Private Sewage Disposal and Water Supply Standards

Illustration . . . Inspection . . . Installation . . .

Newfoundland Labrador

Government Services

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Foreward

The preparation of this document was made possible due to the contributions from a variety of people with expertise in public health, engineering and waste disposal.

In particular, the efforts of the people involved in the preparation of the "Draft Sewage Disposal Technical Guidelines: Newfoundland and Labrador" and the "Standards of Accepted Practise for the Location, Design and Construction of Private Sewage Disposal Systems" was invaluable in the drafting of this document.

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Introduction

Individual on-site sewage systems have been, and continue to be, an important part of waste management in many communities in Newfoundland and Labrador. Providing adequate sewage disposal is an important component in the protection of public health and the protection of groundwater and surface water from pollution. Many rural communities, due to their size and population density, cannot provide the traditional engineered sanitary sewer system. Where this is the case, on-site sewage disposal systems have been employed as a practical solution to servicing individual developments. For people in un-serviced areas (e.g., municipal sewage services not available), on-site sewage treatment is often the only practical solution for domestic sewage waste. The septic tank and subsurface absorption field (septic tank system) remains the method of choice. A well designed and properly maintained system installed on an acceptable site can provide long term, safe and effective treatment of domestic sewage.

The Government of Newfoundland & Labrador through the *Sanitation Regulations* under the *Health and Community Services Act* regulate onsite sewage disposal systems with a daily sewage flow of less than 4546 litres. The regulations govern the design, construction and installation of such systems. This document outlines the minimum acceptable standards for private (household) sewage treatment systems with sewage flows of less than 4546 litres/day.

On-site sewage disposal refers to disposal into the soil and groundwater environment of all domestic sewage, produced by a home, commercial or other establishments. The conventional method for new development is the subsurface disposal system (i.e., the septic tank and soil absorption field). Proper siting, installation and maintenance are the keys to ensuring that a septic system functions properly for the long term. Not every proposed building site can be approved for private sewage disposal and water supply systems. There are minimum requirements with respect to size, location in relation to other physical structures or activities, soil conditions, etc., that must be met. A thorough site evaluation is required to determine if a proposed building lot meets these requirements.

The site evaluation must be performed by an Approved Designer registered with the Government Service Centre (GSC). The results of the evaluation, along with a detailed sewage disposal system design and water supply design (signed by the designer), a completed application (signed by the applicant), and Municipal Approval (in a letter from the municipality) must be submitted to the GSC to be considered for issuance of a "Certificate of Approval". No construction or excavation, other than that necessary for site evaluation, should commence until a "Certificate of Approval" has been issued for the site. An inventory of approved designers is maintained at the local Government Service Centre.

Maximum Daily Sewage Flow under the Sanitation Regulations of the Health and Community Services Act is 4546 L/day. For flows greater than 4546 L/day the Water Resources Act applies.

1. OVERVIEW OF ON-SITE SEWAGE SYSTEMS

The typical on-site sewage system referred to in these *Standards* includes the following components:

- the building sewer, after it leaves the building;
- the treatment unit (e.g., septic tank); and
- the soil absorption system (e.g., absorption trenches).

The building sewer is simply a water tight pipe that carries the sewage from the building to the treatment unit. The treatment unit processes raw wastewater to remove solids, fats and greases.

The soil is recognized as a key component of any on-site sewage system. The degree to which a treatment unit processes the building sewage will determine the design of the system within the soil.

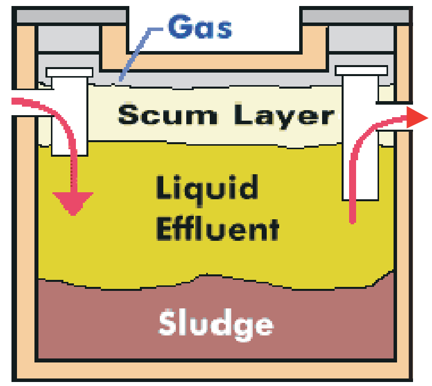
The size and layout of a soil absorption system (e.g., absorption trenches) varies according to type of treatment system, site conditions and anticipated loads. Typically, perforated pipe and gravel distribute the effluent over the absorption area. Gravel or crushed rock provides storage for peak effluent flows; a large infiltration surface between the effluent and underlying soil or sand, provides a bed for the pipe and protection over it.

1.1 The Septic Tank

The septic tank provides primary treatment by separating the solids from the domestic sewage waste. The lighter solids float to the top and the heavier solids settle to the bottom. This leaves a relatively clarified liquid effluent between the layers.

Anaerobic bacterial activity (bacterial activity without the presence of oxygen) partially breaks down the waste in the septic tank. The liquid effluent from the tank is distributed to the absorption field through a distribution box.

Figure 1: Septic Tank



As mentioned, the primary function of a septic tank is to retain fats, greases, and other solids. Primary treatment of sewage takes place within the tank, where anaerobic bacteria digest these materials. The un-digestible portion remains in the tank and is disposed of when the tank is pumped. The effluent which leaves the tank for secondary treatment in the absorption field is, ideally, free of suspended fats, greases, and other solids. However, it does contain organic materials, bacteria, and viruses.

Those solids that are stabilized settle to the bottom of the septic tank where they form a sludge blanket. Fats and greases rise to the top of the septic tank forming a scum blanket. The sludge and scum blankets must be removed periodically to preserve the liquid capacity necessary for satisfactory solids removal.

A typical septic tank removes about 40 to 50% of the 5-day biochemical oxygen demand, 50 to 70% of the total suspended solids, 20 to 30% of the nitrogen, and up to 30% of the phosphates. Disease organisms do not multiply in the septic tank; they survive or are reduced.

Septic tank contents must be pumped out regularly.

1.2 Distribution Box

The distribution box must be water tight and level.

The distribution box and the absorption trenches form the absorption field.

The distribution box has an outlet to each absorption trench. The effluent from the septic tank flows into the box and through the different outlets to the absorption trenches. Because the outlets are level with each other, each line should receive an equal volume of effluent. The distribution box must be level; if not, the flow to the absorption trenches will be uneven.

1.3 Absorption Trenches

The absorption trenches, through a series of perforated pipes laid in a bed of crushed stone, filters and distributes the effluent throughout the field by allowing the effluent to slowly trickle from the perforated pipe into the crushed stone and down through the soil. The crushed stone and soil act as biological filters.

Continuous or frequent ponding of septic tank effluent on the bottom of the absorption field results in the growth of a biological layer that filters out more and more solid particles and dissolved pollutants from the septic tank effluent. A **clogging mat** is formed at the point of infiltration into the soil. This mat normally penetrates 1/2 to 6 centimeters into the soil. It consists of a slimy mass of septic tank effluent solids, mineral precipitates, microorganisms, and the by-products of decomposition. Microorganisms in the mat feed on septic tank effluent nutrients to produce slimes, polysaccharides, carbon dioxide, etc. Filtered-out cellulose, undigested food residues, etc., hydrolyze and biodegrade slowly. Mineral precipitates, such as ferrous sulfide, etc., also contribute to the clogging mat. As the effluent filters through the soil, organisms present in the soil act to remove harmful bacteria, viruses and other pollutants.

Seed or sod absorption fields to facilitate transpiration.

Unlike the septic tank where treatment is facilitated through the activity of anaerobic bacteria, waste in the absorption trenches is broken down by aerobic bacteria. Aerobic bacteria requires oxygen to be present for survival.

Oxygen, therefore, is essential to the efficient operation of the absorption field. **Since oxygen diminishes with the depth of soil, it is important that the depth of absorption trenches not exceed the maximum set out in the standards**. Exceeding the requirements increases the likelihood of the system malfunctioning.

Evapotranspiration, the uptake of moisture through evaporation and through transpiration by vegetation, contributes to the effective functioning of the disposal field. Evapotranspiration reduces the absorption load on the soil. Ensuring that the disposal field does not exceed recommended depths is again important since the deeper the trenches, the less evaporation that occurs and the less transpiration since the effluent is farther away from the roots of vegetation. To ensure the system receives the full benefits from transpiration, seeding or sodding of the disposal field should be done soon after the system is installed.

Total coliforms concentrations of 57,000 colonies per milliliter within the absorption field are typically reduced to less than 200 colonies per milliliter at or beyond a foot of the clogging mat. Fecal coliforms concentrations of 19,000 colonies per milliliter within the disposal field are typically reduced to less than 2 colonies per milliliter at or beyond a foot of the clogging mat. Fecal streptococci concentrations of 1,600 colonies per milliliter within the disposal field are typically reduced to less than 2 colonies per milliliter at or beyond a foot of the clogging mat. The clogging mat typically removes approximately 10% of the nitrogen but is less effective in removing phosphates.

1.4 Separation Distances

The distance that septic tanks and absorption fields have to be separated from bodies of water, property boundaries, drilled and dug wells, etc., is provided in the *Sanitation Regulations* and these *Standards*. With respect to separation from bodies of water, consider the following information related to what would be considered a surface water body.

- A stream that is on a topographic map is a stream. The fact that a stream doesn't show up on a map does not mean it is not a stream. If there's flowing water then it is a stream. If there is only flowing water at certain times, then it is an intermittent stream.

- Ditches are man-made conveyances and it does not matter if there is water in them or not. Usually ditches are dry and are meant to carry storm water runoff only. However, all streams and ditches lead elsewhere and eventually join up with larger streams, brooks, rivers, ponds, lakes and the ocean.

- It might be wiser to determine if the septic system will have an impact on the water body and if that impact will carry downstream. On that basis, it would not matter what it is. All that is required is occasional flowing water. If there is insufficient separation from the septic system, then there could be adverse impacts. In other words, separation from any source of flowing water ought to be determined by the properties of the ground (slope and permeability) rather than what type of water body might be adjacent.

(Source: Water Resources Division, Department of Environment and Conservation)

2. APPROVED DESIGNERS

Under the Approved Designer policy of the Department of Government Services the initial inspections/assessments of building lots with proposed on-site sewage services can be carried out by individuals registered with Government Service Centre as Approved Designers.

2.1 Approved Designer Designation

The evaluation of a site for on-site sewage systems must be performed by an Approved Designer registered with the Government Service Centre (GSC). Persons who are Certified Public Health Inspectors, Professional Engineers, Certified Engineering Technicians or Certified Engineering Technologists generally can be expected to have sufficient expertise to provide proper assessments, designs and construction drawings for the proposed systems. Individuals holding these designations are automatically considered Approved Designers and may apply for registration as an Approved Designer without any requirement, other than the submission of an application. **Applicants must provide proof of their certification or professional designation**. Alternatively, these individuals may simply request in writing or by fax to be listed by the Government Service Centre as an Approved Designer. A registration number will be issued to the qualified applicant. No fee is required for registration.

It is recognized, however, that there are contractors and others who have the necessary expertise but lack the designations as aforementioned. These persons can be recognized as Approved Designers of on-site septic systems by:

- submitting an application to become an approved designer; and
- successfully completing a written exam designed to test knowledge in the area of on-site sewage systems and private water supplies.

The exam is to be written in the presence of an official of the Government Service Centre. The results of the exam will be reviewed by an Environmental Health Officer and, if a satisfactory mark is obtained, the Environmental Health Officer will recommend to his/her supervisor that the successful applicant be registered as an Approved Designer and that a registration number be given to identify the person on the Approved Designer listing.

2.2 Approved Designer Examination

Candidates who wish to become Approved Designers must have the ability to communicate satisfactorily through writing and documentation. Candidates for Approved Designer status must successfully complete a written exam. The exam will be administered by the Government Service Centre at its various locations throughout the province. Three Approved Designer exams exist. They must be written in sequence: Exam A is to be written first followed by exam B, if necessary, and then exam C, if necessary.

To successfully pass the exam, a minimum mark of 75% must be attained overall. A candidate must receive a minimum of 20 out of a possible 30 marks on Section IV of the exam.

If a candidate is unsuccessful in obtaining Approved Designer status after the first exam, a candidate cannot re-write the exam for a two (2) month period. If after the second writing the candidate is unsuccessful s/he cannot re-write the exam for a six (6) month period. A candidate who is unsuccessful after writing the third exam, will not be considered again for Approved Designer status, without proof of education in the area of lot assessment/on-site sewage disposal and successful completion of the

Approved Designer exam.

2.3 Conflict of Interest

To avoid a conflict of interest situation, persons who hold a CPHI(C), P. Eng., CET or CTech designation and are currently employed by the Government Service Centre, Regional Health and Community Services Boards or Department of Health and Community Services are not to prepare designs for submission for approval, unless they have appropriate approval per the *Conflict of Interest Act*.

2.4 Suspension of Approved Designer Status

The designation of an individual as an Approved Designer may be suspended due to reoccurring deficiencies in submissions. Examples of deficiencies include repeated submission of flawed designs which are incomplete or based upon deficient or incorrect field data. Individuals may apply for reinstatement after a period of nine months. At that time, individuals, including CPHI(C)'s, P.Eng's, CET's, etc. will be required to successfully complete the Approved Designer exam.

When an Approved Designer submits designs which fail to comply with these *Standards* or are based on false or misleading information, his/her Approved Designer status shall be revoked. For the purposes of removing an Approved Designer's status, a deficiency shall include:

- Actively facilitates installation of a water supply/or a sewage disposal system without submission of plans and receipt of approval from the GSC for the system(s).
- Submission of a design based on inaccurate or insufficient information.
- Repeated submission of plans in contravention of good design practice.
- Failure to identify existing elements of development and maintain the required separation distances for wells and sewage disposal systems.
- Any other issue found to be significant in the effective operation of the sewage disposal system or the water supply or which could result in a risk to the health or safety of the homeowner or the adjacent property owners.

NOTE

Design submissions that contain "deliberate misinformation" or are part of an "illegal activity" may result in the immediate lifetime removal of an individual's Approved Designer status.

Approved Designers who are inactive for a period of greater than two years must reapply to the Government Service Centre to obtain Approved Designer status.

3. APPLICATION PROCESS

The decision to approve the development of land may be subject to input from various government departments/agencies dependant on the location of the land and the type of development proposed. The Government Service Centre will continue to require that an applicant demonstrate a site is suitable for installation of a septic system prior to approving development of a particular lot even in cases where an applicant may only intend to install a pit privy. The only exception to this is remote sites. The following are some of the points that should be noted during the application process.

3.1 Areas in Municipalities

The decision whether or not a particular site may be developed rests with the Municipality in accordance with the *Municipalities Act*. Generally, municipalities rely on the GSC to determine the suitability of land for private sewage systems. For those municipalities that issue an occupancy permit, we will be requesting that this permit not be issued until the municipality receives from the GSC a Final Approval Certificate of the private sewage and water system.

3.2 Un-serviced Subdivisions

A subdivision for the purpose of this policy shall be defined as a development of five lots or greater. Professional Engineers, only, can prepare submissions for subdivisions.

Subdivisions of between five and fifteen lots, with the exception of the Professional Engineer requirement, will require submissions for each lot in accordance with the procedure outlined in this document.

Proponents wishing to develop subdivisions of greater than fifteen lots in un-serviced areas will be required to submit an engineering study of the overall development to the Government Service Centre which should form in part the basis for the consultant's recommendation about the suitability of the sites for individual water supplies and sewage disposal systems. The Government Service Centre will review for consideration of conceptual approval of the overall development.

Reference can be made to the document "Guidelines for Assessment of Un-serviced Subdivisions” **(See Appendix)** for items that should be addressed in the engineering study and report. Apart from the overall engineering assessment, each site will require evaluation and design data as outlined in Section 3.4 of these *Standards*. Any Approved Designer may evaluate and design onsite services for lots deemed to be suitable for development in the overall engineering assessment.

3.3 Application

The applicant, or Approved Designer acting on behalf of the applicant, must provide the Government Service Centre with **two complete copies** of the water and/or sewage system design (application and building site evaluation). Upon approval, one copy will be retained by the Government Service Centre and the second copy will be forwarded to the appropriate municipal authority.

All applications pertaining to building sites requiring installation of private water and/or sewage systems require the approval of the Government Service Centre, Department of Government Services.

A water and/or sewage system design submission is made as one complete package. If a submission is received from an Approved Designer and all required information (including municipal approval and completed application form) has not been provided at that time, the incomplete package will be returned to the Approved Designer, and will be noted as an incomplete submission. No submissions will be processed whereby it is stated that further information will be sent at a later date. Specifically, no submissions will be processed pending municipal approval.

3.4 Components of a Submission

The applicant or approved representative must submit the following:

1. A GSC "Application to Develop Land" completed and signed by the applicant;

2. A detailed diagram of the lot (see Figure 2) with dimensions indicating:

   - lot boundaries (property lines)
   - lot size
   - location of adjacent wells and sewage systems
   - separation distances
   - existing and proposed buildings
   - ditching
   - brooks & streams, ponds and other natural water courses
   - municipal or private water services
   - driveways
   - livestock operations;

3. A floor plan for the proposed dwelling/ establishment, including basement and below ground level pipes/plumbing, if applicable;

4. Municipal Approval;

5. Results of a percolation test indicating the date the test was performed as well as the name, address and phone number of the person responsible for performing the test;

6. Information regarding soil strata and type in the area proposed for installation of the system. The applicant should have test pits dug to determine this information;

Submissions with incomplete or erroneous information will be returned to the Approved Designer for correction and re-submission and may lead to suspension of design privileges.

If the building lot is within a municipal authority, Municipal Approval is required to be included at the time of the water and/or sewage system design submission. If not, the submission will be returned to the Approved Designer without processing.

7. Depth of ground water table;

8. Design calculations for design of the septic system;

9. Detailed drawings showing all construction details required to install the septic tank, distribution box, absorption trenches and proposed water supply;

10. A profile of the land which accurately describes the grade of the land in the general area where the septic system is to be installed;

11. A description of the general ground conditions in the area where the system is to be installed. The applicant should note the presence of rock, topsoil, gravel, bog, etc. A photograph of the site would be helpful;

12. If imported fill is to be used to compensate for a depth of good soil that is less than the 161 centimetre minimum requirement, then the following is required for design submission:

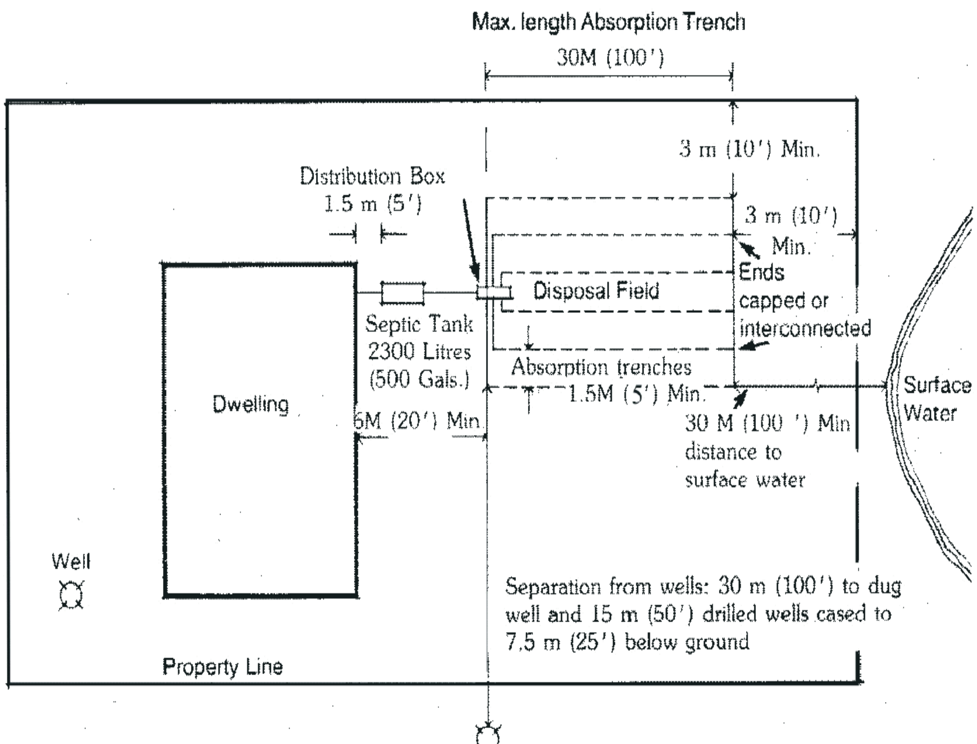
    - the source (location) of the imported fill;
    - the soil type of the imported fill;
    - in situ percolation rate of the imported fill*; and
    - characteristics (e.g., type and strata) of the soil present at the site to be developed.

