

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

(Not to be reproduced without the permission of BIS or used as an Indian Standard)

भारतीय मानक मसौदा
कृषि उप-उत्पादों से बने खाद्य परोसने के बर्तन — विशिष्टि
(आई एस 18267 का पहला पुनरीक्षण)

Draft Indian Standard

FOOD SERVING UTENSILS MADE FROM AGRI BY-PRODUCTS — SPECIFICATION
(First Revision of IS 18267)

ICS 97.040.01

Agriculture and Food Processing Equipment Sectional Committee, FAD 20	Last date of comments: 18 June 2024
--	--

FOREWORD

(Formal clause will be added later)

The demand for the disposable / one time use food serving utensils in the gatherings and social activities have increased in the recent years, due to the advantage of no cleaning efforts after the usage. Most of such disposable utensils are polythene based and ultimately non-degradable, posing environmental concerns. Use of degradable, preferably biodegradable materials for the manufacture of such disposable utensils has gained importance over the years. Many agriculture-based materials, usually leaves, sheaths, etc. are preferred for making the utensils in the form of plates, cups, bowls, etc. as per requirement. Such materials are the waste or by-products of cultivation practices and available at no or low cost. The leaves/sheath are collected from the fields, as fallen, or removed after the harvest of the economic part of the plant/crop.

In the recent years, the number of manufacturers of degradable utensils has increased across the country. These manufacturers produce the utensils as per their standards and quality. Standard on the subject was published in 2023 to guide the manufacturers and the consumers on the quality parameters and ensure uniform standards across the country.

During preparation of this standard, significant assistance has been drawn with respect to testing methodology of various parameters from GB 18006-2008 (*National Standard of the People's Republic of China*) and the report of research study “*Evaluation of Agro-based Disposable Utensils for Defining their Standard and Test Methods*” carried out at ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana.

In order to resolve the problems faced in the implementation of this standard, a need was felt to revise this standard. Accordingly, the following modifications have been made in this revision based on the

comments received from manufacturers and branch offices of BIS:

- a) The requirement for bending test for utensils made through hot pressing and moulding method has been omitted as this test is not relevant for such utensils;
- b) In terminology, the definitions of the terms ‘moisture content (dry basis)’ and ‘normal temperature’ have been incorporated for guidance; and
- c) Tolerances on the dimension of the utensils have been reset and categorized based on the size of utensils.

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 analysis, shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard specifies the requirements for food serving utensils meant for single use only and made from Agri by-products. It also provides guidance on the general manufacturing process employed for making such utensils of different shapes and sizes.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 1060 (Part 2): 1960	Methods of sampling and test for paper and allied products: Part 2
IS 2491: 2013	Food hygiene — General principles — Code of practice (<i>third revision</i>)
IS 3748: 2022	Tool Steels — Specification (<i>third revision</i>)
IS 14595: 1998	Food hygiene — microbiological criteria — Principles for establishment and application
IS 1060 (Part 5/Sec 2) : 2021/ ISO 287: 2017	Methods of sampling and test for paper and allied products part 5 methods of test for paper and board section 2 Determination of moisture content of a lot — Oven-drying method (<i>first revision</i>)
IS 18352 : 2023 / ISO 18593: 2018	Microbiology of the food chain — Horizontal methods for surface sampling

3 TERMINOLOGIES

For the purposes of this standard, the following terminology shall apply.

3.1 Agriculture or Agro Based Material — The biological materials/resources that contain cellulose, hemicelluloses and lignin. They generally include wood, agricultural crop residues, water plants, grasses, and other plant substances.

3.2 Agricultural By-Products — The resources/materials of agro base, left after the conversion or utilization into major products and that can be further utilized for conversion/utilization.

3.3 Agricultural Wastes — The resources/materials left after conversion/utilization of agro-based materials that find less scope for further utilization/conversion. They can be further utilized by burning, decomposing, etc.

