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Can anyone believe what WSSC says about its PCCP?
by Wayne Goldstein

In my New Year's Day column, I quoted from news accounts from the '90s that described WSSC's experiences with major breaks of its Prestressed Concrete Cylinder Pipes (PCCP) as early as 1975, a problem that became much more widespread in the '80s. What has WSSC done to deal with this problem in the decades since? WSSC apparently has been unable or unwilling to provide any detailed information to the government or to the rate-paying public about those efforts. However, in the September/October 2008 issue of Underground Infrastructure Management Magazine, WSSC was far more forthcoming, although not necessarily more accurate nor entirely truthful:

"Given its size and stature, [WSSC] cannot afford to take a reactive approach to maintaining its infrastructure. As a result of several (PCCP) water transmission main breaks in the early and mid-1980s, WSSC began investigating inspection and testing techniques for PCCP that eventually led to an aggressive and innovative approach to assess the condition of its transmission mains with the intent of preventing future failures and optimizing the pipe-line service life. One area of particular concern was a portion of the Commission's 400 miles of PCCP installed during the late 1960s and early 1970s."

"WSSC was an early adaptor of non-destructive testing, monitoring and inspection of PCCP. In the late 1980s, WSSC began its PCCP inspection program with internal visual and sounding methods. WSSC researched and worked closely with consultants during the development of the non-destructive testing and monitoring techniques widely used today for PCCP. WSSC's PCCP program when first established included the inspection of all 60 miles of PCCP water transmission mains 54-inch and greater. WSSC is currently working with Pure Technologies and others, to embark on an expanded program to inspect all 140 miles of PCCP 48 inches or larger. According to WSSC, this proactive program is key to the management of these critical assets. By proactively maintaining an understanding of the condition of the transmission mains, WSSC is able to optimize the service life of the pipelines, identify short-term repairs, plan for long-term capital improvements and provide value to ratepayers."

"WSSC uses a combination of visual and sounding inspection, sonic/ultrasonic testing, and electromagnetic inspections to assess the condition of its large-diameter PCCP. The inspection identifies anomalies, areas in need of repair and establishes a baseline condition, which includes estimating the number of broken wires in each pipe section. WSSC uses acoustic monitoring methods to identify and track additional wire breaks. To date, WSSC has inspected all PCCP water transmission mains 54 inches and larger and installed acoustical monitoring equipment for 17 of its 60 miles of PCCP of this diameter."

"Mike Higgins, regional manager for Pure Technologies, said that WSSC is one of the leaders in the area of large diameter PCCP inspection nationwide. 'A lot of agencies would have replaced or sliplined the pipelines, but WSSC was able to go in and find the problem areas and fixed them to operate the system in a safe manner,' he said. 'The WSSC experience has shown the ability to extend the service life of problematic pipelines.' "

Let's look at the facts to see how accurate this story is. In a response to questions from the Montgomery County Council about the June 2008 break of the 48-inch PCCP in Derwood, WSSC wrote: "It is known in the industry that large diameter PCCP pipelines manufactured in the period from 1960 through early 1970 similar to the one that broke have a proven track record of reliability and do not have high break history." The Derwood PCCP was installed in 1969. A national study of PCCP breaks published in the spring of 2008 found "a significantly increased rate of failure for pipe installed between 1971 and 1979. Fully 50 percent of the

catastrophic leaks and breaks recorded were manufactured or installed between those years." It appears that WSSC fudges the years of greatest concern by at least 2 to 3 years from "the late 1960s and early 1970s"; to the 1970s when reporting to the government and to the public as compared to what it tells its water industry colleagues.

What this also means is that the other 50% of PCCP that failed in the national study were manufactured or installed in other years. The River Road PCCP was installed in 1964. It may even be that most or all of WSSC's PCCP was installed in the '60s and '70s, meaning that pipe failures might be from throughout this time period. As I indicated in my last column, the biggest problem with PCCP is the susceptibility of the prestressed wire to corrosion, regardless of its thickness or its year of installation. Once the protective cement coating is breached, it is only a matter of time before the wires start to break. Thicker wires just take longer to break than thinner wires. The result could be that the older PCCP from the '60s with thicker wires could fail in the same time period as the younger PCCP from the '70s with thinner wires.