    * *the in situ percolation rate of the imported fill must be determined each time fill is removed from the site (i.e. gravel pit).*

13. Additionally, dependant on site conditions, adjacent developments, etc., the applicant may be required to provide additional information requested by the Environmental Health Officer such as:

    - sieve analysis data,
    - water table monitoring.

Figure 2: General Layout of Private Sewage Disposal System



NOTE: "Surface water" includes all bodies of water such as lakes, streams, ponds and wetlands.

3.5 Certificates of Approval

1. Certificate of Approval

All applications for approval of a private sewage disposal system and water supply shall be reviewed and assessed by an Environmental Health Officer with the Government Service Centre. A Certificate of Approval will be completed and provided to the applicant if the application and building site evaluation submission are considered satisfactory following a review by an Environmental Health Officer. A copy of the Certificate of Approval and a copy of the Approved Designer's submission will be forwarded to the appropriate municipal authority and/or controlling agency. Applicants will be notified in writing if their building site evaluation submission is unacceptable.

2. Final Approval Certificate

A final inspection must be conducted by an Environmental Health Officer on all newly installed sewage disposal systems. A Final Approval Certificate will be issued to the applicant when the installation is in compliance with the building site evaluation submission, these *Standards* and the *Sanitation Regulations*. A copy of the certificate will be submitted to the municipal authority and/or controlling agency and may be provided to the Approved Designer.

4. BUILDING SITE EVALUATION

SITE EVALUATION

- **percolation rate**
- **soil characteristics**
- **ground water table**
- **slope**
- **separation distances**
- **building lot size**

The assessment/evaluation of building lots which require on-site sewage is to be carried out by Approved Designers registered with the Government Service Centre. This section provides details on several elements of the building site evaluation that are required to be submitted with the GSC "Application to Develop Land".

The site evaluation will include:

- identifying the location for the proposed sewage disposal system and water supply that satisfies the minimum separation requirements set out in this document;
- determining the absorption rate of the soil by performing a minimum of three percolation tests;
- conducting a soil evaluation which may require examination of a test pit that is a minimum of 1.8 metres deep;
- ensuring that the slope is within acceptable limits; and,
- where a municipal water supply is not available, identifying a suitable location for a well.

4.1 Lot Size and Suitability

The land area in which an on-site subsurface sewage system is to be installed must be:

- adequate to permit the installation of a well and septic tank with soil absorption on-site.
- sufficient to allow the appropriate separation distances between wells, springs, existing buildings, inland waters, property boundaries, embankments, etc.
- sufficient enough to accommodate a complete replacement system, should the first one malfunction and require replacement.

4.2 Land Area and Lot Width

1. Un-Serviced Building Lots

For un-serviced building lots (lots where water and sewage disposal services will be provided on-site), a minimum lot size of **1860 square metres** is required. A **minimum lot width of 30 metres** is required throughout the entire area in which the absorption field (distribution box to end of absorption trenches) is to be installed. This area must be able to accommodate the septic system while maintaining separation distances and have sufficient space for the installation of a replacement system.

2. Semi-Serviced Building Lots

For semi-serviced building lots (lots where water or sewage disposal services will be provided off-site), a minimum lot size of **1400 square metres** is required. A **minimum lot width of 23 metres** is required throughout the entire area in which the absorption field (distribution box to end of absorption trenches) is to be installed. This area must be able to accommodate the septic system while maintaining separation distances and have sufficient space for the installation of a replacement system.

NOTE

1. Some municipalities may have minimum lot frontage requirements. Please check with the municipality to determine if minimum lot frontages exist.
2. For lots where duplexes are proposed the lot size will be two times the size required for a single family residence (e.g., 2 X 1860 m^2 = 3720 m^2).

3. Rural Infilling Variance

Where land is surrounded by development which prohibits expansion and where an approval cannot be awarded because the proposed lot does not comply with the minimum lot size and width requirements, the requirements to literal conformity may be varied if:

i the variance amounts to no more than a twenty per cent (20%) reduction in the requirements;
ii the variance is not contrary to the general intent and purpose of the policy and procedure;
iii. the application of the variance would not interfere with the maintenance of required distance separations and sewage system dimensions;
iv. the application of the variance would not undermine the quality of adjacent property or pose a hazard to human health;
v. the application of the variance is related to the specific property and is not general to land within the area;
vi. the particular practical difficulties for the owner or developer are distinguishable from a mere inconvenience or desire to acquire monetary gain.

The variance referenced in paragraph "i" applies to land area requirements and minimum lot width requirements for **infilling lots, only**. The **variance cannot exceed 20%**.

Assuming the maximum variance is granted for an un-serviced infilling lot, the land area requirement could be reduced to 1488 m^2 from 1860 m^2. Similarly, the minimum lot width would be reduced to 24 m from 30 m.

Assuming the maximum variance is granted for a semi-serviced infilling lot, the land area requirement could be reduced to 1120 m^2 from 1400 m^2. Similarly, the minimum lot width would be reduced to 18 m from 23 m.

In addition to ensuring that the minimum required land area is available, municipal by-laws and the requirements of other government departments or agencies must be met. For example, for developments within 600 metres of **livestock operations** reference should be made to the Department of Forest Resources and Agrifoods for guidance concerning minimum separations.

4.3 Seasonal Site Evaluations

The diverse weather conditions in Newfoundland and Labrador dictate that site evaluations may not be possible for a portion of year (e.g., winter). Given this, Government Service Centre officials may not be able to accept submissions by Approved Designers year round. Regional Government Service Centre officials can establish time periods during which design submissions will not be accepted due to weather conditions being unacceptable to carry out site evaluations (e.g., percolation tests).

This time period may vary from year to year, again due to the variability in weather conditions.

For example, GSC officials may decide not to accept submissions in Labrador from December to April, while officials on the Avalon may decide not to accept submissions from January to March. This may vary from year to year and is strictly at the discretion of regional GSC officials.

4.4 Soil Characteristics

Soil conditions are the most important aspect of on-site evaluation and system design. An estimate must be made of the ability of the soil to accept the effluent from the disposal system. This is not an easy task. Installation of the system itself may change absorption capacity. Clogging of the soil interface, which may take place at some future date, cannot be measured at the time of installation.

Assessment of the ability of the soil to accept the effluent is a judgment decision based on soil properties and past experience. Combined with the result of a test such as the in situ permeability test, some indication of permeability can be ascertained. Good soil makes a good system. Appropriate soils should facilitate treatment and disposal of septic system wastewater. Soils acceptable for the effective absorption and treatment of sewage effluent generally will have a percolation rate of less than 30 minutes per 2.5 cm (30 minutes/inch). Information regarding soil strata and type can be described with reference to texture, colour, porosity and consistency. Acceptable soils are identified in Table 1.

Table 1: Acceptable soils for on-site subsurface sewage systems

Sands & Gravels: these types are not widely available throughout the province and exhibit percolation rates of **less than 5 minutes** per 2.5 cm (5 minutes/inch).

Loams: this type, a mixture of sand, silt, gravel and organic material, provides the most effective permeability and treatment of effluent exhibiting percolation rates of **less than 15 minutes** per 2.5 cm (15 minutes/inch).

Silts: generally, silts are beige or tan colour often with evidence of mottling. The percolation rate will vary from **15 minutes** per 2.5 cm (15 minutes/inch) for dry silts with a high sand content to in **excess of 30 minutes** per 2.5 cm (30 minutes/inch) for the harder silts.

Soil properties that are useful in assessing the soil suitability include:

- texture
- structure
- depth
- colour
- density

1. Soil Texture:

Soil texture is a relative amount of gravel, sand, silt and clay content. Some soil classes and ways of identifying them are given in Table 1. When water passes through soil it goes through the voids between soil particles and not the solid particles themselves. In most cases this means that the larger the voids or pore spaces and the more pore spaces, the faster the water will pass through the soil. If you compare a sand to a clay you can appreciate that the sand has many large voids between relatively large particles whereas the voids between the small clay particles are so small that little, if any, water can pass through. A sand has high permeability, a clay a very low permeability.

As effluent from a disposal field passes through a silty soil, particulate matter is physically filtered out in a relatively short distance. Most bacteria, viruses or other potentially disease causing organisms (pathogens) are not able to pass through long distances of unsaturated soil. They are retained within the first few feet of soil until the numbers are greatly reduced in the hostile environment. In saturated soils the organisms may travel greater distances.

When effluent enters a heavy gravel with little or no fine material (silt and clay particles), it will pass through the voids unfiltered so quickly that pathogens can travel hundreds of feet. The ideal soil on a lot is several feet of silty sand.

2. Soil Structure:

Soil structure has a significant influence on the soil's acceptance and transmission of water. Soil structure refers to the aggregation of soil particles into clusters of particles, called **peds**, that are separated by surfaces of weakness. These surfaces of weakness open planar pores between the peds that are often seen as cracks in the soil. These planar pores can greatly modify the influence of soil texture on water movement. Well structured soils with large voids between peds will transmit water more rapidly than less structured soils of the same texture, particularly if the soil has become dry before the water is added. Fine-textured, massive soils (soils with little structure) have very slow percolation rates.

If a detailed analysis of the soil structure is necessary, the sidewall of the test pit should be carefully examined, using a pick or similar device to expose the natural cleavages and planes of weakness. Cracks in the face of the soil profile are indications of breaks between soil peds. If the cracks are not visible, a sample of soil should be carefully picked out and, by hand, carefully separated into the structural units until any further breakdown can only be achieved by fracturing. Since the structure can significantly alter the hydraulic characteristics of soils, more detailed descriptions of soil structure are sometimes desirable. Size and grade of durability of the structural units provide useful information to estimate hydraulic conductivities.

3. Soil Depth:

The depth of permeable soil will determine minimum lot dimensions and system design. Other site characteristics must also be considered in combination with soil depth. For example, a system installed in a very shallow soil on a lot with a steep slope is more likely to malfunction than similar soil conditions on a lot with only a moderate slope. If the depth of suitable soil over permanent watertable or bedrock is not enough to adequately treat the effluent, it is possible for contaminants to enter wells in the area. If this depth of soil is not naturally present on the lot, infilling with suitable soil may be considered as outlined in Part 3 of Section A4.2 of these *Standards*.

Some types of vegetation, such as alders and rushes, tend to grow in wet areas. These may be an indication of saturated soils.

4. Soil Colour:

The colour and colour patterns in soil are good indicators of the drainage characteristics of the soil. Soil properties, location in the landscape, and climate, all influence water movement in the soil. These factors cause some soils to be saturated, or seasonally saturated, affecting their ability to absorb wastewater. Soil colours are a result of the colour of primary soil particles, coatings of iron and manganese oxides, and organic matter on the particles.

Soils that are seldom or never saturated with water and are well aerated, are usually uniformly red, yellow or brown in colour. Soils that are saturated for extended periods, or all the time, are often grey or blue in colour, although such colouration does not necessarily mean a saturated soil. An unoxidized parent soil is often grey or bluish in colour.

Soils that are saturated, or nearly saturated, during portions of the year often have spots or streaks of different colours, mostly grey or red, called mottles, which indicate zones of saturated soil that may occur during wet periods. Mottles result from chemical and biochemical reactions when saturated conditions, organic matter, and temperatures above 4 degrees Celcius occur together in the soil.

The mottling process can be explained by assuming the presence of a brown soil horizon in which the brown colour is formed by finely divided iron particles spread throughout the horizon. Assume the soil becomes saturated with water. Under these conditions, the bacteria present rapidly deplete any oxygen present while feeding on the organic matter. When the oxygen is depleted, other bacteria continue the organic decomposition, using the oxidized iron and manganese compounds, rather than oxygen, in their metabolism. Thus, the insoluble oxidized iron and manganese, which contribute much of the colour to soil, are reduced to soluble compounds. This causes the soil to lose its colour, turning the soil grey. When the soil drains, the soluble iron and manganese are carried by the water to the larger soil pores. Here they are reoxidized when they come in contact with the oxygen introduced by the air-filled pores, forming insoluble compounds once again. The result is the formation of red, yellow and black spots near surfaces, and the loss of colour, or greying, at the sites where iron and manganese compounds were removed. This sequence can be repeated each time the soil in this horizon is saturated. The reason that the process is not reversed when the soil is re-saturated is due to the fact that the very finely divided iron in the brown soil dissolves much more easily than the relatively large concentrations of iron forming the spots.

While mottling indicates periodic saturation in most cases, lack of mottles does not always indicate lack of saturation. For example, periodically saturated red clays do not show mottles; or one of the conditions needed for mottle formation is not present. Also, colour spots and streaks can be present in soils for reasons other than soil saturation. For example, soil parent materials sometimes create a colour pattern in the soil similar to mottling, but these patterns usually can be distinguished from true mottling. Some very sandy soils have uniform grey colours because there are no surface coatings on the sand grains. This colour can be mistakenly interpreted as the grey colour indicative of frequent saturation and poor draining. Direct measurement of zones of soil saturation may be necessary to confirm the soil moisture if interpretation of soil colours is not possible.

5. Soil Density:

Soil density or degree of compaction can influence the ability of soils to accept water. Two soils with similar textures can have different permeability if their densities are different. The denser a soil becomes, the smaller the pore spaces and the slower the rate of water movement. The last glacial age has impacted the soil conditions significantly. In many areas the soil is comprised of glacial till, an assortment of material that was deposited beneath the ice and subject to great compaction forces. Other areas have soils consisting of sediments deposited by melt water streams that tend to be less compact. Although the top few feet of till tend to have been loosened by weathering and root action, it is common to find increasing compaction with depth and extremely dense and impervious till below a couple of feet. Soil can also be compacted by man-made actions such as running heavy machinery over it.

6. Test Pits:

During the assessment of building sites, test pits should be excavated to provide information on:

i) soil suitability (estimation of permeability using soil classification or other test procedures),

ii) the existence of impervious strata,

iii) maximum elevation of ground water table.

The procedure for excavating test pits is provided on the next page along with an example of a test pit log that is to be included in the design submission.

Test Pit Procedure

To excavate test pits and view soil characteristics, please adhere to the following procedure.

- A minimum of 1.8 m deep holes are required.
- A backhoe is the usual method of excavation in the area where the sub-surface absorption field is to be located.
- Slope one side of the pit for ease of access and exit. Ensure the pit is dug to prevent collapse while a person is examining the soil.
- Where more than one pit is constructed, they must be separated by a minimum of 9 m.
- Applicants are advised to cover holes until they are inspected and to have them filled in immediately afterwards, due to potential safety hazards.

Test pits provide invaluable information such as level of ground water, depth of suitable soil, and location of impermeable geological material.

Example of Test Pit Log

Depth (metres)	Soil Description	Groundwater/Bedrock Observations
0.00 - 0.30 m	Topsoil: dark brown sandy silt; surface boulders	________________
0.30 - 1.20 m	Sandy gravel: reddish brown; interspersed with pebbles	________________
1.20 - 1.80 m	Sandy silt: reddish brown; some grey larger pebbles	________________
1.80 - 2.00 m	________________	Ground water observed at 2.00 m

7. Percolation Test:

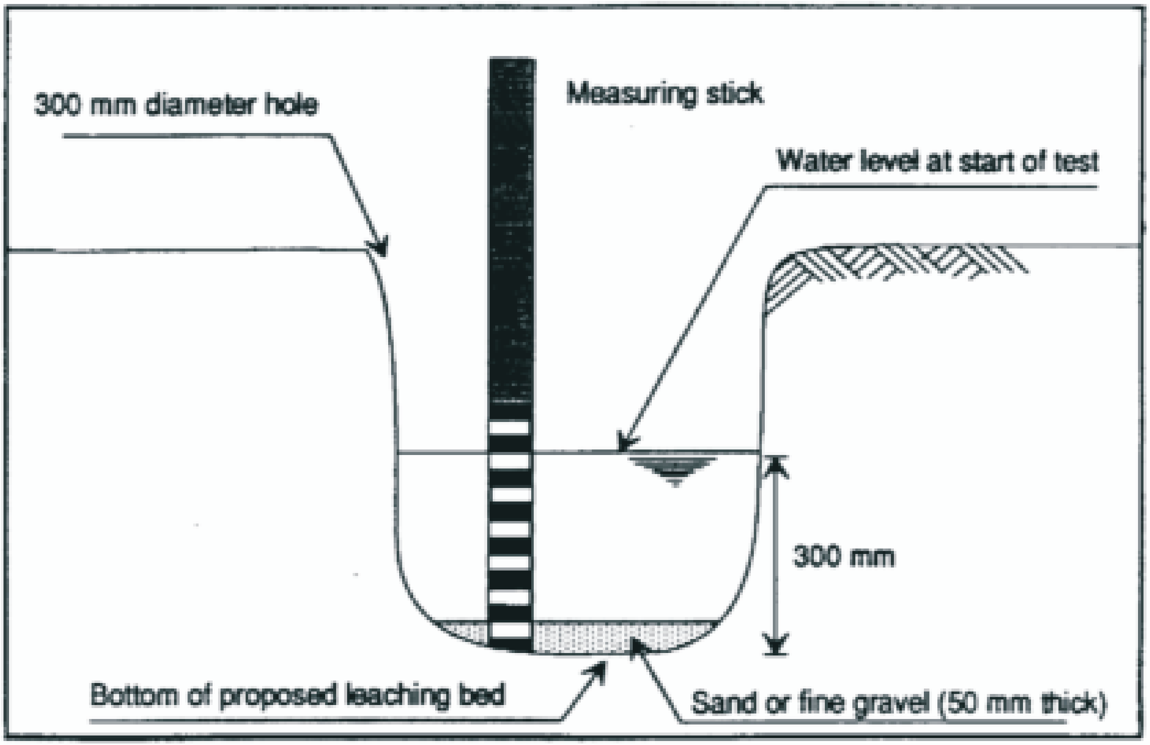
A percolation test is a simple test of the soil's capacity to absorb liquid. The test is a measure of the relatively constant rate at which clear water, maintained at a constant depth, will seep out of a standard size test hole. The test hole is constructed at a depth equal to the proposed depth of the disposal field trenches. The percolation rates should be calculated from test data collected after the soil has been saturated.

An adequate number of test holes must be dug to ensure reliable results. A minimum of three test holes are recommended. The percolation test procedure and the method of determining the average percolation rate are outlined on the next page.

The percolation rate, taken by measuring the time it takes water to drop a given distance in saturated soil, is not an adequate determinant of soil/site quality, by itself. One could obtain favourable rates at certain times of the year due to climatic conditions(e.g. a dry spring). However, the **soil strata** will contain certain markers which will assist in the reliability of the percolation rates derived.

Figure 3 below is a diagrammatical representation of a typical hole dug to conduct a percolation test on a building site where on-site sewage services are proposed.

Figure 3: Percolation Test Hole



The procedures for obtaining a percolation rate are provided below:

Standard Percolation Test

1. A minimum of three percolation test holes are required and shall be located in the proposed area for the disposal system. One test hole shall be located at each end of the disposal field and the third should be located equidistant between the other two test holes.

2. (a) The standard test shall be conducted as follows:

   (i) An excavation shall be made in the soil which shall have the following dimensions:

   - a diameter of 30 cm;
   - a depth equal to the distance between the ground level and the bottom of the proposed absorption trenches (to a maximum of 91 cm).

   (ii) All loose material or smeared clay shall be removed from the sides and bottom of the excavation and the bottom of the excavation shall be covered by 5 cm of coarse sand or fine gravel.

   (iii) Clear water shall be poured into the excavation to a depth of at least 30 cm.

   (iv) Additional clear water shall be added as necessary to maintain a depth of water of at least 30 cm until the soil has swollen and becomes saturated so that the water being added seeps away at a constant rate; that is, two consecutive readings for a 2.5 cm (1 in) drop. The variance for a 2.5 cm (1 in) drop should not exceed 2 minutes. Once this rate has been reached, the hole should be filled to the 30 cm level and the time recorded for the water level to drop one inch.

(v) Thereafter, the time required for the water to drop 2.5 cm (1 in) shall be observed. This time expressed in minutes is the percolation rate "t".

(b) The need to saturate the soil as described is to simulate the conditions to be found in the soil surrounding the trenches in a leaching bed. The time required for this saturation depends not only on the type of soil but also on when the test is commenced. For example, clay soils, if dry, will absorb considerable moisture before saturation is reached and overnight soaking or longer will be required. In coarse sands and gravels, if it is impractical to saturate the soil (because the water seeps away too fast to be measured), a "t" of 5 minutes may be taken.

