



MUNICIPAL

Installation Guide

AquaSpring® C900, AquaMax® C909, AquaConnect®

Westlake
Pipe & Fittings

Municipal Installation Guide

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Introduction

This guide is intended for use by installers, supervisors, and inspectors responsible for the installation of Westlake Pipe & Fittings PVC and PVCO Pressure Pipe and Fittings. It is not a design manual. Rather, it is intended as a guide for the proper receiving, handling, and installation of PVC and PVCO pressure pipe and fittings. If used properly, the information in this booklet can help maximize product performance.

This booklet is not intended to assume the authority of the Design Engineer. System requirements and actual field conditions will vary significantly. The sole responsibility for all design and installation decisions lies with the Design Engineer.

For more information visit AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings. And AWWA M23, PVC Pipe – Design and Installation, or the PVC Pipe Association's *Handbook of PVC Pipe Design and Construction*.

Additional References: ASTM F1668 and CSA B137.3

For further guidance, contact Westlake Pipe & Fittings Technical Services:

- Phone: 484-435-7474
- Email: technical@westlakepipe.com

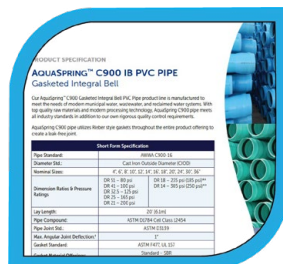


[Certifications/Submittals](#)

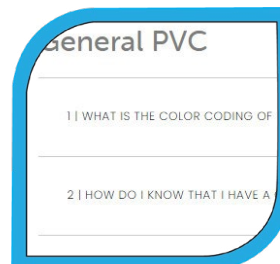
A table with three columns and 12 rows of data, representing pipe dimensions and weights. The table is titled 'Product Specifications' and is enclosed in a blue border.

26.926	1.177	6.9
26.063	5.188	6.9
28.750	11.875	8.5
30.250	30.250	13.9
29.934	1.307	15.9
28.938	5.813	15.9
39.188	16.250	24.0
42.000	42.000	40.1
44.956	1.961	41.1
45.375	8.688	41.1
52.000	21.563	56.1

[Product Specifications](#)



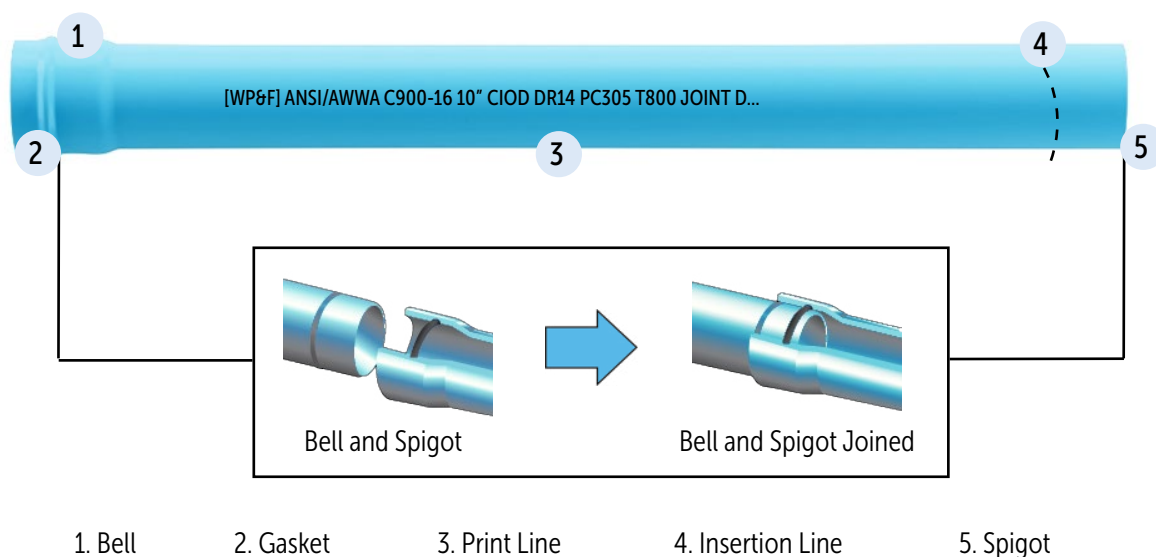
[Technical Bulletins](#)



[Technical FAQs](#)

PVC Pipe Guide

PVC Pipe Overview

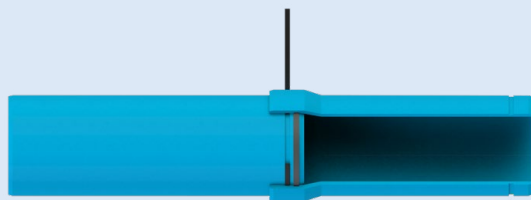


Joint Types

Certa-Lok® Restrained Joint Integral Bell Pipe (RJIB)



Bell and spigot with internal groove and spline locking system.



Certa-Lok® Restrained Joint Pipe (RJ)

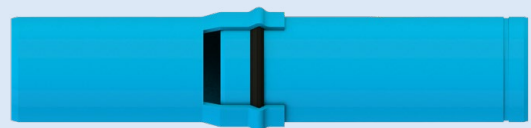


Two pipes joined by one coupling with internal groove and spline locking systems on each side.



Integral Bell (IB)

Bell-shaped end equipped with a gasket, allowing for easy and secure connection with another pipe without the need for adhesive or glue.



Solvent Weld

Bell and spigot end joined together using solvent cement, a permanent, water-tight joint seal.*

**Solvent Welding is not recommended for C900/C909.*



PVC Fittings Guide

Wye



Hub x Hub x Hub

Adapter



CIOD Spigot x IPS Hub

Fabricated Bend



Gasket x Spigot

Terminology

- HUB:** Female, bell-shaped end of a fitting that holds the end of a smaller pipe, known as a spigot, to make a tight joint.
- SPIGOT:** Male end of a pipe designed to be inserted into a fitting hub to create a joint.
- BRANCH:** Part that connects a smaller pipe to a larger one, letting liquids go in a new direction.
- KNIT LINE:** Occur during the injection molding process when converging flows of plastic material unite within the mold cavity, potentially creating a subtle seam in the finished product.

Fitting Types

Fabricated Fittings



Made-To-Order Custom Fabrication

If customers have a specific fitting configuration, we have the flexibility to create the fitting that meets the needs of their project. Contact your Sales Representative for inquiries.

Injection Molded Fittings

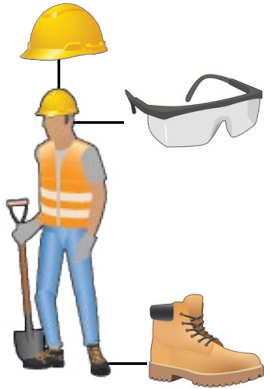


Common in smaller sizes, common off-the-shelf fittings.

