

## **15A NCAC 18A .1956 MODIFICATIONS TO SEPTIC TANK SYSTEMS**

The following are modifications to septic tank systems or sites which may be utilized singly or in combination to overcome selected soil and site limitations. Except as required in this Rule, the provisions for design and installation of Rule .1955 and .1970 of this Section shall apply:

- (1) **SHALLOW SYSTEMS:** Sites classified UNSUITABLE as to soil depth or soil wetness may be reclassified as PROVISIONALLY SUITABLE with respect to soil depth or soil wetness conditions by utilizing shallow placement of nitrification trenches in the naturally occurring soil. Shallow trenches may be used where at least 24 inches of naturally occurring soil are present above saprolite, rock, or soil wetness conditions and all other factors are PROVISIONALLY SUITABLE or SUITABLE. Shallow trenches shall be designed and constructed to meet the vertical separation requirements in Rule .1955(m) or .1970 of this Section. The long-term acceptance rate shall be based on the most hydraulically limiting naturally occurring soil horizon within 24 inches of the ground surface or to a depth of one foot below the trench bottom, whichever is deeper. Soil cover above the original grade shall be placed at a uniform depth over the entire nitrification field and shall extend laterally five feet beyond the nitrification trench. The type and placement of soil cover shall be approved by the local health department.
- (2) **DRAINAGE AND RESTRICTIVE HORIZONS:** Sites classified UNSUITABLE as to soil wetness conditions or restrictive horizons may be reclassified PROVISIONALLY SUITABLE as to soil wetness conditions or restrictive horizons when:
  - (a) Soils are Soil Groups I or II with SUITABLE structure, and clay mineralogy;
  - (b) Restrictive horizons, if present, are less than three inches thick or less than 12 inches from the soil surface;
  - (c) Modifications can be made to meet the requirements in Rule .1955(m) of this Section for the separation between the water table and the bottom of the nitrification trench at all times and when provisions are made for maintenance of the drainage systems;
  - (d) Easements are recorded and have adequate width for egress and ingress for maintenance of drainage systems serving two or more lots; and
  - (e) Maintenance of the drainage system is made a condition of any permit issued for the use or operation of a sanitary sewage system.

Drainage may be used in other types of soil when the requirements of Rule .1942, .1970 or .1948(d) in this Section are met.

- (3) **MODIFIED TRENCHES:** Modified nitrification trenches or lines, including large diameter pipe (greater than four inches I.D.), and specially designed porous block systems may be permitted by the local health department as follows:
  - (a) **GRAVELLESS TRENCHES:** Gravelless nitrification trench systems may be substituted for conventional trench systems on any site found to be SUITABLE or PROVISIONALLY SUITABLE in accordance with Rules .1940 to .1948 of this Section to eliminate the need for gravel, minimize site disturbance, or for other site planning considerations. Gravelless nitrification trench systems shall not be used, however, where wastes contain high amounts of grease and oil, such as restaurants. Large diameter pipe systems and porous block systems may be permitted by the local health department as follows:
    - (i) Large diameter pipe systems shall consist of eight-inch or 10-inch (inside diameter), corrugated, polyethylene tubing encased in a nylon, polyester, or nylon/polyester blend filter wrap installed in a nitrification trench, 12 or more inches wide and backfilled with soil classified as soil group I, II, or III. Nitrification area requirement shall be determined in accordance with Rules .1955(b) and .1955(c), or in Rule .1956(6)(b), Table III(a) of this Section, when applicable, with eight-inch tubing considered equivalent to a two-foot-wide conventional trench and 10-inch tubing considered equivalent to a two and one-half-foot-wide conventional trench. The long-term acceptance rate shall not exceed 0.8 gallons per day per square foot. Tubing and fittings shall comply with the requirements of ASTM F-667, "Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings," which is hereby incorporated by reference including any subsequent amendments and editions. Copies of the standards may be inspected at the Division of Environmental Health Central Office, located at 2728 Capital Blvd., Raleigh, NC,

and copies may be downloaded from the Internet at <http://www.astm.org>, or obtained from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19438-2959, at a cost of thirty dollars (\$30.00). The corrugated tubing shall have two rows of holes, each hole between three-eighths and one-half-inch in diameter, located 120 degrees apart along the bottom half of the pipe (each 60 degrees from the bottom center line) and staggered so that one hole is present in the valley of each corrugation. The tubing shall be marked with a visible top location indicator, 120 degrees away from each row of holes. Filter wrap shall be spun, bonded, or spunlaced nylon, polyester, or nylon/polyester blend nylon filter wrap meeting the minimum requirements in Table III(a):