(c) The percolation rate for the disposal area shall be determined by averaging the slowest rate determined for each of the test holes.

4.5 Slope

Slopes should not be greater than 30%.

Building lots with slopes in excess of 30% are unacceptable for conventional on-site sewage treatment systems. Such slopes present a high risk of sewage effluent breakout. Where excessive slopes exist, the land must not be developed unless measures are taken to reduce the slope below 30% to mitigate the breakout risk. This will generally require the importation or redistribution of soil. Installing an absorption field across the slope is also recommended.

There are several common methods of reporting slope:

1. **Percent of Grade (%)**: metres (feet) of vertical rise or fall in 100 metres (feet) horizontal distance.
2. **Slope**: ratio of vertical rise or fall to horizontal distance.
3. **Angle**: degrees and minutes from horizontal.
4. **Topographic Arc**: metres (feet) of vertical rise or fall in 20 metres (66 feet) horizontal distance.
5. Other interpretable description/means.

The combination of an acceptable average percolation rate, corresponding soil conditions and an acceptable slope, together with all other minimum requirements being met, should produce a site suitable for an on site sewage disposal system and water supply system.

4.6 Site Upgrading

It may be determined during the course of the evaluation that a site, as it exists, is unacceptable. Often, such a site may, with modification, be upgraded to an acceptable standard. In this case, the extent and details of the modification must be presented with the design data accompanying the application. If the modifications involve raising the site to accommodate an absorption field, a percolation test must be performed, at the source, on any soil to be imported and that information must be included with the application. Part A3.4 (**Components of a Submission**) of these *Standards* provides the requirements for filled sites, under the twelfth requirement.

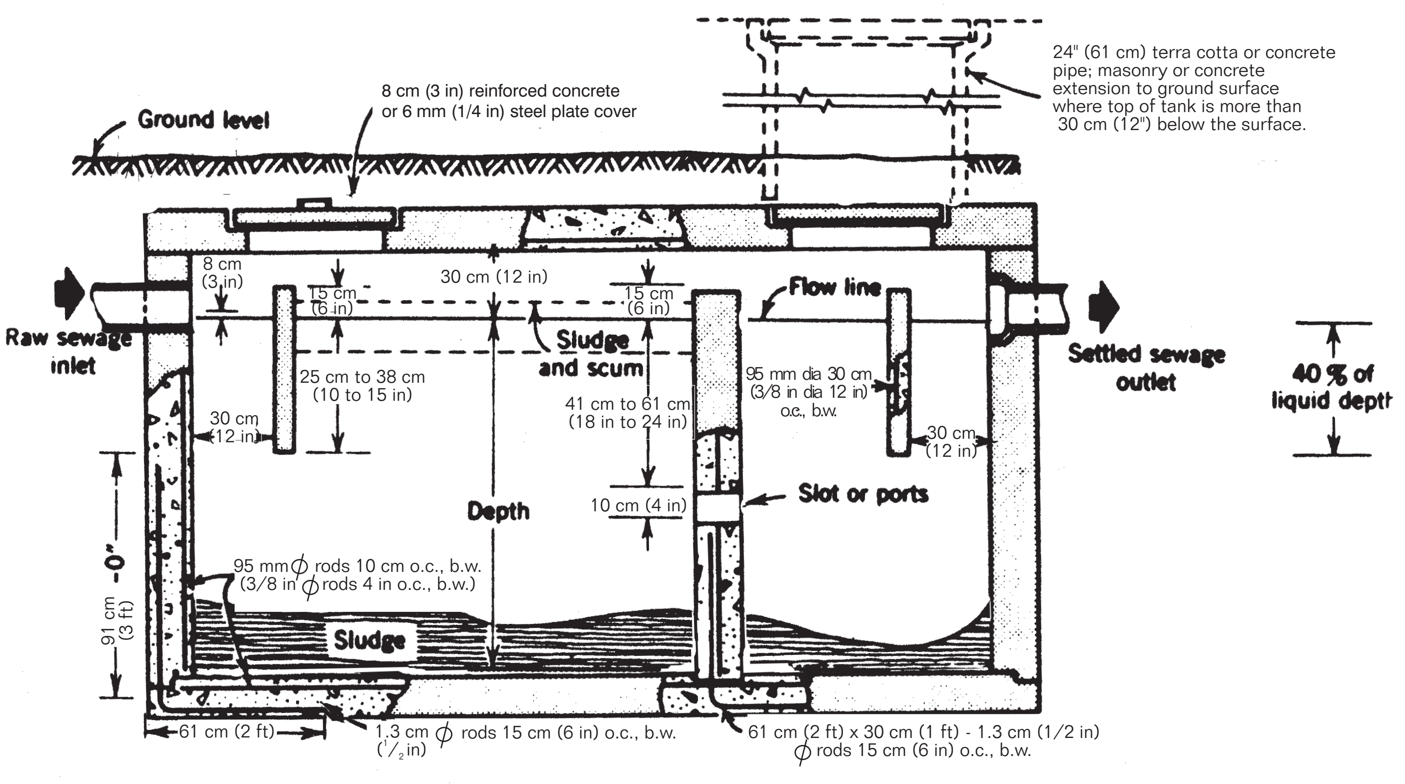
Percolation rates of soil to be imported must be provided. Percolation rates must be done before being imported to the building lot site.

Section B

1. SEPTIC TANK STANDARDS

A septic tank shall be a component of all private sewage disposal systems (see Figure 1). With the exception of grey water, all household effluent is to discharge into the septic tank. Part 10 provides additional information on grey water disposal.

Figure 1: Septic Tank Dimensions



NOTE: Outlet pipe of septic tank must be a minimum of 5 cm (2 in) lower than inlet pipe.

Eaves trough drainage or other non-household sewer must not discharge into the septic tank or other part of the septic system.

1.1 Construction/Installation Requirements

All septic tanks shall:

1. not be located under a driveway, parking lot or roadbed.

2. have a minimum liquid (working) capacity of 2,300 litres.

3. have space in the top of the tank equal to:
   - 20% of the liquid depth in the case of tanks having vertical sides, and
   - 15% of the total circle in the case of the horizontal cylindrical tanks.

4. be watertight and made of concrete, synthetic materials, metal, or other approved materials.

5. have an inlet and outlet at least 10 cm in diameter with the crown of the outlet 5 cm below the crown of the inlet.

6. have an open top inlet tee or baffle extending 15 cm above and 30 cm below the liquid level.

7. have an open top outlet tee or baffle extending 15 cm above and 41 cm below the liquid level.

8. have inlet and outlet pipes angled to prevent them from resting against baffles and retarding flows.

9. have at least one opening for each compartment with each having a minimum area of 0.1 square metre.

10. where two-compartment tanks are used, have the liquid volume of the first compartment 2/3 the total liquid volume.

11. have a minimum of 30 cm of suitable soil cover. The depth of the septic tank is dependent on the topography of the property and the absorption field.

12. be installed with care and caution when various styles/types of CSA tanks are used (i.e. plastic).

13. be connected to the structure by a building sewer consisting of 10 cm approved rigid sewer pipe. The minimum grade for the building sewer is 1 cm/metre.

14. be level when installed.

15. be manufactured/constructed in accordance with Canadian Standards Association Standard (CAN/CSA - B66-M90), as updated.

16. be provided with the following minimum separation distances:

Table 1: Separation Distances from Septic Tanks

Object	Separation Distance
Buildings	1 metre
Property Boundaries	3 metres
Dug Wells and Springs	30 metres
Drilled Wells	16 metres (Well Drilling Regulations, 2003)
Embankments	3 metres
Water Service Lines	4.5 metres
Surface Water	30 metres

WARNING

The natural treatment processes in septic tanks produce toxic gases, including methane and hydrogen sulphide. These gases can kill you very quickly. Never enter a septic tank and be careful when looking into one. Septic tank pump-out contractors can inspect your tank for you after the regular sludge pump-out.

From the National Plumbing Code: “. . . steeper slopes and higher velocities will help to keep pipes clean by moving heavier solids that might tend to clog pipes.”

1.2 Septic Tank Sizing

1. Size - Residential:

The determination of septic tank size for residential dwellings is based on the number of bedrooms proposed for the dwelling and assumes full occupancy of two persons per bedroom. Table 2 provides the liquid capacity for septic tanks based on the number of bedrooms in the proposed residence.

Table 2:
Septic Tank Dimensions for Dwelling Units
Rectangular Tanks

COL.1	COL. 2	COL. 3		COL. 4		COL. 5		COL. 6		COL. 7	
NUMBER OF BEDROOMS	MAX. NO. PERSONS	LIQUID CAPACITY		INSIDE WIDTH		INSIDE LENGTH		LIQUID DEPTH		MIN. TOTAL DEPTH	
		L	G	MM	IN	MM	IN	MM	IN	MM	IN
3 or less	6	2300	500	1010	40	1900	75	1200	47	1550	61
4	8	2900	640	1100	43	2200	87	1200	47	1550	61
5	10	3540	780	1100	43	2300	91	1400	55	1700	67

L - LITRES G - IMPERIAL GALLONS MM - MILLIMETRES IN - INCHES

NOTE 1: Where the number of bedrooms exceeds 5, an additional 450 litres (100 imperial gals.) of capacity must be added for each additional bedroom.

NOTE 2: Dwelling units with an apartment must have a minimum septic tank size of 4546 litres (1000 imperial gals.).

2. Size - Commercial:

For nonresidential uses, the septic tank size is determined by multiplying the total daily sewage flow, as determined by the Unit Sewage Flow Table (Table 3), by 1.5.

Septic Tank Size

Residential: Based on # of Bedrooms

Commercial: Based on Daily Sewage Flow Multiplied by 1.5

Table 3: Daily Sewage Flows for Various Types of Commercial Establishments (Unit Sewage Flow Table)

Type of Establishment	Unit	Litre/Day	Imperial gallons per day
Apartment Buildings	Person	340	75
Transit Dwelling Units			
Hotels	Bedroom	340	75
Lodging Houses and Tourist Homes	Bedroom	270	59
Motels and Tourist Cabins	Bedroom	270	59
Camps			
Trailer Camps (private bath)	Person	340	75
Trailer Camps (central bath, etc.)	Person	230	51
Luxury Camps (private bath)	Person	340	75
Children's Camps (central bath, etc.)	Person	230	51
Labour Camps	Person	180	40
Day Camps - No Meals	Person	70	15
Restaurants (including washrooms)			
Average Type (2 X Fire Commissioner's Capacity)	Patron	70	15
Bar and Cocktail Lounges (2 X Fire Commissioner's Capacity)	Patron	25	6
Short Order or Drive-in Service	Patron	25	6
Clubhouses			
Residential Type	Person	340	75
Non-Residential (serving meals)	Person	160	35
Institutions			
Hospitals	Person	900	198
Other Institutions	Person	570	125
Schools			
Elementary (no shower or cafeteria)	Person	50	11
With Cafeteria	Person	70	15
With Cafeteria and Showers	Person	90	20
With Cafeteria, Showers, and Laboratories	Person	115	25
Boarding	Person	340	75
Theatres			
Theatre (indoor)	Seat	25	6
Theatre (drive-in with food stand)	Car	25	6
Automobile Service Stations			
No Car Washing	Car Served	23	5
Car Washing	Car Washed	340	75
Miscellaneous			
Stores, Shopping Centres, Office Buildings	$metres^2$	6	1.32
Factories (8-hour shift)	person	115	25
Self-service Laundries	wash	230	51
Bowling Alleys	alley	900	198
Swimming Pools and Beaches	person	70	15
Picnic Parks (with flush toilets)	person	50	11
Fairgrounds (based upon average attendance)	person	25	6
Assembly Halls	seat	25	6
Airports (based on passenger use)	passenger	15	3.3
Churches	seat	15	3.3
Beauty Parlours	seat	200	44
Barber Shops	seat	75	17
Hockey Rinks	seat	15	3.3

2. ABSORPTION FIELD STANDARDS

All **Absorption Fields** shall consist of:

A. a **distribution box**; and

B. either:
- **sub-surface absorption trenches**; or
- **seepage** or **leaching pits** (limited for use on existing residences).

2.1 Distribution Boxes

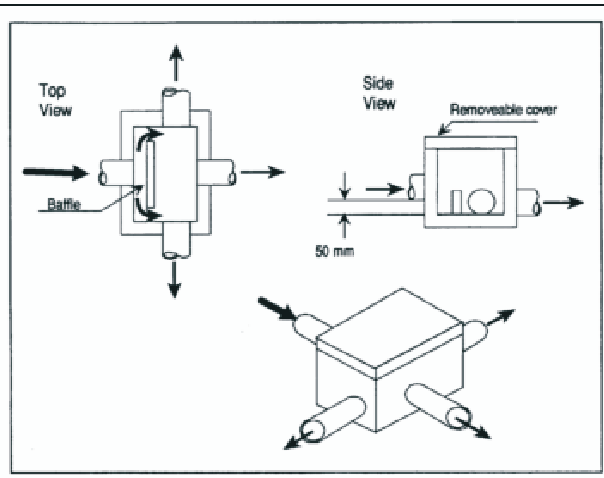
All **Distribution Boxes** (see Figures 2 and 3) shall:

1. be rigidly constructed;

2. be watertight to prevent infiltration;

3. be constructed of concrete, plastic, fibreglass, metal* or other approved materials;

4. *metal distribution boxes shall be constructed of steel or other approved metal, with a minimum thickness of 3 mm and be primed and painted with a protective rust coating on both the exterior and interior;



TYPICAL DISTRIBUTION BOX DETAILS

Figure 2: Distribution Box Details

5. be equipped with a removable cover, which, in the case of plastic, fiberglass and/or metal, is folded on either side to fit over the distribution box;

6. have inlets and outlets equipped with fittings or flanges to accept pipework and provide an easily sealable joint;

7. have outlets flush with the interior walls of the box;

8. have all outlets at the same elevation to permit even flow of sewage effluent;

9. be of various sizes depending on the number of outlets leaving the box;

10. have outlet pipe openings spaced a minimum of 10 cm apart to protect the integrity of the box;

11. have the crown of the inlet 5 cm higher than the crown of the outlets;

12. have outlets and inlet sized to accept 10 cm diameter pipe;

13. have a gravel fill or footing below the box, extending below frost, to help keep the box level;

14. be installed to insure that all disposal lines receive equal flow of sewage effluent;

15. be connected to the septic tank via a solid sewer line diameter of 10 cm equipped with sealed joints;

16. be equipped with an outlet for each trench or disposal line.

DISTRIBUTION BOX
(Examples)

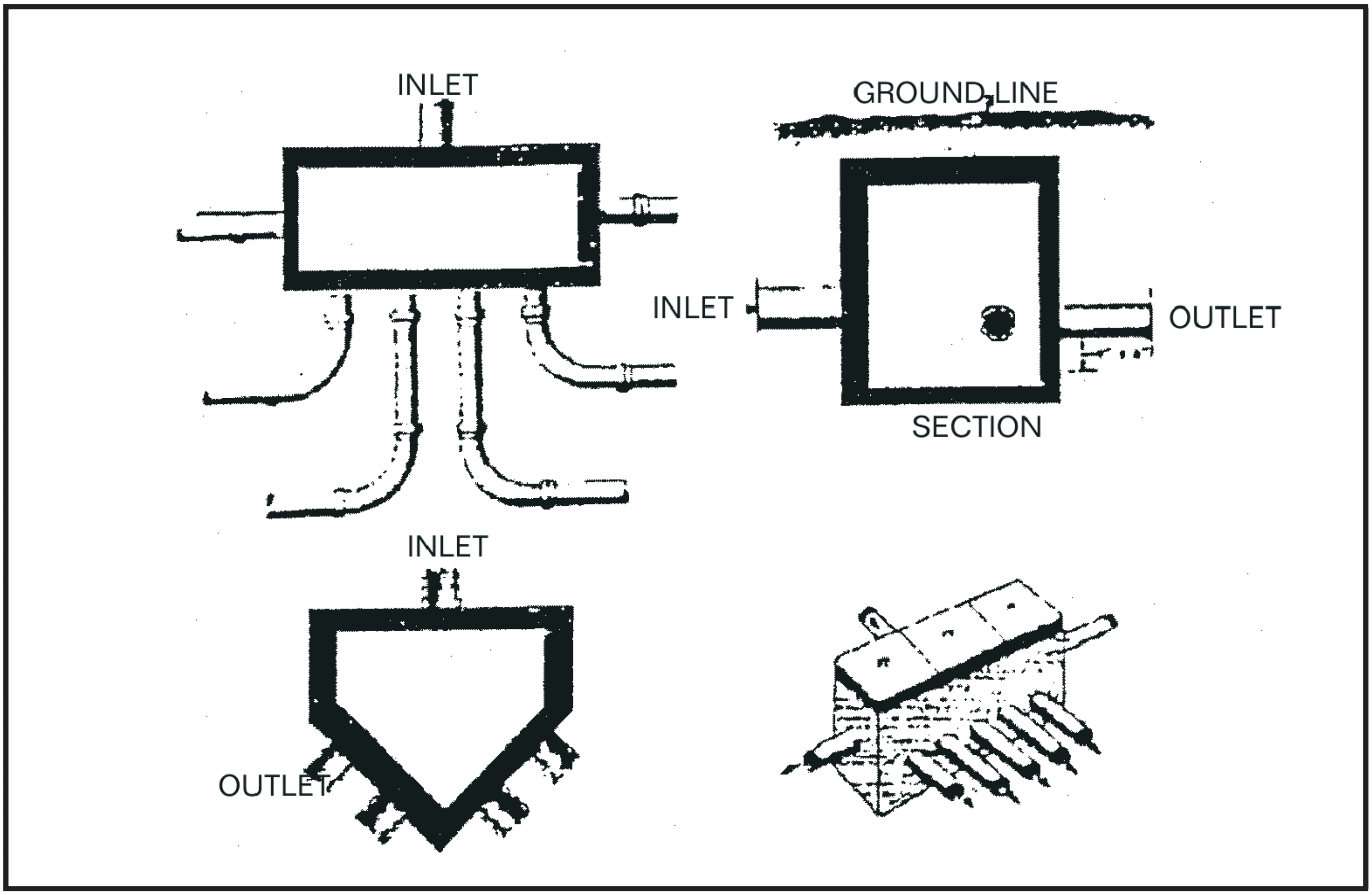


Figure 3: Examples of Distribution Box

2.2 Absorption Trenches

1. Residential Dwellings

The total size of the absorption trenches for residential dwellings, including cottages, is determined by:

- the **percolation rate;** and
- the **number of bedrooms.**

The system, however, shall not be less than the following for a:

- single dwelling unit: **60 metres** of perforated pipe
- cottage: **45 metres** of perforated pipe

The rates obtained from percolation tests conducted on the proposed site are to be averaged to provide an average percolation rate. This rate is applied to the appropriate range in Table 4 opposite the corresponding number of bedrooms for the residence.

For example, if the average percolation rate was five minutes per 2.5 cm (5 minutes/inch) and a three bedroom house was proposed, the minimum required length of absorption field would be 45 metres (150 ft). However, the minimum size of absorption field for residences of three bedrooms and above is 60 metres (200 ft). Therefore, the length of the absorption field would be 60 metres (200 ft).

Forty-five metre trench lengths indicated in Table 4 apply only to cottage lots.

Table 4: Absorption Trench Sizing Based on Bedrooms and Percolation Rate

NUMBER OF BEDROOMS	PERCOLATION RATE - MINUTES TO DROP 2.5 cm (1 inch)															
	1-5 MINUTES		5 - 10 MINUTES		10 - 20 MINUTES		20 - 30 MINUTES		30 - 40 MINUTES		40 - 50 MINUTES		50 - 60 MINUTES		> 60 MINUTES	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
2 or less	45	150	45	150	55	180	67	220	76	250	90	300	110	360	unsuitable	
3 or less	45	150	60	200	90	300	110	360	120	400	137	450	150	500	unsuitable	
4 or less	55	180	76	250	110	360	137	450	150	500	168	550	198	650	unsuitable	
5 or less	67	220	90	300	130	430	160	525	186	610	207	680	230	755	unsuitable	
6 or less	80	260	110	360	160	525	192	630	222	730	250	820	270	890	unsuitable	

NOTE

For dwellings with greater than 6 bedrooms, 15 metres (50 ft) of perforated pipe will be added for each additional bedroom.

