PWPipe®

PVC C900 High Pressure Water Pipe

PWPipe
Waterworks Products

Tough, Reliable and Perfect for Municipal Water Systems

www.pwpipe.com

Why more specifiers choose PWPipe C900 for potable water systems.

PWPipe is the largest producer of PVC pipe in western North America and our products are available from distributors throughout this geographic region. Our water works products are distributed primarily in the states West of the Rockies.

PWPipe products include PVC and polyethylene pipe and tubing for a variety of applications servicing the potable water, well casing, sewer, turf, agriculture, plumbing, communications, and electrical markets. Our manufacturing facilities in Oregon, Washington, California, Utah, and Nebraska assure on-time delivery.

PWPipe C900 high pressure water pipe combines superior materials with the latest manufacturing technology.

PWPipe products meet or exceed industry standards because of our rigorous quality-control program.

PWPipe supports the PVC pipe industry's efforts to maintain the highest design and manufacturing standards. We are members of the Uni-Bell PVC Pipe Association and American Water Works Association (AWWA).

Corrosion Resistance
C900 is immune to nearly all types of internal and external corrosion. Since PVC is a non-conductor, it is not affected by electrolysis. Nor is it susceptible to alkaline or acid soil conditions. A correctly installed PWPipe system will provide long-term service at reduced operating costs.

Water Quality
Extractant water purity tests performed by independent test laboratories ensure that our pipe meets the requirements for water purity as specified by ANSI/NSF Standard 61.

Superior Flow Characteristics
An extremely smooth inner surface gives C900 a Hazen-Williams flow coefficient of C=150. This means less burden on pumps and reduced pumping costs, because there's less friction between moving water and pipe walls.

Exceptional Strength and Durability
Every piece of C900 is hydrostatically proof tested at four times its pressure class.

A 2.5-to-1 safety factor is applied to the long-term pressure capacity of the pipe. The resulting value is further reduced by a surge pressure value, which also incorporates a 2.5-to-1 safety factor. Burst test pressure capability of C900 Class 150 is at least 755 psi, with sustained pressure test capability of 500 psi.

Throughout the country, in all conditions and climates, C900 has served admirably in municipal water mains, fire lines, and sewage force mains.

Joint Integrity
PWPipe's integral bell gasketed joint meets the same strength requirements of the C900 pipe, as well as the demanding test criteria of ASTM D 3139. The ability of PVC to bend without breaking allows the joint and pipe assembly to compensate for minor earth movement, which can cause problems in more rigid, non-PVC assemblies.

Certification
C900 is periodically tested to maintain listings from Factory Mutual System* (FM) and Underwriters Laboratories (UL). C900 also conforms to applicable requirements of the Uniform Plumbing Code™.

*Factory Mutual is not applicable to Class 100, DR 25 products.

Uni-Bell PVC Pipe Association MEMBER

American Water Works Association MEMBER

FM

UL LISTED

ASTM

1. Clean all debris from the bell end of the pipe. Check the gasket position. Be sure it's completely seated in the groove, with no raised areas.

2. Lubricate the spigot end, using only the PWPipe recommended lubricant supplied with the pipe.

3. Place the pipes in straight alignment. Assemble to the insertion line on the spigot—**but no farther**.

See the PWPipe installation guide for more detailed instructions.

Basic Assembly Instructions


1.


2.


3.

