Comments on the

April 2006 Draft Specifications

for

High Efficiency Toilets

Compiled on July 12, 2006

Commenter: Burt Preston
Affiliation: Eljer Inc.
Comment Date:

Comments on Draft Specifications for the EPA Water Efficiency Program

Overview - Eljer supports the proposed Water Efficiency Program as a means of both establishing a specification for the next level of water conserving toilets and exposing these toilets to plumbers and consumers. Further, we will be developing products to these specifications so we can participate in the program. Our reason for commenting is to strengthen the technical aspects of the specifications to establish a better test program.

Our comments are focused on Section 4 and Appendix A of the draft specifications; the cased soybean paste test. We have been involved in the development of the ANSI/ASME standards for about thirty years. One of the biggest problems the industry has faced is developing a good "bulk load" test. When Veritec started promoting the original (uncased) soybean paste test through testing and publishing of test results it was beneficial in forcing manufacturers to focus on improving flush performance. But, in the last several months we have started using the cased soybean paste test. Based on our brief experience with this alternative test we believe that users, consumers, and water conservation will be better served if the specification in Section 4 were changed to reference the original (uncased) soybean paste test.

The original (uncased) soybean paste test was used for more than a decade by Toto with good success. Then it was publicized by Veritec and used by a number of competitors. The only problem with this test was in the amount of time and material needed to run the test. As a result Mr. Bill Gauley spent significant time trying to find a test which would be *equivalent* to the original (uncased) soybean paste test. It should be noted that the objective was equivalency not improvement; I think we all agree that the original (uncased) soybean paste test was a proven and successful test.

The result of Mr. Gauley's efforts was the cased soybean paste test. Prototypes were distributed to manufacturers in August 2005, and in late September we received the first supply for our laboratories and we have used it for our laboratory tests ever since. As a result of this experience we have learned the following.

The original (uncased) soybean paste test, once Veritec started controlling the supply, was very consistent. Our tests showed virtually no variation when the same bowl was tested.

- The cased soybean paste test has proven to have too much variation to be creditable. We have seen flush performance range from 300 grams to 1400 grams on the same bowl that consistently averaged 1100 grams using the original (uncased) soybean paste test. This variance is much too large for test purposes.

- We believe that the variation in the cased soybean paste test is caused by differences in the soybean paste which were inconsequential without the casing, but which become significant when it is in a casing. To evaluate what we saw as unpredictable flush performance, we flushed one set of test media 340 times using the same bowl, same lab technician, and same laboratory water supply to establish some good statistics. This lead to some unusual results. As the test load increased from 250

grams to 300 grams we went from passing 100 percent of the time to passing 70 percent of the time. Then, as the load increased from 300 grams to 400, 500, 600, 700, 800, 900 and then 1000 grams, the bowl continued to pass almost exactly 70 percent of the time. Finally, when the load increased from 1000 grams to 1100 grams the percentage dropped to 58 percent. This is a highly unusual pattern. Normally a bowl will pass every time until it reaches the point where it is almost overloaded and then the pass percentage drops off rapidly. We have never seen the pass percentage drop to a specific level and then hold there while the load was increased more than 30% before it then dropped off rapidly. We believe that by using the cased soybean paste we have inadvertently created a false failure mode. The cased soybean paste test media can not break up and the bending of the cylinders is controlled by minor changes in the viscosity of the soybean paste. The viscosity was not much of a factor with the original (uncased) soybean paste test, but with the cased soybean paste test if you have a batch of test media that has a slightly higher viscosity the cylinders are not as flexible. As a result, the test results are controlled by how the cylinders are oriented when they fall into the bowl. If they fall parallel to the orientation of the trapway they pass easily. If they fall perpendicular to the orientation of the trapway they can lodge. If the soybean paste in the casing is soft, they are less likely to lodge than if the paste is firm. This is what we saw with our large scale test; 30% of the time they would not pass. Then if a different batch of cased soybean paste test media is used, with a different viscosity, the failure percentage changes or even becomes so small that it is not a factor. Obviously, orientation is not an issue with the original (uncased) soybean paste because if the media fall perpendicular to the orientation of the trapway they can be broken in half by the jet pressure and flushed through.

Conclusion – We appreciate Veritec's effort to develop a test equivalent to the original (uncased) soybean paste test to reduce the expense of running the test. But after about six months of experience we find that the cased soybean paste test is inconsistent. Therefore it is not really equivalent and it should not be used by the EPA Water Efficiency Program. Further, changing the specification back to the original (uncased) soybean paste test will not create much of a hardship on the industry. This change will only require using the original (uncased) soybean paste test for certification. Manufacturers will be free to develop substitutes for their laboratory and quality control tests which are less labor intensive and provide appropriate results.

If the cased soybean paste test is made part of the EPA Water Efficiency Program specification we believe that it will hurt the EPA's efforts in three ways.

- First, the test results will be misleading because of the inconsistencies with the test.

- Second, it leaves the possibility that some weak products that would not normally pass the requirements will be certified by a test laboratory. Significantly, because the variation occurs due to changes in the media from batch to batch, if an "easy" batch is received by a test laboratory all products tested with that batch will do better than normal. And since the media has a relatively long life, hundreds of tests can be run with that "easy" media.

- Third, the cased soybean paste test may falsely restrict future designs. Because the cased soybean paste can not breakup it places false limits on the design of future bowls. It is too early in the development of high efficiency toilets to use a test media with limitations.

Tracing the history of water conserving toilets over the past thirty years the one issue which has consistently caused problems and slowed the development is the lack of good flush performance tests. It seems a false economy to not use the best test as we take the next step to reduce consumption.

Supporting Documentation – Enclosed in an Excel file are five exhibits; four pages of test results and a graph. To help understand each exhibit, below is an explanation and discussion of each.

Exhibit A

Exhibit A is the *Longitudinal Study of Extruded and Bagged Miso*. This is a study which records the history of our lab tests on both the uncased and cased soybean paste media using the same bowl. We selected a bowl in June 2005 for our quality control program and saved it in our test lab. It is known as Titan standard #11. Whenever we have a question about any test media (soybean paste, ASME, or proprietary Eljer tests) we use this bowl to check the media. The *Longitudinal Study of Extruded and Bagged Miso* dates back to June 14, 2005. At that time we were using the original (uncased) soybean paste test. It shows that on four occasions we ran tests on Titan standard #11 using the original (uncased) soybean paste test and each time the bowl passed 1100 grams. Then in August we began testing with the new cased soybean paste test. In September the results were 800 to 1000 grams. Then in November and December, when we received a new shipment of cased media, the results jumped to 1200 to 1400 grams. In February, when we again received a new shipment of cased media, the results dropped to 900 grams. Then in March, because we saw a dramatic drop off in test results, we ran hundreds of tests over four days on Titan standard #11 and the results were 300 to 400 grams. Note these test results are discussed in detail in Exhibit B. The most recent set of tests were run in May, when we received a new shipment of cased media, and the results rose to 700 to 900 grams.

Exhibit A shows that we had very consistent results (1100 grams) with the original (uncased) soybean paste test but that when we switched to the cased soybean paste test the results ranged from 300 to 1400 depending on which shipment of cased soybean paste was used.