Basic Safety Precautions

When drilling or tapping any pressurized water pipe, basic safety precautions are advised to assure personal safety of the workers in the event of a sudden and unexpected pipe failure. Although such failures are extremely infrequent, the following safety practices are recommended.

All local Health and Safety Regulations must be followed.

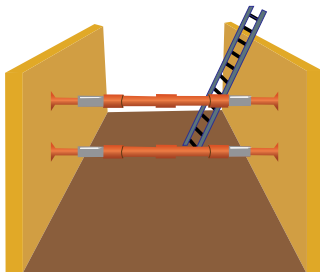


Worker Gear

Protective clothing including:

- Hard hat
- Safety shoes
- Goggles
- Face mask

Means of quick egress from the trench must be available.



Installation Warnings

WARNING: Compressed Air should never be used with PVC pipe, fractures can produce dangerous projectiles.

Solvent Cement and Primer: Concentrated product: in a confined space: do not allow product to accumulate in the air in work or storage areas, or in confined spaces. Use local exhaust ventilation and enclosure, if necessary, to control amount in the air. Exhaust directly to the outside, taking any necessary precautions for environmental protection. Provide eyewash in work area, if contact or splash hazard exists. Provide safety shower in work area, if contact or splash hazard exists.

Trench Safety: Use trench box to prevent soil cave-ins. Construct trench wide enough to place ladder. or comparable OSHA-approved state plan requirements.

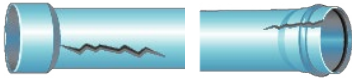
For more detail, visit [OSHA Fact Sheet](#)

Worker Tapping Safety: A second worker or supervisor should always be present in the immediate vicinity when making “wet and hot” taps. In addition, workers should be positioned at isolation valves.

Do not use compressed air (except for low pressure sewer testing).

Receiving

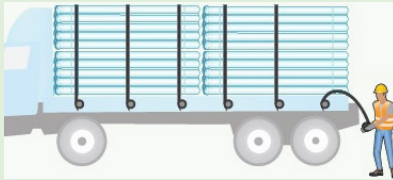
When receiving a pipe and fittings shipment at the job site, the contractor or purchaser should exercise established precautions. Each shipment should be inventoried and inspected upon arrival. The pipe and fittings are inspected and loaded with due care at the factory using methods acceptable to the carrier. It is the carrier's responsibility to deliver the shipment in good condition, and it is the receiver's responsibility to ensure that there has been no loss or damage.

	Conduct overall examination of the load. If the load is intact, ordinary inspection while unloading should be sufficient to ensure that the pipe has arrived in good condition.
	If load has shifted, has broken bundles, or show rough treatment, carefully inspect each piece for damage.
	Check total quantities and details of each item against shipping documents. Note any damaged, incorrect, or missing items on the delivery receipt.
	Notify the carrier immediately and make a claim according to their instructions.
	Do not dispose of any damaged material. The carrier will inform you of the procedure to follow.
	Replacements for shortages and damaged materials are not re-shipped without request. If replacement materials are needed, please re-order from your Westlake Pipe & Fittings distributor or representative.

Unloading

The means by which pipe and fittings are unloaded in the field is the decision and the responsibility of the receiver. The following recommendations should be followed:

DO ✓



Remove restraints from the bundles. These may be straps, ropes, or chains with padding.

Remove any boards on the top or sides of the load that are not part of the pipe/fittings packaging.

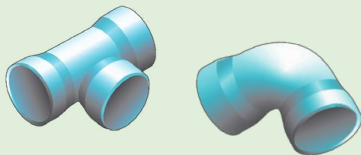
Protect bundles with packing materials the same way they were protected while on the truck.

DON'T ✗



Do not open bundles while is still on truck. The broken bundle pipe can be unstable if the bundle is broken-do not open bundles while they are on the truck.

Do not unload pipe bundles by hand.

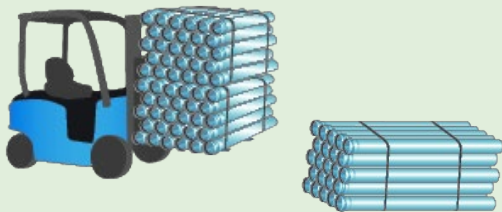


When unloading fittings use industry-accepted means. Use extreme caution when unloading fittings with any type of machinery, as fittings may be fiberglass wrapped for added strength.

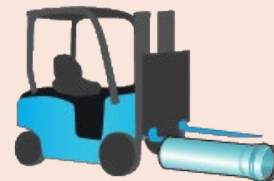
Damage to wrapping could reduce strength of fabricated fitting.



Do not drop or throw fittings into trench. Westlake Pipe & Fittings is not responsible for damage to mishandled pipe or fittings.



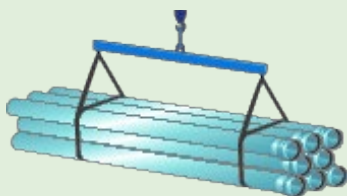
Using a forklift (or a front-end loader equipped with forks), remove the top bundles of pipe, one at a time from the truck.



Never stick forks into the end of the pipe as this could damage the gasket and pipe.

Unloading

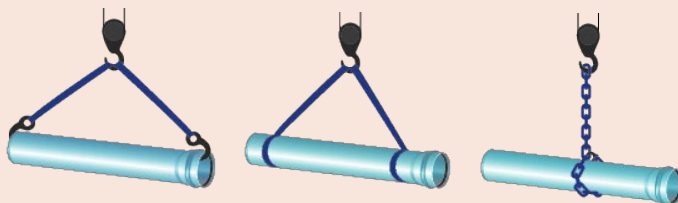
DO ✓



If a forklift is not available, use a spreader bar with fabric straps capable of carrying the load.

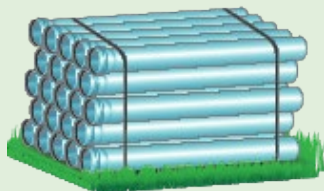
Space straps approximately 8ft (2.4m) apart. Loop straps under the load.

DON'T ✗

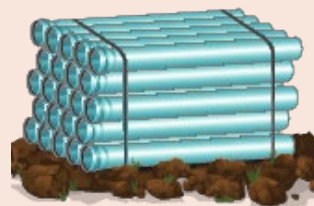


Do not handle bundles with individual chains or single cables, even if padded.

Do not attach lifting cables to bundles or bands.



Place pipe bundles on level ground.



Avoid placing pipe bundles on uneven ground.



Stack bundles under 8ft (2.4m) high.

