

WATER PIPE SAFETY-FACTOR REDUCTION: A RISKY PROPOSAL FROM THE HDPE INDUSTRY

Conservative pipe-design safety factors have been the cornerstone of North America's high performance water systems. Use of conservative safety factors (or conservative design factors) help to offset unavoidable variations in pipe manufacturing, handling, installation, and operation. The consistent practice among water utilities that use AWWA's water transmission and distribution pipe standards has been to require a safety factor (SF) ≥ 2.0 [an equivalent design factor (DF) ≤ 0.50] for pipe manufactured to the following standards:

- Asbestos cement (AWWA C296)
- Ductile iron (AWWA C150)
- HDPE (AWWA C906)
- PVC (AWWA C900 and C905)
- PVCO (AWWA C909)
- Steel (AWWA C200)

To gain competitive advantage, some HDPE pipe manufacturers have proposed a risky change in AWWA C906 that moves away from the traditional use of a SF = 2.0 (DF = 0.50). The manufacturers are presenting this change as an increased design factor with no change to the safety factor. However, increasing the design factor effectively decreases the actual safety factor being applied.

NO INCREASE IN MATERIAL'S PRESSURE CAPACITY

The latest draft of the AWWA C906 standard reduces the SF from 2.0 to 1.6 (a 26% increase in the DF from 0.50 to 0.63) for two new HDPE compounds: PE 3710 and PE 4710. However, this change is based on material properties unrelated to pressure ratings. The new HDPE compounds may have improved crack resistance, but their required minimum burst strength (tensile strength = 2,900 psi) and HDB category (long-term stress capacity = 1,600 psi) are no better than those for HDPE compounds currently in AWWA C906.

Over long periods of time, certain HDPE pipe-grade compounds can develop microscopic cracks which can grow and cause premature failure. While new more crack-resistant HDPE pipe compounds can mitigate this problem, there is no valid scientific basis for allowing these new compounds to be pressure-rated using a DF that is 26% higher than those used with AWWA's other standardized water distribution and transmission pipe materials.

PIPE MATERIAL WITH SHORTEST PERFORMANCE RECORD WILL HAVE LOWEST SAFETY FACTOR

By raising the DF from 0.50 to 0.63, the C906 revision would lower the current safety factor from 2.0 to 1.6 – allowing the lowest tensile-strength pipe material, which also has the shortest in-service performance record, to be rated using the lowest safety factor. This will increase the risk of pipe failure, shorten the pipe's design life, and set a precedent for competing pipe materials to seek lower safety factors.

The Uni-Bell PVC Pipe Association opposes lowering the safety factor (or raising the design factor) for any pipe material, particularly for new HDPE compounds for which there are no independent evaluations of in-service performance risk. We encourage water utilities and professional engineers to remain consistent in requiring all pipe materials be designed and pressure-rated using a minimum SF of 2.0 or a maximum DF of 0.50.