Exhibit B

Exhibit B gives the results from running a series of tests over four days. We were concerned because the cased soybean paste media we had received was giving us unusual results. We weren't sure if it was the way we were running the test so we set up this experiment. Three times a day, morning, mid day, and late afternoon we would run a test session. We would use our quality control bowl, Titan standard #11. And we would monitor the water temperature. The same lab technician would run the test and we would use the same water supply. The test media used would all come from the same box, from the same shipment. For each test session, we would run five trials at 600, 700, 800, 900, 1000, and 1100 grams. We would repeat this for a total of ten test sessions, or 50 trials at each level, 600, 700, 800, 900, 1000, and 1100 grams, or a total of 300 flush trials. When we got the results we found that at all levels of loading, except 1100 grams, the bowl passed 70% of the time plus or minus 4%! In fact, as the test load got larger, the bowls did slightly better; at 600 grams it passed 66% and this inched up until at 1000 grams it passed 74%.

After seeing these results we realized that we did not run the test over a sufficiently broad range to really see the entire picture. Then we expanded the test and ran 10 trials each at 250, 300, 400, and 500 grams.

Amazingly at 300, 400, and 500 grams the bowl again passed 70% of the time! Finally, at 250 grams the bowl passed 100% of the time.

After examining the results we didn't perceive that the day, the time of day, or the water temperature had any bearing on the results. As discussed above in the third bullet point of my *Overview*, starting at the bottom of page 1, these results are very unusual. This situation is shown graphically in Exhibit C.

Exhibit C

Exhibit C is a graph which shows two lines. One is the Bulk Load Curve with Bagged (cased) Miso. This is the information from Exhibit B with the results from 300 grams through 1000 grams smoothed to the average result of approximately 70%. The second line is the Theoretical Bulk Load Curve which has been created for illustration. The basic difference between these two curves is the area cross hatched in the load range of 300 to 1000 grams

The Theoretical Bulk Load Curve explains the behavior of a good bulk media test. At low levels of loading, imagine 10, 20, or 30 grams of the original (uncased) soybean paste test media, the bowl will pass the media 100% of the time. Likewise at very large levels of loading, imagine 2000, 3000, or 4000 grams of the original (uncased) soybean paste test media, the bowl will pass the media none of the time. At some point between these two extremes the bowl will transition between passing the media 100% of the time to passing the media none of the time. This transition generally occurs over a relatively short level of loading as shown on the Theoretical Bulk Load Curve, at 1100 grams it starts to drop off and by 1400 grams it is down to 0.

The Bulk Load Curve with Bagged (cased) Miso implies that the transition from passing to not passing the media begins at 300 grams and continues up to 1200 grams. This drawn out transition with a four fold increase in load seems unrealistic. Also, the transition drops immediately from passing 250 grams 100% of the time to only passing 300 grams 70% of the time and then the 70% level is held clear up to 1000 grams. Further, the 70% pass rate is held to a very tight tolerance, plus or minus 4%. Clearly something else is happening. As mentioned in the note on the graph, "We believe this factor is probably the inability of the bagged miso to bend easily or break up due to the high strength casing. As a result the orientation of the cased cylinders becomes a factor and a certain percentage of the time (30% with this batch of miso) the orientation causes a failure." It then goes on to state that, "With most batches of miso the miso bends more easily and the orientation factor is minimal which allows the curve to approach the Theoretical Bulk Load Curve."

We believe that with the majority of shipments of cased soybean paste test media they tend to bend easily, so what we observed with the March shipment would not occur and the bulk load curve would resemble the theoretical curve and the results would thus be similar to the original (uncased) soybean paste test. However with at least one shipment we found the results shown in Exhibit B and plotted in Exhibit C. We don't know how frequently this will happen, to date we have found one out of five. However, from exhibit A we can surmise that it happens to a lesser extent somewhat frequently, two out of five times, as we had results either somewhat above average late in 2005 (1200-1400) or somewhat lower than average in May (700-900).

Exhibit D

Exhibit D gives some insight into the variation that occurs in the cased soybean paste test media from box to box. When we receive a shipment, we receive four boxes of the cased soybean paste test media, each containing 1000 grams of media. We mark the boxes 1, 2, 3, and 4, and keep the cased soybean paste test media segregated by box through its useful lifetime. We have found that the test results using one box will vary from the results using a second box. Further, we have found that the media tends to be very consistent within a box, but not necessarily between boxes. That is partially shown in Exhibit A for the test date September 23, 2005. We tested all four boxes of cased soybean paste test media on our quality control bowl Titan standard #11. The results for box 1 were 800 grams, for box 2 were 900 grams, for box 3 were 900 grams, and for box 4 were 1000 grams. When these tests were repeated several weeks later on Titan standard bowl #11, we had identical results.

Exhibit D repeats a variation of this experiment. After running our tests in Exhibit B, we wanted to send a bowl to Veritec so they could verify our test results. We couldn't send our quality control bowl, Titan standard #11, so we found a bowl that performed virtually identical to Titan standard #11 which we christened Bowl V (Veritec). By the time we had completed the 340 flushes listed in Exhibit B, some of the cased soybean paste test media needed to be replaced so about 7 of the 20 media from box 1 were replaced with media from box 2. When we ran the cased soybean paste test on Bowl V we had different results. When loaded between 600 and 1100 grams Bowl V passed the combination of box 1 and 2 media 80% of the time. Since the bowls were otherwise very similar we questioned why we had a higher pass rate. So we tried the same test on Titan standard #11 and we got an 80% pass rate! By simply changing about one third of the media in box 1 with media from box 2 we consistently changed the pass rate from 70% to 80%!

Thus, we have found that the cased soybean paste test media changes from shipment to shipment and from box to box within the shipment. But, from the results in Exhibit B we also know if you pick a single box of cased soybean paste test media and run many tests on it that the results will be very consistent.

Exhibit E

Exhibit E is a recent test using a shipment of cased soybean paste test media received in late April. For this test, we tested two bowls; the first is our quality control bowl, Titan standard #11, and the second is a competitors bowl. We selected this bowl because of a conversation we had with Mr. Bill Gauley. He had stated that he thought that the test media orientation issue discussed above could be minimized by narrowing the sides of the bowl in the area adjacent to the entrance of the trapway. It seemed like a reasonable statement, although we had looked at this in the past and while it may increase performance on cased soybean paste test media, it may hurt performance on other flush tests. Anyway, we decided to try testing a bowl with such a configuration. For this test we also tested each bowl with both boxes of cased soybean paste test media received in this shipment (the other two boxes were delayed). As these results show, the performance appears scattered. Actually the results would probably make more sense if we tested each box of cased soybean paste test media at least 25 times at each load for each bowl. But, that would be 900 flushes. This quick test does at least cast some doubt on the idea of trying to design the bowl to orient the test media.

