SRI LANKA STANDARD 1101 : 1995

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SPECIFICATION FOR MELAMINE TABLEWARE

SRI LANKA STANDARDS INSTITUTION

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SLS 1101 : 1995

Gr. 8

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This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD
SPECIFICATION FOR MELAMINE TABLEWARE

FOREWORD

This standard was approved by the Sectoral Committee on Chemicals and Chemical Technology and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1995-11-23.

Melamine formaldehyde moulding compound, a thermosetting moulding compound has been widely used for tableware. This standard is expected to assure the performance of melamine tableware during normal use. The gradual build up of surface deposits may cause eventual staining, but such deposits may normally be readily removed by prompt and correct cleaning methods. Intimate contact between plastic tableware and food introduces the possibility of transfer of traces of the plastic material or additive to the food. As such, both the resin and other additives must be selected to ensure that any such transfer is at the minimum. Therefore, food grade melamine formaldehyde is recommended for tableware.

Guidelines for the determination of a compliance of a lot with the requirements of this standard based on statistical sampling and inspection are given in Appendix A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

In the preparation of this standard, the assistance obtained from the following publications is gratefully acknowledged.

ISO 2112 : 1990	International Standard for Plastics - Aminoplastic moulding materials - specification
BS 1322 : 1981	British Standard specification for aminoplastic moulding materials.
IS 9220 : 1979	Indian Standard specification for Tableware made of melamine plastics
MS 853 : 1983	Malaysian Standard specification for Melamine tableware
SS 170 : 1978	Singapore Standard specification for Melamine tableware

Plastic for food contact applications, Revised edition 1986, The British Plastics Federation and The British Industrial Biological Research Association.

1 SCOPE

This specification prescribes the requirements and methods of test for tableware such as cups, saucers, plates, bowls, compartmented trays and similar articles, made from melamine formaldehyde moulding compounds.

2 REFERENCES

CS 102 Presentation of numerical values
SLS 428 Random sampling methods.

3 DEFINITIONS

For the purpose of this specification the following definitions shall apply :

3.1 melamine formaldehyde resin : An amine resin made by polycondensation of melamine with formaldehyde.

3.2 melamine formaldehyde moulding compound: A thermosetting moulding compound consisting of the melamine formaldehyde resin binder that has been intimately combined in the uncured or partially cured condition with fillers, pigments and other chemical agents.

3.3 alpha cellulose filler : A highly refined, insoluble cellulose added to plastic.

3.4 surface glaze : Application of a special unfilled melamine formaldehyde resin to the surface of moulded article.

4 REQUIREMENTS

4.1 General requirements

The melamine tableware shall be manufactured from alpha cellulose filled melamine formaldehyde moulding compound intended for food contact applications.

The finished tableware shall contain no constituents that are capable of being extracted by foodstuffs under normal conditions of use, in quantities sufficient to be injurious to health. The surface of melamine tableware shall not be altered by the application of lacquer, polish or other surface coatings other than the surface glaze.

If decorations are used, those should be moulded in and coated with a surface glaze which shall in any case be as durable as the undecorated melamine surface.

4.2 Appearance

The finished melamine tableware shall have uniformly high gloss. The flash lines shall be polished. The finished tableware shall have rounded edges and shall be clean, well made and free from any defects likely to impair its serviceability or appearance.

Moulded handles shall be free from knit lines and similar flaws.

4.3 Migration of constituents

The finished melamine tableware shall not give any smell or impart any colour when subjected to free boiling in water for 10 minutes.

4.4 Tolerance on capacity

Where the nominal capacity of the tableware is declared, the actual capacity shall be not less than the nominal value and shall not exceed it by more than 4 per cent.

4.5 Thickness

4.5.1 The thickness of vessels having minimum depth of 38 mm (with or without handles) shall be not less than the values specified in Table 1 when measured as given in 6.3.

4.5.2 The thickness of saucers, plates, dishes and shallow bowls having maximum depth of 38 mm shall be not less than the values specified in Table 2 when measured as given in 6.3.

