



## Deflection Testing of Gravity Sewer Pipe

Deflection testing is usually performed with a properly sized “go no-go” mandrel or sewer ball. For the purpose of deflection measurements the base inside pipe diameters without deflection are provided in the following table. The base inside diameter, or ID, is a pipe ID derived by subtracting a statistical tolerance package from the pipe’s average I.D. The tolerance package is defined as the square root of the sum of the squared standard manufacturing tolerances (OD, wall thickness, and out of roundness). The following table provides the base ID and mandrel sizes for deflections of 5% and 7.5% and for SDR35/PS46 and SDR26/PS115 pipe.

Nominal Size	Base ID	SDR35/PS46		Base ID	SDR26/PS115	
		5% Deflection Mandrel Size	7 1/2% Deflection Mandrel Size		5% Deflection Mandrel Size	7 1/2% Deflection Mandrel Size
4"	3.895	3.70	3.60	3.811	3.62	3.53
6"	5.742	5.45	5.31	5.612	5.33	5.19
8"	7.665	7.28	7.09	7.488	7.11	6.93
10"	9.563	9.08	8.85	9.342	8.87	8.64
12"	11.361	10.79	10.51	11.102	10.55	10.27
15"	13.898	13.20	12.86	13.575	12.90	12.56
18"	16.976	16.13	15.70	16.586	15.76	15.34
21"	20.004	19.00	18.50	19.545	18.57	18.08
24"	22.480	21.36	20.79	21.964	20.87	20.32
27"	25.327	24.06	23.43	24.744	23.51	22.89
30"	29.132	27.68	26.95	28.461	27.04	26.33
36"	34.869	33.13	32.25	34.120	32.41	31.56

The maximum recommended installed deflection is 7.5% at not less than 30 days following installation. That deflection includes a safety factor of four before any reverse curvature develops. It is important that the inside of the sewer line be cleaned thoroughly before deflection testing. Debris or sediment in the pipe can impede the passing of the mandrel and provide a false indication of excessive deflection.

PVC pipe is classified as a flexible conduit. It is because of this flexibility that PVC pipe can be installed at burial depths in excess of 50 feet. A flexible pipe will deflect when placed under a load. With Flexible conduit theory vertical deflection of the pipe allows that soil load to be transferred and supported by the strength of the supporting soil on each side of the pipe. As a result, the ability of PVC pipe to withstand soil load without exceeding maximum deflection limits is directly related to the quality of the installation and compaction of the embedment material around the pipe. (See Uni-Bell PVC pipe association publication UNI-TR-1 “Deflection: The Pipe /Soil Mechanism” for more information.)

Deflection testing is not an issue when using proper construction practices and inspection during pipe installation and when using embedment material which has been properly selected, placed, and compacted. Locations with excessive deflection should be repaired by re-bedding. As an alternate, technology exists that utilizes a vibrating “rerounder” that is pulled down the pipe to reshape the pipe and consolidate the soil around it. This process can save time and money in locations where excessive deflection is found.