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Septic Tank for Sewage Disposal on the Farm

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INTRODUCTION

The purpose of this little circular is to show the plan for constructing an efficient, and inexpensive septic tank for the disposal of sewage from the farm home. If properly installed this tank will need no attention whatever except the removal of the greater part of the sludge every three or four years.

If a larger plan of the tank is desired, it may be obtained in blueprint form for five cents (to cover the cost of the blue print paper) by addressing the Extension Division of the South Dakota State College, Brookings, S. Dak.

ADVANTAGES OF A SEPTIC TANK

A septic tank is more sanitary than the leaching cesspool or the outside vault.

There is very much less danger of the water supply being contaminated. In practical operation it is far more efficient than the cesspool and requires less attention.

It is no more expensive to install than the cesspool if the cesspool is located as far from the house as it should be.

The septic tank will work in tight soils where the cesspool fails and is much less dangerous in porous soil where the cesspool will work.

TWO WAYS OF DISPOSING OF LIQUID EFFLUENT

A satisfactory disposal of sewage through a septic tank may be had in any location high enough so that the water in the ground does not actually stand within three or four feet of the surface. All possible locations may be divided into two classes; those that are high enough so an open outlet is available and those that are so flat that no outlet is available.

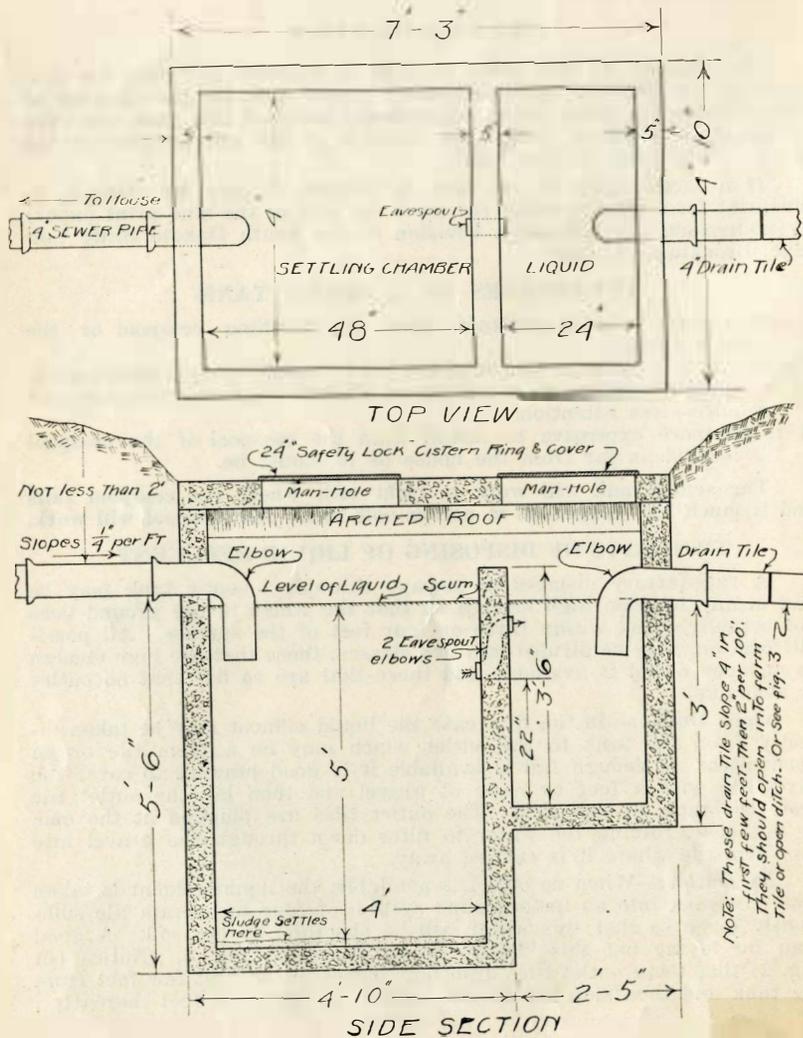
Open Outlet:—In the first case the liquid effluent may be taken directly from the tank to the outlet which may be a farm tile or an open ditch. If enough fall is available it is good practice to cover the farm tile with a foot or more of gravel and then lay the outlet tile from the tank on top of it. The outlet tiles are plugged at the end, in this case, forcing the water to filter down through the gravel into the farm tile where it is carried away.