3.4 Biodegradable Material — Degradable material that is decomposed using microorganisms, like

fungi and bacteria.

3.5 Decomposing/Decomposition — Process by which dead organic substances are broken down into simpler organic or inorganic matter such as carbon dioxide, water, simple sugars and mineral salts.

3.6 Decomposers— Organisms that facilitate decomposition are known as decomposers.

3.7 Degradable Material — Material capable of being degraded or degrading, especially capable of being readily decomposed naturally by chemical action.

3.8 Food Serving Utensils — Set of vessels used for the purpose of serving the cooked food to others. These include the containers, for holding the cooked foods, hand tools for handling and distribution of foods and other accessories for use by the consumers to handle and consume food.

3.9 Mechanical Strength — The strength of the object to withstand the applied load against failure or deformation. It may be the strength required to overcome/prevent bending, crushing, breaking, etc.

3.10 Microbial Load — The number and type of microorganisms contaminating an object or organism. Microbial loads are typically expressed in units such as colony-forming units (CFUs) of microorganisms per unit mass or volume.

3.11 Sheath — The basal part of a leaf that encircles the stem is called sheath which falls down when matured and fully dried up.

3.12 Moisture Absorption Percentage — The amount of water/moisture absorbed by the biological material upon immersion / soaking in water for specific duration which is expressed as percentage of mass of water/moisture calculated based on the dry mass of material and expressed in percentage.

3.13 Warping of Plates — A distorting effect that can result when a piece of wood / the object made of ligno-cellulosic material dries unevenly. As the moisture leaves, the fibers of flat surface will contract slightly and change to a curved or misshapen surface because the fibers are contracting at different rates that then shift the overall lay of the fibers.

3.14 Normal Temperature — It is defined as the temperature that does not surpass or fall short of the ambient temperature of the relevant region by more than 5 degrees Celsius.

3.15 Moisture Content (Dry Basis) — Percentage of moisture available in product calculated based on the dry matter of the product.

4 RAW MATERIALS

Agriculture based material as defined in **3.1** may be used for the manufacture of the utensils where the leaves and sheath of plants and trees having wider area should be utilized. Some of the commonly used plant species whose leaves and sheath used in making plates and cups/bowls are given in Table 1 for guidance.

**Table 1 Leaves, Sheaths and Pulp of Plants & Trees Utilized for The Manufacture of
Food Serving Utensils
(Clause4)**

SI No.	Species	Material	Process/Method
(1)	(2)	(3)	(4)
i)	Flame of forest <i>Butea monosperma</i> (Lam.) Taub	Leaves	Joining by stitching/cold/hot pressing.
ii)	Teak (<i>Tectona grandis</i>)	Leaves	Joining by stitching/cold/hot pressing.
iii)	Almond (<i>Terminalia Catappa</i>)	Leaves	Joining by stitching/cold/hot pressing.
iv)	Banana (<i>Musa spp.</i>) – green	Leaves	Cold pressing.
v)	Banana (<i>Musa spp.</i>) – dry	Leaves	Hot pressing.
vi)	Banyan tree (<i>Ficus benghalensis</i>)	Leaves	Joining by stitching/cold/hot pressing.
vii)	Fig (<i>Ficus auriculate</i>)	Leaves	Joining by stitching/cold/hot pressing.
viii)	White fig (<i>Ficus virens</i>)	Leaves	Joining by stitching/cold/hot pressing.
ix)	Jack (<i>Artocarpus heteropgyllus</i>)	Leaves	Joining by stitching/cold/hot pressing.
x)	Taro (<i>Colacasia esculanta</i>)	Leaves	Joining by stitching/cold/hot pressing.
xi)	Kanak champa (<i>Pterospermum accerifolium</i>)	Leaves	Joining by stitching/cold/hot pressing.
xii)	Sal (<i>Shorea robusta</i>)	Leaves	Joining by stitching/cold/hot pressing.
xiii)	Maloo creeper (<i>Panera vahalii</i>)	Leaves	Joining by stitching/cold/hot pressing.
xiv)	Sacred lotus (<i>Nelumbo nucifera</i>)	Leaves	Joining by stitching/cold/hot pressing.
xv)	Badam (<i>Terminalia catappa</i>)	Leaves	Joining by stitching/cold/hot pressing.
xvi)	Chandada (<i>Macaranga peltata</i>)	Leaves	Joining by stitching/cold/hot pressing.
xvii)	Bagasse	Pulp	Moulding by cold/hot pressing.
xviii)	Areca nut (<i>Areca catechu</i>)	Sheath	Hot pressing.

