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**metric
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metric measures

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metric measures

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**NAYE PAISE
PER SEER
TO
NAYE PAISE
PER
KILOGRAM**

RUPEES
PER SEER
TO
RUPEES
PER
KILOGRAM

1 Seer=80 Tolas: 1 Kilogram=1,000 Gram

V. B. MAINKAR,
Editor & Ex-Officio
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Metric System in India : the First Phase

K. V. VENKATACHALAM

Joint Secretary,
Ministry of Commerce & Industry,
New Delhi

WHEN legislation to introduce the metric system of weights and measures in India was under consideration some six years ago there was wide general support for the reform; but there were also apprehensions. The common man, it was feared, would find it hard to understand and operate the new system. The task of manufacturing new weights for the whole country, of converting the existing machinery, of recalibrating measuring instruments, etc. was considered formidable.

The experience of the working of the metric system during the first five years has shown that while difficulties had to be faced, the change could be effected smoothly, so long as the programme was planned realistically and in close coordination and in consultation with those vitally affected by the change.

Realising that a change of this magnitude would necessarily take time, Parliament provided for a transitional period of 10 years during which the weights and measures prevalent in the country would be gradually

replaced by metric units. The reform, moreover, would be of full advantage in day to day life only when associated with decimalisation of coinage. The first step, therefore, in the reform towards metric system was the decimalisation of the rupee which was enacted by Parliament in 1956. Here again a period of 3 years was allowed for transition.

The task of conversion to metric system was coordinated through the Standing Metric Committee which was set up in 1956 under the Chairmanship of the Minister for Commerce. The Planning Commission and the Indian Standard Institution were associated with the Committee which drew up a programme of gradual change-over. In the interim period, however, all new machinery was to be acquired only on the metric system.

Phased Programme

The programme for the change-over has been phased, with a period of one or two years for the transition. The introduction

was industrywise, the date of change depending upon the convenience of the industry; the programme itself was drawn up in conference with representatives of the industry concerned. Thus the sugar or jute industry chose the beginning of the crop season for the change-over though industries generally changed on 1 April 1958. Secondly, the use of metric weights in retail market transactions was enforced area-wise. Initially on 1-10-1958 selected areas, including cities like Delhi, Bombay, Calcutta etc. were chosen for the introduction of metric weights. The usual period of transition was also allowed. From 1-10-1960, use of metric weights has become compulsory, rendering indigenous weights illegal. The phasing in regard to time has in fact been one of the essential features of the change-over, the intervening period being utilised for intensive educational and publicity measures to familiarise the public with the new weights. It also provides adequate time for the traders to acquire new weights, quote prices in metric units and bring the system in daily use.

There is no doctrinaire approach to the reform; practical considerations have always been supreme. For instance, the existing 4 gallon tin corresponds to 18 litres. To avoid scrapping of the tins, the existing sizes were allowed to be used, merely the marking on the tin being in metric units. In regard to jute, tea, the bulk of which are exported to the U.K. and U.S.A. the packages continue to be in yards and pounds so as not to inconvenience foreign customers.

Even within the country there were certain well established traditions which had to be accommodated, while changing over to the metric system. For instance, in Madras and Kerala, grain has always been sold in measures and not by weight. In deference to

this wide-spread practice, provision has been made in the rules to permit the sale of grain in these areas in metric capacity measures of 1 litre, 5 litres, 10 litres, etc.

Enforcement

This reform would, no doubt, result in a uniform system of weights and measures throughout the country, but it had been realised by previous experience, that without adequate and vigorous enforcement, there was every possibility of inaccuracy in the weights, use of unauthorised weights and fraudulent practices in day to day transactions. It was, therefore, decided at the earliest stage to have a net-work of Inspectors of Weights and Measures in all the States and Union Territories, with a Controller of Weights & Measures in each State; there are nearly a thousand Inspectors in India now. On an average an Inspector has to deal with two to three thousand establishments. He is authorised to verify and stamp weights and measures and for this purpose he has working standards of weights and balances, the sensitivity of latter is so high that they can detect a variation of 0.1 gram in 50 kilograms. The degree of variation permitted in a metre rod is only 1 mm and in a litre measure only 2 ml.

No weights or measures can be used in the market unless they have been verified and stamped. The Inspector, moreover, is empowered to inspect establishments and conduct test checks; faulty or unauthorised weights will be seized. The metric weights will further have to be reverified and stamped once in two years.

Supply of Weights

The introduction of the reform was attended by administrative and organisational

METRIC SYSTEM IN INDIA: THE FIRST PHASE

problems of considerable magnitude. Initially, there was no idea of how many new weights would be required. A sample survey conducted in 1957 gave an estimate of about 40 million weights in use all over the country. Machinery had to be set up for the production and distribution of so many weights of accurate standard specification. The prescribed dates for the enforcement of the reform gave this matter added urgency. It was, therefore, decided to license a large number of manufacturing units in different States and to make available to them raw material such as iron or G.I. sheets for the manufacture of weights and litre measures. Over 800 manufacturers have so far been licensed and among themselves they produce a total of over 2 million weights a month; the capacity can be raised if the off-take of weights is kept steadily at the maximum.

The supply of accurate balances to the Inspectors (known as working standard balances) has also been a problem; there were few manufacturers within the country who could produce balances of such accuracy; initially, therefore, some balances had to be imported. Arrangements were side by side made to encourage competent manufacturers who undertook to produce these balances.

Contrary to the fears and doubts expressed by the urban spokesmen on behalf of the 'poor villager', the average Indian in rural areas has been able to adjust himself to the change. The experience of the working of the metric system in areas where it has already been enforced shows that even petty shop-keepers and labourers not only understand the new weights but find it easy to operate them. Confusion persists only in places where enforcement has been partial, resulting in old and new weights being used side by side; or in areas where new weights

are used but prices are quoted in terms of seer or pound.

The programme for enforcement is reviewed and modified at the periodical Conferences of Controllers of Weights and Measures in the light of the administrative, technical and legal problems and experience. These Conferences are also helpful in coordinating arrangements for the production and supply of weights in the different States. Exchange of ideas based on the actual experience of enforcement measures helps to give direction and purpose to the programme of change-over.

Task Ahead

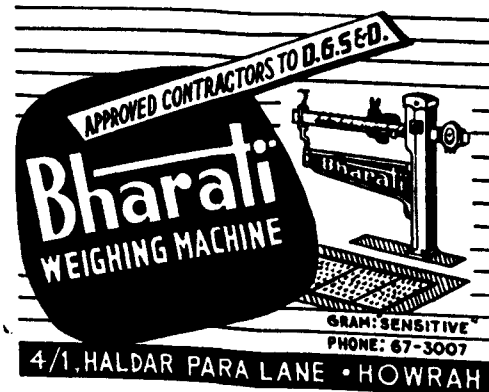
There is, however, much that remains to be done before people can think wholly in metric terms. At this transitional stage the tendency is to reconvert metric weights and lengths to older units like seer or yard for the purpose of reckoning and to satisfy oneself about reasonableness of the price or calculation of the cost. Thus while the law recognises only the metric units and the trader uses metric weights and measures, the consumer continues to hitch his counting to the old units; for years he has been used to them. This change in the reckoning and shopping habits of individuals, especially adults, is bound to take time but it must be done if the value of the metric system as a simple means of reckoning is to be fully realised.

Another problem of immense importance relates to education. Children now in school will grow up to deal wholly in metric units but unfortunately they continue to be educated in the indigenous system of weights and measures in which they are made to learn several tables. While it has been repeatedly

emphasised that the metric system saves the school children's time and much more of their energy, teachers continue to burden the children with units which are already obsolete and which will be totally useless when the children grow. A complete revision of textbooks and the methods in teaching is called for immediately. Every year this is

delayed will result in thousands of more children being educated in the 'wrong' way.

These then are the tasks ahead but meanwhile India is doing away with the medley of weights and measures and has joined the fraternity of nations using the metric system, extending over four-fifths of the world.



Rational Pricing Units & Wholesale Trade

THE use of metric weights became compulsory for some 20 per cent of the population of the country from 1 October 1960. For the remaining population the compulsion to use new weights would begin from 1 April 1962. Thus from April 1962, metric weights alone would have to be used all over India, and the use of other weights like the pound and the seer will become illegal after that date.

Converted Pricing Units

As a result of the change-over in October 1960, people in the areas notified became familiar with the use of new weights although in the areas around them old weights continued to be used. This sometimes resulted in an incomplete adoption of the metric system which was particularly noticeable in the wholesale trade. Thus, while the wholesale traders weighed their commodities using metric weights, many of them continued to adapt and use pricing units based on the old system but expressed in terms of the new weights.

One of the main reasons for this partial adoption of the metric system was that the wholesalers in metric areas often had to purchase their requirements from areas where the new weights were not yet enforced. They, therefore, converted the units current in those areas to the metric system and some-

times rounded them off. This led to the use of pricing units like 37.32 kg, 40 kg, 50 kg and in certain areas, even units of 70 kg, 75 kg, 250 kg or even 300 kg in place of the maund, hundred weight, khandi and similar other units. For example, some markets adopted units of 250 kg for groundnuts but 50 kg for linseed, probably because other units in use were the candy of 560 lb* or hundred weight of 112 lb which on conversion came to 254.01 kg and 50.8 kg respectively. In all these cases it would have been appropriate and simpler for the trade had they adopted the unit of one quintal (100 kg) for pricing.

Pricing by Containers

In certain other trades, as for example, the edible oil trade, the rates continue to be quoted in terms of the tin. This apparently also has led to a certain amount of confusion. While the same tin was used for packing oil, in one area the rate is per tin of 17.108 kg (including the weight of the tin), while in another market it is 17 kg (including the weight of the tin), while in a third market the same oil is sold at the rate of 16.329 kg per tin, or even 16 kg (whether with or without weight of tin is not mentioned). Certain other markets have been more rational and quoted the rate per unit of 10 kg without any reference to a tin.

These practices have necessarily to be treated as transitional arrangements until the

*This is a peculiar unit. There used to be a 'Bombay' maund which was equated to 28 lb, and 20 of these maunds in turn were supposed to contain 40 'Bombay' seers. This system was not legally recognised in the Bombay Weights and Measures Act, 1932 but perhaps continued in existence under the respectability given by its relation with the British units.

rest of India changes over to metric weights. Now that in April 1962 the complete change-over to metric weights will occur in India, the wholesale trade should adopt the rational unit of the quintal in place of the maund and other such units. Pricing units like 37 kg, 37.32 kg, 40 kg, 50 kg, 75 kg, 250 kg, 300 kg, etc., should be replaced by the quintal.

It is also necessary in this connection to stress that the quotation of prices per tin of oil containing a certain weight of the oil is not a desirable practice and the trade should adopt a rational unit like 10 kg or 100 kg, irrespective of the actual contents of the tin.

Benefits of Rational Units

The wholesale trade in India is very well organized and has associations practically in every market in the country. If the wholesale trade adopts rational units in the metric system, the effect is bound to percolate to the retail trade which is very much diffused and unorganised even in urban areas. If the wholesale trade continues to adhere to irrationally converted or adapted units it is likely to create confusion not only for itself, but more so in the retail trade and the advantages which the metric system can confer on us will be frittered away. Admittedly a certain amount of difficulty will be felt by the wholesale trade in any change-over from the old practice to the new rational units, even if the latter happen to be units of the simple metric system of weights and measures.

But the change-over has to be carried out and the greater will be its utility if a single system of units for price quotation is followed all over the country. The association of decimal currency with the decimal units of weights and measures would result in simplification of calculations and price quotation,

if the trade adopts the same rational units all over the country. A glance at the newspapers or trade magazines shows the variety of units in which prices are quoted. Even the simple everyday commodities like rice and wheat are quoted in the numerous units indicated earlier and it is not easy to relate these prices to a single common unit.

The metric system is a great unifying force in the field of weights and measures and the trade of the whole country will benefit if it adopts a common set of units, irrespective of whether the trade is carried out in the North or South or in the East or West. One of the great merits of the metric system under Indian conditions is that it is not related with any of the older systems of weights and measures current in India. There should, therefore, be no controversy as to what units of metric system could be adopted by the trade, because we have to make a complete break with the past practices everywhere in India, if we want to derive the greatest benefit from the change-over. The earlier this is realised by the trade and put into practice, the greater will be the benefit for the whole country.

Recommended Pricing Units

There is no difficulty about the choice of the appropriate units because the Ministry of Commerce and Industry recommended some time back a set of pricing units to be used for various commodities. These have been adopted by a large number of traders in the areas notified earlier, and are now given in Appendix 1 for information. It is to be hoped that these pricing units would be used in wholesale trade all over the country from April 1962.

RATIONAL PRICING UNITS & WHOLESALE TRADE

APPENDIX—1

Typical Metric Pricing Units for Wholesale Transactions

Serial No.	Commodity	Metric Unit
(1) Gold		10 grams (g)
(2) Grocery and Confectionery		
	Biscuits, sweetmeats, cardamoms	1 kilogram (kg)
	Textiles & Textile Fibres	
	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufactures (when sold by weight).	
	Paints & Chemicals	
	Paint (if sold by weight), indigo, liquid chlorine	
	Hides, Skins & Leather	
	Raw hides, leather (hides and skins).	
	Metals	
	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	
	Miscellaneous	
	Tea, meat, camphor tablets, mica	
(3) Grains and Pulses		
	Rice, wheat, jowar, arhar, moong, masur, gram	1 quintal (q) (100 kilogram)
	Spices	
	Black pepper, mustard, chillies, dhania, dalcini, turmeric, betelnuts.	
	Plantation Products	
	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured)	
	Forest Products	
	Lac and lac products, gums, myrobalans, galnuts, soapnuts	
	Textile & Textile Fibres	
	Raw jute, raw hemp, coir yarn	
	Oils, Oilseeds & Oilcakes	
	Vegetable oils, oilseeds, oil cakes	
	Non-Ferrous Metals	
	Aluminium: ingots, bars, blocks, slabs, billets	
	Lead: ingots, sheets and strips	
	Copper: ingots, blooms, slabs, cakes, tiles, bricks, billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles.	
	Brass: ingots, rods, sections, pipes, sheets, strips, circles	
	Zinc: ingots, sheets, strips	
	Tin: blocks	
	Chemicals	
	Caustic soda, bleaching powder, glycerine, soaps, paper, salt	
	Others	
	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind	
(4) Minerals		
	Iron ore, manganese ore, bauxite, coal	one metric tonne (t) (1000 kilogram)
	Iron and Steel	
	Pig iron, iron and steel manufactures, semis (billets for rolling etc.)	
(5) Cloth (mill, handloom, silk, rayon and woollen cloth)		1 metre (m)
(6) Jute carpets, coir mats and matings, sheet glass		one square metre (m ²)
(7) Timber		one cubic metre (m ³)
(8) Paints (when sold by measure), spirits		one litre (l)

Weights

- (1) In place of the present units of seer, pound, rattal, viss etc., use the kilogram.
- (2) In place of the tola, use the gram or 10 grams.
- (3) In place of maund or corresponding unit, use the quintal *i. e.*, 100 kg.

Capacity Measures

In place of seer or gallon or any other measure use the litre.

Length Measures

- (1) Use the metre in place of yard or foot and the centimetre in place of inch.

Square Measures

- (1) Use the square metre in place of square yard or square foot, and square centimetre in place of square inch.

Cubic Measures

- (1) Use the cubic metre in place of cubic yard or cubic foot and cubic centimetre in place of cubic inch.

Packaging

It is advantageous if sizes of packages correspond to series of commercial weights and measures prescribed. These are: 50 kg, 20 kg, 10 kg, 5 kg, 2 kg, 1 kg, 500 g, 200 g, 100 g, 50 g, 20 g, 10 g, 5 g, 2 g, 1 g, and so on.

Development of Weights in Madras Area : Part 1 .

L. RAJU

Ministry of Commerce & Industry,
New Delhi

THE history of the development of weights and measures in India is a fascinating subject for study. At whatever stage in the history of India we take up the thread, ultimately the origin goes back to the ancient Indian practices. Perhaps, the single system of weights and measures which may have existed in ancient India was in the course of millenia influenced by so many factors externally and internally that even the original meanings, leave alone the mass or capacity or length of the units have been lost. New units were introduced and the entire system was reshuffled to constitute a hybrid system of weights and measures in India, which now is far removed from the original.

A systematic study of the development of weights and measures in India is, therefore, an extremely difficult task as the various influences have to be traced, their impact gauged and conclusions drawn which have necessarily to be theoretical. Such a situation arises mainly because the actual physical replica of even a single weight used during the last 2,000 years or more is rarely available, although strangely enough, the actual weights used some 5,000 years ago are available for physical study. As a result an analysis of weights and measures at any period in India, except in the bronze age civilization, is a matter of guess work.

As the subject is vast, this article is restricted to a brief study of the possible lines of development of only the important units of weights current in South India today. The history of these units is summarized and the possible variations and their causes indicated. Some remarks on the weights of coins have also been included as often enough weights were related with coins. It is proposed to present in Part 1 of this article a broad historical sketch of the various influences which could have had their effect on weights and measures in South India. In Part 2 the possible lines of the historical development of some important units of weights in the Madras area will be traced.

Ancient Weights

Excavations and discoveries in the vast region extending over India and Pakistan in the Indus Valley show that there existed in ancient India (B.C. 3500-1500) an efficient administration of weights and measures second to none in the world of those days. A uniform system of weights and measures was used in an area some 1,500 kilometres in length as well as width. In fact, it is likely that organised control of weights and measures by a centralised authority, perhaps governmental, was first established in the ancient world in the Indus Valley Civilization. After the decay of this civilization, there is a dark period.

In Sanskrit literature, the Manu Smriti (1,2) gives a table of weights and measures and lays down that the king should inspect weights and measures and have them stamped every six months and punish offenders and cheats. The table of weights given by Manu in Chapter 8 (अध्याय ८) has perhaps an important bearing on South Indian weights and so is given below. References to some of these weights will be made later.

8 trasarenu (त्रसरेणु)	= 1 liksha (लिक्खा)
3 liksha	= 1 black mustard (राजमर्षप)
3 black mustards	= 1 white mustard (गौरसर्षप) (6.89 mg)
6 white mustards	= 1 barley-corn (यव) (41.33 mg)
3 barley corns	= 1 krishnala (कृष्णल) (124 mg)*
5 krishnala	= 1 masha (माषा) (620 mg)
16 masha	= 1 suvarna (सुवर्ण) (9.92 g)
4 suvarna	= 1 pala or nishka (पल, निष्क) (39.680 g)
10 pala	= 1 dharana (धरण) (396.8 g)
<i>For Silver</i>	
2 krishnala	= 1 masha (रूप्यमाषक) (248 mg)
16 masha	= 1 dharana or Purana (धरण, पुरण) (3.968 g)
10 dharana	= 1 shatamana (शतमान) (39.680 g)
<i>For Copper</i>	
Karshapana (कार्षापण)	16 masha = 80 krishnala = 1/4 pala = (9.920 g)

The smallest unit here is the trasarenu which is defined as 'the very small mote which is seen when the sun beam passes through a lattice'

जालानारगते भानौ यत्सूक्ष्मं दृश्यते रजः । प्रथमं तत्प्रमाणानां त्रसरेणुं प्रचक्षते ॥ १३२ ॥

For the purposes of this article, the systematic development of weights in South India may be taken to have started earnestly with the Mauryas, although the influence of Manu is not negligible. The period earlier than Manu is somewhat obscure from the metrological point of view. The Mauryan kings during the period B.C. 320-200 extended their rule over North India and most of South India. The Mauryas were well-known for their efficient central administration and a special Officer of the high rank of the Superintendent was in charge of the administration of weights and measures over the entire kingdom. The *Arthashastra* of Kautilya (3,4) gives an admirable blue-print of such an organisation. The table of weights he has given is important from the point of view of this article and is shown below.

