



Draft Showerhead Specification

Public Meeting
October 21, 2009



Meeting Agenda

- Introduction to WaterSense®
- Showerheads Background and Specification Development Process
- Draft Showerhead Specification
 - Scope
 - General requirements
 - Water-efficiency criteria
 - Performance criteria
- Certification and Labeling
- Next Steps



Part 1

Introduction, Background, and Specification Development



What Is WaterSense?

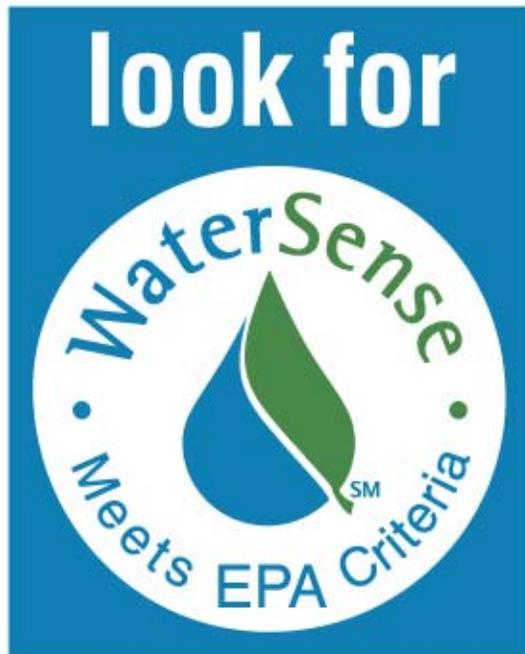
**A partnership program
sponsored by the U.S. EPA**

Promotes the value of water and helps
Americans make smart decisions regarding
water use and water-using products

Aims to increase the adoption of water-
efficient products and services by
consumers and organizations



WaterSense Product Evaluation Factors



WaterSense uses the following factors in determining which products to label

Products must:

- Offer equivalent or superior performance
- Be about 20 percent more water-efficient than conventional models
- Realize water savings on a national level
- Provide measurable results
- Achieve water efficiency through several technology options
- Be effectively differentiated by the WaterSense label
- Be independently certified



Showerhead Background

- The Energy Policy Act (EPAAct) of 1992 set the maximum flow rate of showerheads at 2.5 gallons per minute (gpm) at 80 psi
- The federal regulation and existing standards do not address showerhead performance
- The WaterSense label means *water-efficiency and performance*
- WaterSense needed to determine what characteristics are important to users and how to test those in a laboratory



Showerhead Specification Development Process

- In February 2007 WaterSense began collaborating with the ASME/CSA joint harmonization task force on water-efficient showerheads
- In mid 2007 WaterSense issued an NOI identifying EPA's intent to evaluate the following areas of showerhead performance:
 - Pressure compensation
 - Spray pattern (water distribution)
 - Temperature drop
 - Effectiveness (removal of soap/shampoo)



Showerhead Specification Development Process

- The task force then identified and began developing test protocols for characteristics that *could* be measured in the lab to assess the key performance areas identified
 - Flow rate verses pressure
 - Temperature drop
 - Water distribution (shape of cone, volume and area of distribution)
 - Droplet size
 - Water stream (spray exit velocity)



Consumer Testing

- In 2008 WaterSense conducted consumer testing
 - To determine if users uniformly liked or disliked certain showerheads
 - To confirm which characteristics were important to users
 - To establish minimum acceptable performance levels
- Consumer testing methodology
 - 37 users tested 4 different showerheads in their own homes for a week each
 - 22 different showerheads were tested in all (16 different models)
 - Consumers were asked to rate each showerhead based on its temperature profile, force, spray coverage, rinsing ability, and their overall opinion of the showerhead