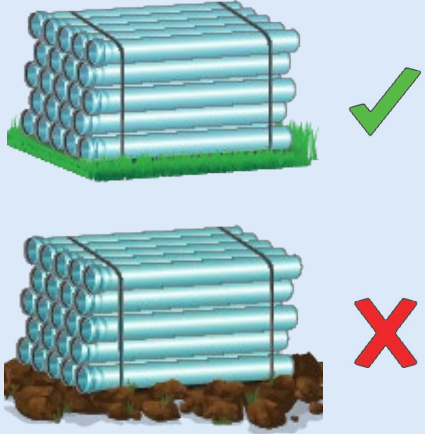
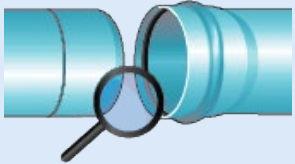
Protect bundles with packing materials the same way they were protected while on the truck.



Stacking bundles over 8ft (2.4m) can result in a crush hazard.

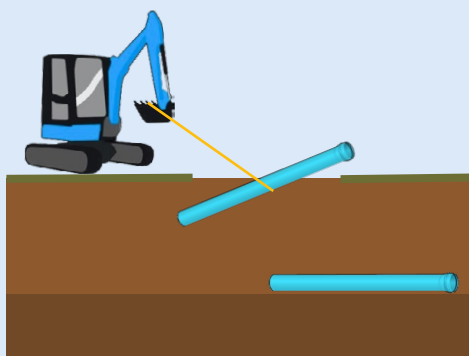
Storage

The following procedures are recommended to prevent damage to the pipe:

	Pipe Storage Store the pipe at the site in bundles. Avoid compression, deformation or damage to bell ends of the pipe. When bundles are stacked, ensure that: - The weight does not cause deformation of the pipe. The weight should be supported by the dunnage. - The stack is a maximum of 2 bundles high. - The stack is stable. Support pipe bundles at 8ft (2.4m) intervals, 4ft (1.2m) from each end on raggles to prevent damage to the bottom surfaces during storage. When bundles are stacked, ensure that the stack remains stable.
	Lubricant Storage Tightly seal lubricant container by using a rubber mallet to close lid. Store lubricant in tightly sealed containers under cover.
	Gasket Care Do not store pipe and fittings where gaskets may be exposed to contamination (grease, oil or other chemicals. Also be aware of damage by animals or other environmental effects). If gasket has become hard or cracked, it cannot be used. Inspect gasket for signs of cracking or dry rot.
	Outdoor Storage Protect the interior and sealing surfaces of pipe and fittings from dirt and foreign material. When pipe and fittings are being stored for a prolonged period, the bundles should be covered with a light coloured opaque cover, to protect against exposure to direct sunlight. The covering should allow adequate air circulation above and around the pipe to prevent excessive heat accumulation. Inspect gasket for signs of cracking or dry rot. For further information on the effects of UV exposure and other prevention methods, visit "Ultraviolet (UV) Radiation Exposure of PVC Pipe Products" technical bulletin.

Handling

The following procedures are recommended for handling pipe and fittings:



Proper Handling

When unloading and handling pipe and fittings, and when using mechanical equipment, exercise care to prevent damage to the pipe/fittings.

Damage to pipe and fittings that have been dropped is not always visible. If the following guidelines are not met, the pipe and fittings should not be used:

- a. Do not drop pipe/fittings off of the truck.
- b. Do not insert a forklift fork into a pipe end to transport.
- c. Lower pipe and fittings into the trench, do not drop.



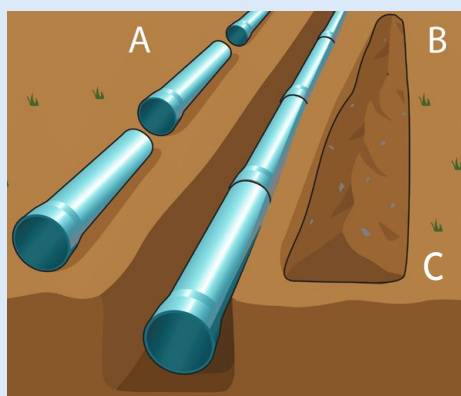
Temperature Considerations

Colder temperatures result in increases in pipe stiffness and tensile strength and decreases in impact strength. The decrease in impact strength requires care in handling during installation in freezing temperatures.

The actual rate of expansion/contraction for PVC is 0.36 inch per 100 feet of pipe per 10°F temperature change.

Wet or frost-covered materials can be slippery.

For more information view Technical Brief - [Cold Weather Unibell](#)



Excavated Open Trench
(A) Prepared Pipe Laid Out
(B) Pipe Assembled in Trench
(C) Excavated Dirt Pile

Pipe Placement at Job-site

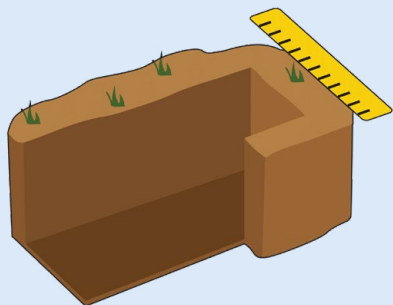
- A. When distributing the pipe along a trench (stringing), place pipe on the opposite side of the trench from the excavated earth.
- B. Place pipe with bell ends in the direction of the work progress. Holding the bell stationary and pushing spigot into the bell will prevent scooping material from trench bottom into bell and risking a joint leak.
- C. Place excavated dirt on the opposite side of stringed pipe. Avoid dirt contamination when installing pipeline.

If pipe is capped, keep caps in place until the pipe is ready to be assembled.

Installation Instructions – Trench Construction

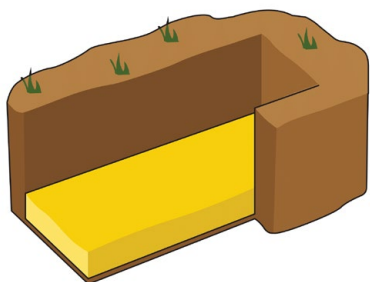
Gasketed C900, C909 and IPS Pipe

The contractor shall follow all local regulations for trench safety. For further information, refer to AWWA C605 and M23, ASTM F1668, CSA B137.3.



Trench Width

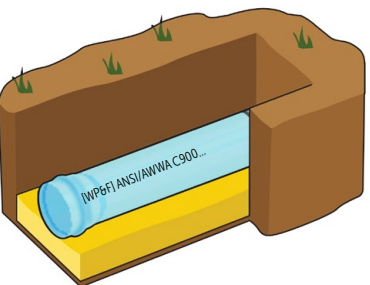
1. The minimum clear width of the trench at the pipe springline should be the greater of either 18 inches (450mm) or the pipe OD plus 1ft (300mm).
2. The maximum clear width at the crown of the pipe should not be greater than the pipe diameter plus 2ft (600mm).



Bedding Material

Preparation of Trench Bottom

- The trench bottom should provide firm, stable and uniform support for the full length of the pipe.
- Bell holes should be provided at each joint to permit proper joint assembly and pipe support.
- Any part of the trench bottom excavated below grade should be backfilled to grade and compacted as required to provide firm pipe support.
- When an unstable sub-grade condition which will provide inadequate pipe support is encountered, additional trench depth should be excavated and refilled with a suitable foundation material as recommended by the project's geotechnical engineer. Ledge rock, boulders, frozen materials, and large stones should be removed to provide 4" (100mm) of soil cushion on all sides of the pipe and accessories.



