

# PVC VS. POLYPROPYLENE (PP) SEWER PIPE

## PVC: PROVEN PERFORMANCE MAKES IT THE RIGHT CHOICE

**PP Pipe Doesn't Measure Up:** The recent introduction of PP into the sanitary sewer market should be cause for concern to wastewater utilities. Unsupported claims about performance, lack of rigorous studies and testing, questions regarding joint integrity, reduced safety factor, limited selection of fittings for connections, all point to the need to exercise caution when considering PP alternatives over PVC pipe.

**Choose PVC Pipe:** Today's sewer utilities require piping products with a proven track record of performance. Supported by over 40 years of standards and testing, PVC pipe offers exceptional joint integrity, low maintenance, and a high safety factor, backed by stringent mandrel and low-pressure air tests. With a broad assortment of fittings for connections, which help avoid compromising system integrity through use of cut-in fittings, PVC pipe is available in a wide array of options suitable for the most difficult applications.

Property	ASTM D3034 & F679	ASTM F794	ASTM F949	ASTM F1803	ASTM F2736	ASTM F2764
Material	PVC	PVC	PVC	PVC	PP	PP
Year Approved	1972	1983	1985	1997	2010	2010
Tensile Min.	6000 psi	6000 psi	6000 psi	6000 psi	3500 psi	3500 psi
Modulus Min.	440,000 psi	440,000 psi	440,000 psi	440,000 psi	175,000 psi	175,000 psi
Pipe Stiffness Min. @ 23° C / 73° F	46	46	46	46	46	46
Pipe Stiffness @ 40° C / 104° F	40	40	40	40	Not Stated	Not Stated
Impact Resistance*	220 ft-lbf	220 ft-lbf	140 ft-lbf	220 ft-lbf	140 ft-lbf	140 ft-lbf
Air Test	N/A	Yes	No	Yes	No	No
Minimum Wall**	0.853	0.235	0.130	0.150	0.108	0.070
Manning "N"	0.009	0.009	0.009	0.009	0.012	0.012
Flattening	60%	40%	40%	40%	20%	40%
Recommend Max. Diameter Deflection	7.5%	7.5%	7.5%	7.5%	None Given	None Given
Deflection Before Buckling	30+%	30+%	3.43 x (OD/OD-ID)	Unspecified	Unspecified	Unspecified
Base ID	Specified	Unspecified	Specified	Unspecified	Unspecified	Unspecified
7.5% Mandrel	Specified	Unspecified	Specified	Unspecified	Unspecified	Unspecified
Fittings	Full Line; Multiple Sources	Full Line; Multiple Sources	Full Line; Multiple Sources	Full Line; Multiple Sources	Single-Source	Single-Source
Joints	Meet ASTM D3212	Meet ASTM D3212	Meet ASTM D3212	Meet ASTM D3212	Bells Require Stiffeners	Bells Require Stiffeners

\* Per pipe standard when tested using ASTM D2444 apparatus (10" & larger).

\*\* Minimum waterway wall (inner wall) thickness for the 30" trade size.

ASTM D3034-08: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

ASTM F679-08: Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

ASTM F794-03: Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

ASTM F949-10: Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

ASTM F1803-06: Standard Specification for Poly (Vinyl Chloride) (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter

ASTM F2736-10: Standard Specification for 6 to 30 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe

ASTM F2764-10: Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications

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## PVC: PROVEN PERFORMANCE MAKES IT THE RIGHT CHOICE

With more than one million miles in service, PVC pipe has been used for sanitary sewers for over 40 years, offering cost effectiveness and proven performance. Available in sizes up to 60 inches, it is used in over 85% of new installations. Specified in 87% of the 100 largest cities in North America, its design, quality control testing, ease of installation and maintenance make it the material of choice for sanitary sewers.

**PVC Pipe – Long-Term Performance You Can Trust:** Over four decades of unsurpassed reliability in sanitary sewer applications backed by PVC sewer pipe standards that include: ASTM D2729 (1968), ASTM D3034 (1972), ASTM F679 (1980), ASTM F794 (1983), and ASTM F949 (1985).

**Exceptional Joint Integrity & Abrasion Resistance:** PVC sewer pipe systems meet the most stringent joint tightness standard: 25 gallons/inch of diameter/mile/day as specified by Uni-Bell's *Handbook of PVC Pipe*. This reduces groundwater infiltration, conserving costly treatment plant capacity, decreases sewage exfiltration, protecting public health and the environment, and prevents root intrusion, lowering maintenance costs. PVC is extremely tough, and its abrasion resistance has been confirmed by numerous studies and years of service. Condition assessments, including video and laser profiling, have shown PVC sewer pipe remains sound after decades of service.

**Quality Assurance Through Stringent Acceptance Tests:** PVC sewer pipe systems conform to stringent design criteria. Quality acceptance tests for PVC pipe systems, including mandrel and low-pressure air acceptance testing (UNI-B-06, ASTM F1417), help ensure long-term performance. *Uni-Bell recommends these tests for all pipe materials.*

**Mandrel Testing – PVC Pipe Ensures a High Safety Factor:** The PVC pipe industry and ASTM have long recommended mandrels that allow no more than 7-1/2% deflection of the PVC pipe diameter – which provides an installation safety factor of 4:1. Several PVC sewer pipe standards, like ASTM D3034, ASTM F679, and ASTM F949, include test mandrel diameters. *Unlike PVC, pipes with lower deflection capacities such as profile-wall PP must specify lower deflection levels to ensure the same degree of safety.*

**Most Widely Used Air Test:** Low-pressure air testing should apply to all sanitary sewer line installations. Uni-Bell's *Recommended Practice for Air Acceptance Testing of Sewer Pipe, Standard UNI-B-06* has become the industry benchmark as a result of testing and research done since the 1950s. ASTM also provides material-specific standards for low-pressure air testing of sewer systems, including ASTM C828, ASTM C924, and ASTM F1417. While none measure up to UNI-B-06 for ensuring system tightness, ASTM F1417 is the most widely used of ASTM's low-pressure air testing standards. *PP, on the other hand, has a lower modulus and lower resistance to creep, so standard low-pressure air testing may not give adequate assurance of long-term joint tightness. Further study of PP is needed to validate its long-term joint integrity.*

**Proven Final Verification:** Utilities often specify minimum waiting periods of 30 days before performing final verification of newly installed PVC sewer pipes. This deflection-versus-time testing is a proven method of ensuring proper design and installation of PVC pipe systems – borne out by over 40 years of research and field experience. *Until comparable testing is completed for PP pipe, to confirm joint integrity and adherence to specified deflection limits, users should not assume that mandrel and low-pressure air tests provide the same assurance of installation quality as they do for PVC.*

**Maximize System Integrity with PVC Fittings:** Unlike PP systems, PVC sewer pipe comes with a wide assortment of fittings available from many manufacturers: elbows, tees, wyes, reducers, etc. Joints using PVC fittings meet the same high performance requirements, since pipe joints and systems can easily be designed without the need for fittings that require cutting holes into the pipe, ultimately compromising system integrity. *Maximum sanitary sewer system watertightness is achieved by avoiding cut-in fittings whenever possible.*

**PVC for Challenging Design Applications:** For difficult installations — where deep burial, poor soils, high water tables, and high drag-down forces due to settlement are factors — PVC pipe offers heavy-wall higher-stiffness pipe, as well as higher-stiffness and deep-socket fittings, which is not the case for PP.