Natural Resources Defense Council
Appliance Standards Awareness Project

August 13, 2012

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program
1000 Independence Avenue, SW
Mailstop EE-2J
Washington, DC 20585

RE: Docket No. EERE-2011-BT-TP-0061 / RIN 1904-AC65: Test Procedures for Showerheads, Faucets, Water Closets, Urinals, and Commercial Prerinse Spray Valves

Dear Ms. Edwards,

This letter constitutes the comments of the Natural Resources Defense Council (NRDC) and the Appliance Standards Awareness Project in response to the Department of Energy (DOE) notice of proposed rulemaking (NOPR) regarding test procedures for showerheads, faucets, water closets, urinals, and commercial prerinse spray valves. 77 Fed. Reg. 31742. We appreciate the opportunity to provide input to this process. Much time has elapsed since the Department adopted test procedures for plumbing products in 1998. This NOPR affords an opportunity to ensure that federally adopted test procedures produce results that more accurately measure water use during product usage and can be relied upon to determine compliance with efficiency standards.

Test Procedures for Showerheads and Faucets

a. Effective capture of leakage from a showerhead ball joint during testing should be ensured.

Leakage from a point on a showerhead other than the spray face, such as the ball joint, contributes to the water consumption of the showerhead and should be effectively measured. The ASME standard that DOE proposes to incorporate by reference into the federal test procedure, ASME/ANSI A112.18.1-2011, includes a maximum leakage rate at ball joints of showerheads, body sprays, and hand-held showers of 0.01 gpm at a flowing pressure of 50±5 psi. Unfortunately, this requirement is a) set at a test pressure that differs from the flow rate specified for the showerhead flow rate test (80±2 psi); b) includes no specific methodology for conducting a test or determining compliance; and, c) located in section 5.3.5, and thus outside of the section (5.4) proposed by DOE to be incorporated by reference into the federal test procedure.

The final test procedure rule should clearly state that ball joint leakage must be accounted for in showerhead testing, and either separately measured and added to the flow rate determined under section 5.4 or effectively captured during the flow rate test itself. We note, however, that section 5.4 allows for the flow rate to be determined by either a fluid meter or by the time/volume method. While a fluid meter test should effectively capture leakage at the ball joint, a time/volume test may or may not capture such leakage, depending upon the configuration and location of the container used to collect water, assuming that leakage will fall vertically or move in a direction outside the spray pattern that the container is positioned to capture.

b. The time/volume test method is not specified in sufficient detail in ASME/ANSI A112.18.1-2011 to ensure accurate and repeatable results, and should not be part of the federal test method.

As noted above, ball joint leakage may not be effectively captured by a time/volume test. Furthermore, the ASME standard contains no narrative description of the set-up for this test method. The single schematic in Figure 3 of the ASME standard is insufficient to ensure that water flowing at 80 psi does not spatter out of the container during the test, nor does it specify the procedure for measuring the volume of water collected in the container, the incremental resolution of the volume of the container, any specifics for measuring the time of the test, any stated number of repetitions of the test, or any procedures for weighting or averaging the test results.

Test Procedures for Water Closets and Urinals

a. Pressure requirements for the testing of flushometer valve water closets allow excessive consumption to go unreported.

The ASME standard that DOE proposes to incorporate by reference into the federal test procedure, ASME/ANSI A112.19.2-2008, calls for test data to be collected from tests run at different test pressures, and then averaged. Flushometer valve water closets operate directly off the pressure of the water supply line (as contrasted with a gravity tank-type toilet supplied with water stored at atmospheric pressure), and thus the water flowing to flushometer units is more sensitive to supply line pressure. Section 7.4.5 of the ASME standard, together with Table 5 of that standard, have the effect of over-weighting the test results compiled at 35 psi, a pressure value below the mid-point of the range of supply pressure considered normal (20 to 80 psi) by public water suppliers, and well below the supply pressure found at many commercial locations, including high-rise buildings that are often equipped with pressure booster systems.

We recommend that the Department evaluate the effect of averaging test results that have been obtained at different test pressures. To ensure that test reporting does not obscure the level of water efficiency that many building owners will actually experience, DOE's test procedure should require reporting of the higher water consumption value obtained by the average of three tests at 80 psi and the average of 3 tests at 35 psi. At a minimum, the Department should discard the ASME standard's 2 to 1 weighting of test results obtained at lower pressure.

b. The federal test procedure should capture water that is wasted by the phantom flushes of hands-free flushometer valves, which are not recorded in the ASME test procedure.