TABLE 1 - Thickness of vessels

Fluid capacity ml	Minimum thickness mm
50 to 500	2.5
501 to 1000	2.8
1 001 to 2 000	3.0
2 001 and above	3.2

TABLE 2 - Thickness of saucers, plates dishes and shallow bowls

Projected area cm^2	Minimum thickness mm
20 to 50	1.8
51 to 200	2.3
201 to 300	2.5
301 to 400	2.8
401 to 600	3.1
601 to 1 000	3.5
1 001 and above	3.8

4.6 Cure test

4.6.1 When tested in accordance with the dye test given in **B.1**, the articles shall show not more than slight staining of the surface except at flash lines.

4.6.2 When tested in accordance with the sulfuric acid test given in **B.2**, the articles shall not show chalking (dry, chalklike appearance or deposit on the surface).

NOTE

A separate article shall be used for each test.

4.7 Resistance to wet heat

When tested by the method described in **6.4**, the melamine tableware shall not develop cracks or any other defects that will impair its serviceability or appearance.

4.8 Resistance to dry heat

When tested by the method described in **6.5**, the melamine tableware shall not develop cracks or any other defect that will impair its serviceability.

4.9 Resistance to low temperature

When tested by the method described in **6.6**, the melamine tableware shall not break or develop cracks.

4.10 Warping

When the melamine tableware is tested by the method described in 6.7, after having been subjected successively to the tests specified from 4.7 to 4.9, it shall not be possible to insert a 0.4-mm feeler gauge at any point between the feet or base of the article and a flat surface.

4.11 Extractability requirements

4.11.1 *Extractability of formaldehyde*

When tested by the method described in C.2.2 the colour of the test solution shall not be deeper than that of the reference solution.

4.11.2 *Extractability of oxidizable matter*

When tested by the method described in C.2.3, the extracted solution shall not consume more than 10 mg/kg of potassium permanganate.

4.11.3 *Extractability of lead*

When tested by the method described in C.2.4, the colour of the test solution shall not be deeper than that of the reference solution.

4.11.4 *Total extractable matter*

When tested by the method described in C.2.5, residue shall not be more than 30 mg/kg.

4.12 Resistance to staining

When tested as Appendix D, the melamine tableware shall be free from any visible stains.

5 PACKAGING AND MARKING

5.1 Packaging

The tableware shall be packed in cardboard boxes or any other suitable containers or as agreed to between the manufacturer and the purchaser.

5.2 Marking

5.2.1 Each package shall be legibly and indelibly marked with the following:

a) Name of the tableware;
b) Name and address of the manufacturer, including the country of origin;
c) Registered trade mark, if any;
d) Batch identification code ; and
e) Colour of the tableware.

5.2.2 Each article shall be marked legibly and indelibly with the following either by engraving or embossing.

a) Brand name or registered trade mark.

NOTE

Attention is drawn to the certification facilities offered by the Sri Lanka Standards Institution. See the inside back cover of this standard.

6 METHODS OF TEST

6.1 During the analysis, unless otherwise stated, use only reagents of recognized analytical grade.

6.2 Tests shall be carried out in accordance with the methods given in 6.3 to 6.7 and Appendices B to D of this specification.

6.3 Determination of thickness

Measure thickness of 20 randomly selected points. (Avoid selecting points within 10 mm distance from the edges)

6.4 Determination of wet heat resistance

Immerse the melamine tableware in boiling water for 30 minutes. Then remove the tableware and allow to stand for 1 hour at room temperature. Repeat the cycle making a total of four cycles. Condition the tableware for 24 hours at ambient temperature. Inspect the tableware for cracks and surface defects. If it passes the test preserve the tableware for the determination of dry heat resistance.

6.5 Determination of dry heat resistance

Place the melamine tableware used for determination of wet heat resistance in an air-circulating oven at a temperature of 77± 2 °C for 8 hours, and remove and then allow to cool. Condition for 24 hours at ambient temperature and inspect for cracks and surface defects. If it passes the test preserve the tableware for the determination of resistance to low temperature.

