

6.3.2 Revised CCHD OSTs Regulations Base  
Code

**On-site Sewage Treatment System  
Regulations**



**Public Health**  
Prevent. Promote. Protect.

Adopted by Resolution on the 29<sup>th</sup> day of April 2019,  
by the Cavalier County Board of Health  
for Cavalier County, North Dakota

**Regulations in Effect: May 1, 2019**  
**Updated October 25, 2021 (Section XIX 5.)**

## Table of Contents

<b>Section I</b>	<b>Purpose</b>
<b>Section II</b>	<b>Authority</b>
<b>Section III</b>	<b>Scope and Jurisdiction</b>
<b>Section IV</b>	<b>Minimum Standards</b>
<b>Section V</b>	<b>Definitions</b>
<b>Section VI</b>	<b>Licensing of On-site Sewage Treatment System Installers</b>
<b>Section VII</b>	<b>Permit for Installation of On-site Sewage Treatment Systems</b>
<b>Section VIII</b>	<b>Inspection of Newly Constructed On-site Sewage Treatment Systems</b>
<b>Section IX</b>	<b>General Provisions</b>
<b>Section X</b>	<b>Site Conditions</b>
<b>Section XI</b>	<b>Construction Requirements</b>
<b>Section XII</b>	<b>Other Systems</b>
<b>Section XIII</b>	<b>Unsuitable Soils</b>
<b>Section XIV</b>	<b>Administration</b>
<b>Section XV</b>	<b>Variance</b>
<b>Section XVI</b>	<b>Appeals</b>
<b>Section XVII</b>	<b>Suspension and Revocation</b>
<b>Section XVIII</b>	<b>Cease and Desist Orders</b>
<b>Section XIX</b>	<b>Regulation Enforcement</b>
<b>Section XX</b>	<b>Penalties</b>
<b>Section XXI</b>	<b>Fees</b>
<b>Section XXII</b>	<b>Severability</b>
<b>Section XXIII</b>	<b>Appendices – Adoption by Reference</b>
<b>Section XXIV</b>	<b>Effective Date</b>

### **APPENDICES:**

#### **Appendix A – Procedures for Soil Determination and Material Acceptability**

- A**      **Soil Borings**
- B**      **Percolation Tests**
- C**      **Jar Test – Clean Sand**
- D**      **Jar Test – Drain field Rock**

#### **Appendix B – Design Standards**

- A**      **Septic Tanks**
  - General**
  - Design**
- B**      **Distribution and Dosing of Sewage Effluent**
  - Supply Pipe**
  - Gravity Distribution**
  - Pressure Distribution**
  - Dosing of Sewage Effluent**

- C      Soil Treatment Area**
  - General**
  - Sizing**
  - Design and Construction**
  - Trench**
  - Seepage Bed**
  - Mound**
  - At-grade System**
- D      Alternative Systems**
  - Holding Tanks**
  - Chemical Tanks**
  - Privies**

**Appendix C – On-site Wastewater Technical Review Board**

- A      General**
- B      Registration of Products**
- C      Continuing Education**

**Appendix D – Estimated Sewage Flow from Other Establishments \*For Reference Only\***

# **Regulations Adopting Requirements for Licensing of Installers, Permits for Installation, Inspection, Construction Requirements, and Use and Maintenance of On-Site Sewage Treatment Systems**

## **Section I Purpose**

The purpose of these regulations is to protect the health, safety, and welfare of the public and environment in North Dakota through the establishment of minimum requirements for the regulation of on-site sewage treatment systems (OSTS) with the intent to protect ground water quality and prevent or eliminate the development of public nuisances. The improper design, location, installation, use, and maintenance of OSTS systems can adversely affect the public health, safety, general welfare, and environment by discharge of inadequately treated sewage to surface and ground waters. These regulations are intended to protect the county's citizens by protecting their health, safety, general welfare, and natural resources.

## **Section II Authority**

These regulations are adopted in accordance with the authority granted in North Dakota Century Code Chapter 23-35.

## **Section III Scope and Jurisdiction**

These regulations regulate the siting, design, installation, alteration, operation, maintenance, monitoring and management of all OSTS systems within the applicable jurisdiction. Where a municipality has passed an ordinance, code, or law to regulate and enforce in an equivalent or more restrictive manner, such requirements established hereunder shall not apply, but the validity of the remaining portions of these regulations shall be valid.

## **Section IV Minimum Standards**

The requirements and standards adopted by these regulations are intended to be minimum standards for the siting, design, installation, alteration, operation, maintenance, monitoring and management of all on-site sewage treatment systems. Nothing contained herein shall be construed to prevent the adopting authority from requiring compliance with greater requirements than those contained herein where such requirements are necessary to maintain safe and sanitary conditions.

## **Section V      Definitions**

As used in these regulations, the following words and terms, unless the context clearly requires otherwise, shall have the following meanings:

"Alternative System" is an on-site sewage treatment system employing such methods as described in the Alternative Systems section, and may include devices not presented in these regulations.

"Adopting Authority" means North Dakota district health units, county, or city health departments, or their designees.

"At-grade System" means a pressurized soil treatment and dispersal system where sewage effluent is dosed to an absorption bed that is constructed directly on original soil at the ground surface and covered by loamy soil materials.

"Baffle" is a device installed in a septic tank for proper operation of the tank and to provide maximum retention of solids, and includes vented sanitary tees and submerged pipes in addition to those devices that are normally called baffles.

"Bedroom" is any room within a dwelling that may be reasonably used as a sleeping room and includes, but is not limited to unfinished areas that have potential to become a bedroom(s).

"Capacity" is the liquid volume of a septic tank using inside dimensions below the outlet.

"Centralized System" is an on-site sewage treatment system serving 4 or more dwellings or buildings.

"Cesspool" (Seepage Pit) is an underground pit into which raw sewage and/or other untreated liquid waste is discharged and from which the liquid seeps into the surrounding soil.

"Clean Sand" is a soil texture composed by weight of at least 25% very coarse, coarse, and medium sand varying in size from 2.0 to 0.25 mm, less than 50% of fine or very fine sand ranging in size between 0.25 and 0.50 mm, and no more than 10% of particles smaller than 0.05 mm. The jar test can be used as a method for testing clean sand. See Appendix A Procedures for Soil Determination and Material Acceptability.

"Distribution Pipes" are perforated pipes that distribute sewage effluent within a medium including drain field rock, chambers, and gravelless pipe.

"Dosing Device" is a commercially manufactured sewage effluent pump, grinder pump, or siphon.

"Drain field Rock" is clean, washed, rock, crushed igneous rock or similar insoluble, durable, and decay-resistant material. The size shall range from ¾ inch minimum diameter to 2 ½ inches effective

diameter, with no more than 5% by weight passing a 3/4 inch sieve, and no more than 1% by weight passing a number 200 sieve. Materials greater than 2 1/2 inches in diameter shall not exceed 5% by weight. The jar test can be used as a method for testing drain field rock. See Appendix A Procedures for Soil Determination and Material Acceptability.

"Dwelling" is any building or place used or intended to be used by human occupants as a single-family or multiple-family unit.

"Floodway" is the bed of a wetland or lake, the channel of a watercourse, and those portions of the adjoining floodplain that are reasonably required to carry the regional flood discharge.

"Holding Tank" is a water-tight tank, with a minimum required capacity of 1,000 gallons, meeting the minimum requirements set forth in Appendix B Design Standards, used for the storage of sewage until it can be transported to a point of approved disposal.

"Impermeable" with regard to soils, is a soil horizon or layer having a vertical permeability less than 1 inch in 24 hours and shall be considered impermeable.

"Limiting Factor" means any factor that adversely affects the soils ability to effectively treat sewage effluent. This encompasses actual soil saturation, redoximorphic features, or active fluctuating seasonal soil water table, bedrock, layers/conditions of low permeability or any physically identifiable condition that limits installation of a septic system.

"Malfunctioning or Failing System" is a system that is not operating properly and constitutes a Public Health Nuisance.

"Mound System" means a soil treatment and dispersal system designed and installed such that all of the infiltrative surface is installed above grade, using clean sand between the bottom of the infiltrative surface and the original ground elevation utilizing pressure distribution and capped with suitable material to stabilize the surface and encourage vegetative growth.

"On-site Sewage Treatment System" (OSTS) is a sewage treatment system or part thereof, serving a dwelling or building, or group thereof, which utilizes soil treatment and/or disposal.

"Parallel Distribution" is the distribution of sewage tank effluent by gravity which loads all sections of an on-site sewage treatment system equally at the same time.

"Percolation Rate" is the timed rate of drop of water infiltrating into a test hole. The percolation rate can be determined by the percolation test. See Appendix A Procedures for Soil Determination Material Acceptability.

"Permeability" the rate at which gases or liquids penetrate or pass through a bulk mass of soil or layer of soil.

