Update No. 1
ASME 112.18.1-2011/CSA B125.1-11
November 2011

Note: General Instructions for CSA Standards are now called Updates. Please contact CSA Information Products Sales or visit shop.csa.ca for information about the CSA Standards Update Service.

Title: Plumbing supply fittings — originally published June 2011

The following revisions have been formally approved and are marked by the symbol delta (Δ) in the margin on the attached replacement pages:

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<th>Revised</th>
<th>ASME Project Team 18.1 list, Clauses 3.1, 4.2, 5.9.3.2.2.3, and 5.10.6.2.4 and Table 1</th>
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- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.
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<tr>
<td>J.W. Lauer</td>
<td>Sloan Valve Company</td>
<td>Franklin Park, Illinois, USA</td>
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<tr>
<td>L.A. Mercer</td>
<td>Moen Inc.</td>
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<tr>
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</tbody>
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<table>
<thead>
<tr>
<th>Name</th>
<th>Company/Location</th>
<th>Role</th>
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<tbody>
<tr>
<td>N. Covino</td>
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</tr>
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<td>Bradley Fixtures Corporation, Menomonee Falls, Wisconsin, USA</td>
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<tr>
<td>F. Fernández</td>
<td>TOTO USA Inc., Orange, California, USA</td>
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<td>G.D. Goodson</td>
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<td>C.R. Graham</td>
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November 2011
(Replaces p. x, June 2011)
Shank — the rigid threaded portion of a supply fitting that extends below the mounting surface and has a means for connecting to the supply piping.

Shower head — an accessory to a supply fitting for spraying water onto a bather, typically from an overhead position.

Significant surface — an exposed surface that, if blemished, spoils the appearance or affects the performance of a fitting.

Standard tools — tools that are normally carried by plumbers for installing and maintaining plumbing.
Note: Examples include screwdrivers, key wrenches, flat-jawed wrenches, and pliers.

Substrate — the base material and all of the layers of coating under the final coating.

Supply stop — a valve that is placed immediately upstream of a terminal fitting to shut off the water supply to the terminal fitting so that it can be serviced or replaced.

Thermal shock — a rapid change in the water temperature that is felt by the user and is sufficient to produce a potentially hazardous reaction.

User — an individual who can adjust the outlet water temperature at the point of use while he or she is in contact with the outlet water.

Valve — a fitting with a movable part that regulates the flow of water through one or more passages.

Cycling mixing valve — a supply fitting with a single handle that can rotate from the closed position, through cold to hot, and in the reverse direction back to the closed position.

Single-control mixing valve — a supply fitting with a single handle that turns water on and off and changes water volume and temperature.

Single-handle mixing valve — a supply fitting with a single handle for changing the discharge water temperature when the fitting is supplied with both hot and cold water.

Two-handle mixing valve — a supply fitting with separate hot and cold water control valves.

3.2 Abbreviations
The following abbreviations apply in this Standard:

CL — critical level
IPS — Iron Pipe Size
NPS — Nominal Pipe Size
NPSM — National Pipe Straight Mechanical
NPT — National Pipe Tapered
PTC — Performance test code
PVD — physical vapour deposition
SC-1 — service conditions 1
SC-2 — service conditions 2

4 Design requirements
4.1 Supply fittings
4.1.1 Rated pressure

4.1.1.1
Supply fittings shall be designed for a rated supply pressure of 690 kPa (100 psi).
4.1.1.2
Supply fittings shall be designed to function at a supply pressure between 140 and 860 kPa (20 and 125 psi).

4.1.2 Rated temperatures
Supply fittings shall be designed for rated supply temperatures from 5 to 71 °C (40 to 160°F).

4.1.3 Seating members

4.1.3.1
The following fittings shall have replaceable seats:
- (a) supply valves for bath and shower fittings, except concealed stops;
- (b) combination lavatory fittings;
- (c) combination kitchen sink fittings;
- (d) bidet fittings;
- (e) single lavatory faucets; and
- (f) exposed valve-type bath and shower fittings.

4.1.3.2
Seat disc arrangements shall be replaceable.

4.1.3.3
Seat disc arrangements shall not vibrate in service. When a threaded device is used to secure the disc, it shall remain secure after the disc has been removed and replaced five times.

