in general;	person/liters	70	0.3
- Desk	person/liters	50	0.2
- Public or commercial buildings;	person/liters	50	0.2
- School (half day) and long permanence sites;	person/liters	50	0.2
- Bars;	person/liters	6	0.1
- Restaurants and similar;	repasts	25	0.1
- Cinema theaters and sites of short permanence;	place	2	0.02
- Public sanitary	vase	480	4

(*) Only of access opened to the public (highway season, railway, public common land, stage, etc). Source: ABNT-NBR n° 7.229/1993.

Table 4

Septic tank designed for all wastes including laundry wastes

Recommended Dimensions calculated according with equation 1 and 2.

Number of users	Nominal Capacity (litres)	Recommended dimensions (m)			
		Length	Width	Liquid Depth	Total Depth
5	1660	1.48	0.90	1.25	1.55
6	1792	1.43	1.00	1.25	1.55
8	2056	1.58	1.00	1.30	1.60
10	2320	1.56	1.10	1.35	1.65
15	2980	1.84	1.20	1.35	1.65
20	3640	1.93	1.30	1.45	1.75

Note: The above table was calculated using the following variables:

$$C = 130 \text{ (average standard)}, T = 1, K = 2, L_f = 1$$

4.1.2 Table 5 is recommended for use in areas where impermeable soil strata prevail, that is, where the percolation rate exceeds 60 minutes. In such a case discharge into the septic tank may be limited to toilet wastes only.

Table 5
Septic tank designed

Number of users	Nominal capacity (litres)	Recommended Dimensions (m)			
		Length	Width	Liquid depth	Total depth
Up to and including 9	1450	1.50	0.75	1.20	1.50
10	1610	1.75	0.75	1.30	1.60
11 to 15	1820	1.90	0.75	1.30	1.70
16 to 20	2420	2.20	0.75	1.40	1.70

Note: Table 1 is useful in areas where the percolation rate exceeds 60 minutes

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Table 6

Septic tank designed for all wastes excluding laundry wastes

Number of users	Nominal Capacity (litres)	Recommended Dimensions (m)			
		Length	Width	Liquid Depth	Total Depth
5	2130	2.10	0.85	1.20	1.50
6	2560	2.25	0.90	1.25	1.55
7 to 8	2730	2.30	0.95	1.25	1.55
9 to 10	3410	2.50	1.10	1.25	1.55
11 to 15	3830	2.70	1.10	1.30	1.60
16 to 20	5110	2.95	1.30	1.35	1.65

4.2 Capacities

Septic tanks shall have capacities not less than the capacities shown in **Table 5**, **Table 6**, or **Table 4**, as appropriate. The capacities shall be obtained by measurement of the internal volume of the tank, the depth being taken from the outlet level of the tank.

The capacities shown in **Table 5**, **Table 6**, or **Table 4** shall be used only with the approval of the responsible local authority.

4.3 Location

Septic tanks shall not be located within 1.5m of a building or property boundary. It shall be accessible for cleaning or de-sludging. The septic tank should not be located at the front of the Building.

4.4 Minimum dimensions

Septic tanks shall have a minimum width of 0.75m and a liquid depth ranging from 1.2 to 1.5m. The clearance above water level should be not less than 0.3m.

4.4.1 The length to width ratio for rectangular septic tanks shall be not less than 2 nor shall it be greater than 3.

4.5 Recommended design

Septic tanks shall be designed and constructed with two compartments. Double compartments tanks are recommended as they have a great capability for suspended solids removal. Recommended designs are shown in **Figure 2**.

4.5.1 In double compartment tanks the inlet compartment should have a capacity of one-half to two-thirds of the total tank capacity, and the inlet compartment should have a capacity of not less than 1450 L.

4.6 Pipes and fittings

Pipes shall be laid as far as possible, in straight lines, in both horizontal and vertical planes. Where bends are unavoidable they should be long radius bends with clean-outs (cleaning eyes). A minimum pipe diameter of 100mm is recommended.

4.6.1 Inlet pitting

The inlet to a septic tank shall be either the baffle type arrangement or the square junction type fitting shown in **Figure 2**.

4.6.2 Diameter

The inlet shall be made of durable material with a nominal diameter of not less than 100mm or nominal internal cross-section of not less than 100mm x 100mm.

4.6.3 Inlet invert

The invert level of the inlet fitting shall be at a distance not less than 75mm above the water level in the Septic Tank and the clearance between the top of the vertical leg of the inlet fitting and the underside roof of the tank shall be not less than 75mm.

4.6.4 Outlet filling

The outlet to a septic tank shall be a square junction type of fitting with a nominal internal diameter of not less than 100mm or with a nominal cross-section of not less than 100 mm x 100 mm.

4.6.5 Outlet invert

The invert level of the outlet fitting shall be not less than 75 mm below the invert level of the inlet fitting and the vertical leg of the outlet fitting shall extend downward for a distance of not less than 330 mm.

4.6.6 Tank cover

Each tank shall be provided with a cover of adequate strength. Access openings shall be provided for the purposes of de-sludging and inspection. If circular, the clear opening shall have a minimum diameter of 500 mm. If rectangular, the minimum cross-section shall be 650 mm x 450 mm. The thickness of the tank cover is dependent on the construction of the septic tank. Each compartment shall be provided with an access opening. The tank cover shall be located directly above the interior opening of the outlet pipe.

4.6.6.1 Structural design of tank cover

In addition to its dead load the tank cover shall be designed to withstand any likely imposed loads such as that due to earth cover and shall be adequately reinforced to prevent cracking. Where sectional slabs are used they may be considered as simply supported beams but the tank shall be protected against surface water run-off.

4.6.7 Minimum cover to reinforcement

The minimum cover to reinforcement in reinforced concrete tank sections shall be 43 mm (50% more than the ordinary concrete).

