

Australian Standard[®]

Performance of showers for bathing



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- Australian Chamber of Commerce and Industry
 - Australian Industry Group
 - Consumers Federation of Australia
 - CSIRO
 - Department of Sustainability, Environment, Water, Population and Communities
 - Master Plumbers and Mechanical Services Association of Australia
 - National Association of Testing Authorities
 - Plumbing Distributors Association of New Zealand
 - Plumbing Products Industry Group
 - Queensland Brassware Association
 - South Australian Water Corporation
 - Sydney Water Corporation
 - Testing Interests (Australia)
 - Victorian Water Industry Association
-

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Performance of showers for bathing

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-038, Water Efficient Showers, to supersede AS/NZS 3662:2005.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The *Plumbing Code of Australia* requires that showers be certified to WaterMark Level 2.

The objective of this Standard is to specify the requirements for showers for bathing purposes. Shower types include—

- (a) showerhead(s) fastened to fixed arm(s);
- (b) showerhead(s) fastened to pivot arm(s);
- (c) showerheads with integral mixing valves;
- (d) handheld showers connected to flexible hoses—
 - (i) supported by a fixed wall handset holder;
 - (ii) attached to a slide rail; or
 - (iii) mounted on a holder attached to a bath/shower mixer.

Where showers are supplied together with other components (e.g. a fixed or pivot arm, a flexible hose with or without a flow controller or mixing valve), which could affect the performance of the shower, such components will need to be attached to the shower for testing. Where showers are supplied together with components that would not affect their performance (e.g. tap top assemblies, or other components), such additional components need not be attached to the shower for testing.

For prefabricated bathroom modules that include showerheads(s), see ATS 5200.050, *Technical Specification for plumbing and drainage products*, Part 050: *Prefabricated bathroom modules*.

Showers, when supplied as an assembly with tapware, may be WaterMark approved under AS/NZS 3718, *Water supply—Tap ware*.

This revision includes—

- (A) amended procedures to meet requirements of the Water Efficiency Labelling and Standards (WELS) scheme for greater consistency of test results across recognized testing laboratories;
- (B) new performance test for shower spray force and shower spray coverage.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

CONTENTS

	<i>Page</i>
FOREWORD	4
1 SCOPE	5
2 COMPLIANCE WITH THIS STANDARD	5
3 NORMATIVE REFERENCES	5
4 DEFINITIONS	5
5 PERFORMANCE REQUIREMENTS	6
6 MARKING REQUIREMENTS	8
APPENDICES	
A MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD	9
B DETERMINATION OF NOMINAL FLOW RATE FOR HIGH PRESSURE SHOWERS	11
C DETERMINATION OF MEAN SPRAY SPREAD ANGLE	15
D MEASUREMENT OF TEMPERATURE DROP	21
E INTEGRITY OF SHOWER HOSES	25
F ENDURANCE TEST FOR FLOW CONTROLLERS USED IN SHOWERS	29
G DETERMINATION OF NOMINAL FLOW RATE FOR LOW PRESSURE SHOWERS	31
H DETERMINATION OF NOMINAL SPRAY FORCE	33
I DETERMINATION OF SPRAY COVERAGE	38

FOREWORD

As showers are significant consumers of water, this Standard has been revised to encourage the development of showers that will give a comfortable and effective shower at lower flow rates—more than 6 L/min and less than 7.5 L/min.

A shower is essentially a tactile experience and what may look like a good shower may not be confirmed by use. The following factors, among others, influence the quality of a shower:

- (a) *Water flow rate.*
- (b) *Temperature drop* Showers with significant temperature drops, which increase with distance from the head, could present a scalding hazard and may require greater heated water usage to achieve acceptable water temperatures. The ability of water to rinse soap is temperature sensitive; therefore, showers with a minimum temperature drop (drop in water temperature from the showerhead to the lower limbs) are more effective for ablution purposes.

The criterion for temperature drop in this Standard is based on what can be readily achieved by many showers currently on the market.

- (c) *Temperature stability* Showers with restriction in unequal pressure installations are more susceptible to fluctuations in supply pressure, which could present a scalding or thermal shock hazard to the bather.
- (d) *Spray pattern* The spray pattern of a shower has two main features—the first is the shape of the cone of water emitted and the second is the distribution of spray within the cross-sections of the cone. Showers with wide cones can display two undesirable features:
 - (i) If the water spray is evenly distributed throughout the cone, a significant temperature drop may be felt with increasing distance from the shower spray head.
 - (ii) If the spray is concentrated around the perimeter of the cone, the shower may have a hollow feel.

