

**MINISTRY OF CONSUMER AFFAIRS, FOOD AND  
PUBLIC DISTRIBUTION**

(DEPARTMENT OF CONSUMER AFFAIRS)

**NOTIFICATION**

New Delhi, the 7th February 2011

**G.S.R. 71(E).**— In exercise of the powers conferred by sub-section (1) read with clauses (c), (f), (h), (i) and (s) of sub-section (2) of section 52 of The Legal Metrology Act 2009, (1 of 2010), the Central Government hereby makes the following rules, namely

**CHAPTER I**

**PRELIMINARY**

**1. Short title and commencement**

(1) These rules may be called the Legal Metrology (General) Rules, 2011.

(2) They shall come into force on the 1<sup>st</sup> day of April, 2011.

**2. Definitions**

In these rules, unless the context otherwise requires,—

- (a) "Act" means the Legal Metrology Act, 2009 (1 of 2010);
- (b) "Schedule" means a Schedule appended to these rules;
- (c) "Section" means a Section of the Act;
- (d) words and expressions used in these rules and not defined but defined in the Act shall have the meanings respectively assigned to them in the Act.

**CHAPTER II**

**SPECIFICATIONS OF STANDARDS OF WEIGHTS AND  
MEASURES**

**3. Reference standards**

(1) Every reference standard weight shall conform, as regards denomination, material used in construction, and design, to the specifications laid down in Part I of First Schedule.

(2) The maximum permissible error in respect of any reference standard weight, on verification or re-verification after adjustment, shall be such as is specified in Part I of First Schedule.

(3) Every reference standard metre bar shall conform, as regards material used in construction, and design, to the specifications laid down in Part II of First Schedule.

(4) The maximum permissible error in respect of any reference standard metre bar, on verification or re-verification, shall be such as is specified in Part II of First Schedule.

**4. Secondary standards**

(1) Every secondary standard weight shall conform, as regards denomination, material used in construction, and design, to the specifications laid down in Part I of Second Schedule.

(2) The maximum permissible error in respect of any secondary standard weight, on verification or re-verification after adjustment, shall be such as is specified in Part I of Second Schedule.

(3) Every secondary standard metre bar shall conform, as regards material used in construction, and design, to the specifications laid down in Part II of Second Schedule.

(4) The maximum permissible error in respect of any secondary standard metre bar, on verification or re-verification, shall be such as is specified in Part II of Second Schedule.

(5) Every secondary standard capacity measure shall conform, as regards denomination, material used in construction, and design, to the specifications laid down in Part III of Second Schedule.

(6) The maximum permissible error in respect of any secondary standard capacity measure, on verification or re-verification after adjustment, shall be such as is specified in Part III of Second Schedule.

**5. Working standards**

(1) Every working standard weight shall conform, as regards denomination, material used in construction, and design, to the specifications laid down in Part I of Third Schedule.

(2) The maximum permissible error in respect of any working standard weight, on verification or re-verification after adjustment, shall be such as is specified in Part I of Third Schedule.

(3) Every working standard metre bar shall conform, as regards material used in construction, and design, to the specifications laid down in Part II of Third Schedule.

(4) The maximum permissible error in respect of any working standard metre bar, on verification or re-verification, shall be such as is specified in Part II of Third Schedule.

(5) Every working standard capacity measure shall conform, as regards denomination, material used in construction, and design, to the specifications laid down in Part III of Third Schedule.

(6) The maximum permissible error in respect of any working standard capacity measure, on verification or re-verification after adjustment, shall be such as is specified in Part III of Third Schedule.

#### **6. Power to specify any other reference, secondary or working standard**

(1) Any other reference standard, or secondary standard, or working standard shall conform as regards the denomination, material used in construction, and design, to such specifications as the Central Government may, from time to time, by notification, specify.

(2) The maximum permissible error in relation to such other reference standard, or secondary standard, or working standard shall be such as the Central Government may, from time to time, by notification, specify and different maximum permissible errors may be specified in relation to different types of reference standards, or secondary standards, or working standards.

### **CHAPTER III**

#### **SPECIFICATIONS OF STANDARD EQUIPMENT**

#### **7. Reference standard balances**

(1) A set of reference standard balances shall be maintained at every place where the reference standard weights are kept for the purpose of verification of secondary standards.

(2) The number, types and specifications of such balances shall be as are specified in Part I of Fourth Schedule.

(3) Every reference standard balance shall be verified at least once in six months and shall be adjusted, if necessary, to make it correct within the limits of sensitivity and other metrological qualities as are specified in Part I of Fourth Schedule.

#### **8. Secondary standard balances**

(1) A set of secondary standard balances shall be maintained at every place where secondary standard weights are kept for the purpose of verification of working standards.

(2) The number, types and specifications of such balances shall be as are specified in Part II of Fourth Schedule.

(3) Every secondary standard balance shall be verified at least once in one year and shall be adjusted, if necessary, to make it correct within the limits of sensitivity and other metrological qualities as are specified in Part II of Fourth Schedule.

#### **9. Working standard balances**

(1) A set of working standard balances shall be maintained at every place where working standard

weights are kept for the purpose of verification of weights intended to be used for transaction or protection.

(2) The number, types and specifications of such balances shall be as are laid down in Part III of Fourth Schedule.

(3) Every working standard balance shall be verified at least once in a year and shall be adjusted, if necessary, to make it correct within the limits of sensitivity and other metrological qualities as are specified in Part III of Fourth Schedule.

#### **10. Power to specify the standard equipment**

The Central Government may, by notification, specify such other standard equipment as it may think necessary to carry out the provisions of the Act and every such standard equipment shall conform, as regards the metrological qualities, to such specifications as the Central Government may, in the same notification or subsequent notification, specify.

### **CHAPTER IV**

#### **WEIGHTS OR MEASURES AND WEIGHING AND MEASURING INSTRUMENTS**

#### **11. Weights**

(1) Save as otherwise provided in these rules, every weight used or intended to be used—

- (a) in any transaction, or
- (b) for protection,

shall conform, as regards physical characteristics, configuration, constructional details, materials, performance, tolerances and such other details, to the corresponding specifications laid down for such weight in Fifth Schedule.

(2) The maximum permissible error in respect of such weight shall be such as is specified in Fifth Schedule.

(3) Nothing in this rule shall apply to the product of an industry which is required, by or under any law for the time being in force, to conform to any other specifications with regard to the matters specified in sub-rule (1) or sub-rule (2), if, under such law, the product is required to conform to the specifications laid down by the International Organisation of Legal Metrology with regard to the matters aforesaid.

#### **12. Measures (other than measuring instruments)**

(1) Every measure used or intended to be used for—

- (a) any transaction, or
- (b) protection,

shall conform, as regards physical characteristics, configuration, constructional details, materials, performance, tolerances and such other details, to the corresponding specifications laid down for such measure in Sixth Schedule.

(2) The maximum permissible error in such measure shall be such as is specified in the corresponding specifications laid down for such measure in Sixth Schedule.

### 13. Weighing and measuring instruments

(1) Every weighing instrument used or intended to be used—

- (a) in any transaction, or
- (b) for protection,

shall conform, as regards physical characteristics, configuration, constructional details, materials, performance, tolerances and such other details, to the corresponding specifications laid down for such weighing instrument in Seventh Schedule:

(2) Every measuring instrument used or intended to be used—

- (a) in any transaction, or
- (b) for protection,

shall conform, as regards physical characteristics, configuration, constructional details, materials, performance, tolerances and such other details, to the corresponding specifications laid down for such measuring instrument in Eighth Schedule.

(3) The maximum permissible error on such weighing or measuring instrument shall be such as is specified in the corresponding specifications laid down for such weighing or measuring instrument in Seventh Schedule or as the case may be in Eighth Schedule.

### 14. Procedure for carrying out calibration of vehicle tanks, etc.

The procedure for carrying out calibration of vehicle tanks, etc. shall be as is specified in Ninth Schedule.

## CHAPTER V

### IMPORT OF WEIGHTS AND MEASURES

#### 15. Registration of Importer

(1) Every manufacturer or dealer of weight or measure who intends to import any weight or measure shall apply to the Director, through the Controller of the State in which he carries on such business, for registration of his name as importer in the form specified in Tenth Schedule.

(2) Every application received by the Controller under sub-rule (1) shall be forwarded by him to the Director with a report as to the antecedents and technical capabilities of the applicant.

(3) Nothing in this rule shall take away or abridge the right of any person referred to in sub-rule (2) to carry on the business of importing of any weight or measure until he has been informed by the Director in writing that he cannot be registered as an importer, and on receipt of such letter he shall stop forthwith the import of any weight or measure:

PROVIDED that registration of a person carrying on, at the commencement of these rules, the business of importing weights or measures shall not be refused except after giving him a reasonable opportunity of showing cause against the proposed action.

(4) Every application for the registration of an importer shall be submitted to the Director, in the manner aforesaid, together with the fee specified in Twelfth Schedule, at least one month before the date on which import is proposed to be made.

(5) The registration of a person as an importer shall remain effective for a period of five years from the date of such registration.

(6) On the expiry of the period of registration as an importer, the Director may, on the application of the registered importer and on payment of the prescribed fee, renew registration for a like period.

(7) The registration or renewal of the registration of a person as an importer may be suspended or revoked before the expiry of the period of validity thereof, if the Director is satisfied after an inquiry, and after giving to the person concerned a reasonable opportunity of being heard, that any statement made by such person in the application for registration or renewal of registration was false or incorrect in material particulars or that such person has contravened any provision of the Act or rules made there under or any term or condition of such registration.

#### 16. Conditions, etc. for manufacture of a weight or measure exclusively for export

(1) The provisions of this rule shall apply to weights or measures which are made or manufactured exclusively for the purpose of export.

(2) No non-standard weight or measure shall be made or manufactured by any person unless he has obtained the previous permission from the Central Government.

(3) Every person intending to manufacture any non-standard weight or measure for the purpose of export shall make an application for permission to the Central Government on payment of a fee of rupees five hundred for such permission authorising him to manufacture such weight or measure and shall in such application indicate—

- (a) his name and full address;
- (b) location of the factory in which such weight or measure is proposed to be manufactured;
- (c) description of weight or measure proposed to be manufactured;
- (d) documentary or other evidence indicating the existence of a firm contract for the export aforesaid or where there is no such firm contract for export, documentary or other evidence indicating that there is likely to be a demand for the export of non-standard weight or measure.

(4) The Central Government shall, if it is satisfied from the documentary or other evidence produced by the applicant or otherwise that the applicant intends to manufacture non-standard weight or measure for export, grant the permission authorising him to manufacture such weight or measure:

Provided that the Central Government may, if it is satisfied that the applicant has contravened any of terms and conditions of the permission or that weights or measures manufactured by the applicant have found their way into the Indian market or that the applicant had made any statement in his application for the permission which is false in material particulars or he had concealed some material particulars, cancel the permission:

Provided Further that no permission shall be cancelled except after giving to the applicant a reasonable opportunity of showing cause against the proposed action.

(5) Every permission granted under sub-rule (4) shall remain valid for a period of one year and shall be renewed for a like period on payment of a like fee unless the Central Government is satisfied that the applicant has made any statement in his application which is false in material particulars or that he had concealed some material particulars or had contravened any provision of the Act or any rule made there under:

Provided that no order for the refusal to renew a licence shall be made by the Central Government except after giving the applicant a reasonable opportunity of showing cause against the proposed action.

(6) Every person who is granted permission under this rule shall submit to the Central Government, at the end of the calendar year, a statement as to the quantity of the non-standard weights and measures exported by him and the particulars of the person to whom such export has been made.

### **17. Prohibition on sale of non-standard weight or measure within the country**

No non-standard weight or measure made or manufactured exclusively for export shall be sold or otherwise distributed within the territory of India.

### **18. Maintenance of record in relation to non-standard weight or measure**

Every person who makes or manufactures any non-standard weight or measure for export shall maintain a monthly record of the number of such non-standard weights or measures manufactured by him, number of weights or measures already exported by him, and number of weights or measures in stock or under production. The record so maintained shall be open to inspection by any officer authorised by the Central Government in this behalf.

### **19. Sample checking of weight and measure**

(1) Standard weights or measures which are intended for export shall not ordinarily require any verification and stamping, but if the party to whom the export is to be made so requires, a sample checking of such weight or measure shall be made by such agency as the Central Government may specify in this behalf, and thereupon the agency so specified shall, after checking the weight or measure, issue a certificate indicating whether or not such weight or measure conforms to the requirements of the Act and the rules made there under.

(2) The weight or measure to be checked as sample under this rule shall be selected at random and proper records shall be maintained with regard to the sample checking so made.

(3) The Central Government shall, while specifying the agency for checking the weight or measure, ensure that the agency completes the checking well in time so that the export of the weight or measure is not delayed by reason of such checking.

### **20. Checking of non-standard weights and measures sample which are to be exported**

(1) Non-standard weight or measure, which is made or manufactured exclusively for export, shall not ordinarily require any verification and stamping, but if the party to whom the export is to be made so requires, a sample checking of such weight or measure shall be made by such agency as the Central Government may specify in this behalf; and thereupon the agency so specified shall, after checking the weight or measure, issue a certificate indicating whether or not such weight or measure conforms to the specifications given by the party to whom the export is to be made or, where the party aforesaid has not given any specification, whether the weight or measure conforms to the specifications laid down by the manufacturer.

(2) The weight or measure to be checked as sample under this rule shall be selected at random and proper records shall be maintained with regard to the sample checking so made.

(3) The fee for checking of any non-standard weight or measure shall be—

- (i) if it is similar to any standard weight or measure, equal to the fee leviable for the verification and stamping of such standard weight or measure; and
- (ii) where such non-standard weight or measure is not similar to any standard weight or measure, the Central Government may specify such amount as fees as is commensurate with the labour involved in checking the non-standard weight or measure.

(4) The Central Government shall, while specifying the agency for checking the non-standard weight or measure, ensure that the agency completes the checking well in time so that the export of such weight or measure is not delayed by reason of such checking.

#### CHAPTER VI

##### NON-STANDARD WEIGHT OR MEASURE TO BE USED FOR SCIENTIFIC INVESTIGATION OR RESEARCH

#### 21. Permission to get manufactured non-standard weight or measure for scientific investigation or research

Where the manufacture of any non-standard weight or measure is needed exclusively for the purpose of scientific investigation or research, the person needing such non-standard weight or measure shall make an application to the Central Government for permission to get such non-standard weight or measure manufactured and on receipt of such application, if the Central Government is satisfied that the manufacture of such non-standard weight or measure is needed for the purpose aforesaid, it may authorise the applicant to get the non-standard weight or measure needed by him manufactured by such manufacturer as he may think fit, and thereupon, it shall be lawful for such manufacturer to manufacture the said non-standard weight or measure in accordance with the specifications given by the applicant.

*Explanation:* For the purpose of this rule, a non-standard weight or measure means a weight or measure which is, or is proposed to be, manufactured in accordance with any unit of weight or measure, other than standard unit of weight of measure specified by or under the Act.

#### CHAPTER VII

##### MISCELLANEOUS

#### 22. The manner of disposal of goods seized under this Act/rule

(1) Where any goods seized under sub-section (3) of Section 15 are subject to speedy or natural decay, the Director or any person authorised by him or Controller and other Legal Metrology Officers in this behalf shall have the goods weighed or measured on a verified weighing or measuring instrument available with him or near the place of seizure and enter the actual weight or measure of the goods in a form specified by the Director for this purpose and shall obtain the signature of the trader or his agent or such other person who has committed the offence. The goods in question shall, after such weighing or measuring is returned to the trader or the purchaser as the case may be:

PROVIDED that if the trader or his agent or the other person (who has committed the offence) refuses to sign the form, the Director or the person authorised by him in this behalf shall obtain the signature of not less than two persons present at the time of such refusal by the trader or his agent or other person.

(2) Where the goods seized under sub-section (1) are contained in a package and the package is false or does not conform to the provisions of the Act or any rules made there under and the goods in such package are subject to speedy or natural decay, the Director or any person authorised by him or Controller and other Legal Metrology Officers in this behalf, so far as may be, may dispose of the goods in such package in accordance with the provisions of sub-rule (1).

(3) Where the goods seized under sub-rule (1) are not subject to speedy or natural decay, the Director or any person authorised by him or Controller and other Legal Metrology Officers in this behalf may retain the package for the purpose of prosecution under this Act after giving the trader or his agent or the other person (who has committed the offence) a notice of such seizure.

#### 23. Time within which unverified weight and measure to be verified and stamped

No unverified weight or measure, seized under sub-section (3) of Section 15, shall be forfeited if the person, from whom such weight or measure was seized, agrees to get the same verified and stamped within a period of ten days or such extended period from the date of such seizure; and for this purpose, the person making the seizure of such weight or measure shall afford a reasonable opportunity by

returning such weight or measure exclusively for the verification and stamping.

#### **24. Register and reports to be maintained by persons referred to in Section 17 of the Act**

(1) Every person referred to in sub-section (1) of Section 17 shall maintain a register in the appropriate form set out in Eleventh Schedule.

(2) Notwithstanding anything contained in sub-rule (1), if the Director is of the opinion that having regard to the nature or volume of the business carried on by any maker, manufacturer, dealer or repairer, it is necessary to do so, he may, by order, exempt any such maker, manufacturer, dealer or repairer from the operation of that sub-rule.

#### **25. Scale of fee**

The scale of fees to be collected for the service specified in column (2) of Twelfth Schedule shall be at the rate specified in column 3 of the said Schedule.

#### **26. Use of regional languages**

Any legend or denomination specified in any Schedule to these rules, which is required to be indicated on any weight or measure in English, or in Devanagri script, may also be indicated (in addition to English or Devanagri) on such weight or measure in such regional language as the manufacturer may consider to be practicable.

#### **27. Periodical verification of weights or measures—**

(1) Every weight or measure used or intended to be used in any transaction or for protection of living beings or things in clause (k) of Section 2 shall be verified and stamped by the Legal Metrology Officer in the State in which such weight or measure is put to use and shall be re-verified and stamped at periodical intervals.

(2) The re-verification shall be carried out on the completion of a period of,—

- (a) twenty four months for all weights, capacity measures, length measures, tape, beam scale and counter machine,
- (b) sixty months for storage tanks, and
- (c) twelve months for all weight or measure including tank lorry other than that mentioned in clauses (a) & (b).

(3) Notwithstanding anything contained in sub-rule (2) every weight or measure which has been verified and stamped in situ shall, if it is dismantled and re-installed before the date on which the verification falls due shall be duly re-verified and stamped, before being put into use.

(4) Notwithstanding anything contained in sub-rule (1) every weight or measure which has been verified and stamped shall, if it is repaired before the date on which the verification falls due shall be duly re-verified and stamped before being put into use.

#### **28. Qualifications of Legal Metrology Officer**

(1) No person shall be appointed as Legal Metrology Officer unless he —

- (a) is a graduate of a recognized university in Science (with physics as one of the subjects), technology or engineering or holds a recognized diploma in engineering with three years professional experience; and
- (b) is able to speak, read and write the regional language of the State.

(2) Nothing in sub-rule (1) shall apply to officials who have been working as Legal Metrology Officer and are also eligible for promotion to the next higher grade of Legal Metrology Officer on the date of commencement of these rules.

(3) The person appointed to the post of Legal Metrology Officer shall have to successfully complete the basic training course at the Indian Institute of Legal Metrology, Ranchi before his posting.

(4) The Central Government may, in consideration of the practical difficulties faced by the State Government and on its recommendation, relax the qualification specified in sub-rule (1) for the post of legal Metrology Officers for that State.

#### **29. Nomination of Director by a Company under the Act**

Every company shall inform the Director (Legal Metrology) or the concerned Controller or his authorized officer, by notice in duplicate, in the format specified in Thirteenth Schedule containing the name and address of its Director after obtaining his consent in writing, who has been nominated by the company under sub-section (2) of Section 49 to be in-charge of and be responsible for the conduct of business of the company or any establishment, branch or unit thereof.

#### **30. Repeal and savings**

(1) The Standards of Weights and Measures (General) Rules, 1987 (herein under referred to as the said rules) are hereby repealed.

