

332

# Metric measures

VOL 4

NOV 1961

NO-6



X: 0.000125 8MM.

14-2-61

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# metric 33<sup>2</sup> measures

(JOURNAL OF WEIGHTS AND MEASURES)  
STANDING METRIC COMMITTEE  
MINISTRY OF COMMERCE AND INDUSTRY

Vol. 4 NOVEMBER 1961 (KARTIKA 1883) No. 6

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Cover design by R. Sarangan

Annual Subscription Rs. 2.00

Single Copy 40 nP.

# metric measures

METRIC MEASURES is published every two months.

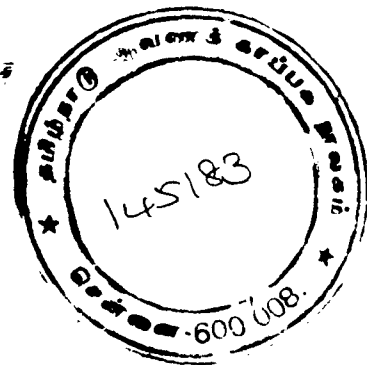
METRIC MEASURES provides information to the general public on the administrative, commercial, educational, industrial, historical and other aspects of weights and measures, with particular reference to the introduction of the metric system in India.

Contributions for publication should be sent to the Editor, METRIC MEASURES, Standing Metric Committee, Ministry of Commerce & Industry Udyog Bhavan, New Delhi.

Enquiries regarding subscriptions and supply of copies should be addressed to the Business Manager, Publications Division, Ministry of Information and Broadcasting, Old Secretariat, Delhi-8.

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## Metrology in India

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METROLOGY is often mistakenly taken to be a branch of production engineering. Actually it is mainly based on the principles of applied physics, mathematics and engineering. In its wider scope it covers almost everything concerned with the life of mankind since none of our daily transactions, work and various functions are complete without the application of measuring. It is perhaps this thought that made Theodor Mommsen, the German historian, say :—

'It is only the art of measuring which helps man to rule the world.'

Bertrand Russell, the famous philosopher avers :

'Measuring is a masterpiece of simplification without falsification.'

Lord Kelvin feels :

'If you are able to measure by a number what you talk and express, you then know something; but if you cannot measure what you are able to express by a number, your conception is very poor and unsatisfactory.'

What is Metrology?

The 'art of measuring' has been developed in its varied applications and branches of learning into the 'science of metrology'. Thus 'scientific metrology' deals with the evolution and development of the fundamental or derived standards.

'Engineering metrology' mainly deals with the precise measurement of articles and components of the engineering industry in their various stages of unfinished and finished condition. It covers the measurement of dimensions, angular measurement, surface finish, profile forms etc. with the requisite degree of accuracy according to the nature of the end product. Articles such as gauges, screw threads, micrometers, comparators, interferometers and a numerous variety of measuring instruments come under the compass of the subject.

'Legal metrology' deals with the metrology of public transactions in commerce, industry and agriculture i.e. measuring articles which are purchased or sold in commercial transactions through the medium of weights, measures or weighing and measuring instruments which are subject by law to verification, stamping and periodical inspection by a competent state authority like the Department of Weights and Measures.

Besides the above, there are other subdivisions of metrology such as physical metrology of natural phenomena, biological metrology, metrology of hygiene and collective security, metrology of sailing, metrology of flying, of astronomy, of chemistry,

metrology of man and perhaps, in keeping with the times, metrology of radiations and metrology of space travel.

In this article only the subjects of scientific metrology, engineering metrology and legal metrology are briefly considered.

Scientific metrology forms the basic link between the other two as it concerns the evolution and acceptance of fundamental standards.

#### Standards of Measurement

As India has now adopted the metric system, there is no need to refer to other systems in this article. The International Prototype Kilogram made of platino-iridium alloy and the International Prototype Metre also made of platino-iridium alloy in the well-known Tresca Section, lodged in the Pavillon de Breteuil, Bureau International des Poids et Mesures (BIPM), Sevres, France, are the respective fundamental standards of weight and length measure. (Recently the definition of the metre has been changed to which reference is made later).

Each country which is a member of the 'Metric Convention' has received a prototype copy of these standards and these are the highest standards in use in those countries. The intention of the original promoters of the fundamental standards was to connect the standards to a 'natural quantity'. For example, they decided to fix the length of the metre as equal to 1/40 millionth part of the earth's meridian passing through the observatory of Paris, a portion of which was actually measured to the highest degree of accuracy obtainable in the 1790's.

It was, however, found later that there was still some error and the unit of length was fixed as the distance between two marks

on the International Prototype Standard at 0°C and under normal atmospheric pressure.

In October 1960, even this definition has been changed and the metre has been defined and accepted by the representatives of 32 Governments at the Eleventh Conference of Weights & Measures as the distance equal to 1 650 763.73 wavelengths of the orange red light of krypton 86 in *vacuo*. The wavelength of this light is 0.605 892 microns.\*

The unit of the kilogram was based on the mass of one cubic decimetre of distilled water at 4°C. Subsequently it was found that there was an error of 3 parts in 100,000 due to the fact that one kilogram of distilled water has a volume of 1.000 028 cubic decimetres. Although for practical purposes 1 cubic centimetre of pure, air-free water at its temperature of maximum density and at normal atmospheric pressure weighs 1 gram, it is not scientifically correct to say that one cm<sup>3</sup> of pure, air-free water weighs one gram or one dm<sup>3</sup> weighs one kilogram.

The accuracy of International Standards is of the order of 10<sup>-7</sup> to 10<sup>-8</sup> of their unit values.

In the Standards of Weights and Measures Act, 1956, the following primary and secondary units have been defined :

|        |    |    |              |
|--------|----|----|--------------|
| Length | .. | .. | Metre        |
| Mass   | .. | .. | Kilogram     |
| Area   | .. | .. | Square Metre |
| Volume | .. | .. | Cubic Metre  |

\*An apparatus recently installed in the BIPM, Sevres, which has been manufactured and supplied by M/s. Societe Genevoise Instrument d'physique, Geneva, and is capable of measuring the graduations to a precision of some millionths of a millimetre, is based on the principle of interferometry and is fitted with photoelectric microscopes and electronic controls.

#### METROLOGY IN INDIA

|                      |    |    |         |
|----------------------|----|----|---------|
| Capacity             | .. | .. | Litre   |
| Time                 | .. | .. | Second  |
| Electric Current     | .. | .. | Ampere  |
| Luminous Intensity   | .. | .. | Candela |
| Scale of Temperature | .. | .. | °C      |

Recently the Eleventh General Conference of Weights and Measures has approved a number of secondary units\*.

#### Engineering Metrology

Even an engineer who is familiar with drawing scales or workshop measuring scales, requires some practice to get the correct feel of instruments like micrometers or calipers used for measuring diameters or widths of objects to an accuracy of 25 microns *i.e.* 0.025 mm (one thousandth of an inch). In most of the precision engineering works, tool rooms and inspection laboratories of today it is not uncommon to aim at an accuracy of 5 microns *i.e.* 0.005 mm ( $\pm 0.002$ ) or better. The inspection and reference gauges used in such precision laboratories have to be still more precise in accuracy. An idea of the degree of accuracy is given by the DIN formula *e.g.* tolerance on reference end standard =  $(0.1 + 0.002 L)\mu$  where  $\mu = 0.001$  mm, and

$L$  = Length of the standard in mm.

Thus the tolerance on a metre bar is  $\pm 0.0021$  mm (2.1 microns). The actual precautions one has to take for achieving this precision will be appreciated from the fact that a steel bar one metre long undergoes a change in length of 1.2 microns for each tenth of a degree Centigrade temperature change.

The basic knowledge for students to be trained in engineering metrology must be in the main in the following subjects :

- (1) Mathematics: engineering level.
- (2) Physics (applied), specially relating to heat, optics, electricity and sound: B.Sc. level.

\*Metric Measures, September 1961, p. 22

#### (3) Mechanics.

#### (4) Heat treatment of steel.

#### (5) Properties of materials.

#### (6) Standardization.

#### (7) Workshop technology including fits and tolerances.

#### (8) Extensive knowledge and practical use of measuring instruments, comparators, slip gauges, dial gauges, surface measuring instruments, interferometers, profile measuring machines, universal measuring machines, internal and external cylindrical measuring machines, gear measuring machines, etc.

#### (9) Electronics and its industrial application in measuring machines.

#### (10) Air conditioning: temperature control, vibration.

#### (11) Engineering drawing.

#### (12) Manufacture and design of gauges and measuring instruments.

#### (13) Testing of straightness, flatness, squareness and alignment.

#### Legal Metrology

In its application legal metrology requires full knowledge of the practical use and application of all types of standards of weights, capacity measures, linear measures and machines, apparatus and appliances. It also covers the measurement of area, volume, distance, and in some countries electricity and gas supply. The commercial standards employed for these purposes are required by law to be previously verified and stamped, before they are used for commercial transactions. They also have to undergo periodical inspection. Any apparatus, appliance and machine *viz.* scales, balances, weighing machines (automatic or otherwise), platform machines, counter machines, steelyards, batch weighing machines, cloth and leather measuring machines, petrol pumps, meters used for measuring petrol, lubricants and hydrocarbons, meters for measuring gas and electricity, proving vessels, tapes, heavy weights for testing tare of

- (12) Measurement of electrical energy: Electrical meters.
- (13) Temperature measurements and heat.
- (14) Optical measuring.
- (15) Strength of materials and applied mechanics.
- (16) Technology of materials and alloys of construction, types of wood and other material used in construction.
- (17) Industrial drawing.
- (18) Administrative Law and Penal Code.
- (19) Rules and Regulations relating to weights and measures.

**ENGINEER'S DEGREE COURSE (Newly introduced in 1960).**

**Admission :** Chosen from diploma and degree holders from polytechnics on the result of an entrance examination.

**Duration :** 2 years course at the College.

**Syllabus :** (1) Higher mathematics including tensor, vector calculus, calculus of probability, statistical control, statics, dynamics and hydrostatics.

- (2) Fluid mechanics, thermodynamics, optics, photometry, acoustics, electrical technology, electronics, modern physics and nuclear physics.
- (3) Principles of standardization, terminology etc.
- (4) General principles of measures, standards of units of measure, quality of measuring apparatus, preparation and verification of measures, errors, tolerance etc.
- (5) Various types of measuring machines, instruments etc. covered by items (5 to 14) of the Inspector's course.
- (6) Precision measurement.
- (7) Strength of materials and applied mechanics.
- (8) Technology of materials and alloys of construction, their analysis and specifications and physical characteristics.
- (9) Industrial design and drawing.
- (10) Administrative Law and Penal Code.
- (11) Rules and Regulations relating to weights and measures.

*For discussion  
at the Comptroller  
of Head of*

## International Paper Sizes

**S. K. SEN**

Deputy Director,  
Indian Standards Institution,  
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**'BRITISH** paper sizes, like Topsy, just grew'. This very apt observation of the British Federation of Master Printers in one of its pamphlets for production aids to the printing industry explains the growth in that country of the multiplicity of paper sizes without any common basis. The Indian industry, largely fashioned after its counterpart in the UK, has inherited this multiplicity. To one who is uninitiated in the intricacy of the paper industry and trade, it constitutes a source of much confusion. Many sizes differ only slightly from one another and the nomenclature used to denote them adds to the confusion, as in post, small post, large post, demy, small demy, large demy and so on.

The economic implications of this state of affairs are far-reaching. The cost of manufacture and stocking at multiple points by dealers and consumers grows with the growth of variety. The printing industry has to invest a larger amount of capital in stocks of different sizes of paper. Manufacturers of printing machinery have to align themselves with the paper sizes. Ancillary industries dealing with paper products and stationery equipment are

also similarly affected. The result is an avoidable national wastage on the one hand and an increased burden on the consumer in the form of enhanced prices on the other.

There can be no doubt that a reduction in the number of paper sizes will benefit all concerned, but any attempt to rationalize the existing sizes is met with an inherent difficulty. The sizes, having developed without any correlation with one another, do not offer any logical basis on which reduction can be effected. To choose one in preference to any of the other near sizes is just arbitrary. This difficulty led the Paper Committee of the International Organization for Standardization (ISO) to turn to a series of paper sizes which had been in use in some of the European countries. It was found that these sizes, by virtue of the coherent system on which they were based, possessed some remarkable properties to ensure substantial economies to both paper manufacturing and printing industries and, of course, to consumers in general. These sizes have since been adopted by a very large number of the national standardizing bodies of the world and is

now referred to as the international series of paper sizes.

**Basis of International Paper Sizes**

The basis of the international series of paper sizes, or A-sizes, is a rectangle having an area of one square metre, the sides of which are in the proportion of  $1:\sqrt{2}$ . The effect of this arrangement is that if the area of the sheet is doubled or halved, the shorter

the smaller the sheet. Figure 2 shows some subdivisions from A1.

Where larger dimensions are required, the letter A is preceded by a figure. Thus 2A0 means twice the size of A0; and 4A0 means four times the size of A0. Table 1 gives the designations and sizes of the A series. The dimensions are of the trimmed or finished sizes. Stock sizes from which they are obtained are given later.

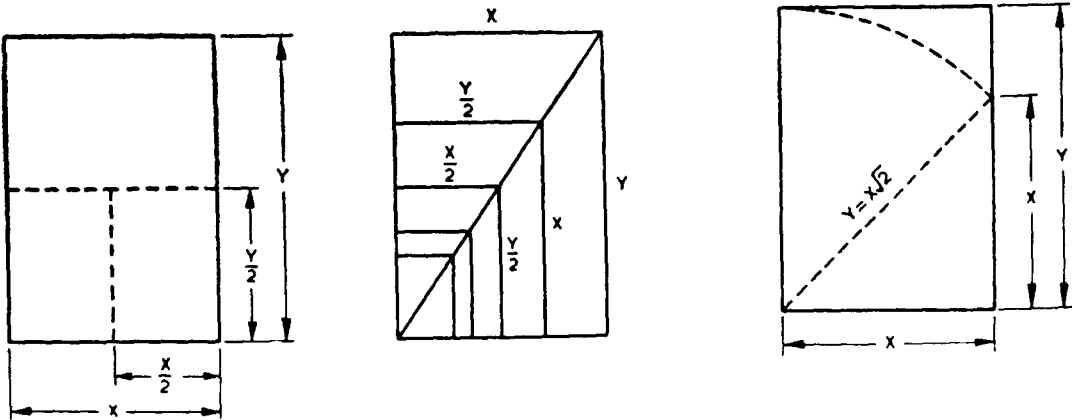


Fig. 1—Basis of International Paper Sizes

side and the longer side of the new sheet are still in the proportion  $1:\sqrt{2}$  as shown in Fig. 1.

Thus it is possible to derive successive sizes of the series merely by repeated halving. This also provides advantages in the preparation of copy, as any size in the series can be obtained from one copy by enlargement or reduction.

The designation of the series consists of capital A followed by a figure. The basic size has the designation A0; half A0 is A1; half A1 is A2 and so on. The higher the figure which follows the letter, the greater is the number of subdivisions and, therefore,

**TABLE 1—A-SERIES OF INTERNATIONAL PAPER SIZES**

| Designation | Size in mm    | Exact Size in in. |
|-------------|---------------|-------------------|
| 4A0         | 1 682 × 2 378 | 66.22 × 93.62     |
| 2A0         | 1 189 × 1 682 | 46.81 × 66.22     |
| A0          | 841 × 1 189   | 33.11 × 46.81     |
| A1          | 594 × 841     | 23.39 × 33.11     |
| A2          | 420 × 594     | 16.54 × 23.39     |
| A3          | 297 × 420     | 11.69 × 16.54     |
| A4          | 210 × 297     | 8.27 × 11.69      |
| A5          | 148 × 210     | 5.83 × 8.27       |
| A6          | 105 × 148     | 4.13 × 5.83       |
| A7          | 74 × 105      | 2.91 × 4.13       |
| A8          | 52 × 74       | 2.05 × 2.91       |
| A9          | 37 × 52       | 1.46 × 2.05       |
| A10         | 26 × 37       | 1.02 × 1.46       |

**INTERNATIONAL PAPER SIZES**

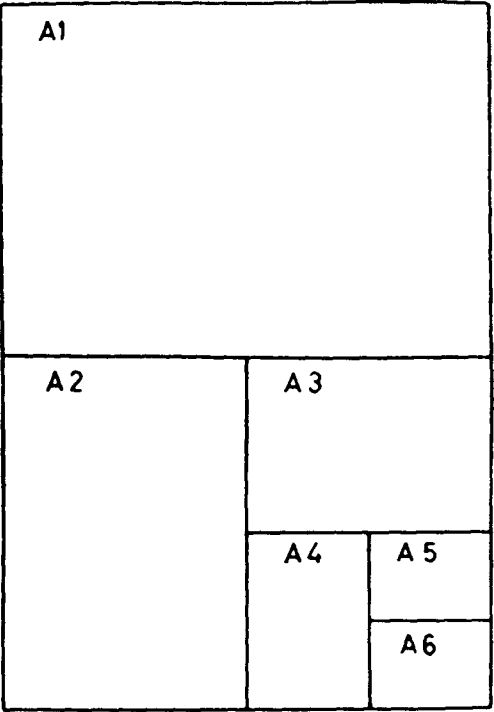


Fig 2—A—Series of Paper Sizes

**B and C Sizes**

In addition to the A sizes, three other series of international paper sizes were originally devised, namely B, C and D. The D series is obsolete. The B sizes are obtained from the A series as the geometrical intermediates of consecutive A sizes. They are intended primarily for posters, wall charts and similar items where the difference in sizes of the A series represented too large a jump. It is also used for envelopes where it is necessary for an envelope in the C series to be inserted in another envelope.

