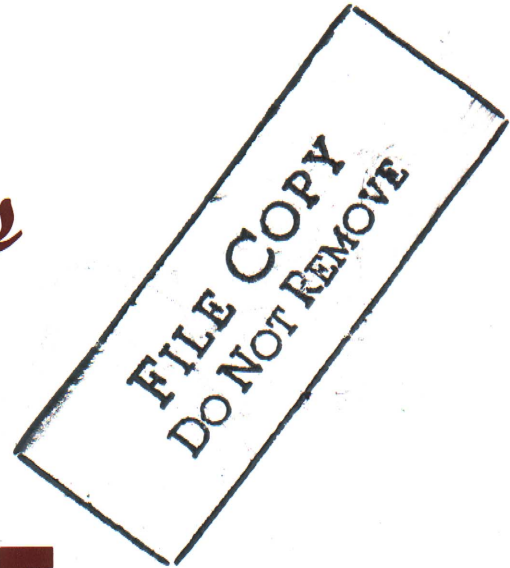


*Questions  
and  
Answers*

about

**HOME  
SEWAGE  
DISPOSAL**



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# Questions and Answers About HOME SEWAGE DISPOSAL

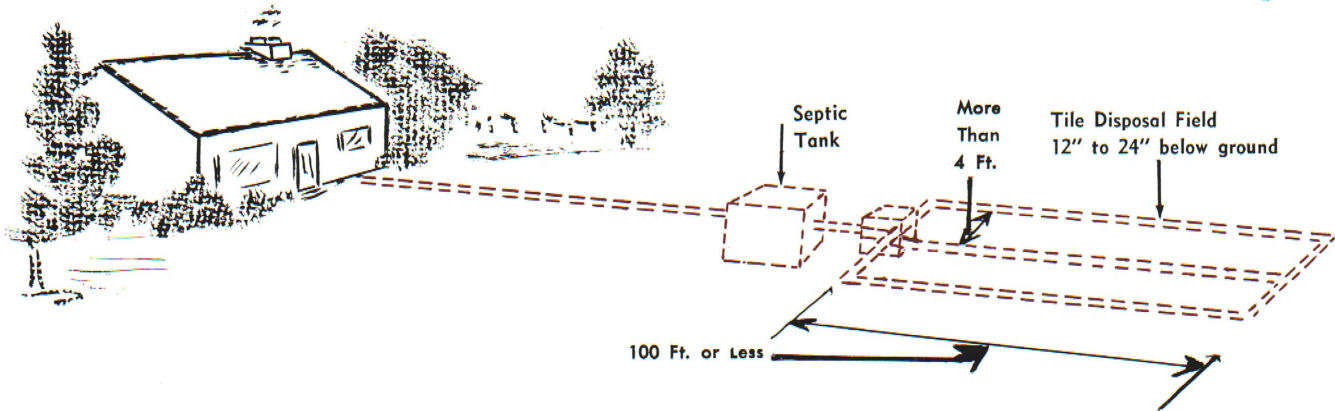
BY JOHN E. VOGT<sup>1</sup> AND JAMES S. BOYD<sup>2</sup>

Keeping your family in good health depends on many things—food, rest, cleanliness, and other factors. One important item to good health is proper sewage disposal—all through history, disease epidemics have spread like wildfire because of poor sanitation.

If you live in an area where a public sewer is available, you should by all means connect your house sewer to it. If you live in an area where a public sewerage system is not present, this bulletin will help you take the right steps to maintain good family health.

## What Is a Home Sewage Disposal System?

A home sewage disposal system has two basic units: a septic tank and some device for letting the liquid drain off into the soil. The latter units are called seepage beds, subsurface disposal fields, percolation systems, tile absorption fields, etc. (See Fig. 1.) A septic tank is a watertight tank through which sewage flows very slowly. It allows solids to separate from the liquid and be decomposed or broken down by bacterial action (Fig. 2).



HOME SEWAGE DISPOSAL SYSTEM

Fig. 1. The home sewage disposal system is made up of two basic units: a septic tank and some device for letting the liquid drain off into the soil.