As for WSSC being an early adaptor of PCCP inspection processes, the record is either scant or contrary. According to the 1996 news account referenced in my last column: "WSSC General Manager Cortez White said yesterday that the utility had developed special imaging equipment to test the integrity of the concrete pipe. White said the section of pipe that blew Tuesday was scheduled to be tested within a year. He said other sections of concrete pipe have been found to be at risk and were replaced without disruption in service to WSSC customers."

Another WSSC General Manager said this at a February 2007 meeting: "Lastly, Mr. Brunhart noted it is time for the six-mile inspection of the PCCP as it had not been done for five to six years." WSSC also noted in its July 2007 Utility-Wide Master Plan Phase 1 Final Report: "The PCCP inspection program was said to have lagged in recent years, and was felt by the Delphi workshop group to have been beneficial in identifying issues before failure of the pipe. It is recommended that WSSC reinvest in this program, since the consequence of failure of large diameter transmission mains is very high."

There was also this response last month about the River Road PCCP break: "Among the possible causes, they said, was corrosion of metal support wires inside the concrete pipe, which passed its last inspection in 1998, or shifts in the ground beneath it. 'Something has happened in the last 10 years, and we hope to figure that out,' said Gary Gumm, chief engineer for the [WSSC]." Another account stated: "the pipeline was last inspected in 1998 and was scheduled to be reinspected by 2011."

Apparently, WSSC had a program to inspect 66-inch PCCP like that along River Road as little as once every 13 years. It appears to have inspected some of its largest PCCP every 5-6 years, but then not to have ever inspected "smaller" 48-inch PCCP like the one in Derwood, even 39 years after installation. How does this compare to the development of inspection technologies and programs elsewhere?

Pure Technologies, one of the companies now helping WSSC to inspect and monitor its PCCP, has written a series of research papers about PCCP over the years. According to one such paper: "Research done in the late 1980s and early 1990s by the United States Department of the Interior, Bureau of Reclamation, investigated the use of continuous acoustic monitoring to track the deterioration of prestressed concrete pipelines. Results from work done at the Agua Fria pipeline in Arizona indicated that deliberate wire cuts generated large distinctive acoustic anomalies, which could be recorded by suitable equipment."

"In 1993, Pure Technologies Inc. began to use continuous acoustic monitoring to track the failure of unbonded post-tensioning strands in concrete buildings and parking structures. The size and complexity of these structures required the development of specialized equipment and software to collect, manage, and analyze the large amounts of data flowing from these sites. These programs, techniques and equipment designs have been applied to the monitoring of prestressed concrete pipe."

"In 1996, Pipeline Acoustic Systems (PAS) of Phoenix, Arizona was awarded a contract to supply a 6,200-ft. hydrophone array and data acquisition system to be deployed at different locations in the pipeline. PAS selected Pure Technologies to design and manufacture the system. A prototype system was developed and first tested in September, 1996. After several design modifications and software enhancements, a functional system was deployed in August, 1997."

A different company wrote this: "Immediately upon organization of Pipeline Technologies Inc. in June 1995, the firm answered a formidable challenge of the pipeline industry to develop a method of determining the structural condition of buried large diameter water pipelines while they remain in service. PTI, parent firm of Pipetech International, conducted a rigorous development program to meet this challenge, resulting in the introduction of acoustic emission technology to the PCCP industry in late 1996. In the decade since its introduction, acoustic emission technology has become the widely used technology of choice for determining the health of PCCP pipelines on every continent throughout the world."

Given that the technology to allow for the continuous monitoring for the sound of wire breaks, first through hydrophones and later through fiber-optics, has been available for at least 12 years, when did WSSC and other water utilities take advantage of it? Next week, I will show the comprehensive approach of other water utilities to monitoring its PCCP, in stark contrast to WSSC.

The views expressed in this column do not necessarily reflect formal positions adopted by the Federation. To submit an 800-1000 word column for consideration, send as an email attachment to waynemgoldstein@hotmail.com