



## TECHNICAL BULLETIN

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### System Sand: Functions and Specifications

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**Abstract:** *System Sand is a required component used in the installation of Advanced Enviro-Septic® (AES), Enviro-Septic® (ES) and Simple-Septic® (SS) Wastewater Treatment Systems (collectively referred to as “Enviro-Septic® technology”). This bulletin highlights the function of System Sand and elaborates on the manufacturer’s specifications regarding the correct composition of materials to be used. An explanation of how to interpret a sieve analysis is also provided.*

At Presby Environmental, one of the product support services we offer is troubleshooting assistance. A system assessment often includes obtaining samples of and analyzing the sand used during installation to determine whether it meets our specifications. (When doing so, it is our practice to take several samples from various locations in the system to account for variations within the bed due to settling.) The sand specimen is then submitted to a lab to perform a “sieve analysis” (also called a “particle size distribution report.”) Our observations have led us to conclude that, even if the design is adequate and installation procedures correct, using the “wrong” sand can cause problems.

Our System Sand specifications have evolved over the years based on the results of these field inspections; we now recommend limiting the fines content to no more than 3%. The reason for this is that the fines (mostly silt and clay) settle to the bottom of the bed over time; if there is too much, the collected fines become a restrictive layer, interfering with the process of dispersing treated wastewater into the receiving soils. In extreme cases, this can even lead to “ponding” or even failure.

A coarse textured sand has larger pore spaces, facilitating airflow in and around the system; oxygen is essential because it supports the aerobic, bacterial processes that purify wastewater. Enviro-Septic® technology creates a living, breathing eco-system, and the System Sand works as the “lungs” of the system, providing a controlled intake of oxygen and a mechanism for releasing the gases produced as a by-product of bacterial digestion of wastes. In a system without venting, the correct System Sand is even more important, since oxygen has to be pulled through the ground and into the pipes.

System Sand of the specified consistency creates a capillary effect that encourages the movement of water away from the system; it also provides storage capacity for treated wastewater, allowing it to be released gradually and evenly into the underlying soils. However, too *coarse* of a material being used for System Sand can also have an adverse effect on treatment and system function, allowing the wastewater to pass through *too* quickly, faster than the underlying soil’s capacity to accept it and too fast to receive optimal purification.

It is extremely difficult to just “look” at sand and determine whether it meets our specs., even for our own staff. The only way to be *certain* that the sand delivered to your site is suitable for System Sand is to request a sieve analysis from the supplier. The sieve analysis will typically include a graphical representation of the sample; often, the sample

will be shown in comparison to an established spec. like ASTM C-33. The sieve analysis will contain other data, including a breakdown indicating the percentage of the sample that passes through (or is retained by) various size sieves. Keep in mind that sand samples taken from the very same gravel pit pile can vary due to the settling of fines to the bottom; an early sample from the top of the pile may differ significantly from a later sample at the bottom. In some states where sand is more difficult to obtain, it is acceptable to use “manufactured sand” for System Sand as long as it meets the particle size percentages noted in the table below.

As a reminder, while C-33 (fine aggregate) concrete sand is *close* to our specs., our limitation on the fines is more stringent, and we allow a greater amount of gravel content. The intended purpose of C-33 sand is for making concrete; keep in mind that what is acceptable for that purpose does not necessarily correspond with our requirements. C-33 allows up to 5% fines (silt and clay content) while System Sand is limited to 3% of these materials. (The percentage of fines content can be found on the sieve report table next to the #200 sieve.) System Sand can contain gravel materials with up to a 3/4 inch diameter, while C-33 requires no particles larger than 3/8 inch. Acceptable System Sand is readily available, but in order to get the “right” sand, it is important to be specific by providing your supplier with our written specifications. If you just ask for “septic sand,” “washed sand,” “C-33,” or even “Presby Sand,” you may or may not get the type of sand that is optimal for use with Enviro-Septic® technology. Suppliers routinely perform sieve analyses of their materials and, in our experience, most do not charge a fee in order to supply a copy of the report. The sieves used in PEI’s System Sand specs. are 3/4 in., #10, #35 and #200. If you obtain a sieve analysis, but have any difficulty interpreting it, contact us and we will assist you.

System Sand is an important component of a properly functioning Advanced Enviro-Septic®, Enviro-Septic® or Simple-Septic® system. By enhancing the supply of oxygen and facilitating efficient dispersal, System Sand ensures system longevity and performance. Remember, a minimum of 6 inches of System Sand is required in every direction around all AES, ES or SS pipes. Being encased in sand stabilizes the system, minimizing shifting of components during backfilling, as well as preventing settling over time because it is not subject to compaction; System Sand also protects the pipe by distributing the weight of the soil cover evenly.

System Sand should be “clean;” that is, it should not contain any organic materials such as grass, leaves, forest litter, topsoil, etc. No barrier materials should ever be used between System Sand and soil cover material. If you discover a system suffering from “wrong sand syndrome,” keep in mind that AES, ES and SS components can be re-used in the same location by removing the “bad” sand and reinstalling the system components with System Sand that meets our specs.

| <b>Presby Environmental System Sand Specifications</b> |                                    |                        |                                     |                                |
|--|------------------------------------|------------------------|-------------------------------------|--------------------------------|
| System Sand contains...                                | PEI Specs % (by weight)            | Particle Size (metric) | Particle Size (inches)              | Sieve # reference              |
| <b>GRAVEL</b><br>(up to 3/4 in.)                       | 0 – 35%                            | 2-76 mm                | 0.08-0.75 in.<br>5/64 – 3/4 in.     | Passes 3/4 in.<br>Retained #10 |
| <b>SAND</b><br>(coarse & very coarse)                  | 40 – 90%<br>(the more, the better) | 0.5-2.0 mm             | 0.0196-0.079 in.<br>1/64 – 5/64 in. | Passes #10,<br>Retained #35    |
| <b>FINES</b><br>(silt/clay)                            | No more than 3%<br>(CRITICAL)      | < .075 mm              | < 0.0029 in.                        | Passes #200                    |

| <b>Sieve Analysis Interpretation<br/>Comparison of ASTM C-33 and<br/>Presby Environmental System Sand</b> |                                     |   |
|---|-------------------------------------|---|
| <b>Sieve Size</b>   | <b>ASTM C-33<br/>fine aggregate</b> | <b>AES and ES<br/>Specifications</b>                        |
| 3/4 inch  |                                     | 0% retained   |
| 3/8 inch  | 100% passing                        | "Gravel"  |
| #4  | 95-100% passing                     |   |
| #8  | 80-100% passing                     |   |
| #10   |                                     |   |
| #16   | 50-85% passing                      | "Coarse to Very<br>Coarse Sand"                             |
| #30   | 25-60% passing                      |   |
| #35   |                                     | 40-90% retained   |
| #40   |                                     |   |
| #50   | 5-30% passing                       |   |
| #100  | 0-10% passing                       |   |
| #200  |                                     | "Fines" (silt &<br>clay)<br><br>< 3% MAX<br>passes-CRITICAL |

**IMPORTANT REMINDERS:**

- System Sand is a clean, granular, coarse to very coarse sand, free of organics
- System Sand should contain less than 3% fines (clay and silt)
- System Sand extends a minimum of 6 inches in every direction around the pipe
- We recommend confirming System Sand meets specs. by obtaining sieve analysis
- Manufactured sand is acceptable for System Sand provided it meets specs.

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Dated: July, 2014