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Septic tank systems

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NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No.

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TECHNICAL NOTE

NOT FOR PUBLICATION

FOR INTERNAL USE

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APPROVED BY

PREPARED FOR General Distribution

DATE October 1955

SUBJECT Septic Tank Systems

The information contained in this Note is provided as a guide for the construction of septic tanks in accordance with the requirements of The National Building Code, 1953.

Table ISeptic Tank Sizes for Dwelling Units

(Based on a sewage flow of 35 gallons per person per day, with sludge storage of 6 cubic feet per person)

<u>Max. no. of persons served</u>	<u>W (feet)</u>	<u>L (feet)</u>	<u>LD (feet)</u>	<u>TD (feet)</u>
5	3	5½	4	5
6	3	6	4	5
8	3½	7	4	5
10	3½	7½	4½	5½
12	4	8	4½	5½
14	4	9	4½	5½
16	4	10	4½	6

Legend for recommended inside dimensions

W - width
L - length
LD - liquid depth
TD - total depth

General Requirements for Tanks

Tanks should be designed to receive all sewage including laundry and kitchen wastes. They should discharge into an adequate subsurface disposal field, or one or more seepage pits.

Location

The system should be so located that drainage is away from all sources of domestic water supply. The tank should be set to a depth that will permit a minimum fall of 1/8 inch per foot in the pipe running from the house to the tank.

Tank should be located no closer than 50 feet to any source of water supply, and 3 feet (and preferably 5) to any dwelling.

Under no circumstances shall the house foundation wall serve as one wall of a septic tank.

Design

- (1) Tank should be water-tight.
- (2) Minimum liquid capacity should be 400 imperial gallons in the sedimentation compartment. Inside liquid depth (LD) below the outlet should be a minimum of 4 feet. The length (L) of a rectangular tank should be 2 to 3 times the width (W). Septic tank sizes are given in Table I.
- (3) Inlets and outlets should be provided with sanitary "T's" or baffles. Baffles should extend the full width of the tank and be located 12 inches from the end walls. They should extend at least 6 inches above the flow line and 12 to 18 inches below the flow line. Sanitary "T's" should be tile or cast iron with the long leg extending downward 12 to 18 inches.
- (4) The bottom of the inlet pipe should be at least 3 inches above the bottom of the outlet pipe. Details are shown in Figure 1.

Absorption Fields

- (1) A subsurface disposal field should not be placed under roadways and the field should be at least 100 feet from any well, (50 feet from drilled wells where the casing extends to a depth of at least 25 feet from the surface) and 25 feet from any stream or dwelling unit.
- (2) A concrete distribution box (see Figure 2) may be provided between the tank and the disposal field if it is considered necessary because of sloping ground or other unusual conditions. The inlet to the box should be about 2 inches above the outlets and all outlets should be at the same elevation.

(3) No installation should have less than a total of 150 feet of drainage pipe or tile. Perforated pipe or field tile should be at least 4 inches in diameter and sloped so as not to exceed 4 inches per 100 feet (approximately $\frac{1}{2}$ inch in 12 feet). Rows of pipe or tile should be spaced at least 3 feet apart and the length of any row should not exceed 100 feet.

(4) Field tile should be laid with joints $\frac{1}{4}$ to $\frac{1}{2}$ inch wide. The top half of the joint should be covered with asphalt paper to prevent soil particles entering and clogging the tile (Fig.2).

(5) The depth of cover for pipe should be not less than 18 inches and preferably not more than 24 inches unless the system is specially designed for a particular set of conditions.

(6) Except in very porous subsoil such as sand, all pipe or tile should be laid on a 6-inch bed of gravel or crushed rock.

(7) The trenches should be at least 18 inches wide at the bottom. The effective absorption area is dependent on the bottom width of a trench.

Tests should be made as follows:

Dig a 1-foot square or 4 to 6 inch round hole to the depth of the proposed disposal trenches. Put at least a 6 inch depth of water in the hole and allow it to seep away. Repeat this procedure until the drop in water level is at a constant rate. When a constant rate has been reached, note the time in minutes required for the water level to drop 1 inch. The effective absorption area may then be determined from Table II.