10 seeds of masha (धान्यमाषा)	
<i>Phaseolus Radiatus</i>	
or	= 1 Suvarna-masha (सुवर्णमाषक) (620 mg)
5 seeds of gunja (गुंजा)	
<i>Abrus precatorius</i>	
16 suvarnamasha	= 1 suvarna or karsha (सुवर्ण, कर्ष) (9.920 g)
4 karsha	= 1 pala (पल) (39.680 g)
88 white mustard seeds (गौरसर्षप)	= 1 silver masha (रूप्यमाषक) (606 mg)
16 silver masha	
or	1 dharana (धरण) (9.696 g)
20 saibya seeds (सैभ्य)	
20 grains of rice (तण्डुल)	1 dharana of diamonds (वज्रधरण)

*The values of the various units are calculated on the basis of a *krishnala* being equal to 124 mg.

The *Arthashastra* further lays down that a series of weights based on masha, suvarna and dharana should be made. Kautilya then prescribes the rules for the verification of weights, beam scales, steelyards, weighing of commodities, fines for offences and so on.

Later Sanskrit literature reveals a certain amount of variation from these old tables. There is, therefore, no need to trace any further variations through the ages in Sanskrit literature. The two tables of Manu and Kautilya, which happen to be the most ancient records of weights and measures in India are useful in explaining the origin of some of the weights in South India. The main basic commercial weight on which the series is built up is the *Krishnala* in *Manu-smriti* and the *Gunja* in *Arthashastra*. Both refer to the same seed. Its names in various languages are given below.

Besides the above two names it is also called *raktika* (रक्तिका) in Sanskrit. Other current names are: *ratti* or *ghunchi* (in Hindi) *Kunch* (Bengali), *gunja* (Marathi), *Chanoti* (Gujerati), *guriginja* (Telugu), *gundumani* (Tamil), *guluganii* (Kannada), *gunji* (Malayalam), *gunjidi* (Arabic), *chachni khari* (Persian) (5).

The weight of this basic unit determines the weights of subsequent denominations. As the *gunja* or *krishnala* is a seed it is likely to vary in weight from time to time as also from place to place. Thus the variation of the basic weight of the *krishnala* or *gunja* itself could lead to a variety of values for weights based on it.

The difference could, however, have been set right in the course of time had there been no attempts by the large number of later invaders and others to standardize them in their own way in terms, perhaps, of their own foreign standards. A short historical sketch

of these developments may help in the discussion later.

Historical Background

After the Mauryans, the South was ruled by various dynasties, the important ones among them being the Shatvahans, Kadambas, Pallavas, Pandyas, Cholas, Chalukyas of Badami and Kalyani, Hoysalas and others. (6) South India in olden days traded extensively with African and Middle East countries and Rome, and foreign weights and currencies of these countries were also known and used in coastal towns. In trade transactions, overseas traders paid for goods purchased in South India in their own coins and often on the basis of weights and measures obtaining in their own countries. It is, however, possible that the Hindu kings may have tried to standardise the weights to suit the requirements of their own internal trade.

Subsequently came the conquests by the Muslims from the 13th century and later, and then by the British, French and Portuguese traders and colonialists from the 16th century onwards. During the 18th century there were warring kingdoms and principalities like the Marathas, Nizam, Travancore, Malabar, Tanjore, the French at Pondicherry, Mysore under Hyderali, the Portuguese on the West Coast and English at Madras. By the end of the 18th century the British became the strongest power and soon held sway over the entire country. These developments were also reflected in the confusion in weights and measures. Perhaps the British contributed the 'lion's share' to the creation of this variety.

The British came to Madras early in the 17th century and they purchased some lands from the Raja of Chandrigiri and established the first English factory at Fort St. George in 1639. They also established another factory simultaneously at Fort William on the Hooghly.

Hun

As bazaar weights were often related to weights of a certain number of coins it may not be out of place, here to indicate briefly the various coins used normally in India.

The Madras mint came in existence around 1660. From this mint were issued the pagodas—the single Swami pagoda, the old star pagoda (see Fig. 1), three Swami pagoda (see Fig. 2) and the mohur in gold (see Fig. 3) and the star pagoda in silver. Salaries were paid and accounts were maintained in star

pagodas known as Company Varahans. The English factories were then engaged in reproducing the rupees of the Mughal Emperors. East India Company rupees bearing the names of Alam Gir II and Shah Alam II were issued from the Madras, Surat and Bengal Mints. In 1742, the Mughul Emperor Mohammad Shah permitted the Company to mint Arkat rupees and in 1756 after the battle of Buxar the Bengal Mints were taken over by them.



Fig.—1 Star Pagoda—Half: These star pagodas issued from the Madras Mint continued to be the standard coin of the British East India Company in the South until it was abolished in 1816 and the silver rupee was made the standard coin.

This coin has on one side the temple gopuram surrounded by 18 stars. Near the edge is the inscription both in English and Persian, *Half Pagoda*. The other side has the figure of Vishnu surrounded by dots and a star. The denomination of the coin, 'Half Pagoda' is inscribed here both in Tamil and Telugu scripts.

Fig.—2 Three Swami Pagoda: This pagoda issued by the English East India Company from the Madras Mint is called the three Swami Pagoda, as it has on one side the figures of Lord Venkateswara and his two consorts, as at the Tirupati temple. The other side is blank.

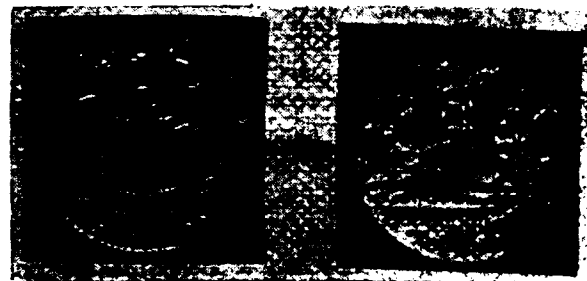
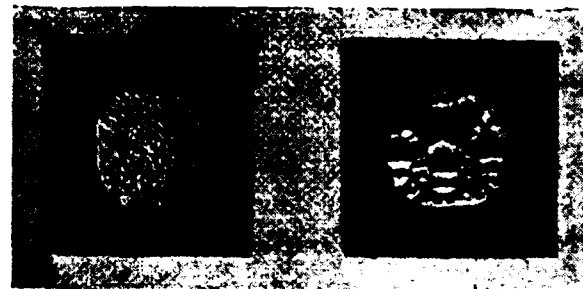


Fig.—3 Single Mohur: The English East India Company issued gold pagodas and mohurs from the Madras Mint from the latter part of the 17th century.

The Mohur has on one side the arms of the Company and the inscription in English—English East India Company. On the other side is found the Persian inscript which means 'Ashrafi of the honourable English Company.'

The English factory at Madras minted in 1811, a silver 'pagoda' with a representation of the goddess Bhagavati on its face and the gate tower, or gopuram of a temple on the reverse(?). It had a weight of 52.56 grains. Pagoda is probably a Portuguese word derived from the pyramidal temple depicted on the coin. The old Hindu name varied according to the image on the coin. Thus the Matsya Hun of Vijayanagar had four fish on the obverse (see Fig. 4). Other pagodas had Vishnu (see Fig. 5), Jagannath, Venkateshwar etc. on them. Hun was the term commonly used for the pagoda. It signified gold in Kannada (Honnu).



Fig. 4—The name of the King, Dharmajaya, who issued this coin is known to us only from legend.

On one side of the coin has a three-line Sanskrit legend which reads: 'Sri Panda (ndya) Dhama (a), Jaya'

The other side shows some symbols made up of lines and dots which have been identified as forming the figure of a fish.

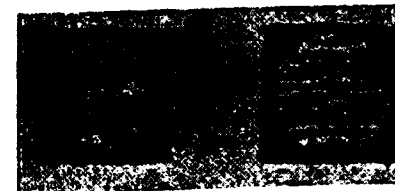


Fig. 5—Varahan of Krishnadeva Raya: Krishnadeva Raya (1509-1530) is the most famous of all Vijayanagar Kings. During his reign the Vijayanagar empire reached its zenith.

This gold varahan has on one side the figure of seated Vishnu and on the other a three-line legend in Sanskrit, 'Sri Pratapa Krishna Raya.'

The 'hun' which later went under the name of pagoda and became an important weight for the bullion trade in the South was current in South India from the 7th century A.D. in the territories of the king of Golconda, the king of Visapur, the Raja of Karnatic, the

Raja of Velonche (Vellore). The hun used to weigh 55-56 grains, (3.560 to 3.630 g) sometimes even upto 70 grains (4.5g) (see Fig. 6).

The star pagoda was abolished in 1816, and the rupee became the 'standard coin' although the weight of the rupee varied from 175 to 185 grains or even more. In 1835 a standard weight of 180 grains was adopted for the rupee (8).



Fig. 6—Varahan of Krishnaraja: After the death of Tipu in 1799, the English restored Mysore to its old Hindu dynasty of Wodeyars, and a boy, Krishna Raja (1799-1868), was installed on the throne.

This gold varahan of Krishnaraja has on one side the figures of Shiva and Parvati. The other side has a three-line Sanskrit legend 'Sri Krishna Raja'.



Fig. 7—This coin is of Chalukya Dynasty with figures of a bear in symbolic words on obverse sides. weight: 4.33 g (66.8 grains)



Fig. 8—This coin is of Chola Dynasty with figure of fish on both sides. weight: 3.37 g (52 grains)

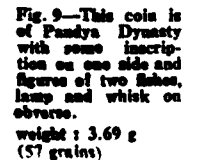


Fig. 9—This coin is of Pandya Dynasty with some inscription on one side and figures of two fishes, lamp and whisk on obverse. weight: 3.69 g (57 grains)

The hun was subdivided into fanams and kas. Fanam, or more probably panam, is perhaps related with the word pana, known as one of divisions of ancient Hindu weights. The old fanam was made of gold only and was 1/16 of a hun. In Lilavati we find,

16 pana = 1 dharan
16 dharan = 1 nishka

In this table the dharan seems to accord with the hun.

Kasu is interpreted in many ways. According to one, kasu is a Dravidian word, common to the Tamil, Telugu, Canarese and Malayalam languages. It has the general significance of money, wealth and likewise of coin, such as pon kasu = gold coin, velli kasu = silver coin, semba (or red) kasu = copper coin; as well as of a particular coin, anai kasu of Chera or Kongu dynasty⁽⁹⁾.

Kasu, according to other authorities, may also represent the cowrie of Bengal, eighty of which made a pan, a fanam or pana⁽⁹⁾. The kasu has even been identified with the Sanskrit karsha, and they are both probably derived from the same original source, as according to ancient law books a karsha of eighty ratis is called a pana or karsha pana i.e. 9.92 g or 153 grains^(1,2). In later days it came to be restricted to a 'weight of gold or silver equal to 180 grains troy⁽⁹⁾'. The silver rupee of 180 grains was convertible at the rate of Rs. 350 for 100 pagodas. The formula being :

80 cash = 1 fanam, 42 fanam = 1 star-pagoda

This was, perhaps, based on the exchange and relative value of the cash to silver fanam, according to which twelve fanams went to the rupee, and three and half rupees to the pagoda, giving forty-two fanams for the pagoda. The Ikkeru pagoda, however, contained 16 fanams, Virarai and Anandrai 14 and the Kalyan pagoda 28. The division adopted by the English was 42.

It is against this background that a brief discussion of the probable lines of development of the more prominent units among the South Indian weights would be taken up in Part 2 of this article.

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Eleventh General Conference of Weights & Measures (2)

(The Annual Report for the year 1960 sent by the International Committee of Weights and Measures to the Governments of the countries who are members of the Convention of the Metre, gives the texts of sixteen resolutions passed at the Eleventh General Conference of Weights and Measures held in October 1960. Already the texts of three resolutions dealing with the definitions of the metre, (Resolution 6) time, (Resolution 9) and the international system of units (Resolution 12) have been published in the September 1961 issue of *Metric Measures* on pp. 22-24. The following is a translation from the original French of the remaining thirteen resolutions—Editor)

Extension of the Activities of the International Bureau in the Field of Standards of Measurement of Ionising Radiations

RESOLUTION 1

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED that the development of atomic energy and nuclear research requires that uniformity of standards for measurement of ionising radiations be ensured,

that international uniformity of measurements of the principal physical quantities has been achieved, maintained and improved with undeniable success in the last 85 years through the activities of the International Committee and the International Bureau of Weights and Measures,

that the major National Standards Laboratories associated with the work of ensuring

uniformity of measurements in their respective countries have found in the International Bureau and in the meetings of the Consultative Committees the facilities which they desire for cooperative effort towards international uniformity of physical measurements and have expressed their desire that the laboratories and the scientific personnel of the International Bureau may be augmented and brought to full strength in order that the common task of unification of measurements may be extended to standards for measurements of ionising radiations,

that the International Committee of Units and Radiological Measurements (ICRU), which has played a decisive role in the selection and comparison of standards in the field of ionising radiations has now announced its desire to relinquish this part of its activity on condition that it be taken up by the International Bureau which alone is capable of taking up this activity with supreme authority,

that the work of international unification of standards for measurement of ionising radiations necessitates establishment of a single permanent scientific co-ordinating centre financed by an intergovernmental non-political agreement and that the International Bureau of Weights and Measures satisfies these conditions,

that the physical experiments for the preparation and execution of comparisons of

standards for measurements of ionising radiations require the use of standards of measurement of other physical quantities, that these latter standards are available in the most accurate form with the International Bureau, and that the personnel of this Bureau, inheriting a long tradition, is fully conversant with the general rules of metrology and those applicable to each form of standard,

RATIFIES the action already taken by the International Committee of Weights and Measures in the field of ionising radiations, and

INVITES the International Committee to organize in the International Bureau a section of standards for measurement of ionising radiations, equipped with a laboratory and scientific personnel, and to work for the unification of the standards for measurement of ionising radiations and of the corresponding units, taking into account the results obtained by national, international and other laboratories and organisations.

RESOLUTION 2

The Eleventh General Conference of Weights and Measures,

DECIDES to sanction for the expansion of the laboratories of the International Bureau of Weights and Measures and for equipping them physically with standards for measurement of ionising radiations a sum of 1,800,000 gold-francs covered by an exceptional contribution of 900,000 gold-francs by adding to the annual endowment for the years 1962 and 1963,

DESIRES that the French Government grant an extension of the land which it

has placed at the disposal of the International Committee of Weights and Measures around the Pavillon de Breteuil,

DESIRES that the Governments agree to the anticipated instalments so that the extension of the laboratories of the International Bureau may commence immediately without difficulty.

RESOLUTION 3

The Eleventh General Conference of Weights and Measures,

THANKS the Radium Institute of the University of Paris for its willingness to entrust the custody of the International Radium Standard No. 5430 to the International Bureau of Weights and Measures and

AUTHORISES the International Bureau to take charge of this standard.

RESOLUTION 4

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED the necessity of establishing precisely certain units and concepts used in the field of ionising radiations,

INVITES the International Committee of Weights and Measures to undertake the necessary studies without delay,

GIVES A MANDATE to the International Committee of Weights and Measures to take decisions on this subject which will be submitted for approval to the Twelfth General Conference.

Endowment of the International Bureau

RESOLUTION 5

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED that the constant refinement of the precision expected of the measurements which are in the charge of the International Bureau of Weights and Measures require more and more expensive instruments,

that the field of activities of the International Bureau has been extended to the standards for measurement of ionising radiations,

that in all its activities the International Bureau should be served by personnel with high scientific qualifications (who are) difficult to recruit,

HAVING ACCEPTED without contrary opinion the proposal of the International Committee duly notified in advance to the Governments in compliance with article 6, paragraph 5, of the Rule annexed to the Metric Convention of 1875, modified in 1921,

DECIDES to increase the fixed portion of the annual grant in such a manner that the total of the fixed and complementary parts of the annual grant covering the maintenance expenses of the International Bureau and of the International Committee of Weights and Measures may be raised to 900,000 gold-francs. The total amount of the fixed part thus calculated will apply to the contributions payable in 1962 and the subsequent years.

RESOLUTION 7

The Eleventh General Conference of Weights and Measures,

INVITES the International Committee (1) to lay down directives for implementing the new definition of the metre*;

(2) to select secondary standards of wavelength for the interferometric measurement of lengths and to lay down directions for their use;

(3) to continue the studies with a view to improve the standards of length.

RESOLUTION 8

The Eleventh General Conference of Weights and Measures,

*In its session of October 1960, the International Committee of Weights and Measures adopted the following recommendation concerning the initial directions for implementing the definition of the metre:

"In conformity with paragraph 1 of Resolution 7 adopted by the 11th General Conference of Weights and Measures (October 1960), the International Committee of Weights and Measures recommends that the radiation of krypton 86, adopted as the fundamental length standard, may be obtained by means of a hot cathode discharge lamp containing krypton 86 of a purity not less than 99 percent, in quantity sufficient to ensure the presence of solid krypton at the temperature of 64° K, this lamp being provided with a capillary satisfying the following requirements: internal diameter 2 to 4 millimetres, thickness of walls about 1 millimetre.

It is estimated that the wavelength of the radiation emitted by the positive column is equal within 1 hundred-millionth (10⁻⁸) part to the wavelength corresponding to the transition between the unperturbed levels, when the following conditions are satisfied:

1. The capillary is observed end-on in such a manner that the utilised light rays travel from the cathodic side towards the anodic side;
2. the lower part of the lamp, including the capillary, is immersed in a refrigerating bath maintained at the temperature of the triple point of nitrogen, correct to 1 degree;
3. The current density in the capillary is 0.3 ± 0.1 ampere per square centimetre".

HAVING CONSIDERED the initial directives laid down by the International Committee of Weights and Measures for implementing the new definition of the metre,

INSTRUCTS the International Bureau of Weights and Measures to verify the national prototypes as in the past.

RESOLUTION 10

The Eleventh General Conference of Weights and Measures,

HAVING APPRECIATED the experimental results obtained by competent laboratories in the recent years which prove that a standard of time interval based on the transition between two energy levels of an atom or molecule can be obtained and reproduced with a very high precision,

HAVING CONSIDERED that such an atomic standard of time interval is essential for demands of higher metrology,

INVITES the expert national and international laboratories in this field to continue their researches as actively as possible,

the International Committee of Weights and Measures to cooperate immediately with the concerned international organisations and to co-ordinate the results so as to enable the Twelfth General Conference to pass a resolution on this point.

