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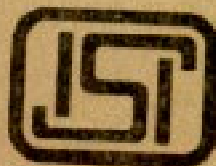
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METHODS FOR
SAMPLING OF HELMETS

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Indian Standard

METHODS FOR SAMPLING OF HELMETS

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Indian Standard

METHODS FOR SAMPLING OF HELMETS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 November 1980, after the draft finalized by the Building Materials and Components Sampling Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Helmets are being increasingly used for personal protection by scooter and motorcycle riders, industrial workers, firemen, police force and persons engaged in civil defence. The production of various types of helmets has considerably increased in the country and is expected to go up still further in view of statutory compulsion for their use being gradually enforced by the respective administrative authorities. It has, therefore, been felt necessary to formulate rational and economical sampling procedures for the proper and objective evaluation of the quality of helmets. Such sampling procedure may also help in the healthy development and expansion of the helmet manufacturing industry besides providing adequate protection to the users of helmets.

0.2.1 Proper quality control during production would also substantially reduce the quality fluctuations of the ultimate products. The procedures recommended in this standard, therefore, include the provision for both process control and lot inspection.

0.3 This standard is a necessary adjunct to the following Indian Standard specifications:

IS : 2745-1969 Firemen's helmets (*first revision*)

IS : 2925-1975 Industrial safety helmets (*first revision*)

IS : 4151-1976 Protective helmet for scooter and motorcycle riders
(*first revision*)

IS : 9562-1980 Non-metal helmet for police force

0.4 In reporting the results of a test or analysis, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes methods of sampling and criteria for conformity for various types of helmets. Broad guidelines with regard to process control to be exercised during manufacture have also been indicated.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

2.1 Item — The ultimate unit of product on which inspection will be performed.

2.2 Defective — The item, the quality of which does not meet the specified requirements.

2.3 Lot — A collection of items of the same type, pattern, shape, size, etc, produced under relatively uniform conditions of manufacture.

2.4 Sample — A group of items drawn from a lot for inspection.

2.5 Single Sampling — A type of sampling inspection in which the decision to accept or reject the lot is based on the inspection of single sample.

2.6 Double Sampling — A type of sampling inspection in which the inspection of the first sample leads to a decision to accept the lot, to reject it or to take a second sample and the inspection of the second sample when required, always leads to a decision to accept or reject the lot.

2.7 Acceptance Number — The maximum number of defectives permissible in the sample for acceptance of the lot.

2.8 Rejection Number — The minimum number of defectives in the sample for rejection of the lot.

3. PROCESS CONTROL

3.1 The object of inspection of helmets by the purchasers is to ensure their conformity to the specified requirements whereas, inspection done by the manufacturers during production is to ensure uniformity and to reduce quality fluctuations in their production to the minimum. For process control, the manufacturer may take representative sample of the product at regular intervals to control the quality fluctuations. The

following inspection levels may serve as a guide for routine control over the manufacturing process:

<i>Characteristics/Tests</i>	<i>Frequency of Inspection/Tests</i>
i) Visual inspection of moulds before their use	Every mould
ii) Visual inspection, shape and weight of raw shells	Five every hour for machine moulding otherwise ten every hour
iii) Visual inspection for workmanship, finish and weight of finished shells before assembling	Five every hour
iv) Visual inspection, workmanship and finish of assembled helmets	Every helmet
v) Weight of finished helmets	Two every hour
vi) Head clearance/depth of fit, attachment for chin strap, strength of retention system, flexibility of peak, test for brim, ventilation gap as applicable	Five per day
vii) Peripheral vision, extent of protection penetration resistance, flammability resistance, electrical resistance, heat resistance, corrosion resistance, water absorption, as applicable	One per week
viii) Rigidity	One per month and on resumption of production after a long stoppage
ix) Shock absorption and firing if applicable	Once in three months and on resumption of production after stoppage

3.2 The basic raw materials used in the manufacture of helmets shall conform to the requirements laid down in the relevant Indian Standard specifications, if any. Obtaining necessary test certificate from suppliers with each consignment of the material and performing random check-tests independently on receipt of supplies of raw materials, may be helpful in ensuring the quality of the raw materials.

3.3 For effective process control, the use of Statistical Quality Control techniques is recommended. Helpful guidance may be obtained in this respect from IS : 397 (Part I)-1972* and IS : 397 (Part II)-1975†.

3.3.1 The inspection data or the results of tests done at the place of manufacture during process control may be made available along with the items supplied to enable the purchaser to judge the acceptability of the lot.

3.4 When it is not possible to make such information available to the purchaser or when the purchaser so desires, procedure laid down in 4 shall be followed for judging the conformity of the lot of the helmets to the requirements of the relevant Indian Standard specifications.

4. LOT INSPECTION

4.1 Each lot of helmets constituted in accordance with 2.3 shall be taken up separately for judging its conformity to the requirements of the relevant Indian Standard specification.

4.2 The number of sample helmets to be selected from a lot shall depend upon the size of the lot and shall be in accordance with 4.4, 4.5 and 4.6.

4.3 The sample helmets from a lot shall be chosen at random in accordance with the random sampling procedures laid down in IS : 4905-1968‡.

4.4 Scale of Sampling and Criteria for Conformity for Requirements of Materials, Size, Construction, Workmanship and Finish — The number of sample helmets to be selected from a lot for the inspection in respect of each of these requirements, shall be in accordance with col 1 and 3 of Table 1 on the basis of a double sampling plan.

