COMMONWEALTH of VIRGINIA

Karen Remley, MD, MBA, FAAP
State Health Commissioner

Department of Health
P O BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

December 12, 2013

TO: District Health Directors, Managers, and other staff

THROUGH: Cynthia Romero, MD, FAAFP
State Health Commissioner

THROUGH: Allen Knapp, Director
Office of Environmental Health Services

FROM: Dwayne Roadcap, Director
Division of Onsite Sewage, Water Services, Environmental Engineering, and Marina Programs

SUBJECT: GUIDANCE MEMORANDUM AND POLICY 135.A

Purpose: The Board of Health promulgated emergency regulations for the use of gravelless material and drip dispersal pursuant to legislation approved in 2013 (Chapter 220, Acts of Assembly, 2013- see Appendix A). The emergency regulations amend sections 30, 920, 930, 940, 950, and 955 of the Sewage Handling and Disposal Regulations (12VAC5-610, the *Regulations* - see Appendix B). This policy provides interim guidance to implement the emergency regulations and is effective on the effective date of the emergency regulations. Guidance, Memoranda, and Policies (GMP) 107, 116, 127, and 135 are hereby rescinded and replaced with this policy.

Scope: This policy applies to any conventional onsite sewage system with flows less than 1,000 gallons per day and that use gravelless material in accordance with the *Regulations*. Alternative onsite sewage systems that use gravelless material are addressed by the Regulations for Alternative Onsite Sewage System (12VAC5-613). Conventional and alternative system designs greater than 1,000 gallons per day require the practice of engineering and must follow applicable regulations. This policy also applies to the use of drip dispersal pursuant to Va. Code Section 32.1-163.5.

Background: Since 1987, the Virginia Department of Health (VDH) has recognized gravelless material as an acceptable means of dispersing and disposing of wastewater. Since 2002, the State Health Commissioner has issued four policies for the use of gravelless material: GMP 102, 116, 127, and 135. Gravelless material complying with

the requirements of these policies was approved for use. Conditions of approval included a manufacturer warranty, a financial assurance, and a notice of substitution. These policies were developed after a review of experiences from other jurisdictions and available technical literature. VDH concluded that gravelless material could adequately treat and disperse septic tank effluent when properly designed, installed, used, and maintained in accordance with the policies.

Gravelless material meeting the requirements of the policies has been considered generally approved pursuant to Section 448 of the *Regulations*. To gain general approval, the Commissioner must find that the method, process, or equipment has demonstrated operational competency and satisfactory performance equal to or better than that of a gravity flow septic tank drainfield. Additionally, Section 448 states that approved methods, materials, and systems must be incorporated into the *Regulations* (in accordance with the Administrative Process Act, Va. Code Section 2.2-4000).

The 2013 General Assembly passed HB 1726 (Chapter 202 of the 2013 Acts of Assembly), which required the Board of Health to incorporate gravelless material into applicable regulations within 280 days of enactment (see Appendix A). HB 1726 also allowed the Board of Health to promulgate regulations for other effluent distribution technologies, such as drip dispersal. Following approval of HB 1726, the Office of Environmental Health Services convened two technical advisory committees (TAC). The Chamber and Bundled Expanded Polystyrene TAC and the Drip Dispersal TAC provided guidance for the development of the emergency regulations. This policy implements many of the recommendations developed through the TAC.

Procedures: Designs for drip dispersal require the practice of engineering. Drip dispersal designs pursuant to Va. Code Section 32.1-163.5 must comply with the emergency regulations; otherwise, a professional engineer (PE) can propose drip dispersal in accordance with Va. Code Section 32.1-163.6 and not adhere to the emergency regulations.

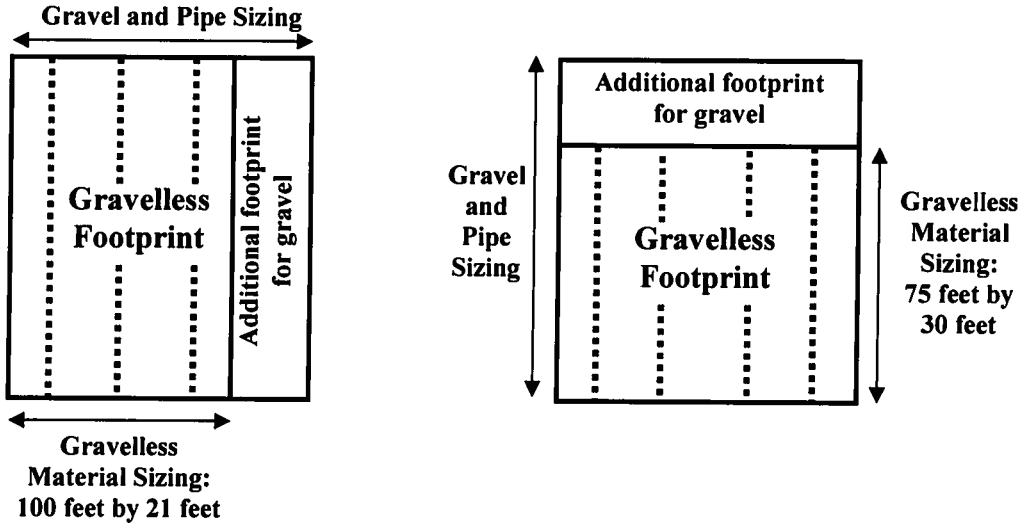
Onsite Soil Evaluators (OSEs) employed by VDH shall include a statement on every VDH permit that allows for the use of gravelless material.[1] VDH OSEs must always specify primary absorption areas with a total area (or "footprint") based on the largest, gross available absorption area required. Gravity gravel and pipe requires the largest, gross absorption area. If sufficient area for use of a gravity gravelless system exists (at regulation sizing), but there is insufficient area for a gravity gravel and pipe trench system, then the VDH OSE shall specify a primary absorption area based on regulation sizing for gravelless material. VDH OSEs shall also specify reserve areas

[1] The agency approved statement is as follows: "Gravelless material may be used, in lieu of gravel and pipe, within the approved absorption area in accordance with Table 5.4 of 12VAC5-610. If gravelless material is used, then the distribution box location remains the same. Install the amount shown for gravel, or, at a minimum, __ trenches, __ feet long, __ depth, __ foot center-to-center spacing. Contact [local] Health Department at [local health department number] to address installation questions."

based on the largest gross available absorption area sizing required under the *Regulations*. The flowcharts outlined in Appendix C describe the evaluation process for a VDH OSE to specify a gravity gravelless system for the primary and reserve areas.