Gravimetric System

RESOLUTION 11

The Eleventh General Conference of Weights and Measures,

HAVING NOTED with satisfaction the progress made in the absolute measurement of acceleration due to gravity, thanks to the work of the International Bureau of Weights and Measures and the national laboratories, but observing that several important determinations are still in progress,

1. **DECIDES** to retain provisionally the gravimetric system of Potsdam;

2. **INVITES** the International Bureau and the national laboratories to continue their determinations;

3. **AUTHORISES** the International Committee of Weights and Measures to take a decision on the change of the Potsdam system when it is considered that the value of this acceleration is known with adequate accuracy.

Cubic Decimetre and Litre

RESOLUTION 13

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED that the cubic decimetre and the litre are not equal and differ by about 28 parts in a million,

that the determination of physical quantities involving measurements of volume are having increasingly higher precision, augmenting thereby the chances of a possible confusion between the cubic decimetre and the litre,

INVITES the International Committee of Weights and Measures to take up this problem for study and present its conclusions to the Twelfth General Conference.

Adherence of Countries to the Metric Convention

RESOLUTION 14

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED that all countries benefit from the useful results of the work of the International Committee and the International Bureau of Weights and Measures, illustrated particularly by the report of its President on the activities of this Committee during 1954-1960,

that the development of contemporary science and technology would be promoted by an increasingly greater extension of the metric system throughout the world,

DESIRES that countries which do not yet adhere to the Metric Convention, and particularly countries which have recently achieved independence, should not delay in acceding to this Convention, and

RECOMMENDS to all the member countries of the Convention to exercise their influence in this direction through their scientific and technical bonds.

Negotiation for an Agreement Regarding the Office with the French Government

RESOLUTION 15

The Eleventh General Conference of Weights and Measures,

HAVING CONSIDERED that the International Bureau of Weights and Measures derives help from the generous hospitality of

France, but that, in the accomplishment of its mission it meets with certain difficulties due to the application of rules laid down for French or foreign nationals and establishments existing in France,

INSTRUCTS the International Committee of Weights and Measures to negotiate with the French Government an agreement regarding an office on a non-discriminatory basis in accordance with the agreements of this type already concluded by this Government with other international institutions, and

DESIRES that this agreement may be immediately implemented as a provisional measure pending its approval by the Twelfth General Conference.

Revision of the Metric Convention

RESOLUTION 16

The Eleventh General Conference of Weights and Measures,

HAVING OBSERVED that it has not been possible to obtain agreement in the course of its sessions on the changes to be made in the Metric Convention and the annexed Rule, in spite of the praiseworthy conciliatory efforts of the Working Group set up at its first session and presided over by Mr. de Boer,

GIVES A MANDATE to the International Committee of Weights and Measures to pursue its studies with a view to arriving at a draft at the earliest which receives the consent of all the Contracting Parties.



News & Views

Fifth Conference of Controllers

The fifth Conference of Controllers of Weights and Measures is scheduled to be held in Jaipur on 4-6 January 1962. Among the points for discussion are:

- (1) Review of the progress in implementing the recommendations of the fourth Conference of Controllers.
- (2) Review of the enforcement of metric weights in areas where the use of metric weights has become compulsory, and the steps to be taken to enforce them in remaining areas where compulsion starts from 1 April 1962.
- (3) Review of the enforcement of metric capacity measures in the areas where their use will be compulsory from 1 April 1962, and the steps to be taken to enforce them in other areas.
- (4) The use of metric length measures has been legalised from 1 October 1961 with a transition period of one year. Enforcement aspects of the question will be discussed.
- (5) In order to meet the demand for weights and measures of capacity and length when they are compulsorily enforced over the entire country it is necessary to produce them in large numbers and assure their supplies. The steps to be taken to achieve this aim are to be discussed.

- (6) There are a number of States where the enforcement organisation has been recently set up. It has been found necessary to lay down a general pattern of organisation for enforcement of weights and measures and the question will be discussed in detail.

- (7) In view of the resolutions passed at the Eleventh General Conference of Weights and Measures, the definitions of the metre and the second have undergone changes. These have now to be reflected in the Standards of Weights and Measures Act, 1956. The steps to be taken will be discussed.

Besides these, there will be many other points arising out of the experience of enforcement of weights and measures over the last 2-3 years, which will be discussed in the Conference.

A report on the Conference will be published in the March 1962 issue of *Metric Measures*.

Possession of Old Weights is Illegal

A PTI release published in *The Hindu* on Monday, 6 November 1961 reports the following:

Allahabad, Nov. 4.

Mr. Justice Mathur of the Allahabad High Court to-day dismissed a writ petition, filed by a local shop-keeper, for directing the Civil Supply authorities not to interfere with

his right of keeping old weights—maunds, seers and chataks—at his shop.

After the Standards of Weights and Measures Act of 1956, fixing the standard units of weights and measures, was enacted by Parliament, the State Government by a notification under Section 13 of the Act had enforced it at Allahabad.

The Inspector of Weights and Measures visited the shop of the petitioner on August 7 last and took away the old weights.

The petitioner had challenged the validity of Rule 22 of the Act which provided for seizures, detention and disposal of the unauthorised weights, on the ground that the rule imposed an unreasonable restriction on the petitioner's right to carry on his trade.

His Lordship said that it was in the interest of general public that only standard weights should remain at shops and all weights not conforming to standard should be removed and if necessary seized by the authorities. The restriction imposed on the possession of the old weights at a shop was thus in the interest of general public and this restriction was reasonable.

Keeping in mind, His Lordship added, that businessmen were not in any way restrained from carrying on business, the only restriction imposed was that they should possess and weigh articles in kilogram and not in maunds, seers and chataks.

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The British Scene

THE discussion on the possibilities of adoption of decimal coinage and the metric system of weights and measures in Britain in the wake of the recent report of the Joint Committee of the British Association for Advancement of Science and the Association of British Chambers of Commerce and as a consequence of Britain joining the European Common Market has been arousing considerable interest all over the world. The publication of the pamphlet *Systems of Measurement** by the Political and Economic Planning (PEP) which is an independent and non-party organisation in Britain is a welcome step. The PEP acts as a bridge between research on the one hand and policy-making on the other, whether in Government, the social services, or industry. It studies problems of public concern to find out the facts and present them impartially to suggest ways in which the knowledge can be applied.

The publications of this organisation take three forms: Reports, Planning Broad-sheets and Occasional Papers arising from the study undertaken by this organisation. It has brought out a reprint of the Planning broadsheet on the *Systems of Measurement* which makes interesting reading. The small booklet running into only 21 pages reviews the history of the movement for the decimalisation of currency and the

**Systems of Measurement* (P.E.P.) Planning, Vol. XXVII, No. 449, 20 February 1961, 3 shillings.

adoption of metric weights and measures in Britain.

In its introduction it has briefly indicated the pressures which are building up in Britain for the movement. It says:

'Britain at present stands at something of a cross-roads in respect of its units of quantity. It would be truer to say perhaps that it drifts in the eddies of many currents since in such matters it is not possible to stand still. A Bill amending the law relating to weights and measures is before Parliament; there have been two major reports recently published; the countries of the Commonwealth are in the process of changing over to a decimal system of coinage; increased competition for foreign markets and also closer economic and military links with European nations since the war have brought into prominence the inconvenience of contrasted systems both of measure and of coinage; a consolidation of practice in the engineering and related industries between the Commonwealth and the United Kingdom has been taking place, and there have been a number of small adjustments such as the change-over from the Fahrenheit to Centigrade (Celsius) scale for all Meteorological Office calculations since 1 January 1961.

'It seems clear that further modifications, or even changes, to our traditional system will soon be made and may even be forced upon us, so that this is an appropriate moment to take stock of the situation.'

Decimalization of Coinage

It reviews the position of decimalisation of coinage in the Commonwealth countries and shows that almost all the countries except Britain have taken active steps either to introduce decimal coinage or to make the

necessary enquiries before proceeding with the step.

On the recent Weights and Measures Bill it says:

'The legislation foreshadowed in this Bill is sound, sensible—and minimal. It is the first comprehensive legislation in this field since the Weights and Measures Act of 1878. These eighty years have seen unprecedented technical advances and industrial expansion. During this time the need for nations to act and work together has superseded earlier political concepts. Such concerted action has been made possible and necessary by the shrinkage in world distances brought about by a revolution in transport and by the interdependence of scientific and technological research work. Yet part from the setting up of the permanent Commission the present Bill takes no account of these developments; it does little more than make a good job of consolidating previous legislation.'

The British Government's policy about the change-over appears to be lukewarm and it was announced in the British Parliament that the Government desired to have the widest public discussion of this question. A similar reply was given by Mr. Gladstone on the same subject in 1854—more than 100 years back. In the nineteenth-century considerable efforts were made to make the British Government to adopt the metric system. The booklet recounts an interesting story about the international acceptance of Greenwich as the prime meridian of longitude. It appears that 'the international conference held in Washington in 1884 for the purpose of getting world agreement to adopting Greenwich as the prime meridian of longitude for the convenience of navigators ran into severe difficulties with the French who were adamant that Paris had the preferential claim. When at last they realised they were almost alone in this view the French delegation magnanimously

offered to accept Greenwich as the prime meridian if Britain would adopt the metric system'.

It is pointed out that 50 years ago promoters of currency and weights and measures reform in the Commonwealth countries used to be 'held back by the indelicacy of seeming to take action independently of the Imperial Government. Nowadays Commonwealth countries have no such inhibitions'. Decimal coinage is now well on the way to adoption in most of the Commonwealth countries. Metric weights and measures may follow. When this happens, 'Britain will be numerologically isolated and will possess the doubtful distinction of having the most antiquated counting system of any industrial nation. There is of course precedent for this conservatism: Britain lagged a century and a half behind the other countries of western Europe in adopting the modern calendar'.

Metric Impact on Britain

On analysing the extent of the impact of the British system on other countries and of the metric system in Britain, the pamphlet points out that the metric system is already in use universally for scientific and laboratory work and is used exclusively in the British optical and photographic industries. Pharmaceutical industry in Britain is also fast changing over to the metric system. At present all new products are made out and sold in metric units and it is expected that when the new Bill becomes effective, doctors will also adopt the metric units. In aircraft loading also kilogram is used exclusively. Dealings in jewellery and precious stones are principally in metric units (the carat). Electrical engineers use the metric system widely. Mechanical engineers also use metric units to some extent. The British Ordnance Survey conducts triangulation surveys in metres and metric

units are provided in all their publications. Height, however, is given in feet. By 1962 all mining surveys of the National Coal Board will also be redrawn to metric scale, depths being indicated in feet. The military maps have also a metric grid, but again heights are given in feet. The Meteorological Office has changed over to Centigrade for almost all purposes except forecasts and reports issued to the public.

Similarly it has been pointed out that the use of decimals is gaining ground. For example, the use of decimalised inch, foot and mile have also come into wide use and the use of decimalised units in pricing, costing, estimating etc. is also common. In measuring sand and ballast the use of decimals of the foot is common. Property is generally expressed in decimal acres and even the London foreign exchange market recently changed from fractions to decimals in quotations of dollar and other foreign currency rates. Decimal steps of weights *i.e.* 10, 50, 100 lb are being used in preference to 7, 14, 28, 56 etc.

It is also pointed out that British units are also used in international practice, though the use is rather restricted, as in leather manufacture and aircraft industry. The pamphlet states that the only aircrafts in the world that are all-metric are the Russian. Components of the oil industry are dominated by inch/pound sizes because of the hold that the American interests retain in this sphere.

The pamphlet analyses the various arguments put forth in the recent study made jointly by the British Association for the Advancement of Science and the Association of British Chambers of Commerce.

Cost of Change-over

The conclusion is that the Committee's recommendations stress the financial and practical aspects rather than the logical.

They do not take into account the saving of time that would accrue on adoption of decimal coinage and the metric system. The joint report had given considerable weight to the complications and cost facing the industry if a complete change-over to the metric system was made. The pamphlet points out that the cost and difficulties drop dramatically with extension of the period in which the change has to be made. The bogey of complications is not so frightening in view of the industry's experience with the compulsory adoption of Unified threads (substantially based on American standards) ten years ago which had now been satisfactorily settled into the structure of the industry though when the agreement was announced there was a general outcry that it was 'impossible'. However this outcry progressively died down and Unified screw threads have now become common in Britain. 'The fact that they have several technical disadvantages compared with the threads used in Britain previously has not prevented them from being used for everything from military equipment to lawn mowers.'

So far as the decimal currency is concerned, the pamphlet feels that the 10 shilling main unit could be rechristened the £ and the 10s-cent system used as in South Africa.

Conclusion

In conclusion it states:

'Within a few years the United Kingdom will be out of step numerologically with all other countries of the world. Monetarily it will be isolated in the Commonwealth as the only member with non-decimal currency. It will be isolated in the world at large as the only major country with non-decimal currency and non-decimal measures.

'A change in the way in which we count money and measure in this country seems inevitable within a finite period, say fifty years. The question at issue is whether we choose to

change by an act of corporate will or are contents to be pushed. The problem resolves itself into orderly change carefully phased to suit the best interests of the economy as a whole versus *laissez-faire*.'

'Immediately after the war the United Kingdom was in a position to give a two-fold lead: to the Commonwealth in decimalising sterling and in the appropriate choice of a system; and to industry in their country where the newly set up nationalised undertakings could have set an example to the rest by adopting more up-to-date standards and units (as was urged by the British Standards Institution).

'This problem in common with the need for basic research and other technological questions, has the disadvantage for the politician that legislation will produce immediate expense and upheaval while the benefits expected are long-term, gradual and intangible and likely to be reaped by another hand. A government cannot often be expected to look far beyond its five-year term of office in the measures it is prepared to undertake.

'If a fundamental change is to be made at all it would seem important to make the one change that can be guaranteed to involve no subsequent changes, that is to the metric system. The metric system means one thing and one thing only; it is precisely defined and already in world-wide use, and would be a step towards standardisation where standardisation can only be an advantage.

'In this matter of units, time is not on our side. Where decimalisation of the coinage is concerned, the longer the delay the greater will be the expense. Where weights and measures are concerned the longer the delay the greater the confusion to be ultimately disentangled and the heavier the handicaps to exports, particularly of high conversion value goods, such as precision engineering measuring instruments and machine tools. We have also to reckon with the cumulative loss of time involved both in calculations with imperial units and in conversions to and from decimal weights, measures and currencies.'

Book Review

PRATHAM PATHYA DASHMIK DHARAPAT: (Bengali)—P.N. Seth, General Secretary, Indian Decimal Society, Calcutta-6—Published by the General Library, 115A, Upper Chitpur Road, Calcutta-6, pp. 104+VIII, Price Rs. 1.00.

First Book of Decimal Arithmetic (Pratham Pathya Dashamik Dharapat) is perhaps the first book to incorporate decimal coinage and metric system of weights and measures exclusively in all the examples and exercises meant for the students in the primary classes. At least this is true so far as Bengali books are concerned.

Earlier, authors and publishers just added one or two chapters dealing with the new system in their old publications, the greater portion of which was done in the traditional way. The result was, rarely anybody noticed the additional chapters. This was partly because Governmental authorities had not yet laid down new syllabi for arithmetic.

The book begins with a chapter on how to write and express numerals. In enumeration after ten, Shri Seth has introduced a refreshing and new attempt to rationalize the names of numerals. For example, he suggests the following new and rational names for some units.

- 11—is pronounced as 'akara' (not agara),
- 19—as 'nayara' (not unis)
- 29—as 'naybis' (not untris)
- 39—as naytris (not unachallis)
- 49—as naychallis (not una pachas)
- 59—as nayanna (not unashat)
- 69—as nayshatti (not unasattar)
- 79—as nayattar (not unaashi)
- 99—as nayanabai (not niranabai)

The argument that this has been done to maintain symmetry in all cases is not quite unconvincing. It is, however, difficult to foresee at this stage how the public in general would react to such innovations. The chances of the illiterate mass being misled in the initial stages are not small. When one says nabis, a layman generally understands nine times twenty. But in Shri Seth's style of expression, this simply means 29. The reaction of the children to the learning of such new but rational nomenclature does, however, deserve to be gauged.

Each chapter is followed by exercises. As the book is intended to be studied through a number of years, the exercises gradually become stiffer. In the preface, Shri Seth has requested the teachers to determine the exercises suitable for a particular class and have them worked out by the students accordingly. This was perhaps unavoidable as the volume had to be written in a condensed form to keep it within a reasonable price limit.

The book illustrates the simplicity and superiority of the metric system over the existing Indian and English systems and also the logical correlation between the different metric units of weights, capacity and length. To assist in the initial difficulties of the transitional period, Shri Seth has appended conversion tables necessary for day to day transactions. The lucid language, intelligent arrangement of the subject matter and the masterly way in which the subject has been presented should make the publication extremely useful.

J. RAY

Readers' Forum

Dear Sir,

It is because of the low standards in design and workmanship of the various makers in India (as compared with those of other countries) which bring a bad name to the country itself, that I venture to put forth an humble suggestion for consideration to manufacturers of weighing instruments.

The business enterprises in the private sector, which are of recent origin, lack the experience which foreign firms of this industry possess. Mutual competition between firms in India itself often becomes unhealthy and in any case no individual maker can lay stress on very high quality and quality alone. If, on the other hand, all makers in India merge and form a single co-operative concern (a voluntary combination) BHARAT, BHARATI, ATLAS, AVENUE, ASIA, etc., are replaced by a single 'INDIA' trade-mark, then it leaves no room for unhealthy competition, poor-quality design or workmanship and their energies can well be directed towards developing inventive genius and research.

In the UK, it is understood, M/s. Avery & Co. Ltd., was formed after persuasion by the Government after merging Henry Pooley & Co., Hodgson & Stead, W. & T. Avery Ltd. & James Spencer & Co. etc. Today, the word *Avery* stands as the hallmark of quality, durability and service all over the world.

A research and improvement section must be a special feature of the new combine, which must be in constant touch with sugges-

tions and complaints of the users and using Government Departments as well.

The formation and registration of competitive firms of lesser standards must be made impossible by legislation or executive authority.

If the existing firms do not merge to form a single company by a certain date, they should all be liquidated to permit the coming into existence of an industrial unit in the Public Sector—in other words, nationalised—in the larger interests of the country as a whole.

R. Rajagopalan

Weighing Machine Inspector,
Secunderabad.

Advantages of Metric System

Dear Sir,

In India there are over 143 different types of systems of weights and measures in use in trade. But the Government of India wants to introduce a uniform system viz. the metric system throughout the country in all spheres of business. The system is easier to understand and for calculation. The uniform system is more advantageous both to the traders and the people.

The use of metric weights will become compulsory throughout the country from 1 April 1962. This should help the common man in purchasing the commodities without any difficulty. He need not be afraid of the mischief of the traders. That is why the Central Government fixed the units for gold as '10 grams' and silver as '1 kg'

or '1000 grams' instead of tola and 100 tolas (now in common use). In the same way the Government fixed the weight of the cement bag at 50 kg. These weights are uniform throughout the country.

Even though the system brings about uniformity throughout the country in the regulated markets, the pricing and selling units of various commodities are not uniform. They vary from one State to another and one market to another.