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## Under What Conditions Should You Use A Home Sewage Disposal System?

Such systems should be used only where no public sewer system is available, and where they can operate well. To do a good job, a system must have: (1) a soil with percolation rates within the range shown on page 5; (2) a ground water table at least 4 feet below the ground surface; (3) room enough to keep the system away from wells, lakes and streams; and (4) protection from surface flooding.

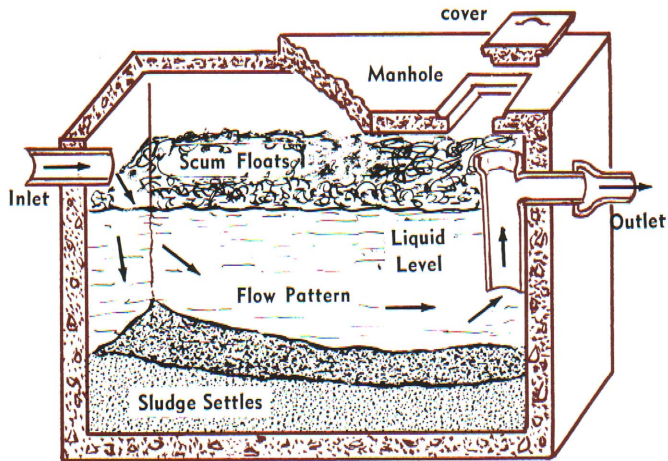
Liquid coming from the septic tank is by no means pure and may contain disease-producing germs. This liquid should not run into any open ditch, stream, lake, storm-water drain, or onto the ground surface. Septic tank wastes, if allowed to collect on the ground surface, will decompose. This causes an odor nuisance as well as creating a health hazard by the possible spread of disease.

## What Are the Limitations of These Systems?

Home sewage disposal systems are only a second choice to public sewerage systems in built-up areas.

The authors express appreciation to LaRue Miller, Norman Papsdorf, and other Health Department and Michigan State University personnel for their help in preparing this publication. This is a revision of an earlier bulletin by W. F. Shephard, George Amundson, and Walter Sheldon.





**SEPTIC TANK — IN OPERATION**

Fig. 2. Within the watertight tank, solids separate from the liquids and are broken down by bacterial action.

But, when properly built and maintained, a home system offers a fairly good means of sewage disposal for single isolated homes, farm homes, estates, and the like. The septic tank, if well cared for, will give many years of service. The tile field or soil absorption system may do a good job for only about 3 to 5 years, although many last much longer. County sanitation codes were written to allow for local conditions in their minimum requirements. They offer home owners the best help in providing a suitable disposal system.

### What About Local Ordinances?

Most cities, villages, townships, and counties require that home disposal systems meet certain standards.

Be sure to consult your local health department before installing your system. Your county agricultural agent may also be able to tell you of any other local controls, or refer you to the right official.

### What Should You Connect to Your System?

All liquid wastes from the kitchen, bathroom, and laundry should go through your system. Roof water, footing drainage, and yard drainage should **not** go into the septic tank or disposal field (Fig. 3). Grease traps are not usually needed.

Waste brines from household water-softener units have no adverse effect on the action of the septic tank, but may cause a slight shortening of the life of a disposal field installed in a structured clay-type soil.

Table 1. — Isolation Distances

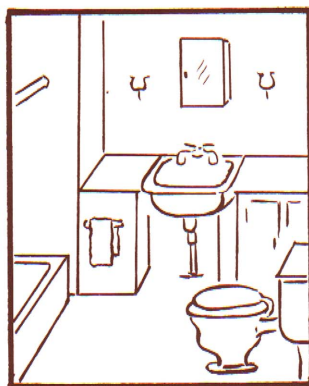
Isolation From	Septic Tank	Disposal Field
Property line	10 feet	10 feet
Dwelling foundation	8 feet	10 feet
Well	50 feet	50 feet
Lake, stream, open country drain	25 feet	50 feet

