SYSTEM DESCRIPTION SUMMARIES

Standard Gravity Systems

These are the most common and generally least expensive type of system. These are generally used where there is little risk to surface or groundwater, and where there is a suitable soil of sufficient thickness which facilitates adsorption, filtration, and treatment (percolation rates > 10 min / inch).

Uniform Pressure Distribution

Uniform pressure distribution (UPD) provides for the periodic discharge of a determined volume of effluent to a drainfield, a specified dose (Exhibit A). Dosing uses the principle of wetting and resting, which provides multiple daily dosings of effluent to a subsurface soil absorption system with a period of resting and re-aeration between doses. This resting period is important in maintaining the aerobic condition of the soil absorption system, and thus slowing the development of a clog of soil interfaces and subsequent failure that naturally occurs over time.[1]

Research evidence indicates that periodic dosing and resting are preferable to continuous effluent discharge into a gravity drainfield. A period of resting allows the soil to re-aerate, limiting the thickness of the clogging mat and allowing **aerobic digestion** of filtered organic particles in the soil. It is applied when disposal and treatment is preferred higher in the soil profile, such as situations with high percolation rates, shallow groundwater, or bedrock.

In lieu of pumps, automatic dosing siphons (no electricity required) may be used for dosing where a suitable downhill gradient exists from the elevation of the siphon to the drainfield.

UPD with [Eljen] Geotextile Sand Filters (GSF) formerly known as "In-Drains"

The Eljen Geotextile Sand Filter, used in conjunction with UPD, provides an enhanced two-stage level of treatment over that of standard gravity or UPD used alone. The approved GSF product contains two parts: a geotextile filtration component, which is a corrugated surface, and a cuspated plastic core, which provides a support surface for the geotextile.

The geotextile filtration unit stores the wastewater for treatment and also supports aerobic digestion. The geotextile fabric, a coarse cloth, constrains the flow of the wastewater out, encouraging nitrification in the sand layer that receives the effluent prior to the soil. This supports nitrification of the wastewater[2]. The system requires the use of a uniform surrounding sand bed to provide the substrate for second stage aerobic treatment. SJBHD requires this completely surround the units (Exhibit B).

Advanced Treatment (ATS)

Advanced treatment systems differ from conventional systems in a number of ways, the primary difference being that they treat and cleanse the wastewater before it is dispersed to the soil environment.[3]

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[1] Wa. Dept of Health. Recommended Standards And Guidance For Performance, Application, Design, And Operation & Maintenance, Dosing Gravity Drainfield Systems. July 1, 2007

[2] On Site Water Treatment Magazine. Journal for Decentralized Wastewater Treatment. Jan 2007.
[3] Univ. Rhode Island. http://www.uri.edu/ce/wq/RESOURCES/wastewater/Onsite_Systems/Advanced/index.htm.

The treatment provided by the advanced treatment system serves to reduce the "strength" of the wastewater, or the solids, fats, oils, and greases (FOG) that are suspended in the effluent. This step may also contribute to reductions in pathogens and/or nutrients in the wastewater depending on the design and configuration of the system. Systems that function to reduce nitrogen generally recirculate the effluent back to the septic tank or to a separate recirculation step where raw effluent and treated effluent are mixed, creating conditions that facilitate the removal of nitrogen by beneficial bacteria (Exhibit C).

Three basic forms of ATS are most often considered for local use:

Aerobic treatment units (ATUs) rely on air injection systems and blowers to create an oxygenated (aerated) environment, which is able to support bacterial populations that break down organic material. This aeration process produces an effluent that is lower in total suspended solids (TSS) and biochemical oxygen demand (BOD) than that of conventional systems. The injection of air into the ATU agitates the wastewater, so solids are readily mixed with the bacteria, facilitating digestion of the organic matter by bacteria. There is a step in the process where any settled solids and bacteria are returned back to the aerobic portion of the tank for mixing and additional treatment. A clarification step is also a part of the treatment, allowing for solids and bacteria to settle out of the wastewater prior to distribution to the drainfield, helping to ensure that effluent leaving the ATU contains as few solids and organic matter particulates as possible.

Media filters consist of a lined or watertight structure containing specified media, which serves as a surface for bacteria to colonize and for biochemical and physical treatment processes to occur. These are the most prevalent ATS's in Colorado. As the wastewater trickles through the media bed, the organisms growing on the media treat it by breaking down organic matter and consuming nutrients in the effluent. This filter is never saturated with wastewater, and the presence of air promotes the establishment of beneficial aerobic microorganisms. The media may be absorbent (such as peat or textile media) or non-absorbent (sand or plastic).

A sequencing batch reactor (SBR) is a specific type of treatment unit that uses a single treatment tank to perform both aeration and clarification (solids settling). The cycle begins as wastewater enters the tank. The full tank is aerated for biological treatment. After aeration, the mixing system is stopped, and the solids are allowed to settle. Clarified effluent is decanted from the clear zone in the tank. The cycle is completed when the system moves into an idle period for development of anaerobic conditions to facilitate potential nitrogen removal;

A number of different "off-the-shelf" systems are available. When a maintenance contract is required for proper system performance, the continued maintenance is conditional to the permit. If maintenance is neglected or discontinued, the permit is invalid. Some of the commercial names of these Pre-treatment products are Advantex Orenco, FAS, Cromaglas (pending), and others.

Experimental Systems [under review]

Occasionally an owner wishes to reclaim water or has a new treatment concept to propose. The Department will examine these on a case-by-case basis. Approval of these systems is not routine. Regulations, performance analysis, as well as supporting published literature are examined in the process of reviewing one of these systems when proposed.

Greywater systems

Greywater systems are similar to a septic system and require a tank and subsurface discharge. These are approvable, but are also subject to stringent review.

Note: In the matter of experimental or greywater systems, a back-up standard system is usually required as a contingency.