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| **BUREAU OF INDIAN STANDARDS** | |
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| *भारतीय मानक मसौदा* | |
| **बेकरी उत्पाद — नमूनाकरण की पद्धतियााँ** | |
| (*आई एस* *12741* *का* *पहला पुनरीक्षण* ) | |
| *Draft Indian Standard* | |
| **Bakery Products** — **Methods of Sampling**  (*First Revision* *of* *IS 2741*) | |
| ICS No. | |
| Ready to Eat Foods and specialized Products Sectional Committee, FAD 24 | Last Date of Comments: |

**FOREWORD**

(*Formal clause would be added later*)

The bakery industry is a well-organized and established industry in India. With the considerable increase in the consumption of bakery products, a strong need has been felt for stricter quality control and evolving uniform methods of sampling which will help in proper and objective evaluation of various characteristics of different bakery products.

The sampling procedures given in this standard include, besides lot inspection plans, recommended provisions for process control for the guidance of the manufacturers. Proper quality control during process would substantially reduce quality fluctuations and help a manufacturer in achieving in-built quality of product. Lot inspection plan would enable the manufacturer or purchaser or other independent inspection and testing agencies to decide the conformity or otherwise of a lot of bakery products to the requirements of the relevant material specifications.

This standard lays down methods of sampling for bakery products. The bakery products have

been classified into the following three homogeneous groups for the purpose of sampling:

a) Biscuits, wafers, bread rusks and ice cream cones;

b) Breads and bread type of products; and

c) Cakes.

A separate sampling plan has been prescribed for each of these groups.

The committee responsible for preparing this standard felt that the sampling plans for these three groups of bakery products evolved on the basis of statistical analysis of the relevant data would be more realistic and easily implementable. Hence, a large amount of data for various characteristics of bakery products was statistically analysed and minimum sample sizes were estimated on the basis of 95 percent confidence level and maximum coefficient of variation. The lot sizes are based on the current practices of trade and industry. The number of tests and criteria for conformity are based on a variety of considerations including variation in the test results, importance of a characteristic from the view point of end use of the product, cost of testing, time of testing and quality protection desired.

This standard is subject to the restrictions imposed under *PFA Act* 1954 *(*including the rules framed thereunder) and *Standards of Weights and Measures (Packaged Commodities) Rules,* 1977*,* wherever applicable.

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 prescribes the methods of sampling and criteria for ascertaining the conformity of a lot of bakery products to the relevant product specifications, such as,biscuits, breads and cakes. It also includes the recommended provisions for process control for the guidance of manufacturers.

**2 REFERENCES**

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

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 498 : 2018 | Grading for vacuum pan (plantation white and refined) sugar (*sixth revision*) |
| IS 1009 : 2023 | Maida — Specification (*third revision*) |
| IS 1011 : 2002 | Biscuits — Specification (*fourth revision*) |
| IS 1151 : 2021 | Refined sugar — Specification (*second revision*) |
| IS 1155 : 2022 | Atta — Specification (*third revision*) |
| IS 1320 : 1988 | Specification for baker’s yeast (*third revision*) |
| IS 2491 : 1972 | Food hygiene — General principles — Code of practice (*fourth revision*) |
| IS 4905 : 2015/ISO 24153 : 2009 | Random sampling and randomization procedures (*first revision*) |
| IS 5059 : 1969 | Code for hygienic conditions for large scale biscuit manufacturing units and bakery units |
| IS 5982 : 2003 | Plantation white sugar — Specification (*first revision*) |
| IS 7463 : 2004 | Wheat flour for use in bakery industry (second revision) |
| IS 7464 : 1988 | Wheat flour (maida) for use in bread industry — Specification (*first revision*) **withdrawn** |
| IS 9194 : 1979 | Specification for wheat flour for use by cake industry |
| IS 10633 : 1986 | Vanaspati — Specification (*third revision*) |
| IS 10634 : 1986 | Specification for bakery shortening (*first revision*) |

**3 GENERAL REQUIREMENTS OF SAMPLING**

**3.0** In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

**3.1** Sample shall be taken in a protected place which is free of odour and not exposed to damp air, dust, drains or soot.