Provided that such repeal shall not affect:

- (a) the previous operations of the said rules or anything done or omitted to be done or suffered therein; or
- (b) any right, privilege, obligation or liability acquired, accrued or incurred under the said rules; or

(c) any penalty, forfeiture or punishment incurred in respect of any offence committed against the said rules; or

(d) any investigation, legal proceedings or remedy in respect of any such right, privilege, obligation, liability, penalty, forfeiture or punishment as aforesaid.

And any such investigation, legal proceedings or remedy may be instituted, continued or enforced and any such penalty, forfeiture or punishment may be imposed as if the said rules had not been rescinded.

(2) Notwithstanding such repeal anything done or any action taken or purported to have been done or taken including approval of letter, exemption granted, fees collected, any adjudication, enquiry or investigation commenced, license and registration of manufacturers, dealers, importers of weights and measures, non-standard weights and measures or show cause notice, decision, determination, approval, authorisation issued, given or done under the said rules shall if in force at the commencement of the said rules continue to be in force and have effect as if issued, given or done under the corresponding provisions of these rules.

(3) The provisions of these rules shall apply to any application made to the Central Government or as the case may be the State Government under the said rules for licence, registration of manufacturers, importers, dealers, repairers of weights and measures pending at the commencement of these rules and to any proceedings consequent thereon and to any registration granted in pursuance thereof.

(4) Any legal proceeding pending in any court under the said rules at the commencement of these rules may be continued in that court as if these rules had not been framed.

(5) Any appeal preferred to the Central Government or as the case may be the State Government under the said rules and pending shall be deemed to have been made under the corresponding provisions of these rules.

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[See Rule 3]

**PART I REFERENCE STANDARD WEIGHTS****1. Denominations**

Kilogram series	Gram series	Milligram series
(1)	(2)	(3)
5	500	500
2	200	200
2	200	200
1	100	100
	50	50
	20	20

**2. Materials**

- Weights of 5 kg to 1g shall be made from admiralty bronze (88 Cu, 10 Sn, 2 Zn), nickel chromium alloy (80 Ni, 20 Cr) or austenitic stainless steel (25 Ni, 20 Cr) or (20 Ni, 25 Cr).
- Weights of 500 mg to 10 mg shall be made from wire of either pure platinum, nickel chromium alloy (80 Ni, 20 Cr) or austenitic stainless steel (25 Ni, 20 Cr) or (20 Ni, 25 Cr).
- Weights of 5 mg to 1 mg shall be made of aluminium wire. Copper, silicon and zinc contained as impurities in aluminium shall not exceed 0.3 per cent in the aggregate.

**Note:** The material used for all the weights shall be non-magnetic and it shall be ensured that the finished weights are also practically non-magnetic.

**3. Shape and finish**

- For kilogram and gram series—  
Integral cylindrical body with knob rounded at top.
- For milligram series—  
The weights shall be made from the wire having five segments for 500, 50, 5 mg weights, two segments for 200, 20, 2 mg weights and one segment for 100, 10, and 1 mg weights. One end of the wire shall be bent at right angles for the purposes of lifting it with a pair of forceps.
- The denominations shall be marked only on kilogram and gram series weights.
- The entire surface of the weights, including their base and corners shall be free from any roughness and the surface of the weights when inspected visually shall not show any porosity and shall have a mirror finish.

**4. Maximum permissible errors**

Denomination	Permissible error $\pm$ mg
(1)	(2)
5 kg	7.5
2 kg	3.0
1 kg	1.5

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(1)	(2)
500 g	0.75
200 g	0.30
100 g	0.15
50 g	0.10
20 g	0.080
10 g	0.060
5 g	0.050
2 g	0.040
1 g	0.030
500 mg	0.025
200 mg	0.020
100 mg	0.015
50 mg	0.012
20 mg	0.010
10 mg	0.008
5 mg	0.006
2 mg	0.006
1 mg	0.006

### 5. Protective and carrying case

- These weights shall be stored in their boxes made from teakwood or any other suitable non-corrosive material with proper housing lined with chemically neutral velvet, chamois leather or soft plastic material. Wood used in such boxes shall be reasonably free from resins and volatile materials. Glue shall not be used for fixing velvet or such other material. The weights shall be housed in such a manner so as to avoid their movement during transit.
- Each milligram weight shall be provided with a separate housing. A covering glass or a sheet of any other transparent and non-reactive and non-corrosive material shall be provided so as to ensure that these weights are not dislocated during transit.
- A suitable device for lifting the kilogram and gram weights covered with chamois leather or other suitable material shall be provided. A pair of forceps capable of lifting easily milligram weights shall also be provided.

### 6. Inscription

The boxes containing the weights shall have the following inscriptions:

- The words 'Reference Standards Weights'
- The identification number of such boxes,
- The name of the manufacturer,

- The material used for weights,
  - kilogram and gram series,
  - milligram series,
- The year of manufacture,
- The verification mark of the NPL.

## PART II- REFERENCE STANDARD METRE BAR

### 1. Material

The Reference Standard Metre Bar (hereafter called metre bar) shall be manufactured from 58 per cent nickel-steel.

### 2. Shape and dimensions

- The metre bar shall be of H-section, approximately 25 mm x 25 mm (as per Figure 1)
- The overall length of the metre bar shall be  $1030 \pm 1$  mm and the graduated length shall be 1008 mm.
- Ungraduated space of 11 mm shall be left after the last graduation mark.

### 3. Finish

The graduated surface shall be bright highly polished, and free from surface irregularities in the neighbourhood of the graduation marks.

### 4. Graduations

- The main scale shall be situated on the neutral plane and shall be graduated in millimetres throughout from 0 to 1000 mm.
- The main scale shall also have one additional mm mark before 0 and another after 1000 mm mark.
- An additional fine scale shall also be provided at each end of the main scale for calibrating a micrometre microscope. This fine scale shall consist of ten 0.1 mm graduations (1 mm sub-divided into 10 parts) and shall be situated before the first graduation mark after leaving a blank space of 2 mm and also after the last mark with the same blank spacing.
- The graduation marks shall be well-defined, of symmetrical section and have clean edges.
- The width of graduation marks shall be between 8 and 10 micrometres. This width shall be constant to within ten per cent over the length of each mark between the longitudinal setting lines.
- The graduation marks shall not differ in width one from another by more than  $\pm 10\%$  of the average width of all the marks.

- (g) The graduation marks shall be parallel to one another to within one micrometre between the longitudinal setting lines.
- (h) The graduation marks shall be square to the scale axis to within ten minutes of arc.
- (i) The length of graduation marks shall be as follows :—  
 2 mm for half cm marks.  
 1 mm for mm marks.
- The marks shall be disposed equally on either side of an imaginary centre line.
- (j) The lengths of the graduation marks on the two fine scales referred to in 4(c) shall be as follows :—  
 3 mm for first and last mark.  
 2 mm for 0.5 mm marks.  
 1 mm for 0.1 mm marks.
- (k) The Bessel points shall be indicated by two vertical lines marked on either external side of the metre bar. The Bessel points shall be 571 mm apart, and shall be disposed equally on either side of the 50 mm mark.
- (l) No figures or numerals shall be marked on the surface of the main scale.
- (m) When supported at the marked Bessel points, the graduated surface shall be flat to within 0.05 mm, i.e. all points on the surface shall be between two parallel planes 0.05 mm apart.

### 5. Auxiliary scale

- (a) An auxiliary scale shall be marked on one of the top edges of the metre bar.

- (b) The auxiliary scale shall consist of 1000 marks corresponding to the marks of the main scale.
- (c) The marks of the auxiliary scale shall be collinear (i.e., passing through the same vertical planes) with the graduation marks of the main scale to within  $\pm 0.1$  mm.
- (d) The width of graduation marks shall be not more than 100 micrometres and shall be clearly visible to the naked eyes having normal vision.
- (e) The length of the graduation marks shall be :  
 2.5 mm for cm marks.  
 2.0 mm for half cm marks.  
 1.5 mm for mm marks.
- One of the ends of all the marks shall lie on a straight line.
- (f) The centimetre graduation marks shall be numbered in the increasing order of numeration.
- (g) The height of the numerals and the letters shall be approximately 3 mm.

### 6. Setting lines

- (a) A pair of longitudinal setting lines shall transverse the graduation marks and shall be parallel to the scale axis to within one minute of arc.
- (b) The two longitudinal lines shall be disposed symmetrically on either side of the centre of the graduation marks.

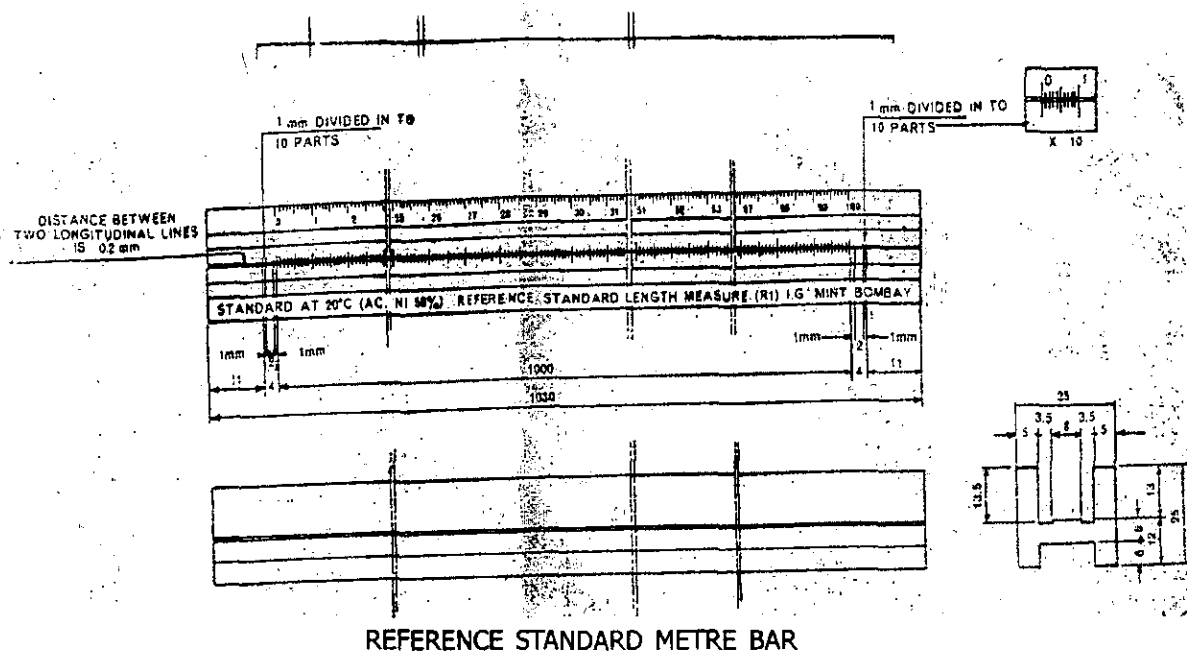


Figure-1

- (c) The separation of the longitudinal setting lines shall be 0.2 mm and their width shall be in between 8 and 10 micrometres.
- (d) Each longitudinal setting line shall be straight to within 30 micrometres.
- (e) The longitudinal setting lines shall be parallel to each other to within 50 micrometres.

### 7. Maximum permissible error

- (a) When the metre bar is supported on its marked Bessel points, the errors in length between any two graduation marks of the main scale at the temperature of 20°C, shall not exceed 0.010 mm.
- (b) In the case of the fine scales, the error between any two 0.1 mm marks shall not exceed 0.005 mm.

### 8. Inscription

The metre bar shall bear the following inscription :

- (a) the words "REFERENCE STANDARD METRE BAR",
- (b) the identification number of the metre bar,
- (c) the verification mark of the NPL, after the first calibration and marks of subsequent verification to be made on the plate of the carrying case of the metre bar,
- (d) the name of the manufacturers,
- (e) the material of the metre bar,
- (f) the words, figures and letter "STANDARD AT 20°C",
- (g) the year of manufacture.

### 9. Protective and carrying case

- (a) The standard metre bar shall be housed in a case made from suitable material and provided with a handle, lined internally with velvet, a plastic material or any other material and in such a way that the metre bar is not likely to be damaged, particularly by shocks or corrosion.
- (b) The case shall have affixed on it a plate bearing the inscription "REFERENCE STANDARD METRE BAR" and the identification number.

### SECOND SCHEDULE

#### DENOMINATIONS, MATERIALS, SHAPE AND PERMISSIBLE ERRORS

#### IN RESPECT OF SECONDARY STANDARDS

[See Rule 4

#### PART I—SECONDARY STANDARD WEIGHTS

##### 1. Denominations

Kilogram series	Gram series	Milligram series
(1)	(2)	(3)
10	500	500
5	200	200
2	200	200

(1)	(2)	(3)
2	100	100
1	50	50
	20	20
	20	20
	10	10
	5	5
	2	2
	2	2
	1	1

### 2. Materials

- (a) Weights of 10 kg to 1 g shall be made from admiralty bronze (88 Cu, 10 Sn, 2 Zn), or nickel-chromium alloy (80 Ni, 20 Cr) or austenitic stainless steel (20 Ni, 25 Cr) or (25 Ni, 20 Cr).
- (b) Weights of 500 mg to 50 mg shall be made from cupro-nickel (75 Cu, 25 Ni), or nickel chromium alloy (80 Ni, 20 Cr), or austenitic stainless steel (20 Ni, 25 Cr), or (25 Ni, 20 Cr).
- (c) Weights of 20 mg to 1 mg shall be made of aluminium sheets. Copper, silicon and zinc contained as impurities in aluminium shall not exceed 0.3 per cent in the aggregate.

### 3. Shape and finish

- (a) For kilogram and gram series—Integral cylindrical body with knob flattened at the top. Weights of 10 kilogram to 100 gram (both inclusive) shall have adjusting devices.
- (b) For milligram series—the weights shall be in the form of square sheets, one of the corners being bent at right angle.
- (c) The denominations shall be marked only on kilogram and gram series weights.
- (d) The entire surface of the weights, including their base and corners shall be free from any roughness and the surface of the weights, when inspected visually, shall not show any porosity and shall have a mirror polish appearance.

### 4. Maximum permissible error

Denomination	Permissible error $\pm$ mg
10 kg	50
5 kg	25
2 kg	10
1 kg	5
500 g	2.5
200 g	1.0
100 g	0.5
50 g	0.30

(1)	(2)	(3)
20 g		0.25
10 g		0.20
5 g		0.15
2 g		0.12
1 g		0.10
500 mg		0.08
200 mg		0.06
100 mg		0.05
50 mg		0.04
20 mg		0.03
10 mg		0.02
5 mg		0.02
2 mg		0.02
1 mg		0.02

### 5. Protective and carrying case

- These weights shall be stored in their boxes made from teakwood or any other suitable non-corrosive material with proper housing lined with chemically neutral velvet, chamois leather or soft plastic material. Wood used in such boxes shall be reasonably free from resins and volatile materials. Glue shall not be used for fixing velvet or such other material. The weights shall be housed in such a manner so as to avoid their movement during transit.
- Each milligram weight shall be provided with a separate housing. A covering glass or a sheet of any other transparent, non-reactive and non-corrosive material shall be provided so as to ensure that these weights are not dislocated during transit.
- A suitable device for lifting the kilogram and gram weights, covered with chamois leather or other suitable material, shall be provided. A pair of forceps capable of lifting easily milligram weights shall also be provided.

### 6. Inscription

The boxes containing the weights shall have the following inscriptions:—

- the words 'SECONDARY STANDARD WEIGHTS',
- the identification number of the secondary standard weights,
- the name of the manufacturer,
- the material used for weights—
  - kilogram & gram series
  - milligram series,
- the year of manufacture,
- the mark of verification.

## PART II- SECONDARY STANDARD METRE BAR

### 1. Material

The secondary standard metre bar (hereafter called metre bar) shall be manufactured from 58 per cent nickel-steel.

### 2. Shape and dimensions

- The metre bar shall have a rectangular cross-section with dimensions 30mm x 15mm approximately.
- The top surface shall have two rectangular grooves along its length (as per Figure 2).
- The overall length of the measure shall be 1030  $\pm$ 1 mm and the graduated length shall be 1010 mm.
- Ungraduated space of 10 mm shall be left after the last graduation mark.

### 3. Finish

The graduated surface shall be bright, highly polished and free from surface irregularities in the neighbourhood of the graduation mark.

### 4. Graduations

- The metre bar shall be graduated in millimetres throughout from 0 to 1000 mm.
- A length of 10 mm before the zero graduation mark shall also be graduated in millimetres.
- The scale shall be regular. The width of the graduation marks shall be between thirty and fifty micrometres.
- The width of the graduation marks shall be uniform to within  $\pm$  ten per cent of the average width of all the marks.
- Each graduation marks shall be straight to within ten micrometres over its length.
- The graduation marks shall be parallel to one another to within ten micrometres.
- The graduation marks shall be square to the scale axis to within twenty minutes of arc.
- The graduation marks representing centimetres shall be longer than those representing half centimetres and the graduation marks representing half centimetres shall be longer than those representing millimetres.
- The length of the graduation marks shall be not less than:
  - 2 mm for mm marks.
  - 3 mm for half cm marks.
  - 4 mm for cm marks.

These marks shall be disposed equally on either side of an imaginary centre line defined by the two setting lines.

- (j) There shall be two short longitudinal setting lines each of 5 mm in length which shall be drawn leaving a blank space of 2 mm, the one before the first and the other after the last graduation mark. The longitudinal lines shall be on a straight line which represent the imaginary central line and the departure from the central line shall be not more than 0.1 mm.
- (k) When supported on the Bessel points or on a flat surface the graduated surface shall be flat to within 0.05 mm, i.e. all the points on the surface shall be between two parallel planes 0.05 mm apart.

### 5. Auxiliary scale

- (a) Auxiliary scale shall be marked on one of the top edges of the metre bar.
- (b) The auxiliary scale shall consist of centimetre and half centimetre marks corresponding to the marks of the main scale.
- (c) The marks of the auxiliary scale shall be collinear (passing through the same vertical planes) with the graduations of main scale to within  $\pm 0.1$  mm.
- (d) The width of the graduation marks shall be not more than one hundred micrometres.
- (e) The graduation marks representing centimetres shall be longer than those representing half centimetres.

- (f) The length of the graduation marks shall be not less than:

3 mm for cm marks, and

2 mm for half cm marks.

One of the ends of the marks shall lie on a straight line.

- (g) The centimetre graduation marks shall be numbered in the increasing order of numeration.
- (h) The height of the numerals and the letters shall be approximately 3 mm.

### 6. Maximum permissible error

The error on the length between any two graduation marks on the secondary standard metre bar, at the standard temperature of 20°C, shall not exceed the value "e" calculated according to the following formula:

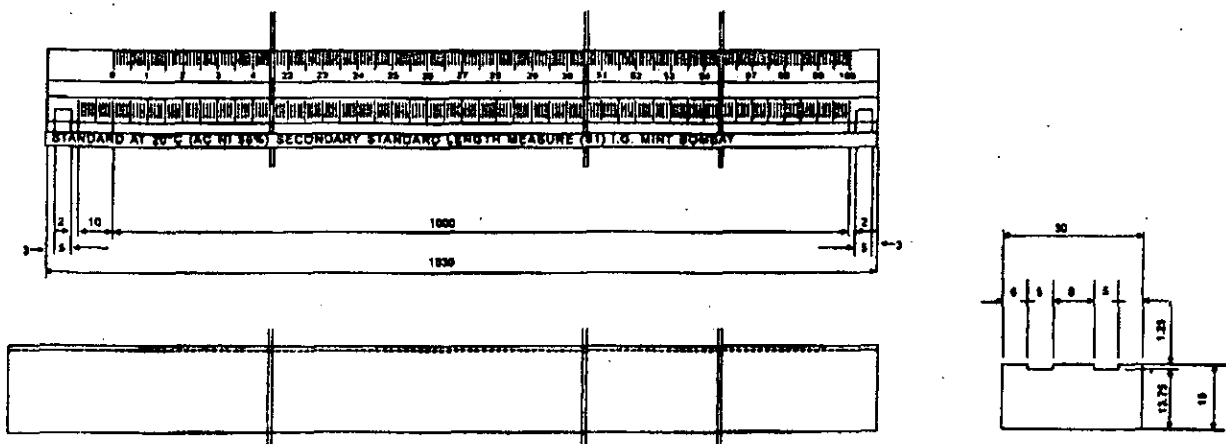
$$e = \pm (25 + L/40) \text{ micrometres}$$

Where L is the nominal length in millimetres of that part of the metre bar between the two graduation marks, the error on which is being determined. The calculated value of "e" shall be rounded to the nearest integer.