Longitudinal Study of Extruded & Bagged Miso

All Tests Were Run Using Titan Bowl No. 11 [1]

Test Date		Extruded Miso	Bagged Miso		Notes
June 14, 2005		1100			
June 22, 2005		1100			New shipment of miso
August 8, 2005		1100			Baseline test for comparison with Bagged miso.
August 8, 2005			1000		Received prototype sample of Bagged miso
September 2, 2005		1100			New shipment of miso
September 23, 2005			800		First order of bagged miso - Box #1 [2]
September 23, 2005			900		First order of bagged miso - Box #2 [2]
September 23, 2005			900		First order of bagged miso - Box #3 [2]
September 23, 2005			1000		First order of bagged miso - Box #4 [2]
November 7, 2005			1400		New order of bagged miso - Checking lab results [3]
December 2005			1200		Checking lab results [4]
February 8, 2006			900		New order of bagged miso
March 2, 2006			300 - 400		New order of bagged miso - See expanded tests. [5]
May 1, 2006			900		New order of bagged miso - Box #1
May 1, 2006			700		New order of bagged miso - Box #2

Notes:

1. For purposes of quality control, a representative sample bowl was pulled from production and set aside for comparison testing. This bowl was produced on June 11, 2005 and is labeled "Titan Standard #11".
2. These tests were repeated about one month later and the results were consistent.
3. We observed higher than normal results in lab testing so the miso was checked against our standard Titan No. 11 bowl and we confirmed that the bagged miso results were above average.
4. The lab results continued to be above normal so they were re-checked against our standard test bowl, Titan No. 11.
5. The lab results were much lower than normal so we ran extensive tests on our standard test bowl, Titan No. 11. These results are shown on the next page.

Evaluation of Bagged Miso from March 2006

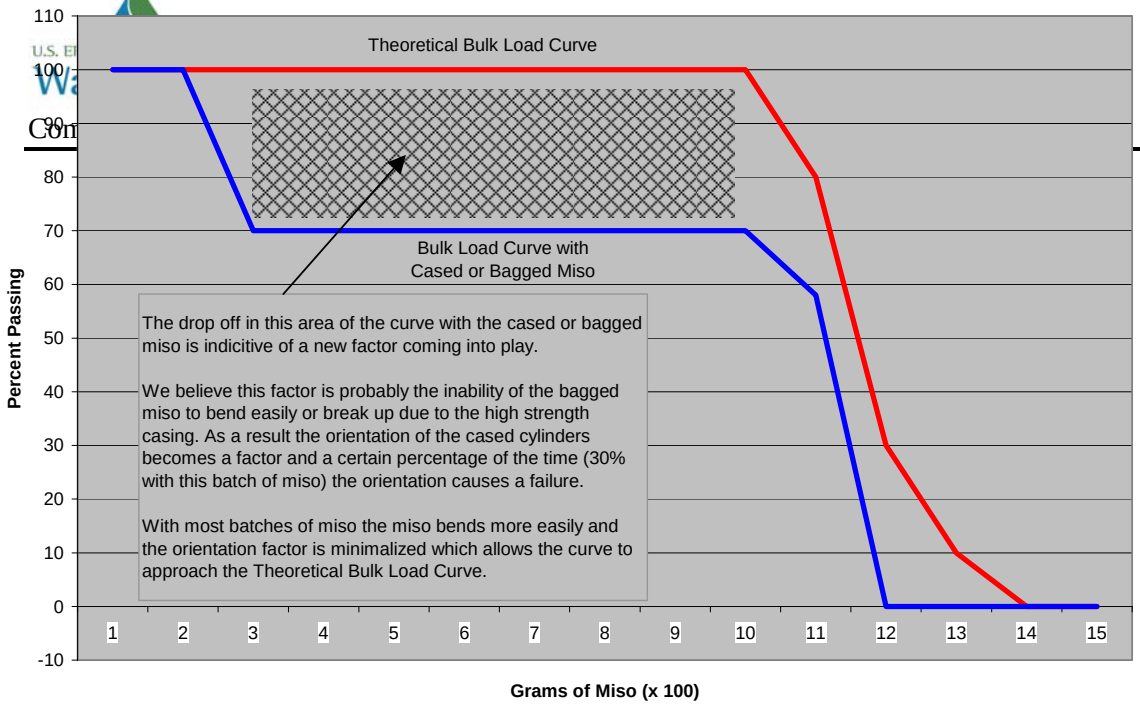
All Tests Were Run Using Titan Bowl No. 11

Repetitive Miso Tests on Standard #11 - Miso Box 1													
Test		Water	Main Vol	Grams of Miso - Number that Passed out of 5 Trials									
Date	Time	Temp	50 psi	250	300	400	500	600	700	800	900	1000	1100
03/02/06	1:00 PM	64	1.54					1	3	3	4	4	2
03/03/06	7:45 AM	58	1.53					4	2	1	2	4	2
03/03/06	10:30 AM	57	1.55					4	5	2	4	4	3
03/03/06	2:00 PM	64	1.55					3	4	5	4	1	3
03/06/06	7:45 AM	54	1.52					3	3	5	5	4	2
03/06/06	10:30 AM	59	1.52					5	4	4	5	5	3
03/06/06	2:00 PM	56	1.51					3	5	4	2	5	3
03/07/06	7:40 PM	54	1.52					4	3	4	3	3	2
03/07/06	10:30 AM	54	1.54					3	2	4	4	2	4
03/07/06	12:40 PM			5	5	3	4						
03/07/06	1:10 PM			5	2	4	3						
03/07/06	2:00 PM	56	1.49					3	3	4	4	5	5
Total Trials at each Load				10	10	10	10	50	50	50	50	50	50
Average % Passing				**100%**	**70%**	**70%**	**70%**	**66%**	**68%**	**72%**	**74%**	**74%**	**58%**
								Overall Average 300 to 1000					**72%**

Note:

1. All of these tests (340 flush trials) were all conducted on the same bowl; our standard Titan No. 11 produced on June 11, 2005.
2. Except for loads greater than 1000 grams, all of the bagged miso came from the same container which we labeled "Miso Box #1". For loads greater than 1000 grams, two pieces of miso were added from box #2.
3. Due to the dramatic change from prior test results we were looking at what might cause the variation; therefore tests were run at different times of the day and the water temperature was measured. These factors did not seem to influence the results.

Illustration of Bulk Load Test Results
Theoretical vs Actual Bagged Miso



Evaluation of Bagged Miso from March 2006

All Tests Were Run Using Titan Bowl No. 11

Repetitive Miso Tests on Standard #11 - Miso Box Mixed 1 & 2													
Test		Water	Main Vol	Grams of Miso - Number that Passed out of 5 Trials									
Date	Time	Temp	50 psi	300	400	500	600	700	800	900	1000	1100	1200
03/20/06	2:00 PM		1.53				4	4	5	4	3	4	3
Total Trials at each Load							5	5	5	5	5	5	5
Average % Passing							**80%**	**80%**	**####**	**80%**	**60%**	**80%**	**60%**
								Overall Average 600 to 1000					**80%**

Repetitive Miso Tests on Bowl V - Miso Box Mixed 1 & 2													
Test		Water	Main Vol	Grams of Miso - Number that Passed out of 5 Trials									
Date	Time	Temp	50 psi	300	400	500	600	700	800	900	1000	1100	1200
03/20/06	11:00 AM		1.54				4	5	3	4	4	4	2
Total Trials at each Load							5	5	5	5	5	5	5
Average % Passing							**80%**	**###**	**60%**	**80%**	**80%**	**80%**	**40%**
								Overall Average 600 to 1000					**80%**

Notes:

1. Two bowls were used in these tests. The first is our standard Titan No. 11. The second bowl is a bowl selected to be very nearly identical to standard Titan No. 11. This bowl was designated Bowl V because when we completed our tests it was sent to Veritec to all their lab to run duplicate tests.
2. The bagged miso test media in this test was slightly different from the prior test in that the media primarily came from box number 1, but about 30% came from box number 2.
3. There were two differences observed between the bagged miso in boxes 1 and 2. The miso in box 1 was lighter in color and firmer to the touch.