TABLE II

Trench Requirements from Percolation Test

Time Required for Water Level to fall 1 inch in Minutes	Length of 18-inch wide Trench required per Person for 35 gal. per day flow (feet)
1	7
5	12
10	16
20	27
30	35
40	44
50	47
60	58

Where soil conditions exist that are unsuited to field disposal operation, special alternative arrangements must be made for sewage disposal. Highly impervious soil such as heavy clay or rock strata near the surface should be classed as unsuitable for disposal field purposes. Fields underlain by fissured rock are unsuitable due to the danger of pollution to basements and wells.

Information pertaining to capacity, location, operation and maintenance applies equally well to other than concrete tanks of comparable design. The life of a well-constructed concrete tank is expected to be considerably longer than the average steel tank. Steel tanks should be coated inside and out with bituminous coatings to prolong their life. Wood baffles should always be painted with a bituminous paint to prevent rot.

Operation and Maintenance

Septic tanks, when first put into operation, do not need starters, such as yeast, to promote bacterial action.

Frequency of cleaning depends on the capacity of the tank and the quantity and composition of the sewage. The tank should be cleaned when sludge accumulates to approximately one-third of the liquid depth (LD) of the tank. This quite often occurs every two or three years but annual inspections are recommended. Sludge can be removed by bailing or by pumping with a sludge or bilge pump. Most people engaged in the practice of cleaning tanks are equipped with tank trucks and pumps and the operation is relatively simple provided openings in the tank are readily accessible.

The location of the tank and the field tile relative to the house should be recorded so that no difficulty arises in finding the system when inspection or cleanings are required. This also reduces the probability of heavy trucks breaking through the top of the tank or crushing the field tile. Some home owners have the necessary distances and reference points for locating the system marked on the inside of the house foundation wall. A sketch of the tank should be kept by the home owner showing construction details, liquid capacity, and other pertinent information. All compartments in multi-compartment tanks should be clearly shown to assure proper cleaning.

A septic tank is intended to handle sewage and laundry wastes only. Coffee grounds and ground garbage may be included if there is ample supply of water for flushing and the tank is cleaned more frequently than would otherwise be done. The size of the tank should be increased at least 25 per cent if these materials are included in the sewage.

Soaps, drain solvents, and other mild cleaning or disinfecting solutions used for normal household purposes cause no trouble in the tank. Constant use in large quantities, however, may prove harmful.

Wastes from filters or water softeners not only reduce bacterial action but also cause abnormally rapid accumulation of sludge and clogging of tile lines.

Septic tank systems seldom freeze when in daily use. Warm water and the decomposition of the sewage usually maintain above-freezing temperatures. It is not advisable to install the system below frost depth as this will remove the effluent from the action of the aerobic bacteria in the upper layers of the soil and make the system less accessible.

New systems put into operation during very cold weather may freeze unless large quantities of hot water are discharged during the first few weeks.

Specific questions pertaining to septic tank systems can be directed to the Building Practice Section of the Division of Building Research or to the Sanitary Engineering Department of your Provincial Department of Health. All matters pertaining to sanitation are under Provincial jurisdiction.

