

Why Is That PVC Purple?

Unified Sewerage Agency's Directive Results in Creative Dual-Purpose System

By John Houle
PW Pipe

When the Unified Sewerage Agency decided to install a sewer force main containing more than eighteen miles of pressure pipe, they specified purple PVC pipe. Why purple? The purple color designates the pipe as containing non-potable water. The color serves as a permanent warning that the pipe should not be tapped for drinking water.

Another question: Why PVC pipe? The answer—PVC pipe is able to provide many other advantages for the Agency besides the purple color.

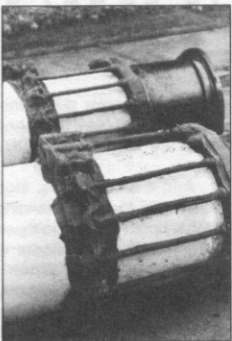
The Unified Sewerage Agency (USA) covers the

"The size of the project was impressive: 27.2 total miles"

western suburbs of Portland, Oregon. The Agency serves a population of approximately 340,000 people, primarily in Washington County. Growth has been rapid in the Agency's region. (Population has increased by almost 25% since 1987.) This growth, along with stricter environmental regulations for effluent discharge, resulted in the Forest Grove - Rock Creek Pipeline.

Forest Grove - Rock Creek Pipeline Project

The project called for the construction of 45,000 feet of



Metallic joint restraint devices are coated for corrosion protection.

trench connecting three USA wastewater treatment plants. Two 24-inch PVC pressure pipes and one 3-inch PVC electrical conduit run the full

length of the trench. The pressure pipes carry raw sewage and reclaimed water among the three facilities as required to meet varying seasonal flow requirements. This approach was judged to be more economical than upgrading treatment capacity and quality.

The size of the project was impressive: 90,000 feet (17 miles) of 24-inch pressure pipe, 9,200 feet (1.7 miles) of smaller sizes of pressure pipe, and 45,000 feet (8.5 miles) of conduit. Total weight of PVC pipe was 5.3 million pounds.

Most of the pipe used on the project was produced in California and shipped to Oregon. In an effort to keep the project on schedule and in a spirit of partnership, the pipe manufacturer produced 11,500 feet of 24-inch pipe prior to finalization of a contract among the involved parties.

The Unified Sewerage Agency chose Brown and Caldwell Consultants to design the project. Brown and Caldwell is headquartered in Pleasant Hill, California, with more than twenty branch offices throughout North America. The firm specializes in environmental consulting and analytic services for water and wastewater projects.

Creativity in design was necessary because of the Agency's directive that all future growth could not generate additional discharge to local waterways. Instead, any additional effluent would be treated and used as irrigation water. To satisfy this constraint, Brown and Caldwell designed a dual-purpose system that allowed flow in both directions in the pipes. The system tied three treatment plants together to provide flexibility for future growth and for flow variations.

Contractor bids were received on May 24, 1993. Low bidder on the project was Copenhagen Utilities and Construction of Portland, Oregon. Copenhagen has been

providing project management and construction services for industrial, government, and commercial projects for more than thirty-five years. While preparing for the Forest Grove - Rock Creek Project, Copenhagen was already involved in two other major PVC pipe projects that totaled more than 93,000 feet of gravity sanitary sewer pipe.

PVC Pipe

USA decided to specify PVC pipe because of the advantages. Specifically advantages when compared to ductile iron, a comparison which USA did. Foremost among these advantages is corrosion resistance, but other benefits such as ease of

PVC is not affected by the sulfuric acid generated in sanitary sewers.

External corrosion is also important. Several thousand feet of the pipeline lie in Jackson Bottom, a low-lying wetlands area. Soil conditions in the Bottom would have required expensive corrosion-combating measures if iron pipe had been used.

As a result of PVC pipe's resistance to both internal and external corrosion, neither linings, coatings, nor cathodic protection were required for the project. This represented a significant savings for the Agency, both in initial construction costs and in future maintenance costs.

Ease of Construction

Another advantage provided by PVC pipe is that it is easier to work with than are competitive materials. This was very important for this project, since more than three miles of trench were constructed in a railroad right-of-way that provided only a twenty-foot wide work zone. In the words of Ralph Whiteis, project superintendent: "PVC provided a quick and simple installation system, and we were very happy with how smoothly the project progressed." PVC pipe's lighter weight allowed the use of smaller equipment; there were no coatings or linings to repair; pipe was easily cut to length using hand-held power tools.

The "quick and simple" installation system produced another benefit. The PVC pipe's gasketed joining system gave the contractor the confidence to delay pressure testing of the line until sizable portions of the installation were completed. Cost savings were realized because the test crew and equipment were used fewer times.

Surge Pressures

Because PVC is a more flexible material than ductile iron, surge pressures are lower in PVC pipe than in ductile iron pipe. "Our surge analysis

showed a notable difference in PVC's peak surges versus ductile iron," says Hank Fenske, project engineer.



Both pipe materials could easily withstand the design surges. However, a design that incorporated PVC pipe was economical because other pipeline components were able to be designed for lower pressures.

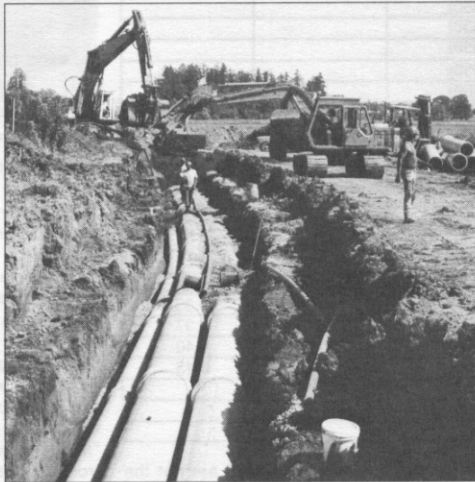
Color-coding

The color-coding used on the project is in addition to two other warnings. The first is a continuous tape buried above each pipe that warns that a reclaimed water pipe lies below. The second is a line of print on each piece of pipe stating: "CAUTION: RECLAIMED WATER--DO NOT DRINK."

The agency desired a fool-proof warning system that did not rely on tapes, coatings, or print lines. The concern was that all of these systems could be disturbed or degraded over time, leaving the pipe without an adequate warning. The pipe manufacturer was able to allay the Agency's concern by adding a purple pigment to the PVC compound before the pipe was extruded. The result was a pipe that is purple throughout its thickness, not merely coated with a thin layer of color.

The Bottom Line

The advantages of PVC pipe over the traditional pipe material were best summed up by Hank Fenske, project engineer: "Everything that was a down-side with ductile iron was an up-side with PVC." By specifying purple PVC pipe, the Unified Sewerage Agency was able to realize benefits and economies not only in design and construction, but throughout the life of the piping system.



You'll have to take our word for it that these pipes are purple.

construction, lower surge pressures, and color-coding played a part in the decision.

Corrosion Resistance

A major benefit provided to the Agency by PVC pipe is corrosion resistance. PVC is immune to nearly all types of corrosion experienced in underground piping systems.

Several conditions inside the pipe would cause internal corrosion of ductile iron pipes. During low-flow periods, effluent could spend as long as eighteen hours in the pipe's 8.5-mile length. And since the pipeline's grade is relatively flat, a portion of the line can experience open-channel flow. The hydrogen sulfide gas generated by these conditions would quickly cause ductile iron pipe's mortar lining to deteriorate, exposing the iron itself to the corrosive environment. In contrast,