SIX-LITER WATER CLOSETS EQUIPPED WITH A DUAL FLUSHING DEVICE

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The American Society of Mechanical Engineers

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In memory of, and dedicated to the life of,
our dear friend, colleague, and long-standing leader,
Patrick J. Higgins.

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FOREWORD

In 1992, the Federal Energy Policy Act was enacted into law by Congress. This Act not only addressed energy issues but also included criteria for water conservation products in the United States that became effective in January 1994. As a complement to the enactment of this Act, the plumbing industry had already developed numerous water-efficient plumbing products that improved the performance of 1.6 gal per flush water closets.

One recent advance in the development of water closets is the use of dual flush technology that allows the consumer to flush with either a short flush, 1.10 gal (4.1 L) or less, or a long or full 1.6 gal (6 L) flush, depending upon need. This Standard addresses the performance of these products.

This Standard establishes test criteria for 1.6 gal (6 L) dual flush water closets. It was prepared by an ad hoc committee from the International Association of Plumbing and Mechanical Officials (IAPMO). It was then referred to ASME and assigned to the A112 Project Team 19.14. It was subsequently reviewed and approved by the ASME A112 Standards Committee.

Suggestions for the improvement of this Standard are welcome. They should be addressed to The American Society of Mechanical Engineers, Secretary, A112 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

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Standardization of Plumbing Materials and Equipment

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PERSONNEL OF A112 PROJECT TEAM 19.14 — DUAL FLUSH FOR 6-LITER WATER CLOSETS

J. A. Sargent, *Project Team Leader,* Kohler Co.
O. Dufau, Fluidmaster
P. J. Higgins, PJ Higgins & Associates, Inc.
M. T. Kobel, IAPMO
J. Koeller, Koeller and Co.
W. P. McDonnell, Los Angeles Metropolitan Water District
J. R. Paschal, NSF International
S. Rawalpindiwala, Kohler Co.

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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the edition, the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation. When appropriate, proposals should be submitted using the A112 Project Initiation Request Form.

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Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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SIX-LITER WATER CLOSETS EQUIPPED WITH A DUAL FLUSHING DEVICE

1 GENERAL

1.1 Scope

This Standard establishes physical, material, testing, and marking requirements for six-liter water closets that incorporate a water-conserving dual flushing feature into the design of the fixture. The tests specified in this Standard are for removal of liquid wastes and toilet tissue or other comparable waste loads that are expected when actuating the reduced flush feature of the unit. The use of alternate materials or methods is permitted, provided that the proposed material and method comply with the performance requirements and the intent of this Standard.

1.2 Units of Measurement

Values are stated in U.S. Customary units and the International System of Units (SI). The U.S. Customary units shall be considered as the standard.

1.3 Reference Standards

The following documents form a part of this Standard to the extent specified herein (the latest issue shall apply):

ANSI Z124.4, Plastic Water Closet Bowls and Tanks

Publisher: International Association of Plumbing and Mechanical Officials (IAPMO), 20001 East Walnut Drive, South Walnut, CA 91789-2825

ASME A112.19.2M, Vitreous China Plumbing Fixtures

ASME A112.19.6, Hydraulic Requirements for Water Closets and Urinals

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department, 22 Law Drive, Fairfield, NJ 07007-2900.

1.4 Definitions

dual flush: a feature that allows the user to flush the water closet with either a reduced or full volume of water, depending upon bowl contents.

low-consumption water closet: a water closet having an average water consumption (total flush volume) less than or equal to 1.6 gal (6 L) over the range of test pressures as specified in ASME A112.19.6 for each water closet type, and not exceeding 2.0 gal (7.6 L) at any one test pressure (based upon average values from the three run test).

2 REQUIREMENTS

2.1 Operation

The dual flush mechanism shall function by actuation and release of the selector control, switch, or handle and shall complete its cycle without requiring further action or holding by the user.

2.2 Water Closets

Water closets equipped with dual flush features shall conform to the requirements of ASME A112.19.2M or ANSI Z124.4.

3 TESTING

3.1 Full Flush Mode

Water closets equipped with dual flush features shall meet all the requirements of ASME A112.19.6 for low-consumption water closets when the full flush volume is activated.

3.2 Reduced Flush Mode

3.2.1 Trap Seal Restoration Test. The water closet as tested in paras. 3.2.2 through 3.2.5 shall also meet the performance requirements of para. 7.1.6.3 of ASME A112.19.6.

3.2.2 Reduced Flush Volume Test. The reduced flush volume shall not exceed 1.10 gal (4.1 L) per flush when tested in accordance with para. 7.1.6 of ASME A112.19.6. This testing shall be conducted before the durability testing in para. 3.2.6. The same

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testing shall be conducted after the durability testing in para. 3.2.6 and the reduced volume shall not vary more than 0.11 gal (0.41 L).

3.2.3 Rim Wash Test. The water closet shall use the test methods and meet the performance requirements of para. 7.1.4 of ASME A112.19.6, when in the reduced flush cycle.