In either case, the shower may present difficulties when washing and rinsing the lower body extremities.

This Standard maintains a requirement for the angle of spread from the shower spray head to form a cone. Consumer acceptance tests on different showerheads indicated a preference for shower spray heads with a mean spray spread angle of between 3° and 7°.

- (e) *Comfort and effectiveness* Optional additional testing procedures in Appendices H and I for shower spray force and shower spray coverage are only applicable to showers with flow rates of more than 6 L/min and less than 7.5 L/min. The spray coverage test is for determining uniform spray distribution. The spray force test is to provide a functional cleansing performance. The spray force and spray coverage performance requirements were determined specifically for showers in this flow rate range and are not intended to be used to assess showers with higher flow rates.

STANDARDS AUSTRALIA

Australian Standard

Performance of showers for bathing

1 SCOPE

This Standard specifies requirements for the performance of showers for bathing.

2 COMPLIANCE WITH THIS STANDARD

Demonstration of compliance with the requirements of this Standard shall be in accordance with Appendix A.

3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

AS

5200 Plumbing and drainage products

5200.037.2 Part 037.2: Flow controllers for use with heated or cold water systems

AS/NZS

3500 Plumbing and drainage (series)

6400 Water efficient products—Rating and labelling

EN

1113 Sanitary Tapware—Shower Hoses for Sanitary Tapware for Water Supply Systems of Type 1 and Type 2—General Technical Specification

Plumbing Code of Australia

New Zealand Building Code

4 DEFINITIONS

For the purpose of this Standard, the definitions in AS/NZS 3500.0 and the ones below apply.

4.1 High pressure shower

A shower where both the heated water and cold water static supply pressures are at 150 kPa or above.

4.2 Low pressure shower

A shower where either—

- (a) both the heated water and cold water static supply pressures are below 120 kPa; or
- (b) the heated water static supply pressure is below 120 kPa and the static cold supply pressure is at or above 150 kPa.

4.3 Nominal flow rate

The water consumption of a shower at the maximum flow setting, which is measured in litres per minute, using a dynamic water pressure of—

- (a) 35 kPa in accordance with Appendix G; or
- (b) the average of 150 kPa, 250 kPa and 350 kPa in accordance with Appendix B.

4.4 Shower

A showerhead through which water is intended to pass to form a spray for bathing purposes, which may include a fixed or pivot arm, a flexible hose (with or without a flow controller), tap top assemblies, or other components.

5 PERFORMANCE REQUIREMENTS

5.1 Flow rate

5.1.1 General

Where showers are supplied as an assembly with other components (e.g. a fixed or pivot arm, a flexible hose with or without a flow controller or backflow prevention device, or a mixing valve), which could affect the performance of the shower, such components shall be attached to the shower for testing.

Where showers are supplied together with components that would not affect their performance (e.g. tap top assemblies, or other components), such additional components need not be attached to the shower for testing.

5.1.2 High pressure

The nominal flow rate of a high pressure shower shall be determined in accordance with Appendix B, measured at pressures of 150 kPa, 250 kPa and 350 kPa, and—

- (a) the maximum difference between the highest and lowest average flow rate shall not exceed 2.0 L/min;
- (b) the highest average flow rate shall not exceed the upper limit of the flow range for the nominal flow rate, determined in accordance with AS/NZS 6400, by more than 1.0 L/min; and
- (c) the lowest average flow rate shall be not less than the lower limit of the flow range for the nominal flow rate, determined in accordance with AS/NZS 6400, by more than 1.0 L/min.

NOTE: Where a manufacturer/supplier has nominated that the showers have a nominal flow rate above 16 L/min when tested in accordance with Appendix B and intends to seek a WELS Scheme zero star rating, compliance with Items (a), (b) and (c) above may not be applicable.

5.1.3 Low pressure

The nominal flow rate of a low pressure shower shall be determined in accordance with Appendix G, measured at a dynamic pressure of 35 kPa.