The C sizes are geometrical intermediates between consecutive A and B sizes. They are primarily meant for envelopes or folders suitable for enclosing the A series of sta-

tionery. The relationship between A, B and C sizes is shown in Fig. 3. A will be seen to fit in C and C in B. Table 2 below gives the dimensions of some of the B and C sizes.

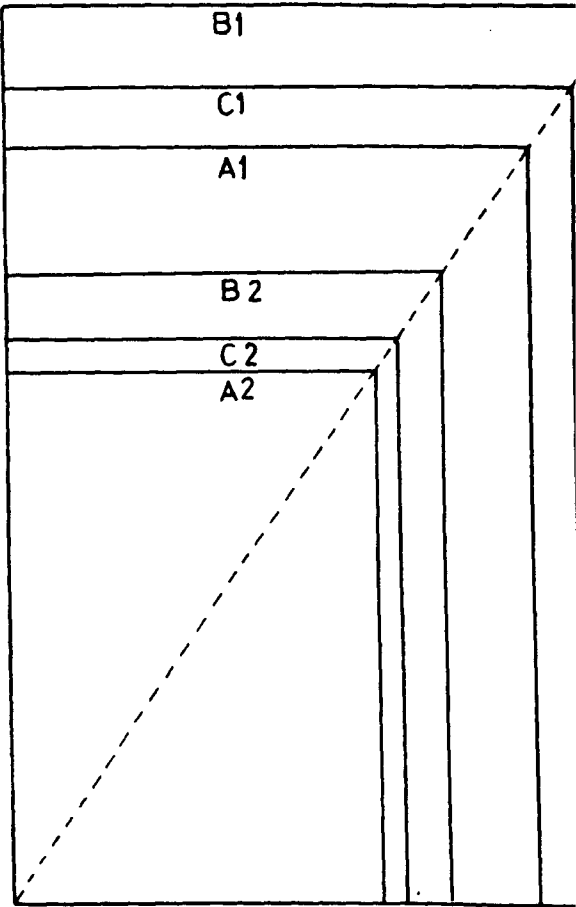


Fig 3—Relation Between A, B and C Sizes

Table 2 below gives the dimensions of some of the B and C sizes

TABLE 2—B AND C SERIES OF INTERNATIONAL PAPER SIZES

| Designation | Size in mm  | Exact Size in in. |
|-------------|-------------|-------------------|
| B1 ..       | 707 × 1 000 | 27·83 × 39·37     |
| B2 ..       | 500 × 707   | 19·68 × 27·83     |
| B3 ..       | 353 × 500   | 13·90 × 19·68     |
| C1 ..       | 648 × 917   | 25·51 × 36·10     |
| C2 ..       | 458 × 648   | 18·03 × 25·51     |
| C3 ..       | 324 × 458   | 12·76 × 18·03     |

The Indian Standards Institution has adopted the international paper sizes in IS: 1064—1957 Indian Standard Specification for Paper Sizes. The A series is recommended as the principal series for all general printing work. In particular, size A4 has been recommended for business letters and periodicals, and books may correspond to any convenient size of the A series preferably in the range A4 to A6. It is realized, however, that the change-over to the A series for printing papers involves considerable deviations from existing practices. The B and C sizes which are nearer to crown and foolscap papers were, therefore, standardized as additional special sizes. As stated before, B and C series are not meant for paper sizes and should be used only rarely to facilitate the transition to the A series.

#### Stock Sizes

The sizes described above are all trimmed sizes. Raw stock sizes in which paper is manufactured and stocked must necessarily allow for a margin for trimming. No international recommendation is yet available for raw stock sizes but the discussion at the subcommittee level of the ISO Paper Committee has advanced sufficiently to give an indication of the trend of thought now prevailing at the international level. Taking note of it, the Paper Sectional Committee of ISI prepared a draft specification for raw

stock sizes which has just been finalized after eliciting the comments of the industry, trade and other consuming interests.

The proposed raw stock sizes are given in Table 3. They represent a compromise between the wide range of deckle widths of existing paper mills in the country and the minimum trimming margin required by the printing industry for various types of work. The ordinary raw stock sizes are appropriate to cover a large amount of general work but for bleeding work and where extra trims are necessary the special size may have to be ordered.

TABLE 3—UNTRIMMED (RAW STOCK) PAPER SIZES

| Designation | Untrimmed Size | Standard Size cm | Special Size cm |
|-------------|----------------|------------------|-----------------|
| RA0 ..      | 86 × 122       |                  | 88 × 124*       |
| RA1 ..      | 61 × 86        |                  | 62 × 88*        |
| RB1 ..      | 75 × 105       |                  | —               |
| RC1 ..      | 67 × 94        |                  | 68 × 96*        |

\*For bled work or where extra trim is required.

#### Change-over to New Sizes

Fig 4 shows the correspondence of the demy, crown and foolscap paper sizes, which are the most popular sizes in demand now, and the A, B and C series of paper sizes.

It is evident that they are fairly close to enable the paper making and printing industries to adopt the nearest international size. It should be borne in mind, however, that if all the three A, B and C sizes are brought into use, the advantage of variety reduction will be largely lost. For this reason, B and particularly C sizes are not recommended to be used unless there are weighty economic considerations against the immediate adoption of the A sizes. The Conference of the State Controllers of Printing and Stationery which has been reported earlier in *Metric*

*Measures\** came to the conclusion that for all items of work for which the A sizes can be used, they should be adopted straightaway and for other work the B series may be adopted as a transitional measure for working towards the A sizes in a gradual manner.

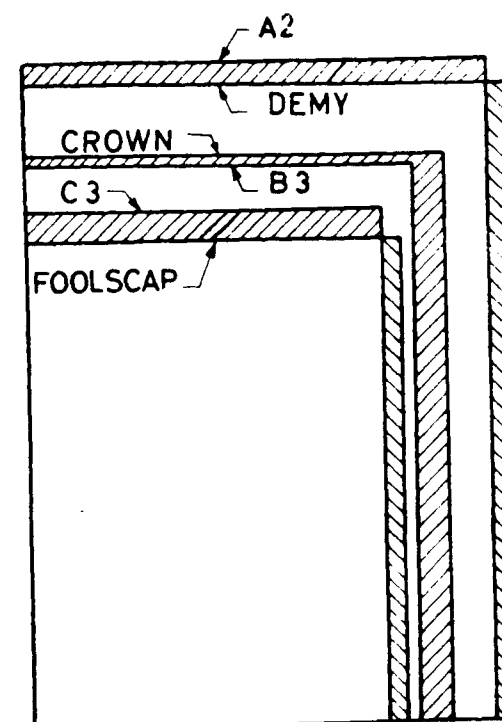


Fig 4—Correspondence Between Some Existing and International Sizes.

\**Metric Measures*, March 1961, pp. 20-22.

There would seem to be no serious difficulty in implementing the recommendations of the Conference of the State Controllers of Printing and Stationery by the printing industry in general. There is nothing inherently mandatory in the form of a publication which means that it should be possible to set it in A size as well as in its present size. For forms, the adoption of the A series of paper sizes is much easier. The problem, however, arises in regard to the economics of printing in A sizes in existing printing machines. This question has been examined in detail by the Office of the Chief Controller of Printing and Stationery, New Delhi and it has been shown that a large number of existing printing machines will be able to accommodate A sizes of paper. For the rest, the B sizes will involve little problem.

The international paper sizes have been adopted after much thought both at the national and the international levels. Its adoption will put an end to the recurring wastage of existing multitude of paper sizes. It is to be hoped that the various industries and trade connected with paper making and printing will willingly co-operate with each other and will solve the few problems that may arise in the transition period and clear the way towards the adoption of the international paper sizes in India in the very near future.

# Metric System in Architectural, Building and Structural Drawings

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THE Standards of Weights and Measures Act, 1956, lays down a period of 10 years for the complete adoption of the metric system. We are now passing through the transition period. During this period the architect and the building engineer will come across many problems regarding preparation of drawings in metric units and sizes of metric drawing accessories. This article brings together information needed by the architect and the structural engineer for the preparation of architectural, building and structural drawings.

The Indian Standards Institution (ISI) have published IS: 962—1960 'Code of Practice for Architectural and Building Drawings'. This standard lays down detailed procedure for the preparation of architectural drawings in the metric system.

A comprehensive code for the preparation of structural drawings in the metric system is under preparation by the ISI.

## Sizes of Drawing Sheets (From IS: 962—1960)

| Designation | Trimmed Size | Untrimmed Size |
|-------------|--------------|----------------|
|             | mm           | Minimum<br>mm  |
| A0          | 841 × 1189   | 880 × 1230     |
| A1          | 594 × 841    | 625 × 880      |
| A2          | 420 × 594    | 450 × 625      |
| A3          | 297 × 420    | 330 × 450      |
| A4          | 210 × 297    | 240 × 330      |
| A5          | 148 × 210    | 165 × 240      |

Note.—The trimmed sizes of drawing sheets are based on the following principles (see IS: 1064—1957) :

- The surface area of the basic size A0 is one square metre.
- The width and length bear a ratio of 1 :  $\sqrt{2}$ . In consequence at each doubling or halving lengthwise of any paper size in the series, the aspect ratio of 1 :  $\sqrt{2}$  is maintained.

## Sizes of Drawing Boards (From IS: 1444—1959)

| Designation | Dimensions      |
|-------------|-----------------|
|             | mm              |
| B0          | 1250 × 900 × 20 |
| B1          | 900 × 650 × 20  |
| B2          | 650 × 500 × 20  |
| B3          | 500 × 350 × 20  |

Note.—(a) For drawings exceeding these sizes, special drawing boards may be used, but the width of drawing boards should not exceed 1 000 mm.

(b) There are four sizes of engineer's pattern tee squares, designated as T0, T1, T2 and T3 (made according to IS : 1360—1959) for use with drawing boards, designated as B0, B1, B2 and B3 respectively. The B0 of board size should not be confused with B0 paper size.

## METRIC SYSTEM IN ARCHITECTURAL, BUILDING AND STRUCTURAL DRAWINGS

### Sizes of Printing Frames for Reproduction

| Designation<br>(1) | Size<br>(2) |
|--------------------|-------------|
|                    | mm          |
| F0                 | 1250 × 900  |
| F1                 | 900 × 650   |
| F2                 | 650 × 500   |
| F3                 | 500 × 350   |

(b) Preliminary Sketch Drawings  
1/500, 1/200, 1/100

(c) Working Drawings, Plans, Elevation and Sections  
1/200, 1/100, 1/50

(d) Large Scale Drawings—General Details  
1/20, 1/10

(e) Enlarged Detail  
1/10, 1/5, 1/2.5, 1/2, 1/1

### Metric Scales for Architectural Purposes (From IS: 1491—1959)

There are 6 scales for architectural purposes, designated as A, B, C, D, E and F and marked with 12 different scales of reduction as given below:

|   |                                |                    |
|---|--------------------------------|--------------------|
| A | { Full size<br>1 cm = 2 cm     | 1/1<br>1/2         |
| B | { 1 cm = 2.5 cm<br>1 cm = 5 cm | 1/2.5<br>1/5       |
| C | { 1 cm = 10 cm<br>1 cm = 20 cm | 1/10<br>1/20       |
| D | { 1 cm = 0.5 m<br>1 cm = 1 m   | 1/50<br>1/100      |
| E | { 1 cm = 2 m<br>1 cm = 5 m     | 1/200<br>1/500     |
| F | { 1 cm = 10 m<br>1 cm = 20 m   | 1/1 000<br>1/2 000 |

The scales used for various purposes will be as follows:

(a) Large Scale Surveys and Layouts  
1/2 000, 1/1 000, 1/500

### Metric Scales for Use with Drafting Machines (From IS: 1482—1960)

According to IS: 1482—1960, the metric scales for use with drafting machines are to be made in two lengths : 30 cm and 50 cm and incorporate four scales of reduction, namely, 1/1, 1/2.5, 1/5 and 1/20.

### Metric Steel Scales for Engineers (From IS: 1481—1959)

According to IS: 1481—1961, the scales are of the following denominations :

|                       |
|-----------------------|
| 10 cm                 |
| 15 cm (non-preferred) |
| 20 cm                 |
| 30 cm                 |
| 50 cm                 |
| 100 cm                |

The scales are graduated in cm and mm. The first 5 cm are divided into 0.5 mm divisions.

### Numbering of Building Floors, Rooms and Components (From IS: 962—1960)

| Floors<br>(1) | Rooms<br>(2) | Windows<br>(3) | Doors<br>(4) | Columns<br>(5) | Beams<br>(6) |
|---------------|--------------|----------------|--------------|----------------|--------------|
| Floor 001     | R001/1 etc   | W001/1 etc     | D001/1 etc   | C001/1 etc     | B001/1 etc   |
| Floor 01      | R01/1 etc    | W01/1 etc      | D01/1 etc    | C01/1 etc      | B01/1 etc    |
| Floor 1       | R1/1 etc     | W1/1 etc       | D1/1 etc     | C1/1 etc       | B1/1 etc     |
| Floor 2       | R2/1 etc     | W2/1 etc       | D2/1 etc     | C2/1 etc       | B2/1 etc     |

Note:

- Floor 001 refers to second floor below the floor at the ground level (that is, Floor 1) such as sub-basement.
- Floor 01 refers to the floor just below the floor at the ground level, such as basement.
- Floor 1 refers to the floor immediately above ground. This is commonly referred to as ground floor.

## Gals on the Line

(The following article, written by Mr. C. A. Howard-Luck, Inspector in-Charge, Nyanza Province, Kenya, is reproduced from *The Monthly Review* (The Journal of the Institute of Weights and Measures Administration, U.K.) June 1961, pages 133-134.

It is hoped that it would be of interest to many in India as it describes the possible effect of variation of gravity on spring balances. The need for accurate readjustment of spring balances when they are to be used in the tropics, is stressed in the article.

It may be mentioned that some Continental countries do not legally permit the use of spring balances in commercial transactions. —Editor)

The Kisumu office of the Kenya Weights and Measures Department is situated only  $6\frac{1}{4}$  miles from the Equator and is the nearest Weights and Measures office in the Commonwealth to the "Line". It is therefore in an excellent position for a study of the effect of the equatorial bulge in the earth's shape on the value of  $g$ .

The study was made mathematically at first. Using Helmert's formula for correcting the value of  $g$  for latitude ( $g=980.616 - 2.5928 \cos 2\lambda + 0.0069 \cos^2 2\lambda$ ), it was calculated that the force of gravity at the Kisumu office (position:  $34^\circ 45'E$ ;  $0^\circ 06'S$ ) should be  $978.030 \text{ cm/sec.}^2$ . This, however, only gave a value for sea-level and the working level in the office is 3,860 feet above sea-level. A correction for altitude was then applied to the result, by subtracting from it  $0.0003086 h$ ,  $h$  being the altitude of

1 177 metres. The theoretical value of  $g$  at the Kisumu office was finally calculated to be 977.667 cm.

It was realised, however, that the local geomorphological conditions would cause a considerable variation or anomaly in the actual force of gravity when compared with the theoretical value. As has already been described in Mr. Venable's letter (68 MR 61), Kisumu is surrounded on three sides by large land masses, the nearest being the Nandi Escarpment which towers 2,000 feet above the plain at a distance of 6 miles from the office. These neighbouring land masses are certain to affect the true value of  $g$ . Fortunately a recent gravimetric survey had been carried out by a team of geophysicists in the Kisumu area and its results were made available to the Weights and Measures Office there.

It is desirable at this point to give a brief description of a gravimetric survey. The object of this survey is to measure small local variations, known as anomalies, in gravitational force, which are caused by geological formations, such as salt domes, faults and anticlines. The geometrical shapes and the differences in density of these formations control the size of these anomalies, but as the geological formations are very small when compared with the earth's volume, the anomalies are correspondingly small. The unit used in gravimetry is the

GAL (derived from Galileo), which is defined as the strength of a gravitational field that will act upon a mass of 1 gram with a force of 1 dyne. Anomalies are measured in milligals. Pendulums and gravimeters are employed in making a survey. Pendulums, together with crystal clocks, are used at base stations to determine absolute values for  $g$ . Gravimeters, which are a sensitive type of spring balance, are then used at various points around the base station to determine changes in  $g$  directly from measured changes in their spring extensions. Gravimeters can measure changes of 0.1 milligal in the vertical component of gravity,  $\frac{\delta z}{\delta v}$  (if  $v$  is the gravity potential

then  $\frac{\delta v}{\delta z}$  is the gravity component in the  $z$  or vertical direction). Accurate level data are essential since a 1 foot difference in altitude corresponds to approximately 0.2 mgal in the vertical component of gravity.

Readings taken with a Worden gravimeter in the Kisumu area by the geophysicists mentioned previously gave results ranging from 977.607 gals to 977.610 gals. These results were plotted on a 1/10,000 map and,

allowing for differences in altitude, it was calculated that gravity at the work-bench level in the Kisumu Weights and Measures office equalled 977.608 gals.

This experimental result of 977.608 gals was compared with Clark's result for the National Physical Laboratory, Teddington of 981.181 5 gals (1940 Proc. Roy. Soc. A, 175, 113), and it was calculated that a spring balance accurately calibrated at the N.P.L. would show an error of 0.364 percent on a test carried out at Kisumu. When it is considered that the verification tolerance on a 200 lb. spring balance is 0.125 percent and that on a 20 lb. spring balance is 0.098 percent the need for accurate re-adjustment of spring balances intended for use in the tropics is clearly evident.