For permits based on VDH OSE work, and issued prior to the effective date of the emergency regulations, gravelless material may be used in lieu of gravel and pipe when installed in accordance with Table 5.4 of the *Regulations* (see Appendix D). If gravelless material is used, the VDH OSE shall document on the inspection statement and as-built drawing all modifications made for use of the gravelless material.

When gravelless material is used, the total area ("footprint") for the primary and reserve area (if applicable) must comply with the minimum requirements of the *Regulations* and the manufacturer's instructions. Below are two examples using a hypothetical gravel and pipe primary absorption area of 100 feet by 30 feet and how that footprint may be changed using gravelless material. The examples are not to scale.



In accordance with 12VAC5-610-330, 12VAC5-610-930.F.8, and Va. Code Section 32.1-164.1, gravelless material may be used, provided the certifying PE or OSE approves such use. The following requirements apply:

i. The use of gravelless material must comply with the *Regulations* and the manufacturer's recommendations and instructions;

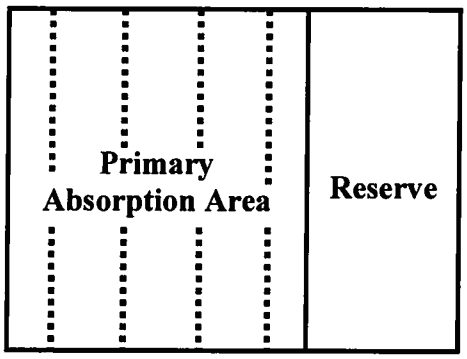
ii. Except for resizing the absorption area in accordance with Table 5.4 of the *Regulations* and the manufacturer's specifications, the location of the drainfield remains the same. No other change is authorized (e.g., trench location, depth, or contour orientation). Center-to-center spacing must comply with 12VAC5-610-950.F of the *Regulations*, unless a specific

exemption has been granted in accordance with 12VAC5-610-930.F.1.b; and

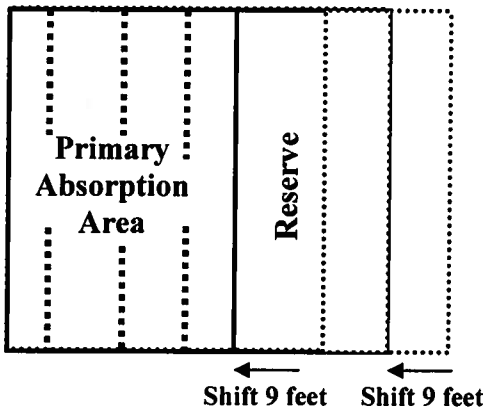
iii. The certifying PE or OSE documents on the inspection statement and as-built drawing all modifications, including the make and model of the gravelless material used, the number of gravelless material units installed, the number of trenches, the length of trenches, and the location of trenches.

When gravelless material is used to modify a construction permit that specifies gravel and pipe, then the reserve area may be shifted within the undisturbed portions of the originally designated absorption area. The certifying OSE or PE shall document any change in the reserve area's location on the inspection statement and as-built drawing. Below is an example of how a reserve area may shift (no scale). Please note that a reserve area does not need to be contiguous with the primary absorption area and may be located elsewhere on the parcel.

Gravel and Pipe Trench System



Gravelless Trench System



Va. Code Section 32.1-164.1 and 12VAC5-610-330 of the *Regulations* allow property owners to petition the local health department to inspect an installation and render a case decision if the certifying PE or OSE fails or refuses to inspect the installation in a timely manner, or declines to certify that the installation was completed substantially in accordance with the approved evaluation and design. Petitions regarding the use of gravelless material will be handled on a case-by-case basis.

Private sector OSEs and PEs may use gravelless material when designating primary absorption areas and reserves (if applicable) for certification letters and subdivision approvals. VDH OSEs shall always specify the largest gross available absorption area sizing required by the *Regulations* (see Appendix C).

Appendix A: HB 1726

CHAPTER 202

An Act to require the Board of Health to promulgate regulations for chamber and bundled expanded polystyrene effluent distribution systems for onsite sewage systems.

[H 1726]
Approved March 12, 2013

Be it enacted by the General Assembly of Virginia:

1. *§ 1. The Board of Health shall promulgate regulations for chamber and bundled expanded polystyrene effluent distribution systems for onsite sewage systems permitted by the Commissioner pursuant to Article 1 (§ 32.1-164 et seq.) of Chapter 6 of Title 32.1 of the Code of Virginia. Such regulations shall include requirements for chamber and bundled expanded polystyrene effluent distribution systems for onsite sewage systems, which shall include (i) specifications for the physical construction of chamber and bundled expanded polystyrene effluent distribution systems including minimum exterior width, height, effluent storage capacity, and structural capacity; (ii) requirements for a permeable interface between chamber and bundled expanded polystyrene effluent distribution systems and trench sidewall soil surfaces for the absorption of wastewater; (iii) criteria for the allowable slope, maximum length, minimum sidewall depth, and minimum lateral separation of chamber and bundled expanded polystyrene effluent distribution system absorption trenches; (iv) criteria for substituting chamber and bundled expanded polystyrene effluent distribution systems for gravity percolation trenches and gravel and crushed stone low pressure systems; (v) criteria for determining the minimum area requirements for chamber and bundled expanded polystyrene effluent distribution system absorption trenches; and (vi) such other requirements pertaining to the promulgation of chamber and bundled expanded polystyrene effluent distribution system regulations for onsite sewage systems as may be deemed necessary by the Board.*

2. That an emergency exists and this act is in force from its passage.

3. That the Board of Health shall promulgate regulations to implement the provisions of this act to be effective within 280 days of its enactment.

4. That the Board of Health shall promulgate regulations for other effluent distribution system technologies for onsite sewage systems as may be deemed necessary by the Board.

Appendix B: *Emergency Regulations* (effective for 18 months)

Underlined text indicates new text and strikethroughs indicate deleted text

12VAC5-610-30. Relationship to ~~Virginia Joint Sewerage~~ Other Regulations.