### Where Should You Locate Your System?

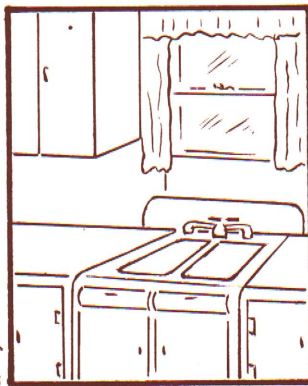
You must select the site for your home sewage disposal system with great care. The septic tank and absorption system should be at least 50 feet (measured horizontally) from the nearest well, whether on the same or neighboring land. Any pipe carrying sewage that must be less than 50 feet from any well should be cast iron pipe with watertight joints. No such pipes should be within 10 feet of any well casing or

### CONNECT THESE TO YOUR SEPTIC TANK

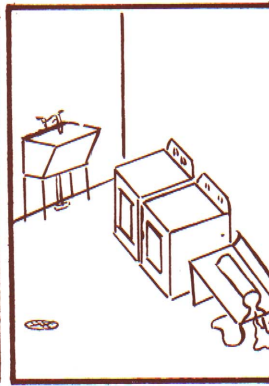
#### CONNECT THESE TO YOUR SEPTIC TANK



BATHROOM—YES

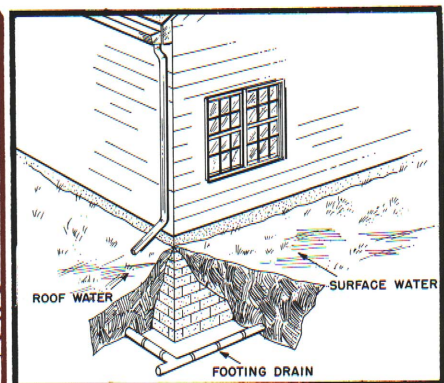


KITCHEN—YES



LAUNDRY—YES

#### DON'T CONNECT THESE



ROOF WATER—NO  
FOOTING DRAINAGE—NO  
YARD DRAINAGE—NO

Fig. 3. Kitchen, bathroom, and laundry liquid wastes should go through your disposal system; roof water, footing drainage, and yard drainage should not.



suction pipe. All parts of the system should be at least 25 feet from any lake or stream. (See Table 1.)

The septic tank should be at least 8 feet from the foundation walls of your house; this requires two full lengths of soil pipe. The usual location for a septic tank is back of the house. If a public sewer is likely to be laid in the street, the septic tank might well be in front. If this is impossible, a sewer line can be installed under the basement floor so the future connection to the sanitary sewer can be made easily.

If possible, choose a location that will permit a cleaning truck to drive to within 35 feet of the septic tank without damage to your lawn or shrubs. The tank should be placed at such depth that the soil absorption system can be covered with about 12 inches of earth and still be at least 2 feet above the maximum ground water level.

Do not locate the septic tank where it will be driven over by vehicles. Do not locate the tile absorption system in an area which will be packed down by regular use, such as a driveway or parking area. Neither should you locate them in low areas subject to flooding, or beneath a building.

### Should You Buy or Build Your Septic Tank?

Most new septic tanks are precast commercial units instead of those built at the site. Either is all right. The most important features to look for in either are durable materials, ample capacity, and an outlet which will prevent the escape of solids. Ask your county agricultural agent or health department sanitarian for the names of manufacturers of good septic tanks, or for plans to follow in building a septic tank.

### How Big Should Your Septic Tank Be?

Table 2. — Recommended Minimum Sizes

House Size	Tank Capacity Without Garbage Grinder	Tank Capacity With Garbage Grinder
2 bedrooms or less	750 gallon	1000 gallon
3 bedrooms	900 gallon	2-750 gallon
4 bedrooms	1000 gallon	1-1000 gallon plus 1-500 gallon

Each additional bedroom — 400 gallons of capacity.

Septic tanks for lake cottages should be designed the same as normal dwellings because many of them will be used for permanent retirement homes in the future.

