

# Pipe Comparisons



## Prestressed Concrete Cylinder Pipe (PCCP) vs PVC Pipe

First used in the early 1940's, Prestressed Concrete Cylinder Pipe (PCCP) combines a water tight steel cylinder with structural concrete and high tensile steel wire to produce a high-performance pipe suitable for a wide range of water conveyance applications, such as transmission mains, force mains, reclaimed water, industrial, intake and discharge pipelines. PCCP is used in buried applications, as well as above ground and subaqueous lines. It's cement-rich mortar coating electrochemically protects the steel components from corrosion. Being a rigid pipe, PCCP has a high load carrying capability and can generally be installed without special bedding or backfill procedures.

This document is a comparison between PCCP and PVC pipe utilizing information available from industry standards and resources. It is intended to differentiate key performance attributes of the materials to assist specifiers in product selection for water and wastewater pipelines.



ITEM	Prestressed Concrete Cylinder Pipe (PCCP)	PVC Pipe
Pipe Standards	<ul style="list-style-type: none"> <li>• AWWA C301 – Prestressed Concrete Pressure Pipe, Steel Cylinder Type</li> <li>• AWWA C304 – Design of Prestressed Concrete Cylinder Pipe</li> <li>• AWWA M9 – Concrete Pressure Pipe</li> </ul>	<ul style="list-style-type: none"> <li>• AWWA C900</li> <li>• AWWA M23 manual</li> <li>• AWWA C905-10 is now obsolete</li> </ul>
Service Life	<ul style="list-style-type: none"> <li>• Estimated service life of 75 to 105 years.<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Estimated service life of 55-100 years.<sup>1</sup></li> </ul>
Pressure and Diameter Ranges	<ul style="list-style-type: none"> <li>• Typical diameters range from 16" (400mm) through 144" (3600mm) but 156" (3900mm) has been produced.</li> <li>• Prestressed concrete cylinder pipe has been designed for operating pressures greater than 400 psi.<sup>2</sup></li> </ul>	<p>Maximum pressures by diameter:</p> <ul style="list-style-type: none"> <li>• Up to 30" (750mm) – 235-psi</li> <li>• 36" (900mm) – 200-psi</li> <li>• 42" and 48" (1050mm and 1200mm) – 165-psi</li> <li>• 54" and 60" (1350mm and 1500mm) – 50-psi</li> </ul>
Pipe Strength/Stiffness	<ul style="list-style-type: none"> <li>• Designed as a rigid pipe which allows the use native material for embedment providing significant installation savings.</li> </ul>	<ul style="list-style-type: none"> <li>• Flexible pipe design with pipe deflections limitations.</li> <li>• Pipe stiffness declines as dimension ratio (DR) increases</li> </ul>
Restrained Joints	<ul style="list-style-type: none"> <li>• Mechanical restraint options utilizing Snap-Ring, Holdfast and Harness Clamp Restraints for all pressure and diameter ranges.</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanical restraint options provided by third party.</li> <li>• Pressure and diameter range limitation based on type of restraint.</li> </ul>
Corrosion Performance	<ul style="list-style-type: none"> <li>• Integrated cement mortar coating and concrete lining provides protection for pipe and fittings.</li> <li>• Supplemental corrosion protection available for adverse environments.</li> </ul>	<ul style="list-style-type: none"> <li>• Ductile Iron Pipe fittings and pipe restraints require additional protection from corrosion.</li> </ul>
Bedding and Backfill Requirements	<ul style="list-style-type: none"> <li>• Rigid pipe with no limitation on burial depth.</li> <li>• Pipe is designed to handle burial depth.</li> <li>• Minimal bedding is required, and native soils can be used as bedding material.</li> </ul>	<ul style="list-style-type: none"> <li>• More oversight of bedding material required</li> <li>• Significantly more backfill, compaction and oversight required.</li> <li>• Installation recommendations conflict with OSHA trench box requirements.<sup>3</sup></li> </ul>
Negative Pressures	<ul style="list-style-type: none"> <li>• No special design considerations required for full vacuum or external pressure.</li> </ul>	<ul style="list-style-type: none"> <li>• Susceptible to collapsing and joint performance issues from surge waves and partial vacuum.</li> </ul>
Buoyancy	<ul style="list-style-type: none"> <li>• More suitable for saturated ground conditions due to inherent weight of pipe.</li> </ul>	<ul style="list-style-type: none"> <li>• Susceptible to floatation in saturated ground conditions.</li> </ul>
Pressure Tapping	<ul style="list-style-type: none"> <li>• Procedure has more predictable behavior.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential risk of pipe failure during the tapping process.</li> </ul>

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Product Support	<ul style="list-style-type: none"><li>• Pipe supplied direct from manufacturer along with OEM engineering and field service support.</li></ul>	<ul style="list-style-type: none"><li>• Pipe typically supplied through distribution chain with limited engineering and field service support.</li></ul>
Special Circumstances	<ul style="list-style-type: none"><li>• Pipes capable of being installed on piers.</li><li>• Heat/flame resistant.</li></ul>	<ul style="list-style-type: none"><li>• Cannot be installed on piers.</li><li>• Not flame resistant</li><li>• Pressure derating at 75° F</li></ul>
Fittings	<ul style="list-style-type: none"><li>• Custom fittings configuration and geometry to match customer needs.</li><li>• Adaptability to all pipe types.</li><li>• Produced domestically by pipe manufacturers.</li></ul>	<ul style="list-style-type: none"><li>• Uses Ductile Iron Pipe fittings with external corrosion protection.</li><li>• Typically imported.</li><li>• Limited configuration options</li><li>• Long lead times.</li><li>• Availability of larger diameter fittings is limited.</li></ul>
Pipe Design	<ul style="list-style-type: none"><li>• Manufacturers provide project specific lay schedule, pipe design and engineered shop drawings.</li><li>• Project design consultant verifies manufacturers design.</li></ul>	<ul style="list-style-type: none"><li>• Manufacturers do not provide project specific lay schedule, pipe design or shop drawings.</li></ul>
Impact Resistant	<ul style="list-style-type: none"><li>• High impact strength.</li></ul>	<ul style="list-style-type: none"><li>• Low impact strength.</li></ul>

### REFERENCES

1 AMERICAN WATER WORKS ASSOCIATION (AWWA) (2015). "BURIED NO LONGER: CONFRONTING AMERICA'S WATER INFRASTRUCTURE CHALLENGE."

2 CONCRETE PRESSURE PIPE AWWA MANUAL M9 – 3RD EDITION, AMERICAN WATER WORKS ASSOCIATION.

3 "TRENCHING SAFETY CAN COMPROMISE PLASTIC PIPE PERFORMANCE." CCPPA, 25 FEB. 2021, [HTTPS://CCPPA.CA/TRENCHING-SAFETY-PLASTIC-PIPE-PERFORMANCE/](https://ccppa.ca/trenching-safety-plastic-pipe-performance/).



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