6.6 Determination of resistance to low temperature

Subject the melamine tableware used for determination for dry heat resistance to a temperature between 0 °C and 7 °C. After 24 hours condition at ambient temperature for 24 hours and inspect for cracks. If it passes the test preserve the tableware for the determination of warping.

6.7 Determination of warping

Place the melamine tableware used for determination of resistance to low temperature on a flat surface so as to keep it in place by exerting light pressure with one finger at the centre of the base. Check the space between the base of the tableware and a flat surface, right round the base, using a 0.4 - mm feeler gauge.

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this Appendix should be applied where compliance of a lot to the requirements of this standard is to be assessed based on statistical sampling and inspection.

Where compliance with this standard is to be assured based on manufacturing control system coupled with type testing and check tests or any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 LOT

A.1.1 In any consignment all containers of melamine tableware belonging to one batch of manufacture or supply shall constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 Samples shall be tested from each lot for ascertaining the conformity of product to the requirements of this specification.

A.2.2 The number of packages and tableware to be selected from the lot shall be in accordance with the following table.

TABLE 3 - Scale of sampling

No of packages in the lot (1)	No. of packages to be selected (2)	No. of tableware to be selected (3)	Acceptance number (4)
Up to 90	5	14	1
91 to 150	6	20	2
151 to 280	8	32	3
281 and above	10	50	5

A.2.3 The packages and tableware shall be selected at random. In order to ensure randomness of selection, random number tables as given in SLS 428 shall be used.

A.3 NUMBER OF TESTS

A.3.1 Each package and tableware selected as in A.2.2 shall be inspected for packaging and marking requirements.

A.3.2 Each tableware selected as in Column 3 of the table shall be inspected for the requirements given in 4.2, 4.4 and 4.5.

A.3.3 Two samples inspected as in A.3.2 shall be taken and one sample shall be tested for the dye test (4.6.1) and the other sample shall be tested for the sulfuric acid test (4.6.2).

A.3.4 One sample inspected as in A.3.2 shall be taken and tested for the requirements 4.3 and 4.12.

A.3.5 Two samples inspected as in A.3.2 shall be taken and tested for the requirements given in 4.7, 4.8, 4.9 and 4.10 in that order one after the other as described in 6.

A.3.6 Four samples inspected as in A.3.2 shall be taken and one sample at a time shall be tested against one requirement given in 4.11.

A.4 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied :

A.4.1 Each tableware inspected as in A.3.1 satisfies the relevant requirements.

A.4.2 The number of samples not conforming to the relevant requirements when inspected as in A.3.2 is less than or equal to the acceptance number given in Column 4 of the table.

A.4.3 Each tableware tested as A.3.3 and A.3.4 satisfies the relevant requirements.

A.4.4 Each tableware tested as A.3.5 and A.3.6 satisfies the relevant requirements.

APPENDIX B
DETERMINATION OF CURING

B.1 DYE TEST

Immerse the tableware for 10 minutes in a boiling 0.01 per cent aqueous solution of Rhodamine B. Where the colour of the tableware masks the colour of the dye, use boiling 0.01 per cent boiling aqueous solution of methylene blue. Remove the tableware, wash with hot water and wipe with a cloth, rinse and dry. Inspect the surface for staining.

NOTES

1 Care should be taken to ensure that the whole surface of the tableware is freely exposed to the test solution during the whole period of immersion.

2 Irrespective of the state of cure of the tableware deep staining will occur at all flash lines, scratches, or sections, staining on such parts should be ignored.

3 When tableware, particularly undercured specimens are tested, free formaldehyde develops in the dye bath. This limits the number of tests that can be carried out in the same solution. The presence of excessive formaldehyde in the solution can be readily detected by its odour.

4 Rhodamine B and methylene blue are not very fast to light and if it is required to keep the tested specimens for any length of time, they should be stored in the dark.