5 MANUFACTURING PROCESS

The process involved in manufacturing of food serving utensils from agricultural by-products is given in Annex A for guidance.

6 STANDARD UTENSILS AND DIMENSIONS

The utensils made from agricultural by-products like, plates are generally made in round, elliptical, square and rectangular shapes either plain or with compartments. The utensils are made in various sizes and dimensions according to the requirements of the customers. Some of the examples of the food serving utensils and available in various sizes and shapes are shown in Fig. 1. The dimensions of various utensils as given in Table 2 are for guidance only. However, shapes and dimensions of utensils other than those given in Table 2 may be used based on agreement between manufacturer and purchaser.



FIG.1A ARECA LEAF MADE UTENSILS OF VARIOUS SHAPES



FIG.1B ARECA LEAF MADE PLATES OF VARIOUS SIZES



FIG.1C CUP



FIG.1D FORK



FIG.1E SPOON



FIG.1F PACKAGING CONTAINERS



FIG.1G PLANTAIN LEAVES BASED UTENSILS

FIG.1 VARIOUS TYPES OF FOOD SERVING UTENSILS FROM LEAVES / SHEATH

Table 2 Dimensions of The Various Utensils Made from Agri By-Products
(Clause 6)

Sl. No.	Source / Leaf	Utensil (Plate / Cup / Crockery)	Shape	Dimension in mm							Weight	Thickness	Serving type (Wet or Dry)
				Diameter	Length	Breadth	Depth	Rim					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
i)	Areca leaf sheath	Plates	Round	305	-	-	25	10	-	-	Wet and dry		
				254	-	-	25	10	-	-	Wet and dry		
				203	-	-	25	10	-	-	Wet and dry		
				152	-	-	35	05	-	-	Wet and dry		
				102	-	-	35	05	-	-	Wet and dry		
			Square	-	254	254	20	05	-	-	Wet and dry		
				-	203	203	20	05	-	-	Wet and dry		
				-	152	152	20	05	-	-	Wet and dry		
		Tray with lid	Square	-	254	254	20	05	-	-	Wet and dry		
				-	203	203	20	05	-	-	Wet and dry		
		Containers with	Square	Holding capacity – 250 ml									Wet and dry

		lid		Holding capacity– 500 ml				-	-		
				Holding capacity– 750 ml				-	-		
				Holding capacity– 1 000 ml				-	-		
ii)	Bagasse	Snacksplate	Square		156	156	20	-	11 g	-	Dry
		Mini meal plate	Square		206	206	20	-	15 g	-	Wet
		Dinner plate	Square		256	256	20	-	127 g	-	Wet
		180 ml bowl	Rectangular		105	65	35	-	15 g	-	Wet
		250 ml bowl	Rectangular		300	90	35	-	7 g	-	Wet
		4 Compartment food tray	Rectangular		305	255	30	-	36 g	-	Wet
		5 Compartment meal tray	Rectangular		130	90	35	-	36 g	-	Wet
		500 ml container	Rectangular		237	132	40	-	15 g	-	Wet
		750 ml container	Rectangular		287	157	40	-	21 g	-	Wet
		Plain plate	Circular	260	-	-	23	10	18.42g	0.5	Dry
		Compartment plate (3 section)	Circular	260	-	-	23	10	18.80g	0.5	Dry
Plain plate (small)	Circular	145			15	5	6.35 g	0.5	Dry		
iii)	Areca	Bowl plain	Rectangular		110	105	1.6	4.3	9.34 g	1.5	Dry
iv)	Wheat straw	Plain plate	Circular	250			26	10	27.92g	0.6	Dry

