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Document Name: ASSE 1016: Performance Requirements for Individual Thermostatic Pressure Balancing and Combination Control for Bathing Facilities

CFR Section(s): 24 CFR 3280.604(b)(2)

Standards Body: American Society of Sanitary Engineering

APPROVED

Official Incorporator:

THE EXECUTIVE DIRECTOR
OFFICE OF THE FEDERAL REGISTER
WASHINGTON, D.C.

A.S.S.E. Standard No. 1016
Issued: November, 1973
ANSI Approved: January 8, 1979
Revised: December, 1988

Performance Requirements for

INDIVIDUAL THERMOSTATIC PRESSURE BALANCING AND COMBINATION CONTROL VALVES FOR BATHING FACILITIES

· Sponsored by: American Society of Sanitary Engineering

AMERICAN SOCIETY OF SANITARY ENGINEERING
P.O. Box 40362 · Bay Village, OH 44140
Phone: 216-835-3040 · FAX: 216-835-3488

GENERAL INFORMATION

Neither this Standard, nor any portion thereof, may be reproduced without the written consent of the American Society of Sanitary Engineering.

Although this Standard may be used as a benchmark for in-house product evaluation, no product may be said to be A.S.S.E. approved unless the manufacturer has applied to the A.S.S.E., has had his product tested by an official A.S.S.E. recognized independent laboratory, according to the applicable A.S.S.E. Standard, and when the product has passed the test, displays the A.S.S.E. Seal on the product. Instructions for receiving the authorization to display the Seal are available from the A.S.S.E. Central Office.

It is recommended that all devices designed for plumbing systems, especially those which pertain to public health and safety, should be installed consistent with local codes by qualified and trained professionals.

FOREWORD

This A.S.S.E. Standard has been developed in the interests of consumer safety.

Several suggestions received from persons having had disturbing experience with shower valves which were potentially hazardous allowing sudden surges of high temperature water to flow from the shower head prompted the initiation of this Standard in 1973. Documents and field experiences relating to the behavioral characteristics of different classes of devices were studied and evaluated, and from this, the Standard text was developed. Since that time, extensive research has been conducted toward the development of this Standard in its current form.

The shower control valves covered by this Standard are only those which will, in cases of reduction or loss of cold water supply, protect the user against exposure to injurious water temperature.

This Standard does not conflict with any federal specifications for this class of Individual Thermostatic, Pressure Balancing and Combination Control Valves for Bathing Facilities.

Performance standards for systems and devices must be reviewed periodically and upgraded as research and field conditions and experience suggest. This is the policy of the American Society of Sanitary Engineering. This period is approximately every three to seven years depending upon the class of product involved. Between such reviews the Standards Committee works with interested groups in obtaining information for study and evaluation for acceptance in upgrading a standard.

The working group which developed this Standard revision, was set up within the framework of the Standards Committee of the American Society of Sanitary Engineering.

Recognition is made of the time volunteered by members of the working group and of the support of the manufacturers who also participated in the meetings for this Standard.

Although many of the material specifications are detailed within Section 1.4 of this Standard, it is the responsibility of the manufacturer to comply with the requirements of the Safe Drinking Water Act, United States Public Law 93-523.