### 7. Inscription

The metre bar shall bear the following inscriptions:

- (a) the words "SECONDARY STANDARD METRE BAR",
- (b) an identification number of the secondary standard metre bar,
- (c) the name of the manufacturer,



SECONDARY STANDARD METRE BAR  
FIGURE - 2

- (d) the material of the metre bar,
- (e) the words, figures and letter "STANDARD AT 20°C",
- (f) the year of manufacture,
- (g) the mark of verification on the plate of the carrying case of the metre bar.

#### 8. Protective and carrying case

- (a) The metre bar shall be housed in a case made from suitable material and provided with a handle, lined internally with velvet, a plastic material or any other material, and in such a way that the measure is not likely to be damaged, particularly by shocks or corrosion.
- (b) The case shall have affixed on it a plate bearing the inscription "SECONDARY STANDARD METRE BAR" and the identification number.

**Note:** The existing secondary standard metre bars may differ in minor details in regard to setting lines and inscriptions, etc.

### PART III-SECONDARY STANDARD CAPACITY MEASURES

#### 1. Denominations

Litre series (l)	Millilitre series (ml)
5	500
2	200
1	100
	50
	20

**Note:** 1 litre = 1 dm<sup>3</sup> = 0.001 m<sup>3</sup>; 1 ml = 1 cm<sup>3</sup>

#### 2. Material

Secondary standard capacity measures shall be cast out of admiralty bronze of the same composition as is employed in the case of secondary standard weight.

#### 3. Shape

- (a) The secondary standard capacity measure of five litre shall be cylindrical and have its inside diameter equal to the height of the measure. This shall have two handles attached securely to its sides.
- (b) The measure of 2 l and below shall be of the same shape as above but shall not have any handles.
- (c) The denominations of the secondary standard capacity measures shall be engraved on the outside surface.
- (d) Each secondary standard capacity measure shall be provided with a specially selected striking glass on the measures and glasses shall be securely packed in velvet lined teakwood boxes.

#### 4. Maximum permissible error

Denomination	Permissible error $\pm$ ml
5 l	2
2 l	1
1 l	0.8
500 ml	0.5
200 ml	0.4
100 ml	0.3
50 ml	0.2
20 ml	0.1

#### 5. Protective and carrying cases

These capacity measures shall be stored in their boxes made from teakwood or any other suitable non-corrosive material with proper housing lined with velvet, chamols leather or soft plastic material. Wood used in such boxes shall be reasonably free from resins and volatile materials. Glue may not be used for fixing velvet or such other materials. Each capacity measure shall be housed in such a manner so as to avoid their excessive movement during transit.

Each striking glass of the capacity measure shall be securely housed in proper grooves so as to protect them from breakage during transit.

#### 6. Inscriptions

The boxes containing these capacity measures shall have the following inscriptions:—

- (a) the inscription SECONDARY STANDARD CAPACITY MEASURES;
- (b) the identification number of secondary standard capacity measures;
- (c) the name of the manufacturer;
- (d) the year of manufacture;
- (e) the mark of verification of proper verification authority.

### THIRD SCHEDULE

#### DENOMINATIONS, MATERIAL, SHAPE AND PERMISSIBLE ERRORS IN RESPECT OF WORKING STANDARDS

[See Rule 5]

#### PART I-WORKING STANDARD WEIGHTS

#### 1. Denominations

Kilogram series	Gram series	Milligram series
(1)	(2)	(3)
20	500	500
10	200	200
10	200	200
5	100	100
2	50	50
2	20	20
1	10	10

(2)	(2)	(3)
	5	5
	2	2
	2	2
	1	1

### 2. Material

- (a) Weights of 20 kg to 1 g shall be cast from admiralty bronze (88 Cu, 10 Sn, 2 Zn) or made from cupro-nickel (75 Cu, 25 Ni) or nickel chromium alloy (80 Ni, 20 Cr) or austenitic stainless steel (25 Ni, 20 Cr) or (20 Ni, 25 Cr).
- (b) Weights of 500 mg to 100 mg shall be made from admiralty bronze (rolled) (88 Cu, 10 Zn, 2 Sn) sheets or from the sheets of nickel chromium alloy (80 Ni 20 Cr) or austenitic stainless steel (25 Ni, 20 Cr) or (20 Ni, 25 Cr).
- (c) Weights of 50 mg to 1 mg shall be made of aluminium sheets. Copper, silicon and iron contained as impurities in the aluminium shall not exceed 0.3 per cent in the aggregate.

### 3. Shape and finish

- (a) Weights of 20 kg and 10 kg shall be cylindrical in shape and shall be cast in two parts, the top part being screwed snugly into the bottom part. The top part shall be cast in the form of a handle for lifting purposes. The two parts after assembly shall be locked by means of a set screw over which the seal of the verifying authority shall be affixed.
- (b) Weights of 5 kg to 200 gm (inclusive) shall be cast in two parts, the top part being screwed snugly into the bottom part. The top part shall be cast in the form of a knob for lifting purposes. The two parts, after assembly, shall be locked by means of a set screw, over which the seal of the verifying authority shall be affixed.
- (c) Weights of 100 g to 10 g (inclusive) shall be as in (b) above except that there shall be no locking arrangement.
- (d) Weights of 5 g to 1 g (inclusive) shall be integral weights with knob.
- (e) Weights of 500 mg to 1 mg (inclusive) shall be of square shape with the one of the sides bent at right angles to the flat surface for ease of handling.
- (f) The denominations shall be marked on the weights.

- (g) The entire surface of the weights, including their base and corners shall be free from roughness.

The surface of the weights, when inspected visually, shall not show any porosity and shall have a mirror polish appearance.

### 4. Maximum permissible error

The permissible errors in excess and in deficiency shall be as follows:—

Denomination	Permissible error $\pm$ mg
20 kg	300
10 kg	150
5 kg	75
2 kg	30
1 kg	15
500 g	7.5
200 g	3.0
100 g	1.5
50 g	1.0
20 g	0.8
10 g	0.6
5 g	0.6
2 g	0.4
1 g	0.3
500 mg	0.25
200 mg	0.20
100 mg	0.15
50 mg	0.12
20 mg	0.10
10 mg	0.08
5 mg	0.06
2 mg	0.06
1 mg	0.06

### 5. Protective and carrying case

- (a) These weights shall be stored in their boxes made from teakwood or any other suitable non-corrosive material with proper housing lined with chemically neutral velvet, chamois leather or soft plastic material. Wood used in such boxes shall be reasonably free from resins and volatile materials. Glue shall not be used for fixing velvet or such other material. The weights shall be housed in such a manner so as to avoid their movement during transit.
- (b) Each milligram weight shall be provided with a separate housing. A covering glass or a sheet of any other transparent, non-reactive

and non-corrosive material shall be provided so as to ensure that these weights are not dislocated during transit.

- (c) A suitable device for lifting the kilogram and gram weights, covered with chamois leather or other suitable material, shall be provided. A pair of forceps capable of lifting easily milligram weights shall also be provided.

### 6. Inscription

The boxes containing the weights shall have the following inscriptions :—

- (a) the words 'WORKING STANDARD WEIGHTS',  
 (b) the identification number of the working standard weights,  
 (c) the name of the manufacturer,  
 (d) the year of manufacture,  
 (e) the marks of verification.

### PART II—WORKING STANDARD METRE BAR

#### 1. Material

The working standard metre bar (hereinafter called metre bar) shall be manufactured from 58 per cent nickel-steel, or austenitic stainless steel, or stainless steel with 13 per cent chromium or pure nickel (minimum purity 99 per cent).

#### 2. Shape and dimensions

- (a) The metre bar shall have a rectangular cross section of minimum dimensions 20 mm x 10 mm. The existing cross-section with dimensions 30 mm x 15 mm shall be preferred.  
 (b) The overall length of the metre bar shall be  $1030 \pm 1$  mm and the graduated length shall be 1010 mm.  
 (c) Ungraduated length of 10 mm shall be left after the last graduated marks.

#### 3. Finish

The graduated surface shall be bright, nicely polished and free from surface irregularities in the neighbourhood of the graduation marks.

#### 4. Graduations

- (a) The metre bar shall be graduated in millimetre throughout from 0 to 1000 mm on the wider upper surface.  
 (b) A length of 10 mm before the zero graduation mark shall also be graduated in millimetres.  
 (c) The scale shall be regular. The thickness of the graduation marks shall be uniform and shall lie between 30 and 80 micrometres.  
 (d) The width of the graduation marks shall be uniform to within  $\pm$  fifteen per cent of the average width of all the marks.

- (e) The graduation marks representing centimetres shall be longer than those representing half centimetres and the graduation marks representing half centimetres shall be longer than those representing millimetres.  
 (f) Each graduation mark shall be straight to within ten micrometres over its length.  
 (g) The graduation marks shall be parallel to one another to within ten micrometres.  
 (h) The length of the graduation marks shall be not less than—  
     3 mm for mm marks.  
     5 mm for half cm marks.  
     8 mm for cm marks.  
 (i) The centimetres graduation marks shall be numbered in the increasing order of numeration.  
 (j) The height of the numerals and the letters (symbols) shall be approximately 3 mm.  
 (k) The graduation marks shall be square to the scale axis to within 30 minutes of arc.

#### 5. Cursor

- (a) The errors on the length measure under verification shall be determined by means of a scale marked on a plate, made from transparent material, which is carried by a cursor capable of moving along the length of the metre bar. The plate shall have appropriate and constant dimensions and thickness.  
 (b) The scale on the plate shall :  
     (i) either be a length of 9 mm divided into 10 parts thus forming a Vernier scale to read the errors to the nearest of 0.1 mm; or  
     (ii) one millimetre divided into 10 parts for reading the errors directly to the nearest of 0.1 mm.  
 (c) The thickness of the graduation marks on the scale shall be less than that of the graduation marks on the metre bar.  
 (d) The graduation marks on the scale shall be inscribed on the surface facing the graduation marks on the metre bar.  
 (e) The readings shall be taken by means of a magnifying glass, the magnification of which shall be not less than 5X if the scale is graduated in 0.1 mm and not less than 3X if the scale is of Vernier type.

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- (f) The cursor shall be such that it would be possible to move it smoothly without jerks, along a straight line from one end of the measure to the other.
- (g) A mechanism to raise, lower and laterally move the measure under verification, within a view to putting its graduated surface at a proper level and aligning its zero mark with that of the metre bar shall be provided.
- (h) For facilitating the verification of end measures, two vertical stops bearing reference lines shall be provided. The first stop shall be such that its reference line can be aligned with the zero mark of the metre bar. The second stop shall be capable of moving along the entire length of the metre bar.

#### 6. Maximum permissible errors

- (a) The error on the length between any two graduation marks on the working standard length measure, at the standard temperature of 20°C, shall not exceed the value "e" calculated according to the following formula :

$$e = (50 + L/20) \text{ micrometres}$$

where L is the nominal length in millimetres of that part of the metre bar between the two graduation marks, the error on which is being determined. The calculated value of "e" shall be rounded to the nearest integer.

- (b) The errors on the length between any two graduation lines on the plate shall not exceed  $\pm 20$  micrometres.

#### 7. Inscription

The metre bar shall bear the following inscription:

- (a) the words "WORKING STANDARD METRE BAR",
- (b) identification number of the metre bar,
- (c) the name of the manufacturer,
- (d) the material of the metre bar,
- (e) the words, figures and letter "STANDARD AT 20°C",
- (f) the year of manufacture.

#### 8. Protective and carrying case

- (a) The standard metre bar shall be housed in a case made from suitable material and provided with a handle, lined internally with velvet, a plastic material or any other material and in such a way that the metre bar is not likely to be damaged, particularly by shocks or corrosion.
- (b) The case shall have affixed on it a plate bearing the inscription "WORKING

STANDARD METRE BAR" and the identification number.

**Note :** The existing working standard length measure (metre bars) may differ in minor details in regard to inscriptions, etc. on it.

### PART III—WORKING STANDARD CAPACITY MEASURES

#### 1. Denomination

Litre series (l)	Millilitre series (ml)
10	500
5	200
2	100
1	50
	20

#### 2. Material

Working standard capacity measures shall be pressed out of oxygen free, deoxidized annealed copper sheets of deep drawing quality.

#### 3. Shape

- (a) Working standard capacity measure of 10 litres shall be cylindrical and have its inside diameter approximately equal to the height of the measure. This shall have two handles attached securely to its sides.
- (b) Working standard capacity measures of 5 litres and below shall be of the same shape as above but shall not have any handles.
- (c) The outside of the body of the working standard capacity measures shall be oxidized to give a smooth dull black surface and the inside shall be tinned.
- (d) The denominations of the working standard measures shall be engraved on the outside surface.
- (e) Each working standard capacity measure shall be provided with specially selected striking glass and the measures and glasses shall be securely packed in velvet lined teakwood boxes.

#### 4. Maximum permissible error

Denomination	Permissible error in ml $\pm$ ml
10 litres	8
5 litres	4
2 litres	2
1 litre	1.5
500 ml	1.0
200 ml	0.8
100 ml	0.6
50 ml	0.4
20 ml	0.2

**5. Pipette measures**

Pipettes of the following description may also be used as working standard measures :

- (a) One mark pipettes of capacities 10 ml and 5 ml.
- (b) Graduated pipettes of capacities 5 ml graduated at every tenth of ml.

**6. Delivery time and maximum permissible errors of pipette measures**

Denomination ml	Delivery time In seconds		Permissible error ( + ml)
	Minimum	Maximum	
10	15	25	0.04
5	10	20	0.03
5	10	40	0.05

(Graduated)

**7. Protective and carrying cases**

These capacity measures shall be stored in their boxes made from teakwood or any other suitable non-corrosive material with proper housing lined with velvet, chamois leather or soft plastic material. Wood used in such boxes shall be reasonably free from resins and volatile materials. Glue may not be used for fixing velvet or such other materials. Each capacity measure shall be housed in such a manner so as to avoid their excessive movement during transit.

Each striking glass of the capacity measure shall be securely housed in proper grooves so as to protect them from breakage during transit.

**8. Inscriptions**

The boxes containing these capacity measures shall have the following inscriptions :

- (a) the words "WORKING STANDARD CAPACITY MEASURES",
- (b) the identification number of the capacity measures,
- (c) the name of the manufacturer,
- (d) the year of manufacture,
- (e) the mark(s) of verification of proper verification authority.

**FOURTH SCHEDULE****SPECIFICATIONS FOR STANDARD EQUIPMENT**

[See Rules 7, 8 and 9]

**PART I—REFERENCE STANDARD BALANCES**

1. Every reference standard balance shall be of such robust construction and have such metrological qualities so as to ensure the continued good performance, as indicated in paragraph 2.

2. Sensitivity figure/readability and precision of measurement of every reference standard balance shall be such as to give overall precision of measurement of 1 part in one million for weights from 10 kg to 10 g and  $\pm 0.01$  mg for weights from 5 g to 1 mg.

**PART II—SECONDARY STANDARD BALANCES**

1. Every secondary standard balance shall conform as regards capacity, sensitivity figure in mg per division, minimum scale division, variation in sensitivity figure with respect to load and overall accuracy of measurement, to the specifications as indicated below :

Capacity	Sensitivity figure mg/div.	Min. scale division	Maximum variation in sensitivity figure with respect to load	Minimum overall accuracy of measurement
1	2	3	4	5
20 kg	25	1.5 mm	10 per cent	25 mg in 10 kg
5 kg	7.5	1.0 mm	10 per cent	7.5 mg in 2 kg
1 kg	1.5	1.0 mm	10 per cent	1.5 mg in 500 g
200 g	0.5	1.0 mm	10 per cent	0.5 mg in 50 g
20 g	0.1	1.0 mm	10 per cent	0.01 mg in 1 mg
2 g	0.02	0.75 mm	10 per cent	0.02 mg in 1 mg

2. the standard deviation of the 10 consecutive rest points for every secondary standard balance shall not be more than one scale division.

3. The deviation in arm ratio from unity, for every secondary standard equi-arm balance shall not be more than a fraction equal to sensitivity figure divided by full load (both being taken in the same unit).

4. The variation in time periods at different loads for every secondary standard balance shall not be more than 20 per cent.

5. Every secondary standard balance shall be provided with a device so that the contact between the knife-edges and their respective planes is broken when the balance is in arrested position.

6. The secondary standard balance shall, ordinarily, be used for indoor work in laboratories.

7. Every secondary standard balance of digital type shall conform as regards value of verification scale

interval as given below:—

Capacity	Maximum value of verification scale interval	Type of weights to be verified
20 kg	1 mg	20 kg to 500 g
200 g	0.01 mg	200 g to 1 mg

#### PART III—WORKING STANDARD BALANCES

1. Working standard balances may be of the following two types:—

- Equi-arm types balances;
- Digital type balances.

2. Every working standard balance of equi-arm type shall conform, as regards capacity, sensitivity figure, maximum variation in sensitivity figure with respect to load and maximum overall inaccuracy of measurement to the specification as indicated below—

Capacity	Max. Sensitivity figure/division	Maximum variation in sensitivity figure	Minimum overall accuracy of measurement
50 kg	100 mg	20 per cent	100 mg in 10 kg
5 kg	10 mg	20 per cent	10 mg in 500 g
200 g	1 mg	20 per cent	1 mg in 100 g
50 g	0.4 mg	20 per cent	0.4 mg in 5 g
2 g	0.05 mg	20 per cent	0.05 mg in 1 mg

2.1 The standard deviation of ten consecutive rest points for every working standard balance shall not be more than one scale division.

2.2 The deviation in arm ratio from unity, for every working standard equi-arm balance shall not be more than the fraction equal to sensitivity figure divided by the full load (both being taken in the same unit).

3. Every working standard digital type balance shall conform, as regards value of verification scale interval as given below:—

Capacity	Max. value of verification scale interval	Type of weights to be verified
50 kg	1 g	Non-bullion : 50 kg and 20 kg
20 kg	0.1 g	Bullion : 10 kg, 5 kg; Non-bullion : 20 kg to 2 kg
2 kg	10 mg	Bullion : 2 kg to 500 g; Non-bullion : 2 kg to 200 g
200 g	0.1 mg	Bullion : 200 g and below; Non-bullion : 200 g and below

4. The standard deviation of the 10 consecutive rest points for every working standard balance shall not be more than one scale division.

5. The deviation in arm ratio from unity, for every working standard equi-arm balance shall not be more than a fraction equal to sensitivity figure divided by full load (both being taken in the same unit).

6. The variation in time periods at different load for every working standard balance shall not be more than 20 per cent.

7. Every indoor type working standard balance shall be provided with a device so that the contact between the knife-edges and their respective planes is broken when the balance is in arrested position.

**Note:** For verification of bullion or carat weights, only indoor type working standard balances shall be used.

#### FIFTH SCHEDULE

[See Rule 11]

##### PART—I

#### Weights (Other than Carat Weights)

##### General

This Part deals with the following categories of weights:—

- (A) Iron weights, paralleloiped (50 kg to 5 kg)  
 (B) Cylindrical knob type weights (10 kg to 1g)  
 (C) Iron weights, hexagonal (50 kg to 50 g)  
 (D) Bullion weights (10 kg to 1 g) and  
 (E) Sheet metal weights (500 mg to 1 mg)

#### A.—IRON WEIGHTS PARALLELOIPIED (50 kg to 5 kg)

##### 1. Denominations

Paralleloiped iron weights shall have the following denominations:—

Kilogram series : 50, 20, 10 and 5.

##### 2. Shape

- (a) The weights shall be integral and in the form of paralleloiped rectangles with corners rounded off and having a rigid handle for ease of handling.  
 (b) The shapes shall be as shown either in Figure 3 or in Figure 4.

##### 3. Material

- (a) Body: The body shall be made or manufactured from grey cast iron.  
 (b) Handles: Handles shall be made or manufactured from the following materials:  
 (i) Type 1 weights—Steel tube without soldering  
 (ii) Type 2 weights—Cast along with the body  
 (c) Method of manufacture:

The weights shall be made or manufactured by means of any suitable foundry and moulding process.

