BRITISH STANDARD

BS 7557:1992

Specification for

Limits of metal release from painted surfaces of articles, liable to come into contact with foodstuffs

Confirmed
December 2009

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Consumer and Contract Goods Standards Policy Committee (CCM/-) to Technical Committee CCM/47, upon which the following bodies were represented:

Aluminium Federation
Association of Metropolitan Authorities
Association of Public Analysts
British Adhesives and Sealants Association
British Ceramic Gift and Tableware Manufacturers Association
British Ceramic Research Ltd.
British Cookware Manufacturers Association
British Cutlery and Silverware Association
British Food Manufacturing Industries Research Association
British Glass Manufacturers Confederation
British Importers Confederation
British Paper and Board Industry Federation
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Ministry of Agriculture, Fisheries and Food
Packaging and Industrial Films Association
Paintmakers Association of Great Britain Ltd.
Pira International
Royal Society of Chemistry
Stainless Steel Fabricators Association of Great Britain
Vitreous Enamel Development Council

This British Standard, having been prepared under the direction of the Consumer and Contract Goods Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 February 1992

The following BSI references relate to the work on this standard:
Committee reference CCM/47
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Amendments issued since publication

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Contents

Foreword

This British Standard has been prepared under the direction of the Consumer and Contract Goods Standards Policy Committee, at the request of the Department of Trade and Industry Consumer Safety Unit, to provide requirements for the maximum permitted release of lead and cadmium from those painted surfaces of an article which are liable to come into contact with foodstuffs in the course of normal use of the article.

The limits specified in this standard and the analytical method of test to determine compliance with these are based upon the requirements already established for related products in BS 6748.

The limits for lead and cadmium release specified in this standard are intended as an interim safeguard with the object of reducing overall exposure to these metals. The surfaces considered fall within the scope of work currently under way in the European Community on materials and articles in contact with foodstuffs which may lead eventually to an EC Directive on permitted levels of lead and cadmium. When the EC work is complete, this British Standard will be revised and re-issued to include the necessary limits and method of test to enable the United Kingdom to implement fully the EC Directive.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover 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 limits for lead and cadmium, expressed as a concentration of the elements, released from the painted surfaces of articles liable to come into contact with foodstuffs, when the article is subjected to a specified method of test.

The limits specified apply to all painted surfaces liable to come into direct contact with foodstuffs, including painted shelves, but excluding surfaces in contact only with those foodstuffs which subsequently receive some external preparation, such as washing or peeling, before consumption.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

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

2.1
article

item intended for use in the storage, display, preparation, cooking and/or serving of food and having a painted surface, or surfaces, liable to come into contact with foodstuffs under normal conditions of use of the item

NOTE Painted handles and the painted external surfaces of containers, excepting those of lids and covers which are reversible, are not regarded as surfaces liable to come into contact with foodstuffs under normal conditions of use.

2.2
painted surface

surface with a protective and/or decorative and/or release coating provided by means of a bound pigmented film, usually applied as a dispersion or solution in a liquid medium or as a coating of powder

NOTE Silicate surfaces, i.e. those covered by BS 6748, are not regarded as painted surfaces.

2.3
relevant surface area

area of the painted surface of an article which is liable to come into contact with foodstuffs in normal use

3 Lead and cadmium release

3.1 Limits

When tested in accordance with Appendix A, the painted surface(s) of any article shall not release into the extracting solution a quantity of lead (Pb) or cadmium (Cd), calculated as the element, exceeding 0.8 mg of Pb or 0.07 mg of Cd, respectively, per dm^2 of relevant surface area.

3.2 Sampling provision

Where the painted surface of an article releases a quantity of lead and/or cadmium into the extracting solution at a level exceeding that given in **3.1** by not more than 50 %, at least three further articles shall be tested and the average quantity of lead and/or cadmium released per dm^2 determined.

The average quantity so determined shall not exceed that given in **3.1** for a single article and no one sample shall exceed the value by more than 50 %.

Appendix A Method for determination of metal release

A.1 Reagents

A.1.1 *General*. All reagents shall be of recognized analytical quality.

A.1.2 *Water*, complying with grade 2 of BS 3978.

A.1.3 *Acetic acid* (CH_3COOH), glacial.

