

BY HEATHER MCCUNE, EDITOR IN CHIEF

Restoring Frank Lloyd Wright's Masterpiece

A challenging problem with a pristine result.



Designed in 1935 and completed in 1939, Fallingwater is recognized as one of the most unique houses ever built in America. It is also one of architect Frank Lloyd Wright's most distinctive accomplishments.

Indeed, its importance is singular; in a 1991 poll of members of the American Institute of Architects, Fallingwater was voted "the best all-time work of American architecture." It is a monument to Wright's concept of organic architecture — harmonizing man with nature so effectively, the structure and its surrounding environment become a single, unified composition.

In 2001, the Western Pennsylvania Conservancy launched an \$11.5 million restoration project to preserve this house and its equally important natural setting. The restoration encompassed major structural repairs to Fallingwater, restoration of its wood furniture and steel sash windows and doors, waterproofing of its flat roofs and terraces, the construction of an on-site zero-discharge waste management system and an ambitious landscaping plan to improve the visitor experience while protecting the Fallingwater property.

Following a complaint filed with the state Department of Environmental Protection about sewage discharges into

E/One low-pressure sewer pumps helped preserve the pristine beauty of Fallingwater, recognized as the single best American architectural achievement of the 20th century.

PHOTOGRAPH: ROBERT P. RUSCHAK, COURTESY OF WESTERN PENNSYLVANIA CONSERVANCY

Bear Run, the stream that tumbles over the waterfall next to Wright's cantilevered masterwork, a new sewage treatment facility was planned that would not pipe a drop into that Fayette County flow.

The \$3 million, zero-discharge system consists of 2.5 miles of pipe, nine pumps and a unique microfiltration

apparatus. It handles not only the waste generated by Fallingwater's 140,000 annual visitors, but also serves as a model for development in the state's purest watersheds.

The Western Pennsylvania Conservancy required that the 1,800-square-foot treatment facility be located at a higher elevation than Fallingwater, well away from both the house and Bear Run.

Because the sewage treatment plant is located at a higher elevation than the Fallingwater complex, any collection system would require pumping of sewage uphill. The various buildings were spread out

The system was designed to treat up to 8,800 gallons a day. Peak flows during October are a little more than 3,000 gallons a day.

The initial phase of the project was limited to serving the main house and guest house. The conservancy selected the Environment One (E/One) low-pressure sewer (LPS) system using E/One grinder pumps. Two pumps were installed on a test basis to determine dependability, ease of installation, ability to blend into the surroundings, serviceability, etc. Based on the performance of the pumps, the conservancy was comfortable with selection of the collection system.

How It Works

The E/One LPS system begins with a closed grinder pump, smaller than a washing machine, that accepts wastewater, grinds its contents into a fine slurry, and transports it through small-diameter pipes. Unlike conventional gravity central sewers, which use 24-inch pipe and require deep excavation, an LPS system is not destructive to the landscape's natural or built features

and requires less maintenance. Since gravity is replaced by the power of the pump, sewer systems need not run downhill nor require large-diameter pipes, deep trenches, or lift stations.

"This project was as challenging as any project we had ever tackled in 25 years," said Rob Trombold, vice president of Trombold Equipment. "The pumps had to be dependable, economical, capable of pumping at high head, low profile, invisible to the guests, silent, odorless, and easily serviced."

The terrain at Fallingwater is steep, rising from the creek and extending at a steep, jagged incline to the treatment facility. The conservancy stressed that any collection system must blend into the natural beauty of the surroundings and be unseen, unheard, and generate no odor to visitors. Disruption of the rock, trees, and vegetation was to be minimized. In addition, the severity of the local winters necessitated freeze protection consideration.

"We could not dig for a large sewer system because there was too much rock," said Jeff Gaul, director of maintenance at Fallingwater. "We didn't have eight feet to dig in and the excavations would have been much too disruptive to the landscape. The E/One piping is 1 1/4 to 2-inch diameter pipe from all of our pump stations to the plant. In critical areas, we used directional boring to lay pipe to minimize the disruption."

"The site was a real challenge," Gaul continued. "In some place the holding basins had to fit in shallow terrain because of the solid bedrock. E/One sized each pump basin according to what we needed."

The system had to be quiet, invisible, and odorless, so that visitors would have no knowledge of its existence. "All the pump covers are at ground level," said Gaul. "They are even dark green, which blends in to our environment. We get 13,000 to 145,000 visitors a year, so the esthetics are very, very important. There are two pumps right by the main house and the guest house, and no one knows that they are there."

Fallingwater, recognized as the single best American architectural achievement of the 20th century, finally has a sewage system worthy of the pristine, creek-side environment celebrated in Frank Lloyd Wright's design. **CB**



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PHOTO COURTESY OF WESTERN PENNSYLVANIA CONSERVANCY

throughout the complex, so installation of a centralized pump station would have destroyed the landscape and the cost would have been prohibitive. The conservancy required that directional and horizontal drilling be used to minimize disruption of surface trees and plants and protect the aesthetic values of the Fallingwater landscape.

Fallingwater has some other unique requirements, including low flow levels in the winter and high flow levels over the summer and fall.