1989 - A.S.S.E. Standards Committee Members

Stuart F. Asay, P.E., Ph.D.
A.S.S.E. Standards Coordinator, Northglenn, Colorado

Robert C. Smith, P.E.
Standards Committee Chairman, Tulsa, Oklahoma

George Bliss
U. A. of Plumbers & Pipefitters, Washington, DC

James C. Church, P.E.
Mamaroneck, New York

Robert DuPont, C.I.P.E.
State of Wisconsin, D.I.L.H.R., Madison, Wisconsin

Richard Emmerson
The Chicago Faucet Co., Des Plaines, Illinois

John Gallagher
City of Chicago, Chicago, Illinois

Larry Gallowin, Ph.D.
Natl. Inst. of Stds. & Tech., Gaithersburg, Maryland

Patrick Higgins
P.J. Higgins & Assoc., Frederick, Maryland

Valentine Lehr, P.E.
Lehr Associates, New York, New York

Herb Panzer, P.E., F.A.S.S.E.
Warren & Panzer Engineers, New York, New York

Cliff Storm
Broward County Building Inspect., Fort Lauderdale, Florida

Morris Weinberg, P.E., F.A.S.S.E.
Atlantic City, New Jersey

Working group members for the revision of the A.S.S.E. Standard 1016

William H. Woodard, Chair
MCC Powers Process Controls
Skokie, Illinois

Herbert C. Barnhart
Danfoss Mfg. Co., Ltd.
Hampton, Virginia

Al Corwin
Grohe America Inc.
Wood Dale, Illinois

W.A. Denham
Speakman Company
Wilmington, Delaware

Richard Emmerson
The Chicago Faucet Co.
Des Plaines, Illinois

Colin MacDonald
Symmons Industries, Inc.
Braintree, Massachusetts

Craig W. Selover
Delta Faucet Company
Indianapolis, Indiana

Matthew Tarnay
Price Pfister
Pacoima, California

Gregory L. Wilcox
Leonard Valve Company
Cranston, Rhode Island

Walter F. Schlotman
Stanadyne, Inc.
Elyria, Ohio

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INDIVIDUAL THERMOSTATIC, PRESSURE BALANCING AND COMBINATION CONTROL VALVES FOR BATHING FACILITIES

SECTION I

1.0 SCOPE, PURPOSE, GENERAL INSTRUCTIONS, CONSTRUCTION

1.1 Scope

1.1.1 Class of Product

This Standard applies only to individual control valves for bathing facilities of the following types:

(a) Type T - Thermostatic.

(b) Type P - Pressure balancing.

(c) Type T/P - Combination thermostatic and pressure balancing.

1.1.2 Size

The device shall have a 1/2" inlet NPT. or CWT.

1.1.3 Capacity

1.1.3.1 A minimum flow rate of three and sixty hundredths (3.60) g.p.m. (0.227 l/s), in accordance with Section 2.4 of this Standard.

1.1.4 Working Water Pressure

1.1.4.1 The control valve shall be designed for pressures up to one hundred twenty-five (125) p.s.i. (862 kPa).

1.1.5 Product Use

1.1.5.1 The product covered by this Standard is for use in bathing facilities for individual showers, baths, or a combination of both.

1.2 Purpose

1.2.1 General

This Standard is established primarily to provide engineers, designers, manufacturers, health authorities, inspection agencies, and others with performance requirements for individual control valves, which will provide the user reasonable protection against exposure to excessive water temperature or excessive outlet temperature fluctuations resulting from a variation in the inlet water pressure of up to fifty (50) percent.

1.2.2 Handicapped

Products covered by this Standard are intended for use by the physically handicapped, and shall comply with the American National Standard A117.1.

1.3 General Instructions

1.3.1 Literature

Manufacturers must illustrate, by graph or table, the outlet flow of their product between the inlet pressure of zero (0) to one hundred (100) p.s.i.g. Conditions must be established in accordance with Section 2.4.2 (a) through (e) of this Standard.

1.3.2 Drawings

Assembly drawings and other data, which are needed to enable a testing agency to determine compliance with this Standard, shall accompany the product when submitted for examination and performance tests under this Standard.

1.3.3 Instructions

Full instructions for installing, adjusting and maintaining shall be packaged with each unit. The instructions shall state:

"When not equipped with an integral shutoff or when there is a shutoff valve installed after the control valve, there shall be stop and check valves on the inlet(s)."

1.3.4 Responsibility

Responsibility for installation and adjustment, in accordance with the manufacturer's instructions, lies with the installer.

1.3.5 Limit Stop

Instructions must be packaged with the product so that the Limit Stop setting can be made by the installer, with regard to seasonal and other inlet temperature variations, according to ASTM1 F444.