"Plastic Limit" is soil moisture content below which the soil may be manipulated for purposes of installing a soil treatment system and above which manipulation will cause compaction or smearing. If a fragment of soil can easily be rolled into a wire 1/8 inch diameter, the moisture content is above the limit and the soil cannot be used. The standard method of determining the plastic limit is specified by the American Association of State Highway Officials (AASHO) Designation: #T 90-61.

"Professional Engineer" shall mean an individual who by reason of special knowledge or use of the mathematical, physical, and engineering sciences and the principles and methods of engineering analysis and design, acquired by engineering education and engineering experience, is qualified to practice engineering, and who has been registered and licensed by the State Board of Registration for Professional Engineers and Land Surveyors.

"Redoximorphic Features" (Active Mottling) reflects alternating reduction and oxidation conditions due to water table fluctuations.

"Registered Professional Soil Classifier" shall mean a person who by reason of their special knowledge of the physical, chemical, and biological sciences applicable to soils as natural bodies and of the methods and principles of soil classification as required by soils education and soil classification experience in the formation, morphology, description, and mapping of soils is qualified to practice soil classifying and who has been duly registered by the State Board of Registration for Professional Soil Classifiers, as per North Dakota Century Code, Chapter 43-36.

"Seepage Bed" means a soil treatment and dispersal system, the absorption width of which is greater than three feet but no greater than 25 feet.

"Serial Distribution" is the distribution of sewage tank effluent by gravity that progressively loads one section of an OSTTS system to a predetermined level before overflowing to the succeeding section.

"Septic Tank" is a watertight tank, with minimum required capacity of 1,000 gallons, meeting the minimum requirements laid out in Appendix B Design Standards. That shall receive the discharge of sewage from a building sewer or preceding tanks, stores liquid for a detention period that provides separation of solids from liquid and digestion of organic matter, and allows the sewage effluent to discharge to a succeeding tank, treatment device, or soil treatment area.

"Septic System Servicer" is any person or business, permitted by the North Dakota Department of Health Division of Water Quality, who engages in the business of servicing septic systems, cesspools, privies, chemical toilets, holding tanks, and similar devices that receive sewage, and who deposits such materials at some location approved by the North Dakota Department of Health.

"Setback" is a separation distance measured horizontally, unless otherwise noted.



"Sewage" means waste produced by toilets, sinks, bathing, laundry, or culinary operations or the floor drains associated with these sources, and includes household cleaners, medication and other constituents in the sewage restricted to amounts normally used for domestic purposes.

"Sewage Effluent" is that liquid which flows from a septic tank under normal operation.

"Site" is the proposed on-site sewage treatment system area.

"Slope" is the ratio of vertical rise or fall to horizontal distance.

"Soil Boring" is any type of excavating capable of revealing in detail characteristics of soils penetrated.

"Soil Texture Classification" is where soil particle sizes or textures are specified in these regulations; they refer to the Guide for USDA Textural Classification.

"Soil Treatment Area" is an area where sewage effluent is dispersed in to the soil for treatment, absorption, and filtration and includes, but is not limited to trenches, seepage beds, at-grade systems, and mound systems.

"Soil Type" is the lowest unit in the natural system of soil classification; a subdivision of a soil series and consisting of or describing soils that are alike in all characteristics including the texture of the A Horizon.

"Standard System" an on-site sewage treatment system employing a septic tank and the soil treatment system commonly known as seepage beds, trenches, at grades, or mound systems.

"Surface Water Body" is any significant accumulation of water, which includes lakes, rivers, streams, reservoirs, bogs, ponds, and wetlands.

"Supply Line" are pipes used to distribute sewage effluent to distribution boxes, drop boxes, and valve boxes.

"Trench" means a soil treatment and dispersal system, the absorption width of which is 18-36 inches, and having a minimum sidewall absorption height of six inches of natural soil.

## **Section VI Licensing of On-site Sewage Treatment System Installers**

1. No person, firm, or corporation shall engage in the business of installing or constructing OSTs without first obtaining a license from the local adopting authority where the business is located. If there is not a licensing adopting authority where the business is located, then the business shall obtain a license from the nearest licensing adopting authority.
2. Licensure Requirements
  - a. Submission of license application and fee. The fee for the license shall be set by the adopting authority.
  - b. Attend approved OSTs training before being licensed and every 3 years thereafter.
  - c. Documentation and other requirements determined by the adopting authority shall be met.
3. All new construction and/or alterations/modifications to existing systems shall be done by a licensed OSTs installer or the property owner. Mound systems, at-grade systems, and commercial sites shall only be installed by a licensed OSTs installer.
4. Property owners are not required to be licensed to install systems on their property, but they shall attend an approved training or meet appropriate alternatives as defined by the adopting authority. It is the property owners' responsibility to procure appropriate equipment to install the system and any additional requirements as set forth by the adopting authority.
5. Installation, construction, alteration, or repair of an OSTs by licensee in violation of the provisions of these regulations or any refusal to comply herewith on the part of the licensee shall be cause for revocation of, suspension, or refusal to renew a license. Before any license issued under the provision of this section may be revoked, the licensee shall be provided an opportunity to request a hearing to show cause why such license should not be revoked. Notice of the time, place, and purpose of such hearing shall be given in writing.

## **Section VII Permit for Installation of On-site Sewage Treatment Systems**

1. No person, firm, or corporation shall install, alter, repair, or extend any individual OSTs without first obtaining a permit from the adopting authority.
2. The permit shall be issued by the adopting authority within the jurisdictional limits where the work is being done. The fee for the permit shall be set by the adopting authority. The application/permit shall be signed by the property owner.
3. Application for permits shall be made upon forms furnished by the adopting authority. A permit to construct is valid for a period of 12 months from date of issuance. If construction is

not started on the building or sewage system within 12 months of the date of approval of the application, it will be necessary to resubmit a current application along with all necessary information for the system to insure that the lot, building plan, or location have not changed and that the proposed sewage system continues to meet the requirements set forth herein.

4. The adopting authority shall refuse to grant a permit for the construction of an individual sewage treatment system where a public sewer system is available within 200 feet of the property line, unless the municipality denies hookup in a written document.
5. If the estimated sewage flow from a building is less than 2,500 gallons/day, an OSTs shall be designed in accordance with these regulations. If the estimated sewage flow is greater than 2,500 gallons/day, a professional engineer may be required to design the system. A permit shall still be required to be issued by the adopting authority.
  - a. For any OSTs serving 25 or more individuals, plans and specifications may be required to be prepared by a North Dakota registered professional engineer and submitted to the North Dakota Department of Health, Division of Municipal Facilities, for review and approval. Construction of such systems may not commence until approval is granted by the Division. These regulations shall apply with any onsite sewage treatment systems approved by the North Dakota Department of Health

#### **Section VIII Inspection of Newly Constructed On-site Sewage Treatment Systems**

1. The adopting authority or its designee may perform inspections on all newly constructed OSTs. No part of the soil treatment area system shall be covered until it has been inspected, unless prior approval has been granted. It shall be the duty of the owner or occupant of the property to give the adopting authority free access to the property at reasonable times for the purpose of making an inspection.
2. If, upon inspection, it is discovered that any part of the system is not constructed in accordance with the minimum standards provided in these regulations, the applicant and or the OSTs installer shall be responsible for the correction or elimination of all defects, and no system shall be placed in service until all defects have been corrected or eliminated.

#### **Section IX General Provisions**

1. The owner, building contractor, plumbing contractor, and OSTs installer are jointly responsible for compliance with these regulations.
2. No property shall be improved in excess of its capacity to properly absorb sewage effluent in the quantities and by the means provided herein.
3. The minimum lot size in which a new OSTs can be installed shall be 40,000 square feet. There

shall be approved area for a permitted OSTS system on property prior to building on it.

4. Water carried from bathrooms, kitchens, laundry fixtures, and other household plumbing shall pass through a septic tank prior to its discharge into the soil. Where underground disposal for treatment is not feasible, consideration will be given to special methods of collection and disposal.
5. Floor drains in commercial shops shall not be connected to an OSTS drainfield. Building footing water, sump pumps, draitile, eve spouts/roof, backwash from water softeners, pool water, treated hot tub water, or pool filter backwash shall not enter the OSTS system.
6. Surface and storm waters shall not be discharged into (or on top of) any soil treatment area.
7. All sewage shall be disposed of by a valid method of collection, treatment, and/or disposal. Sewage shall not be disposed of in any manner that may create a nuisance or that may create a malfunctioning or failing system.
8. Cesspools shall not be installed and/or utilized and are considered a public nuisance. When a cesspool is actively used or abandoned, the pit shall be pumped out and then removed or filled with soil, sand, or gravel. This requirement is binding on all systems.
9. When a septic tank is abandoned, it shall be pumped by a septic system servicer, the tank shall then be crushed and backfilled with soil, sand, or gravel or filled with a flowable fill, and then capped. Upon a finding of exceptional need, a septic tank may be ordered to be removed and disposed of in compliance with all applicable state and local rules and regulations.
10. No OSTS shall be installed during wet conditions or other conditions by which the soil would become smeared during construction. No OSTS shall be installed when the ground is frozen. The ground is considered frozen when the frost penetrates the top 6 inches of soil or to the depth trenches would be installed.
11. No OSTS or parts, thereof, shall be located on any parcel of land other than the parcel of land where the dwelling or building serviced by the OSTS is located, except if there is a permanent easement recorded or a centralized treatment system.
12. No provision set forth herein shall be deemed to require a change in any portion of an existing OSTS or any other work regulated by these regulations in or on an existing building or lot when such work was installed and is maintained in accordance with the regulations in effect prior to the effective date of these regulations, except, when it is determined by the adopting authority that a system constitutes a public health nuisance.

