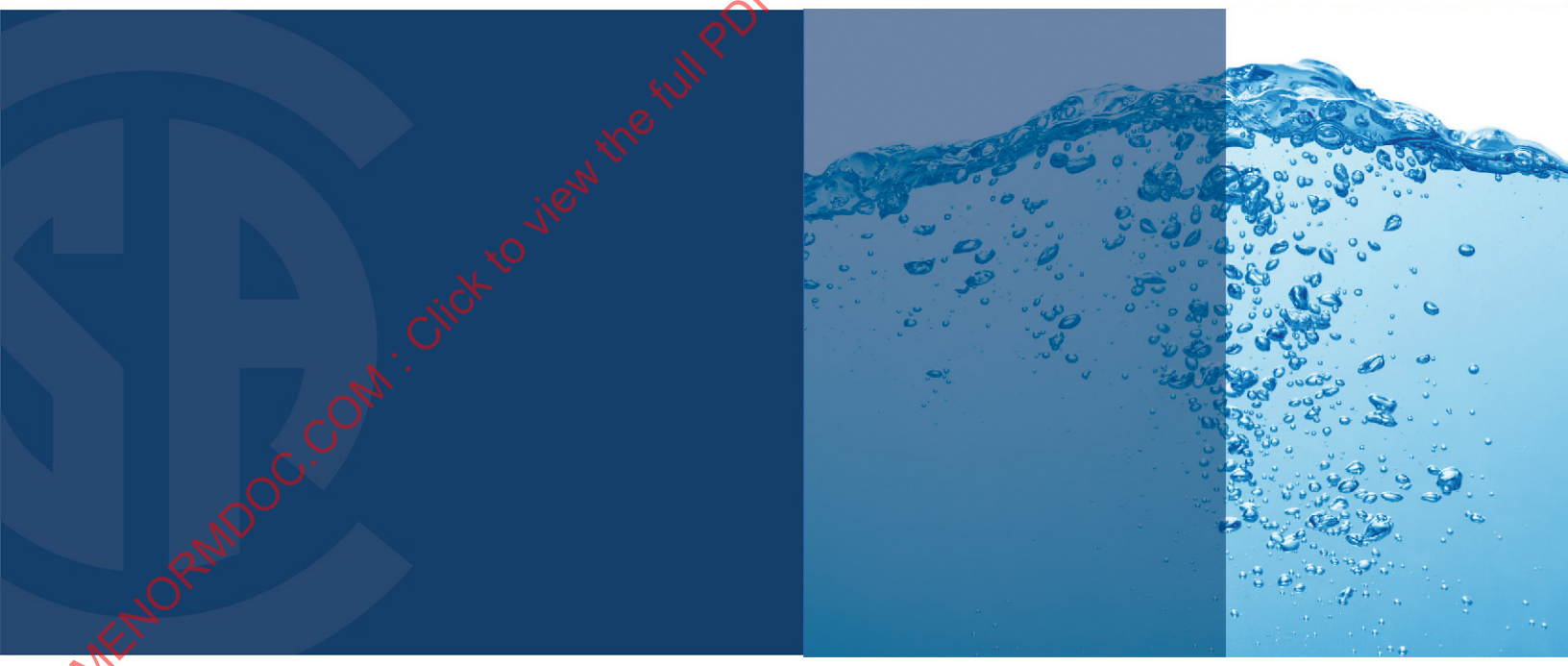
ASSE 1070-2020/ ASME A112.1070-2020/ CSA B125.70:20

National Standard of Canada

Performance requirements for water temperature limiting devices



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September 2020

Title: *Performance requirements for water temperature limiting devices*

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Preface

This is the second edition of ASSE 1070/ASME A112.1070/CSA B125.70, *Performance requirements for water temperature limiting devices*. It supersedes the previous edition published in 2015.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the ASSE/ASME/CSA Harmonization Task Group on Plumbing Fittings, under the jurisdiction of the ASME A112 Standards Committee on Plumbing Materials and Equipment, the ASSE Product Standards Committee, and the CSA Technical Committee on Plumbing Fittings. The CSA Technical Committee operates under the jurisdiction of the CSA Strategic Steering Committee on Construction and Civil Infrastructure.

This Standard has been formally approved by the ASME Standards Committee on Plumbing Materials and Equipment, the ASSE Product Standards Committee, and the CSA Technical Committee on Plumbing Fittings.

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ASSE 1070-2020/ ASME A112.1070-2020/ CSA B125.70:20 Performance requirements for water temperature limiting devices

Section I

1 Scope

1.1

This Standard covers water temperature limiting devices intended to limit the hot or tempered water temperature supplied to fittings for fixtures such as sinks, bidets, lavatories, and bathtubs to reduce the risk of scalding. These devices are not designed to address thermal shock.

