Alaska CEs Use State-of-the-Art Technology to Renew Water Mains

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The water infrastructure at Joint Base Elmendorf-Richardson (JBER), Alaska, is over 70 years old and, like that at many other bases and cities in the country, is in great need of repair and renewal. A sizeable portion of the base's 350,000 feet of water mains is deteriorated. Although the base has worked over the years on replacing some of the old water distribution piping, breaks and leaks — and water shutdowns — occur regularly.

Many breaks are due to the old age of the pipes, regular ground movement, or ground heave due to frost or small earthquakes. Others are due to the water mains freezing in the winter. Complaints of low flows or pressures and red water (caused by rust) are common.

The breaks and leaks, and the shutdowns and repairs, all have a negative impact on the base's mission, its population of 18,000 (7,000 living on base), and the local traffic. Water shutdowns can last up to 12 hours, property landscape is destroyed, and street or driveway access is generally blocked.

Repairs also come with high financial costs, for several reasons. Alaska has a short construction period. Pipes have to be buried 10 feet, so the trenches are generally deep and wide (up to 40 feet). Breaks and leaks often happen during the winter when the ground is frozen or at night or on weekends, requiring heavier equipment or more labor and overtime hours.

The effects on the base's mission and populace, coupled with the technical and financial issues weighed heavily in the choice of trenchless technology for the renewal of a water main in 2008 at one of JBER's housing areas. Base engineers had turned to the technology before, using it successfully in 1995 to renew deteriorated sewer mains. (Elmendorf AFB was actually the first to use trenchless technologies in the state of Alaska.)

This choice was made possible by a trenchless technology product called Aqua-Pipe® developed in 1997 by Sanexen Environmental Services specifically to rehabilitate small diameter water mains and also reinstate the small house connections from inside the pipe with the use of special robotic equipment. Certified to NSF/ANSI Standard 61, Aqua-Pipe® eliminates the need for trenches by installing a resin-impregnated flexible tube within the existing pipe to create a hard, impermeable, corrosion-resistant liner or "pipe-within-a-pipe." The liner can withstand all dead and live loads as well as internal pressures (including vacuum) without the help of the residual strength of the existing pipe.

No previous technology could line small diameter water mains and also reinstate the house connections from inside the pipe. Other trenchless technologies, such as slip-

Replacing pipes using traditional (non-trenchless) methods requires 40-wide excavation (left). During pipe repair at JBER using trenchless technology, a flexible liner is impregnated with expoxy (right), then pulled into existing pipe (center). (U.S. Air Force photos)