No Outlet:—When no outlet is available, the liquid effluent is taken from the tank into an underground system of four inch drain tile sufficiently large so that this water will be absorbed by the soil. A good plan for laying out this "blind" tile is shown in Fig. 3. Notice (in Fig. 2) that these outlet tiles drop four inches in the first few feet from the tank and then slope about two inches for each 100 feet thereafter.

The grade for all these branches should be the same. The number of feet of tile in this system for each member of the family will vary from 15 to 50 feet according to the nature of the soil.

DEPTH OF THE TANK

The depth of the tank will depend on the location. As shown in Fig. 2 it is five feet below the outlet elbow. This insures five feet of depth below the water level. The septic action is believed to be better for this depth and it will require less frequent cleaning. The inlet is a tenth of a foot (1¼ inches) higher than the outlet. The depth of the tank below the ground then will depend upon the depth of the inlet at the point where it enters the tank from the house. If the laundry



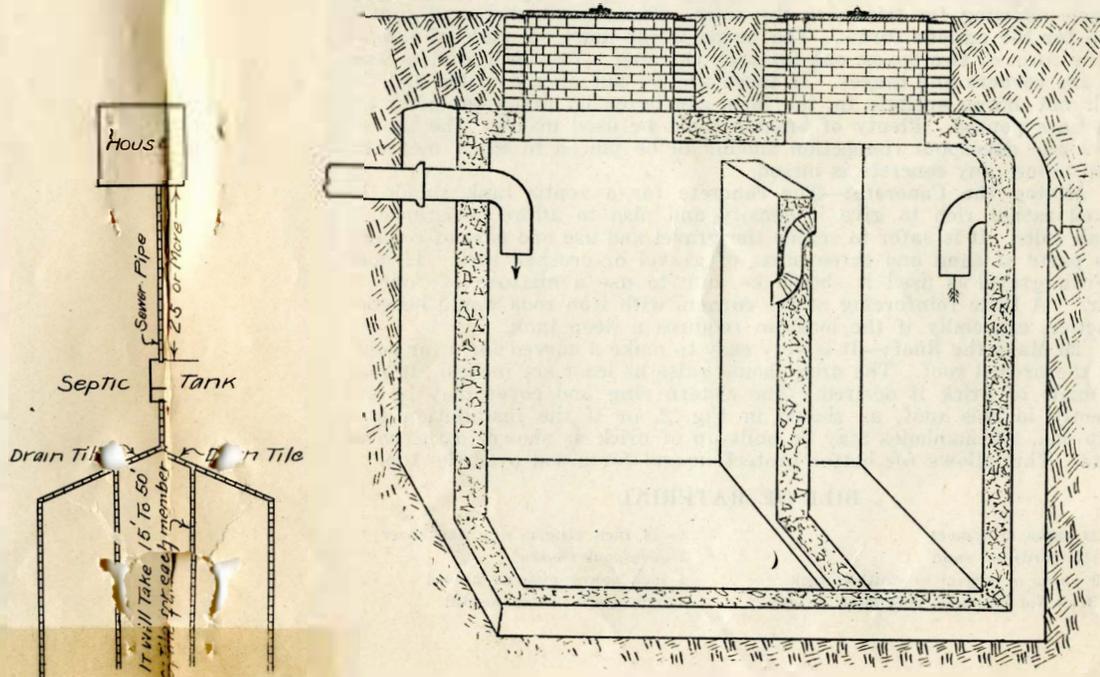
room is in the basement the system should be installed so as to drain the wash water and scrub water from the basement into the septic tank. This will mean that the sewer pipe must be deeper and the tank must go down five feet below them. If no outlet is provided for the basement the sewer pipe may be laid from two to three feet below the ground and the tank will not be so deep. The septic tank system should not be depended upon to drain the basement of seepage water. Another outlet should be provided as the seepage water running through the tank, if in any considerable amount, will dilute the sewage to such an extent as to materially retard the septic action.

