
The Vault Evaporator Toilet System— An Innovative Alternative for Waste Disposal

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Due to rapid development in Colorado, the cost of vault waste disposal is increasing significantly. In addition, as wastewater treatment plants near capacity, finding locations that accept vault waste is becoming more difficult. One solution to these problems is to construct composting toilets instead of vault toilets. Composting systems, however, require significantly more maintenance and a building with a basement.

Biological Mediation Systems' (BMS) patented Vault Evaporator, an innovative waste disposal alternative, avoids many drawbacks of both standard vault toilets and composting toilets. This system uses mechanical ventilation to effectively control odors and substantially reduce waste volume and, therefore, pumping frequency. One vault with a vault evaporator system can accommodate up to eight toilets, as well as multiple drinking fountains and sinks. For several years, the Colorado Department of Transportation and the National Park Service have successfully used Vault Evaporators at highway rest areas and national parks, respectively.

PROJECT DESCRIPTION

Fish Creek Falls Recreation Area is a very popular year-round day-use site in Steamboat Springs, CO, on the Routt National Forest. The site's existing vault toilet is inaccessible and undersized. Development at this site included designing and building an accessible toilet to handle 750 visitors a day on weekends and 300 visitors a day on weekdays during high-use season. (see figures 1 and 2.)

POTENTIAL WASTE DISPOSAL SOLUTIONS

The alternatives evaluated for this site included standard vault toilets, a vault toilet with a vault evaporator (BMS Vault Evaporator), composting toilets (Clivus Multrum), and evaporation/dehydration toilets (BMS Devap2000 System and Bio-Sun System). Factors weighed in the selection of the preferred alternative included cost, the building's visual impact with or without solar arrays, fitting the building to the site topography, and minimizing maintenance.

The composting system was immediately eliminated as a viable alternative because the visitation patterns would require many composting units. Vault toilets using Sweet Smelling Toilet (SST) design principles would have required two separate buildings some distance apart, which the site could not accommodate.

A life cycle cost comparison done on feasible alternatives included a comparison of waste systems and grid versus solar power. Capital construction costs included the waste system, the building cost, earthwork, and site work. Annual costs included replacement parts, maintenance, and vault pumping.

**VAULT EVAPORATOR:
THE MOST
ADVANTAGEOUS
ALTERNATIVE**

The preferred alternative was the grid-powered Vault Evaporator. It was the most effective waste reduction system with the least amount of maintenance. It further met the project's needs by permitting the location of all the toilets in a single building that did not require a full basement and therefore could be sited more conveniently for maintenance and visitor access. As a bonus, the building could be customized to suit other structures, the site, and architectural guidelines in the U.S. Department of Agriculture (USDA) Forest Service's Built Environment Image Guide. It fell in the middle of the total present-worth cost range, but was clearly the most advantageous solution for the site.

SYSTEM DESCRIPTION

The vault evaporator waste system has a 3-foot-deep concrete vault beneath the building floor slab and an 18-inch-diameter pipe around the vault's inside perimeter. The pipe is slotted in one section to allow liquids to enter and has two vents fitted with fans that force air down the toilet risers and through the pipe. The pipe provides a large surface area for liquids evaporation, reducing the amount of waste that collects in the vault. The evaporation process is estimated to reduce vault waste volume by two-thirds. Although the forced-air system is designed for evaporation, the waste remains aerobic, which reduces odor problems.

The toilet building at Fish Creek Falls Recreation Area is a rustic, 234-square-foot structure containing two women's toilets, one men's toilet, one urinal, and a hose bibb for cleaning. A 4,000-gallon vault lies under the building. Each of the two vent fans connected to the evaporator pipe blows 640 cubic feet of air a minute. It is estimated that the vault will have to be pumped only once a year, compared to three times a year for two double standard vault toilets.

The vault system can be purchased by itself from BMS, or the company can build a custom building on top of the vault. The Fish Creek Falls toilet building has a log exterior and a 3-foot stone wainscot. It was constructed by BMS at its plant with input from the district and regional offices. The building's total cost was \$88,716, including delivery to the site from Ft. Collins, CO. This cost did not include the stone wainscot or site work.

The building was completed in September 2001. Feedback thus far has been very positive. Arguments in favor of the vault evaporator system have been so compelling that construction of another one began in this region just a few months later. Time will tell whether the toilets are as odor- and maintenance-free as anticipated.

For further information and evaluation of available toilet systems, please see Guidelines for the Selection of a Toilet Facility, April 1991, 1923–1204 SDTDC, San Dimas Technology and Development Center. This document can be requested via the SDTDC Web site at fswb.sdtdc.wo.fed.us.



Figure 1. Fish Creek Falls Recreation Vault Evaporator Toilet Building (front view)



Figure 2. Fish Creek Falls Recreation Vault Evaporator Toilet Building (side view)



Figure 3. Installation of the vault evaporator. Liquid enters the perimeter pipe and fans force air through the pipe to promote evaporation.

Using Lotus Notes to Share Information on Water and Wastewater Issues

Do you ever feel like you are working on a water or wastewater issue that you are certain someone in the USDA Forest Service has already figured out? Do you ever need water or wastewater information that you are sure someone in the USDA Forest Service must know about?

Use the Lotus Notes Water and Wastewater Engineering Discussion Database to post or answer questions and share information. This database has been set up by Region 2 employees but can be accessed by anyone who has access to the USDA Forest Services' Lotus Notes System. Anyone in the recreation or engineering staffs who is responsible for water and wastewater systems would find this database especially useful.

Access the database the first time, bookmark it manually by going to File → Database → Open → server = R2DATA01 → database = <fsfiles\unit\engineering\engwater.nsf> → Bookmark; then choose a navigational icon under which to bookmark the database. If R2DATA01 doesn't appear on the server pulldown list after selecting Open, select Other and navigate to it.

To find the bookmarked database, move your cursor to the Notes navigation column (the gray column on the left side of the Notes screen) and find the icon called Databases. Click on that icon and a list of bookmarked databases will show up in the Notes navigation pane (the block just to the right of the gray column). Notes adds databases to the bottom of the list when it automatically bookmarks them.

Another: When you're in this database (and, actually, most of the Notes databases the USDA Forest Service is creating right now), you'll see a list of several views in the navigation pane (just as in your e-mail database you see inbox, trash, etc.). By Category is one of the most commonly used views because it's a good way to sort messages by topic. This particular database opens with the same view you used the last time you were in the database; if you are in the By Category view when you leave the database, it should open in that same view the next time you access it.

For some other good hints on using a discussion database such as this one, see at Help → Using This Database, as well as Help → About This Database.

If you have any comments or questions about this database, please contact Marina Connors by e-mail Marina.Connors/R2/USDAFS@FSNOTES or mconnors@fs.fed.us or by phone at 303-275-5186.