## **Section X      Site Conditions**

1. All proposed sites for an OSTS soil treatment area shall include at minimum the following information:
  - a. Depth of the seasonal high water table and bedrock or other limiting conditions.
  - b. Soil conditions - properties and permeability
  - c. Slope
  - d. The existence of lowlands, depressions, rock outcrops
  - e. Surface water drainage patterns
  - f. All setbacks, as required in these regulations, shall be described or drawn out.
  
2. Flood prone areas
  - a. No part of a system shall be installed in the floodway.
  - b. The soil absorption area shall be located on the highest feasible area of the lot and shall have location preferences over all other improvements except the water supply well.
  - c. The tank shall be protected against flotation under high water table conditions. This shall be achieved by weight of tank, earth anchors, or shallow bury depths.
  - d. If a pumping station is used to move sewage effluent from the septic tank to the soil treatment area, provisions shall be made to prevent the pump from operating when inundated with flood waters.
  - e. The building sewer shall be designed to prevent back flow of liquid into the building when the system is inundated. If a holding tank is utilized, the building sewer shall be designed to permit rapid diversion of sewage into the holding tank when the system is inundated.
  - f. Whenever the water level has reached a stage above the top of the septic tank, the tank shall be pumped to remove all solids and liquids after the flood has receded before the use of the system is resumed.

## **Section XI Construction Requirements**

1. Every OSTS installed, and every alteration, extension, and/or repair to any system made after the effective date of these regulations shall conform to the standards herein.
2. The proposed area or an OSTS shall be protected from disturbance, compaction or other damage by an effective method.
3. Approval of a system by the adopting authority does not constitute a guarantee that the system will provide trouble-free service.
4. Proper installation, maintenance, and use, will decrease the possibility of a premature failure.

## **Section XII Other Systems**

Where unusual conditions exist, special systems of treatment and disposal other than those

specifically mentioned in these regulations may be provided if:

1. An engineering design providing reasonable assurance of performance of such system is provided to the adopting authority;
2. The engineering design, with the professional engineers stamp affixed, of such system is first approved by the adopting authority;
3. There is no discharge to the ground surface or to surface waters, unless it meets drinking water standards;
4. Treatment and disposal of wastes is in such a manner so as to protect the public health and general welfare; and
5. Such systems shall comply with all applicable requirements of these regulations except as otherwise affected by variance and with all local codes and ordinances.

### **Section XIII Unsuitable Soils**

If the application for an OSTs permit has been denied because of the soil conditions being identified as unsuitable for an OSTs, a professional engineer may present plans for consideration by the adopting authority for a specialized sewage treatment system that overcomes the limitations of the lot and existing soil conditions.

### **Section XIV Administration**

1. The adopting authority or its designee shall administrate and enforce the provisions of these regulations.
2. The adopting authority may appoint an On-site Wastewater Technical Review Board, Appendix C for purposes of establishing approved materials and design standards not otherwise established herein.

### **Section XV Variances**

1. Upon application, the adopting authority may grant a variance from the requirements of these regulations when, in its opinion, undue hardship may result from strict compliance and that strict application would be unreasonable, impractical, or not feasible.
2. No variance shall be issued unless the adopting authority finds:
  - a. that there are special circumstances or conditions affecting the property such that the strict application of the provisions of these regulations would deprive the applicant of the reasonable use of the land;
  - b. that the variances necessary for the preservation and enjoyment of a substantial

property right of the petitioner provided, however, any such variance includes conditions for prevention, control, or abatement of pollution consistent with the general purposes of these regulations and applicable local, state, or federal laws;

- c. that the granting of the variance will not be detrimental to the public health or welfare or injurious to other property in the area in which said property is situated; and
  - d. that the need for such variance is not the result of any act, omission or decision of the applicant.
3. The adopting authority shall prepare a written decision, including findings of facts, supporting any decision it makes with respect to an application for a variance.

### **Section XVI Appeals**

1. If the petitioner is aggrieved by the determination of the adopting authority, the petitioner may pursue an appeal in accordance with N.D.C.C. Section 28-34-01.
2. Any person directly affected by any order or determination of the adopting authority may within 30 days of such action petition the local Board of Health for a hearing. Such appeal shall be in writing and shall specify in detail the grounds for the appeal. The appeal shall be filed with the local Board of Health.
3. Within 30 days of filing, the local Board of Health shall fix a date for a hearing.
4. Notice in writing shall be given to the petitioner at least 5 days prior to the hearing.
5. Within 30 days after the hearing, the local Board of Health shall take action and shall mail, by registered mail, a copy of its order to the petitioner.

### **Section XVII Suspension and Revocation**

Any license or permit issued by the adopting authority pursuant to these regulations shall be subject to action taken by the adopting authority to suspend or revoke any such license or permit upon a finding of noncompliance with these regulations, a material misrepresentation in any application or materials presented in support of any license or permit; any willful noncompliance with these regulations; and/or nonpayment of any fees or costs imposed pursuant to these regulations.

### **Section XVIII Cease and Desist Orders**

Cease and desist orders may be issued when the adopting authority, or its designee, has probable cause to believe that an activity regulated by these regulations or any other official act is being or has been conducted without a permit or in violation of a permit or in violation of applicable law.

When work has been stopped by a cease and desist order, the work shall not resume until the reason for the work stoppage has been completely satisfied, any fees paid, and the cease and desist order lifted.

### **Section XIX Regulation Enforcement**

1. Malfunctioning OSTS systems are a risk to the general health and welfare of this state and are hereby declared to be a nuisance.
2. Whenever brought to the attention of the adopting authority that any unsanitary conditions exist in any OSTS system or that any construction or work regulated by these regulations is dangerous, unsafe, unsanitary, a nuisance, risk to life, health, property, or otherwise is in violation of these regulations, it is the responsibility of the adopting authority to investigate. The adopting authority may order any person using or maintaining any such condition to repair, alter, change, remove, or demolish the problem area for the proper protection of life, health, and/or property. Every such order shall be in writing, addressed to the person using or maintaining any such conditions and shall specify a reasonable date or timeline for compliance with such order.
3. The property owner or designee shall notify the adopting authority when a property that requires or has an OSTS is planned on being developed.
4. For a new property that has not been built on previously, feasibility for a new OSTS design and installation shall be determined.
5. When requested to inspect a property with an existing OSTS, the status and compliance of the existing system shall be determined by the adopting authority, based on information provided by the property owner and visual inspection.
  - a. If the found to be "failing" at the time of/during the process of the property being sold, the system shall be brought up to the current regulations within a reasonable period as determined by the adopting authority.
  - b. All parts of an OSTS system associated with a piece of property shall be included with the sale/transfer of that property.
  - c. If there are plans to put a new dwelling/building on the property, the OSTS system shall be permitted based on the new dwelling information and current regulations. If the existing OSTS system is found to be up to current regulations and meets design standards for the new dwelling, the new dwelling/building may be hooked in to the existing system.



**Section XX Penalties**

Any person who violates these regulations or any rule or regulation adopted by the adopting authority, or who violates any determination or order of the adopting authority under these regulations, is guilty of a class B misdemeanor for each violation. Each continuing day of a violation is considered a separate offense.

**Section XXI Fees**

The adopting authority is hereby authorized to establish and impose reasonable fees for inspections, plan reviews, site evaluations, filing of variance requests and filing of appeals.

**Section XXII Severability**

If any section, subsection, sentence, clause, phrase or portion of these regulations is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this Regulation.

**Section XXIII Appendices – Adoption by Reference**

The following appendices are hereby adopted and incorporated herein by reference:

Appendix A – Procedures for Soil Determination and Material Acceptability

Appendix B – Design Standards

Appendix C – On-site Wastewater Technical Review Board

Appendix D – Estimated Sewage Flow from Other Establishments \*For Reference Only\*

**Section XXIV Effective Date**

These regulations are hereby adopted by **Cavalier County Health District’s Board of Health** on the **29<sup>th</sup> day of April, 2019** and shall be effective as of the **1<sup>st</sup> day of May, 2019**.

**Section XIX 5.** of these regulations were updated and adopted by the **Cavalier County Health District’s Board** of Health on the **25<sup>th</sup> Day of October 2021** and shall be effective the **25<sup>th</sup> Day of October 2021**.