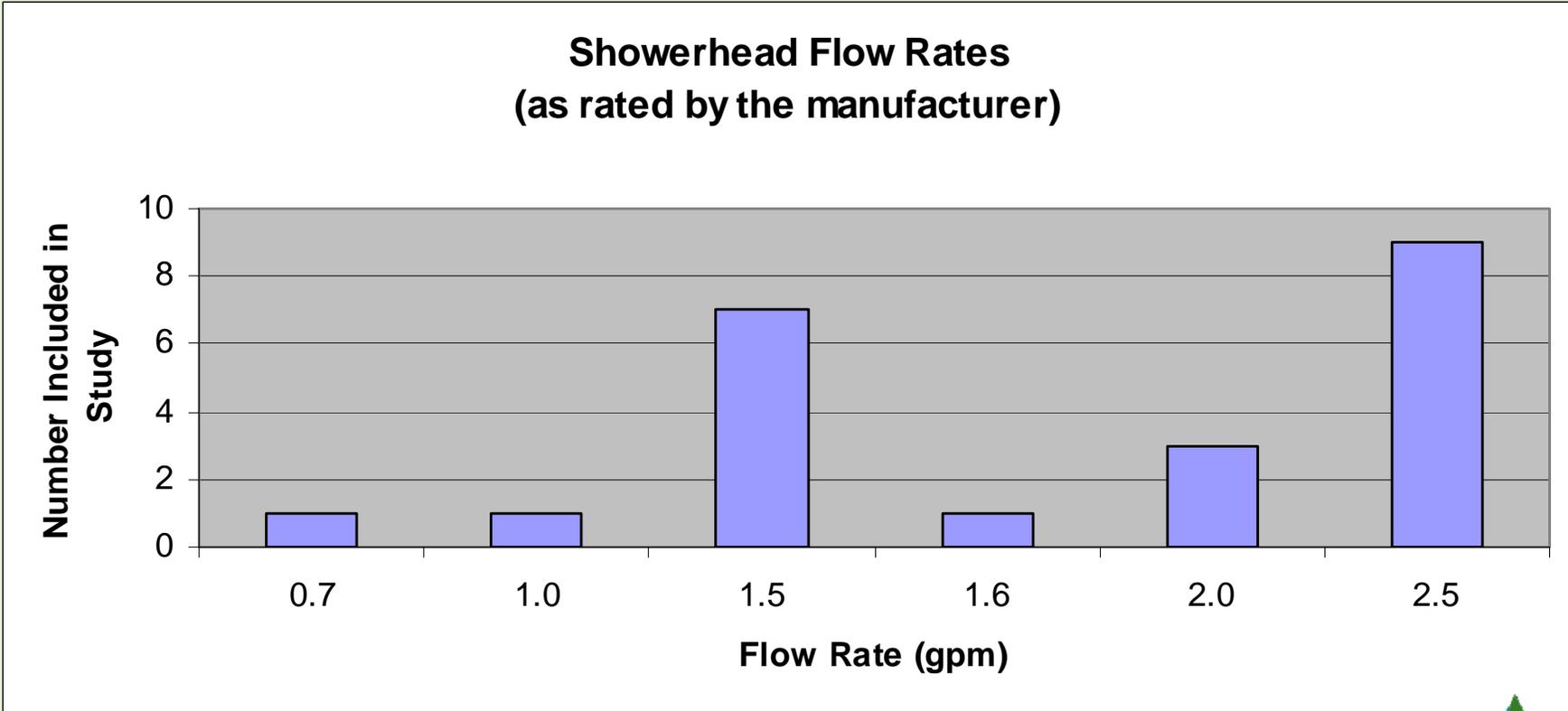


Consumer Testing

- Consumer profiles
 - 20 males, 17 females
 - Ages: 22-78
 - 50% short hair, 50% medium and long hair
 - 20% curly/wavy hair, 80% straight hair
 - 50% thick hair, 50% medium or thin hair

Consumer Testing

Distribution of showerhead flow rates included in study





Consumer Testing

- **Conclusions**

- There was clear discernment between some good and bad showerheads among the users (and some in the middle)

% Users Satisfied	Number of Showerheads
Less than 30%	9
30% to 70%	7
Greater than 70%	6