2. Residence With Apartment

In a dwelling unit with an apartment, the total number of bedrooms in the primary residence, plus the total number of bedrooms in the apartment unit, must be utilized to determine the total length of absorption trenches. For example, consider a 3 bedroom residence with a 2 bedroom apartment.

Three (3) bedrooms @ 10 - 20 minute percolation rate = 90 metres (300 ft)

Plus (+)

Two (2) bedrooms @ 10 - 20 minute percolation rate = 55 metres (180 ft)

For a total absorption trench length = 145 metres (475 ft)

3. Duplexes

The two units of a duplex shall be considered separate and will require their own septic system. The septic tank and absorption field sizes for each unit of the duplex shall be based on the tables:

- *Table 2 - Septic Tank Dimensions for Dwelling Units - Rectangular*; and
- *Table 4 - Absorption Trench Sizing*.

4. Commercial Buildings

The absorption requirements for commercial building sites will be determined by the anticipated **daily sewage flow** from Table 3 and the **percolation rate** utilizing the formula presented on the following page.

$$L = 0.011\,Q\sqrt{T}$$

Where:

L = total length of the distribution pipe(metres);

Q = total daily sewage flow in litres;

T = percolation rate (minutes).

The minimum total length of absorption trenches for commercial sites shall not be less than 60 metres.

5. Absorption Field Construction/ Installation Requirements

1. All septic tank and soil absorption systems shall have the following grades:

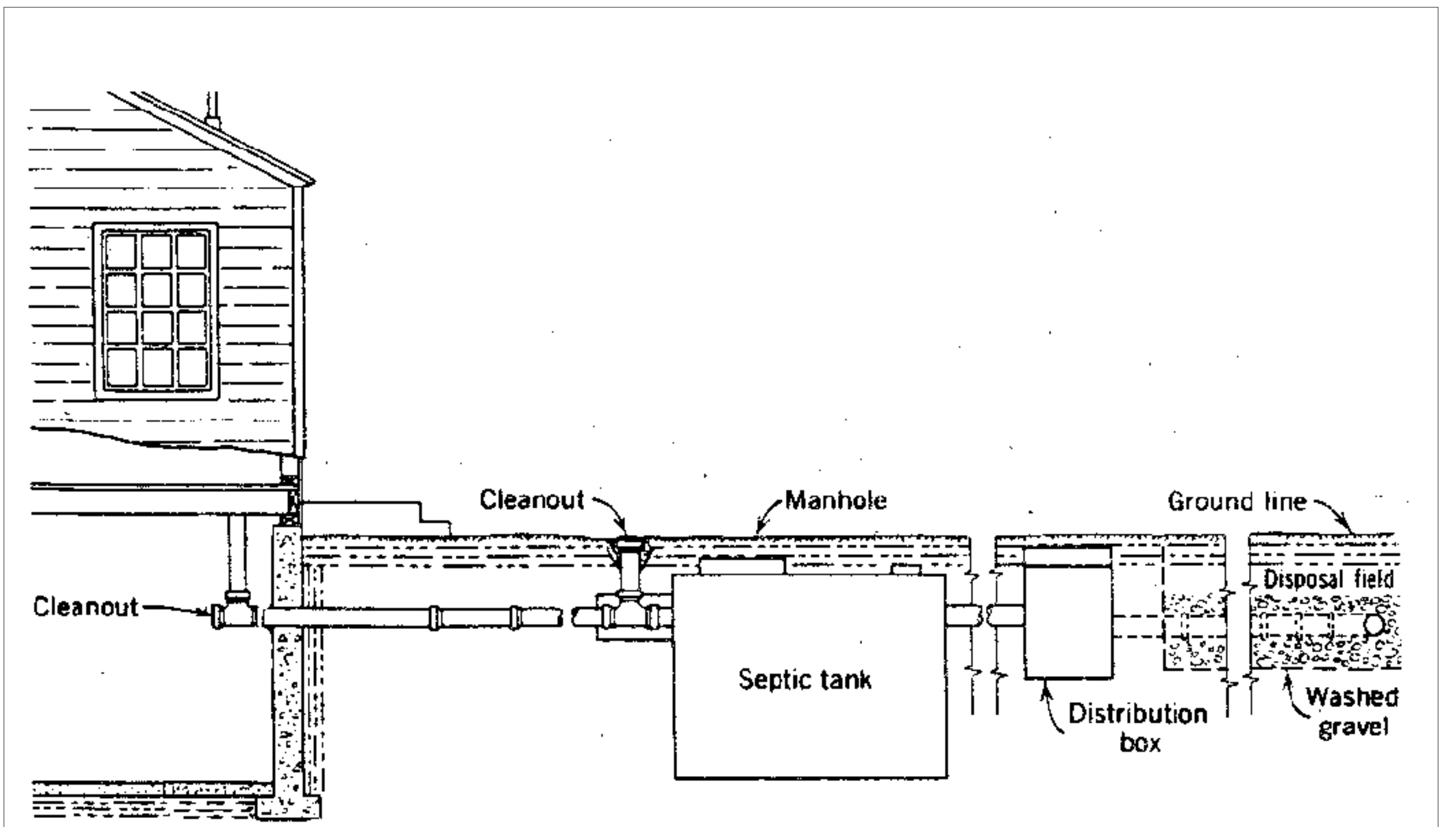
   i) building sewer: minimum grade 1 cm per metre (1/8" per foot);

   ii) pipe from septic tank to distribution box: minimum grade 1 cm per metre (1/8" per foot);

   iii) perforated pipe in absorption trenches: maximum grade 5 cm per 15m (2" per 50 foot).

2. The bottom of absorption trenches shall be at least 1 metre above the water table, rock or impervious soil formations.

Figure 4: Sewage Disposal System - Cross-Section



3. All absorption trenches shall:

A. have a total effective absorption area which shall be determined by the soil percolation rate (see Table 3);

B. have 10 cm diameter approved perforated rigid sewer pipe to convey sewage through the trenches;

C. have the ends of each pipe line interconnected by solid pipe or capped;

D. have stone in trenches overlaid with untreated building paper or other suitable material which will prevent clogging but not inhibit evapotranspiration;

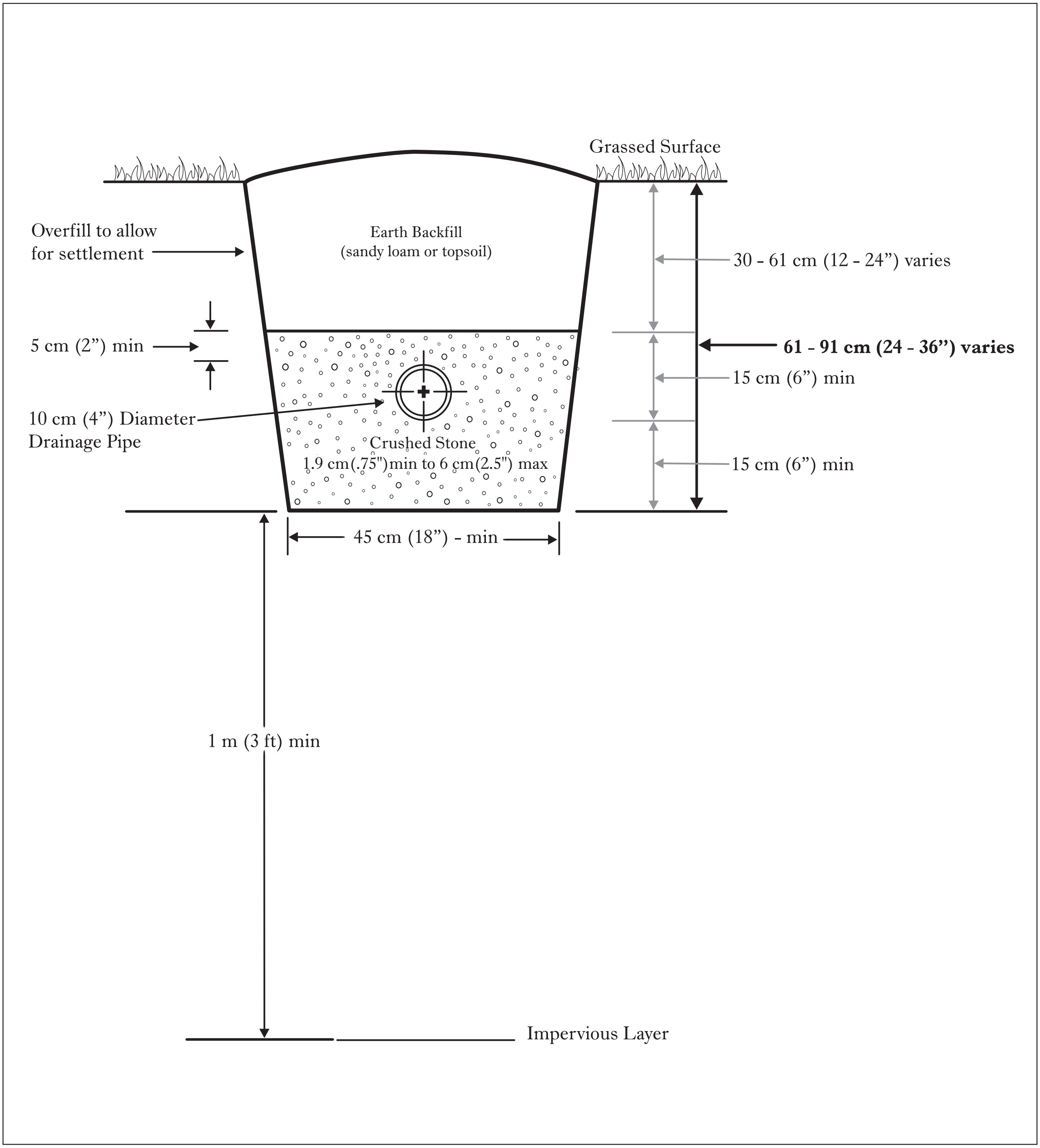
E. have stone that is clean and free of fine material, used for the bottom of the trenches;

F. be constructed in accordance with the following **dimensions** as in Table 5 (Also, see Figure 5):

Table 5: Absorption Trench Dimensions

ITEM	DIMENSION	
	Minimum	Maximum
Trench Width	46 cm	61 cm
Trench Depth	61 cm	91 cm
Trench Length	———	30 m
Separation Between Trenches	1.8 m	———
Size of Crushed Stone	1.9 cm	6 cm
Depth of Crush Stone Below Pipe	15 cm	———
Height of Crushed Stone Above Pipe	5 cm	———
Inside Diameter of Pipe	9 cm	———

Figure 5: Absorption Trench (Cross-Section)



G. have the following minimum **separation distances**:

Table 6: Absorption Trench Separation Distances

Object	Distance
Buildings	6 m
Property Boundaries	3 m
Dug Wells and Springs	30 m
Drilled Wells	16 m *(Well Drilling Regulations, 2003)*
Surface Water	30 m
Embankments	4.5 m
Water Service Lines	7.5 m
Driveways	3 m
Water Table: minimum distance to bottom of trench	1 m

2.3 Dosing Device

When the calculated absorption field length is 150m (500 ft) or greater, a dosing device shall be provided with a discharge 70% to 75% of the total volume of the absorption field pipes. This may be accomplished with either a bell syphon (see Figure 6), or a lift station (submersible) pump (see Figure 7).

When equipped with a lift station, the pump shall be equipped with an alarm light to indicate malfunction.

The force main between the lift station and the distribution box shall be either high density polyethylene (HDPE), with butt-fused joints, or ductile iron pipe with mechanical joints.

NOTE

When determining separation distances between absorption trenches and inland water courses, the distance shall be taken from the seasonal (e.g., spring) high water mark.

"Surface water" includes all bodies of water such as lakes, streams, ponds and wetlands.

Figure 6: Septic Tank with Siphon

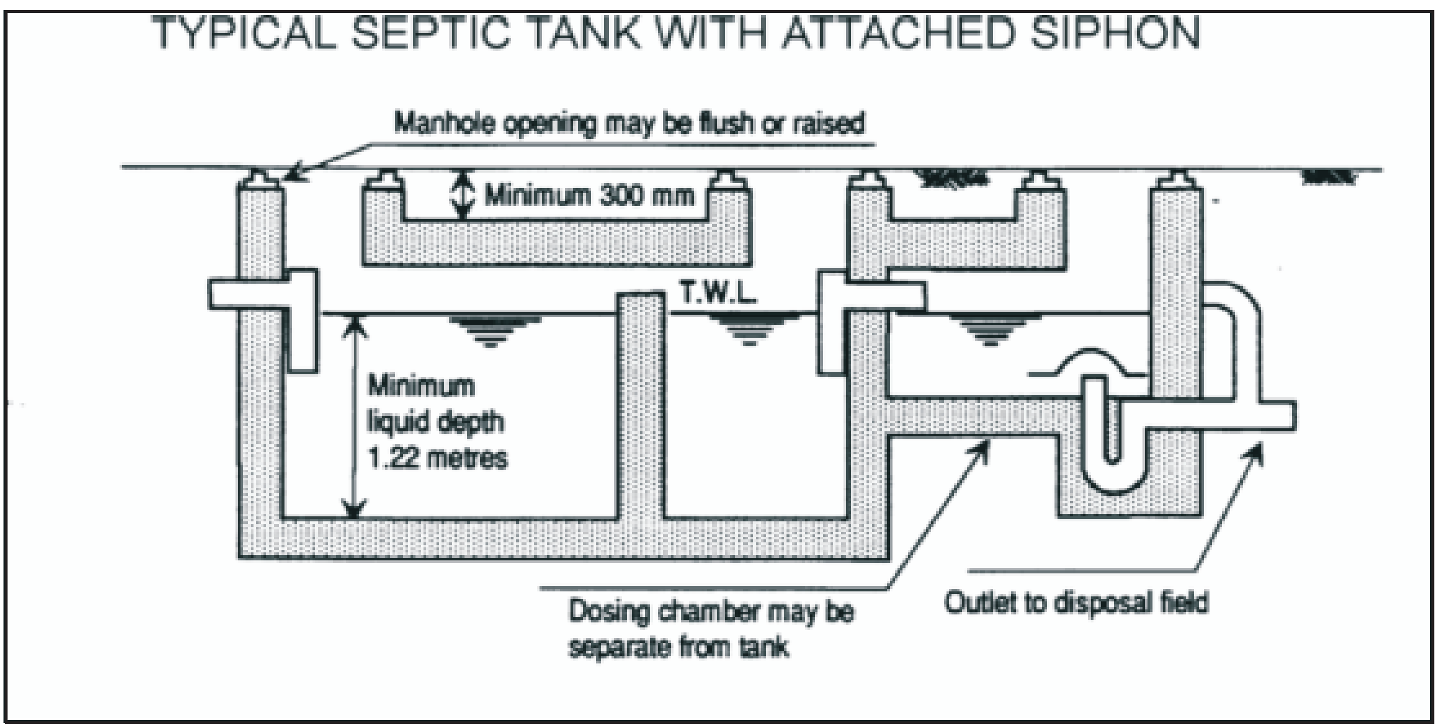
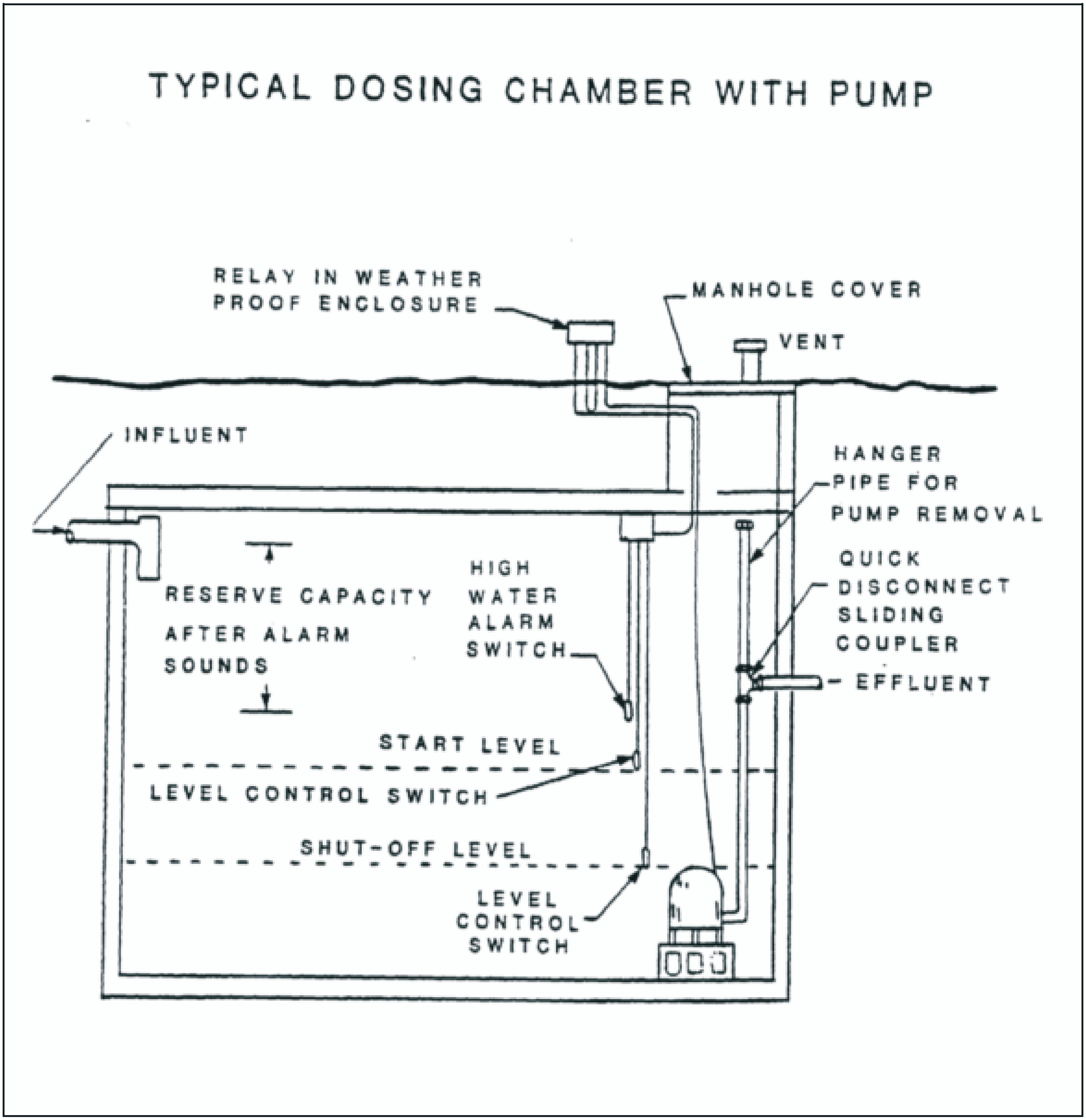


Figure 7: Dosing Chamber with Pump

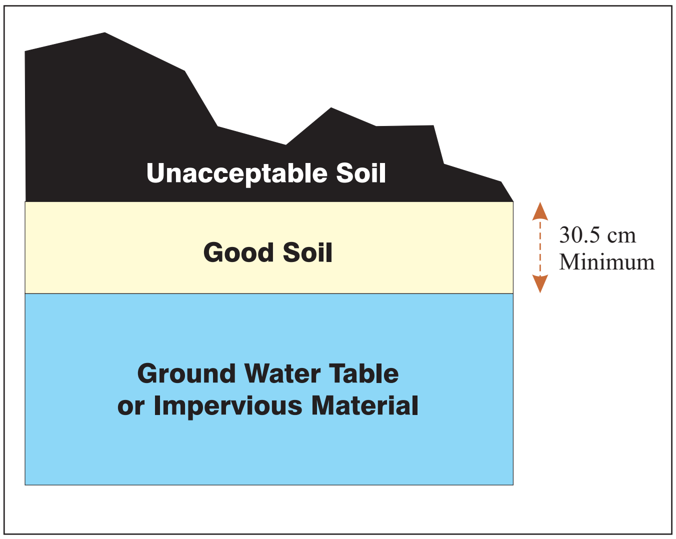


3. FILL SYSTEMS

3.1 Description

Fill systems may be used on sites where there is a minimum of 30.5 centimetres of good soil overlying the ground water table or impervious layer (see figure 8).

