

# LOS ANGELES DEPARTMENT OF WATER AND POWER

## Requirements for Ultra-Low-Flush Toilets

### Supplementary Purchase Specification to ASME A112.19.2-2003

Revised: November 16, 2005

Toilets conforming to the applicable requirements of this specification will be listed as “SPS Certified” by LADWP. Sections I, II, III, IV and V of the following requirements shall apply to tank-type gravity fed toilets. Sections I, II and VI of the following requirements shall apply to tank-type flushometer (pressure-assist) and tank-type electrohydraulic toilets. Contact information regarding this specification can be found in Appendix A.

- I. Conform to ASME A112.19.2-2003 and listed by the City of Los Angeles or listing agency approved by the City of Los Angeles. Evidence of listing has been provided to the LADWP.
- II. Evidence of listing by the City of Los Angeles or listing agency approved by the City of Los Angeles as meeting the requirements of the Supplementary Purchase Specification has been provided to the LADWP.
- III. Conform to supplementary requirements regarding flapper replacement marking and fill valve. Conformance defined as follows:

- A. Flapper Replacement Marking: The interior of the toilet tank, underside of the toilet tank lid or the overflow tube shall be marked with the manufacturer’s part number for a replacement flapper valve, and a manufacturer’s telephone number to be used for obtaining a replacement flapper valve. Marking shall be permanent, visible (3/16 inch letter height minimum) and legible.

***NOTE: Flapper replacement marking requirement becomes effective on February 1, 2006.***

- B. Fill Valve: The fill valve shall be the pilot valve type only OR, alternatively, the fill valve shall be classified “Compliant” after being subjected to the test protocol included in Appendix B. LADWP must be provided hard copy documentation showing that a non-pilot valve type fill valve is classified as “Compliant” before the subject toilet may be certified as meeting this supplementary specification.

***NOTE: Fill Valve requirement becomes effective on February 1, 2006.***

- IV. Conform to supplementary requirements regarding toilet flush valve seal durability. Conformance defined as follows:

- A. Tanks equipped with a flush valve shall contain a flush valve seal that is classified “Compliant” after being subjected to the test protocol included in Appendix C<sup>1</sup> of this specification. All other flappers/seals must first be subjected to that protocol by a City of Los Angeles approved listing agency or by the Metropolitan Water District of Southern California (Metropolitan). Test results must show that the subject flapper/seal is "Compliant" when tested in the two consumer products: Clorox<sup>®</sup> (bleach) and 2000 Flushes<sup>®</sup> (bleach) as defined herein. Those results must be reported to LADWP.

---

<sup>1</sup> This test protocol has been adapted from Appendix C of the study “Toilet Flappers, Material Integrity Tests,” by the Metropolitan Water District of Southern California (Metropolitan), dated January 2000. Inclusion of this test protocol is with the permission of the Metropolitan Water District of Southern California.

- B. LADWP must be provided hard copy documentation showing that the flapper/seal is classified as “Compliant” before the subject toilet may be certified as meeting this supplementary specification.

V. Conform to supplementary requirements regarding toilet tank capacity. Conformance defined as follows:

- A. Any barrier, bucket, “dam”, displacement device, etc., used in a toilet tank to affect flush volume shall be tamper-resistant and permanently affixed to the tank (i.e., any device that can be tampered with or removed such that the toilet can be made to flush with greater than 2.0 gallons when tested in accordance with Section B below shall be deemed noncompliant).

***NOTE: A manufacturer or its representative may, at its option, submit proposed tank designs to LADWP for evaluation prior to production. Should the submitting party designate those designs as proprietary, all information and ensuing discussions will be kept confidential. LADWP will render a written decision on compliance with this requirement within 15 working days of receipt.***

AND

- B. Either one of the following requirements (1 or 2):

1. The maximum capacity of the tank or, alternatively, the water containment vessel inside the tank, shall not exceed **2.0** gallons, measured as follows:

**Purpose of Test:** The objective of this test is to determine the maximum water holding capacity of the toilet tank or other containment vessel internal to the tank.

