STEALTH REDUCTIONS IN PLASTIC PIPE THICKNESS, AND OTHER CONSIDERATIONS

Engineers reading market studies on the performance of plastic pipe should be aware that the pipe provided in accordance with today's AWWA standards will likely be notably thinner than the pipe on which performance studies have been based. Hence, the future reliability of new installations of these plastic pipes will likely not achieve that of their older in-ground predecessors unless engineers require the old design procedures.

In 2007, the PVC standard C900 was revised to reduce the safety factor and eliminate the built-in surge allowance. This change in the design approach results in a 33% reduction in wall thickness required for a given working pressure rating. In a somewhat similar fashion, the AWWA HDPE standard C906 included a 21% reduction in the safety factor calculations allowed in the 2015 edition, which leads directly to a 21% reduction in wall thickness for a given working pressure rating.

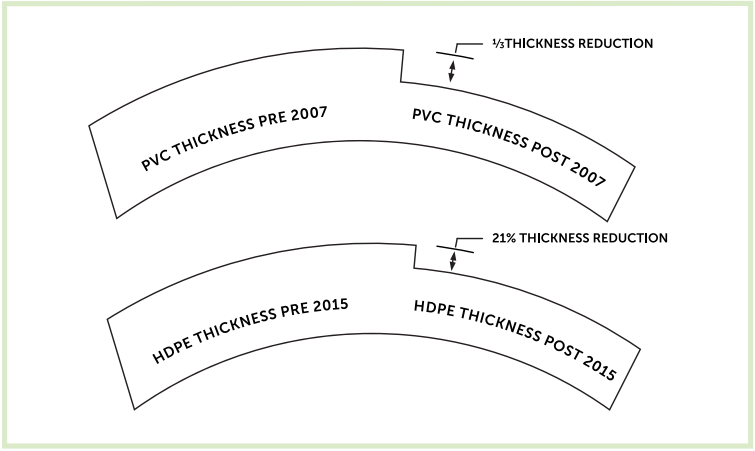

Illustration of thickness reductions allowed by AWWA standards for plastic pipe.

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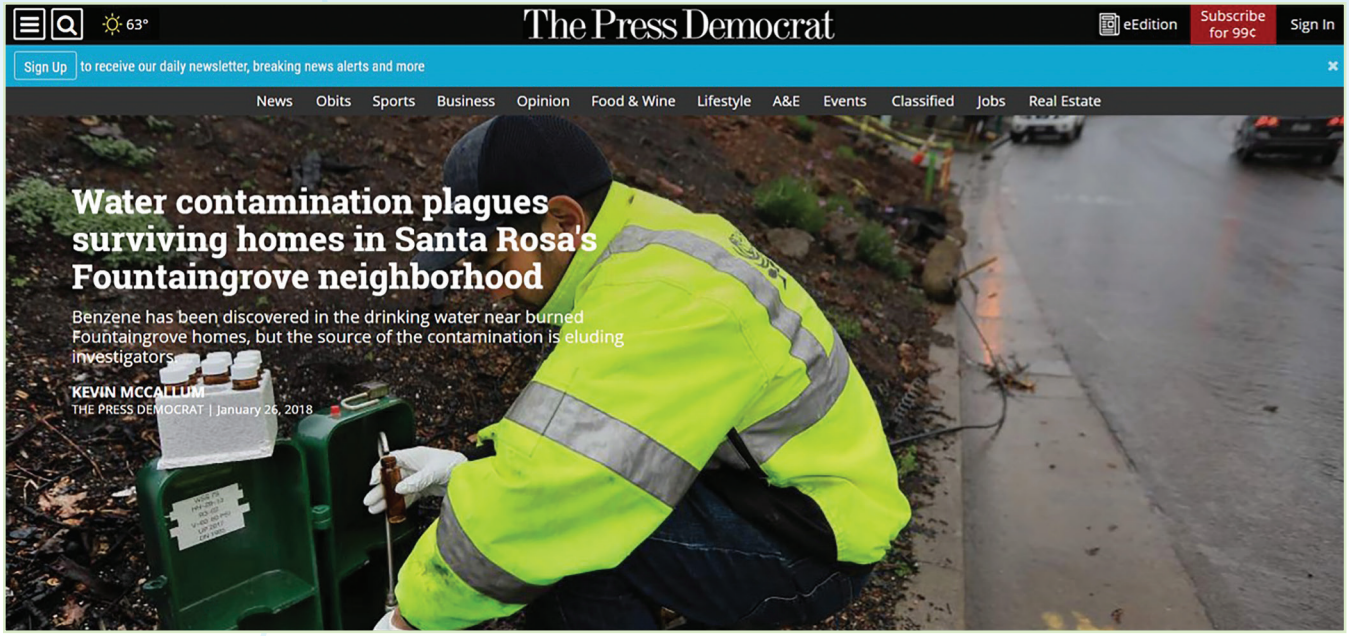