##### 4. Loading holes

- (a) The weights shall be provided with loading holes of either Type 1 or Type 2 indicated below:

###### *Type 1 loading hole*

- (i) The loading hole shall be located within the tube which forms the handle (See Figure 3).  
 (ii) The loading hole shall be closed either with a screwed brass plug or a brass

disc. The screwed brass plug shall be provided with a screw driver slot and the brass disc shall have a central hole to facilitate lifting.

- (iii) The plug or a disc shall be sealed by means of a lead pellet pressed firmly into an internal circular slot or in the threaded part of the tube.

###### *Type 2 loading hole*

- (i) The loading hole shall be cast in one of the upper surfaces of the weights and shall open out on the upper surface (See Figure 4).  
 (ii) This loading hole shall be closed by a plate cut from mild steel.  
 (iii) The mild steel plate shall be closed by a lead pellet pressed firmly into the conical hole.  
 (b) In case of new weights, about two-third of the depth of the loading hole shall remain empty after adjustment.

##### 5. Markings

- (a) The denomination of the weight and the marker's or manufacturer's name or trade mark shall be indicated indelibly in the sunken form or in relief, on the upper surface of the central portion of the weight. (See Figure 3 and Figure 4.)  
 (b) The denomination of the weight shall be indicated in the international form of Indian numerals in an indelible manner with the symbols as illustrated below:

किलो or किय्रा 5 kg

**Note:** The abbreviation किलो or किय्रा, may be indicated in the regional script.

##### 6. Dimensions

- (a) The dimensions of the two types of weight shall be as specified in Tables 1 and 2.  
 (b) The tolerances on dimensions shall be  $\pm 5$  per cent.

**TABLE 1**

*Paralleloiped Weights Dimensions for  
Type 1 Weights*

(In millimetres)

Denomination	A	A'	B	B'	H	C	D	E	F	G/G'
5 kg	150	152	75	77	84	36	30	6	66	12/20
10 kg	190	193	95	97	109	46	38	8	84	12/20
20 kg	230	234	115	117	139	61	52	12	109	24/32
50 kg	310	314	155	157	192	83	74	16	152	24/32

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Denomination	I	J	K	T	L	N	O	U	V	W	P
5 kg	145	5	12	M16 x 1.5	14	1	2	16.5	18	16	5
10 kg	185	6	16	M16 x 1.5	14	1	2	16.5	18	16	5
20 kg	220	8	20	M27 x 1.5	21	2	3	27.5	30	27	8
50 kg	300	10	25	M27 x 1.5	21	2	3	27.5	30	27	8

Sides A and A' as also B and B' may be inverted.

TABLE 2

Paralleloiped Weights Dimensions for Type 2 Weights.

(In millimetres)

Denomination	A	A'	B	B'	H	C	D	E	F	G	J	K	M	N	P
5 kg	150	152	75	77	84	36	30	6	66	19	5	12	16	13	55
10 kg	190	193	95	97	109	46	38	8	84	25	6	16	35	25	70
20 kg	230	234	115	117	139	61	52	12	109	29	8	20	50	30	95
50 kg	310	314	155	157	192	83	74	16	152	40	10	25	70	40	148

Sides A and A' also B and B' may be inverted.

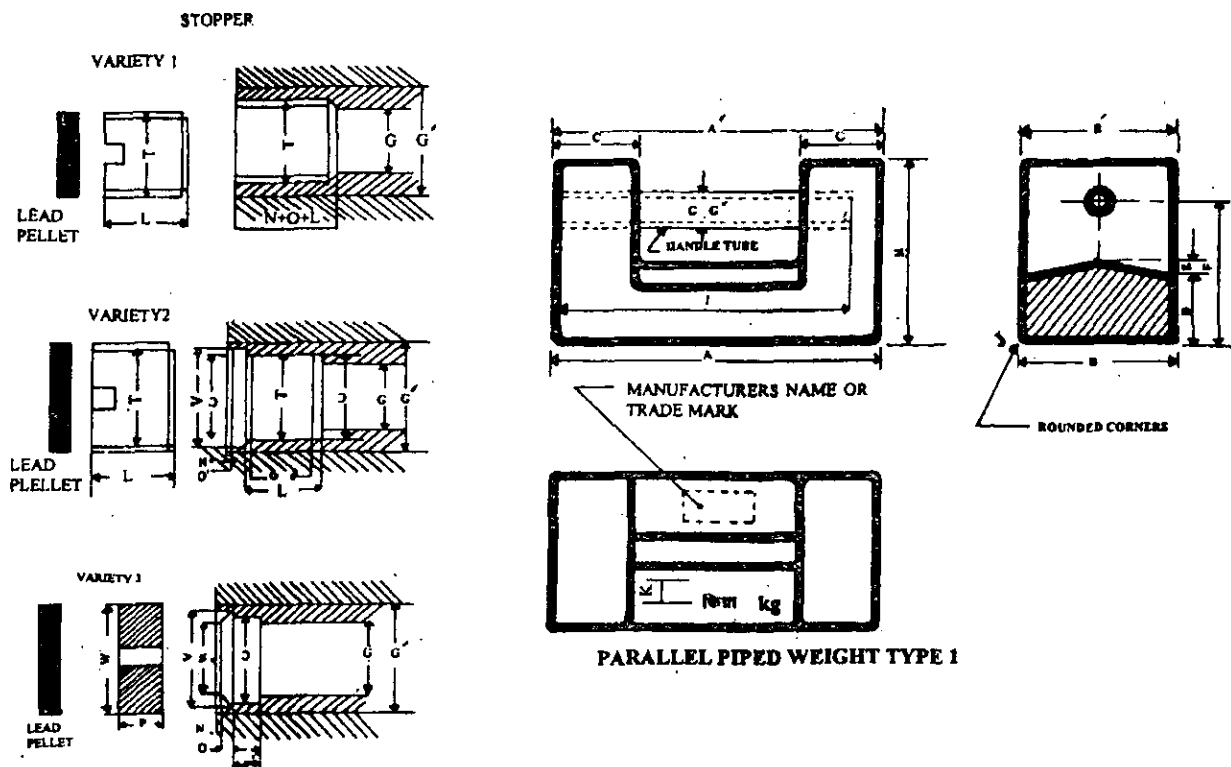


Figure 3



- (b) Weights of denominations 10 kg to 20 g both inclusive, shall be provided with a loading hole.
- (c) The loading hole shall be cylindrical and shall pass through the axis of the weight open out on the upper surface of the knob and have wider diameter at its upper end as shown in Figure 5.
- (d) The loading hole shall be closed either by means of a threaded brass plug or a flat brass disc. (See Figure 5).

**Note :** The thread used shall be that commonly known as 'ISO Metric'.

- (i) The threaded plug shall have a slot for adjusting it by means of a screw driver.
- (ii) The flat disc shall be provided with a suitable hole in the centre to facilitate handling.
- (e) The plug or the flat disc shall be closed by means a lead pellet pressed firmly into the circular groove in the wider part of the loading hole.
- (f) Weights without a loading hole shall be adjusted by machining or grinding.
- (g) Weights with loading hole shall be adjusted with heavy metallic materials such as lead shots.
- (h) In the case of new weights about two-thirds of the depth of the loading hole shall remain empty after adjustment.

### 6. Marking

- (a) The denomination of the weight and the maker's or manufacturer's name or trade mark shall be indicated indelibly, in the sunken form or in relief, on the flat knob. (See Figure 5).
- (b) The denomination of weights of 10 kilograms to 500 grams may also be indicated on the cylindrical body of the weight, provided that the numerals and letters of the symbol shall be larger than those used for indicating them on the knob.
- (c) The denomination of the weight shall be indicated in the international form of Indian numerals in an indelible manner with the symbols as illustrated below :

किलो or किरा 5 kg

ग्रा or ग्राम 100 g

**Note :** The abbreviation किलो, किरा, ग्रा or ग्राम may be indicated in the regional script.

### 7. Dimensions

- (a) The dimensions of cylindrical weights shall be as specified in Tables 3 and 4.
- (b) The tolerances on dimensions shall be :
- (i) for weights 1 kg. and below  $\pm 10$  per cent;
- (ii) for weights above 1 kg  $\pm 5$  per cent.

TABLE 3

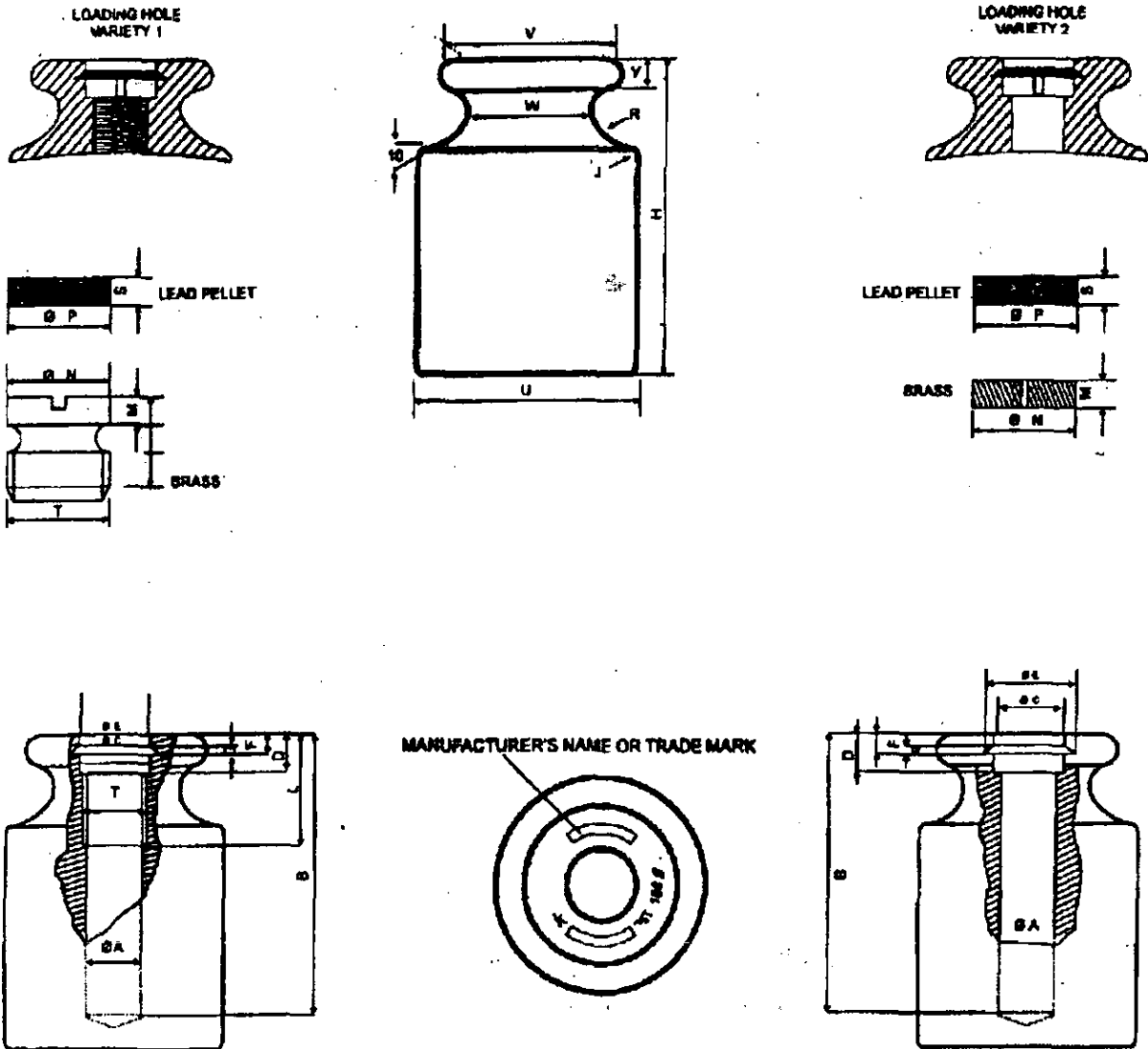
*Cylindrical Knob Type Weights—Dimension for Weights in mm.*

Denomination	U	V	W	H	Y	R	J	K
10 kg	100	90	58	According	17	15	3	10
5 kg	80	72	46	to	13	12	2	10.
2 kg	60	54	36	material	10	9	2	5
1 kg	48	43	27		8	7	2	5
500 g	38	34	22		6	5.5	1.5	3.2
200 g	28	25	16		4.5	4	1.5	3.2
100 g	22	20	13		4	3.5	1	2
50 g	18	16	10		3	2.5	1	2
20 g	13	11.5	7.5		2	1.8	0.5	1.5
10 g	10	9	6		1.6	1.5	0.5	1 Without
5 g	8	7	4.5		1.4	1.25	0.5	1 loading
2 g	6	5.5	3		1	0.9	0.5	1 hole
1 g	6	5.5	3		1	0.9	0.5	1

**TABLE 4**

*Cylindrical Knob Type Weights—Dimension for Loading Hole Variety I and II In mm.*

Denominations	A	B	C	D	E	F	G	L	T	I	M	N	P	S
20 g	3	18	5.5	2.5	6.5	1.5	1	9	M4 x 0.5	5	1	5	5	1
50 g	4.5	25	7.5	3.5	9	2	1	10	M6 x 0.5	5	1.5	7	7	1.5
100 g	4.5	30	7.5	3.5	9	2	1	10	M6 x 0.5	5	1.5	7	7	1.5
200 g	7	40	10.5	4.5	12	2.5	1.5	15	M8 x 1	8	2	10	10	2
500 g	7	50	10.5	4.5	12	2.5	1.5	15	M8 x 1	8	2	10	10	2
1 kg	12	65	18.5	7	20	4	2.5	20	M14 x 1.5	13	3	18	18	3
2 kg	12	80	18.5	7	20	4	2.5	20	M14 x 1.5	13	3	18	18	3
5 kg	18	120	24.5	8	26.5	4	2.5	35	M20 x 1.5	18	4	24	24	3
10 kg	18	160	24.5	8	26.5	4	2.5	35	M20 x 1.5	18	4	24	24	3



**CYLINDRICAL KNOB TYPE WEIGHTS  
FIGURE - 8**

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**8. Finish**

The weights shall be polished smooth. They may be protected against corrosion by applying an appropriate coating which is resistant to normal usage and wear and tear.

**9. Permissible error**

The maximum permissible errors shall be as specified below :

Denomination	Permissible error	
	Verification (mg)	Inspection (mg)
10 kg	1500	± 1500
5 kg	750	± 750
2 kg	300	± 300
1 kg	150	± 150
500 g	75	± 75
200 g	30	± 30
100 g	15	± 15
50 g	10	± 10
20 g	8	± 8
10 g	6	± 6
5 g	5	± 5
2 g	4	± 4
1 g	3	± 3

**10. Stamping**

- The Legal Metrology Officer's seals shall be stamped on the load pellet within the loading hole, where loading hole is provided.
- The Legal Metrology Officer's seals shall be stamped on the bottom of weights which have no loading hole.

**C.—IRON WEIGHTS, HEXAGONAL (50 kg to 50 g)****1. Denominations**

Hexagonal iron weights shall have the following denominations :

Gram series : 500, 200, 100 and 50.

Kilogram series : 50, 20, 10, 5, 2 and 1.

**2. Shape**

- The weights shall be integral and hexagonal. The shape shall be as shown in Figures 6 and 6A.
- The weights of denominations of 50 kg and down to and including 5 kg shall be provided with cast-in handles made of mild steel.

- The weights of denominations 2 kg and down to and including 50 g shall nest with each other.

**3. Material**

The weights shall be made or manufactured from grey cast iron.

**4. Method of manufacture**

The weights shall be made or manufactured by means of any suitable foundry and moulding process.

**5. Loading hole**

The weights must have a loading hole formed at the foundry

- For weights in Figure 6, this hole must be in the shape of a right circular cone located axially and opening into the bottom face of the weight with its smaller diameter.
- For weights in Figure 6A, this hole must be in the shape of a frustum of a pyramid with rectangular base and opening into the bottom face of the weight with its smaller end.
- In the case of new weights about two-thirds of the depth of the loading hole shall remain empty after adjustment.

**6. Marking**

- The denomination of the weights and the maker's or manufacturer's name or trade mark shall be indicated indelibly in the sunken form or in relief, on the upper surface of the central portion of the weight (See Figure 6).
- The denomination of the weight shall be indicated in the international form of Indian numerals in indelible manner with the symbols as illustrated below (See Figure 6).

किलो or किय्रा 2 kg

ग्रा or ग्राम 200 g

**Note :** The abbreviation किलो, किय्रा, ग्रा or ग्राम may be indicated in the regional script.

**7. Dimensions**

- The dimensions shall be as specified in Tables 5 and 5A.
- The tolerances on dimensions shall be :
  - for weights 1 kg and below ± 10 per cent
  - For weights above 1 kg ± 5 per cent.

TABLE 5

Dimensions for Cast Iron or Forged  
Mild Steel S Weights

(All dimensions in millimetres)

Denomination	A	B	C	D	H	P	Q	R	S	T
2 kg.	94	101	78	41	10	34	30	9	18	4
1 kg	73	79	62	34	8	32	28	8	16	4
500 g	57	62	47	27	6	23	20	6	13	3
200 g	42	48	38	21	6	22	20	4	9	3
100 g	33	38	31	17	5	18	16	3	7	2.5
50 g	27	31	24	12	3	16	14	3	5	2

TABLE 5A

Dimensions of Cast Iron Weights with Cast-in Handles

(Dimensions in mm)

Denomination	A	B	C	D	E	G	P	Q	R	S	T
50 kg	236	253	134	170	100	27	58	48	24	102	32
20 kg	188	200	112	113	90	21	44	38	19	66	22
10 kg	152	161	92	88	74	18	36	30	15	54	19
5 kg	125	132	75	65	62	15	29	25	12	40	16

**8. Finish**

The weight shall be finished smooth and be free from pits, blow-holes and other defects. They shall be protected against corrosion by applying an appropriate coating which is resistant to normal usage of wear and tear.

**9. Permissible error**

The maximum permissible errors shall be as specified below :

Denomination	Permissible error	
	Verification (mg)	Inspection (mg)
50 kg	7500	± 7500
20 kg	3000	± 3000
10 kg	1500	± 1500
5 kg	750	± 750
2 kg	300	± 300
1 kg	150	± 150
500 g	75	± 75
200 g	30	± 30
100 g	15	± 15
50 g	10	± 10

**10. Stamping**

The Legal Metrology Officer's seals shall be stamped on the lead pellet within the loading hole (See Figure 6).

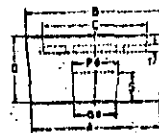
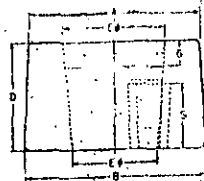
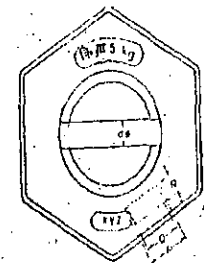
CAST IRON OR FORGED MILD STEEL  
With Cast-in Handles FIG - 6

FIG 1A CAST IRON WEIGHTS WITH CAST-IN HANDLE

**D.—BULLION WEIGHTS (10 kg to 1 g)****1. Denominations**

Bullion weights shall have the following denominations :

Gram series : 500, 200, 100, 50, 20, 10, 5, 2 and 1.

Kilogram series : 10, 5, 2 and 1.

**2. Shape**

Bullion weights shall be of the following two types :

- (i) Cylindrical knob types—Cylindrical knob type weights of denomination 10 kg to 1 g, both inclusive, shall be of the shape as specified in paragraph B-2 of this Part (See also Figure 5) but shall bear indications, specified in paragraph 6 to indicate that they are bullion weights.
- (ii) Flat cylindrical type—Flat cylindrical type weights of denominations 1 kg to 1 g both inclusive, shall be flat cylindrical in shape, without a knob and shall nest with each other (See Figure 7).

**3. Material**

Weights shall be made or manufactured from brass, gun metal, bronze or the like.

**4. Method of manufacture**

Weights shall be either cast, pressed or turned from rods, or made or manufactured by any other suitable method as may be applicable to the selected material.