Figure 8: Acceptable Soil Profile for Fill



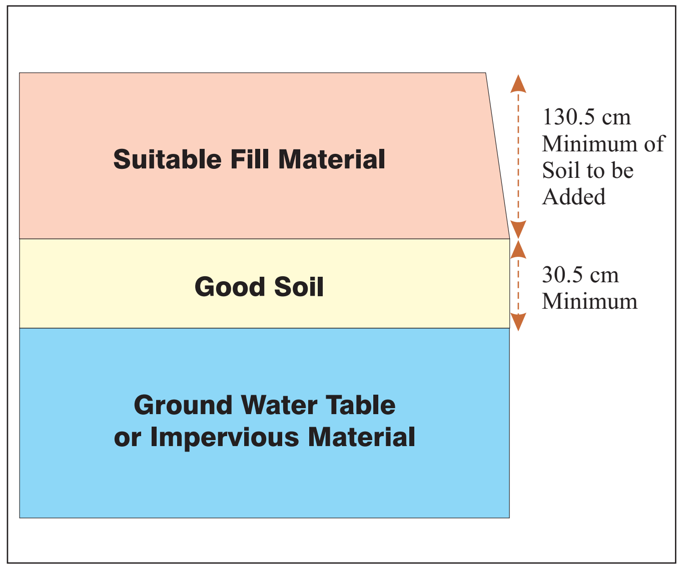
If the depth from the top surface of the underlying sand or sandy loam to the seasonally high water table or impervious layer (e.g., bedrock) is inadequate to construct an absorption field, any unacceptable soil above the sand or sandy loam may be stripped away and replaced with a sandy fill material to provide unsaturated soil.

Where the depth of good soil is **greater** than 30.5 centimetres, the addition of suitable sandy fill material must be enough to total a depth of at least 161 centimetres overall.

Where the depth of good soil is 30.5 centimetres, the minimum allowed, a minimum of 130.5 centimetres of suitable sandy fill material must be added to ensure that:

- there is adequate soil for the installation of absorption trenches; and
- the bottom of the absorption trenches is not within one (1) metre of the water table or impervious material (see figure 9).

Figure 9: Fill to be Added for Absorption Trench with a 61 m Depth



3.2 Site Considerations

The use of **fill is restricted to sites where unsuitable surface soils may be stripped away without damaging underlying acceptable soils**. Therefore, fill is limited to sites where the underlying soils are sands or sandy loams and the **seasonally high water table or impervious material (e.g., bedrock) is not within 30.5 cm (1 foot) of the sand or sandy loam surface.**

Once the fill is in place, the site must meet all the site and soil criteria required for absorption trench systems.

3.3 Design

Since fill systems differ from trench only in that they are constructed in a filled area, the design of fill systems is identical to trench systems. The only unique features are the sizing of the area to be filled and the fill selection.

A. Sizing of the Filled Area

A minimum separation distance of 4.5 metres between the sidewalls of the absorption trenches and the edge of the filled area should be maintained. This distance allows for sidewall absorption and lateral movement of the wastewater.

If a perched water table condition occurs in the surface soils that are to be moved, provisions should be made to prevent this water from flowing into the filled area. Curtain drains, perimeter drains or barrier trenches may be necessary up slope or around the filled area to remove this water.

B. Fill Selection

The fill material should be similar in texture to the underlying sand or loamy sand. The backfill material used to cover the system should be finer textured to shed surface runoff. It may be the original soil that was removed.

3.4 Construction

Care should be exercised in removing the unsuitable soil prior to filling to prevent excessive disturbance of the sandy soil below. The machinery should always operate from areas that are not excavated. The top few inches of the sand or sandy loam soil should be removed to ensure that all the unsuitable soil is stripped.

The exposed surface should be harrowed or otherwise broken up to a depth of 15 cm prior to filling. This eliminates a distinct interface forming between the fill and the natural soil that would disrupt liquid movement.

A. Settling of Fill

Once the fill has been placed, construction of the absorption system can proceed as for trenches in sands. However, if the fill depth is greater than 120 cm, the fill should be allowed to settle before construction begins. This may require a 3 to 12 month period for settling to occur naturally. To avoid this delay, the fill can be spread in shallow lifts and each mechanically compacted. This must be done carefully, however, so that layers of differing density are not created. The fill should be compacted to a density similar to the underlying natural soil.

Fill should be dumped to one of the surfaces on which it is to be placed and pushed over this area in layers and compacted so that the equipment is at all times running on the fill rather than the soil on which it is placed such that compaction is performed in layers of not more than 10 cm.

B. Other Requirements

Other requirements that should be adhered to when considering a site for fill include the following:

- demonstrate a T-rate for fill to be between 5 - 20 min;
- the fill material should follow the general slope of the natural ground;
- when the depth of fill material exceeds 61 cm, the disposal trenches must be 3 m apart;
- on-site mixing of soil is not recommended;
- grass all filled surfaces;
- do not construct an absorption field, or place fill, when the soil is too wet;

- if an area is leveled for the construction of an absorption field using imported fill, the surface of the soil on which the fill is to be placed should be scarified prior to fill placement;
- the bottom and side walls of trenches excavated in cohesive soils should be roughed (e.g. raked) prior to placement of the stone layer;
- the barrier placed on top of the stone layer must effectively prevent soil particles from entering and plugging the voids in the stone during and after backfilling. The standards require a layer of untreated building paper, or other like material to form the barrier;
- light tracked equipment is recommended;
- stone used in absorption trenches should be free of fine material.

3.5 Operation and Maintenance

The operation and maintenance of fill systems are identical to trenches constructed in sands.

NOTE

Approved Designers are responsible for percolation tests performed on fill used in fill systems, The soils on which the percolation tests are performed are expected to be used on the building site for which the sewage system design submission has been made. If Contractors use soils other than the soils that demonstrated satisfactory percolation tests on the design submission, then the respective Certificate of Approval is null and void.

4. SEEPAGE OR LEACHING PITS

Seepage pits may be substituted for absorption trenches for:

i) existing structures with limited land area where an improvement is made; or system corrected and/or a pollution problem is solved;

ii) remote sites where absorption trench installation is not feasible or possible;

iii) temporary systems where long term use is not anticipated.

4.1 Construction/Installation Requirements

A. The bottom of a seepage pit must be a minimum of 1 m above ground water table.

B. The effective absorption area of a seepage pit should be equivalent to the effective absorption area of absorption trenches.

C. Seepage pits should be of a dry wall construction; however, in high traffic areas where percolation rates are exceptional, a rock filled pit may be considered.

D. The minimum separation distances for seepage pits shall be the same as those for absorption trenches.

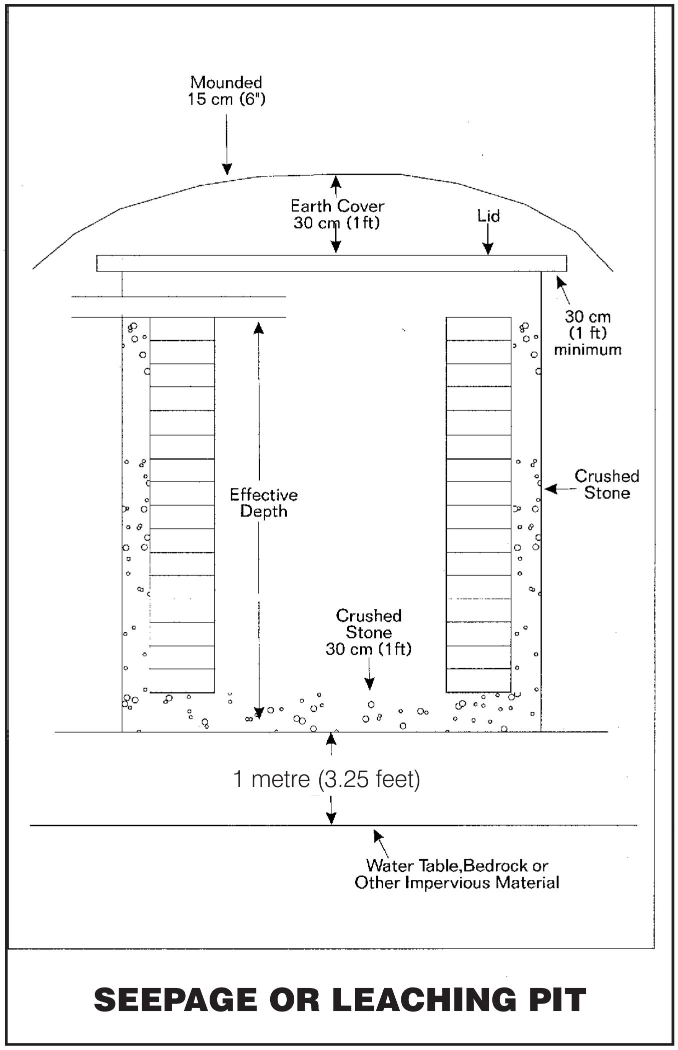
E. Where more than 1 pit is recommended, a distribution box must be used.

4.1.1 Dry Wall Constructed Pit

This is a wall pit with rock, brick or block (see figure 10). The following standards apply to dry wall constructed pits:

1. Ensure 1.5 cm spacings between brick or block.
2. Fill behind entire wall with crushed stone.
3. Place stone to a depth of 30cm on floor of pit.
4. Cover pit with minimum 10 cm concrete lid, steel or other similar strength material.
5. Lid is to rest on undisturbed ground around pit and not on the wall.
6. Pit is to be suitably covered with earth to prevent freezing.
7. Influent pipe should enter pit just under lid.
8. Ensure all pipe joins are leakproof.
9. Earth around the perimeter to be mounded at least 15 cm above surrounding ground level and whole area graded to divert surface water away from the pit.

Figure 10: Dry Wall Constructed Seepage Pit

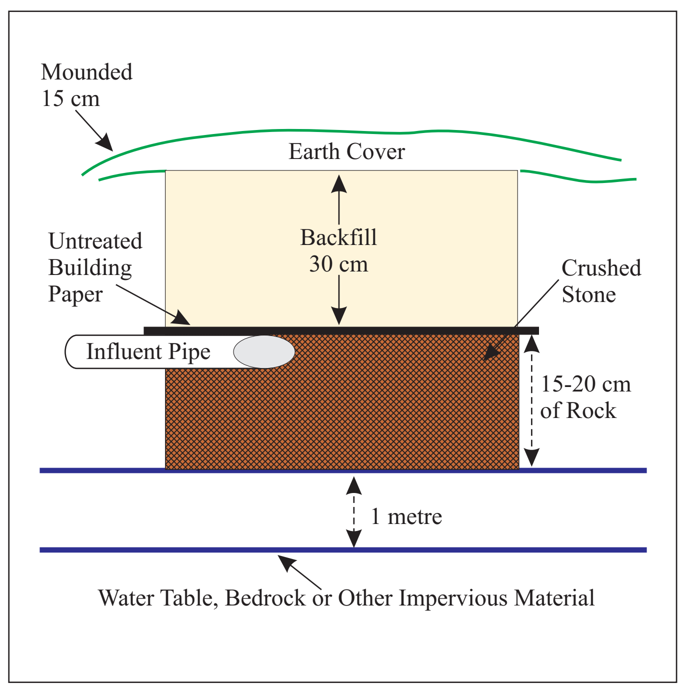


4.1.2 Rock Filled Pit

A rock filled pit (see Figure 11) may be used for areas of traffic where safety is an issue, provided percolation rates are 5 minutes or less. The following construction requirements apply:

1. Fill pit with 15-20 cm (6-8 in) of rock.
2. Level surface of larger rock with crushed stone.
3. Overlay crushed stone with untreated building paper or other suitable material which will not inhibit evaporation.
4. Backfill pit to a depth of 30 cm (1 ft).
5. Influent pipe should enter the pit just under the overlay material.
6. Earth around the perimeter is to be mounded at least 15 cm (6 in) above surrounding ground level and the area graded to divert surface water away from pit.
7. Ensure all pipe joins are leakproof.

Figure 11: Rock Filled Seepage Pit



5. OCEAN OUTFALLS

A septic tank and ocean outfall may be considered by an Environmental Health Officer only after:

- ! the building lot is deemed not suitable for a subsurface sewage disposal system; and
- ! this method of sewage disposal is common practice in the area.

A site would be considered unsuitable if the assessment identifies:

- ! poor soil conditions,
- ! unacceptable percolation rates,
- ! impervious material near surface and other topographical features that are problematic.

A building lot with a septic tank and ocean outfall is considered to have an on-site sewage disposal system. If the lot with the ocean outfall has on-site water services (e.g., drilled well) then the lot would be considered to be un-serviced. If the lot has off-site water services (e.g., municipal water) then the lot would be considered to be semi-serviced.

Due to the *Sanitation Regulations* limiting on-site sewage disposal approvals to daily sewage flows of less than 4546 L/day, a maximum of two residential dwellings units can be connected to a single ocean outfall under the authority of the *Sanitation Regulations*. Daily sewage flows greater then 4546 L/day are approved under the authority of the *Water Resources Act*, Department of Environment and Conservation.

Where an ocean outfall is being considered, contact should be made with the Licensing and Administration Division, Aquaculture Branch, Department of Fisheries and Aquaculture to determine if the proposed ocean outfall may interfere with existing or proposed/planned aquaculture developments.

5.1 Construction Requirements

1. A septic tank should not be located under a driveway, parking lot or roadbed.

2. The pipeline or effluent line must:

   (a) be solid, non-perforated pipe and be a minimum of 10 cm in diameter.

   (b) be constructed of approved pipe which may include PVC and ABS.

   (c) have sealed watertight joins.

   (d) be a minimum of 7.5 m from a drilled well and 16 m from any shallow well or surface drinking water supply. Where the above distance cannot be met, the sewer pipeline may be passed nearer provided any joins are watertight. In no case may a sewer pipeline pass within 3 m of a drilled well or 6 m of a dug well.

   (e) be a minimum of 7.5 m from any fresh water body. Where this distance cannot be met, the sewer pipeline may pass nearer provided the line is double piped with watertight joins.

   (f) be encased in concrete, constructed of cast iron or equivalent (e.g., “road grade” pipe) when crossing through a road bed, driveway or parking lot.

   (g) be a minimum of 1 m from any building or structure.

   (h) have a clean-out installed for every 30 m of linear pipe.

   (i) have a minimum slope of 1 cm per metre.

   (j) be so installed as to prevent freezing.

3. The ocean outfall must:

(a) discharge into salt water beyond the low tide mark.

(b) be protected from disruption by sea and/or sea action by either anchoring to the sea bottom or cribbing with rock or other suitable material from the beginning at high water mark to the end beyond low water mark.

(c) not be extended into a salt water estuary, barachois, river mouth or any area of low minimal tidal action/flushing.

(d) not be extended into any shellfish harvesting or conservation areas.

(e) not be extended into a recreational beach area.

In an area where the beachfront is sandy or where tidal action is such to disrupt cribbing or anchorage at low tide, the sewer outfall may empty into a buried, properly constructed dry well or exfiltration pit.

5.2 Legal Easements

A legal easement must be obtained where:

(a) the sewer pipeline is proposed to cross through property not owned by applicant.

(b) the sewer pipeline crosses through a public road.

The legal easement must be in the form of a written contract (or deed) between the applicant and the other property owner.

6. PIT PRIVIES

Pit privies (see Figures 12, 13 and 14) should not be placed in boggy or marshy areas or areas where soil is minimal and bedrock is largely exposed.

6.1 Construction Requirements

1. The pit must be at least 1 m X 1 m square and 1.5 m deep.

2. The bottom of the pit must be 1 metre above the groundwater table, bedrock and or other impervious material.

3. Pit privies must be provided with **minimum separation distances** as follows:

Table 7: Pit Privy Minimum Separation Distances

Item	Separation Distance
Buildings	7.5 m
Property Boundaries	4.5 m
Embankments	4.5 m
Drilled Wells	16 m *(Well Drilling Regulations, 2003)*
Dug Wells or Springs	30 m
Lakes, rivers, streams, etc.	30 m
Water Table or Bedrock: minimum distance to bottom of pit	1 m

4. (a) Pit privy structure must be made of strong durable weather-proof materials.

   (b) The floor must be solid and supported by a sill.

   (c) The privy must be equipped with one or more seats having close fitting covers supported by an enclosed bench.

   (d) The privy should be equipped with a self-closing door and at least one screened window for ventilation.

   (e) The bench or riser and floor should be watertight and fly proof so that flies and other pests do not have access to the pit contents.

   (f) A ventilation duct, screened at the top, should extend from the underside of the bench to a point above the roof.

   (g) Sides of the privy pit should be braced to prevent collapse.

   (h) The ground around all privies should be graded to keep surface water away from the pit.

Figure 12: Sanitary Pit Privy

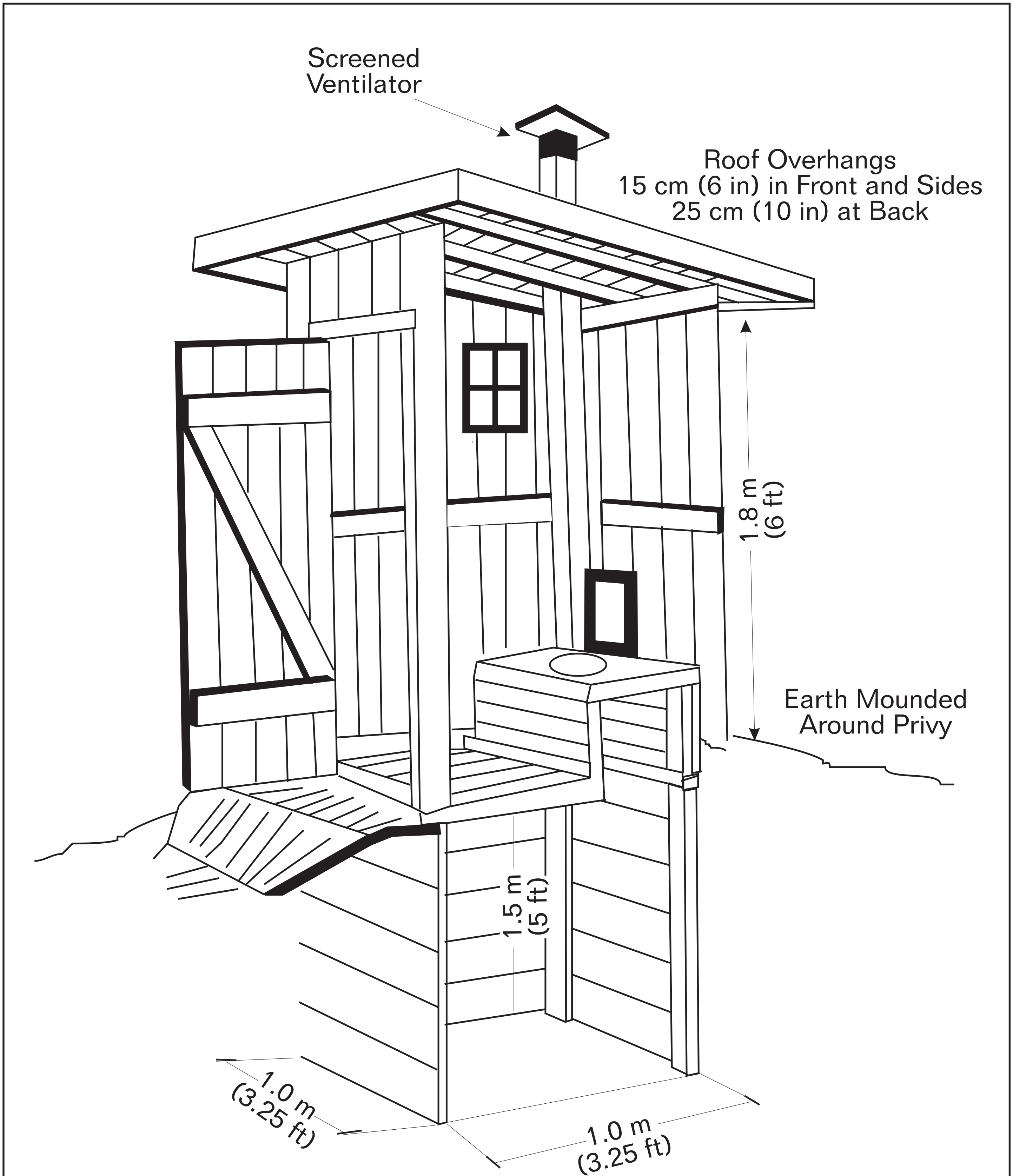
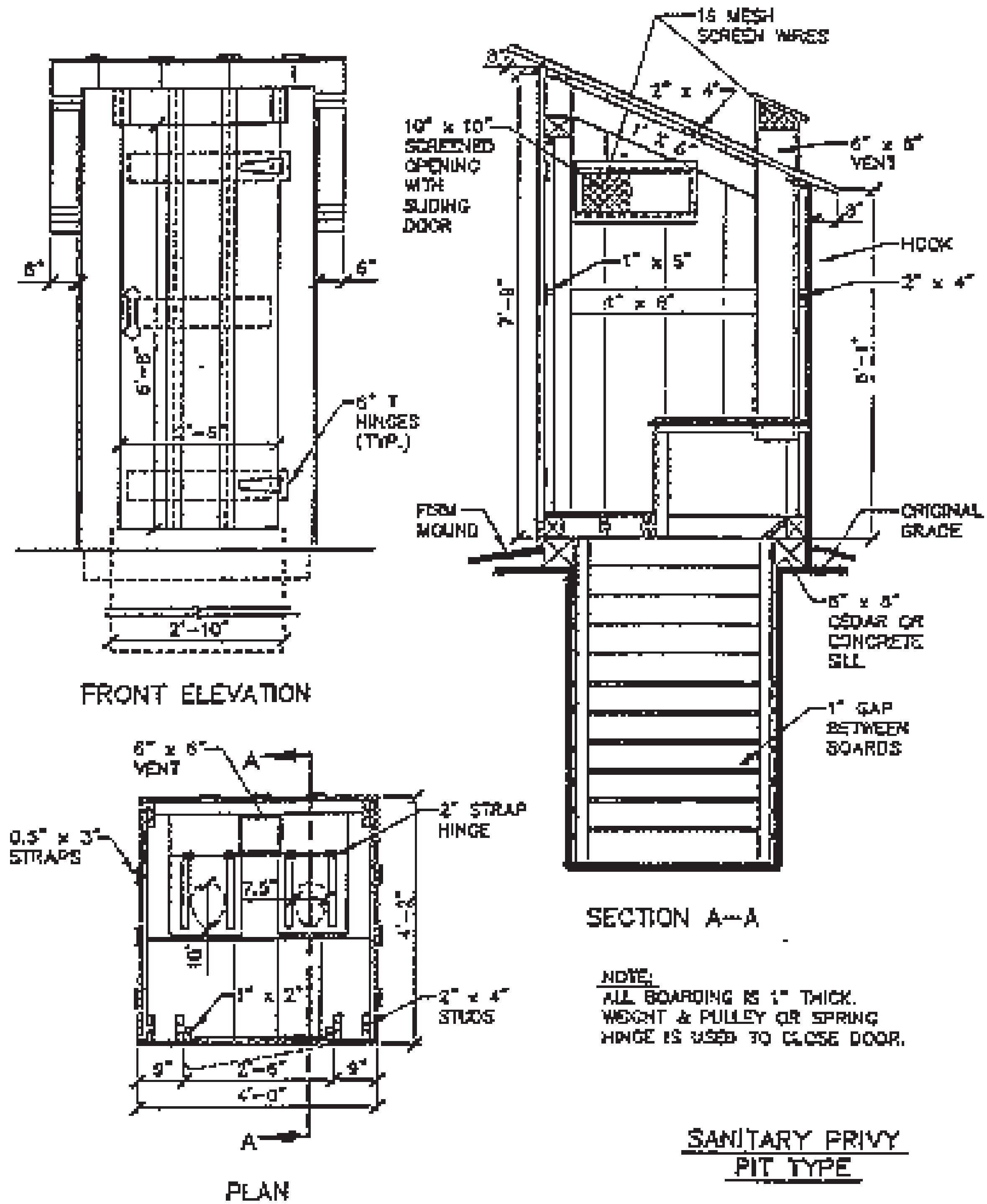


