

# Know

You Should



A Message from the American Concrete Pipe Association

Bulletin No. 133

## Abrasion Affects Durability In Some Drainage Pipe

Durability is the capability of pipe to continue to perform satisfactorily for an economically acceptable period of time. This is significant in the pipe's ability to perform intended structural and hydraulic functions. Precast concrete pipe has a long history of excellent durability as a storm drainage pipe. Traditionally, there are certain physical and chemical factors that affect a product's durability and one of those factors is velocity-abrasion.

Velocity, by itself, does not create problems for concrete pipe within the ranges normally encountered. At velocities of 40 feet per second, or greater, cavitation effects can be serious unless the surface is smooth and internal offsets at joints are closely controlled. Within the range of velocities up to 40 feet per second, the severity of velocity-abrasion effects depends upon the characteristics of the bed load.

The abrasion durability of precast concrete pipe is well known when compared to that of corrugated metal pipe. As new pipe products converge on the North American drainage markets, it is important to conduct research to evaluate the abrasion performance of new and existing pipe. Because of this, the American Concrete Pipe Association commissioned the

University of Texas at Arlington to conduct tests of the abrasion of one new product, cellulose fiber cement pipe, in comparison to the performance of precast concrete pipe. Based on the test results, the study concluded that the abrasion of cellulose fiber cement pipe is significantly higher than that of precast concrete pipe under similar circumstances.

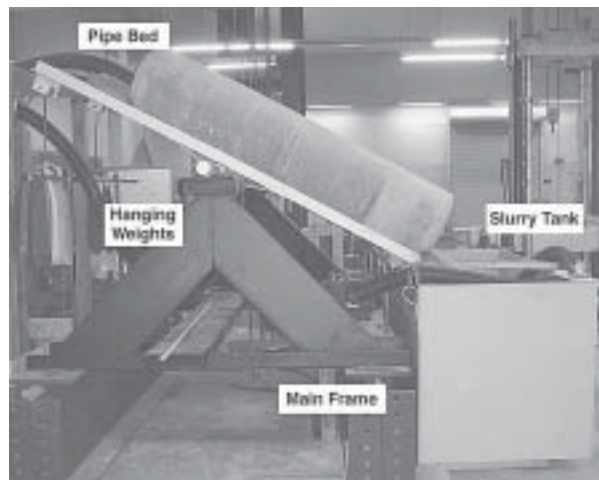


Photo of Lateral View of Abrasion Test Apparatus

Many researchers have investigated the abrasion characteristics of precast concrete pipe and alternative products to prove their abrasion capacities. Typically, rocking abrasion and rotating abrasion tests have been utilized to perform those tests.