7 GENERAL REQUIREMENTS

The following general requirements shall be followed in the production and handling of agricultural by-products-based utensils:

7.1 The utensils shall be made only from the agricultural by-products.

7.2 The utensils shall be clean, well dried, and free from any dust, dirt, foreign materials, etc. and ready to use.

7.3 No chemicals, colors (synthetic or natural), resins, adhesives, etc. shall be used in the manufacture of utensils.

7.4 The surface of the utensil shall be smooth and free from any dent / damage that will cause leakage of food materials from the utensil.

7.5 The patches of discoloration and change in color of the leaves shall be ensured as natural formation and not related to any plant disease or microbial activity.

7.6 The surface of the utensil coming in contact with food materials shall be free from any damage caused by insects and microorganisms.

7.7 The edges of the utensils shall not be sharp, which will cause inconvenience during handling.

7.8 It shall be ensured that, the utensils are free from damage along the folding in the formation process.

7.9 In both the manual and machine stitching methods of manufacturing, it shall be ensured that mid ribs/twigs/any part of the plants/thread used for joining is firmly placed and does not get into the food material being served.

7.10 The utensils should be arranged by stacking and packaged as per the requirement of the customer/market and occupy less space and preferably wrapped with moisture proof material to avoid moisture absorption by the utensils.

8 PERFORMANCE REQUIREMENTS

8.1 The deviations in all the dimensions declared by the manufacturer for the size of utensils in any parameter i.e. length, width, diameter, depth, or thickness, etc. shall be within the tolerance as given below:

- a) ± 3 % for the size up to 30 mm,
- b) ± 2.5 % for size more than 30 mm and up to 50 mm,

- c) $\pm 2\%$ for size more than 50 mm and up to 100 mm,
- d) $\pm 1.5\%$ for size more than 100 mm and up to 200 mm, and
- e) $\pm 1\%$ for size more than 200 mm.

The dimensions of the utensils shall be measured using vernier caliper, screw gauge or any other suitable measurement system having least count not more than 0.5 mm. Measurement will be done with minimum ten numbers of samples and the mean shall be taken.

8.2 The moisture content of the utensils shall be not more than 10 percent (dry basis) when removed from the package. The moisture absorption percentage shall not be more than 5 percent (dry basis), when completely immersed in water for 10 minutes. The moisture content shall be calculated as per the method given in Annex B.

8.3 The surface of the food serving utensils shall be tested for the presence of the microorganism. The total plate count of the microorganisms on the surface shall be not more than 5 cfu/cm² when tested as per IS 18352.

8.4 During the bending test of the utensils as per Annex C, the average length of break shall not be more than 6 mm. This requirement is not applicable on utensils made through either hot pressing or moulding.

8.5 During load bearing test of the utensil as per Annex E, the average percent reduction in height of utensils shall be not more than 5 percent. The load bearing test shall be applicable only for utensils such as food boxes, bowls and cups which can be held in the hands or may be stacked while containing food. It is not a requirement for utensils such as knives, forks, spoons, chopsticks, dishes, plates, or any utensils having an outer holder.

8.6 There shall be no cracks or splits in any of the three samples of utensils dropped freely, facing bottom-down, from a height of 0.8 m, onto a level cement floor.

8.7 For utensils where the container part and its lid are hinged together, there shall be no cracks or damage to any of the three samples when the lid of a hinged-lid container is continuously opened and shut for 15 times.

8.8 There shall be no deformations or smears or leakages to the utensils such as boxes, cups, and bowls, which are intended to contain hot dishes, hot food and hot drinks, during the hot-water resistance test and hot-oil resistance test when tested as per Annex E.

