

TANK SELECTION

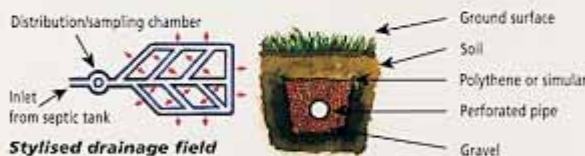
The principal functions of the septic tank are to separate and retain solids from the incoming flow. It should be designed with this in mind; high levels of solids in the outlet flow will reduce the life of the drainage field.

Prefabricated septic tanks constructed from glass fibre, thermoplastics or precast concrete are widely available. They should have inlet and outlet pipes, access for desludging and maintenance, and robust secure covers. They should be large enough to serve the number of users (see BS6297) - the minimum permitted capacity is 2700 litres. The tank should have two or more chambers, with the primary chamber providing at least two thirds of the total tank capacity.

You should preferably install a septic tank awarded third party certification, confirming its structural integrity and fitness for purpose. Glass fibre and thermoplastic tanks should have an Agrément Certificate (BBA) and precast concrete tanks should be constructed to appropriate British Standards (BS6297, BS8110).

DRAINAGE FIELD DESIGN

The proper design and construction of the drainage field is the key to reliable septic tank system performance. Its objectives are to: ● purify and absorb the tank effluent ● protect water resources and prevent nuisance.



An assessment must be carried out by a suitably qualified engineer to ensure that a drainage field will function on a particular site. A guide to site assessment may be found in British Standard 6297. However, percolation tests on their own do not provide an adequate assessment of the suitability of a site and may give optimistic results in certain weather conditions (e.g. long dry spells). [For advice in England and Wales 0645 333111; Scotland 01786 457700; Northern Ireland 01232 254 754]. Important factors include:

- subsoil nature, depth (at least 1m) and rate of percolation (e.g. free draining sandy silts, very clayey sands, clayey gravels and very silty gravels offer the best conditions; orange or grey soil mottles and a number of moisture loving plants could mean the site is prone to waterlogging and not suitable).

- location of water table (recommend not less than 1m below the drainage field trench at any time of the year)
- distance from watercourses, at least 10m, and water sources (e.g. wells), at least 50m
- site size, location and slope (e.g. not too steep)
- land use (avoid cultivated land and areas subject to compaction, e.g. car parks)
- sensitivity of adjacent habitats (for some sites the risk of environmental damage will be unacceptable)
- number and effectiveness of other septic tank systems in the area.

If the assessment indicates that a septic tank system is not appropriate, you must adopt one of the other methods.

The preferred type of drainage field (sub-surface irrigation) is a network of perforated pipes laid in shallow trenches partially filled with shingle. A distribution chamber should be installed between the tank and the pipes. The configuration of a field should be determined by site characteristics, but usually the pipes should be laid as a loop, with a slight gradient (1 in 200). They should also be located downslope of the property and away from surface water soakaways, wells and the site boundary. The size of the field can be calculated using the percolation data in BS6297.

LEGAL REQUIREMENTS

Any new septic tank system, package plant or cesspool requires planning permission. In Scotland and Northern Ireland the Planning Authority must be consulted in all cases. In England and Wales it will not be necessary to submit a planning application if the disposal method:

- is to serve a single dwelling, and
- is within its curtilage, and
- is not installed between the house and a highway (or if so, it is more than 20m from the highway).

In all other cases a planning application must be made. If you are in any doubt, consult your Local Authority. In addition, prior to construction, you must seek Building Control approval from your Local Authority or an Approved Inspector.

The owner of an on-site disposal system, or occupier of the property, has a legal responsibility to ensure that it functions properly. This includes making sure the system does not cause a nuisance and does not pollute the environment. Control over discharges from septic tanks and package plants to ground and surface waters is the responsibility of the Environmental Regulator. Legal consent to discharge may be required depending on location, local conditions and the volume to be released.

CONSULTATION

Consult early! This will save time, ease the process of installation, reduce the risk of flooding or pollution, and reduce costs.

To help you choose the correct on-site sewage disposal method, it is important to talk to the Environmental Regulator responsible for discharge of effluent in your area. You will also find it helpful to talk to your Local Authority, and to Building Control or the Approved Inspector responsible for approving installation. That way you will find out what is, and is not, acceptable. It may also be valuable to talk to experts in this area, such as system suppliers and manufacturers.

PROJECT FUNDERS

This initiative was funded by the DoE, the Environment Agency, the Institute of Building Control, Klargester Environmental Engineering, NHBC, SNIFFER and The National Trust. It was technically supported by Albion Concrete Products, the Centre for Alternative Technology, the Geological Survey of Ireland, Imperial College of Science, Technology and Medicine, Maltin Pollution Control Systems (1967) Ltd., the Royal Town Planning Institute and South Oxfordshire District Council.