I wish to acknowledge the advice and assistance given in the preparation of this paper by the Nyanza Provincial offices of both the Survey Department and the Mines and Geology Department, Kenya; also the information supplied by Mr. J. Bryant, M.I.W.M.A., Superintendent of Weights and Measures, Kenya, and by Mr. J. L. Penn, M.I.W.M.A., of the Federal Assize Department, Nyasaland.

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## Conversion Tables for Tola and its Fractions

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(An article on the above subject by the author was published in the March 1961 issue of *Metric Measures*. The article contained an abridged table for conversion of fractions of tola to grams and milligrams. Since then a number of enquiries have been received for publication of the full table. Shri Luther has been kind enough to prepare a table in which the values proceed in steps of one chawal upto one tola and then in steps of one tola upto 20 tolas. The metric values have been rounded

off to the nearest milligram. This table is published in the following pages.

It is hoped that the table would be useful to bullion merchants, vaidyas and others concerned with fine weighments.

The fractions of the tola converted here are:

8 chawal = 1 rati  
8 rati = 1 masha  
12 masha = 1 tola

—Editor)

TABLE 1

Chawals, Ratls, Mashas, Tolas to Milligrams and Grams

Factor used: 1 tola = 11.6638 grams

| Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram |
|-------|------|--------|------|-----------|-------|------|--------|------|-----------|-------|------|--------|------|-----------|
| ..    | 1    | ..     | 15   |           | 2     | 3    | ..     | 289  |           | 4     | 4    | ..     | 547  |           |
| ..    | 2    | ..     | 30   |           | 2     | 4    | ..     | 304  |           | 4     | 5    | ..     | 562  |           |
| ..    | 3    | ..     | 46   |           | 2     | 5    | ..     | 319  |           | 4     | 6    | ..     | 577  |           |
| ..    | 4    | ..     | 61   |           | 2     | 6    | ..     | 334  |           | 4     | 7    | ..     | 592  |           |
| ..    | 5    | ..     | 76   |           | 2     | 7    | ..     | 349  |           | 5     | —    | ..     | 607  |           |
| ..    | 6    | ..     | 91   |           | 3     | —    | ..     | 364  |           | 5     | 1    | ..     | 623  |           |
| ..    | 7    | ..     | 106  |           | 3     | 1    | ..     | 380  |           | 5     | 2    | ..     | 638  |           |
| 1     | —    | ..     | 121  |           | 3     | 2    | ..     | 395  |           | 5     | 3    | ..     | 653  |           |
| 1     | 1    | ..     | 137  |           | 3     | 3    | ..     | 410  |           | 5     | 4    | ..     | 668  |           |
| 1     | 2    | ..     | 152  |           | 3     | 4    | ..     | 425  |           | 5     | 5    | ..     | 683  |           |
| 1     | 3    | ..     | 167  |           | 3     | 5    | ..     | 440  |           | 5     | 6    | ..     | 699  |           |
| 1     | 4    | ..     | 182  |           | 3     | 6    | ..     | 456  |           | 5     | 7    | ..     | 714  |           |
| 1     | 5    | ..     | 197  |           | 3     | 7    | ..     | 471  |           | 6     | —    | ..     | 729  |           |
| 1     | 6    | ..     | 213  |           | 4     | —    | ..     | 486  |           | 6     | 1    | ..     | 744  |           |
| 1     | 7    | ..     | 228  |           | 4     | 1    | ..     | 501  |           | 6     | 2    | ..     | 759  |           |
| 2     | —    | ..     | 243  |           | 4     | 2    | ..     | 516  |           | 6     | 3    | ..     | 775  |           |
| 2     | 1    | ..     | 258  |           | 4     | 3    | ..     | 532  |           | 6     | 4    | ..     | 790  |           |
| 2     | 2    | ..     | 273  |           |       |      |        |      |           |       |      |        |      |           |

TABLE 1—contd.

| Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram |
|-------|------|--------|------|-----------|-------|------|--------|------|-----------|-------|------|--------|------|-----------|
| 1     | 6    | ..     | 805  |           | 1     | 6    | —      | ..   | 701       | 2     | 5    | 3      | ..   | 597       |
| 1     | 6    | 6      | 820  |           | 1     | 6    | 1      | ..   | 716       | 2     | 5    | 4      | ..   | 612       |
| 1     | 6    | 7      | 835  |           | 1     | 6    | 2      | ..   | 731       | 2     | 5    | 5      | ..   | 627       |
| 7     | —    | ..     | 850  |           | 1     | 6    | 3      | ..   | 747       | 2     | 5    | 6      | ..   | 643       |
| 7     | 1    | ..     | 866  |           | 1     | 6    | 4      | ..   | 762       | 2     | 5    | 7      | ..   | 658       |
| 7     | 2    | ..     | 881  |           | 1     | 6    | 5      | ..   | 777       | 2     | 6    | —      | ..   | 673       |
| 7     | 3    | ..     | 896  |           | 1     | 6    | 6      | ..   | 792       | 2     | 6    | 1      | ..   | 688       |
| 7     | 4    | ..     | 911  |           | 1     | 6    | 7      | ..   | 807       | 2     | 6    | 2      | ..   | 703       |
| 7     | 5    | ..     | 926  |           | 1     | 7    | —      | ..   | 822       | 2     | 6    | 3      | ..   | 719       |
| 7     | 6    | ..     | 942  |           | 1     | 7    | 1      | ..   | 838       | 2     | 6    | 4      | ..   | 734       |
| 7     | 7    | ..     | 957  |           | 1     | 7    | 2      | ..   | 853       | 2     | 6    | 5      | ..   | 749       |
| 1     | —    | ..     | 972  |           | 1     | 7    | 3      | ..   | 868       | 2     | 6    | 6      | ..   | 764       |
| 1     | —    | 2      | 987  |           | 1     | 7    | 4      | ..   | 883       | 2     | 6    | 7      | ..   | 779       |
| 1     | —    | 3      | 18   |           | 1     | 7    | 5      | ..   | 898       | 2     | 7    | —      | ..   | 794       |
| 1     | —    | 4      | 33   |           | 1     | 7    | 6      | ..   | 914       | 2     | 7    | 1      | ..   | 810       |
| 1     | —    | 5      | 48   |           | 1     | 7    | 7      | ..   | 929       | 2     | 7    | 2      | ..   | 825       |
| 1     | —    | 6      | 63   |           | 2     | —    | —      | ..   | 944       | 2     | 7    | 3      | ..   | 840       |
| 1     | —    | 7      | 78   |           | 2     | —    | 1      | ..   | 959       | 2     | 7    | 4      | ..   | 855       |
| 1     | 1    | —      | 93   |           | 2     | —    | 2      | ..   | 974       | 2     | 7    | 5      | ..   | 870       |
| 1     | 1    | 1      | 109  |           | 2     | —    | 3      | ..   | 990       | 2     | 7    | 6      | ..   | 886       |
| 1     | 1    | 2      | 124  |           | 2     | —    | 4      | ..   | 5         | 2     | 7    | 7      | ..   | 901       |
| 1     | 1    | 3      | 139  |           | 2     | —    | 5      | ..   | 20        | 3     | —    | —      | ..   | 916       |
| 1     | 1    | 4      | 154  |           | 2     | —    | 6      | ..   | 35        | 3     | —    | 1      | ..   | 931       |
| 1     | 1    | 5      | 169  |           | 2     | —    | 7      | ..   | 50        | 3     | —    | 2      | ..   | 946       |
| 1     | 1    | 6      | 185  |           | 2     | 1    | —      | ..   | 65        | 3     | —    | 3      | ..   | 962       |
| 1     | 1    | 7      | 200  |           | 2     | 1    | 1      | ..   | 81        | 3     | —    | 4      | ..   | 977       |
| 1     | 2    | —      | 215  |           | 2     | 1    | 2      | ..   | 96        | 3     | —    | 5      | ..   | 992       |
| 1     | 2    | 1      | 230  |           | 2     | 1    | 3      | ..   | 111       | 3     | —    | 6      | ..   | 7         |
| 1     | 2    | 2      | 245  |           | 2     | 1    | 4      | ..   | 126       | 3     | —    | 7      | ..   | 22        |
| 1     | 2    | 3      | 261  |           | 2     | 1    | 5      | ..   | 141       | 3     | 1    | —      | ..   | 37        |
| 1     | 2    | 4      | 276  |           | 2     | 1    | 6      | ..   | 157       | 3     | 1    | 1      | ..   | 53        |
| 1     | 2    | 5      | 291  |           | 2     | 1    | 7      | ..   | 172       | 3     | 1    | 2      | ..   | 68        |
| 1     | 2    | 6      | 306  |           | 2     | 2    | —      | ..   | 187       | 3     | 1    | 3      | ..   | 83        |
| 1     | 2    | 7      | 321  |           | 2     | 2    | 1      | ..   | 202       | 3     | 1    | 3      | ..   | 98        |
| 1     | 3    | —      | 336  |           | 2     | 2    | 2      | ..   | 217       | 3     | 1    | 4      | ..   | 113       |
| 1     | 3    | 1      | 352  |           | 2     | 2    | 3      | ..   | 233       | 3     | 1    | 5      | ..   | 129       |
| 1     | 3    | 2      | 367  |           | 2     | 2    | 4      | ..   | 248       | 3     | 1    | 6      | ..   | 144       |
| 1     | 3    | 3      | 382  |           | 2     | 2    | 5      | ..   | 263       | 3     | 1    | 7      | ..   | 159       |
| 1     | 3    | 4      | 397  |           | 2     | 2    | 6      | ..   | 278       | 3     | 2    | —      | ..   | 174       |
| 1     | 3    | 5      | 412  |           | 2     | 2    | 7      | ..   | 293       | 3     | 2    | 1      | ..   | 189       |
| 1     | 3    | 6      | 428  |           | 2     | 3    | —      | ..   | 308       | 3     | 2    | 2      | ..   | 205       |
| 1     | 3    | 7      | 443  |           | 2     | 3    | 1      | ..   | 324       | 3     | 2    | 3      | ..   | 220       |
| 1     | 4    | —      | 458  |           | 2     | 3    | 2      | ..   | 339       | 3     | 2    | 4      | ..   | 235       |
| 1     | 4    | 1      | 473  |           | 2     | 3    | 3      | ..   | 354       | 3     | 2    | 5      | ..   | 250       |
| 1     | 4    | 2      | 488  |           | 2     | 3    | 4      | ..   | 369       | 3     | 2    | 6      | ..   | 265       |
| 1     | 4    | 3      | 504  |           | 2     | 3    | 5      | ..   | 384       | 3     | 2    | 7      | ..   | 280       |
| 1     | 4    | 4      | 519  |           | 2     | 3    | 6      | ..   | 400       | 3     | 3    | —      | ..   | 296       |
| 1     | 4    | 5      | 534  |           | 2     | 3    | 7      | ..   | 415       | 3     | 3    | 1      | ..   | 311       |
| 1     | 4    | 6      | 549  |           | 2     | 4    | —      | ..   | 430       | 3     | 3    | 2      | ..   | 326       |
| 1     | 4    | 7      | 564  |           | 2     | 4    | 1      | ..   | 445       | 3     | 3    | 3      | ..   | 341       |
| 1     | 5    | —      | 579  |           | 2     | 4    | 2      | ..   | 460       | 3     | 3    | 4      | ..   | 356       |
| 1     | 5    | 1      | 595  |           | 2     | 4    | 3      | ..   | 476       | 3     | 3    | 5      | ..   | 372       |
| 1     | 5    | 2      | 610  |           | 2     | 4    | 4      | ..   | 491       | 3     | 3    | 6      | ..   | 387       |
| 1     | 5    | 3      | 625  |           | 2     | 4    | 5      | ..   | 506       | 3     | 3    | 7      | ..   | 402       |
| 1     | 5    | 4      | 640  |           | 2     | 4    | 6      | ..   | 521       | 3     | 4    | —      | ..   | 417       |
| 1     | 5    | 5      | 655  |           | 2     | 4    | 7      | ..   | 536       | 3     | 4    | 1      | ..   | 432       |
| 1     | 5    | 6      | 671  |           | 2     | 5    | —      | ..   | 551       | 3     | 4    | 2      | ..   | 448       |
| 1     | 5    | 7      | 686  |           | 2     | 5    | 1      | ..   | 567       | 3     | 4    | 3      | ..   | 463       |
|       |      |        |      |           | 2     | 5    | 2      | ..   | 582       | 3     | 4    | 4      | ..   |           |

TABLE 1—contd.

| Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram |
|-------|------|--------|------|-----------|-------|------|--------|------|-----------|-------|------|--------|------|-----------|
| 3     | 4    | 5      | 3    | 478       | 4     | 3    | 6      | 4    | 344       | 5     | 3    | —      | 5    | 224       |
| 3     | 4    | 6      | 3    | 493       | 4     | 3    | 7      | 4    | 359       | 5     | 3    | 1      | 5    | 240       |
| 3     | 4    | 7      | 3    | 508       | 4     | 3    | —      | —    | —         | 5     | 3    | 2      | 5    | 255       |
| 3     | 5    | —      | 3    | 523       | 4     | 4    | —      | 4    | 374       | 5     | 3    | 3      | 5    | 270       |
| 3     | 5    | 1      | 3    | 539       | 4     | 4    | 1      | 4    | 389       | 5     | 3    | 4      | 5    | 285       |
| 3     | 5    | 2      | 3    | 554       | 4     | 4    | 2      | 4    | 404       | 5     | 3    | 5      | 5    | 300       |
| 3     | 5    | 3      | 3    | 569       | 4     | 4    | 3      | 4    | 419       | 5     | 3    | 6      | 5    | 316       |
| 3     | 5    | 4      | 3    | 584       | 4     | 4    | 4      | 4    | 435       | 5     | 3    | 7      | 5    | 331       |
| 3     | 5    | 5      | 3    | 599       | 4     | 4    | 5      | 4    | 450       | 5     | 4    | —      | 5    | 346       |
| 3     | 5    | 6      | 3    | 615       | 4     | 4    | 6      | 4    | 465       | 5     | 4    | 1      | 5    | 361       |
| 3     | 5    | 7      | 3    | 630       | 4     | 4    | 7      | 4    | 480       | 5     | 4    | 2      | 5    | 366       |
| 3     | 6    | —      | 3    | 645       | 4     | 5    | —      | 4    | 495       | 5     | 4    | 3      | 5    | 391       |
| 3     | 6    | 1      | 3    | 660       | 4     | 5    | 1      | 4    | 511       | 5     | 4    | 4      | 5    | 407       |
| 3     | 6    | 2      | 3    | 675       | 4     | 5    | 2      | 4    | 526       | 5     | 4    | 5      | 5    | 422       |
| 3     | 6    | 3      | 3    | 691       | 4     | 5    | 3      | 4    | 541       | 5     | 4    | 6      | 5    | 437       |
| 3     | 6    | 4      | 3    | 706       | 4     | 5    | 4      | 4    | 556       | 5     | 4    | 7      | 5    | 452       |
| 3     | 6    | 5      | 3    | 721       | 4     | 5    | 5      | 4    | 571       | 5     | 5    | —      | 5    | 467       |
| 3     | 6    | 6      | 3    | 736       | 4     | 5    | 6      | 4    | 587       | 5     | 5    | 1      | 5    | 483       |
| 3     | 6    | 7      | 3    | 751       | 4     | 5    | 7      | 4    | 602       | 5     | 5    | 2      | 5    | 498       |
| 3     | 7    | —      | 3    | 766       | 4     | 6    | —      | 4    | 617       | 5     | 5    | 3      | 5    | 513       |
| 3     | 7    | 1      | 3    | 782       | 4     | 6    | 1      | 4    | 632       | 5     | 5    | 4      | 5    | 528       |
| 3     | 7    | 2      | 3    | 797       | 4     | 6    | 2      | 4    | 647       | 5     | 5    | 5      | 5    | 543       |
| 3     | 7    | 3      | 3    | 812       | 4     | 6    | 3      | 4    | 662       | 5     | 5    | 6      | 5    | 559       |
| 3     | 7    | 4      | 3    | 827       | 4     | 6    | 4      | 4    | 678       | 5     | 5    | 7      | 5    | 574       |
| 3     | 7    | 5      | 3    | 842       | 4     | 6    | 5      | 4    | 693       | 5     | 6    | —      | 5    | 589       |
| 3     | 7    | 6      | 3    | 858       | 4     | 6    | 6      | 4    | 708       | 5     | 6    | 1      | 5    | 604       |
| 3     | 7    | 7      | 3    | 873       | 4     | 6    | 7      | 4    | 723       | 5     | 6    | 2      | 5    | 619       |
| 4     | —    | —      | 3    | 888       | 4     | 7    | —      | 4    | 738       | 5     | 6    | 3      | 5    | 634       |
| 4     | —    | 1      | 3    | 903       | 4     | 7    | 1      | 4    | 754       | 5     | 6    | 4      | 5    | 650       |
| 4     | —    | 2      | 3    | 918       | 4     | 7    | 2      | 4    | 769       | 5     | 6    | 5      | 5    | 665       |
| 4     | —    | 3      | 3    | 933       | 4     | 7    | 3      | 4    | 784       | 5     | 6    | 6      | 5    | 680       |
| 4     | —    | 4      | 3    | 949       | 4     | 7    | 4      | 4    | 799       | 5     | 6    | 7      | 5    | 695       |
| 4     | —    | 5      | 3    | 964       | 4     | 7    | 5      | 4    | 814       | 5     | 7    | —      | 5    | 710       |
| 4     | —    | 6      | 3    | 979       | 4     | 7    | 6      | 4    | 830       | 5     | 7    | 1      | 5    | 726       |
| 4     | —    | 7      | 3    | 994       | 4     | 7    | 7      | 4    | 845       | 5     | 7    | 2      | 5    | 741       |
| 4     | —    | —      | 4    | 9         | 5     | —    | —      | 4    | 860       | 5     | 7    | 3      | 5    | 756       |
| 4     | 1    | 1      | 4    | 25        | 5     | —    | 1      | 4    | 875       | 5     | 7    | 4      | 5    | 771       |
| 4     | 1    | 2      | 4    | 40        | 5     | —    | 2      | 4    | 890       | 5     | 7    | 5      | 5    | 786       |
| 4     | 1    | 3      | 4    | 55        | 5     | —    | 3      | 4    | 905       | 5     | 7    | 6      | 5    | 802       |
| 4     | 1    | 4      | 4    | 70        | 5     | —    | 4      | 4    | 921       | 5     | 7    | 7      | 5    | 817       |
| 4     | 1    | 5      | 4    | 85        | 5     | —    | 5      | 4    | 936       | 6     | —    | —      | 5    | 832       |
| 4     | 1    | 6      | 4    | 101       | 5     | —    | 6      | 4    | 951       | 6     | —    | 1      | 5    | 847       |
| 4     | 1    | 7      | 4    | 116       | 5     | —    | 7      | 4    | 966       | 6     | —    | 2      | 5    | 862       |
| 4     | 2    | —      | 4    | 131       | 5     | 1    | —      | 4    | 981       | 6     | —    | 3      | 5    | 877       |
| 4     | 2    | 1      | 4    | 146       | 5     | 1    | 1      | 4    | 997       | 6     | —    | 4      | 5    | 893       |
| 4     | 2    | 2      | 4    | 161       | 5     | 1    | 2      | 4    | 12        | 6     | —    | 5      | 5    | 908       |
| 4     | 2    | 3      | 4    | 176       | 5     | 1    | 3      | 4    | 27        | 6     | —    | 6      | 5    | 923       |
| 4     | 2    | 4      | 4    | 192       | 5     | 1    | 4      | 4    | 42        | 6     | —    | 7      | 5    | 938       |
| 4     | 2    | 5      | 4    | 207       | 5     | 1    | 5      | 4    | 57        | 6     | 1    | —      | 5    | 953       |
| 4     | 2    | 6      | 4    | 222       | 5     | 1    | 6      | 4    | 73        | 6     | 1    | 1      | 5    | 969       |
| 4     | 2    | 7      | 4    | 237       | 5     | 1    | 7      | 4    | 88        | 6     | 1    | 2      | 5    | 984       |
| 4     | 3    | —      | 4    | 252       | 5     | 2    | —      | 5    | 103       | 6     | 1    | 3      | 5    | 999       |
| 4     | 3    | 1      | 4    | 268       | 5     | 2    | 1      | 5    | 118       | 6     | 1    | 4      | 6    | 14        |
| 4     | 3    | 2      | 4    | 283       | 5     | 2    | 2      | 5    | 133       | 6     | 1    | 5      | 6    | 29        |
| 4     | 3    | 3      | 4    | 298       | 5     | 2    | 3      | 5    | 148       | 6     | 1    | 6      | 6    | 45        |
| 4     | 3    | 4      | 4    | 313       | 5     | 2    | 4      | 5    | 164       | 6     | 1    | 7      | 6    | 60        |
| 4     | 3    | 5      | 4    | 328       | 5     | 2    | 5      | 5    | 179       | 6     | 2    | —      | 6    | 75        |
|       |      |        |      |           | 5     | 2    | 6      | 5    | 194       | 6     | 2    | 1      | 6    | 90        |
|       |      |        |      |           | 5     | 2    | 7      | 5    | 209       | 6     | 2    | —      | 6    |           |