Table 3. Tank Sizes to Provide Recommended Capacities

Water Depth	Inside Length	Inside Width	Capacity Gallons*
4' 0"	6' 8"	2' 8"	530
4' 0"	6' 8"	4' 0"	800
4' 8"	6' 8"	4' 0"	940
4' 0"	8' 0"	4' 0"	960
4' 8"	8' 0"	4' 0"	1100

\*Each cubic foot below water level holds 7.5 gallons.

### What Happens to the Liquid From a Septic Tank?

The liquid leaving the septic tank should not run on the surface of the ground or into lakes, streams, storm sewers, or ditches. Even though it looks clear, this liquid may spread disease or create an odor nuisance. One way to get rid of the liquid, if conditions will allow, is to let it seep out into the soil through open-jointed tile lines buried in shallow trenches.

Another system uses a covered trench, walled up with ordinary 8- by 16-inch concrete blocks without mortar. The openings through the blocks are laid horizontally so liquid can seep through the side walls as well as the bottom.

Seepage pits or dry wells which put liquid wastes many feet below the ground surface are not recommended. With these, there is danger of contaminating well water supplies. Soil absorption systems will not work in a so-called "tight" soil such as clay. You can make percolation tests to help you find out if your soil is suitable. They will also help you find out how large an absorption field you need. For details, see page 6. Dry wells should not be used except where satisfactory drainage cannot be obtained in the upper two to three feet of soil.

In areas around lakes or where houses are very close together, extra precautions should be taken to prevent contamination of neighboring water wells.

Again, it is important to check with your county agricultural agent or local health official. They probably have had experience with such installations in your area that will show how well such systems have done, and how much absorption area you will need.

### How Can You Make a Percolation Test?

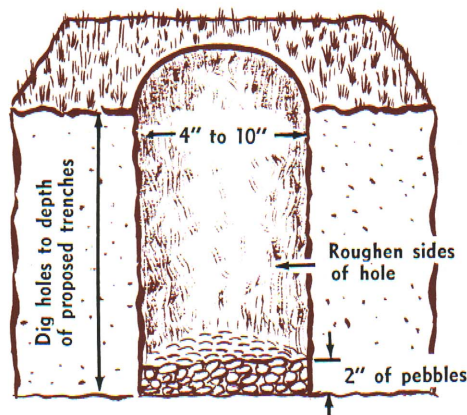
The percolation rate of your soil is the number of minutes needs for the water level to drop 1 inch in a test hole. A percolation test is a way you can find



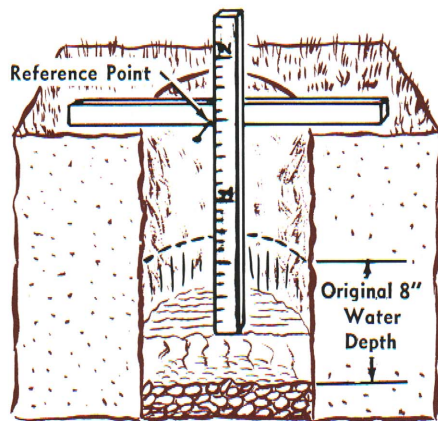
this rate. Here is the recommended way to make such a test:

1. Dig 4 to 6 test holes in the area where the disposal system will probably be placed. These test holes should be at least 4 inches in diameter and as deep as the proposed trenches. If the sides of the holes have a slick or glazed coating, roughen them a little. Dig another test hole deep enough to be sure that the highest ground water level is 2 or more feet below the bottom of the proposed trenches and that tight soil does not lie close below the trench level.

2. Level off the bottom of the shallow holes and place 2 to 3 inches of gravel or pebbles in each one. (See Fig. 4 top.)



(a) PREPARATION OF PERCOLATION TEST HOLE



(b) METHOD OF MEASURING WATER LEVEL IN THE PERCOLATION TEST HOLE

Fig. 4. (a) Dig the percolation test holes carefully and place 2 to 3 inches of gravel or pebbles in each one. (b) Measure the rate of water drop in the holes; repeat this test until your time figures are about the same.