**5. Loading holes**

- (a) Weights of denominations 10 kg to 20 g, both inclusive, made or manufactured according to requirements specified in paragraph 11 of this Part, shall have loading holes of the type specified for them.
- (b) Weights of denominations 10 g to 1 g, both inclusive of either type shall be solid integral weights without a loading hole.
- (c) Flat cylindrical weights from 1 kg to 20 g both inclusive, shall have loading holes, in the shape of a right circular frustum of a cone located axially and opening into the

bottom face of the weight with its smaller diameter (See Figure 7).

- (d) In the case of new weights about two-thirds of the depth of the loading hole shall remain empty after adjustment.

**6. Markings**

- (a) The denominations and other marking on cylindrical knob type weights shall be as specified in paragraph 15 of this Part.
- (b) Cylindrical knob type weights of denomination 100g to 1g, both inclusive, shall be marked on the body with a 'diamond' and those of denominations 10 kg to 200g, both inclusive, shall be marked on the knob with the words 'Bullion' and (बुलियन) within a 'diamond'.
- (c) The denominations of flat cylindrical weights and the maker's or manufacturer's name or trade mark shall be indicated indelibly, in the sunken form or in relief, on the upper surface of the central portion of the weights (See Figure 7).
- (d) Flat cylindrical weights of denominations 10 g to 1 g, both inclusive, shall be marked with only a 'diamond' and those of denominations 1 kg to 20 g, both inclusive, shall be marked with the words 'Bullion' and (बुलियन) within a 'diamond'.
- (e) The denomination of the weight shall be indicated in the international form of Indian numerals in an indelible manner with the symbols as illustrated below (See Figure 7):

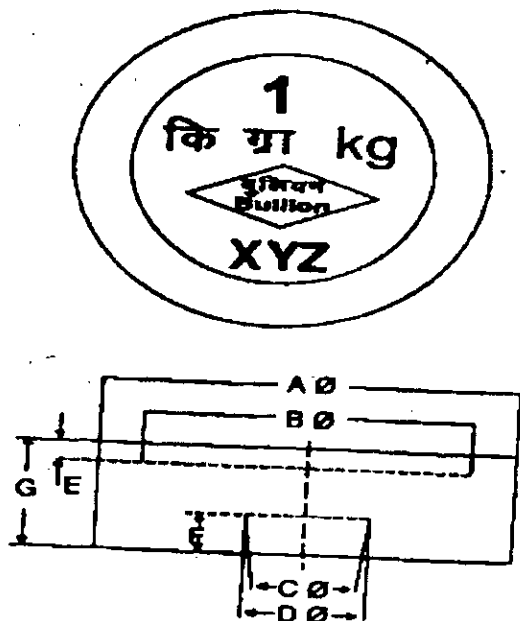
किलो or किग्रा 2 kg

ग्रा or ग्राम 10 g

TABLE 6  
DIMENSIONS FOR FLAT CYLINDRICAL BULLION WEIGHTS

(All dimensions in millimetres)

Denomination	A	B	C	D	E	F	G
1 kg	80	61.5	20	23	4.0	12	26.6
500 g	61	48.5	16	19	2.5	10	22.5
200 g	48	37.5	14	16	2.0	7	14.8
100 g	37	28.5	12	14	2.0	6	12.7
50 g	28	21.5	10	11	1.5	3	11.0
20 g	21	16.5	9	10	1.5	3	8.4
10 g	16	12.5	**	**	1.5	**	6.9
5 g	12	9.5	**	**	1.0	**	5.9
2 g	9	7.0	**	**	1.0	**	4.4
1 g	6.5	**	**	**	**	**	3.6



Flat Cylindrical Bullion Weights  
Figure - 7

**Note :** The abbreviation किलो, किग्रा, ग्रा or ग्राम may be indicated in the regional script.

### 7. Dimensions

- The dimensions of cylindrical knob type weights shall be as specified in Tables 3 and 4.
- The dimensions of flat cylindrical weight shall be as specified in Table 6.
- The tolerances on dimensions for both types of weights shall be—
  - for weights 1 kg and below  $\pm 10$  per cent.
  - for weights above 1 kg  $\pm 5$  per cent.

### 8. Finish

The surface of the weights shall be polished, smooth and shall not show any porosity to the naked eye.

### 9. Permissible error

The maximum permissible errors shall be as specified below :

Denomination	Permissible error	
	Verification (mg)	Inspection (mg)
(1)	(2)	(3)
10 kg	500	$\pm 500$
5 kg	250	$\pm 250$
2 kg	100	$\pm 100$
1 kg	50	$\pm 50$
500 g	25	$\pm 25$

(1)	(2)	(3)
200 g	10	$\pm 10$
100 g	5	$\pm 5$
50 g	3	$\pm 3$
20 g	2.5	$\pm 2.5$
10 g	2.0	$\pm 2.0$
5 g	1.5	$\pm 1.5$
2 g	1.2	$\pm 1.2$
1 g	1.0	$\pm 1.0$

### 10. Stamping

- The Legal Metrology Officer's seals shall be stamped on the lead pellet within the loading hole, where loading hole is provided.
- The Legal Metrology Officer's seals shall be stamped on the bottom of weights which have no loading hole.

### E.—SHEET METAL WEIGHTS

#### 1. Denominations

Sheet metal weights shall have the following denominations:—

Milligram series : 500, 200, 100, 50, 20, 10, 5, 2 and 1.

#### 2. Shape

- Bullion weights shall be circular in shape and shall have one edge bent for ease of handling (See Figure 8).
- Non-bullion weights shall have the following shapes and shall have one edge bent for ease of handling (See Figure 9).

Denomination (mg)	Shape after bending along one of the sides
5, 50, 500	Equilateral triangle
2, 20, 200	Square
1, 10, 100	Regular hexagon

#### 3. Material

Sheet metal weights shall be made or manufactured from brass, stainless steel, aluminium nickel-silver or cupro-nickel sheets.

#### 4. Method of manufacture

Sheet metal weights shall be made or manufacture by pressing or by any other suitable process.

#### 5. Markings

- Sheet metal weights shall bear only the denomination and symbol for 'milligram' as

**TABLE 7**  
**DIMENSIONS FOR SHEET METAL WEIGHTS**  
**(NON-BULLION) (Figure 9) (All dimensions in millimetres)**

Denomination (mg)	A1	A2	A3	B	H
50	14.0	—	—	2.0	3.0
200	...	12.0	...	2.0	3.0
100	...	...	12.0	2.0	2.5
50	8.0	...	...	1.5	2.5
20	...	7.0	...	1.5	2.5
10	...	...	7.0	1.5	2.5
5	4.5	...	...	1.0	2.0
	...	4.0	...	1.0	2.0
	...	...	4.0	1.0	2.0

indicated below (See also Figure 8 and Figure 9).

(मिग्रा) 500 mg

**Note :** The abbreviation मिग्रा may be indicated in the regional script.

- (b) The maker's or manufacture's name or trade mark shall be indicated indelibly on the box containing the sheet metal weights.
- (c) The box shall also bear a serial number to identify it.

#### 6. Dimensions

- (a) The dimensions of sheet metal weights shall be as specified in Tables 7 and 8.
- (b) The tolerances on dimensions shall be  $\pm 10$  per cent.

**TABLE 8**  
**DIMENSIONS FOR SHEET METAL WEIGHTS**  
**(BULLION) (Figure 8)**  
**(All dimensions in millimetres)**

Denomination	D	C	H
500 mg	15	2.0	3.0
200 mg	13	2.0	3.0
100 mg	11	2.0	2.5
50 mg	9	1.5	2.5
20 mg	8	1.5	2.5
10 mg	7	1.5	2.5
5 mg	6	1.0	2.0
2 mg	5	1.0	2.0
1 mg	4	1.0	2.0

#### 7. Finish

The sheet metal weights shall be clearly sheared and free from burrs. The stamped markings on sheet metal weights shall be legible and deep enough to ensure indelibility but not so deep as to crack the sheet metal weights.

#### 8. Permissible error

The maximum permissible errors shall be as specified below :

Denomination (mg)	Maximum permissible error			
	Verification		Inspection	
	Bullion (mg)	Non-bullion (mg)	Bullion (mg)	Non-bullion (mg)
1	2	3	4	5
500	0.8	2.5	$\pm 0.8$	$\pm 2.5$
200	0.6	2.0	$\pm 0.6$	$\pm 2.0$
100	0.5	1.5	$\pm 0.5$	$\pm 1.5$
50	0.4	1.2	$\pm 0.4$	$\pm 1.2$
20	0.3	1.0	$\pm 0.3$	$\pm 1.0$
10	0.25	0.8	$\pm 0.25$	$\pm 0.8$
5	0.20	0.6	$\pm 0.20$	$\pm 0.6$
2	0.20	0.6	$\pm 0.20$	$\pm 0.6$
1	0.20	0.6	$\pm 0.20$	$\pm 0.6$

**9. Stamping**

(a) Legal Metrology Officer's seals shall not be affixed on weights of 10 mg, 5 mg, 2 mg and 1 mg. These weights shall be

authenticated by the issue of a certificate of verification which shall also mention the serial number on the box containing the weights.  
 (b) Legal Metrology Officer's seal for year alone shall be stamped on sheet metal weights of 20 mg.

Figure 8  
 Sheet Metal Bullion Weights

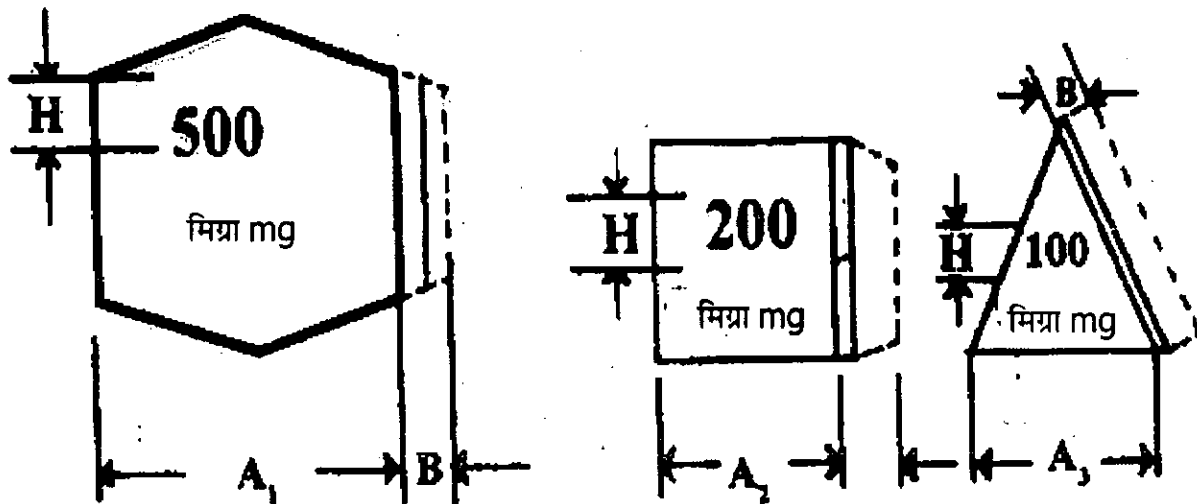
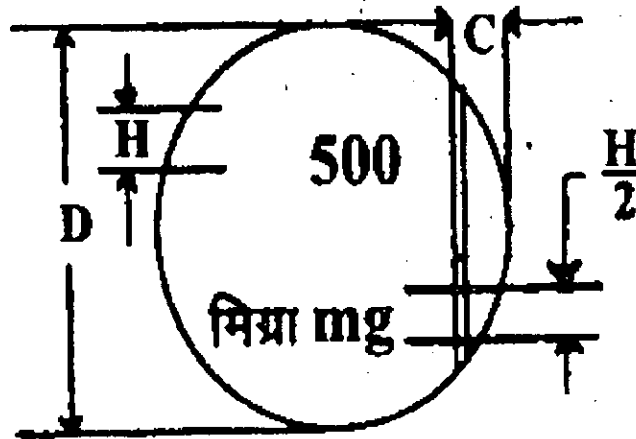


Figure 9  
 Sheet Metal Weights

- (c) The Legal Metrology Officer's seals (namely, year, quarter and identification) shall be stamped on sheet metal weights of denominations 500 mg to 50 mg, both inclusive.

**PART II**  
**CARAT WEIGHTS**

**1. General**

This Part deals with the requirements for carat weights intended for use in weighing pearls, diamonds and other precious stones.

**2. Denominations**

The denominations of carat weights shall be as given below (the gram and milligram equivalents are shown against each for ready reference) :

(a) KNOB WEIGHTS		(b) SHEET METAL WEIGHTS	
Denomination carat	Equivalent g	Denomination carat	Equivalent mg
500	100	2	400
200	40	1	200
100	20	0.5	100
50	10	0.2	40
20	4	0.1	20
10	2	0.05	10
5	1	0.02	4
		0.01	2
		0.005	1

**3. Knob weights**

(a) *Materials*

- (i) The weights shall be made from rolled, drawn or extruded material and shall not be cast.
- (ii) The weights shall be made from brass, bronze, gun-metal, nickel-chromium alloy or non-magnetic stainless steel.

(b) *Shape and dimensions*

The shape and dimensions of the weights shall be as shown in Figure 10 and Table 9.

(c) *Permissible error*

The maximum permissible errors shall be as specified below :

Denomination Carat	Verification mg	Inspection mg
500	5.0	± 5.0
200	3.0	± 3.0
100	2.5	± 2.5
50	2.0	± 2.0
20	1.5	± 1.5
10	1.2	± 1.2
5	1.0	± 1.0

**TABLE 9**

**NOMINAL DIMENSIONS OF KNOB CARAT WEIGHTS**

[Clause 3(b)]

(All dimensions in millimetres)

Denominations Carat	A*	C**	D	E	F	G	H
500	12.0	0.4	4.0	10.0	6.0	32.0	14.2
200	10.0	0.4	3.0	8.5	5.0	23.0	10.8
100	8.0	0.4	2.5	7.0	4.0	19.0	7.9
50	6.0	0.3	2.0	5.5	3.0	15.0	6.4
20	5.0	0.3	2.0	4.0	2.0	11.0	4.6
10	4.0	0.3	1.5	3.0	1.5	9.0	3.5
5	3.0	0.2	1.5	2.5	1.5	7.0	2.9

\* The cross-section of the top of the knob is elliptical for all weights major axis being twice the minor axis (therefore for all weights  $B = A/4$ )

\*\* This is a recommended dimension.

**Note :** With a material of density 8400 kg/m<sup>3</sup> (exactly) the above dimensions will give weights which possess masses to within the required tolerance limits on the plus side (this ensures a longer life for the weights). However, as the density of the material may vary considerably as also the manufacturing techniques, a tolerance of  $\pm 10$  per cent is allowed on all obligatory dimensions (that is those other than C). Final values of masses can be adjusted by controlling the dimension H.

**4. Sheet metal weights**

- (a) *Materials*—Weights of denominations 0.2 carat and below shall be made of aluminium sheet. Weights of higher denominations shall be made of sheets of brass, aluminium, nickel-silver, nickel chromium alloy, bronze or cupro-nickel.
- (b) *Shape and dimensions*—Sheet metal weights shall be square with one edge bent for ease of handling (See Figure 11). They shall have dimensions given in Table 10.
- (c) *Permissible error*

The maximum permissible errors shall be as specified below:—

Denomination Carat	Verification mg	Inspection mg
1	2	3
2	0.8	$\pm 0.8$
1	0.6	$\pm 0.6$
0.5	0.5	$\pm 0.5$
0.2	0.4	$\pm 0.4$
0.1	0.3	$\pm 0.3$
0.05	0.25	$\pm 0.25$
0.02	0.20	$\pm 0.20$
0.01	0.20	$\pm 0.20$
0.005	0.20	$\pm 0.20$

**TABLE 10**  
*Nominal dimension for sheet metal carat weights*

Denomination Carat	Size mm
2	12
1	10
0.5	9
0.2	8
0.1	7
0.05	6
0.02	5
0.01	4
0.005	3

Tolerance  $\pm 10$  per cent

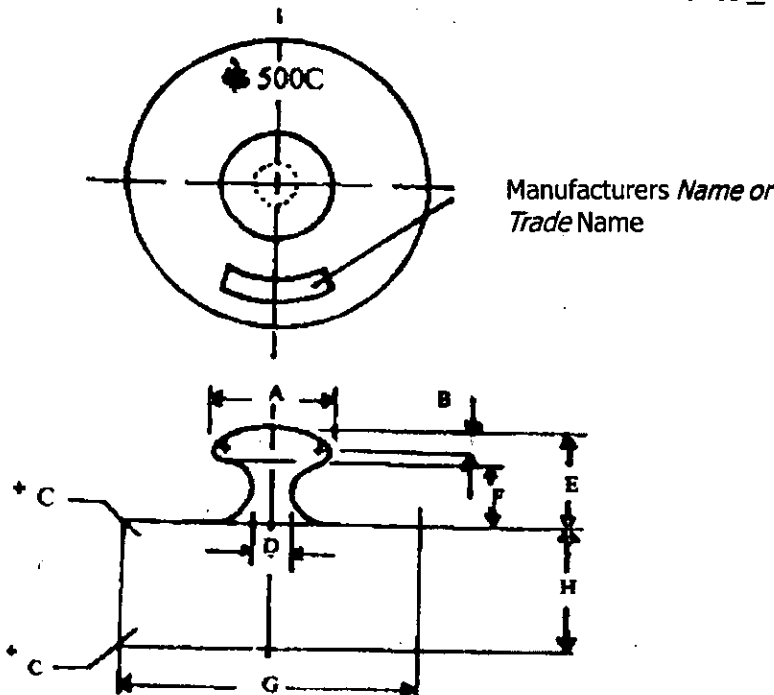


Figure 10  
Knob Carat Weight

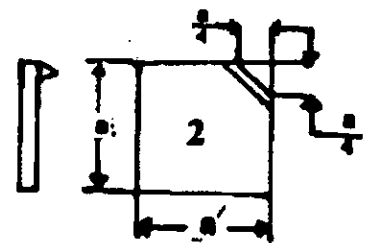


Figure 11  
Sheet Metal Carat Weight

**5. Manufacture and finish**

- (a) The surface of the weights shall be reasonably smooth. Sheet metal weights shall be smoothly sheared and shall be free from burrs.
- (b) For better stability and finish, the weights may be nickel, or rhodium plated.

**6. Marking**

- (a) Every weight, except weights of 50 carat and lower denominations, shall have the manufacturer's name or trade mark and the denomination indelibly marked on it.
- (b) The denomination shall consist of the International form of Indian numeral prefixed and suffixed by the letter 'के' and 'c' respectively except that in the case of weights below 50 carat, only the numerals shall be marked. The size of numerals and letters indicating the denomination of weights shall be at least twice the size of letters indicating the manufacturer's name or trademark.

**Note :** The abbreviation 'के' may be indicated in the regional script.

- (c) The marking shall be legible and deep enough to ensure indelibility over a long period of use, but not so deep as to crack the weight itself.

**7. Packing**

- (a) Each set of carat weights shall, in addition to the series of denomination specified under 2, consist of an additional piece of weight of 2 carat and the relevant decimal multiple of two.
- (b) The weights shall be supplied in a suitable velvet-lined box. The small sheet metal weights shall be so housed and provided with a cover of glass or any other transparent material that they will not get dislodged from their proper places. The box shall also contain a pair of forceps for lifting the weights.

**PART III****STANDARD WEIGHTS FOR TESTING OF HIGH CAPACITY WEIGHING MACHINES****1. Scope**

These specifications shall apply to standard weights having a nominal value equal to or greater than 50 kg, used for testing (and adjusting, where appropriate) of high capacity weighing machines in accuracy class III (medium) and class IV (ordinary), defined in the Metrological regulations for non-automatic weighing machines.

(a) It sets forth the technical and metrological requirements to which these standard weights must conform. In particular it establishes the values of the maximum permissible errors for standard weights and minimum densities as functions of the maximum number of scale divisions on the machines to be verified using these weights.

**2. Nominal values**

The nominal value of the standard weight is 50 kg, or of the form  $k \times 10^n$  kg, where  $k$  is generally equal to 1, 2 or 5, and  $n$  is whole number equal to or greater than 2.

