

**NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SECTION
ON-SITE WATER PROTECTION BRANCH**

INNOVATIVE WASTEWATER SYSTEM APPROVAL
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INNOVATIVE WASTEWATER SYSTEM NO: IWWS 2015-02

Issued To: Presby Environmental Inc.
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Contact: David W. Presby, President

For: Presby Advanced Enviro-Septic (AES) Systems

Approval Date: April 24, 2015

In accordance with General Statute 130A-343, 15A NCAC 18A .1969 and .1970, a proposal by Presby Environmental Inc. for an approval of subsurface wastewater systems utilizing the Presby Advanced Enviro-Septic (AES) systems has been reviewed, and found to meet the standards of an innovative system when all of the following conditions are met:

I. General

A. Scope of this Innovative Approval

1. Design, installation, use, and operation and maintenance guidelines for Presby AES systems to meet NSF-40 and TS-I effluent standards in accordance with Rule 15A NCAC 18A .1970. Refer to Rule .1970(a) Table VIII – Effluent Quality Standards for Advanced Pretreatment Systems for treatment performance levels.
2. Operation, maintenance and monitoring requirements for Presby AES systems and subsurface systems to ensure the treatment performance standards are met.

- B. This Innovative System Approval is applicable to domestic strength sewage systems (non-industrial wastewater) utilizing Presby AES systems that have a design flow not exceeding 1,500 gallons per day.

Use of Presby AES systems for facilities with an influent waste strength that exceeds domestic septic tank quality effluent standards pursuant to Rule 15A NCAC 18A .1970(b) may be proposed by Presby Environmental Inc. and a North Carolina Professional Engineer to the Department for review and approval on a case-by-case basis, prior to permitting by the local health department (LHD). The system design must include the proposed raw wastewater strength (BOD₅, COD, TN, TSS, fats, oils and grease, etc.), the expected organic loading rate (in pounds of BOD), and hydraulic loading rate on the pretreatment system, and the calculations, references, and any other needed information to support the proposed design.

- C. Any site utilizing these systems shall have wastewater with sufficient alkalinity to facilitate biological treatment processes. The influent shall not have a pH or toxins that significantly inhibit microbial growth.
- D. Use of Presby AES systems that have a design flow exceeding 1,500 gallons per day may be permitted on a case-by-case basis after approval by the Department in accordance with the State Review/Approval Process (Rule 15A NCAC 18A.1938).

II. System Description

The Presby AES system consists of the following components: a Department approved septic tank; a subsurface gravity final treatment and bed dispersal system utilizing two or more rows of AES pipe and surrounding system sand. A final dosing tank may be used between the septic tank and the subsurface AES bed dispersal system if required to meet site conditions.

The system sand surrounding the AES pipe is typically installed directly onto native soil at the bottom of the bed. The system may alternately be installed on a six-inch layer of washed gravel or rock first placed uniformly along the excavated bed bottom.

III. Siting Criteria

- A. The Presby AES systems shall be sited and sized in accordance with Rule .1970 for NSF-40 or TS-I systems, as applicable. The Presby AES system shall meet all applicable horizontal setback requirements and be located to prevent surface/subsurface water inflow/infiltration.
 - 1. AES systems designed to meet NSF-40 standards, only, shall have a design flow not exceeding 600 gallons per day where the soil is classified based on texture as Soil Group I, II, or III. Siting requirements are delineated in Rule .1970(d)(1) and (3).
 - 2. AES systems designed to meet TS-I standards shall have a design flow not exceeding 1500 gallons per day (480 gallons per day for an existing fill site). Siting requirements are delineated in Rule .1970(i)(1) and (2) for systems designed for up to 1000 gallons per day, and Rule .1970(j)(1) and (2) for systems designed for over 1000 gallons per day. For systems sized based upon the meeting TS-I standards, the soil shall be classified based on texture as Soil Group I or II.

Note: Vertical separation requirements are measured from the bottom of the system sand when installed directly onto native soil, or at the gravel-native soil interface, when installed on a gravel bed, if applicable.

- B. The slope shall not exceed fifteen (15) percent for an AES system designed to meet NSF-40 standards and ten (10) percent for an AES system designed to meet TS-I standards. Note that a hydraulic assessment completed pursuant to Rules .1970(i)(1)(B) and .1970(p) is required for TS-I systems installed on sites with a slopes greater than two (2) percent.