Evaluation of Bagged Miso from May 2006

Tests Were Run Using Titan Bowl No. 11 & Competitor

Repetitive Miso Tests											
Test Date	**Bowl**	**Miso Box #**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**	**1100**	**1200**
April 28, 2006	Titan Standard #11	#1			**4**	**4**	3	2	3	**4**	3
May 1, 2006	Titan Standard #11	#2			**4**	**4**	**5**	**4**	2	3	3
May 1, 2006	Competitor X	#1	**5**	**4**	3	2	**4**	**5**	**4**	3	
May 1, 2006	Competitor X	#2	**4**	3	3	**4**	3	**4**	**4**	**4**	3

Notes:

1. These tests were run using a new shipment of bagged miso received on April 28.
2. Two bowls were used. The first was our standard Titan #11 which has been used for most of the previous tests. The second bowl was a competitor's toilet which was recently purchased. This toilet was selected because in talking with Mr. Bill Gauley he had indicated that bowls with a narrow well where the sides went straight from the jet to the upleg entrance did not have as much variability with the bagged miso test. This bowl has just such a well.
3. Two boxes of miso were tested to see if there was a difference between the two boxes. We did't observe any differences.
4. Shaded boxes indicate that the bowl would pass the test (pass 4 out of 5 trials).

Commenter: David Iribarne
Affiliation: City of Petaluma, California
Comment Date: 5/3/2006

Subject: HET Specifications

I would recommend you revise your current draft HET specification to read “solidwaste removal must be 500 grams or greater…”rather than 350 grams. This would insure the fixtures performed properly on a consistent basis thus increasing consumer confidence. Many, if not most, of the existing HETs currently meet this specification.

Thank you,

Dave Iribarne
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Commenter: Pete DeMarco
Affiliation: American Standard
Comment Date: 5/4/2006

Subject: American Standard, Inc. comments on the HET draft specification

American Standard supports the specification as written with the following few exceptions:

Section 5.2.3.2 Flush Volume Adjustability: American Standard supports the flush volume allowances provided for single flush HET's and for dual flush HET's at full flush mode. However, the limit of 1.10 gpf on the reduced flush mode is inadequate. We recommend revising this limit to 1.4 gpf, an increase of 0.3 gpf, for the following reasons:

The ASME standard for dual flush toilets, A112.19.14, defines a dual flush at a toilet with maximum flush volumes of 1.6 gpf for the full flush mode and 1.1 gpf for the reduced mode. Most dual flush toilets are of European design and are indeed capable of flushing at 0.9 or even 0.8 gpf, and for these designs the 1.1 gpf requirement is not a problem. However, these models are predominately non-siphonic and all have very small water surface areas. Our customers feel that toilets with larger water surface areas are highly preferable to toilets with small water surface areas in terms of reduced staining and general cleanliness.

Therefore, we would like to provide to the market a siphonic dual flush HET. However, siphonic toilets, with the inherent larger water surface area, require a reduced flush volume closer to the 1.1 gpf maximum value allowed by the ASME standard in the reduced mode. Therefore, we need at least a 0.3 gpf allowance in order to accommodate the adjustability of tank trim. By not allowing an increase to this value, the EPA would in effect be requiring all dual flush HET's to be non-siphonic designs, which of course is restrictive.

As discussed at the stakeholders hearing, it is extremely unlikely that anyone would ever actually try to make adjustments to an HET that meets all of the performance requirements in the draft specification. Therefore, there is very little risk of losing any real water savings and accommodating our recommendation will allow for the introduction of very high performing siphonic dual flush toilets.

Appendix D: Please contact IAPMO R&T for an updated list of laboratories approved to test to the specification.

Regarding the issue of extruded versus the encased miso, American Standard has no preference in this matter.

We support the 350 gram threshold and the pass / fail approach.

Thank you for consideration of these comments. Please contact me if you have any questions.

Respectfully submitted,

Peter DeMarco
Director, Compliance Engineering

Commenter: Pete DeMarco and Al Dietemann
Affiliation: Steering Committee for Water Efficient Products
Comment Date: 5/26/2006

Steering Committee for Water Efficient Products
1001 Connecticut Ave., NW Suite 801
Washington, DC 20036

May 26, 2006

Sheila Frace
Office of Wastewater Management
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

Dear Ms. Frace:

These comments are submitted in response to your letter of April 7, 2006, proposing a draft specification for labeling program eligibility for high efficiency toilets. As you know, we co-chair a steering committee formed from over one hundred organizations, companies, water utilities, and public agencies that support a national voluntary water-efficient product labeling program. Following several years of generalized program planning and scoping, we welcome the initiation of the product specification development process.

1. Water efficiency criteria. The language of the performance criteria should account for the possibility of various tank and bowl combinations for two-piece toilets, some of which may not meet all the performance and design criteria contained in the proposed specification. A qualifying model should consist of a specific combination of tank and bowl. No single component (tank or bowl) of a two-piece toilet should be independently qualified as meeting the specification.

2. Supplementary requirements. ASME A112.19.14 should be listed as a requirement that all dual-flush toilets must meet. In addition, the maximum volume of discharge for dual-flush fixtures in the reduced flush mode, currently proposed at 1.10 gallons per flush, is unrealistically low, and should be increased by a reasonable increment, such as 0.25 or 0.3 gpf.

3. Testing and certification. Manufacturers of products proposed for certification must agree to make all testing documentation available to EPA if and when requested, and this requirement should be explicitly stated in the criteria.

4. Future specification revisions. The specification should state that potential future revisions to the specification would be made following discussions with industry partners “and other interested stakeholders.”

Finally, we note that the proposed specification was not accompanied by any market analysis of this product. In order to better understand the "value added" and the potential benefits from various levels of efficiency that might be considered for specification, some basic characterization of the marketplace for

the product would be very helpful. In the future, EPA should prepare a brief market analysis for each product or service under consideration for specification, and as specifications are considered for subsequent revision, these analyses should be updated accordingly and used to inform such revisions. For examples, see these Department of Energy reports:

- *Market Impact Analysis on the Potential Revision of the ENERGY STAR Criteria for Dishwashers*, June 10, 2005;
- *Market Impact Analysis of Potential Changes to the ENERGY STAR Criteria for Clothes Washers*, August 6, 2004.

We thank you for your attention to these views. Questions about, or responses to, this letter can be directed to our Steering Committee coordinator, Edward Osann, at 301-535-4013, and at the above address.

Sincerely,

Peter DeMarco, Co-Chair
American Standard
(732) 980-3472

Al Dietemann, Co-Chair
Seattle Public Utilities
(206) 684-5881

Commenter: Malcolm Castor
Affiliation: Southwest Florida Water Management District
Comment Date: 5/10/2006

Subject: Comments - Draft High Efficiency Toilet Specification

Good day:

I had the opportunity to review the Draft specifications for high efficiency toilets and would like to commend the Environmental Protection Agency for moving forward in area of performance standards for water conserving plumbing fixtures. In the course of my review, I did note one item that I believe warrants comment. Specifically, in Section 3.0
addressing water efficiency criteria, Subsection 3.1 regarding single flush toilets states that "...effective flush volume is the average flush volume when tested in accordance with ASME A112.19.2-2003." Subsection 3.2 regarding dual flush toilets states that "...Flush volumes should (emphasis added) be tested in accordance with ASME A112.19.2-2003 and ASME A112.19.14-2001." I believe the verbiage in Subsection 3.2 should conform to the Subsection 3.1 verbiage, e.g., "...Flush volumes will be established by testing units in accordance with ASME A112.19.2-2003 and ASME A112.19.14-2001."

