ONLINE VERSION

Septic tanks

1.15 Septic tanks should only be used in conjunction with a form of secondary treatment (e.g. a drainage field, drainage mound or constructed wetland).

Siting

1.16 Septic tanks should be sited at least 7m from any habitable parts of buildings, and preferably downslope.

1.17 Where they are to be emptied using a tanker, the septic tank should be sited within 30m of a vehicle access provided that the invert level of the septic tank is no more than 3m below the level of the vehicle access. This distance may need to be reduced where the depth to the invert of the tank is more than 3m. There should also be a clear route for the hose such that the tank can be emptied and cleaned without hazard to the building occupants and without the contents being taken through a dwelling or place of work.

Design and construction

1.18 Septic tanks should have a capacity below the level of the inlet of at least 2,700 litres (2.7m^3) for up to 4 users. The size should be increased by 180 litres for each additional user.

1.19 Factory-made septic tanks are available in glass reinforced plastics, polyethylene or steel and should meet the requirements of BS EN 12566-1. Particular care is necessary in ensuring stability of these tanks.

1.20 Septic tanks may also be constructed in brickwork or concrete, roofed with heavy concrete slabs. Brickwork should be of engineering bricks and be at least 220mm thick. The mortar should be a mix of 1:3 cement–sand ratio. In situ concrete should be at least 150mm thick of C/25/P mix (see BS 5328).

1.21 Septic tanks should prevent leakage of the contents and ingress of subsoil water and should be ventilated. Ventilation should be kept away from buildings.

1.22 The inlet and outlet of a septic tank should be designed to prevent disturbance to the surface scum or settled sludge and should incorporate at least two chambers or compartments operating in series. Where the width of the tank does not exceed 1200mm the inlet should be via a dip pipe. To minimise turbulence, provision should be made to limit the flow rate of the incoming foul water. For steeply laid drains up to 150mm the velocity may be limited by laying the last 12m of the incoming drain at a gradient of 1 in 50 or flatter.

1.23 The inlet and outlet pipes of a septic tank should be provided with access for sampling and inspection (see Approved Document H1, paragraph 2.48).

1.24 Septic tanks should be provided with access for emptying and cleaning. Access covers should be of durable quality having regard to the corrosive nature of the tank contents. The access should be lockable or otherwise engineered to prevent personnel entry.

Marking

1.25 A notice should be fixed within the building describing the necessary maintenance. An example of such wording is:

'The foul drainage system from this property discharges to a septic tank and a *<insert type of secondary treatment>*. The tank requires monthly inspections of the outlet chamber or distribution box to observe that the effluent is free-flowing and clear. The septic tank requires emptying at least once every 12 months by a licensed contractor. The *<insert type of secondary treatment>* should be *<insert details of maintenance of secondary treatment>*. The owner is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance.'

Drainage fields and drainage mounds

1.26 Paragraphs 1.27 to 1.44 give guidance on design and construction of drainage fields and drainage mounds to provide secondary treatment to the discharge from a septic tank or package treatment plant.

Siting

1.27 A drainage field or mound serving a wastewater treatment plant or septic tank should be located:

a. at least 10m from any watercourse or permeable drain;

b. at least 50m from the point of abstraction of any groundwater supply and not in any Zone 1 groundwater protection zone;

c. at least 15m from any building;

d. sufficiently far from any other drainage fields, drainage mounds or soakaways so that the overall soakage capacity of the ground is not exceeded.

1.28 The disposal area should be downslope of groundwater sources.

1.29 No water supply pipes or underground services other than those required by the disposal system itself should be located within the disposal area.

1.30 No access roads, driveways or paved areas should be located within the disposal area.

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Ground conditions

1.31 Well drained and well aerated subsoils are usually brown, yellow or reddish in colour. Examples of subsoils with good percolation characteristics are sand, gravel, chalk, sandy loam and clay loam. It is important that the percolation characteristics are suitable in both summer and winter conditions. Poorly drained or saturated subsoils are often grey or blue in colour. Brown and grey mottling usually indicates periodic saturation. Examples of subsoils with poor percolation characteristics are sandy clay, silty clay and clay.

1.32 A preliminary assessment should be carried out including consultation with the Environment Agency and local authority to determine the suitability of the site. The natural vegetation on the site should also give an indication of its suitability for a drainage field.