3. Fill the holes with water, be sure to pour it onto the pebbles carefully, so you don't wash out the top or sides of the hole or disturb the pebbles on the bottom. Add water if necessary to keep them full for 4 hours. This will saturate the soil and get it ready for the next step.

4. Now you are ready to find out how porous your soil is—how well it will drain off the liquid from your septic tank.

If you had trouble keeping your holes filled with water during Step No. 3, your soil is so porous that you can go ahead with the shortest trench for the tile that your local code allows. Or if there is no local code and you are still not sure after you have saturated the soil, fill the holes with water and measure how long it takes for them to empty. If you check this twice and the holes empty within 5 minutes, your soil is porous enough for a tile field.

At the other extreme, if your soil is so tight and non-porous that hardly any water disappeared during Step 3, your soil is too tight for a tile field—look around for another location.

If your soil falls between these two extremes (very porous or too tight for good drainage), take the following step to find the soil percolation rate. While the soil is still well-saturated—at least 4 hours but not more than 24 hours after first filling the holes—adjust the water level in the test holes to 8 inches deep above the gravel layer. Check the number of inches that the water level drops in 30 minutes (Fig. 4, bottom). If all the water disappears in less time than that, check how long it takes for the water level to drop 6 inches. Repeat this step until your time figures are about the same for each test. Then you will be sure of accurate results.

From these time figures, calculate the time needed, in minutes, for the water level to drop 1 inch; to do this, divide the time in minutes by the number of inches to drop. The figure you get is the "percolation rate." If this rate shows that it takes water more than 60 minutes to drop 1 inch, the soil is not good for a tile field—you should look for another location or get special advice.

5. This percolation rate will help you find how large a soil absorption area you need for the average 3 bedroom home. If your local codes does not give the required tile length in relation to percolation rates, the following suggestions may help you:

- a. No matter how low the percolation rate is, provide a **minimum** of 225 square feet of absorption area, or 150 feet of trench 18 inches wide.



- b. If the percolation rate is between 6 and 15 minutes, provide from 300 to 600 square feet of absorption area (200-400 feet of 18 inch width trench).
- c. If the percolation rate is between 15 and 30 minutes, provide from 600 to 750 square feet of absorption area (400 to 500 feet of 18 inch width trench).
- d. If the percolation rate is between 30 and 45 minutes, provide from 750 to 900 square feet of absorption area (500 to 600 feet of 18 inch width trench).
- e. If the percolation rate is between 45 and 60 minutes, the absorption area probably won't drain unless you use a very small amount of water in your home.
- f. If the percolation rate is 60 minutes or more, look for other ways to get rid of liquid waste.

If your home has more than three bedrooms, or if you plan to install equipment which uses lots of water, ask for help in deciding how much absorption area to install.

### How Can You Build a Tile Field?

The percolation test or code requirements tell you the length of trench to use and the amount of tile you need. Lines should be about the same length and should be spaced not less than 4 feet apart, center to center. The length of each line should not exceed 100 feet. All of the lines are connected by a header across each end as shown on back page. Use 4-inch

vitrified farm drain tile or other highly durable tile or pipe for disposal lines. The tile lines in the seepage trenches should have a fall of about 2 inches, but not greater than 4 inches, per hundred feet. They need not be straight, but may follow the contours of the ground. Cover them with 12 to 24 inches of earth above the top of the tile.

Dig the trenches about 4 to 6 inches below the level at which you will lay the tile. Backfill to this level with  $\frac{1}{2}$ - to  $1\frac{1}{2}$ -inch crushed stone or gravel. This material should have been screened and washed. Then lay the tile on this base, keeping the ends spaced  $\frac{1}{4}$ - to  $\frac{3}{8}$ -inch apart. Some plans and codes call for covering the top half of the joints with 6-inch strips of roofing felt or similar material to keep sand or soil from washing into the joints.