~~This chapter is supplemental to the current Virginia Sewerage Regulations, or their successor, which were adopted jointly by the State Board of Health and the Department of Environmental Quality pursuant to § 62.1-44.19 of the Code of Virginia. This chapter addresses the handling and disposal of sewage not regulated by a Virginia Pollutant Discharge Elimination System (VPDES) Permit.~~

A. This chapter addresses the handling and disposal of those portions of sewage flows not regulated by a Virginia Pollutant Discharge Elimination System (VPDES) or a Virginia Pollutant Abatement (VPA) Permit issued in accordance with 9VAC25-31 or 9VAC25-32, respectively.

B. Reclamation and reuse of sewage may be subject to permitting by the Department of Environmental Quality under 9VAC25-740.

12VAC5-610-920. Distribution methods.

The term distribution methods refers to the piping, flow splitting devices, gravel, and other appurtenances beginning at the point of flow splitting and ending at the ~~soil-gravel or sand interface~~ point of effluent application to the soil absorption area. Two basic methods are considered:

A. Gravity; and

B. Pressure.

12VAC5-610-930. Gravity distribution.

Gravity distribution is the conveyance of effluent from a distribution box through the percolation lines at less than full flow conditions. Flow to the initial distribution box may be initiated by pump, siphon or gravity.

A. Enhanced flow distribution. Enhanced flow distribution is the initiation of the effluent flow to the distribution box by pump or siphon for the purpose of assuring more uniform flow splitting to the percolation lines. Enhanced flow distribution shall be provided on systems where the flow is split more than 12 times or the system contains more than 1200 linear feet of percolation lines. For the purpose of this chapter, enhanced flow distribution is considered to produce unsaturated soil conditions.

B. System size. Distribution systems containing 1800 or more linear feet of percolation piping shall be split into multiple systems containing a maximum of 1200 linear feet of percolation piping per system.

C. Distribution boxes. The distribution box is a device for splitting flow equally by gravity to points in the system. Improperly installed distribution boxes are a cause for absorption field malfunction.

1. Materials. The preferred material for use in constructing distribution boxes is concrete (3000 psi). Other materials may be considered on a case-by-case basis. All materials must be resistant to both chemical and electrolytic corrosion and must have sufficient structural strength to contain sewage and resist lateral compressive and bearing loads.

2. Design. Each distribution box shall be designed to split the influent flow equally among the multiple effluent ports. All effluent ports shall be at the same elevation and be of the same diameter. The elevation of the effluent ports shall be at a lower elevation than the influent port. The placement of the influent ports shall be such as to prevent short circuiting unless baffling is provided to prevent short circuiting. The minimum inside width of a gravity flow distribution box shall be equal to or greater than 12 inches. The inside bottom shall be at least four inches below the invert of the effluent ports and at least five inches below the invert of the influent port. A minimum of eight inches freeboard above the

invert of the effluent piping shall be provided. The distribution box shall be fitted with a watertight, removable lid for access.

3. Installation. The hole for placement of the distribution box shall be excavated to undisturbed soil. The distribution box shall be placed in the excavation and stabilized. The preferred method of stabilizing the distribution box is to bond the distribution box to a four inch poured in place Portland cement concrete pad with dimensions six inches greater than the length and width dimensions of the distribution box. The box shall be permanently leveled and checked by water testing. Conduits passing through the walls of a distribution box shall be provided with a water stop.

D. Lead or header lines. Header or lead lines are watertight, semirigid or rigid lines that convey effluent from a distribution box to another box or to the percolation piping.

1. Size. The lead or header lines shall have an internal diameter of four inches.

2. Slope. Minimum slope shall be two inches per 100 feet.

3. Materials. The lead or header lines shall have a minimum crush strength of 1500 pounds per foot and may be constructed of cast iron, plastic, vitrified clay or other material resistant to the corrosive action of sewage.

4. Appurtenances.

a. Joints. Lead or header lines shall have joints of the compressions type with the exception of plastic lead or header lines which may be welded sleeve, chemically fused or clamped (noncorrosive) flexible sleeve.

b. Adapters. Joining of lead or header lines of different size and/or material shall be accomplished by use of a manufactured adapter specifically designed for the purpose.

c. Valves. Valves shall be constructed of materials resistant to the corrosive action of sewage. Valves placed below ground level shall be provided with a valve box and a suitable valve stem so that it may be operated from the ground surface.

5. Construction.

a. Bedding. All lead or header lines shall be bedded to supply uniform support and maintain grade and alignment along the length of the lead or header lines. Special care shall be taken when using semirigid pipe.

b. Backfilling and tamping. Lead and header lines shall be backfilled and tamped as soon as possible after the installation of the lead or header lines has been approved. Material for backfilling shall be free of large stones and debris.

6. Termination. Header or lead lines shall extend for a minimum distance of two feet into the absorption trenches.

E. Gravity percolation lines. Gravity percolation lines are perforated or open joint pipes that are utilized to distribute the effluent along the length of the absorption trenches.

1. Size. All gravity percolation lines shall have an internal diameter of four inches.

2. Slope. The slope of the lines shall be uniform and shall not be less than two inches or more than four inches per 100 feet.

3. Design. Effluent shall be split by the distribution system so that all gravity percolation lines installed shall receive an equal volume of the total design effluent load per square foot of trench, i.e., the fraction of the flow received by each percolation line divided by the length of the gravity percolation lines shall be equal for all gravity percolation lines in a system.

4. Length. No individual gravity percolation line shall exceed 100 feet in length.

5. Materials.

a. Clay. Clay tile shall be extra-strength and meet current ASTM standards for clay tile.

b. Perforated plastic drainage tubing. Perforated plastic drainage tubing shall meet ASTM standards. At not greater than 10 feet intervals the pipe shall be plainly marked, embossed or engraved thereby showing the manufacturer's name or hallmark and showing that the product meets a bearing load of 1,000 lb. per foot. In addition, a painted or other clearly marked line or spot shall be marked at not greater than 10 feet intervals to denote the top of the pipe.

The tubing shall have three holes, 1/2 to 3/4 inch in diameter evenly spaced and placed within an arc of 130 degrees, the center hole being directly opposite the top marking.

Spacing of each set of three holes shall be at four inch intervals along the tube. If there is any break in the continuity of the tubing, an appropriate connection shall be used to join the tubing.

6. Installation

a. Crushed stone or gravel. Clean gravel or crushed stone having a size range from 1/2 inch to 1-1/2 inches shall be utilized to bed the gravity percolation lines.