## Appendix A Procedures for Soil Determination and Material Acceptability

### A **Soil Borings** - where soil borings are required, they shall be made as follows:

1. Each boring or excavation shall be made to a sufficient depth to provide the required design information.
2. A soil texture description shall be recorded by depth and notations made where texture changes occur.
3. Measurements shall be made to determine the depth to the limiting factor. This includes the highest notable water table by recording the first occurrence of redoximorphic features observed in the boring or excavation.

### B **Percolation Tests** - where percolation tests are required they shall be made as follows:

1. Test hole dimensions and locations:  
Each test hole shall be 6 to 8 inches in diameter, have vertical sides, and be bored or dug to the depth of the bottom of the proposed individual sewage treatment system.
2. Preparation of the test hole:  
The bottom and sides of the hole shall be carefully scratched to remove any smearing and to provide a natural soil surface into which water may penetrate. Remove all loose material from the bottom of the hole. Add 2 inches of clean rock or sand in a mesh bag to protect the bottom.
3. Soil Saturation and swelling:  
The hole shall be carefully filled with clear water to a minimum depth of 12 inches over the soil at the bottom of the test hole and maintained for no less than 4 hours and preferably overnight.  
The soil shall then be allowed to swell for at least 16 hours, but no more than 30 hours. In sandy soils, the saturation and swelling procedure shall not be required and the test may proceed if filling of the hole has seeped away in less than 10 minutes.
4. Percolation rate measurement:
  - a. In sandy soils, adjust the water depth to 8 inches over the soil at the bottom of the test hole. From a fixed reference point, the drop in water level shall be measured in inches to the nearest 1/8 inch at approximately 10 minute intervals. A measurement can also be made by determining the time it takes for the water level to drop 1 inch from an 8 inch reference point. If 8 inches of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 8 inches. The test shall continue until 3 consecutive percolation rate measurements vary by a range of no more than 10%.
  - b. In other soils, adjust the water depth to 8 inches over the soil at the bottom of the test hole. From a fixed reference point, the drop in water level shall be measured in inches to the nearest 1/8 inch at approximately 30 minute intervals, refilling between measurements to maintain an 8 inch starting head. The test shall continue until 3 consecutive percolation rate measurements vary by a range of no more than 10%. The percolation rate can also be made by observing the time it takes the water level to drop 1 inch from an 8 inch reference point if a constant water depth of at least 8 inches has been maintained for at least 4 hours prior to the measurement.

5. Calculating the percolation rate:
  - a. Divide the time interval by drop in water level to obtain the percolation rate in minutes-per-inch.
  - b. Percolation rates determined for each test hole shall be averaged to determine the final soil treatment system design.
6. For reporting the percolation rate, worksheets showing all calculations and measurements shall be submitted.
7. A percolation test shall not be run where frost exits below the depth of the proposed soil treatment system.

**C Jar Test – Clean Sand**

1. Place 2 inches of sand in the bottom of a quart size glass jar and then fill the jar 3/4th full of water.
2. Cover the jar and shake the contents vigorously.
3. Allow the jar to stand for 30 minutes and observe whether there is a layer of silt or clay on top of the sand.
4. If the layer of these fine particles is more than 1/8 of an inch thick, the sand is not suitable for use in mound construction, because too many fine particles tend to cause the soil to compact during constructions and future operation. Also, long-term acceptance rate of this soil will be slower than the long-term acceptance rate of clean sand, which is used for sizing the absorption bed area.

**D Jar Test –Drain field Rock**

1. Fill a quart sized glass jar nearly full with rock and then fill with water.
2. Cover the jar and shake the contents vigorously.
3. Allow the jar to stand for 30 minutes and observe whether a film forms on the surface or if fines collect on the bottom of the jar.
4. There should be less than 1/16-inch of fines in the bottom of the jar. If the measured fines layer is 1/16-inch or greater, a sieve analysis needs to be run (#200 sieve wash) to determine if the rock is acceptable or not.

## Appendix B Design Standards

### A Septic Tanks

#### General

1. All tanks shall be concrete, plastic or fiberglass, regardless of material or method of construction; the tank shall be watertight.
2. So designed and constructed as to withstand all lateral earth pressures under saturated soil conditions with the tank empty.
3. So designed and constructed as to withstand the pressure, at the depth of the septic tank, of saturated earth cover above the tank top.
4. Not subject to excessive corrosion or decay.
5. Tanks shall be installed in accordance with manufacturer requirements. Tanks susceptible to freezing shall be insulated.

#### Design – all tanks shall conform to the following criteria:

1. The liquid depth of any septic tank or compartment thereof shall not be less than 30 inches. A liquid depth greater than 6 ½ feet shall not be considered in determining tank capacity.
2. No tank or compartment thereof shall have an inside horizontal dimension less than 24 inches.
3. Inlet and outlet connections of the tank shall be submerged by means of baffles or sanitary tees.
4. The space in the tank between the liquid surface and the top of the inlet and outlet baffles shall not be less than 6 inches or 100 gallons, whichever is greater, for all liquid depths with an effluent screen and alarm or for liquid depths of less than 39 inches without an effluent screen and alarm. The space between the liquid surface and the top of the inlet and outlet baffles shall not be less than 8 inches for liquid depths of 39 inches or more without an effluent screen and alarm.
5. Inlet and outlet baffles shall be constructed of acid resistant concrete, acid resistant fiberglass, or plastic. Baffles shall be resistant to excessive corrosion or decay. Inlet baffles shall not restrict the movement of solids.
6. Sanitary tees shall be affixed to the inlet or outlet pipes with a permanent water-proof adhesive. Baffles shall be integrally cast with the tank, affixed with a permanent water-proof adhesive or affixed with stainless steel connectors, top and bottom.
7. The inlet baffle, or sanitary tee, shall extend at least 6 inches, but not more than 20% of the total liquid depth below the liquid surface and at least 1 inch above the crown of the inlet sewer.
8. The outlet baffle, or tee, and the baffles between compartments shall extend below the liquid surface, a distance equal to 40% of the liquid depth, except that the penetration of indicated baffles or sanitary tees for horizontal cylindrical tanks shall be 35% of the total liquid depth. They also shall extend above the liquid surface. In no case shall they extend less than 6 inches above the liquid surface.
9. There shall be at least 1 inch between the underside of the top of the tank and the highest point of the inlet and outlet devices.

10. The inlet invert shall not be less than 2 inches above the outlet invert.
11. The inlet and outlet shall be located opposite each other along with the axis of maximum dimension. The horizontal distance between the nearest points of the inlet and outlet devices shall be at least 4 feet.
12. If site conditions warrant, the approving authority may allow the inlet and outlet to be located on walls that are not opposite each other along the axis of maximum dimension. However, the horizontal distance between the nearest points of the inlet and outlet shall be at least 4 feet. However, the requirements of #10 above shall be met.
13. Sanitary tees shall be at least 4 inches in diameter. Inlet baffles shall be no less than 6 inches or no more than 12 inches measured from the end of the inlet pipe to the nearest point on the baffle. Outlet baffles shall be 6 inches measured from the beginning of the outlet pipe to the nearest point on the baffle.
14. Access to the septic tank shall be as follows:
  - a. There shall be 1 or more manholes, with a minimum diameter of 18 inches (least dimension) and located within 6 feet of all walls of the tank. All manhole covers shall be at a minimum brought 6 inches above the finished grade or as approved by the adopting authority.
  - b. Covers shall be safely secured by being locked, bolted or screwed, having a weight of at least 95 pounds, or other methods as approved by the adopting authority to prevent unauthorized entry.
  - c. There shall be a 4 inch minimum inspection pipe for each baffled wall. The manhole cover can serve as the inspection cover. All inspection pipes shall be at minimum brought 6 inches above the finished grade.
15. Compartmentation of single tanks
  - a. Septic tanks larger than 3,000 gallons and fabricated as a single unit shall be divided into 2 or more compartments.
  - b. When a septic tank is divided into 2 compartments, not less than 1/2 nor more than 2/3 of the total volume shall be in the first compartment.
  - c. When a septic tank is divided into 3 or more compartments, 1/2 of the total volume shall be in the first compartment and the other half equally divided in the other compartments.
  - d. Connections between compartments shall be baffled so as to obtain effective retention of scum and sludge.
  - e. Adequate venting shall be provided between compartments by baffles or by an opening of at least 50 square inches near the top of the compartment walls.
  - f. Adequate access to each compartment shall be provided by 1 or more manholes. Manholes shall meet the provisions of these regulations.
16. Multiple tanks
  - a. Where more than 1 tank is used to obtain the required liquid volume, the tanks shall be connected in series.
  - b. Each tank shall comply with all other provisions of these regulations.
  - c. No more than 4 tanks in series can be used to obtain the required liquid volume.
  - d. The first tank shall be no smaller than any subsequent tanks in series.