Table III(a): Minimum Filter Wrap Requirements for Large Diameter Pipe Systems	
PROPERTY	VALUE
Unit Weight	1.0 ounce per square yard
Sheet Grab Tensile Strength	Machine Direction: 23 pounds
Trapezoid Tear Strength	Machine Direction: 6.2 pounds Cross Direction: 5.1 pounds
Mullen Burst Strength	40 pounds per square inch or 276 kilopascals
Frazier Air Permeability	500 cubic feet per minute per square foot at pressure differential of 0.5 inches of water

Corrugated tubing shall be covered with filter wrap at the factory and each joint shall be immediately encased in a black polyethylene sleeve which shall continue to encase the large diameter pipe and wrap until just prior to installation in the trench to prevent physical damage and ultraviolet radiation deterioration of the filter wrap. Large diameter pipe systems shall be installed in accordance with this Rule and the manufacturer's guidelines. The trench bottom and pipe shall be level (with a maximum fall of one inch in 100 feet). Rocks and large soil clumps shall be removed from backfill material prior to being used. Clayey soils (soil group IV) shall not be used for backfill. The near end of the large diameter pipe shall have an eight-inch by four-inch offset adapter (small end opening at top) suitable for receiving the pipe from the septic tank or distribution device and making a mechanical joint in the nitrification trench.

- (ii) A Prefabricated, Permeable Block Panel System (PPBPS), utilizing both horizontal and vertical air chambers and constructed to promote downline and horizontal distribution of effluent, may be used under the following conditions:
  - (A) the soil and site criteria of this Section shall be met;
  - (B) in calculating the required linear footage for a PPBPS's nitrification field, the linear footage for the nitrification line as determined in Rule .1955 (b) and (c), or in Rule .1956 (6)(b), Table III(a) of this Section when applicable, shall be multiplied by 0.5 for a 16 inch PPBPS;
  - (C) installation of the PPBPS shall be in accordance with Rule .1955 except:
    - (I) the PPBPS trench shall be located not less than eight feet on centers;
    - (II) the installation shall be in accordance with the manufacturer's specifications; and
    - (III) the sidewalls of nitrification trenches placed in Group IV soils shall be raked to open pores which were damaged or sealed during excavation;
  - (D) where design sewage flow is more than 480 gallons per day, the system shall be pressure-dosed; and
  - (E) the long-term acceptance rate shall not exceed 0.8 gallons per day per square foot.

- (b) Other types of nitrification trenches or lines may be approved by the local health department on a site-specific basis in accordance with Rule .1969 of this Section.
- (4) INTERCEPTOR DRAINS: Sites classified as UNSUITABLE as to soil wetness conditions because of the presence of lateral water movement may be reclassified PROVISIONALLY SUITABLE as to soil wetness conditions when such water is intercepted and diverted to prevent saturation of the soil absorption system.
- (5) STEEP SLOPES: Stable slopes greater than 30 percent may be reclassified as PROVISIONALLY SUITABLE when:
  - (a) The soil characteristics can be classified as SUITABLE or PROVISIONALLY SUITABLE to a depth of at least one foot below the bottom of the nitrification trench at the upslope side of the trench;
  - (b) Surface water runoff is diverted around the nitrification field if necessary to prevent scouring or erosion of the soil over the field; and
  - (c) The finished grade over the nitrification field site is returned to the original topography and seeded to establish a permanent vegetative cover, unless otherwise specified by the local health department.
- (6) SAPROLITE SYSTEM: Sites classified UNSUITABLE as to soil depth, with saprolite present, may be reclassified PROVISIONALLY SUITABLE as to soil depth when:
  - (a) An investigation of the site using pits at locations specified by the local health department is conducted. The following physical properties and characteristics shall be present in the two feet of saprolite below the proposed trench bottom:
    - (i) the saprolite texture is sand, loamy sand, sandy loam, loam, or silt loam;
    - (ii) clay mineralogy is suitable;
    - (iii) greater than two-thirds of the material has a moist consistence that is loose, very friable, friable, or firm;
    - (iv) the saprolite wet consistence is nonsticky or slightly sticky and nonplastic or slightly plastic;
    - (v) the saprolite is in an undisturbed, naturally occurring state; and
    - (vi) the saprolite has no open and continuous joints, quartz veins, or fractures that are relic of parent rock to a depth of two feet below the proposed trench bottom.
  - (b) Table III(b) is used in determining the long-term acceptance rate. The long-term acceptance rate shall be based on the most hydraulically limiting, naturally occurring saprolite to a depth of two feet below trench bottom.