The leaflet was prepared by David Butler of Imperial College and Sián John of CIRIA, and designed by Norman Reynolds.

It is part of a series which also includes: *Septic tank systems: a user's guide*, *Septic tank systems: design and installation*, and *Septic tank systems: a regulator's guide*. Copies can be obtained from the funding organisations and certain local authority offices.

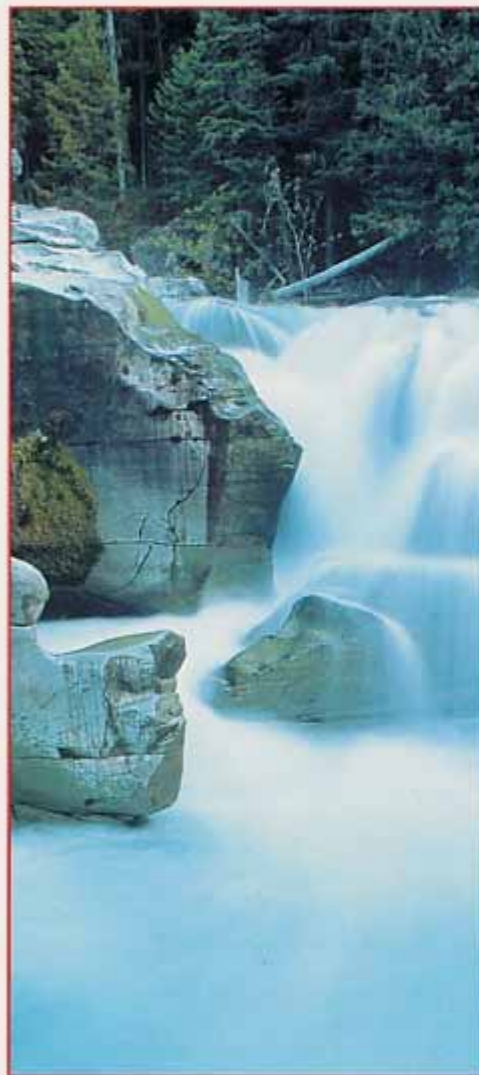


CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION
6 Storey's Gate, Westminster, London SW1P 3AU
E-mail: water@ciria.org.uk
Tel: 0171-222 8891

Fax: 0171-222 1708

ON-SITE SEWAGE DISPOSAL

options



CIRIA

2

Are you considering what options are open to you for the disposal of domestic sewage on-site? YES - then this leaflet will provide you with valuable information to help you determine which of the available methods best suits your circumstances.

WHAT ARE THE OPTIONS?

There are three basic methods open to individual or small groups of properties, and a number of alternative options.

SEPTIC TANK SYSTEMS

Consist of two main components: a watertight, underground tank, into which raw sewage is fed, and (normally) a drainage field, to which wastewater is released. Direct discharge from the tank to a ditch or stream should not occur (however, in Northern Ireland and Scotland, the use of a perforated pipe which drains to a waterway is allowed under certain conditions).



Septic tanks may be constructed of glass fibre, thermoplastics or precast concrete.



The **tank** provides suitable conditions for the settlement, storage and partial decomposition of solids, which need to be removed from time to time. The tank effluent can, however, still cause harm and needs further treatment in a drainage field.

The **drainage field** is critical for protecting the environment from pollution through the removal of potentially harmful impurities. It typically consists of a system of sub-surface perforated pipes or a soakaway, which allows the liquid to drain into the surrounding soil. To function properly, it relies on adequate soil drainage and good contact being maintained between the liquid, air and organisms in the subsoil, which break down and purify the effluent.

It is better to use a network of sub-surface perforated pipes, or alternatives such as constructed reed beds, rather than soakaways. The former methods maximise contact with the soil, or plants, and aid the natural breakdown of the waste.

PACKAGE SEWAGE TREATMENT PLANTS

The term package plant refers to a range of commercially available, prefabricated treatment units. They use a number of processes which are different in detail, but all include some form of settlement of solids and enhanced biological



Package plants - (left) an ecological filter, (right) a biological treatment plant

decomposition of the sewage by aeration. Package plants treat waste directly or may follow a septic tank. They treat effluent to a higher standard than septic tank systems and this normally allows direct discharge to a watercourse. They also produce sludge which must be removed from time to time and need regular maintenance. The manufacturer's instructions must be followed carefully.

CESSPOOLS

A cesspool is a watertight, underground tank used only for the storage of sewage. No treatment is involved. Cesspool liquors are strong, usually in a septic condition and must be removed from the tank frequently. Accidental or deliberate damage could allow raw sewage to escape from the tank and lead to prosecution.