17. Outlet pipe from septic tank

- a. The outlet pipe from the septic tank shall not be cast iron.
- b. The outlet pipe extending from the septic tank shall be of sound and durable construction, not subject to corrosion or decay.
- c. The outlet pipe extending from the septic tank to the undisturbed soil beyond the tank shall meet the strength requirements of the American Society for Testing and Materials (ASTM), Schedule 40 plastic pipe and shall be supported in a manner that there is no deflection during the backfilling and subsequent settling of the soil between the edge of the septic tank and the edge of the excavation.
- d. The soil around the pipe extending from the septic tank shall be compacted to original density for a distance of 3 feet beyond the edge of the tank excavation.

18. Capacity

- a. Dwelling - the liquid capacity of a septic tank serving a dwelling shall be based on the number of bedrooms contemplated in the dwelling served and shall be at least as large as the capacities given below in Table I:

Table I Tank Sizing for Dwellings

Number of Bedrooms	Tank Liquid <u>Working</u> Capacities (Gallons)
1 to 3	1,000
4 to 5	1,500
6 to 7	2,000
8 to 9	2,500

\*For 10 or more bedrooms, the septic tank shall be sized as an "other" establishment.

- b. Other establishments. The liquid capacity of a septic tank serving a building other than a dwelling (see Appendix D -Estimated Sewage Flow for Other Establishments

\*For Reference Only\*) shall be determined by using the following formulas:

- i. For sewage flows up to 1,500 gallons/day, the septic tank shall have the capacity to hold a minimum of 36 hours of sewage flow (but no less than 1,000 gallons).
  - ii. For sewage flows greater than 1,500 gallons per day, minimum liquid capacity shall be equal to 1,125 gallons plus 75 percent of the daily sewage flow.
- c. If a garbage disposal is installed in a dwelling or other establishment at any time, an effluent filter shall be installed on the outlet of the septic tank, the septic tank capacity shall be at least 50% greater than that required in items a. and d. and either multiple compartments or multiple tanks shall be provided.
  - d. For other establishments and for dwellings utilizing a pressurized soil treatment area, an effluent filter shall be installed on the outlet of the last tank, closest to the pump chamber or soil treatment area.
  - e. Pump chamber capacity cannot be included in the sizing for septic tank liquid capacity.

## 19. Location

- g. The septic tank shall be placed so that it is accessible for the removal of liquids and accumulated solids.
  - h. The septic tank shall be placed on firm and settled soil capable of bearing the weight of the tank and its contents.
  - i. Setbacks see Table IV in Section C - Soil Treatment Area –Design and Construction.
20. The owner of any septic tank or their agent shall regularly inspect the tank. Whenever the top of the sludge layer is less than 12 inches below the bottom of the outlet baffle or whenever the bottom of the scum layer is less than 3 inches above the bottom of the outlet baffle, the owner shall arrange for servicing by a septic system servicer.

## **B Distribution and Dosing of Sewage Effluent**

### **Supply Pipe**

1. The supply pipe extending from the septic tank to the undisturbed soil beyond the tank excavation meet the strength requirements of American Society for Testing and Materials (ASTM), Schedule 40 pipe, contained in the Standard Specifications for Poly Vinyl Chloride (PVC) Plastic Pipe Schedules 40, 80 and 120, ASTM D1785.
2. Supply pipe shall
  - a. Be made from materials resistant to breakdown from sewage and soil;
  - b. Be watertight, including all joints;
  - c. Be durable throughout the design life;
  - d. Not deflect, buckle, crush or longitudinally bend;
  - e. Be resistant to pressures, fatigue, and strain for the application
  - f. Be installed according to ASTM Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications ASTM D2321;
  - g. Be designed, installed, and protected to minimize the danger of freezing in the pipe;
  - h. Not be closer than 6 inches from final grade. Pipes susceptible to freezing shall be insulated and meet setback requirements, see Section C -Soil Treatment Area -Design and Construction.
3. Minimum slope for gravity supply pipes is 1%. Pipe restraints shall be used for slopes greater than 20% or where fluid velocities in the pipe exceed 15 feet per second.
4. For pressure supply pipes, a minimum slope of 1% for drain back or other frost protection shall be employed.

### **Gravity Distribution**

1. Serial distribution shall be used to distribute sewage effluent to individual trenches in a soil treatment area. If the necessary elevation differences between trenches for serial distribution cannot be achieved by natural topography or by varying excavating depths, parallel distribution shall be used. Serial distribution shall not create a pressure head on trenches at lower elevations.
2. If drop boxes are used for serial distribution, the following shall apply:

- a. Boxes shall be watertight and be constructed of durable materials not subject to excessive corrosion or decay.
  - b. The invert of the inlet supply pipe shall be at least 1 inch higher than the invert of the outlet supply pipe to the next drop box.
  - c. The invert of the outlet supply pipe to the next drop box shall be no greater than 2 inches higher than the crown of the distribution pipe serving the trench in which the box is located.
  - d. When sewage effluent is delivered to the drop box by pump, the pump discharge shall be directed against a wall or side of the box on which there is no outlet or directed against a deflection wall or other energy dissipater. The discharge rate into the drop box shall not result in surfacing of sewage from the drop box. The supply pipe shall drain after the pump shuts off.
  - e. The drop box shall be covered by a minimum of 6 inches of soil. If the top of the box is deeper than 6 inches, access shall be provided above, at, or within 6 inches of finished grade.
  - f. The drop box shall be placed on firm and settled soil.
  - g. Connections between drop boxes shall be constructed with watertight pipes with a minimum diameter of 4 inches.
3. Distribution boxes shall meet the following:
- a. Shall be watertight and be constructed of durable materials not subject to excessive corrosion or decay
  - b. The distribution box shall be covered by a minimum of 6 inches of soil. If the top of the box is deeper than 6 inches, access shall be provided above, at, or within 6 inches of finished grade.
  - c. The invert and all outlets shall be set and maintained at the same elevation.
  - d. The inlet invert shall be either
    - i. 1 inch above the outlet invert
    - ii. Sloped such that an equivalent elevation above the outlet invert is obtained within the last 8 feet of the inlet pipe.
  - e. Each trench line shall be connected separately to the distribution box and shall not be subdivided. Distribution boxes shall not be connected to one another if each box has distribution pipes.
  - f. When sewage effluent is delivered by pump, a baffle wall must be installed in the distribution box or the pump discharge must be directed against a wall, baffle, side of the box on which there is not outlet, or directed against a deflection wall, battle or other the pump discharge shall be directed against a deflection wall, baffle, or other energy dissipater. The baffle shall be secured to the box and extend at least 1 inch above the crown of the inlet pipe. The discharge rate into the drop box shall not result in surfacing of sewage from the box. Pressure shall not build up in the box during pump discharge.
4. Non-pressurized distribution pipes shall comply with the following:
- a. Shall be at least 4 inches in diameter, constructed of sound/durable material not subject to corrosion/decay or to loss of strength under continuously wet conditions.



- b. Shall have at least 1 row of holes of no less than 1/2 inch in diameter spaced no more than 36 inches apart.
- c. Shall be laid level orientated away from the distribution device.
- d. Shall have a load bearing capacity of not less than 1,000 pounds per lineal foot.
- e. The distribution pipes in beds shall be uniformly spaced no more than 5 feet apart and not more than 30 inches from the side walls of the bed.

**Pressure Distribution**

- 1. Pressure distribution pipes and associated fittings shall be properly joined together and withstand a pressure of at least 40 pounds per square inch.
- 2. The distribution network shall be designed so there is less than 10% variance in flow for all perforations.
- 3. Perforations shall be no smaller than 1/8 inch diameter and no larger than 1/4 inch diameter. The number of perforations, perforation spacing and pipe size for pressure distribution shall be in accordance with Table II. The friction loss in any individual perforated lateral shall not exceed 20% of the average pressure head on the perforations.

Table II Maximum Number of Perforation per Lateral

¼ inch holes	Pipe diameter in inches				
	1	1.25	1.5	2	3
Perforation spacing in feet	Number of perforations per lateral				
2	10	13	18	30	60
2.5	8	12	16	28	54
3	8	12	16	25	52
3/16 inch holes	Pipe diameter in inches				
	1	1.25	1.5	2	3
Perforation spacing in feet	Number of perforations per lateral				
2	12	18	26	46	87
2.5	12	17	24	40	80
3	12	16	22	37	75
1/8 inch holes	Pipe diameter in inches				
	1	1.25	1.5	2	3
Perforation spacing in feet	Number of perforations per lateral				
2	21	33	44	74	149
2.5	20	30	41	69	135
3	20	29	38	64	128

4. Perforation holes shall be drilled straight into the pipe and not at an angle. Pressurized distribution laterals shall be installed level. Perforation holes shall be free of burrs. The pipes shall drain after the pump turns off.
5. The pressure distribution pipes in beds shall be uniformly spaced no more than 36 inches apart and not more than 24 inches from the outside edge of the bed or mound.
6. Pressure distribution pipes shall be connected to a header or manifold pipe that is of a diameter of such that the friction loss in the header or manifold will be no greater than 5% of the average head at the perforations. The header or manifold pipe shall be connected to the supply pipe from the pump.
7. Perforated pressure distribution pipes shall not be installed closer than 12 inches from the edge of the absorption bed and shall terminate no closer than 12 inches from the ends of the absorption bed.
8. Pressure distribution pipe cleanouts shall be provided to check the system for proper operation and cleaning of plugged perforations. Cleanouts shall be accessible from final grade.