- A. The system shall be considered to be a fill system only if the sand bed bottom is installed directly onto native soil and is less than 12 inches below the naturally occurring soil surface. When installed over a six-inch layer of washed rock, the system is considered to be a fill system only if the gravel bed bottom is less than six inches below the naturally occurring soil surface.

IV. System Sizing

The Presby AES systems and associated drainfields shall be sited and sized in accordance with Rule

.1970 for NSF-40 or TS-I systems, as applicable.

- A. AES systems designed to meet NSF-40 standards: The allowance in Rule .1970(d)(2) for a 25 percent bed size reduction for an AES system designed to meet NSF-40 standards, only, is applicable in soils which are Groups I or II with SUITABALE structure and clay mineralogy, only, as allowed under Rule .1970(d)(2). Therefore, the bed bottom area shall be 12.5% greater than the bottom area required for a trench system receiving septic tank effluent with no additional pretreatment, per Rule .1955(b) and (c). In soils which are Group III, the bed bottom area for the AES system shall be 50% greater than the bottom area required for a trench system.
- B. AES systems designed to meet TS-I standards: The bed size shall be determined pursuant to Rule .1970(i)(3)(A), allowing for the net reduction in required bed size of 50 percent, compared to the area required for a bed system receiving septic tank effluent with no additional pretreatment.

V. Special Site Evaluation

A special site evaluation may be required based on the requirements of Rule .1970 proposed ground absorption system.

VI. Design Criteria

- A. The Presby AES system shall be designed in accordance with the following criteria.
 - 1. A septic tank sized as required in Rule .1952 shall be provided. An access riser with access manhole extending at least to finished grade shall be provided over the outlet and be designed and maintained to prevent surface/water inflow.
 - 2. A state-approved pump tank shall be provided with the required tank liquid capacity if needed to pump to the required elevation. Dosing shall be demand dosing for a system designed for up to 1000 gallons per day, and timer-dosing as required for a system designed for over 1000 gallons per day. Dosing frequency shall range from 4 to 8 doses per day. The system shall be designed to deliver a dosing volume no greater than 1 gallon per linear foot of AES pipe per dose.
 - 3. Components common to all AES Systems:
 - a. Septic tank for primary treatment
 - b. Distribution box
 - c. Two or more Rows of AES Units (each unit 10-ft. long)
 - d. Sampling device
 - e. Vent
 - f. System Sand (See Attachment A)
 - 4. The AES System MINIMUM amount of pipe is specified in Table 1.

Table 1 – AES Specifications		
Number of Bedrooms	Maximal Hydraulic Capacity (gpd)	Minimum Amount of AES
2	240	12
3	360	15
4	480	20
5	600	25
> 5	Design Daily Flow (Q)	≥ Q/24

5. Distribution of the AES shall be evenly spaced across the System Sand bed.
6. Minimum System Sand depths and minimum and maximum spacing requirements are as follows:
 - a. Minimum below AES – NSF-40: 12”; TS-I: 24”
 - b. Minimum center to center spacing of AES – 18”
 - c. Maximum center to center spacing of AES – 48”
 - d. Lateral extension distance from center of last lateral row of pipes to the limit of the AES system – NSF-40: 24-48”; TS-I: 18-48”.
 - e. End extension distance from end of a row of pipes to the limit of AES System: 12-18”
 - f. Minimum cover over system – 8”, 4” minimum must be system sand.
7. Minimum and maximum AES row lengths.
 - a. Minimum length – 20’
 - b. Maximum length – 60’
8. To meet bed sizing requirements in Section III, and the spacing requirements in Subsections 5, 6, and 7 of this Section, it may be necessary to either:
 - a. Provide more AES pipe than the minimum required by Subsection 4; or
 - b. Increase the spacing requirements in the following manner when the system is installed on a 6” layer of gravel or crushed stone (said gravel bed can extend a maximum of 102” from the boundaries of the System Sand around the treatment area). The following modifications to the spacing requirements in Subsection 6 are also applicable:
 - i. Maximum center-to-center spacing of AES – 102”
 - ii. Lateral extension distance – 51”
 - iii. End extension distance – 45”.
9. The system design shall incorporate provisions for complying with a means for determining at least the daily, 7-day, and 30-day flow monitoring requirements of Rule .1970.
 - a. If a pump is involved, a cycle counter will be incorporated into the pump’s control circuit. This cycle counter will be used to estimate daily flow.
 - b. If the system is gravity fed, the system design will either incorporate a siphon system with a dosing cycle counter, a tipping D-box with a cycle counter where the counter display would be used as a mechanical logger or another mechanical approach which allows for accurate monitoring of daily flows as required Rule 1970, proposed by the manufacturer and approved by the State.
 - c. A data logging system will be incorporated with the cycle counter in order to allow review of flows over time.
 - d. Where none of the above options are feasible, a water meter can be placed on the incoming line to the house connected to a data logging system, with the understanding that not all the water entering the house will also enter the septic system due to personal consumption, landscaping purposes, etc.
10. For systems designed for over 1,000 gallons per day, requiring two or more beds to be used, effluent shall be distributed to the beds and separate AES lines uniformly and evenly over a 24-hour period using a pump, pump control, and effluent dispersal system, in accordance with manufacturer requirements for pump systems.