**3.2** Precautions shall be taken to protect the samples, the lots being sampled, the sampling instrument and the containers for samples from adventitious contamination.

**3.3** The samples shall be placed in air tight, clean and dry glass, metallic containers suitably lacquered or lined and stored in such a manner that the material is not unduly affected.

**3.4**Each container containing the samples shall be marked with full details of sampling, such as, date and time of sampling, batch or code number, used by date, name of the manufacturer and other relevant particulars.

**3.5** The samples shall be stored at room temperature, in a properly ventilated room and in a well-lighted area (away from dark area).

**3.6** Sampling shall be done by a person agreed to between the purchaser and the vendor, and if desired by them, in the presence of the purchaser (or his representative) and the vendor (or his representative).

**3.7** Unless otherwise agreed to between the purchaser and the vendor, sampling shall be done at the bakery.

**3.8** Samples shall be tested within as short a time as possible after their drawl, preferably within 24 hours of sampling.

**4 PROCESS CONTROL**

**4.1** It is recommended that the manufacturer of bakery products follows the hygienic and sanitary conditions given in IS 2491 and IS 5059.

**4.2** In order to ensure the quality of finished product, proper checks shall be exercised on raw materials and at different stages of processing. The following stages of inspection along with the frequency of inspection are recommended for various characteristics of some of the bakery products, such as biscuits, breads and cakes.

**4.2.1** *Biscuits*

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Stage of Inspection** | **Characteristics to be Checked** | **Recommended Frequency of Checking** |
| 1. | Ingredients | a) Flour — *see* IS 7463  b) Wheat flour – *see* IS 1155  c) Maida – *see* IS 1009 | Each consignment/batch |
| b) Fat or shortening — *see* IS 10633 or IS 10634 | do |
| c) Oil | do |
| d) Water |  |
| e) Sugar — *see* IS 5982 |  |
| f) Milk, SMP, condensed milk, salt |  |
| 2. | Preparation of ingredients | Correct weight of each major ingredient | Twice a shift |
| 3. | Creaming of fat, sugar, additives and mixing of dough (Mixing) | Homogeneity, consistency and mach inability | Each batch |
| 4. | Relaxing of dough, if required | Proper relaxation of dough | Twice a shift |
| 5. | Feeding of the dough into hopper | Uniform feeding of dough pieces into the machine | Constantly |
| 6. | Moulding and cutting | Raw weight of the biscuits | Twice a shift |
| 7. | Baking | a) Heat profile | Twice a shift |
| b) Baking time | do |
| c) Metal detector | constantly |
| 8. | Cooling | a) Cooling the product so that it becomes fit for handling and packing | do |
| b) Weight, gauge and colour | Twice a shift |
| 9. | Packing | a) Correct weight of packet | Every half an hour |
| b) Moisture | At the beginning,  middle and end of each shift |
| c) Metal detector | constantly |
| d) Other than moisture — *see* IS 1011  Coding – Every hour | One sample of each variety every day |