5.2 Mean spray spread angle

When determined in accordance with Appendix C, the mean spray spread angle shall be between 0° and 8°.

5.3 Temperature drop

When determined in accordance with Appendix D, the temperature drop shall not exceed 3°C.

5.4 Optional additional tests

5.4.1 Spray force

When tested in accordance with Appendix H, the nominal spray force and the maximum difference between the highest and lowest average spray forces shall be in accordance with the requirements of Table A2, Appendix A.

5.4.2 *Spray coverage*

When tested in accordance with Appendix I, the spray coverage shall be in accordance with the requirements of Table A2, Appendix A.

5.5 Shower hoses

5.5.1 *General*

Shower hoses shall comply with Clause 5.5.2 to Clause 5.5.5 or EN 1113.

5.5.2 *Tensile strength and watertightness*

When tested in accordance with Paragraph E2 of Appendix E, the shower hose shall not rupture, permanently deform in a manner that would affect its performance or visibly leak.

5.5.3 *Temperature resistance*

When tested in accordance with Paragraph E3 of Appendix E, the shower hose shall not rupture, permanently deform in a manner that would affect its performance or visibly leak.

5.5.4 *Thermal shock resistance*

When tested in accordance with Paragraph E4 of Appendix E, the shower hose shall not rupture, permanently deform in a manner that would affect its performance or visibly leak.

5.5.5 *Effectiveness of rotary connection*

When tested in accordance with Paragraph E5 of Appendix E, the initial torque shall be not greater than 1 Nm.

5.6 Watertightness of end connections

All shower end connections shall have a G1/2 or G1/2B type thread. When attached to a water supply, in accordance with the manufacturer's specified method of attachment, the end connections shall be watertight.

5.7 Flow controller

5.7.1 *General*

Where a flow controller is incorporated in a shower or a component of a shower, the controller shall be mechanically retained to prevent dislodgment and shall require a tool for removal.

Flow controllers shall comply with AS 5200.037.2 or Clause 5.7.2.

A flow controller, tested and compliant with AS 5200.037.2 or Clause 5.7.2, may be used in a range of showers without further endurance testing.

5.7.2 *Endurance test for flow controller fitting in or integral to shower or shower components used in high pressure showers*

When tested in accordance with Appendix F—

- (a) the maximum difference between the highest and lowest average flow rate, measured at pressures of 150 kPa, 250 kPa and 350 kPa, shall not exceed 2 L/min; and
- (b) the flow rate shall be within ± 1 L/min of the nominal flow rate, as determined in Clause 5.1.2.

6 MARKING REQUIREMENTS

Showers or their packaging shall be durably and legibly marked with the following:

- (a) Certification mark, licence number, the number of this Standard (i.e. AS 3662) and the manufacturer's or supplier's name.
- (b) For high pressure showers, a clear statement to indicate that the shower may not be suitable for use with gravity-fed water heaters, low pressure supply networks, instantaneous water heaters, tempering valves and thermostatic mixing valves.
- (c) For low pressure showers, a clear statement to indicate that the shower is not for use with high pressure systems.
- (d) Where showers incorporate flow controllers, instructions that care be exercised during installation to ensure that the male connecting threads do not damage the flow controllers.
- (e) Additional installation instructions that include statements reflecting the requirements of the warranty as defined in the *Plumbing Code of Australia, New Zealand Building Code*, and the installation requirements of AS/NZS 3500 series of Standards covering any limitations on the product's installation and use (e.g. flow rate, maximum supply pressure, backflow prevention device where shower hoses are fitted, etc.).

APPENDIX A
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD
(Normative)

A1 SCOPE

This Appendix sets out the means for demonstrating compliance with this Standard.

NOTE: The *Plumbing Code of Australia* requires that showers for bathing be certified to WaterMark Level 2.

A2 DEFINITIONS

A2.1 Sample

One or more units of product selected at random from a production run without regard to quality.

A2.2 Type testing

Testing performed on a sample to demonstrate that the product complies with this Standard.

A2.3 Design change

Alterations to the product which affect its performance or compliance with this Standard.

A3 TESTING

A3.1 Type testing

Table A1 sets out the requirements for type testing and frequency of re-verification.

Product samples for type testing shall be of the same type, identical dimensions and characteristics, all the same nominal diameter and wall thickness, and from the same materials.