1.4 Construction

1.4.1 Hot and Cold Water Supply Temperatures

1.4.1.1 The control valve shall be capable of being adjusted from full cold up to a minimum of one hundred five (105) degrees Fahrenheit (41 degrees Celsius) valve outlet temperature, with hot water inlet temperatures ranging from one hundred twenty (120) degrees Fahrenheit (54 degrees Celsius), to one hundred eighty (180) degrees Fahrenheit (82 degrees Celsius), and the cold water inlet temperature ranging from thirty-nine (39) degrees Fahrenheit (4 degrees Celsius) to eighty-five (85) degrees Fahrenheit (29 degrees Celsius). Type T, P, and T/P valves shall be equipped with an adjustable stop to limit the movement of the control handle toward the full hot position.

1.4.2 Shut-off valves

When specified, the inlet shut off stop valves or shut off stop and check valves shall be available for all control valves covered by this Standard.

1.4.3 Adjustment Knobs or Handles

1.4.3.1 Adjustment control handle shall be of the lever, blade, multi-arm or knob type. Where applicable, the handle shall comply with requirements of ANSI2 A117.1, "*Making Buildings Accessible to the Physically Handicapped*."

1.4.4 Mixing of Hot and Cold Water

1.4.4.1 Thermostatic and pressure balancing valves Type T, P, T/P shall mix the hot and cold water automatically, and shall meet or exceed the minimum discharge rates required for bathtub faucet fittings by ANSI A112.18.1.

1.4.5 Accessibility

1.4.5.1 Internal controlling components shall be accessible from the finished wall surface and without disturbing pipe connections.

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1 American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (215) 299-5400

2 American National Standards Institute, 1430 Broadway, New York, NY 10018 (212) 354-3300

1.4.6 Pipe Threads

1.4.6.1 Pipe threads and other connections shall conform to appropriate standards as listed in ANSI A112.18.1.

1.4.7 Finishes and Materials

1.4.7.1 Finishes of exposed surfaces shall conform to requirements of ANSI A112.18.1.

1.4.7.2 Toxicity Evaluation. All plastic materials, in contact with the potable water, shall be evaluated by a recognized testing agency as complying with the applicable sections of NSF Standards. Metals presently approved for use in water distribution systems may be used.

1.4.8 Identification and Markings

1.4.8.1 Temperature Control Setting Identification. The control valve shall have identifiable control settings, such as cold, warm, hot, numbers or graphic identification, and indicate the direction of knob or handle rotation to increase the temperature. Markings shall be clear, permanent, and visible after installation.

1.4.8.2 In addition to visible markings, all devices shall bear the following markings:

(a) Manufacturer's name or trade mark

(b) Model Identification, as necessary to establish proper repair parts, maintenance, and adjustment procedures

SECTION II

2.0 PERFORMANCE AND TESTING

2.1 Product Required for Testing

2.1.1 Submittal

The manufacturer shall submit three (3) of each size and class product for which tests are required. The units must be of production quality. One (1) unit from each lot shall be tested and if it fails, the design shall be rejected until the manufacturer gives indication that the errors have been corrected and shall submit three (3) units of the corrected design for complete evaluation.

2.2 Working Water Pressure

2.2.1 Purpose

The control valve shall withstand, without damage or impairment of its performance capabilities, an operating hydrostatic pressure of one hundred twenty-five (125) p.s.i. (862 kPa).

2.2.2 Method of test and test procedure

With the seating member(s) closed and outlet open to atmosphere, water pressure of one hundred twenty-five (125) p.s.i. shall be applied to the inlet of the control valve for one (1) minute.

2.3 Burst Pressure

2.3.1 Purpose

The control valve shall withstand for one (1) minute, a hydrostatic pressure of five hundred (500) p.s.i. (3,447 kPa) without a permanent distortion or leakage through the valve body.

2.3.2 Method of test and test procedure

With the connection blocked and valve sitting members open, pressurize the valve body with water to five hundred (500) p.s.i. (3,447 kPa) for not less than one (1) minute.

