PVCO Pipe “Future-Proofing” Water Pipelines

JM Eagle

Manufacturing PVCO

- Concept developed in the 1970's
- PVCO retains many of the same features as PVC, including resistance to corrosion and ease of installation
- Designed to be lighter, have better impact resistance, and increased tensile strength when compared to standard PVC

Manufacturing PVCO

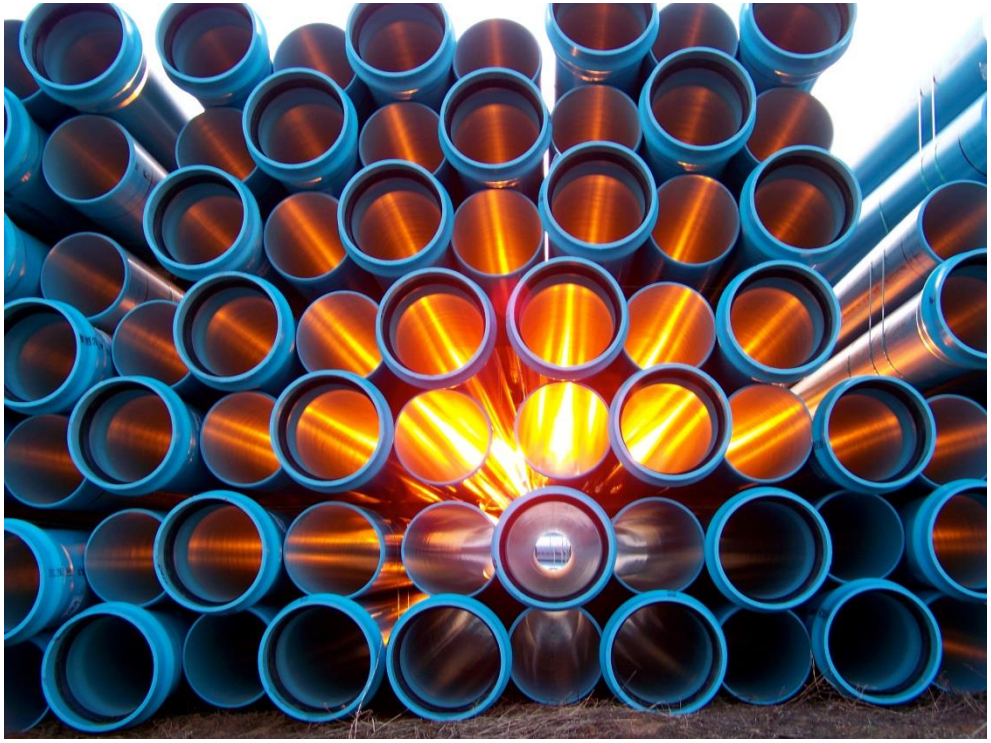
- Continuous Process
  - PVC “Stock” pipe is extruded at about half the outside diameter and twice the thickness of the finished PVCO pipe.
  - Under controlled conditions during the extrusion process, the starting stock pipe is pulled over a mandrel, doubling the pipe’s diameter.
  - The expansion process stretches the pipe in both the radial and longitudinal directions, reorienting the molecules to become biaxially oriented PVCO.

Benefits of PVCO

- 75%+ reduction in weight compared to ductile iron pipe (12”)
- 40% + reduction in weight compared to PVC
- Increased flow capabilities
- Lower maintenance and pumping costs

Benefits of PVCO

- Corrosion resistance
- Greater tensile properties
- Increased resistance to impact damage
- Lowest manufacturing carbon footprint
- Simple installation



PVCO Standards & Applications

- AWWA C909-16 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger
  - 4 in. through 30 in. In CIOD outside diameters
  - CIOD pressure ratings 165, 235, and 305psi

PVCO Standards & Applications

- ASTM F1483 Standard Specification for Oriented Poly (Vinyl Chloride), PVCO, Pressure Pipe
  - 4 in. through 16 in. In CIOD and IPS outside diameters
  - CIOD pressure ratings 150, 200, and 250 psi
  - IPS pressure ratings 160, 200, and 250 psi