1.33 A trial hole should be dug to determine the position of the standing groundwater table. The trial hole should be a minimum of 1m^2 in area and 2m deep, or a minimum of 1.5m below the invert of the proposed drainage field pipework. The groundwater table should not rise to within 1m of the invert level of the proposed effluent distribution pipes. If the test is carried out in summer, the likely winter groundwater levels should be considered. A percolation test should then be carried out to assess the further suitability of the proposed area.

1.34 **Percolation test method** – A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the effluent distribution pipe. Where deep drains are necessary the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out. 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.

1.35 Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.

1.36 Next day, refill the test section with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (i.e. a depth of 150mm). Divide this time by 150. The answer gives the average time in seconds (V_p) required for the water to drop 1mm.

1.37 The test should be carried out at least three times with at least two trial holes. The average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

1.38 Drainage field disposal should only be used when percolation tests indicate average values of V_p of between 12 and 100 and the preliminary site assessment report and trial hole tests have been favourable. This minimum value ensures that untreated effluent cannot percolate too rapidly into groundwater. Where V_p is outside these limits effective treatment is unlikely to take place in a drainage field. However, provided that an alternative form of secondary treatment is provided to treat the effluent from the septic tanks, it may still be possible to discharge the treated effluent to a soakaway.

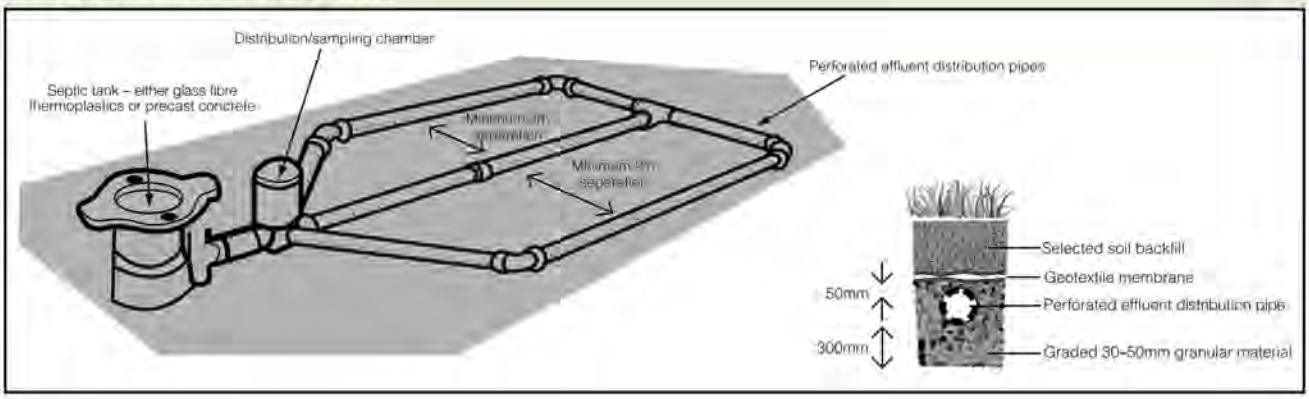
Design and construction

1.39 Drainage fields or mounds (see Diagrams 1 and 2) should be designed and constructed to ensure aerobic contact between the liquid effluent and the subsoil.

1.40 Drainage fields should be constructed using perforated pipe, laid in trenches of a uniform gradient which should be not steeper than 1:200.