A.1.4 *Acetic acid solution*, (4 % *V/V*). To 500 ml of water (**A.1.2**) add 40 ml of glacial acetic acid (**A.1.3**) and make up to 1 l. Freshly prepare the solution prior to use in sufficient quantity to enable the whole of any group of tests and analyses to be completed, using proportionately greater quantities if necessary.

A.1.5 *Standard metal solutions*

A.1.5.1 *Standard lead solution*, containing 1 000 ± 1 mg Pb in 1 l of 4 % *V/V* acetic acid solution (**A.1.4**).

A.1.5.2 *Standard cadmium solution*, containing 500 ± 0.5 mg Cd in 1 l of 4 % *V/V* acetic acid solution (**A.1.4**).

NOTE Commercially available standard solutions for atomic absorption spectroscopy may be used provided that the concentrations of such solutions are known to an equivalent accuracy.

A.2 Apparatus

A.2.1 *Atomic absorption spectrophotometer*, with a detection limit equal to or better than 0.2 mg/l Pb (in 4 % *V/V* acetic acid solution) and 0.02 mg/l Cd (in 4 % *V/V* acetic acid solution).

NOTE The detection limit is the concentration of the element which gives a signal equal to three times the standard deviation of the background noise level of the instrument.

A.2.2 *Laboratory glassware*. Volumetric glassware of class B accuracy or better, as specified in BS 700, BS 846 or BS 1792, as appropriate. General laboratory glassware of borosilicate glass incapable of releasing detectable levels of lead or cadmium into 4 % *V/V* acetic acid solution during the test procedure.

A.2.3 *Waterproof silicone carbide abrasive paper,* of grammage 74 ± 6 g/m^2 coated with 1200 grade abrasive (see BS 871).

A.2.4 *Metal cutting implement,* comprising shears, saw or punch, clean and free of grease on all cutting edges and any surfaces contacting test pieces during their preparation.

NOTE The paint on some hacksaw blades is known to contain lead and such blades should be effectively stripped of paint before use.

A.3 Preparation of samples

Abrade the relevant surface area(s) of the article using abrasive paper (**A.2.3**) lubricated copiously with a solution containing 1 ml/l of domestic liquid detergent until a uniformly smooth surface is achieved, taking care to avoid abrading through the paint to the underlying base material. Rinse the abraded surface with tap water and dry with a disposable paper towel. Inspect the surface for any unabraded areas of paint and, if areas evidently have not been abraded, continue the abrasion process.

Dry the abraded surface carefully, and by means of the cutting implement (**A.2.4**) cut or punch a test piece of area 0.36 ± 0.01 dm^2 from this, avoiding contamination by any lubricant on the cutting instrument. In cases of difficulty in obtaining a single test piece of the correct size, take smaller and/or multiple test pieces to provide an equivalent area.

Wash the test piece in an aqueous solution at 40 ± 5 °C containing 1 ml/l of domestic liquid detergent. Rinse the sample and wipe it carefully with a damp disposable paper towel. Inspect the paper towel for any pigment debris transferred from the abraded surface; if loose particles are present rewash the test piece and again wipe with a damp disposable paper towel.

NOTE 1 The use of a paper towel of contrasting colour to that of the painted surface under test will facilitate inspection for pigment debris.

If pigment debris is not present rewash the test piece, rinse thoroughly with water (**A.1.2**) and allow to drain then dry with clean filter paper. Do not use any test piece which shows residual staining.

After washing and drying, cover any exposed bare metal surfaces and edges of the test piece(s) with a protective coating which will withstand the effect of 4 % *V/V* acetic acid solution and will not release any detectable levels of Pb or Cd into 4 % *V/V* acetic acid solution during the test procedure.

NOTE 2 High melting point paraffin wax is a suitable coating.

Do not handle the surface to be tested after it has been prepared.

A.4 Procedure

A.4.1 Determine and record the exposed area of the test piece, *a,* in dm^2 to an accuracy of 0.001 dm^2 by any convenient means and transfer the test piece to a suitable glass vessel (**A.2.2**) with the abraded surface uppermost. Condition the test piece and vessel to 22 ± 2 °C.

NOTE Where the test piece is taken from an article painted on both sides, only that side liable to come into contact with foodstuffs should be considered and the other side should be effectively masked-off during the test procedure or, if of the same paint composition, the test result obtained may be divided by two provided that this side has also been prepared in accordance with **A.3** and has been exposed fully to the extracting solution.