Note: *Unless otherwise specified in this Standard, water temperature limiting devices are referred to as "devices".*

1.2

In this Standard, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the Standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the Standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

1.3

SI units are the units of record in Canada. In this Standard, the inch/pound units are shown in parentheses.

The values stated in each measurement system are equivalent in application; however, each system is to be used independently. Combining values from the two measurement systems can result in non-conformance with this Standard.

All references to gallons are to U.S. gallons.

For information on the conversion criteria used in this Standard, see Annex A.

Section II

2 Reference publications and definitions

2.1 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

ASME/CSA Group

ASME A112.18.1-2018/CSA B125.1-18
Plumbing supply fittings

ASSE International

Plumbing Dictionary Sixth Edition — 2007

ASTM International

ASTM F877-19
Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution Systems

ASTM D2846/D2846M-19a
Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold Water Distribution Systems

CSA Group

CSA B137-17
Thermoplastic pressure piping compendium

NSF International

NSF/ANSI 61-2019
Drinking Water System Components — Health Effects

NSF/ANSI 372-2016
Drinking Water System Components — Lead Content

2.2 Definitions

In addition to the definitions in ASME A112.18.1/CSA B125.1 and in the ASSE Plumbing Dictionary, the following definitions shall apply in this Standard:

Temperature setting — an adjustable means to limit the maximum setting of the device towards the hot position limiting the maximum discharge temperature.

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

Section III

3 Design and general requirements

3.1 Rated pressure, flow rate, and temperature range

3.1.1 Rated pressure

Water temperature limiting devices shall be designed to function at any supply pressure between 140 kPa and 860 kPa (20 psi and 125 psi).

3.1.2 Flow rate

The manufacturer shall designate the minimum rated flow rate of devices other than those integral to plumbing supply fittings that have a maximum flow rate. The flow rates for devices designed into fixture fittings shall be in accordance with ASME A112.18.1/CSA B125.1.

3.1.3 Temperature range

Water temperature limiting devices shall

a) be designed with an adjustable outlet temperature that includes the range of 41 °C to 43 °C (105 °F to 110 °F);
b) operate with inlet
   i) cold water temperatures between 4 °C and 27 °C (39 °F and 80 °F); and
   ii) hot water temperatures between 49 °C and 82 °C (120 °F and 180 °F); and
c) be set to deliver a maximum water temperature of 49 °C (120 °F) or less.

For non-adjustable water temperature limiting devices, the outlet temperature shall be a maximum of 43 °C (110 °F).

3.2 End connections

End connections for temperature limiting devices shall comply with a nationally or internationally recognized standard.

3.3 Function

3.3.1

Water temperature limiting devices are

a) intended to supply tempered water to plumbing supply fittings, or to be integral with plumbing supply fittings supplying tempered water;
b) intended to reduce the risk of scalding; and
c) not intended to protect against thermal shock.

3.3.2

Water temperature limiting devices shall have a

a) fixed (non-adjustable) temperature setting; or
b) temperature setting that can be
   i) adjusted and locked in position; or
   ii) adjusted with the use of a tool to protect against ready adjustment by the user.

3.3.3
Supply fittings with an integral water temperature limiting device and user control shall allow the outlet temperature to be adjusted by the user up to a maximum temperature of 49 °C (120 °F).

3.3.4
In addition to complying with this Standard, water temperature limiting devices integral to plumbing supply fittings shall comply with the applicable requirements of ASME A112.18.1/CSA B125.1.

3.4 Cross-flow
Water temperature limiting devices shall have check valves or other means of preventing cross-flow that comply with Clause 4.4.

3.5 Toxicity and lead content

3.5.1
Devices covered by this Standard and that are in contact with drinking water intended for human ingestion shall comply with the applicable requirements of NSF/ANSI 61.

3.5.2
Solders and fluxes in contact with potable water shall not exceed, by mass, 0.2% lead content. Metal alloys in contact with potable water shall not exceed 8% lead content.

3.5.3
Fittings intended to convey or dispense water for human consumption through drinking or cooking shall not contain a weighted average lead content in excess of 0.25% when evaluated in accordance with NSF/ANSI 372.

3.6 Devices incorporating electrical features

3.6.1
Electrical power to low-voltage circuits involving a peak open-circuit potential of not more than 42.2 V shall be supplied by a

a) primary battery supply;
b) suitable Class 2 low-voltage transformer complying with the applicable CSA or UL electrical Standards; or
c) combination of a transformer and fixed impedance that, as a unit, complies with the requirements for a Class 2 transformer specified in Item b).