One question did occur to me. Does the latex casing for the test media significantly change the friction coefficients, thereby providing an appearance of efficient flush characteristics? I would be interested in the answer to this question, since it was unclear in the 2006 MaP Test Protocol, Version 3 if this had been considered.

Thank you for the opportunity to review and comment on this Draft.

Sincerely,

Malcolm O. Castor, Staff Water Conservation Analyst
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Commenter: Matt Tomsic
Affiliation: CSA International
Comment Date: 5/2/2006

Subject: high efficiency toilets

To whom it may concern,

I am an engineer and plumbing certifier that tests water closets to existing low-consumption standards. I have deep rooted concerns with your proposal to increase the restrictions on water consumption for toilets. After working in this industry for several years and just being an average citizen who uses the toilet regularly, it is fairly easy to see that the already existing restrictions do not work. In previous efforts to improve water conservation by restricting the water consumption to 1.6 gpf, most manufacturers barely meet those requirements. This causes the home user to flush the toilet twice, thus negating any water savings sought to be realized. This now means that less water does not mean more efficient.

Manufacturers have been making some innovations that will help water conservation though. Some manufacturers are going to a 3" flush valve instead of the traditional 2" valves. This lets an equal volume of water into the bowl at a faster rate thus producing more force to clean out the bowl. This however means that all previously made 2" flush valve toilets can not be retrofit to accommodate these new valves. The migration to the new style of toilets will take many years if not decades before widespread use of these is commonplace. Many home users still have the old 5 gpf toilets still in their homes, which cuts into your plans for water conservation as it is.

Another innovation is the use of pressurized flushing devices. These are very efficient and reliable, but a little more costly and noisy. Right now it seems that many hotel chains are buying these as they do provide the desired results of consistent water savings. The trade off is that everyday consumers do not want this type of product in their homes, whether it is because of price or noise.

Since water closets pass the already existing standards yet do not provide the results the consumers want, wouldn't it be more prudent to put more stringent performance requirements into the standards making more efficient use of the 1.6 gpf rather than cutting down the water consumption that will just lead to even more consumers flushing more than once again negating the water conservation.

Sincerely,

Matt Tomsic
project engineer
CSA International

Commenter: Niagara Conservation Corp.
Affiliation: Niagara Conservation Corp.
Comment Date:

Comments Regarding Proposed HET Standards
Submitted to: EPA Water Efficiency Program
Submitted by: Niagara Conservation Corp.

Re: Pertaining to HET Proposed Standard 5.2.3.2 regarding "the maximum water use setting for single flush High Efficiency Toilet (HET) fixtures."

Proposed Standard Section 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 flush3
- For dual flush fixtures: 1.10 gallons (4.2 liters*) per flush4 in reduced flush mode and 2.00 gallons (7.6 liters*) per flush5 in full flush mode."

Niagara Conservation Corp. comments:
Niagara Conservation recommends that the HET standard "when field adjustment of the tank trim is set at its maximum water use setting" be revised to a limit of 1.40 gallons (6.4 liters) per flush (gpf) for the single flush3 fixture. Niagara Conservation believes that the proposed 1.68 gallons (7.6 liters) per flush is excessively high, and will reduce the probability that the EPA Water Efficiency Program will achieve its desired goals relating to the HET. Although toilet manufacturers need a tolerance level on maximum water settings in developing their HET product lines, creating an HET standard that allows for field adjustments that currently exceed the 1.6 gpf level for existing low-flow toilets is not only unreasonable, but will subject the committee and EPA to criticism. This HET standard should be design to guide the industry toward manufacturing toilets that are functional while reducing the use of limited natural resources below levels currently available in the marketplace. Furthermore, Niagara Conservation believes that setting the standard to allow for a field adjustment of 1.68 gpf is not only counterintuitive, but conflicts with the "efficient water use" objective set forth in the EPA Water Efficiency Program. This standard, as currently designed, allows for excessive water use by the end-user and/or installer who chooses to conveniently (yet unnecessarily) increase flow levels that reduce the effectiveness of the HET initiative.

*Note: The gallons to liter conversions are incorrect in the Standard (i.e. 1.68 gallons equals 7.6 liters, 1.10 gallons equals 5.0 liters, and 2.00 gallons equals 9.1 liters.)

Commenter: Tony Gregg, P.E.
Affiliation: Austin Water Utility
Comment Date: 5/25/2006

Comments on HET Specification

The flush volume specifications for toilets using after market flappers do not cover all appropriate contingencies and are open to possible abuse.

1. Section 3.2. The effective flush volume for dual flush toilets is based on one study. At this time, there is not sufficient data to support the calculation of the effective flush being the "average of two reduced flush and one full flush". Using such as calculation could significantly overstate the expected savings from dual flush toilets. In order to be conservative in this calculation, the portion of the spec should be revised to the "average of one reduced flush and one full flush." As additional research is completed at a later date, this specification could be considered for revision.

2. Section 4.3. Perhaps not having a standard for solid waste removal for the reduced flush option on dual flush toilets is adequate for now. However, there could be an opportunity to identify premium performance of those toilets that do have adequate solid waste removal at the reduced flush. I think further study should be conducted on this portion of the spec and be considered for a future revision.

3. Appendix C, Section 3.2.2: For non-standard flush valve sizes, the proposed specification directs that replacement seals available at hardware or building supply stores will be used. This is insufficient since replacement flappers for some models may only be available from plumbing supply stores or from the manufacturer. Restricting the replacement flappers tested to those only available from hardware or building supply stores unnecessarily removes some flappers that may cause high flush volumes from consideration.

4. Appendix C, Footnote 11: Allowing the testing laboratory to decide which after market flapper is used to test the flush volumes in cases where the specified 3-inch flappers do not work or where the flush valve is of a non-standard size poses two problems. First, it sets up a potential conflict of interest. Since the toilet manufacturers are paying the testing laboratories to certify their toilets, they could be pressured to choose a flapper design that does not maximize the flush volume as the test is intended. Second, it invites future problems. When they were introduced, 3-inch flush valves were non-standard and after-market flappers were not available, so some testing standards let them avoid this type of test. Now that most manufacturers are using or introducing 3-inch flush valves, after-market flappers are becoming available. Non-early closing flappers are being sold as replacements for toilets designed to use early closing flappers, thus increasing their flush volumes. To avoid these problems, the specification should stipulate that for non-gasket type seals, a non-early closing flapper that drains the entire volume of the tank must be used to test the flush volume. If a non-early closure flapper is not available in a certain diameter, EPA should issue specifications or guidance on how to develop a prototype flapper that would be used to test the toilet for flush volume.

We should learn from the experience with the 3-inch flapper when it was exempted from being tested with a non-early closure flapper in the LA specifications. Unless this proposed HET specification is changed, a manufacturer could develop a toilet with a 3 3/16 inch or other odd sized early closure flapper for which there is no replacement non-early closure replacement flapper and possible get their toilet approved under this specification. Let's completely close this loophole now so we can have clarity in the marketplace and a clean specification.