B.2 SULFURIC ACID TEST

B.2.1 Reagent

B.2.1.1 *Sulphuric acid.* Dissolve 4.45 ml of concentrated sulfuric acid in 1 000 ml of water.

B.2.2 Apparatus

B.2.2.1 *Porcelain enamelled or stainless steel pail*., of about 3 000-ml capacity with cover. (Enamelled ware is not suitable if the inside surface is chipped exposing bare metal).

B.2.2.2 *Heater*, preferably a gas burner, having sufficient capacity to keep the acid solution boiling fairly vigorously.

B.2.3 Procedure

Test the entire melamine tableware where practicable. Otherwise use test piece having a total area of approximately 13×10^3 mm^2. Boil sulfuric acid (B.2.1.1) in a porcelain enamelled or stainless steel pail. Immerse completely melamine tableware or the test piece in boiling sulfuric acid. (If a number of samples are to be tested together, samples should be kept separately in the acid bath). Remove the test sample after 10 minutes ± 5 seconds, rinse in cold water, dry in air for 15 to 20 minutes and then inspect for chalking.

APPENDIX C
DETERMINATION OF EXTRACTABILITY REQUIREMENTS

C.1 REAGENTS

C.1.1 Phosphoric acid, 20 per cent (v/v) solution.

C.1.2 Acetyl acetone reagent

Dissolve 150 g of ammonium acetate in distilled water and add 3 ml of glacial acetic acid and 2 ml of acetyl acetone to this solution. Dilute to 1 litre with distilled water. This solution must be prepared immediately before testing.

C.1.3 Dilute sulfuric acid

Add one part of concentrated sulfuric acid to three parts of water.

C.1.4 0.002 mol/l potassium permanganate solution

Dissolve about 0.33 g of potassium permanganate in distilled water in a 1-litre volumetric flask and make up to 1 litre.

C.1.5 0.005 mol/l sodium oxalate solution

Dissolve 0.67 g of sodium oxalate in distilled water in a 1-litre volumetric flask and make up to 1 litre.

C.1.6 **Acetic acid,** 4 per cent (v/v) solution

C.1.7 **Standard lead solution**

Dissolve 159.8 mg of lead nitrate in 10 ml of dilute nitric acid in a 1-litre volumetric flask and make up to 1 litre with distilled water. Take 10 ml of this solution into 100-ml volumetric flask and make up to 100 ml with distilled water.

C.1.8 **Sodium sulfide solution**

Dissolve 5 g of sodium sulfide in a mixture of 10 ml of distilled water and 30 ml of glycerin.

C.2 **PROCEDURE**

C.2.1 **Extraction**

Clean the objects to be tested thoroughly with distilled water and carry out the extraction as given in **C.2.1.1** or **C.2.1.2** using the following :

a) Distilled water
b) 4 per cent acetic acid

C.2.1.1 In case of a sample which can be filled with the extraction solution, fill it with the specified extraction solution at 60 °C. Cover it with a watch glass/glass plate and leave for 30 minutes, maintaining the temperature of solution at 60 °C.

C.2.1.2 In case of a sample which cannot be filled with the extraction solution, immerse a test sample (or a test piece cut from the object to be tested) totally into the extraction solution at 60 °C in a glass vessel. (Quantity of extraction solution should be approximately 0.02 ml per square millimetre of surface of the test sample). Cover the vessel with a watch glass/glass plate and leave it for 30 minutes, maintaining the temperature of solution at 60 °C.

C.2.2 **Determination of extractability of formaldehyde**

Extract the melamine tableware or test piece with distilled water as described in **C.2.1.1** or **C.2.1.2**.

Take 10 ml of the extracted solution into a distillation flask and add 1 ml of 20 per cent phosphoric acid (C.1.1). Steam distill the extracted solution and collect the distillate in a 200-ml measuring cylinder, containing 5 to 10 ml of distilled water. (Outlet of the condenser should be immersed in the water in the measuring cylinder.) Collect 190 ml of distillate and dilute to 200 ml with distilled water. Take 5 ml of the diluted distillate into a test tube of inner diameter of about 15 mm and add 5 ml of acetyl acetone reagent (C.1.2). Mix well and heat in a water bath for 10 minutes.