**3. Shape**

The standard weights must have a relatively simple shape, with no sharp edges or corners. They shall not have any cavities liable to cause a rapid accumulation of dirt. If they are intended to run on a flat surface (or on rails), they must be equipped with roller tracks (or grooves) of limited area.

**4. Basis of adjustment**

The standard weights must be adjusted taking the reference conditions applicable to the adjustment of standard weights as follows :

- (a) standard reference density :  $8000 \text{ kg/m}^3$ ,
- (b) ambient air density :  $1.2 \text{ kg/m}^3$ , and
- (c) equilibrium in air at  $20^\circ\text{C}$ , without correction for air buoyancy.

### 5. Adjusting cavity

The standard weights must include one or more adjusting cavities. It must be possible to seal the closure of these cavities; the closures must be watertight and airtight (e.g., by means of a joint). The volume of adjusting cavities must be at least equal to 5/100 of the volume of the standard weight. Furthermore, it is desirable that, after the initial adjustment, a volume of at least 1/100 of the volume of the standard weight remains empty.

### 6. Material

Standard weights are in general made of grey cast iron. They may be made of one or more other materials, provided the provisions of paragraph 8 are observed. The material used must be of such hardness and strength that they withstand the loads and shocks liable to occur under normal conditions of use.

### 7. Surface condition

The standard weights may be coated with materials suitable for providing protection against corrosion by rendering their surface impermeable. This coating must withstand shocks and atmospheric conditions. Zinc-plating is an example of a coating which meets with these specifications.

### 8. Metrological characteristics

The maximum permissible error for the standard weights must not exceed 1/3 of the maximum permissible error for the corresponding load considered, on the weighing machine under verification. The absolute error for various denominations of standard weights shall be as given in Annexure I. These maximum permissible errors for the standard weights must therefore be compatible with the number of scale divisions on the machines which they are intended to verify. Furthermore, the density of standard weights must be such that a variation of  $\pm 10$  per cent ambient air density, with respect to its reference value, does not produce a variation, in the result of weighing the standard weight in air, exceeding 1/4 of its maximum permissible error. By way of application of these requirements, the following table gives examples of the relation amongst :—

- the maximum number of scale divisions "n" on weighing machines under verification (assumed to be in accuracy class III);
- the maximum permissible positive or negative relative error on standard weights used for initial verification of these machines; and
- the corresponding lower limit for the density of the standard weights.

TABLE

Maximum number of scale divisions "n" on weighing machines (accuracy class III), capable of verification with the standard weights during verification	Maximum permissible positive or negative relative error on the standard weights	Minimum density kg/m <sup>3</sup>
(1)	(2)	(3)
1000	3.3/10000	1231
3000	1.7/10000	2087
5000	1.0/10000	3000
10000	0.5/10000	4364

**Note :** Independent of the requirements concerning the density of the weights, it is desirable to obtain—particularly for reference standards or those of a high nominal value—a density of about 8000 kg/m<sup>3</sup>. For example, a cast iron body may be used, which incorporates a special cavity in which a lead core may be cast, with a mass of approximately 30 per cent of the total nominal mass of the standard.

### 9. Inscriptions and markings

Standard weights must carry their nominal value in numerals, followed by the symbol for the unit used and a verification mark.

### 10. Adjustment and verification

Adjustment of the standard weights must be such as to comply with the maximum permissible errors given in this specification. In particular this may be achieved in the case of adjustment by the double substitution weighing technique (Gauss transposition method, or Borda substitution method), using as reference standards, weights having an error of less than 1/3 of the maximum permissible error for the weight to be adjusted, and as the comparator machine, a weighing machine for which the limit of repeatability error does not exceed 0.2 times of the maximum permissible error for the weight to be adjusted.

**Note :** Standard weights used for verification of a weighing machine with "n" scale divisions may be used for the re-verification of a weighing machine with "p.n" scale divisions, where the maximum permissible error for this re-verification is "p" times

(where p has a value equal to or greater than 1), the maximum permissible error on verification.

**11. Dimensions**

The Dimensions for 500 kg and 1000 kg denominations weights shall be as given in Annexure II

**ANNEXURE I**  
ABSOLUTE ERRORS FOR STANDARD WEIGHTS

Normal Value.kg	Maximum permissible error for the standard weights			
	3.3/10,000	1.7/10000	1/10000	0.5/10000
	Corresponding absolute error (grams)			
50	17	8.5	5	2.5
100	33	17	10	5
200	66	33	20	10
500	170	85	50	25
1000	330	170	100	50
2000	660	330	200	100
5000	1700	850	500	250
	1000	3000	5000	10000

Maximum number of scale divisions  $\leq n \geq$  on weighing machines (accuracy class III) capable of being verified (verification) with the standard weights (see note given at clause 10)

**ANNEXURE II**

TYPICAL EXAMPLES

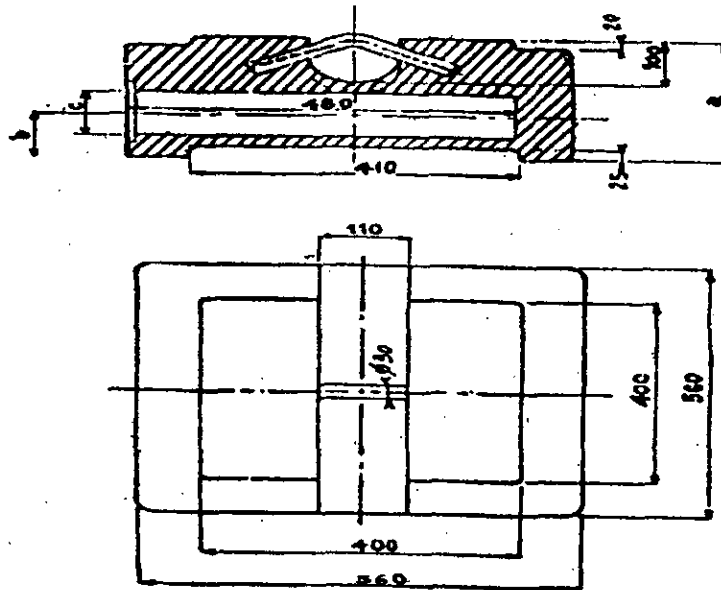
This annexure contains diagrams of weights used for testing of high capacity weighing machines, which are considered suitable for use as patterns because of their design and ease of use.

**RECTANGULAR STANDARD WEIGHTS**

500 kg. and 1000 kg.

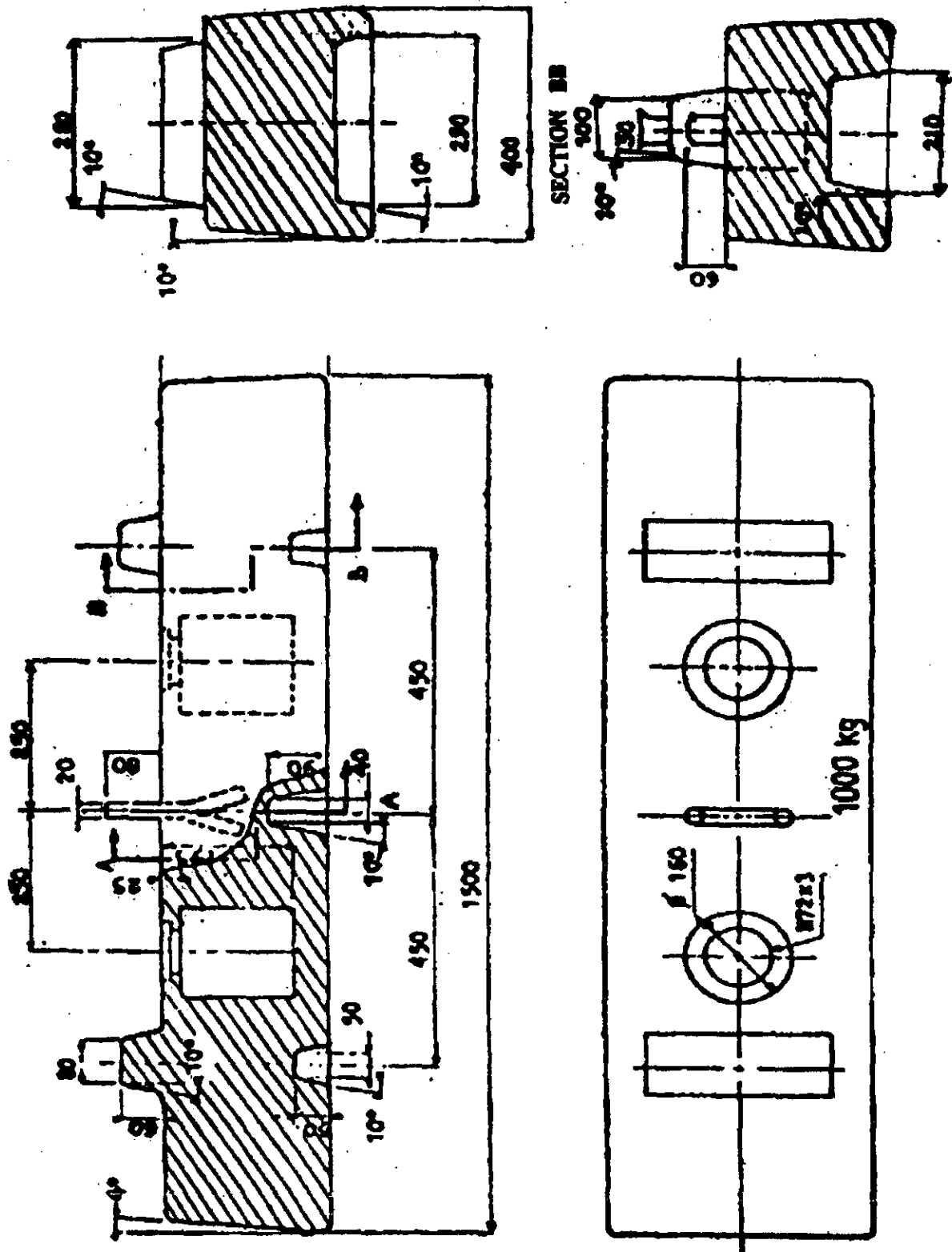
**SUITABLE FOR STACKING**

Dimensions (mm)



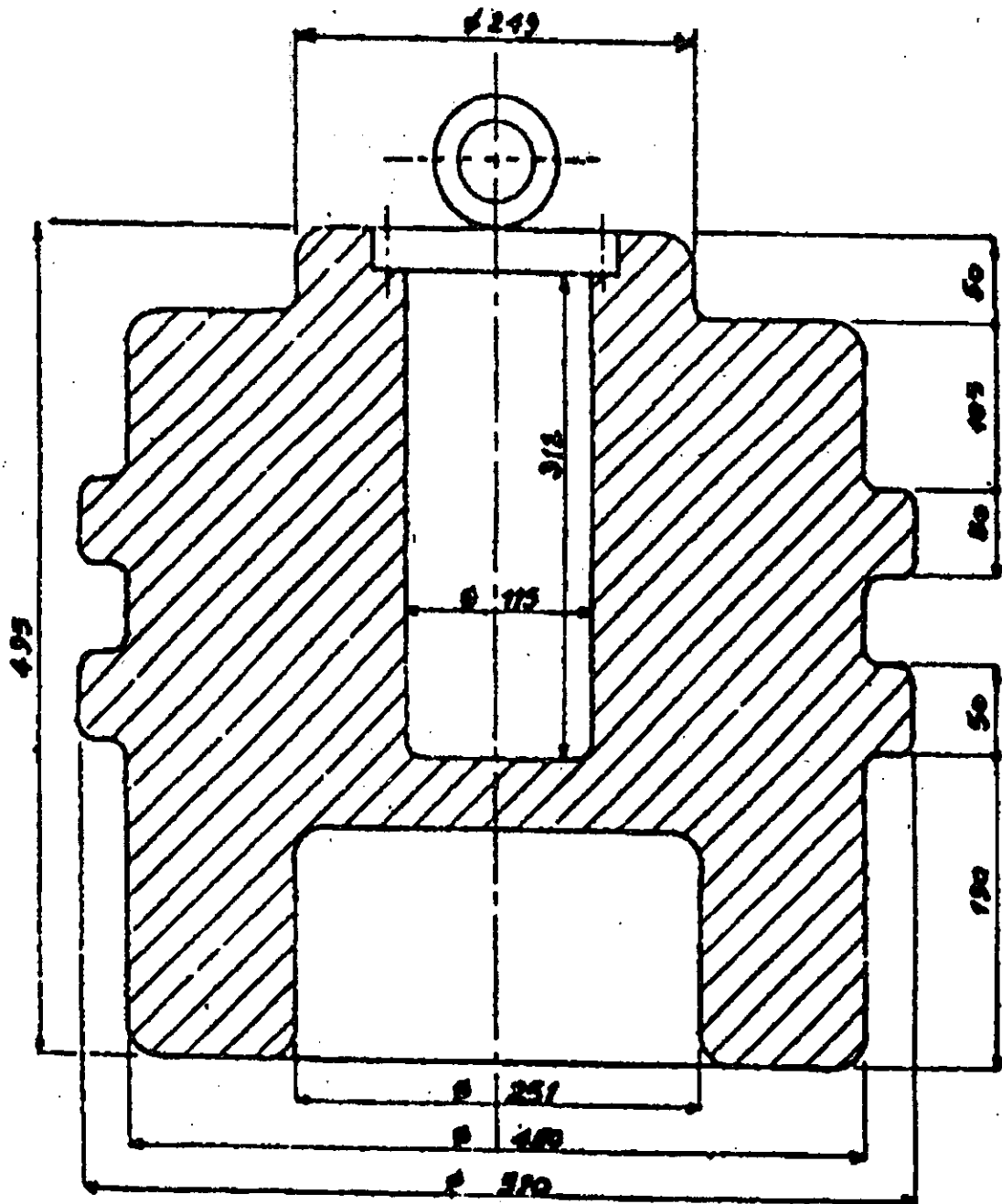
	a	b	c
500 kg	273	100	Ø 100
1000 kg	504	120	Ø 140

RECTANGULAR STANDARD WEIGHT 1000 kg SUITABLE FOR STACKING



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CYLINDRICAL STANDARD WEIGHTS  
500 kg and 1000 kg  
SUITABLE FOR STACKING AND ROLLING  
Dimensions (mm) FOR 500 kg WEIGHT



[r = 10

R = 20]

**SIXTH SCHEDULE  
SPECIFICATIONS FOR MEASURES  
[See Rule 12]**

**PART I - LIQUID CAPACITY MEASURES**

**1. General**

This Part deals with two types of cylindrical liquid measures, namely the dipping and the pouring types, and one type of conical measures.

**2. Denominations**

The denominations of the different types of measures shall be as under :

Cylindrical measures		Conical measures
Dipping type	Pouring type	
1 litre	2 litres	20 litres
500 ml	1 litre	10 litres
200 ml	500 ml	5 litres
100 ml	200 ml	2 litres

Cylindrical measures		Conical measures
Dipping type	Pouring type	
50 ml	100 ml	1 litre
20 ml	50 ml	500 ml
	20 ml	200 ml
		100 ml

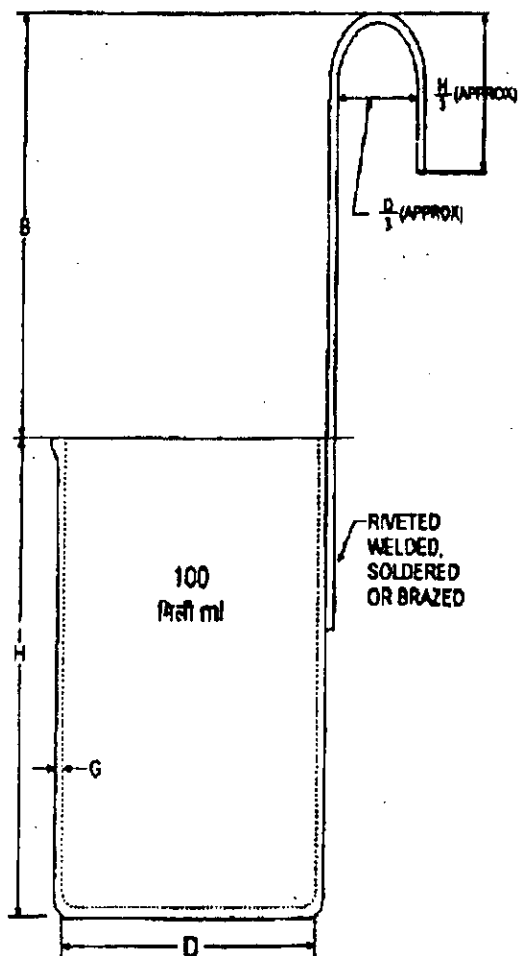
**3. Shapes and dimensions**

(a) The shape and dimensions of cylindrical measures (dipping and pouring types) shall be as shown in Figures 12 and 13 and Table 11.

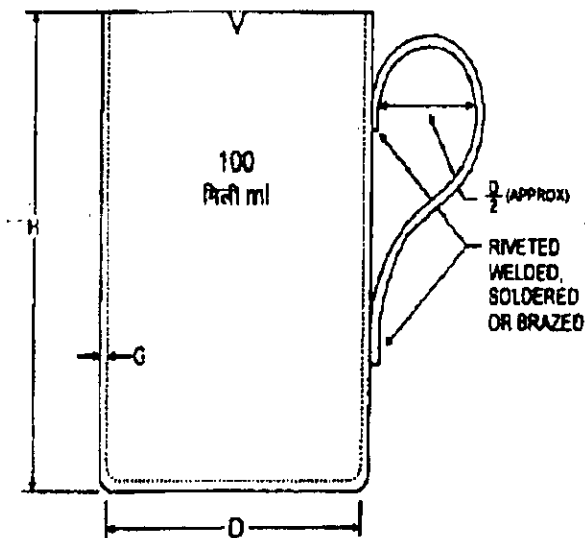
**TABLE 11**

Nominal Dimensions of Cylindrical Capacity Measures

Denominations	D	H	B	G
			Max. Min.	Min.



**DIPPING TYPE CYLINDRICAL MEASURES  
(SCHEMATIC)  
FIGURE- 12**



**POURING TYPE CYLINDRICAL MEASURES (SCHEMATIC)  
FIGURE-13**

(b) The shape and dimensions of conical measures shall be as shown in Figure 14 and Table 12.

**TABLE 12**

NOMINAL DIMENSIONS OF CONICAL CAPACITY MEASURES

Denomination	A	B	C	D	E	F	G	H	J	K	M
	Min.										
20 litres	97	388	288	208	194	390	1.00	35	86	29	30
10 litres	77	308	307	174	154	309	1.00	30	75	26	25
5 litres	61	244	245	147	122	247	0.80	25	65	24	20
2 litres	45	180	180	118	90	182	0.80	20	56	22	16
1 litre	36	143	143	95	72	145	0.63	20	45	18	16
500 ml	28	114	113	74	56	115	0.63	15	35	14	12
200 ml	21	84	84	53	42	86	0.63	10	24	10	8
100 ml	17	66	67	41	34	69	0.63	10	18	7	8

**Note 1 :** All dimensions in millimetres.

**Note 2 :** Tolerance on dimensions  $\pm 10$  per cent except in case of 10 litre and 20 litre measures for which the tolerance shall be  $\pm 5$  per cent.

#### 4. Material

- (a) Cylindrical measures—The body of cylindrical measures shall be manufactured in one piece from aluminium alloy sheets, brass sheets or stainless steel sheets. The minimum thickness of the sheets shall be as specified in Table 11.
- (b) Conical measures—The conical measures shall be fabricated from galvanised steel sheets, aluminium alloy sheets, copper sheets, brass sheets, stainless steel sheets or tinplate. The minimum thickness of the sheets shall be as specified in Table 12.
- (c) The handles for the measures shall be fabricated from the same material as that used for the body.

- (b) The handles shall be of robust construction and shall be well formed and shaped generally as shown in Figure 12, 13 and 14. They shall be securely fixed to the body by means of riveting, soldering or brazing.