Commenter: Jeremy Brown
Affiliation: NSF International
Comment Date: 6/22/2006

Per our conversation today, I have a comment the question "How will EPA verify the testing? on the WaterSense FAQ's found at www.epa.gov/watersense/fq.htm

The response indicates that laboratories need to be certified by IAPMO. I believe this is an inappropriate reference for the qualification of laboratories. While IAPMO does approve laboratories for their own data acceptance, they are not a laboratory accreditation organization. This essentially forces any laboratory who has an interest in this testing to enter into a business relationship with one particular company.

I think the idea here is that you want the laboratory to be competent. Normally this is done by requiring the laboratory to be accredited to ISO 17025 General Criteria for the Competence of Testing and Calibration Laboratories. This is the standard utilized by testing laboratories and accreditation agencies around the world. There is an organization called International Laboratory Accreditation Cooperation (ILAC). This is an association of laboratory accreditation agencies from around the world. Their general website is http://www.ilac.org/. Making reference to this organization is more appropriate than the reference to IAPMO. Basically each laboratory has the right to choose which accrediting agency with which they do business.

The second sentence in the response should be replaced with "All testing will be performed at laboratories accredited to 17025 by a member of the International Laboratory Accreditation Cooperation (ILAC)".

I would like to get the name of EPA staff for follow-up on this issue. I am more than happy to answer any questions about on this topic.

Regards,

Jeremy Brown
Codes & Regulatory Manager
NSF International
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Commenter: Dr. Lawrence Galowin
Affiliation: National Institute of Standards and Technology
Comment Date: 4/17/2006, 5/4/2006

Subject: Inquiry on HET testing

It seems to me that any recognized testing accreditation program for plumbing evaluations undertaken by a recognized and international standards conforming standard process should have been identified as acceptable testing sources in your announcement on the newly announced project for water closets. In particular, the National Voluntary Laboratory Accreditation Program (NVLAP) has been at the forefront of setting the most demanding sets of requirements for accreditation but EPA does not (for reasons unknown to me) seem to acknowledge such criteria as essential to assurances from testing. I would share some of my assessor experiences if you desire only on a personal basis. Please modify the announcement to take into account my comment.

Best regards,

Dr. Lawrence Galowin

Commenter: Dr. Lawrence Galowin
Affiliation: National Institute of Standards and Technology
Comment Date: 4/17/2006, 5/4/2006

Subject: Comments on hearing recommendation for HET

Program Managers - repeated for error message on non delivery I have previously forwarded recommendation that the HET project specifically change the requirements for laboratory testing to assure that actions by all accrediting bodies that follow ISO 17025 in rigidly controlled programs for plumbing accreditations in testing under usual ASME plumbing standards be recognized by EPA for this endeavor. In particular, the NVLAP program at NIST should always be listed by EPA as a part of the U.S. government organizations (at NIST) that conduct accreditation programs and serves almost all agencies.

My comments attached deal with several specifics that need to be acted on to assure that this program is developed with adequate assurances that ell important aspects for water (and energy) savings are achieved BUT that assure the consumer as well as the plumbing industry can have confidence in the promotions and implementations anticipated.

If my assistance may be of help please call upon me at any instant.

Dr. Lawrence Galowin
(See attached file: Comment WC EPA 'Water Saver HET.doc)

Commenter: Dr. Lawrence Galowin
Affiliation: National Institute of Standards and Technology
Comment Date: 4/17/2006, 5/4/2006

Subject: HET Test Requirements

Congratulations on efforts to undertake this important water savings and energy savings project. It will benefit all the U.S. and needs nurturing but needs desperately more attention to potential that demonstrated performance as an installed WC into the plumbing drainage systems will be satisfactory. I provide my recommendations in this memo.

Urgently needed is testing of several WCs of characteristics in a simplistic drainline configuration with pipe fitting (A112.19.2 drain carry) but with the new media and only requiring a 3 or 5 meter length drain test rig. All accredited laboratories accredited to A1122.19.2 MUST have such a configured arrangement (usually in 10 ft sections) in order to be accredited. Hence the surprise at the meeting that tests have been performed into open air vertically downward that allows free fall for acceleration of the water (spray) and solids that make it over the discharge from the bowl HAS NO MEANING for plumbing installations. Release into an open outlet that provides the usual acceleration of bodies freely falling may be useful to manufacturers but not to the arrangement used everywhere that have turning fittings and pitched pipes of the drain. Interferences from the fitting and pipes is a MUST in evaluations for the functions and NOT an open falling scheme.

The following comments are provided to assist in assuring efforts to achieve major successes. This critique provides achieving the desired end point of assuring that performance of water closets with lowered water consumption meets proper physics that govern the actions through test procedures consistent with usual configurations for WC installation practices in building drainage systems. Those require that the solid wastes are extracted and the drainline waste carry is adequate into drains for transport and final delivery into stack(s) and sewer or disposal field. **The current proposed actions DO NOT MEET SUCH REQUIREMENTS!**

The A112.19.2 test standard does not provide for representation of installed configuration test setup (allows vertical open air down flow exit for solids extraction that is meaningless). Building installed plumbing requires turning fittings into shallow pitched drain piping. The installation results in a closed piping arrangement; the physics of the situation is totally different from open air discharge with freely falling water and solids. Such a transport scheme is in the A112.19.2 standard but the balls roll down the pipe (yes, physics still apply!). Measured velocities and deceleration and reacceleration of simulant waste solids in fittings and drain from WC entries that differed was shown in the mid-1970's by Waklin and Swaffield (Brunel University, U.K.) for plastic and cast iron drain materials. Applications from available world research do not seem to find ready utilizations in U.S. applications (low flush WC volume standards in world practices have required total extractions for some time now). WHY?

The open to air downflow configuration test rig has no fitting/drain piping. That open to air outlet provides an **essentially variable orifice nozzle opening (governed by a 'vena contracta' formation at outlet) driven by the gravity field with usual 'g' value.**. The solids rapidly leave and result in **NO** INTERACTIONS with other solids or falling water flow dispersals under gravity acceleration away from the discharge opening. Such an arrangement is similar to a variable nozzle applied by firefighters that adjust intensity and flow rate from an adjustable nozzle with the same pressure behind it! The test

arrangement provides for solids acceleration downward from the bowl at near 32 ft/sec in the down leg operation (surrounded by the water discharged) that results in **total clearance of solids so that no further interactions result**!

Such actions are far different from actualities of installed WCs with drainage piped systems. Since no relationship to installed situations (turning fitting, pipe wall friction, diminished energy and resultant motion that results from turning action and forces that change momentum vectors) there cannot be any correlation for the physics of water and solids in motion. Additionally, the ball carry test of A112.19.2 is meaningless since balls roll down the pitched pipe due to gravity and not WC operations (also to add to confusion many water closets cannot clear all the 100 balls).

The utility of the open modes of testing used now are probably extremely useful to manufacturer needs for product developments and configuration studies in selected product needs, e.g., jets to evacuate solids within the bowl, but **do not have any usefulness for the applications to installed drainage systems**.