Figure 13: Sanitary Pit Privy



7. VAULT PRIVY

A **vault privy** (see figure 14) is a sealed privy with an impervious lining. A vault privy is for use in areas where the groundwater table is near the surface of the ground.

7.1 Construction Requirements

1. **Vaults** should be:

   (i) constructed of concrete and be watertight.

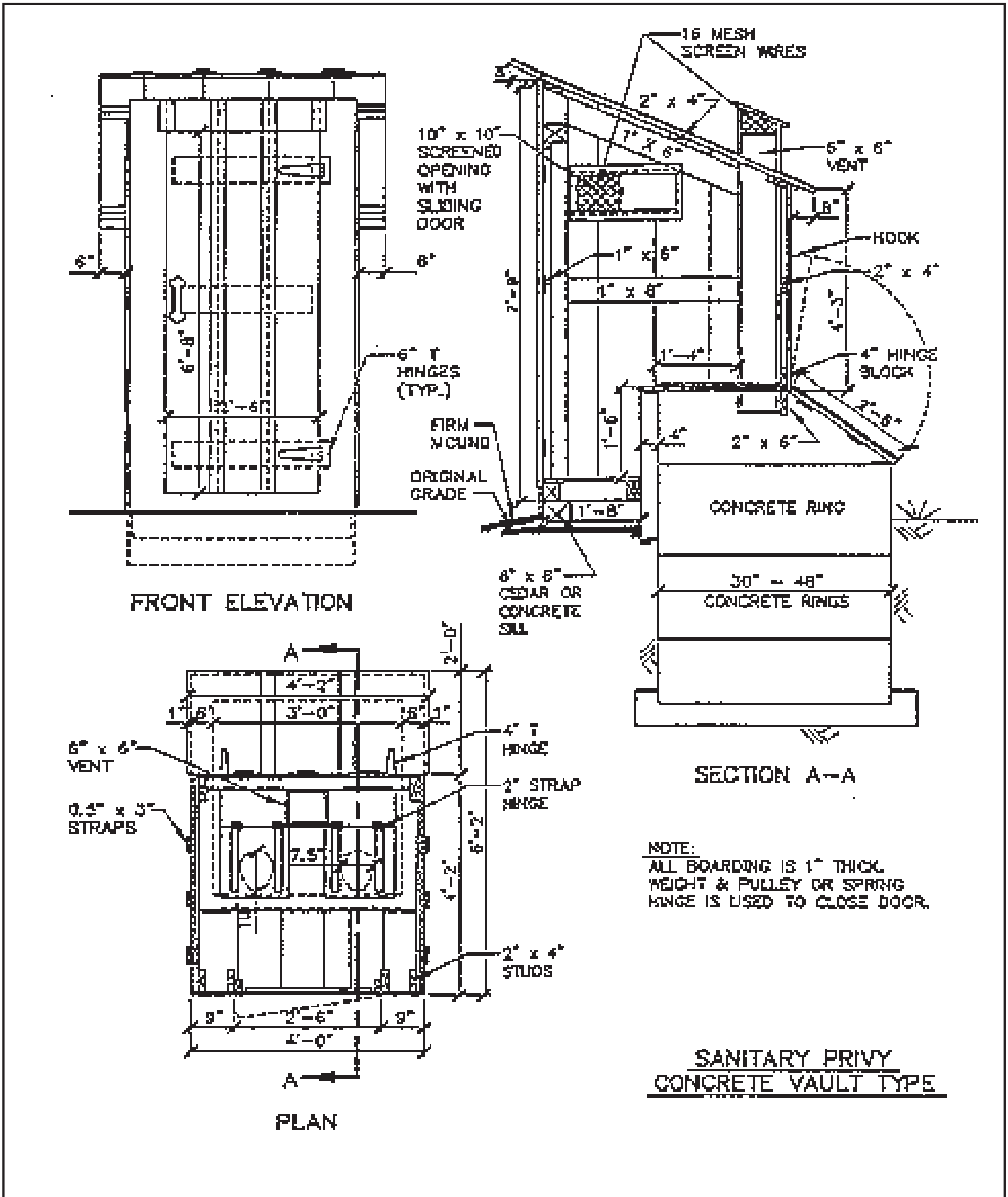
   (ii) have a capacity to contain a minimum of 1.5 m^3 of waste.

   (iii) equipped with a readily accessible clean-out door designed to prevent access by flies, animals and surface water.

2. **Vaults** should be pumped out on a routine basis and waste contents disposed of at an approved waste disposal site.

A copy of a written agreement with a licenced sewage waste hauler should be submitted to the Government Service Centre before approval of the vault privy can be granted.

Figure 14: Sanitary Vault Privy

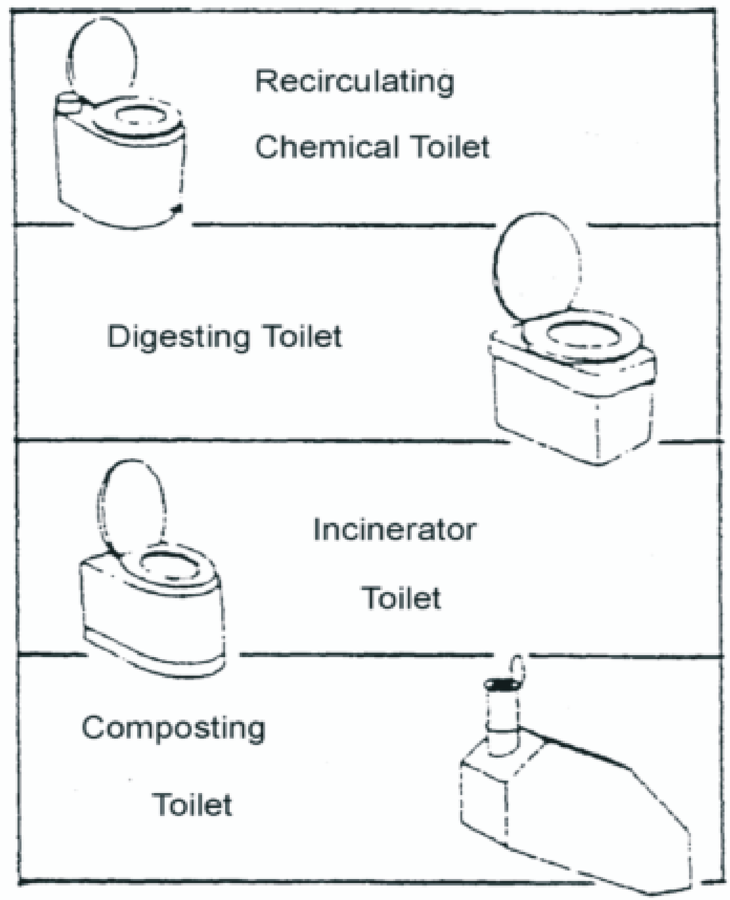


8. COMPOSTING, INCINERATING AND CHEMICAL TOILETS

Primary treatment can be avoided if individual house holds use special toilets for human waste and have separate grey water disposal systems (or a single, community, grey water disposal field).

Composting toilets function in the same way as a garden compost heap by decomposition. Incinerating toilets rely on electricity or gas to burn up solid matter and evaporate liquids. Chemical toilets use special liquids to deodorize and clean human waste. Composting and incinerating toilets are preferred over chemical units because chemical toilets need frequent maintenance and must be emptied frequently to a holding tank.

Figure 15: Examples of Toilets



Compost toilets, **chemical toilets** and **incinerator toilets** should be installed and maintained in accordance with manufacturer's instructions.

9. HOLDING TANKS

9.1 Construction Requirements

Holding tanks must be:

(i) sized to receive the amount of sewage produced between removals with an additional reserve.

(ii) structurally able to withstand all pressures and forces it may experience.

(iii) adequately anchored if above ground.

(iv) watertight, with all fittings and openings properly sealed.

(v) corrosion resistant.

(vi) approved under the *Sanitation Regulations* only if the daily sewage flow is estimated to be less than 4546 L/day.

9.2 Sizing Holding Tanks

The required **size of a holding tank** can be expressed by the equation:

$$Q = f \times q \times p$$

where:

Q = **size** of holding tank.

f = **safety factor** providing reserve capacity beyond established requirement.

q = **estimated total quantity of wastewater**, produced daily from the premises, based on types of facilities, habits and number of inhabitants.

p = **maximum normal period** of time between **emptying** of holding tanks expressed in days.

9.3 Disposal of Holding Tank Waste

Wastes from a holding tank should be disposed of at an approved dumping site/station.

10. GREY WATER DISPOSAL

Grey water sewage is sewage containing waste such as kitchen culinary waste, dishwashing waste and laundry waste. **Grey water sewage does not contain human body waste**.

A grey water pit shall receive or be used only for the disposal of sewage other than human body waste. The disposal of grey water wastes may be accomplished by the use of a grey water pit, providing proper soil conditions exist in the area where the grey water pit is to be constructed and, providing that water usage through the disposal system is limited.

Grey water pits provide a suitable system for disposing of grey water when the daily amount of such waste is small and site conditions are favorable. They are paired with pit privy systems in cottages where either, the water is hand carried or, the water system is pressurized and the connected fixtures are limited to a kitchen sink or handwash basins. Higher daily sewage flows soon overload a small grey water pit, or require pits of such proportion as to be impractical. In most areas where grey water pits are used the soil cover is limited. This further restricts their use in any situation but for low flows.

Grey water systems should not be used with pressurized water systems where showers, baths and water using appliances, such as washing machines and dish washers are installed.

With new construction, their use should be limited:

- to hunting cabins / remote cabins.
- to seasonally used cottages in which the connections to the water system are limited to such fixtures as the kitchen sink and hand basins.
- on a temporary basis, to serve a small construction or maintenance crew which moves on after a short stay in one location.

Should there be any likelihood of the owner, or subsequent owners, improving the property by connecting more water using fixtures or appliances, or by adopting all year occupancy, a greywater sewage system should only be approved initially if there is a suitable area on the property for the construction of a conventional subsurface sewage system, which may be required at a later date. With all but the most remote cases this requirement will be normal.

10.1 Construction Requirements

In order to provide for the proper disposal of grey water sewage, a grey water pit (see figure 16) should meet the following requirements:

(i) Have sufficient effective sidewall area to allow grey water to infiltrate into the surrounding soil.

(ii) The bottom of the pit must be a minimum 0.6 metres above the maximum elevation of the ground water and 0.6 metres above any impervious stratum.

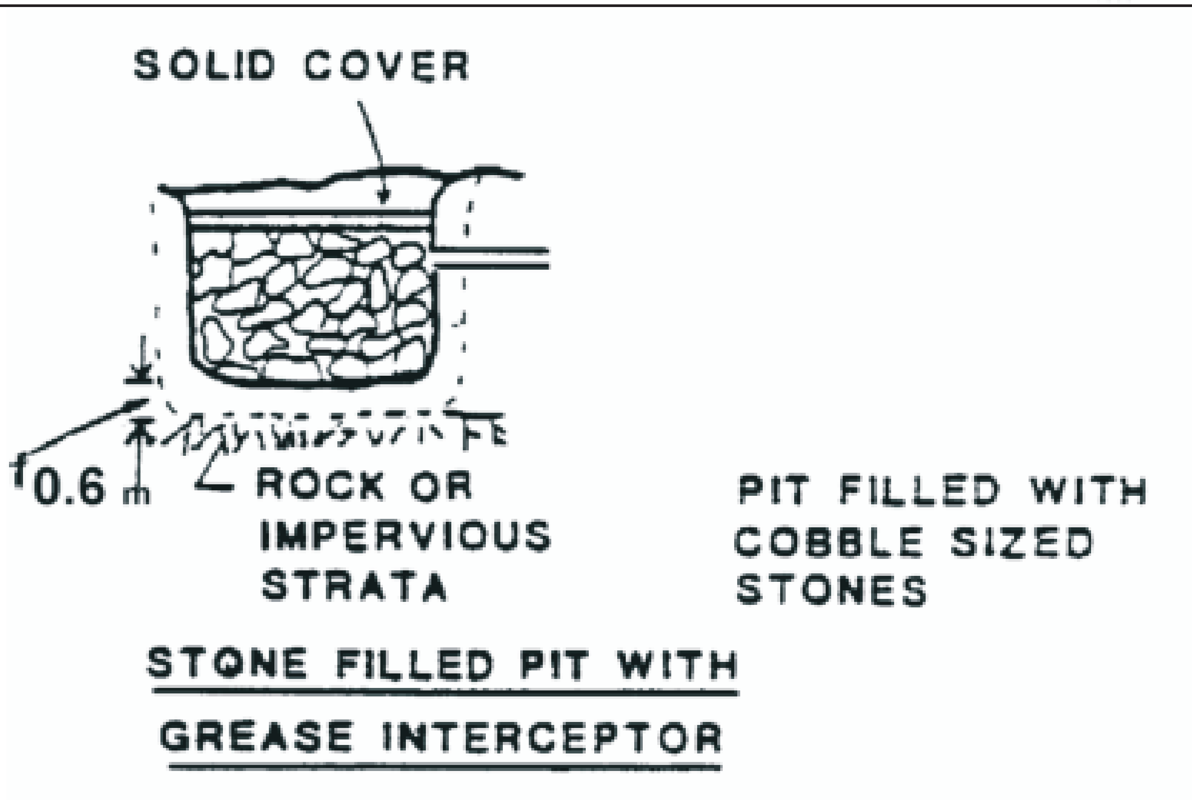
(iii) The sides of the pit must be constructed in such a manner as to prevent their collapse, and be lined with open jointed material which will permit leaching from the pit.

(iv) Have a tight, strong cover.

(v) Earth around the top should be mounded a minimum of 0.15 metres to prevent surface run off from entering pit.

(vi) The pit must be surrounded on all sides by sufficient earth to prevent surface breakout of effluent. In no instance is there to be less than 0.6 metres of surrounding soil.

Figure 16: Grey Water Pit



11. DECOMMISSIONING SEPTIC SYSTEMS

11.1 Septic Tank and Distribution Boxes

During the decommissioning of septic tanks and distribution boxes, one of the following two options should be considered.

- The tank and distribution box are to be pumped out and removed; or

- The tank and distribution box are to be pumped out and filled with gravel or similar material.

If there is any spillage of tank contents during decommissioning, the area in question should be treated with lime.

11.2 Absorption Fields

Absorption fields (trenches) may be left in the ground (in situ) when they are no longer of any use.

NOTE

A copy of a written agreement with a licenced sewage waste hauler must be submitted to the Government Service Centre if a letter of approval for the decommissioning is to be considered.

12. WATER SERVICE HOOK-UPS

The following standards apply to water service hook-ups in relation to on-site sewage disposal systems.

1. Water mains must not pass within 15 m of any part of an absorption field.

2. Water service lines for individual dwellings may pass within 7.5 m of an on-site sewage disposal field, provided that:

   Either (a) there is no join in the service between the dwelling and the connection to the water main; and

   (b) ground water levels will not be above the service line for extended periods of time; and

   (c) the service line is not downslope of a sewage disposal field on slopes greater than 6%, in the case of soils with percolation rates slower than 60 minutes per 2.5 cm (60 minutes per one inch), or slopes greater than 12% in the case of soils with percolation rates faster than 60 minutes/2.5 cm.

   Or (d) the water service line runs up slope of the disposal field; and

   (e) the water service line's elevation is above that of the disposal field piping.

If the above conditions a, b and c, or, d and e, cannot be met, then the water service line may not pass within 7.5 m (25 ft) of a sewage disposal area, unless the water service line is double piped and without joins for a distance which ensures required separations. In no case will a water service line pass within less than 3 m (10 ft) to the closest part of a sewage disposal field.

NOTE

An issue has arisen on a number of occasions where municipalities have installed new water and sewage services to replace on-site subsurface sewage systems on a property and the new water line has gone through the decommissioned absorption field. When this situation occurs, the following should be considered:

- **the contractor should ensure that all waterlines are disinfected before the new water line is commissioned;**
- **the contractor should ensure that worker health and safety are protected while working in an area with effluent from a recently functioning absorption field.**

13. PRIVATE WATER SUPPLIES

13.1 Water Supplies

All onsite sewage system submissions must identify a water supply whether or not the supply is located on-site or off-site (e.g., municipal water supply). The location, type and construction of the on-site water supply must be approved by the Government Service Centre. Private water supplies are regulated under the authority of the *Sanitation Regulations* under the *Health and Community Services Act* and the *Well Drilling Regulations* under the *Water Resources Act*.

Generally, dug or drilled wells are utilized as sources of drinking water. Specific site conditions may dictate different requirements regarding the type and location of a well. Conditions on one site may be favourable to either a dug well or drilled well; another site may be restricted to the use of a drilled well. From a bacteriological point of view, a drilled well is the preferred source for drinking water.