#### **Dosing of Sewage Effluent**

1. The pump controls and pump discharge line shall be installed to allow access for servicing or replacement without entering the dosing chamber.
2. The dosing chamber shall be water tight and constructed of concrete, plastic or fiberglass.
  - a. There shall be 1 or more manholes, with a minimum diameter of 18 inches (least dimension) preferably located directly above the dosing device. Manhole covers shall be brought 6 inches above the finished grade.
  - b. Covers shall be safely secured by being locked, bolted or screwed, having a weight of at least 95 pounds, or other methods as approved by the adopting authority to prevent unauthorized entry.
  - c. The size of the sewage effluent dose shall be determined by design of the soil treatment unit but in no case shall the dosing chamber be sized to provide a dose of less than 75 gallons.
  - d. It shall be the responsibility of the installer to contact a qualified electrician for proper installation of any electrical component used for dosing.
  - e. A mechanical warning system shall be installed to warn of pump failure. An external electrical outlet is required for pumps.
3. Pumps for gravity distribution
  - a. The pump shall discharge at least 10 gallons per minute but no more than 45 gallons per minute
  - b. The pump shall be constructed and fitted in accordance with ASTM Standards.
  - c. The pump shall have sufficient dynamic head for both the elevation difference and friction loss.

4. Pumps for pressure distribution
  - a. The pump shall be constructed and fitted in accordance with ASTM Standards.
  - b. The pump discharge capacity shall be based on perforation discharges for a minimum average head of
    - i. For dwellings: 1 foot for 3/16 inch to 1/4 inch perforations and 2 feet for 1/8 inch perforations
    - ii. For other establishments: 2 feet for 3/16 inch to 1/4 inch perforations and 5 feet for 1/8 inch perforations

Perforation discharge is determined by the following formula:

$$Q = 19.56cd^2h^{1/2}$$

Where q = discharge in gallons per minute

C = 0.60 = coefficient of discharge

D = perforation diameter in inches

H = head in feet

- c. The pump discharge head shall be at least 5 feet greater than the head required to overcome pipe friction losses and the elevation difference between the pump and the distribution device.
  - d. The quantity of sewage effluent delivered for each pump cycle shall be no greater than 25% of the design flow and at least 4 times the volume of the distribution pipes plus the volume of the supply pipe.
5. Pumps shall be installed in accordance with manufacturer requirements.

## **C Soil Treatment Area**

**General** - Final treatment and disposal of all sewage effluent shall be approved by the adopting authority.

1. The soil and limiting factors shall determine the type of soil treatment area. See Appendix A for soil boring and percolation test procedures.
2. Soils shall be analyzed and reported by an entity approved by the adopting authority or a registered professional soil classifier.
3. The soil sizing factor shall be determined by the soil between the limiting factor and the bottom of the soil treatment area, using the most restrictive layer as the soil sizing factor.
4. The vertical separation between the bottom of the soil treatment area and the limiting factor shall be at least 24 inches.
5. A minimum of 36 inches of vertical separation shall be required in exclusively sandy soils, where the sand is located below where the trenches would be installed.
6. Excessive overland surface flow shall be diverted from the soil treatment area.

## Sizing

1. After considering the soil conditions, the required size of the soil treatment area shall be determined by number of bedrooms for dwellings, the sum of the areas required for each individual unit for multiple residential units, and by the daily sewage flow for other establishments.
2. For a multifaceted building, the gallons per day of each service, number of bedrooms etc. shall be cumulative to determine the gallons per day.
3. Estimates of sewage flow for dwellings are given below in Table III.

Table III Dwelling Sewage Flow

Number of Bedrooms	Sewage Flow (gallons per day)
2	300
3	450
4	600
5	750
6	900
7	1050
8	1200
9	1350

4. For other establishments, see Appendix D as reference.
5. The minimum soil treatment area required for any dwelling shall provide treatment for at least 2 bedrooms, 300 gallons per day.

## Design and Construction

Setbacks are given below in Table IV:

Table IV Minimum Setback Distances

Feature	Sewage tanks, holding tank (feet)	Soil treatment area and distribution device (feet)
Well < 100 feet deep	100	100
Well > 100 feet deep	50	50
Any other water supply well or buried water suction pipe	50	50
Buried pipe distributing water under pressure	10	10
Surface Water bodies—from ordinary high water mark	100	100
Buildings	10	20
Property lines	10	10

## Trench

1. The sizing of the soil treatment area shall be determined in accordance with Table V:

TABLE V Soil Sizing Factors (reference only)

Percolation Rate (minutes-per-inch)	Soil Texture	Soil Sizing Factor (feet <sup>2</sup> /gallon per day)	Area per Bedroom (feet <sup>2</sup> )
<0.1*	Coarse sand		
0.1 – 5	Medium sand	0.83	125
0.1 – 5	Fine sand	1.67	250
6 – 15	Sandy loam	1.27	190
16 – 30	Loam	1.67	250
31 – 45	Silt loam, silt	2.00	300
46 – 60	Clay loam sandy clay or silty clay	2.20	330
61 - 120**	Clay, sandy or silty clay	4.20	630
>120***			
*Soil is unsuitable for standard system if percolation rate is less than 0.1 minutes-per-inch		** Consider at- grade or mound for soils with this percolation range	***Soil is unsuitable for standard system if percolation rate is slower than 120 minutes-per-inch

2. On slopes in excess of 12%, the soil profile shall be carefully evaluated in the location of the proposed soil treatment system and down slope to identify the presence of layers with different permeability that may cause side hill seepage. In no case shall a trench be located within 15 feet of such a layer surfacing on the down slope.
3. Trenches shall not be less than 18 inches nor more than 36 inches wide. Any trench wider than 36 inches shall be considered a bed. See Section C -Soil Treatment Area -Seepage Bed.
4. Trenches should have a minimum spacing of 6 feet on center, unless located on a slope of more than 6%, then a minimum of 10 feet of undisturbed soil is required between each of the trenches.
5. The bottom of the trench excavation shall be level and along the contour. Sidewalls shall be as vertical as practical and not intentionally sloped.
6. The bottom and sides of the soil treatment system to the top of the filter material shall be excavated in such a manner as to leave the soil in a natural, un-smearred, and uncompacted condition. Excavation shall be made only when the soil moisture content is at least or less than the plastic limit.

7. Trenches shall not be more than 110 feet in length, without approval from the adopting authority. If separated by a box that will distribute water to both sides of the trenches, the 110 feet can extend on both sides of the box.
8. Trenches shall not have a depth greater than 4 feet.
9. When in slower draining loam to clay soil, excavation shall be by back hoe or other means that allow the equipment wheels or tracks to remain on the surface soil. Excavation equipment or other vehicles shall not be driven on the soil treatment area.
10. When installed in exclusive sand, the soil treatment area shall employ one of the following:
  - a. Employ pressure distribution;
  - b. Divide the total dispersal area into multiple units that employ serial distribution, with each dispersal unit having no greater than 15 percent of the required bottom absorption area.
11. Material Used
  - a. Drain field rock trench system
    - i. There shall be a layer of at least 6 inches but no more than 24 inches of filter materials on the bottom of the trenches.
    - ii. The filter material shall completely encase the distribution pipes; see Section B -Distribution and Dosing of Sewage Effluent, to a depth of at least 2 inches.
    - iii. The filter material shall be covered with an unwoven geo-textile fabric or a similar, permeable material approved by the adopting authority
  - b. Other materials and devices may be used to distribute sewage effluent over the soil treatment area and shall be installed in accordance with manufacturer requirements, upon approval by the adopting authority.
12. The minimum depth of cover over the crown of the distribution pipes shall be 12 inches of soil. The maximum depth of cover over the the crown distribution pipes shall be no more than 36 inches. No more than 24 inches is preferred.
13. Each trench shall have an inspection pipe that is 4 inches in diameter. The inspection pipes shall be located at the end opposite where sewage effluent enters the drain field and allow for monitoring of current water level. Perforations shall not be located above the fabric, if used. The inspection pipe shall extend to the bottom of the distribution medium, be secured, and capped 6 inches above finished grade, or accessible below grade. The first trench shall have an additional inspection pipe at the entrance of the trench.
14. The trenches shall be backfilled and crowned above finished grade to allow for settling.
15. A grass cover shall be established over the soil treatment system.

### **Seepage Bed**

In addition to applicable design and construction information found in Trench Design and Construction, beds shall meet the following requirements:

1. Beds shall have prior approval from the adopting authority.
2. Beds shall be sized with 50% more square feet than trenches.
3. Bed construction shall be limited to areas having natural slopes of less than 6%.

