



# THE PIPELINE

## IRONCLAD FACTS FROM DIPRA

### **A Second Look at: Water Main Break Rates in the USA and Canada by Utah State University professor, Steven Folkman • April 2012**

*The study, funded in part by Uni-Bell PVC Pipe Association, is presented as an analysis of responses to a survey of “188 utilities representing approximately 10 percent of the nation’s installed water main pipe network.” Of those 188 respondents, 47 also completed a more “detailed” survey.*

#### **Limitations of the study and its conclusions:**

- The survey specifically excluded the reporting of failures due to joint leakage, construction damage, and tapping of service lines, three failure modes that are often reported to be primary problems for PVC pipe. In fact, strength and tapping difficulties were among the most commonly cited reasons for a utility to exclude PVC pipe from their systems.
  - The report also states that the greatest percentage of PVC pipe failures occur in the first 20 years of service life, and that over 40% of the failures occur in the first year. According to the study “(o)ften the cause of these failures in PVC pipe is related to improper installation practices and not a defect in the pipe.” In fact, these initial failures are undoubtedly often due to tapping issues or installation problems associated with over-stabbing of joints—two failure phenomena that were specifically excluded from the report.
  - The study could not correlate corrosion protection methods to failure rates, citing limited records; therefore, protected pipe that would not be suffering from higher failure rates was lumped in with unprotected pipe that may be experiencing higher, but avoidable, failure rates. As the study states: “(t)he results reported represent generic pipe material behavior *but may not represent a specific product material on the market today*” (emphasis added).
- “The study specifically excludes certain failure data that would be predominately linked to PVC pipe, including tapping failures, joint leaks, and construction damage.”**
- Further, in the data shown in Figure 22 (page 20), 27.9% of ductile iron failures are reported as circumferential cracks. Ductile iron pipe does not—and cannot—fail in this manner; these failures are undoubtedly misreported cast iron pipe failures.
  - While the study asserts more than once that PVC pipe can be expected to last in excess of 100 years (Burn, 2006), there is no substantive foundation for this statement. In fact, according to Burn, the source is attributed to Uni-Bell (2001). In other words, the Utah State report was funded by Uni-Bell and cited Burn who used Uni-Bell as a source.
  - The fact is that PVC pipe fails under stress, and there is no way to measure the stress that a particular PVC pipe is under at an unspecified time or circumstance. Regardless, one thing we do know is that the higher the stress, the sooner the pipe will fail.
  - Most failures of water mains occurred as circular cracks, which is the primary failure mode for cast iron pipe—a material no longer sold and one which has been replaced by stronger ductile iron pipe, a material that does not fail in this manner.

**continued ►**

- The most common failure mode for ductile iron pipe is due to corrosion, which can be prevented (as noted in the AWWA report, “Buried No Longer”) by using “evolved” construction practices such as polyethylene encasement in aggressive soils.
- The most common failure mode for PVC pipe was reported to be longitudinal cracks. This is a major problem as a mode of failure and causes significant repair efforts. In those situations, entire sections of pipe must be removed and replaced.
- While ductile iron failure rates are calculated to be almost double those of PVC pipe, both rates are small and misleading (4.9/100 miles/year for ductile; 2.6/100 miles/year for PVC). These numbers do not factor in the use of corrosion control methods that would lower the rate for protected ductile iron pipe, and they specifically exclude failures attributable to tapping and installation damage (which would increase the numbers for PVC). Moreover, the ductile numbers also include reports of circumferential breaks, which do not even occur in ductile iron pipe.

### **The bottom line: There are three considerable criticisms of the results of the report:**

- The largest single subset of data that is missing from the report refers to the performance of ductile iron pipe that has been provided with corrosion control. Failure rates for ductile iron pipe are low; and if protected pipe could be evaluated separately from unprotected pipe, those comparisons would necessarily drop the failure rates for ductile iron to lower levels. The AWWA report “Buried No Longer,” does just that and projects a service life in excess of 100 years for ductile iron pipelines that were designed and installed with corrosion control in mind. The AWWA report also analyzed break data and reported projected service lives for PVC pipe as low as 55 years in some service areas.
- The study specifically excludes certain failure data that would be predominately linked to PVC pipe, including tapping failures, joint leaks, and construction damage. Tapping problems have long been significant issues for PVC pipe, even causing injuries to workers. Leaks resulting from over-stabbing PVC pipe joints are more recently reported as a common occurrence, and the strength of iron pipe has often been promoted as an advantage when iron is exposed for unrelated construction work. In fact, regarding joint leaks and referencing Burn, 2006 (as was done in this report to assert a 100 year service life for PVC pipe), the experience in the UK for PVC pipe failures indicated “...20% of recorded failures are described as ‘joint’ which probably corresponds to leaking joints...”
- Another critical observation is that the number of failures of ductile iron pipe is over-reported, since 27.9% is attributed to circumferential cracks—a failure mode that is not found in ductile iron. If this is the case, then the 4.9 failures/100 miles/year for ductile iron shown in Figure 15 would be reduced to 3.5 failures/100 miles/year. If the ductile iron pipe that has been protected from corrosion was analyzed separately, the failure rates for ductile iron would undoubtedly be lower than for PVC—even excluding the most common failure mechanisms for PVC pipe.
- We are not criticizing Utah State’s work in preparing this report but it is important to understand the limitations of these results. This report tells us some things, but it leaves out others. Once all the facts are known, ductile iron pipe remains the best choice for water utilities. Just as previous generations have benefited from cast iron pipe, our children will benefit from the reliable, outstanding service of ductile iron pipe.

**For details about the benefits of ductile iron pipe or the  
Ductile Iron Pipe Research Association visit**

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