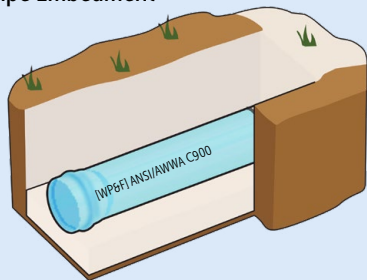
Laying of the Pipe

To prevent damage, proper implements, tools and equipment should be used to position the pipe in the trench. Under no circumstances should the pipe or accessories be dropped into the trench.

All foreign matter or dirt should be removed from the pipe interior. When pipe laying is not in progress, open ends of the installed pipe should be covered to prevent entrance of trench water, dirt, and foreign matter into the line.

It is good practice to lay the pipe with the print line rotated to the top (12 o'clock), facing the sky. This will help with the identification of the pipe if it ever has to be re-excavated.

Pipe Embedment



Pipe Embedment

Pipe Embedment Should:

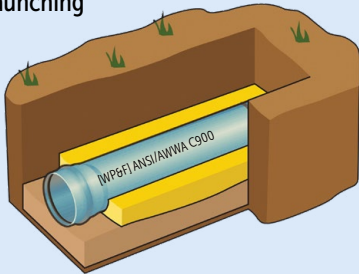
Provide uniform longitudinal support to the pipe.

Be worked under the sides of the pipe to provide satisfactory support in the haunching area.

Installation Instructions – Trench Construction

Gasketed C900, C909 and IPS Pipe

Haunching



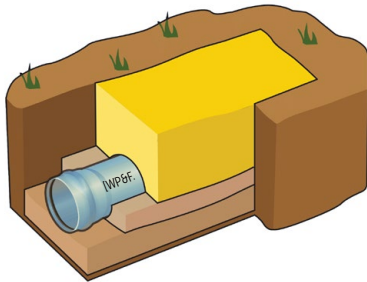
Pipe Embedment *(continued)*

Have a minimum initial backfill depth of 1ft (300mm) over the crown of the pipe.

Be properly compacted to provide soil densities as specified by the design engineer.

Not contain cobbles, large stones, frozen lumps, ledge rocks, or debris. Limit particle size to $\frac{3}{4}$ " (19mm) unless otherwise specified in local requirements or specifications.

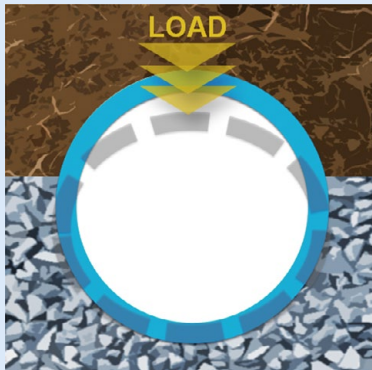
To prevent damage to the pipe, compaction equipment used directly over the pipe should be limited based on the depth of cover and the depth of influence of the equipment.



Final Backfill

After placement and compaction of pipe embedment materials, the balance of backfill material may be machine placed.

The final backfill should contain no large stones or large rocks, frozen material or debris. Proper compaction procedures should be exercised to provide required soil densities.



Burial Depth

Minimum burial depth is governed by a few criteria. ASTM D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping, Section 6.4.2 states that "a minimum of 24 in. for pipe shall be required when subjected to heavy overhead traffic. In areas of light overhead traffic, a minimum of 12 to 18 in. is required." Westlake Pipe & Fittings recommends that this requirement is followed during project design and construction.

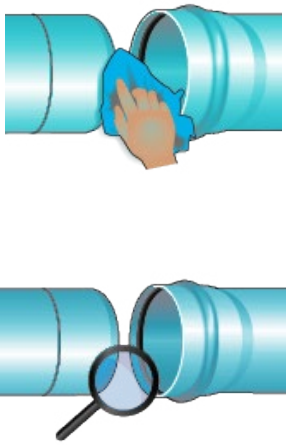
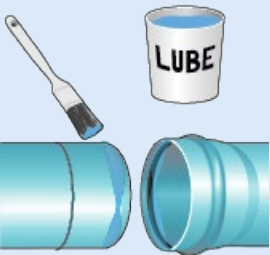
AWWA C605, Section 7.2.8, recommends the following depths of cover to prevent pipe flotation:

- SDR 32.5 and Thicker Pipe – Depth of Cover of 1.5 pipe diameters
 - SDR 41 & 51 – Depth of Cover of 2.0 pipe diameters
- Earth loads, from soil above a buried pipe, and live loads, from vehicles and objects on the surface, place vertical loads on the pipe that attempt to deform the pipe from a circle to an oval. The strength of the pipe wall, known as pipe stiffness, and the support afforded to the pipe by surrounding embedment soils counteracts these earth and live loads.

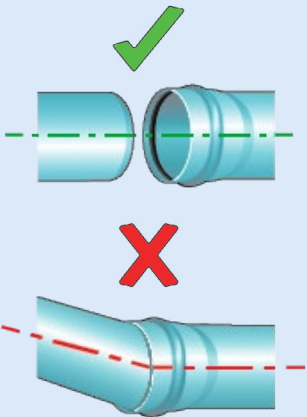
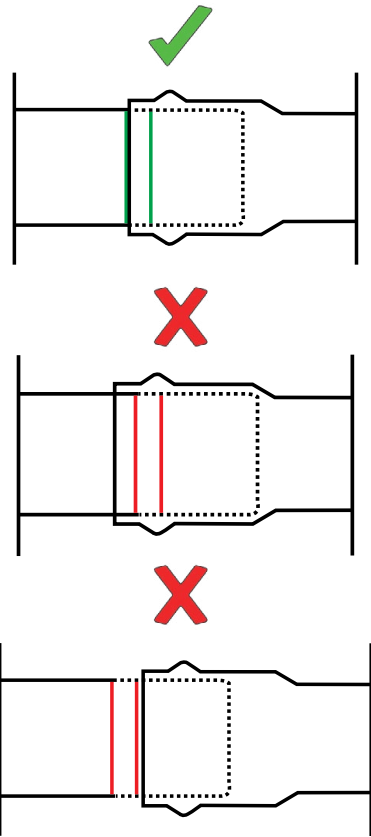
The Modified Iowa formula is widely used to calculate the expected deflection of installed PVC/PVCO pipe at various depths and installation conditions. AWWA C605, Section 8.3, states that "the vertical cross-section long-term ring deflection of the pipe should not exceed 7.5 percent." We recommend that an engineer familiar with the Modified Iowa equation be consulted to determine if the embedment soil and pipe stiffness is adequate to counterbalance the loading conditions at specific burial depths.

