Storm-Proof Sewers

Florida community learns lessons during hurricanes of 2004.

By Donald Eckler, P.E.

The citizens of Central Florida will never forget 2004. Within a six-week period three major hurricanes hit the peninsula. The storms left a trail of wrecked homes, flooded neighborhoods, and tens of thousands of displaced people.

First came Hurricane Charley. It made landfall near Punta Gorda in mid-August and did major damage to that area and then continued to dump heavy rain across the middle of the state. On September 4, Hurricane Francis came ashore on the east coast near Fort Pierce, and then moved across the state before heading northward through the panhandle. Less than three weeks later Hurricane Jeanne made landfall at almost the same location before moving up the Atlantic coast and into South Georgia.

Needless to say, Florida was devastated, especially its utilities as some areas experienced a loss of power. Electric utilities were lost for weeks. Roads were flooded making access and repair extremely difficult. Communications were also affected due to the loss of telephone relay towers and downed power lines.

The Indian River County community of Rockridge was particularly hard hit. Located just 20 miles north of Fort Pierce, the city lost electrical service for two extended periods of time, ten days after Hurricane Francis and 14 days after Jeanne. Without electricity, the community's low-pressure grinder pump sewer system was shut down. Sewage backed up into homes and contaminated the area's groundwater. Entire neighborhoods became giant bacteria-producing Petri dishes.

"It was bad," said Phil Carpenter, president of the Rockridge Homeowners Association. "When we came back, everything had to be destroyed, the sheetrock, furniture, carpets, all of it. We had to spray everything with bleach and chemicals to kill the bacteria. Rockridge is primarily a retirement community and many of the homeowners are in their eighties, so it was an especially difficult situation for them."

Vacuum sewer service lateral installation is simplified because lines are shallow and can easily be diverted over or under buried obstructions.

When it came time to rebuild Rockridge, the community turned to the federal and state governments for funding. Various agencies looked at Rockridge's low-pressure grinder pump sewers and declared the system condemned. They saw no need to repair a system so susceptible to power loss and prone to environmental nightmares such as the one that occurred in 2004.

After much study and deliberation, community leaders and utility department engineers decided to install a new AIRVAC (www.airvac.com) vacuum sewer system. The new system, which went online in mid-2008, solved a host of problems. Furthermore, the project was completed under budget and several months ahead of schedule.

"The residents of Rockridge got a very good deal and they are happy with the results," said Larry Brown, environmental engineer for Indian River County Utilities, which manages the sewers for Rockridge. "I was initially reluctant to work with a vacuum sewer

system because I had no experience with the technology, but it turned out to be the most economical solution given the geography of the area. After several months of operation, we're very pleased."

Virtues of Vacuum

For more than 20 years Rockridge residents relied on low-pressure grinder pumps for their sewer needs. Each of the community's 400-plus houses had an electrically-powered grinder pump, typically located at the rear of each home. Effluent from the grinder pump entered a two-in. force main that eventually led to a master pumping station and then to the treatment plant. The system worked fine until there was a power failure. Without electricity the grinder pumps were rendered useless. In places where hurricanes and thunderstorms are common, power outages occur all the time and sometimes the repairs can take days or even weeks.

Vacuum sewers also require electricity, but unlike low-pressure grinder-pumps that rely on power from each individual home, a vacuum system needs electricity only at the central vacuum station. If electricity is lost at the vacuum station, a standby generator will automatically and immediately restore power to the central vacuum station so there is no interruption of sewer service. Furthermore, if there is a power failure at an individual home, it will still have functioning sewer service.

"In the old days a power surge might blow out a grinder pump and you'd have to wait several hours for the county to come and repair it," explained Carpenter. "We don't have that problem anymore."

Maintaining sewer service during power outages was a significant factor in Rockridge's choice of new sewer technology, but there were many other compelling reasons to choose vacuum sewers. Among the most important was ease of installation.

The flat terrain of Florida's coastal area makes gravity sewer installation difficult. To achieve the necessary grade you either must dig very deep trenches or install many pumping stations, or both. Digging deep trenches in Rockridge was particularly difficult for two reasons. As the name implies, the community is located on a layer of rock covered by sandy soil. Deep trenching would be time consuming and costly. There is also the problem of Florida's high groundwater table. Deep trenches would require lots of dewatering, another time-consuming and expensive procedure.

Shallow installation of vacuum sewer pits was important in Rockridge because the community is located on a layer of rock covered by sandy soil—making deep excavation costly—and in addition, groundwater levels are high.

Vacuum sewer lines can be buried in shallow trenches, usually between three and six ft deep. Because the trenches are smaller and shallower, the vacuum mains could be laid in the swale area adjacent to the roads, rather than underneath the roads. This reduced disruption during the installation phase. The entire system also is served by a single vacuum station, rather than multiple pumping stations, so far less construction was required.

