

Deflection Testing



American **Concrete Pipe** Association

Concrete pipe carries most of the soil and live load, therefore a structural test of the pipe is performed at the plant in a three-edge bearing test as per ASTM C497, confirming strength. A deflection test of concrete pipe is not applicable.



Plastic pipe relies primarily on the soil envelope that is built around the pipe in the field by the contractor. Deflection testing of the pipe is needed, after back fill is completed to confirm the structural integrity of the installation.



WHY DOES DEFLECTION MATTER?

POTENTIAL STRUCTURAL FAILURE

Excessive deflection can lead to inverse curvature, buckling, tearing, or severe tensile strain.



COMPROMISES PIPE JOINTS

Leads to infiltration or exfiltration and causes the loss of backfill materials leading to cracks in pavements, settlement or dips in the road, and sinkholes.



REDUCES HYDRAULIC CAPACITY

Corrugation growth will affect the flow characteristics of the pipe. Also, the flattening of the pipe crown and invert will decrease flow velocity which will result in debris build-up and could require frequent maintenance.



HOW DO YOU CHECK DEFLECTION?

Mandrel pull or manual measurements performed by Contractor and witnessed by the Engineer.

Laser profiler tests performed by a 3rd party inspection company and reviewed by the Engineer.

Note:

Deflection of plastic pipe is the decrease in vertical diameter of the pipe and expressed as:

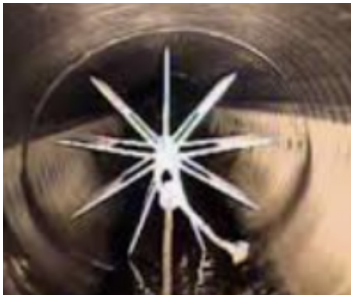

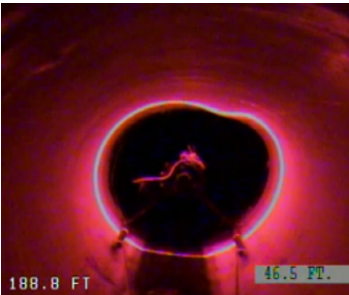

$$\text{percent deflection} = \frac{\text{change in diameter}}{\text{base inside diameter}^1} \times 100$$

¹ Base inside diameter is not the same between PVC, HDPE and PP pipe products.

Determining pipe deflection visually or with CCTV video is not possible (difficult to see deflections).

Proving rings are required to confirm proper shape of 9-point mandrel prior to testing pipe.

As per AASHTO Section 30: deflection less than 5% is acceptable, between 5 to 7.5% requires further engineer evaluation, and greater than 7.5% requires remediation or replacement of the pipe.

Plastic Pipe Size (inches)	Deflection Test Method		
12 to 48	Two options: <ul style="list-style-type: none"> • Mandrel (9-point) pull is a quick go-no-go check. • Laser profiler accurately provides location, measurement, and shape of pipe. 		
48 in. and larger	Manual measurements taken along the internal length of pipe.		
 <p data-bbox="147 1423 326 1451">9 Point Mandrel</p>	 <p data-bbox="475 1423 626 1451">Laser Profiler</p>	 <p data-bbox="875 1423 1094 1484">Laser Profile Image (14% deflected)</p>	 <p data-bbox="1252 1472 1500 1499">Manual Measurement</p>

WHEN SHOULD WE DO A DEFLECTION TEST?

No sooner than 30 days after back fill as per AASHTO Section 30.

Prior to final acceptance or end of the warranty period.

Regularly throughout the service life of the pipe as part of a maintenance or asset management program.

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