4.2 Servicing
Supply fittings, excluding supply stops, shall be designed so that replacement of wearing parts can be accomplished
- (a) without removing the fitting from the supply system;
- (b) without removing the piping from the body;
- (c) without disturbing the finished wall; and
- (d) using standard tools or manufacturer-provided tools.

Swing spouts designed to use adjustable packing in the joint between the spout and the body shall be constructed so that the adjustments can be made without removing the spout.

4.3 Installation
A method of sealing between the fitting and the fixture to which it is fastened shall be provided.

4.4 Threaded connections

4.4.1
Pipe threads shall comply with ASME B1.20.1.

4.4.2
Hose threads shall comply with ASME B1.20.7.
5.8.3.2 Test procedure
The swing spout strength test shall be conducted as follows:
(a) Mount the faucet in accordance with the manufacturer’s instructions.
(b) Measure the spout outlet angle from the vertical.
(c) Suspend the mass from the centreline of the spout outlet for 3 min and then remove it.
(d) After 30 min, measure the spout outlet angle.

5.9 Backflow prevention

5.9.1 General
Fittings shall be tested in accordance with the applicable tests specified in Clauses 5.9.2 and 5.9.3 and then retested within 48 to 96 h of completing all applicable life cycle tests specified in Clause 5.6.

5.9.2 Fittings with plain outlets

5.9.2.1 Air gaps
Fittings with plain outlets shall be protected by an air gap in accordance with ASME A112.1.2. For deck-mounted fittings, the air gap shall be measured as the vertical distance from the plane of the mounting surface of the fitting to the lowest point of the outlet. Where the fittings incorporate threads to accept an aerator or similar device, this measurement shall be taken with the aerator or similar device installed (see Figure 1).

A critical level mark on the fittings may be used as an alternative to the air gap. The critical level shall be confirmed by the test method specified in Clause 5.9.2.2.

5.9.2.2 Test procedure

5.9.2.2.1
The specimen shall be set up as follows:
(a) Remove all checking members or open them fully.
(b) Install the specimen as recommended by the manufacturer by mounting it over a container measuring approximately 380 × 250 × 150 mm (15 × 10 × 6 in). Ensure that the mounting surface is plumb or level with the water surface in the container.
(c) Allow the outlet of the specimen to have a free area at least four times the area of its effective opening between the container and the outlet.

5.9.2.2.2
The critical air gap test for fittings with plain outlets shall be conducted as follows:
(a) Connect the inlet(s) of the specimen to a vacuum source.
(b) Measure the vacuum at the inlet(s) of the specimen.
(c) Provide a means to change the water level in the container, relative to the outlet of the specimen.
(d) Start the test with the water level at the mounting surface level.
(e) With the specimen fully open from the inlet(s) to the place of discharge to the atmosphere, apply a vacuum of 85 kPa (12 psi) to the inlet(s).
(f) Hold for 1 min. Back siphonage at this time shall be a cause for rejection.
(g) Slowly bring the water level closer to the discharge outlet until the level at which back siphonage occurs is reached.
(h) At the level specified in Item (g), measure and record the distance between the lowest point of the outlet of the specimen and the water surface.
(i) Return the specimen to atmospheric pressure.
(j) Starting with the water level higher than where back siphonage occurred, apply a vacuum of 85 kPa (12 psi) to the inlet(s).
(k) Slowly lower the water level until back siphonage ceases.
(i) Maintain the vacuum for 1 min to ensure that water is not being drawn into the discharge outlet.
(m) At the level specified in Item (k), measure and record the distance between the lowest point of the outlet of the specimen and the water surface.

The greater of the distances determined in Items (h) and (m) shall be the critical air gap of the fitting.

The critical air gap test shall be repeated twice to confirm the critical air gap measurement.

The critical level mark on the fittings (see Clause 5.9.2.1) shall be at or below the critical air gap determined by this test.

Note: *85 kPa (12 psi) is equivalent to 638 mm (25 in) of mercury.*

5.9.3 Fittings with submersible outlets

5.9.3.1 General

Fittings where the outlets are submersible shall

(a) have a backflow prevention device(s) that complies with the applicable requirements of the CAN/CSA-B64 Series or ASME A112.18.3; or
(b) comply with the applicable requirements specified in Clause 5.9.3.2 or 5.9.3.3.

5.9.3.2 Single-outlet fittings with a submersible outlet

5.9.3.2.1 General

Single-outlet fittings with a submersible outlet shall comply with Clause 5.9.3.2.2 and shall have an atmospheric vent between two check valves. The atmospheric vent shall be located downstream of the last control valve and the critical level of the device shall be at least 25 mm (1 in) above the plane of the mounting surface of the fitting.