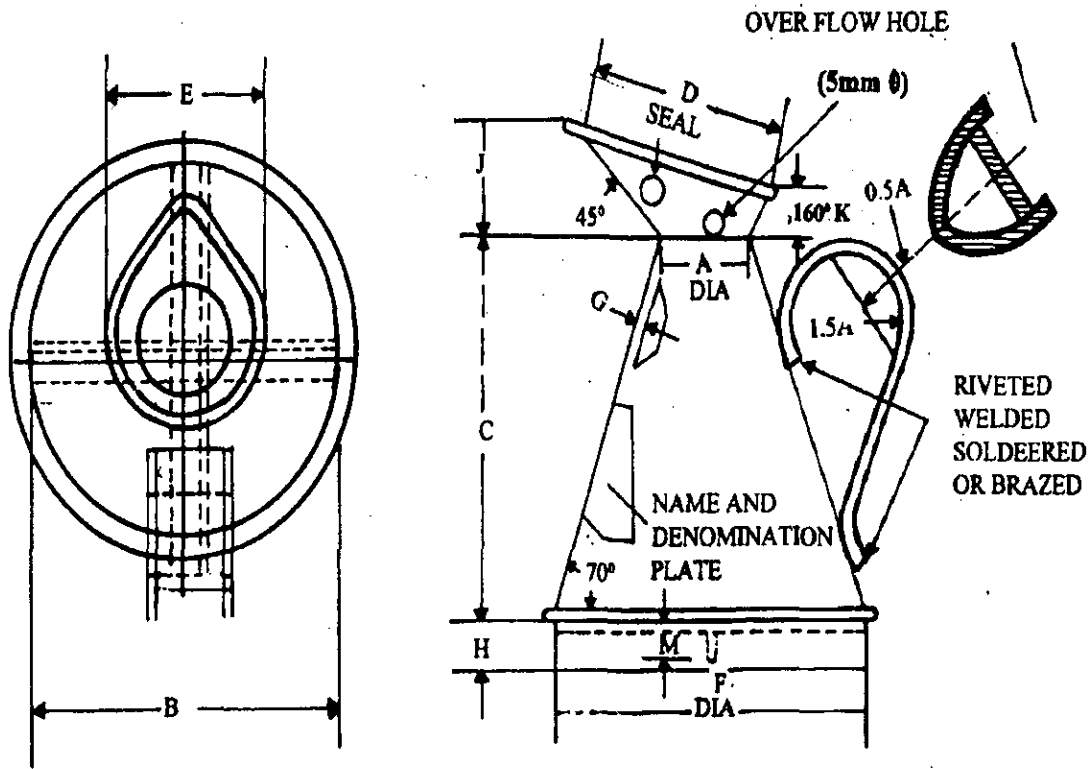
**Note 1 :** Capacity measures when used for measuring milk shall have the handle fixed by welding, soldering or other suitable methods. Brazing so as not to leave pockets in which dirt may accumulate.

**Note 2 :** Dipping type of cylindrical measures may also have handles substituted by two suitable but diagonally opposite brackets affixed to the walls of the measure by means of soldering, brazing or welding so as to hold the measure properly by a handle at right angles to the walls of the measures to facilitate its use in hot and boiled milk trade.

#### 5. Manufacture and finish

- (a) Cylindrical measures made of brass sheets and copper sheets shall be tinned or tin-plated uniformly all over the inside as well as the outside surfaces. Conical measures made of brass sheets or copper sheets, shall be well tinned or tin-plated uniformly all over the inside when they are used for measuring commodities like milk, edible oils and such other food articles.

- (c) The measures shall be free from any surface defects and indentations and shall be smoothly finished at the top.
- (d) Cylindrical measures shall be provided with a well formed and proportioned spout to facilitate pouring.
- (e) Conical measures shall be provided with a retaining lip to avoid spilling. The retaining lip shall be provided with a plug of suitable



POURING TYPE CONICAL MEASURE (SCHEMATIC)

FIGURE-14

material with a collar to receive the lead for the Legal Metrology Officer's seal. A small hole, about 5 mm in diameter shall be provided at the bottom of the retaining lip to indicate the level to which the measures shall be filled and the hole shall be located on the side at right angles to the handle. The bottom of conical measures shall be suitably reinforced.

- (f) The measures shall be so designed that, when they are tilted 120 degrees from the vertical, they shall become completely empty.
- (g) The finished measures shall have adequate robustness for durability.

**6. Permissible error**

The maximum permissible errors shall be as specified:

Denomination	Verification in excess only		Inspection			
	Cylindrical measures ml	Conical measures ml	Cylindrical measures		Conical measures	
			Excess	Deficiency ml	Excess	Deficiency ml
20 l	...	100	Error same as in verification	...	Error same as in verification	50
10 l	...	50	...	...	...	25
5 l	...	30	...	...	...	15
2 l	30	15	15	...	...	7.5
1 l	20	10	10	...	...	5
500 ml	15	8	7.5	...	...	4
200 ml	8	4	5	...	...	2
100 ml	5	3	2.5	...	...	1.5
50 ml	3	...	1.5	...	...	...
20 ml	2	...	1	...	...	...

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**7. Marking**

- (a) Every cylindrical measure shall have the denomination and manufacturer's name or trade mark indelibly stamped on it. In the case of conical measures, the denomination and manufacturer's name or trade-mark shall be either embossed on the body or indelibly marked on a name plate securely fixed to the body.
- (b) The denominations shall be indicated with the abbreviations 'l' and 'ली' for litre; and 'ml' and 'मिली' to indicate millilitre.

**Note :** The abbreviation 'ली' or 'मिली' may be indicated in the regional script.

The size of numerals and letters indicating denominations on the measures shall be twice the size of the letters indicating the manufacturer's name or trade mark.

**8. Stamping**

- (a) *Cylindrical capacity measures:* The Legal Metrology Officer's seal shall be stamped just above the indication of the denomination of the capacity measure.
- (b) *Conical capacity measures:* The Legal Metrology Officer's seal shall be stamped on the lead pellet provided for this purpose.

**PART II****DISPENSING MEASURES****1. General**

This Part deals with two types of dispensing measures made of glass or transparent plastic materials, used for dispensing purposes. Conical dispensing measures of capacity 100 ml may also be used in the sale of liquor.

**2. Types and denominations**

Dispensing measures shall be of the following types and denominations:—

- (a) *Conical measures*—200 ml, 100 ml, 50 ml, 20 ml, 10 ml and 5 ml.
- (b) *Beaker measures*—1000 ml and 500 ml.

**3. Materials**

- (a) *Glass measures*—The measures shall be made from clear and transparent glass. They shall be well annealed; free from stones, cracks and chippings; and as free as possible from blisters and other defects.

Lead glass shall not be used for the measures.

- (b) *Transparent plastic measures*—The measures shall be made from a clear and transparent plastic material, manufactured from plasticised polyvinyl chloride or copolymer, the major constituent of which is polyvinyl chloride. The plastic materials used shall not contain any constituents known to be injurious to health and likely to be extracted by contact with liquids.

**4. Definition of capacity**

The capacity corresponding to any graduation marks is defined as the volume of water at 27°C, expressed in millilitres, required to fill the measure to that graduation mark at 27°C, the observer's eye being level with the front graduation marks and the lowest point of the water meniscus appearing to touch the top edge of that mark.

**5. Shape, construction, etc. of conical measures**

- (a) *Shape*—The measures shall be conical as shown in Figure 15A to 15G. The 50 ml measures shall be either tall or squat as shown in Figure 15C and 15D respectively.
- (b) *Construction*—
- (i) Each measure shall have a pouring lip. The form of the lip shall be such that, when the measure is filled with water to the highest graduation mark, the contents may be poured from the lip in a stream falling clear of the outside of the measure.
  - (ii) Each measure shall have a base on which it shall stand vertically without rocking when placed on a horizontal surface. The size of the base shall be such that the measure, when empty, shall not fall when placed on a plane inclined at 15° to the horizontal. The bottom of the measuring space shall be uniformly rounded and shall merge smoothly into the sides of the measure.
  - (iii) The wall thickness of the measures shall be sufficient to ensure sturdy construction and shall not show any local departures from uniformity.
  - (iv) The external surface of the measure shall be a cone having an included

angle of not less than  $13^\circ$  and not more than  $14^\circ$ .

- (v) The overall volume of the measure shall be such that when it is filled with water to the highest graduation mark and a volume of water equal to half its nominal capacity is added to it, there shall be no overflow. But, the addition of a further quantity of water equal to quarter the nominal capacity shall result in water overflowing from the pouring lip.

(c) *Graduations—*

- (i) The conical measures shall be graduated in accordance with Table 13.
- (ii) With the pouring dip of measure facing to the right, the front graduation marks shall be placed at right angles to and on the right hand side of a vertical line extending from above to the top graduation mark to near the base of the measure and below the

bottom graduation mark.

- (iii) The graduation marks shall be marked as shown in Figure 15A to 15G. The marks shall be engraved or etched and they shall be of a uniform thickness not exceeding 0.3 mm., provided that they may taper slightly towards the ends. The graduation marks shall lie in planes perpendicular to the axis of the measure and shall be horizontal when the measure is standing on a horizontal surface.
- (iv) Each graduation number shall be etched or engraved close to the end of the graduation mark to which it relates and in such a manner that it would be bisected by a prolongation of that graduation mark.
- (v) The numbered graduation marks shall have the minimum length specified in Col. 7 of Table 13. The unnumbered graduation marks shall be at least two-third the length of the numbered graduation marks and clearly shorter than the numbered marks.

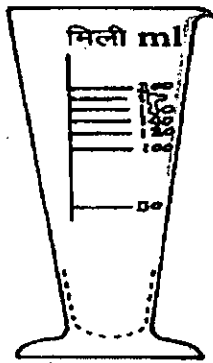
**TABLE 13**  
**Details of Conical Measures**

Denomination	Graduated At	Numbered At	Back Lines At	Lowest Graduation mark	Height of lowest graduation Mark above bottom of measuring space	Minimum length of mark
1	2	3	4	5	6	7
ml	ml	ml	ml	ml	cm	cm
200	50, 100, 120, 140, 160, 180, 200	50, 100, 120, 140, 160, 180, 200	50, 100, 200	50	$6.5 \pm 0.5$	2.0
100	Every 10 ml from 10 to 100 ml	10, 20, 40, 60, 80, 100	20, 60, 100	10	$3.0 \pm 0.5$	1.75
50 (Tall)	Every 10 ml from 10 to 50 ml	10, 30, 50	30, 50	10	$4.0 \pm 0.5$	1.5
50 (Squat)	Every 10 ml from 10 to 50 ml	10, 30, 50	30, 50	10	$2.0 \pm 0.5$	1.5
20	Every 5 ml from 5 to 20 ml	5, 10, 20	10, 20	5	$2.5 \pm 0.5$	1.25
10	Every ml from 2 to 10 ml	2, 4, 6, 8, 10	2, 6, 10	2	$2.5 \pm 0.5$	1.0
5	Every ml from 1 to 5 ml	1, 3, 5	3, 5	1	$2.5 \pm 0.5$	0.75

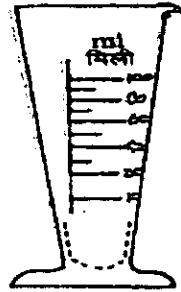
(vi) The height of the lowest graduation mark above the lowest point of the

bottom of the measuring space shall be within the limits given in Col. 6 of Table 13.

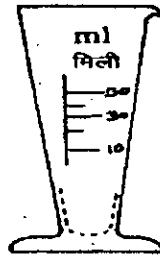
**FIGURE-15A**  
2000 ml



**FIGURE-15B**  
100 ml



**FIGURE-15C**  
50 ml  
(Tall)



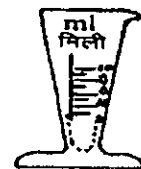
**FIGURE-15D**  
50 ml  
(SQUAT)



**FIGURE-15E**  
20 ml



**FIGURE-15F**  
10 ml



**FIGURE-15G**  
5 ml



(d) *Permissible errors*—The maximum permissible errors on verification or on inspection shall be as specified below (in ml) :

Capacity corresponding to graduation mark	Measures except 50 ml (Squat)	50 ml (Squat) measures
(1)	(2)	(3)
200, 180, 160	± 3.0	..
140, 120, 100	± 2.0	..
90, 80, 70, 60	± 1.5	..
50, 40	± 1.0	± 1.00
30	± 0.8	± 1.00
20	± 0.6	± 0.80
15	± 0.5	—
10, 9	± 0.4	± 0.6
8, 7, 6	± 0.3	—
5	± 0.25	—
4	± 0.20	—
3	± 0.16	—
2	± 0.12	—
1	± 0.08	—

**Note :** The permissible errors, apart from those of the 50 ml squat measure, apply to graduation marks corresponding to the capacities stated, irrespective of the nominal capacity of the conical measure concerned.

**6. Shape construction, etc. of beaker measures**

(a) *Shape*—The measure shall be in the form shown in Figure 16A and 16B.

(b) *Construction*—

- (i) Each measure shall be provided with a pouring lip. The form of the lip shall be such that, when the measure is filled with water to the highest graduation marks, the contents may be poured from the lip in a stream falling clear of the outside of the measure.
- (ii) Each measure shall be provided with a base on which it shall stand vertically without rocking when placed on a horizontal surface. The size of the base shall be such that the measure, when empty, shall not fall when placed on a plane inclined at 15° to the horizontal. The bottom of the measuring space shall be uniformly rounded and shall merge smoothly into the sides of the measure.
- (iii) The overall volume of the measure shall be such that when the measure is filled with water to the highest graduation mark and a volume of

water equal to quarter the denomination volume is added to it, the water shall not overflow.

(c) *Graduations*—

- (i) The graduation marks shall be marked as shown in Figures 16A and 16B and Table 14. The marks shall be etched or engraved and shall be of a uniform thickness not exceeding 0.3 mm, provided that they may taper slightly towards the ends. The graduation marks shall lie in places perpendicular to the axis of the measures and shall be horizontal when the measure is standing on a horizontal surface.
- (ii) Each graduation numbered shall be etched or engraved close to the end of the graduation mark to which it relates and in such a manner that it

would be bisected by a prolongation of that graduation mark.

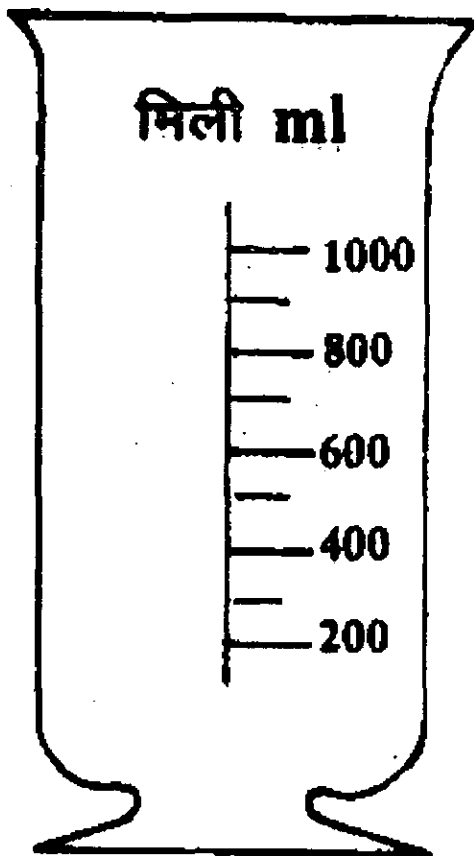
- (iii) The distance between the highest and the lowest graduation marks and the height of the lowest graduation mark above the inside of the base of the measure shall be in accordance with Cols. (3) and (4) respectively of Table 14.

- (d) *Permissible error*—The maximum permissible errors on verification or on inspection shall be  $\pm 7$  ml for 1000 ml measures and  $\pm 5$  ml for 500 ml measure.

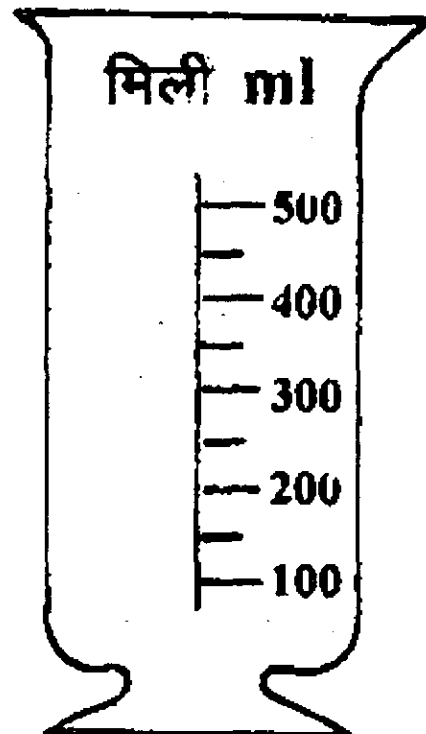
**7. Marking**

Each measure shall have permanently and legibly engraved or etched its denomination in Indo-Arabic numerals, the abbreviations 'ml' and 'मिली' being used to indicate millilitres. The manufacturer's name or trade mark shall be marked on the underside of the base of each measure.

*Note* : The abbreviation 'मिली' may be indicated in regional script.



**1000 ml**



**500 ml**

BEAKER MEASURES OF METRIC SERIES

**FIGURE-16 A**

**FIGURE-16 B**

**TABLE 14**  
**GRADUATION AND DIMENSIONS OF BEAKER MEASURES**

<i>Denomination</i>	<i>Graduation at</i>	<i>Distance between lowest &amp; highest graduation marks</i>	<i>Height of lowest graduation mark above bottom of measuring surface</i>	<i>Diameter of top</i>	<i>Min. Diameter of base</i>	<i>Overall height</i>
(1) ml	(2)	(3) cm	(4) cm	(*5) cm	(*6) cm	(7)
1000	200 to 1000 ml at each 100 ml; numbered back lines at 200, 600 and 1000 ml	11±1	4±1	12	9	23
500	100 to 500 ml at each 50 ml; numbered at each 100 ml; unnumbered back lines at 100, 300 and 500	9±0.5	3±0.5	10	8	18

\* *These are only recommendatory*

### 8. Stamping

The Legal Metrology Officer's seal shall be affixed after each verification just above the uppermost graduation marks.

## PART III- LIQUOR MEASURES

### 1. General

This Part deals with the requirements for liquor measures of two types.

### 2. Types

Liquor measures shall be of the following two types:—

- (i) Hand operated, and
- (ii) Automatic.

### 3. Denominations

The denominations of the types of liquor measures shall be as given below:—

Hand operated : 100 ml, 60 ml and 30 ml.

Automatic : 20 ml.

### 4. Material

The body of the liquor measures shall be made from glass or brass sheet or stainless steel sheet. The

minimum thickness of the sheet for liquor measures shall be 1.2 mm.

### 5. Shapes and dimensions

The shapes and nominal dimensions of hand operated liquor measures and automatic liquor measures shall be as given in Figure 17, 18 and 19 respectively.