For example, regulated units in markets in Andhra Pradesh vary from one market to another. The same happens from one State to another also.

In the above markets the commodities are

sold in various weights even when using the metric system. When the weights differ from one market to another and one State to another, the advantages of adopting the metric system are lost. Previously also throughout India the weights of the commodities sold varied from one market to another. The Government has fixed the standard units to be used for pricing of various commodities throughout the country. Markets and traders in the country should use these irrespective of whether they be in Punjab or Kerala or Bengal or Gujerat.

G. Seshadri Sarma
Inspector of Weights & Measures,
Narasipatnam, Vizag Dist.
Andhra Pradesh.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9, Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta and Madras).

Draft Specification for Spanners

The Indian Standards Institution has prepared the following four draft Indian Standard Specifications on spanners:

- (a) Width Across Flats for Spanners.
- (b) Open Jaw Spanners.
- (c) Ring Spanners.
- (d) Box Spanners.

These draft specifications prescribe the requirements regarding dimensions, manufacture, finish and methods of test for the respective products.

Pursuant to the decision of the Government of India to change-over to the metric system of weights and measures, the Indian Standards Institution, had adopted metric screw threads with ISO profile as recommended by the International Organization for Standardization (ISO). Indian Standards have already been published for different grades of bolts and nuts having dimensions and threads as recommended by ISO. The draft standard for spanners have now been prepared to pave the way for a smooth change-over to the new threads.

Draft Indian Standards for Calibration of Vehicle Tanks for Petroleum Products and Other Liquids

A draft Code of Practice for Calibration of Vehicle Tanks for Petroleum Products

STANDARDS NEWS

and Other Liquids, which covers recommendations for the calibration of vehicle tanks used for transport of petroleum and other products has been circulated for comments.

Draft Indian Standard for Set Squares, Protractors and Metric Diagonal Scales

The Indian Standards Institution has prepared three draft Indian Standard Specifications for the following subjects;

- (1) Set Squares for Use of Drawing offices;
- (2) Protractors for Use of Drawing Offices; and
- (3) Metric Diagonal Scales (Cartographers, Surveyors and Engineers).

The first two draft standards prescribe requirements with regard to material, dimensions and test for set squares and protractors, which are used in drawing offices by engineers and draftsmen for marking angular measurements on geometrical and other drawings.

The third draft standard, namely, Metric Diagonal Scales, lays down provisions regarding material, constructional details and accuracy for such scales, which are used by cartographers, surveyors and engineers in measuring or setting off distances upon geometrical and other drawings on mass plans, etc., with correctness aimed up to one hundredth part of a millimetre.

Draft Indian Standards for Galvanized Steel Sheets (Plain and Corrugated) (IS: 277—1951)

The Indian Standards Institution has prepared a draft revision of Indian Standard Specification for Galvanized Steel Sheets (Plain and Corrugated), IS: 277—1951, which covers the minimum requirements for four classes of plain and corrugated galvanized steel sheets produced by hot dip galvanizing.

This standard was first issued in 1951, and the main modifications made in this revision relate to the inclusion of another class of galvanized steel sheets having a light coating of

zinc and inclusion of rationalized metric values in the standard.

Draft Indian Standard for Mild Steel Wire for General Engineering Purposes (IS: 280—1961)

The Indian Standards Institution has prepared a draft revision of Indian Standard for Mild Steel Wire for General Engineering purposes, IS: 280, which covers requirements for mild steel wire of sizes 0.125 mm to 12.5 mm diameter or equivalent cross sectional area for general engineering purposes.

This standard was first issued in 1951, and based upon the experience gained in the use of the standard during the last 10 years, has now been revised.

The draft revision has been put into wide circulation.

Draft Indian Specification for (1) Steel Sheet Piling Section [DOC: SMDC 6(322)] and (2) Angle Section with Legs of Unequal Width and Thickness DOC: SMDC 6(320)

Under the Steel Economy Programme initiated at the instance of the Planning Commission, the Indian Standards Institution has prepared the following two draft Indian Standards :

- (a) Steel Sheet Piling Section, DOC: SMDC 6(322); and
- (b) Angle Sections with Legs of Unequal Width and Thickness, DOC: SMDC 6(320).

The draft standard for a steel sheet piling section lays down the nominal dimensions and shape of hot rolled steel sheet piling sections. Structural properties of these sections as calculated on the nominal dimensions are also included. Piling sections are required in large quantities for coastal protection, hydroelectric, irrigation and power projects. Necessity has, therefore, arisen to standardize piling sections for immediate production in the country. Accordingly, three sections with section moduli of 1171, 1625 and 2222 cubic

centimetre, similar to the well-known sections already being used in the country, have been covered in the present draft standard. Further types sizes, if required, will be included later depending upon the needs.

The draft standard for Angle Sections with Legs of Unequal Width and Thickness prescribes the dimensions of angle sections with legs of unequal width and thickness for use in ship-building industry. Structural properties of these sections as calculated on the nominal dimensions are also included. With the publication of IS: 1863 Rolled Steel Bulb Plates (Under Print), and the finalization of this draft standard, it may be possible to meet the major requirements of the ship-building industry.

Draft Indian Specification for Surface Plates DOC: EDC 43 (549)

The Indian Standards Institution has prepared a draft specification for Surface Plates (Cast Iron) [DOC : EDC 43 (549)] which covers rectangular and square surface plates made of cast iron and used for inspection and marking purposes. The draft standard prescribes two grades of surface plates depending on the flatness of the top surface; Grade A for sizes up to and including 2000×1000 mm and Grade B for sizes up to 36000×2000 mm.

Indian Standard for Code of Practice for Architectural and Building Drawings (IS: 962—1960)

The Indian Standards Institution has just published IS : 962—1960 Code of Practice for Architectural and Building Drawings, which lays down recommendations for sizes and layout of drawings, methods of projections, sectioning and sectional views, sizes of lettering, dimensioning, abbreviations and symbols used in architectural and building drawing office practices.

The standard code has been prepared with a view to rationalizing and codifying the different practices in vogue in various architectural and civil engineering departments

so that the drawings prepared in any office can be read and interpreted with care and without fear of misinterpretation. The code is also intended to serve as a basis for providing instructions and guidance to architects and civil engineering students, and the technical committee concerned has recommended the extensive use of the code by the educational and technical training centres for instructions in the preparation of architectural and civil engineering drawings.

Price: Rs. 8.50

Indian Standard for Dimensions of Screw Thread Run Outs and Undercuts (IS: 1369—1961)

The Indian Standards Institution has just published IS: 1369—1961 Dimensions of Screw Thread Run Outs and Undercuts. The Standard covers the dimensions of profile and width of undercuts of external and internal threads of pitches 0.2 to 6 mm having the ISO metric profile. It also deals with the lengths of thread run outs for different lead or throat angles.

In line with the decision of the Government of India to change-over to the metric system of weights and measures, this Institution has decided to adopt the metric screw threads as recommended by Technical Committee, ISO/TC 1 Screw Threads, of the International Organization for Standardization (ISO). A series of Indian Standards relating to screw threads and threaded fasteners is being issued; and this standard is a necessary adjunct to the Indian Standards for threaded fasteners.

Price: Rs. 2.00

Indian Standard for Metric Steel Scales for Engineers (IS: 1481—1961)

The Indian Standards Institution has just published IS: 1481—1961 Specification for Metric Steel Scales for Engineers, which covers the requirements for metric scales made of steel for the use of engineers.

This standard is primarily meant to cover scales [divided into metric units. Non-metric values to which industry has been accustomed are also given, wherever necessary, for the sake of smooth change-over by December 1966.

Price: Rs. 2.50

Indian Standard for 4 Metre Levelling Staff, Folding Type (IS: 1779—1961)

The Indian Standards Institution has just published IS: 1779—1961 Specification for 4-Metre Levelling Staff, Folding Type. This Standard covers the requirements of the folding type of levelling staff, 4-metre in length, used in territory levelling to provide height control for topographical of engineering surveys.

Price: Rs. 1.50

Indian Standard for Drums large Fixed Ends (IS: 1783—1961)

The Indian Standards Institution has just published Indian Standard Specification for Drums, Large Fixed Ends (IS: 1783—1961), which covers the requirements regarding types, capacity, dimensions, material, manufacture, finish and tests for light duty mild steel 200-litre drums, large, with plain and dished fixed ends.

Price: Rs. 1.50

Indian Standard for Mild Steel Wire for Manufacture of Wood Screws (IS: 1812—1961)

With a view to assisting the manufacturers to supply mild steel wire of suitable quality for the manufacture of wood screws, the Indian Standards Institution has just published Indian Standards Specification for

Mild Steel Wire for Manufacture of Wood Screws (IS: 1812—1961).

This Standard covers the requirements for cold drawn mild steel wire upto 12.5 mm diameter suitable for the manufacture of wood screws by the cold heading process.

Price: Rs. 1.50

Indian Standard for Dimension for Clearance Holes for Metric Bolts (IS: 1821—1961)

The Indian Standards Institution has just published IS: 1821—1961 Dimensions for Clearance Holes for Metric Bolts, which gives the dimensions of clearance holes for metric bolts from 1.6 up to 39 mm diameter.

In keeping with the policy of the Institution to collaborate actively with the work at the International level, this standard is based upon the relevant Draft Recommendation of the International Organization for Standardization.

Price: Rs. 1.50

Indian Standard for Writing and Printing Papers (IS: 1848—1961)

The Indian Standards Institution has just published IS : 1848—1961 Specification for Writing and Printing Papers, which prescribes the requirements for the commonly used types of writing and printing papers.

It is necessary that the industry should supply paper of suitable quality, the consumption of which for writing and printing purposes is rising rapidly under the impact of the industrial and other developments. This specification is, therefore, intended to help the consumers and the manufacturers in achieving this objective.

Price: Rs. 1.00

Licensed Manufacturers, Dealers and Repairers of Weights and Measures (17)

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 seventeenth 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 the *Metric Measure* 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 915 manufacturers, 3,154 dealers 727 repairers. The details of published information are as follows:

Sl. No.	State/Union Territory	Manufacturers	Licensees	
			Dealers	Repairers
1.	Andhra Pradesh ..	40	84	31
2.	Assam	11	44	16
3.	Bihar	20	69	34
4.	Delhi	22	76	19
5.	Gujarat	107	544	132
6.	Himachal Pradesh ..		17	1
7.	Kerala	18	283	34
8.	Madhya Pradesh ..	99	310	4
9.	Madras	79	210	37
10.	Maharashtra ..	95	163	185
11.	Manipur	9	85	5
12.	Mysore	75	399	41
13.	Orissa	14	17	1
14.	Punjab	36	150	26
15.	Rajasthan	16	69	18
16.	Tripura	1	9	0
17.	Uttar Pradesh ..	207	515	88
18.	West Bengal ..	65	200	55
		915	3,154	727

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (17)

PUNJAB (12)

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

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Ludhiana Measuring Tape Co-operative Industrial Society Ltd., Ludhiana.	Measuring tapes 100 ft.

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Anand Singh Jagdish Rai, Gandhi Chowk, Hissar	Weights, Measures, Weighing and Measuring Instruments.
(2)	Chaman Lal Aggarwal Sangrur	Weights, Measures and Beam Scales.
(3)	Udaiya Ram Ram Partap, Lehragaga	Weights, Measures, Beam Scales and Measuring Instruments.
(4)	R. C. Uppal and Sons, Hamirpur (Kangra)	Weights, Measures, Weighing Measuring Instruments.
(5)	Jai Ram Bhoop Singh Bhattu Kalam, Teh Fatehbad (Hissar)	Weights, Measures, Weighing and Measuring Instruments.

RAJASTHAN (1)

Manufacturers

Serial No.	Name of the Manufacturer	Details of Articles Manufactured
(1)	M.C. Bhargava, Kuchari Road, Ajmer	Weights, Measures and Weighing Instruments.
(2)	Cables Scale Manufacturers and Repairers, Sardarpur, Jodhpur.	Counter Machines.
(3)	Chand Iron Foundry, Jaipur Road, Ajmer	Cast Iron kilogram Weights.
(4)	Gopal Industries, Shahpura Mohalla, Bewar	Cast Iron kilogram Weights.
(5)	Hassanali Alliji, Kapasanwale, Police Choki, Bora wadi, Udai pur.	Capacity Measures.
(6)	Krishna Industries, Raghunath Bhawan, Ajmer	Weights, Measures and Weighing, Instruments.
(7)	Mahesh Metal Works, Madanganj, Kishanganj	Capacity Measures.
(8)	Modern Scale Manufacturer & Repairers, Near Panna Niwas, Jodhpur.	Counter Machines.
(9)	Mundra Metal Works (P) Ltd., Bikaner	Brass and Cast Iron Weights.
(10)	Om Prakash Gupta & Co., Rampura Bazar, Kotah	Length Measures.
(11)	Rajasthan Engineering Works, Amber	Weights. ..
(12)	Rajasthan Industries Behind Power House, Jodhpur	Cast Iron kilogram Weights.
(13)	Rajasthan Trunk Co., Sriji Ki Mori, Tripolia Bazar, Jaipur ..	Weights, Measures and Weighing Instruments.
(14)	Ramesh Iron Foundry, Mal Godam Road, Bharatpur	Brass & Cast Iron kilogram Weights.
(15)	Shanuram Chandra Prakash, Adarsh Nagar, Jaipur	Bullion Brass Weights.
(16)	Swastick Iron and Metal Works, Bhim Gunj Mandi, Kotah ..	Brass & Cast Iron & kilogram Weights.

Dealers

Serial No.	Name and Address of Dealer	Details of Articles Sold
(1)	Abdul Salam Abdul Rehman, General Merchants, opposite Srijji Ki Mori, Tripolia Bazar, Jaipur.	Weighing and Weighing Instruments.
(2)	Ahsan Hussain M. Abdul Hussain, Rampura Bazar, Kotah	Weights, Measures and Weighing Instruments.
(3)	Akbar Ali Taiyyabali, Mandikinal, Udaipur	Weights, Measures and Weighing Instruments.
(4)	Ali Mohd & Co., Mochibazar, Girwa, Udaipur	Weights, Measures and Weighing Instruments.
(5)	Ali Mohd Hussainji Chadra (Kota) Rashoolji Mohd Ali, Chabra, Kotah.	Weights and Weighing Instruments.
(6)	Arahtmal & Sons, Mirchi Bazar, Jodhpur	Weights, Measures and Weighing Instruments.
(7)	Arora Crokery & Metal Co., Station Road, Jodhpur ..	Weights.
(9)	Badri Narain Om karmal, Naya Bazar, Ajmer	Tape Measures.
(10)	Baldev Kani Ram, Tripolia Bazar, Jaipur	Weights, Measures and Weighing Instruments.
(11)	Bansilal & Sons, Tobacco Bazar, Jodhpur	Weights, Measures and Weighing Instruments.
(12)	Bhanamal & Co., Madanganj Kishangarh, Ajmer	Weights, Measures and Weighing Instruments.
(13)	Bhanamal & Co. (P) Ltd., Tripolia Bazar, Jaipur ..	Weights, Measures and Weighing Instruments.
(14)	Chopra Bros., Tripolia, Jodhpur	Weights, Measures and Weighing Instruments.
(15)	Faiz Mohd Khan, Chandi Ki Taksal, Jaipur	Weights and Weighing Instrument
(16)	Gagandas & Sons, Darga Bazar, Ajmer	Weights and Weighing Instruments.
(17)	Gallula Lohiya, Opposite Nawab's Hawali, Triplia Bazar, Jaipur.	Weights, Measures and Weighing Instruments.
(18)	Ganesh Das Samir Mal, Chandpole Bazar, Jaipur ..	Weights, Measures and Weighing Instruments.
(19)	Girdhari Lal Mangilal, Pali Bazar, Beawar	Weights, Measures and Weighing Instruments.
(20)	Gulab Bohara & Sons, Outside Hati Pole, Udaipur ..	Weights, Measures and Weighing Instruments.
(21)	Haji Aabid Hussain, M. Nazirji Mandi ki nal, Dhanmandhi, Udaipur	Weights, Measures and Weighing Instruments.
(22)	Hanuman Dass & Co., Vaido Ka Chowk, Bikaner ..	Weights, Measures and Weighing Instruments.
(23)	Hassan Bhai M. Rahmatullaji, Bhadur Bazar, Kotah ..	Weights, Measures and Weighing Instruments.
(24)	Her Pd. Gupta, Nataniyan Ka Rasta, Jaipur	Weights, Measures and Weighing Instruments.
(25)	Hussain Ali Yoosufali, Fatehnagar, Tehsil Mavli, Udaipur	Weights, Measures and Weighing Instruments.
(26)	Isaji Aliji, Clock Tower, Udaipur	Weights, Measures and Weighing Instruments.
(27)	Ismail Hassanji, Sangod, Kotah	Weights
(28)	Jamuna Lal Shankarlal Loheya, Tripolia Bazar, Jaipur ..	Weights, Measures and Weighing Instruments.
(29)	Jamuna Metal Works, Chandi Ki Taksal, Jaipur	Weights.
(30)	Jeevanali Gulam Hussain, inside Surajpole, Udaipur ..	Weights, Measures and Weighing Instruments.
(31)	Kalyan Tin Factory, Iron Merchants, Cinema Road, Ajmer ..	Weights, Measures and Weighing Instruments.

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(32)	Khatri Gangaram Mancharam, Kandoi Bazar, Jodhpur ..	Weights.
(33)	Kewalram Govindram, Sabjimandi Road, Kotah	Weights, Measures and Weighing Instruments.
(34)	Ladu Ram Ram Niwas, Naya Bazar, Ajmer	Tape Measures.
(35)	Lal Chand Tirathdas Kapoor, Naya Bazar, Ajmer	Weights, Measures and Weighing Instruments.
(36)	Madan Mohan Laxmi Kant, Loha Bazar, Bewar	Weights, Measures and Weighing Instruments.
(37)	Madanlal Laxmilal, Sadar Bazar Vijai Nagar, Ajmer	Weights, Measures and Weighing Instruments.
(38)	Mangaldas Wadhmal, Srinagar Road, Ajmer	Weights, Measures and Weighing Instruments.
(39)	Manpasand, Ghara Kothi Bistiyan Ka Bas, Shahpura, Jodhpur..	Weights, Measures and Weighing Instruments.
(40)	Malwa Iron Stores, Naya Bazar, Ajmer	Weights and Weighing Instruments
(41)	Mohd. Ali and Co., Chabra, Kotah	Weights and Weighing Instruments.
(42)	Mohd. Bux and Sons, Ghas Mandi, Jodhpur	Weights and Weighing Instruments.
(43)	Mohd. Ismail, Lohar Mohalla, Beawar	Weights, Measures and Weighing Instruments.
(44)	M. K. M. Mussa Bhai, Bhadur Bazar, Kotah	Weights and Weighing Instruments.
(45)	Naraindas Mangaldas, Ladpura, Kotah	Weights, Measures and Weighing Instruments.
(46)	Narsingdas Vitthalidas, Tripolia Bazar, Jaipur	Weights, Measures and Weighing Instruments.
(47)	Nathmal Madan Gopal, Naya Bazar, Ajmer	Weights, Measures and Weighing Instruments.
(48)	Om Prakash & Co., Rampura Bazar, Kotah	Weights, Measures and Weighing Instruments.
(49)	Poonam Chand, Proprietor M's Man Mohan Raj Kunj, Tripolia, Jodhpur.	Weights, Measures and Weighing Instruments.
(50)	Prakash Distributors and Co., K.E.M. Road, Bikaner ..	Weights and Weighing Instruments.
(51)	Prahladdass Mohanlal, Tripolia Bazar, Jaipur	Weights.
(52)	Prathviraj Mathur, Khatriyon Ki Kothi Girdhi Kot, Jodhpur.	Weights and Counter Machines
(53)	Prem Sukhdas Ramd Khatri, New Circular Market, Bikaner.	Weights, Measures and Weighing Instruments.
(54)	Quadarji Rasiaji, Clock Tower, Udaipur	Weights, Measures and Weighing Instruments.
(55)	Rajabali, Daoodji and Sons, Clock Tower, Udaipur ..	Weights, Measures and Weighing Instruments.
(56)	Rajabali Quadar Ji, Nathdwara, Udaipur	Weights, Measures and Weighing Instruments.
(57)	Rajasthan Trunk Co., Srijji Ki Mori, Jaipur	Weights, Measures and Weighing Instruments.
(58)	Rashoolji Mohd. Ali, Chabra, Kotah	Weights and Weighing Instruments.
(59)	Roop Chand Duddalal, Rampura Bazar, Kotah	Weights, Measures and Weighing Instruments.
(60)	Sadique Bhai Ahmed Bhai, Tobacco Bazar, Jodhpur ..	Weights, Measures and Weighing Instruments.
(61)	Sardar Ram Singh Sanghi Building, Naya Pura, Kotah	Weights, Measures and Weighing Instruments.
(62)	Shiv Chand Arora and Sons, K.E.M. Road, Bikaner ..	Weights, Measures and Weighing Instruments.