See technical bulletin "[Burial Depth Guidance](#)" for more information.

Installation Instructions – Assembly of Gasket Joints

Gather 	Gather Gaskets provided with Westlake Pipe & Fittings products are identified by shape, color and size. - Gather needed materials: - Wet Rag - Pipe Lubricant (NSF 61 certified) - Brush - Spline (if using Certa-Lok restrained joint product)	Technical Bulletin - Gasket Identification Chart Certa-Lok® Spline Color Coding
Inspect & Clean 	Inspect & Clean Remove caps and clean the gasket, bell interior and spigot area with a clean rag to ensure all debris is removed from bell and spigot ends of the pipe. Check the gasket position. Inspect the gasket, pipe spigot bevel and sealing surfaces for damage or deformation. Be sure the gasket is seated uniformly in the groove by running your finger across the edge of the gasket. Set aside any questionable pieces of pipe. NOTE For AquaSpring® C900 IB pipe utilizes the Rieber gasket system. For this product DO NOT REMOVE THE GASKET FROM THE GROOVE FOR CLEANING. The gasket is not removable and will be damaged by attempts to remove it. AquaMax® C909 IB pipe gaskets can be removed from the groove and replaced if necessary."	Reference a factory cut piece of pipe to match the length of the 15° bevel or visit product specification relating to pipe type.
Lubricate 	Lubricate Apply lubricant to the gasket and outside surface of spigot from the bevel to approximately halfway back to insertion lube. Westlake Pipe & Fittings supplied pipe lubricant is preferred, pipe lubricant must be NSF 61 certified. For guidance on usage, see Westlake Pipe & Fittings technical bulletin for lubricant usage chart. NOTE Use of non-approved lubricants may promote bacterial growth and cause damage to the gaskets or pipe, as well as void the manufacturer's warranty.	For proper lubricant application and joints per tub, review "Lubricant Usage Chart" technical bulletin.

Installation Instructions – Assembly of Gasket Joints

Assemble		
	4. After lubrication, the pipe is ready to be joined. Straight alignment of the pipe is essential for ease of assembly. Align the spigot and the bell, and insert the lubricated spigot into the bell until it contacts the gasket uniformly. • Do not suspend the pipe and “stab” it into the bell. • Ensure the spigot does not touch bedding material during installation.	Technical Bulletin - Changing Direction of PVC Pipelines
	The spigot end of the pipe will be marked by Westlake Pipe & Fittings to indicate the maximum depth of insertion. 5a. For pipe with dual insertion, insert the spigot into the bell until the first insertion line is no longer visible and the second insertion line is visible in front of the bell face. 5b. For pipe with single insertion, insert the spigot until the insertion line is visible in front of bell face. NOTE • Do not assemble the joint beyond the second reference line. Joints assembled beyond this line would VOID the pipe warranty. • Over-insertion can cause leaks and/or breakage of the pipe bell.	

Installation Instructions – Assembly of Gasket Joints

Pipe Assembly

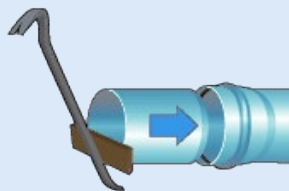


Figure 1: Manual Bar and Block Method

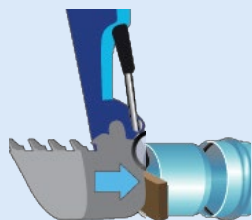


Figure 2: Backhoe with Block Method

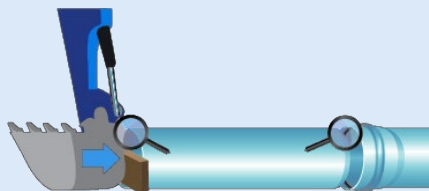


Figure 3: Focused on Pipe Ends

Pipe Assembly

The assembly can be done by hand, or by using a bar and block (wood) as shown in figure 1.

When unable to assemble using the bar and block method, another mechanical method such as a come-along or a pipe puller should be used. If the backhoe bucket is used to assemble the pipe, extra care must be taken to ensure the pipe is not assembled beyond the second insertion line. A backhoe bucket should never contact the pipe directly, wood should be placed between the bucket and the face of the bell. Refer to figure 2.

Place and consolidate embedment material in the haunching area and initial backfill along the barrel, leaving the previous joint exposed.

After inserting the next spigot, go to the previous joint and check to ensure that cascading of this joint has not occurred. (Cascading occurs when the spigot of the previous joint inserts further into the bell than was originally intended.)

Use a spotter when using a large excavator to prevent pipe damage.

Joint Assembly



Joint Assembly Problems

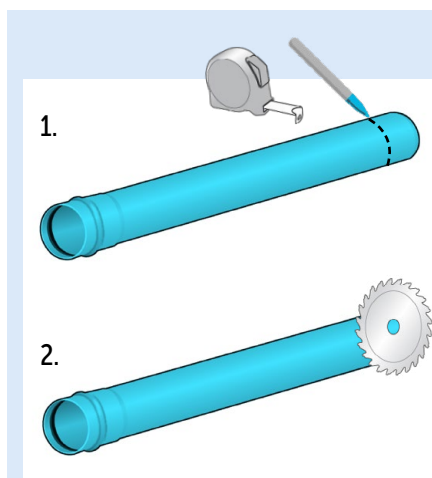
If there is difficulty assembling the joint, disassemble and examine the gasket. Be sure the gasket is properly seated and both pipe segments are in straight alignment. For AquaSpring® C900 IB pipe, if the gasket is damaged, cut off the bell, bevel the new edge, and use a coupling to assemble the two pipe segments. The gaskets for AquaMax® C909 IB pipe can be removed and replaced if damaged.

If the pipe is misaligned, over-inserted, or assembled with excessive force, the following are possible consequences:

- Rolled or torn gaskets,
- Split bells,
- Acceptance testing failure (e.g. hydrostatic pressure test),
- Leaky joints after temperature changes or earth movement,
- Damage to previously assembled joints

Contact your Sales Representative or Tech Services for assistance in the field.

Installation Instructions – Assembly of Gasket Joints



Field Cutting

Pipe can be easily cut with a power saw using an abrasive disc. Other cutting tools may be appropriate, depending on the size of the pipe. It is recommended that the pipe be marked around its entire circumference prior to cutting to ensure a square cut. Both portions of the pipe on either side of the cut line should be supported from below such that neither portion of pipe pulls at the other while it is being cut.

If inserting into a gasketed joint, the newly cut pipe must be beveled and have the insertion marks redrawn. Use a factory-finished beveled spigot end as a guide for proper bevel angle (15°) and depth. Draw new insertion marks at the same distance as the original.

Field Grooving

Certain Certa-Lok® products are manufactured with thickened spigot ends to accommodate the Certa-Lok® groove while maintaining their designed performance ratings.