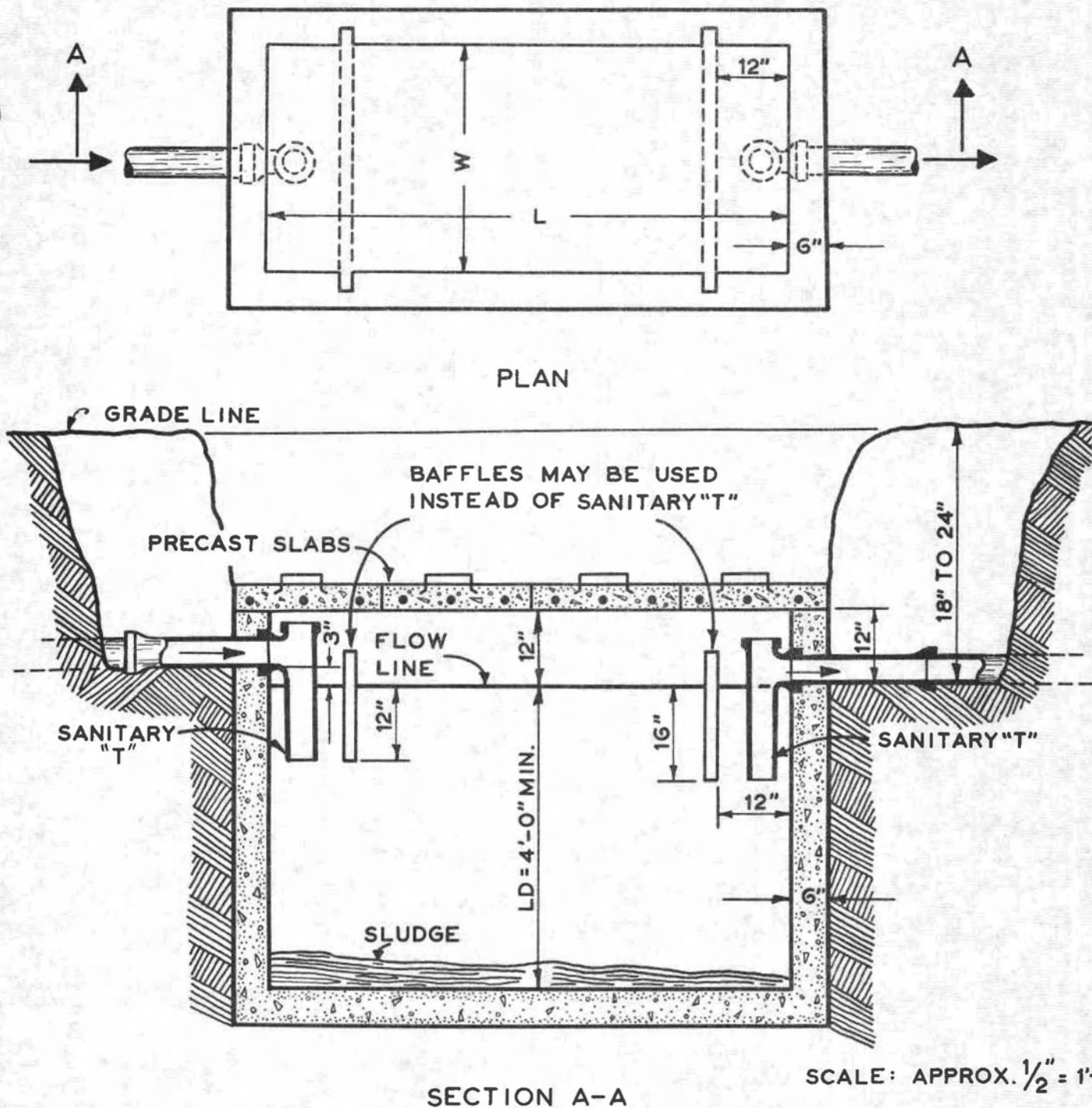
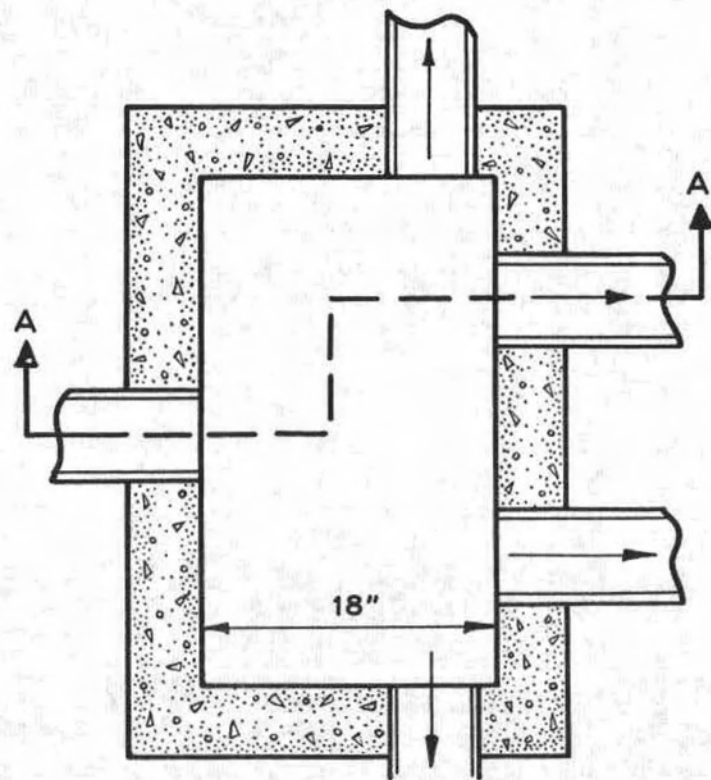