B. Presby AES systems shall be designed by a designer authorized in writing by Presby Environmental Inc. or a North Carolina Professional Engineer. Systems over 1,000 gpd shall be designed by a North Carolina Professional Engineer.

VII. Installation and Testing

- A. A preconstruction conference shall be required to be attended by the designer authorized in writing by Presby Environmental Inc., engineer (if applicable), installer authorized in writing by Presby Environmental Inc., and LHD prior to beginning construction of the Presby AES system.
- B. All Presby Environmental systems shall be installed according to directions provided by Presby Environmental Inc. Additionally, all Presby Environmental systems and components used with, but not manufactured by Presby Environmental Inc. shall be installed in accordance with all applicable regulations and manufacturer instructions.
- C. All individuals/companies installing Presby Environmental systems shall be in possession of all necessary permits and licenses before attempting any portion of a new or repair installation. The company/individual must be a Level IV installer and authorized in writing by Presby Environmental Inc.
- D. The AES shall be installed level on a sand bed, or alternatively on a bed of gravel. Elevation shall be high enough to meet constraints established for the site by the final treatment and disposal system. When sited in accordance with the appropriate sections of this approval, the bottom of the sand bed for AES systems or the underlying gravel bed may be installed up to but no deeper than 5 feet below finished grade, provided that the vertical separation requirements in Section III of this approval are met.
- E. For AES Systems, the bed shall be constructed as a rectangle, with the long axis as parallel to the ground elevation contours of the slope as possible. The bottom of the bed shall be excavated level (+ 1/4") in all directions. The sand bed shall be immediately installed without allowing machinery to traverse the excavated/exposed bed bottom. Presby-approved track-machinery may be used on the bed after there is 6-inches of system sand under the tracks.
- F. When the system is installed on a bed of gravel, the gravel shall be clean, washed gravel or crushed stone, or equivalent, in accordance with Rule .1955(h) and manufacturer specifications, including gravel with nominal size of 3/4-inch, at least 6-inches thick. A layer of smaller washed gravel (1/4-inch nominal size), 3- to 4-inches thick, shall be installed over the 3/4-inch gravel and prior to installation of the AES system to prevent migration of system sand or backfill into the underlying gravel layer or onto the infiltrative surface. The AES system pipes and system sand shall be centered on the gravel bed. The exposed portions of the rock bed (portions not under the AES pipe and surrounding system sand) shall be covered by a geotextile fabric prior to back filling capable of preventing the downward movement of silt-sized particles while allowing the movement of moisture and gases.
- G. Backfill shall be installed over the finished sand bed and gravel bed, where applicable, and between the AES pipe and the perimeter of the system. Minimum backfill depth shall be eight inches above the AES pipe. System sand shall be at least four inches above the AES pipe, and extend laterally at this same minimum elevation over the entire perimeter of the sand bed. At least the final four-inches of backfill, after settling, shall have a finer texture (such as Group II, III) for the establishment of a vegetative cover. Backfill shall be installed with a side slope not to exceed a rise to run ratio of 1:3, unless a dry stacked interlocking block retaining wall is constructed adjacent to the AES pipe and surrounding sand, or adjacent to the gravel bed, where applicable. Any other type of retaining wall shall be designed by a professional engineer and approved by the local health department. (Note: use of a retaining wall for supporting backfill does not supersede side slope requirements for fill systems, which still must be met, where applicable).