The widespread adoption of electronic, hands-free flushing operation for valve-type water closets and urinals has been accompanied by the widespread phenomenon of the phantom flush – the unintended activation of the flush valve, one or many extra times. At least one study[1] has shown a significant increase in water consumption following the installation of hands-free water closet valves. (See Attachment A). Section 7.4.3 of the ASME test procedure directs the test operator to ""trip the actuator" to initiate the flush being measured. This allows the test operator to use the mechanical actuator on a hands-free valve rather than the electronic sensor. The efficacy of the sensor is never subjected to testing under the ASME procedure, notwithstanding that this feature can contribute to excessive water consumption of the tested unit upon actual installation. The Department should fill this gap in the ASME test procedure, through a supplemental NOPR if necessary.

c. Field adjustability that can undermine achievement of efficiency standards is not effectively limited by the ASME standard.

The US EPA WaterSense specification of tank-type toilets incorporates specific language on field adjustability that are lacking in the ASME standard proposed for incorporation into the federal test procedure. WaterSense limits the effects of field adjustability to 0.4 gallons per flush in additional consumption. Specifically –

> 5.2.3.2 The maximum volume of water that may be discharged by the toilet, when field adjustment of the tank trim is set at its maximum water use setting, shall not exceed the following amounts:
> - For single flush fixtures: 1.68 gallons (6.4 liters) per flush
> - For dual flush fixtures: 1.40 gallons (5.3 liters) per flush in reduced flush mode and 2.00 gallons (7.6 liters) per flush in full flush mode.[2]

Although the specific value of 0.4 gpf should be examined further before incorporation into the federal test procedure, the frame developed by WaterSense is one that the Department should consider in this rule-making. In contrast, Table 5 of the ASME standard specifically permits adjustments to tank trim components during testing, without establishing any quantitative limits on the effect of such adjustments on flush performance.

d. The annual usage factor for dual-flush water closets should be validated before adoption by DOE.

We support the Department's intention to adopt a test procedure to measure the water use of a dual-flush water closet over a representative average period of consumer use. 77 Fed. Reg. 31746. However, the proposed average of two reduced flushes and one full flush has little

[1] Gauley, B. and Koeller, J., *Sensor-Operated Plumbing Fixtures Do They Save Water?*, Veritec Consulting Inc. / Koeller & Co., 2010.
[2] US EPA, WaterSense Specification for Tank-Type Toilets, v. 1.1, May 20, 2011.

empirical evidence to support its adoption into the federal test procedure at this time.[3] We recommend that the Department collect additional data before adopting a ratio that can be substantiated, with careful attention to potential differences in consumer behavior in residential and commercial settings.

e. DOE should consider changes to the descriptors of maximum permissible water use for water closets to capture the propensity of water closets to leak significant amounts of water on an annual basis.

It has long been known that water closets have a propensity to develop internal leaks that result in significant amounts of water being wasted down the drain, often at flow rates that are imperceptible to the consumer. One major study found leakage flows in single-family homes averaging 9.5 gallons per capita per day, or nearly 13 percent of indoor water use, with toilet leakage a primary contributor.[4] Another large study of residential toilets found nearly 6% with active leaks observable with dye testing (and over 7% of toilets 5 years old or less).[5] A more recent study found leakage volumes for new homes built to US EPA WaterSense specifications to be little changed from levels recorded in the pre-2000 housing stock.[6] If the water consumption and relative efficiency of new water closets were expressed in annual metrics rather than episodic metrics, an efficiency standard could be considered that would more effectively capture this hidden consumption. Analogous to the recent modification of the test procedures for certain appliances to capture standby and off-mode power consumption, a revised test procedure for water closets that would join an annual usage factor with a flush volume test and a leakage test could yield an annual consumption metric that would more accurately encompass the water consumption of the product as installed.

The ASME standard that DOE proposes to incorporate by reference into the federal test procedure, ASME/ANSI A112.19.2-2008, does not contain a leakage test. However, ASME A112.19.5-2011, *Flush Valves and Spuds for Water Closets, Urinals, and Tanks*, does have a leak rate test (section 5.5) and a life cycle test calling for 150,000 cycles of the flush valve with no signs of leakage (section 5.2). DOE should consider the testing burden and potential consumer benefits of an annual water consumption metric for water closets in a supplemental NOPR, and request test results from manufacturers for covered products currently tested under ASME A112.19.5-2011. If all new water closets were required to certify an annual consumption rate that incorporated a reasonable limitation on losses due to leakage, the federal efficiency standard would more effectively encourage the use of designs and materials that eliminate leakage altogether.

