

# PVC PIPE ASSOCIATION ISSUE BRIEF

## PIPE PERFORMANCE MATTERS: PVC PIPE LONGEVITY REPORT

A comprehensive study on PVC pipe excavations, testing and life cycle analysis; Utah State University, Buried Structures Laboratory, by Steve Folkman, Ph.D., P.E., May 2014.

### MAJOR FINDINGS

**The comprehensive nature of this study has provided several national recommendations and rules of thumb which utilities can use for benchmarking and procurement purposes.**

1. Dig-up test results in the U.S. and around the world indicate that PVC pipe can be expected to provide reliable service in excess of 100 years.
2. The average water main is failing at 47 years. Corrosion is the major cause.
3. Utilities using non-corrodible pipe materials are able to reduce the number of water main breaks.
4. Many utilities still have the ability to reduce water main breaks and to reduce O&M costs by utilizing non-corrodible pipes in their replacement and procurement strategies.
5. Internationally, PVC dig-up reports support the previous findings of PVC having the lowest water main break-rate.
6. Improved installation and inspection practices have been shown to contribute to lower failure rates and increased pipe longevity and affordability.
7. Dig-up studies on PVC pipe materials around the world report no degradation after decades of operational service.
8. Recently excavated PVC pipes, some nearly 50 years old, were tested by Utah State University and met all applicable standards. They are expected to easily exceed 100 years of service life.
9. PVC pipes offer a high degree of resilience in freezing conditions and after 25 years meet virtually all new pipe requirements.
10. PVC pressure pipes exhumed after being in operation for almost 30 years have not suffered any loss of strength. All tested PVC pipes would be expected to exceed a 100 year life under normal operating conditions.
11. After over 35 years of operation, PVC pipes have virtually no change in mechanical properties due to aging. Both ductility and resistance to internal pressure are still on the same level as new pipes.
12. Based on stress regression, slow crack growth and fatigue testing, the service life of PVC pressure pipe should exceed 100 years.
13. The Water Research Foundation reported that 100 years is a conservative estimate for a properly designed and installed PVC pipe.
14. Life cycle costing provides a basis to financially evaluate pipe selection over a 100 year period.
15. Including the realistic costs of corrosion control mitigation\* for ductile iron (DI) pipes over the 100 year period for all pipe sizes is critical in developing a comparable evaluation of PVC pipe costs and DI pipe costs.

*\* Corrosion mitigation methods approved by the National Association of Corrosion Engineers.*