

## TECHNICAL BULLETIN

# LONGITUDINAL BENDING OF CERTA-LOK® PVC PIPE

### OVERVIEW

In 2020, the third edition of AWWA M23 PVC Pipe Design and Installation was published. Revisions to the document have generated confusion and miscommunication in regards to bending of the pipe barrel of segmented PVC pipe.

### WHAT DOES THE THIRD EDITION OF M23 SAY?

In chapter 12 *Other Design Considerations; Allowable Bending Limits*, a statement was added which reads;

*"The bending of PVC pressure pipe larger than nominal 6 in. (150 mm) is not recommended for segmented (elastomeric gasketed) pipe because of the higher forces required to bend larger pipe and associated difficulty in preventing excessive axial joint deflection."*

This addition in the third edition of AWWA M23 is not a new idea, rather a step towards consistency amongst industry documents. It is worth noting that a similar statement has existed since 2013 in *AWWA C605-13 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings*.

### WHY WERE THESE STATEMENTS ADDED?

The purpose of this statement is two-fold. First, to address potential safety concerns when bending large pipe in open-cut installations. The second purpose is to address the need for adequate restraint of the pipe joint when bending pipe.

Bending large diameter pipe can require a lot of force. To generate the necessary force, heavy equipment is often utilized. Controlling the energy stored in a bent pipe with heavy equipment presents a unique challenge. If the pipe is released or breaks loose from the equipment, the pipe will want to spring back to its straight alignment. In an open cut installation this can present a safety hazard to personnel working in the pipe trench.

Additionally, as the pipe barrel is bent the unrestrained gasketed joint will begin to deflect. Too much deflection in the pipe joint can cause poor joint performance. To prevent over deflection in unrestrained joints, the embedment material around the pipe joint must be very well compacted before the pipe is bent. For open cut installations of large diameter pipe, this is sometimes less practical than alternative means of changing direction.

A full list of necessary steps for bending the pipe barrel of unrestrained gasketed integral bell PVC pipe may be found in the UNIBELL PVC Pipe Association's *Handbook of PVC Pipe Design and Construction 5th ed.*

### WHAT HAS BEEN LEFT OUT?

Without context, this statement has been used by competitors of Certa-Lok Restrained Joint PVC pipe to imply that all segmented, gasketed, PVC pipe cannot utilize longitudinal bending of the pipe barrel. However, several key points were omitted from this statement.

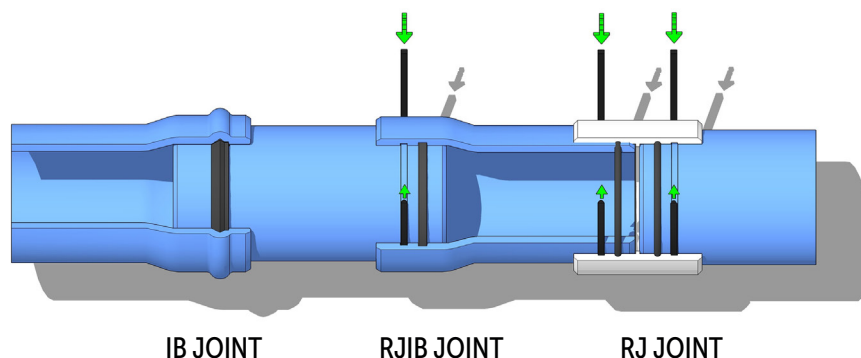
First, the statement fails to distinguish unrestrained pipe joints from fully restrained joints. Certa-Lok pipe joints are engineered to provide bi-lateral restraint against both tensile and compressive forces allowing for uniform bending of the pipe section while limiting the deflection and stress created in the pipe joint. For this reason, the design limiting factor in bending of the pipe is the allowable flexural stress in the pipe wall. What this means is that pipe strings of Certa-Lok pipe segments are capable of bending to equivalent bending radii of fusible PVC pipe.



Longitudinal bending of the pipe barrel requires proper restraint of the pipe joint.  
Certa-Lok® restrained joint pipe systems address these requirements.

## TECHNICAL BULLETIN

## LONGITUDINAL BENDING OF CERTA-LOK® PVC PIPE



A typical unrestrained gasketed PVC joint (left). Certalok/RJIB (Center) and Certalok/RJ (Right)  
PVC pipe joints are bilaterally restrained, allowing for full bending of pipe segments.

Second, the statement fails to address the installation method. In trenchless applications, uniform support of all sizes of pipe is achieved as the pipe contacts the borehole. This uniform support allows for even distribution of the bending force across the length of the pipe. Proper support of the pipe at the entrance pit prior to pullback is easily achieved with pipe segments strung together. See this demonstrated in the photos below.

For open cut installations, the bi-lateral restraint of Certalok joints prevents over deflection by limiting the offset created between the pipe spigot and pipe bell inside of the joint. Certalok products also allow for several pipe segments to be strung together prior to bending. Stringing pipe before bending eliminates the challenges of bending individual segments.

**WHAT THIS MEANS**

The bending referenced in AWWA M23 refers to longitudinal bending of unrestrained elastomeric gasketed pipe in an open cut installation and does not apply to restrained elastomeric gasketed pipe in a trenchless installation. As per our install guide, Westlake Pipe & Fittings recommends that longitudinal bending of the pipe should not be used for pipes larger than 12" in open-cut trench installations. Axial deflection and longitudinally bending are not to be combined with any pipe size in open cut installations.

In a trenchless installation using our Certalok, the gasketed joint is bi-laterally restrained allowing for uniform longitudinal bending of the pipe barrel while limiting deflection at the pipe joint. What this means is the pipe is longitudinally deflected as it follows the bore path and that angular deflection at the PVC pipe joint is negligible and is not a concern for trenchless applications.



Installation of Certalok/RJ via HDD demonstrates the bending capability of a string of Certalok pipe segments while maintaining full integrity of the gasketed joint.

## TECHNICAL BULLETIN

# LONGITUDINAL BENDING OF CERTA-LOK® PVC PIPE

### LEARN MORE

View all of our technical bulletins including “*Gasketed Pipe Testing Requirements*” and “*Changing Directions of PVC Pipelines*” at [www.westlakepipe.com](http://www.westlakepipe.com).

Don't just take our word for it, see it bend for yourself:



This Technical Bulletin is published for general informational purposes only and is not intended to imply that these materials, procedures, or methods, are suitable for any particular job or should be relied on by the user. Materials, procedures, or methods may vary according to the particular circumstances, local building code requirements, design conditions, or statutory and regulatory requirements. While the information in this Technical Bulletin is believed to be accurate and reliable, it is presented without guarantee or responsibility on the part of Westlake Pipe & Fittings. User is solely responsible for usage of any material, procedure, or method contained herein.