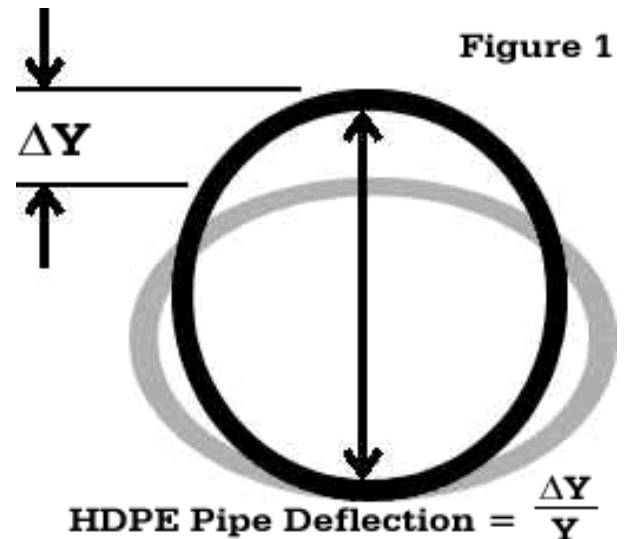


HDPE PIPE DEFLECTION: THE BENDING STRESS PROBLEM

HDPE Pipe's ability to support a load is typically assessed by measuring the deflection from its original shape (Figure 1). This measurement is relatively simple, both in the laboratory and the field, and allows a measurable quantity to be compared with calculated design values. Measuring deflection is a way to verify the design. Controlling factors for deflection can include;

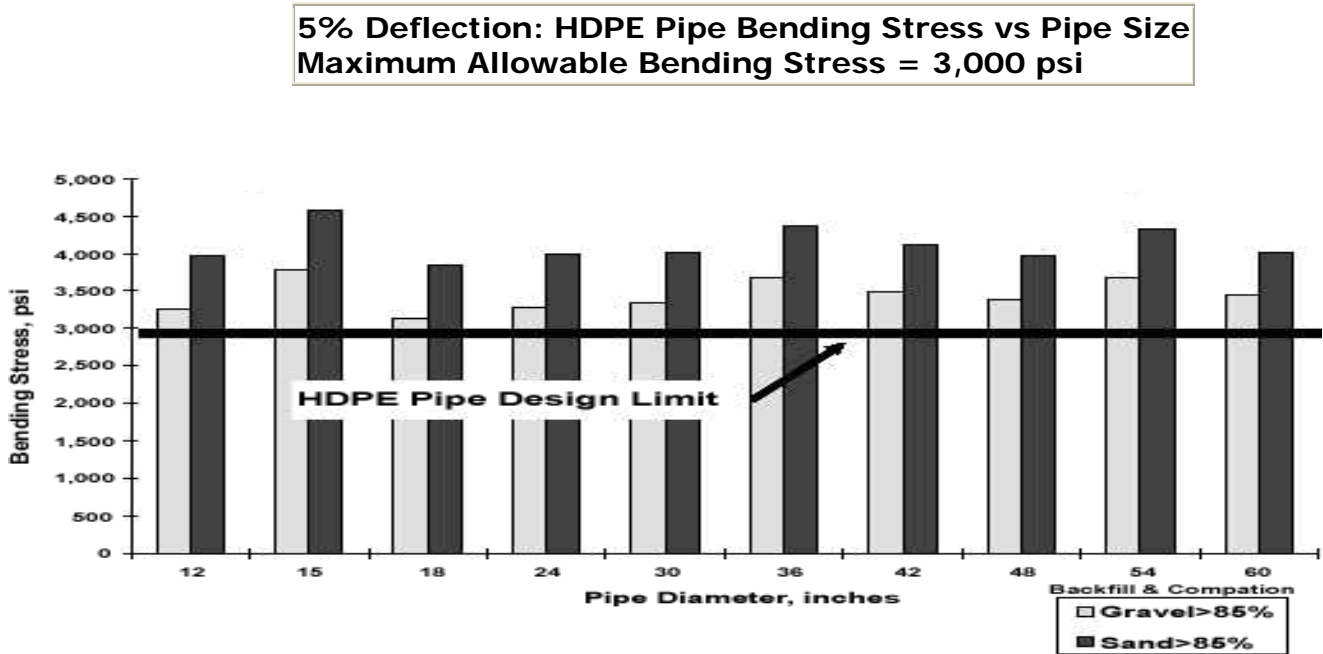
- Pipe Stiffness
- Soil Stiffness
- Contractor Methods
- Temperature
- Pipe Wall Thickness
- Groundwater
- Compaction Control
- Inspection



Deflection characteristics typically control HDPE design limitations and help to identify structural problems associated with other performance criteria, including bending stress in the pipe wall. It is often assumed that horizontal and vertical deflection are equal. However, when side forces limit the horizontal deflection, stresses in the pipe "corners" can become extreme.

Bending stress is so important that the Corrugated Polyethylene Pipe Association¹ (CPPA) and a leading HDPE manufacturer state that bending stress **SHOULD NOT EXCEED 3,000 psi**. The American Association of State Highway and Transportation Officials (AASHTO) also recognized this limit by requiring HDPE material to have a minimum strength of 3,000 psi (Section 18 and M 294-98). Bending Stress is directly related to pipe deflection. Every pipe size exceeds HDPE's bending stress limits of 3,000 psi (Figure 2) at deflection levels of 5% (1/3 less than the CPPA's suggested maximum allowable deflection of 7.5%).

Figure 2



Limit HDPE pipe deflection to 5% maximum - to prevent excessive bending stress!

Reference:

1. *Structural Design Method for Corrugated Polyethylene Pipe*, Corrugated Polyethylene Pipe Association, 1996