Minimum depth of gravel or crushed stone beneath the percolation lines shall be six inches. Clean course silica sand (does not effervesce in presence of dilute hydrochloric acid) may be substituted for the first two inches (soil interface) of the required six inches of gravel beneath the percolation lines. The absorption trench shall be backfilled to a depth of two inches over the gravity percolation lines with the same gravel or crushed stone. Clean sand, gravel or crushed stone shall be free of fines, clay and organic materials.

b. Grade boards and/or stakes. Grade boards and/or stakes placed in the bottom or sidewalls of the absorption trench shall be utilized to maintain the grade on the gravel for placement of the gravity percolation lines. Grade stakes shall not be placed on centers greater than 10 feet.

c. Placement and alignment. Perforated gravity percolation piping shall be placed so that the center hole is in the horizontal plane and interfaces with the minimum six inches of graded gravel. When open joint piping is utilized the upper half of the top of the 1/4-inch open space shall be covered with tar paper or building paper to block the entrance of fines into the pipe during the backfilling operation. All gravity percolating piping shall be placed in the horizontal center of the absorption trench and shall maintain a straight alignment and uniform grade. d. Backfilling. After the placement of the gravity percolation piping the absorption trench shall be backfilled evenly with crushed stone or gravel to a depth of two inches over the piping. Untreated building paper~~,~~ or other suitable material shall be placed at the interface of the gravel and soil to prevent migration of fines to the trench bottom. The remainder of the trench shall be backfilled with soil to the ground surface.

F. Gravelless material is a proprietary product specifically manufactured to disperse effluent within the absorption trench of an onsite sewage system without the use of gravel. Gravelless material may include chamber, bundled expanded polystyrene, and multi-pipe systems. The division shall maintain a list of all generally approved gravelless material. Gravelless material on the generally approved list may be used in accordance with Table 5.4.

1. Gravelless material that received general approval as of December 12, 2013 shall retain such status when used in accordance with the requirements of this chapter. After December 12, 2013, the division shall review and evaluate new applications for general approval pursuant to the requirements of this chapter.

a. Any manufacturer of gravelless material may submit an application for general approval to the division using the form provided by the division. A complete application shall include the manufacturer's contact information, product specifications, product approvals in other states or

territories, installation manual, and other information deemed necessary by the division to determine compliance with this chapter.

b. The manufacturer of gravelless material shall identify in the application for general approval any recommendation that deviates from the requirements of this chapter. If the recommendation is approved by the division, then the manufacturer shall include the deviation in the gravelless material's installation manual.

2. Gravelless material shall have the following minimum characteristics for general approval:

a. The minimum exterior width shall be at least 90 percent of the total width of the absorption trench. The exterior width of a chamber system shall be measured at the edge or outer limit of the product's contact with the trench bottom unless the division determines a different measurement is required based on the gravelless material's design. The exterior width of bundled expanded polystyrene and multi-pipe systems shall be measured using the outside diameter of the bundled gravelless material unless the division determines a different measurement is required based on the gravelless material's design. The division shall establish the exterior width of any gravelless material that is not considered a chamber, bundled expanded polystyrene, or multi-pipe system.

b. Gravelless material shall have a minimum height of 8 inches to provide a continuous exchange of air through a permeable interface.

c. Gravelless material shall have a permeable interface which shall be located along the trench bottom and trench sidewalls within the absorption trench.

d. Gravelless material shall provide a minimum storage capacity of 1.3 gallons per square foot of trench bottom area.

e. Gravelless material shall pose no greater risk to surface water and groundwater quality than gravel in absorption trenches. Gravelless material shall be constructed to maintain structural integrity such that it does not decay or corrode when exposed to sewage.

f. Gravelless material shall have a minimum load rating of H-10 or H-20 from the American Association of State Highway and Transportation Officials or equivalent when installed in accordance with the manufacturer's minimum specified depth of compacted cover in non-traffic or traffic areas, respectively.

3. For designs using gravelless material, the absorption trenches shall receive an equal volume of effluent per square foot of trench. Trench bottom area shall be equal to or greater than the minimum area requirements contained in Table 5.4. Trench sidewall shall not be included when determining minimum area requirements. When open-bottom gravelless material is utilized, it shall provide a splash plate at the inlet of the trench or other suitable method approved by the manufacturer to reduce effluent velocity.

4. Installation of gravelless material shall comply with this chapter unless the department grants a deviation pursuant to 12VAC5-610-660 or the division has granted a deviation identified in the installation manual.

5. Gravelless material shall contain a pressure percolation line along the entire length of the trench when low pressure distribution is utilized pursuant to 12VAC5-610-940.D.

6. When pumping effluent to overcome gravity, any open-bottom gravelless material shall provide a high-flow splash plate at the inlet of the trench or other suitable method approved by the manufacturer to reduce effluent velocity.

7. When enhanced flow distribution is required by this chapter, open-bottom gravelless material shall contain a percolation pipe that extends a minimum of 10 feet from the trench's intersection with the header line. The percolation pipe shall be installed in accordance with the manufacturer's approved

installation manual. The dosing volume shall be a minimum 39 gallons per 100 linear feet of absorption trench.

8. Gravelless material may be substituted for gravel in accordance with this chapter, provided that the certifying licensed professional engineer or onsite soil evaluator approves the substitution. The certifying licensed professional engineer or onsite soil evaluator shall identify the substitution on the inspection report submitted in accordance with 12VAC5-610-330. A new construction permit pursuant to 12VAC5-610-310 is not required for the substitution.

12VAC5-610-940. Low pressure distribution.

Low pressure distribution is the conveyance of effluent through the pressure percolation lines at full flow conditions into the absorption area with the prime motive force being a pump or siphon. Low pressure systems are limited to a working pressure of from one to four feet of head at the distal end of the pressure percolation lines. For the purpose of this chapter low pressure distribution is considered to provide unsaturated soil conditions.

A. Dosing cycle. Systems shall be designed so that the effluent volume applied to the absorption area per dosing cycle is from seven to 10 times the volume of the distribution piping, however, the volume per dosing cycle should not result in a liquid depth in the absorption trench greater than two inches.

B. Manifold lines. Manifold lines are watertight lines that convey effluent from the initial point of flow splitting to the pressure percolation lines.

1. Size. The manifold line shall be sized to provide a minimum velocity of two feet per second and a maximum velocity of eight feet per second.