8.9 For utensils such as boxes, bowls and cups which have the function of containing liquid and semi-liquid, after the water leakage test, there shall be no water leakage when tested as per Annex F.

9 HYGIENECONDITIONS

All the utensils shall be manufactured under strict hygienic conditions as prescribed in IS 2491.

10 MARKING AND PACKING

10.1 Packing and Marking

10.1.1 The utensils can be packed suitably in numbers of 10, 20, 25, and 50 or according to the market requirement or consumers' choice.

10.1.2 Each utensil may be pasted with a sticker using non-toxic glue in a location not coming in contact with food materials, preferably at outside bottom. Whenever, it is not possible to provide the sticker in each piece, it may be placed as conspicuously visible in the bulk package.

The sticker shall provide the following information:

- a) Manufacturer's name and address or recognized trademark, if any;
- b) Batch or code number;
- c) Type of raw material;
- d) Type of product and sizes (in mm);
- e) Date of manufacture;
- f) Best Before (Month and Year format);
- g) Suitability of usage/application (both dry/wet – applications);
- h) Declaration stating 'For single use only'; and
- j) Any other information required under the *Legal Metrology (Packaged Commodities) Rules, 2011*.

10.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

ANNEX A
(Clause 5)

MANUFACTURING PROCESS

A-1 GENERAL

Leaves and sheaths are used in making the food serving utensils, mainly the plates and cups/bowls. The leaves being smaller in size and inadequate to hold the required quality of food materials are joined together to reach adequately larger size. The leaves/sheath in larger size and adequately thick to form into a desired shape are then mechanically pressed, either cold or hot. The processes generally involved in making the plates and cups/bowls from these materials is provided hereunder for guidance. The various methods employed for making the food serving utensils include:

- a) Stitching
- b) Pressing
- c) Stitching and pressing
- d) Moulding from pulp

A-2 STITCHING

Stitching is followed to join the smaller size leaves to make into usable from in large size. Number of small leaves are used to reach a larger area of the surface. They are held together by stitching. Both manual and machine stitching are followed in forming a larger size leaf.

A-2.1 Manual Stitching

Small size leaves are placed together by the side with an overlap and fixed using mid ribs/twigs/any part of the plants, which can be used like a pin, which is called as stitching. At intervals of 10 to 15 mm, manual stitching is done using these twigs for a length of 5 to 10 mm. The final required shape of the leaf, rectangular, round, elliptical, square, etc., will be formed during the stitching itself. After stitching the leaves will be dried, either shade drying or moderate sun drying, to less than 10% moisture content without much shrinkage or wrinkles. These stitched leaves after drying will be stacked and bundled in convenient numbers as per the market requirement. A view of the hand/manually stitched leaf is shown in Fig.2A.



FIG.2A HAND / MANUALLY STITCHED LEAVES

A-2.2 Machine Stitching

To reduce time taken in manual stitching and avoid the use of twigs/other portions of plant materials,

machine stitching is done using thread. The type of thread used depends on the manufacturers, may be natural or biodegradable material. During stitching the leaves will be at intermediate moisture level with flexibility for stitching and followed by drying, either shade drying or moderate sun drying. After drying these stitched leaves will be stacked and bundled in convenient numbers as per the market requirement. A view of the machine stitched leaf is shown in Fig. 2B.



FIG.2B LEAVES STITCHED WITH MACHINE

FIG.2 MANUAL AND MACHINE STITCHED LEAVES

A-3 PRESSING

The leaf either as single or many leaves joined together by manual or machine stitching, will be pressed mechanically in a mould of desired shape and formed into plate. Depending on the nature of the leaves, cold pressing or hot pressing will be followed. Suitable mould / dies will be made according to configuration following the guidelines of IS 3748.