**4.2.2** *Breads*

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Stage of Inspection** | **Characteristics to be Checked** | **Recommended Frequency of Checking** |
| 1. | Procurement of  ingredients | a) Flour — *see* IS 7464 | Each consignment |
| b) Yeast — *see* IS 1320  Sugar, oil, water, salt | do |
| 2. | Preparation and mixing of ingredients | Correct temperature of water and correct weight of each ingredient | Each batch |
| b) Consistency of dough as well as dough temperature | do |
| c) Yeast to be tested preferably before usage — *see* IS 1320 | Each consignment |
| 3. | Fermentation, if necessary |  |  |
| a) First fermentation | Fermentation conditions | Every half an hour |
| b)Knock back/remixing | During knock back ensure that no large air pockets remain in the dough | Each batch |
| c) Second fermentation | Fermentation conditions | Every one hour |
| 4. | Dividing | Correct weight of dough pieces | Every 5-10 minutes |
| 5. | Rounding | Smoothening of each dough piece | Constantly |
| 6. | Intermediate proofing | a) Relaxation time | Regular Pre-deter-mined intervals |
|  |  | b) Dough pieces falling in the individual pockets of interprover | Regular Pre-deter-mined intervals |
| 7. | Moulding | Each individual piece is tightly moulded so that seams do not open-up | Regular Pre-deter-mined intervals |
| 8. | Final proofing | a) Temperature and humidity  Temperature - (30 to 40 oC) Relative  humidity - (65 to 85%)  b) Proof time | Constantly |
| As & when required |
| 9. | Baking | a) Temperature of baking chamber | Every hour |
| b) Baking time | Every batch |
| 10. | Cooling | a) Correct crumb temperature for slicing  b) Rh of Cooling chamber- once in a shift  c) Bread temp. at outlet of cooling chamber | Every batch |
| 11. | Slicing | Sharpness of blades | Regular Pre-deter-mined intervals |
| 12. | Packing | a) Appropriate packing of bread loaves  b) Coding – Every hour (MRP, batch no., used by date  c) Unit sell price mandatory by Legal metrology for all the packed product  d) Metal detector | Do  Constantly |
| b) Declaration on the wrapper shall meet statutory requirements | do |

**4.2.3** *Cakes*

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Stage of Inspection** | **Characteristics to be Checked** | **Recommended Frequency of Checking** |
| 1. | Ingredients | a) Flour — *see* IS 9194 | Each consignment |
|  |  | b) Fat — *see* IS 10633 | do |
|  |  | c) Sugar — *see* IS 1151 or IS 498 | do |
| 2. | Whisking of eggs and sugar with flavours | Proper aeration and temperature of mix | Each batch |
| 3. | Beating of flour and fat | Proper aeration and temperature | do |
| 4. | Amalgamation of whisked eggs to beaten flour-fat mass | a) Even amalgamation of the two mixtures | do |
| b) Check against over mixing | do |
| 5. | Addition of remaining flour, leavening agents, etc | a) Consistent mixing | Each batch |
| b) Specific gravity of batter | Twice a shift |
| 6. | Depositing cake batter in moulds | a) Correct weight of batters | Each batch |
| b) Proper levelling | do |
| 7. | Baking | a) Temperature of baking chamber | do |
| b) Baking time | do |
| 8. | Cooling | Proper cooling | Constantly |
| 9. | Slicing | Proper sharpness of blades before slicing | do |
| 10. | Packing | a) Weight of each packet | Every half an hour |
| b) Statutory requirements | do |

**5LOT INSPECTION**

**5.1** If the manufacturer has maintained an adequate and satisfactory system of quality control in the manufacture of bakery products, the resulting data and information may be made available to the purchaser along with the material supplied to enable him to judge the acceptability or otherwise of the consignment. When it is not possible to provide this information, or if the purchaser so desires, the procedure laid down in the following clauses shall be followed for determining the conformity of the material to the requirements of the specification.

**5.2** **Group I Biscuits, Wafers, Bread Rusks and Ice Cream Cones**

**5.2.1** *Scale of Sampling*

**5.2.1.1***Lot* — All the containers in a single consignment belonging to the same batch of manufacture shall constitute a lot.

**5.2.1.2** For ascertaining the conformity of the material to the requirements of the specification, samples shall be tested from each lot separately.

**5.2.1.3** The number of containers to be sampled from a lot shall depend upon the size of the lot and shall be in accordance with Table 1.