4.6.8 Partitions

A partition in a double compartment septic tank shall be fixed and durable. Connections between two compartments shall be made at one half the operating depth of the tank and preferably shall be in the form of a 90° bend ell (L) whose lower end does not penetrate into the liquid at a depth lower than the outlet fitting.

4.7 Installation loads

All septic tanks shall be designed and constructed so that there will be no structural failure or undue distortion under external hydrostatic groundwater pressure when, empty. They shall either be protected from or designed to withstand any likely vehicular, foundation, or other imposed loadings.

4.8 Construction

The wall of a septic tank may be constructed of blocks, concrete or other suitable material approved by the responsible authority. If the walls and floors are constructed of concrete, they shall be rendered water-tight by the use of mortar of adequate strength or other suitable durable materials.

4.8.1 Access opening covers

The cover to access openings shall be of reinforced concrete, cast iron or any other material approved by the responsible authority. A cover shall incorporate a suitable lifting device, shall be in one piece, and shall fit neatly and be seated to prevent the ingress of water. Safety shall be adhered to prevent unintentional or accidental access, by adequately sealing the covers upon completion of construction.

4.8.2 Thickness of floors and walls

The minimum thickness of floors and walls shall be as follows, unless otherwise approved by the responsible authority:

- (a) for plain concrete walls, 150 mm, but the floor slab shall be 100 mm thick and shall be provided with anti-crack reinforcement at the top and bottom;
- (b) for reinforced concrete floors and walls, 100 mm thick;
- (c) for walls constructed of blocks, 175 mm thick, but the floor shall be of reinforced concrete 100 mm thick and provided with anti-crack reinforcement at the top and bottom; and
- (d) if other durable materials are used, the conditions set out in clause 4.7 shall be met; and
- (e) the floor shall be level.

4.9 Polyethylene and polyvinylchloride tanks

4.9.1 Moulded polyethylene tanks

4.9.1.1 Compound

The compound in polyethylene tanks shall comply with ASTM D1248, Class B (requiring an ultravioletstabilizer) or Class C (requiring a minimum of 1% carbon black).

4.9.1.2 Wall thickness

Side walls, tops, bottoms, and covers of polyethylene tanks shall be not less than 5 mm thick. Inlet and outlet ends shall be not less than 3 mm thick. Chamber dividers and partitions shall be not less than 1.5 mm thick.

4.9.2 Extruded polyethylene and polyvinylchloride tanks

4.9.2.1 Compound

4.9.2.1.1 The compound in extruded polyethylene tanks shall comply with cell classification 424430C or 424430E as specified in CAN/CSA-B182.6.

4.9.2.1.2 The compound in extruded polyvinylchloride tanks shall comply with cell classification 12364 or 12454 as specified in CAN/CSA-B182.4.

4.9.2.2 Stiffness

Extruded polyethylene and polyvinylchloride tanks and tank components shall have a pipe stiffness of not less than 210 kPa when measured in accordance with CAN/CSA-B182.4 or CAN/CSA-B182.6, as applicable.

4.9.2.3 End wall thickness

The welded end walls of extruded polyethylene and polyvinylchloride tanks shall be not less than 5 mm thick.

4.9.3 Quality of work and finish

Tanks shall be rectangular in shape with the first compartment being 2/3 the Length of the tank and the second chamber being 1/3 the Length of the tank. Tanks shall be as free of visible defects as practicable.

5 Secondary treatment and disposal systems

5.1 Disposal of effluent

The effluent from a septic tank shall be disposed of by one of the methods given in 5.2 to 5.5. The method selected shall be approved by the authority before any construction is started. Recommended methods of disposal for various soil and subsoil conditions are given in **Table 7**. It should be noted that soil absorption systems may be rendered useless as a result of the eventual clogging of pores of the surrounding soil by suspended solids in the tank effluent. Soil absorption systems may have useful lives of up to 15 years where the tank is properly maintained. Provision should therefore be made for future replacement drain fields or pits. At least two are necessary, one being operational while the other is being rested.

Table 7
Recommended methods of disposal of septic tank effluent

Position of subsoil water level from ground level	Soil and Subsoil Condition		
	Porous soil with percolation rate < 30 minutes	Porous soil with percolation rate >30 minutes and < 60 minutes	Dense clays and soil with percolation Rate > 60 minutes
Within 1.8 m	Filter box	Filter box	Filter box
Below 1.8 m	Seepage pit or absorption trench	Absorption trench	Filter box

Alternatively Septic tank waste effluent may be routed to nearby sewage system.

5.1.1 Distance from drinking water supply

The minimum distance of any disposal system from any source of recreational and drinking water supply shall be 30 m unless specially approved by the authority.

5.1.2 Distance from buildings

The minimum distance of a disposal system from any habitable building shall be 2.5 m unless specially approved by the authority.

5.1.3 Distance from property boundary

The minimum distance of a disposal system from any property boundary shall be 1 m unless specially approved by the authority.

Filter box

The filter box shall be used wherever the water table is below 1.8 m or where impermeable soil strata prevail. Filter boxes are used to provide additional treatment of septic tank effluent. They consist of a lined excavation of water tight structure filled with uniformity tight medium that is normally placed over an under-drain system. These contain media filters also known as packed bed filters. The recommended medium is gravel or crushed rocks, ranging from 3.8 – 6.4 cm. The depth of the media filter is 1.8m. If the filter is round, its diameter is 1.5m. The minimum hydrodynamic load is 0.1m. The under-drain collects the filtrate for further processing, recycling or discharging to a water-body. Sand filters are essentially anaerobic, fixed-filmed bioreactors used to treat septic tank effluent. The minimum volume of the filter is 1250 L. The supporting media bottom has rows of 3cm with spacing of

15 cm between each row. The pipes and fittings between the septic tank and the filter shall have a minimum diameter of 0.1 m.