2. Materials. All pipe used for manifolds shall be of the pressure type with pressure type joints.

3. Bedding. All manifolds shall be bedded to supply uniform support along its length.

4. Backfilling and tamping. Manifold trenches shall be backfilled and tamped as soon as possible after the installation of the manifold has been approved. Material for backfilling shall be free of large stones and debris.

5. Valves. Valves for throttling and check valves to prevent backflow are required wherever necessary. Each valve shall be supplied with a valve box terminating at the surface.

C. Pressure percolation lines. Pressure percolation lines are perforated pipes utilized to distribute the flow evenly along the length of the absorption trench.

1. Size. Pressure percolation lines should normally have a 1-1/4 inch inside diameter.

2. Hole size. Normal hole size shall be 3/16 inch to 1/4 inch.

3. Hole placement. Center to center hole separation shall be between three and five feet.

4. Line length. Maximum line length from manifold should not exceed 50 feet.

5. Percent flow variation. Actual line size, hole size and hole separation shall be determined on a case-by-case basis based on a maximum flow variation of 10% along the length of the pressure percolation lines.

6. Materials and construction. The preferred material is plastic, either PVC or ABS, designed for pressure service. The lines shall have burr free and counter sunk holes (where possible) placed in a straight line along the longitudinal axis of the pipe. Joining of pipes shall be accomplished with manufactured pressure type joints.

7. Installation.

a. Crushed stone or gravel. Clean gravel or crushed stone having a size range from 1/2 inch to 3/4 inch shall be utilized to bed the pressure percolation lines. Minimum depth of gravel or crushed stone beneath the percolation lines shall be 8-1/2 inches. Clean course silica sand (does not effervesce in the presence of dilute hydrochloric acid) may be substituted for the first two inches (soil interface) of the required 8-1/2 inches of gravel beneath the pressure percolation lines. The absorption trench shall be backfilled to a depth of two inches over the pressure percolation lines with the same gravel or crushed stone. Clean sand, gravel or crushed stone shall be free of fines, clay and organic materials.

b. Grade boards and/or stakes. Grade boards and/or stakes placed in the bottom or sidewalls of the absorption trench shall be utilized to maintain the gravel level for placement of the pressure percolation lines. Grade stakes shall not be placed on centers greater than 10 feet.

c. Placement and alignment. Pressure percolation lines shall be placed so that the holes face vertically downward. All pressure percolation piping shall be placed at the same elevation, unless throttling valves are utilized, and shall be level. The piping shall be placed in the horizontal center of the trench and shall maintain a straight alignment. Normally the invert of the pressure percolation lines shall be placed 8-1/2 inches above the trench bottom. However, under no circumstance shall the invert of the pressure percolation lines be placed closer than 16-1/2 inches to the seasonal water table as defined in 12VAC5-610-950 A 3. When the invert of the pressure percolation lines must be placed at an elevation greater than 8-1/2 inches above the trench bottom, landscaping over the absorption area may be required to provide the two inches of gravel and six inches of fill over the pressure percolation lines required in subdivision 7 a of this subsection.

d. Backfilling. After the placement of the pressure percolation piping the absorption trench shall be backfilled evenly with crushed stone or gravel to a depth of two inches over the opening. Untreated building paper or other suitable material shall be placed at the interface of the gravel and soil to prevent migration of fines to the trench bottom. The remainder of the trench shall be backfilled with soil to the ground surface.

8. Appurtenances. The distal (terminal) end of each pressure percolation lines shall be fitted with a vertical riser and threaded cap extending to the ground surface. Systems requiring throttling valves will be supplied with couplings and threaded riser extensions at least four feet long so that the flow may be adjusted in each line.

D. Gravelless material with general approval may be used for low pressure distribution in accordance with the manufacturer's approved installation manual, Table 5.4 and the applicable requirements of this chapter.

12VAC5-610-950. Absorption area design.

A. The absorption area is the undisturbed soil medium ~~beginning at the soil-gravel or sand interface which is~~ utilized for absorption of the effluent. The absorption area includes the infiltrative surface in the absorption trench and the soil between and around the trenches when trenches are used.

B. Suitability of soil horizon. The absorption trench bottom shall be placed in the soil horizon or horizons with an average estimated or measured percolation rate less than 120 minutes per inch. Soil horizons are to be identified in accordance with 12VAC5-610-480. The soil horizon must meet the following minimum conditions:

1. It shall have an estimated or measured percolation rate equal to or less than 120 minutes per inch.

2. The soil horizon or horizons shall be of sufficient thickness so that at least 12 inches of absorption trench sidewall is exposed to act as an infiltrative surface; and

3. If no single horizon meets the conditions in subdivision 2 of this subsection, a combination of adjacent horizons may be utilized to provide the required 12-inch sidewall infiltrative surface. However, no horizon utilized shall have an estimated or measured percolation rate greater than 120 minutes/inch.

C. Placement of absorption trenches below soil restrictions. Placement of the soil absorption trench bottom below soil restrictions as defined in 12VAC5-610-490 D, whether or not there is evidence of a perched water table as indicated by free standing water or gray mottlings or coloration, requires a special design based on the following criteria:

1. The soil horizon into which the absorption trench bottom is placed shall be a Texture Group I, II or III soil or have an estimated or measured percolation rate of less than 91 minutes per inch.

2. The soil horizon shall be a minimum of three feet thick and shall exhibit no characteristics that indicate wetness on restriction of water movement. The absorption trench bottom shall be placed so that at least two feet of the soil horizon separates the trench bottom from the water table and/or rock. At least one foot of the absorption trench side wall shall penetrate the soil horizon.

3. A lateral ground water movement interceptor (LGMI) shall be placed upslope of the absorption area. The LGMI shall be placed perpendicular to the general slope of the land. The invert of the LGMI shall extend into, but not through, the restriction and shall extend for a distance of 10 feet on either side of the absorption area (See 12VAC5-610-700 D 3).

4. Pits shall be constructed to facilitate soil evaluations as necessary.

D. Sizing of absorption trench area.

1. Required area. The total absorption trench bottom area required shall be based on the average estimated or measured percolation rate for the soil horizon or horizons into which the absorption trench is to be placed. If more than one soil horizon is utilized to meet the sidewall infiltrative surface required in subsection B of this section, the absorption trench bottom area shall be based on the average estimated or measured percolation rate of the "slowest" horizon. The trench bottom area required in square feet per 100 gallons (Ft^2/100 Gals) of sewage applied for various soil percolation rates is tabulated in Table 5.4. The area requirements are based on the equation:

$\log y = 2.00 + 0.008 (x)$

where $y = Ft^2/100$ Gals

x = Percolation rate in minutes/inch

Notwithstanding the above, the minimum absorption area for single family residential dwellings shall be 400 square feet.