TABLE A1
TYPE TEST

Characteristic	Requirement (Clause)	Property	Test method	Frequency of retesting
Performance	5.1	Flow rate	Appendix B or G	On change of design
	5.2	Mean spray spread angle	Appendix C	
	5.3	Temperature drop	Appendix D	
	5.4.1	Spray force (see Note)	Appendix H	
	5.4.2	Spray coverage (see Note)	Appendix I	
	5.5	Shower hoses	Appendix E or EN 1113	On change of materials or supplier or design
	5.6	G1/2 or G1/2B threads and watertightness	Visual inspection	On change of design
	5.7.1	Mechanical retention of flow controller	Visual inspection	
	5.7.2	Endurance	Appendix F or AS 5200.037.2	
Marking	6	Marking	Visual inspection	

NOTE: Spray force and spray coverage testing under Clauses 5.4.1 and 5.4.2 are optional additional tests.

TABLE A2
SPRAY FORCE AND SPRAY COVERAGE PERFORMANCE REQUIREMENTS

Characteristic		Nominal flow rate, more than 6.0 but not more than 7.5 L/min	
Spray force	Nominal spray force—Minimum	85 gf (gram-force)	
	Highest and lowest—Average spray forces maximum difference	45 gf (gram-force)	
Spray coverage	Volume	Collection zones	Collection volume
		Zone 1	0.4% to 20%
		Zone 2	5% to 60%
		Zone 3	15% to 65%
		Zone 4	0.2% to 50%
		Zone 5	0% to 20%
		Zone 6	0% to 20%
	Standard deviation	Collection zones	Collection volume
		Zones 1 to 4 (Collectively)	4.0 (max.)
		Zones 2, 3, 4, 5 and 6 (Individually)	3.0 (max.)

APPENDIX B

DETERMINATION OF NOMINAL FLOW RATE FOR HIGH PRESSURE SHOWERS

(Normative)

B1 SCOPE

This Appendix sets out the method for determining the nominal flow rate of a high pressure shower.

B2 PRINCIPLE

The shower to be tested is supported in a test rig and water is passed through the shower at a dynamic flow pressure of 150 kPa, 250 kPa, and 350 kPa; when the flow rate has stabilized it is recorded at each of these pressures at ambient water temperature.

B3 APPARATUS

The following apparatus is required:

- (a) Water supply capable of delivering water at—
 - (i) a flow rate of more than 20 L/min; and
 - (ii) a dynamic flow pressure of at least 500 kPa.
- (b) Piping for the water flow made from DN 15, Type B copper pipe. The branch for flow pressure measurements shall be located at least 250 mm downstream of any valve or fitting. The shower connection shall be not more than 300 mm downstream of the branch for flow pressure measurements.

NOTE: For an illustration of a typical test arrangement, see Figure B1.
- (c) Water pressure measuring instrument with a resolution of 1 kPa or better and with an accuracy of measurement of 2% or better.
- (d) Water flow measuring instrument with a resolution of 0.1 L/min or better and with an accuracy of measurement of 2% or better.

B4 PROCEDURE

Water pressure measurements shall be recorded to the nearest 1 kPa or better.

Water flow measurements shall be recorded to the nearest 0.1 L/min or better.

The procedure shall be as follows:

- (a) Where a shower(s) is(are) supplied with other components (e.g. an arm, shower hose, elbow with a flow controller or backflow prevention device, mixing valve) assemble the shower in accordance with the manufacturer's specification.
- (b) Mount the shower in the test rig with the water supply connected to the intended inlet(s).
- (c) Ensure shower faceplate is on a horizontal plane to the test rig (see Figures B1 and B2). Where the shower faceplate is above or below the centre-line of the connection inlet to the test rig an adjustment to the pressure reading shall be applied [see Step (d) of Paragraph B4].

- (d) If required, apply the following pressure differential adjustment:

$$P_{\text{diff}} = \rho \times g \times h \text{ (m)}$$

where

P_{diff} = pressure differential, in kilopascals

ρ = water density, in kilograms per cubic metre
= 1 kg/m³

g = gravity, in metres per second squared
= 9.81 m/s²

h = height, in metres (negative value if above centre-line and positive value if below the centre-line—both measurements to 2 decimal places)

The pressure differential calculated above shall be applied at 150 kPa, 250 kPa and 350 kPa dynamic flow pressures.