4. Maximum width for a gravity bed is 12 feet, the maximum for pressurized bed is 25 feet.
5. Multiple beds shall be spaced at 1/2 the bed width.

**Mound**

1. Buildings and dwellings utilizing a mound system as the soil treatment area shall have an effluent filter installed on the outlet of the septic tank that is capable of removing food waste.
2. Buildings and dwellings utilizing a mound system as the soil treatment areas shall not have a garbage disposal installed inside the building.
3. Mounds shall be constructed on original soil and meet the separation requirement between the bottom of the distribution medium and limiting factor.
4. There shall be at least 12 inches of original soil with a percolation rate faster than 120 minutes-per inch above the limiting factor.
5. The sizing of the soil treatment area shall be determined in accordance with Table VI by using the percolation rate of the 12 inches of original soil immediately under the clean sand layer,

Table VI Absorption Width Sizing ("reference only")

Percolation rate of original soil (minutes-per-inch)	Soil Texture	Loading Rate (gallons per day/ square foot)	Absorption Ratio (square feet per gallon/day)
<5	Coarse sand Sand	1.20	1.00
0.1 – 5	Fine sand Loamy fine sand	0.6	2.0
6 – 15	Sandy loam	0.78	1.50
16 - 30	Loam	0.60	2.00
31 – 45	Silt loam, silt	0.50	2.40
46 – 60	Clay loam, silty or sandy clay loam	0.45	2.67
61 – 120	Silty or Sandy Clay or Clay	0.24	5
>120	Soil is unsuitable for standard system if percolation rate is slower than 120 minutes-per-inch		

6. Mounds shall not be located on natural slopes exceeding 12%.
7. On slopes of 3% or greater, and where the original soil is a clay, sandy clay or silty clay soil, mounds shall not be located where the ground surface contour lines that lie directly below the long axis of the distribution bed represent a swale or draw, unless contour lines have a radius of curvature greater than 100 feet. Mounds shall never be located in swales or draws where the radius of curvature of the contour lines is less than 50 feet.

8. The required absorption width of mounds constructed on ground sloping from 0 to 1% shall include the width of the distribution bed plus a distance measured between the outer edges of the upslope and the down- slope banks. The required absorption width for mounds constructed on ground sloping between 1% and 12% shall include the width under the drain field rock layer plus a portion of the width of the downslope bank.
9. The side slopes on the mound shall not be steeper than 4 to 1.
10. The supply pipe from the pump to the mound area shall be installed before soil surface preparation. The trench shall be carefully backfilled and compacted to prevent seepage of sewage effluent.
11. All vegetation in excess of 4 inches in length and dead organic debris shall be removed from the surface of the total area selected for the mound, including the area under the banks. The total area shall be roughened by plowing to a depth of at least 8 inches or the sod layer broken and roughened by backhoe teeth. Furrows shall be thrown uphill and there shall be no dead furrow under the mound.
12. The soil shall be plowed or roughened when the moisture content of a fragment 8 inches below the surface is below the plastic limit. The soil under a mound including the area under the banks shall not be roughened by rototilling or pulverizing. In soils that are sandy in the top 8 inch depth, discing may be used for surface preparation as a substitute for plowing. Mound construction shall proceed immediately after surface preparation is completed.
13. A rubber-tired tractor may be used for plowing or disking, but shall not be driven on the absorption area after the surface preparation is completed. A crawler or track type tractor shall be used for mound construction.
14. Materials Used
  - a. Drain field rock mound system
    - i. The bottom area of the drain field rock layer shall be sized on the basis of 0.83 square feet-gallon per day of water per day at a minimum.
    - ii. A minimum of 12 inches of soil defined as clean sand shall be placed in contact with the bottom area of the drain field; the rock layer area is to be located and shall be uniformly tapered to cover the entire original soil absorption area.
    - iii. The clean sand shall be placed by using a construction technique that minimizes compaction. If the clean sand is pushed into place, a crawler tractor with a blade or unloaded bucket shall be used to push the clean sand into place. At least 6 inches of clean sand shall be kept beneath the equipment to minimize compaction of the plowed layer. When placing clean sand with a backhoe that has rubber tires, the tractor shall not drive over the drain field rock or banks of the mound. The clean sand layer upon which the drain field rock is placed shall be level.
    - iv. A depth of at least 9 inches of drain field rock shall be placed over the rock layer area below the distribution pipe.



- v. Distribution of sewage effluent over the rock layer shall be by distribution pipe under pressure see Section B -Distribution and Dosing of Sewage Effluent.
  - vi. The drain field rock shall completely encase the top and sides of the distribution pipes to a depth of 2 inches. The top of the drain field rock shall be level in all directions.
  - vii. The width of the drain field rock layer in a single mound shall not exceed 10 feet.
  - viii. The drain field rock shall be covered with a permeable synthetic fabric.
  - ix. Construction vehicles shall not be allowed on the drain field rock until back fill is placed.
  - x. On slopes of 3% or greater, the long axis of the level drain field rock layer shall not diverge up or down the slope by more than 12 inches of elevation from the natural contour line. The depth of the clean sand layer along the upper edge of the level drain field rock layer shall not vary by more than 12 inches.
  - xi. Soil suitable to grow vegetative cover shall be placed on the soil treatment area to a depth of 1 foot in the center of the mound and to a depth of 6 inches at the sides.
  - xii. A maximum of two 10-foot wide rock layers may be installed side by side in a single mound if the original soil is sandy loam, loam, silt loam, silt, clay loam, sandy clay or silty clay to a depth of at least 24 inches below the clean sand layer. The rock layers shall be separated by 4 feet of clean sand.
  - xiii. When 2 rock layers are installed side by side, the sandy loam fill shall be 18 inches deep at the center of the mound and 6 inches deep at the sides.
- b. Other material and devices may be used to distribute sewage effluent over the soil treatment area upon approval by the adopting authority; materials shall be installed in accordance with manufacturer requirements.
15. A clean out and vertical inspection pipe at least 4 inches in diameter shall be installed and secured at the distribution medium and sand interface. The inspection pipe shall allow for monitoring of current water level. Perforations shall not be located above the fabric, if used. The inspection pipe shall extend to the bottom of the distribution medium, be secured and capped 6 inches above finished grade, or accessible below grade.
16. A grass cover shall be established over the entire area of the mound.
17. Shrubs shall not be planted on the top of the mound. Shrubs may be placed at the foot and side of the mound.
18. Whenever mounds are located on slopes, a diversion shall be constructed immediately upslope from the mound to intercept and direct runoff.

### **At-grade System**

1. Buildings and dwellings utilizing an at-grade system as the soil treatment area shall have an effluent filter installed on the outlet of the septic tank that is capable of removing food waste.
2. Buildings and dwellings utilizing an at-grade system as the soil treatment areas shall not have a garbage disposal installed inside the building.
3. At-grade systems shall not be installed in areas with slopes greater than 25%.
4. At-grade beds shall not exceed a width of 15 feet. The at-grade width for slopes 1% and greater does not include any width of media necessary to support the upslope side of the pipe.
5. The sizing of the soil treatment area shall be determined in accordance with Table VI by using the loading rate for the upper 12 inches of soil.
6. Materials Used
  - a. Distribution of sewage effluent over the drain field rock layer shall be by distribution pipe under pressure; See Section B -Distribution and Dosing of Sewage Effluent.
  - b. At-grade systems located on 1% slope or greater require only one distribution pipe located on the upslope edge, with the bed width being measured from the distribution pipe to the downslope edge. Multiple distribution pipes may be allowed for use to provide even distribution if necessary, based upon site conditions.
  - c. The upslope edge of an at-grade bed shall be installed along the natural contour.
  - d. At-grade materials shall be placed by using construction techniques that minimize compaction.
  - e. 12 inches of soil suitable to grow vegetative cover shall be installed over the distribution media. Cover shall extend at least 5 feet from the ends of the media bed and be sloped to divert surface water. Side slopes shall not be steeper than 4 to 1.
  - f. Other material and devices may be used to distribute sewage effluent over the soil treatment area upon approval by the adopting authority; materials shall be installed in accordance with manufacturer requirements.
7. A clean out and vertical inspection pipe at least 4 inches in diameter shall be installed and secured at the distribution medium and sand interface. The inspection pipe shall allow for monitoring of current water level. Perforations shall not be located above the fabric, if used. The inspection pipe shall extend to the bottom of the distribution medium, be secured and capped 6 inches above finished grade, or accessible below grade.
8. A grass cover shall be established over the entire area of the at-grade system.

### **D Alternative Systems**

All alternative systems require pre-approval from the adopting authority.

