BRITISH STANDARD

BS 3402:1969

Incorporating Amendment Nos. 1 and 2

Specification for

Quality of vitreous china sanitary appliances

Confirmed February 2010

Co-operating organizations

The Sanitary Appliances Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Association of Public Health Inspectors*
British Bath Manufacturers Association
British Ironfounders' Association*
British Plastics Federation*
British Waterworks Association*
Council of British Ceramic Sanitaryware Manufacturers*
Flushing Cistern Makers' Association*
Greater London Council*
Institute of Plumbing*
Institution of Municipal Engineers*
Institution of Public Health Engineers*
Metal Sink Manufacturers' Association*
Ministry of Housing and Local Government
Ministry of Public Building and Works*
Ministry of Public Building and Works — Building Research Station*
National Brassfoundry Association*
National Federation of Building Trades Employers
Royal Institute of British Architects*
Royal institute of Public Health and Hygiene
The Royal Institution of Chartered Surveyors
Royal Society for the Promotion of Health*
Scottish Federation of Plumbers' and Domestic Engineers' (Employers') Associations
Water Companies Association

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Ceramic Research Association
British Steel Industry
Department of Health and Social Security
Good Housekeeping Institute
Institute of Housing Managers
Institute of Vitreous Enamellers
Institution of Water Engineers
Modular Society
National Federation of Builders' and Plumbers' Merchants
National Federation of Plumbers and Domestic Heating Engineers
Stainless Steel Development Association
Women's Advisory Committee of BSI
Individual manufactures

This British Standard, having been approved by the Sanitary Appliances Industry Standards Committee was published under the authority of the Executive Board on 13th January, 1969

First published, July, 1961
First revision, July, 1964
Second revision, January, 1969

The following BSI references relate to the work on this standard:
Committee reference SAB/I

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Amendments issued since publication

Amd. No.	Date	Comments
714	April 1971	
4922	May 1989	Indicated by a sideline in the margin

Contents

Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 6 000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, which may be purchased from BSI Sales Department. It may also be consulted in many public libraries and similar institutions.

This British Standard was first published in 1961 to specify the permissible limits of water absorption and of resistance to crazing for vitreous china, and to establish test methods for assessing these properties. At the request of the sanitary pottery industry, it was revised in 1964, and enlarged to include additional requirements and test methods. The present revision is for the purpose of implementing the change to the metric system of measures.

It is still not possible to include tests for impact strength and abrasion resistance. This is because satisfactory tests, giving reproducible results, have not yet been devised; as soon as such tests are available, they will be included in the standard.

Requirements to ensure adequate thicknesses of sanitary ware are given on the British Standard for individual appliances.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies certain requirements concerning the quality and dimensional tolerances for vitreous china sanitary appliances and details the methods of test by which their properties may be assessed.

2 Definitions

For the purposes of this British Standard the following definitions apply:

2.1
bubble

a raised portion of the surface less than 1 mm maximum diameter

2.2
craze

fine cracks in the glaze

2.3
discoloration

a coloured spot greater than 6 mm maximum dimension or a concentrated number of specks or spots to give the effect of a change in colour

2.4
dull finish

undeveloped glaze, slightly matt in appearance or a non-glossy finish on a visible surface

2.5
dunt

a hair-line fracture extending through the body

2.6
exposed body

an unglazed portion not less than 2 mm maximum dimension

2.7
finish

the texture and condition of a surface other than its colour

2.8
fire crack

a fine shallow crack in the body not covered with glaze. (Fire cracks, where not on a visible surface, may not necessarily be detrimental)

2.9
flushing surface

the surface visible after installation and which becomes wet during the operation of the appliance

2.10
grouping

a number of spots, blisters, pinholes or specks within any pottery square

2.11
integral

a part cast integrally with the appliance

2.12
large blister

a raised portion of the surface not less than 3 mm and less than 6 mm maximum dimension

2.13
large spot

an area of contrasting colour not less than 3 mm and less than 6 mm maximum dimension

2.14
medium blister

a raised portion of the surface not less than 1 mm and less than 3 mm maximum dimension

2.15
pinhole

a small hole in the glazed surface less than 2 mm maximum dimension

2.16
polishing mark

a spot not more than 10 mm maximum dimension where a minor blemish has been ground off and the surface polished

2.17
pottery square

a square of side 50 mm, i.e. with an area of 2 500 mm^2.