The reductions in wall thickness also mean the pipe will expand and contract more as the pipe responds to cyclic changes in working pressure and surges. The expansion/contraction cycle is not only effective circumferentially, but also longitudinally due to the Poisson effect. The pipe will move relative to its backfill materials, expanding the probability of eventual wall damage from scraping against rock backfill.

Any thinner designs will only exacerbate the issues associated with getting a flexible pipe successfully enveloped with sufficient structural support from the bedding and sidefill. This is made much more difficult when pipe is laid in a trench box, since any consolidation of sidefill materials is disturbed each time the box is moved forward. Hence, re-consolidation of the sidefill materials either must be performed by workers inside a trench box while it is being moved, or working outside the trench box after it is moved, or – more likely – the reconsolidation is not accomplished.

To assure flexible pipe has sufficient support under the haunches of the pipe after installation and backfilling, the ovality of the pipe must be checked along with the overall vertical deflection. Because soil consolidation continues over time, the final installation condition will not be indicated for months.

Another aspect of use of plastic pipe that is often overlooked is the potential loss of water flow and chemical contamination due to pipe damage from wildfires. Often thought to be simply a "western" or "forest" issue, wildfires actually occur in states from coast to coast. In recent fires, melting or burning of the pipe material resulted in no water for fighting the fire, and later observation of multiple hazardous chemicals in the repaired water system.[1]

A burning HDPE culvert under Santa Barbara California Highway 101 in 2015.

Typically, more than 90% of the strength of a flexible pipe's pipe-soil structure is installed in field conditions with varying materials by a low-bid contractor who may or may not exercise careful installation and quality control techniques. Thorough inspection for these installations is critical but by the very nature of field work is provided under less than ideal conditions.

Engineers and utilities can avoid all these risks by selecting concrete pressure pipe for their new construction. Concrete pressure pipe has far higher temperature resistance than plastic pipe and will not release hazardous chemicals into the water nor allow them to permeate through the pipe wall where pipelines are installed through unexpectedly polluted soil. Concrete pressure pipe has the robustness to withstand the energy required to properly compact beddings and sidefill, even when bedding and backfilling with native material. With rigid concrete pressure pipe, more than 90% of the strength of the pipe-soil structure is provided by the pipe. The pipe is manufactured and quality-checked in the factory within a controlled environment. Quality assurance and control procedures are also verified annually for each ACPPA-member factory producing concrete pressure pipe.

CONCLUSION

Utilities are often required in their bylaws to reduce risk to the customers. Use of rigid and reliable concrete pressure pipe takes more than 90% of the risk of the pipe/soil structure out of the hands of the low-bid contractor, giving owners more peace of mind.

[1]McCallum, Kevin, "Water contamination plagues surviving homes in Santa Rosa's Fountaingrove neighborhood", The Press Democrat, (Santa Rosa, CA, January 26, 2018).

LEARN MORE

For more information about the advantages of using Concrete Pressure Pipe for your major water lines, speak with your Concrete Pressure Pipe supplier, or contact the American Concrete Pressure Pipe Association at **714.801.0298** or **www.acppa.org.**

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