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It shall be placed in the centre of the filter and is allowed a steady level of effluent, 30 cm from top of the filter bed. **See Figure 3.**

Calculations

The volume of the filter (V) in litres should be calculated using the following equation: $V = 1.6 \times N \cdot C \cdot T$

The horizontal section (S) in m² should be calculated using the following equation:

$$S = \frac{V \times 0.001}{1.8}$$

1.8

Where: V = volume, in litres; and

S = horizontal section

5.2 Seepage pit (Soakaway)

The seepage pit may be of any suitable shape with the least cross-sectional dimension not less than 900mm and the depth below the invert level of the inlet pipe not less than 1m. The minimum distance between the bottom of the pit and the highest expected ground water level shall be 1m. The seepage pit shall be constructed to meet the requirements laid down in **Table 8.**

Table 8

Absorption area requirements for seepage pits (Soakaways) and absorption trenches

Percolation rate (minutes)	Required absorption area (m ² per 1000 litres per day)
2 or less	12.1
4	17.1
5	18.4
10	24.5
15	28.2
30	36.8
45	44.5
60	48.9
Over 60	Unsuitable

Notes:

1. The absorption area for seepage pits is the effective side wall area, effective depth being measured from 4150mm below invert level of inlet pipe to the bottom of the pit.

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2. The absorption area for an absorption trench is the trench sidewall area.
3. The volume of effluent to be disposed of per day is one-half of the volumes given in Table 5, 6 and 4 as appropriate, as these septic tank volumes are based on an average retention time of 2 days.

5.2.1 Construction

The seepage pit may be lined with boulders or concrete blocks laid with open vertical joints and then backfilled with a layer of clean gravel 75mm minimum thickness. The portion of lining above the inlet level should be finished with mortar. Alternatively the pit may be filled with boulders. (See Figure 4).

5.2.2 Seepage pit cover

The pit shall be provided with a tight fitting removable cover as shown in Figure 4.1 and 4.2 to prevent access to flies, mosquitoes, rodents and to surface water. A separate inspection cover in the seepage pit cover shall be provided.

5.3 Absorption trench

Trenches shall be 0.5m to 1m wide, 0.3 m to 1m deep and excavated to a gradient of between 0.16% and 0.32%. The maximum length for dug trench shall be 30m. The minimum distance between the trench bottom and the highest expected ground water level shall be 1m and the minimum spacing shall be 1.8 m. The size and length of trenches required shall be calculated on the basis of Table 5. A section through a typical absorption trench is shown in Figure 5.

5.3.1 Distribution box

The inlet pipe from the septic tank should enter the box about 50mm above the bottom. The sides of the box should extend about 0.3m above the invert level of the inlet pipe and the box should be provided with a removable cover which may be placed 0.3m to 0.5m below the ground surface. A diagram of a typical distribution box is shown in Figure 6.

5.3.1.1

Outlet pipes shall be constructed with inverts at the bottom level of the box or approximately 25mm above the bottom; all the drainage pipes shall be at the same elevation. The pipes shall be laid straight in the desired direction, horizontal bends being avoided wherever possible.

5.3.2 Construction of trenches

Plain end pressure pipes or bell and spigot sewer pipes of 100mm nominal diameter may be used. A small stone or cement fillet may be used in the bottom of each socket joint to centre the spigot in the bell. Plain end pipes should be supported by a flat board for example 25mm x 100mm which is nailed to stakes and driven at intervals in the bottom of the trench. The top of the board may then be laid to the desired grade.

5.3.3 Both types of pipes shall be laid in such a way as to leave an open space of 6mm to 12mm between pipe lengths so that the effluent is allowed to seep out. When plain end pipes are used the joints shall be covered with a strip of asphalt or tar paper or polythene sheet to prevent entrance of fine

sand or silt. The trench may be covered with approximately 0.3 metre of existing soil to form a mound and compacted to prevent flooding of the trench during precipitation.

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5.4 Sand filter trench

Sand filter trenches shall be designed on the basis of a sewage loading rate of 38L/m² per day of filter surface and shall be constructed to meet the following requirements:

(a) the effluent distributing pipe shall have a gradient of between 0.16 and 0.31, a nominal diameter of 100mm, and shall be surrounded by a layer of pebble gravel (4mm - 64mm / 0.2" - 2.5");

(b) the depth of the sand filter shall be not less than 0.6 m and shall consist of clean, coarse sand; and

(c) the under-drain shall have a nominal diameter of 100mm, a gradient of between 0.5% and 1%, and shall be surrounded by a 76.2 mm (3") layer of pebble gravel laid from the bottom of the trench to 76.2mm (3") above the top of the pipe.

5.4.1 Construction

The effluent distribution pipes and the under drains may be built of plain end pipes, long perforated pipes, or bell and spigot sewer pipes. When grade boards are not used to obtain a uniform grade, the sand bed should be flooded to ensure thorough settlement before the effluent distribution pipes are laid. A diagram of a sand filter trench arrangement is shown in **Figure 7**.

5.4.2 The effluent from a sand filter trench should be disposed of in a ditch, stream or similar watercourse.

5.5 Pumping

Wherever possible the septic tank system should be located so as to work by gravity flow. Where due to a high water table or low soil permeability or the presence of rock this is not possible or desirable,

pumping of the tank effluent may be required. Pumping should normally take place after sedimentation; thus a pump well to receive the tank effluent should be constructed. Where pumping is necessary details of the pumping system shall be included in the plans submitted to the responsible authority for approval.

6 Work on site, Inspection, testing and maintenance

6.1 Work on site

Work on site shall conform to acceptable levels of compliance of the standard.

6.1.1 Filter media and aggregate

All aggregate used shall be clean, inert and insoluble in sewage.