Twenty-one thousand linear feet of vacuum mains were installed as part of the new vacuum sewer system. Any time you do that much trenching, you're bound to run into unexpected underground obstacles. Vacuum lines simplify installation because you can easily divert over or under buried obstructions. No change orders or design alterations are needed. The on-site engineers and installation contractors also got excellent support from AIRVAC's field service team. Any questions or design changes that occurred during the installation were quickly answered.

Minimal Maintenance

In the old days when Rockridge had a grinder-pump system, most of the routine maintenance took place in residential back yards, where the grinder pumps were located. Now two to three homes are served by one vacuum valve pit, buried adjacent to the street. In the rare cases where service is required, workmen can access the pit quickly and easily without inconveniencing the homeowner. The pits all have a pneumatic valve that operates on vacuum pressure so there are no electricity costs to the homeowner, a nice benefit for every Rockridge resident.

From an environmental standpoint,

the new AIRVAC system is ideal. A break or puncture of the vacuum main will not pollute the environment because of the vacuum pressure within the line. Wastewater remains in the pipe. In fact, the system's environmental qualities are so good that the Florida Department of Environmental Protection reduced the separation requirements between sewer and potable water lines from ten ft to three ft. Workmen rarely, if ever, come in contact with raw sewage and any compromises in the line can be isolated and repaired quickly, often within a couple of hours. And everyone loves the fact that there is virtually no odor associated with vacuum sewers, even at the pumping station.

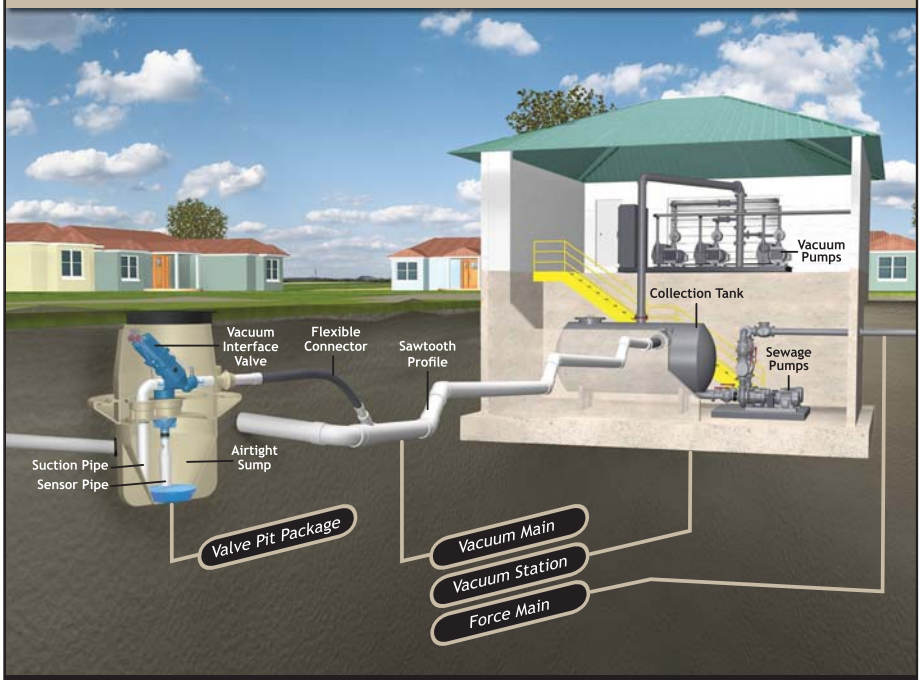
Single vacuum station, which services all of Rockridge's 400-plus houses, features an attractive stucco exterior that matches local architecture.

Good decisions by the utility department are often measured in dollars and cents. The cost of Rockridge's new vacuum sewer system was less than a comparable gravity system when installation and inconvenience issues are factored in. Over the long term, the system will be easier to maintain than either a gravity flow or a low-pressure grinder pump system and provide a large measure of reliability when electrical power is lost. Vacuum sewers also are environmentally friendly and cost-effective.

It is a virtual certainty that more hurricanes will come Florida's way, but the residents of Rockridge won't have to worry about losing their sewer service again. They also will enjoy higher property values and fewer sewer maintenance issues.

"I've spoken with people in other cities here in South Florida who want to know how vacuum sewers are working for us," said Carpenter, the president of the property owners association. "I tell them, if you want a good system that works and is reliable during power outages, AIRVAC is the way to go. It's a great system that works wonderfully." GE

AIRVAC Vacuum Sewer System



See this sytem in action at www.airvac.com and learn how the AIRVAC Vacuum Sewer System works. You may also request a copy of the animation on DVD.

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