

# Know You Should Know



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A Message from the American Concrete Pipe Association

Bulletin No. 124

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## Questionable Recommendations Based on Study Findings

In December 2000, a study on the “Performance Evaluation of Existing High-Density Polyethylene Pipe (HDPE)”, sponsored by the South Carolina Department of Transportation (SCDOT) and the Federal Highway Administration was submitted by the University of South Carolina’s (USC) Department of Civil and Environmental Engineering. After reviewing the authors’ findings and recommendations, this “You Should Know” would probably be more correct as “**Does Anyone Know?**”

A total of 45 HDPE pipelines were inspected throughout South Carolina, with the majority being used in sideline applications, running parallel to major roadways under driveways. All HDPE pipelines were less than 7 years old and were visually inspected using a video camera and a mandrel set to 5% deflection.

The authors reported the following findings:

- Circumferential cracks in 18% of the pipes
- Localized bulges in 20% of the pipe
- Tears and punctures in 7% of the pipes
- End damage to 13% of the pipes
- Deflections greater than 5% were found in 20% of the pipes, 27% could not be tested for various reasons
- 36% of all the pipe had some kind of cracks, punctures or bulges
- 29% of the pipes exhibited undulating flow lines (ponding)

With full knowledge of the results listed above, the authors still concluded that the pipes were performing well and maintaining a “relatively” round shape. They went on to say, “HDPE pipe is worthy of being one of the pipe materials that can be used on SCDOT maintenance and roadway construction projects”. We would like to know – **When is an HDPE pipe considered to have failed?**

The authors report a large number of Maintenance personnel surveyed agree that HDPE pipe is easier to install than concrete or corrugated metal pipe. The authors then qualify their findings by explaining that questionable bedding materials and installation procedures were used in many of the cases. These are not new conclusions, since most failures of flexible pipe are blamed on the installation. 85% and greater of the load carrying capabilities of a buried flexible pipe system is dependent on the installation. We would like to know – **How much additional time and money is required for a quality HDPE pipe installation?**

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They also state that pipe material quality (resin) will affect the pipe performance and for the purpose of this analysis, are unknown. If the quality of the material used to manufacture the pipe does not meet a recognized specification, it is impossible to determine the short term or long term properties of the pipe. We would like to know – **How does the specifier determine if HDPE pipe will survive the design life of their project?**

The study investigated primarily pipes of 18-inch diameter or less. The authors go on to report that the most common size was 15 inch (of which 32% did not pass the 5% mandrel test). However, their conclusion that “HDPE is worthy...” does not address size. They also mention the possible concern of flotation, but do not address the issue. Little or no information is provided on burning issues, end damage and HDPE joint integrity, all of which are valid concerns. We would like to know – **Would a study not have to address all characteristics of a product before the authors recommend it as an “approved” pipe material for SCDOT projects?**

The authors do not seem to be concerned by the number of deflections greater than 5%. The deflections, internal corrugations and pipe misalignment reported in these samples all would affect the value of “n” in the Manning formula, which could alter the pipe sizing and hydraulics. The authors simply state that hydraulics is a topic for future study. These deflections also raise concerns about the soil and water tightness of the HDPE joints. The report gives the impression that if liquid can still move through the conduit, it is acceptable. Of course, this is not true, but, we would like to know – **When is the HDPE pipe not performing the purpose for which it was designed in the opinion of the USC group?**

One could question the relevance of this study for a number of reasons. The sample size of 45 pipelines is considered small. Only 3 HDPE pipes were as much as 5 years old, and 90% were installed within 2 years prior to this investigation. Therefore, no conclusions relative to age can be made. If the samples inspected by the USC study have sustained the deflections, cracks, punctures and localized bulges listed after only 2 or 3 or 7 years, what condition will they be in at the end of 15 years, 20 years or more? There is no reference to the cost of installation if the proper procedures are followed, nor is there any reference to life cycle costs. We would like to know – **Can the conclusions reached in this report be substantial enough to make any recommendation about allowing the use of HDPE pipe on State projects?**

The recommendations made from the findings of this study do not seem justified. The large number of pipe found with damage and the aspects of the product not investigated should have resulted in the only recommendation being for further tests and study. The “Performance Evaluation of Existing High-Density Polyethylene Pipe” was only successful in raising many questions that need to be answered before any valid recommendation can be made.

**What constitutes failure of HDPE pipe? Can HDPE pipe be installed correctly in a time and cost efficient manner? What are the material properties of the resin? What are the properties of the HDPE pipe? What is the anticipated life of the product? How is the hydraulics of HDPE pipe altered by the changing physical characteristics after installation?**

The owners, specifiers and contractors should and need to know the answers to these questions and more prior to recommending HDPE pipe. Concrete pipe offers detailed information for the pipe properties, the pipe design for all applications and many decades of field use and research such that anyone specifying concrete can do so with confidence. The HDPE pipe industry should be offering nothing less.