6.2 Inspection

The work shall be carefully inspected by the relevant authority at all stages of construction to ensure that it is being undertaken according to the recommendations of this code. Proprietors shall inform the Relevant Authority when the construction of the septic tank commences.

6.3 Testing

Before the tank is commissioned for use it should be tested for water-tightness by filling it with water and allowing it to stand for 24 hours. It should then be topped up if necessary for a further 24 hours during which time the water level should not fall by more than 15mm.

6.4 Commissioning of tank

The sewerage system should be completed and ready for operation before connection is made to the building.

6.4.1 The tank should be filled with water to its outlet level before the sewage is let into the tank. The tank should be seeded with about 5 buckets of well digested sludge obtained from a septic tank already in operation or from sludge digestion tank or from other sources recommended by the authority.

6.5 Maintenance

The designs recommended provide for desludging approximately every 2 years; 0. However inspection of the tank should take place every 12 to 18 months. The inspection shall be directed towards the determination of the following:

- (a) the depth of accumulation of sludge over the tank bottom; and
- (b) the depth of the scum.

Septic tanks shall be pumped when sludge or scum accumulations exceed 1/3 of the tank volume or are encroaching on the inlet and outlet baffle entrances. Periodic pumping of septic tanks is recommended to ensure proper system performance and reduce the risk of hydraulic failure.

6.5.1 The total depth of scum and sludge accumulations shall not be greater than 0.5m.

6.5.2 The depth of scum and sludge may be determined by inserting a rod or pole with a terry-cloth towel wrapped around it vertically into the septic tank to its bottom. The towel will be blackened by the sludge, and the scum layer thickness may be judged by poking the pole through the layer. If the

combined thickness is greater than that recommended in **6.5.1** the sludge should be removed until its depth is reduced to about 25mm.

6.5.2.1 Desludging should preferably be carried out mechanically by vacuum trucks from service providers approved by the Environmental Health Authorities. Manual handling of sludge should be avoided.

6.5.2.2 The scum and sludge should be removed and disposed in sites previously approved by the environmental health authorities. If not, it should be buried in impermeable shallow trenches approximately 0.6m deep. If not, it should be buried in shallow trenches approximately 0.6m deep where soils are impermeable.

6.5.3 Distribution box

Distribution boxes should be examined frequently, an inspection every 3 to 6 months should be adequate.

Appendix A

Percolation test for the determination of percolation rate

A-1 Percolation test

A-1.1 A percolation test shall be conducted as described in this Appendix to determine the permeability of the soil at any depth at which it is intended to dispose of the septic tank effluent. The number of test holes shall be as stated by the authority, but in no case less than one.

A-1.2 A square or circular hole with width or diameter of 100mm to 300mm and vertical sides shall be dug or bored to the depth of the proposed absorption area. The bottom and sides of the hole shall be carefully scratched to remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. All the loose material shall be removed from the hole and coarse grained sand or fine gravel shall be added for a depth of about 50mm to protect the bottom from scouring and sediment.

A-1.3 Water shall then be poured into the hole up to a minimum depth of 300mm over the gravel. In order to ensure that the soil is given ample opportunity to swell and to approach the condition it will be in, during the wettest season of the year, the percolation shall be determined 24 hours after the water is added. If water remains in the test hole after the overnight swelling period, the depth shall be adjusted to 150mm over the gravel. Then from a fixed reference point the drop in the water level should be noted over a period of 30 minutes. This drop shall be used to calculate the percolation rate.

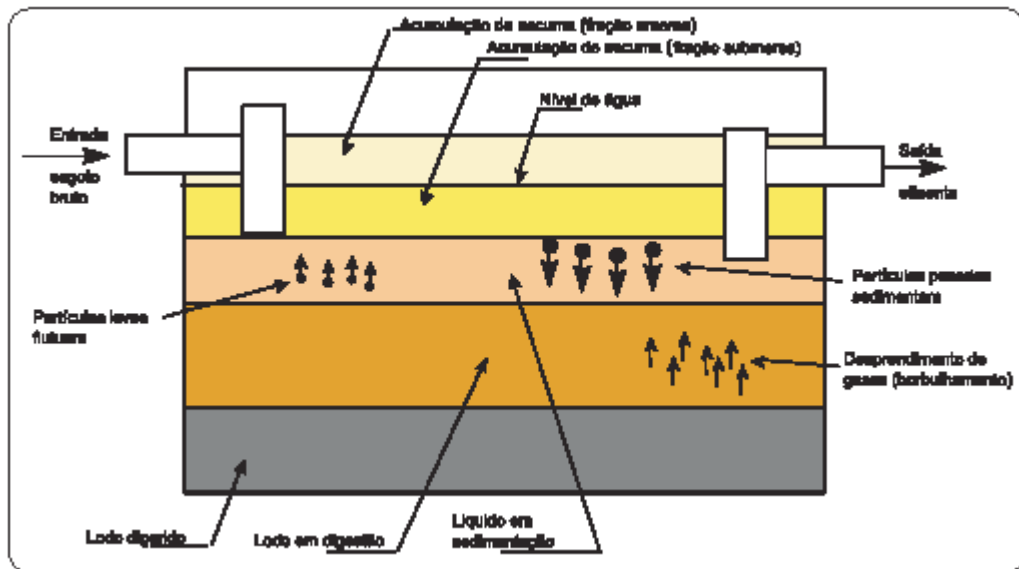
A-1.4 If no water remains in the hole, water shall be added to bring the depth of the water in the hole 150mm over the gravel. From a fixed reference point, the drop in water level shall be measured at intervals of 30 minutes for 4 hours, refilling 150mm over the gravel as is necessary. The drop that occurs during the final 30 minutes period shall be used to calculate the percolation rate. The drops during prior periods provide information for possible modification to suit local circumstances.