TABLE 1—contd.

| Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal | Gram | Milligram |
|-------|------|--------|------|-----------|-------|------|--------|------|-----------|-------|------|--------|------|-----------|
| 6     | 2    | 2      | 6    | 105       | 7     | 1    | 3      | 6    | 977       | 8     | —    | 4      | 7    | 837       |
| 6     | 2    | 3      | 6    | 120       | 7     | 1    | 4      | 6    | 986       | 8     | —    | 5      | 7    | 852       |
| 6     | 2    | 4      | 6    | 136       | 7     | 1    | 5      | 7    | 1         | 8     | —    | 6      | 7    | 867       |
| 6     | 2    | 5      | 6    | 151       | 7     | 1    | 6      | 7    | 17        | 8     | —    | 7      | 7    | 882       |
| 6     | 2    | 6      | 6    | 166       | 7     | 1    | 7      | 7    | 32        | 8     | —    | —      | 7    | 897       |
| 6     | 2    | 7      | 6    | 181       | 7     | 2    | —      | 7    | 47        | 8     | 1    | 1      | 7    | 913       |
| 6     | 3    | —      | 6    | 196       | 7     | 2    | 1      | 7    | 62        | 8     | 1    | 2      | 7    | 928       |
| 6     | 3    | 1      | 6    | 212       | 7     | 2    | 2      | 7    | 77        | 8     | 1    | 3      | 7    | 943       |
| 6     | 3    | 2      | 6    | 227       | 7     | 2    | 3      | 7    | 92        | 8     | 1    | 4      | 7    | 958       |
| 6     | 3    | 3      | 6    | 242       | 7     | 2    | 4      | 7    | 108       | 8     | 1    | 5      | 7    | 973       |
| 6     | 3    | 4      | 6    | 257       | 7     | 2    | 5      | 7    | 123       | 8     | 1    | 6      | 7    | 988       |
| 6     | 3    | 5      | 6    | 272       | 7     | 2    | 6      | 7    | 138       | 8     | 1    | 7      | 8    | 4         |
| 6     | 3    | 6      | 6    | 288       | 7     | 2    | 7      | 7    | 153       | 8     | 2    | —      | 8    | 19        |
| 6     | 3    | 7      | 6    | 303       | 7     | 3    | —      | 7    | 168       | 8     | 2    | 1      | 8    | 34        |
| 6     | 4    | —      | 6    | 318       | 7     | 3    | 1      | 7    | 184       | 8     | 2    | 2      | 8    | 49        |
| 6     | 4    | 1      | 6    | 333       | 7     | 3    | 2      | 7    | 199       | 8     | 2    | 3      | 8    | 64        |
| 6     | 4    | 2      | 6    | 348       | 7     | 3    | 3      | 7    | 214       | 8     | 2    | 4      | 8    | 80        |
| 6     | 4    | 3      | 6    | 363       | 7     | 3    | 4      | 7    | 229       | 8     | 2    | 5      | 8    | 95        |
| 6     | 4    | 4      | 6    | 379       | 7     | 3    | 5      | 7    | 244       | 8     | 2    | 6      | 8    | 110       |
| 6     | 4    | 5      | 6    | 394       | 7     | 3    | 6      | 7    | 260       | 8     | 2    | 7      | 8    | 125       |
| 6     | 4    | 6      | 6    | 409       | 7     | 3    | 7      | 7    | 275       | 8     | 3    | —      | 8    | 140       |
| 6     | 4    | 7      | 6    | 424       | 7     | 4    | —      | 7    | 290       | 8     | 3    | 1      | 8    | 156       |
| 6     | 5    | —      | 6    | 439       | 7     | 4    | 1      | 7    | 305       | 8     | 3    | 2      | 8    | 171       |
| 6     | 5    | 1      | 6    | 455       | 7     | 4    | 2      | 7    | 320       | 8     | 3    | 3      | 8    | 186       |
| 6     | 5    | 2      | 6    | 470       | 7     | 4    | 3      | 7    | 335       | 8     | 3    | 4      | 8    | 201       |
| 6     | 5    | 3      | 6    | 485       | 7     | 4    | 4      | 7    | 351       | 8     | 3    | 5      | 8    | 216       |
| 6     | 5    | 4      | 6    | 500       | 7     | 4    | 5      | 7    | 366       | 8     | 3    | 6      | 8    | 231       |
| 6     | 5    | 5      | 6    | 515       | 7     | 4    | 6      | 7    | 381       | 8     | 3    | 7      | 8    | 247       |
| 6     | 5    | 6      | 6    | 531       | 7     | 4    | 7      | 7    | 396       | 8     | 4    | —      | 8    | 262       |
| 6     | 5    | 7      | 6    | 546       | 7     | 5    | —      | 7    | 411       | 8     | 4    | 1      | 8    | 277       |
| 6     | 6    | —      | 6    | 561       | 7     | 5    | 1      | 7    | 427       | 8     | 4    | 2      | 8    | 292       |
| 6     | 6    | 1      | 6    | 576       | 7     | 5    | 2      | 7    | 442       | 8     | 4    | 3      | 8    | 307       |
| 6     | 6    | 2      | 6    | 591       | 7     | 5    | 3      | 7    | 457       | 8     | 4    | 4      | 8    | 323       |
| 6     | 6    | 3      | 6    | 606       | 7     | 5    | 4      | 7    | 472       | 8     | 4    | 5      | 8    | 338       |
| 6     | 6    | 4      | 6    | 622       | 7     | 5    | 5      | 7    | 487       | 8     | 4    | 6      | 8    | 353       |
| 6     | 6    | 5      | 6    | 637       | 7     | 5    | 6      | 7    | 502       | 8     | 4    | 7      | 8    | 368       |
| 6     | 6    | 6      | 6    | 652       | 7     | 5    | 7      | 7    | 518       | 8     | 5    | —      | 8    | 383       |
| 6     | 6    | 7      | 6    | 667       | 7     | 6    | —      | 7    | 533       | 8     | 5    | 1      | 8    | 399       |
| 6     | 7    | —      | 6    | 682       | 7     | 6    | 1      | 7    | 548       | 8     | 5    | 2      | 8    | 414       |
| 6     | 7    | 1      | 6    | 698       | 7     | 6    | 2      | 7    | 563       | 8     | 5    | 3      | 8    | 429       |
| 6     | 7    | 2      | 6    | 713       | 7     | 6    | 3      | 7    | 578       | 8     | 5    | 4      | 8    | 444       |
| 6     | 7    | 3      | 6    | 728       | 7     | 6    | 4      | 7    | 594       | 8     | 5    | 5      | 8    | 459       |
| 6     | 7    | 4      | 6    | 743       | 7     | 6    | 5      | 7    | 609       | 8     | 5    | 6      | 8    | 474       |
| 6     | 7    | 5      | 6    | 758       | 7     | 6    | 6      | 7    | 624       | 8     | 5    | 7      | 8    | 490       |
| 6     | 7    | 6      | 6    | 774       | 7     | 7    | —      | 7    | 639       | 8     | 6    | —      | 8    | 505       |
| 6     | 7    | 7      | 6    | 789       | 7     | 7    | 1      | 7    | 654       | 8     | 6    | 1      | 8    | 520       |
| 7     | —    | —      | 6    | 804       | 7     | 7    | 2      | 7    | 670       | 8     | 6    | 2      | 8    | 535       |
| 7     | —    | 1      | 6    | 819       | 7     | 7    | 3      | 7    | 685       | 8     | 6    | 3      | 8    | 550       |
| 7     | —    | 2      | 6    | 834       | 7     | 7    | 4      | 7    | 700       | 8     | 6    | 4      | 8    | 566       |
| 7     | —    | 3      | 6    | 849       | 7     | 7    | 5      | 7    | 715       | 8     | 6    | 5      | 8    | 581       |
| 7     | —    | 4      | 6    | 865       | 7     | 7    | 6      | 7    | 730       | 8     | 6    | 6      | 8    | 596       |
| 7     | —    | 5      | 6    | 880       | 7     | 7    | 7      | 7    | 745       | 8     | 6    | 7      | 8    | 611       |
| 7     | —    | 6      | 6    | 895       | 7     | 7    | —      | 7    | 761       | 8     | 7    | —      | 8    | 626       |
| 7     | —    | 7      | 6    | 910       | 7     | 7    | 1      | 7    | 776       | 8     | 7    | 1      | 8    | 642       |
| 7     | 1    | —      | 6    | 925       | 8     | —    | —      | 7    | 791       | 8     | 7    | 2      | 8    | 657       |
| 7     | 1    | 1      | 6    | 941       | 8     | —    | 2      | 7    | 806       | 8     | 7    | 3      | 8    | 672       |
| 7     | 1    | 2      | 6    | 956       | 8     | —    | 3      | 7    | 821       | 8     | 7    | 4      | 8    | 687       |

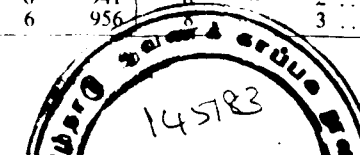


TABLE 1—contd.