5.9.3.2.2 Test to determine the presence of hidden check valves

5.9.3.2.2.1 General

Fittings incorporating check valves shall be tested in accordance with Clause 5.9.3.2.2.4.

When the test is performed as specified in Clause 5.9.3.2.2.4, water shall be drawn into the sight tube, demonstrating that all check valves are fouled open and that there are no hidden check valves.

5.9.3.2.2.2 Settings

The procedure for testing the settings shall be as follows:

(a) Connect a sight tube in a leak-proof manner to the outlet of the specimen.
(b) Seal all atmospheric vents.
(c) Foul all check valves open.
(d) Install the specimen in accordance with Clause 5.9.3.2.3.
(e) Conduct the test in accordance with Clause 5.9.3.2.4.
(f) Once water is drawn into the sight tube, terminate the test.

5.9.3.2.2.3 Mounting

The specimen shall be mounted in its normal operating position in accordance with the manufacturer's instructions and using the test set-up shown in Figure 5. The inlet pipe(s) shall be connected collectively to

(a) a water supply that can deliver water through the specimen at normal flow;
(b) a vacuum system that can maintain a 0 to 85 kPa (0 to 12 psi) vacuum; and
(c) the atmosphere.

The coloured-water reservoir shown in Figure 5 shall be located below the mounting surface level of the specimen. The coloured water in the reservoir shall be at the mounting surface level.

The terminal end of the sight tube shall be immersed 13 mm (0.5 in) below the mounting surface level of the coloured water in the reservoir. The sight tube shall be transparent and have an inside diameter of 13 ± 1.5 mm (1/2 ± 1/16 in).
5.10.6.1.2 Thermostatic compensating valves
When tested in accordance with Clauses 5.10.6.2, 5.10.6.3.1, and 5.10.6.3.3, thermostatic compensating valves shall not exceed a temperature variation of ±2.0 °C (±3.6 °F) from the set temperature after the initial 5 s following a temperature change at the outlet (Thermocouple TC3 in Figure 7). Within the initial 5 s following a temperature change at the outlet (TC3), the following temperature spikes shall be allowed:
(a) temperature spikes exceeding +3.0 °C (+5.4°F) from the set temperature, as long as the elapsed time during which the temperature variation is greater than +3.0 °C (+5.4°F) does not exceed 1.5 s for each spike (see Figure D.1); and
(b) temperature spikes exceeding −5.0 °C (−9.0°F) from the set temperature, as long as the elapsed time during which the temperature variation is greater than −5.0 °C (−9.0°F) does not exceed 1 s for each spike (see Figure D.2).

5.10.6.1.3 Combination pressure-balancing and thermostatic compensating valves
Combination pressure-balancing and thermostatic compensating valves shall comply with the Clauses 5.10.6.1.1 and 5.10.6.1.2.

5.10.6.2 Data gathering

5.10.6.2.1 Temperature measurements shall be taken with thermocouples and associated measuring equipment capable of detecting a 63.2% step change within 0.3 s with a frequency rate of 20 Hz (one value every 0.05 s). See Figures 7 and C.1.

5.10.6.2.2 Thermocouples TC1, TC2, and TC3 shall be Type J or T thermocouples in accordance with ISA MC96.1. Thermocouple TC3 shall be located within the flow stream 914 ± 13 mm (36 ± 0.5 in) from the outlet.

5.10.6.2.3 The outlet piping shall be the same size as the valve outlet connection and shall be made of Type K or L copper tubing.

5.10.6.2.4 Temperature measurements shall be taken as follows at the thermocouple locations identified as follows:
(a) Measurements shall be taken at a minimum rate of 20 Hz (one value every 0.05 s) for 25 ± 5 s unless otherwise specified in this Standard.
(b) For pressure-balancing compensating valves, the outlet temperature measurements (TC3) shall be recorded every 0.05 s.
(c) For thermostatic compensating valves, the outlet temperature measurements (TC3) shall be averaged and recorded every 0.25 s.
(d) The pressure changes specified in Clauses 5.10.6.3.2 and 5.10.6.3.3 shall be accomplished in less than 1 s.
(e) The temperature-recording device shall be started 10 s before the step changes.