3.6.2
Devices incorporating electrical features other than low-voltage circuits shall comply with the applicable CSA or UL electrical Standards.

3.6.3
Electrical plumbing controls, including solenoid valves, shall

a) be considered components of the device;
b) be tested with the device; and
c) comply with Clause 4.5.

Replacement of a battery during the life cycle testing specified in Clause 4.5 shall not be considered a failure.

3.7 Servicing

Internal parts of water temperature limiting devices shall be repairable without removal of the device from the plumbing system, except for devices with union connections.

Section IV

4 Performance requirements and test methods

4.1 General

4.1.1 Preconditioning

Before testing, specimens shall be conditioned at ambient laboratory conditions for at least 12 h.

4.1.2 Installation for testing

For test purposes, specimens shall be installed in accordance with the manufacturer's instructions.

4.1.3 Test sequence

Tests shall be conducted on the same specimen, in the order listed in this Standard.

4.2 High-temperature conditioning test

4.2.1 Purpose

The purpose of this test is to determine if the materials can withstand the maximum temperatures specified in Clause 3.1.3.

4.2.2 Procedure

Specimens shall be conditioned as follows:

a) Set up the specimen in accordance with Figure 1, with shut-off valves V1 and V2 in the full open position:
   i) For water temperature limiting devices not integral to plumbing supply fittings, set valve V3 in the full open position.
   ii) For water temperature limiting devices integral to plumbing supply fittings and with maximum flow requirements in accordance with ASME A112.18.1/CSA B125.1, a flow control device shall be installed.
b) Establish and maintain an equal pressure of 310 ± 14 kPa (45 ± 2 psi) on both the hot and cold water supplies.
c) Set the hot water temperature to 82 +0, –6 °C (180 +0, –10 °F).
d) Set the cold water temperature to 10 ± 3 °C (50 ± 5 °F).
e) Adjust the outlet temperature to the maximum outlet temperature of the device, or 49 °C (120 °F), whichever is lower.
f) For water temperature limiting devices not integral to plumbing supply fittings or where the integral devices are not required to comply with a maximum flow rate, adjust valve V3 to the

manufacturer's minimum rated flow +10%, –0% and maintain the conditions established in Items b) to e).

g) Allow the water to flow through the specimen for 5 min.

4.2.3 Failure criteria

Seals of water temperature limiting devices shall not leak.

4.3 Working pressure and temperature test

4.3.1 General

On water temperature limiting devices integral to plumbing supply fittings, the working pressure and temperature test shall be conducted in accordance with ASME A112.18.1/CSA B125.1.

4.3.2 Purpose

The purpose of this test is to determine if the device can withstand pressures of 140 and 860 kPa (20 and 125 psi). See Figure 1 for set-up of the test.

4.3.3 Procedure with the valve closed

Water temperature limiting devices with integral closure mechanisms shall be tested in accordance with Clause 4.3.5. During the test, the pressures and temperatures specified in Clause 4.3.5.2 shall be maintained for 5 to 6 min each, with the valve closed.

4.3.4 Procedure with the valve opened and the outlet(s) blocked

Specimens shall be tested in accordance with Clause 4.3.5. During the test, the pressures and temperatures specified in Clause 4.3.5.2 shall be maintained for 5 to 6 min each, with the outlet(s) blocked.

Where the outlet(s) is difficult to block, the flowing pressure shall be increased to the pressures and temperatures specified in Clause 4.3.5.2 for 5 to 6 min each.

4.3.5 Test temperatures and pressures

4.3.5.1

The test shall be conducted in an ambient environment of 20 ± 5 °C (68 ± 9 °F). The specimen shall be brought to equilibrium test temperatures by running water through it.

4.3.5.2

The test pressures and temperatures shall be as follows:

a) 140 ± 14 kPa and 10 ± 6 °C (20 ± 2 psi and 50 ± 10 °F);
b) 860 ± 14 kPa and 10 ± 6 °C (125 ± 2 psi and 50 ± 10 °F);
c) 140 ± 14 kPa and 66 ± 6 °C (20 ± 2 psi and 150 ± 10 °F); and
d) 860 ± 14 kPa and 66 ± 6 °C (125 ± 2 psi and 150 ± 10 °F).

4.3.6 Failure criteria

Seals of water temperature limiting devices shall not leak.

4.4 Cross-flow test

4.4.1 Purpose

The purpose of this test is to determine if cross-flow leakage occurs when the outlet(s) is blocked.