**Table 1 Number of Containers to be Selected**

(*Clauses* 5.2.1.3 *and* 5.2.2.1)

|  |  |
| --- | --- |
| **Lot size** | **Sample Size** |
| (1) | (2) |
| Up to 50 | 3 |
| 51 to 150 | 4 |
| 151 to 300 | 5 |
| 301 to 500 | 6 |
| 501 to 1 000 | 8 |
| 1 001 and above | 10 |

**5.2.1.4** The containers shall be selected from the lot at random and to ensure the randomness of selection, procedures given in IS 4905 may be followed.

**5.2.2** *Test* *Samples and Referee Samples*

**5.2.2.1**From each lot, draw the number of containers of biscuits as given in co1 (2) of Table 1. These containers shall be opened and mixed. From each selected container, about 600 g of biscuits shall be taken from different packets/portions. This quantity of 600 g shall be, after proper mixing, divided into two equal parts of 300 g biscuits each. The first part of 300 g shall be divided into three equal parts of 100 g each. One of them shall be for the purchaser, another for the vendor and the third for the referee. These biscuits shall be packed in air tight dry containers and labelled with the particulars as given in **3.4.** Each of these containers of 100 g shall constitute individual test sample. These individual test samples shall be separated into three identical sets of test samples in such a way that each set has a sample representing each selected container.

**5.2.2.2** The second part of 300 g shall be suitably powdered and divided into two equal parts of 150 g each. While powdering the biscuits, the following precautions shall be observed:

a) A sample of plain biscuits shall be ground as quickly as possible.

b) The cream, chocolate, jam, jelly of any other filling between biscuits should be removed by gently scrapping before powdering the sample.

c) As far as possible, the coating and fillings should be removed before powdering the biscuits.

d) As the biscuits are highly hygroscopic, the preparation of the sample should be done very quickly, preferably in a closed and dry place.

**5.2.2.3** Out of these two portions of 150 g each, the first portion shall be divided into three equal parts of 50 g each. These parts shall be transferred immediately to clean, air tight and dry containers which are then scaled and labelled with the particulars as given in **3.4**. Each of these sample containers of 50 g shall constitute individual test sample to be tested for moisture. These individual moistures shall be separated into identical sets of test samples in such a way that each set has a sample representing each the purchaser, another for the vendor, and the third for the referee.

**5.2.2.4** Out of the second portion of 150 g, approximately equal quantity of material shall be taken from each container selected from the lot. It shall be thoroughly mixed so as to constitute the composite sample of not less than 450 g. This shall be divided into three equal parts. These parts shall be transferred to clean, air tight and dry containers which are then sealed and labelled with all the particulars given in **3.4**. One of them shall be for the purchaser, another for the vendor and the third for the referee.

**5.2.2.5** Referee samples shall consist of a set of individual test samples (*see* **5.2.2.1**), a set of individual moisture samples (*see* **5.2.2.3**) and the composite sample (*see* **5.2.2.4**) and shall bear the seals of the purchaser and the vendor. These shall be kept at a place agreed to between the two so as to be used in case of a dispute.

**5.2.3** *Number of Tests and Criteria for Conformity*

**5.2.3.1** The general requirements shall be tested on each of the individual test samples (*see* **5.2.2.1**).

**5.2.3.2** The moisture content shall be tested on individual moisture samples (*see* **5.2.2.3**)

**5.2.3.3** Tests for the determination of remaining characteristics, such as, acid insoluble ash and acidity of extracted fat shall be conducted on the composite sample (*see* **5.2.2.4**).

**5.2.3.4** The lot shall be declared as conforming to the requirements of the relevant material specification if all the test results on individual and composite samples meet the relevant specification requirements.

**5.3** **Group II Breads and Buns**

**5.3.1** *Scale of Sampling*

**5.3.1*.*1***Lot* — All the loaves of bread/buns, in a single consignment, of the same type and belonging to the same batch of manufacture, not exceeding 10 000 loaves shall constitute a lot.

**5.3.1.2** For ascertaining conformity of the material to the requirements of the relevant material specification, samples shall be tested from each lot separately.