[3] See the discussion of dual flush toilets in new high-efficiency homes in DeOreo, William, *Analysis of Water Use in New Single-Family Homes*, Aquacraft Water Engineering and Management, 2011, pp. 92-94
[4] Mayer et al, *Residential End Uses of Water*, AWWA Research Foundation, 1999, pp. 90-94.
[5] Koeller and Company, *Toilet Flapper Study: Final Report*, California Urban Water Conservation Council, 2004, pp. 13-14.
[6] DeOreo, op. cit., pp. 91-92.

Design Requirements for Showerheads

a. A test procedure for verifying the force needed to remove the flow restrictor from a showerhead is needed to end the gaming by manufacturers seeking to gain advantage by promoting easy removal of flow restrictors.

The Department has correctly identified a significant omission in ASME/ANSI A112.18.1-2011 regarding showerhead flow restrictors. For most showerheads, the flow rate upon which certification is based will be greatly exceeded if the flow restrictor is removed, and for this reason, a minimum force requirement for the removal of a flow restrictor was written into the statute alongside the original flow rate standard. 42 U.S.C. 6295(j)(1). Although the removal force requirement was in the ASME standard prior to its adoption in federal law in 1992, neither the current ASME standard nor any previous version has contained any standard test method for verifying that a flow restrictor remains mechanically retained when subjected to a force of up to 8 pounds. This is not simply an academic issue. In the recent past, a major retailer has carried name brand showerheads with advertising on the exterior of the packaging advising of the easy removal of the flow restrictor "for cleaning".

The retention requirement is as much a part of the federal standard as the maximum flow rate, and the Department has the responsibility to ensure that compliance with the standard can be verified. We support the development of a standardized test method that would feature alternative procedures for testing the principal configurations of flow restrictor placement and design. For novel designs, the manufacturer could submit a proposed test method to the Department under currently available waiver provisions prior to certification and introduction of the product into commerce. We support the development and adoption of this test procedure through a supplemental NOPR if necessary.

Definitions

a. New definitions are needed to clarify the scope of coverage for shower products, but ambiguity remains in the language as proposed.

We support the Department's intent to adopt new or revised definitions for "showerhead", "body spray", and "hand-held showerheads". However the attempt to harmonize these terms with the ASME definition of "accessory" adds confusion rather than clarity. ASME definitions attempt to erect a distinction between showerheads and body sprays, in part by classifying the former as accessories and the latter not accessories. DOE's acquiescence in classifying showerheads as accessories hardly seems apt, when removal of a showerhead would clearly prevent the shower supply pipe from fulfilling its primary function by substituting a laminar jet of water at substantially higher volume and pressure for the spray delivery of water that is commonly associated with "taking a shower." It is unclear what is to be gained by the definition tree DOE is proposing, nesting "accessory" within the definition of showerhead. The key objective of new or revised definitions should be to bring clarity to the coverage of shower products under EPCA. We specifically support the treatment of body sprays as showerheads for the purposes of regulatory coverage. Defining showerheads as accessories is not essential for this purpose.

Supplementary Plumbing Requirements

a. The definition of a Basic Model for valve-type toilets and urinals needs clarification to ensure that testing covers all likely combinations of fixtures and valves.

The Department's explanation of its compliance certification framework fails to clarify how a fixture manufacturer can establish that its bowl could not be paired with a flushing device that would provide a higher flush volume and still function properly. 77 Fed. Reg. 31748. It is unclear what type of dysfunction the Department expects manufacturers to observe and record to draw a bright line where none exists, and what obligation fixture manufacturers have to test their bowls with non-conforming flushing devices. DOE should consider extending the current definition of "tested combination" in 10 CFR 430.2 to include language and procedures specific to water closets and urinals and their associated flushing devices. Concepts currently applying to testing separate air conditioning components may prove useful in devising a clearer framework for certifying fixture and valve combinations.

Thank you very much for considering these comments.

Sincerely,

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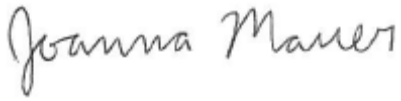
Natural Resources Defense Council



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Attachment A: Gauley, B. and Koeller, J., *Sensor-Operated Plumbing Fixtures Do They Save Water?*

Questions about or responses to this letter may be directed to Edward R. Osann, Natural Resources Defense Council, 1314 Second Street, Santa Monica, CA 90401; 310-434-2300; eosann@nrdc.org.