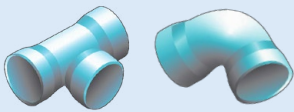
Grooving a non thickened pipe body will result in a less-than-designed performance for the new joint and is therefore not recommended. A fitting or adapter must be used.

For more information on field cutting and field grooving visit ["Field Grooving"](#) installation guide.

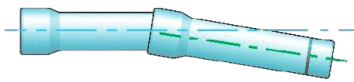
Changes in Alignment

There are multiple methods of achieving alignment changes in a pipeline:

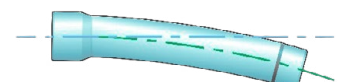
Fittings



Angular Deflection in the Pipe Joint



Longitudinal Bending of Pipe Barrel



Westlake Pipe & Fittings recommends that changes in alignment should be designed and accomplished with the use of fittings. Either push on PVC Fittings (injection molded or fabricated) or Ductile Iron fittings (MJ or Push On) can be used.

The use of a fitting provides for straight insertion of the spigot into the joint, allowing the directional change (horizontal or vertical) to be made quickly and easily during construction. Since different fitting types have different insertion requirements always check the bell depth of the fitting and if necessary re-mark the insertion line on the spigot, to ensure the correct insertion depth is achieved.

Westlake Pipe & Fittings offers a wide variety of molded and fabricated fittings, including 5 through 90 degree bends, elbows, and sweeps. The radius shape of the 5° bend creates virtually no axial forces; therefore, they can be installed without need for joint restraint.

Ductile Iron Fittings

Ductile Iron fittings Mechanical Joint (MJ) or Push On in either compact (AWWA C153) or long body (AWWA C110) can be used with PVC pipe. See the fitting manufacturer's recommendations for alignment changes and deflections available with this type of fitting.

Ductile Iron Fittings have shallower bells than PVC Fittings. For Ductile Iron Fittings, the edge of the pipe should be square cut. For Push-On Ductile Iron Fittings, a small chamfer $\frac{3}{8}$ " (9.5mm) is required. For more detailed information about assembly to Ductile Iron Fittings, please contact the fittings manufacturer.

Deflecting the Joint at PVC Fittings

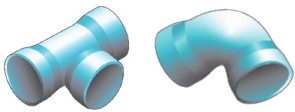
The maximum angle of deflection is 1° for all sizes of Westlake Pipe & Fittings manufactured PVC pressure fittings. This is equivalent to 4" (100mm) of deflection over a 20' (6.1m) length of pipe.

When deflecting the pipe/fitting joint, use the following procedure:

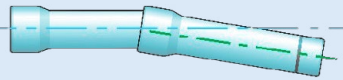
1. Assemble the pipe/fitting joint such that there is a $\frac{1}{2}$ " (13mm) gap between the maximum insertion line as per Figure 4 (page 14), and the edge of the bell. This gap will allow more movement at the end of the pipe.
2. Shift the bell end of the 20' (6.1m) length of pipe 4" (100mm) in the direction of deflection.

Changes in Alignment

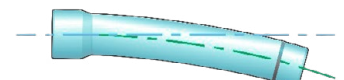
Fittings



Angular Deflection
in the Pipe Joint



Longitudinal Bending
of Pipe Barrel



The small amount of offset allowed by angular deflection should be reserved for installation irregularities and not utilized in the pipeline design for alignment changes. The use of fittings is recommended for greater changes.

Procedure

1. Insert the spigot into bell; stop inserting when the first insertion line is even with the face of the bell.
2. Check to ensure that spigot is in straight alignment with the bell.
3. Manually, move the other (bell) end of the pipe to achieve allowable offset.

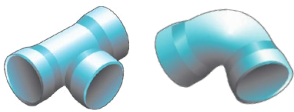
Maximum angular deflection of Westlake Pipe & Fittings IB (standard gasketed pipe) is 1 degree per joint. For pipe manufactured in Abbotsford, BC, 4" – 12" C900 trade sizes have a maximum angular deflection of 2 degrees.

For reference purposes 1 degree of joint deflection is equal to a 4" (100mm) offset for a 20ft (6.1m) piece of pipe.

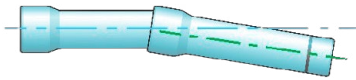
For more information, visit the "[Changing Direction of PVC Pipelines](#)" technical bulletin.

Changes in Alignment

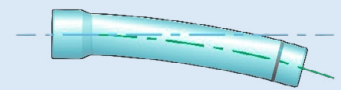
Fittings



Angular Deflection
in the Pipe Joint

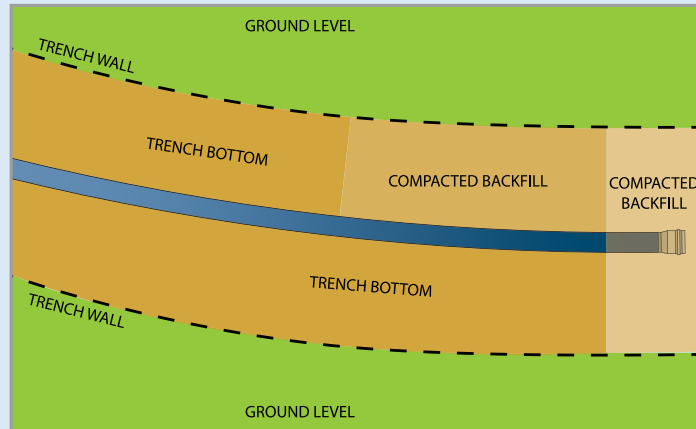


Longitudinal Bending
of Pipe Barrel



This should be only be used when minor directional changes are encountered during construction. Longitudinal bending can cause increased wall stresses, therefore it is generally not recommended to tap pipe that has been longitudinally bent. Above 12" (300mm) trade size, Westlake Pipe & Fittings recommends alternate means of changing pipeline direction for open cut jobs.

1. Insert the spigot into bell, leaving the second insertion line showing.
2. Place and consolidate haunching and initial backfill along one third of the pipe including the joint you have just assembled.
3. Place compacted backfill at the inside of the curve at the midpoint of the pipe length to form a fulcrum.
4. Manually, move the other (bell) end to achieve the offset desired.
5. Place and consolidate the remaining haunching and initial backfill.
6. Remove pry bar from against the bell.



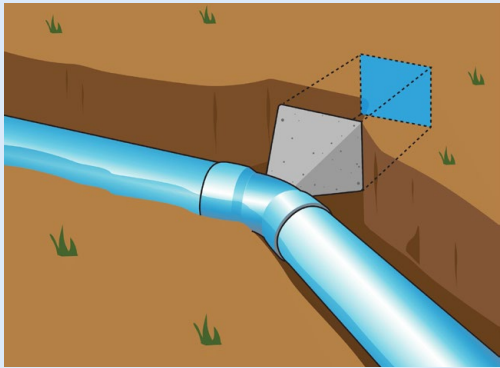
Longitudinal Pipe Bending.

