

Pipe Comparisons

Concrete Bar Wrapped Steel Cylinder Pipe (BWP) vs HDPE Pipe

First used in the early 1940's, Concrete Bar-Wrapped Steel Cylinder Pipe Type, commonly called Bar-Wrapped Pipe (BWP), combines a water-tight steel cylinder and helically wrapped reinforcing bar, with concrete or mortar lining and coating to produce a high-performance pipe suitable for a wide range of water conveyance applications, such as transmission mains, reclaimed water, industrial, intake and discharge pipelines. It's cement-rich mortar coating electrochemically protects the steel components from corrosion.

This document is a comparison between BWP and ductile iron 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	Concrete Bar Wrapped Steel Cylinder Pipe (BWP)	HDPE Pipe
Pipe Standards	<ul style="list-style-type: none"> • AWWA C303 – Concrete Pressure Pipe, Bar Wrapped Steel- Cylinder Type • AWWA M9 – Concrete Pressure Pipe 	<ul style="list-style-type: none"> • AWWA C906 – Polyethylene Pressure Pipe and fittings 4"-65" for Waterworks. • AWWA M55 – PE Design and Installation.
Service Life	<ul style="list-style-type: none"> • Estimated service life of 75 to 105 years.¹ 	<ul style="list-style-type: none"> • Estimated service life of 50-100 years.²
Pressure and Diameter Ranges	<ul style="list-style-type: none"> • Typical diameters range from 10" (250mm) through 72" (1800mm) although larger diameters may be available. • Bar Wrapped Cylinder Pipe has been designed for operating pressures greater than 400 psi.³ • Actual inside diameter is consistent with nominal diameter. 	<p>Maximum pressure class (PC) vary by diameter</p> <ul style="list-style-type: none"> • DR21 = 14" (350mm) to 60" (1500mm) = 100psi • DR17 = 14" (350mm) to 60" (1500mm) = 125psi • DR13.5 = 14" (350mm) to 48" (1200mm) = 160psi • DR11 = 14" (350mm) to 36" (850mm) = 200psi • DR9 = 14" (350mm) to 30" (750mm) = 250psi • DR7 = 14" (350mm) to 24" (600mm) = 335psi <ul style="list-style-type: none"> • Actual internal diameters significantly smaller than nominal pipe diameters. Larger pipe diameter may be required. <p>• DR = Dimension ratio</p>
Pipe Strength/Stiffness	<ul style="list-style-type: none"> • The pipe stiffness range for 36" (900mm) is from 540 psi to over 1500 psi. 	<ul style="list-style-type: none"> • The maximum pipe stiffness for 36" (900mm) ranges from 23 psi (DR26-80 psi pressure rating) to 357 psi (DR11- 200 psi pressure rating).
Restrained Joints	<ul style="list-style-type: none"> • Mechanical restraint options utilizing Snap-Ring, Holdfast and/or Harness Clamp restraints for most pressures and diameters. • Welded joints available for all pressures and diameters. 	<ul style="list-style-type: none"> • Fused joints require extra time for the fusion welding process. Long sections of open trench for extended periods of time are needed for installation. • Specialized equipment required for fused joints. • Expansion and contraction of pipe prior to and during installation must be considered.
Contaminated Soils (Hydrocarbons)	<ul style="list-style-type: none"> • Product is not permeable. • Only gasketed sections of pipeline need to be addressed for performance. 	<ul style="list-style-type: none"> • Product is permeable to gasoline contaminated soils.⁴ • Not suitable for potable water applications in the presence of hydrocarbons.⁴
Bedding and Backfill Requirements	<ul style="list-style-type: none"> • Minimal bedding is required, and native soils can be used as bedding material. 	<ul style="list-style-type: none"> • More oversight of bedding material required. • Significantly more backfill, compaction and oversight required.

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Negative Pressures	<ul style="list-style-type: none">No special design considerations required for full vacuum or external pressure.	<ul style="list-style-type: none">Susceptible to collapsing from any vacuum.
Buoyancy	<ul style="list-style-type: none">More suitable for saturated ground conditions due to inherent weight of pipe.	<ul style="list-style-type: none">Susceptible to floatation in saturated ground conditions.
Pressure Tapping	<ul style="list-style-type: none">Procedure has more predictable behavior.	<ul style="list-style-type: none">Flexibility of pipe requires significant care when tapping.
Product Support	<ul style="list-style-type: none">Pipe supplied direct from manufacturer along with OEM engineering and field service support.	<ul style="list-style-type: none">Pipe typically supplied through distribution chain with limited engineering and field service support
Special Circumstances	<ul style="list-style-type: none">Heat/flame resistant.Hydrocarbon resistant gaskets available (Nitrile).	<ul style="list-style-type: none">Not flame resistant, susceptible to damage from flames/excess heat.Pressure derating at 80°F.
Thermal Coefficient of Expansion	<ul style="list-style-type: none">4.1 to 7.3 x 10⁻⁶ in/in /°F or 7.4 to 13 x 10⁻⁶ m/m/°C (values for Portland Cement Concrete).Longitudinal contraction is not a major concern.	<ul style="list-style-type: none">9 x 10⁻⁵ in/in/°F⁵Thermal expansion is 1 inch per 100 F for 100 feet of pipe.Longitudinal contraction needs to be carefully considered for flanged connections⁵

REFERENCES

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

2 "KEY FACTORS THAT INFLUENCE THE SERVICE LIFE PE PIPE: PEAK PIPES." PEAK PIPES | MANUFACTURERS OF POLYETHYLENE PIPE, 1 SEPT. 2021, <https://www.peakpipesystems.com/key-factors-that-influence-the-service-life-pe-pipe/#:~:text=TYPICALLY%20POLYETHYLENE%20PIPE%20CAN%20LAST,DESIGNED%2C%20MAINTAINED%20AND%20INSTALLED%20CORRECTLY>. ACCESSED SEPT-01-2022

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

4 AMERICAN WATER WORKS ASSOCIATION RESEARCH FOUNDATION (AWWARF) (2007). "IMPACT OF HYDROCARBONS ON PVC/PE PIPES AND PIPE GASKETS" (ONG, ET AL).

5 PLASTIC PIPE INSTITUTE (PPI) <https://www.plasticpipe.org/common/uploaded%20files/technical/TN-27.pdf> - ACCESSED JUNE-02-2022



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