

# Concrete Pipe **Insights**

A Message from the American **Concrete Pipe** Association

## Concrete or HDPE: Strength versus Stiffness

The primary difference between concrete pipe and high density polyethylene pipe (HDPE) is one of structural strength versus pipe stiffness. These terms are not interchangeable: the differences between them are significant and technical in nature.

Concrete pipe is a rigid pipe that has significant structural strength. This is best demonstrated through the traditional method for measuring pipe strength, the three-edge-bearing test. Easily the most severe loading to which any pipe will be subjected, the three-edge-bearing test allows no lateral support for the pipe and applies forces that are virtually point loads. The load carrying capacity of this rigid pipe when installed is increased by at least two-fold because of active soil pressure.

Furthermore, concrete pipe's structural strength can be adjusted through several means, most notably by varying the wall thickness, concrete strength, or the amount and shape of the reinforcing steel.

Installation using concrete pipe should be considered as a pipe-soil structure. Because the structural integrity is derived primarily from the pipe, moderate changes to the soil envelope over time will not compromise the structural integrity.

HDPE is a flexible pipe which relies upon pipe stiffness, rather than strength, for its structural integrity. This is reflected by the parallel plate test, the accepted method for measuring pipe stiffness, which measures the force required to achieve a given deflection. Under soil load the pipe deflects, developing passive soil support at the sides of the pipe. The load carrying capacity of this flexible pipe is derived almost exclusively from the strength of the embedment soil.

Installation using HDPE should be considered as a soil-pipe system. Such a system derives its structural integrity from the soil envelope. Changes to that envelope can - and do - produce deflections that lead to premature system failure.



American **Concrete Pipe** Association