

EBAA IRON Connections™

TECHNICAL DATA FOR THE WATER & WASTEWATER PROFESSIONAL

PV - 3

Who Made That Restraint and What are You Doing to My Pipe? or What's The Point?

When the subject of using the 2000PV series to restrain PVC pipe is broached with some people, the conditioned response is **“I can't use that; it point loads the pipe.”** This has been used as a sales tactic by our competition for many years.

The argument has been used that PVC pipe is delicate and can't be subjected to any kind of loading. In our years of testing we have found that is not the case at all. *PVC can take an extreme amount of strain.*

EBAA Iron utilizes individually actuated gripping wedges to assure even and uniform holding of the PVC pipe. Before we introduced the wedge action PVC restraint, conventional thought was that full circumference grip was the only way to hold PVC. Until we learned differently, we thought that, too.

We endeavored to prove out the early wedge style products with a large number of tests. This involved short term, long term, and cyclic pressure tests. These tests gave us the evidence needed to show that wedge style gripping of PVC pipe not only worked but offered some points of advantage.

As the popularity of the product grew, we improved it and reintroduced it as the 2000PV. We continued to test and prove out our restraint products. **Connections™ bulletins PV-1 and PV-2** give more detail on some of these tests that we have done.

Let's Get to the Point

The phrase “POINT LOADING” originally came from PVC pipe bedding standards that cautioned against the bedding of a pipe so that a rock or other object would “load” the pipe at one “point”. This happens to be very

good practice for any piping material.

PVC pipe is very forgiving. ASTM F480 is a PVC well casing specification that requires a Tub Puncture Test where a rounded tup is punched into the casing wall to 30% of the pipe diameter. **Now that is point loading.** To pass the test there must not be any evidence of cracking, rupture, or other visible failure. The PVC compound used in the C-900 and C-905 pipe is equal or superior to that used in well casing pipe.

To take this point a little further... We have performed tests where a rounded tup was pressed into the pipe wall for a deflection of 15%, then subject the pipe to quick burst tests with 2000PVs restraining both ends. The pipes routinely burst above the minimum burst pressure and in locations that were away from either the tup or the 2000PVs. We subjected the same type of setup to cyclical pressure loading. The pipe eventually failed at 44% more cycles than predicted by the Vinson equation.

Therefore, PVC pipe is capable of an extreme amount of deflection.

Pipe Damage?

One “demonstration” of damage to PVC pipe that some people point to is “WHITENING”.

PVC pipe comes in many varieties. In the beginning you had your choice of white, white, or white. Today, there are many pigments available for many different applications. When pigmented pipe is strained, the pigments separate and the color becomes less dense. This result in what has been called “whitening”. *We have found that this can occur at strains of less than one percent.* The presence of whitening, however, does not

indicate damage to PVC.

Strain in the wall of PVC pipe does not indicate failure or ultimately lead to failure of the pipe. A series of tests were performed at Utah State University to try to determine the strain life of PVC pipe. Several sections of pipe wall were taken to different levels of uniform strain. Some of the samples were taken to 50% strain. (Now that will whiten your pipe.) In no case did a sample fail after 24 hours at a given level of strain. Some of the samples had even been notched to try to accelerate any type of failure that might result. Since they had no failed, after a period of four years, most of the samples were evidently discarded.

So even if the pipe has been strained enough to produce whitening, the strain by itself will not result in pipe failure.

[That's Why We Test the Way We Do](#)

Yes, we use wedges to restrain pipe. Yes, there is some pipe wall deflection under each wedge. No, this is not a problem because the wedges were designed specifically for holding the PVC.

Rather than rely on hearsay and innuendo, we have performed tests on pipe with restraint to the same levels required for the pipe alone. It stands to reason that if the pipe passes the various performance tests without the restraint, and then the pipe passes the same performance tests with the restraint, the restraint does not damage the pipe. That is the basic philosophy we use in our testing program.

[Therefore](#)

Testing and years of experience have shown that the 2000PV is a reliable joint restraint system. When some tells you that they think it damages the pipe ask them **“What’s your point?”**

[Learn More About It](#)

“Is PVC Pipe Strain Limited After All These Years?”

Moser, A.P., Shupe, O.K. and Bishop, R.R., Buried Plastic Pipe Technology, ASTM STP 1093, George Buczala and Michael J. Cassady, Eds., American Society for Testing Materials, Philadelphia, PA, 1990.

“Strain as a Design Basis for PVC Pipes?”

Moser, A.P., Proceedings of the International Conference on Underground Plastic Pipe, B. Jay Schrock, Ed., American Society of Civil Engineers, New York, NY, 1981.

“The Testing of Joint Restraint Systems and Localized Load Bearing Attachments on PVC Pipe”

Kennedy, H., and Shumard, D.D., Proceedings of the Society of Plastics Engineers Annual Technical Conference, Brookfield, CT. 1992.

“The 2000PV, A Background and Summary of Tests”

Connections™ Bulletin PV-1, EBAA Iron Sales, Inc., Eastland, TX 1993

“Long Term Burst Strength of PVC Pipe and the 2000PV”

Connections™ Bulletin PV-2, EBAA Iron Sales, Inc., Eastland, TX 1993



This is one in a series of Connections reports addressing design and application subjects. If you would like additional copies of other reports or a listing of available reports contact your EBAA Iron representative or call EBAA Iron Sales at 800.433.1716 or fax 254.629.8931. EBAA's engineering group can be reached at 800.633.9190 or fax 254.629.2079. Copyright© 1995 Ebaa Iron Sales, Inc.