2. Area reduction. See Table 5.4 for ~~percent~~ area reduction when gravelless material or low pressure distribution is utilized. A reduction in area shall not be permitted when flow diversion is utilized with low pressure distribution. When gravelless material is utilized, the width of the trench excavation shall be used to calculate minimum area requirements for absorption trenches.

E. Minimum cross section dimensions for absorption trenches.

1. Depth. The minimum trench sidewall depth as measured from the surface of the mineral soil shall be 12 inches when placed in a landscape with a slope less than 10%. The installation depth shall be measured on the downhill side of the absorption trench. When the installation depth is less than 18 inches, the depth shall be measured from the lowest elevation in the microtopography. All systems shall be provided with at least 12 inches of cover to prevent frost penetration and provide physical protection to the absorption trench; however, this requirement for additional cover shall not apply to systems installed on slopes of 30% or greater. Where additional soil cover must be provided to meet this minimum, it must be added prior to construction of the absorption field, and it must be crowned to provide positive drainage away from the absorption field. The minimum trench depth shall be increased by at least five inches for every 10% increase in slope. Sidewall depth is measured from the ground surface on the downhill side of the trench.

2. Width. All absorption trenches utilized with gravity distribution shall have a width of from 18 inches to 36 inches. All absorption trenches utilized with low pressure distribution shall have a width of eight inches to 24 inches.

F. Lateral separation of absorption trenches. The absorption trenches shall be separated by a center to center distance no less than three times the width of the trench for slopes up to 10%. However, where trench bottoms are two feet or more above rock, pans and impervious strata, the absorption trenches shall be separated by a center to center distance no less than three times the width of the trench for slopes up to 20%. The minimum horizontal separation distance shall be increased by one foot for every 10% increase in slope. In no case shall the center to center distance be less than 30 inches.

G. Slope of absorption trench bottoms.

1. Gravity distribution. The bottom of each absorption trench shall have a uniform slope not less than two inches or more than four inches per 100 feet.

2. Low pressure distribution. The bottom of each absorption trench shall be uniformly level to prevent ponding of effluent.

H. Placement of absorption trenches in the landscape.

1. The absorption trenches shall be placed on contour.

2. When the ground surface in the area over the absorption trenches is at a higher elevation than any plumbing fixture or fixtures, sewage from the plumbing fixture or fixtures shall be pumped.

I. Lateral ground water movement interceptors. Where subsurface, laterally moving water is expected to adversely affect an absorption system, a lateral ground water movement interceptor (LGMI) shall be placed upslope of the absorption area. The LGMI shall be placed perpendicular to the general slope of the land. The invert of the LGMI shall extend into, but not through, the restriction and shall extend for a distance of 10 feet on either side of the absorption area.

Table 5.4.

Area Requirements for Absorption Trenches

Percolation Rate (Minutes/Inch)	Area Required (Ft^2/100 Gals)			Area Required (Ft^2/Bedroom)		
	Gravity	Gravity Gravelless	Low Pressure Distribution	Gravity	Gravity Gravelless	Low Pressure Distribution
5	110	83	110	165	124	165
10	120	90	120	180	135	180
15	132	99	132	198	149	198
20	146	110	146	218	164	218
25	158	119	158	237	178	237
30	174	131	164	260	195	255
35	191	143	170	286	215	260
40	209	157	176	314	236	264
45	229	172	185	344	258	279
50	251	188	193	376	282	293
55	275	206	206	412	309	309
60	302	227	217	452	339	325
65	331	248	228	496	372	342
70	363	272	240	544	408	359
75	398	299	251	596	447	375
80	437	328	262	656	492	394
85	479	359	273	718	539	409
90	525	394	284	786	590	424
95	575	489	288	862	733	431
100	631	536	316	946	804	473
105	692	588	346	1038	882	519
110	759	645	379	1138	967	569
115	832	707	416	1248	1061	624
120	912	775	456	1368	1163	684

J. Controlled blasting. When rock or rock outcroppings are encountered during construction of absorption trenches the rock may be removed by blasting in a sequential manner from the top to remove the rock. Percolation piping and sewer lines shall be placed so that at least one foot of

compacted clay soil lies beneath and on each side of the pipe where the pipe passes through the area blasted. The area blasted shall not be considered as part of the required absorption area.

12VAC5-610-955. Drip Dispersal.

A. Drip dispersal applies wastewater in an even and controlled manner over an absorption area. Drip dispersal system components may include treatment components, a flow equalization pump tank, a filtration system, a flow measurement method, supply and return piping, small diameter pipe with emitters, air/vacuum release valves, redistribution control, and electromechanical components or controls.

B. Drip dispersal system tubing shall be color coded and certified by the manufacturer as designed and manufactured for the dispersal of wastewater. All drip dispersal system tubing shall be equipped with emitters approved for use with wastewater. For the application of septic tank effluent, the tubing must have self cleaning emitters.

1. The minimum linear feet of tubing in the system shall be one-half of the minimum soil absorption area in square feet.

2. All tubing shall be placed on contour.

3..Except as provided by 12 VAC 5-613, drip systems dispersing septic tank effluent shall comply with the requirements of 12 VAC 5-610-594. Drip systems dispersing secondary effluent or better require a minimum of six inches of cover over the tubing. Cover may be achieved by a combination of installation depth and Group II or Group III soil cover or other approved material over the drip field.

4. The discharge rate of any two emitters shall not vary by more than 10% in order to ensure that the effluent is uniformly distributed over the entire drip field or zone.

5. The emitters shall be evenly spaced along the length of the drip tubing at not less than six inches or more than 24 inches apart.

C. Drip dispersal systems shall comply with the following minimum soil absorption area requirements:

1. For the dispersal of septic tank effluent, the minimum soil absorption area for a drip system shall be calculated by multiplying the trench bottom area required for a low pressure distribution system in Table 5.4 of this chapter, by three.

2. For the dispersal of secondary or better effluent, the minimum soil absorption area shall be calculated by multiplying the trench bottom area for pressure distribution systems in accordance with 12VAC5-613-80.10 by three.