A-1.5 In sandy soils or other porous soils in which the first 150mm of water seeps away in less than 30 minutes after the overnight swelling period, the time interval between measurements shall be taken as 10 minutes and the test run for one hour. The drop that occurs during the final 10 minutes shall be used to calculate the percolation rate.

A-1.6 Percolation rate

Based on the final drop, the percolation rate, that is, the time, in minutes required for water to fall 25mm, shall be calculated.

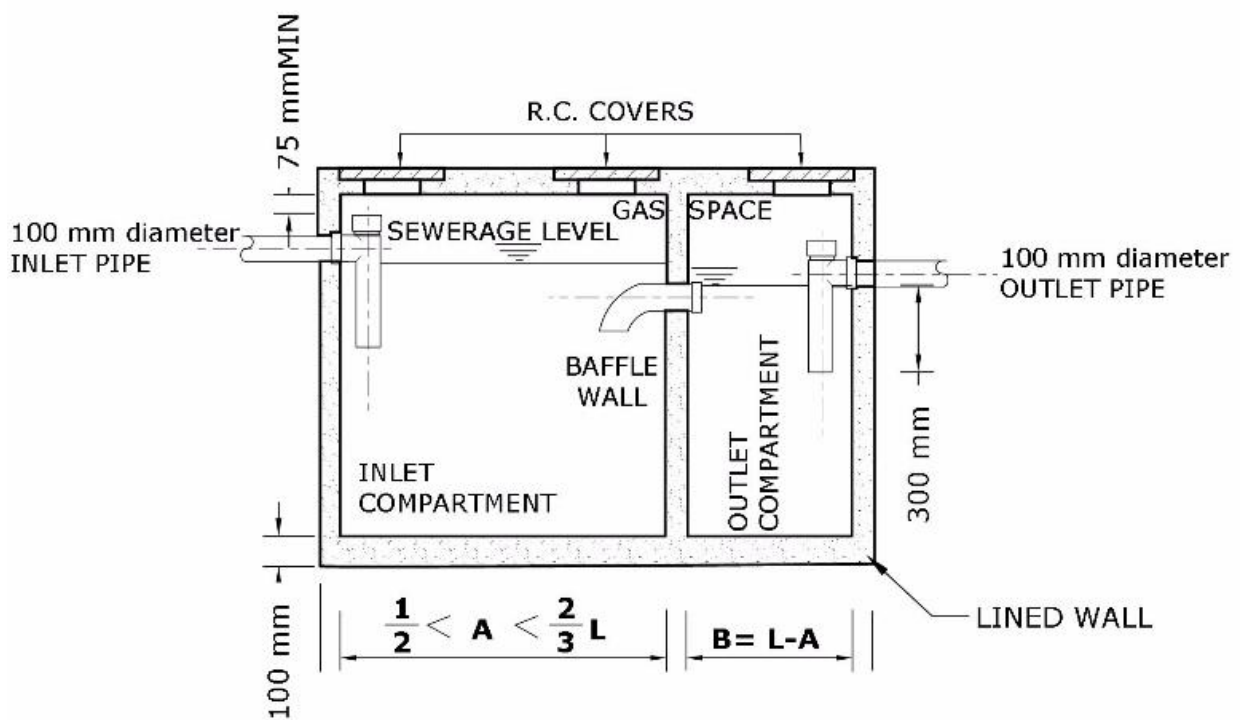
Figure 1 - General operation of a septic tank



Source: ABNT-NBR Nº 7.229/1993.

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Figure 2 - Typical septic tank
Septic tank (Two compartment)