**Test Procedure:**

- a. Set an empty toilet tank (with complete tank trim installed) on a leveled test stand.
- b. Fill the tank or containment vessel to a level 0.25 inches +/- 0.06 inches below the top of the overflow tube. Where the tank utilizes an internal containment vessel and does not possess an overflow tube, the vessel shall be filled to a level 0.25 inches +/- 0.06 inches below the top rim of the vessel or to the manufacturer’s designated water line, whichever is higher.
- c. Drain the tank (or vessel) into a container by activating/flushing the tank trip lever and holding it until no more water drains out.

**Performance Requirement:** Water collected in the container shall not exceed **2.0** gallons.

***NOTE: The volume of water may be determined visually using a graduated container or by weight calculated as a unit to volume unit.***

2. Supplementary requirements regarding adjustability and flush performance for original equipment and after-market flush valve seals shall be as follows:

For Original Equipment

The maximum volume of water that may be discharged by the toilet, when field adjustment of original equipment tank trim is set at its maximum water-use setting, shall not exceed **2.0** gallons. The following test procedure shall be followed to verify that the toilet meets this requirement:

**Purpose of Test:** The objective of this Adjustability Test is to determine the upper limit to the volume of water that may be discharged by the field adjustment of tank trim components.

Test shall be conducted per section 8.4 of ASME A112.19.2-2003 with the following modification:

**Test procedure:**

- a. The toilet shall be installed on a leveled test stand and all adjustable tank trim components (any field adjustment features in the tank that might increase the toilet flush volume) shall be adjusted to the maximum water use setting, while taking care not to damage or alter the parts.
- b. The water level in the tank shall be set to 0.25 inches +/- 0.06 inches below the top of the overflow tube. Where the tank utilizes an internal containment vessel and does not possess an overflow tube, the vessel shall be filled to a level 0.25 inches +/- 0.06 inches below the top rim of the vessel or to the manufacturer's designated water line, whichever is higher.
- c. The static pressure of the water supply shall be adjusted to 80 PSI +/- 2 PSI.
- d. The toilet shall be flushed maintaining the activator in the flushing position for a period of one (1) second maximum, the water being drained into a container.
- e. After the flush cycle is complete, the total flush volume shall be observed and recorded.
- f. This procedure shall be repeated until five (5) sets of data are obtained.
- g. The static pressure of the water supply shall be adjusted to 20 PSI +/- 2 PSI or at the manufacturer's recommended minimum pressure as noted in the product literature and product packaging, and test procedure steps d-e-f shall be repeated.

**Report:** The five (5) individual flush volumes and the average of the five (5) runs shall be reported for each of the two static water supply pressures specified.

**Performance Requirement:** The average total flush volume for five (5) test runs for each of the two static water supply pressures shall not exceed **2.0** gallons.

**NOTE:** *The volume of water may be determined visually using a graduated container or by weight calculated as a unit to volume unit.*

For after-market closure seals

The maximum volume of water that may be discharged by the toilet, when the original equipment flush valve seal (flapper or other sealing device) is replaced with a standard seal available in home improvement centers and hardware stores, and the field adjustment of tank trim is set at its maximum water-use setting, shall not exceed **2.0** gallons. The following test procedure shall be followed to verify that the toilet meets this requirement:

**Purpose of Test:** The objective of this Adjustability and After-Market Seal Test is to determine the upper limit to the volume of water that may be discharged when an off-the-shelf replacement flush valve seal/flapper is installed on the toilet.