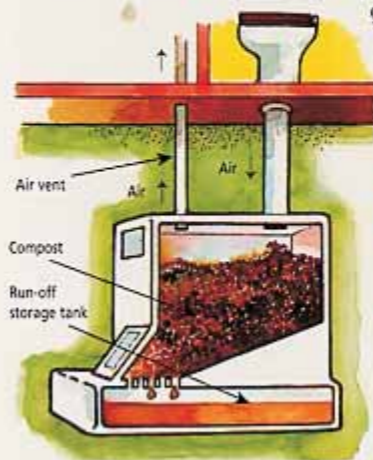
Side view of a prefabricated cesspool

ALTERNATIVE OPTIONS

In certain circumstances it may be feasible to pump wastewater to an appropriate public sewer. Design and construction of such a system requires specialist advice.

Alternatively, you could use dry toilets (in conjunction with a greywater treatment system) instead of conventional toilets. These require no water supply or effluent treatment. They include:

- electric toilets which dry the waste
- chemical toilets which disinfect the waste
- composting toilets which compost the waste for return to the land.



Composting toilet

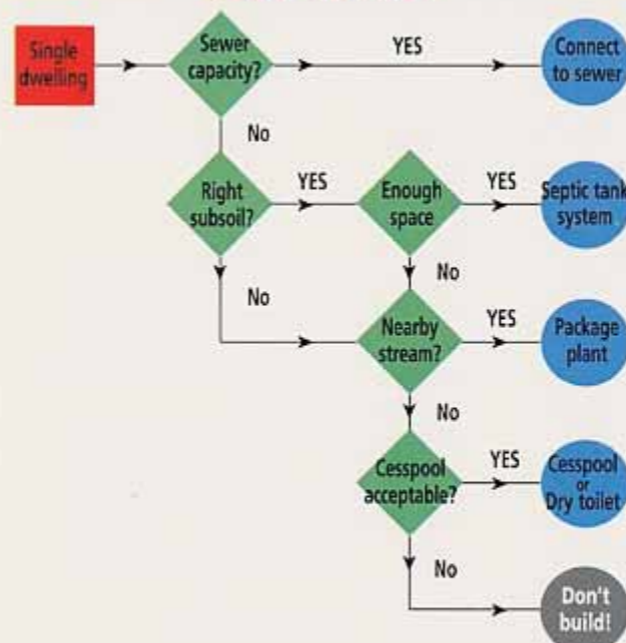
SELECTING THE BEST OPTION

Correctly choosing your disposal method is vital to ensure effective, long-term performance, protection of public health and the environment, and compliance with relevant regulations. You must assess the suitability of your site for each method. The Option Selector will help you to make a preliminary choice between the main alternatives, however, selection should only be finalised after seeking expert advice. The factors that will influence your choice include:

- **SEWER CAPACITY?** Is there an appropriate sewer nearby, and does it have spare capacity?
- **RIGHT SUBSOIL?** Is the subsoil sufficiently free-draining and is the site prone to flooding or waterlogging?
- **ENOUGH SPACE?** Is there enough land to provide an effective drainage field, which is a sufficient distance from a watercourse or water source?
- **NEARBY STREAM?** Is there a nearby watercourse and do you have the Environmental Regulator's* permission to discharge into it?
- **CESSPOOL ACCEPTABLE?** Is a cesspool an acceptable option to the Environmental Regulator?

*In England and Wales the Environment Agency; in Scotland the Scottish Environment Protection Agency; and in Northern Ireland the DoE (NI) Environment and Heritage Service.

OPTION SELECTOR



Connection to a sewer - a readily accessible (foul or combined) sewer with spare capacity will enable disposal of domestic sewage off-site. For further information contact your local sewerage service provider.

Septic tank systems - consider these as a first choice for on-site disposal. They are very efficient and cost-effective systems in the right ground conditions.

Package plants - the preferred method where discharge must be to a watercourse. They are compact and most suitable for handling sewage from larger properties and groups of properties. They are less appropriate in situations where use is very intermittent (e.g. holiday homes). All package plants require a power supply which means they cost more to run, in addition to having relatively high capital and maintenance costs.

Where discharge is to a watercourse and space permits, a septic tank drainage field can be replaced or followed by a package plant or natural alternatives such as constructed reed beds or pond systems.

Cesspools - may be the only option in areas where no discharge is possible at all. They normally cost the least to install but are more expensive to run because they must be emptied many times a year. For this reason, and the environmental risks associated with damage to cesspools, they are the least favoured option in the UK and are not permitted at all in Scotland.

Dry toilets/greywater treatment systems - can also be used in certain situations, but residents must be prepared to take more personal responsibility for their waste.

SEPTIC TANK SYSTEMS

The following sections of this leaflet focus on septic tank systems; the most commonly used on-site disposal method and the preferred choice in many situations.

To work satisfactorily septic tank systems depend on proper siting, design, installation, operation and maintenance. Local ground conditions are a major factor in their performance as they determine the rate at which the effluent soaks into the subsoil. Care at the design stage and during implementation will help to avoid problems later, such as foul odours, backing-up of sewage or surface flooding.

Also remember, tanks will only operate properly if they are regularly and competently desludged.

