भारतीय मानक **IS 18267 : 2024**

Indian Standard

कृषि उप-उत्पादों से बने खाद्य परोसने के बर्तन — विशिष्टि

(पहला पुनरीक्षण)

Food Serving Utensils Made from Agri By-Products — Specification

(First Revision)

ICS 55.230

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Agriculture and Food Processing Equipments Sectional Committee, FAD 20

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Agriculture and Food Processing Equipments Sectional Committee had been approved by the Food and Agriculture Division Council.

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. This standard was originally published in 2023 to guide the manufacturers and the consumers on the quality parameters and ensure uniform standards across the country. In order to resolve the problems faced in the implementation of this standard, a need was felt to revise this standard.

Accordingly, In this revision, following major changes have been done:

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;

c) Tolerances on the dimension of the utensils have been reset and categorized based on the size of utensils; and

d) The reference standard for the test method for the presence of the microorganism has been changed to IS 5402 (Part 1).

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.

The composition of the Committee responsible for the formulation of this standard is given in Annex H.

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.

Indian Standard

FOOD SERVING UTENSILS MADE FROM AGRI BY-PRODUCTS — SPECIFICATION

(First Revision)

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 standards listed in Annex A 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 edition of these standards.

3 TERMINOLOGY

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 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.

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

3.13 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 ºC.

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

3.15 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.

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.

5 MANUFACTURING PROCESS

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

Table 1 Leaves, Sheaths and Pulp of Plants and Trees Utilized for The Manufacture of Food Serving Utensils

(*Clause* 4)

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

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

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 that is length, width, diameter, depth, or thickness, etc shall be within the tolerance as given below:

a) 3 percent for the size up to 30 mm;

b) 2.5 percent for size more than 30 mm and up to 50 mm;

c) 2 percent for size more than 50 mm and up to 100 mm;

d) 1.5 percent for size more than 100 mm and up to 200 mm; and

e) 1 percent 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 min. The moisture content shall be calculated as per the method given in Annex C.

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/cm^2 when incubated at temperature 30 °C ± l °C for 72 h ± 3 h when tested in accordance with the method given in IS 5402 (Part 1).

8.4 During the bending test of the utensils as per Annex D, 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 F.

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 G.

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 thereunder, and the products may be marked with the Standard Mark.

11 SUMMARY REPORT

For the guidance of the user, a summary report shall be recorded in the proforma as given in Annex G.

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							Serving Type (Wet or Dry)
				Diameter	Length	Breadth	Depth	Rim	Weight	Thickness	
(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 lid	Square	Holding capacity – 250 ml					–	–	Wet and dry
				Holding capacity – 500 ml					–	–	
				Holding capacity – 750 ml					–	–	
				Holding capacity – 1 000 ml					–	–	
ii)	Bagasse	Snacks plate	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

Table 2 (*Concluded*)

Sl No.	Source/Leaf	Utensil (Plate/Cup/ Crockery)	Shape	Dimension in mm							Serving Type (Wet or Dry)
				Diameter	Length	Breadth	Depth	Rim	Weight	Thickness	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		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	18.42 g	0.5	Dry
		Compartment plate (3 section)	Circular	260	–	–	23	10	18.80 g	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

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1060 (Part 2) : 1960	Methods of sampling and test for paper and allied products, Part II
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 (*first revision*)
IS 2491 : 2013	Food hygiene — General principles — Code of practice (*third revision*)
IS 3748 : 2022/ ISO 4957 : 2018	Tool steels — Specification (*third revision*)
IS 5402 (Part 1) : 2021/ISO 4833-1 : 2013	Microbiology of the food chain — Horizontal method for the enumeration of microorganisms: Part 1 Colony count at 30°C by the pour plate technique (*third revision*)
IS 14595 : 1998	Food hygiene — Microbiological criteria — Principles for establishment and application

ANNEX B

(*Clause* 5)

MANUFACTURING PROCESS

B-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; and
d) Moulding from pulp.

B-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.

B-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 mm to 15 mm, manual stitching is done using these twigs for a length of 5 mm 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 percent 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 leave is shown in Fig. 2A.

B-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 leave is shown in Fig. 2B.

FIG. 2A HAND/MANUALLY STITCHED LEAVES

FIG. 2B LEAVES STITCHED WITH MACHINE

FIG. 2 MANUAL AND MACHINE STITCHED LEAVES

B-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.

B-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.

B-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 W to 1 000 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 ºC to 120 ºC 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 minutes to 30 minutes to reach a moisture content of 15 percent to 20 percent dry basis, 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 tonnes to 2 tonnes, as per the provision given in the machine, for 30 s to 40 s. 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 ºC to 100 ºC for 10 min to 20 min. 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.

B-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.

B-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. 3 HOT PRESS FOR MAKING LEAF PLATES

FIG. 4A MANUALLY STITCHED AND HOT PRESSED

FIG. 4B MACHINE STITCHED AND HOT PRESSED

FIG. 4 STITCHED AND HOT-PRESSED PLATES FROM LEAVES

FIG. 5A MOULDED FROM PULP

FIG. 5B MOULDED FROM LEAVES

FIG. 5 PLATES MADE BY HOT PRESS

ANNEX C

(*Clause* 8.2)

MOISTURE CONTENT AND WATER ABSORPTION ESTIMATION

C-1 PROCEDURE

Place the replicated samples of test piece of leaf, about 10 g to 20 g in a thermostatically controlled ventilated hot air oven maintained at temperature of 105 °C ± 2 °C. Dry the samples until the difference between two successive dryings and weighing (not exceeding 24 h), does not exceed 0.1 percent. 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 D

(*Clause* 8.4)

BENDING TEST OF THE UTENSILS

D-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.