Test shall be conducted per section 8.4 of ASME A112.19.2-2003 with the following modification:

**Test procedure:**

- a. The toilet shall be installed on a leveled test stand and all adjustable tank trim components (any field adjustment features in the tank that might increase the toilet flush volume) shall be adjusted for maximum water use, while taking care not to damage or alter the parts.
- b. Remove the original equipment flush valve seal and replace it with a standard (buoyant) non-adjustable after-market seal/flapper for that toilet. In the case of a standard configuration 2-inch flush valve, a Fluidmaster Bullseye Super flapper (part no. 501) or a Coast Foundry Ultra Blue flapper shall be used. For non-standard flush valves, including 3-inch flush valves, one or more replacement seals available at hardware and building supply stores shall be used<sup>2</sup>.
- c. The water level in the tank shall be set to 0.25 inches +/- 0.06 inches below the top of the overflow tube. Where the tank utilizes an internal containment vessel and does not possess an overflow tube, the vessel shall be filled to a level 0.25 inches +/- 0.06 inches below the top rim of the vessel or to the manufacturer's designated water line, whichever is higher.
- d. The static pressure of the water supply shall be adjusted to 80 PSI +/- 2 PSI.
- e. The toilet shall be flushed maintaining the activator in the flushing position for a period of one (1) second maximum, the water being drained into a container.
- f. After the flush cycle is complete, the total flush volume shall be observed and recorded.
- g. This procedure shall be repeated until five (5) sets of data are obtained.
- h. The static pressure of the water supply shall be adjusted to 20 PSI +/- 2 PSI or at the manufacturer's recommended minimum pressure as noted in the product literature and product packaging, and test procedure steps e-f-g shall be repeated.

**Report:** The five (5) individual flush volumes and the average of the five (5) runs shall be reported for each of the two static water supply pressures specified.

---

<sup>2</sup> Where neither the Fluidmaster Bullseye Super flapper nor the Coast Foundry Ultra Blue flapper fit the flush valve, where a 3-inch flush valve is employed, or in the case of non-standard flush valve seals, the approved listing agency shall have discretion as to which after-market flapper or seal shall be used in the test.

**Performance Requirement:** The average total flush volume for five (5) test runs for each of the two static water supply pressures shall not exceed **2.0** gallons.

**NOTE:** *The volume of water may be determined visually using a graduated container or by weight calculated as a unit to volume unit.*

VI. Tank-type flushometer toilets and tank-type electrohydraulic toilets shall have a fixed non-adjustable flush volume **OR** shall conform to supplementary requirements regarding flush volume adjustability. Conformance defined as follows:

The maximum volume of water that may be discharged by the toilet, when the field adjustment of tank trim is set at its maximum water-use setting, shall not exceed **2.0** gallons. The following test procedure shall be followed to verify that the toilet meets this requirement:

**Purpose of Test:** The objective of this Adjustability Test is to determine the upper limit to the volume of water that may be discharged when tank trim is adjusted to its maximum water-use setting.

Test shall be conducted per section 8.4 of ASME A112.19.2-2003 with the following modification:

**Test procedure:**

- a. The toilet shall be installed on a leveled test stand and all adjustable tank trim components (any field adjustment features in the tank that might increase the toilet flush volume) shall be adjusted for maximum water use, while taking care not to damage or alter the parts.
- b. The static pressure of the water supply shall be adjusted to 80 PSI +/- 2 PSI.
- c. The toilet shall be flushed maintaining the activator in the flushing position for a period of one (1) second maximum, the water being drained into a container.
- d. After the flush cycle is complete, the total flush volume shall be observed and recorded.
- e. This procedure shall be repeated until five (5) sets of data are obtained.
- f. The static pressure of the water supply shall be adjusted to 20 PSI +/- 2 PSI or at the manufacturer's recommended minimum pressure as noted in the product literature and product packaging, and test procedure steps c-d-e shall be repeated.

**Report:** The five (5) individual flush volumes and the average of the five (5) runs shall be reported for each of the two static water supply pressures specified.

**Performance Requirement:** The average total flush volume for five (5) test runs for each of the two static water supply pressures shall not exceed **2.0** gallons.

