

WaterSense Performance Overview: *Flushometer-Valve Water Closets*

Equal or superior product performance is a pillar of the WaterSense label. Ensuring performance is vital for maintaining program integrity and consumer confidence in WaterSense labeled products. As part of specification development, the U.S. Environmental Protection Agency (EPA) also evaluates whether high-efficiency products will have other environmental or economic impacts. This includes whether there will be unintended or negative impacts to overall system performance, which may affect user satisfaction and health and safety. This Performance Overview details EPA's process for developing performance test methods and criteria for flushometer-valve toilets. In general, as part of the [specification development process](#), EPA involves many WaterSense stakeholders, including manufacturers, certifying bodies and testing laboratories, standard development organizations, trade organizations, water and energy utilities, and other water efficiency experts and advocates. Each of these stakeholders offers a unique perspective and has dedicated technical expertise and other resources that have contributed to the development of performance criteria used to ensure WaterSense labeled products perform as well or better than standard products on the market.



EPA released the [WaterSense Specification for Flushometer-Valve Water Closets](#) and associated supporting statement on December 17, 2015.¹

Summary of Performance Requirements

Table 1 summarizes the performance requirements included in the *WaterSense Specification for Flushometer-Valve Water Closets*, either directly or by reference to an applicable national standard. Table 1 also describes the purpose of each performance requirement, the applicable standard the WaterSense specification references, and any specific requirements or deviations from the referenced standard. Unless noted, WaterSense labeled flushometer-valve toilets must meet the specific performance requirements outlined in the applicable referenced standard.

¹ More information on EPA's rationale for establishing its efficiency and performance criteria for flushometer-valve toilets can be found in the supporting statement, response to comments, and other background documents found at www.epa.gov/watersense/product-background-materials.

Table 1. Summary of Performance Criteria Included in the *WaterSense Specification for Flushometer-Valve Water Closets*

Performance Requirement	Purpose	Referenced Standard (if applicable)	Applies to Conventional Models	Applies to WaterSense Labeled Models
Granule and ball	Assesses a toilet's ability to flush media of different sizes and density (i.e., floating versus sinking media).	ASME A112.19.2/ CSA B45.1 <i>Ceramic Plumbing Fixtures</i>	✓	✓
Surface wash	Evaluates a toilet's ability to clean the surface of the bowl.	ASME A112.19.2/ CSA B45.1 <i>Ceramic Plumbing Fixtures</i>	✓	✓
Drainline transport characterization	Assesses a toilet's ability to transport waste media through a drainline.	ASME A112.19.2/ CSA B45.1 <i>Ceramic Plumbing Fixtures</i>	✓	✓
Waste extraction	Determines a toilet's ability to clear soybean paste test media and toilet paper (meant to be representative of human waste) from the bowl.	ASME A112.19.2/ CSA B45.1 <i>Ceramic Plumbing Fixtures</i> The specification explicitly requires successful clearance of 350 grams of soybean paste test media and four balls of toilet paper in four of five flushes.	✓	✓
Flushometer valve life cycle test	Tests whether flushometer valves continue to function as intended after 250,000 cycles.	American Society of Sanitary Engineering (ASSE) 1037/ASME A112.1037/CSA B125.37 <i>Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures</i>	✓	✓
Minimum flush volume	Ensures adequate flush volume is provided to assist in drainline carry of solid waste.	The rated flush volume for the flushometer valve or water closet fixture shall not be less than 1.0 gallons per flush (gpf).		✓
Non-hold-open design	Ensures flush valve does not exceed the rated flush volume when the primary actuator is maintained in the flush position.	No referenced standard.		✓

Performance Requirement	Purpose	Referenced Standard (if applicable)	Applies to Conventional Models	Applies to WaterSense Labeled Models
Adjustability limit	Ensures flush valve does not contain an adjustment that allows the flush volume to vary more than 10 percent of its rated flush volume.	No referenced standard.		✓

Development of Performance Requirements

Because flushometer-valve toilets are expected to perform similarly to tank-type toilets, WaterSense used criteria from the [WaterSense Specification for Tank-Type Toilets](#) as the basis for its specification criteria for flushometer-valve toilets. However, concerns over drainline transport for high-efficiency models persisted, namely because flushometer-valve toilets are typically installed in commercial buildings, where sewer drainlines are potentially required to transport waste over longer distances.

To better understand the impact of flush volume on the performance of drainlines, EPA reviewed two phases of a drainline carry study completed by the Plumbing Efficiency Research Coalition (PERC), a collaborative network of six plumbing stakeholders.² Phase 1 of the study was completed in November 2012³ and was later followed by Phase 2.0 and Phase 2.1, completed in September 2015 and March 2016, respectively.⁴ The PERC studies evaluated the influence of flush volume and other conditions (e.g., drainline slope, drainline diameter, toilet paper selection) on drainline performance. The studies found that drainline blockages are not of significant concern at flush volumes of 1.28 gpf. However, Phase 2.0 of the PERC study did indicate that drainline performance becomes chaotic and can result in drainline blockages or performance issues at flush volumes of less than 1.0 gpf.⁵ PERC, therefore, does not recommend toilets of less than 1.0 gpf be installed in commercial applications that have long horizontal drains and that do not provide additional flows from other sources (e.g., faucets, showerheads) to assist with the drainline transport of solid waste. As a result of this recommendation, EPA instituted a minimum flush volume of 1.0 gpf, which is applicable to all modes of flushometer-valve toilets, including the reduced flush of a dual-flush flushometer-valve

² The six stakeholder groups that comprise PERC include the Alliance for Water Efficiency (AWE), International Association of Plumbing and Mechanical Officials (IAPMO), International Code Council (ICC), Plumbing-Heating-Cooling Contractors (PHCC) Association, American Society of Plumbing Engineers (ASPE), and Plumbing Manufacturers International (PMI).

³ PERC, 2012. *The Drainline Transport of Solid Waste in Buildings*. November 2012. www.plumbingefficiencyresearchcoalition.org/wp-content/uploads/2012/12/Drainline-Transport-Study-PhaseOne.pdf.

⁴ PERC, 2016. *The Drainline Transport of Solid Waste in Buildings – Phase 2.0 Includes Supplemental Report on PERC Phase 2.1*. March 2016. www.plumbingefficiencyresearchcoalition.org/wp-content/uploads/2016/04/PERC-2-0-2-1-FINAL.pdf.

⁵ The PERC study explicitly mentions that these recommendations do not apply to toilets installed in residential applications. Drains within residential homes and buildings are typically much shorter and provide supplemental sewer flows, such as from showers and clothes washers, to assist the transport of solid waste through the drainlines. EPA, therefore, chose not to revisit the *WaterSense Specification for Tank-Type Toilets*, as flush volumes less than 1.0 gpf are viable within residential settings, where these toilets are prominent.

toilet. This minimum was instituted to address potential performance and health and safety concerns with drainline blockages.