3.2.4 Dye Test

3.2.4.1 Test Method

(a) 0.18 oz (5 g) of methlylene blue powder shall be added to 0.26 gal (1 L) of water and mixed thoroughly in a clean container.

(b) The water closet under test shall be flushed once and allowed to complete its filling cycle. One fluid ounce (30 mL) of the dye solution shall be added to the water in the bowl and mixed thoroughly.

(c) 0.34 oz (10 mL) of this solution shall be removed from the bowl and shall be added to 16.9 oz (500 mL) of clean water in a suitable container (i.e., dilution ration of 50:1). A sample of this solution shall be set aside in a test tube or comparator vial as the control sample.

(d) The water closet shall then be flushed several times to ensure that all traces of the dye solution have been removed. One 1 oz (30 mL) of the dye solution [see para. 3.2.4.1(a)] shall be added to the bowl. The flushing device shall be actuated and released in a normal manner and the test fixture shall be allowed to complete its filling cycle. A test tube or comparator vial shall be filled with water from the water closet bowl and compared against the control sample. The test shall be repeated two additional times and the results shall be averaged.

NOTE: Use of a spectrophotometer shall be permitted in case of doubt; however, this method shall necessitate the use of a different color dye.

3.2.4.2 Performance Requirement. A dilution ratio of at least 50:1 shall be obtained in each initial flush, for the average of the three tests. The procedure shall be repeated until three sets of data are obtained.

3.2.5 Toilet Paper Test

3.2.5.1 Test Media. The paper removal test in the reduced flush cycle shall be conducted as follows: the test load shall be composed of four balls of six sheets of untreated single-ply toilet paper, each crumpled into a loose ball measuring 2 in. to 3 in. (51 mm to 76 mm) in diameter. The standard size test sheet shall be 42 in. × 42 in. (114 mm × 114 mm).

The single-ply toilet paper shall first meet both the absorption and wet tensile strength requirements given in paras. 3.2.5.1.1 and 3.2.5.1.2, respectively.

3.2.5.1.1 Absorption

(a) Test Method. A six-sheet strip of the proposed toilet paper shall be obtained. The paper shall be wrapped snugly around a piece of 2 in. Schedule 40 PVC pipe. The paper shall be slid off the pipe. The tube of paper shall be grasped approximately halfway down its length and shall be turned inside out and down over itself. This shall result in a ball approximately 2 in. (51 mm) in diameter. The ball (straight edges down) shall be dropped into a pan of water. The time it takes for the ball to become fully saturated and sink below the water surface shall be recorded.

(b) Performance Requirement. The paper ball shall sink below the surface in less than 3 sec.

3.2.5.1.2 Wet Tensile Strength

(a) Test Method. A 2 in. Schedule 40 PVC coupling and union nut shall be used as a frame to hold the toilet paper for the wet tensile strength test. One sheet of the toilet paper on the coupling and the union nut shall be slid over the coupling. The frame shall be inverted and the paper shall be submerged in water for 5 sec. The frame shall then be removed from the water and shall be returned to an upright position. A 0.312 in. (8 mm) diameter steel ball weighing 6.3 ± 0.1 g shall be placed in the center of the wet sheet.

(b) Performance Requirement. The sheet shall support the steel ball without any evidence of tearing.

3.2.5.2 Test Method. The four 2 in. to 3 in. (51 mm to 76 mm) balls of paper that comply with paras. 3.2.5.1.1 and 3.2.5.1.2 shall be dropped into the water directly above the well and shall be allowed to wet out completely. Within 5 sec. after wetting occurs, the bowl shall be flushed. This procedure shall be repeated until three sets of data are obtained. Note whether any paper is left in the bowl. Flush again and collect any paper that discharges from the outlet.

3.2.5.3 Performance Requirement. No paper shall remain in the well after each initial flush.

3.2.6 Durability Test

3.2.6.1 Test Method. The water closet shall be cycled 15,000 cycles in the full volume flush mode and, after each four full flushes, one reduced flush shall be made followed by 60,000 cycles in the reduced volume flush mode.

3.2.6.2 Performance Requirement. At the completion of the test, the dual flush switch, actuator,

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or levers shall show no sign of deterioration that would affect performance. They shall function smoothly and shall activate with a force of 5 lbf (22 N) or less.

4 MARKING

4.1 Identification of Flush Mode Options

Identification of flush mode options shall be depicted on the actuator. This identification shall be either by graphic display or lettering, or shall be intuitively apparent.

4.2 Water Closets

(a) The water closet shall be legibly marked as specified in ASME A112.19.2M or ANSI Z124.4, as appropriate.

(b) Water closets equipped with a dual flush device shall be marked with the reduced flush volume and the designation ASME A112.19.14 to signify compliance with this Standard. The location of this mark shall be determined by the manufacturer and is not required to be permanent, but it shall be visible after installation. The label shall be intended for removal by the occupant only, and shall be so stated on the label.

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