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# BUILDING PRACTICE NOTE

ANALYZED

SEPTIC TANK SYSTEMS

by

Gaynor P. Williams

CANADA INSTITUTE FOR S.T.I.

JUN 23 1976

OTTAWA  
INSTITUT CANADIEN DE L'I.S.T.

Division of Building Research  
National Research Council of Canada

Ottawa, April 1976



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de recherches Canada

NO.

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## SEPTIC TANK SYSTEMS

by

Gaynor P. Williams

Over one million occupied dwellings in Canada have septic tank type of sewage disposal facilities; in addition thousands of new systems are installed each year at rural and cottage sites where serviced lots are not available. As a result of their widespread use, the Division of Building Research receives numerous inquiries about septic tank design, construction and maintenance. This Note has been prepared as a response to these inquiries.

Septic tank systems provide for the collection of water-borne household wastes in a buried vault where settleable solids are removed. The retained solids are then digested by bacterial action and partially liquefied before passing as an effluent into a subsurface drain system. These systems, functioning without controls of any kind, can be a very acceptable solution for disposal of wastes. Frequently, however, septic systems' performance has been unsatisfactory because of poor design or construction.

The element of the system most frequently causing problems is the drainfield. The clogging of the disposal field may be caused by: a tank that allows too much sludge to pass out with the effluent; failure to clean the tank regularly; or a disposal field that is incorrectly designed. Of these, the design and construction of a drainfield is the most difficult factor to control. Not only is it difficult to design for certain soil conditions but, also, the drainfield is the most susceptible to damage through compaction by vehicles, improper backfilling, or incorrect laying of tiles. In the colder regions of Canada the freezing of the drainfields can cause additional problems. Pollution from an inadequately designed drainfield can be a real danger for public health.

The first step for anyone planning a septic tank system is, to contact local municipal authorities. In areas where there is no municipal authority, advice and assistance may be obtained from the provincial departments concerned with health or pollution problems. These authorities will be able to supply the Provincial



Standards and Regulations governing the construction of septic tank systems in various municipalities.

#### DESIGN & CONSTRUCTION MANUALS AND BROCHURES

There are several publications available giving guidelines for the design and construction of septic tank systems. At least two provincial governments have published comprehensive booklets. They are:

Septic Tank Systems,  
Ministry of the Environment,  
Information Services Branch,  
135 St. Clair Ave., W,  
Toronto, Ont. M4V 1P5.

This publication provides a guide for planning domestic septic tank systems as well as larger systems such as those used in schools, motels, restaurants and other commercial establishments. It includes charts for calculating the size of tank and drainfield for different conditions; and

Farm Home Sewage Disposal in Saskatchewan,  
Sask. Department of Agriculture,  
Family Farm Improvement Branch,  
Regina, Sask, August 1969.

This publication contains information on septic tank systems as well as other rural sewage disposal methods such as sewage mounds and sewage lagoons.

Brochures on septic tank disposal systems have also been issued by the New Brunswick Department of Health and Social Services, Fredericton N.B.

Several other agencies have issued guidelines for septic tanks. These include:

Domestic Sewage Disposal, published by Public  
Health Engineering Division,  
Department of Health and Welfare,  
Ottawa, 1960; and,

Opening Unserviced Lots to Building  
by the Use of Septic Tank,  
Housing Note No. 27, July 1966,  
Division of Building Research,  
National Research Council of Canada,  
Ottawa.

Perhaps the most authoritative manual for septic tank practice  
is the one issued by the U.S. Department of Health.

Manual of Septic Tank Practice,  
Published by the U.S. Department of Health,  
Education, and Welfare, Public Health Service,  
Division of Environmental Engineering and  
Food Protection,  
Washington 25, D.C.; 1963.

This manual is based on a series of extensive  
research projects on household sewage disposal systems.  
This series of investigations culminated in the publi-  
cation of the Manual of Septic Tank Practice, which,  
with subsequent revisions, has been the basic reference  
for septic tank and drainfield design in the United  
States for many years.

Another useful booklet is:

Soils and Septic Tanks -  
Agriculture Information, Bulletin 349 -  
Soil Conservation Service,  
U.S. Department of Agriculture March 1971.  
For Sale by the Superintendent of Documents  
U.S. Government Printing Office,  
Washington, D.C. 20402 - Price 15 cents.

This document gives a concise statement in  
"lay terms" of the soil factors that affect  
absorption fields. It is particularly useful because  
it gives some guidance for using a soil map to select  
a site for a drainage-tile absorption field.

#### RESEARCH REPORTS

There is considerable literature on research investigations  
on septic tank systems. The following four publications, probably  
contain references to most to the pertinent technical studies that  
have been conducted.



Construction Criteria for Septic Tank Systems in  
Manitoba prepared for the Province of Manitoba by  
Underwood McLelland and Associates Ltd.,  
1479 Buffalo Place, Winnipeg, Manitoba,  
March 1973, 53 p.

A comprehensive study carried out by a consulting  
engineering firm for the Department of Municipal  
Affairs and Department of Mines, Resources and Environ-  
mental Management of the Province of Manitoba. The  
purpose of the study was to develop basic design  
criteria for the construction of septic tank systems  
for residential type development areas in Manitoba,  
including allowable septic tank system density. The  
report gives general design criteria for septic tanks  
and septic effluent disposal fields for different  
soil types in Manitoba.

McGauhey P.H., and Winneberger J.H.  
A study of Methods of Preventing  
Failure of Septic Tank Percolation Systems,  
U.S. Department of Housing and Urban  
Development,  
Washington, D.C. 20410, Oct. 1967.  
For Sale by the Supt. of Documents,  
Washington, D.C. 20402 - Price 25 cents.

This publication is the final report of a  
comprehensive study of soil absorption sewage disposal  
systems. The study, sponsored by the U.S. Federal  
Housing Administration, was conducted under contract  
with the Engineering Research Laboratory of the Univer-  
sity of California. The study suggests guidelines for  
improving design and adopting septic systems to the  
soil conditions.

Cotteral, J.A. Jr., Norris, D.P.,  
Septic Tank Systems,  
Journal of the Sanitary Engineering Division,  
Proceedings of the American Society of  
Civil Engineers,  
No. 6735, August 1969.

This paper reviews the theoretical and practical  
factors that control the performance of individual  
septic sewage disposal systems. While the report does

not add to the theoretical knowledge of septic tank operation, it does give a comprehensive review of the past studies, including a bibliography of the most important contributions on the subject.

Design and Operation of Septic Tanks,  
Monograph Series.  
World Health Organization  
Third European Seminar for  
Sanitary Engineers WMD,  
Palais Des Nations,  
Geneva, 1953.

An earlier series of papers outlining European practice on septic tank design, construction and operation.