Notes:
(1) For verifying the time constant of the temperature-measuring equipment, see Annex C.
(2) Data can be gathered in formats similar to those depicted in Figures D.3 and D.4.

5.10.6.3 Test procedure

5.10.6.3.1 All automatic compensating valves
All automatic compensating valves shall be set up for testing as follows:
(a) Install the specimen as shown in Figure 7, with valves V1, V2, and V3 in the fully open position.
(b) Adjust the hot and cold water supply pressures directly upstream of the inlet connections to 310 ± 7 kPa (45 ± 1 psi), as measured by gauges G1 and G2.

(c) Adjust the temperatures at thermocouples TC1 and TC2 so that there is a minimum temperature differential of 44 °C (80°F) between the hot water temperature (minimum of 60 °C [140°F]) and the cold water temperature (maximum of 21 °C [70°F]).

(d) Adjust the specimen so that the outlet temperature at TC3 (point of use outlet) is 40.5 ± 0.5 °C (105 ± 1°F).

(e) Adjust valve V3 so that the specimen delivers 9.5 ± 1.0 L/min (2.5 ± 0.25 gpm) or the manufacturer’s stated minimum flow rate, whichever is less, and maintain the conditions established in Items (b) to (d).

(f) Flow water through the specimen for 1 min.

(g) The initial outlet temperature at TC3 shall be the average of the temperatures for the 10 s immediately preceding the temperature change at TC3 (point of use outlet) resulting from pressure or temperature changes.

5.10.6.3.2 Pressure-balancing compensating valves
Pressure-balancing compensating valves shall be tested as follows and the temperature changes of the valves shall be observed and recorded at TC3 in Figure 7 for 25 ± 5 s after the steps specified in Items (a), (c), (e), and (g):

(a) Decrease the hot water pressure to 155 ± 7 kPa (22.5 ± 1 psi).

(b) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(c) Increase the hot water supply pressure by 465 ± 7 kPa (67.5 ± 1 psi).

(d) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(e) Decrease the cold water supply pressure by 155 ± 7 kPa (22.5 ± 1 psi).

(f) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(g) Increase the cold water supply pressure by 465 ± 7 kPa (67.5 ± 1 psi).

5.10.6.3.3 Thermostatic-compensating valves
Thermostatic compensating valves shall be tested as follows and the temperature change of the valves shall be observed and recorded at TC3 in Figure 7 for 25 ± 5 s after the steps specified in Items (a), (c), (e) and (g):

(a) Reduce the hot water pressure to 248 ± 7 kPa (36 ± 1 psi).

(b) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(c) Increase the hot water supply pressure to 372 ± 7 kPa (54 ± 1 psi).

(d) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(e) Reduce the cold water supply pressure to 248 ± 7 kPa (36 ± 1 psi).

(f) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(g) Increase the cold water supply pressure to 372 ± 7 kPa (54 ± 1 psi).

(h) Repeat the procedure specified in Items (b) to (g) of Clause 5.10.6.3.1.

(i) Increase the hot water supply temperature by 14 ± 0.5 °C (25 ± 1°F) at a rate of 3 ± 0.5 °C (5 ± 1°F) per minute.

(j) Record the temperature measurements for 25 s after the required 14 ± 0.5 °C (25 ± 1°F) temperature increase has been attained.

5.10.6.4 Combination pressure-balancing and thermostatic compensating valves
Combination pressure-balancing and thermostatic compensating valves shall be tested in accordance with Clauses 5.10.6.3.2 and 5.10.6.3.3.
6.5.3
High-efficiency shower heads, body sprays, and hand-held showers shall not be packaged, marked, or provided with instructions directing the user to an alternative water-use setting that would override the maximum flow rate specified in Clause 5.13.2.1. Instructions related to the maintenance of the devices, including changing or cleaning shower head components, shall direct the user on how to return the device to its intended maximum flow rate.

Table 1
Minimum and maximum flow rates
(See Clauses 3, 5.4.1, and 5.4.2.1.)