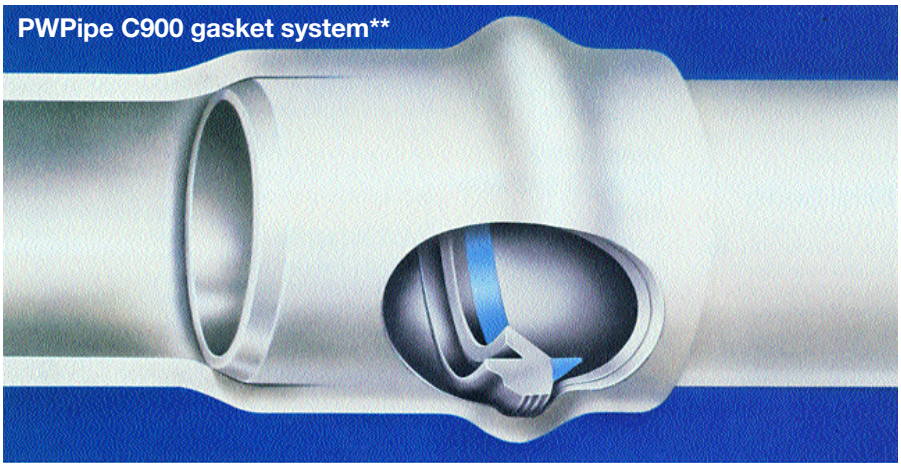
Factors Affecting Design

Hydraulics

C900's pipe wall is extremely smooth and energy-efficient. It has a Hazen-Williams coefficient of C=150.

Pressure Class

PWPipe offers a choice of three pressure classes (100, 150, and 200) which can be used where operating pressures do not exceed the pressure class plus surge allowances. When you have questions or encounter unusual circumstances, call a PWPipe representative.



Temperature

For operation at temperatures 80˚F or higher, multiply the pressure class by these derating factors:

Temperature	Derating Factor
80˚	0.88
90˚	0.75
100˚	0.62
110˚	0.50
120˚	0.40
140˚	0.22

Class 100 DR 25

Nominal Pipe Size (inches)	Average Outside Diameter (inches)	Approximate* Inside Diameter (inches)	Minimum Wall Thickness (inches)	Approximate Weight (lbs/100 ft)	Approximate Crate Weight (lbs)
4	4.80	4.39	0.192	190	1800
6	6.90	6.31	0.276	390	1400
8	9.05	8.28	0.362	670	2010
10	11.10	10.15	0.444	1020	1630
12	13.20	12.08	0.528	1440	1720/2300

Class 150 DR 18

Nominal Pipe Size (inches)	Average Outside Diameter (inches)	Approximate* Inside Diameter (inches)	Minimum Wall Thickness (inches)	Approximate Weight (lbs/100 ft)	Approximate Crate Weight (lbs)
4	4.80	4.23	0.267	260	2470
6	6.90	6.08	0.383	530	1920
8	9.05	7.98	0.503	920	2760
10	11.10	9.78	0.617	1390	2230
12	13.20	11.64	0.733	1970	2360/3150

Class 200 DR 14

Nominal Pipe Size (inches)	Average Outside Diameter (inches)	Approximate* Inside Diameter (inches)	Minimum Wall Thickness (inches)	Approximate Weight (lbs/100 ft)	Approximate Crate Weight (lbs)
4	4.80	4.07	0.343	330	3120
6	6.90	5.85	0.493	680	2430
8	9.05	7.67	0.646	1160	3490
10	11.10	9.41	0.793	1770	2830
12	13.20	11.19	0.943	2500	3000/4000

*These figures allow for manufacturing tolerances. **Gasket shown is for reference purposes only.

Product Description

Standard Specifications

Material
PVC compound meets ASTM D 1784, cell class 12454.

Pipe
Meets AWWA C900. Class 100 meets requirements of DR 25. Class 150 meets requirements of DR 18. Class 200 meets requirements of DR 14.

Elastromeric Seal
Integral bell pipe provided with factory-installed gaskets meeting requirements of ASTM F 477.

Gasketed Joint Assembly
Meets requirements of ASTM D 3139.

Installation
AWWA C605 and PWPipe's Installation Guide for PVC Water Pipe.

Product

C900 is suitable for use as a pressure conduit. Expansion and contraction are accommodated by a properly assembled gasketed joint. Each bell section meets the same pressure capacity requirements as the pipe.

Standard laying lengths are 20 feet (plus or minus 1 inch).