| Masha | Rati | Chawal | Gram | Milligram | Masha | Rati | Chawal  | Gram | Milligram | Masha | Rati | Chawal  | Gram | Milligram |
|-------|------|--------|------|-----------|-------|------|---------|------|-----------|-------|------|---------|------|-----------|
| 8     | 7    | 5 .. 8 | 702  |           | 9     | 6    | 6 .. 9  | 568  |           | 10    | 6    | — .. 10 | 449  |           |
| 8     | 7    | 6 .. 8 | 717  |           | 9     | 6    | 7 .. 9  | 583  |           | 10    | 6    | 1 .. 10 | 464  |           |
| 8     | 7    | 7 .. 8 | 733  |           |       |      |         |      |           | 10    | 6    | 2 .. 10 | 479  |           |
| 9     | —    | — .. 8 | 748  |           | 9     | 7    | — .. 9  | 598  |           | 10    | 6    | 3 .. 10 | 494  |           |
| 9     | —    | 1 .. 8 | 763  |           | 9     | 7    | 1 .. 9  | 614  |           | 10    | 6    | 4 .. 10 | 510  |           |
| 9     | —    | 2 .. 8 | 778  |           | 9     | 7    | 2 .. 9  | 629  |           | 10    | 6    | 5 .. 10 | 525  |           |
| 9     | —    | 3 .. 8 | 793  |           | 9     | 7    | 3 .. 9  | 644  |           | 10    | 6    | 6 .. 10 | 540  |           |
| 9     | —    | 4 .. 8 | 809  |           | 9     | 7    | 4 .. 9  | 659  |           | 10    | 6    | 7 .. 10 | 555  |           |
| 9     | —    | 5 .. 8 | 824  |           | 9     | 7    | 5 .. 9  | 674  |           |       |      |         |      |           |
| 9     | —    | 6 .. 8 | 839  |           | 9     | 7    | 6 .. 9  | 689  |           | 10    | 7    | — .. 10 | 570  |           |
| 9     | —    | 7 .. 8 | 854  |           | 9     | 7    | 7 .. 9  | 705  |           | 10    | 7    | 1 .. 10 | 586  |           |
|       |      |        |      |           |       |      |         |      |           | 10    | 7    | 2 .. 10 | 601  |           |
| 9     | 1    | — .. 8 | 869  |           | 10    | —    | — .. 9  | 720  |           | 10    | 7    | 3 .. 10 | 616  |           |
| 9     | 1    | 1 .. 8 | 885  |           | 10    | —    | 1 .. 9  | 735  |           | 10    | 7    | 4 .. 10 | 631  |           |
| 9     | 1    | 2 .. 8 | 900  |           | 10    | —    | 2 .. 9  | 750  |           | 10    | 7    | 5 .. 10 | 646  |           |
| 9     | 1    | 3 .. 8 | 915  |           | 10    | —    | 3 .. 9  | 765  |           | 10    | 7    | 6 .. 10 | 661  |           |
| 9     | 1    | 4 .. 8 | 930  |           | 10    | —    | 4 .. 9  | 781  |           | 10    | 7    | 7 .. 10 | 677  |           |
| 9     | 1    | 5 .. 8 | 945  |           | 10    | —    | 5 .. 9  | 796  |           |       |      |         |      |           |
| 9     | 1    | 6 .. 8 | 960  |           | 10    | —    | 6 .. 9  | 811  |           | 11    | —    | — .. 10 | 692  |           |
| 9     | 1    | 7 .. 8 | 976  |           | 10    | —    | 7 .. 9  | 826  |           | 11    | —    | 1 .. 10 | 707  |           |
|       |      |        |      |           |       |      |         |      |           | 11    | —    | 2 .. 10 | 722  |           |
| 9     | 2    | — .. 8 | 991  |           | 10    | 1    | — .. 9  | 841  |           | 11    | —    | 3 .. 10 | 737  |           |
| 9     | 2    | 1 .. 9 | 6    |           | 10    | 1    | 1 .. 9  | 857  |           | 11    | —    | 4 .. 10 | 753  |           |
| 9     | 2    | 2 .. 9 | 21   |           | 10    | 1    | 2 .. 9  | 872  |           | 11    | —    | 5 .. 10 | 768  |           |
| 9     | 2    | 3 .. 9 | 36   |           | 10    | 1    | 3 .. 9  | 887  |           | 11    | —    | 6 .. 10 | 783  |           |
| 9     | 2    | 4 .. 9 | 52   |           | 10    | 1    | 4 .. 9  | 902  |           | 11    | —    | 7 .. 10 | 798  |           |
| 9     | 2    | 5 .. 9 | 67   |           | 10    | 1    | 5 .. 9  | 917  |           |       |      |         |      |           |
| 9     | 2    | 6 .. 9 | 82   |           | 10    | 1    | 6 .. 9  | 932  |           | 11    | 1    | — .. 10 | 813  |           |
| 9     | 2    | 7 .. 9 | 97   |           | 10    | 1    | 7 .. 9  | 948  |           | 11    | 1    | 1 .. 10 | 829  |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 1    | 2 .. 10 | 844  |           |
| 9     | 3    | — .. 9 | 112  |           | 10    | 2    | — .. 9  | 963  |           | 11    | 1    | 3 .. 10 | 859  |           |
| 9     | 3    | 1 .. 9 | 128  |           | 10    | 2    | 1 .. 9  | 978  |           | 11    | 1    | 4 .. 10 | 874  |           |
| 9     | 3    | 2 .. 9 | 143  |           | 10    | 2    | 2 .. 9  | 993  |           | 11    | 1    | 5 .. 10 | 889  |           |
| 9     | 3    | 3 .. 9 | 158  |           | 10    | 2    | 3 .. 10 | 8    |           | 11    | 1    | 6 .. 10 | 904  |           |
| 9     | 3    | 4 .. 9 | 173  |           | 10    | 2    | 4 .. 10 | 24   |           | 11    | 1    | 7 .. 10 | 920  |           |
| 9     | 3    | 5 .. 9 | 188  |           | 10    | 2    | 5 .. 10 | 39   |           |       |      |         |      |           |
| 9     | 3    | 6 .. 9 | 203  |           | 10    | 2    | 6 .. 10 | 54   |           | 11    | 2    | — .. 10 | 935  |           |
| 9     | 3    | 7 .. 9 | 219  |           | 10    | 2    | 7 .. 10 | 69   |           | 11    | 2    | 1 .. 10 | 950  |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 2    | 2 .. 10 | 965  |           |
| 9     | 4    | — .. 9 | 234  |           | 10    | 3    | — .. 10 | 84   |           | 11    | 2    | 3 .. 10 | 980  |           |
| 9     | 4    | 1 .. 9 | 249  |           | 10    | 3    | 1 .. 10 | 100  |           | 11    | 2    | 4 .. 10 | 996  |           |
| 9     | 4    | 2 .. 9 | 264  |           | 10    | 3    | 2 .. 10 | 115  |           | 11    | 2    | 5 .. 11 | 11   |           |
| 9     | 4    | 3 .. 9 | 279  |           | 10    | 3    | 3 .. 10 | 130  |           | 11    | 2    | 6 .. 11 | 26   |           |
| 9     | 4    | 4 .. 9 | 295  |           | 10    | 3    | 4 .. 10 | 145  |           | 11    | 2    | 7 .. 11 | 41   |           |
| 9     | 4    | 5 .. 9 | 310  |           | 10    | 3    | 5 .. 10 | 160  |           |       |      |         |      |           |
| 9     | 4    | 6 .. 9 | 325  |           | 10    | 3    | 6 .. 10 | 175  |           | 11    | 3    | — .. 11 | 56   |           |
| 9     | 4    | 7 .. 9 | 340  |           | 10    | 3    | 7 .. 10 | 191  |           | 11    | 3    | 1 .. 11 | 71   |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 3    | 2 .. 11 | 87   |           |
| 9     | 5    | — .. 9 | 355  |           | 10    | 4    | — .. 10 | 206  |           | 11    | 3    | 3 .. 11 | 102  |           |
| 9     | 5    | 1 .. 9 | 371  |           | 10    | 4    | 1 .. 10 | 221  |           | 11    | 3    | 4 .. 11 | 117  |           |
| 9     | 5    | 2 .. 9 | 386  |           | 10    | 4    | 2 .. 10 | 236  |           | 11    | 3    | 5 .. 11 | 132  |           |
| 9     | 5    | 3 .. 9 | 401  |           | 10    | 4    | 3 .. 10 | 251  |           | 11    | 3    | 6 .. 11 | 147  |           |
| 9     | 5    | 4 .. 9 | 416  |           | 10    | 4    | 4 .. 10 | 267  |           | 11    | 3    | 7 .. 11 | 163  |           |
| 9     | 5    | 5 .. 9 | 431  |           | 10    | 4    | 5 .. 10 | 282  |           |       |      |         |      |           |
| 9     | 5    | 6 .. 9 | 446  |           | 10    | 4    | 6 .. 10 | 297  |           | 11    | 4    | — .. 11 | 178  |           |
| 9     | 5    | 7 .. 9 | 462  |           | 10    | 4    | 7 .. 10 | 312  |           | 11    | 4    | 1 .. 11 | 193  |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 4    | 2 .. 11 | 208  |           |
| 9     | 6    | — .. 9 | 477  |           | 10    | 5    | — .. 10 | 327  |           | 11    | 4    | 3 .. 11 | 223  |           |
| 9     | 6    | 1 .. 9 | 492  |           | 10    | 5    | 1 .. 10 | 343  |           | 11    | 4    | 4 .. 11 | 239  |           |
| 9     | 6    | 2 .. 9 | 507  |           | 10    | 5    | 2 .. 10 | 358  |           | 11    | 4    | 5 .. 11 | 254  |           |
| 9     | 6    | 3 .. 9 | 522  |           | 10    | 5    | 3 .. 10 | 373  |           | 11    | 4    | 6 .. 11 | 269  |           |
| 9     | 6    | 4 .. 9 | 538  |           | 10    | 5    | 4 .. 10 | 388  |           | 11    | 4    | 7 .. 11 | 284  |           |
| 9     | 6    | 5 .. 9 | 553  |           | 10    | 5    | 5 .. 10 | 403  |           |       |      |         |      |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 5    | — .. 11 | 299  |           |
|       |      |        |      |           |       |      |         |      |           | 11    | 5    | 1 .. 11 | 314  |           |

TABLE 1—contd.

| Masha | Rati | Chawal  | Gram | Milligram | Masha | Rati | Chawal  | Gram | Milligram | Masha | Rati | Chawal  | Gram | Milligram |
|-------|------|---------|------|-----------|-------|------|---------|------|-----------|-------|------|---------|------|-----------|
| 11    | 5    | 2 .. 11 | 330  |           | 11    | 6    | — .. 11 | 421  |           | 11    | 7    | — .. 11 | 542  |           |
| 11    | 5    | 3 .. 11 | 345  |           | 11    | 6    | 1 .. 11 | 436  |           | 11    | 7    | 1 .. 11 | 557  |           |
| 11    | 5    | 4 .. 11 | 360  |           | 11    | 6    | 2 .. 11 | 451  |           | 11    | 7    | 2 .. 11 | 573  |           |
| 11    | 5    | 5 .. 11 | 375  |           | 11    | 6    | 3 .. 11 | 466  |           | 11    | 7    | 3 .. 11 | 588  |           |
| 11    | 5    | 6 .. 11 | 390  |           | 11    | 6    | 4 .. 11 | 482  |           | 11    | 7    | 4 .. 11 | 603  |           |
| 11    | 5    | 7 .. 11 | 406  |           | 11    | 6    | 5 .. 11 | 497  |           | 11    | 7    | 5 .. 11 | 618  |           |
|       |      |         |      |           | 11    | 6    | 6 .. 11 | 512  |           | 11    | 7    | 6 .. 11 | 633  |           |
|       |      |         |      |           | 11    | 6    | 7 .. 11 | 527  |           | 11    | 7    | 7 .. 11 | 649  |           |

## Tolas to Grams and Milligrams

| Tolas | Gram | Milligram |
|-------|------|-----------|
| 1 ..  | 11   | 664       |
| 2 ..  | 23   | 328       |
| 3 ..  | 34   | 991       |
| 4 ..  | 46   | 665       |
| 5 ..  | 58   | 319       |
| 6 ..  | 69   | 983       |
| 7 ..  | 81   | 647       |
| 8 ..  | 93   | 310       |
| 9 ..  | 104  | 974       |
| 10 .. | 116  | 638       |
| 11 .. | 128  | 302       |
| 12 .. | 139  | 966       |
| 13 .. | 151  | 629       |
| 14 .. | 163  | 293       |
| 15 .. | 174  | 957       |
| 16 .. | 186  | 621       |
| 17 .. | 198  | 285       |
| 18 .. | 209  | 948       |
| 19 .. | 221  | 612       |
| 20 .. | 233  | 276       |

## News & Views

### Recent Notifications

#### (1) Ports & Shipping

No. S. O. 1738 dated 24th July 1961.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby makes the following amendment in the notification of the Government of India in the Ministry of Commerce and Industry No. 1899, dated the 1st August, 1960 (relating to the permission of the continuance of the use of any weight or measure which immediately before the 1st August, 1960 was in use in respect of ports and shipping industry), namely :—

In the said notification, for the words “for a period of one year”, the words “for

a period of eighteen months” shall be substituted.

#### (2) Capacity Measures in Further Areas

No. S.O. 2142, dated 30th August, 1961.

In exercise of the powers conferred by sub-section (3) of section 1 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby appoints the 1st day of October, 1961, as the date on which the provisions of the said Act, in so far as they relate to units of capacity, shall come into force in the areas specified in column 2 of the Table below in the State or Union Territory specified in the corresponding entry in column 1 thereof : except in those classes of undertakings or those classes of goods in respect of which, the said provisions have already come into force.

TABLE

| STATE OR UNION TERRITORY | AREAS IN WHICH METRIC UNITS OF CAPACITY ARE INTRODUCED                                                                                                                                               |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)                      | (2)                                                                                                                                                                                                  |
| Andhra Pradesh           | East Godavari, West Godavari, Khammam, Mahboob Nagar, and Nalgonda.                                                                                                                                  |
| Assam                    | Goalpara District, Kamrup District (except Gauhati municipal area), Darrang District, Sibsagar District, Lakhimpur District, Cachar District, and all District and sub-divisional headquarter towns. |
| Gujarat                  | Municipal Towns governed by the Borough Municipal Acts.                                                                                                                                              |
| Kerala                   | Quilon, Ernakulam and Kozhikode districts.                                                                                                                                                           |
| Madras                   | Districts of Salem, Thanjavur, Tiruchirappalli, and Ramanathapuram.                                                                                                                                  |

## NEWS & VIEWS

| (1)               | (2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maharashtra       | Municipal areas of Thana, Panvel, Ratnagiri, Nasik, Jalgaon, Dhulia, Satara, Sangli, Ahmednagar, Osmanabad, Bhir, Parbhani, Nanded, Buldhana, Chanda and Bhandara.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Mysore            | Belgaum District, Bijapur District, North Canara District, Shimoga District, Hassan District, Mangalore (South Canara) District, Chikmagalur District, Coorg District.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Orissa            | (a) The Municipal area of Jajpur, Kendrapara, Puri, Balasore, Baripada, Bargarh, Deogarh, Keonjhar, Dhenkanal, Bolangir, Sonepur, Sundergarh, Paralakhemidi, Jeypur, Bhawanipatna of the State of Orissa and<br>(b) the notified area council of Bhubaneswar, Nayagarh, Khurda, Bhadrak, Rairangpur, Angul, Talcher, Titlagarh, Kantabanji, Rourkella, Rajgangpur, Biramitrapur, Chatrapur, Bhanjnar, Koraput, Rayagada, Nawarangpur of the State of Orissa and the following Gram Panchayat areas of the State.<br>(c) Grampanchayat areas District<br>Nizgird Athgarh Cuttack<br>Nizgird Nilgiri Balasore<br>Kuchinda Sambalpur<br>Rampur Sambalpur<br>Kamakhyangar Dhenkanal<br>Kaintaragarh Dhenkanal<br>Nizgarh Hindol Dhenkanal<br>Champua Keonjhar<br>Anandpur Keonjhar<br>Phulbani Boud-Phulbani<br>Balligada Boud-Phulbani<br>Boudh Boud-Phulbani<br>Patnagarh Bolangir<br>Bonaigarh Sundargarh<br>Nawapara Kalahandi<br>Dharmagarh Kalahandi<br>Kaptipada Mayurbhanj |
| Rajasthan         | Alwar, Tonk, Sawai-Madhopur, Sikar, Nagaur, Bhilwara, Pali, Sri Ganganagar, Barmer, Jha'awar, Bundi and Bharatpur.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Union Territories |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Himachal Pradesh  | Municipal area of Solan Town (Mahashu District).<br>Municipal area of Chamba Town (Chamba District).<br>Municipal area of Bilaspur Town (Bilappur District).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Manipur           | Imphal East and West Tahsils. Thoubal Sub-division and Bishenpur Sub-Division.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

No. S.O. 2143, dated 30th August, 1961.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby permits, in respect of the areas referred to in the Notification of the Government of India, in the Ministry of Commerce and Industry S.O. No. 2142, dated the 30th August, 1961, the continuance of the use for a period of one year from the 1st day of October, 1961 of any unit of capacity which immediately before that date was in use in respect of the said areas.

(3) *Use of Weights for All Transactions*

No. S.O. 2144, dated 31st August, 1961.

In exercise of the powers conferred by sub-section (3) of section 1 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby appoints the 1st day of October, 1961 as the date on which the provisions of the said Act, in so far as they relate to units of mass, shall come into force in the whole of India except the State of Jammu and Kashmir and except in those classes of undertakings or those classes of goods in respect of which the said provisions have already come into force.

No. S.O. 2145, dated 31st August, 1961.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby permits the continuance of the use for a period of 6 months from the

1st day of October, 1961 of any unit of weight which immediately before that date were in use in respect of the areas referred to in the Notification of the Government of India in the Ministry of Commerce and Industry S.O. 2144, dated the 31st August, 1961.

(4) *Amendment of S. O. 984*

No. S.O. 2146, dated 31st August, 1961.

In exercise of the powers conferred by sub-section (3) of section 1 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby makes the following amendment in the Notification of the Government of India in the Ministry of Commerce and Industry S.O. No. 984, dated the 28th April, 1961.

In the Table to the said notification, in the entries in the second column against 'Madhya Pradesh' in the first column, for the word 'Bhopal', the word 'Schore' shall be substituted.

(5) *Prices of Worsted Hosiery Yarn*

No. 7(2)/61-Control., dated 8th August, 1961.

In exercise of the powers conferred on me by Clause 4(1) of the Woollen Textiles (Production & Distribution) Control Order, 1960, and in supersession of Textile Commissioner's Notification No. T. C. (424)/60, dated 14th November, 1960, I hereby fix the maximum ex-factory prices of worsted hosiery yarn as specified in the Schedule below :

**SCHEDULE: H Y**

**Maximum Ex-Factory Prices of Woollen Hosiery Yarn**

| Count of yarn |            |            | Grade of Wool Top |            |            |            |  |
|---------------|------------|------------|-------------------|------------|------------|------------|--|
|               | 48s/50s    | 56s        | 58s               | 60s        | 64s        | 70s        |  |
| (1)           | (2)        | (3)        | (4)               | (5)        | (6)        | (7)        |  |
|               | Rs. per kg | Rs. per kg | Rs. per kg        | Rs. per kg | Rs. per kg | Rs. per kg |  |
| 2/12s .. .. . | 14.53      | 16.86      | 17.22             | 17.83      | 18.45      | —          |  |
| 2/16s .. .. . | 15.01      | 17.35      | —                 | —          | —          | —          |  |
| 2/22s .. .. . | 15.78      | 18.12      | 18.45             | 19.07      | 19.69      | 20.50      |  |

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|               | (1)   | (2)   | (3)   | (4)   | (5)   | (6)   | (7)   |
|---------------|-------|-------|-------|-------|-------|-------|-------|
| 2/40s .. .. . | —     | —     | —     | 21.83 | 22.44 | 23.06 | 23.88 |
| 2/48s .. .. . | —     | —     | —     | 22.73 | 23.35 | 23.96 | 24.78 |
| 12s .. .. .   | 14.13 | 16.36 | 16.71 | 17.33 | 17.97 | —     | —     |
| 16s .. .. .   | 14.59 | 16.82 | —     | —     | —     | —     | —     |
| 22s .. .. .   | 15.23 | 17.46 | 17.79 | 18.41 | 19.05 | 19.86 | —     |
| 40s .. .. .   | —     | —     | 20.94 | 21.56 | 22.20 | 23.02 | —     |
| 48s .. .. .   | —     | —     | 21.76 | 22.38 | 23.02 | 23.83 | —     |

(i) (a) In the case of Worsted Hosiery Yarn of any count specified in column 1 of the Schedule above, the maximum ex-factory price shall be the price that is specified against the count for the different grades of wool tops in columns 2, 3, 4, 5, 6 and 7 of that Schedule.

(b) In the case of Worsted Hosiery Yarn of any count not specified in the Schedule the maximum ex-factory price shall be arrived at in the manner specified in Note (ii) below :

(ii) The maximum ex-factory price referred to in Note (i) (b) above shall be arrived at :

(a) In the case of Worsted Hosiery Yarn of any count below 2/22s (double) or 22s (single) by deducting from the price specified for the next higher count spun from the appropriate grade of wool top at 7 nP per count (per kg.)

(b) In the case of Worsted Hosiery Yarn of counts above 2/22s (double) or 22s (single) by adding to the prices specified for the next lower count spun from the appropriate grade of wool top at 13 nP per count (per kg.)

(c) In the case of more than 2 fold yarn the prices will be the same as for doubled yarn indicated in the appropriate column of the Schedule above.

Sd/- (W. R. NATU)  
Textile Commissioner.

(6) *Prices of Woollen Hosiery Articles*

No. 7(2)/61-Control, dated 8th August, 1961.