H. Watertightness of the tanks shall be tested by either of the following protocols: 24-hour hydrostatic test or a vacuum test.

1. Hydrostatic Test^{1, 2}

- a. Temporarily seal the inlet and outlet pipes.
- b. Fill tank with clean water to a point at least two inches above the pipe connections or the seam between the tank and the riser, whichever is highest.
- c. Measure the water level.
- d. Allow the tank to sit for 24 hours.
- e. Re-measure the water level.
- f. If the water level change is ½-inch or less or one percent of the liquid tank capacity, the tank passes the leak test.
- g. If the water level change is greater than ½-inch, any visible leaks can be repaired and the tank may be topped off with water and allowed to sit for a minimum of one hour.
- h. The tank passes the leak test if there are no visible leaks (flowing water or dripping in a steady stream) and no measureable drop in water level after one hour. Otherwise, the tank fails the leak test.

2. Vacuum Test³

- a. Temporarily seal the inlet and outlet pipes.
- b. A vacuum of four (4) inches of mercury should be pulled on the tank and held for five (5) minutes.
- c. During the testing, the tank manufacturer or their representative can seal the tank if it is found to be leaking.
- d. If the tank is repaired, the vacuum must be brought back up to four inches and held for five minutes.

I. Specified site preparation steps and construction specifications for the ground absorption system shall be strictly adhered to, including specified depth of bed in relation to site limiting conditions. All Presby AES systems shall be installed according to directions provided by Presby Environmental Inc.

J. The installer authorized in writing by Presby Environmental Inc., the engineer or designer authorized in writing by Presby Environmental Inc., and the ORC authorized in writing by Presby Environmental Inc. shall conduct an inspection/start-up of the Presby AES system and all associated system components. The LHD personnel will attend and observe the inspection/start-up. During the inspection/start-up to include:

1. System watertightness testing.
2. Control panel operation and alarm settings, if needed.
3. Pump model numbers and time clock settings, if needed.

VIII. Operation, Maintenance, Monitoring, and Reporting

A. Presby AES systems shall be classified, at a minimum, as a Type Va system in accordance with Table V(a) of Rule .1961(b). Management and inspection shall be in accordance with Rules .1961 and .1970.

¹ Victor D'Amato and Ishwar Devkota, *Development of Prefabricated Septic and Pump Tank Construction and Installation Standards for North Carolina*.

² National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

³ National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

- B. All Presby AES systems require an operation and maintenance agreement between the system owner and Presby Environmental Inc., its authorized representative, or with an operator authorized in writing by Presby Environmental Inc. as per Rule .1970. The system shall be inspected according to Rule .1961 by a certified subsurface operator authorized in writing by Presby Environmental Inc. The ORC shall be either an employee of Presby Environmental Inc. or authorized in writing by Presby Environmental Inc. to operate and maintain the system. The operator authorized in writing by Presby Environmental Inc. must have proper equipment and training as applicable.
- C. All Presby AES systems shall be operated and maintained according to the latest version of Presby Environmental Inc.'s operation and maintenance manual.
- D. At each Presby AES inspection the ORC authorized in writing by Presby Environmental Inc. shall, at a minimum, observe, monitor, and record the following:
 - 1. Wastewater level in the tanks.
 - 2. Sludge, scum, and grease levels in all the tanks.
 - 3. Clogging of effluent filter.
 - 4. Watertightness of tanks, risers and pipe penetrations at tanks.
 - 5. Operation of pumps, floats, valves, electrical controls and alarms, where applicable.
 - 6. Drainfield pump delivery rate (drawdown test), determination of the average pump run time, and drainfield dosing volume, where applicable.
 - 7. Any structural damage, accessibility issues, adequate ventilation, excess odors, ponding of effluent, insect infestations, vegetative growth over the drainfield, or surfacing of effluent on the drainfield area.
 - 8. Sample of Presby AES system effluent collected from the sampling point to check for effluent clarity and odor and a sample of influent, as required.
 - 9. Readings from pump cycle counters and run time meters and any water meter readings, as applicable.
 - 10. System operating conditions, from the review stored data for indication of 7-day and 30-day flows and flow variances or other abnormal conditions.
- E. The ORC authorized in writing by Presby Environmental Inc. shall also conduct other additional observations, measurements, monitoring, and maintenances activities as specified in the Operation Permit and as recommended by the manufacturer.
- F. Sampling and Testing
 - 1. All sampling shall be done in accordance with Rule .1970(n)(3) and (5). Presby AES systems shall be sampled annually (semi-annually for systems with a design flow of 1,501 to 3,000 gpd).
 - 2. Influent for all systems shall be analyzed for BOD₅ and TKN
 - 3. All NSF-40 systems shall have effluent tested for effluent CBOD₅ and TSS. All TS-I systems shall have effluent tested for CBOD₅, TSS, NH₄-N, and fecal coliforms. Field testing of effluent for pH and DO is also highly recommended for all systems.
 - 4. Additional sampling of effluent or influent may be determined to be necessary by the ORC authorized in writing by Presby Environmental Inc. during a system inspection to assist with troubleshooting or to verify system performance.
 - 5. Influent samples shall be taken from a sampling port located between the septic tank and the drainfield or from the influent dosing tank (where applicable).