Never combine angular deflection and longitudinal bending.

For open cut installations, many restrained joint products like Certa-Lok® prevent over deflection of the joint. Certa-Lok® allows for several pipe segments to be strung together prior to bending. Stringing pipe before bending eliminates the challenges of bending individual segments. For further details, refer to the restrained joint sections of this guide. For additional information on Certa-Lok® view ["Longitudinal Bending of Certa-Lok® PVC Pipe" technical bulletin.](#)

Thrust Restraint

Thrust restraint should be provided at each hydrant, valve, bend, tee and at reducers or fittings where changes occur in pipe diameter or direction. There are two common methods of restraining PVC pressure pipe and fittings in the field:

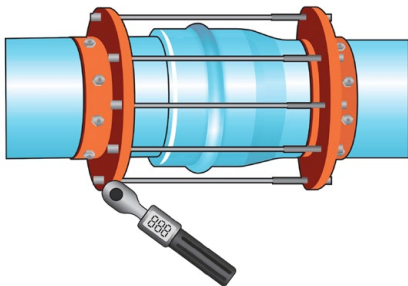


Concrete Thrust Blocking

Concrete thrust blocks shall be cast in place and poured against undisturbed soil. Pre-cast blocks are not permitted. For vertical changes in direction, the fitting should be anchored to the thrust block.

The size and shape of concrete thrust blocks shall be as specified by the designer.

See figure 4 for thrust blocking details.



Mechanical Joint Restraint

Westlake Pipe & Fittings will accept the use of any restraint device that carries third party certification to ASTM F1674 (American Society for Testing and Materials), FM (Factory Mutual) and UL (Underwriters Laboratories). It is the responsibility of the restraint manufacturer to supply the necessary supporting data to prove that their product complies with these requirements and is compatible with the pipe/ fittings.

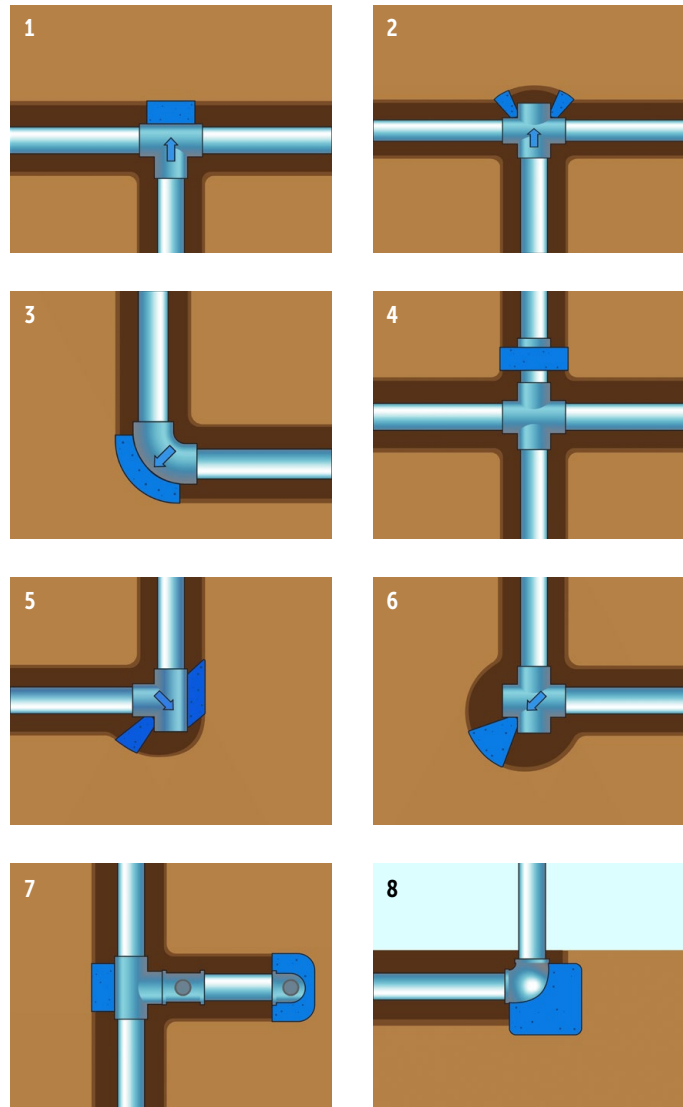
The length of restrained-joint piping shall be as per the designer.

It is important to note that Westlake Pipe & Fittings does not assume liability arising from the use of any external restraints on pipe or fittings manufactured by Westlake Pipe & Fittings.

Joint restraint criteria for C909 pipe can differ from that for C900 pipe. Consult with the restraint manufacturer for specific requirements for C909 pipe. This also applies to glands utilized with MJ fittings.

Thrust Restraint

Figure 4: Thrust Blocking Detail



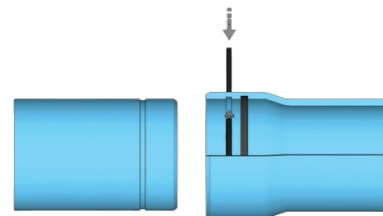
1. Through line connection (tee)
3. Direction change (elbow)
5. Direction change (tee used as elbow)
7. Hydrant Tee

2. Through line connection (cross used as tee)
4. Change line size (reducer)
6. Direction change (cross used as elbow)
8. Hydrant Boot

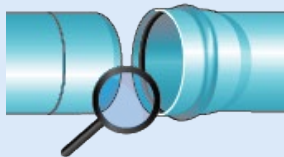
Certa-Lok® RJIB Installation Instructions

Westlake Pipe & Fittings restrained joint systems are self-restrained 900 pressure pipe systems that can be used for trenchless or open-cut installations. These systems include CIOD pressure pipe with bell and spigot; and nylon splines used to lock the pipe bell and spigots together.

These restrained joint products are standard C900 pressure pipe with grooves cut into the pipe wall at the spigot end. The pipe is locked together by lining up the pipe grooves with the bell grooves and inserting a nylon spline.



Assembly



1. Inspect & Clean Bell Socket

- Using a wet rag, clean out all dirt and other material from inside bell sockets including the spline grooves and gaskets. Couplings and other female fittings are shipped with the gaskets already installed.
- Inspect the gaskets for any tears, gouges, cracking, or other defects. Make sure the gaskets are seated evenly in the bell's grooves without falling out, bunching up, or being twisted. Adjust the gaskets' positions as necessary.
- Contact the Distributor for replacement of any questionable gaskets. Do not install pipe into bells having questionable or deformed gaskets.

For gasket and spline information, review "[AquaSpring® C900 Certa-Lok® RJIB With Fluid-Tite® Gasket PVC Pressure Pipe](#)" product specification.

2. Inspect & Clean Male Spigot End

- Using a wet rag, clean off all dirt and other material from the outside surface of the pipe spigot, up to and including the spline grooves.
- Inspect the spigot edge for a consistent, undamaged bevel. Do not use pipe spigots with disfigured bevels that could damage the gasket when inserted into the bell.