Table III(b): Long-Term Acceptance Rates for Saprolite Systems			
SAPROLITE GROUP	SAPROLITE TEXTURAL CLASS		LONG-TERM ACCEPTANCE RATE (gallons per day per square foot)
I	Sands	Sand	0.8 – 0.6
		Loamy Sand	0.7 – 0.5
II	Loams	Sandy Loam	0.6 – 0.4
		Loam	0.4 – 0.2
		Silt Loam	0.3 – 0.1

If a low pressure pipe system is used, the long-term acceptance rate in Table III(b) shall be reduced by one-half and the system shall be designed in accordance with Rule 1957(a) of this Section, except that Rule .1957(a)(2)(B) and Rule .1957(a)(3) shall not apply. Other design criteria may also be used in conjunction with an advanced pretreatment system pursuant to Rule .1970. Saprolite textural classifications shall be determined from disturbed materials and determined by Rule .1941(a)(1) of this Section. Low-pressure distribution shall be used when the total length of nitrification lines exceeds 750 feet in a single system.

- (c) The design daily flow does not exceed 1000 gallons.
- (d) The nitrification field is constructed using nitrification trenches with a maximum width of three feet and a maximum depth of three feet on the downslope side of the nitrification trench. The bottom of a nitrification trench shall be a minimum of two feet above rock or

saprolite that does not meet the requirements of Subparagraph (6)(a) of this Rule, or the requirements of Subparagraph (h)(2) of Rule .1970 in conjunction with an advanced pretreatment system. However, where SUITABLE or PROVISIONALLY SUITABLE soil underlies the trench bottom, this separation distance may be reduced by subtracting the actual soil depth beneath the trench bottom from 24 inches to establish the minimum separation distance from the trench bottom to rock.

- (e) The bottom of any nitrification trench is a minimum of two feet above any wetness condition.
- (f) Surface and subsurface interceptor drains are required on sites with more slowly permeable horizons above the usable saprolite to intercept laterally flowing waters or perched waters.

Exceptions to the provisions of Rule .1950(a) found in Rule .1950 and .1951 of this Section shall not apply to systems installed pursuant to this Item [Rule .1956(6)]. Other saprolite systems may be approved on a site-specific basis in accordance with Rule .1948(d) or .1970 of this Section.

(7) SAND LINED TRENCH SYSTEM: Sites classified UNSUITABLE as to soil wetness, soil morphology, restrictive horizon or soil depth where a horizon with higher permeability underlies less permeable horizons, may be reclassified PROVISIONALLY SUITABLE as to soil wetness, soil morphology, restrictive horizon or soil depth (soil depth to parent material, not rock) when:

- (a) An investigation of the site using pits or auger borings at locations specified by the local health department is conducted. The following physical properties and characteristics shall be present:
  - (i) if the receiving permeable horizon is deeper than five feet below the natural grade, the effluent is to receive pretreatment to TS-I or TS-II level prior to pressure dispersal in the sand lined trenches. If the receiving permeable horizon is encountered at depths of five feet or less below the natural grade, pretreatment to TS-I or TS-II level and pressure dispersal is not required;
  - (ii) the texture of the receiving permeable horizon is sand, loamy sand, sandy loam, loam, or silt loam;
  - (iii) the structure of the receiving horizon is classified as SUITABLE or PROVISIONALLY SUITABLE;
  - (iv) the moist consistence of the receiving permeable horizon is loose, very friable, friable, or firm;
  - (v) if the receiving permeable horizon has zones of heavier textured materials, these zones are discontinuous with an average thickness not exceeding 1/3 of the required thickness of the receiving permeable horizon;
  - (vi) if the texture of the receiving permeable horizon is sandy loam or loam, and the system design flow is greater than 600 gallons per day, the saturated hydraulic conductivity of the permeable horizon shall be field-determined; and
  - (vii) if the texture of the receiving permeable horizon is silt loam, the saturated hydraulic conductivity of the permeable horizon shall be field-determined.
- (b) The minimum thickness required of the receiving permeable horizon is dependent upon the texture of the receiving horizon as follows:
  - (i) sand or loamy sand – 1 foot thick;
  - (ii) sandy loam or loam – 2 feet thick; or
  - (iii) silt loam – 3 feet thick.
- (c) Table III(c) is used in determining the long-term acceptance rate (LTAR) for all sand-lined trench systems. The long-term acceptance rate shall be:
  - (i) the rate set forth in Table III(c), based on the most hydraulically limiting, naturally occurring soils overlying the permeable receiving layer, or
  - (ii) when the saturated hydraulic conductivity of the underlying horizons is required to be determined pursuant to Subitem (7)(a)(vi) or Subitem (7)(a)(vii) of this Rule, either the rate set forth in Table III(c), based on the most hydraulically limiting, naturally occurring soils overlying the permeable receiving layer, or 10 percent of the saturated hydraulic conductivity of the underlying permeable horizon (or 20 percent with TS-I or TS-II pretreatment), whichever is less.

Table III(c): Long-Term Acceptance Rates for Sand Lined Trench Systems			
SOIL GROUP	TEXTURAL CLASS OF MOST HYDRAULICALLY LIMITING OVERLYING SOIL HORIZON	DISTRIBUTION OR PRETREATMENT CONDITION	LONG-TERM ACCEPTANCE RATE (LTAR) (gallons per day per square foot, on trench bottom area basis)*
I	Sands (Sand, Loamy Sand)	Gravity Distribution	0.7 – 0.9
		Pressure Dispersal	0.8 – 1.2
		Pressure Dispersal and TS-I or TS-II pretreatment	0.9 – 1.4
II	Coarse Loams (Sandy Loam, Loam)	Gravity Distribution	0.5 – 0.7
		Pressure Dispersal	0.6 – 0.8
		Pressure Dispersal and TS-I or TS-II pretreatment	0.7 – 1.0
III	Fine Loams (Sandy Clay Loam, Silt Loam, Clay Loam, Silty Clay Loam, Silt)	Gravity Distribution	0.2 - 0.4
		Pressure Dispersal	0.3 – 0.6
		Pressure Dispersal and TS-I or TS-II pretreatment	0.4 – 0.8
IV	Clays (Clay, Sandy Clay, Silty Clay)	Gravity Distribution	0.1 – 0.2
		Pressure Dispersal	0.15 – 0.3
		Pressure Dispersal and TS-I or TS-II pretreatment	0.2 – 0.4

\*The LTAR for all sand-lined trench systems shall not exceed the loading rates set forth in this table or 10 percent of the saturated hydraulic conductivity of the underlying permeable horizon (or 20 percent with TS-I or TS-II pretreatment) when required to be determined pursuant to Subitem (7)(a)(vi) or Subitem (7)(a)(vii) of this Rule, whichever is less. There shall be no reduction in trench length compared to a conventional gravel trench when accepted or innovative nitrification trenches are used.