PVCO Standards & Applications

- CSA Standard B137.3.1 Molecularly Oriented Polyvinylchloride (PVCO) Pipe for Pressure Applications
  - 4 in. through 24 in. In CIOD and IPS outside diameters
  - CIOD pressure ratings 1150, 1620, and 2130 kPa
  - IPS pressure ratings 1100, 1380, and 1720 kPa

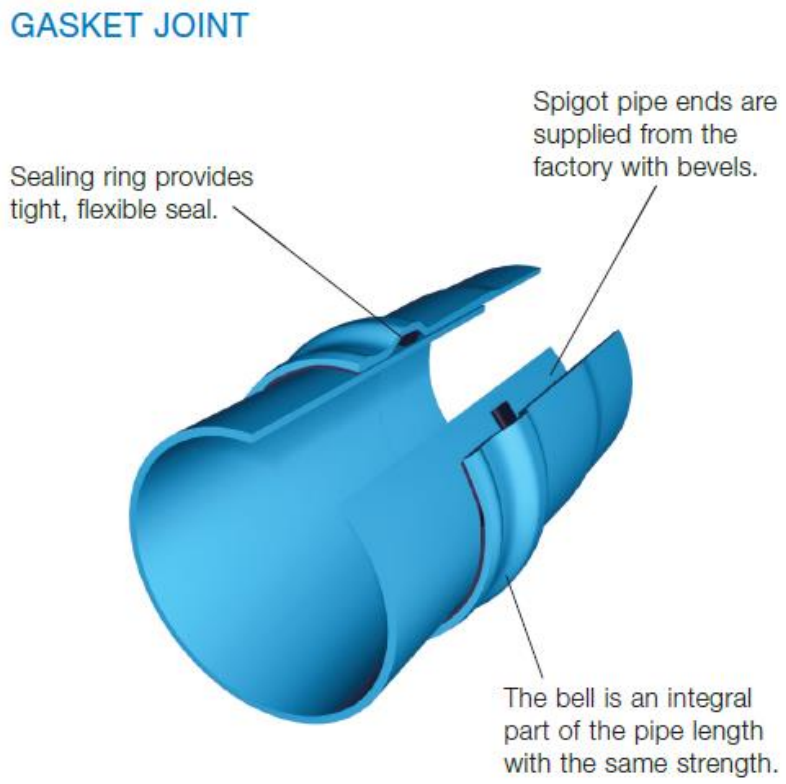
PVCO Standards & Applications

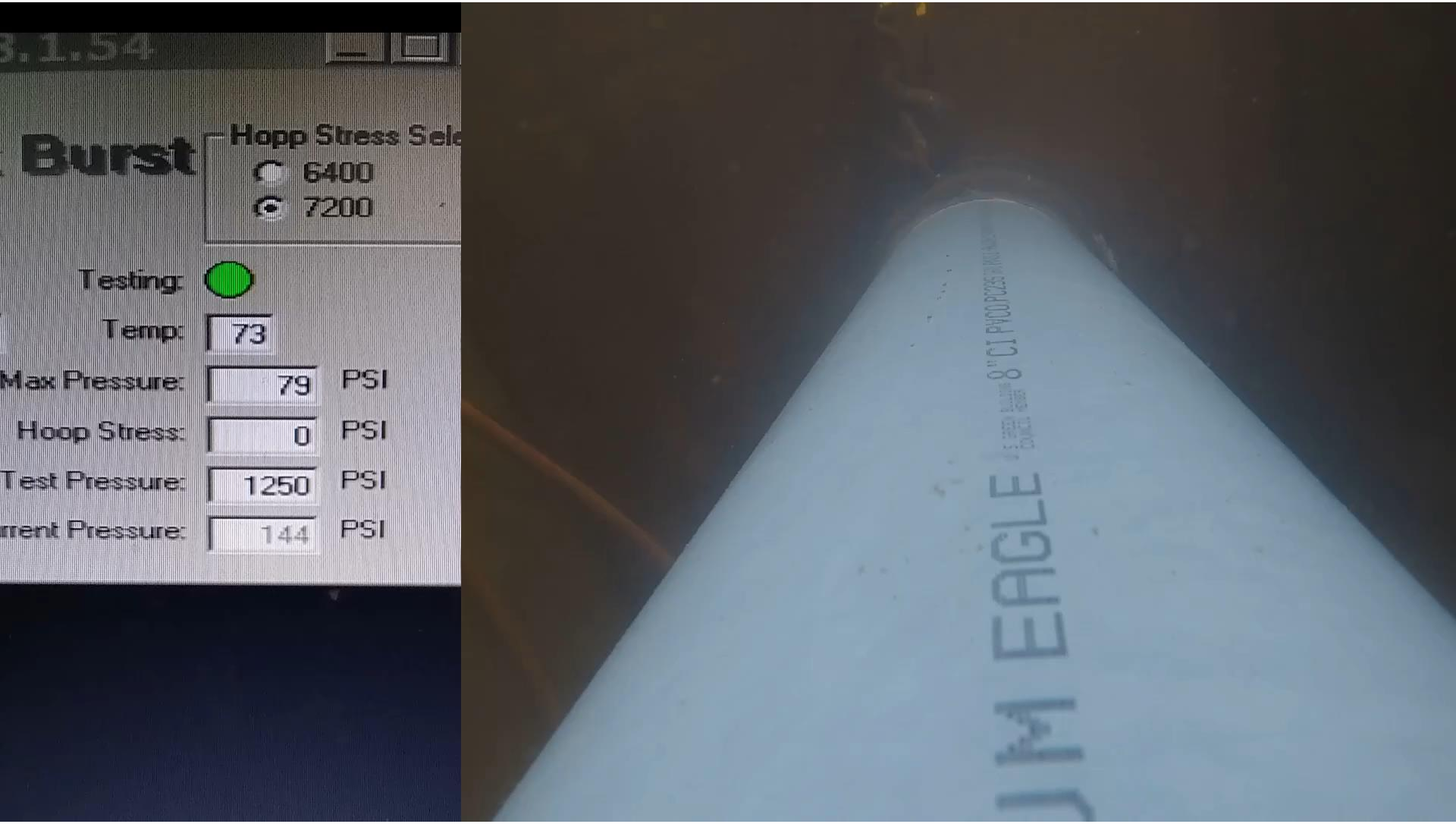
- Potable Water Distribution
- Potable Water Transmission
- Force Main Sewer
- Water Reclamation
- Industrial Process Piping

(QB sample after 900+ psi)

Technical Notes

- Gaskets meet ASTM F477
- Joints meet ASTM D3139
- ASNI/NSF 61
- UL 1285
- 7,100 psi HDB
- ASTM D1784 cell class 12454B
- 2 to 1 factor of safety
- Flow Coefficient C = 150 (Hazen & Williams)
- Manning's Number N = 0.009




Burst
Hopp Stress Sel
6400
7200
Testing:
Temp:
73
Max Pressure:
79
PSI
Hoop Stress:
0
PSI
Test Pressure:
1250
PSI
PSI
144
EAGLE

PVCO Installation

Make certain that the gasket and bell is clean, with no dirt or foreign material that could interfere with proper seating of the gasket or assembly. If necessary, wipe the gasket and bell with a clean, dry cloth. **Lubricating the gasket is not recommended.**

Lubricate the spigot end of the pipe, using only an approved pipe lubricant (NSF approved). Be sure to cover the entire spigot end circumference, with particular attention paid to the beveled end of the spigot.

CAUTION - After spigot end is lubricated, do not allow it to contact the bedding material. Small pieces of stone or soil may adhere to the lubricant and may become lodged between the spigot and the gasket upon assembly, resulting in a possible leak.

PVCO Installation

- Insert the beveled spigot end into the bell so that it is in contact with the gasket.
- Push the spigot end in until the reference mark on the spigot end is flush with the end of the bell.
- Stabbing is not recommended and should be avoided to prevent damage to the gasket and joint.