6. Effluent samples shall be collected from the sampling device.
7. Adjustments in the monitoring schedule and number of parameters sampled may be proposed by the manufacturer and approved by the Department pursuant to Rule .1970(n)(3)(B) or (C).

G. Notification and Performance of Maintenance and Repairs

1. The ORC authorized in writing by Presby Environmental Inc. shall alert Presby Environmental Inc., the LHD, and the system owner within 48 hours of needed maintenance or repair activities including, but not limited to landscaping, tank sealing, tank pumping, pipe or control system repairs, AES unit replacement, and/or adjustments to any other system component.
2. System troubleshooting and needed maintenance shall be provided to maintain the pump delivery rate and average pump run time within 25% of initial measurements conducted during system startup. The ORC authorized in writing by Presby Environmental Inc. shall notify the system owner, Presby Environmental Inc., and the LHD whenever the pump delivery rate efficiency or average pump run times are not within 25% of initial measurements conducted prior to system start-up.
3. The septic tank will be pumped as needed upon recommendation of the ORC authorized in writing by Presby Environmental Inc. and in accordance with the Presby AES system operation and maintenance instructions. However, at a minimum, the septic tank will be pumped whenever the solids level exceeds 25% of the tank's total liquid working capacity or the scum layer is more than four inches thick.
4. The tanks shall be pumped by a properly permitted septage management firm, and the septage handled in accordance with 15A NCAC 13B .0800.
5. The ORC authorized in writing by Presby Environmental Inc. shall notify the LHD, Presby Environmental Inc., and the system owner in writing whenever repairs are indicated. All maintenance activities shall be recorded in the ORC reports provided to the system owner, LHD, and Presby Environmental Inc.

H. Reporting

1. The ORC authorized in writing by Presby Environmental Inc. shall provide a completed written report to the system owner, Presby Environmental Inc., and the LHD within 30 days of each inspection. At a minimum this report shall specify:
 - a. The date and time of inspection,
 - b. System operating conditions according to Section VII.D, VII.E, and VII.F.
 - c. Results from any laboratory analysis of any influent and effluent samples,
 - d. Maintenance activities performed since the last inspection report,
 - e. An assessment of overall system performance,
 - f. A list of any improvements or maintenance needed,
 - g. A determination of whether the system is malfunctioning, and the specific nature of the malfunction,
 - h. Any changes made in system settings, based on recommendations of the manufacturer, and
 - i. A summary report of data retrieved from the control panel or other storage device verifying actual daily, 7-day, and 30-day flows, flow variances, and other operating conditions.

IX. Responsibilities and Permitting Procedures

- A. Prior to the installation of a Presby AES system at a site, the owner or owner's agent shall file an

application at the LHD for the proposed use of this system. After the LHD conducts a soil and site evaluation, the LHD may issue an Improvement Permit or Authorization to Construct or amend a previously issued Authorization to Construct allowing for the use of a Presby AES system.

