Recycled Glass in On-site Wastewater Sand Filters

Material: Recycled Glass

Issue: *Sand filters are a common adjunct to conventional on-site septic treatment systems. When the drain field for a septic treatment system does not meet percolation standards, a sand filter creates an area with the correct permeability for effluent from the septic treatment system. Sand filters are part of a non-proprietary anaerobic septic treatment system in which the sand acts as a mechanical and biological filter. Research suggests that using crushed recycled glass in place of sand may lower construction costs and minimize the potential of system failures.*

Best Practice: This best practice details the benefits of using crushed recycled glass as an alternative to C-33 sand as a medium in septic treatment systems. For methods of reducing the recycled glass to the desired size, refer to the *Crushing and Screening Glass Aggregate* Best Practice. For details on the use of crushed glass as a medium in water filtration systems, refer to the *Crushed Recycled Glass as Medium in Slow Rate Filtration Systems* Best Practice.

Sand filter septic treatment systems typically consist of a septic tank, a sand media filter, and a drain field. The septic tank collects the influx, allows sedimentation to occur, and transfers the effluent through the sand filter to a drainfield, where the effluent infiltrates into the ground. The filter slows the rate of effluent flow and provides a place for microorganisms to break down organic matter and pathogens, and to convert ammonia to nitrate. In the state of Washington, the specification for the filter medium has been ASTM C-33 sand, also known as cement sand, in which up to 10% by weight of the material can be finer than a No. 100 sieve. The flow of effluent through the sand can cause the fines to migrate and form low-permeability lenses. These lenses reduce the rate of flow and encourage accumulations of biological material, called "biomats." Biomats can cause clogging of the filter, resulting in system failure. Repair requires replacement of the filter sand. Minimizing the fines content inhibits the formation of biomats, but also increases the cost of the sand.

Tests conducted with *in-situ* residential septic treatment systems indicate that when crushed to C-33 specifications, the fines in glass wash out with effluent flow easier than the fines in sand, reducing the potential for biomat formation and the associated filter clogging. Experience in field tests indicates that crushed glass used as a replacement for sand starts with much higher permeability thn C-33 sand. The higher permeability appears to reduce the potential of filter clogging. Furthermore, the increased filter permeability may allow greater hydraulic loading of the septic system, therefore reducing the required size of the filter, and thus the installation cost of the filter.

In addition, research indicates that recycled crushed glass filters appear to perform as well as C-33 sand in the treatment of sewage effluent. These treatment parameters include the reduction of five-day biochemical oxygen demand (BOD_5), fecal coliform count (FC), total suspended solids (TSS), oil and grease (O&G), and nitrates. Reducing the BOD_5 and TSS may increase the permeability of drainfield soils by attracting worms and other, higher, life forms, which can reduce the area of leachfield required for a given volume of effluent.

Based on test data accumulated over two years, in October 1996, the Washington State Department of Health amended its filter media specifications to include crushed glass along with mineral sand in intermittent sand filter and sand-lined drainfield trench filter media specifications. The Department of Health cited the higher permeability of glass along with data indicating that the BOD, TSS, and fecal coliforms were kept within acceptable ranges for the duration of the research project. The Department of Health also noted that the glass filter took longer to reach maturity than a sand filter run in parallel. This may have been due to the higher permeability requiring more water volume to establish the biological activity.

Implementation: Recycled glass is collected in excess of traditional market needs in many areas of the country. If some of the cost savings from not needing to landfill the excess glass can be invested in processing equipment, recycled glass can be crushed to meet ASTM C-33 sand gradation specifications. Any local agency or group interested in investigating the possibilities for this application needs to determine the local sand filter material and gradation specifications and to investigate the necessary approvals at the state, county, and local levels. It is not correct to assume that simply because there is ready availability of inexpensive natural sand from local resources, that the sand is of the correct quality and gradation for sand filters. Although sand is readily available in most Washington counties, some counties will not allow local sand to be used in sand filters because of problems with fines or clay.

Initial approvals should probably be sought at the state level. State approval may make county and local approval easier to achieve. In addition, more data needs to be accumulated from research around the country to more closely quantify the effects of using glass in septic treatment systems.

Benefits: The attributes described in this best practice will help promote the use of recycled crushed glass as a filter medium in residential sewage treatment systems. The use of glass as an alternative to conventional filter sand may lower construction costs and improve the overall performance of the treatment system.

Application Sites: Glass suppliers, residential septic system designers. In particular, at the time this was written, all of the glass collected in San Juan County, Washington, was being processed and used in sand filters.

Contact: for more information about this Best Practice, contact CWC (206) 443-7746, e-mail info@cwc.org.

References:

Additions to Guidelines for Sand Filters, correspondence by the Washington State Department of Health, October 1996.

Crushed Glass as a Filter Media for the Onsite Treatment of Wastewater, 1995, Final Report, prepared for the Clean Washington Center by Aqua Test, Inc. and Stuth Co., Inc., Maple Valley, WA, 98109.

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