Showerhead	Flow Rate	Temp	Force	Coverage	Rinse	% No Buy
S	2.5					0%
R	2.5					11%
L	2.0					14%
M	2.0					14%
V	2.5					20%
E	2.5					25%
K	1.6		X			40%
Q	1.5					43%
U	1.5			X		57%
N	1.5					60%
O	1.5					63%
H	2.5		X			63%
A	2.5			X	X	67%
F	1.0		X	X	X	71%
I	2.5		X	X		75%
C	0.7	X		X	X	83%
G	1.5		X	X	X	83%
P	1.5					83%
J	2.5	X	X	X		83%
T	1.5		X	X	X	100%
B	2.0	X	X	X	X	100%
D	2.5					100%



Consumer Testing

- **Conclusions:**
 - Coverage and force were the most important characteristics, followed by rinsing, and then temperature
 - Together poor force and/or coverage were cited as concerns in over 75% of the unsatisfactory showerheads
 - Temperature was the least discriminatory characteristic and was always associated with unsatisfactory ratings of force and/or coverage
 - Users also uniformly preferred showerheads that appeared to provide pressure compensation (based on the flow verses pressure curves for these showerheads)
 - Consumers did not identify any additional important performance characteristics



Laboratory Testing

- The task force developed laboratory test protocols to measure the important characteristics
- Draft specification addresses:
 - Pressure compensation
 - Spray pattern/distribution
 - Effectiveness (force of the shower spray)
- Temperature is not included
 - Difficult to accurately measure
 - Appears to correlate with force and spray coverage
- Attempted to develop a wetting test to measure the rinsing (another aspect of effectiveness)
 - More time is needed to develop a wetting test that provides meaningful results
 - Rinsing also appears to correlate with force and spray coverage



Showerhead Specification Development Process

- Correlated consumer and laboratory test data to identify the appropriate performance levels
 - The goal was identify the levels that were unsatisfactory to most users and weed out showerheads that fell below those levels
- Conducted round-robin testing at manufacturer and independent laboratories to ensure tests are repeatable and data reproducible



Showerhead Specification Development Process

- Questions/Discussion?



Part 2

Draft Specification for Showerheads



Scope and Objective

- Specification establishes criteria for showerhead fixture fittings
- Applies to:
 - Fixed showerheads
 - Hand-held showerheads
- Does not apply to:
 - Body sprays
 - Retrofit devices, including flow control devices



Scope and Objective

- Multiple showerheads are eligible provided:
 - Sold in combination in a single device that is intended to be connected to a single shower outlet
 - Each showerhead meets all of the requirements of the specification
 - The entire multiple-head system meets the maximum flow rate requirement in all possible operating modes



General Requirements

- Showerhead must conform to applicable requirements in ASME A112.18.1/CSA B125.1
- Multimode showerheads must meet maximum flow rate in all modes, and at least one mode must meet all requirements
- The manufacturer cannot provide instructions directing the user to an alternative water-use setting that would override the maximum flow rate
- Any maintenance instructions must direct the user how to return the product to its intended flow rate



Water-Efficiency Criteria

- The flow rate must be tested in accordance with the procedures in ASME A112.18.1/CSA B125.1
- Manufacturers must specify a maximum flow rate of the showerhead (the “rated flow”) equal to or less than 2.0 gpm (7.6 L/min)
- The tested maximum and minimum flow rates are compared to the “rated flow” to determine compliance



Water-Efficiency Criteria

- **Maximum flow rate**

- The maximum flow rate shall be the highest value obtained through testing at flowing pressures of 20, 45, and 80 ± 1 psi (140, 310, and 550 ± 7 kPa)
- The maximum flow rate identified through testing shall not exceed the manufacturer specified flow rate when evaluated in accordance with 10 CFR 430 Subpart F, Appendix B, Step 6(b)