Carry out a blank determination using 10 ml of distilled water in place of the extracted solution. Use the distillate obtained from the blank determination as the reference solution.

Compare the colours of the test solution and reference solution against a white background.

C.2.3 Determination of oxidizable matter

Clean a 200-ml conical flask by boiling a solution containing 100 ml of distilled water, 5 ml of dilute sulfuric acid (C.1.3) and 5 ml of 0.002 mol/l potassium permanganate solution (C.1.4) for 5 minutes. Discard the contents and rinse well with distilled water.

Take 100 ml of the extracted solution as in C.2.2 into the cleaned conical flask. Add 5 ml of dilute sulfuric acid (C.1.3) and 10 ml of 0.002 mol/l potassium permanganate solution (C.1.4) to the flask and boil for 5 minutes. Stop heating and add immediately 10 ml of 0.005 mol/l sodium oxalate solution (C.1.5). Titrate the solution with 0.002 mol/l potassium permanganate solution (C.1.4).

Carry out a blank test in the same manner as above but using 100 ml of distilled water in place of the extracted solution.

C.2.3.1 *Calculation*

$$\text{Consumption of } KMnO_4, \text{ mg/kg} = \frac{(a - b) \times 1000 \times 0.316}{100}$$

where,

a is the volume, in millilitres, of potassium permanganate solution consumed in normal titration, and

b is the volume, in millilitres, of potassium permanganate solution consumed in blank titration.

C.2.4 Determination of extractability of lead

Extract the melamine tableware or test piece with acetic acid (**C.1.6**) as described in **C.2.1.1** or **C.2.1.2.**

Take 20 ml of the extracted solution into a Nessler's tube and dilute to 50 ml with distilled water. Take 2 ml of standard lead solution (**C.1.7**) into a separate Nessler's tube and make up to 50 ml with distilled water. To each of the two tubes, add two drops of sodium sulfide solution (**C.1.8**) and mix well. Leave them to stand for 5 minutes.

Compare the colours of the test solution and the reference solution against a white back ground.

C.2.5 Determination of total extractability

Take 200 ml to 300 ml of the extracted solution as in **C.2.4** into a platinum or porcelain evaporating dish, previously heated to 105 °C.

Heat the dish containing the solution on the water bath and evaporate to dryness. Then dry again at 105 °C in an oven for two hours and leave it to cool in a desiccator. Weigh the residue.

Carry out a blank determination using acetic acid (**C.1.6**).

C..2.5.1 *Calculation :*

$$\text{Residue on evaporation, mg/kg} = \frac{(a - b) \times 1000}{v}$$

where,

a is the mass, in mg, of the residue after evaporation of the test solution ;
b is the mass, in mg, of the residue after evaporation of blank solution ; and
v is the volume, in millilitre, of sample solution.

APPENDIX D
DETERMINATION OF STAINING

D.1 REAGENTS

D.1.1 Citric acid solution - 2 per cent (m/V) solution at room temperature

D.1.2 Coffee at 60 ^{0}C

Make a brew by pouring boiling water on to ground coffee (80 g coffee per litre of water) in a hot vessel, stirring occasionally and decanting from the coffee settled at the bottom for 5 minutes.

D.1.3 Cooking oil at 60 ^{0}C

Any cooking oil with ground turmeric powder, 1 per cent (m/V)

D.1.4 Milk at 60 ^{0}C

D.1.5 Tea at 60 ^{0}C

Make a brew by pouring boiling water on to tea (9 g of tea per litre of water) in a hot vessel, stirring occasionally and decanting from the leaves settled at the bottom for 5 minutes.

D.2 PROCEDURE

Place 4 to 5 drops of the test solution on the surface of the melamine tableware at separate positions and keep for 30 minutes. Wipe the surface with a clean bleached cloth and observe the surface for any stain.

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