July 19, 2021

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
1000 Independence Avenue SW
Washington, DC 20585

RE: Docket Number EERE-2017-BT-TP-0028: Energy Conservation Program: Test Procedures for Water Closets and Urinals; Proposed Rule

The following comments are submitted on behalf of the Natural Resources Defense Council and the Appliance Standards Awareness Project on the Department of Energy's (DOE) Notice of Proposed Rulemaking (NOPR) on Test Procedures for Water Closets and Urinals.

We note that signatories to these comments previously filed comments on the Department's Request for Information on September 4, 2019. These prior comments (Joint RFI Comments) are incorporated herein by reference and will be cited at points below.

Additional directions to voluntary consensus-based test procedures are necessary.

The water consumption test procedures for water closets and urinals in ASME A112.19.2-2008/CSA B45.1-08 incorporated by reference in the DOE test procedures have several weaknesses that subsequent revisions of the voluntary industry standard have failed to remedy. We believe that all of the additional directions in Appendix T are necessary to maintain, and that additional instructions are needed regarding the following procedures.

1. Measurement Increments and Rounding Rules

The ASME standard sets out the water consumption test for water closets and urinals that is incorporated in its entirety by reference in the DOE test procedure (10 CFR 430.30 and 430.31), together with Tables 5 and 6 of the standard, which are also incorporated by reference. These provisions specify that the apparatus for measuring flush volumes of water closets must be capable of reading increments not exceeding 0.25 liters (0.07 gallons). These provisions further specify that the results of each test run are to be rounded *down* to the nearest 0.25 L (0.07 gal). Taken together, these specifications impose a degree of imprecision in the ASME test procedure that serves to mask significantly different test results and allows for models that use up to 0.07 gallons per flush (gpf) in excess of the DOE standard to be certified as meeting the standard.

At the current DOE standard of 1.6 gpf, the ASME test procedure allows for a water closet model with an exceedance of up to 4.4 % to be certified. When applied to a flush volume of 1.28 gpf, which is the current level for the voluntary EPA WaterSense Program and the mandatory level adopted by numerous states, the ASME test procedure allows for a model with an exceedance of up to 5.5 % to be certified. These lower flush volumes available in the market today call for greater precision in the measurement and recording of product performance.

The current rule is even less suitable for establishing the compliance of urinals with the standard. At the current DOE standard of 1.0 gpf, the ASME test procedure allows for a model with an exceedance of up to 7 % to be certified. And when applied to a flush volume of 0.5 gpf, which is the current level for the voluntary EPA WaterSense Program and the mandatory level adopted by several states, the ASME test procedure allows for a model with an exceedance of up to 14 % to be certified.

The allowances for exceedance in the test procedures for water closets and urinals appear large when compared to other covered plumbing products and other covered residential products. The record indicates that this is not for the lack of test instruments capable of greater resolution.[1] The tolerances that result from rounding rules for various other federally regulated products are shown in the following table.

Product	Current DOE standard level	Unit	Rounding allowance	% of standard
Water closets	1.6	gpf	0.07	4.37 %
Urinals	1.0	gpf	0.07	7.00 %
Showerheads	2.5	gpm	0.05[2]	2.00 %
Faucets	2.2	gpm	0.05[2]	2.27 %
Commercial prerinse spray valves (≤5.0 ozf)	1.0	gpm	0.01[3]	1.00 %
Portable dehumidifiers (25.01-50.00 pints/day)	1.6	L/kWh	0.01[4]	0.63 %
Single-package central air conditioners	14	Btu/W-h	0.025[5]	0.18 %

This lack of precision obscures information that should be available to consumers when making product selection decisions. Under 10 CFR 429.12, a certification report is required for each basic model of a covered product, including water closets and urinals. Regulations at 10 CFR

[1] “"First, although the instruments and equipment have a resolution of .01 gallons and fall within their tolerances for calibration, [water closet] fill valves are not exact devices and there are often variations between flushes that are greater than .01 gallons. This is impacted by the water line and by manufacturing tolerances. Manufacturers need to be able to round down the total flush volume to the nearest .07 gallons to account for such factors." Transcript Of Proceedings In The Matter Of: Appliance Standards Public Webinar For Water Closets And Urinals Test Procedure (EERE-2017-BT-TP-0028-0009). June 16, 2021. p. 18.

[2] https://www.ecfr.gov/cgi-bin/text-idx?node=ap10.3.430_127.s&rgn=div9. See also ASME A112.18.1-2012, Table 1, end note.

[3] https://www.ecfr.gov/cgi-bin/text-idx?node=sp10.3.431.o&rgn=div6.

[4] https://www.ecfr.gov/cgi-bin/text-idx?SID=a958fee89bc96094f54b6f920505e6b4&mc=true&node=ap10.3.430_127.x1&rgn=div9.

[5] https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=d7c06c2489cda891197a38d234b10088&mc=true&n=sp10.3.430.b&r=SUBPART&ty=HTML#se10.3.430_123

429.30(b) and 429.31(b) specifically require that certification reports for water closets and urinals include the maximum water use in gallons per flush rounded to the nearest 0.01 gallon. Thus, the current ASME test procedure, with its much wider band of uncertainty, is not adequate to achieve the precision required by the current certification requirements for water closets.