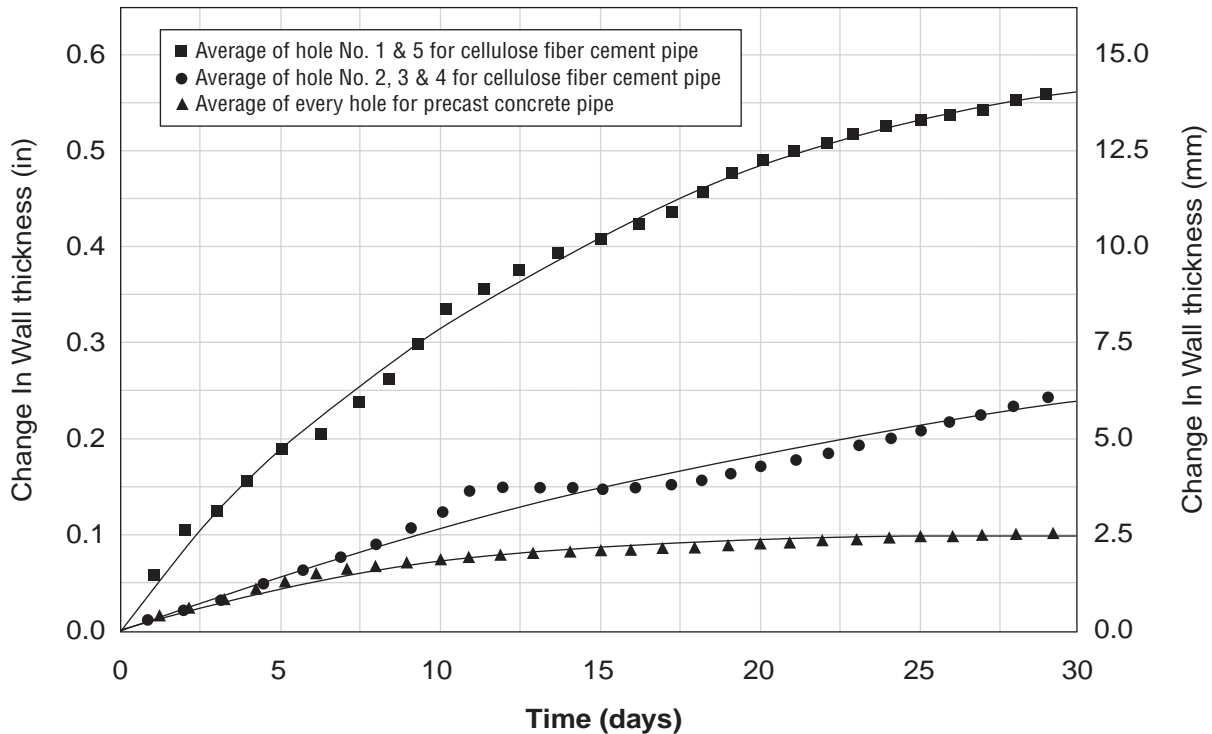
In the research conducted by the University of Texas at Arlington, abrasion testing was performed by simulating actual service conditions of the pipe. The test method consisted of pumping a slurry composed of aggregates and water longitudinally through the pipe. The advantage of the slurry pumping test was that it best simulated actual service conditions of drainage pipe.

The loss of pipe wall due to abrasion was measured by drilling five holes at equal intervals along the longitudinal axis of the pipe. Reduction of wall thickness was measured by a digi-met depth gage every day over a period

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of thirty days. Each measurement was conducted three times at each hole to verify the repeatability of measurements. The average of the three measurements was calculated for each hole.

pipe showed a greater loss than that of precast concrete pipe for the test duration. It was also displayed that the deep abrasion path was created on the surface of the inner wall of cellulose fiber cement pipe. These results may



In the study, the cellulose fiber cement pipe showed considerable reduction in wall thickness during the test period. The precast concrete pipe showed substantially less reduction in wall thickness. For the hole at the down stream end of the pipe, **the cellulose fiber cement pipe lost 12 mm (0.47 in.) over a 30 day period, 4.8 times that of precast concrete pipe 2.5 mm (0.10 in.)**. Some previous rocking and rotating abrasion tests of the cellulose fiber cement pipe resulted in an abrasion loss of 7 to 9 times that of precast concrete pipe. The following graph shows comparisons of reductions in wall thicknesses for the two pipes:

In conclusion, the University of Texas at Arlington Abrasion Study states, “In this study, the wall thickness of cellulose fiber cement

produce a rupture of the pipe when the pipe strength meets the maximum design loads. Consequently, the abrasion resistance of precast concrete pipe is higher than that of cellulose fiber cement pipe for drainage applications...”

Why rely on a drainage product with suspect mechanical properties and brief history of performance? When specifying your next drainage project, go with the proven performer with a service life of 100 years – count on concrete.

*For more information on the durability of precast concrete pipe or to learn more about the referenced abrasion study, contact the American Concrete Pipe Association at [info@concrete-pipe.org](mailto:info@concrete-pipe.org).*

## Concrete Pipe – the SAFE choice