Quality Assurance

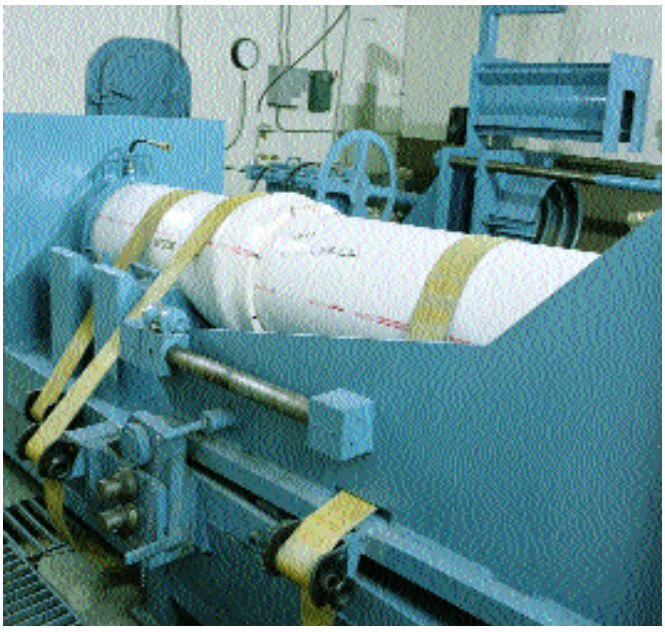
Hydrostatic Proof Testing
Each standard and random length of C900 is tested to four times the pressure class of the pipe, for a minimum of five seconds. The integral bell is tested with the pipe.

Falling Weight Impact Test
At 73°F, C900 withstands an impact energy of 150 ft-lbs, when tested in accordance with ASTM D 2444.

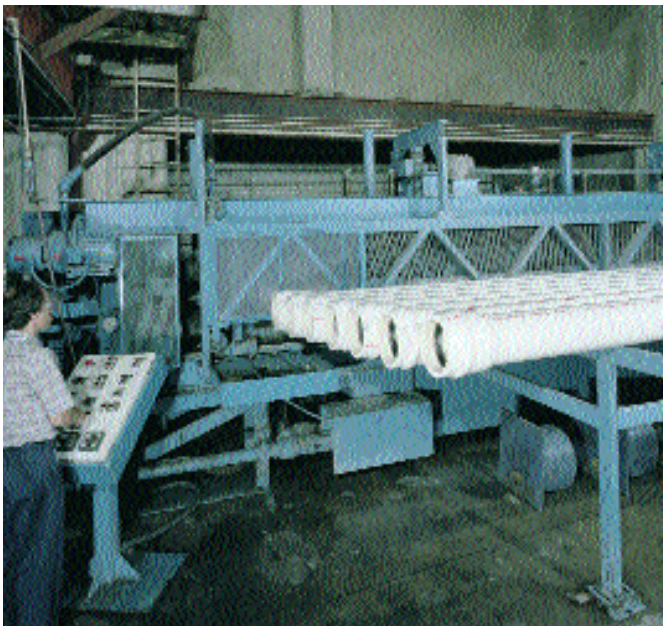
Quick Burst Test
Randomly selected C900 samples are tested in accordance with ASTM D 1599 to withstand pressures listed below. Class 100 has a minimum burst pressure of 535 psi; Class 150, a minimum burst pressure of 755 psi; Class 200, a minimum burst pressure of 985 psi.

Pipe Stiffness
C900 meets these minimum stiffness requirements:

Pressure Class	DR	Pipe Stiffness (psi)
100	25	129
150	18	364
200	14	814



JOINT INTEGRITY



HYDROSTATIC PROOF TEST

Installation

Pipe Embedment

All PVC pipe should be installed with bedding that provides uniform longitudinal support under the pipe. Use embedment material that is free of large stones, frozen matter, or other debris. Use proper compaction procedures to provide soil densities as specified by the design engineer.

Service Connections

Direct Tapping: Direct taps may be made in C900 Class 150 and Class 200 in nominal sizes 6 inch through 12 inch. Corporation stops should be in sizes ⅝, ¾, or 1 inch. When sizes larger than 1 inch are required, tapping saddles or sleeves should be used.

Saddle Tapping: Saddle taps may be made in any size or class of C900 pipe. Maximum outlet size recommended for saddle taps is 2 inches. For sizes larger than 2 inches, a tapping sleeve should be used.

Tapping Sleeves: Tapping sleeves may be used on all sizes and classes of C900. Sleeves are available up to size-on-size.

Caution: Saddles and sleeves should **not**:

- Distort the pipe when tightened
- Have lugs that dig into the pipe when the bolts are tightened
- Have a clamping arrangement not fully contoured to the outside diameter of the pipe

For more information on tapping, see Uni-Bell's tapping video and publications Uni-B-8 and Uni-Pub-8.

Table 1. Thrust Developed per 100 psi Pressure
AWWA C900 PVC Pressure Pipe (C.I.O.D.)