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(63)	Shiv Ram C/o Sukh Deo Iron and Hardware Syndicate, Govind Rajaji Ka Rasta, Jaipur.	Weights.
(64)	Sindh Hard Ware and Iron Merchant, Naya Bazar, Ajmer.	Weights, Measures and Weighing Instruments.
(65)	Sunder Das Kanhyalal, Katla Bazar, Jodhpur	Weights, Measures and Weighing Instruments.
(66)	Surajmal Chaganlal, Dhanji Road, Bikaner	Weights, Measures and Weighing Instruments.
(67)	Vijai Kumar Varma, C/o Shri Gayatri Petrol House, Pushkar	Weights, Measures and Weighing Instruments.
(68)	Vishambar Dyal Badri Pd., Sansar Villa, M. I. Road, Jaipur	Weights, Measures and Weighing Instruments.
(69)	Vyas Bros. K.E.M. Road, Bikaner	Weights, Measures and Weighing Instruments.

Sl. No.	Name and Address of Repairer	Details of Articles Repaired
(1)	Abdul Rehman Mistri, Teh Girwa, Udaipur	Weights, Measures and Weighing Instruments.
(2)	Advin Johnson, House No. 182 A, Christian Colony, Anasagar, Ajmer.	Weights, Measures and Weighing Instruments.
(3)	Cables Scale Manufacturers and Repairers, Sardar Pura, Jodhpur.	Weighing Instruments.
(4)	Faiz Mohd. Khan, Chandi Ki Taksal, Jaipur	Weights and Weighing Instruments.
(5)	Jamna Metal Works, Chandi Ki Taksal, Jaipur	Weights, Measures and Weighing Instruments.
(6)	Kistoorji Dhanji, Laxmi Mills Chawl, Beawar.	Weights, Measures and Weighing Instruments.
(7)	Krishna Industries, Raghunath Bhawan, Ajmer	Weights, Measures and Weighing Instruments.
(8)	Man Pasand, Ghana Kothi, Bhishtiyon Ka Bas, Shahpura, Jodhpur.	Weights, Measures and Weighing Instruments.
(9)	Mangaldas Vadumal, Srinagar Road, Ajmer	Weights, Measures and Weighing Instruments.
(10)	Modern Scale Manufacturer and Repairers, Near Panna Niwas, Jodhpur.	Weights and Weighing Instruments.
(11)	Mohd. Ismail, Loharon Ka Mohalla, Beawar	Weights, Measures and Weighing Instruments.
(12)	Mundra Metal Works (P) Ltd. Binaker	Weights, Measures and Weighing Instruments.
(13)	Narain Dass Mangaldass, Ladpura, Kotah	Weights, Measures and Weighing and Measuring Instruments.
(14)	Narain Dass Mangaldass, Ladpura, Kotah	Weights, Measures and Weighing and Measuring Instruments.
(15)	Rajab Ali Ibraheem Ji, Rampura Bazar, Kotah	Weights, Measures and Weighing Measuring Instruments.
(16)	Rajasthan Trunk Co. Sriji Ki Mori, Tripolia Bazar, Jaipur.	Weights, Measures and Weighing and Measuring Instruments.
(17)	Safuddin Balbir Ali, Hathipole, Udaipur	Weights, Measures and Weighing and Measuring Instruments.
(18)	Shankarlal, New Well, Bikaner	Weights, Measures and Weighing and Measuring Instruments.

TRIPURA (5)

In the March and November 1960, and March and July 1961 issues of Metric Measures lists of licensed dealers, manufacturers, and repairers of weights and measures in Tripura Union Territory were published. The following are the names of dealers in addition to the number of dealers licensed for the current year published in July 1961 issue of Metric Measures.

Sl. No.	Name and address of Dealer
(1)	Banerjee & Co, Motor Stand Road & Central Road Junction, Agartala.
(2)	Kalyan Stores, 59, Central Road, Agartala.
(3)	Radharani Bhandar, 128, Motorstand Road, Agartala.
(4)	Tripura Paint and Hardware Store, 58/2, Central Road, Agartala.

Uttar Pradesh (8)

The list of Dealers of Uttar Pradesh was published in November 1961 issue of Metric Measures. The following is a further instalment of list of dealers licensed under the Uttar Pradesh weights and Measures Act 1958.

Sl. No.	Weights and Measures
(153)	Allahabad Trading Co., 26, Katra, Allahabad
(154)	Agra Weights Agency, 6417 I. Azad Gali Agra.
(155)	Imam Ali Sons, Tin Merchants, No. 15, Gautam Budh Marg, Lucknow.
(156)	V. N. Industries, Opposite Arya Samaj Mandir, Freeganj Road, Agra.
(157)	Kishanlal Jain, Bhoolaganj, Agra.
(158)	Matadin Bhagwan Dass Oil Mills Ltd., Bans Mandi, Kanpur.
(159)	Sita Ram Bhola Nath, Iron Merchants, Muthiganj, Allahabad.
(160)	Pyre Lal Agarwal, S/o Ram Swaroop, Kirana Merchants, Chaumukhapul, Moradabad.
(161)	Star Engineering Works, Sheo-ka-Bazar, Agra.

Sl. No.	Weights and Measures
(162)	Steel Fab. Company, 21, Dalampara, Meerut City.
(163)	Sahjogi Borthers, Civil Lines, Banki.
(164)	Shiv Charan Lal Gupta, Rawat Para, Agra.
(165)	United Industrial Concern, 98, Durga Bari, Meerut Cantt.
(166)	Narain Singh Ram Das, Tara Market, Hapur (Meerut).
(167)	Premchand Agarwal, 55/67, Raja-ka-Phatak, Kahu—Kothi, Kanpur.
(168)	Murari Lal Kalyan Singh, Iron and Hardware Merchants, Kabari Bazar, Meerut City.
(169)	Eagle Metal and Electrical Works, Bansal Building, Chhipotola, Agra.
(170)	Mahaur and Co., Prop. Misri Lal, Mahaur, Anaj Mandi, Budaun.
(171)	S.O. Engg. Works, Mansa Devi, Raja Mandi, Agra.
(172)	Hindustan Engg. Industries, Lisani Gate, Meerut.
(173)	Hanuman Traders, Shivpur (Near Railway Crossing) Varanasi.
(174)	Hari Shankar Agarwal, Hardware Merchants, Pathwari, Agra.
(175)	Hirala Radhe Shyam, Bhainsa Bazar, Gorakhpur.
(176)	Indian Trade Corporation, 3202, Belanganj, Agra.
(177)	Jain and Co., Bharon Bazar, Agra.
(178)	Khandelwal Metric Bant Stores, Deoria.
(179)	Hari Ram Om Prakash, Iron Merchants, 278 Subhash Ganj, Jhansi.
(180)	Kumar Co., 33, Kabari Bazar, Meerut
(181)	Prem Chand Agarwal, 55/67 Raja Ka Phatak, Kahu Kothi, Kanpur.
(182)	Purshotam Das Agarwal, 2442, Jeoni Mandi, Agra.
(183)	Ram Swaroop Shiam Behari Lal, Iron Merchants, Kabari Bazar, Meerut City.
(184)	Ram Swaroop Khandelwal, Iron Merchants, Bahadurganj, Shajahanpur.
(185)	Amar Nath Agarwal, No. 3679, Sultanganj, Agra.
(186)	Jayshree Industries, Haweli Bahadur Jhansi.
(187)	Brij Metal Industries Lanyra ki-Chauki, Agra.
(188)	Khandelwal Metric Bant Stores, Deoria.
(189)	Jhansi Iron and Steel Roling Mills 372, Civil Lines, Jhansi.
(190)	Kanodia Brothers Ltd., Matadia Street, Kanpur.
(191)	Mool Chand Likhdari, Iron Merchants, Bara Bazar, Jhansi.

Weights and Measures—Contd.

- (192) Matadin Bhagwan Dass, Shakkar Patti, Kanpur.
 - (193) Matadin Bhagwan Das Oil Mills Ltd., Banamandi, Kanpur.
 - (194) Kailash Industries, Pathwari, Belanganj, Agra.
 - (195) Kishan Swarup Kali Charan, Rawat Para, Agra.
 - (196) Keshri Narain Jaiswal, 3, Albert Road, Allahabad.
 - (197) Kanpur Iron Foundries, 104-A/307, Rambagh Kanpur.
 - (198) Raj Corporation Post Box No. 200, Chowk, Cawnpore.
- IV. Weights and Weighing Instruments*
- (199) Bharat Hardware Stores, 2836/4, Pathwari Belanganj, Agra.
 - (200) Bhagwan Bansal, Hardware Stores, Belanganj, Agra.
 - (201) Bishambher Lal Ram Lal, Grain Merchants and Commission Merchants, P.O. Naupara, Dist. Bahraich.
 - (202) Chaman Lal Jain and Sons, Pipal Mandi, Dehra Dun.
 - (203) Ganesh Iron Foundry, Freeganj, Agra.
 - (204) K. R. Kohli and Sons, C. K. 31/8, Gyanwapi, Varanasi-1.
 - (205) Lucknow Sarafa Association, Chowk, Lucknow.
 - (206) Prakash Jain, C. K. 21/33, Panchayati Taul, Thatheri Bazar, Varansi.
 - (207) Panchayat Dharam Kanta, Bazar Sarafa, Meerut City.
 - (208) Rewati Sharan Rajindra Sharan, Loha Mandi Agra.
 - (209) Prayag Iron Stores, 60, Bahadurganj, Allahabad.
 - (210) Shiv Sahai Rajendra Prasad Choubey, Ji-ka, Phatak, Kinari Bazar, Agra.
 - (211) Lucknow Sarafa Association, Chowk Lucknow.
 - (212) Majadhar Lal Brij Nath, 76/157, Halsey Road, Lohai, Kanpur.
 - (213) Modi Engineering Works, K-4785, Machadari, Varanasi.
 - (214) Panchayat Dharam Kanta, Bazar Sarafa, Meerut City.
 - (215) Pyare Lal Agarwal S/o Ram Swaroop Kirana Merchants, Chadmukhapal, Moradabad.
 - (216) Shanker Lal Balkishan Das, Timber Merchants, Sardhana Dist. Meerut.
 - (217) S. K. Iron Foundry, Engineering Co., Ram Bagh, Agra.

V. Weights and Measuring Instruments

- (1) R. G. Industries Service, 2442, Jeoni Mandi Agra.
- (2) Naratham Das and Sons, C. K. 43/14, Chhatia, Tola, Varanasi.
- (3) Narayan Das, 16/18, Pandey-Hoonly, Varanasi.
- (4) Pratap Chand Bhagwan Das Jain, Lohe-ke-Veopary Loha Mandi, Agra.
- (5) Ramesh Chand, Lakshmi Chand, Hardware Merchants, Kabirath Bazar, Agra.
- (6) Ram Sanchi Omkar Nath, Bhaunanapura, 87/51, Kalpi Road, Kanpur.

Weighing Instruments

- (1) Electrical Machines Corporation, The Mall, Post Box No. 120, Kanpur.
- (2) Ravi Engineering Co., 81/1, Rajpur Road, Dehra Dun.

IX. Measuring Instruments

- IX. Daulatram Sukhanandam Lal Jain Belanganj, Agra.

Weights

- (1) Alloy Founders, Jeoni Mandi, Jamkuna Road, Agra.
- (2) Adarsh Metal Works 2814, Bagh Auta, Lohamandi, Agra.
- (3) Adarsh Beopar Singh, Kaiser Ganj, Meerut.
- (4) Baburam Sukhdoo Prasad, Iron Merchants, 105/672, Deputy-ka-Parao, Kanpur.
- (5) Bhanamal Gulzarimal (P) Ltd., Reedganj, Faizabad.
- (6) Daulat Ram Nathumal, Keisarganj, Agra.
- (7) G. O. Iron Foundry, Bhairon Bazar, Belanganj, Agra.
- (8) Moti Ram Bihari Ram, Station Road, Moradabad.
- (9) Mittal Brass Industries, 4569 Mohalla Rang Raizan, Raja-ki-Mandi, Agra.
- (10) Madhu Sudan Iron Foundry, 1125, Dayanand Road, Agra.
- (11) Nav Bharat Traders, Shahidganj, Bazar, Saharanpur.
- (12) Raj Kumal Industries, 6382, Khati Para, Lohamandi, Agra.
- (13) Raj Kumar Iron Foundry, Lashkarpur, P.O. Jaganpur, Agra.
- (14) Ramesh Chand and Sons, Pathwari, Belanganj, Agra.
- (15) Om Prakash Jaiswal, 75, Subji Mandi, Kuldabad Allahabad.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (17)

- (16) Paramatma Saran Devendra Kumar Bros., Chaumukhapul, Moradabad.
- (17) Swatantra Bharat Iron Foundry, Narain Bhawan, Moti Lal Nehru Road, Agra.
- (18) India Iron Industries, Langra-ki-Chowki, Agra.
- (19) Baburam Sukhdeo Prasad Iron Merchants, 105/672, Deputy-ka-Parao, Kanpur.
- (20) Gulab Rai Chhootey Lal Iron Foundry, Pathwari, Belanganj, Agra.
- (21) Hindustan Agricultural and Engineering Works, 1075, Baghpat Gate, Meerut.
- (22) Mohd. Ismail Trunk Manufacturers, Hazir Bagh Begumganj, 28/211, Kanpur.
- (23) Om Iron Foundry, Pathari, Belanganj, Agra.
- (24) Om Engineering Works and Manufacturing Co., Chawlawala Bagh, Sulanganj, Agra.
- (25) Bagwan Chandra Tandon, Secretary, The Non-Federation Metal Dealers Association, Reg. Moh. Chauraha New Punjab Bank, Moradabad.
- (26) Sool and Chand Ram Sawak, Iron Merchants, Bara Bazar, Jhansi.
- (27) Standard Chemical Co., (P) Ltd., 113/8, Swarup Nagar, Kanpur.
- (28) Supreme Engineering Co., 983, Belanganj, Near, Barapura Agra.
- (29) Vibhuti Ram Paras Nath, Cinema Road, Golghar, Gorakhpur.
- (30) Bharat Iron Foundry, 1514, Baraf Khana Moti Katra, Agra.
- (31) Sun Rise Engineering Works, Yamuna Bridge, Agra.
- (32) Vishnu Iron Foundry, 4533/1 Freeganj, Agra.
- (33) Lok Nath Bishamber Nath Iron Merchants, 47/91 Hatria Lohai, Kanpur.
- (34) Fateh Chand Bhagwan Das, Johari Bazar, Agra.
- (35) Ghamandi Rai Ram Kishun Agrawal Iron Merchants, Subhas ganj, Jhansi.
- (36) C.S. Industries, No. 2994-A, Naya Bans Loha Mandi, Agra.
- (37) Hind Traders, 90, Bahadurganj, Allahabad, G.O. Iron Foundry Bhairon Bazar, Belanganj, Agra.
- (38) K.R. Industries, Ekkawali Gali, Noorigate, Agra.
- (39) Indian Iron Chain Manufacturers, 76/492, Collie Bazar, Kanpur.
- (40) Jain Iron Works, 5228, City Station Road, Opp. Basant Talkies, Agra.
- (41) Gupta & Co., 55/108, Chommahala, Generalganj, Kanpur.
- (42) Gopal Das Ram Charan, Bara Bazar, Jhansi.
- (43) Goel Foundries 118/229, Kanshalpuri, Kanpur.
- (44) Chandra Bhai Prem Chandra, Iron Merchants, Bachhrawan, Rae Bareli.
- (45) District Co-operative Federation Workshops Sardhana Road, Kankar Khera, Meerut.
- (46) Devi Sahai Gopaldas Iron Foundry Chiptola, Agra.
- (47) M.K. Corporation, Padam Kuteer, Freeganj, Agra.
- (48) Atul Engineering Works, 1251, Belanganj, Agra.
- (49) Agra Mills Stores, 926, Belanganj, Agra.
- (50) Basant Lall & Sons, Pathwari Belanganj, Agra.
- (51) Chandra Prasad Tara Chand, K. 42/29, Seva Chaurdhary Gali Bhairon Nath, Varansi.
- (52) Kanta Prasad Jain, Iron Merchants, Kasarat Bazar, Agra.
- (53) Nenoomal Basarmal, Daresi No. 2, Shop No. 22 Agra.
- (54) National Industries and Foundry, 488/37, Mirpur Cantonment, (Rail Bazar), Kanpur.
- (55) Navin Engineering Works, 2, Tripolia, Hiraganj, Allahabad.
- (56) Pioneer Moulding and Engineering Works, 1058, Lane Ganshala, Agra.
- (57) Ram Shekhar Kailash Nath, 47/91, Hatia Lohai, Kanpur.
- (58) Prakash Hardware Stores, Pathwari Belanganj, Agra.
- (59) Randhir Singh Khubchand Iron Foundry, Masta-ki-Bagichil, Agra.
- (60) Om Engineering Works and Manufacturing Co., Chowlawala Bagh Sultanganj, Agra.

VIII. WEIGHTS MEASURES AND MEASURING INSTRUMENTS.

- (1) Ganesh Das Ram Gopal & Sons, Halwasia Court, Hazratganj, Lucknow.
- (2) Raghumal Nahar Singh, Hardware Merchants, Raja's Road, Dehra Dun.