**5.3.1.3** The number of loaves of breads/buns to be tested froma lot shall depend on the size of the lot as given in col (1) and shall be in accordance with col (2) and (3) of Table 2.

**5.3.1.4** The loaves/buns shall be selected from the lot at random in order to ensure the randomness of selection procedures of simple random sampling or systematic sampling as given in IS 4905 may be followed.

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**Table 2 Number of Loaves of Breads/Buns to be Selected**

(*Clauses*5.3.1.3, 5.3.1.5, 5.3.2.1 *and* 5.3.2.2)

|  |  |  |
| --- | --- | --- |
| **Number of Loaves**  **in the Lot** | **Sample Size** | |
|  |  | |
|  | For Visual,  Volume/Mass  Ratio and Mass | Chemical  Analysis |
|  | n1 | n2 |
| (1) | (2) | (3) |
| Up to 1 000 | 5 | 3 |
| 1 001 to 3 000 | 8 | 3 |
| 3 001 to 5 000 | 13 | 6 |
| 5 001 to 10 000 | 20 | 9 |

**5.3.1.5** The number of loaves/buns given under co1 (2)and (3) of Table 2 combined together (that is n1+n2) shall be selected at random from a lot and then randomly divided into two groups so that the number of loaves/buns given in co1 (2) and (3) are obtained separately.

**5.3.2** *Test Samples and Referee Samples*

**5.3.2.1**Loaves buns selected according to **5.3.1.3** as given under co1 (2) of Table 2 shall constitute test samples for visual examination, volume/mass ratio and mass.

**5.3.2.2** For each of the loaves/buns selected from the lot according to co1 (3) of Table 2, the individual sample for testing total solid content and crude fibre shall be prepared according to the procedure given in **5.3.2.3** and **5.3.2.4**.

**5.3.2.3** In case of loaves/buns weighing up to 400 g, the contents shall be cut into small pieces with the help of a clean, dry scissor or a sharp edged knife and further ground in an electrically driven dry blender, taking care that sample temperature does not rise above 45 °C in the entire operation. From this, the quantity of material required for testing total solid content and crude fibre shall be taken so as to constitute the individual sample.

**5.3.2.4** The loaves/buns of over 400 g shall be sliced uniformly into thin pieces with the help of a sharp edged knife and then two slices from the centre and two from each end shall be taken, leaving the outermost end slices. Afterwards the procedure as prescribed in **5.3.2.3** shall be followed.

**5.3.2.5** The remainder of the material for each sample loaf/bun (*see* **5.3.2.3** and **5.3.2.4**) selected from a lot shall be mixed together so as to constitute the composite sample which shall be sufficient to carry out the tests for remaining requirements, such as, *p*H and acid insoluble ash as given in the specification.

**5.3.3** *Number of Tests*

**5.3.3.1** All the samples of loaves of breads/buns (*see* **5.3.2.1**) shall be inspected for visual requirements, mass and volume/mass ratio as given in the relevant material specification.

**5.3.3.2** Tests for the determination of total solid content and crude fibre shall be conducted individually on each of the sample loaves (*see* **5.3.2.2**).

**5.3.3.3** Tests for remaining requirements such as *p*H and acid insoluble ash as given in the relevant material specification shall be conducted on the composite sample (*see* **5.3.2.5**).

**5.3.4** *Criteria for Conformity*

The lotshall be declared as conforming to the requirements of the relevant material specification, if the following are satisfied.

**5.3.4.1** For the requirements tested on individual samples according to **5.3.2.1**, test results for each of the requirements satisfy the corresponding specification requirements.

**5.3.4.2** For total solid content and crude fibre, each of the test results on sample loaves obtained according to **5.3.2.2** shall meet the corresponding specification requirements.

**5.3.4.3** For remaining requirements such as *p*H and acid insoluble ash, all the test results on the composite sample shall meet the relevant specification requirements.

