Disposal of Effluent to Underground Strata

Septic tank effluent is normally required to be discharged into the underground strata and will not usually be permitted to flow directly into any watercourse.

In almost every case it is necessary to seek the approval of the Local Authority Building Control or Environmental Health Department. It may also be necessary to obtain approval from the Environment Agency (E.A. - England & Wales) or Scottish Environment Protection Agency (SEPA - Scotland).

If the discharge is into porous subsoil such as gravel, sand or chalk, at a level above that of the water table in winter, a soakaway pit may be used. This consists of a pit filled with rubble or other large pieces of inert material, or unfilled but lined with dry laid bricks or precast concrete perforated rings from which the effluent may percolate into the surrounding ground. The pit should be covered by a slab incorporating an inspection cover.

In less porous subsoils a subsurface irrigation system may be practical as a more suitable alternative. It should be very carefully designed and consist of a system of field drains which should be constructed using porous or perforated pipes, laid in trenches, with a uniform gradient no steeper than 1 in 200.

To determine the length of distribution drain required, a "Percolation Test" must be carried out. The method of carrying out this test is set out in BS 6297, a description of which is given below.

Percolation test

Excavate a hole 300mm square to a depth of 250mm below the proposed invert level of the land drain. Where deep drains are necessary the hole should conform to this shape at the bottom but may be enlarged above the 250mm level to enable safe excavation to be carried out.

Fill the 300mm square section of the hole with water to a depth of at least 250mm and allow it to seep away overnight. Next day, refill the test section to a depth of at least 250mm and observe the time, in seconds, for the water to seep away completely.

Divide this time by the depth in millimetres of water placed in the hole to establish the average time required for the water to drop 1mm. Take care when making the test to avoid abnormal weather conditions such as heavy, severe frost or drought. The percolation test should consist of three measurements carried out as above, taking an average of the three results. In the event of any of the measurements in a test being 50% or more above or below the average, make a further three measurements and calculate a further average. Unless an average value of Vp 24 s/mm or less is obtained (in which case no further tests are needed), make further tests on a minimum of three different locations on the route of a land drain, or at least three tests on separate days on the site proposed for a soakaway.

Where deep excavations are necessary a modified test procedure may be adopted using a 300mm earth auger. Bore the test hole vertically to the appropriate depth taking care to remove all loose debris. Make water level observations referring to a fixed datum, using a dip stick or some suitable alternative water level indicator.

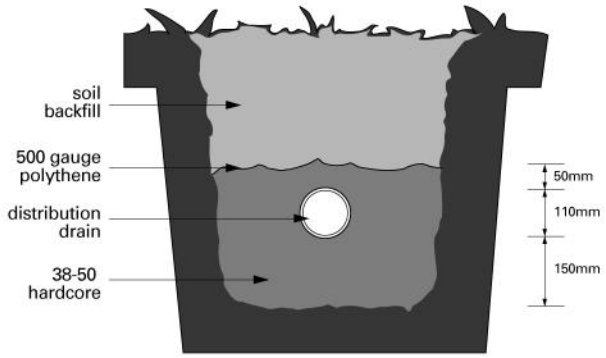
The value found in this way is called the percolation value (Vp in seconds) of the soil and can be used to determine the area of drainage trench floors required to disperse effluents. If the percolation value exceeds 140 seconds the soil is not suitable for drain fields. From 140 s to 100 s (about 10 to 7 hours to fall 250mm), under drains are desirable, and advice should be sought from the local authority.

N.B- If the level of the water table rises in winter to within 1 metre of the proposed invert of the distribution system, it is not advisable to use subsurface irrigation.

Effluent distribution drains

The first 3m length of drain from the septic tank should be solid drain and laid at a good fall - eg 1:40, and should terminate at a sampling chamber built to water authority requirements. Thereafter the distribution drain should be laid out in either herringbone or closed loop system, either level or not exceeding 1 in 200 fall. Clay or rigid uPVC perforated pipe should be used at a minimum depth of 500mm. The drain should be laid in a bed of 38-50mm diameter hardcore or gravel with 50mm cover on top. Lay 500 gauge polythene on top of the gravel and backfill with soil.

Harlequin HydroClear
SEWAGE TREATMENT PLANT



Section through typical distribution drain

Calculation methods

The floor area of the subsurface drainage trench is calculated using the following formula:

At = P x Vp x 0.25

Where:

At = area of trench in square metres
P = number of persons served by the septic tank
Vp = percolation value in seconds as described above
0.25 = constant

N.B- For effluents which have received secondary treatment followed by a settlement tank (normally 30 SS and 20 BOD), this area can be reduced by 20%, ie:

At = P x Vp x 0.20

The area determined is used to calculate the floor area of the drainage trench and therefore the length of distribution drain, or alternatively the floor area of one or more shallow soakaways.
An example using this formula is shown opposite:

Vp = 12 seconds
P = 5 persons
At = 5 x 12 x 0.25
At = 15m² drain trench 0.6m wide
= 25 lineal metres

Further examples are shown in the chart below - assuming the base of the trench is 600mm wide the length of drain will be:

Soak away drain sizing chart

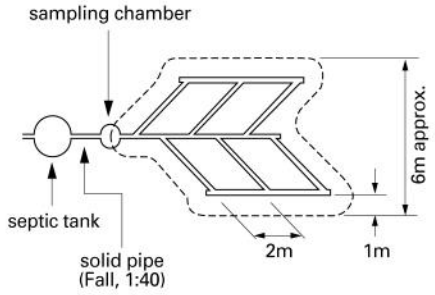
Tank capacity (litres)	2720	3800	4500	6000	7500	9000
Number of persons served	4	10	14	22	30	39
Vp (sec/mm)						
5	8.33	20.83	29.17	45.83	62.50	81.25
10	16.66	41.67	58.33	91.67	125.00	162.50
20	33.32	83.33	116.67	183.33	250.00	325.00
30	50.00	125.00	175.00	275.00	375.00	487.50
40	66.64	166.66	233.33	366.67	500.00	650.00
50	83.33	208.33	291.67	458.33	625.00	812.50

As the chart indicates, for larger populations where the soil is poor it may well be more economic to look at an alternative system for effluent disposal such as installing a sewage treatment plant and taking the effluent directly to a watercourse - or pumping the effluent to a more suitable area of ground.

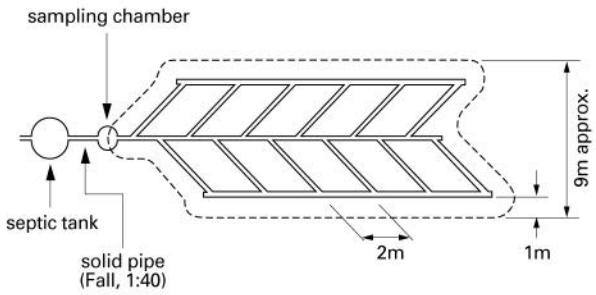
Notes

1 The local authority and Environment Agency should always be consulted and they may require the test to be carried out by a specialist consulting engineer.
2 The information herein is for guidance only and can form no part of any contractual agreement either with Harlequin MFG Ltd or any third parties. Harlequin MFG Ltd can accept no responsibility for any assumptions or agreements made as a result of this information.

Typical herringbone layouts



Average installation, 30m of land drain



Large installation, 100m of land drain

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