In exercise of the powers conferred on me by Clause 4 of the Woollen Textiles (Production and Distribution) Control Order, 1960 and in supersession of the Textile Commissioner's Notification No. Pol. II/2 (105)/61, dated January 11, 1961, I hereby fix the maximum ex-factory price of woollen hosiery articles as specified in the Schedule below :—

## SCHEDULE H.A.

## Maximum Ex-Factory Prices of Woollen Hosiery Articles

| S.No. | Name of the article                    | Specification of counts | Ex-factory prices per kilogram<br>Rs. nP       |
|-------|----------------------------------------|-------------------------|------------------------------------------------|
| (1)   | Jersies                                | 3/11 or 2/12            | 48/50 tops 27.01                               |
| (2)   | Pullovers                              | 2/22                    | 70 tops 52.91<br>60 tops 50.71                 |
| (3)   | Cardigans (Ladies and Gents)           | 2/22                    | 48/50 tops 41.89<br>70 tops 56.22              |
| (4)   | Slipovers                              | 2/22                    | 60 tops 54.01<br>48/50 tops 45.19              |
| (5)   | Socks and Stockings (Civil)            | 2/22                    | 70 tops 50.71<br>60 tops 48.50                 |
| (6)   | Socks, Stockings & Hosetops (military) | 2/22                    | 48/50 tops 39.68<br>70 tops 49.60              |
| (7)   | Mufflers                               | 2/22                    | 60 tops 46.30<br>3/11 or 2/12 48/50 tops 27.78 |
| (8)   | Gloves                                 | 2/22                    | 70 tops 40.34<br>60 tops 38.14                 |
| (9)   | Caps                                   | 2/22                    | 70 tops 55.12<br>60 tops 52.91                 |
| (10)  | Vests                                  | 2/22                    | 70 tops 44.09<br>60 tops 41.89                 |
|       |                                        | 2/22                    | 70 tops 38.58<br>60 tops 36.38                 |

1. The price of the articles mentioned above in the Schedule manufactured out of 2/32s count (including extra for using finer gauges) shall be 12½% more than the corresponding price prescribed for the article manufactured out of yarn of 2/22s counts.

2. The maximum ex-factory price, maximum retail price and maximum excise duty shall be stamped by every producer in letters and figures not less than 6 millimetres in height, provided that the markings shall be made on a piece of paper securely stuck on the hosiery articles.

3. The maximum retail price of the hosiery article shall be the maximum ex-factory price of the article plus 25%.

4. For every increase or decrease in the price of the woollen yarn by Rs. 1.00, the prices of the hosiery articles mentioned in the Schedule shall be revised correspondingly by Rs. 1.25.

5. In the case of hosiery articles of sizes ranging between 36 centimetres and 71 centimetres, the following additional allowances are permissible :—

| Size of the hosiery article                     | Additional Allowances                                                            |
|-------------------------------------------------|----------------------------------------------------------------------------------|
| 36 centimetres to 56 centimetres.               | Rs. 6.60 per kilogram in addition to the price prescribed in the Schedule above. |
| 61 centimetres, 66 centimetres & 71 centimetres | Rs. 4.40 per kilogram in addition to the price prescribed in the Schedule above. |

6. Additional allowances for figurative and knitted designs are permissible as under :—

| Size of the figurative or knitted design                              | Additional Allowances                               |
|-----------------------------------------------------------------------|-----------------------------------------------------|
| Not exceeding 25 square centimetres                                   | Nil.                                                |
| Above 25 square centimetres and not exceeding 100 square centimetres. | Rs. 4.40 per kilogram of weight of the article.     |
| For every additional 75 square centimetres                            | Rs. 2.20 per kilogram of the weight of the article. |

7. The ex-factory price of the hosiery articles prescribed above is for the nett weight of yarn contained therein exclusive of the weight of button, zips and other embellishments.

8. Nothing in this notification applies to jerkins, reversibles, fully fashioned garments and swimweavers.

Sd/- (W. R. NATU),  
Textile Commissioner

## (7) Introduction of Length Measures

No. S.O. 2375, dated 27th September, 1961.

In exercise of the powers conferred by sub-section (3) of section 1 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby appoints the 1st day of October, 1961 as the date on which the provisions of the said Act, in so far as they relate to units of length, shall come into force in the whole of India except the State of Jammu and Kashmir and except in those areas in which, or in those classes of undertakings or those classes of goods in respect of which, the said provisions have already come into force.

No. S.O. 2376, dated 27th September, 1961.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), the Central Government hereby permits, in respect of the areas referred to in the Notification of the Government of India in the Ministry

of Commerce and Industry S.O. No. 2375, dated the 27th September, 1961, the continuance of the use for a period of one year from the 1st day of October, 1961 of any unit of length which immediately before that date was in use in respect of the said areas.

## A New Atomic Clock

Scientists at the Harvard University, U.S.A., have built a new kind of 'maser' which promises to be over 100,000 times more accurate than the best atomic clock now running. The heart of the new device is an ingenious 'bouncing box' that stores high-energy level hydrogen atoms long enough for them to emit a detectable radiation of precisely 21 cm wavelength. The maser can be used both as a sensitive amplifier or as a source of 21 cm radiation of unprecedented stability and purity of tone. The nearly perfect 'monotone' it emits promises to be the most accurate time-piece in the world, a new standard for time or for frequency.

The new maser is the first to use free atoms, rather than atoms trapped in molecules or crystals. The radiation that the free hydrogen atoms give off is much purer than that emitted by other masers; interaction among atoms held in a molecule or a crystal tends to blur or spread out the frequencies they emit.

The working of the atomic hydrogen maser is as follows: A stream of hydrogen

atoms is sent through a magnetic field that reflects those hydrogen atoms at the high-energy state into a unique storage box. Since the radiation given off by the hydrogen is very weak, the trick is to keep the atoms in the high-energy state for a long time—until enough have accumulated to give off a detectable chorus of 21 cm radiation. Ordinarily, the hydrogen atoms, bouncing off the sides of the box, would interact with the surface and quickly drop to the lower energy level. The new device has a special 'bouncing box', a quartz bulb coated on the inside with a paraffin that does not very readily interact with the bouncing atoms. It has been observed that one high-energy level hydrogen atom can endure at least 10,000 bumps in this storage box, *i.e.* a life-time of about 1 sec. In this way, a large number of high-energy level hydrogen atoms are stored up. The gas will then spontaneously emit a nearly perfect 'monotone', thus acting as an oscillator or source of 21 cm waves. But by deliberately decreasing the number of atoms present, this spontaneous emission may be checked. Then the device will emit 21 cm radiation only when it is triggered by an incoming signal of the same wavelength, making the 'bouncing box' a powerful amplifier.

As an oscillator, the new device can be used to measure some of the subtle physical

properties of the protons, electrons and neutrons in atoms much more accurately than has been hitherto possible. Scientists at the Harvard University plan to study the interaction between the nucleus and its orbiting electron in deuterium and tritium (heavy isotopes of hydrogen) with this clock.

[ *J. Franklin Inst.* 271 (1961), 71 and *JSIR* ].

#### Metric System in FPS Countries

It is understood that the American Army is adopting the metric system of weights and measures as early as possible so as to facilitate unification with the NATO forces.

It is reported that the Meteorological Office in the UK has changed over to the Centigrade thermometer from 1 January 1961.

#### Weights and Measures and the Common Market

The Committee of experts in legislation on weightment from the countries of the common market met in Paris on 20 and 21 June 1961, with a view to prepare the ground for the International meeting which is to take place in Bruxelles in September 1961.

The object was to arrive at as thorough a uniformity as possible among all countries and in particular countries of the Common Market.

\* \* \*

## Book Review

THE METRIC SYSTEM IN WEIGHTS & MEASURES (English)—by D. H. Bhayani & J. K. Vyas B.A.: B.Com., published by Bhayani Book Depot, 150, Princess Street, Bombay-2, pp. 40, First Edition: October, 1960, Price: Rs. 2.00.

Conversion tables are necessary for the change-over to the metric system if the general public is to get acquainted with the new units. A number of tables of various types dealing with weights and measures and prices have been brought out by various organisations and individuals. The present book is one more attempt in this direction.

The book is divided into five parts namely, length, weights, area, volume and capacity, and gives a round 50 tables. Each chapter begins with a general idea of the units, their fractions, their conversion tables and the like. Published tables on length include conversion from inches, feet, yards and miles to millimetres, metres and kilometres. Those for weights include conversion of tolas, seers, maunds, pounds, ounces, quarters, cwts and tons to metric units and the reverse, while those for area deal with conversion of sq. inches, sq. feet, sq. yards, sq. miles and acres to the respective metric units. Volume tables include conversion of cubic inches, cubic feet and cubic yards to metric units while the tables for capacity include conversion of cubic feet and gallons to litres.

The book is very well printed and would serve as a handy guide for many transactions.

It, however, appears to be somewhat incomplete without the price conversion tables. Conversion of prices is often a more important aspect in everyday transaction than the conversion of weights and measures. The value of the book would have been enhanced if the tables for the conversion of prices had been included. It would also appear to some purchasers that a price of Rs. 2.00 for a book of 40 pages, may be somewhat high for the common man. However, it is a useful addition to the literature on the metric system now being produced on large scale in the various States in India.

The publishers have also printed this book in Gujrati and are getting ready editions in other Indian languages.

METRIC SYSTEM CONVERSION FACTORS AND TABLES (English)—Published by the Engineering College Students' Co-operative Stores, Anantapur (Andhra Pradesh), First Published: February 1961, pp. 45, Price: Rs. 2.50.

Although conversion tables for the common man have been appearing in large numbers, tables required by students of science, engineering and technology are rarely published. As such this booklet is a useful addition for students.

The tables are given in thirty-six sections and contain the usual tables dealing with conversion of linear measures, square measures, cubic measures and capacities,

weights, and the like. Tables dealing with stresses and pressures, atmospheric and water pressures, speed, rate of discharge, density, viscosity, concentration, moment of work, moment of inertia, moduli of section, thermometer scales, work, power, consumption units, heat flow and other thermal properties, circular measure of angles, weight per unit length, decimal equivalents, wire and sheet metal gauges, and many others are also included in this book. A particularly interesting feature of this booklet is the use of the rationalized MKS system of units in the field of electrical engineering.

Recently the Eleventh General Conference of Weights and Measures adopted a resolution on the 'International System of Units'\*. Many countries have started adopting the various units recommended therein and France has legally accepted the secondary units prescribed in that resolution. A conversion table intended for students should, therefore, now include all these internationally accepted units besides those that are commonly used in

scientific books. This is particularly necessary because we are adopting the metric system at a stage where we can accept it in its latest form, instead of going through the scientific evolution of the whole range of units of the system. It is to be hoped that this aspect of the metric system would be reflected in the second edition of the book.

As the book has been based mainly on the conversion tables given in some other books, certain defects of conversion factors have arisen. For example, the equivalent of one pound has been taken as 0.453 592 43 kg. The factor as laid down by the Standards of Weights and Measures Act, 1956, is 0.453 592 4 kg. Similarly in table 35, certain values for accurate calculations have been given, where one inch is given as equal to 2.539 995 6 cm, instead 25.4 mm exactly and so the conversion factors for the foot and yard to the metre are not the same as given in the Act. These are, however, minor errors and do not detract from the value of the book at this stage in the adoption of the metric system in India.

\*See 'Metric Measures' September 1961, pages 23-24

## Controllers in States & Union Territories

In the January 1961 issue of *Metric Measures* a list of Controllers in the States and Union Territories was published for the guidance of the general public. Since then, many changes have taken place in the list published and an up-to-date list is, therefore, published below.

### (1) ANDHRA PRADESH

Shri C. N. Shastry,  
Controller of Weights & Measures,  
Government of Andhra Pradesh,  
Hyderabad-Deccan.

### (2) ASSAM

Shri S. R. Barua,  
Director of Agriculture and  
Ex-Officio Controller of Weights & Measures,  
Government of Assam,  
Shillong.

### (3) BIHAR

Shri V. N. Singh,  
Controller of Weights & Measures,  
Government of Bihar,  
Patna.

### (4) GUJERAT

Dr. C.B. Patel,  
Director of Industries,  
Government of Gujarat,  
New Civil Hospital,  
Block No. B-4,  
Asarva, Ahmedabad.

### (5) JAMMU AND KASHMIR

Shri M.M. Siddiqui,  
Financial Commissioner and  
Ex-Officio Controller of Weights & Measures  
Revenue Secretariat,  
Jammu-Srinagar.

### (7) KERALA.

Shri K.S. Menon,  
Controller of Weights & Measures,  
Office of the Board of Revenue,  
Trivandrum.

### (7) MADHYA PRADESH

Shri Ram Singh Bawal,  
Controller of Weights & Measures,  
Government of Madhya Pradesh,  
Bhopal.

### (8) MADRAS

Shri S.A. Sundararajan,  
Controller of Weights & Measures,  
No. 19-A, Woods Road, Mount Road, Madras-2

### (9) MAHARASHTRA

Shri V.M. Pednekar,  
Deputy Director of Industries (Metric)  
and Deputy Controller of Weights & Measures,  
Maharashtra State,  
Old Customs House Yard,  
Fort, Bombay.

### (10) MYSORE

Shri Marudeva Gowda,  
Controller of Weights & Measures,  
Old Residency Buildings,  
Bangalore.

### (11) ORISSA

Shri R.N. Dwivedi,  
Joint Director of Marketing &  
Ex-Officio Controller of Weights & Measures,  
Government of Orissa,  
Bhubaneswar.

### (12) PUNJAB

Shri Kanwar Jit Singh,  
Controller of Weights & Measures,  
Government of Punjab,  
Ambala Cantt.

### (13) RAJASTHAN

Shri K.N. Mathur,  
Superintendent,  
Weights and Measures,  
Government of Rajasthan,  
Jaipur.

### (14) UTTAR PRADESH

Shri G.P. Mital,  
Controller of Weights & Measures,  
Government of Uttar Pradesh,  
Lucknow.

### (15) WEST BENGAL

Shri J.B. Sen,  
Controller of Weights & Measures,  
Government of West Bengal,  
45, Ganesh Chandra Avenue,  
3rd Floor, Calcutta-12.

### (16) ANDAMAN AND NICOBAR ISLANDS

Shri Puran Singh,  
Secretary to the Chief Commissioner,  
Andaman and Nicobar Islands,  
Port Blair.

### (17) DELHI

Shri H.L. Mehandru,  
Controller of Weights & Measures,  
Near Bhagirath Palace,  
Chandni Chowk,  
Delhi.

### (18) HIMACHAL PRADESH

Shri N.C. Kaushal,  
Superintendent, Weights and Measures,  
Industries Department,  
Himachal Pradesh,  
Simla-4.

### (19) LACCADIVE, MINICOY AND AMINIDIVI ISLANDS

Shri P. Kelukutty Menon,  
Secretary to Administrator,  
Laccadive, Minicoy and Aminidivi Islands,  
Kozhikode.

- (20) **MANIPUR**  
Shri Pratap Singh,  
Controller of Weights & Measures,  
Manipur Administration,  
Imphal.
- (21) **PONDICHERY**  
Shri J. Arlanda,  
Controller of Weights & Measures,
- Government of Pondicherry.  
Pondicherry.
- (22) **TRIPURA**  
Shri P.R. Purohit,  
Superintendent, Weights & Measures,  
Tripura Administration,  
Agartala.

## Licensed Manufacturers, Dealers and Repairers of Weights and Measures (16)

*Metric Measures* has been publishing a series of lists of manufacturers, dealers and repairers of weights and measures, weighing and measuring instruments licensed by the Governments in the various States and Union Territories under their Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the sixteenth list. The first list appeared in the March 1959 issue.

Progressively steps are being taken for licensing manufacturers, dealers and repairers in all States and further lists of licensees would be published in *Metric Measures* as this work progresses.

The number in brackets against the name of the State or Union Territory indicates the particular instalment number of the State or the Union Territory. The issues of *Metric Measures* in which previous lists appear are also shown suitably.

An analysis of the licensees, including the present list, shows that the total number of licensees in 14 States and 4 Union Territories is 861 manufacturers, 2,957 dealers,

and 634 repairers. The details of published information are as follows:—

| Sl. No. | State/Union Territory | Licensees          |         |                |
|---------|-----------------------|--------------------|---------|----------------|
|         |                       | Manu-<br>facturers | Dealers | Re-<br>pairers |
| 1       | Andhra Pradesh        | 40                 | 84      | 31             |
| 2       | Assam .. ..           | 11                 | 44      | 16             |
| 3       | Bihar .. ..           | 20                 | 69      | 34             |
| 4       | Delhi .. ..           | 22                 | 76      | 19             |
| 5       | Gujarat .. ..         | 93                 | 492     | 121            |
| 6       | Himachal Pradesh      | 1                  | 7       | 1              |
| 7       | Kerala .. ..          | 18                 | 283     | 34             |
| 8       | Madhya Pradesh        | 99                 | 310     | 4              |
| 9       | Madras .. ..          | 79                 | 210     | 37             |
| 10      | Maharashtra ..        | 60                 | 163     | 106            |
| 11      | Manipur .. ..         | 5                  | 5       | 2              |
| 12      | Mysore .. ..          | 75                 | 399     | 41             |
| 13      | Orissa .. ..          | 14                 | 17      | 1              |
| 14      | Punjab .. ..          | 35                 | 145     | 26             |
| 15      | Rajasthan .. ..       | 16                 | 69      | 18             |
| 16      | Tripura .. ..         | 1                  | 5       | 0              |
| 17      | Uttar Pradesh ..      | 207                | 379     | 88             |
| 18      | West Bengal ..        | 65                 | 200     | 55             |
|         |                       | 861                | 2,957   | 634            |

## LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (16)

### GUJERAT (3)

In the March and September 1961 issues of *Metric Measures*, lists of licensed manufacturers, dealers and repairers of weights and measures in Gujarat State were published. The following is a list of manufacturers, dealers and repairers of weights and measures subsequently licensed under the Bombay Weights and Measures (Enforcement) Act, 1958.