Well construction and location are critical to ensuring a safe drinking water supply. Wells should always be located away from surface run-off and upgrade from potential sources of contamination. Surface drainage should be directed away from the well and the well should not be located in an area subject to flooding.

A Certificate of Approval is required from the Government Service Centre before you can start digging a new well. If a new septic system is part of your plans, then an Approved Designer will assess your land to find the best place for a well. Otherwise, you will need to contact an Environmental Health Officer (EHO).

A dug well should be a minimum of 3.6 metres in depth and be equipped with a water tight casing extending at least 3.0 metres below the surface, and 50 cm above. This ensures that any surface water or run-off would have to permeate through at least 3.0 m of soil before entering the well; a process which would filter out harmful organisms. Information on the sound construction features of a dug well are illustrated in Figure 17.

Well drillers in the Province must be licensed with the Department of Environment and Conservation and are required to maintain records for each well that is drilled.

13.2 Construction Requirements

One of the most important aspects of the design and construction of a well is that rain or runoff must be prevented from depositing bacteria into the well water. Figure 17 is an example of a properly constructed dug well. A dug well should meet all of these standards:

- dug above grade of all potential sources of pollution;
- at least 30 metres from any absorption field, privies, cesspools, or any livestock or barnyard areas. The wrong site for a dug well could make the well water unsafe for drinking. Thus it is important to follow the plan set by the EHO.
- the dug well should be at least 3.6 metres deep;
- the space from the bottom of the well up to the liner bottom should be lined with rock, or small boulders;
- a water-tight liner is needed for a depth of at least 3 metres with the liner reaching at least 50 centimetres above the surface of the ground;
- an overlapping, water-tight cover with a screened vent is needed (wooden covers should not be used as they harbour bacteria-carrying insects);
- the ground around the dug well should be sloped to direct surface water away from the well;
- dip buckets are not recommended as they can allow dirt and bacteria to enter a well;

- where the discharge line connection is made below ground, the connection should be made water-tight with a strong, non-toxic sealing material;

- the water service line should be about 1.5 metres below the surface to protect it from frost.

If the dug well is properly constructed and lies in a good location, it can provide clean, safe drinking water for many years. Homeowners should inspect their wells on a regular basis to ensure that:

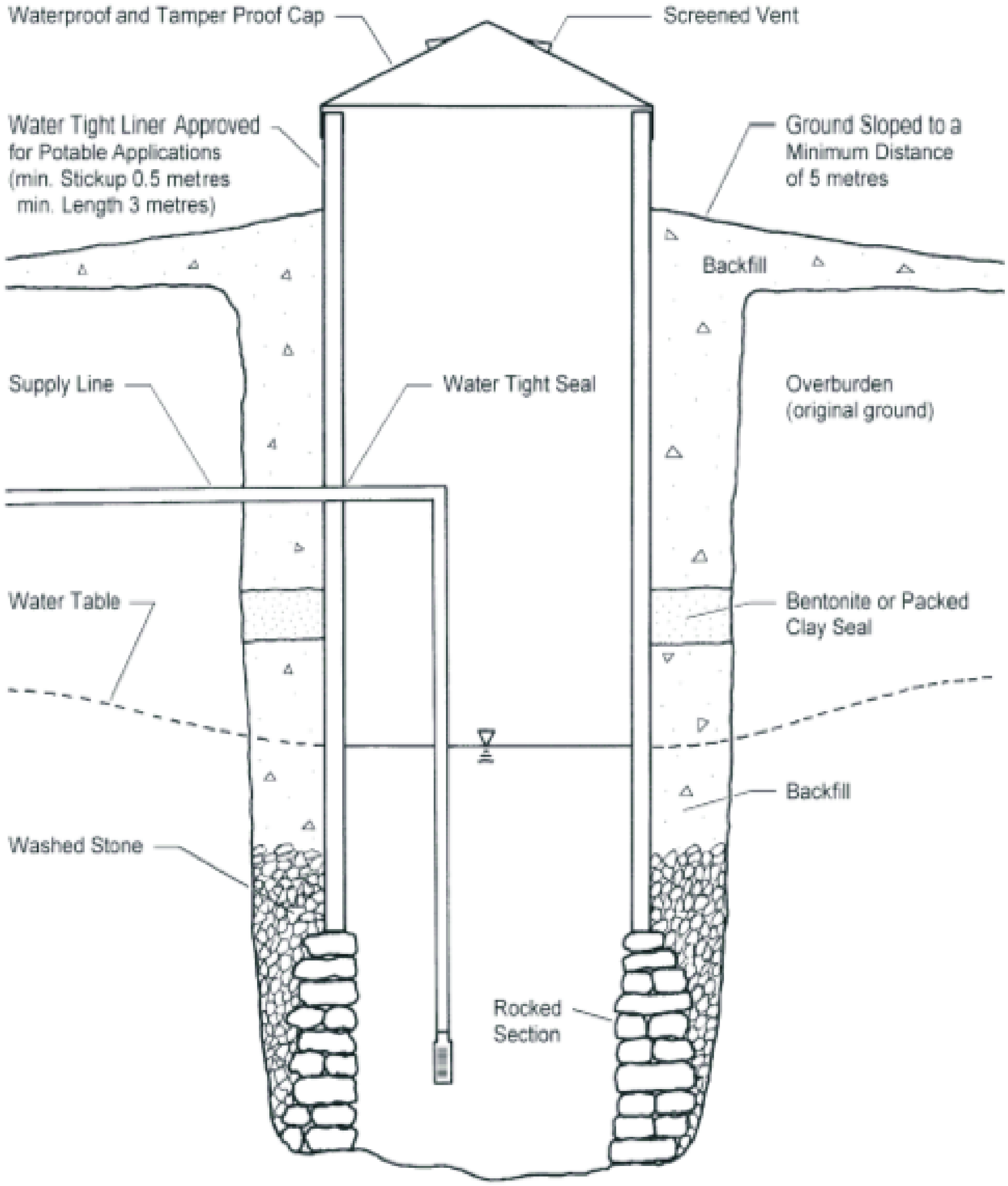
- the cover is secure;

- the vent screen is clear and intact; and

- there is no ponding of water around the well liner.

WELL POINTS
Because well points can be infiltrated by surface waters, they will be considered as dug wells for the purposes of separation distances.

Figure 17: Properly Constructed Dug Well



13.3 Water Quality Testing

The bacteriological quality of well water should be tested at least once a year, or after several months without use, just to ensure its safety. The well owner will be advised of the results and provided with instructions that may be needed if bacteriological concerns are identified. In addition to bacteriological testing, well owners should have the chemical quality of the well tested for any chemical problems such as high lead or arsenic content.

13.4 Well Liners/Casings

There are several different types of well liners on the market, such as concrete, PVC plastic, or steel. Please note that a galvanized steel liner may only be used in wells with a low water level, or in combination with an inner PVC or concrete liner, to prevent its contact with the water. If the steel liner does contact the water, it will rust over time and could put harmful metals into the well water.

13.5 Abandoned Dug Wells

Abandoned dug wells are a safety hazard for children and adults. They can also be a path for surface water to contaminate the local groundwater. This could make the water in nearby wells unsafe for drinking. To remove these health and safety hazards, abandoned wells must be filled in with clean, native fill material. In addition any exposed well liner must be removed.

13.6 Protection from Road Salt

When placing a well on a building site, consideration should be given to preventing contamination of the well by road salt.

Road salts enter surface water, soil and groundwater after snow melt, and are dispersed through the air by splashing and spray from vehicles and as wind-borne powder. This may result in unacceptable levels of chloride and sodium in well water.

Well water quality should be tested regularly.

14. BACKFILL INSPECTIONS

Environmental Health Officers (EHOs) will carry out inspections of sewage disposal systems prior to the system being backfilled.

The following items will be examined by the EHO to ensure compliance with the *Sanitation Regulations* and these *Standards*.

Item #	Items Description
1.	Slope of piping from dwelling to septic tank; tank to distribution box.
2.	Direction of septic tank; inlet and outlet distinction; septic tank level; presence of baffles or tees in tank.
3.	CSA-approved septic tank.
4.	Sizing of crushed stone in trenches.
5.	Appropriate piping (dimensions, perforated and solid).
6.	Sealant applied to all seals and joints.
7.	Distribution box level; constructed of satisfactory material; protective coating; cover suitable; effluent distributed evenly to all outlets.
8.	The configuration and length of the absorption field piping; separate header pipes from distribution box; ends capped or interconnected.
9.	Depth and width of trenches; amount of stone present; untreated building paper over stone; no evidence of ponding.
10.	All set back distances for the septic tank and absorption field.
11.	Other distances noted on the approved design; wells and points of contamination that may not have been noted on the design; topographical features that might not have been addressed in the design which may impact on the on-site sewage system.

14.1 Water Test

The EHO will perform a water test on the distribution box. The purpose of the water test is to check the flow of water through the installed box to verify that outlet elevations are even. The water test is described in the following manner.

Purpose
To check flow of water through the installed distribution box. To verify that outlet elevations are even.

Materials
Operational garden hose or two 23 litre buckets of water at the site of the installed sewage disposal system.

Procedure
By adding water to the distribution box an assessment of the outlet elevation and flow direction can be made. All outlets should receive equal discharge. Uneven outlets become obvious when the lower outlet(s) accept the water flow while the other pipe(s) remain dry.

Recommendations
If the distribution box fails the water test, the distribution box must be replaced with even elevation outlet settings, or the lip of the lower elevated pipe(s) to be blocked off with partial cover to raise water elevation and even flow. Pipes should not be blocked off more than ¼ of their diameter.

15. SEPTIC SYSTEM MAINTENANCE

15.1 General

With proper design, installation, attention and maintenance, a septic system should provide many years of trouble free service. However, overloading the system or failing to clean out the septic tank on a regular basis can lead to problems. There are a number of things an owner or operator of a septic system can do, or be aware of, that will help the system to function properly.

- Sewage disposal systems are not designed to handle garbage, food wastes, fats, disposable diapers, sanitary products, condoms, cigarette butts, or waste chemicals such as paint thinners, motor oil, etc. These should not be flushed into the septic tank.

  Washers should have manually cleaned lint traps. Garbage grinders should not be installed unless the septic tank was sized to

- The hydraulic load should be kept as low as possible and must not constantly exceed the design capacity. Leaking plumbing fixtures must be repaired, and the water should not run excessively. It is better to do one or two clothes washing machine uses every day rather than 10 on one designated weekly wash day. Also, hot tubs, whirlpool baths, etc. can cause excessive loading. Care should be taken to limit excessive use or a larger system is required. Further, low flush toilets using less than 1.5 gallons per flush will also reduce the hydraulic loading.

  Excessive use of water could lead to solids overflowing from the septic tank to the disposal field, greatly reducing its life expectancy. The running of water in winter to prevent water lines from freezing can seriously overload a system, as well as lowering the water temperature in the septic tank to a point where both the tank and disposal field can freeze.

- Surface water drainage and roof drains must direct water away from the septic tank and disposal fields.

- Facilities such as restaurants must have grease chambers. Grease chambers must be properly sized, placed ahead of the septic tank, and should be cleaned as required.

- Normal use of household drain solvents, disinfectants, and cleaners should not interfere with operation of the system. However, the excessive use of some solvents and disinfectants is not recommended. Oil, grease, paint thinners, etc., **should not be discharged to the septic system.**

- The area above a disposal field should have a good grass cover, but the planting of trees and shrubs is not recommended. Not only will tree and shrub roots plug the field, trees will tend to shade the area, lessening evapo-transpiration.

- If root plugging of the tile field does become a problem, the annual application of 1 to 1.5 kg of copper sulfate crystals should kill the roots. The crystals are flushed down the toilet, and when used in this manner will not normally disrupt operation of the septic tank. Care should be exercised in the application, however, as the solution is corrosive to copper, brass and chrome.

- The amount of household and kitchen fats and greases going to the septic tank must be kept to a minimum. Grease traps should be inspected and cleaned regularly as grease does not break down readily in the septic tank. Grease deposits are the most common cause of disposal field failure, due to clogging of the pipes and the soil.

- The septic tank should be inspected at least once every two years, and pumped out when necessary - normally every three or four years. **Failure to remove sludge and scum will lead to solids carryover to the disposal field, resulting in total failure of the field.**

- You should not wait until the system becomes sluggish or fails before carrying out this maintenance. Annual inspections can prove to be very useful, especially in preventing system malfunction and "emergency" corrective maintenance during the winter months.

- When conducting an inspection of the tank via manholes, keep in mind that sewer gasses can be dangerous. After removal of the cover, allow a few minutes for any gasses to dissipate and do not smoke or have open flames in the area. **Under no circumstances should you enter the tank.**

15.2 Water Treatment Units

Backwash water from treatment devices should not be discharged to the sewage disposal system for the following reasons:

- Potential contamination of domestic water plumbing due to possible cross-connection.

- The additional hydraulic load is undesirable.

- Brine solution may set up mixing in septic tank because it is denser than the Afresh@ water contents of the tank; this may cause solids to be pushed up and out of the tank to the disposal field.

- Salt in the brine solution may retard microbiological growth in the septic tank, disrupting the process.

- Possible chemical reactions between the backwash water (with its salt, manganese, iron, calcium, magnesium) and the septic tank contents may form semi-solids particles or slimes which will clog the disposal field pipe holes, or the soil.

- Salt tends to cause the clogging of some soil types thereby reducing the lifespan of the disposal field.

16. ALTERNATE SYSTEMS

Alternate systems require a detailed report from a professional engineer on the installation of an alternate system on a building lot. A qualified expert for these purposes will be a person with demonstrated expertise in the location, design and construction of the system that is proposed and will certify her/his work and take responsibility for the system's function.

The report must be certified by stamp and signature or signature alone and include the following:

- assessment data including water table data, percolation test results, soil profile data and grain size analysis data.
- design specification and plans for the proposed alternate sewage disposal system.
- performance information regarding microbiological and chemical effluent constituents.

Proposals for alternate systems are to be reviewed by GSC officials and regional officials before any recommendations are issued.

A list of chamber, bioreactor, engineered wetlands, and other alternate systems that have gone through an approval process can be obtained from Government Service Centre.

Appendix

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF GOVERNMENT SERVICES AND LANDS
DEPARTMENT OF ENVIRONMENT AND LABOUR
DEPARTMENT OF HEALTH

GUIDELINES FOR ASSESSMENT OF UNSERVICED SUBDIVISIONS

PREPARED BY:

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SHAWN TETFORD, CPHI(C)

MAY, 1992
MAY, 1998 (REVISED)

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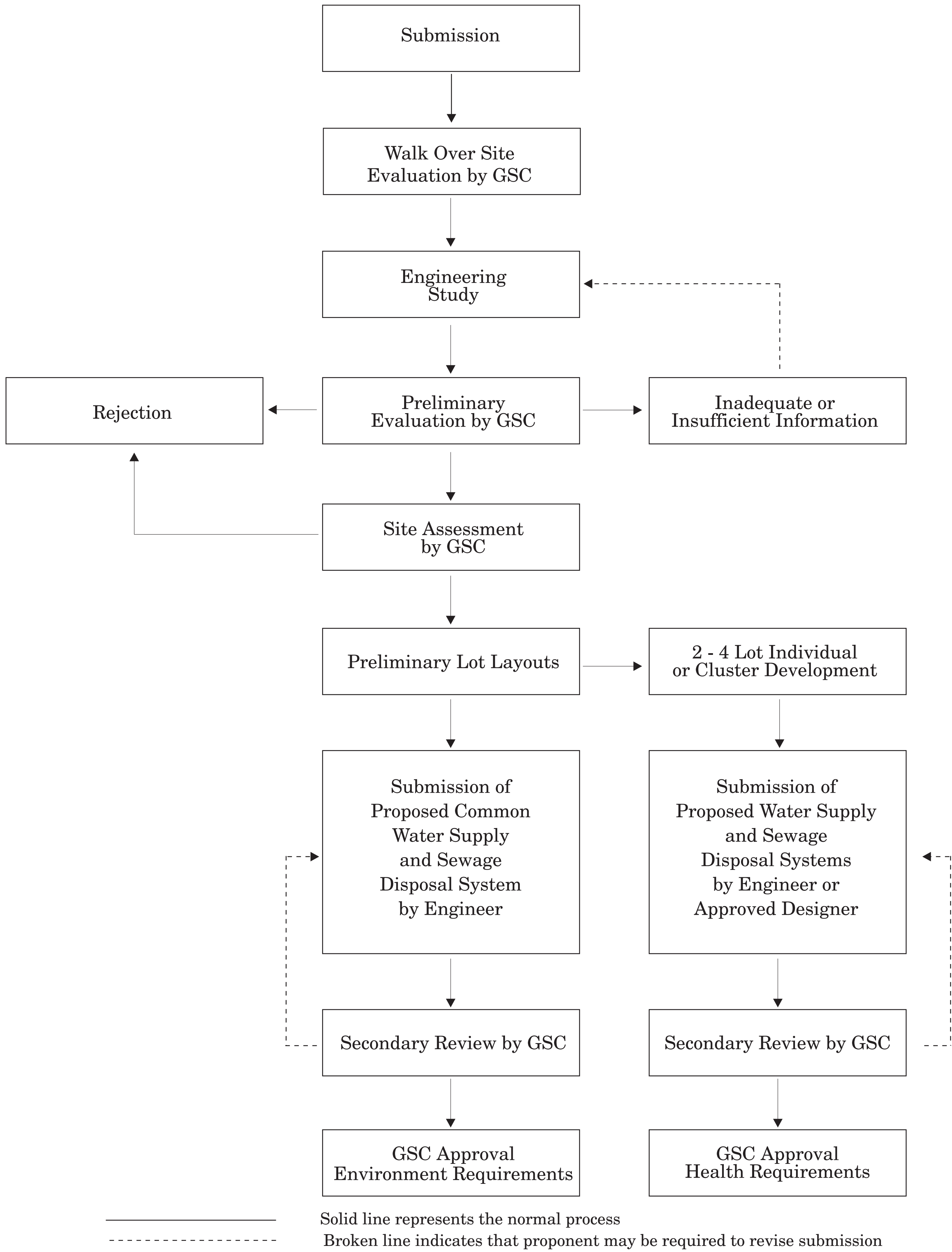
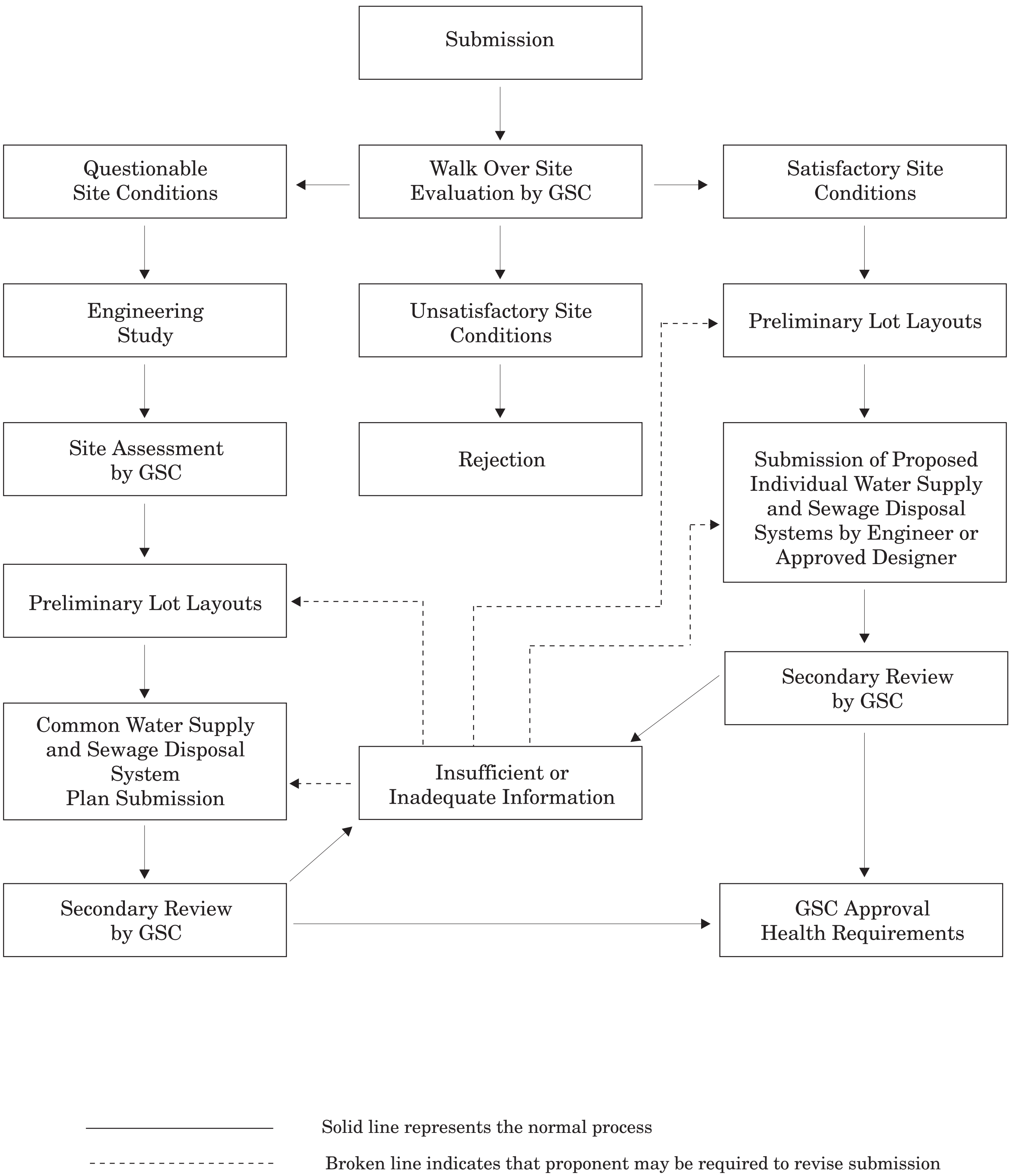
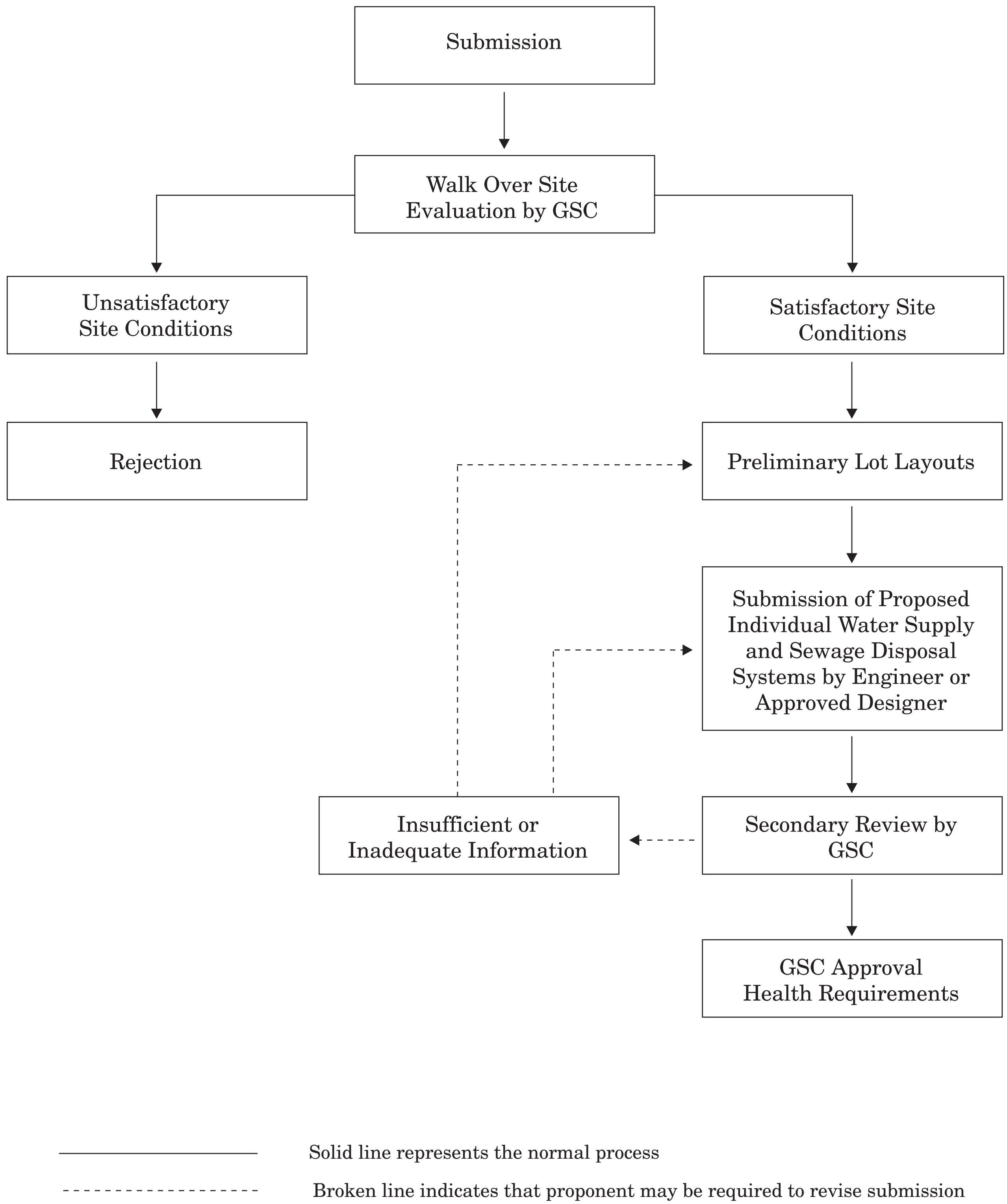
Subdivision Development of More than 15 Lots