4.4.1 Initially, the first sample shall be selected from the lot at random. Each helmet in the first sample shall then be inspected for the requirements of material, size, construction, workmanship and finish. The lot shall be declared as acceptable if the number of defectives in respect of these requirements in the first sample is less than or equal to the acceptance number given in col 5 of Table 1 corresponding to the first sample and shall be rejected if it is greater than or equal to the rejection number given in col 6 of Table 1 corresponding to the first

*Methods for statistical quality control during production: Part I Control charts for variables (*first revision*).

†Methods for statistical quality control during production: Part II Control charts for attributes and count of defects (*first revision*).

‡Methods for random sampling.

sample. If the number of defectives in the first sample lies between these acceptance and rejection numbers corresponding to the first sample, the second sample of the same size as the first sample shall be selected at random from the lot and inspected for the requirements. If the number of defectives in the combined samples is less than or equal to the acceptance number given in col 5 of Table 1 corresponding to the second sample, the lot shall be declared as acceptable, otherwise it shall be rejected.

TABLE 1 SCALE OF SAMPLING FOR MATERIAL, SIZE, CONSTRUCTION WORKMANSHIP AND FINISH

(Clause 4.4)

LOT SIZE	SAMPLE	SAMPLE SIZE	CUMULATIVE SAMPLE SIZE	ACCEPTANCE NUMBER	REJECTION NUMBER
(1)	(2)	(3)	(4)	(5)	(6)
Up to 50	First	8	8	0	2
	Second	8	16	1	2
51 ,, 100	First	13	13	0	2
	Second	13	26	1	2
101 ,, 300	First	20	20	0	3
	Second	20	40	3	4
301 ,, 500	First	32	32	1	4
	Second	32	64	4	5
501 and above	First	50	50	2	5
	Second	50	100	6	7

4.5 Scale of Sampling and Criteria for Conformity for Requirements of Weight, Peripheral, Vision Extent of Protection, Strength of Retention System, Head Clearance, Depth of Fit, Attachment of Chin Strap, Lamp Bracket, Cable Clip, Ventilation Gap, Flexibility of Peak and Brim Test — The number of helmets to be inspected from the lot for each of these requirements as applicable shall be in accordance with col 1 and 2 of Table 2. These helmets shall be selected at random from those which have been inspected and found satisfactory in 4.4.1.

4.5.1 Each of the helmets selected in 4.5 in accordance with Table 2 shall be examined for each of these requirements as specified in the relevant standard. The test for retention system may be performed in the end. The lot shall be declared to conform to the requirement in respect of which all the sample helmets are found satisfactory otherwise the lot shall be declared as non-conforming and shall be rejected.

**TABLE 2 SCALE OF SAMPLING FOR REQUIREMENTS
OF WEIGHT PERIPHERAL VISION, ETC**

(Clause 4.5)

LOT SIZE	SAMPLE SIZE
(1)	(2)
Up to 100	2
101 „ 300	3
301 „ 500	5
501 and above	8

4.6 Scale of Sampling and Criteria for Conformity for the Requirement of Shock Absorption, Rigidity, Penetration Resistance, Corrosion Resistance, Heat Resistance, Flammability Resistance, Electrical Resistance, Firing Test and Water Absorption — The number of helmets to be selected for tests in respect of these requirements shall be in accordance with 4.6.1, 4.6.2 or 4.6.3 whichever is applicable. They shall be selected at random from the helmets already inspected and found satisfactory in 4.4.1.

4.6.1 For lots containing up to 25 helmets, the purchaser if he so desires may test one sample each for any or all of these requirements as in 4.6.2.

4.6.2 For a lot containing 26 to 500 helmets, one test shall be carried out for each of these requirements as applicable. The number of sample helmets to be used for this purpose can be minimized by adopting the sequence of tests to be performed on the sample helmets as recommended in Table 3. The lot shall be considered to be in conformity with respect to a requirement if the test result for that requirement is found to be satisfactory; otherwise the lot shall be declared as non-conforming and rejected.

4.6.3 For lots containing more than 500 helmets, each test listed in 4.6.2 shall be performed in duplicate. The lot shall be considered to be in conformity with the requirement if both the test results for that requirement are found to be satisfactory, otherwise the lot shall be declared as non-conforming and be rejected.

TABLE 3 TESTING SEQUENCE

(Clause 4.6.2)

SERIAL NUMBER OF SAMPLE HELMET	THE TEST OR THE SEQUENCE OF TESTS TO BE MADE ON THE SAMPLE HELMET
1	Shock absorption test in condition (a)* ↓ Heat-resistance test ↓ Flammability resistance test
2	Shock absorption test in condition (b)* ↓ Electrical resistance test ↓ Corrosion resistance test
3	Shock absorption test in condition (c)* ↓ Water absorption test
4	Plate test for penetration resistance
5	Plumb-bob test for penetration resistance
6	Rigidity test along transverse axis ↓ Firing test for sides
7	Rigidity test along longitudinal axis ↓ Firing test for front and back

*Shock absorption test is conducted in the following conditions:

- a) A temperature of $50 \pm 5^{\circ}\text{C}$ for four hours in an oven,
- b) A temperature of $-10 \pm 2^{\circ}\text{C}$ for four hours in a refrigerator, and
- c) Water flowing over the whole outer surface of the shell at room temperature for four hours at a rate of one litre per minute.