FIGURE: I CONCRETE SEPTIC TANK

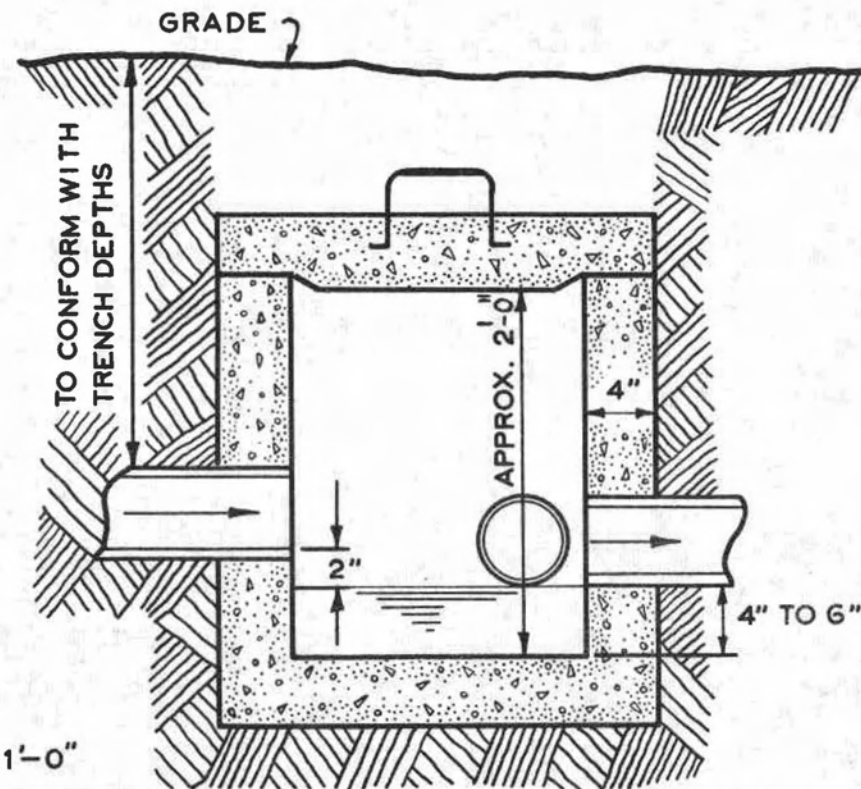
Note:

Precast sectional slabs as shown may be substituted by a solid cast-in-place concrete top. This top shall be provided with a manhole having a minimum diameter of 20 inches. In addition, it is advantageous to have an 8-inch diameter inspection cover over the sanitary "T" at the outlet end of the tank. Manholes and inspection openings should extend to within 6 inches of grade and preferably to grade for inspection and cleaning purposes. Where only one manhole is provided, it should be over the inlet end of the tank.



SCALE APPROX. 1"=1'-0"

PLAN



SECTION A-A

BOX LENGTH CAN VARY TO PROVIDE SPACE FOR
NUMBER OF OUTLETS NEEDED.