Next, cover with about 3 inches of crushed stone or pebbles which are larger than  $\frac{1}{4}$  inch. The top of the stone should be covered with untreated building paper or a 2-inch layer of straw, pine needles, or similar material before placing the earth backfill. This will help prevent the stone from becoming clogged with the earth backfill. An impervious covering should not be used.

Now fill the rest of the trench with sand, gravel, or a light loamy soil. Do not use anything like dense clay. Do not lay a tile field in an area where surface water tends to collect. Don't run over the trench with heavy equipment since it will pack the soil too much above the tile lines.

Fiber or clay tile pipe with openings along the bottom can be used in place of solid tile in a soil absorption system. This allows more area for effluent to seep into the soil. The Sheldon system using fiber

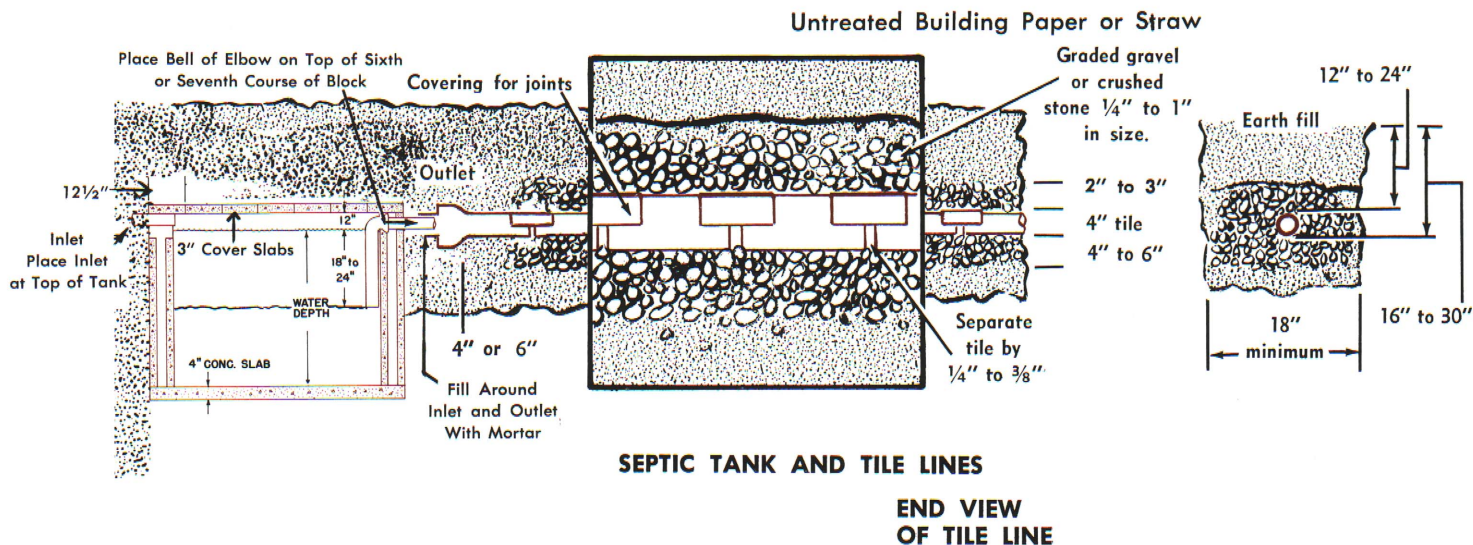


Fig. 5. Liquid wastes should pass from the septic tank through a sealed line to the disposal field made up of as many 100 ft. lines as necessary.



pipe with slits cut on the top or clay tile perforated on the top half with at least 1/2-inch holes and traps on the end of each line for cleaning can also be used.

### **What About Cleaning Septic Tanks?**

How often your tank needs cleaning depends on the size of the tank and the use it gets. Usually, cleaning every 1 to 3 years will be enough. Check the sludge and scum levels each year. Cleaning at the right time will avoid the risk of injuring or destroying the tile field or seepage bed. Michigan law requires that persons in the business of cleaning septic tanks be licensed. A licensed operator can be identified by the sign on the side of his vehicle, "M.D.H. Licensed Vehicle", and the license number. The local health department can provide a list of licensed cleaners.