D-2 PROCEDURE

Prepare a square test piece of at least 60 mm × 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 E

(*Clause* 8.5)

LOAD BEARING PERFORMANCE

E-1 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.

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

where

W = reduction in height of sample, percent;

H_o = the height before weight loaded, mm; and

H = the height after weight loaded, mm.

The average of the three samples is reported.

ANNEX F

(*Clause* 8.8)

HOT-WATER RESISTANCE AND HOT-OIL RESISTANCE

F-1 Place two samples place a sample onto an enamel plate lined with filter paper, fill completely with hot water at a temperature of 95 °C ± 5 °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 min, 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 G

(*Clauses* 8.9 *and* 11)

WATER LEAKAGE RESISTANCE

G-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 min, then check the samples foray 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.

ANNEX H

(*Foreword*)

COMMITTEE COMPOSITION

Agriculture and Food Processing Equipment Sectional Committee, FAD 20

Organization	*Representative(s)*
Indian Council of Agricultural Research, New Delhi	DR SHYAM NARAYAN JHA **(*Chairperson*)**
Agriculture Machinery Manufacturers Association, Pune	DR SURENDRA SINGH SHRI MITUL PANCHAL (*Alternate*)
CCS Haryana Agricultural University, Hisar	DR RAVI GUPTA
Confederation of Food and Agro-Processing Machinery Enterprises, Ludhiana	SHRI GURWANT SINGH DR RAJENDER PAL SINGH AULAKH (*Alternate*)
Dr Panjabro Deshmukh Krishi Vidyapeeth, Akola	DR SUCHITA V. GUPTA DR BHAGYASHREE N. PATIL (*Alternate*)
ICAR - Central Institute for Research on Cotton Technology, Mumbai	DR V. G. ARUDE
ICAR - Central Institute of Agricultural Engineering, Bhopal	DR RAVINDRA NAIK DR SUBIR CHAKRABORTY (*Alternate*)
ICAR - Central Institute of Post-Harvest Engineering and Technology, Ludhiana	DR SANDEEP MANN DR SANDEEP P. DAWANGE (*Alternate*)
ICAR - Indian Institute of Horticultural Research, Bengaluru	DR A. CAROLINA RATHINA KUMARI DR S. BHUVANESWARI (*Alternate*)
Indian Council of Agricultural Research, New Delhi	DR K. NARSAIAH DR KRISHNA PRATAP SINGH (*Alternate*)
Indosaw Industrial Products Private Limited, Ambala	DR VINOD H. KALBANDE
Mahatma Phule Krishi Vidyapeeth, Rahuri	SHRI VIKRAM PARASHARAM KAD
Ministry of Agriculture, Department of Agriculture, New Delhi	SHRI C. R. LOHI SHRI Y. K. RAO (*Alternate*)
National Committee on Precision Agriculture and Horticulture, New Delhi	SHRI ANAND ZAMBRE SHRI KRISHNA KUMAR KAUSHAL (*Alternate*)
National Institute of Food Technology, Entrepreneurship and Management, Thanjavur	DR S. BHUVANA
North Eastern Region Farm Machinery Training and Testing Institute, Biswanath Chariali	DR P. P. RAO SHRI S. G. PAWAR (*Alternate*)
Northern Region Farm Machinery Training and Testing Institute, Hisar	DR MUKESH JAIN SHRI SANJAY KUMAR (*Alternate*)
Punjab Agricultural University, Ludhiana	DR SANDHYA SINGH DR MANINDER KAUR (*Alternate* I) DR ROHIT SHARMA (*Alternate* II)

Organization	*Representative(s)*
Sahyadri Farmers Producer Company, Nashik	SHRI RUPESH H. KHISHTE SHRI SHRIKANT KULKARNI (*Alternate*)
Tamil Nadu Agricultural University, Coimbatore	DR P. RAJKUMAR DR P. SUDHA (*Alternate*)
In Personal Capacity, (*MIG-154, E-7 Sector Area Colony, Bhopal - 462061*	DR S. D. DESHPANDE
In Personal Capacity, (*12/36 Sowbhagya Nagar, A Block Civil, Aerodrome Post, Coimbatore - 641014*)	DR R. VISVANATHAN
BIS Directorate General	SHRIMATI SUNEETI TOTEJA, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (FOOD AND AGRICULTURE) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI PRADEEP SHARMA
SCIENTIST 'B'/ASSISTANT DIRECTOR
(FOOD AND AGRICULTURE), BIS

Panel on Food Serving Utensils Made from Agri By-Products — Specification, FAD 20 : P18

Organization	*Representative(s)*
In Personal Capacity (*12/36 Sowbhagya Nagar, A Block Civil, Aerodrome Post, Coimbatore - 641014*)	DR R. VISVANATHAN **(*Convener*)**
ICAR - Central Institute of Post-Harvest Engineering and Technology, Ludhiana	DR NACHIKET KOTWALIWALE DR THINGUJAM VIDYA LAKSHMI DEVI
Indosaw Industrial Products Private Limited, Ambala	DR VINOD H. KALBANDE
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