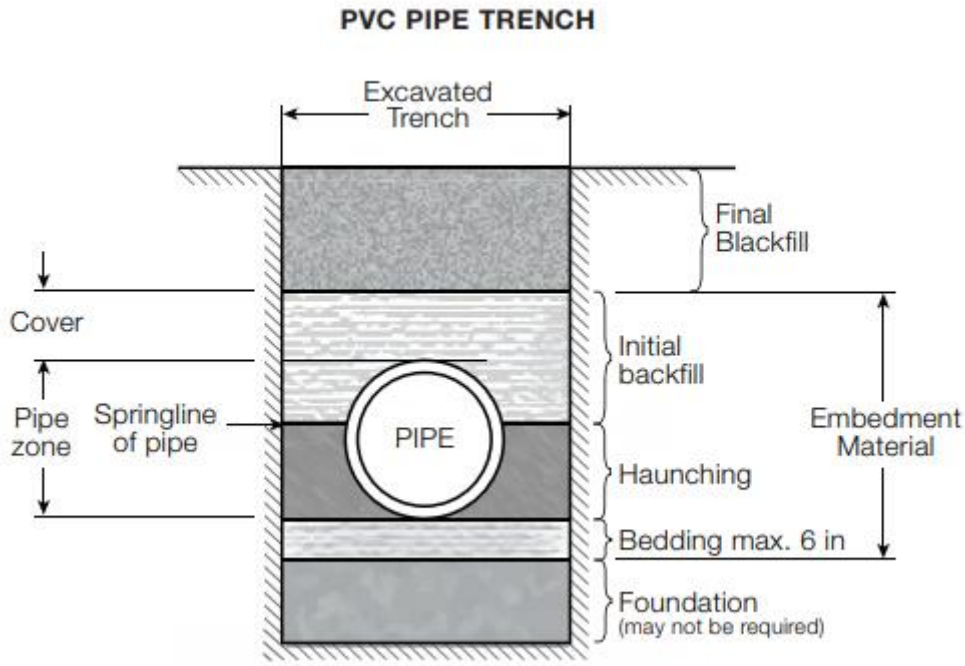
CAUTION - If joint is over-assembled, causing the spigot to jam into the neck of the bell, flexibility of the joint is lost. Uneven settlement of the trench or additional loading may cause this type of joint assembly to leak or crack.

Do not assemble beyond the reference mark.

Bedding & Haunching

Foundation: Is necessary only when native soils are unstable. For such conditions, the trench is over excavated and a layer of supportive material is placed and compacted to provide a firm foundation for the subsequent pipe embedment materials.

Embedment: This zone is the most important in terms of pipe performance. It is divided into the following subzones:



Bedding: Typically 4 to 6 inches of supportive, compacted material. This zone provides even support for the pipe and brings it to grade.