GUJARAT (4)

In the March, September and November 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 manufac-

Sl. No.	Name and Address of Manufacturer	Details of articles manufactured
(1)	Ajit Industries, Bedi Para, Main Road, Rajkot Kuvao, Ahmedabad.	Conical Litre Measures.
(3)	Babubhai N. Mistry, Mahidharpura, Opp. Maniara Sheri, Nershi Mandirs, Chawl, Surat.	Steel yard.
(4)	Bagyodaya Scale Repairing Works, K. 3, 1093/66, Piramshah Raja, near Regal Cinema, Ahmedabad.	Non-Flexible metre measures.
(5)	Bharat Trading Co., Opp. Indirabhai Park, Outside Vniawad Gate, Bhuj.	Weights.
(6)	Gujarat Engineering Works, Behind Police Station, Idar (A.P. Rly), Dist. Sabarkantha.	Do.
(7)	Janta Metal Works, Near Vijay Talkies, Dohad	Do.
(8)	Jayantilal & Brothers, c/o Prabhudas B. Contractor, Raghu-nath Pura, Swaminarayan Wadi, Surat.	Do.
(9)	Laljiibhai Shamji Luhar, Opp. Municipal Corporation Office, City Danapith, Ahmedabad.	Non-flexible Measures.
(10)	Makwana Iron Works, Od-wada, Savarkundla	Counter Machines.
(11)	National Steel Industries, Near Naherpura, Dohad Road, Godhra.	Weights.
(12)	Shah Engineering Works, Canal Road, Rajkot	Do.
(13)	Soni Ramji Ladhahbai & Co., Chokshi Bazar, Junagarh	Flat Cylindrical Bullion Weights and Bullion Sheet Metal Weights.
(14)	Vishwakarma Iron Foundry, Baghikhana Station Road, Near Juni Haveli, Rajpipla.	Weights.

Sl. No.	Dealers Licensed for weights, Measures, Weighing and Measuring Instruments.	
(1)	Asha Metal Industries, Prajapatiwadi Vejal-pura, Navasari.	(10) Ghanshyamwala Traders, Tower Rd., Dabhoi, Dist. Baroda.
(2)	Arvind C. Dalal, Manek Mansion, Goharbag, Bilimora, Dist. Surat.	(11) Ghelabhai Devchand Shah, Baranpuri Bhagol, Surat.
(3)	Balubhai Mohanlal Baranpuri Bhagol, Surat.	(12) Govindji Trikamji Mehta, Bazar, Keshod.
(4)	Shri Bhagwatlal D. Sheth, Ode Bazar, In Marketing Yard Umreth, Dist. Kaira.	(13) Gujrat Engineering Works, Near Police Station, Idar, Distt. S.K.
(5)	Bharat Iron Foundry, 961, Mandvi's Pole, Kansara Pole, Ahmedabad.	(14) Hiralal Ambalal Amin, Bazar, Street, Chikhli, Dist. Surat.
(6)	Bharat Kanta Bhandar, Juna Bazar, Himat-nagar, Dist. Sabarkantha.	(15) Hari Stores, Library Road, Chhota Udepur, Dist. Broach.
(7)	Bharat Trading Co., Short Bazar Bhuj.	(16) Hatim Bros., & Co., New Bazar, Talaja.
(8)	Chandulal Ratansi Modi, Bazar, Bhabhar, Dist. B.K.	(17) Hakimji Mangalji Pokhanwals & Sons, Nani Bazar, Talaja.
(9)	Chhotabhai Bhikhabai, Saloon Bazar, Nadiad, Dist. Kaira.	(18) Ibrahim Badrueldin Jakeen, Rajkot.
		(19) Jadavji Gopalji Parekh, Sardar Road, Morvi.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (17)

Sl. No.	Dealers Licensed for Weights, Measures, Weighing and Measuring Instruments.	
(20)	Jainulbahi Abulkadar & Co., Nathubhai Road, Bulsar, Dist. Surat.	(36) Mohanlal & Bros., Nr. Adumber Well, Godhra, Dist. P. Mahals.
(21)	Jamnadas & Co., Tintol Dist., Sabarkantha.	(37) Mohanlal Chhaganlal Kansara Kansara Bazar, Broach.
(22)	Jayshree Metal Corporation, Shop No. 16, Monyla Baug, Opp. Natraj Cinema, Bhavnagar.	(38) Mohanlal Khimjibhai & Sons, Subhas Road, Chalala.
(23)	Jethalal Mulchand Soni, Near Swami-Narayan Mandir, Himatnagar, Dist. S.K.	(39) Mukeshchandra Natverlal Kothari, Bazar, Radhanpur, Dist. Banaskantha.
(24)	Jupitar Watch Co., Main Road, Bulsar, Dist. Surat.	(40) Nandlal Amritlal Shah, Three Fanesh, Padra, Dist. Baroda.
(25)	K.L. Khandhari Industries Kuberngar, Bungalow Area, P.O. Sardarnagar (Ahmedabad).	(41) Narshi Ladha Luhar, Sardar Road, Morvi.
(26)	Kripalam Muljibhai Doshi, Darbargadh Chowk, Upleta.	(42) Patel & Shah's Co., Station Road, Himatnagar, Dist. S.K.
(27)	Khambha Mahal Co-operative Purchase & Sale Union, Khambher.	(43) Panchal Engineering Works, Nathubhai Road, Bulsar, Dist. Surat.
(28)	Kurbanhusein & Co., Saiyedwada on tank Road, Godhra, Distt. P. Mahals.	(44) Prabhudas Nulji Mahtma Gandhi Road, Dhoraji.
(29)	Maneklal Nathabhai Amanpurwala, Jwaha Bazar, Jambusar, Dist. Broach.	(45) Pragjibhai Lakshmanbhai Mistry, Station Back Road, Rajpipla, Dist. Broach.
(30)	Manilal Umedram Bazar, UNJHA, Dist. Mehsana.	(46) Purnima Store, Dabhan Bhagol, Nadiad, Distt. Kaira.
(31)	Madhusudan M. Mistry, Jawahar Road, Cambay, Distt. Kaira.	(47) Ramji Ladhahbai Soni, Shroff Bazar, Juna-gadh.
(32)	Manager, Sabarkantha District Co., Operative Purchase & Sale Union Ltd., Himatnagar, Dist. Sabarkantha.	(48) Shafibhai and Bros., Hanjipura, Himatnagar, Distt. S.K.
(33)	Maganlal Shivilal Doshi, Mandvi Bazar, Lunavada, Dist. P. Mahala.	(49) Somalal Nagardas Modi, Dana Bazar, Dhandhuka, Distt. Ahmedabad.
(34)	Manjibhai Harjibhai Adhia, Hawahar Road, Dhari.	(50) Taherali Haji Badudin Vohra, Bazar, Road, Balashinor, Dist. Kaira.
(35)	M.C. Mody & Co., Dhan Bazar, Radhanpur Dist. B.K.	(51) Tribhovandas Chakubhai, Near Tower, Amreli.
		(52) Vipinchandra Chandulal Shah, Opp. Tower, Waghodia, Dist. Baroda.

Repairers licensed for Weights, Measures, Weighing and Measuring Instruments.

Sl. No.	Name and address of the repairers	
(1)	Bhegwan Ragha Mistry, Nava Para, Ghogha Road, Bhavnagar.	(7) Naranji Parshottam Chothani, Gokuldas Tejpal Road, Mandvi.
(2)	Bachubhai Thakkershi Soni, Post Mota, Devalia Bald Pipalia.	(8) T.C. Panchal, Shop No. 12, Madansingh, Chowla, Adipur (Kutch).
(3)	Bhikhabhai Fulchand Luhar, Kot Barna, Jambusar, Distt. Broach.	(9) Pragjibhai Lakshmanbhai Mistry, Station Road, Rajpipla, Distt. Brough.
(4)	Chokshi Brothers, Mandi Bazar, Sidhpur, Distt. Mehsana.	(10) Premji Velji, near Jubeli Hospital, Sarpat Naka, Bhuj.
(5)	Lahar Lalji Jettabhai, Shakti Road, Dhrang-gadhra.	(11) Ravji Jivraj Makwana, C/o Purshottam Kala, Hathi Tanki, Probandar.
(6)	Narottamdas G. Padia, (Murshall Scale Industries) Manibhai Road, Savarkundla.	

MAHARASHTRA (3)

In the November 1960 and January 1961 issues of 'Metric Measures' lists of licensed manufacturers, dealers and repairers of weights and measures were published. The following is a further list of Manufacturers and repairers since licensed under the Bombay Weights and Measures (Enforcement), Act, 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles manufactured
(1)	V. S. Ambarkar & Sons, 2-23, Mohamadi Market, Dr. Babasaheb Ambedkar Road, Lalbaug, Bombay-12.	Linear Wooden Measures
(2)	Associated Commercial Mfg. Enterprises (Pvt.) Ltd. Janmabhoomi Chambers, 29, Fort Street, P.B. No. 1895, Bombay-1.	Measuring Instruments (hand operated petrol pumps).
(3)	Bansilal & Co., Main Road, Nasik City	Beam Scales of Class 'B', 'C' & 'D'.
(4)	P. S. Banarse Industries (India) Pvt. Ltd., Badnera Road, Amravati.	Weights.
(5)	Bharat Scale Co., 200, Janjekar Street, Bombay-3.	Beam Scales of Class 'B', 'C' and 'D' and Counter Machines.
(6)	L.M. Chudhary, 123, Gold Finch Peth, Sholapur	Weights.
(7)	Chawra Engineering Works, Balaghat Road, Gondia (S.E. Rly).	Cast Iron Weights
(8)	Ebrahim Mulla Abdultayeb, 69, Sarang Street, Bombay-3.	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(9)	Esaji Gulamhusain, 203, Janjekar Street, Bombay-3	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(10)	Fidali Gulamali, 163, Janjekar Street, Bombay-3	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(11)	Hakamchand Ishwardas, 167, Gurwar Peth, Poona-2.	Litre Measures.
(12)	Hindustan Scale Co., 186-88, Janjekar Street, Bombay-3	Beam Scales of Class 'B', 'C' & 'D'.
(13)	A.A. Kantawala, 194, Janjekar Street, Bombay-3	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(14)	Khandelwal Udyog, Khandelwal Bhawan, 166, Dr. Dadabhai Naoroji Road, Fort, Bombay-1.	Cast Iron Weights
(15)	N. J. Mehta & Co. 10, Keshabji Road, Old Church Bunder Road, Laxmi Niwas, Bombay-9.	Beam Scales of Class 'C' & 'D'.
(16)	Misrilal Motilal, 71, Sarang Street, Bombay-3	Beam Scales of Class 'B', 'C' & 'D', & Counter Machines.
(17)	Mistry Ramji Devji Katewala, Tajnapeth, Akola	Beam Scales.
(18)	Mulji Lakhmidas & Co., 193, Janjekar Street, Cutlery Bazar, Bombay-3.	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(19)	A.M. Master & Co., 179.81, Janjekar Street, Bombay	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(20)	National Scale Traders, 199, Janjekar Street, Bombay-3.	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(21)	New Honesty Engg. Works, Pelodia Manzil, Dintimkar Road, New Nagpada, Bombay-8.	Counter Machines.
(22)	Parvat Revji Mistry, Malegaon Motor Stand, Panchavati, Nasik.	Beam Scales
(23)	Patel Industries, Maasrul Tek, Old Tambat Lane, Nasik	Weights
(24)	Rajkamal Scale Co., 154, Janjekar Street, Nimakwala Bldg. Bombay-3.	Beam Scales of Class 'B' 'C' & 'D' & Counter Machines & linear Measures.

Manufacturers (Contd.)

Sl. No.	Name and Address of Manufacturer	Details of Articles manufactured
(25)	Rajkamal Iron & Metal Works, Gandhinagar Road, Kopergaon, Tal. Kopergaon, Dist. Ahmednagar.	Cast Iron Weights.
(26)	V. D. Rojani, 142, Upper Duncan Road, Bombay-8	Weights.
(27)	Ravindra Works, Gandhi School Road, C. No. 2, New Shukrawari, Nagpur.	Cast Iron Weights
(28)	Sarda Iron Industries, Opp: Nav Bharat Press, Ghat Road, Nagpur-2.	Cast Iron Weights
(29)	Snehal Trading Corporation, 49, Khaka Bazar, Bombay-3	Beam Scales of Class 'B', 'C' & 'D' & Counter Machines.
(30)	Tahira Industries (India) Private Ltd., 19/21, Manohardas Street, Bombay-1.	Measuring Instruments (Petrol Pumps)
(31)	Victory Industries, 215-A, Ripon Road, Bombay-8	Conical Litre Measures.
(32)	Wafadar Metal Industries, 446-E, Shahupuri, Kolhapur	Cast Iron Weights.
(33)	G.B. Wagh & Co., Laxmi Bhuwan, 547, Delisle Road, Bombay-11.	Counter Machines.
(34)	Yande Iron Works, 268, Sadashiv Peth, Poona-2	Cast Iron Weights.
(35)	Zenith Textile Engineering Co., 250, Ripon Road, Bombay-8.	Weights.

Repairers

Serial No.	Name and address of Repairers in Weights, Measures and Weighing Instruments
(1)	Abdul Beg Imangog Mirza, Repairer of Weights & Measures, Hanuman Wadi, Chalisgaon, Distt. E.K.
(2)	Abdul Rehman Chikte, Ahmed House, 25, Mastan Tank Road, Shop No. 3, New Nagpada, Bombay-8.
(3)	Abdul Rehman Vajeerkhan, OPP. Vyapari Mashid, House No. 7101-A, Ahmednagar.
(4)	Asha Iron Beam Scale Repairing Workshop, House No. 13/3550, Sakri Road, Dhulia (Distt. E.K.)
(5)	Asia Engineering Corporation, 13-A, Bruce Street, Fort, Bombay.
(6)	Amrat Shankar Rao, Repairer of Weights & Measures, Parli Vajinath, Distt. Bhir.
(7)	Avery Co. of India (P) Ltd., 16, Dougall Road, Ballard Estate, Bombay-1.
(8)	Balance The Correct Concern, Shop No. 1, Bharat Bldg., Sambhaji Chowk, New Mill Ward, Kurla, Bombay-79.
(9)	B. Bajaj Workshop, 492, Ulhasnagar-2.
(10)	P. K. Bajmar, Nlphad, Distt. Nasik
(11)	Bhikoba Dagdoba Jagtap, 842, Shurkwar Peth, Poona-2.
(12)	Bhujangnath Rao, Repairer of Weights & Measures, Chowk, Nanded.
(13)	Bombay Scale Repairing Works, 186, Kan-chawala Mansion, Kazi Syed Street, Bombay-3.
(14)	S. D. Chaudhari Repairing Workshop, Hanuman Wadi Moghe Building, Chalisgaon, Distt. E.K.
(15)	D. M. Chaudhari, Repairer of Sarje pura, Ahmednagar.
(16)	L. M. Choudhari Workshop, 799, Shukrawar Peth, Sholapur.
(17)	D. E. Cycle Mart & Mechanical Repairers Shop, Khamdara Shivpur (W.K.).
(18)	Deccan Scale Repairing Works, Hanuman Wadi, Chalisgaon, E.K.
(19)	Deccan Industrial Corporation, Station Road, Parbhani.
(20)	B. S. Devagherkar at Gimavana Tal Dapoli, Distt. Ratnagiri.
(21)	Deccan Scale Repairing Works, Chalisgaon, Distt. Jalgaon.
(22)	D'Mello & Co., Kasamali Khatri Chawl, Gokildas Pasta Road, Bombay-14.
(23)	Ebrahim Mulla Abdul Tayeb, 69, Sarang Street, Bombay-3.
(24)	Ganesh & Co., 24 1st Pathan Street, Bombay-4.
(25)	B. L. Godva, H. No. 1203, Ward No. 6, Chipra Distt. Ratnagiri.
(26)	G. N. Godwe & N. K. Shinde, Phadkewadi, Mahatma Gandhi Road, Ratnagiri.
(27)	B. J. Gudgekar, Kutchi Mohulla, Panvel, Distt. Kolaba.

Repairers (Contd.)

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| (28) B. R. Herman & Mohatta (India) Pvt. Ltd., Mustfa Building, Sir P.M. Road, Bombay. | (54) Misrilal Motilal, Chowk, Aurangabad. |
| (29) Herman & Mohatta (P) India Ltd., Peoples Bldg., Sir P.M. Road, Bombay-1. | (55) Misrilal Motilal, 256, Ganpati Peth, Sangli. |
| (30) Indo Aryan Traders, 71, Pipe Road, Kurla, Bombay-70. | (56) Mohan Ranchod Lohar, Station Road, No. 9, Pandharpur. |
| (31) Ideal Cottage Industries, Dharmwala Chawl, Joshi Bhuwan, Property Bazar Ward, Kurla, Bombay-70. | (57) F. T. Oliya Kantalawala, 12, Khetwadi Zaveri Bldg., Bombay-4. |
| (32) C. Jiwan, Amtoobai Clocks, Ghod Bunder Road, Opp. Bus Stop Near Petrol Pump, Bandra, Bombay. | (58) B. T. Patil & Co., 75 Raviwar Peth, Karad. |
| (33) Jai Hind Workshop, 3891, Lakshmi Road, Barshi. | (59) B. M. Patil, Bazar Peth, Roha, Distt. Kolaba. |
| (34) Jalna Industries (P) Ltd., Station Road, Jalna, Distt. Aurangabad. | (60) E. B. Patil, Scales Repairing Workshop, Near Weakly Bazar, Jillah Peth, Galgaon, Distt. E.K. |
| (35) D. N. Jathar & Co., Gamdavi Road, Sultan Buldg., Near Telephone Exchange, Office Navpada Thana. | (61) Pitru Chaya Mechanical Workshop, Main Road, Akkalkot. |
| (36) Jawahar Workshop, Bakri Bazar, Near Dwar-khadish Temple, Nandurbar, Distt. Dhulia. | (62) R. K. Phatate, 260, W-Mangalwar Peth, Shola-pur. |
| (37) S. H. Kadri & Sons, 36, New Kazi St., 1st Floor, Bombay-3. | (63) Pratapmal Sampatlal, Prop: Vijay Repairing, Loha Bazar, Jalna. |
| (38) J. D. Kambala & Co., Sada Bazar Janna, Distt. Poona. | (64) Rahamatulla, M. Naziral Chowk, Auranga-bad. |
| (39) V. J. Kambale, C/o. V. V. Shamde, Watch Maker, Maliwad Sangamner, Distt. Ahmednagar. | (65) Ramesh & Co., 514, New Mill Road, Kurla, Opp. New Model Talkies, Kurla, Bombay-70. |
| (40) Kardak & Co., 138, Vincent Road, Dadar, Bombay-14. | (66) V. R. Ramool, Husein Bhai, Davji Chawl, Navali Road, Palghar, Distt. Thana. |
| (41) A. M. Kantawala, 112, Pakwodia Street, Bombay-3. | (67) G. N. Randive, 36, Panta's Got, Satara City. |
| (42) G. A. Kantawala, Masarain Mansion, Shop No. 42, Hall Road, Kurla, Bombay-70. | (68) G. H. Samel & Co., 162, Hill Road, Bandra, Bombay-20. |
| (43) G. A. Kantawala, 204, Khotwadi Main Road, Bombay. | (69) P. K. Saikh, 5, Malhar Peth, Satara City. |
| (44) S. H. Kantawala, 203, A-Bazar Ward, Kurla, Bombay-70. | (70) Shanker Vallabh Lohar Block No. 10, Old Bakri Bazar, Nandurbar, Distt. Dhulia. |
| (45) H. R. Khan (Chopdekar), Repairing Work-shop, Karvand Road, Shirpur (Distt. W. Khandesh). | (71) V. V. Sonar, Malliwada Carvande Galli, Ahmednagar. |
| (46) Khanbhai Hiplullabhai Amreliwala, Subhash Chowk, Jalgaon (E.K. Distt.). | (72) Suresh Bros., Halay Pool Road, Makadwala Chawl, Javel, Ramas' Hall Ward, Kurla, Bombay-70. |
| (47) Kiran Traders, 10/25, Paringe House, Kaser Ali, Kalyan. | (73) G. S. Sutar, Repairers of Weights & Measures, Near Punjab National Bank, Station Road, Jalgaon, Distt. E.K. |
| (48) B. B. Korde, 36, Pantas Got, Satara City. | (74) Subhash Workshop, 3891, Lakshmi Road, Londhe Building. |
| (49) Larsen & Toubro Ltd., I.C. House, Dougall Road, Ballard Estate, P.B. No. 278, Bombay. | (75) Y. D. Shinde, 276, Shukrawar Peth, Phaltan, Distt. N. Satara. |
| (50) Madhavrao Ramji Wankhede, Blacksmith Shop, Khamgaon, Distt. Buldhana. | (76) Shripati Maruti Ghonte, Near Tanpure Math, Pondharpur. |
| (51) A.M. Marer, 2153 'C' Somwar Peth, Kolhapur. | (77) Vijaya Repairing Works, Gufur Dam Chowk, Kalyan. |
| (52) Maruti Balram Parwar, Nangaon Jali Tal, Sangamner, Distt. Ahmednagar. | (78) Vikas Co., C/o T. D. Waghulkar, 747/48, Shukrawar Peth, Poona-2. |
| (53) Mercantile and Industrial Development Co. Pvt. Ltd., National House 6, Tulloch Road, Appollo Bunder, Bombay-1. | (79) Yevankar Iron Factory, 3298, Bhand Galli, Barshi. |

