Australian Standard®

Vitreous china used in sanitary appliances
This Australian Standard was prepared by Committee WS/3, Sanitary Plumbing Fixtures. It was approved on behalf of the Council of Standards Australia on 12 March 1992 and published on 15 May 1992.

The following interests are represented on Committee WS/3:

- Australian Chamber of Manufactures
- Australian Consumers Association
- Board of Works, Melbourne
- Brisbane City Council
- Confederation of Australian Industry
- Department of Health, N.S.W.
- Engineering and Water Supply Department, S.A.
- Housing Industry Association of Australia
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- Metal Trades Industry Association of Australia
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This Standard was issued in draft form for comment as DR 91134.
PREFACE

This Standard was prepared by the Standards Australia Committee on Sanitary Plumbing Fixtures to supersede AS 1976—1976. The Standard deals with the quality of vitreous china and details the tests by which that quality may be assessed. Requirements for non–vitreous china used in sanitary appliances are given in AS 4023.

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STANDARDS AUSTRALIA

Australian Standard

Vitreous china used in sanitary appliances

1 SCOPE This Standard specifies the quality of vitreous china for use in sanitary appliances, and details the tests by which that quality shall be assessed.

2 DEFINITIONS For the purpose of this Standard, the definitions below apply.

2.1 Blister—a raised projection of the surface having a height or width greater than 1 mm.

2.2 Crazing—cracks in the glaze.

2.3 Discolouration—a coloured spot over 6 mm maximum dimension, or a concentrated number of specks or spots that give the effect of a change in colour.

2.4 Finish—the texture and condition of a surface other than its colour.

2.5 Fire crack—a visible area crack in the body not covered with glaze in the visible area.

2.6 Grouping—a number of spots, blisters, pinholes, or specks within any pottery square.

2.7 Pinhole—a hole in the glazed surface not greater than 0.5 mm.

2.8 Polishing mark—a spot, not greater than 10 mm maximum dimension, where a minor blemish has been ground off and the surface polished.

2.9 Pottery square—a square of side 50 mm, i.e. an area of 2500 mm².

2.10 Speck—an area of contrasting colour less than 1 mm maximum dimension. Specks less than 0.3 mm maximum dimension do not constitute a defect unless sufficient in number to form a discolouration.

2.11 Spot—an area of contrasting colour greater than 1 mm maximum dimension.

2.12 Visible surface—the surface that is readily visible, after installation of an appliance, to an observer in a normal standing position.

2.13 Vitreous china—a ceramic material made from a mixture of clays and other materials, with a mean water absorption of not greater than 0.5 percent.

2.14 Wavy finish—a defect in the finish that has the appearance of numerous runs in the glaze; an irregular or mottled finish.

2.15 Normative—an appendix which is essential to the understanding or implementation of the Standard.

3 GLAZING The glaze shall be thoroughly fused to the body.

4 SURFACE QUALITY When viewed from a distance of between 500 mm and 600 mm with a surface illumination of not less than 300 lx, the surface defects shall not be in excess of those given in Table 1.

<table>
<thead>
<tr>
<th>Maximum number of blemishes or defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavy finish</td>
</tr>
<tr>
<td>Warpage</td>
</tr>
<tr>
<td>Discolouration</td>
</tr>
<tr>
<td>Spots, blisters, or pinholes</td>
</tr>
<tr>
<td>Bubbles or specks</td>
</tr>
<tr>
<td>Polishing marks</td>
</tr>
<tr>
<td>Dull or eggshell finish</td>
</tr>
<tr>
<td>Fire cracks</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Not noticeably warped</td>
</tr>
<tr>
<td>A total of not more than three, and no grouping</td>
</tr>
<tr>
<td>A total of not more than five, and not more than three in one pottery square</td>
</tr>
<tr>
<td>Only one; none permitted for coloured appliances</td>
</tr>
<tr>
<td>Not permitted</td>
</tr>
<tr>
<td>Not permitted</td>
</tr>
</tbody>
</table>

5 TESTS

5.1 Application of tests Each of the tests listed in Clauses 5.2 to 5.4 shall be carried out on an appliance of current production, selected as it is drawn from the exit kiln and the results recorded.

5.2 Water absorption The test for water absorption shall be carried out at least once every week in accordance with Appendix A. None of the individual values of water absorption shall exceed 0.75 percent and the arithmetic mean of the values shall not exceed 0.50 percent.
5.3 Crazing The test for crazing shall be carried out at least once every month in accordance with Appendix B. None of the test specimens shall show any crazing.

5.4 Chemical resistance The test for chemical resistance shall be carried out at least once every 3 months in accordance with Appendix C. The test specimens shall be unaffected in comparison with the control specimen.
APPENDIX A

TEST FOR WATER ABSORPTION
(Normative)

A1 SCOPE This Appendix sets out the method for the water absorption test on vitreous china.

A2 PRINCIPLE Test specimens are weighed dry and then wet, and the difference calculated, as a percentage of the dry mass.

A3 APPARATUS The following apparatus is required:
(a) Desiccator containing a suitable desiccant.
(b) Weighing or balancing machine of suitable capacity, accurate to ±0.005 g.
(c) Vacuum pump and vessel.
(d) Timing device.