Nominal Pipe Size (inches)	Fitting 90° Elbow (lbs force)	Fitting 45° Elbow (lbs force)	Valves, Tees, Dead Ends (lbs force)
4	2,160	1,180	1,530
6	4,460	2,420	3,160
8	7,700	4,160	5,440
10	11,600	6,260	8,190
12	16,400	8,880	11,600

Table 2. Estimated Soil Bearing Capacity

Soil Type	Allowable Bearing Pressure (psf)
Muck, Peat, Etc.	0
Soft Clay	500
Sand	1,000
Sand and Gravel	1,500
Sand and Gravel With Clay	2,000
Sand and Gravel Cemented With Clay	4,000
Hard Pan	5,000

Note: Values are estimated for horizontal thrusts at depths of burial which exceed 2 feet.

Note: These values should be used only for estimating purposes. Values for design should be determined by an engineer familiar with site soil conditions.

Longitudinal Bending

Axial deflection at the pipe joints is not recommended, However, it is possible to curve C900 to allow for slight changes in direction.

Bending to these minimum radii will not jeopardize C900's design capability. See PWPipe's Technical Bulletin "Longitudinal Bending of PVC Pipe" for more details.

Nominal Pipe Size (inches)	Minimum Bending Radius (feet)
4	100
6	145
8	190
10	235
12	275

Thrust Restraint

Adequate thrust restraint is necessary for all gasketed joint systems. The “push on” features of our joints provide many installation advantages, but without adequate thrust restraint they can become “push off” problems. The large thrust forces present in water-distribution systems (see Table 1) require thrust restraints designed to handle test and peak operating pressures.

Concrete Thrust Blocks
If concrete thrust blocks are used, the size and type of thrust blocking must be based on the load-bearing capacity of the soil, pressure in the pipe, and diameter of the pipe. Table 2 provides conservative estimates of load-bearing values for various soil types. When soil conditions are not known, samples should be tested to determine soil properties.

Mechanical Restraints
If mechanical thrust restraint devices are used, they should be a type designed for use with PVC pipe. The devices should meet the test requirements of Uni-Bell’s Specification Uni-B-13 “Joint Restraint Devices for Use with PVC Pipe.” Design manuals and computer software are available from the restraint manufacturers.

For typical thrust blocking and mechanical thrust restraint examples, see Figures 1 through 6.