3. Landscape linear loading rates shall be considered for sloping absorption areas to the greatest extent possible. The landscape linear loading rate is the volume of effluent (gallons) applied per day per linear foot of the system along the natural contour (gallon per day/feet).

4. Air/vacuum release valves shall be located at the high points of the supply and return manifolds to each zone.

D. All drip dispersal systems shall be equipped with devices or methods to restrict effluent from draining by gravity to portions of a zone or laterals lower in elevation. Variable distribution due to gravity drainage shall be 10 percent or less within a zone.

E. A minimum of 6 hours of emergency storage above the high water alarm in the pump chamber shall be provided. The equalization volume shall be equal to 18 hours of storage. The equalization volume shall be measured from the pump off level to the high water alarm level. An audio/visual alarm meeting the requirements of 12VAC5-610-880.B.8 shall be provided for the pump chamber.

F. Each drip dispersal zone shall be time-dosed over a 24 hour period. The dose volume and interval shall be set to provide unsaturated flow conditions. Demand dosing is prohibited. Minimum dose volume per zone shall be 3.5 times the liquid capacity of the drip laterals in the zone plus the liquid capacity of the supply and return manifold lines (which drain between doses) accounting for instantaneous loading and drain back.

1. At each dosing cycle, the system design shall only allow a full dose volume to be delivered.

2. For design flows greater than 1,000 gallons per day, a means to take each zone off line separately shall be provided. The system shall have the capability to bypass each zone that is taken out of service such that each subsequent dose is dispersed to the next available zone in sequence.

G. Filtration shall be provided to remove suspended solids and prevent clogging of emitters. The filtration design shall meet the drip tubing manufacturer's particle size requirements for protection of the emitters at a flow rate equal to or greater than the rate of forward flushing. Filter flush water shall be returned to the treatment system at a point where the residuals and volume of the flush water do not negatively impact the effluent quality or exceed the hydraulic design capacity of the treatment system.

H. A means for measuring or estimating total flow dispersed to the soil absorption area and to verify field dosing and field flushing rates shall be provided.

I. The system shall provide forward field flushing to achieve scouring velocity as specified by the drip tubing manufacturer. Field flushing shall occur on a routine schedule to prevent excessive solids accumulation and clogging. Flush water shall be returned to the treatment system at a point where the residuals and volume of the flush water do not negatively impact the effluent quality or exceed the hydraulic design capacity of the treatment system.

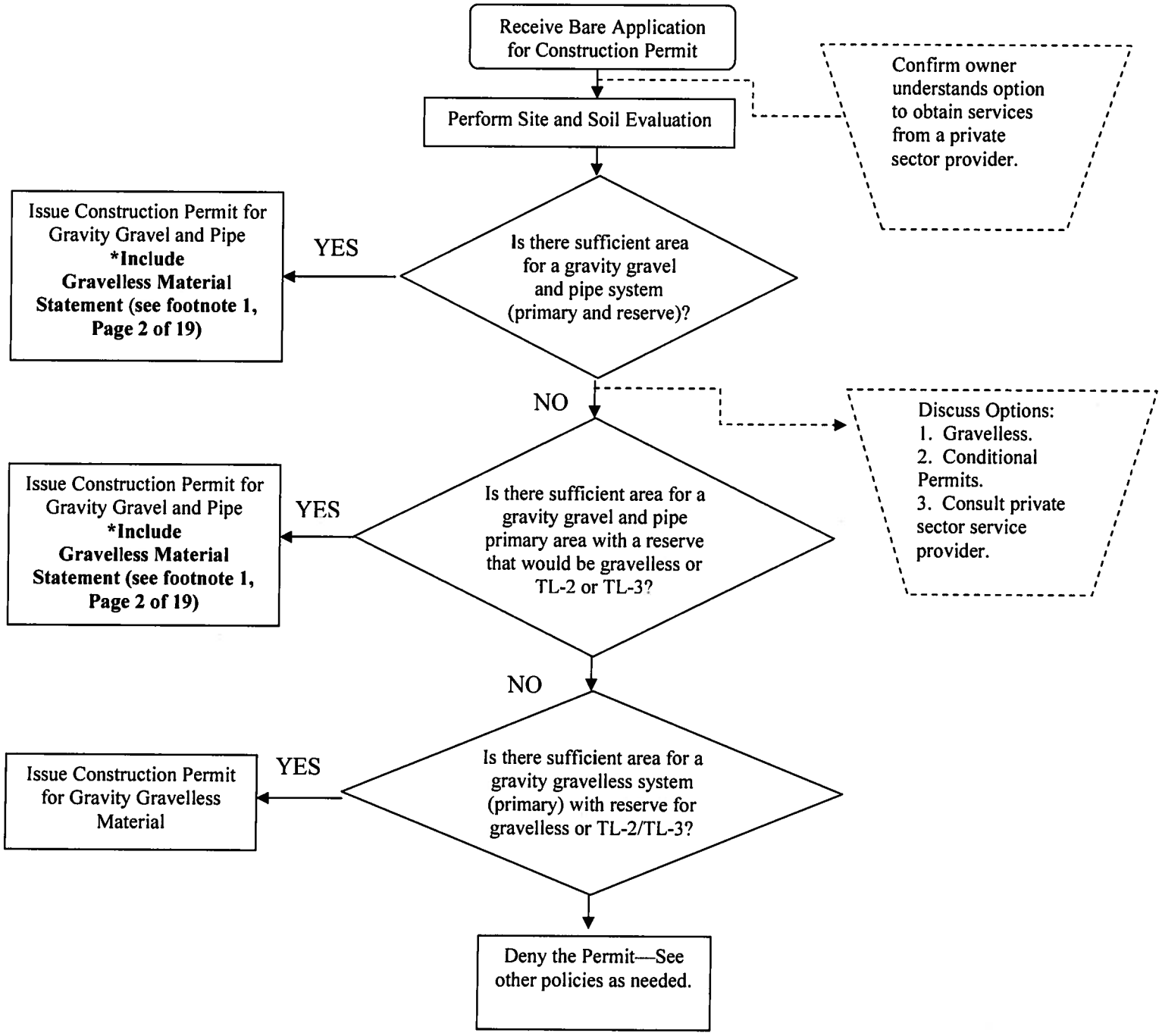
J. Electrical components shall be Underwriters Laboratory (UL) listed for the intended purpose. The designer shall provide a description with a schematic diagram of the electrical and control functions in the operation and maintenance manual. The electrical control equipment shall be mounted within a National Electrical Manufacturers Association (NEMA) 4X rated enclosure with a rigid latching door. All switches shall be clearly identified and all internal wiring shall be factory installed. All wiring shall be installed according to applicable electrical safety codes and the manufacturer's installation schematic.