2.4 Regulation and Temperature Variation

2.4.1 Purpose

2.4.1.1 The water temperature of types T, P and T/P shall be automatically maintained within a variation of plus or minus three (3) degrees Fahrenheit (plus or minus 1.8 degrees Celsius) under the following test conditions:

2.4.1.2 Type P. Outlet water temperature variation with changes in either hot or cold supply for fifty (50) percent of the normal supply pressure.

2.4.2 Method of test and test procedure

Install the control valve as shown in Figure 1, with the outlet throttle valve open completely.

(a) Establish a pressure differential between gauges G1 and G3 and between G2 and G3 of forty-five (45) plus or minus five (5) p.s.i. (310 plus or minus 34.5 kPa) by adjusting valves 1, 2, and 3.

(b) Cold water supply shall be at available supply temperature. If the temperature exceeds seventy (70) degrees Fahrenheit (21 degrees Celsius), a differential of thirty (30) degrees Fahrenheit (17 degrees Celsius) shall be maintained between cold supply temperature and the set point.

(c) Hot water supply shall be maintained at a constant plus or minus five (5) degrees Fahrenheit (plus or minus 3 degrees Celsius) temperature between one hundred twenty (120) degrees Fahrenheit (49 degrees Celsius) and one hundred eighty (180) degrees Fahrenheit (82 degrees Celsius).

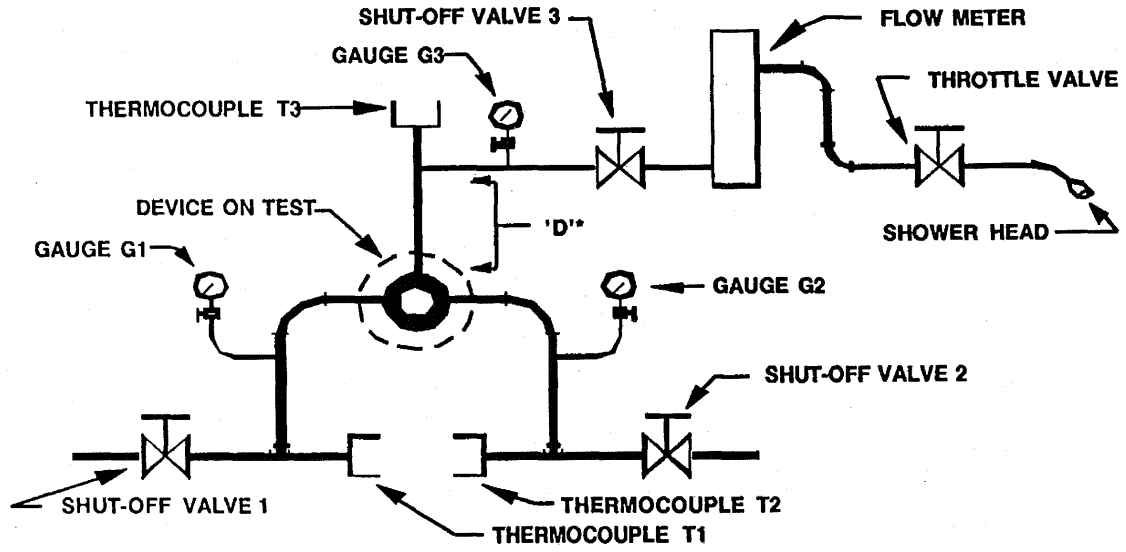
(d) Set the control valve to achieve an outlet temperature of one hundred five (105) plus or minus five (5) degrees Fahrenheit (41 plus or minus 3 degrees Celsius).

(e) Allow the water to flow for 5 minutes through the control valve. Then, observe the flow meter reading and record its reading in g.p.m. (l/s). See Section 1.1.3 of this Standard.

(f) Decrease the hot water pressure by fifty (50) percent and observe and record the change in discharge water temperature.

(g) Restore the conditions as in (a) through (e) above. Decrease the cold water pressure by fifty (50) percent and observe and record the changes in discharge water temperature.