SECTIONAL ELEVATION
FIGURE 2
SEPTIC TANK - 2 COMPARTMENTS

Figure 3 - Filter box

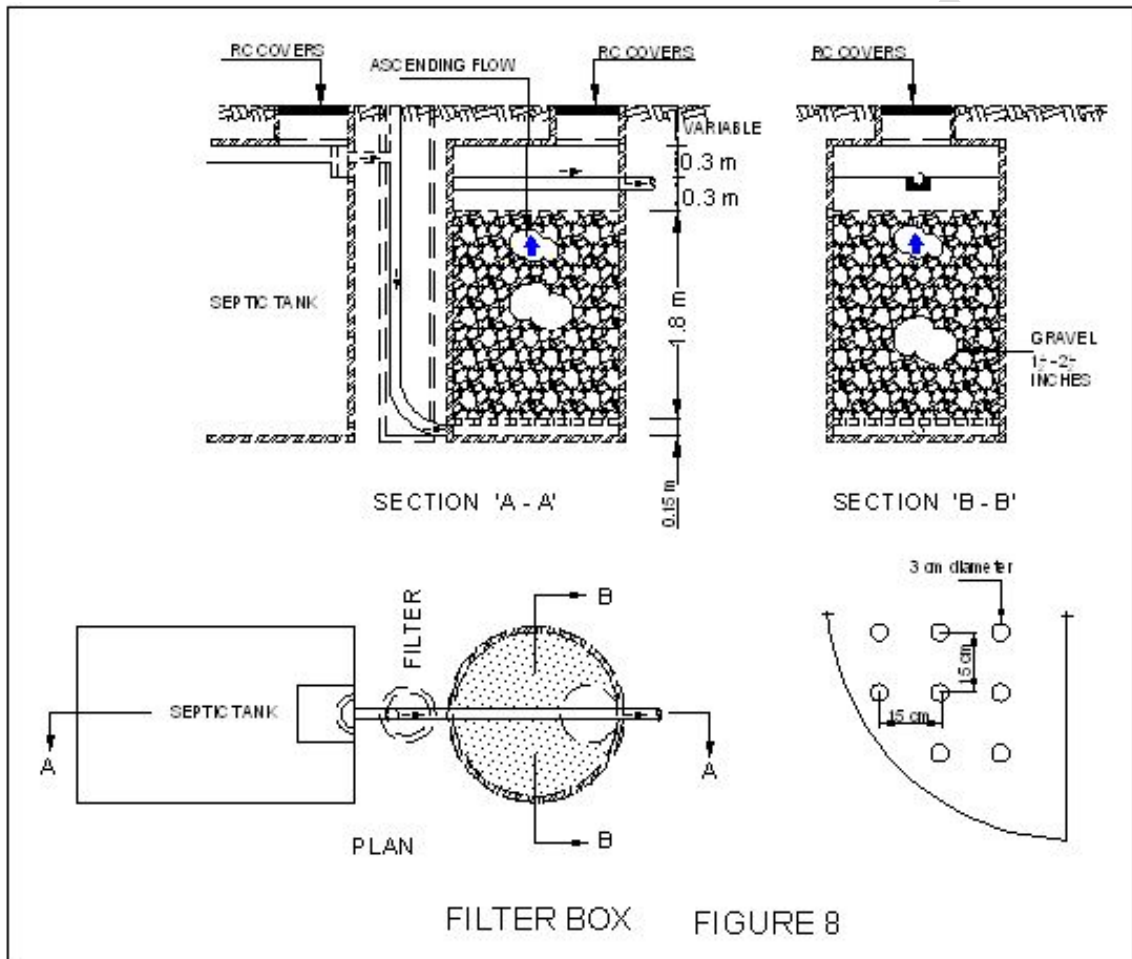


Figure 4 - Seepage pit

Figure 4.1

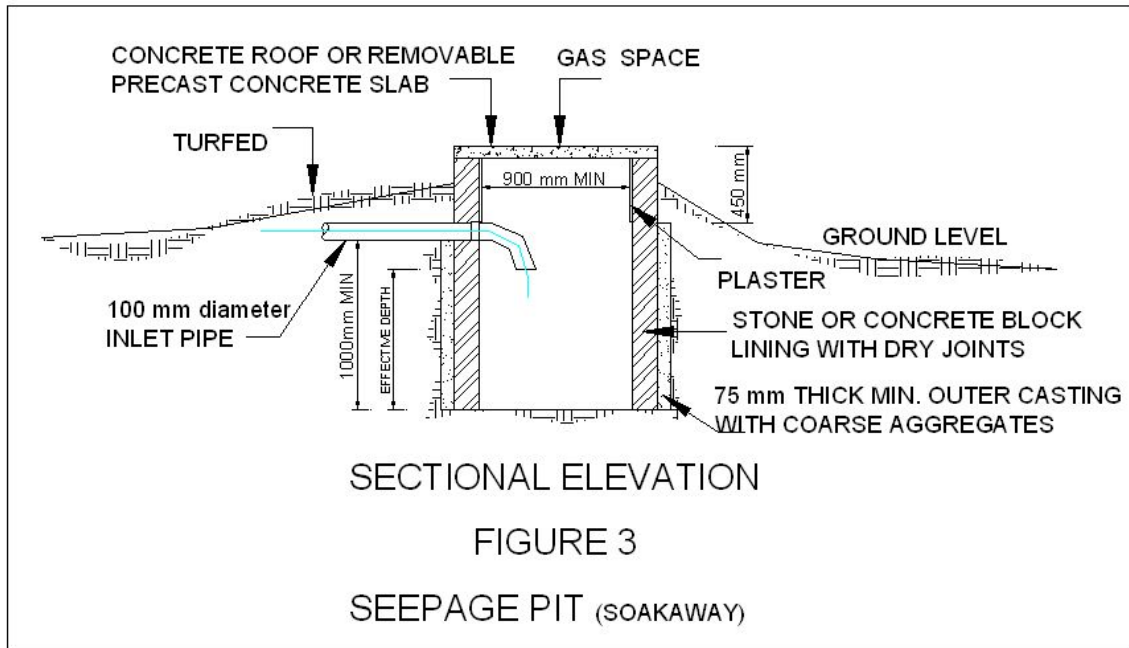