**5.4 Group III Cakes**

**5.4.1** *Scale of Sampling*

**5.4.1.1** *Lot* — All the cakes, in a single consignment, or the same type and belonging to the same batch of manufacture shall constitute a lot.

**5.4.1.2** For ascertaining conformity of the material to the requirements of the relevant material specification, samples shall be tested from each lot separately.

**5.4.1.3** The number of cakes to be tested from a lot shall depend on the size of the lot as given in co1 (1) and shall be in accordance with co1 (2) and (3) of Table 3.

**Table 3 Number of Cakes to be Selected**

(*Clauses* 5.4.1.3 and 5.4.2.2

|  |  |  |
| --- | --- | --- |
| **Number of Cakes**  **in the Lot** | **Sample Size** | |
|  |  | |
|  | For Visual  and Mass | Chemical  Analysis |
| N | n1 | n2 |
| (1) | (2) | (3) |
| Up to 1 000 | 5 | 3 |
| 1 001 to 3 000 | 8 | 3 |
| 3 001 to 5 000 | 13 | 6 |
| 5 001 to 10 000 | 20 | 9 |

**5.4.1.4** The cakes shall be selected from the lot at random. In order to ensure the randomness of selection, procedures of simple random sampling or systematic sampling as given in IS 4905 may be followed.

**5.4.1.5** The number of cakes given under co1 (2) and (3) combined together (that is n1+n2) shall be selected at random from a lot and then randomly divided into two groups so that the number of cakes given in co1 (2) and (3) are obtained separately.

**5.4.2** *Test Samples and Samples*

**5.4.2.1** The cakes selected from the lot according to **5.4.1.3** as given under co1 (2) of Table 2 shall constitute test samples for visual requirements and mass.

**5.4.2.2** For each of the cakes selected from the lot according to co1 (3) of Table 3, the individual sample for testing moisture content shall be prepared according to the procedure given in **5.4.2.3** and **5.4.2.4.**

**5.4.2.3** In case of cakes weighing up to 400 g, the contents shall be cut into small piece with the help of a clean, dry scissor or a sharp edged knife and further ground in an electrically driven dry blender, taking care that sample temperature does not rise above 45 °C in the entire operation. From this, the quantity of material required for testing moisture content shall be taken so as to constitute the individual moisture sample.

**5.4.2.4** The cakes of over 400 g shall be sliced uniformity into thin pieces with the help of a sharp edged knife and then two slices from the centre and two from each end shall be taken, leaving the outermost end slices. Afterwards the procedure as prescribed in **5.4.2.3** shall be followed.

**5.4.2.5** The remainder of the material for each sample cake (*see* **5.4.2.3** and **5.4.2.4**) selected from a lot shall be mixed together so as to constitute the composite sample which shall be sufficient to carry out the tests for remaining requirements such as acidity of extracted fat and acid insoluble ash, as given in the specification.

**5.4.3** *Number of Tests*

**5.4.3.1** All the test samples of cakes (*see* **5.4.2.1**) shall be examined for visual requirements and mass as given in the relevant specification.

**5.4.3.2** The Moisture content shall be tested on each of the individual moisture sample (*see* **5.4.2.2**).

**5.4.3.3** Tests for remaining requirements such as acidity of extracted fat and acid insoluble ash shall be conducted on the composite sample (*see* **5.4.2.5**).

**5.4.4** *Criteria for Conformity*

The lot shall be declared as conforming to the requirements of the relevant material specification, if the following are satisfied.

**5.4.4.1** For visual requirements and mass, the test results on samples according to **5.4.2.1** shall meet the corresponding specification requirements.

**5.4.4.2** For moisture content, each of the test results on individual moisture sample obtained according to **5.4.2.2** shall meet the corresponding specification requirement.

**5.4.4.3** For remaining requirements such as acidity to extracted fat and acid insoluble ash all the test results on the composite sample shall meet the relevant specification requirements.