While there may be some inherent variability in the amount of water in a flush, DOE nevertheless has an obligation to adopt test procedures that demonstrate compliance with the standard in representative use of these products. Rather than offering an overly generous tolerance, averaging additional measurements would be a more appropriate course. More than three tests could be performed at each test pressure, and more than two samples could be required for each basic model. The averaging of a greater number of test events would impart greater confidence that individual exceedances do not impair compliance with the standard. While more precise measurement increments and the application of conventional rounding rules would be preferable, DOE should consider increasing the test repetitions at each pressure level from three to five, and/or increasing the sample size of a basic model from two to five in the event current procedures are retained.

Sec. 323(b)(3) of EPCA states that DOE test procedures must measure water consumption during a representative average use cycle or period of use. However, the imprecision embedded in the current test procedures means that such test results are not actually representative, and the test procedure may be masking a significant difference in the relative performance of different models, making it difficult for consumers to select the more efficient product.

> **We urge that DOE incorporate additional directions in the conduct of the water closet and urinal water consumption tests to require test equipment resolution of 0.01 gal and rounding to the *nearest* 0.01 gal, rather than always rounding down. If current resolution levels and rounding rules are retained, we recommend that the number of test repetitions at each pressure level be increased from three to five, and the number of samples required for testing be increased from two to five.**

2. Averaging of Results from Different Test Pressures

The averaging of test results derived at the widely differing test pressures does not provide a representative depiction of product performance, as DOE test procedures are required to do. The current test procedure calls for tank-type water closets to be tested at three pressures: 20, 50, and 80 pounds per square inch (psi), while flushometer valve water closets are to be tested at 35 and 80 psi for standard siphonic bowls and 45 and 80 psi for blowout bowls. The test procedure then specifies that the maximum flush volume shall be met by the average of all total flush volumes recorded at all pressures specified.

Similarly, the current test procedure calls urinals to be tested three times at each of the test pressures, 25 and 80 psi. The maximum flush volume may be met by the average of all flush volumes recorded at the two pressures.

The water pressure at which a single fixture operates at its point of installation does not vary by the range of pressures embodied in the current test procedure. While water pressure of between 20 and 80 psi is considered acceptable by water utilities for customer usage, actual pressure in water distribution systems is more likely to be closer to the high end of this range than the low end. And to the extent that the operation of some flushometer valves is significantly impacted by water line pressure at the point of installation, with a higher pressure contributing to higher water consumption, the averaging together of high and low test pressure results is inappropriate and may mask non-compliance by water closets and urinals when installed at higher pressure locations.

The Joint RFI Comments recommended that test results at different pressures not be averaged, but rather that the average test results at each pressure be subject to the maximum flush volume of the standard. As explained, the effect of the current averaging is to favor performance at mid-range pressure, when actual system pressures are closer to the high pressure specified in the test. Data was provided in the Joint RFI Comment on California water suppliers' average test pressures to demonstrate this point. In section III.E of the NOPR, DOE discounts this information, asserting that California data may not be representative. DOE requested comment and data regarding water pressures at product installation sites, and information on how water pressures vary in different locations across the nation.

Additional sources of system pressure are available that corroborate the data previously provided. NRDC commissioned the analysis of publicly available water loss audit reports by water utilities in Pennsylvania[6] and New Jersey[7], covering CT 2013 data from 155 and 76 utilities respectively. These reports found the following:

Average System Pressure (psi)				
	Minimum	Median	90th percentile	Maximum
New Jersey (N = 76)	40	58	82	140
Pennsylvania (N = 155)	40	75	100	150

Notably, no system in either state reported an average system pressure of less than 40 psi. Giving equal weight to results of the tests conducted at 20 , 25, or 35 psi with test results conducted at 80 psi, as in the current test procedure, cannot possibly offer a representation of most real world conditions.

More recently, the American Water Works Association has compiled 2018 water audit data from 1,124 water systems in California, Georgia, and the province of Quebec into a publicly available database, the Water Audit Reference dataset (WARD).[8] The reported values of average water system pressure are distributed as follows:

[6] Kunkel Water Efficiency Consulting. 2017. *Report on the Evaluation of Water Audit Data for Pennsylvania Water Utilities.* https://www.nrdc.org/sites/default/files/pa-utilities-water-audit-data-evaluation-20170215.pdf.

[7] Kunkel Water Efficiency Consulting. 2017. *Report on the Evaluation of Water Audit Data for New Jersey Water Utilities*. https://www.nrdc.org/resources/report-evaluation-water-audit-data-new-jersey-water-utilities.

[8] WARD summary data is accessible at https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control/Free-Water-Audit-Software.

Average System Pressure (psi)					
	Minimum	10th Percentile	Median	90th percentile	Maximum
WARD (N = 1,124)	26.8	52	69.9	94.5	165

A test procedure representative of product performance in the real world would maintain testing at the separate levels of water pressure specified in the current procedure, but require the average of test results at *each* test pressure to meet the maximum flush volume requirement. DOE test procedures should inform consumers that a product will meet the DOE performance standard at the location where it is likely to be installed, not its average performance at two or three locations elsewhere with significantly different and less typical water pressure.

> **We recommend that DOE incorporate an additional direction to the ASME test procedure for water closets and urinals that would require the average of flush volumes recorded at *each* pressure to not exceed the gpf standard. We note that this change is simply a revision in the calculation of reported test data, and does not require additional testing or test apparatus, and thus would not increase the burden of testing on manufacturers.**

Conclusion

We believe that the shortcomings identified above compel DOE to consider and adopt revisions to the test procedures for water closets and urinals to be more accurate and representative of average usage. The revisions recommended here would better facilitate the achievement of the basic statutory purposes of the program "to conserve water by improving the water efficiency of certain plumbing products and appliances" (EPCA, sec. 2).

Thank you for your attention to these views.

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