

PVC PIPE ASSOCIATION

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FOR IMMEDIATE RELEASE

June 20, 2017

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Study Examines Environmental Impacts, Safety and Costs of Nation's Drinking Water Pipes

DALLAS — The Uni-Bell PVC Pipe Association (PVCPA), which represents U.S. and Canadian manufacturers of PVC pipe, announced the completion of the first comprehensive environmental and performance review of water and sewer pipes in North America. The study used life cycle assessment methodology to evaluate the cradle-to-grave sustainability of commonly used drinking water and sewer pipe materials, including polyvinylchloride (PVC), concrete, ductile iron, and high density polyethylene pipes over a 100-year service period.

Sustainable Solutions Corporation (SSC), a sustainability consulting firm, was hired by PVCPA to conduct the study. SSC's engineers used the ISO 14040 series life cycle assessment (LCA) standards from the International Organization for Standardization (ISO) to evaluate PVC pipe's environmental footprint. The peer-reviewed report also examines other pipe products based on durability, performance and environmental data and statistics when available.

"The PVC pipe industry is the only pipe material that has transparently reported their sustainability and environmental impacts," said SSC President Tad Radzinski. "This is welcome information for both policy makers and utility professionals to make fully informed decisions in their efforts to improve underground infrastructure with sustainable products."

The report contains a robust set of data utility officials and engineers can use for their asset management plans and life cycle cost assessments for water and sewer piping. The 100-year LCA methodology also helps utilities assess and minimize water quality risks, as well as reduce operations, maintenance and repair costs. More than 200 sources and studies were examined to provide the most up-to-date and thorough industry review of the health, safety, performance characteristics, and sustainability attributes of the different pipe materials available.

"This study provides critical information for federal, state and local policy makers as they look to modern piping materials to help rebuild the nation's crumbling underground infrastructure. Clean water was identified as a high priority by President Trump and this report confirms that safer, more cost-effective and more durable PVC pipe is key to upgrading America's drinking water and wastewater systems," said PVCPA Executive Director Bruce Hollands.

Some of the key findings from the study include:

- When evaluating the sustainability of piping products for life cycle design, it is important to understand and review the life cycle impacts of all materials used in the piping system, including replacements, support materials, corrosion mitigation, maintenance efforts and water quality treatments required during the service life of pipes.
- Based on more than 60 years of field experience, dig ups, laboratory testing, and given its immunity to corrosion and low break rate, a service life in excess of 100 years was confirmed for PVC pipe.
- PVC does not serve as nutrient for bacterial growth and pathogens.

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- Keeping pipes in use past their useful service lives results in higher operating and maintenance costs. Internal pipe wall degradation may begin almost immediately after ductile iron and concrete pipes are installed.
- Traditional definitions of pipe service life should be re-evaluated. For much of the time that iron and concrete pipes are considered "in service," they in fact are not, since they often do not perform as designed. For a good portion of the time they are in use, iron and concrete pipes are prone to breaks, water loss and water quality issues, as well as higher maintenance and operating costs due to corrosion, which significantly affects pumping efficiency.
- PVC pipe is a low initial cost option and provides long-term savings because of its superior pumping efficiency, corrosion resistance and longevity.
- Metallic and concrete pipes require chemical additives (phosphates) in the drinking water to help reduce pipe wall corrosion. Phosphates increase the chances of bio-growth (such as algae blooms) in drinking water sources, lakes and rivers.
- Ductile iron pipe produces up to nine times more carbon emissions during raw materials processing, manufacturing, transportation and installation than equivalent PVC pipe.
- 66% of water supply pipes in the U.S. are 8-inches or smaller. Nationally, using PVC instead of ductile iron pipe in this size range could save \$21 billion in pumping costs over 100 years. If PVC were used instead of HDPE pipe, \$37 billion could be saved.
- Water and wastewater utilities often represent as much as 40% of a municipality's total energy consumption. The energy required to pump water through a pressurized pipe system over the life of the pipe is a significant source of potential environmental impacts.
- The energy required to pump water through PVC pipe over a 100-year design life remains constant because its smooth walls do not roughen over time. This generates overall life cycle cost savings compared to ductile iron and concrete pipes that require more pumping energy over time due to corrosion, leaks and internal degradation.
- Corrosive soils affect 75% of water utilities. The durability and corrosion resistance of a pipe greatly affects life cycle impacts. Ductile iron pipe may last as little as 11-14 years in moderately corrosive soils, requiring numerous replacements over 100 years.
- For equivalent 8-inch pipes, it takes up to 54% more energy to pump water through ductile iron (DI) pipes than through PVC pipes, and 100% more energy to pump water through polyethylene (HDPE) pipes than PVC pipes.
- Of the competing pipe materials, including iron, concrete, and HDPE pipes, PVC pipe is the most favorable alternative when considering the products' energy consumption and carbon footprint from cradle-to-grave in a public water system.
- Recycled material is only a single attribute of a pipe's life cycle environmental impacts. For example, more energy is required to process the recycled metals to manufacture ductile iron pipe than in PVC pipe production. As well, producing iron pipe with recycled scrap iron emits more toxins than pipe made from virgin iron ore.

To view the report, including the full set of key findings and its methodology, [click here](#).

“The federal government is committed to spending \$1 trillion to upgrade the nation's infrastructure, yet it's estimated that \$2 trillion is needed for new water and sewer pipes alone,” said Hollands. “Since PVC pipe can be up to 70 % less expensive than iron pipe, lasts longer with greater pumping efficiency, it's the best choice to replace America's drinking water systems.”

The *Life Cycle Assessment of PVC Water and Sewer Pipe and Comparative Sustainability Analysis of Pipe Materials* report also makes reference to the *2015 Environmental Product Declaration (EPD) for PVC Pipe*, which complies with ISO 14025 standards and was independently certified by global health organization NSF International.

“This study shows that PVC pipe is the safest pipe material available. Water utilities aren't sacrificing safety, longevity, or system performance when they choose PVC pipe—in fact, they are getting the biggest bang for their buck when they do,” said Hollands.

Based on the results of this study, PVC pipe provides a competitive environmental and economic advantage for its use in a variety of water and sewer infrastructure projects, including life cycle cost advantages and the opportunity to substantially reduce GHGs compared to other materials. PVC pipe addresses affordability concerns and enables communities to work towards meeting their sustainable infrastructure goals because of its durability, low break rate, corrosion resistance and long-lasting performance.

The Uni-Bell PVC Pipe Association (www.uni-bell.org) is a non-profit organization that serves the engineering, regulatory, public health and standardization communities. The PVC pipe represented in the study is manufactured in the U.S. and Canada for drinking water, sanitary sewer, and storm sewer piping covering the 4" to 60" rigid PVC pipe market, uses a tin-based stabilizer, and does not contain phthalates, lead, or cadmium. PVC pipe producers contribute in excess of \$14 billion to the U.S. economy and support over 25,000 jobs.