1.41 Pipes should be laid on a 300mm layer of clean shingle or broken stone graded between 20mm and 50mm.

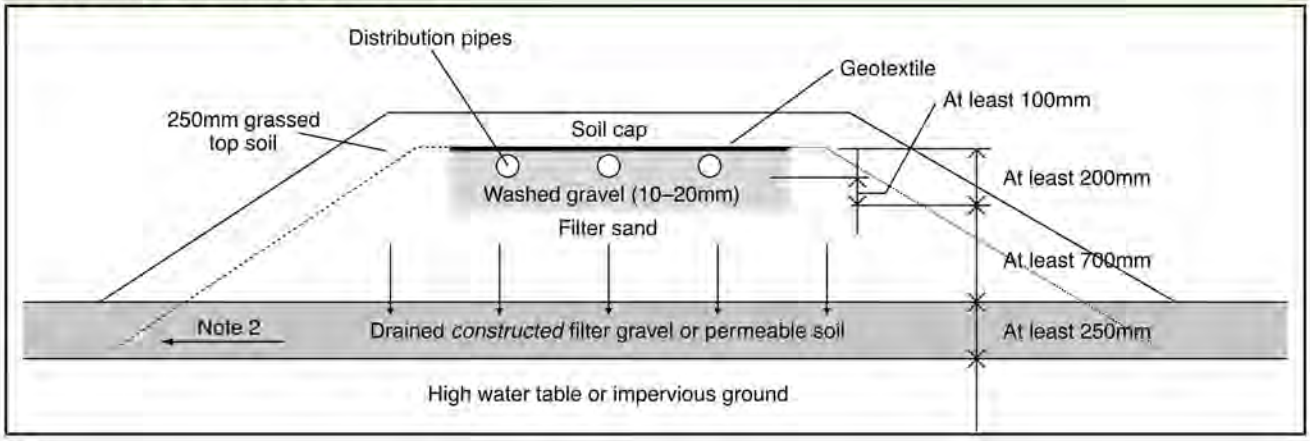
Diagram 1 **Drainage field**



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Diagram 2 **Drainage mound**



Notes:

1. To provide venting of the filter, the upstream ends of the distribution pipes may be extended vertically above mound level and capped with a cowl or grille.
2. Surface water runoff and uncontaminated seepage from the surrounding soil may be cut off by shallow interceptor drains and diverted away from the mound. There must be no seepage of wastewater to such an interceptor drain.
3. Where the permeable soil is slow draining and overlaid on an impervious layer, the mound filter system should be constructed on a gently sloping site.

1.42 Trenches should be filled to a level 50mm above the pipe and covered with a layer of geotextile to prevent the entry of silt. The remainder of the trench can be filled with soil; the distribution pipes should be laid at a minimum depth of 500mm below the surface.

Drainage trenches should be from 300mm to 900mm wide, with areas of undisturbed ground 2m wide being maintained between parallel trenches (see Diagram 1).

1.43 An inspection chamber should be installed between the septic tank and the drainage field.

1.44 Drainage fields should be set out as a continuous loop fed from the inspection chamber (see Diagram 1). To calculate the floor area of the drainage field (A_t in m^2), the following formula should be used:

$$A_t = p \times V_p \times 0.25$$

where p is the number of persons served by the tank, V_p is the percolation value (secs/mm) obtained as described in paragraphs 1.34–1.38.

Constructed wetlands/reed beds

1.45 Reed bed treatment systems or other constructed wetland treatment systems can be used to provide secondary or tertiary treatment of effluent from septic tanks or packaged treatment works. The systems purify wastewater as it moves through the gravel bed around the rhizomes and roots, by removing organic matter (BOD), oxidising ammonia, reducing nitrate and removing a little phosphorus. The mechanisms are complex and involve bacterial oxidation, filtration, sedimentation and chemical precipitation.

1.46 Reed beds generally use the common reed (*Phragmites australis*); other types of plants used in constructed wetlands include the reed maces (*Typha latifolia*), the rush (*Juncus effusus*), the true bulrush (*Schoenoplectus lacustris*) as well as members of the sedge family (*Carex*) and the yellow flag (*Iris pseudacorus*).

1.47 Constructed wetlands should not be constructed in the shade of trees or buildings as this will result in poor or patchy growth. Although winter performance is generally similar with respect to removal of BOD and suspended solids, it tends to be poorer than in summer for removal of ammonia due to lower temperatures. This should be taken into consideration during the design stage.

1.48 There are two main designs of constructed wetland system, horizontal flow and vertical flow.

1.49 **Horizontal flow systems** are continuously fed with wastewater from one end. The effluent flows horizontally through the gravel bed over the full width of the bed to the outlet end (see Diagram 3). Horizontal flow systems tend to be oxygen limited and they therefore tend not to be able to completely treat concentrated effluents, particularly those with high levels of ammonia. Horizontal flow systems require a level site. As they only use a single bed less maintenance is required than with vertical flow systems.

1.50 **Vertical flow systems** are intermittently fed with wastewater from the top flooding the surface followed by a period of rest. For this reason two or more beds are normally provided so that they can be used in rotation. The flow is predominantly downward to an outlet at the bottom (see Diagram 4) and is collected by a drainage network at the base. They therefore require a fall of between 1m and 2m. Vertical flow systems can achieve much better oxygen transfer than horizontal flow systems and therefore achieve more complete treatment, particularly of ammonia. They generally require more maintenance than horizontal systems.

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