A-3.1 Cold Pressing

Mechanical pressing of leaf or leaves on a mould of desired size and shape is done by applying the force through hand or pedal (foot). This method is suitable for the green leaves of less thickness. To join the leaves together no adhesive or glue is preferred. Wet/green leaves when placed together with overlap or number of leaves together, on the mould and pressed, they form the plate according to the shape of the mould. Upon drying they form into plates with moderate strength.

A-3.2 Hot Pressing

Leaves having thickness more than 2 mm will be formed into desired shape by pressing with heat. Force may be applied with hand using a screw press or by foot (pedal). The moulds will be provided with electrical heaters on both bottom and top surfaces. The heaters used are of capacity 750 to 1000 W may be element type, foil/filament type, heating ropes, band heaters, etc. depending on the configuration of mould and provisions available. For the application of load on the mould, hydraulically/pneumatically operated press is used. The temperature of the mould in the range of 100 to 120°C is maintained and controlled through a stem type or capillary type thermostat or digital temperature controller. The cycle of plate formation involves pressing the moulds, heating, holding and releasing. The leaves/sheath in dry nature as transported to the site will be soaked in water for 20 to 30 minutes to reach a moisture content of 15 to 20% db., followed by cleaning the surface using nylon

brush in running water. After allowing for the surface moisture to get drained, the leaf will be manually straightened and made free from wrinkles and rolling, placed in the mould. When the moulds reach the set temperature pressed to the required level of force/load, normally 1.5 to 2 tonnes, as per the provision given in the machine, for 30 to 40 seconds. Leaves with thickness less than 2 mm are placed together upto 3 numbers and formed into plates/cups by hot pressing for duration less than followed for areca leaf plates. Hydraulic power pack operated by 1 hp is provided and upto 5 units can be connected to a pack. In the modern presses, the holding time is set through a timer to alert the operator to release the plate from the mould. The formed plate is checked for the formation and damages, trimmed of excess sheath/leaf and dried in an oven at 90 to 100°C for 10 to 20 minutes. The surface is cleaned and packaged by shrink wrapping in bundles of 50 numbers or as per the domestic market requirement. A hot press for making plate from plant leaves/arecanut sheath is shown in Fig. 3.



FIG.3 HOT PRESS FOR MAKING LEAF PLATES

A-4 STITCHING AND PRESSING

To make plates from green leaves of less thickness, number of smaller leaves are joined by manual or machine stitching. These plates when required to form into any configuration, they will be either cold or hot pressed in the mould. An example of these types of plates is shown in Fig.4.



FIG.4A MANUALLY STITCHED AND HOT PRESSED

FIG.4B MACHINE STITCHED AND HOT PRESSED

FIG.4 STITCHED AND HOT-PRESSED PLATES FROM LEAVES

A-5 MOULDING FROM PULP

In this method, the agricultural materials will be made into pulp by wet grinding. The pulp in the appropriate consistency will be placed in the mould of desired configuration and the utensil is formed. On setting with the shape and partial drying, the utensil will be de-moulded and shade dried. The disadvantages are, time consuming process, heavier in nature and poor strength unless made heavier. Normally leaves will not be wet ground and pulped for making plates since they leave the chlorophyll and the bitter taste to the utensils, which are undesirable for food applications. Mostly the non-leafy parts of the plants will be used for making utensils through this process. A food serving moulded plate is shown in Fig.5.



FIG.5A MOULDED FROM PULP



FIG.5B MOULDED FROM LEAVES

FIG.5 PLATES MADE BY HOT PRESS

ANNEX B
(Clause 8.2)

MOISTURE CONTENT AND WATER ABSORPTION ESTIMATION

B-1 PROCEDURE

Place the replicated samples of test piece of leaf, about 10 to 20 g in a thermostatically controlled ventilated hot air oven maintained at temperature of $105 \pm 2^{\circ}\text{C}$. Dry the samples until the difference between two successive dryings and weighing (not exceeding 24 hours), does not exceed 0.1%. From the wet and dry weights of the samples, calculate the moisture content and express in percentage dry basis. The moisture content can be determined as per IS 1060 (Part 5/Sec 2).