(h) Starting with the control set in accordance with (a) - (d) above, lower the water volume to two and seventy-five hundredths (2.75) plus or minus twenty-five hundredths (0.25) g.p.m. (0.173 plus or minus 0.016 l/s) by adjusting the throttle valve. Allow the water to flow for five (5) minutes, and then test as in Section 2.4.2 (f) and (g) of this Standard and record any changes in outlet temperature.



FOOTNOTES:

1. THERMOCOUPLES IDENTIFIED AS T1, T2, AND T3 SHALL BE EITHER TYPE J OR T PER ANSI/ISA MC96.1. ACCURACY AT THE MEASURING DEVICE SHAL BE TO PLUS OR MINUS 1 DEGREE FAHRENHEIT (0.6 DEGREE C.)

2. FLOW RATE TESTING PER 'DISCHARGE TEST PROCEDURE' SECTION OF ANSI STANDARD A112.18.1.

*NOTE: DIMENSION 'D' FROM THE OUTLET OF THE CONTROL VALVES TO THE THERMOCOUPLE SHALL NOT EXCEED 36 INCHES (91 cm).

PIPING TO THIS POINT SHALL BE THE SAME AS THE CONTROL VALVE OUTLET CONNECTION.

FIGURE 1

2.4.3 Type T

Type T outlet water temperature variations with changes in pressure and hot water supply temperature.

2.4.4 Method of test and test procedure

(a) Establish the conditions described in Section 2.4.2 (a) through (d) and determine flow as in 2.4.2 (e) of this Standard.

(b) Decrease the hot water supply pressure by twenty (20) percent, and observe and record the change in discharge water temperature.

(c) Restore the conditions described in Subsection (a) above. Decrease the cold water pressure by twenty (20) percent, and observe and record the change in discharge temperature.

(d) Starting with the control set in accordance with Section 2.4.2 (a) through (d) of this Standard, lower the outlet water volume to two and seventy-five hundredths (2.75) plus or minus twenty-five hundredths (0.25) g.p.m. (0.173 l/s plus or minus 0.016 l/s) by adjusting the throttle valve. Test the control valve as described in Section 2.4.3 (b) and (c) of this Standard.

(e) Set the discharge temperature at one hundred five (105), plus or minus five (5) degrees Fahrenheit (41 plus or minus 3 degrees Celsius) with the hot water supply at one-hundred forty (140) plus or minus five (5) degrees Fahrenheit (60 plus or minus 3 degrees Celsius). Increase the hot water supply by twenty-five (25) degrees Fahrenheit (14 degrees Celsius) and record the change in outlet temperature.

2.4.5 Type T/P

Type T/P outlet water temperature variations with change in pressure and hot water supply temperature.

2.4.6 Method of test and test procedure

(a) Establish the conditions described in Section 2.4.2 (a) through (d) and determine flow as in 2.4.2 (e) of this Standard.

(b) Decrease the hot water supply pressure by fifty (50) percent, and observe and record the change in discharge water temperature.

(c) Restore the conditions described in Subsection (a) above. Decrease the cold water pressure by fifty (50) percent, and observe and record the change in discharge water temperature.

(d) Starting with the control set in accordance with Section 2.4.2 (a) through (d) of this Standard, lower the outlet water volume to two and seventy-five hundredths (2.75) plus or minus twenty-five hundredths (0.25) g.p.m. (0.173 plus or minus 0.016 l/s) by adjusting the throttle valve. Test the control valve as described in Section 2.4.5 (b) and (c) of this Standard.

(e) Test the control valve as described in Section 2.4.3 (e) of this Standard.

2.5 High Temperature Test, Type T and T/P

2.5.1 Purpose

When tested under the following conditions, there shall be no impairment to the products' thermal element.

2.5.2 Method of test and test procedure

With the valve installed and adjusted, as set forth in Section 2.4.2 of this Standard, increase the hot water supply temperature to two hundred (200) plus or minus (5) degrees Fahrenheit (93 plus or minus 3 degrees Celsius). Maintain the temperature for five (5) minutes, and then re-test, as described in Section 2.4.3, or 2.4.5 of this Standard as applicable.