SIZE AND SHAPE OF THE TANK

The capacity of the tank is figured from the size of the settling chamber below the water line. According to the plan, these dimensions are 4 ft. x 4 ft. x 5 ft., or 80 cubic feet. This capacity will provide for a family of six to ten members and is recommended as the practical size. The rectangular shape shown is believed to be the easiest to build. Other shapes for the compartments would be as good.

ACTION OF THE TANK IN BRIEF

The sewage from the house including the waste from the inside toilet, bathtub, kitchen sink, laundry tubs, etc., is flushed into the tank. Approximately two-tenths of one percent of it is solid matter. A form of Nature's bacteria known as anaerobic bacteria attack the solids, changing a considerable portion of them to a liquid or gaseous state. A small percent (comparable to ashes after burning) settles to the bottom of the tank as sludge and must be cleaned out once in three or four years. Many disease germs are killed in the process but the effluent



from a septic tank cannot be considered entirely harmless. The above named bacteria work and live in the absence of air. It is not necessary to make the tank air tight, however, as the natural scum which forms over the top seals the sewage below from the air. The reason for the two compartments and for the elbows at the inlet and outlet of the tank is to protect this scum.

When the liquid effluent leaves the tank it is further purified by a type of bacteria called the aerobic. They work in the presence of air, during a filtering process or in the stream of water as it flows. In city plants carefully prepared filter beds are made of sand, gravel and drain tile in order to handle a large quantity of effluent. An automatic syphon is desirable under these conditions. These filter beds are ideal for aerobic bacterial action. The layer of gravel or sand between the outlet tile and the farm tile below, as recommended on page 2 will help considerably and should be put in wherever possible. No addition of any material whatsoever is necessary at any time to aid in the septic process. The tank is merely an aid to make Nature's own process more effective. After the system is installed it should be used, as the bacteria must be fed if they are to thrive and do good work. The use of strong lye in cleaning fixtures should be avoided as it kills bacteria.

TO CONSTRUCT THE TANK

After the plumbing is installed in the house the 4 inch sewer pipe should be laid to the point where the tank is to be located, on the grade indicated in the plan, the joints carefully cemented. We recommend the tank be placed at least 20 feet from the house. The hole may then be dug 7 feet 3 inches long by 4 feet 10 inches wide until it is 3 feet 1¼ inches below the sewer pipe. This will be the bottom of the liquid chamber, the hole going on down 2 feet 5 inches deeper for the settling chamber. The hole should be dug smaller rather than larger, allowing for trimming the sides. The smooth dirt wall can be used for the outside forms. The inside forms must be made of lumber in the form of two boxes, one for each chamber. Two inch stuff is used for the corners and braces. If these are all put on the inside and the nails not driven entirely in, the form can be easily taken out after the sides are poured. Plenty of bracing must be used inside. The tile elbows and eavespout connection should all be placed to exact measurement before any concrete is mixed.

Mixing the Concrete:—The concrete for a septic tank should be mixed rather rich to give it density and also to afford resistance to alkali salts. It is safer to screen the gravel and use one part of cement, two parts of sand and three parts of gravel or crushed rock. If good pit-run gravel is used it should be safe to use a mixture of "one to four." A little reinforcing at the corners with iron rods would be good practice, especially if the location requires a deep tank.

To Make the Roof:—It is very easy to make a curved form for pouring the arched roof. The arch should raise at least six inches. It may be made of brick if desired. The cistern ring and cover may be put directly in this roof, as shown in Fig. 2, or if the installation is a deep one, the manholes may be built up of brick as shown in the cover plate. This allows for better protection and for a sod over the top.

BILL OF MATERIAL

22 sacks of cement	2—24 inch cistern ring and cover
1½ yards of sand	2 eavespout elbows
3 yards of gravel or crushed rock	4 inch sewer pipe as needed
Brick for manhole, depending on depth	4 inch drain tile as needed