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## TECHNICAL BULLETIN

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### Valve Standards and Seat Leakage Rates

This technical bulletin discusses some issues related to valve leakage and the specifications that define acceptable leakage for a new valve tested at the factory. It also touches on common language and how that relates to these specifications.

Bronze and iron commercial valves generally follow the production testing listed in the design specification to which the valve is made. Most industrial valves typically adhere to the testing standard API 598 – Valve Inspection and Testing. API 598 is the industrial valve seat leakage baseline and covers all valve types, both metal and soft seated.

Specifications such as API 598 that govern leakage for resilient seated valves call for '0' bubbles of air or '0' drops of water under the specified test conditions over the minimum test duration. These valves are therefore sometimes referred to as 'zero leakage' valves. In reality, there is no such thing as 'zero' leakage, because microscopic amounts of media may indeed cross the seat boundary, especially if helium or hydrogen or other small molecule gases are used. Another common term for soft seated valves is 'bubble tight'.

Milwaukee Valve High Performance butterfly valves and industrial flanged ball valves are tested in accordance with API 598. Milwaukee Valve performs the high-pressure closure test on the HPBV, which is 110% of the design pressure, held to the minimum time duration in that standard. The ball valves are typically tested to low-pressure closure, which is 60-100 psig, for the same hold times. Resilient seated valves tested to this standard are allowed no visible leakage of air or water. The term "no visible leakage" is defined as a leak rate that will produce no visible weeping or formation of drops at the test pressure and for the duration of the test. The same criteria applies to MSS SP-110 resilient seated ball valves and SP-67 rubber lined butterfly valves.

Metal seated valves will typically have some level of acceptable leakage when tested. This is defined in the industry standard as a maximum acceptable amount of liquid, under test conditions, and over the duration of the test. Liquid can be easier to measure, however, gas can be an alternate test media in lieu of a hydrostatic test. Maximum permissible leakage rates for bronze and iron metal seated valves are summarized on the following page per the corresponding MSS standard.

Note: 1 mL is equivalent to 16 drops of water. A maximum rate of 10 mL/hr equates to no more than 2.6 drops/minute past the seat. A maximum rate of 40 mL/hr would be no more than 10.6 drops/minute.

**MSS SP-70 Cast Iron Gate Valves**

All sizes 10 mL of water per hour per inch of diameter of nominal valve size

**MSS SP-71 Cast Iron Swing Check Valves**

All sizes 40 mL of water per hour per inch of diameter of nominal valve size

**MSS SP-85 Cast Iron Globe Valves**

All sizes 10 mL of water per hour per inch of diameter of nominal valve size

**MSS SP-80 Bronze Gate and Globe Valves**

NPS <1" 10 mL of water per hour

NPS ≥1" 10 mL of water per hour per inch of diameter of nominal valve size

**MSS SP-80 Bronze Check Valves**

NPS <1" 40 mL of water per hour

NPS ≥1" 40 mL of water per hour per inch of diameter of nominal valve size

**MSS SP-125 Gray Iron and Ductile Iron In-line, Spring Loaded, Center-Guided Check Valves**

All sizes 30 mL of water per hour per inch of diameter of nominal valve size

Similarly, Milwaukee Valve Cast Steel products are metal seated and tested at the factory per the maximum allowable rates defined in API 598 as summarized below:

**API 598 for Cast Steel Gate and Globe Valves**

NPS ≤2" 0 drops of water per minute (no visible leakage)

NPS >2" 2 drops of water per minute per inch of diameter of nominal valve size

**API 598 for Cast Steel Check Valves**

NPS ≤2" 6 mL of water per minute

NPS >2" 3 mL of water per minute per inch of diameter of nominal valve size

Please consult the factory with further questions or for additional information.