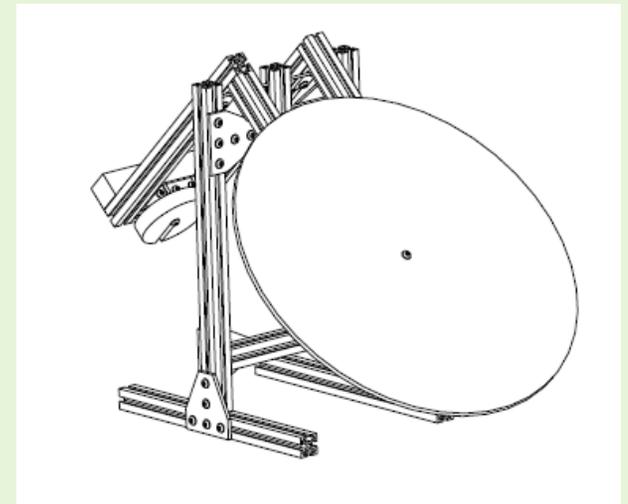


Water-Efficiency Criteria

- Minimum flow rate
 - WaterSense established two minimum flow rate requirements to ensure that showerheads provide consistent flow across a wide range of potential household pressures
 1. At a flowing pressure of 20 ± 1 psi (140 ± 7 kPa) the tested flow rate must be at least 60 percent of the manufacturer specified flow rate
 2. At flowing pressures of 45 and 80 ± 1 psi (310 and 550 ± 7 kPa) the lowest tested flow rate obtained must be at least 75 percent of the manufacturer specified flow rate
 - The minimum flow rates shall be evaluated in accordance with 10 CFR 430 Subpart F, Appendix B, Step 6(a)

Performance Criteria: Spray Force

- Appendix A outlines the spray force test procedures, including:
 - Test setup
 - Force balance method and calibration
 - Test conditions
 - Test procedures
- Minimum spray force must be at least 2.0 ounces (0.56 N) at a pressure of 20 ± 1 psi (140 ± 7 kPa) at the inlet when water is flowing
- Force balance test apparatus drawings are available on the WaterSense Web site



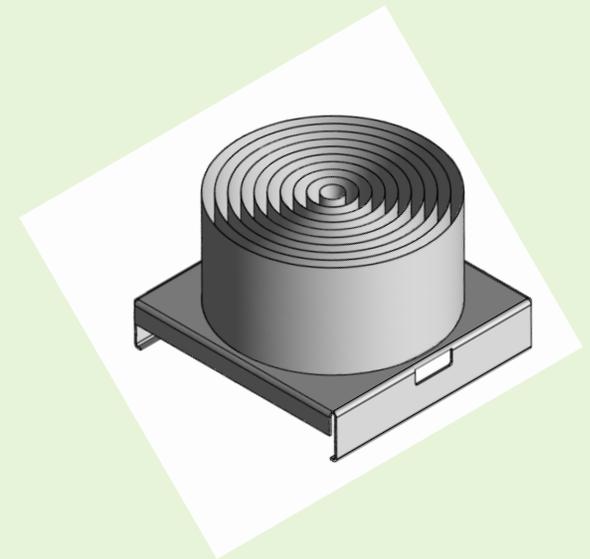


Performance Criteria: Spray Force Test Procedure

- Add counterbalancing weights to the force balance fixture and calibrate
- Mount showerhead so that force target surface and showerhead faceplate are parallel and 18 ± 0.25 in. (457 ± 6 mm) apart
- Initiate flow of water
- Adjust showerhead so that center of spray pattern aligns with center of force target
- If center of spray pattern cannot hit center of force target, then showerhead does not meet the criteria
- Spray force exceeds the minimum force requirement (2.0 oz) when the force balance angle registers equal to or past $0.0 \pm 0.1^\circ$

Performance Criteria: Spray Coverage

- Appendix B outlines the spray coverage test procedures, including:
 - Setup
 - Test conditions
 - Test procedures
 - Annular ring specifications
- Total combined water volume collected in the 2- and 4-inch (50-, 101-millimeter) annular rings cannot exceed 75 percent of the total water volume collected
- Total combined minimum water volume collected in the 2-, 4-, and 6-inch (50-, 101-, and 152-millimeter) annular rings cannot be less than 25 percent of the total water volume collected