**NOTE:** *The volume of water may be determined visually using a graduated container or by weight calculated as a unit to volume unit.*

# Appendix A

## Contact Information for Supplementary ULFT Specification

Los Angeles Department of Water and Power  
Mr. Thomas Gackstetter, Manager of Water Conservation  
(213) 367-0936  
[thomas.gackstetter@ladwp.com](mailto:thomas.gackstetter@ladwp.com)

Los Angeles Department of Water and Power  
Mr. Steve Johnson, Water Conservation Specialist  
(213) 367-0922  
[steve.johnson@ladwp.com](mailto:steve.johnson@ladwp.com)

IAPMO Testing and Services  
Mr. Ken Wijaya, Laboratory Director  
(909) 472-4100  
[kenwijaya@iapmo.org](mailto:kenwijaya@iapmo.org)

Koeller and Company  
Mr. John Koeller, P.E.  
(714) 777-2744  
[koeller@earthlink.net](mailto:koeller@earthlink.net)

Metropolitan Water District of Southern California  
Mr. William McDonnell, Senior Resource Specialist  
(213) 217-7693  
[bmcdonnell@mwdh2o.com](mailto:bmcdonnell@mwdh2o.com)

City of Los Angeles Department of Building and Safety  
Mr. Amir Tabakh, Director of Mechanical Testing Laboratory  
(323) 226-1638  
[atabakh@ladbs.lacity.org](mailto:atabakh@ladbs.lacity.org)

# Appendix B

## Test Protocol – Fill Valve Integrity Test

This requirement shall apply to all fill valves that are not otherwise classified as pilot valves.

Must conform to both of the following requirements (1 *and* 2):

### 1. Consistent Water Level

**Purpose of Test:** To determine whether or not the fill valve shuts off at a consistent water level in a toilet tank independent of any change in inlet water supply pressure.

#### **Test Procedure:**

- a. Install the fill valve in the toilet tank provided, install the tank on a leveled test stand, and adjust the water level per the manufacturer's recommendation at an inlet water pressure of 20 PSI +/- 2 PSI or at the manufacturer's recommended minimum pressure as noted in the product literature and product packaging.
- b. Flush the tank to verify and mark water level after completed refill.
- c. Increase the inlet water pressure to 60 PSI +/- 2 PSI.
- d. Flush the tank.
- e. Measure any difference in water level after completed refill.
- f. Repeat steps c-d-e utilizing 80 PSI +/- 2 PSI inlet water pressure.

**Performance Requirement:** The fill valve shall shut off at the same water level +/- 1/2 inch for all three inlet water pressures. In addition, water shall not enter the overflow tube or flow out of the tank at all three inlet pressures.

### 2. Shutoff Integrity with Increased Water Pressure

**Purpose of Test:** To determine whether or not the fill valve shuts off at a consistent water level in a toilet tank independent of changes in inlet water supply pressure.

#### **Test Procedure:**

- a. Install the fill valve in a toilet tank and adjust the water level per the manufacturer's recommendation at an inlet water pressure of 20 PSI +/- 2 PSI or at the manufacturer's recommended minimum pressure as noted in the product literature and product packaging.
- b. Flush the tank to verify and mark water level after completed refill.
- c. Increase the inlet pressure to the fill valve from 20 (or recommended minimum pressure) to 60 PSI, then to 80 PSI at a rate of less than 10 PSI per second.

**Performance Requirement:** The water level shall remain at the initial mark +/- 1/2 inch. In addition, water shall not enter the overflow tube or flow out of the tank.

# Appendix C

## Test Protocol – Formed Flapper Valve Accelerated Test

### 1. Purpose

To test a flapper valve seal in an accelerated aging environment to determine its likely integrity within a functioning toilet subjected to drop-in bowl cleaners.