2.18
projection

a raised portion of not less than 6 mm maximum dimension on a visible surface

2.19
roughing-in measurements

dimensions from the finished wall or floor to the centre of the waste or supply opening

2.20
speck

an area of contrasting colour less than 1 mm maximum dimension. (Specks less than 0.25 mm maximum dimension do not constitute a defect unless sufficient in number to form a discoloration)

2.21
spot

an area of contrasting colour not less than 1 mm and less than 3 mm maximum dimension

2.22
visible surface

the surface which, after installation of the appliance, is readily visible to an observer in a normal standing position

2.23
vitreous china

a strong high-grade ceramic ware used for sanitary appliances and made from a mixture of white burning clays and finely-ground minerals which, after firing at a high temperature and when tested in accordance with Appendix A, does not have a mean value of water absorption greater than 0.5 % of the dry weight. It is coated on all exposed surfaces with an impervious non-crazing vitreous glaze giving a white or coloured finish

2.24
water surface

the surface of the water left in the WC pan trap after flushing

2.25
wavy finish

a defect in the finish having the appearance of numerous runs in the glaze; an irregular or mottled finish

2.26
eggshell finish

a uniform semi-matt glaze

3 Application of glazing

The glaze shall be thoroughly fused to the body. Subject to the exceptions given in **3.1**, **3.2** and **3.3**, all exposed surfaces shall be glazed.

3.1 Surfaces coming into contact with walls and floors may be without glazed.

3.2 On wash basins set away from walls, those portions of the rear aprons used for supporting the appliances in kilns; the backs of overflows and the undersides of outlet bosses may be without glaze.

3.3 Appliances may have unglazed portions but the unglazed surfaces shall not be visible when the appliance is installed in the normal manner.

4 Tolerances

Except where otherwise specified in this standard the tolerances shall be as follows.

1) on dimensions not less than 75 mm, ± 2 %;

2) on dimensions less than 75 mm, ± 5 %; and

3) on the height of the flush outlet of P-traps or horizontal outlets, ± 5 mm.

5 Visual examination

5.1 WC pans, bidets, bowl urinals and pedestals. When examined from any point on the viewing circle, as illustrated in Figure 1, WC pans, bidets, bowl urinals and pedestals shall not show, to the unaided eye of a trained observer, blemishes or defects in excess of those listed in Table 1.

5.2 Cisterns and covers. When assembled together and when examined from a distance of 0.60 m, the outer surfaces of a cistern and its cover shall not show, to the unaided eye of a trained observer, blemishes or defects in excess of those listed in Table 2.

5.3 Wash basins and drinking fountains. When examined from a distance of 0.60 m, the surfaces of wash basins and drinking fountains shall not show, to the unaided eye of a trained observer, blemishes or defects in excess of those listed in Table 3.

5.4 Illumination during visual examination. When checking an appliance by visual examination, either in natural of artificial light, the uniform light intensity at the surface of the appliance shall be 300 lx when checked with a light meter. When used, artificial lighting shall be provided by one or more fluorescent lamps of colour temperature 6 500 K, positioned 2 m minimum above the top of the appliance. The appliance shall be positioned so that it is between the light source and the observer.

NOTE International effects in the surface are not to be regarded as defects.

6 Water absorption

When tested by the method described in Appendix A, none of the individual values of water absorption shall exceed 0.75 % and the arithmetical mean of the values shall not exceed 0.50 %.

7 Crazing

When tested by the method described in Appendix B, none of the test pieces shall show crazing.

8 Chemical resistance

When tested by the method described in Appendix C none of the test pieces shall appear to the unaided eye of a trained observer to have suffered any loss of reflectivity on the glaze when compared with the control sample.

9 Resistance to staining and burning

When tested by the methods described in Appendix D, no stain shall remain on either of the test pieces.

10 Supplier's certificate

The supplier shall, at the request of the purchaser, give a certificate to the effect that the articles supplied are capable of passing the tests referred to in Clauses **6** to **9** inclusive.

Table 1 — Blemishes and defects permitted in WC pans, bidets, bowl urinals, and pedestals

Location	Blemish or defect	Maximum permitted
General	Wavy finish	None on all visible surfaces
	Warpage WC pans Other fixtures	 Not more than 6 mm Not more than 1 %, total warpage not more than 6 mm
	Discoloration	None on all visible surfaces
Flushing surface and horizontal face of rims of WC pans bidets and urinals	Spots, blisters and pinholes	A total of not over three; no grouping; for coloured appliances, blister and pinhole limited to one each
	Bubbles and specks	Not over two in one pottery square; a total of not over four
	Polishing marks	One only; none permitted for coloured appliances
Visible surfaces other than above	Spots, blisters and pinholes	A total of not over five; no grouping; for coloured appliances, no blisters are permitted and pinholes are limited to a total of two
	Bubbles and specks	Not over three in one pottery square; a total of not over ten

Table 2 — Blemishes and defects permitted in cisterns and covers

Location	Blemish or defect	Maximum permitted
General	Warpage	Not noticeably warped
	Discoloration	None on visible surfaces
Visible surface	Wavy finish	Not more than 2 500 mm^2 on ends only; none on cover
	Spots, blisters and pinholes	A total of not over four; no grouping; a total of not over two on covers except that for coloured appliances, blister and pinhole limited to one each
	Bubbles and specks	Not over two in one pottery square; total of not over six; a total of not over three on covers
	Polishing marks	One only; none on cover; none permitted for coloured appliances