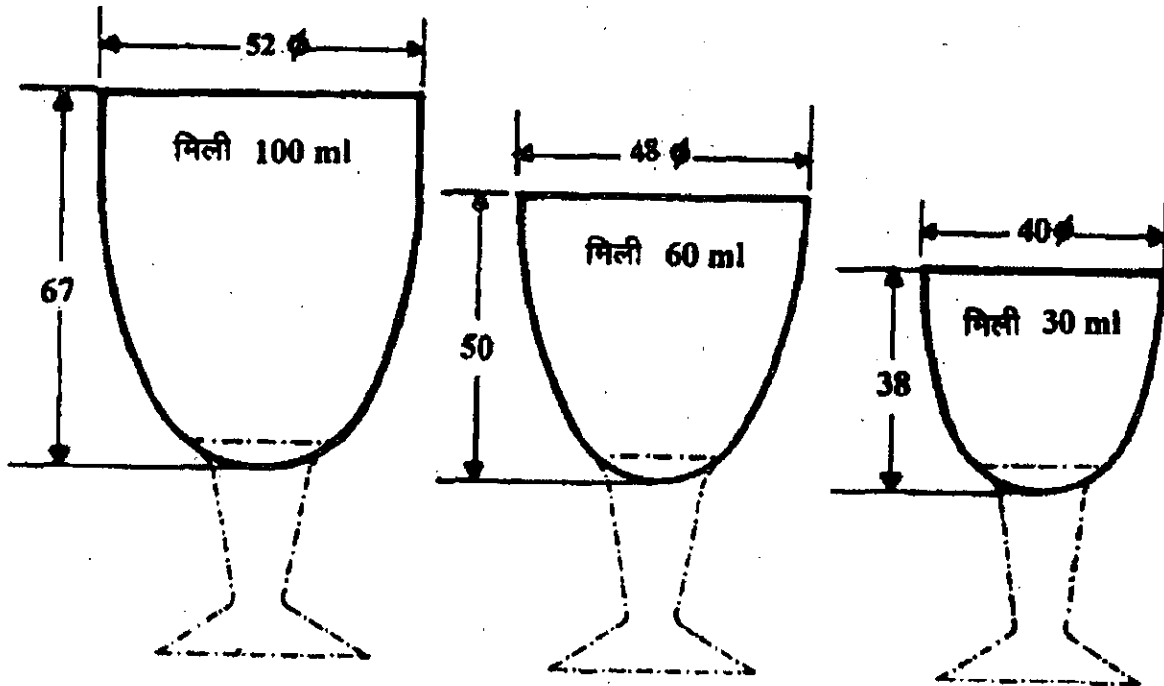
### 6. Manufacture

- (a) Liquor measures made of brass sheet shall be well tinned or silver-plated uniformly all over the inside as well as the outside surface.
- (b) Hand operated liquor measures shall be well formed. Measures of 60 ml and 30 ml capacity may be joined together with a common stem by brazing.
- (c) The measures shall be free from any surface defects and indentations and shall be smoothly finished.
- (d) Automatic liquor measures shall be capable of delivering 30 ml of liquor when tilted at an angle of 120 from the vertical.
- (e) Hand operated liquor measures shall have a knurled edge.

### 7. Permissible error

The maximum permissible errors shall be as given below:—

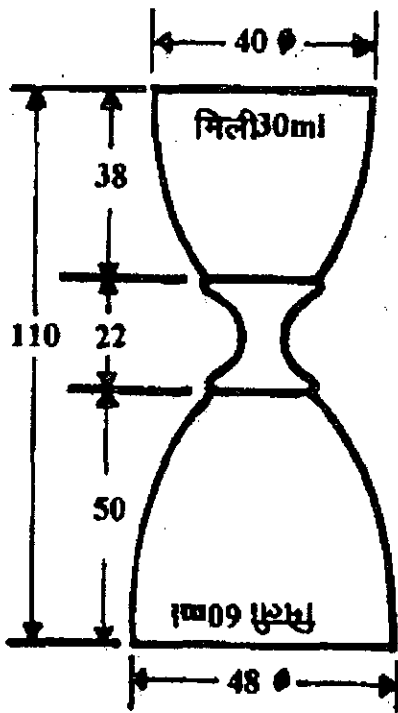
<i>Denomination</i>	<i>Permissible error</i>
100 ml	± 3 ml
60 ml	± 2 ml
30 ml	± 1 ml



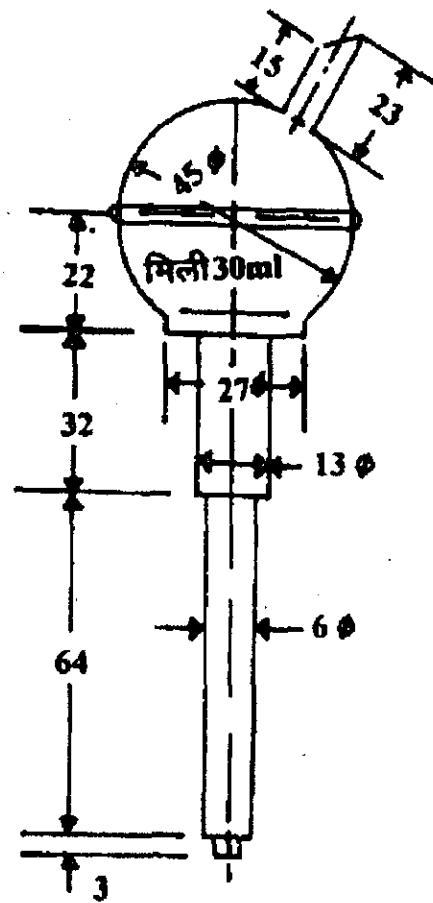
SHAPE AND NOMINAL DIMENSIONS OF COMBINED LIQUOR MEASURES

100 ml, 60 ml and 30 ml capacity

FIGURE-17



SHAPE AND NOMINAL DIMENSIONS OF COMBINED LIQUOR MEASURE  
60 ml and 30 ml Capacity  
FIGURE-18



SHAPE AND NOMINAL DIMENSIONS OF AUTOMATIC LIQUOR MEASURE  
FIGURE-19

**8. Markings**

- (a) Every liquor measure shall have the denomination and manufacturer's name or trade mark legibly and indelibly marked on it.
- (b) The denomination shall consist of international form of Indian numerals and the abbreviations 'ml' and 'मिली' to indicate millilitres. The size of numerals shall be twice the size of the letters indicating the manufacturer's name or trademark.

**Note:** The abbreviation 'मिली' may be indicated in the regional script.

**9. Stamping**

Legal Metrology Officer's seal shall be affixed after every verification just below the indication of the denomination mark.

**PART IV- LENGTH MEASURES  
(NON-FLEXIBLE)**

**1. General**

This Part deals with the non-flexible type of length measures made or manufactured from metal or wood.

**2. Denominations**

The denominations of the length measures shall be as follows :—

Metallic measures	Wooden measures
1 m	2 m
0.5 m	1 m
	0.5 m

**3. Material, shape, etc. of metallic measures**

- (a) *Material*—The measures shall be made from mild steel, brass or stainless steel.
- (b) *Shape and dimensions*—The shape and dimensions of the measures shall be as is shown in Figure 20.
- (c) *Graduations*—The graduation marks shall be made at every centimetre or at every

centimetre for the first ten centimetres and thereafter at every five centimetres. The graduation marks at every ten centimetres shall be numbered. The marks at the centimetre divisions shall extend over half the breadth and those at five centimetre divisions over full breadth of the measures. A cross mark shall be provided at 25 cm in the case of 0.5 m measure and at 25, 50 and 75 cm in the case of 1 m measure (See Figure 20). The graduations shall be only on one side of the measure.

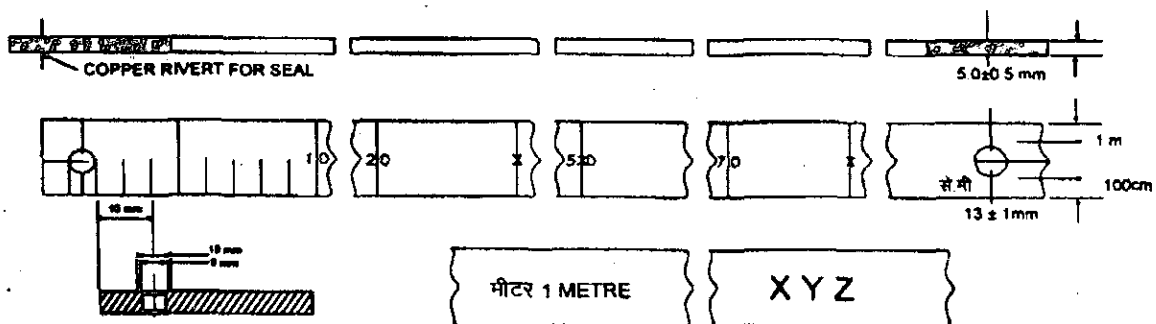
- (d) *Permissible error*—The error on the length between any two consecutive five centimetre graduation marks shall not exceed  $\pm 0.25$  mm and further the error from the beginning of the measure to any graduation mark shall not exceed 1.0 mm for 1 metre bar and 0.5 mm for half metre bars provided that the errors on the full length of the measures shall not exceed the following limits :

Denomination	Verification		Inspection	
	Excess	Deficiency	Excess	Deficiency
1 m	1.0 mm	0.5 mm	1.0 mm	1.0 mm
0.5 m	0.5 mm	0.25 mm	0.5 mm	0.5 mm

- (e) *Provision for stamping*—The measures shall be provided with a copper rivet near each end (see Figure 20) firmly fixed in a hole, countersunk on both sides, for the Legal Metrology Officer's stamp. An arrow head shall be marked at each end of the measure to provide the points for checking the length.

**4. Material, shape, etc. of wooden measures**

- (a) *Materials*—The measure shall be made from well seasoned timber of any one of the following species :—
  - (a) Teak (*Tectona grandis* Linn. f)
  - (b) Rosewood (*Delbergia Latifolia* Roxb)
  - (c) Shisham (*Dalbergia sissoo* Roxb)



SECTIONAL ENLARGED VIEW OF RIVET

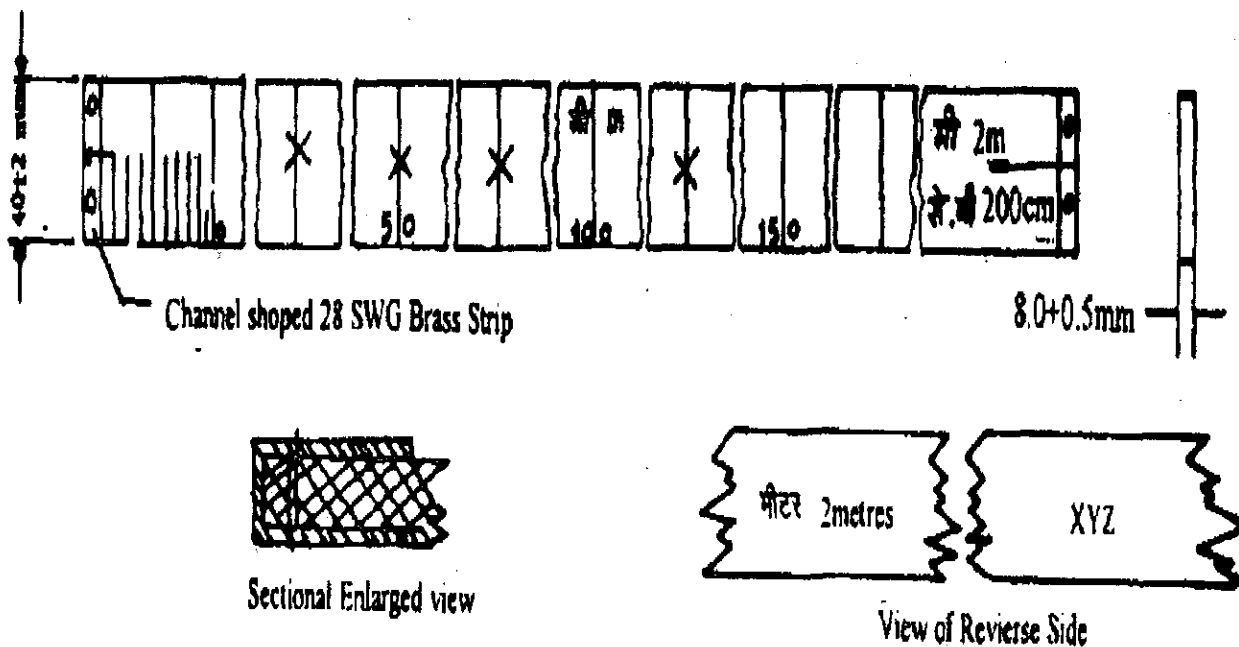
ENLARGED VIEW OF REVERSE SIDE

**METALLIC LENGTH MEASURE**

**FIGURE - 20**

- (d) Haldu (*Adhina cordifolia* Hook. f)
- (e) Bijasal (*Pterocarpus marsupium* Roxb)
- (f) Boxwood (*Biaxux sempervirens*)

- (g) Beech (*Fagus sylvatica*)
- (b) *Shape and dimensions*—The shape and dimensions of the measures shall be as shown in Figure 21.



WOODEN MEASURE  
FIGURE-21

(c) *Graduations*—The graduation marks shall be made at every centimetre for the first ten centimetres and thereafter at every five centimetres. The graduation marks at every ten centimetres shall be numbered. The marks at the centimetre divisions shall extend over half the breadth and those at the five centimetre division over the full breadth of the measures. A cross mark shall be provided at every 25 cm, excluding the one metre and two metre graduations. (See Figure 21) Last and first marks shall coincide with the end faces.

The graduation shall be on one side of the measures only.

(d) *Permissible error*—The error on the length between any two consecutive five centimetre graduation marks shall not exceed  $\pm 1$  mm, and further the error from the beginning of the measures to any graduation marks shall not exceed 2 mm, for 2 metre bar, 1 mm for 1 metre bar and 0.5 mm for half metre bar provided that the errors on the full length of the measure shall not exceed the following limits :

Denomination	Verification		Inspection	
	Excess	Deficiency	Excess	Deficiency
2 m	4 mm	2 mm	4 mm	4 mm
1 m	2 mm	1 mm	2 mm	2 mm
0.5 mm	1 mm	0.5 mm	1 mm	1 mm

(e) *Provision for stamping*—Each measure shall be provided at each end with a metal tip not less than 1 cm in width, securely riveted with two rivets at each end, as shown in Figure 21 for receiving the Legal Metrology Officer's stamp. The width of the tips shall be included in the total length of the measure.

**5. Manufacture and finish**

- (a) The measure shall be evenly finished and shall be reasonably straight.
- (b) In the case of metallic measures, the graduation marks and the cross marks shall be legible and deep enough to ensure

indelibility over a reasonably long period of use, but not so deep as to make the measures liable to be easily bent. In the case of wooden measures, the markings shall be finished neatly, sharply and legibly, in a colour contrasting with the wood finish. They shall be visible from a distance and shall remain indelible over a reasonably long period of use.

### 6. Marking

- (a) The denomination shall be stamped on the ungraduated side of the measure at about one-third of the total length from the beginning of the measure and the manufacturer's name or trade mark at a similar distance from the end of the measure. In the case of wooden measures, the markings shall be finished in the same manner as the graduations.
- (b) In indicating the denominations the numerals shall be preceded by the word 'मीटर' and followed by metre. The size of numerals and letters, indicating denominations of the measures shall be twice the size of the letters indicating the manufacturer's name or trade mark.
- (c) The end of the measure shall be marked on the graduated side with the International form of Indian numeral indicating the denomination, preceded and followed by the letters 'मी' and 'म'.

**Note :** The word and abbreviation 'मीटर' or 'मी' may be indicated in the regional script.

## PART V - FOLDING SCALES

### 1. General

This Part deals with wooden folding scales.

### 2. Denominations

The denominations of folding scales shall be 1 m and 0.5 m.

### 3. Materials

- (a) The scales shall be made from strips or sheets of wood. They shall be reasonably uniform, in width and thickness throughout the entire length.
- (b) The scales shall be made of any one of the following species of timbers:—
  - (i) Boxwood (*Buxus sempervirens*)
  - (ii) Gardenia (*Gardenia sp*)
  - (iii) Parrotia (*Parrotia Jacquemontiana*) (*Randia dumetorum*)
  - (iv) Dudhi (*Wrightia sp*)
  - (v) Bamboo.
  - (vi) Haldu (*Adina cordifolia Hook f.*)

- (vii) Kalam (*Mitragyna parvifolia korth*)
- (viii) Kuthan (*Hymenodictyon excelsum wall*)
- (ix) Gamri (*Gmelina aborea Linn*)

- (c) The timber shall be thoroughly seasoned and radially sawn. The moisture content of the timber shall be between 8 and 12 per cent.

The timber shall be free from knots, cracks, sap wood, snakes and other visible defects such as decay, insect attack, etc. and shall be fairly straight-grained.

### 4. Manufacture

- (a) **General**—The scales shall be reasonably straight and flat, the edges parallel to each other and the ends reasonably square.
- (b) No point on any of the edges shall be more than 0.5 mm distant from the straight line connecting its extremities. No point on the surface of a scale shall be more than 0.5 mm distant from the plane of the surface.
- (c) The scales shall consist of four pieces hinged together and it shall be an end measuring scale. (First and last graduation shall be the end face). The joints shall work smoothly without undue play and shall be sufficiently free from the folds to be opened and closed without strain. The brass caps shall be closely fitted and strongly secured to the blades. They shall be made flush with the sides of the scales.
- (d) A protective layer of suitable lacquer or varnish or any other suitable material shall be provided.

### 5. Dimensions

The principal dimensions of the scale blanks shall be as follows:—

Length of graduated part (m)	Width max. (mm)	Min. (mm)	Thickness (mm)
0.5	15.0	14.5	4 ± 1
1	20.0	19.0	5 ± 1

### 6. Graduations

- (a) Graduation marks shall be made at every millimetre with a longer line at every 5 mm and centimetre. The length of the graduation lines shall be as follows:—
  - cm marks 6 mm
  - 5 mm marks 4 mm
  - 1 mm marks 2.5 mm
- (b) The lines shall be fine and clear, of uniform depth and thickness, and perpendicular to the edges. The thickness of lines shall be not more than 0.2 mm for stamped scales and 0.1 mm for engine divided scales. The lines shall be of sufficient depth to be legible and indelible.

- (c) The lines shall be filled in black and natural background or with a suitable colour which shall contrast with the colour of the base to ensure legibility.
- (d) Every centimetre shall be numbered in international form of Indian numerals. The height of the figures shall be between 2.0 and 2.5 mm.

### 7. Permissible error

The cumulative error for the entire graduated part shall not exceed  $\pm 0.50$  mm. Further, over any 10 cm length scale, the error shall not exceed  $\pm 0.2$  mm.

### 8. Marking

(a) The denomination shall be stamped on the ungraduated side of the measure at a distance about one-third of the total length from the beginning of the measure. The manufacturer's name or trade mark shall be indicated indelibly at the same distance from the other end of the measure. The markings shall be finished in the same manner as the graduations.

- (b) In indicating the denominations the numerals shall be preceded by the word "मीटर" and followed by 'metre'.

**Note:** The word "मीटर" may be indicated in the regional script.

### 9. Stamping

The Legal Metrology Officer's seal shall be affixed either on the metal strip at the ends or the central hinge as may be convenient.

## PART VI—FABRIC OR PLASTIC TAPE MEASURE

### 1. General

- (a) This Part deals with fabric or plastic tape measures, which are used for measurements, where the use of rigid length measures is not convenient or practicable.
- (b) Tape measures of 0.5 m to 5 m, made of materials specified in clause 4(b), are intended to be used for measurements required in the tailoring trade, anatomical measurements or household measurements. Tape measures of 5 m and above made of materials specified in clause 4(c) are intended to be used for measurements of buildings, roads, timber and timber products and for other similar measurements but not for measurements of land, storage tanks, fermentation vats and other similar measurements.

### 2. Classes of accuracy

Fabric or plastic tape measure shall be divided into three classes of accuracy, namely, Class I, Class II and Class III, in accordance with their accuracy.

### 3. Nominal lengths

Fabric or plastic tape measures shall be made in nominal lengths of 0.5 m, 1 m, 1.5 m, 2 m, 3 m, 4 m, 5 m or multiples of 5 metres, provided that the maximum nominal length shall not exceed 100 metres.

**Note:** The nominal length of a fabric or plastic tape measure is the distance at the reference temperature of 20°C between the initial and terminal graduation lines, when the tape measure is stretched, in the wet or dry condition, and without friction on a horizontal plane surface, under an extension of 20 newtons. The length so measured shall be equal, within the limits of maximum permissible errors, to the nominal length of the tape measure.

### 4. Material

- (a) The materials used shall be adequately strong, stable and resistant to atmospheric conditions under the normal conditions of use and shall comply with the following requirements:—

- (i) When ordinarily used at temperatures between  $\pm 8^\circ\text{C}$  of the reference temperature, the variation in length of the tape measure shall not exceed the maximum permissible error.

- (ii) When used with a change of  $\pm 10$  per cent in the tension, the variation in length of the tape measure shall not exceed the maximum permissible error.

- (b) *Tape measures of nominal length 0.5m to 5 m :*

- (i) The tape measure may be made from a suitable fabric or plastic material.

- (ii) The fabric shall be coated with suitable paints, enamels or other suitable coating so as to give the tape measure a good finish. All coatings shall be non-cracking and water resistant.

- (c) *Tape measure of nominal length above 5 m :*

- (i) If made from fabrics, the fabric may be reinforced length-wise with rust-proof and rigid wires of metal or other equivalent material.