K. All components in a drip dispersal system shall be rated to withstand contact with wastewater and recommended for this application by the manufacturer. All components shall be protected from freezing.

L. The designer of the drip dispersal system shall conduct a start up inspection that verifies the dosing rates, the flushing rates, and other parameters critical to the proper operation of the system. A summary of the startup inspection shall be included in the operation and maintenance manual and shall include, at a minimum, the dosing volume; the forward flow flushing rate; the pressure head of the system; and verification of proper cycling between zones.

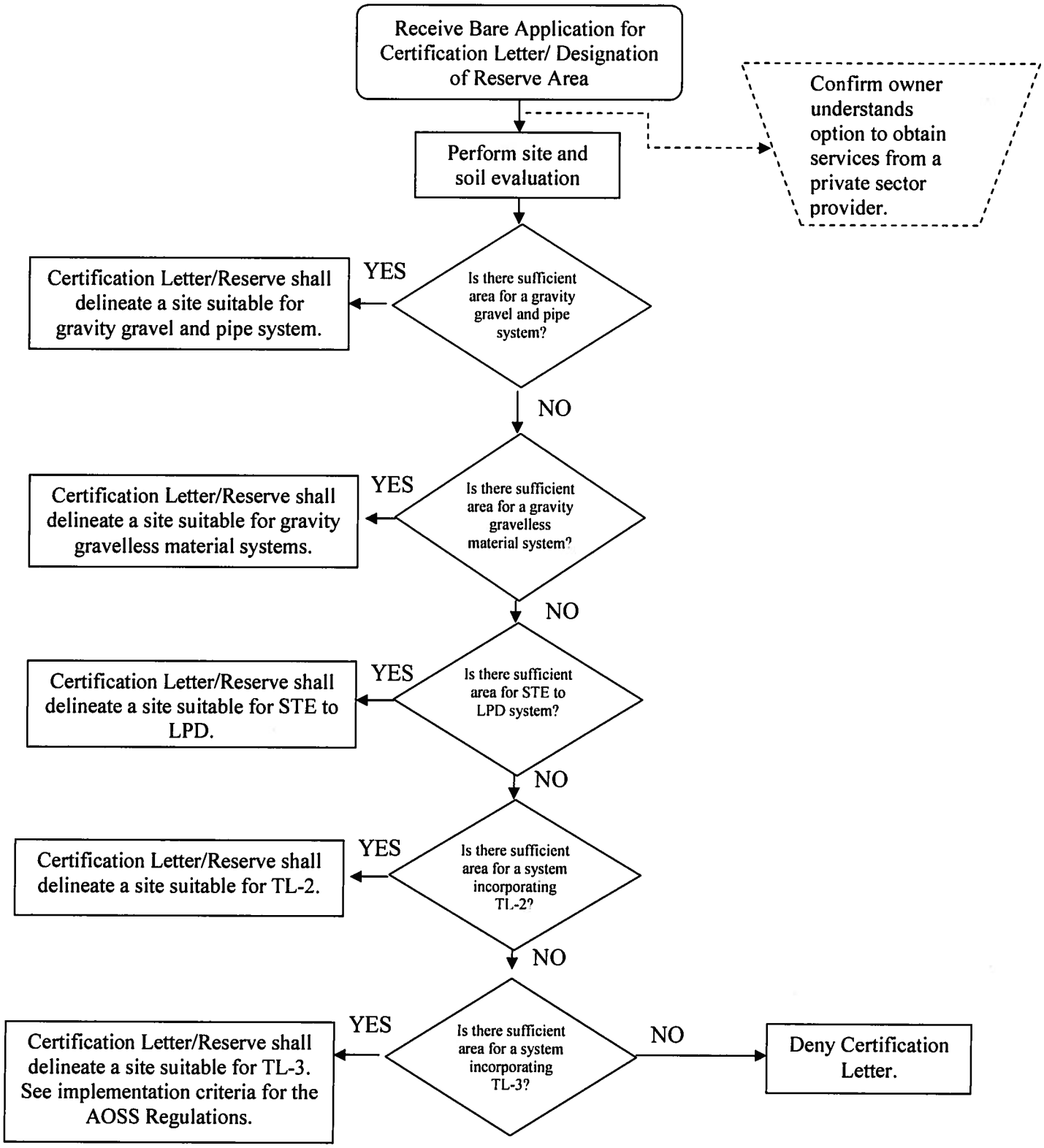
FORMS (12VAC5-610)
Application for a Sewage Disposal System Construction Permit, C.H.S. 200 (rev. 4/83).
Sewage Disposal System Construction Permit, C.H.S. 202A (rev. 6/84).
Schematic Drawing of Sewage Disposal System and Topographic, C.H.S. 202B (rev. 6/84).
Application for Sewage Handling Permit, B.W.E. 23-1.
Application for Pump and Haul, B.W.E. 25-1.
Pump and Haul Storage Facility Construction Permit, B.W.E. 26-1.
Soil Evaluation Form, C.H.S. 201 (rev. 4/83).
Soils Evaluation Percolation Test Data.
Record of Inspection —Non-Public Drinking Water Supply System.
Completion Statement, C.H.S. 204 (rev. 4/83).
Gravelless Material – Application for General Approval

Appendix C: VDH OSE Work,
Absorption Area Trench Material Determination for Construction Permits[2]



[2] Assumes that soils are suitable for installation of a conventional onsite sewage system. If soils are not suitable for a conventional onsite sewage system, then the permit shall be denied.

VDH OSE work, Absorption Area Material Determination
for Certification Letters and Reserve Areas



Appendix D: Table 5.4 from the *Regulations*

Percolation Rate (Minutes/Inch)	Area Required (Ft^2/100 Gals)			Area Required (Ft^2/Bedroom)		
	Gravity	Gravity Gravelless	Low Pressure Distribution	Gravity	Gravity Gravelless	Low Pressure Distribution
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10	120	90	120	180	135	180
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20	146	110	146	218	164	218
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35	191	143	170	286	215	260
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95	575	489	288	862	733	431
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