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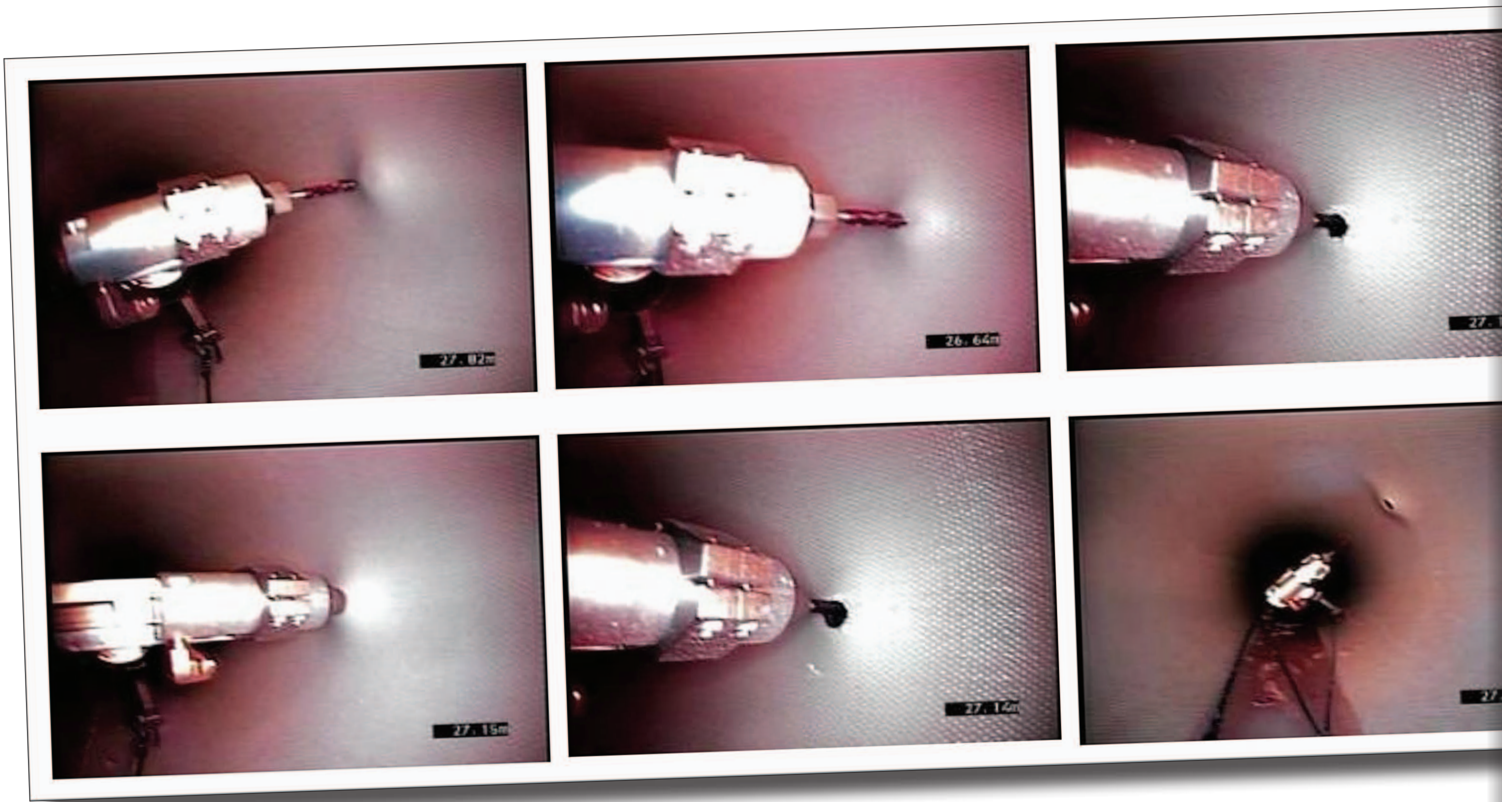

After liner is bonded to inside of existing pipe, house connections are reinstated from using robotic equipment. (courtesy photo)

lining, allowed for the renewal of the pipe but required an excavation at each house connection with the added disadvantage of greatly reducing the inside diameter and the flow within the existing pipe. All these small excavations defeated the purpose of using a low-dig solution to renew the existing water main.

In September 2008, JBER (then Elmendorf AFB) awarded a $0.75M delivery order against a multiyear water/sewer/storm requirements contract to a state-certified installer of this technology for the structural renewal of 3,460 feet of 6-inch diameter cast iron and transite water mains in the housing area. Due to winter shutdown, work was carried out in the fall of 2008 and in the spring of 2009.

In order to continuously supply people with water, a temporary aboveground water bypass was installed. Access to the pipe was achieved by excavating small pits at strategic locations, approximately 400 feet apart. After cleaning the pipe, a closed circuit TV camera was inserted in the pipe to assure that it was cleaned to manufacturer specifications. The camera also recorded the location of every house (service) connection and a special robot inserted a plug in the connections to avoid the migration of resin into them.

Using the access pits, a liner was inserted (pulled) into the existing pipe. This flexible liner consists of two concentric, tubular, woven polyester jackets with a watertight polymer membrane bonded to the interior. The liner is impregnated with a resin epoxy that bonds to the interior of the existing pipe under applied heat. A foam pig pushed through the liner using water pressure shaped the liner, and then hot water was circulated through the liner to cure the resin into a hard, impermeable pipe and bond it to the existing water main. After pressure testing the liner, existing valves and hydrants were replaced with new ones and 34 service connections were reinstated from inside the pipe using special robotic equipment.

The project successfully restored the old pipe's structural integrity, giving it a new, greater than 50-year life. The project produced a 26-percent direct cost savings over using the open cut method, and construction was quicker. Although the indirect "savings" to the mission and base personnel can't be quantified, complaints can and the 673 CES received zero.

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