I suggest the following desirable alternatives for consideration to be adopted since (as now proposed) the test laboratory already has to setup and conduct the ASME A112.19.2 tests noted. BUT, DO NOT PROCEED WITH THE PROJECT WITHOUT SOME VERIFICATION TESTS WITH A BASIS REALISTIC SIMULATED TESTING; ALSO PROVIDE DATA TO THE ATTENDEES (THAT WAS LACKING) FOR COMMENTS AND FEEDBACK.

INDICATOR: Statement in the Gauley/Koeller report (Feb. 2005) with test media that breaks up and easier to transport in drains for carry (p.15): "…distinct differences in waste carry among the different flushing systems, the results are somewhat surprising. That is, the flushing systems that are better at clearing media from the bowl {referring MAP tests - open to air in gravity free fall conditions – LSG comment}are not the same systems that carry the waste the furthest in the drainline."

At this time NO program endeavors show data that the solids loads proposed will clear the WC when properly installed and provide any transport of some distance in the usual building drain configuration. **Until there is a body of testing reported then the project should not go forward until such information is developed.** Future purchasers need some protection from false claims.

My suggested requirements for the provisions for testing that were discussed:
(A) Preferred procedure includes complete testing requirement of ASME A112.19.2
(1) For ASME standard A112.19.2 solids mixed media extarction test substitute language for extraction that "requires 95% removed in all extraction tests" of the standard mixed media.
(2) Replace, in the ball transport test, to require use of the standard mixed media materials load and flush into the pitched drainline as described, but of a 3m or 5 m length (about 10 ft or 15 ft) open to the atmosphere. Require that **three of five tests demonstrate total clearance** from the end of pipe.
Those tests add to the utility of the laboratory evaluations that provides a benefit from useful expansion of data for confidence with other differing materials (from bean paste type materials and shapes). Such additional confidence is a singular benefit essential to this program for water savings in WC applications.
.
(B) Alternate Approach: Elimination of selected non-useful testing from A112.19.2.
Since the sections on waste extraction and ball carry tests have no significance **as established** now, then **DO NOT require either test setup and/or conducting meaningless tests**. That would follow the essential rejection of utility and significance of those and bring reduced cost for laboratory testing.

Commenter: Kevin McJoynt
Affiliation: Gerber Plumbing Fixtures LLC
Comment Date: 5/12/2006

Subject: Fw: New EPA Water Efficiency Specifications

Stephanie and John,

My name is Kevin McJoynt and I am the Director of Marketing for Gerber Plumbing Fixtures LLC. I want to stay informed and become involved in this High Efficiency Toilet specification initiative. Please respond and let me know what I should do.

If I am already in your email database, I apologize. We have moved offices and email servers in the last month and unfortunately some data did get lost.

Thanks in advance.
Kevin

PLEASE NOTE: My new contact information is as follows:

Kevin McJoynt
Gerber Plumbing Fixtures LLC
2500 Internationale Parkway
Woodridge, IL 60517
630-754-0111 dir
630-679-1420 main
kevin.mcjoynt@gerberonline.com

Commenter: Doug Hand
Affiliation: Douglas Flow Control
Comment Date: 4/24/2006

DFC
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DFC CONSERVATION 'GROUP' CO.
Water / Energy / Environmental / Chemical / Infrastructure / Health / $$$'s

April 24, 2006

Environmental Protection Agency
Washington, DC. 20460

Via: Email: plumbing@epa.gov

ATTN: Sheila E. Frace, Director, Municipal Support Division
Stephanie Tanner, Program Response Contact

Thank you for an opportunity to comment on the proposed HET Specification.

A gravity toilet's tank water volume is limited by the height of the tank actuator hole *or* the flush valve overflow tube –whichever is less. Appendix C 2.1 controls OEM equipment overflow tubes, Appendix C 3.1 addresses after market flappers. What isn't regulated are after market overflow tubes. This is critical. It means a toilet's federally mandated water consumption can still be manipulated by **1+ gpf** through the replacement of OEM flush valves with off the shelf DIY flush valves.

Visiting a plumbing outlet shows how. DIY replacement overflow tubes are 9+". OEM tubes are 6+" and not available retail. Two years ago the impact on 1.6gpf toilets of changing to DIY from OEM valves was demonstrated at SGS US Testing in Tulsa, OK. Since then increasing toilet water consumption by 1+gpf has become even easier because fill valves are now height adjustable. For this reason we recommend HET Specification 5.2.3.2 be modified to read "when field adjustment of original, modified or replacement tank trim is set at…"

SGS US Testing also confirmed our Dual Flush Choice (DFC) valve *retrofits* both *installed(1.6 or 3.5+gpf) and new* toilets to provide reduced flush volumes of 30+% less. DFC is simpler to maintain and many times cheaper than dual flush water closets. It's also **sustainable, water volume limiting, leak resistant** and can be produced by molders nationwide exponentially faster than ceramic manufacturers produce toilets.

DFC has been discussed with mold makers and molders, Water Service Organizations, an energy alliance and a research organization that studied dual flush toilets for the DOE. A condensed version of our notebook describing DFC features/benefits, patents, photos etc. is available. We wish to make it part of the public record on this HET specification discussion and for the EPA's new Water Efficiency Program. Please advise on how this should be done.

Thank you.

Doug Hand

Doug Hand, President
DFC Conservation Group Co.

DH/md

Commenter: Chris Dundon
Affiliation: Contra Costa Water District
Comment Date: 4/18/2006

Subject: Comments on HET Specification

Overall, the specification for HETs looks good. However, I have one suggested revision.

Background
Since 1992, public opinion regarding ULFTs is that they perform poorly and require double flushing. However, over the past five or six years, manufacturers have improved the quality of the ULFT and public opinion has probably gotten somewhat better. The MAP testing is also responsible for a lot of this improvement. In the EPA's Focus Group Findings Report (draft August 20, 2004- page 8), participants mentioned their concern with water conserving products. They specifically commented on ULFTs stating: "like those water-efficient toilets that you have to flush three times."

We have an opportunity to erase the black eye that the conservation industry received with the poor performing ULFTs. The HETs endorsed by the conservation industry need to be consistently high quality performers. This is vital to the success of toilet water use efficiency and will improve public opinion for other water fixtures as well.

Suggested Revision:
Revise the specification to require HETs to flush a minimum of 500 grams or greater.
(Note, this will not adversely affect the HET market, as the vast majority of HETs already meet this threshold.)

Thank you for receiving my comment.

Chris Dundon
Water Conservation Coordinator
Contra Costa Water District
(925) 688-8136

Commenter: Fred A. Froewiss
Affiliation: Control Fluidics, Inc.
Comment Date: 4/23/2006

For over two decades, Control Fluidics Inc. has been involved in the research and development of products for water conservation.

Our company's principal focus is the manufacture and sale of the Fluidizer Ultra Low Flush Toilet system. Toilet flushing is the largest consumer of water used in the home accounting for approximately 40 percent of total indoor residential use. In commercial settings, i.e., hotels, office buildings etc., about 30% of total water consumption is accounted for by toilet use.

The Fluidizer uses only 2 liters of water, 66% less than the most efficient 1.6-gallon units currently on the market; consequently, we believe that our product can be a major factor in water conservation. It is patent protected (two new patents were issued in 2002) and has it been life-tested for durability at the Stevens Institute of Technology.

Importantly, the Fluidizer produces at least 66% less sewage than existing toilets, resulting in substantial environmental benefits. Obviously, savings in energy needed to transport and treat sewage will result, and by effectively increasing the capacity of existing sewage treatment plants, the likelihood of polluting overflows becomes less likely. Additionally, local governments will have the option of deferring major capital investments in new sewage treatment facilities.