ANNEX C
(Clause 8.4)

BENDING TEST OF THE UTENSILS

C-1 This test applied to paper and allied products as per IS 1060 (Part 2) is modified for adoption to test the bending strength of leaf / agri-material made utensils.

C-2 PROCEDURE

Prepare a square test piece of at least 60 × 60 mm or maximum sized square that can be cut from utensil whichever is less and fold by fingers along the diagonal so that the inner surfaces are in contact completely. Unfold and repeat the folding along the same crease in the opposite direction until the other surfaces are in contact completely. Repeat the test with a second test piece of different utensil. Record any visible fibrous breaks or cracks on the surface of the folded test piece after each crease is made. Report the average number and length of the visible breaks on the surface.

Record any visible fibrous breaks or cracks on the surface of the folded test piece after each crease is made. Repeat the test with three samples obtained from different utensils. If no break is more than 6 mm long, the board may be classified as fair. If the board shows no fibrous break, it is classified as good. Repeat with three different samples and report the average of the number and length of the visible breaks on the surface.

ANNEX D
(Clause 8.5)

LOAD BEARING PERFORMANCE

For the test, two smooth glass plates of size 200 mm × 150 mm × 4 mm, a weight of 3 kg and a steel rule with accuracy of 1 mm are required. Take minimum three samples, position the main body of the samples up-side down on one of the glass plates (bottom glass), and put another glass plate onto the base of the samples (top glass). Measure the height between the top surface of the first glass (bottom glass) plate to the bottom surface of the second glass plate (top glass). Place the 3 kg weight onto the centre of the second (top) glass plate. After one minute, accurately measure the height between the top surfaces of the first glass plate to the bottom surface of the second glass plate. Determine the reduction in height using formula. The arithmetic average value of the reductions in height of two samples is regarded as the avg reduction in height.

$$W = \frac{H_0 - H}{H_0} \times 100 \%$$

where,

- W = reduction in height of sample, %;
- H_0 = the height before weight loaded, mm;
- H = the height after weight loaded, mm.

The average of the three samples is reported.

ANNEX E
(Clause 8.8)

HOT-WATER RESISTANCE & HOT- OIL RESISTANCE

Place two samples Place a sample onto an enamel plate lined with filter paper, fill completely with hot water at a temperature of $95 \pm 5^{\circ}\text{C}$ (use hot water at 100°C for instant noodle cups) or hot cooking oil (drinking sets only require a temperature resistance test with hot water at 100°C). Move the samples and leave them to stand in a thermostat container at 60°C for 30 minutes, then check the samples for any deformation or any traces of smeared discoloration or leakage. After the hot-water resistance test, there shall be no deformations, peelings, or wrinkles to the utensils. For utensil that functions as a vessel, there shall be no deformations, smears, or leakages. There must be no deformations or smears to, or leakages of, either sample. The hot-water resistance test applies only to utensils such as boxes, cups or bowls which are intended to contain hot dishes, hot food and hot drinks, for utensils such as plates, dishes, knives, forks or chopsticks which do not require heat resistance, the hot-water resistance test is not a requirement, for any utensil which is marked as non-heat resistant, the hot-water resistance and hot-oil resistance tests are also not a requirement. Repeat with minimum three different samples and report the observation.

ANNEX F
(Clause 8.9)

WATER LEAKAGE RESISTANCE

F-1 PROCEDURE

Place two samples onto Place a sample onto an enamel plate lined with filter paper, fill completely with hot water, at normal temperature, leave the samples standing for 30 minutes, then check the samples for any deformations there to or any traces of smears or leakage at the bases thereof for utensils such as boxes, bowls and cups which have the function of containing liquid, after the water leakage test, there must be no water leakage. For utensils which is marked as not for containing liquid or any other utensils which has no liquid-containing function, water leakage resistance is not a requirement. Repeat with minimum three different samples and report the observation.