MANIPUR (2)

In the November 1961 issue of *Metric Measures* a list of manufacturers, dealers and repairers of weights and measures in Manipur State was published. The following is a list of licensees further licensed by the Manipur Administration.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
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(Conversion Factor used: 1 m = 1.09361 yard)

nP/Yard nP/m	nP/Yard nP/m	nP/Yard nP/m	nP/Yard nP/m	nP/Yard nP/m	nP/Yard nP/m
1	21	23	41	45	61
2	22	24	42	46	62
3	23	25	43	47	63
4	24	26	44	48	64
5	25	27	45	49	65
6	26	28	46	50	66
7	27	30	47	51	67
8	28	31	48	52	68
9	29	32	49	53	69
10	30	33	50	54	70
11	31	34	51	55	71
12	32	35	52	56	72
13	33	36	53	57	73
14	34	37	54	58	74
15	35	38	55	59	75
16	36	39	56	60	76
17	37	40	57	61	77
18	38	42	58	62	78
19	39	43	59	63	79
20	40	44	60	64	80
89	81	89	81	89	81
90	82	90	82	90	82
91	83	91	83	91	83
92	84	92	84	92	84
93	85	93	85	93	85
94	86	94	86	94	86
95	87	95	87	95	87
96	88	96	88	96	88
97	89	97	89	97	89
98	90	98	90	98	90
99	91	99	91	99	91
100	92	100	92	100	92
101	93	101	93	101	93
102	94	102	94	102	94
103	95	103	95	103	95
104	96	104	96	104	96
105	97	105	97	105	97
106	98	106	98	106	98
107	99	107	99	107	99
108	100	108	100	108	100
109		109		109	

NAYE PAISE
PER YARD
TO
NAYE PAISE
PER
METRE

RUPEES
PER YARD
TO
RUPEES
PER
METER

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metric measures

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ABBREVIATIONS FOR METRIC UNITS

(1) DECIMAL MULTIPLES AND SUBMULTIPLES

Prefix	Value in Terms of Unit	Abbreviation
kilo	1,000	k
centi	0.01 (10 ⁻²)	c
milli	0.001 (10 ⁻³)	m
micro	0.000 001 (10 ⁻⁶)	μ

(2) WEIGHTS

Denomination	Value	Abbreviation
tonne	1,000 kg	t
quintal	100 kg	q
kilogram	1 kg	kg
gram	1 g	g
milligram	1 mg	mg
carat	200 mg	c

(3) CAPACITY

kilolitre	1 000 l	kl
litre	1 l	l
millilitre	1 ml	ml

(4) VOLUME

cubic metre	m ³	m ³ or cu m*
cubic centimetre	cm ³	cm ³ or cu m*
cubic millimetre	mm ³	mm ³ or cu mm*

(5) LENGTH

kilometre	1 000 m	km
metre	1 m	m
centimetre	1 cm	cm
millimetre	1 mm	mm
micron	1/1 000 mm or 10 ⁻³ mm	μm

(6) AREA

square kilometre	1 000 000 m ²	km ² or sq km*
square metre	1 m ²	m ² or sq m*
square centimetre	1 cm ²	cm ² or sq cm*
square millimetre	1 mm ²	mm ² or sq mm*

(7) LAND MEASURE

are	100 m ²	a
hectare	100 a ²	ha
centiare	m ²	ca

*Both these abbreviations are current, but the first set should preferably be used. The former abbreviation is used internationally.

Rules for Abbreviations:

- (1) Do not make any change, such as addition of 's' to indicate plurality e.g. write 1 kg, 10 kg, 20 g, 5 g, 10 t, 20 ml, 27 l, 165 km, 2 mm, 100 cm³, 66 km²;
- (2) Do not capitalize the abbreviations. For example, do not write 1 Kg, 2 Kg, 20 MM, 50 MM; the right way is to write 1 kg, 2 kg, 20 mm, 50 mm, etc.
- (3) Do not use any other abbreviations except those given above.

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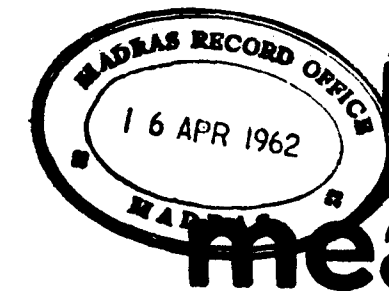
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metric measures

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Development of Weights in Madras Area : Part 2

L. RAJU

Ministry of Commerce and Industry,
New Delhi

IN the first Part of this article* the general historical background against which the variety of the more important South Indian units of weights could be discussed was briefly presented. In this Part the discussion can now be taken up.

In South India, as in the North, commercial weights were often based on multiples of local coins such as the pagoda, hun or the silver rupee coins issued by various authorities. The weight of the gold, silver and copper coins in turn was related to the gunja or ratti, which does not have a constant weight. The British tried to standardise the weights and the efforts of the Madras Government and the municipalities to assign exact values in terms of British units or rupees to the weights added to the confusion. It may, therefore, be interesting to trace the broad changes in the weights and the causes of variation of some of the principal weights. The very brief analysis taken up here may appear somewhat cursory because of the lack of full data and inadequate knowledge of local customs, traditions, prejudices, trade practices and the like.

The Madras Weights and Measures Act, 1948 (Madras Act No. XXII of 1948), which was not fully enforced, lists among others,

*See *Metric Measures*, January 1962, pp 11-16.

the following typical weights. In later discussions this table as also another given later on, would be frequently referred to. Approximate metric values are indicated in brackets against each unit.

1 tola	= 180 grains	troy
	(11.6638 g)	
3 tola	= 1 palam	(34.99 g)
8 palam (24 tola)	= 1 Madras seer	(279.93 g)
5 Madras seer (120 tola)	= 1 viss	(1.40 kg)
8 viss (960 tola)	= 1 Madras maund	(11.20 kg)
20 maund (19,200 tola)	= 20 Madras maunds or	
	1 kandy	(223.94 kg)
carat	= 1/120 of a tola	(97.2 mg)

Krishnala

The krishnala or raktika may be taken as the starting point.

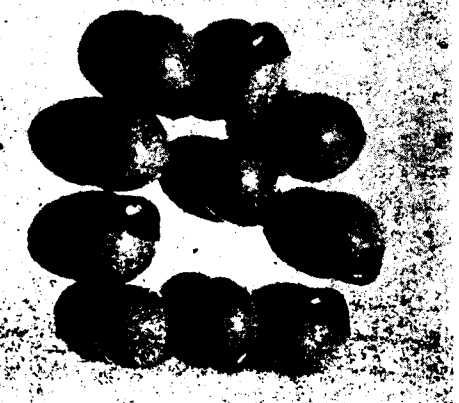


Fig. 1—The Gunja seeds. The seed is red with a spot of black. This is the basic weight for the ancient series of weights.

As shown earlier, the krishnala or gunja is the basic weight on which higher units of commercial weights were based. Its actual weight has been known to vary and many values have been obtained varying between 1.2 grains (65-130 milligrams)⁽¹⁰⁾. One of the values accepted for long was $1\frac{5}{16}$ grains (85 mg)^(3,7). Values obtained by others vary e.g. 1.75 grains (113 mg)⁽¹¹⁾, 1.8 grains (117 mg)⁽¹²⁾ while on the basis of the standard tola (180 grains) divided into 96 rattis, the value is 1.875 grains (121.5 mg).

Recently, Shri H. L. Mehandru, Controller of Weights and Measures, Delhi, carried out a few preliminary experiments on the weight of the ratti seeds available in the Delhi area and found that the value varied between 115.5 mg to 129 mg, the arithmetic mean being 124 mg (1.93 grains). This value may be taken as the unit value for the present analysis in view of the paucity of other reliable data. The weights prescribed by Manu and Kautilya and given in Part-1 are evaluated on this basis.

The two ancient authorities do not agree among themselves about the weight of the silver masha. According to Manu, the silver masha is 2 krishnala or 36 white mustard seeds but according to Kautilya it is 88 white mustard seeds. Both, however, agree that the weight of the pala is 320 krishnala.

Tola and Pagoda

The tola as a unit of weight does not seem to have been known in ancient India⁽¹¹⁾. It appears very late in the development of weights in India and may have been related with the weight of the silver coin, the rupee, minted particularly by the Muslim rulers of the North. The name of Sher Shah (1540-1545) is often mentioned in connection with the tola⁽⁸⁾ whose influence could have percolated to the South. The tola does not, however, correspond with the dharana

which weighs about 9.7 grams if Kautilya's table is considered and some 4 grams if Manu's table is taken as basis. Coins of weight 3.5-4 grams (54 to 60 grains) have been in use from ancient times in North India as well as South India. Suffice to say that the tola as a unit of weight came into use very late in the history of India and silver coins employed in 16th-19th century and later, used to weigh between 175 to 200 grains. Perhaps this variation was due to the basic weight of the ratti being taken differently by different kings and rulers.

The British tried to standardise the tola and around 1811 the Madras mint fixed its value at 180 grains which subsequently became the all-India Standard tola⁽⁹⁾. This standardisation, however, may have affected the actual mass of higher units of weights based as they were on the weight of a certain number of local silver coins. The silver rupee may have formed the basis perhaps on account of its easier availability in commercial transactions than the gold coins and because copper coins lost their accuracy due to constant circulation and could not be used as standards. The tendency to relate weights with silver coins may have arisen because of these considerations.



Fig. 2—A Series of tola weights. The 1 tola piece weighs 11.66 grams.

In South India, however, the bullion trade used a special weight which was called the pagoda and which apparently had the same weight as the gold hun. The British standardised it (in 1950) at 54.79 grains (3.550 g)⁽¹³⁾. This figure is somewhat different from

the actual weights of other pagodas or huns of old. Perhaps the value is 54.69 grams which would make it 1/8 ounce avoirdupois i.e. 2 drams. As is obvious this weight is at variance with the older value of pagoda. The star pagoda weighed 52.56 grains (3.406 g). Other huns like Anandrai (52.46 grains), Bangalore (52.87 grains), Dharwar (50.52 grains), Durgi (51.55 grains), Ikkeri old and new (52.40 grains and 52.50 grains), Madras (45.83 grains), Travancore (51.00 grains) were also known. Thus the pagoda was standardised so as to give a rational value in terms of British units, irrespective of the basic considerations. Here is one source of diversity.



Fig. 3—A set of pagoda weights used in the bullion trade. This particular pagoda weighs 3.84 grams as against the standard weight of 3.55 grams. The two pagoda weight, however, weighs 7.08 grams.

At this stage the following table of weights, compiled on the basis of weights mentioned in the various volumes of the Madras District Gazetteers⁽¹⁴⁾, may be of interest, particularly with reference to other units to be discussed later. Most of the units given below were still now in use the Madras area:

4 paddy grains	= 1 kundu seed (<i>Abrus precatorius</i>)
4 kundu	= 1 panavedai (panam weight)
8 panavedai	= 1 varahanedai (pagoda weight)
	= 54.79 grains.....I
10 varahanedai	= 1 palam
8 palam	= 1 seer
5 seer	= 1 viss
8 viss	= 1 maund
20 maund	= 1 candy

Also the following:

800 tolas	= 1 tulam
70 kundu	= 1 sovereign 123.27447 grains
	II
102 kundu	= 1 tola of 180 grains or 3 1/2 pagodas....III



Fig. 4—The panavedai or manjadi is a red seed. This particular seed shown here weighs 0.304 grams.

From the above tables, the values of kundu i.e. ratti from equations I, II and III work out to be 1.71 grains (111 mg), 1.761 grains (114 mg), and 1.765 grains (114.5 mg), respectively as against the standard value of 1.875 grains (121.5 mg). The value of the pagoda also works out to 51.43 grains on the basis of the 180 grain tola (see equation III). Thus the attempt to standardise the pagoda (i.e. hun, varaha etc.), the sovereign and other coins in terms of both Indian and British weights led to a number of values for the kundu or ratti, the basic unit. It is no wonder then that many types of weights were used in trade. A few examples may suffice to illustrate the point. The ratti is taken as 124 mg and the tola as 11.664 grams i.e. 180 grains for evaluating the various units.

Gold was usually weighed in pagodas, the standard pagoda weighing 54.79 grains (3.550 grams). In some places a large seed was used which was 1/16 of a pagoda or 2 rattis (248 mg). The fanam was also used as a weight for gold and was equivalent to 1/9 pagoda (3 5/9 rattis or 441 mg) in North Arcot, Coimbatore, Nilgiris, Malabar and in parts of Coimbatore district but 1/10 pagoda (3.2 rattis or 397 mg) in Tanjore. In Trichanapalli the fanam was 1/32 tola i.e. (3 rattis or 372 mg). The weight of Varaha i.e. pagoda differs from district to district.

In Cuddappah it is 7/24 tola (52.50 grains or 3.402 g) in Coimbatore it is 18/61 tola (53.1 grains or 3.44 g). Scents and medicines of indigenous manufacture were also weighed with weights used for gold (15).

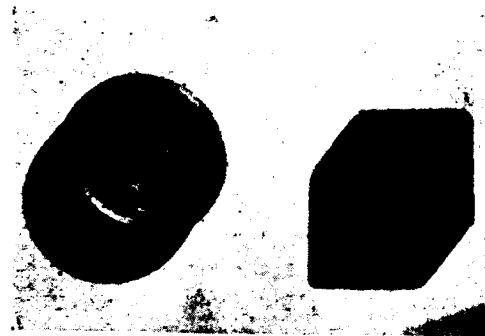


Fig. 5—Two sovereign weights. These are also used in the bullion trade. The square piece weighs 8.02 grams and the round one 7.91 grams.

Diamonds and rubies were weighed by carats in Bellary, 58 carats being equal to one tola, each carat thus being 3.1 grains (200 mg). A carat of 1/57 tola (3.16 grains or 204.8 mg) was used in Ramnad district for imitation rubies (15).

Pearls were valued on real and nominal weights. Real weights were used for purchase and nominal weights for sale. Real weight was the Mangelin (6 grains or 389 mg) which was divided into 16 parts. The nominal weight was equal to 317/1000 tola (57 grains or 3.70 grams) derived from Mangelin and divided into 64 parts. A masha of 1/12 tola was used in the Kurnool district.

It should now be clear how the variety has occurred in the smaller denomination weights of the pagoda and the tola which were mostly used for weighing gold, silver and other precious commodities.

Palam

The next important higher unit is the palam. This unit may have been derived from

the weights mentioned by Manu and Kautilya. According to both a pala weighs 320 krishnala or gunja (39.68 grams). The modern palam is 3 tolas (35 grams). Because of the large number of values which have been assigned in the past to the ratti, the palam also has tended to differ in weight. Moreover, if 3 standard tolas make the British defined palam, and each tola is equal to 96 rattis, the palam is 288 krishnala i.e. 32 less than the palam defined by Manu. On the basis of a ratti of 124 mg, the weight of 288 rattis would be 35.722 g which agrees closely with the standard of 35 g now accepted. In other words, 3 1/3 standard tolas make a palam of Manu.

If the table given earlier is to be used then 306 kundu (ratti) i.e. 37.944 g make a palam. Thus the present standard palam cannot be easily related with the old weights because its very definition has changed in the course of time and particularly by the standardization brought about by the British in terms of their own weights. The result has been that a variety of palams based on traditional values has continued to be used all over South India.

In Malabar, Tinnevely and in certain taluks in Krishna the palam is 3 3/8 tolas (39.36 g) which agrees with the Manu palam; in Malabar the ordinary palam is either 1/4 lb (116.6 g) or 1/3 lb avoirdupois (155.517 g) the pound being 40 tolas. These are close to the 3 and 4 palams of Manu. In the 19th century there was in Malabar a palam of 9 Pondicherry rupees, weighing 1624 grains or say 9 tolas (104.9 grams). In some parts of the district a palam was 10, 12, 14 and 15 tolas. In Tinnevely, the palam is exactly 1/7 pound avoirdupois (1,000 grains or 64.8 grams).

Seer

The standard Madras seer is 8 palams (24 tolas or 279.931 g). In terms of ancient

weights it would be $320 \times 8 = 2560$ krishnala = 26 2/3 tolas i.e. 317.14 grams.

The seer was often derived in older times from the weight of a certain number of silver coins i.e. rupees, or even pagodas that were current in the respective areas. The weight of the silver coins and pagodas varied from place to place, and also depending upon the period when the coin was originally minted. The variety of seers can now be examined on this basis.

In Cuddappah the seer ordinarily in use was 20 standard tolas (233.3 g) and 5 seers made a viss (i.e. 100 tolas). In Kurnool the most common seer was 21 tolas (244.9g) with a viss of 6 seers and a maund of 8 visses. Bellary and ceded districts were using a seer of 21 Mysore rupees (20.621 standard tolas).