### **General Information on Home Sewage Disposal Systems**

1. Liquid in the tank may contain disease germs. It can cause sickness if swallowed or if it comes in contact with food or hands which are later placed in the mouth. While the liquid discharged from a septic tank may look clear and free from solids, it is not pure water.

2. There is no proof that soapy water is bad for septic tank operation. All liquid wastes, including those containing soap or detergents, should drain into the septic tank.

3. The kinds of bacteria needed in a septic tank are always found in sewage. Bacterial action is slow during the fall and winter because of low temperatures. If you clean your tank in the fall or winter, leave several gallons of sludge in it. This sludge will help build up bacteria in the tank faster. If you start a new tank in the fall or winter, add 5 to 10 gallons of digested sludge to increase the number of bacteria. This is especially helpful if you have a garbage disposal unit.

4. The moderate use of bowl cleaners or cleansing compounds, or draining ordinary amounts of water softener backwash will not kill the bacterial action or slow down the normal operation of the septic tank.

5. There is no proof that yeast or the so-called "rejuvenators" which are on the market have any practical value in septic tank operation.

6. Tree roots can enter the sewer line from the house to the septic tank if this line is not watertight. Make sure this line has tight joints. To prevent most tree roots from entering tile lines in the absorption system, place 12 inches of coarse gravel or stone below these lines. This will permit the liquid to leave the tile and reduce the tendency for roots to enter such lines.

Tree roots in a disposal line can be killed by using copper sulfate. A few crystals can be placed in a floor drain and 3 or 4 gallons of water used to wash the dissolved crystals into the sewer line. Do not flush a lot of water down the drain, as the solution will be too weak to be effective.

### **Other Agency Approval**

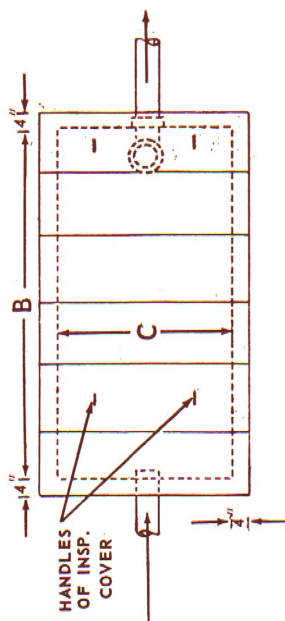
The Federal Housing Administration (F.H.A.) and Veterans Administration (V.A.) work closely with lending agencies in financing homes. They have certain requirements as to private sewage disposal systems. Following the directions given in this bulletin would not guarantee approval in connection with F.H.A. or V.A. insured loans.

### **Where Can You Get Answers To Special Problems?**

Consult your local health department, county agricultural agent, or state health department for advice before you start building a new home. Also check with them before you build a septic tank system for an existing home, or in case of any unusual operation problems with an existing system.



### SEPTIC TANK

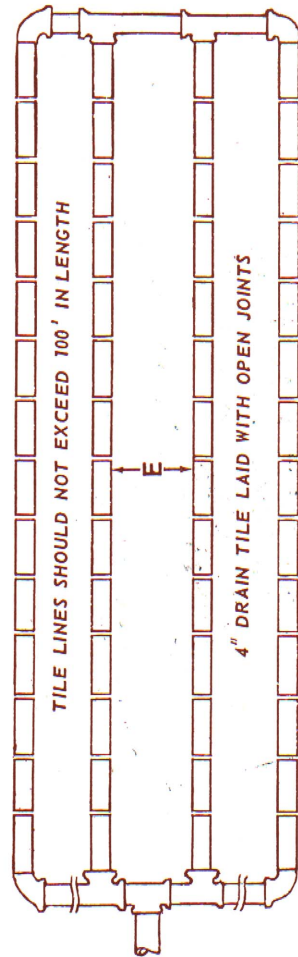


PLAN VIEW OF TANK SHOWING SLAB TOP

INSIDE DIMENSIONS FOR SEPTIC TANKS OF VARYING CAPACITIES*				
TANK GALLONS	A	B	C	AS
500	4'-0"	5'-10"	2'-10"	9.6"
600	4'-6"	5'-10"	3'-1"	10.8"
750	4'-6"	6'-8"	3'-4"	10.8"
1000	5'-0"	9'-0"	3'-0"	12.0"