### Manufacturers

| Sl. No. | Name and Address of Manufacturer                                              | Details of Articles Manufactured                      |
|---------|-------------------------------------------------------------------------------|-------------------------------------------------------|
| (1)     | Ambica Moulding and Engineering Works, Bhurta Bawa's Nahera, Bhavnagar.       | Weights.                                              |
| (2)     | C. & G. Chokshi, Chokshi Niwas, Haveli Street, Rajkot                         | Sheet Metal Weights.                                  |
| (3)     | Jyoti Mechanical Industries, Behind Income Tax Office, Navasari.              | Dipping type liquid capacity Measures.                |
| (4)     | Luhar Khimji Ranchhod, Kansara Bazar, Bhuj (Kutch) ..                         | Flat cylindrical Bullion weights Beam Scales class B  |
| (5)     | Narayan Moulding Works, Dargah Road, Naran Khapa Chawl, Navasari.             | Weights.                                              |
| (6)     | M.J. Parmar and Sons, Kansara Bazar, Bhuj (Kutch) ..                          | Flat cylindrical Bullion weights Beam scales class B. |
| (7)     | Star Metal Industries, Dariapur, Jardon Road, Inside Prom Darwaja, Ahmedabad. | Bullion and Commercial Brass weights                  |
| (8)     | Shanta Vijay Chain Factory, Pandya Street, Savar-Kundla                       | Beam Scales Class C & D.                              |
| (9)     | Sutar Devshi Bhimji, Vanda, Via, Savarkundal .. ..                            | Counter mahines Beam Scales Class B & C.              |
| (10)    | Vanraj Engineering, Corporation, Station Road, Patan                          | Weights.                                              |

### Dealers of Weights, Measures, Weighing and Measuring Instrument

|                                                                                                                             |                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| (1) Abdulkarim Pribhai Memon, Near Station, Jadar, Taluka: Idar, District Sabarkantha.                                      | (9) Bharat Iron & Brass Works, Near Haveli Patan, District Mehsana.                  |
| (2) Abdullbahi Hasanbhai Sodagar, Bazar, Jambusar, District—Broach.                                                         | (10) Bharat Traders, 4/867, Begumpura Main Road, Corner of Chopra Street, Surat.     |
| (3) Abdulaly Haji Hasanly Lokhandwala, and Co., Satharia Bazar, Godhra, District Panchmahals.                               | (11) Bhujangilal Shivji Shah, Opp: Bus Stand, Bhuj/Kutch.                            |
| (4) Admadbhai Haiderbhai Lokhandwala, Limda Chowk, Surat.                                                                   | (12) Bodalji Taibji Jodiawalas Mulla Medi Road, Sanghadia Bazar, Jamnagar.           |
| (5) Ahmedabad Photographic Cooperative Consumer's Society Ltd., Tourist Bureo, 5, Rani Manzil, Saraspur, Khadia, Ahmedabad. | (13) Champaklal Bhagvatlal Shah, Near Vegetable Market, Ankleshwar, District Broach. |
| (6) Akberalli F. Vakharwala, Mullawad, Ankleshwar, District Broach.                                                         | (14) Champaklal K. Mehta, Bazar, Chikhli District Surat.                             |
| (7) Asiatic Agency, 1593/6, Mohmadi Manjil, Pirsakarganj Masjid, Chudiodal, Ahmedabad.                                      | (15) Champaklal P. Kansara, Kansara Bazar, Broach.                                   |
| (8) Bansal Iron Foundry, Sales Corporation Dudheswar Road, Plot No. 82, Ahmedabad.                                          | (16) Chandulal Vithaldas Shah, Station Road, Bechrapi, District Mehsana.             |
|                                                                                                                             | (17) Chhaganlal Ramji, Porbandar Naka Road, Bhanvad.                                 |

## Dealers (Contd.)

- (18) Chimanlal Popatlal Mistry, Opp. Police Head Quarter, Amreli.
- (19) Chhotalal Manilal & Co., Bayad, District, Sabarkantha.
- (20) Chunilal Kevaldas Panchal, Bazar, Umta District Mehsana.
- (21) Dharamchand Hirachand & Sons., Station Road, Motamiya Mangrol, District Surat.
- (22) Fajlehusain Fidali, Vakharwala, Mullawad, Ankleshwar, District Broach.
- (23) Girdharlal Laxman & Brod., Sardar Road, Morvi.
- (24) Gohilwad Jilla Udyogic Sahakari Sangh Ltd., Opp. Bhaga Talav, Bhavanagar.
- (25) Goverdhan Hardware Stores, Bazar Kalol, District—Panchmahals.
- (26) Gullamali Mohamedali Limdiwala, Bazar, Lunavada, District Panchmahals.
- (27) Harshadray Nathubhai Shah, Station Road, Madhi, Distt. Surat.
- (28) Himathlal Bogilal Shah, 15, Sarvodaya, Society Surendranagar.
- (29) Indian Iron Industries, C/o 16, Commercial Chambers, Rajkot.
- (30) Ismail Mohamed Jabar, Station Road Dohab, District Panchmahals.
- (31) J.N. Bros., Bazar, Devgadhi-Baria, District Panchmahals.
- (32) Jagdishchandra Babubhai Mistry, Jawahar Road, Cambay, District Kaira.
- (33) Jain Book Depot, Station Road, Talod, District Sabarkantha.
- (34) Jayantilal Manilal Sheth, Bazar Vejalpur, District Panchmahals.
- (35) Jivabhai Gangadas Patel, Bazar ODE District Kaira.
- (36) K.B. Parmar, Opp. Plaza Cinema Below U. Co., Bank, Porbandar.
- (37) Kanchanlal Pursottamdas Mehta, Bazar Kalol, District Panchmahals.
- (38) Kansara Bhagvanji Damodar, Kaji Chakla, Near Haveli, Jamnagar.
- (39) Kantilal & Brothers, Shroff Bazar, Modasa District Sabarkantha.
- (40) Keshavlal Bhogilal Lokhandwala, Kalol, District Panchmahals.
- (41) Keshavlal Devchand Shah, Kansara Bazar, Manek Chowk, Ahmedabad.
- (42) Khimji Govindji Radia, Near Darbargadh, Bhanvad.
- (43) Kurbanhusin Fidlay Vakharwala, Kullawad, Ankleshwar, District Baroach.
- (44) Lalji Bhanii Tinwala, Natvar Chowk, Porbandar.
- (45) Luhar Gordhan Jinabhai, Bazar Road, Wankaner.
- (46) Luhar Hiram Trikamji Gohel, Motva Sheri, Near Jagawala, Chora, Jetpur.
- (47) Luhar Ramji Valji Keshav, Chandhi Chowk, Savarkundla.
- (48) Maganlal Himatlal, Kumbhar Gali, Near Kalupur Tower, Kalupur, Ahmedabad.
- (49) Maneklal Chimanlal Patel, Saraspur Vasan-sheri No : 1315, Ahmedabad.
- (50) Marshal Scale Industries, Manibhai Road, Savarkundla.
- (51) Mohamad Abdulla Dadani, Bazar Chowk, Dhoraji.
- (52) Mohammedali Hajee Yusufali Vasanwala, Netaji Subhas Road, Dohad, District Panchmahals.
- (53) Mohanlal Chunilal, Chauta Bazar, Ankleshwar, District—Broach.
- (54) Mohanlal Vasanji, Natvar Chowk, Porbandar.
- (55) Mulla Fidahusen Kikabhai & Sons, Bazar Road, Chhotaudepur, District Baroda.
- (56) Munavarali Fidaali Vohra—Bazar, Thasra, District, Kaira.
- (57) Narandas Tribhovandas Panchal, Nani-chhipwad, Aklakor Wada, Baroda.
- (58) Narshi Lakhamshi & Co., Lakada Bazar, Anjar/Kutch.
- (59) National Steel Industries, Near Bharpura, Dehad Road, Gohara, District Panchmahals.
- (60) Natubhai Kashibhai Patel, Golden Street, Sejitra, District Karia.
- (61) Dehhavilal Purshettamdas & Co., Kansara Bazar, Cambay, District Kaira.
- (62) Pradip Hardware Mart, Chauta Bazar, Ankleshwar, District Broach.
- (63) Pragji Dhag-vanji Mulji, Daria Sthan Chowk, Bhanvad.
- (64) Ramanlal Jivanlal Shah, Bazar, Halol, District Panchmahals.
- (65) Rajabali Abdulhusan Mulla, Kata Bazar, Dhandhuka, District Ahmedabad.
- (66) Rajendrakumar Shantilal Vyarawalla, Madhi, District Surat.
- (67) Ratilal and Co., Kansara Bazar, Petlad, District Kaira.
- (68) Ratilal Dahyabhai Shah, Near Mota Mandir, Jambhusar, District Broach.
- (69) Ratilal Manilal Shah, Soni Chakla Bazar, Jambhusar.
- (70) Safakathusein Yakubali Bardanwals, Katorpor Darwaja, Broach.

## Dealers (Contd.)

- (71) Sakarchand Govindji & Bros., Motamiya Monsrol, District Surat.
- (72) Sohan Co-operative Consumer's Society Ltd., Bureo '5' Rani Munzil Sarangpur Khadir, Ahmedabad.
- (73) Sankarchand Madhavilal & Co., Sankada Bazar, Mehmabad, District Kaira.
- (74) Standard Engineering Works, Opp. Vagheshwaji Temple, Mahava.
- (75) Sutar Manjibhai Premjibhai, Post Vanda, Via Savarkundla.
- (76) T. Mohsin & Bros., Mota Bazar, Godhara District Panchmahals.
- (77) Thakar Kanji Madhavji, Kaneriwala Bazar, Keshod.
- (78) Thakerbhai Bhikhabhai Shah, Main Bazar, Bar-doli, District Surat.
- (79) Tulsidas Sundarji Mistry, New Gandhi Chowk, Petlad, District Kaira.
- (80) Ujamshi Laheab-hai Lokhandwala, Mahatma Gandhi Road, Bulsar, District Surat.
- (81) Uttamlal and Co., Main Road, Surrendranagar.
- (82) Vallabh Govind, Pandya Sheri, Savarkundla.
- (83) Vanmalidas Laxmichand Soni, Shop No. 55, Mithapur.
- (84) Vanraj Engineering Corporation, Station Road, Patan, District Mehsana.
- (85) Vijay Industries, Station Plot, No : 8, Gondal.
- (86) Vohra Salehbhai Abdulhusen & Sons, Bazar, Killapardi, Dist. Surat.
- (87) Vrajlal Hirchand Rupani, Grain Market, Jamnagar.
- (88) Zinabhai Huskishandas Lokhandwala, Limda Chowk, Surat.

## Repairers of Weights, Measures, Weighing and Measuring Instruments.

- (1) Balusingsh Harising, Near Sejota, Godhavav Pati, Girnar Road, Junagadh.
- (2) Chimanlal Popatlal Mistry, Opp: Police Head Quarter, Amreli.
- (3) Chunilal Kevaldas Panchal, Umta, District Mehsana.
- (4) Ismail Mohomad Jabar, Station, Road, Dohad, District Panchmahals.
- (5) Jilani Scale Works, Taluka Kheralu, District Mehsana.
- (6) Kansara Ranji Jivram, Kansara Bazar, Anjar, Kutch.
- (7) Laxman Chandubhai Kantawala, Lalu Kaka's Lavi, Talod, District Sabarkantha.
- (8) Luhar Jeram Trikamji Gohel, Opp : Matva Sheri, Jagavala Chora Road, Jetpur.
- (9) J.J. Makwana, Opp : Miraji's Medi, Jetpur.
- (10) Mistry Bhagwan Ragha, Nava Para, Ghogha Road, Bhavnagar.
- (11) Narandas Tribhovandas Panchal, Nani-chhipwad, Akalkorwada, Baroda.
- (12) K.B. Parmar, Plaza Cinema, Below U. Co., Bank, Opp : Porbandar.
- (13) Ramji Hirji Mistry, Stall No. N-98, Ghandhi-dham.
- (14) Solanki Brothers Engineering Works, Dhrangadhra.
- (15) Vallabh Govind Pandhya Street, Savarkundla.
- (16) Vanmalidas Laxmichand Soni, Shop No. 55 Mithapur.

## MANIPUR (I)

The following is the first instalment of manufacturers, dealers and repairers by licensed by the Manipur Administration.

## Manufacturers

| Sl. No. | Name and Address of Manufacturer                      | Details of Articles Manufactured                       |
|---------|-------------------------------------------------------|--------------------------------------------------------|
| (1)     | Aryvart Engineering Works, Khairnagar, Meerut ..      | Weights, Measures, Weighing and Measuring Instruments. |
| (2)     | Avery Compnay Private Ltd., Lakhokia Road, Gauhati .. | Weights, Measures, Weighing and Measuring Instruments. |

**Manufacturers (Contd.)**

| Sl. No. | Name and Address of Manufacturer                     | Details of Articles Manufactured                       |
|---------|------------------------------------------------------|--------------------------------------------------------|
| (3)     | G.O. Iron Foundry, Bhairon Belanganj, Agra .. ..     | Weights, Measures, Weighing and Measuring Instruments. |
| (4)     | Jaiswal Trading Co. P.O. Dhambad .. ..               | Weights, Measures, Weighing and Measuring Instruments. |
| (5)     | Naba Kumar Routh, 78, Netaji Subhas Road, Calcutta-7 | Weights, Measures, Weighing and Measuring Instruments. |

**Dealers**

| Sl. No. | Name and Address of Dealer                               | Details of Articles Sold |
|---------|----------------------------------------------------------|--------------------------|
| (1)     | Ganeshlal Bagri & Co. Paona Bazar, Imphal .. ..          | Weights.                 |
| (2)     | Gokul Singh Manikchand Singh, Thangal Bazar, Imphal      | Weights and Measures.    |
| (3)     | Jamunalal Mangilal, Paona Bazar, Imphal .. ..            | Weights.                 |
| (4)     | Manipur Apex Marketing Co-operative Society Ltd. Imphal. | Weights and Measures.    |
| (5)     | Punjab Hardware Store, Phangal Bazar, Imphal .. ..       | Weights and Measures.    |

**Repairers**

| Sl. No. | Name and Address of Repairer                           | Details of Articles repaired                           |
|---------|--------------------------------------------------------|--------------------------------------------------------|
| (1)     | Ksh Damodar Singh, Singamei Burma Road, Imphal .. ..   | Weights, Measures, Weighing and Measuring Instruments. |
| (2)     | Electrical and Auto Works, Thangal Bazar, Imphal .. .. | Weights, Measures, Weighing and Measuring Instruments. |

**PUNJAB (11)**

In the July and September 1959, March, May, July September and November 1960 and March, May and July 1961 issues of *Metric Measures* lists of Manufacturers, Dealers and Repairers of Weights and Measures in Punjab State were published. The following is a list of manufacturers, dealers and repairers subsequently licensed by the Government of Punjab under the Punjab Weights and Measures (Enforcement) Act, 1958.