A4 TEST SPECIMENS Test specimens shall consist of three pieces of vitreous china that have been broken from widely-separated parts of the selected appliance. Each specimen shall have a total surface area of 10 000 ±100 mm².

A5 PROCEDURE The procedure shall be as follows:
(a) The specimens shall be dried to a constant mass at a temperature of 105°C to 115°C and then cooled to room temperature in a dessicator containing a suitable desiccant.
(b) When cool they shall be weighed individually to an accuracy of not less than 0.01 g (m₁).
(c) Specimens shall then be placed in a vacuum device and maintained at a vacuum of 30 mm mercury for not less than 60 min.
(d) Add cold freshly-boiled distilled water to the vessel without reducing the vacuum, until the specimens are covered.
(e) Admit air into the vessel, remove specimens and boil in distilled water for not less than 20 min.
(f) Allow specimens to cool in water for not less than 16 h.
(g) Remove any surface water with a damp cloth and weigh specimens individually (m₂).

A6 CALCULATIONS The following calculations shall be made:
(a) Percentage water absorption shall be calculated by dividing the difference in weight of the water-treated specimen and dry specimen by the weight of the dry specimen.

\[
m = \frac{m_2 - m_1}{m_1} \times 100 \quad \ldots \quad (A1)
\]

where
- \( m \) = percentage of water absorption
- \( m_1 \) = mass of dry specimen
- \( m_2 \) = mass of wet specimen

(b) The arithmetic mean of these three specimens shall be calculated and greatest of three individual values shall be recorded.

A7 TEST REPORT The following shall be reported:
(a) The mean water absorption and the greatest of the three individual values.
(b) Reference to this test method, i.e. Appendix A of AS 1976.
APPENDIX B
TEST FOR CRAZING
(Normative)

B1 SCOPE This Appendix sets out the method for the crazing test on vitreous china.

B2 PRINCIPLE Test specimens are subjected to saturated steam pressure, cooled and soaked in a dye solution.

B3 APPARATUS The following apparatus is required:
(a) Pressure vessel containing saturated steam maintained at a pressure of 330 to 360 kPa.
(b) Container for dye solution.
(c) Timing device.

B4 TEST SPECIMENS Test specimens shall consist of three pieces of vitreous china that have been broken from widely-separated parts of the selected appliance. Each specimen shall have a total surface area of 25 000 ±150 mm².
At least one major surface shall be a glazed surface. Surfaces other than major surfaces shall be unglazed and freshly broken. Care shall be taken not to produce cracks either in the body or in the glaze; any such pieces shall be discarded.

B5 PROCEDURE The procedure shall be as follows:
(a) Place the specimens in a pressure vessel, for not less than 10 h, in which saturated steam is maintained at a pressure between 330 and 360 kPa.
(b) Allow the specimens to cool to room temperature and then place in a container of dye solution for not less than 7 h. A small quantity of wetting agent should be added to dye solution.
(c) Examine each specimen for crazing.
NOTE: The period of not less than 10 h in Item (a) may be either continuous or, for convenience, split into two equal periods.

B6 TEST REPORT The following shall be reported:
(a) The results for each specimen (no crazing is permitted).
(b) Reference to this test method, i.e. Appendix B of AS 1976.
APPENDIX C

TEST FOR CHEMICAL RESISTANCE
(Normative)

C1 SCOPE This Appendix sets out the method for the chemical resistance test on vitreous china.

C2 PRINCIPLE Test specimens are partially immersed in chemical solutions and compared to a control specimen.

C3 APPARATUS The following apparatus is required:
(a) Container suitable to contain specimens and chemical solutions.
(b) Suitable heat source.
(c) Desiccator with suitable desiccant.
(d) Reflux condenser or other apparatus to allow elevated temperatures to be maintained over extended periods without loss of chemical solutions due to evaporation.
(e) Timing device.

C4 TEST SPECIMENS Test specimens shall consist of seven pieces of vitreous china, each at least 2000 ± 50 mm² that have been taken from the glazed part of the selected appliance. One piece is to be placed in a desiccator and used as a control specimen.

C5 PROCEDURE The procedure shall be as follows:
(a) Place one specimen in the desiccator for use as a control specimen.
(b) Immerse one each of the other six specimens in each of the six solutions given in Table C1, for the length of time, and at the temperature stated, for each solution. The solutions shall be aqueous.
(c) Examine each specimen for discolouration and deterioration.

C6 TEST REPORT The following shall be reported:
(a) The results of each specimen for discolouration and deterioration.
(b) Reference to this test method, i.e. Appendix C of AS 1976.

**TABLE C1**

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Strength of solution %</th>
<th>Time h</th>
<th>Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>10</td>
<td>≥16</td>
<td>100 ±5</td>
</tr>
<tr>
<td>Citric acid</td>
<td>10</td>
<td>≥16</td>
<td>100 ±5</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>See Note</td>
<td>≥48</td>
<td>18 ±3</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>5</td>
<td>≥48</td>
<td>60</td>
</tr>
<tr>
<td>Sodium stearate</td>
<td>0.15</td>
<td>≥48</td>
<td>60</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>3</td>
<td>≥16</td>
<td>100 ±5</td>
</tr>
</tbody>
</table>

NOTE: The solution consists of equal volumes of water and of hydrochloric acid of density 1.18.