FIGURE: 2 SUGGESTED DESIGN FOR DISTRIBUTION BOX

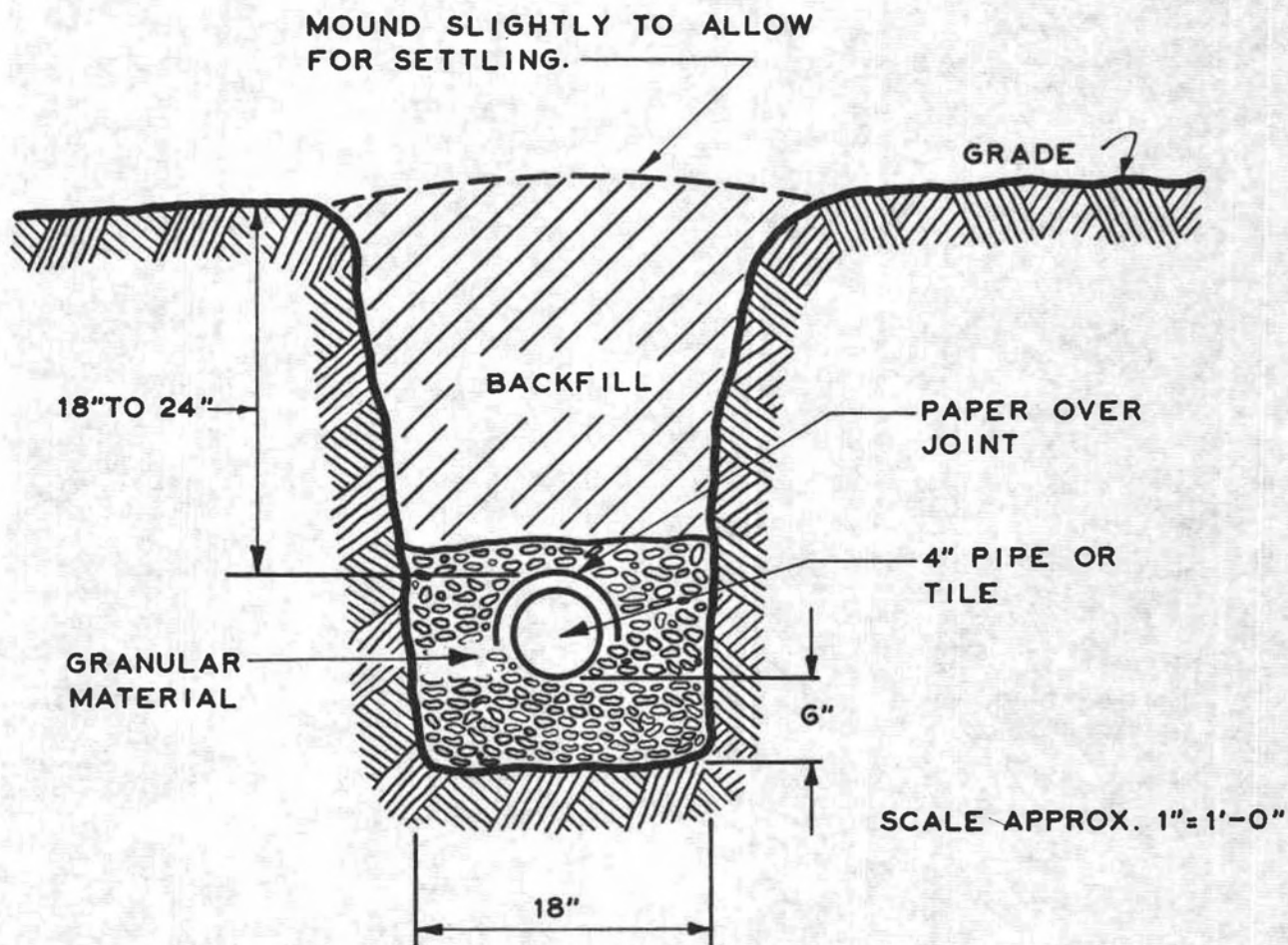


FIGURE: 3

PERCOLATION TESTS TO DETERMINE
ABSORPTION PROPERTIES OF THE SOIL