Figure 4.2

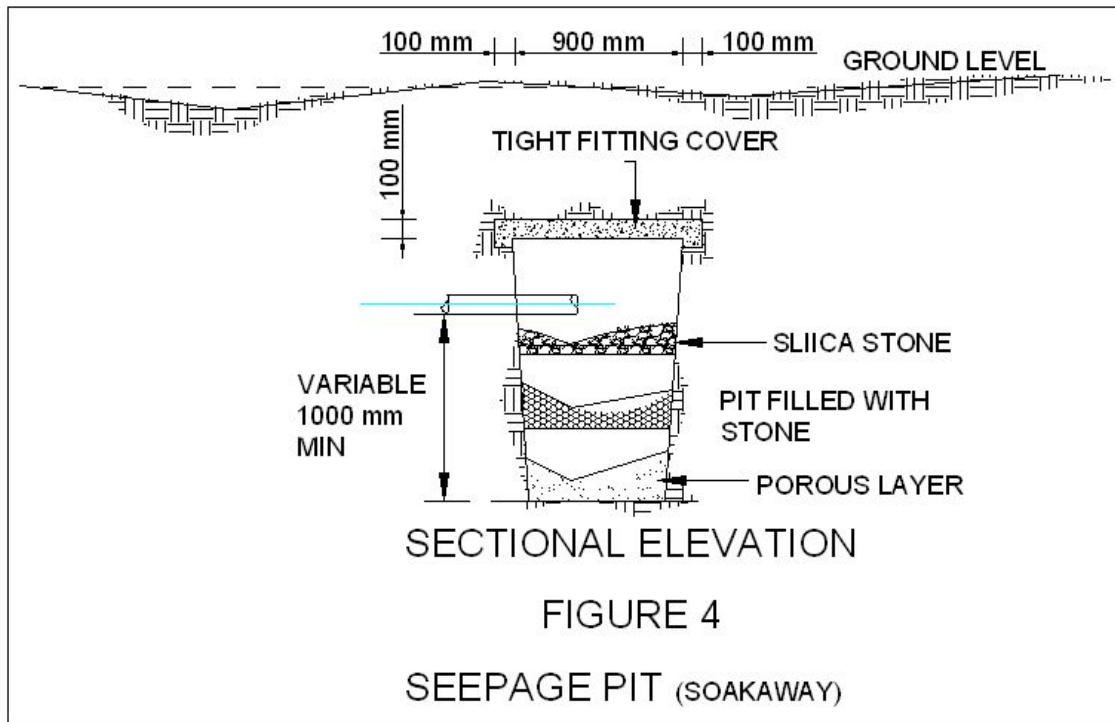


Figure 5 - Absorption trench

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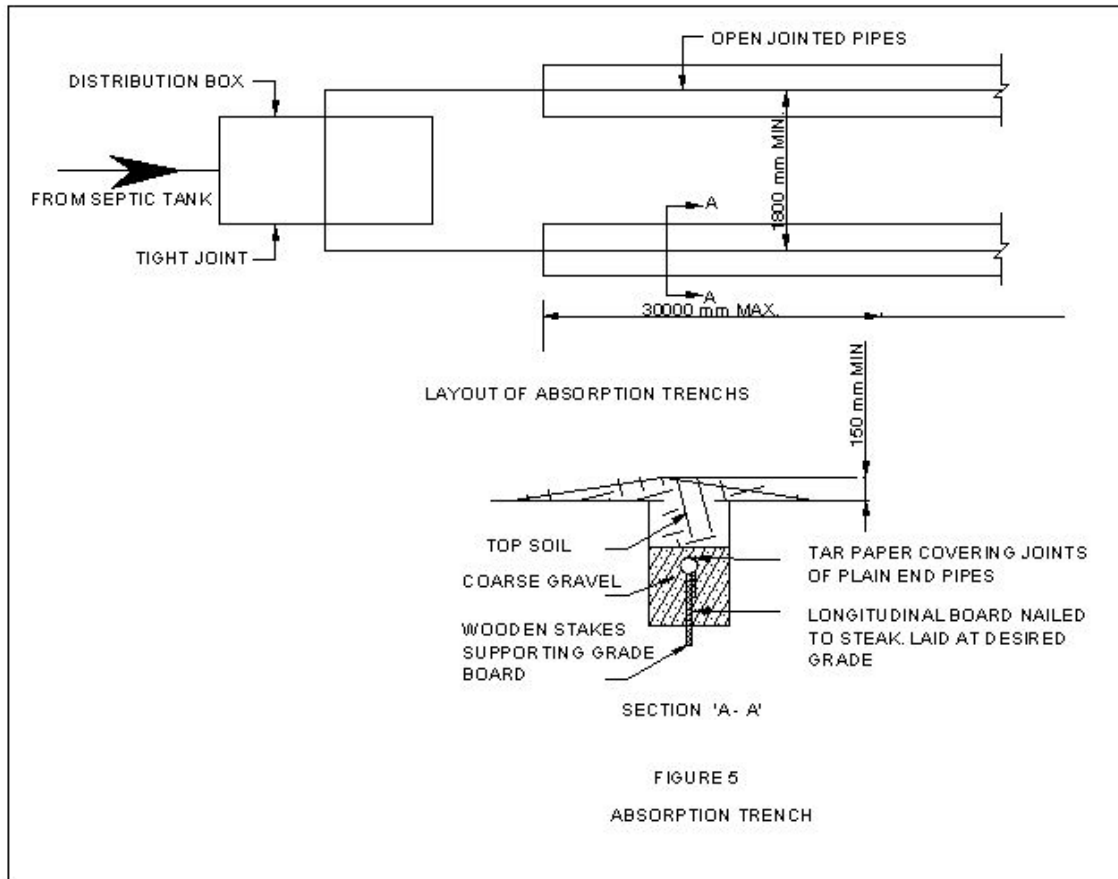
