

# PVC PIPE ASSOCIATION TECHNICAL BRIEF

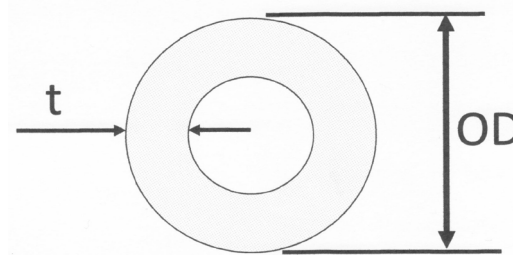
## DIMENSION RATIO (DR) EXPLAINED FOR PVC PIPE

Dimension ratio is an important but often misunderstood concept for PVC pipe. Some of the confusion arises because of the use of both “Dimension Ratio” (DR) and “Standard Dimension Ratio” (SDR) in product standards.

Mathematically, the concepts are simple:

1. For practical purposes,  $DR = SDR$ .
2.  $DR = SDR =$  the specified outside diameter of the pipe (OD) divided by the specified minimum wall thickness (t).

$$DR = SDR = OD/t$$



## WHAT IS STANDARD DIMENSION RATIO?

SDRs are a series of preferred numbers known as “Renard Numbers.” The series is a geometric progression where each SDR is approximately 25% higher than its predecessor. For PVC pipe, SDRs start at 13.5 and include 17, 21, 26, 32.5, 41, 51, and 64. Other ratios (such as 14, 18, 25, or 35) found in pipe standards are not SDRs, but merely DRs.

## WHY USE DIMENSION RATIO?

The use of DRs allows standardization of product dimensions to provide consistent mechanical properties independent of pipe size.

- **DR for PVC Pipe Designed for Internal Pressure**

For PVC pressure pipe, a product with a particular hydrostatic strength and DR will have the same Pressure Class (PC) or Pressure Rating (PR) no matter what the size. For example:

1. AWWA C900 – DR18 pipe has a PC of 235 psi for the 4-inch size through the 60-inch size.
2. ASTM D2241 – for a PVC material with an HDB of 4000 psi, SDR21 pipe has a PR of 200 psi throughout its size range.

The benefit of this system to designers is that upsizing or downsizing a pipe will not change its pressure capacity (potentially requiring a redesign). Contrast this with the ASTM D1785 standard, where each size of Schedule 40 pipe has a different PR.

- **DR for PVC Pipe Designed for External Loads**

For external loads, the concept is similar but the property that remains constant is Pipe Stiffness (PS). For example: ASTM D3034 Table 3 – SDR26 sewer pipe has a constant PS of 115 psi no matter the size. Again, the benefit here is consistency in design capacity regardless of size.

## ADDITIONAL CONSIDERATIONS FOR PVC PIPE AND DR

- A PVC pipe with a higher DR has a thinner wall. This means that as DR increases, the pipe will have less pressure capacity and lower pipe stiffness.
- By definition, DR is applicable only to solid-wall pipe and has no relevance for profile-wall products.

The bottom line: DR and SDR are identical.

References: ASTM standards D1785, D2241, and D3034; and AWWA standard C900