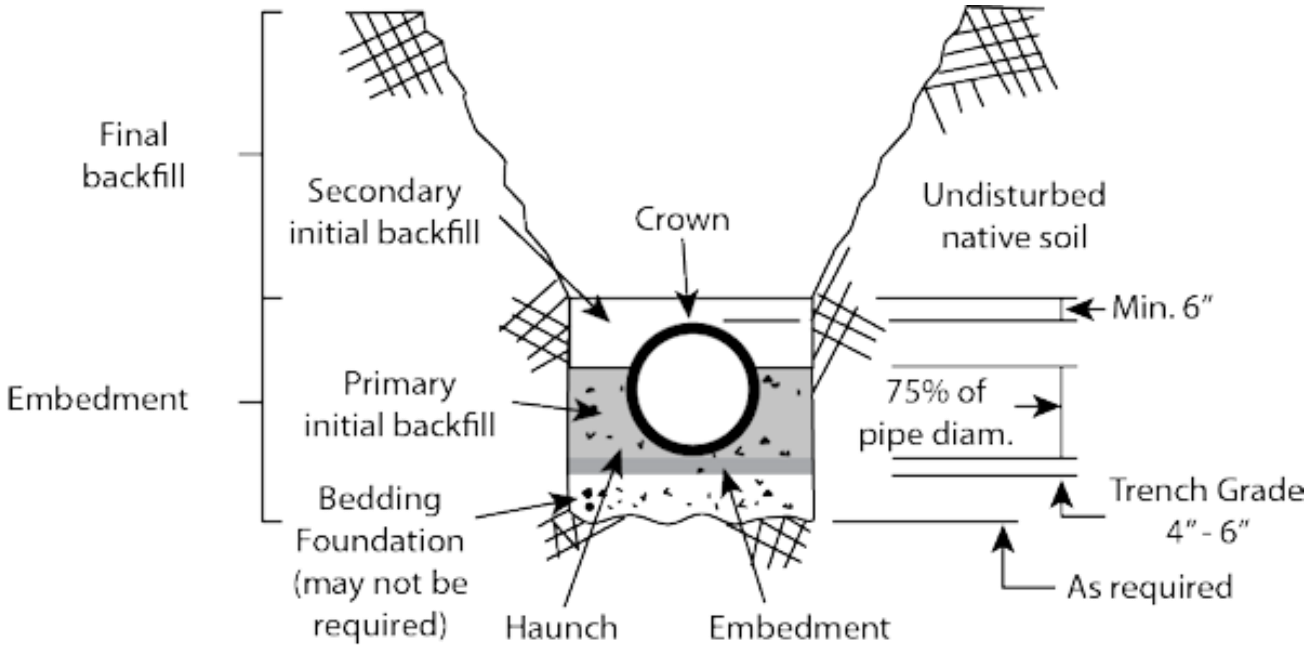
Haunching: Extends from the bottom of the pipe to the centerline of the pipe ("Springline"). It provides the most resistance to the pipe deflection. Specifying proper materials & compaction are most important for this zone.

Compaction

Soil density in the embedment zone, and particularly in the haunching zone, is important for limiting pipe deflection due to soil weight and live loads.

It is important that the embedment material completely surround the pipe and be free of voids.

NOTE: To prevent excessive pipe deflection, the haunching zone **must** be compacted **prior** to placement and compaction of initial and final backfills



Temperature Effects

Like conventional PVC, the hydrostatic pressure capacity of PVCO is temperature dependent, and thermal de-rating factors need to be used when appropriate. These temperature coefficients (FT) are the same as those found in Table below for PVC pipe; however, for PVCO pipe the maximum recommended service temperature is 130°F (54°C).

Maximum service temperature °F (°C)	Multiply pressure class (PC) at 73.4°F (23°C) by factor shown
80 (27)	0.88
90 (32)	0.75
100 (38)	0.62
110 (43)	0.50
120 (49)	0.40
130 (54)	0.30
140 (60)	0.22

PVCO Resistance

Abrasions

PVC and PVCO pipe exhibits outstanding resistance to wear and abrasion. PVC pipe has proven itself more durable than pipes of metal, concrete, or clay for the transport of abrasive slurries.

UV Exposure

A two-year study was undertaken to quantify the effects of UV radiation on the properties of PVC pipe. It found that exposure to UV radiation results in a change in the pipe's surface color. While all impact samples exceeded required standard requirements, a slight reduction of properties were recorded. Other properties such as tensile strength (pressure rating) and modulus of elasticity (pipe stiffness) are not adversely affected.

Temperature Extremes

PVCO pipe durability is not adversely affected by wet/dry cycles, hot/cold cycles, or freezing temperatures. In fact, gasketed PVCO pressure pipe has performed well in climates ranging from tropical to permafrost.

Repetitive Fatigue

Repeated stress variation is known to shorten the life of many pipe materials through fatigue. PVCO pipes have been evaluated under conditions of repetitive external live loads and repetitive internal pressure surges.

The JM Eagle 50-Year Warranty

- 50 Year Warranty
- Industry Exclusive
- Ensures Confidence

* Complete details of warranty are at www.jmeagle.com.