Table 3 — Blemishes and defects permitted in wash basins and drinking fountains

Location	Blemish or defect	Maximum permitted
General	Wavy finish	None on all visible surfaces
	Warpage	Warpage of slab out of horizontal plane not to exceed 6 mm on all sizes (warpage of backs of wash basins which are attached to the wall not to exceed 3 mm)
	Discoloration	None on all visible surfaces
Service space, top of slab, inside of bowl, front of fascia	Spots, blisters and pinholes	A total of not over two; no grouping; for coloured appliances, no blisters are permitted and pinhole limited to one
	Bubbles and specks	A total of not over four; no grouping
	Polishing marks	One only; none permitted for coloured fixtures
Face of internal back and sides	Spots, blisters and pinholes	One only on back or on either side; a total of not over three
	Bubbles and specks	A total of not over four; no grouping

Appendix A Test for water absorption

A.1 The test sample consists of three pieces broken from widely separated parts of the article, each piece having a total surface area of approximately 10 000 mm^2. At least one major surface shall be a glazed surface. Surfaces other than major surfaces shall be unglazed and freshly broken.

A.2 Dry the test pieces thus obtained to constant weight at a temperature between 105 °C and 115 °C and then cool them to room temperature in a desiccator. When they are cool, weigh them to an accuracy not less than 0.01 g and then place them in a vessel from which the air can be removed. Maintain the pressure at less than 30 mmHg for 1 hour, then admit cold freshly-boiled distilled water to the vessel, without reducing the vacuum, until the pieces are covered. Then admit air to the vessel, and remove the pieces and boil them in distilled water for not less than 20 minutes. Then allow the pieces to cool in and remain in this water overnight.

A.3 Wipe the test pieces with a damp smooth cloth in such a manner as to remove surface water only and then weigh them. Calculate the water absorption in the following manner:

If W_1 is the weight of a dry piece and W_2 its weight after the treatment described, the percentage water absorption W is given by:

$$\frac{(W_2 - W_1)}{W_1} \times 100$$

Report both the arithmetic mean of the three determinations and the greatest of the three individual values.

Appendix B Test for crazing

B.1 The test sample consists of three pieces broken from widely separated parts of the article, each piece having a total surface area of approximately 25 000 mm^2. At least one major surface shall be a glazed surface. Surfaces other than major surfaces shall be unglazed and freshly broken. Care should be taken not to produce cracks either in the body or in the glaze; any such pieces should be discarded.

B.2 Place the test pieces thus obtained for 10 hours in a vessel in which saturated steam is maintained at a pressure between 0.33 MN/m^2 and 0.35 MN/m^2.

Allow the pieces to cool to room temperature, and afterwards soak them for several hours in a solution of dye to which a small quantity of wetting agent has been added. Then examine the pieces for crazes.

NOTE The period of 10 hours may either be continuous or, for convenience, split into two periods, each of 5 hours.

Appendix C Tests for chemical resistance

C.1 The test sample consists of eight pieces, each not smaller than 75 mm × 25 mm × 6 mm, taken from the glazed part.of the appliance. One piece is placed in a desiccator and is used as a control test piece.

C.2 The other seven test pieces are partially immersed, one in each of the seven solutions listed in Table 4, at the strengths of solution, for the lengths of time and at the temperatures stated; the solutions are all aqueous.

Table 4 — Chemical solutions

Name of Chemical	Strength of solution	Time	Temperature
	%	hours	°C
Acetic acid	10	16	100
Citric acid	10	16	100
Detergent (Note 1)	(Note 1)	48	60
Hydrochloric acid	(Note 2)	48	15 to 21
Sodium hydroxide	5	0.5	60
Sodium stearate	0.15	48	60
Sulphuric acid	3	16	100

NOTE 1 This consists of an aqueous solution containing 0.04 % (wt/vol) of a condensation product of nonylphenol with 8–10 molecules of ethylene oxide. A suitable solution which contains 0.15% (wt/vol) of the product is obtainable commercially under the trade name "Lissapol N".

NOTE 2 This solution consists of equal volumes of water and of hydrochloric acid of specific gravity 1.18.

Appendix D Tests for resistance to staining and burning

D.1 The test sample consists of two pieces, each not smaller than 75 mm × 25 mm × 6 mm, taken from the glazed part of the appliance.

D.2 One of the test pieces is placed, at room temperature, with a glazed surface level, uppermost, clean and dry. One spot, not less than 10 mm diameter, of each of the six chemicals listed in **D.3** is then placed on the glazed surface and allowed to dry. Any residue is then removed with a clean cloth which has been moistened with distilled water only.