THRUST BLOCKS

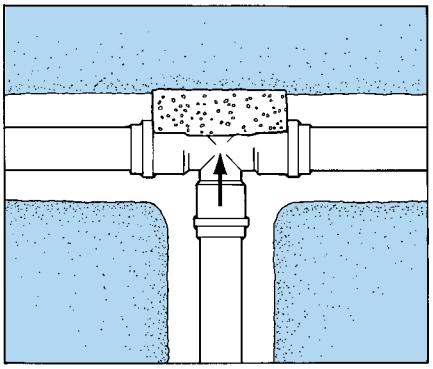


FIGURE 1: Through line connection, tee

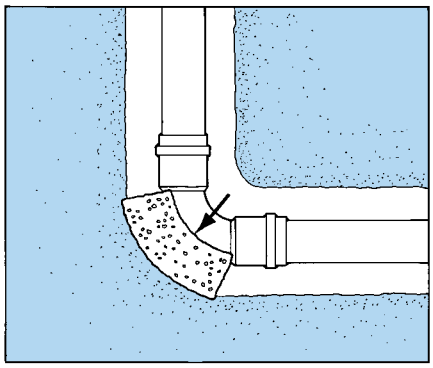


FIGURE 2: Direction change, elbow

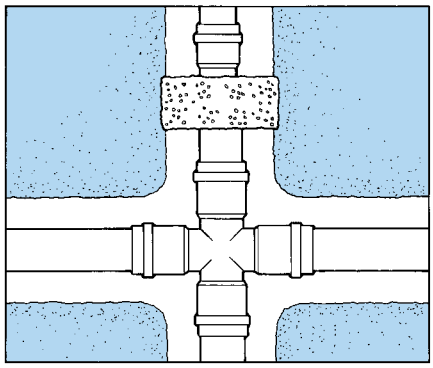


FIGURE 3: Change line size, reducer

MECHANICAL THRUST RESTRAINT DEVICES

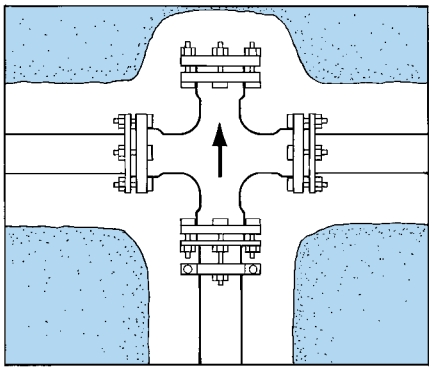


FIGURE 4: Through line connection, cross used as tee

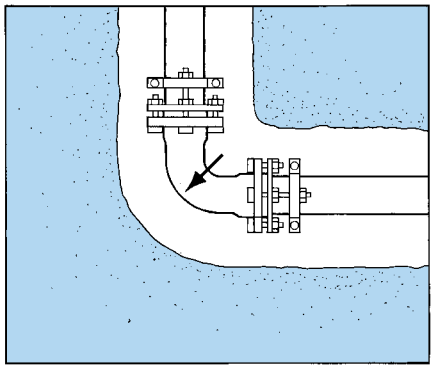


FIGURE 5: Direction change, elbow

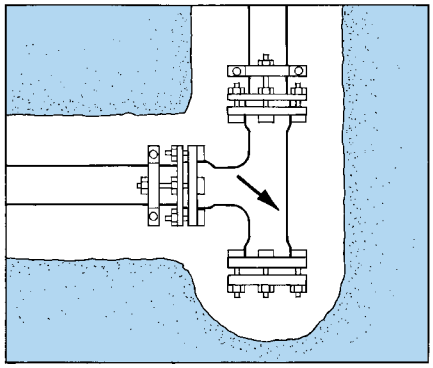


FIGURE 6: Direction change, tee used as elbow

Testing of Installed Systems

Place sufficient backfill before pipe filling and field testing. Under conditions requiring immediate backfilling of trenches, test after backfilling but prior to placement of permanent surface. Testing short lengths of pipe first will verify proper installation and joint assembly. If concrete thrust blocks are required, allow sufficient curing before testing.

Separate tests for pressure and leakage may be performed. If separate tests are done, the pressure test should be done first. See Table 4.

Procedure

While the line is under pressure, check for leaks in all exposed pipe, fittings, valves, and hydrants. Repair or replace all defective elements. Repeat the test until all visible leaks stop and the allowable leakage requirements are met, per Table 5. For detailed pressure-testing requirements, consult your engineer or the PWPipe installation guide.

WARNING: Do not use PVC pipe for pressurized air systems. Injury or death may result due to the catastrophic nature of pipe failure should failure occur. Rapid expansion of compressed air could propel shards of plastic throughout the area.

WARNING: Expel all air from the pipeline during filling and again before testing for pressure or leaks. Automatic air-release valves are recommended. Compressed entrapped air can greatly amplify surges or pumping pressures. Also, compressed air might leak through a joint that will not leak water.

Table 3. Volume of Water Required for Testing

Nominal Pipe Size (inches)	Volume (U.S. gal/100 ft)
4	70
6	153
8	259
10	405
12	573

Table 4. System Test Methods

Procedure	Pressure	Test Duration
Simultaneous pressure and leakage tests	150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation*	2 hr
Separate pressure test	150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation*	1 hr
Separate leakage test	150% of working pressure of segment tested*	2 hr

Source: Underground Installation of PVC Pressure Pipe and Fittings for Water, AWWA C605.

*Under no circumstances should test pressures exceed 305 psi for DR 14, 235 psi for DR 18, and 165 psi for DR 25 C900 PVC pipe.

Table 5. Allowable Leakage per 50 Joints
U.S. Gallons per Hour

Nominal Pipe Size (inches)	Average Test Pressure (psi) 50	100	150	200	250	300
4	0.19	0.27	0.33	0.38	0.43	0.47
6	0.29	0.41	0.50	0.57	0.64	0.70
8	0.38	0.54	0.66	0.76	0.85	0.94
10	0.48	0.68	0.83	0.96	1.07	1.17
12	0.57	0.81	0.99	1.15	1.28	1.40

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