Performance Criteria: Spray Coverage Test Procedure

- Mount showerhead so faceplate is horizontal and parallel with the top of the annular rings
- Position and center the annular rings 18 ± 0.25 in. (457 ± 6 mm) below the center of the showerhead
- Initiate water flow and allow to run for a minimum of 1 minute
- Record the measured flow rate and the time elapsed to the nearest second and calculate total volume collected
- Collect, measure, and record volume of water in each annular ring
- Calculate and record percentage of water collected in each ring (if total volume collected varies from the calculated volume by more than ± 5 percent, repeat procedure)
- Evaluate and verify spray coverage meets specified minimum and maximum values (< 75% in two center rings, >25% in three center rings)



Flow Rate Marking

- The product and product packaging must be marked with the manufacturer specified maximum flow rate in gpm and L/min (verified through compliance testing)



Draft Specification for Showerheads

- Questions/Discussion?



Part 3

Certification & Labeling and Next Steps



Product Certification and Labeling

- Manufacturers must sign a partnership agreement with EPA in order to have their products labeled
- All products must be certified by an EPA licensed certifying body (LCB)
 - Approved list of LCBs will be posted on WaterSense Web site with the release of the final specification
- Manufacturers apply to an LCB of choice
- LCB certifies product in accordance with WaterSense specification
- LCB authorizes manufacturer to use WaterSense label
 - Provides manufacturer with graphic artwork of label
- LCB conducts periodic surveillance
 - Factory visits
 - Product retesting
 - Label policing



Product Certification and Labeling

- For showerheads that bear the WaterSense label, the product packaging must be marked with the minimum flow rate in gpm and L/min at 45 psi (310 kPa), as specified by the manufacturer and verified through compliance testing



Other Issues

- There is concern that reducing showerhead flow rates may increase the risk of thermal shock and scalding
- Plumbing code now requires ASSE or ASME compliant automatic-compensating mixing valves, but these are currently only tested and certified at a flow rate of 2.5 gpm at 45 psi
- Problems persist
 - Valves are not tested at lower flow rates, so there may not be adequate assurance that the valve is sensitive enough to provide the required protection when paired with high-efficiency showerheads
 - Not all homes are equipped with an automatic-compensating mixing valve, especially homes built prior to the 1990's



Other Issues

- The task force evaluated flow rate and temperature deviations from pressure changes and determined:
 - Risks of thermal shock and scalding are present for showerheads of all flow rates
 - More efficient showerheads may be more sensitive to sudden changes in water pressure
- WaterSense concluded that thermal shock and scalding risks cannot be fully addressed through the specification for showerheads
 - Currently showerheads are certified at a flowing pressure of 80 psi while valves are certified at a flowing pressure of 45 psi and are not tested at flow rates less than 2.5 gpm
 - The outlet temperature and control of the risks are associated with design of the plumbing system, which includes the hot water heater and delivery system and the mixing valve



Other Issues

- To address this issue WaterSense:
 - Is requiring manufacturers to mark product packaging with the minimum flow rate at 45 psi to assist consumers in matching showerheads and mixing valves
 - Plans to continue working with ASSE and ASME to revise the existing standards for mixing valves to ensure their compatibility in terms of both tested pressure and flow rates
 - Plans to prepare materials to educate partners and consumers so they can make informed purchasing decisions



Questions?

- Questions/discussion on certification and labeling?
- Questions/discussion on other issues?
- Questions/discussion on other draft specification supporting documentation?
- Other questions, comments, or concerns?



Next Steps

- Submit written comments to watersense-products@erg.com by November 9
- EPA will make public the comments received during the comment period
- Final specification issued after evaluation of public comments
- Anticipated effective date: Spring 2010



More Information



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