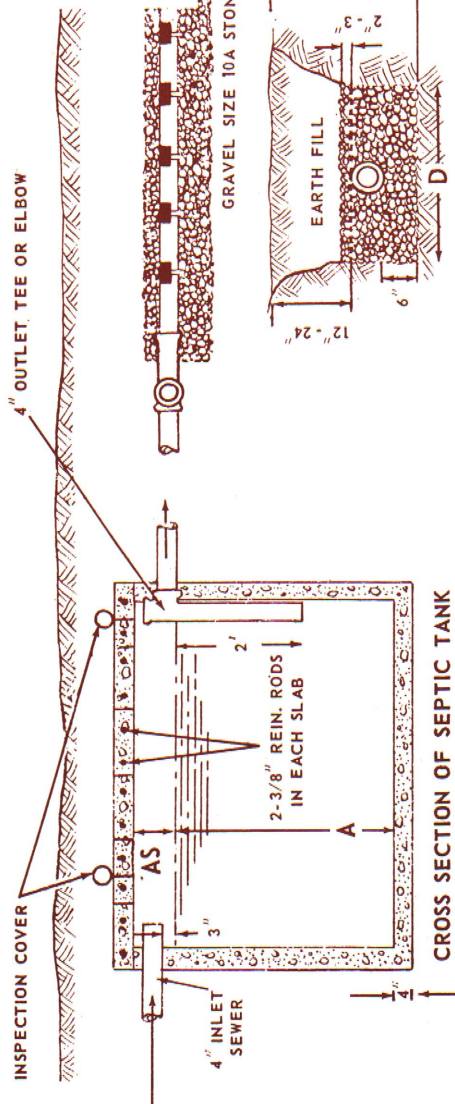
\*Many local codes specify tank capacities be sure to check local requirements

### TILE DISPOSAL FIELD

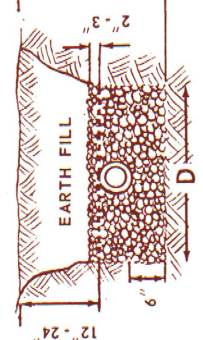
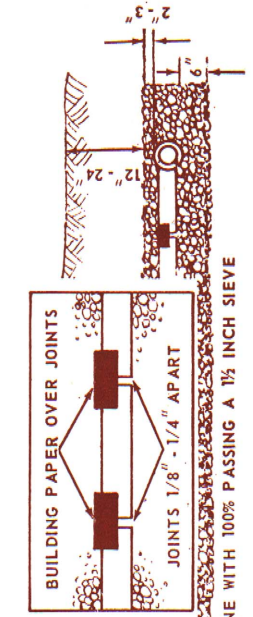


TILE FIELD REQUIREMENTS VARY WITH SOIL CONDITIONS. A MINIMUM OF 150 SQUARE FEET OF ABSORPTION AREA SHOULD BE PROVIDED IN SANDY OR GRAVELLY SOIL. TILE LINES SHOULD HAVE APPROXIMATELY 1 INCH FALL IN 50 FEET

SIZE AND SPACING FOR DISPOSAL TRENCHES			
D	E	F	G
18"	20"-36"	150 sq. ft.	6.0'
24"	20"-36"	200 sq. ft.	6.5'
30"	20"-36"	250 sq. ft.	7.0'
36"	20"-36"	300 sq. ft.	7.5'



CROSS SECTION OF SEPTIC TANK



CROSS SECTION OF TRENCH

PLAN OF A SEWAGE DISPOSAL SYSTEM FOR SMALL INSTALLATIONS

DIVISION OF ENGINEERING  
MICHIGAN DEPARTMENT OF HEALTH

D 13.1-1  
5-58