Note: *When a water temperature limiting device is integral to a plumbing supply fitting, the test is conducted in accordance with the requirement of ASME A112.18.1/CSA B125.1.*

4.4.2 Procedures

The cross flow test shall be conducted as follows:

a) Install the device in the open position with the mixed water outlet blocked.
b) Pressurize the cold water inlet(s) to 35 ± 7 kPa (5 ± 1 psi) water.
c) Maintain for 1 min.
d) Examine for leakage at the hot inlet(s).
e) Pressurize the hot water inlet(s) to 35 ± 7 kPa (5 ± 1 psi) water.
f) Maintain for 1 min.
g) Examine for leakage at the cold inlet(s).

4.4.3 Failure criteria

The rate of leakage shall not exceed 50 mL/min (0.01 gpm).

4.5 Life cycle test

4.5.1 Purpose

The purpose of this test is to determine if there is any deterioration in performance upon completion of the cycles of operation noted in Clause 4.5.2.

4.5.2 Procedure

The life cycle test shall be conducted as follows:

a) Supply water to the specimen at a flowing pressure of 345 ± 35 kPa (50 ± 5 psi) and a supply pressure of 550 kPa (80 psi) maximum (valve closed) shall be supplied to the specimen throughout the test, and at
   i) 10 ± 3 °C (50 ± 5 °F) to the cold-water inlet; and
   ii) 60 ± 3 °C (140 ± 5 °F) to the hot-water inlet.
b) Set the discharge flow rate at the manufacturer's minimum rated flow, or in the case of integrated fittings with outlet flow control, the flow shall be set at maximum.
c) Open the hot- and cold-water valves.
d) Set the specimen to discharge water at 40 ± 3 °C (105 ± 5 °F).
e) Cycle the specimen for 100,000 cycles at a rate of 3 to 5 cycles per minute. Each cycle shall be as follows:
   i) Flow water for at least 6 s.
   ii) Reduce the hot water temperature to ambient temperature for at least 6 s.
   iii) Increase the hot water temperature to 60 ± 3 °C (140 ± 5 °F).

4.5.3 Failure criteria

There shall be no leakage.

4.6 Pressure and temperature variation test

4.6.1 Data gathering (see Figure 1)

Data shall be gathered as follows:

a) The temperature-recording device shall be started 10 s before the step changes.
b) Temperature measurements shall be taken at temperature sensors T1, T2, and T3 with 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) for 25 ± 5 s unless otherwise specified in this Standard. See Annex B.
c) The outlet temperature measurements at sensor T3 shall be averaged every 0.25 s.
d) Temperature sensors T1, T2, and T3 shall be located as follows:
    i) temperature sensors T1, T2, and T3, within the flow stream in Type K or Type L copper water tube;
    ii) temperature sensors T1 and T2, within 914 mm (36 in) of the device; and
    iii) for devices integral to a plumbing supply fitting, temperature sensor T3 shall be within 25 mm (1.0 in) of the discharge outlet to the fixture in the flow stream. For specimens with multiple discharges, the test shall be conducted for each discharge outlet except for the rim flush mode of bidet fittings. For all other devices, the maximum distance shall be 457 mm (18 in) from the outlet of the specimen.

The outlet tube shall be the same size as the outlet connection size of the device.

Note: *For verifying the time constant of the temperature-measuring equipment, see Annex B.*

4.6.2 Procedure (see Figure 1)

4.6.2.1

Controllers with pressure feedback loops shall not be active during the tests, but may be used to set the test parameters.

Note: *Controllers with pressure feedback loops interact with the specimen and result in inaccurate test results.*

4.6.2.2

The pressure and temperature variation test shall be conducted as follows:

a) Set the valves as follows:
    i) For specimens integral to plumbing supply fittings that comply with the maximum flow rate requirements of ASME A112.18.1/CSA B125.1,
        1) set up the specimen as shown in Figure 1, with valves V1, V2, and the specimen in the fully open position; and
        2) fully open valve V3 or remove valve V3 so that the specimen is tested with its intended flow-control device(s) attached.
    ii) For all other specimens, adjust valve V3 so that the specimen delivers the manufacturer's minimum rated flow +10%, –0% at which the specimen complies with the temperature limiting requirements of Clauses 4.6 and 4.7.
b) Adjust and maintain the hot and cold water supply pressures directly upstream of the inlet connections to a flowing pressure of 310 ± 14 kPa (45 ± 2 psi), as measured by gauges G1 and G2.
c) Adjust the temperatures at temperature sensors T1 and T2 so that there is a temperature differential of 44 °C to 56 °C (80 °F to 100 °F) between the hot water temperature [minimum of 60 °C (140 °F)] and the cold water temperature [maximum of 21 °C (70 °F)].
d) After the hot water and cold water inlet temperatures are established, maintain the inlet temperatures at ±1.0 °C (±2.0 °F).