A.4.2 Immerse the conditioned test piece in a volume of $(140 \times a) \pm 1$ ml of 4 % *V*/*V* acetic acid solution (**A.1.4**) at 22 ± 2 °C, cover and weigh the vessel and its contents to an accuracy of 0.1 g.

NOTE Cling film is a suitable means for covering the vessel.

A.4.3 Where tests are for cadmium or for both cadmium and lead, place the covered vessel with the test piece in a dark place and ensure that throughout the extraction period the surface under test is kept in complete darkness.

NOTE If lead only is to be determined, the test may be conducted in normal lighting.

Maintain the immersed test pieces at 22 ± 2 °C for 24 ± 0.5 h. At the end of the extraction period reweigh the covered vessel and its contents, if the difference between the mass at the commencement of the extraction period and its completion exceeds 1 %, apply an appropriate correction factor in the calculation of the result for lead and cadmium release.

A.4.4 Homogenize the extract solution, by stirring or other method, without loss of solution or abrasion of the surface being tested and withdraw or otherwise transfer a portion for the determination of lead and/or cadmium.

NOTE A suitable method of homogenizing the extract solution is to remove a quantity by pipette and allow it to run back into, or onto, the sample several times, avoiding dilution or evaporation losses in the process.

A.5 Analysis

A.5.1 Set up the atomic absorption spectrophotometer having regard to the manufacturer's instructions using wavelengths of 217.0 nm for lead determination and 228.8 nm for cadmium determination with appropriate correction for background absorption effects.

NOTE Where appropriate, a wavelength of 283 nm may be used for the analytical confirmation of lead.

A.5.2 Aspirate water (**A.1.2**) and adjust the zero. Aspirate a range of dilute standard metal solutions prepared by dilution of the standard metal solutions (**A.1.5**) with 4 % *V*/*V* acetic acid solution (**A.1.4**). Aspirate water (**A.1.2**) after each standard metal solution and record the absorbance values obtained.

A.5.3 Aspirate water (**A.1.2**) and then 4 % *V*/*V* acetic acid solution (**A.1.4**) and measure the absorbance value. Aspirate the sample extracts (see **A.4.4**), accurately diluted where appropriate, interspersed with water (**A.1.2**). Measure the absorbance values of the sample extracts or accurately diluted sample extracts.

A.5.4 To check for instrument drift, aspirate dilute standard metal solutions interspersed with sample extracts and with water (**A.1.2**).

Provided that the absorbance values of the dilute standard metal solutions and of the 4 % *V*/*V* acetic acid solution (**A.1.4**) indicate minimal drift, the results may be calculated by the bracketing technique (see **A.6**), from a manually prepared calibration curve or by using the calibration facilities of the instrument.

A.6 Calculation of results by the bracketing technique

The lead or cadmium content, C_0, expressed in mg/dm^2 of relevant surface is given by the equation

$$C_0 = \left[\left\{\left(\frac{A_0 - A_1}{A_2 - A_1}\right)(C_2 - C_1)\right\} + C_1\right] d \times \frac{v}{a}$$

where

A_0 is the absorbance of the lead or cadmium in the sample extract;

A_1 is the absorbance of the lead or cadmium in the lower bracketing solution;

A_2 is the absorbance of the lead or cadmium in the upper bracketing solution;

C_1 is the lead or cadmium content of the lower bracketing solution (in mg/l);

C_2 is the lead or cadmium content of the upper bracketing solution (in mg/l);

d is the factor by which the sample was diluted;

v is the volume of 4 % *V*/*V* acetic acid solution used for the extraction step (in l) (see **A.4.2**);

a is the area of the test piece(s) extracted (in dm^2) (see **A.4.1**).

NOTE The lower and upper bracketing solutions should be chosen to have absorbance values close to that of the sample extract or diluted sample extract.

A.7 Test report

The test report shall contain the following information:

a) the nature of the article under test;

b) the amount of lead and/or cadmium released from the article expressed as milligrams of Pb or Cd per square decimetre of relevant surface area.

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Publication(s) referred to

BS 700, *Graduated pipettes.*

BS 846, *Specification for burettes.*

BS 871, *Specification for abrasive papers and cloths.*

BS 1792, *Specification for one-mark volumetric flasks.*

BS 3978, *Specification for water for laboratory use.*

BS 6748, *Specification for limits of metal release from ceramic ware, glassware, glass ceramic ware and vitreous enamel ware.*

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