- (e) For showers with adjustable spray settings, adjust the spray to the maximum flow setting.
- (f) Condition the shower by allowing the water to flow and adjusting the control valve gradually until the dynamic flow pressure of at least 500 kPa is achieved. Maintain the flow for a minimum of 60, +10, –0 s.
- (g) Over a 10 s period, gradually adjust the control valve to turn off the flow of water.
- (h) Over a 10 s period, gradually turn on the flow of water until a stabilized flow at a dynamic flow pressure of 150 +5, –0 kPa is achieved.
- (i) Observe the flow meter and record the flow rate at that stabilized dynamic flow pressure.
- (j) Repeat Steps (g) and (i) with the dynamic flow pressure increased to 250 +5, –0 kPa, 350 +5, –0 kPa.
- (k) Gradually adjust the control valve to turn off the flow of water.
- (l) Repeat Steps (h) to (k) to obtain a second reading of the flow rates at each pressure.
- (m) Calculate and record the average flow rates at each of the following dynamic pressures:
- (i) 150 kPa.
 - (ii) 250 kPa.
 - (iii) 350 kPa.
- (n) Calculate the mean of the average flow rates obtained in Step (m)(i) to (m)(iii), and record this value as the nominal high pressure flow rate.
- (o) From the averages obtained in Step (n), record the highest and lowest average flow rates.
- (p) Calculate and record the maximum differences between the highest and lowest average flow rates at Step (o).

NOTE: Clause 5.1.2(a) specifies that the maximum difference between the highest and lowest average flow rates is not to exceed 2 L/min.

B5 TEST REPORT

The following shall be reported:

- (a) Manufacturer, brand name, model name and model number (wherever they exist) of the shower and description of other components tested with the sample.
- (b) The average flow rate in litres per min (L/min) through the test sample, at the dynamic flow pressures of—
 - (i) 150 kPa;
 - (ii) 250 kPa; and
 - (iii) 350 kPa.

NOTE: The average flow rates, as determined in Step (m) of Paragraph B4.

- (c) The nominal flow rate, as determined in Step (n) of Paragraph B4.
- (d) The highest and lowest average flow rates, as determined in Step (o) of Paragraph B4.
- (e) The difference between the highest and lowest average flow rates at 150 kPa, 250 kPa and 350 kPa, as determined in Step (p) of Paragraph B4.
- (f) Compliance with Clause 5.1.2(b) for highest average flow rate.
- (g) Compliance with Clause 5.1.2(c) for lowest average flow rate.
- (h) Product nominated for use with high pressure as defined in this Standard.
- (i) Reference to this test method, i.e., Appendix B, AS 3662.

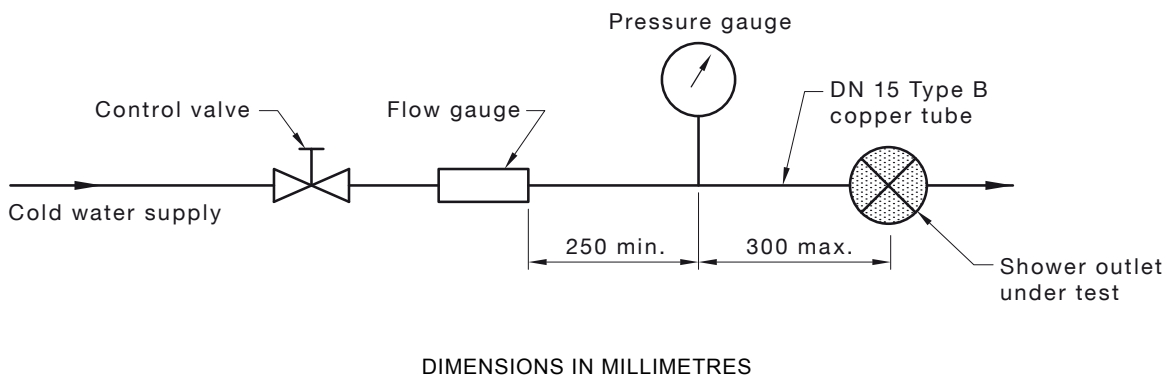


FIGURE B1 TYPICAL TEST ARRANGEMENT