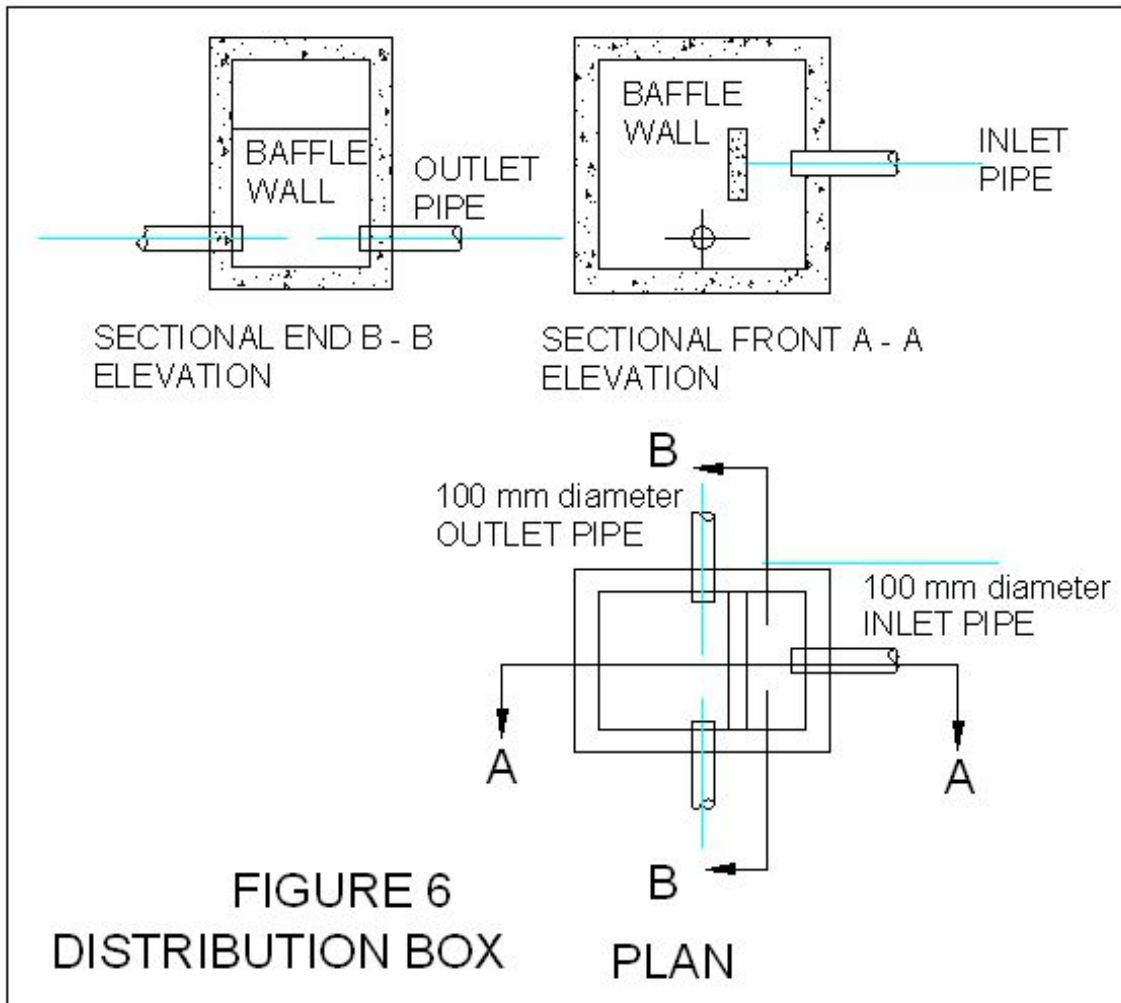
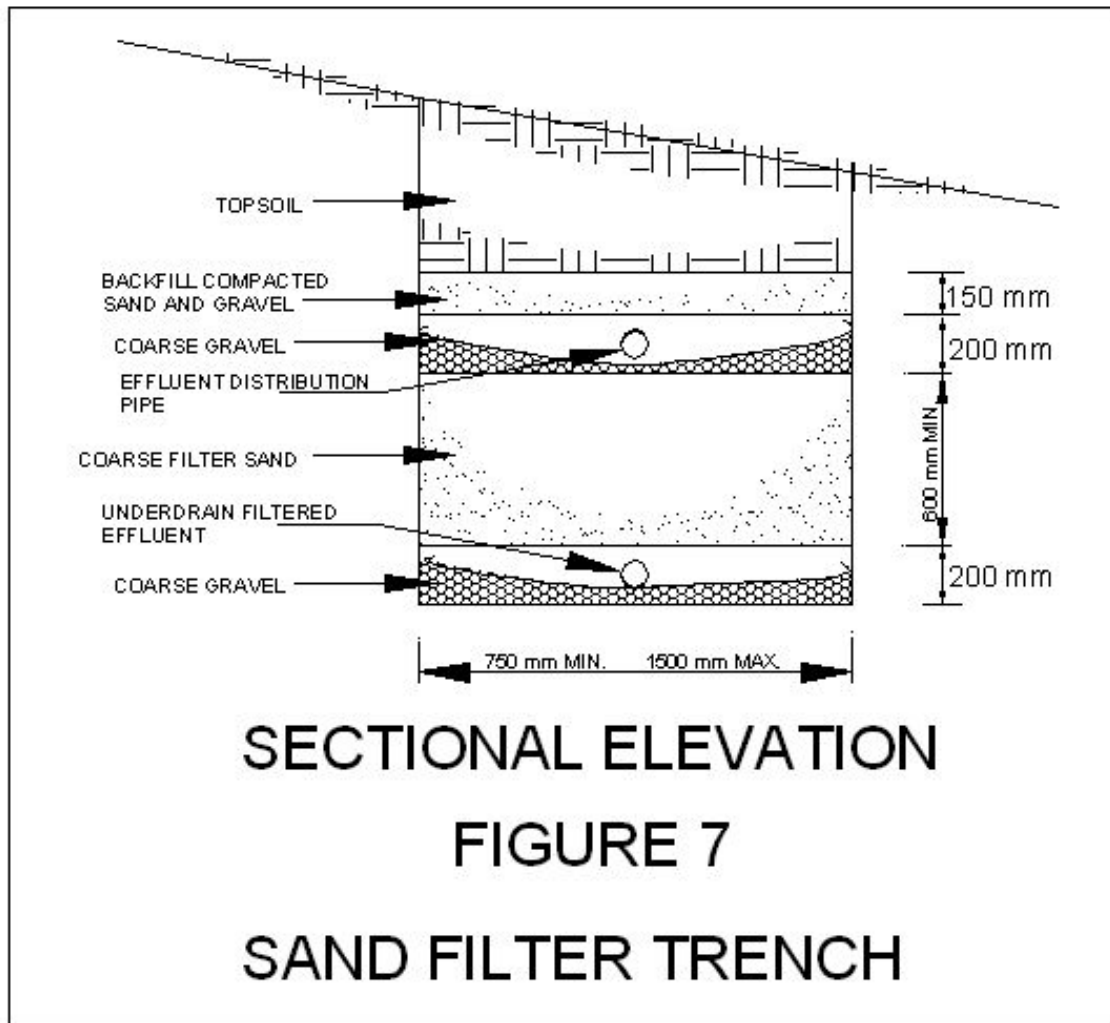


Figure 6 - Distribution box





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