Subdivision Development of 5 to 15 Lots



Subdivision Development 2 to 4 Lots



OVERVIEW: The following guidelines have been prepared by The Government Service Centre in conjunction with The Department of Health and The Department of Environment and Labour. The guidelines are intended to provide the proponent, the consultant/designer, The Government Service Centre, The Department of Health, and The Department of Environment and Labour with site information necessary to ensure that proposed developments are acceptable from both a public health and an environmental point of view. Particular emphasis is placed on the prevention of sewage pollution of water bodies and the groundwater within and adjacent to the development.

SUBMISSIONS: All subdivision submissions having a proposed (or potential) development size of 2 lots or more shall be submitted to the Government Service Centre location nearest the development. All proposals will be assessed by the Government Service Centre in accordance with the requirements of the Government Service Centre, The Department of Health and the Department of Environment and Labour depending on the size and nature of the development. The assessment of Subdivisions will vary depending on the size of the proposal.

The proponent shall submit a conceptual plan of the proposed development showing preliminary lot layouts, existing and/or proposed roads, proposed drainage improvements, and other significant information such as water bodies, water courses and wells on or adjacent to the development, and any existing developments in the area. Ideally, the conceptual plan should include contour lines to assist in making an initial evaluation of the development.

APPROVAL PROCESS: Upon receipt and satisfactory review of the initial proposal, the Government Service Centre will make an initial site visit and preliminary evaluation, to ensure that unsuitable lots or land areas are avoided. The submission of subdivision proposals will be required to follow different requirements depending on the size of the

Developments of More than 15 Lots: After a walk over site evaluation by the GSC, proponents of proposals for more than 15 lots will be required to submit an Engineering Study with their submission.

Developments of 5 to 15 Lots: For developments of 5 to 15 lots in some instances it may be possible following the site visit to recommend preliminary approval of the sites without requiring an engineering assessment, at which time the proponent may proceed with lot layouts. During design of the water supply an sewage disposal systems in this situation the designer must follow the Onsite Water and Sewage Disposal Guidelines. In other instances, the initial site visit will indicate the need to obtain further information on water table elevations, soils analysis, etc., at which time an Engineering Study will be required. In a few cases, after the site inspection, a recommendation may be made not to proceed with the development, or to alter the scope of the proposal. The proponent has the option at this time of proceeding with the engineering evaluation, should they feel that some or all of they property can be developed. The results of the study must be submitted for approval before any lots are developed, should the study indicate that possibility.

Developments of 2 to 4 Lots: Development proposals in this category would not normally require an Engineering Study. They can be assessed in accordance with the Onsite Water and Sewage Disposal Guidelines. However if the lots are deemed unsuitable, an Engineering Study will be necessary if the proponent wishes to

THE ENGINEERING STUDY: The engineering study shall consist of the following components:

SITE VISIT: A site visit by the Government Service Centre and the consultant/engineer/designer is required to clarify any site specific requirements prior to the commencement of any work.

WATER TABLE MONITORING: A water table monitoring program is required to determine the water table elevations. The program shall be of at least 3 month's duration and should be carried out in the spring or fall when the water table is at its highest. If readings are taken during the summer months or during an unusually dry spring or fall, the levels shall be adjusted accordingly.

The water table must be monitored by the installation of standpipes or piezometers, which shall conform to either of the attached designs as shown on pages 8 and 9. Any modifications must be approved by the appropriate Department prior to their installation.

The standpipes shall be installed to a depth of 3 meters or to bedrock, and no readings shall be taken within 36 hours of their installation. Thereafter, readings shall be taken at least weekly.

The number of standpipes required shall be based on variations in topography. Generally, the following rule of thumb shall apply: a variance of less than 20 meters within the development will require 1 standpipe for every 1.5 hectares; and a variance of 20 to 60 meters will require 2 standpipes per hectare. A minimum of 3 standpipes will be required, and regardless of the number to be installed, the standpipes shall be positioned in triangular patterns with respect to other pipes.

The results of the standpipe monitoring shall be used to produce a water table contour map and a depth to water table map for interpretation by The Department of Environment and Labour and/or the Department of Health in consultation with the Department of Environment and Labour, Groundwater Branch.

TEST PITS: A test pit shall be dug on every third proposed lot to a depth of at least 2 meters or to bedrock and the soil profile recorded if soil conditions appear consistent. If the soil conditions appear to vary or if there is significant change in topography a test pit will be required on each lot. A sieve analysis shall be conducted on the soil from the bottom area of each pit. The analysis should indicate cumulative percent passing versus grain size, and shall include percentages of gravel, sand, clay and silt.

SOIL PERMEABILITY: Standard percolation tests shall be conducted 2 to 4 meters from each test pit, and in-situ permeability tests shall also be conducted at each test pit location to correlate sieve analysis with percolation tests. Where test pits are installed on each lot in the in-situ permeability tests may be conducted at every third test pit location.

OTHER DATA: For cottage lot developments in particular, or for areas where an attempt will be made to limit the amount of tree clearing normally required for multiple trench or bed systems, lots should be assessed for the possibility of installing contour trench sewage disposal systems. A contour trench may be suitable for lots with 30 cm or more of clayey-silt or greater permeability soil, with a slope in

THE REPORT: Following completion of the study, the data accumulated shall be submitted in the following format:

A. LOCATION MAP

The location of all piezometers, test pits, percolation test pits, and permeability test holes shall be indicated on a large scale contour map of the subdivision. Each site shall be referenced in conjunction with the text of the report. All lots, roads, bridges, culverts, drainage enhancements, green areas, topography, water bodies, streams, and wells shall be shown. Discussion regarding the location of each test site shall be included in the text.

B. CONSTRUCTION OF PIEZOMETERS

All piezometer construction details, including any variations in design, depth below ground, total length of pipe installed. amount of pipe above ground, interval of screened portion, depth of sand pack, mesh size of sand pack, depth and placement of bentonite seal, backfill material, cement or grouting depth and interval, and geologic log of overburden and/or bedrock shall be summarized in a general diagram for each piezometer, and discussed in the text.

C. WATER LEVEL INFORMATION

For each piezometer, the following data shall be tabulated:

- label number
- date constructed
- ground elevation
- top of pipe elevation
- depth of pipe below ground, including screened portion
- depth of water table below ground level
- thickness of unsaturated overburden
- tabulation of readings and dates monitored
- meteorological data on precipitation during study period

D. SOILS ANALYSIS

The sieve analysis from each test pit, the percolation tests and the permeability tests shall be summarized in tabular form and discussed in the text, including the methodology for the in-situ permeability tests.

E. OTHER DATA

The results of the contour trench capabilities of each lot should be discussed, and recommendations made as to whether trench type C1, C2, or C3 can be installed. Additionally, the report should discuss the source, quality, and infrastructure requirements for any proposed water supply system other than individual wells for the development. If it is anticipated that lot owners may utilize a surface water supply, information should be provided on the chemical and bacteriological condition of the proposed or anticipated water source(s).

F. <u>MAPS</u>

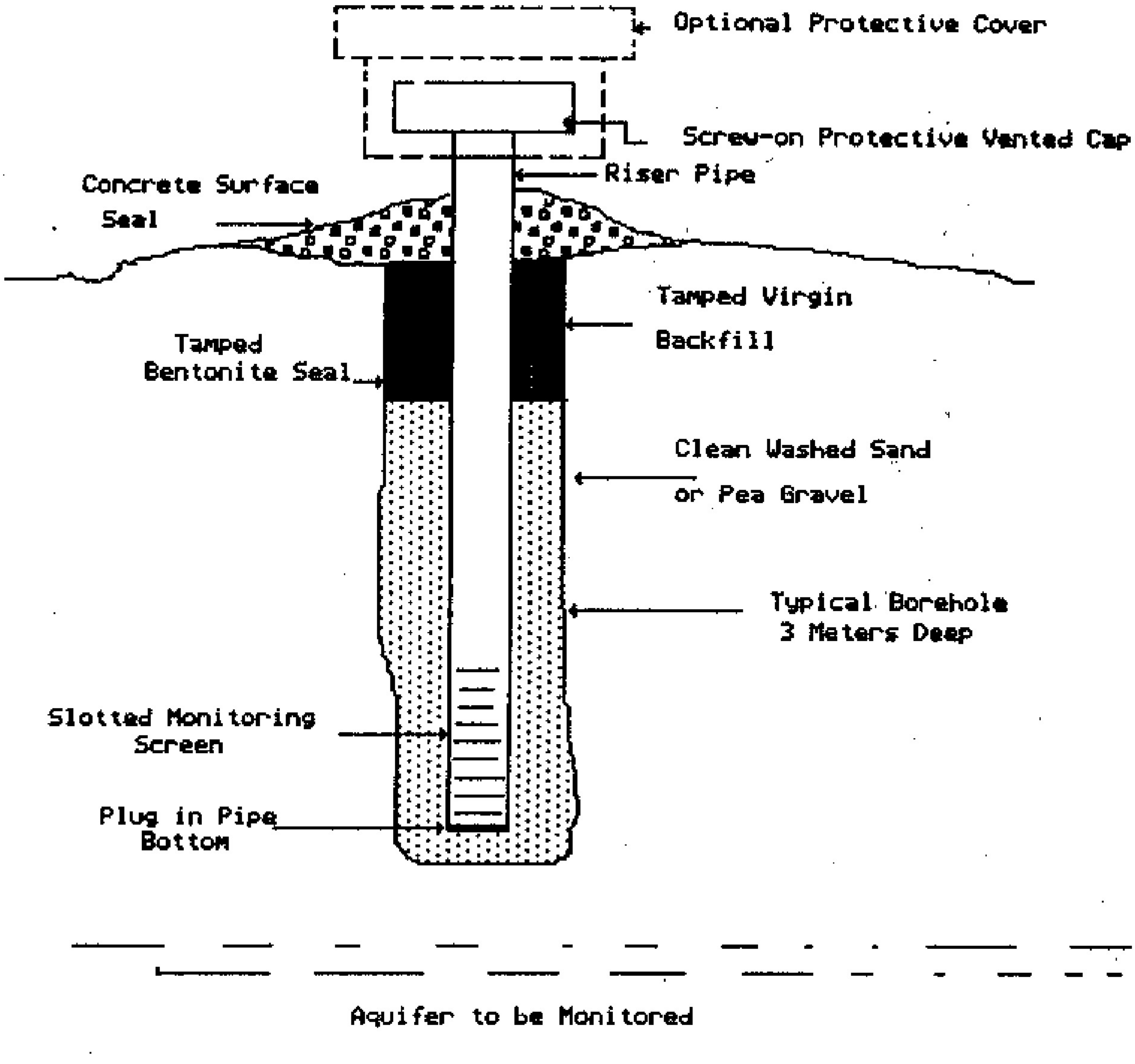
In additions to the lot layout map, the following maps shall be provided:

Water Table Map on which the elevation contours of the water table beneath the subdivision shall be shown.

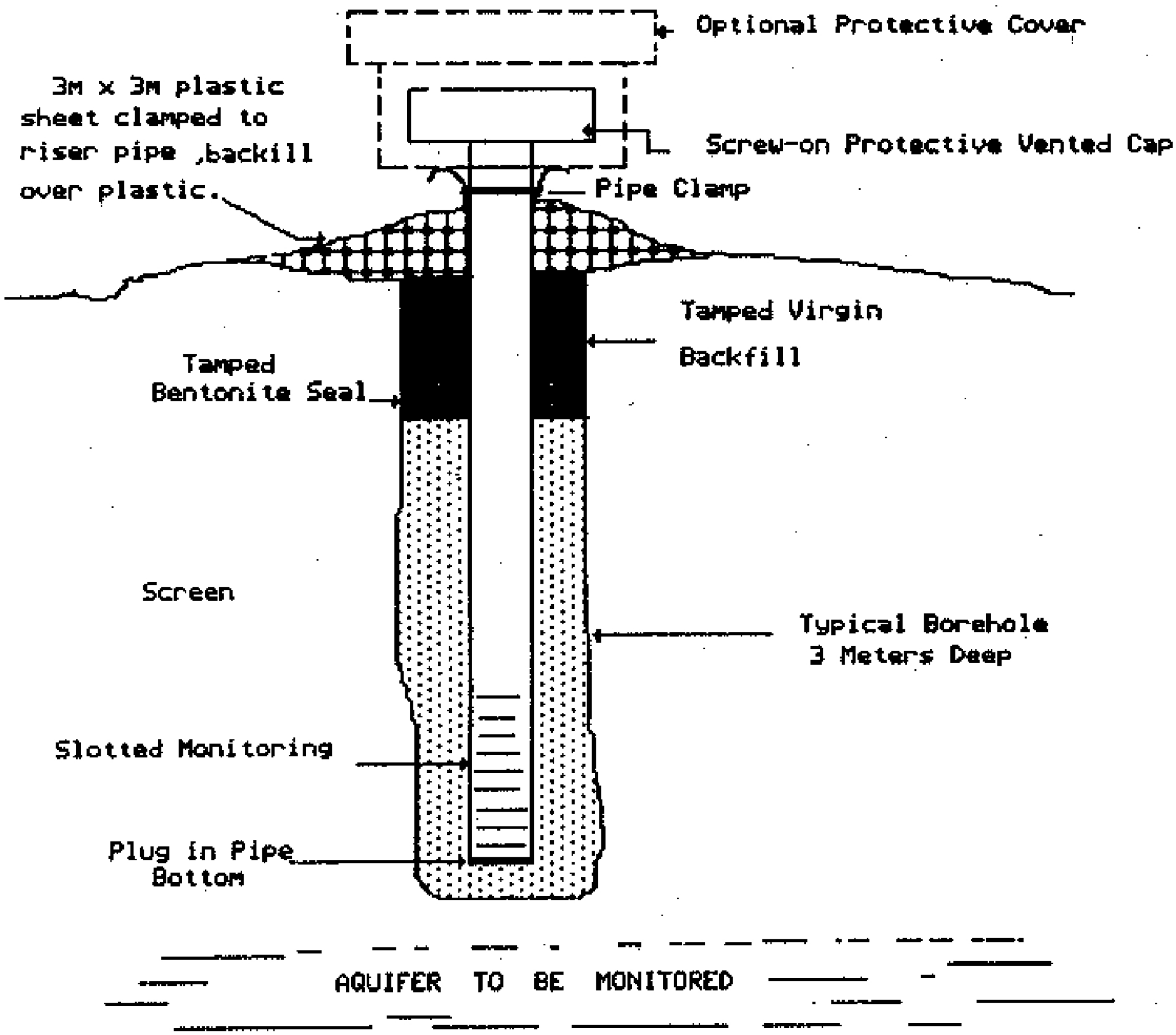
Overburden Thickness Map on which the thickness of the unsaturated overburden shall be contoured, and the presence of any bedrock shown.

Flood Plain Map on which the 20 year and 100 year flood zones for any major water body or stream within the subdivision shall be shown.

STANDARD GROUNDWATER MONITORING DEVICE



ALTERNATE CONSTRUCTION METHOD - MONITORING DEVICE



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