D.3 The chemicals referred to in **D.2** are:

1) 0.5 % aqueous solution of methylene blue.

2) "A solution of sodium hypochlorite 10–14 % w/v available chlorine. A 10 % dilution is prepared for the test."

3) 3 % aqueous solution of hydrogen peroxide.

4) Amyl acetate.

5) Carbon tetrachloride.

6) 13 g of iodine in 1 litre of ethanol.

D.4 The other test piece is placed, at room temperature, with a glazed surface level, uppermost, clean and dry. A lighted cigarette is placed on the glazed surface, allowed to remain for 15 minutes and then removed. The stained area is wiped with a clean cloth which has been moistened with distilled water only.

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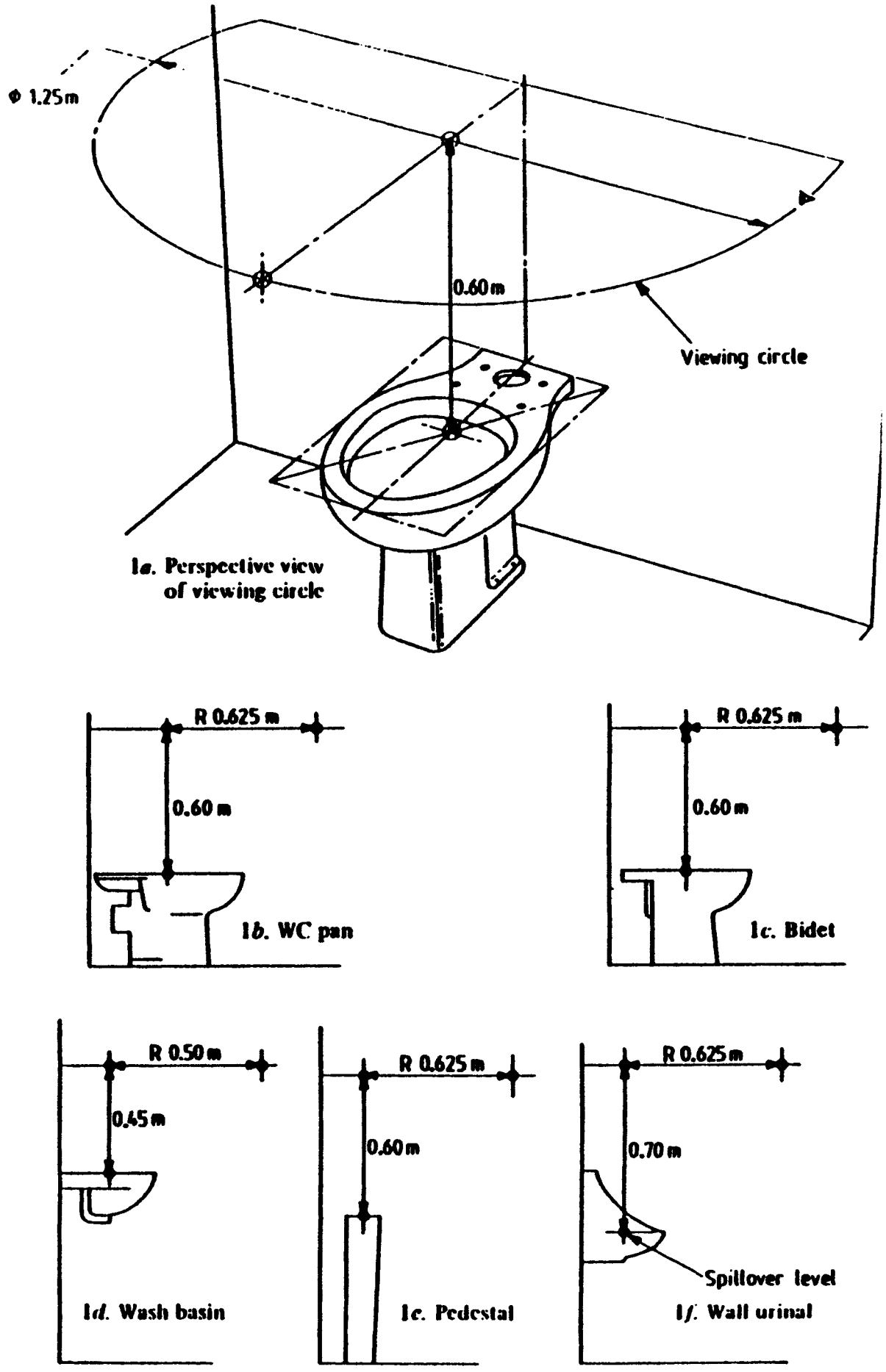

Figure 1 — Viewing circle for WC pans, bidets, wash basins, pedestals and urinals

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