### 2. Scope

This test will assess the sealing characteristics of a formed flapper valve or other seal in two accelerated aging environments, each consisting of one of the following two commonly available consumer products: (a) Clorox<sup>®</sup>-Bleach and (b) 2000 Flushes<sup>®</sup> (Bleach). Upon completion of testing, the subject flapper valve will be evaluated as to its ability to withstand these drop-in bowl cleaners and maintain a "Compliant" seal. "Compliant" is defined as no-leak OR does not leak more than the specified rate, 0.25 ml per hour,

### 3. Procedure

#### 3.1 Leak Rate Test (to be performed prior to and at the end of the accelerated test)

- 3.1.1 Attach test specimen to valve seat (as specified by the manufacturer) in test apparatus. In this case, the apparatus consists of an 8-inch diameter clear PVC pipe attached to a flat piece of 0.25-inch (minimum) PVC flat stock and appropriately sealed. The valve seat is attached to the apparatus through the properly sized hole in the flat stock. The apparatus is then placed on top of a three-liter graduated beaker for the purpose of accurately monitoring and measuring any leaks. (Note: An alternate set of apparatus is permitted if it will enable the tester to provide the required environment for the test.)
- 3.1.2 Fill the test apparatus with tap water to the specified fill line. The temperature of the tap water shall be within a 16°C - 27°C range. The fill line is to be set at 7-inches above the valve seat as this represents the lowest water level in most commercially available residential toilets.
- 3.1.3 Lift the specimen and "flush" the test apparatus. Fill and repeat 2 more times. This allows the specimen to be wetted and to find its "seat."
- 3.1.4 Fill the test apparatus to the fill line. Allow the flapper to seat properly by leaving the set-up undisturbed for 24 hours +/- 1 hour.
- 3.1.5 At the end of the 24-hour period, start test. Test should run for one hour +/- two minutes.



- 3.1.6 At the conclusion of the test remove the test apparatus from the graduated beaker and inspect the beaker for any water that may have leaked from test apparatus. If the beaker is dry, report “Compliant”. If water is present, determine the volume from the graduations on the beaker. If the volume is too small to determine from the large graduations on this size beaker, transfer the water to a smaller graduated beaker or cylinder for determination. Report the volume leaked as “xx ml/hr”.
- 3.1.7 Repeat steps 3.1.1 – 3.1.6 at the conclusion of the “Accelerated Test.”
- 3.1.8 Criteria: Leakage from the flapper in excess of 0.25 ml/hr (three drops) shall be considered a failure.

### 3.2 Accelerated Test

- 3.2.1 The following two drop-in bowl cleaners shall each be included as a separate test: (a) Clorox<sup>®</sup>-Bleach and (b) 2000 Flushes<sup>®</sup> (Bleach). A concentrated stock solution shall be made using each bowl cleaner. This concentration shall be at 2,000 ppm of total chlorine in a tap water solvent. For each stock solution, steps 3.2.2 through 3.2.8 shall be followed.
- 3.2.2 The stock solution shall be analyzed initially upon preparation and at each solution change, at which time the concentration level shall be recorded. In the event that an analysis indicates that the concentration of the stock solution has changed by more than ten percent (10%) from that prepared in accordance with paragraph 3.2.1, the solution shall be discarded and a new stock solution prepared.
- 3.2.3 The test specimen shall be inserted into a test vessel (jar or other suitable vessel) such that the sealing surface of the test specimen is not under physical stress. No more than one specimen per jar is allowed.
- 3.2.3 The stock solution shall be added to the test vessel so as to completely cover the test specimen; fill the test vessel with the stock solution as completely as possible.
- 3.2.5 The test vessel containing the stock solution and the test specimen shall then be placed in a mechanically convected oven or other device capable of maintaining a test temperature of 40°C +/- 3°C. The test temperature shall be maintained at 40°C +/- 3°C for the 28-day duration of the accelerated test.

- 3.2.6 The solution in the test vessel shall be changed daily (as permitted) with fresh stock solution.
- 3.2.7 The test specimen shall be removed from the test vessel at the end of 28 days and within one (1) hour +/- two minutes subjected to the leak test as specified in 3.1 above.
- 3.2.8 Steps 3.2.3 - 3.2.7 above shall be repeated for each test specimen.
- 3.2.9 To assist in verifying test accuracy, a minimum of two samples of each specimen shall be tested in each stock solution.