- B. The Improvement Permit and Authorization to Construct shall contain all conditions the site approval is based upon, including the proposed used of the Innovative system. The Operation Permit will include all conditions specified in the Improvement Permit and the Authorization to Construct.
- C. When a special site evaluation is required pursuant to Rule .1970(p)(1), an evaluation and written, sealed report from a Licensed Soil Scientist regarding the site shall be provided to the LHD. The report shall contain the information as specified in Rule .1970(p)(2) and "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs". The LHD may request the assistance of their Regional Soil Scientist in evaluating this report prior to permit issuance.
- D. The Presby AES system shall be designed by one of the following: a designer authorized in writing by Presby Environmental Inc. or a North Carolina Professional Engineer. Systems over 1,000 gallons per day, or as otherwise required, shall be designed by a North Carolina Professional Engineer.
- E. Prior to issuance of an Authorization to Construct for an Presby AES system, a design submittal prepared by an authorized designer or a North Carolina Professional Engineer shall be submitted for review and approval by the LHD. The design submittal shall include the information required in "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs".
- F. It is recommended that local authorized environmental health practitioners attend a design training session offered by the manufacturer/authorized representative prior to permitting the system. Also, at the request of the LHD, a Regional Engineer will review the design.
- G. A designer authorized in writing by Presby Environmental Inc. shall certify in writing that the Presby AES system was installed in accordance with the approved design prior to Operation Permit issuance.
- H. A North Carolina Professional Engineer shall certify in writing that a system designed by an engineer was installed in accordance with the approved plans and specifications prior to Operation Permit issuance.
- I. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist (see Section V and IX.C), the health department may specify as a condition on the Improvement Permit and Authorization to Construct that a Licensed Soil Scientist or Professional Geologist oversee critical phases of the drainfield installation and certify in writing that the installation was in accordance with their specified site/installation requirements prior to the Operation Permit issuance.
- J. The ORC authorized in writing by Presby Environmental Inc. shall be present during the final inspection of the system prior to the issuance of the operation permit. The ORC shall be certified as a NC Subsurface Operator and authorized in writing by Presby Environmental Inc.

K. The LHD issues the Operation Permit after the following:

1. Field verification of installation completion;
2. Receipt of written documentation from the designer authorized in writing by Presby Environmental Inc., or the engineer, as applicable, that the system has been designed, installed, and is operating in accordance with the approved plans; and
3. All necessary legal documents have been completed, including the contract between the system owner and the ORC authorized in writing by Presby Environmental Inc.

L. On an annual basis, Presby Environmental Inc. shall provide a report to the On-Site Water Protection Branch including the number and location of new system installations during the previous year, and effluent data and operator reports for each operational Presby AES system installed in North Carolina under this Innovative Approval. Effluent data should be compiled and submitted electronically. If available, a web-based system for data posting of laboratory results should be utilized. These reports shall provide information to the Department based upon the monitoring data and observations made from the Innovative systems installed pursuant to this Approval. This should include an assessment of system performance in relation to the established treatment performance standards; an assessment of physical and chemical properties of the materials used to construct the system, in terms of strength, durability, and chemical resistance to loads and conditions experienced, recommended areas of applicability for the system; and any conditions and limitations related to the use of the system. The report shall also include an updated list of authorized designers, installers, and ORCs.

X. Repair of Systems

The provisions of 15A NCAC 18A .1961(l) shall govern the use of the Presby AES System for repairs to existing malfunctioning wastewater systems.

Approved By: _____ Date: _____

Attachment A: **SYSTEM SAND SPECIFICATIONS**

The System Sand that surrounds the Presby pipes is an essential component of the system. It is **critical** that the correct type and amount of System Sand is used during construction. System Sand must be coarse to very coarse, clean, granular sand, free of organic matter. A minimum of 12 to 24 inches of System Sand is placed below (depending on type of system installation), 6 inches between and 4 inches over all the Presby pipes. The System Sand must extend 12 inches minimum around the perimeter of the Presby pipes.

ORIGINAL SYSTEM SAND	ASTM-C33 Modified for SYSTEM SAND
0% larger than ¾ in.	100% passing 3/8 in.
0-35 % retained by #10	95-100% passing #4
40-90% retained by #35	80-100% passing #8
3% max. passing #200	50-85% passing #16
Comment: System Sand is coarse to very coarse clean, granular sand, free of all organic matter. The correct sand provides pore space for gas transfer and encourages efficient dispersal into soil below.	25-60% passing #30
	5-30% passing #50
	0-10% passing #100
	0-3% passing #200
	Comment: This specification was derived in order to provide reference to a readily available, standardized sand product. The added restriction on fines content (3% max.) makes ASTM C-33 appropriate material for System Sand.

Notes: (%) by weight shown; (#) Refers to Standard US Sieve Sizes; fines must be determined by washing sample