

PVC PIPE ASSOCIATION TECHNICAL BRIEF

AN ENGINEERING PRIMER ON AWWA C900/C905 PVC PIPE

Utility and consulting engineers sometimes have questions about the adequacy of PVC pressure pipes manufactured to the American Water Works Association (AWWA) Standards C900 (4- through 12-inch) and C905 (14- through 48-inch). Listed below are facts that should leave no doubt regarding the suitability of PVC pipe for municipal water-pipe projects.

Long-Term Pressure Capacity: The AWWA C900/C905 standards define the Pressure Class (PC) as “the design capacity to resist working pressure up to 73°F sustained operating temperature.” Thus, the Pressure Class is the PVC pipe’s long-term pressure capacity.

Short-Term Pressure Capacity: The AWWA standards define Occasional Surge Pressure as “surge pressures caused by emergency operations, usually as the result of a malfunction.” These occasional surge pressures plus the pipe’s working pressure must not exceed the pipe’s short-term rating, which is 1.6 x Pressure Class.

Cyclic Surge Pressures: The standards also provide a design method for cyclic surge. The method requires calculation of the average stress and the stress amplitude generated by cyclic surges. From these two values, a cyclic life is determined from a chart of cyclic design curves found in each standard.

Pressure Testing: AWWA C900/C905 standards require that every piece of pipe be hydrostatically proof-tested. In addition, periodic quality-control burst-pressure testing is performed. The table below shows the pressures for each test for the DRs found in the C900 standard.

Product	Pressure Class (psi)	Each-Piece Hydrostatic Test (psi)	Burst-Pressure Test (psi)
DR25	165	330	535
DR18	235	470	755
DR14	305	610	985

AWWA Safety Factors: The C900/C905 standards use a safety factor of 2 to calculate pressure capacities:

- Long-term capacity – the Pressure Class is determined by dividing the long-term pressure strength by 2.
- Short-term capacity – the short-term rating is determined by dividing the burst pressure by 2.

Note that this safety factor of 2 is intended to cover items such as variations in materials, manufacturing, handling, installation, and operations, as well as to be a cushion against unforeseen circumstances.

Water System Safety Factors: A recent study by Folkman found that the average operating pressure in municipal systems is 77 psi. This means that in an average system, safety factors for long-term operating pressure would be:

DR25 Pipe	DR18 pipe	DR14 Pipe
4.3	6.1	7.9

PVC – the Best Pipe for Most Applications

AWWA C900/C905 pipe is often the most cost-effective, trouble-free option for a pipeline project. The specifier of PVC pipe can rely on the material’s inherent advantages supported by demanding product standards and rigorous quality testing.

References: AWWA C900 standard “Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in., for Water Transmission and Distribution” (2007); AWWA C905 standard “Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. Through 48 in.” (2010); *Handbook of PVC Pipe*, Uni-Bell (2013); “Water Main Break Rates in the USA and Canada: A Comprehensive Study,” Folkman, S. (2012)

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