2.6 Cold Water Supply Failure Test All types

2.6.1 Method of test and test procedure

The control valve to be tested shall be installed as in Figure 1, and conditions set forth in accordance with Section 2.4.2 (a) through (d) of this Standard. The control valve shall, when the cold water supply fails, automatically reduce the discharge flow, such that the outlet temperature does not exceed one hundred twenty (120) degrees Fahrenheit (40 degrees Celsius), prior to a reduction in the flow to one-half (0.5) g.p.m. (0.002 l/s). The time to accomplish this reduction in flow shall not exceed five (5) seconds.

2.7 Maximum Allowable Adjustment Torque

2.7.1 Purpose

The maximum allowable torque required to adjust the control valve shall not exceed fifteen (15) inch-pounds (0.92 N-m). Where applicable, the handle design shall comply with requirements of ANSI A117.1.

2.7.2 Method of test and test procedure

With the control valve set up as in Section 2.4.2 of this Standard, attach a measuring device to the valve adjustment means, which

will indicate the torque required for adjustment. Vary the discharge water temperature between cold and one hundred five (105) plus or minus five (5) degrees Fahrenheit (41 plus or minus 3 degrees Celsius) and record the maximum torque observed.

2.8 Life Cycle Test

The control valve covered by this Standard shall be cycle tested in accordance with ANSI A112.18.1, except as follows:

2.8.1 Purpose

2.8.1.1 The control dial shall be cycled at a constant rate through its full operating range from off to hot and back to off, at a minimum cycle speed of five (5) cycles per minute.

2.8.1.2 Pressure compensating Type P control mechanism shall be tested for one-hundred thousand (100,000) cycles of the control dial.

2.8.1.3 Thermostatic Type T and combination Type T/P control mechanisms shall be tested for twenty thousand (20,000) cycles of the control dial.

In addition, the temperature sensing element shall be subjected to eighty thousand (80,000) cycles as follows:

2.8.2Method of test and test procedure

Cold water shall be supplied to the cold water inlet. Cold and hot water shall be supplied to the hot water inlet, in a sequence of three (3) seconds of hot and six (6) seconds of cold water. The discharge flow rate of the valve shall be set at one and two-tenths (1.2) g.p.m. (0.076 l/s) minimum, with the hot and cold supply valves open and tempered water at one hundred five (105) plus or minus five (5) degrees Fahrenheit (40 degrees Celsius, plus or minus 3 degrees Celsius).

2.9 Product rejection

2.9.1 Requirement

Failure to comply with any requirement of this Standard shall be cause for the rejection of the control valve for the model tested.

SECTION III

3.0 DEFINITIONS

Definitions not found in this Section may be located in the *Plumbing Dictionary*, Fourth Edition, published by the A.S.S.E.

PRESSURE, Burst — A non-operational pressure level in excess of the proof pressure established to provide an additional margin of safety in the event of unscheduled pressures in excess of operation level.

PRESSURE, Hydrostatic Test — The pressure required to be applied to a vessel or other equipment to test its ability to operate safely at its rated water working pressure.

PRESSURE, Normal Supply — The water pressure normally provided in the supply system.

PRESSURE, Water Working — The highest water pressure normal to the system conditions. (Does not include surges of water hammer shock pressures).

THERMAL ELEMENT — A temperature responsive component unit which acts cooperatively with the cold and/or hot control valves to activate them as needed to maintain the desired shower water temperature.

TORQUE, Adjustment — The mechanical force which is needed to turn or move the temperature means.

VALVES, Control

1. Pressure balancing valve (Type P) senses incoming hot and cold water pressures and compensates for fluctuations in either to stabilize outlet temperature.
2. Thermostatic valves (Type T) senses outlet temperature and compensates for fluctuation in either incoming hot and cold water temperature.
3. Combination thermostatic/pressure balancing valve (Type T/P) senses outlet temperature and incoming hot and cold water pressures and compensates for fluctuation in incoming hot and cold water temperatures or pressures to stabilize outlet temperature.