There are many areas in the United States where new construction has been halted or sharply curtailed due to inadequate water resources and overtaxed waste treatment facilities. We believe our company can make a substantial contribution to alleviating these problems.

We have contacted several large plumbing manufacturers and received essentially the same responses. They told us that they have made substantial capital investments in tooling for the new 1.6-gallon toilet and they have no desire to commit additional resources for a next generation product. They also claim to see no consumer demand for a more water efficient toilet. Clearly, we have what might be termed a "disruptive technology", and since the domestic plumbing fixtures industry is dominated by a small number of players, we are not optimistic that a major manufacturer will accept our product.

It is interesting to note that we are currently in negotiations with a Middle Eastern Government for the establishment of a joint venture to manufacture and market our products for that water starved area.

If you would like further information on our activities, please feel free to contact us:

Fred A. Froewiss
Email: faf@cf-inc.com
Phone: 718 273-7200
Fax: 718 273-7229

Commenter: Patrick Costello
Affiliation: City of Napa, California
Comment Date: 4/24/2006

Subject: Comments on Draft HET Specifications

After reviewing the Draft High Efficiency Toilet (HET) Specification, the City of Napa Water Division recommends the following change to the Flush Performance Criteria:

Require that solid waste removal be 500 grams or greater

In the cooperative Canadian/American Maximum Performance (MaP) testing, the overwhelming majority of existing HETs already meet this more stringent standard. By using a 500 gram standard rather than the proposed 350 grams, the EPA Water Efficiency labeling program will help overcome remaining public resistance to water-saving toilet technology. In City of Napawater conservation programs, we frequently encounter customers convinced that ultra-low-flush toilets (ULFTs) do not work well and require at least two flushes. This attitude persists despite the plethora of high-performing ULFTs brought to market in the past decade. The skepticism results from certain poor-performing ULFTs introduced in the early 1990s. For this next generation of toilets, HETs, the water conservation industry has a chance to eliminate skepticism by insisting that only consistently high-performing models are endorsed. In labeling only models with top-tier (500 gram) MaP test results, the EPA program will spur manufacturers of borderline or lower-performing HETs to improve their designs, and the public will benefit by seeing that extremely water-efficient toilets can flush even better than their old toilets. This public acceptance of new HETs can only benefit the public acceptance of other water-saving fixtures.

Patrick Costello
Water Resources Specialist
City of Napa, California

Commenter: Thomas E. Pape
Affiliation: California Urban Water Conservation Council
Comment Date: 4/25/2006

Subject: HET Specifications

It is important for the specifications to be based on water use and performance, not technology. Also, dual-flush technology lacks adequate research to prove how often users choose the lower flush cycle. It would be better to set a maximum flush volume (1.28 GPM) for ALL flushes.

There is no need to specify types of technology (gravity, pressure assist, etc.). We do not want to limit any new innovations that might be developed in the future. It makes no difference what achieves the water savings, as long as performance and water use is maintained. All technology, even composting type toilets should meet this requirement and be included in this effort.

Thomas E. Pape
Technical Advisor
California Urban Water Conservation Council
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DFC CONSERVATION 'GROUP' CO.
Water / Energy / Environmental / Chemical / Infrastructure / Health / $$$'s

June 22, 2006

Ms. Sheila E. Frace, Director
EPA East
Room 7225-A
1201 Constitution Avenue
Washington, DC 20460

Hard copy to follow by Federal Express
Airbill #8564 4497 7846

Via email to: tanner.stephanie@epa.gov
June 22, 2006

Attn: Stephanie Tanner

Addendum No. 3
Supplement to DFC May 18, 2006 & June 12, 2006
a) EPA Draft HET Specification Response
b) DFC Alternative HET Specification – Proposal
c) DFC June 12, 2006 Addendum No. 2 – DFC Alternative HET Specification

Dual-flush Conservation Choice (DFC)
DFC Water Sense single- and dual-flush Float-Valve & Handle Assembly (FVHA) Specifications.

DFC herewith offers HET related specifications for FVHAs to be utilized with most tank toilet/water closets and configured to independently limit tank water volume while providing sustainable flush valve water conservation through simple, quick, and affordable maintenance support. Said specifications apply to related yet distinct implementation strategies. (1) HE-FVHA for after market retrofit of hundreds of millions of toilet/water closets. An interim strategy, HE-FVHA makes an immediate meaningful impact upon potable water conservation. (2) HET-FVHA for new, OEM toilets is an ongoing strategy making HET certification attainable. FVHA's modular nature makes component cost sharing by various stakeholders plausible.

I. Flush Float-valve Assembly (FVA) specifications.

1. A particular-height, single-flush float valve including overflow tube individually, or in combination with a particular-height full-flush float valve comprising a dual-flush float-valve assembly, slidingly coupled to a particular-height valve guide including valve guide stop cap and spud end for attachment to outflow hole of particular-size toilet or water closet tank, thereby limiting flush volume in accordance with HET specification;

2. A single- or dual-flush float-valve assembly configured to independently limit tank water volume in accordance with HET specification for single-flush float-valve assembly and dual-flush assembly's full-flush mode;

3. Said reduced-flush float-valve section of dual-flush float valve assembly comprising direct water evacuation route between reduced flush-valve outflow and toilet-bowl inlet, thereby maintaining positive water siphon velocity action.

4. Said flush float-valve assembly configured to be nonadjustable, nonextendable, or exchanged for taller flush valve(s);

5. Said flush float valve configured for sharing tank cavity with simple and more durable pilot valve-type ballcock float-ball style **fill** valve;

6. The full-flush float valve portion of dual-flush valve assembly is configured for user cognitive thought process emergency – .50±gpf addition to HET specification (1.68 gpf) – through user continuation retention of full-flush mode actuator control handle or other device, thereby eliminating need to double flush.

7. A dual-flush float-valve assembly for tank toilet comprising dual-flush float valve seat seal being of greater diameter than diameter of companion reduced-flush float valve seat seal, thereby requiring greater user flush-handle actuation force thereby lessening user's unintended flush action;

8. Said flush float-valve assembly comprising a nonmechanical and frictionless flush float valve(s);

9. Said flush float valve seat seal – inside tank replaceable;

10. Said flush float valves and overflow tube – inside tank replaceable;

11. Said single-flush float valve convertible to dual-flush float-valve assembly – inside tank;

12. Said single- and dual-flush float-valve assemblies - inside tank convertible within two minutes' time;

13. Said dual-flush float valve(s) manufactured from chlorine-resistant, virgin or recycled polypropylene, or better;

14. Said flush float valve seat seal manufactured from silicone product, or better;

15. Cost-effective life-cycle, after market *retrofit* dual-flush float valve and companion handle assembly projected repayment is less than one year. Two years for FVHA equipped HET specification toilet fixture.

II. A FVHA specification applicable to HET specification toilet/water closet equipped with optional single- or dual-flush float valve assemblies.

1. A handle assembly mechanism adapted for dual-flush operation, the handle assembly, including a first-handle member and a second-handle member, and the mechanism further comprises removing the second-handle member where the handle assembly is adapted for single-flush operation.

Sincerely,

Douglas P. Hand, President

DPH/md