**Manufacturers**

| Sl. No. | Name and Address of Manufacturers                               | Details of Articles Manufactured |
|---------|-----------------------------------------------------------------|----------------------------------|
| (1)     | East and West, 149/9-A, Ludhiana .. ..                          | Measuring Tapes upto 100 ft.     |
| (2)     | Harbans Tank Engineering Works, Gurdaspur Road, Pathankot.      | Petrol Tanks Cap. upto 100 ft.   |
| (3)     | Ramgarhia Motor Mechanical Workshop, Gurdaspur Road, Pathankot. | Petrol Tanks 8000 Litre Cap.     |

**Dealers**

| Sl. No. | Name and Address of Dealer                                                 | Details of Articles Sold                                             |
|---------|----------------------------------------------------------------------------|----------------------------------------------------------------------|
| (1)     | Amin Chand Shadi Ram, G.T. Road, Phagwara .. ..                            | Weights, Measures, Weighing and Measuring Instruments.               |
| (2)     | Anant Ram Roshan Lal, Railway Road, Taran Taran .. ..                      | Weights, Measures and Beam Scales.                                   |
| (3)     | Bachint Singh and Sons, Industrial Area, Ludhiana .. ..                    | Weights, Measures, and Beam Scales.                                  |
| (4)     | Bawa Industrial Steel Works Ltd., Sonapat .. ..                            | Cast Iron Weights 100g to 50 kg.                                     |
| (5)     | Ishwar Das Charanji Lal, Anandpur Sahib (Hoshiarpur)                       | Weights, Measures, Weighing and Measuring Instruments.               |
| (6)     | Charanji Lal Dev Raj, Iron Merchants, Raman (Bhatinda)                     | Weights, Measures, and Beamscales only.                              |
| (7)     | Khan Chand Arore, Bazar Kathian, Amritsar .. ..                            | Weights, Measures, and Beamscales only.                              |
| (8)     | K.R. Kohli and Sons, Civil Lines, Ludhiana .. ..                           | Weights, Measures, Beamscales and Platform Machines upto 800kg. Cap. |
| (9)     | Phul Kumar Parkash Chand, Nai Mandi, Nissar .. ..                          | Weights, Measures, Weighing and Measuring Instruments.               |
| (10)    | Ram Ji Dass Jai Chand, Majith Mandi .. ..                                  | Weights, Measures, and Beamscales.                                   |
| (11)    | Ram Partap, Chandni Chowk, Sirsa .. ..                                     | Weights, Measures, Weighing and Measuring Instruments.               |
| (12)    | Ram Gyanshwar Dass, Iron Merchants, Bhiwani .. ..                          | Weights, Measures and Beamscales only.                               |
| (13)    | Sonipat Bharat Printing and Sport Cooperative M.P. Coop. Society, Sonapat. | Weights, Measures, Weighing and Measuring Instruments.               |
| (14)    | Satya Narain Aggarwal, Outside Mandi Gate, Narnaul .. ..                   | Weights, Measures, Weighing and Measuring Instruments.               |
| (15)    | Susta Mal Mohan Lal, Rly Road, Kotkapura .. ..                             | Weights, Measures and Beamscales.                                    |
| (16)    | Tulsi Ram Pyare Lal Jain, Patalia .. ..                                    | Litre Measures 5 to 100 ml.                                          |
| (17)    | Vijay Kumar Sish Pal, Bazar, Kathian, Amritsar .. ..                       | Weights, Measures and Beamscales.                                    |

**Repairers**

| Sl. No. | Name and Address of Repairer          | Details of Articles Repaired |
|---------|---------------------------------------|------------------------------|
| (1)     | Munshi Ram, Naya Bazar, Bhiwani .. .. | Weights.                     |

**UTTAR PRADESH (7)****I. Dealers Licensed for Weights, Measures, Weighing and Measuring Instruments.**

|                                                                  |                                                                              |
|------------------------------------------------------------------|------------------------------------------------------------------------------|
| (1) Abdul Hameed, Bachhan Behari, 11/30 Gwatoli, Kanpur.         | (6) Agrawal Weights and Measures Manufacturing Co., Daulat Market, Agra.     |
| (2) Arjan Singh, Hammander Singh, Ambala Road, Saharanpur.       | (7) Anand Bartan, Brass Merchants, Stores, Pipal Mandi, Dehra Dun.           |
| (3) R.L. Agrawal & Bros., Laxmi Buildings, The mall, Kanpur.     | (8) Anand Hardware & Paint Mart, Rajas Road, Dehra Dun.                      |
| (4) Agra Taj Industries, Behind Police Station, Lohamandi, Agra. | (9) Anil Stores, 54/11, Nayaganj, Kanpur.                                    |
| (5) Agrawal Hardware Stores, 792 Rakabganj, Fazizabad.           | (10) Agrawal Tin Manufacturing Co., and Engineering Works, Sultanganj, Agra. |
|                                                                  | (11) Agra Tools Stores, Namak-ki-Mandi, Agra.                                |

## Dealers (Contd.)

- (12) Bajrang Iron Foundry, 1014, Kala Bhairon, Belanganj, Agra.
- (13) Braham Prakash Bhuvanesh 201, Handya Mohalla, Muzaffarnagar.
- (14) Brij Metal Industries, Langra-Ki-Chauki, Agra.
- (15) Bishambher Lal Ram Grain Merchants & Commission Agents, P.O. Naupara Bahraich.
- (16) Babu Ram Tulsi Ram Mohalla Parkinganj, Sultanpur.
- (17) Balli Ram Bhagwan Das, Pipraich, P.O. pipraich, Gorakhpur.
- (18) Smt. Balwanta Devi Sushila Devi Iron & Cement Dealers, Sultanpur (Oudh).
- (19) S. Batin Bhoj & Co., 24, Latouche Road, Lucknow.
- (20) Babu Ram Mathura Prasad, 49/63, Nayaganj, Agra.
- (21) Babu Lal Agrwal, Stamp Vendor and General Merchant, Belanganj, Agra.
- (22) Balak Ram Banarasi Dass, Iron & Hardware Merchants, Sadar Bazar, Meerut Cantt.
- (23) Bishambar Sahai & Sons, Iron & Hardware Merchants, Sadar Bazar, Meerut Cantt.
- (24) Bhagat Jewellers, Sarafa Bazar, Meerut.
- (25) Bhartiya Ispat Udyog, 77/3, Cooli Bazar, Kanpur.
- (26) Chota Lal Dhan Prakash, 26-C, New Mandi, Muzaffarnagar.
- (27) Chitram Tahel Dass, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (28) Chowdhary Badri Das Suraj Bhan, Ghia Mandi, Mathura.
- (29) Cawanpore Steel Products, 76/2, Halse Kanpur.
- (30) Dina Nath Lohia, Bara Bazar, Bareilly.
- (31) Dayal & Bros., Kishanganj, Meerut.
- (32) Dhan Prakash Tilak Chand Iron Merchants, Bara Bazar Muzaffarnagar.
- (33) Chajju Lal Babu Lal Jain, Lohamandi, Agra.
- (34) Fakruddin Irkramuddin, 267, Bazaza Street, Meerut City.
- (35) Dharamkanta Sarafa Committee, Chowk Bazar Moradabad.
- (36) Ganesh Prasad Dhaniram & Co., Iron Merchants, Mandaha P.O. Ragani Distt. Hamirpur.
- (37) Kuldip Singh, 66, New Ganeshganj, Lucknow.
- (38) Jadish and Satish Bros., 119, Kesarganj, Meerut City.
- (39) Daulatram Sunejri Lal Jain, Belanganj, Agra.
- (40) Hazari Lal Bhagwan Dass, Jain, Loha Mandi, Agra.
- (41) Hori Lal Krishna Chandra, Arya Nagar Sitapur.
- (42) Hindustan Casting Corporation 2002, Chiman Lal Road, Freeganj, Agra.
- (43) A.K. Industries Ekkawali Gali, Noorigate, Agra.
- (44) V.N.P. Jaiswal, C. 21/3 Maldehia, Varanasi.
- (45) Jain Hardware Stores, Belanganj, Agra.
- (46) Janta Industrial Co-operative Society Ltd., 81, North Vijay Nagar, Agra.
- (47) Jagdish Saran & Co., Bara Bazar, Bareilly.
- (48) Kishan Swaroop Kaushal Kishore, 73/34, Collectorganj, Bawan Dukan Kanpur.
- (49) Fateh Chand & Sons, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (50) Goenka Traders, 35, Sri Ram Road, Lucknow.
- (51) Gobardhan Das Brij Nath, P.O. Bridgman-ganj, Gorakhpur.
- (52) Govind Prasad, Place & P.O. Sridutta Ganj, Gonda Teh. Utranal, Distt. Gonda.
- (53) Har Sahai Mal Govind Ram, Iron Merchants, Moulviganj, Budaun.
- (54) Hzari Lal Ram Chandra, Das Iron Merchants, Bara Bazar, Muzaffarnagar.
- (55) Jai Prakash Jagmohan Lal, Iron Merchants, Bara Bazar Muzaffarnagar.
- (56) Industrial Traders, Baxipur Chowk, Gorakhpur.
- (57) Jit Singh Anand & Sons, Pipal Mandi, Dehra Dun.
- (58) Jagdish Prasad Satyapal, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (59) Jai Prakash Jagmohan Lal, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (60) Janeshwar Das & Bros., Iron Merchants 57-C, New Mandi, Muzaffarnagar.
- (61) Kishan Swrup Gupta, 393, Mah. Kunj, Kacheri Ghat, Agra.
- (62) Kedar Nath & Sons, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (63) Kishan Agencies, 22 Chakrata Road, Dehra Dun.
- (64) Kishori Lal Hoshier Singh, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (65) Kishori Lal Kailash Chand Iron Merchants, Bara Bazar Muzaffarnagar.
- (66) Kundan Lal Mulakraj, Sohrab Gate, Meerut.
- (67) Kanahiya Lal Prag Dass, 7, Nazirabad, Lucknow.

## Dealers (Contd.)

- (68) Krishna Kumar Agrawal, 26, Gautam Budh Marg, Lucknow.
- (69) Kashi Ram Phool Chand, Hardware Merchants Pipal Mandi, Dehradun.
- (70) Mitthan Lal Padam Kumar Jain, Lohamandi, Agra.
- (71) Jodha Ram Ram Prakash, Hardware Merchants, Lohamandi, Agra.
- (72) Khanna Weight Measurement Co., Krishan Maraiya, Humayunpur, Gorakhpur.
- (73) Krishna Engineering Works, Shivpur, Varanasi.
- (74) Lalitpur Consumers' Co-operative Society Ltd., 110, Saraipura Lalitpur, Dist. Jhansi.
- (75) Laxmi Metal Works, 914, Belanganj, Agra.
- (76) Martin & Co., 47/48, New Market, Begum Bridge, Meerut.
- (77) Mukundlal Babu Lal, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (78) Mitter Sen Goel, Iron Merchants, 12C, Bhopa Road, New Mandi, Muzaffarnagar.
- (79) Maharaj Kishan Hansraj, Iron Merchants, 2946, Loha Mandi, Agra.
- (80) Moti Lal Vijay Kumar, Iron Merchants, Loha Mandi, Agra.
- (81) Mohan Industrial Corporation, Mina Gate, Pathwari, Agra.
- (82) Manga Ram Suresh Chand, Iron Dealers, Bara Bazar, Muzaffarnagar.
- (83) Mithan Lal Padam Kumar Jain, Loha Mandi, Agra.
- (84) Mohammad Yasin, Hardware Merchants, Kabari Bazar, Meerut City.
- (85) Mool Chand Har Narain Jain, Belanganj, Agra.
- (86) Patan Din Satya Prakash, Moh. Khirki, P.O. Utranla, Distt. Gonda.
- (87) Matin & Co., Delhi Gate, Meerut.
- (88) L. Ramadhin Gupta, Iron Merchants, Fatehganj, Lucknow.
- (89) Ram Niwas Pushakar Dutt, Fatehganj, Faizabad.
- (90) Ramchandra Sharma, Vill. & P.O. Saidpur, Distt. Bulandshair.
- (91) Prakash Trunk & Crockery Stores, Subzi Bazar, Hapur, Distt. Meerut.
- (92) Nand Kishore Agrawal, (Prop. Shambeer Milk Stores), Sipri Bazar, Jhansi.
- (93) Nihal Chand Ram Kishan and Co., Iron Merchants, Bara Bazar, Muzaffarnagar.
- (94) Ramji Das & Sons, Sarafa Bazar, Muzaffarnagar.
- (95) Raja Ram Uggar Sen, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (96) Ram Dass, Iron Hall, Bareilly.
- (97) Ramjimal Ram Prashad, Iron Merchants, Old Ganj, Rampur.
- (98) Rajendra Kumar, Charhai Neem, Bareilly.
- (99) Radhey Shyam Shusil Kumar Gupta, Fateh Ganj, Lucknow.
- (100) Ram Lal Ram Kumar, P.O. & Vil. Nagar, Distt. Gorakhpur.
- (101) Naveen Engineering Co., 915, Belanganj, Agra.
- (102) Narain Singh Babu Lal, Iron Foundry, Sheo Station, Behind Lohamandi, Agra.
- (103) Nukal Sain Siri Ram, Kagzi Bazar, Meerut City.
- (104) Narain Das Daya Ram, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (105) Premier Fair Price Dealers Private Ltd., 68/2, Gandhi Road, Dehradun.
- (106) Padam Chand & Bros., 926, Belanganj, Agra.
- (107) Pramatta Saran Devandra Kumar, Iron Merchants, Kabari Bazar, Meerut City.
- (108) Rakesh Bros., Merchants and Commission Agents, Saran Villa Ramnagar, Ghaziabad.
- (109) Ram Chand Dharam Lal, Iron Merchants, Bara Bazar, Muzaffarnagar.
- (110) Ram Asray Lal, Gali Mirdhan, Bareilly.
- (111) Ram Swaroop Gupta & Co., Thompson Ganj, Sitapur.
- (112) Rathi Iron Stores, Urdu Bazar, Gorakhpur.
- (113) Ram Autar Son of Lal Misri Lal, resident of Nawabganj, Bareilly.
- (114) Ram Chand Om Prakash, Iron & Hardware Merchants, Kabari Bazar, Meerut City.
- (115) Ram Gulam Bachai Lal, Town Bindki Moh. Bazar, Fatehpur.
- (116) Rama Iron Stores, 248, Baghpat Gate, Meerut.
- (117) Roop Kishore Bansal, Kotwari, Meerut.
- (118) Ram Gauri Shankar, Iron Merchants, Sahebganj, Gorakhpur.
- (119) Shankar Nath Kapoor, 20, Lakaramandi, Daliganu, Lucknow.
- (120) Sajjad Ahmed Khan, Moh. Pulpukhta, Rampur.
- (121) Shankar Bhagwan Stores, Station Road, Galeghar, Gorakhpur.
- (122) Shivaldas Mool Chand, Hardware Merchants, 311, Belanganj, Agra.

Dealers (Concl'd.)

- |                                                                                            |                                                                |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| (123) M. M. Sharma & Sons, 185, Lisar Gate, Meerut.                                        | (142) Vijai Narain Gupta, Lohewale, Gosainganj, Lucknow.       |
| (124) Shital Dass Hardayal, Iron Merchants, Bara Bazar, Muzaffarnagar.                     | (143) Virendera Kumar Bros., Chaumukhapul, Moradabad.          |
| (125) Sita Ram Shrichand, Lal Tata Dealers, Lohani Marg, Saharanpur.                       | (144) Vinod Kumar, 285 Muttiganj, Allahabad.                   |
| (126) Standard Engineering Corpn. Tining Factory Buildings, Lane Ganshala, Pathwari, Agra. | (145) Vibhuti Ram Paras Nath, Cinema Road, Golghar, Gorakhpur. |
| (127) Suraj Prakash Ram Gopal, Iron Merchants, Bara Bazar, Muzaffarnagar.                  |                                                                |
| (128) Shyam Sunder Hari Nanadan, Moh. Sheikhpur, Gorakhpur.                                |                                                                |
| (129) Saraf Trading Company, 54/1 Nayaganj.                                                |                                                                |
| (130) Swatantra Iron Industries, Patelganj, Meeru City.                                    |                                                                |
| (132) Singhal Brothers, Iron & Merchants, 226/A, Sadar, Meerut.                            |                                                                |
| (132) Sahjogi Brothers, Civil Lines, Bara Banki.                                           |                                                                |
| (133) Swathi & Co., Massey Lodge, 124, Begam Bagh, Meerut.                                 |                                                                |
| (134) Singhal Iron Foundry, Distt. Mathura.                                                |                                                                |
| (135) Sarvodaya Industrial Corp., 89/193-194 Bans Mandi, Kanpur.                           |                                                                |
| (136) Subhash Iron Stores, Iron Merchants, Bara Bazar, Muzaffarnagar.                      |                                                                |
| (137) Tota Ram Nithan Lal Jain, Lohamandi, Agra.                                           |                                                                |
| (138) Trilok Chand Gupta, Smithganj, Meerut City.                                          |                                                                |
| (139) Upper India Iron & Hardware Stores, Hapur Chandi Road, P.O. Hapur.                   |                                                                |
| (140) U.P. Agricultural Industries, Station Road, Roorkee.                                 |                                                                |
| (141) United Iron & Metal Works, C-124/25 Govind Nagar, Kanpur.                            |                                                                |

2. WEIGHTS, MEASURES/WEIGHING INSTRUMENTS

- |                                                                                 |
|---------------------------------------------------------------------------------|
| (146) Bharat Brush Traders, Gaushala Lane, Belanganj, Agra.                     |
| (147) Tara Chand Monoharlal, Iron Merchants, Ujhani, Budaun.                    |
| (148) Shravan Kumar Praveen Kumar, Iron Merchants, Chandausi, Distt. Moradabad. |
| (149) Shadi Ram Bal Mukund, Moreganj, Saharanpur.                               |
| (150) Sandhana Metal Industries, Lohamandi, Naya Bans, Agra.                    |
| (151) Solanki Brothers, 4, Chowk Lohathi Bazar, Allahabad.                      |
| (152) Mahajan Iron Foundry, Opposite Billochpura, Railway Station, Agra.        |
| (153) S. K. Dutta & Bros., Sonarpura, Varanasi.                                 |
| (154) Indra Narain Gupta, Iron Dealer, Bawan Dokan, Collectorganj, Kanpur.      |
| (155) Lucknow Millers' Association, Ganeshganj, Lucknow.                        |
| (156) Shanker Das Durga Pradas, Ganj Bazar, Sadar, Meerut.                      |
| (157) Ram Shanker Tripathi, 73/5, Collectorganj, Gusahi, Kanpur.                |

(Further list of licensed dealers will be published in the next issue of *Metric Measures*).

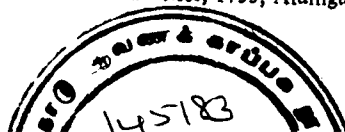
CORRECTIONS

- (1) Against item 34 appearing on page 39 of May 1961 issue of *Metric Measures* "R. K. Sheet Metal Works" for the words "Bangalore-1" in last line, please read "Mangalore-1"
- (2) In the list of Manufacturers of Uttar Pradesh, appearing on page 46 in September 1961 issue of *Metric Measures*, the following correction may please be made:

For the existing item (77), please read

Milan Iron Industries, 1755, Alamganj, Karwan, Agra

Cast Iron & Brass Weights



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