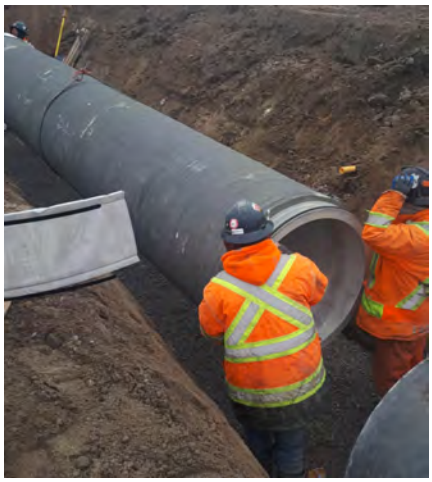
PCCP vs PVC Pipe Comparison

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 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	PCCP	PVC
Pipe Standards	• AWWA C301 - Prestressed Concrete Pressure Pipe, Steel- Cylinder Type • AWWA C304 - Design of Prestressed Concrete Cylinder Pipe • AWWA M9 – Concrete Pressure Pipe	• AWWA C900 • AWWA M23 manual • AWWA C905-10 is now obsolete
Pressures and Diameter Range	Typical diameters range from 16" through 144", but 156" has been produced. [1] Prestressed concrete cylinder pipe has been designed for operating pressures greater than 400 psi.	Maximum pressures by diameter: • Up to 30" (750mm) – 235-psi • 36" (900mm) – 200-psi • 42" and 48" (1050mm and 1200mm) – 165-psi • 54" and 60" (1350mm and 1500mm) – 50-psi
Negative Pressures	No special design considerations required for full vacuum or external pressure.	Susceptible to collapsing and joint performance issues from surge waves and partial vacuum.
Pipe Design	• Manufacturers provide project specific lay schedule, pipe design and engineered shop drawings. • Project design consultant verifies manufacturers design.	• Manufacturers do not provide project specific lay schedule, pipe design or shop drawings.
Pipe Strength/Stiffness	Designed as a rigid pipe which allows the use native material for embedment providing significant installation savings.	• Flexible pipe design with pipe deflections limitations. • Pipe stiffness declines as dimension ratio (DR) increases
Pressure Tapping	Procedure has more predictable behavior	Potential risk of pipe failure during the tapping process
Fittings	• Custom fittings configuration and geometry to match customer needs. • Adaptability to all pipe types • Produced domestically by pipe manufacturers.	• Uses Ductile Iron Pipe fittings with external corrosion protection. • Typically Imported • Limited configuration options • Long lead times • Availability of larger diameter fittings is limited
Bedding and Backfill Requirements	Rigid pipe with no limitation on burial depth. Pipe is designed to handle burial depth. Minimal bedding is required, and native soils can be used as bedding material.	• More oversight of bedding material required • Significantly more backfill, compaction and oversight required. • Installation recommendations conflict with OSHA trench box requirements [5]
Restrained Joints	Mechanical restraint options utilizing Snap-Ring, Holdfast and Harness Clamp Restraints for pressure and diameter ranges.	• Mechanical restraint options provided by third party . • Pressure and Diameter range limitation based on type of restraint.

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Corrosion Performance	Integrated cement coating and lining provides protection for pipe and fittings. Supplemental corrosion protection available for adverse environments.	Ductile Iron Pipe fittings and pipe restraints require protection from corrosion.
Buoyancy	More suitable for saturated ground conditions due to inherent weight of pipe.	Susceptible to floatation in saturated ground conditions.
Service Life	[6] Estimated service life of 75 to 105 years	[4] Estimated service life of 55 to 100 years
Product Support	Pipe supplied direct from manufacturer along with OEM engineering and field service support.	Pipe typically supplied through distribution chain with limited engineering and field service support.
Special Circumstances	• Pipes capable of being installed on piers • Heat/flame resistant	• Installation on piers not viable. • Not flame resistant • Pressure derating at 75° F
Impact Resistance	High impact strength	Low impact strength

REFERENCES

[1] Concrete Pressure Pipe AWWA MANUAL M9 – 3rd Edition, American Water Works Association.

[2] Steel Pipe - A Guide for Design and Installation AWWA MANUAL M11 – 5th Edition, American Water Works Association.

[3] AWWA C200, Steel Water Pipe, 6 In. (150 mm) and Larger - Latest Edition, American Water Works Association.

[4] American Water Works Association (AWWA) (2015). “Buried No Longer: Confronting America’s Water Infrastructure Challenge.”

[5] "Trenching Safety Can Compromise Plastic Pipe Performance.” CCPPA, 25 Feb. 2021, https://ccppa.ca/trenching-safety-plastic-pipe-performance/.

[6] American Water Works Association (AWWA) (2015). “Buried No Longer: Confronting America’s Water Infrastructure Challenge.”

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