## Holding Tanks

1. A holding tank shall comply with the septic tank provisions of these regulations, including setbacks; see Section A -Septic Tanks.
2. Capacity:
  - a. For permanent buildings other than dwellings and temporary facilities, the tank capacity shall be based on measured flow rates or estimated flow rates. The tank capacity shall be at least 7 times the daily flow rate, but a minimum of 1,000 gallons.
3. Holding tanks shall be located:
  - a. In an area readily accessible to a pump truck under all weather conditions.
  - b. Where accidental spillage during pumping will not create a nuisance.
4. Proof for disposal and treatment of the sewage wastes shall be maintained by the owner with a septic system servicer, and provided to the Adopting Authority, if requested.
5. Holding tanks shall be monitored to minimize the chance of accidental sewage overflows. A mechanical warning system shall be installed which allows at least 25% reserve capacity after actuation. It shall be the responsibility of the installer to contact a qualified electrician for proper installation of any electrical component, prior to the building being occupied.
6. Property owners may be allowed a holding tank exemption to these regulations, if the approved protocols and procedures are followed according to policies in place to protect public health and the environment.
  - a. Holding tank allowances may include: campers, park models, and buildings up to 600 square feet in size for the livable area; commercial buildings without bedrooms/livable space; disturbed or probable disturbed soil; high water table; and inadequate size/room for a drainfield.
  - b. The minimum tank size is 1,000 gallons. If a livable area exists, a minimum of 1500 gallon tank capacity or larger is required.

## Chemical Toilets

1. Chemical toilets shall consist of a toilet seat connected by a metal hopper to a metal tank containing chemicals, usually sodium hydroxide. All connections to the toilet seat and the tank shall be watertight. A rod shall extend above the floor of the room to operate the agitator in the chemical tank.
2. A supply of the chemical shall be available in a closed container for periodic additions to the toilet.

## Privies

1. General specifications for the design and construction of a privy.
  - a. A privy pit shall be constructed by providing a watertight structure in the pit. The watertight structure shall provide a minimum capacity of 1000 gallons.
  - b. A privy building shall be placed over the structure.
  - c. The floor of this building shall be of concrete with the privy seat of suitable material

which is easily cleanable and serviceable.

- d. A vent located adjacent to the seat shall extend from the vault to a point above the roof of the building. The seat shall be provided with a cover.
2. All openings in the building shall be screened to prevent the entrance of flies. The building shall be so constructed as to prevent the entrance of vermin to the vault. The privy door shall be self-closing.
3. A contract for disposal and treatment of the sewage wastes shall be maintained by the owner with a septic system servicer.
4. Privies shall be monitored to minimize the chance of accidental sewage overflows. If a mechanical warning system is installed, it shall allow 25% reserve capacity after actuation. It shall be the responsibility of the installer to contact a qualified electrician for proper installation of any electrical component.
5. Removable cans: When removable cans are used in a privy, they shall be placed in watertight vaults and provisions made for removing the seat so the cans can be moved for disposal of the contents in a manner acceptable to the adopting authority. The privy building shall comply with the above specifications for a pit privy building.

## **Appendix C On-site Wastewater Technical Review Board**

### The On-site Wastewater Technical Review

#### **A General**

Board shall be at minimum comprised of environmental health representatives from adopting authorities. The board may include members from North Dakota Department of Health, industry, and licensed installers.

#### **B Registration of Products**

1. The Board shall develop product review and registration process and maintain a list of registered products for on-site sewage treatment systems.
2. The Board shall develop recommended standards for different types of sewage treatment technologies and sewage distribution technologies.
3. Registrations shall be valid unless:
  - a. The design is changed
  - b. The manufacturing process is changed
  - c. The product is recalled for any reason
  - d. The product is found to be defective
  - e. The product is no longer available

#### **C Continuing Education**

1. The Board shall be responsible for continuing education for septic installers.
2. This will include:
  - a. Trainings
  - b. Testing requirements

**Appendix D Estimated Sewage Flow from Other Establishments**  
**\*For Reference Only\***

<b>Estimated Sewage Flow from Other Establishments</b>		
<b>Dwelling Units</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Hotel or Luxury Hotel	Guest	55
	Square Foot	0.28
Motel	Guest	38
	Square Foot	0.33
Rooming House	Resident	45
	Add for Each Nonresident Meal	3.3
Daycare (no meals)	Child	19
Daycare (with meals)	Child	23
Dormitory	Person	43
Labor Camp	Person	18
Labor Camp (semi permanent)	Employee	50
<b>Commercial/Industrial</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Retail Store	Square Foot	0.13
	Customer	3.8
	Toilet	590
Shopping Center	Employee	11.5
	Square Foot	0.15
	Parking Space	2.5
Office	Employee 8-Hour Shift	18
	Square Foot	0.18
Medical Office*	Square Foot	1.1
	Practitioner	275
	Patient	8
Industrial Building*	Employee 8-Hour Shift	17.5
	Employee 8-Hour Shift with Showers	25
Laundromat	Machine	635
	Load	52.5
	Square Foot	2.6
Barber Shop*	Chair	68
Beauty Salon*	Station	285
Flea Market	Nonfood Vendor Space	15
	Limited Food Vendor Space	25
	With Food Vendor Space	50

**Appendix D Estimated Sewage Flow from Other Establishments**

**\*For Reference Only\***

<b>Estimated Sewage Flow from Other Establishments</b>		
<b>Eating and Drinking Establishments</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Restaurant (does not include bar of lounge)	Meal Without Alcoholic Drinks	3.5
	Meal With Alcoholic Drinks	8
	Seat (open 16 hours or less)	30
	Seat (open more than 16 hours)	50
	Seat (open 16 hours or less, single service articles)	20
	Seat (open more than 16 hours, single service articles)	35
Restaurant (short order)	Customer	7
Restaurant (drive-in)	Car Space	30
Restaurant (carry out including caterers)	Square Foot	0.5
Institutional Meals	Meal	5
Food Outlet	Square Foot	0.2
Dining Hall	Meal	8.5
Coffee Shop	Customer	7
Cafeteria	Customer	2.5
Bar or Lounge (no meals)	Customer	4.5
	Seat	36
<b>Entertainment Establishments</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Drive-in Theater	Car Stall	5
Theater	Auditorium Seat	4.5
Bowling Alley	Alley	185
Country Club	Member (no meals)	22
	Member (with meals and showers)	118
	Member (resident)	86
Fairground and Other Similar Gatherings	Visitor	1.5
Stadium	Seat	5
Dance Hall	Person	6
Health Club	Gym Member	35

**Appendix D Estimated Sewage Flow from Other Establishments**

**\*For Reference Only\***

<b>Estimated Sewage Flow from Other Establishments</b>		
<b>Outdoor Recreation and Related Lodging Facilities</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Campground	Campsite with Sewer Hook-up (per person)	32
	Campsite with Sewer Hook-up (per site/space)	100
	Campsite without Sewer Hook-up, with Central Toilet or Shower Facility(per site)	50
	Campsite without Sewer Hook-up, with Central Toilet or Shower Facility, Served by Dump Station (per site)	63
Permanent Mobile Home	Mobile Home	225
Camp, Day without Meals	Person	20
Camp, Day with Meals	Person	25
Camp, Day and Night with Meals	Person	45
Resort	Lodge Hotel Person	62
Cabin, Resort	Person	50
Retail Resort Store	Customer	4
Park or Swimming Pool	Guest	10
Visitor Center	Visitor	13
<b>Transportation</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Gas Station	Convenience Store Customer	3.5
	Service Station* Customer	11
	Service Bay	50
	Toilet	250
	Square Foot	0.25
Car Wash* (does not include car wash water)	Square foot	5
Airport, Bus Station, Rail Depot	Passenger	5
	Square Foot	5
	Restroom	565
<b>Institutional</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Hospital*	Bed	220
Mental Health Hospital*	Bed	147
Prison or Jail	Inmate	140
Nursing Home, Other Adult Congregate Living	Resident	125
Other Public Institution	Person	105
School (no gym, no cafeteria, and no showers)	Student	14



**Appendix D Estimated Sewage Flow from Other Establishments**

**\*For Reference Only\***

<b>Estimated Sewage Flow from Other Establishments</b>		
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<b>Institutional (cont.)</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
School (with cafeteria, no gym, and no showers)	Student	18
School (with cafeteria, gym, and showers)	Student	27.5
School (boarding)	Student	95
Church	Seat	4
	add for each meal prepared	5
Assembly Hall	Seat	4
<b>Miscellaneous</b>	<b>Unit</b>	<b>Design flow (gal/day/unit)</b>
Public Lavatory	User	5
Public Shower	Shower Taken	11

Unless otherwise noted in Table I, the flow values do not include flows generated by employees. A flow value of 15 gallons/employee/eight-hour shift must be added to the flow amount. Design flow determination for establishments not listed in Table I shall be determined by the best available information & approved by the approving authority.

Slaughter-houses: Do not allow blood to enter system. Collect blood separately and sell to a renderer. To provide sufficient time to stabilize the remaining high strength waste, twice the capacity is required.

Dairy: Septic tanks and soil treatment areas will not treat milk or whey wastes. Do not allow to enter the system.

Swimming Pool/Spa: Chlorinated water shall not be allowed to enter the system.