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<tr>
<th>Fitting or accessory</th>
<th>Minimum, L/min (gpm)</th>
<th>Maximum, L/min (gpm)</th>
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<tr>
<td>Bathtub</td>
<td>9.0 (2.4)</td>
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<tr>
<td>Bidet</td>
<td>5.7 (1.5)</td>
<td>—</td>
</tr>
<tr>
<td>Laundry tray</td>
<td>15 (4.0)</td>
<td>—</td>
</tr>
<tr>
<td>Lavatory (other than public lavatory or metering)</td>
<td>—</td>
<td>8.3 (2.2)</td>
</tr>
<tr>
<td>High-efficiency lavatory faucet</td>
<td>3.0 (0.8)</td>
<td>5.7 (1.5)</td>
</tr>
<tr>
<td>Lawn or sediment faucet</td>
<td>15 (4.0)</td>
<td>—</td>
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<tr>
<td>Metering</td>
<td>—</td>
<td>1.0 L/cycle (0.25 gal/cycle)</td>
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<tr>
<td>Commercial pre-rinse spray valve</td>
<td>—</td>
<td>6.0 (1.6)</td>
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<tr>
<td>Low-flow commercial pre-rinse spray valve</td>
<td>—</td>
<td>4.7 (1.25)</td>
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<td>Public lavatory (other than metering)</td>
<td>—</td>
<td>1.9 (0.5)</td>
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<td>Service sink</td>
<td>15 (4.0)</td>
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<td>Shower head*</td>
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<td>High-efficiency shower head and hand-held shower</td>
<td>See Clause 5.13.2.2</td>
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<td>Sink</td>
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<td>Supply stop†</td>
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<td>3/8 in (pipe)</td>
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<tr>
<td>3/8 in (compression)</td>
<td>15 (4.0)</td>
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<tr>
<td>1/2 in (pipe)</td>
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<tr>
<td>1/2 in (compression)</td>
<td>21 (5.5)</td>
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</table>

*Includes hand-held shower heads and body sprays. Safety shower heads shall be exempt from the maximum flow rate requirements specified in this Table.
†Supply stop sizing shall be based on the nominal size for the outlet indicated in the manufacturer’s literature.
### Table 2
**Operating requirements**
(See Clauses 5.5.1, 5.6.1.2, 5.6.1.5.1, 5.6.2.4, 5.8.1.1, and 5.10.4.1.)

<table>
<thead>
<tr>
<th>Operating control</th>
<th>Linear force, N (lbf)</th>
<th>Operating torque, N•m (lbf•in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessible design</td>
<td>See Clause 5.5.2</td>
<td>—</td>
</tr>
<tr>
<td>All other operating controls*</td>
<td>45 (10)</td>
<td>1.7 (15)</td>
</tr>
<tr>
<td>Supply stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPS-1/2 and smaller</td>
<td>67 (15)</td>
<td>1.7 (15)</td>
</tr>
<tr>
<td>Larger than NPS-1/2</td>
<td>110 (25)</td>
<td>2.8 (25)</td>
</tr>
</tbody>
</table>

*For self-closing valves, the specified torques and forces shall apply only to the opening operation of the valves.

### Table 3
**Life cycle test**
(See Clauses 5.6.1.1 and 5.6.3.1.2.)

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath or shower fitting*</td>
<td>250 000</td>
</tr>
<tr>
<td>Bidet fitting</td>
<td>50 000</td>
</tr>
<tr>
<td>Body spray, hand shower, or shower head adjusting mechanism (flow or function control)</td>
<td>10 000</td>
</tr>
<tr>
<td>Body spray or shower head ball joint</td>
<td>10 000</td>
</tr>
<tr>
<td>Diverter (tub-to-shower, shower-to-shower, tub spout, bidet, shampoo, shower-to-body spray, or in-line flow control device)</td>
<td>15 000</td>
</tr>
<tr>
<td>Laundry tub fitting</td>
<td>250 000</td>
</tr>
<tr>
<td>Lavatory or sink fitting*</td>
<td>500 000</td>
</tr>
<tr>
<td>Lawn or sediment faucet or hydrant</td>
<td>150 000</td>
</tr>
<tr>
<td>Metering faucet*</td>
<td>150 000</td>
</tr>
<tr>
<td>Self-closing faucet*</td>
<td>150 000</td>
</tr>
<tr>
<td>Side spray assembly, including the diverter (pullout spout handpiece function control or multi-function aerator)</td>
<td>10 000</td>
</tr>
<tr>
<td>Supply stop†</td>
<td>2 000</td>
</tr>
<tr>
<td>Swing spout</td>
<td>50 000</td>
</tr>
</tbody>
</table>

*Includes electronic fittings.
†Supply stops integral with automatic compensating valves are not subject to the life cycle test.