If a low pressure pipe system is used, the system shall be designed in accordance with Rule .1957(a) of this Section, except that Rule .1957 (a)(2)(B) and Rule .1957(a)(3) shall not apply and trenches shall be a maximum of three feet in width. Textural classifications of the overlying material shall be determined from disturbed materials and determined by Rule .1941(a)(1) of this Section. Pressure distribution shall be used when the total length of nitrification lines exceed 600 linear feet in a single system and pressure dispersal such as LPP or drip irrigation shall be used when the total length of nitrification lines exceeds 1200 linear feet in a single system.

- (d) A Certified Operator or a Public Management Entity with a Certified Operator is required for all sand lined trench systems, if required by Article 3 of G.S. 90A. A Public Management Entity with a Certified Operator, if required by Article 3 of G.S. 90A, shall be required for sand lined trench systems when drainage is utilized to lower the water table on a site.
- (e) The sand lined trench system is classified as a type V system in accordance with Rule .1961 of this Section, except that the required inspection frequency shall be at least once per year by the operator and greater frequency for advanced pretreatment and pressure dispersal systems as required by Rule .1961, Rule .1969 or Rule .1970.
- (f) The design daily flow does not exceed 1000 gallons.
- (g) The nitrification field is constructed using nitrification trenches with a maximum width of three feet. The bottom of the gravel portion of the sand lined trench shall be no deeper than 24 inches below finished grade.
- (h) The sand lined trenches are constructed to extend into the permeable horizon. If the sand lined trench bottoms are deeper than five feet below the natural grade, the effluent shall receive pretreatment to TS-I or TS-II level prior to dispersal in the sand lined trench.
- (i) Filter media used in the sand lined portion of the trench is sand or loamy sand in texture. If required by the local health department in the Construction Authorization, the installer shall

provide written laboratory verification of the media textural classification and quality prior to the sand lined trench being installed. When laboratory analysis is required, the material shall be determined to be a clean, uncoated fine, medium, or coarse sand with at least 90 percent in sizes ranging from 0.1 to 1.0 millimeters, with no more than one percent smaller than 0.002 millimeters.

- (j) Drainage is required when the sand lined trench is used and soil wetness conditions are present that are not related to lateral water movement. Drainage shall extend into the permeable layer. Drainage shall be maintained on the site to provide for 18 inches of separation between the water table and the bottom of the gravel portion of the trench. This separation distance may be reduced to 12 inches if pressure dispersal is utilized, nine inches if advanced pretreatment meeting TS-I or TS-II is utilized and six inches if both pressure dispersal and TS-I or TS-II pretreatment are utilized.
- (k) The drainage plan is prepared by a person or persons who are licensed or registered to consult, investigate, evaluate, plan or design wastewater systems, soil and rock characteristics, ground water hydrology, or drainage systems if required in G.S. 89C, 89E, 89F, or 90A Article 4. The drainage shall have an outlet accessed by gravity or by a designed pump drainage system. The outlet location and elevation must be shown with relative water level elevations and drainfield site elevations labeled on the drainage plan.
- (l) Plans and specifications for a drainage system serving two or more lots are prepared in accordance with Rule .1938(c) of this Section.
- (m) All required drainage components are considered to be a part of the wastewater system and subject to ownership and easement requirements in Sub-item (2)(d) of this Rule and Paragraphs (c) and (j) of Rule .1938.
- (n) Side ditches or surface swales in a U shape around the system are used to facilitate surface water removal. Swales shall be at least 18 inches deep and located at least 25 feet from the outer edge of the nitrification trenches.
- (o) The drainfield area is crowned at a minimum grade of one percent as measured from the centerline of the drainfield to the top of the bank of the side ditches or surface swales.
- (p) No depressions are allowed over the drainfield area, including no linear depressions shall be allowed over the trenches.

Exceptions to the provisions of Rule .1950(a) found in Rule .1950 and .1951 of this Section shall not apply to systems installed pursuant to this Item [Rule .1956(7)]. Other sand lined trench systems may be approved by the local health department on a site-specific basis in accordance with Rule .1948(d) of this Section.

*History Note: Authority G.S. 130A-335(e) and (f);  
Eff. July 1, 1982;  
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August 1, 1988.*