Lubricate



3. Lubricate

- IMPORTANT:** Use an NSF approved potable water pipe lubricant only!
- Spigot End** – Using a brush, apply lubricant to the pipe exterior from the beveled edge back to the spline groove. **DO NOT** lubricate the spigot spline groove.
- Bell** – Apply lubricant to the exposed surfaces of the installed gasket. **DO NOT** lubricate the bell spline groove.
- Wipe off any excess lubricant.

For proper lubricant application and joints per tub, review "[Lubricant Usage Chart](#)" technical bulletin.

Certa-Lok® RJIB Installation Instructions

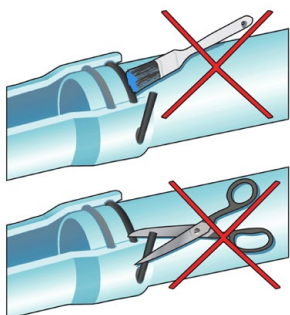
Assemble Joint



Assemble Joint

- a. Rotate the bell so the spline hole is accessible for spline insertion.
 - i. For applications with pipe sitting on the ground, the spline hole should be at or near the top so the spline enters horizontally.
 - ii. For applications with the pipe in a narrow pit, the spline hole should be at the side so the spline enters vertically.
- b. Align the spigot end of the pipe so that the spigot is entering the center of the bell and the two pieces are in straight alignment. The spigot must not be inserted into the bell at an angle; this may damage or dislodge the gasket.
- c. Using mechanical means if necessary, push the spigot straight into the bell so the spline grooves align. The bar and block method of assembly is recommended, although larger pipe may require mechanical assistance.
- d. If the pipe does not easily insert – STOP – check the bell, spigot, and gaskets for issues. Clean or lubricate as necessary.

Spline



Insert Spline

- a. DO NOT lubricate the spline!
- b. Insert the pointed end of the spline into the bell spline hole. For rectangular splines, the wider face should be parallel to the length of the pipe. For square splines, either face can be parallel to the length of the pipe.
- c. Push the spline into the spline hole until the spline "bottoms out". It may be necessary to use a Westlake Pipe & Fittings Spline Insertion Tool or mallet. Approximately, 1" to 3" of the spline should extend beyond the connected pipe joint.
- d. It is not necessary to trim the excess spline "tail". Trimming the tail will not affect the strength of the joint but may make disassembly very difficult.

HDD



Horizontal Directional Drilling (HDD)

When pulling restrained joint products using HDD, do not exceed the recommended maximum pulling force or bending limits.

For detailed information such as bending, dimensions, and force, visit "[Using Certa-Lok® Pipe for Horizontal Directional Drilling \(HDD\)](#)" technical bulletin for more information.

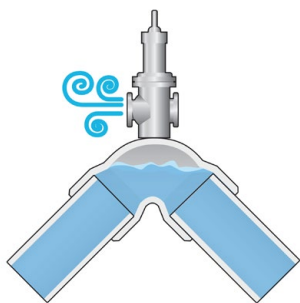
Inspection and Testing

Good practice dictates pressure testing portions of lines as they are completed in advance of the entire system. The following three points should be considered when testing:

- 1. The pipe to be tested must be sufficiently backfilled to prevent movement while under test pressure.
- 2. Thrust restraint at fittings should be permanent and constructed to withstand test pressure. If concrete thrust blocks are used, sufficient time must be allowed before testing to permit the concrete to cure.
- 3. Test ends should be capped and braced to withstand the thrusts that are developed under test pressure.



Pressure Acceptance Test
A pressure acceptance test is recommended. The test pressure and duration shall be as specified by the Design Engineer or as per AWWA C605. The test pressure should never exceed the pressure rating of the pipe and fittings being tested.



Relieving Air From Pipeline
The pipeline should be filled as slowly as possible (not faster than 1 ft/s) to void any unnecessary surges and entrapment of air. Venting air from the line is of utmost importance. Pressure pipe is seldom laid to flat grade, so there are high and low sections along the line. If the high section elevation is above the low part of the line, a larger amount of air will be trapped. Corporation stops or automatic air relief valves should be installed at these points. Air can be blown from hydrants in pipe sizes up to 200mm (8"). In larger diameter pipes, air will not enter the hydrant branch, therefore it will be necessary to install air release valves at high points.

The line should be filled slowly with water to static pressure, and all air vents opened to allow air to escape. The line should be filled at a rate that allows air to leave the line at the same rate. It is recommended practice to let the line remain under static pressure for at least 15 minutes. All air valves should then be opened again to allow any remaining air to be released from the line, after which the line may be brought up to full test pressure. Test pressure should never exceed the pressure rating on the pipe and fittings being tested.



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WARNING
Air pressure testing of installed PVC and PVCO Pressure Pipe is expressly prohibited for safety reasons.

Service Connections and Tapping

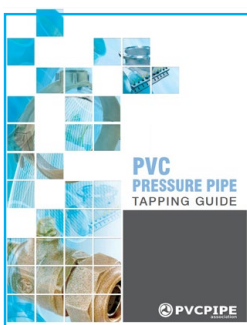
Service lines can be connected to Westlake Pipe & Fittings PVC and PVCO Pressure Pipe by the following methods:



Fittings - Tap Couplings

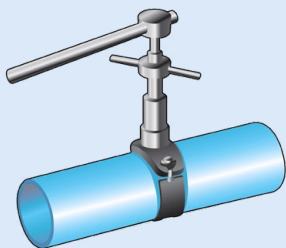
C907 AquaConnect® fittings which provide a threaded service connection are available from Westlake Pipe & Fittings.

For more detailed information, visit "[AquaConnect® C907 Injection-Molded PVC Pressure Fittings](#)" product specification.



Tapping

The PVC Pipe Association publishes a comprehensive [PVC Pressure Pipe Tapping Guide](#) for guidance on making service taps on Westlake Pipe & Fittings PVC pressure pipe.

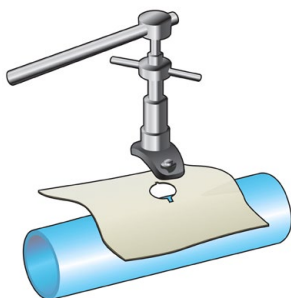


Tapping - General

Only C900 PVC pipe can be direct tapped. C909 PVCO pipe should never be direct tapped.

Saddle tapping can be used for both PVC and PVCO Pressure Pipe.

Never tap in an area of the pipe that has been bent.



Tapping Safety Blanket

A heavy protective blanket, 1.2m x 1.8m (4ft x 6ft) should be used to cover the exposed pipe in the area of the tap. The blanket should have a hole in the center permitting access and operation of the drilling and tapping machine.

The safety blanket is recommended to prevent shards of plastic from projecting.