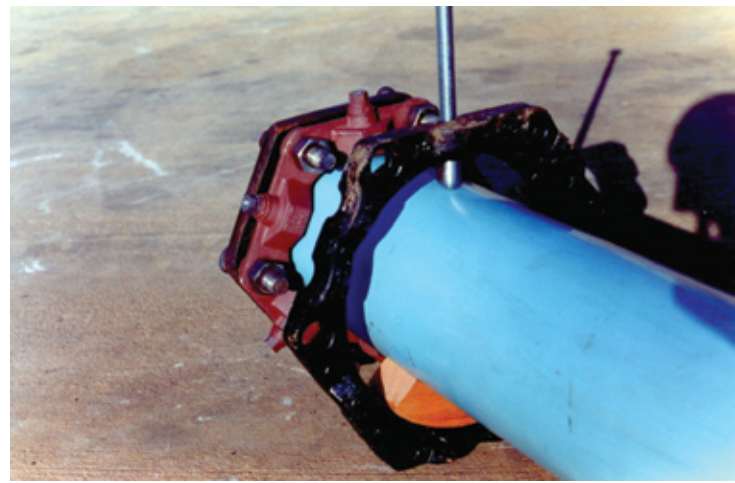
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6 inch DR18 PVC Pipe and 1/2 inch Tup Before Penetration

Photograph 1



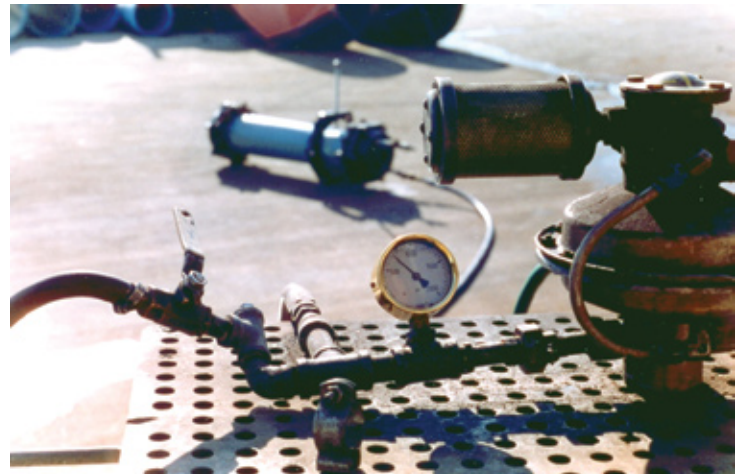
Assembled Pipe and Tup

Photograph 2



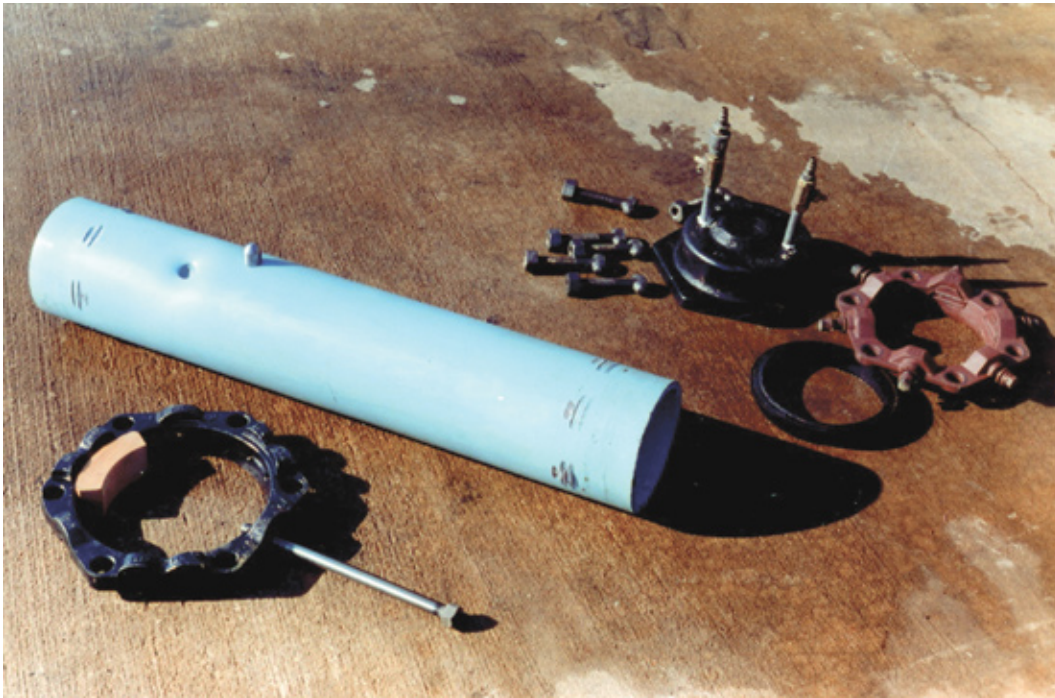
1.5 inch Penetration of Tup into 6.90 inch Diameter Pipe Wall, 0.38 inch Thick, 70° Ambient Temperature

Photograph 3



Pressure to 750 PSI

Photograph 2



After Completion of Test and Removal of the Tup

Photograph 5



Close Up of Tup Impression on the ID of the Pipe

Photograph 6