The seer of 24.9 tolas was used by Madras butchers. This could perhaps be the seer of 80 Madura pagodas which came to 24.913 standard tolas. The palam used by butchers would then be 3 9/80 tolas—almost equal to the ancient palam. A seer of 25 tolas was in common use in one taluq of North Arcot and in part of Ramnad, while a seer of 27 tolas for firewood, vegetables, locally manufactured articles, dry fish etc. was used in Krishna district.

Besides these seers, others which contained 22, 22.5, 23.4, 24.4, 27, 32, 36, 71.5, 72, 75, 80, 82.5, 84, 105 tolas were also in use in many areas. Many of these seers may be explained on the basis of the weights of coins or foreign weights.

These variations arise because the number rupees or pagodas that go to make a seer varies. Besides, the weight of the rupee, hun, varaha or pagoda itself varied. The variation in the weight of the hun or pagoda has already been indicated. The silver rupee

and similar coins had also different weights. Thus the old Madras 'rupee' weighed 176.4 grains but the British coin of 1811 weighed 186.701 while the Mysore rupee was equal to 174.28 grains. Added to this were the European and other weights such as the Portuguese mark of 19.675 standard tolas, the Egyptian rottolo of 36.965 standard tolas, the Persian rottel of 39.78 tolas, the English troy pound of 32 tolas and the old Roman libra of 29.077 tolas.

Thus a 24 rupee seer would weigh 23 to 24 tolas depending upon which rupee was used as the basis. The Kachcha seer of Mysore, for example, was equal to 24 Mysore rupees or 24.304 tolas, while the Belgaum seer was 24 Shahpur rupees or 23.091 tolas. The Bellary seer was 21 Mysore rupees or 20.621 tolas. The Calicut seer was equal to 20 Surat rupees or 19.849 tolas, the Quilon seer was the old Dutch pound of 42.535 tolas, the Hyderabad seer was 80 Hyderabad rupees or 77.17 tolas, the Masulipattam seer was 90 Madras pagodas or 27.875 tolas and the Arkat seer was 24 palams or 70.486 tolas, the Srirangapattanam pakka seer was 84 saltani rupees (82.604 tolas (7)). Some of the seers are apparently of North Indian origin e.g. 80 tolas, 84 tolas (Jaipuri), the Malva seer of 80 Bhopal rupees (73.892 tolas), or 84 Salimsahi rupees (78.689 tolas), the Banaras seer of 105 tolas (tola being 215 grains), the Farrukhabad seer for spices which consisted of 82 tolas and so on.

Viss

The viss is generally 5 seers (120 standard tolas), but occasionally varies. In Ganjam there are visses of 118 and 180 tolas, in Kurnool, Bellary and Anantapur, the viss is six seers of 21 tolas i.e. 126 tolas; there are visses of 125 tolas and 2 3/4 lb in Vizagapatam (15). These variations can be easily

explained as the viss is based on the seer as the main unit and the variety of seers is immense as shown earlier.

Maund

The customary unit like the maund probably originated in some feature of packing and transport. In the extreme North and North West of India it was associated with a donkey-load known as 'Kharwar'. In Kashmir the donkey load was '3 maunds and 8 seers—Akbari Shahi' which implied the Akbari maund so that in this region the unit was 176 lb, a wayload for a mountain donkey but not inconsistent with the implications of the name.

Babur's 'maund of Hind' was taken as 15 lb while the Akbari maund was supposed to be 55 lb. Jehangir maintained two Indian units, Akbari and Hindustani and four foreign units, those of Iraq, Khurasan, Wilayat and Iran. The equation with which he connected them were contradictory and he used them loosely⁽¹⁶⁾. It is possible that the term maund may have come down to South India from the North.

In Southern states the maund is generally 8 visses i.e. 40 seers (960 standard tolas). Thus again we find a unit based on the seer and so reflects the variations in the seer. Additionally trade practices also introduced their own peculiarities. For example, there are special maunds in use in certain places and they consist of 1 000 tolas (40 seers of 25 tolas each) or 1,008 tolas (48 seers of 21 tolas each) 1024 tolas, 1050 tolas and 22, 24 (Seringapatam, Madras) 26, 28 lb (Mangalore). It will be extremely difficult to assign a particular basic unit to any of these maunds. The British attempted to standardize the maund unit, making it equivalent to 25 lb irrespective of its actual local value which used to be related with the actual weight of the seer. This has also contributed in no small measure to the variety.

Candy

A candy is normally 20 maunds (i.e. 800 seers). The British standardized the Madras maund at 25 lb and the candy automatically became 500 lb, a convenient unit for trade. Even then a variety of candies existed to suit the requirements of various commodities. Thus the candy for onions was 900 lb and oil cakes 1,200 lb in South Arcot, and a candy of groundnut or oil cakes etc. was 480 French pounds⁽¹⁵⁾ (French pound or livre=489.5 g).

Travancore merchants used a candy of 30 tulams (597 lb) for purchase and a candy of 20 maunds (or 500 lb) for sale⁽⁷⁾.

Tulam

The tulam was defined as equal to 144 palams or 800 tolas (9.331 kg). The palam would then work out to 5.55 tolas. Earlier it was pointed out that the Tinneveli palam was 1,000 grains=5.55 tolas.

In Madura, however, there was a tulam of 810 tolas; and in Malabar there were tulams of 1,400 and 1,500 tolas and 30 Dutch pounds and 25 lb (1,000 tolas), 32 lb (1,200 tolas), 33 lb (1,333 tolas) and 34 lb (1,360 tolas). In Travancore there was a tulam of 20 lb; in Quilon there was a tulam of 100 palams for cotton (about 16½ lb) and a tulam of about 15½ lb for spices. Malabar was using a tulam of 40 seers (or about 23½ lb)⁽¹⁵⁾.

Conclusion

This discussion shows some of the causes that may have led to the variety of weights obtaining in South India. There are a large number of other weights which have not been taken into account here. But as they are not commonly used, they have not been considered here. It is now clear that the variety arose through historical reasons but mainly because at every step

a compromise between the old and the new as, for example, between the ratti and the grain or the maund and the pound or the rupee and the seer was attempted. Every such compromise led to a new set of values for units without a change of their names.

On applying this reasoning to the present when metric weights are to be enforced

shortly all over India, it should be clear that if we have to make the best use of the rational metric system, we must give up any attempt to evaluate it in terms of old weights. If this lesson is learnt, the variety of Indian weights can be done away with early; if not, we shall continue with our chaos in weights.

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IMPORTANT TRADERS

Have you purchased your metric weights ?

The use of any other weights except metric weights will become illegal from 1 April 1962 all over the country.

Weights are now available for sale. Purchase your requirements of weights well before 1 April 1962 to avoid inconvenience and trouble later on.

French Experts Study Metric Progress in India

M. Francis Viaud, General Engineer and Head of the French Department of Measuring Instruments, and M. Louis Krach, Chief Engineer of Measuring Instruments, France, were deputed by the French Government to visit India in November and December 1961.

The purpose of the visit was to study the conditions under which the metric system was being adopted in India and the enforcement of various types of weighing and measuring instruments likely to be introduced and developed in India. The Experts toured all over the country and met most of the Controllers of Weights and Measures in the States, visited foundries producing weights etc., attended various meetings and had discussions with a number of people representing various interests. They have now submitted their report and made a number of recommendations which are now under the consideration of the Government of India and are likely to come up for discussion in the next Conference of Controllers sometime in the middle of this year.

Change in Definition of Litre

Analysing the provisions of the Standards of Weights and Measures Act, 1956, the experts have suggested that the definition of the litre should be amended and the litre be made equivalent to 1 cubic decimetre. The difference between the litre and the cubic decimetre is so small as to be negligible for most purposes. The maintenance of two definitions, one for the

litre and the other for the cubic metre, lead to incoherence. The French law has already laid down that the litre is just another name of the cubic decimetre.

It is laid down in the Standards of Weights and Measures Rules, 1958, that reference standards of weights and length should be verified every five years by the National Physical Laboratory of India. The experts recommend that the reference standards should be verified once in ten years because these standards were not subject to much wear and tear and retain their accuracy for fairly long periods.

Organizational Aspects

So far as State (Enforcement) Acts are concerned, they feel that the basic law provides for the adoption of the metric system and the establishment of the verification organization in the State under satisfactory conditions.

Studying the role of various bodies, such as the Standing Metric Committee, the Indian Standards Institution, the National Physical Laboratory of India etc., they have recommended that the Standing Metric Committee should set down the principles and follow up the legal and administrative evolution of the law relating to metrology. The specifications laid down by the Indian Standards Institution (ISI) should not be fully adopted in the laws. They should be examined by the Weights and Measures Authorities and adapted to the requirements of the law. This step is necessary because conditions under

FRENCH EXPERTS STUDY METRIC PROGRESS IN INDIA

which the specifications are drafted may be influenced considerably in favour of manufacturers and not consumers. They should also recommend representation for the Controllers of Weights and Measures in the ISI Sectional Committees concerned with various aspects of weights and measures. On the Commercial Weights and Measures Sectional Committee at least half the members should be representatives of the Weights and Measures Department.

State Enforcement Act

After examining some of the State (Enforcement) Acts and Rules, the experts recommend that there should be uniformity throughout the country regarding the specifications and methods of verification of weights, measures, weighing and measuring instruments. They also felt that the sole use of the old units should be avoided in all fields, more particularly, in public administration.

Another recommendation is that in some States, manufacturers are required to seek prior approval of the Weights and Measures Authorities of the design of weights, measures and weighing and measuring instruments they intend to manufacture. There was no such control in other States. Such control is necessary and must be exercised on manufacturers throughout the country. Every manufacturer should submit designs to the Weights and Measures Authority in advance for approval. On approval,

a few specimens should be manufactured. Scale manufacture should be allowed only after the specimen has been thoroughly examined and found satisfactory. To achieve this aim, a permanent organization should be set up under the Standing Metric Committee, to examine and approve designs of samples. This body should be advised by a Committee in which Controllers as well as the Indian Standards Institution were represented. Technicians of this organization should keep in close touch with the State (Enforcement) Organizations to ensure uniformity in the procedure for verification and inspection. Where material differences arise, they should be brought to the notice of the Advisory Committee or the Controllers' Conference.

So far as the manufacture of weights is concerned, they have recommended that as in France, cast iron weights should remain as cast, their surface should be smooth and even, so as to avoid the use of any paint or machining. Such a provision would prevent any filing or painting of the weights and it would be easier to detect defective weights.

Inspector's Equipment

For verification of commercial weights of 5 kg and above, steelyards may be used. Equal armed beam scales may be used for smaller weights. The following types of steelyards and beams were recommended:

TABLE I—PERIODICAL VERIFICATION EQUIPMENT (PORTABLE)

Sl. No.	Type	Max. Range kg.	Denominations of weights for which this type will be used	Sensitivity mg per division	Accuracy mg
(1)	Steelyard	50	50 kg (normal) 20 kg (exceptional)	2,000	2,000
(2)	Steelyard	20	20 kg & 10 kg (normal) 5 kg (exceptional)	500	500
(3)	Equal armed beams	5	5 kg to 500 g (normal) 200 g (exceptional)	50	50
(4)	Equal armed beams, Assay Balance Type	0.2	200 g to 1 g	1	1

Verification of bullion weights should be done in the laboratory against secondary standard weights using secondary standard balances.

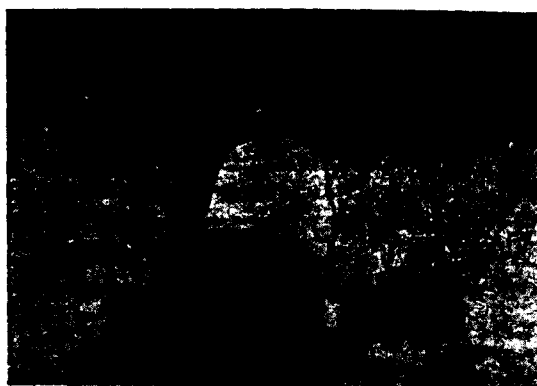


Figure - 1 : Two French Experts M. Francis Viaud and M. Louis Krach visited India recently. They visited the various States and Union Territories. They also visited M/s. Saple's Scale Manufacturing Company (Private) Ltd., Bombay. In the above picture are seen from left to right M. Viaud, M. Krach and Sarvasri Bhutani, Dhurandhar, Saple Junior and Pednekar.

On examining the specification for dispensing measures, they have pointed out that plastic materials may not have the same coefficient of expansion in all cases and this might lead to errors larger than the permissible errors.

So far as the working standard capacity measures are concerned, these are at the moment metal cylinders having equal height and diameter. In France, such metallic measures have been discarded long ago and replaced by standard measures made of glass and having graduated index. It is easy to use these glass measures and to read out the error of the measure on the graduated part of the neck. With the metal cylindrical measures, a pipette has to be used for measuring the error.

Coming to the non-flexible metre rods, the experts pointed out that the first 10 centimetres are now divided into centimetre parts and thereafter marks are provided at every five centimetres, and cross-marks at 25, 50 and 75 centimetres.

The experience of France and Europe in the last century has shown that such a measure is insufficient and it may be desirable to graduate metre rods at every centimetre, and figures or special marks provided at 10, 20, 30 centimetres and not at 25, 50 and 75 centimetres.

Suggestions for Future

On review, they opine that the work that has been done is 'worthy of the highest praise'. They have summed up their general reaction by saying: 'In the three fields—mass, volume and length—the work was wonderfully carried out'.

For the future they have a few suggestions and they feel that in a developing country like India, it is necessary to think of further avenues of work for the Weights and Measures Organization. For this purpose, it is necessary to start thinking of bringing under the purview of the Organization, the verification of the more complicated instruments like water meters, gas meters, electricity meters, etc.



Figure - 2 : The above picture shows M. Krach seated while M. Viaud standing facing him. Others in the picture are from left to right Sarvasri Pednekar, Dhurandhar and Bhutani.

In the field of scientific equipment, they feel that the National Physical Laboratory of India is well equipped and competent to meet all the requirements of India in future.

FIFTH CONFERENCE OF CONTROLLERS

As for training of Inspectors, the experts recommend that more advanced training than is being imparted in India at present is necessary. They suggest the following syllabus.

(1) General

- (a) *Composition*: It should enable those receiving training to draft reports in clear and precise language.
- (b) *Law*: General laws of the country, special laws on weights and measures, legal procedure, etc.
- (c) *Mathematics*.
- (d) *Mechanics*: including strength of materials.
- (e) *Physics*.

- (f) *Chemistry*.
- (g) *Electricity*.

(2) Special Course on Weights and Measures.

- (a) *Weighing*: (current devices).
- (b) *Capacity measures*.
- (c) *Length measures*.
- (d) *Volume measurement*.
- (e) *Gauging* (tank lorries, tank wagons, etc.).
- (f) *Liquid meters*. (water, petrol, etc.)
- (g) *Electricity meters*.
- (h) *Gas meters*.

The minimum qualification for Inspectors should be a University degree. The training should be preferably for a year, but not less than 6 months in any case.

(Contd. on P. 30)

Fifth Conference of Controllers

THE fifth Conference of Controllers of Weights and Measures was held in Jaipur on 4, 5 and 6 January 1962.

The Conference was inaugurated by Shri R.D. Dhariwal, Minister for Industries, Rajasthan. Shri K.V. Venkatachalam, Joint Secretary, Ministry of Commerce and Industry, New Delhi, presided. It was attended by Controllers of Weights and Measures in States and Union Territories and by representatives of the Ministries of Commerce and Industry, Law, Information and Broadcasting, as also the Indian Standards Institution, the Government of India Mint, Bombay, and the National Physical Laboratory.

Inaugural Speech

Welcoming the delegates the Minister for Industries said that weights and measures played an important role in life. In India,

weights and measures varied from place to place. Often even in the same place, different weights were used for weighing different commodities. In the State of Rajasthan which was formed by the integration of 22 princely states, weights and measures were in a confusing and chaotic state. There were no laws regulating the use of weights and measures. It was common to use even pieces of stone as weights. The weight of the seer varied from place to place. It was 100 tolas in Jodhpur, 86 tolas in Jaipur and 108 tolas in Bilwara. This state of affairs affected all sections of the people adversely. There was a crying need for the reform of weights and measures by adoption of a single system of weights and measures throughout the country.

Parliament decided that the metric system should be the standard system for the country

because of its simplicity and universality. Its adoption would simplify all calculations involving weights and measures and facilitate trade. The complete replacement of the weights and measures in use would be no easy task. People would not easily take to a new system in preference to the indigenous systems or to which they are used. The Controllers of Weights and Measures had an arduous task in introducing the new system. Experience in the last 5 years had been encouraging. The metric system had come into use in the Railways and in major industries like cotton and jute textiles, iron and steel, engineering, petroleum, tea, coffee, chemicals, cement, salt and paper.

In Rajasthan, the use of metric weights had become compulsory in 6 districts. In the remaining parts of the State also, the use of other weights would become illegal on 1 April 1962. Metric capacity and length measures would also be enforced throughout the State in 1962-63.

The Conference was being held, he added, at a critical stage in the reform of weights and measures. Rajasthan had made significant progress in organising the enforcement of weights and measures during the last two years. Sixteen Weights and Measures Laboratories had been established. The number would be raised to 20 in the current year. There had been considerable increase in the capacity for the production of weights and measures. Metric weights and measures had been made available in the remotest parts of the State. A campaign of publicity to familiarise people with the new weights was in progress. The transition to the new system of weights and measures in the State had been remarkably smooth and there had been very little opposition from the public.

A manufacturer in the State had been able to produce satisfactory working standard

balances used by Inspectors of Weights and Measures. This should be regarded as a significant achievement since production of balances of this sensitiveness and quality is a highly exacting task, and there were only 3 units in the whole country capable of producing them.

The success achieved by the State's Weights and Measures Department, he said, had been due to the assistance and cooperation it had received from manufacturers and traders in the State and guidance from the Central Standing Metric Committee.

Chairman's Remarks

Shri K.V. Venkatachalam, the Chairman, said that the Conference would review the progress of the reform of weights and measures in the last 5 years. During this period there had been significant gains and a foundation had been laid for the reform. Legislation had been enacted by Parliament laying down the metric system as the system of weights and measures for the whole country. Complementary legislation had been enacted by the State Legislatures to enforce this system. The State Governments had set up organisations to enforce weights and measures.

The base of the Organisation, he said, was the Inspector of Weights and Measures who visited trading establishments, verified traders' weights and measures, and advised the public and the trading community on the new system of weights and measures. About 800 Inspectors were at work in the field in the whole country. It was not an easy task to recruit, train and equip such a large force of Inspectors during the relatively short period of two to three years. Inspectors worked with standard weights and measures and sensitive balances. Production of these standards and balances was a highly exacting task. A sufficient number of the standards had been produced in the country and distributed to the States. The manufacture of

such sensitive balances as required by Inspectors of Weights and Measures was developed within the country.

In 1958 it was decided to introduce metric weights in selected areas and in major industries. In these areas and industries, the use of other weights was banned in 1960. It was proposed to make other weights illegal throughout the country on 1 April 1962. By April 1963 metric weights and measures of capacity and length would be enforced throughout the country.

The task had, however, only begun and much yet remained to be done. The public at large had yet to be educated on the new weights and measures. They still understood them imperfectly and continued to ask for things from their shop-keepers in seers instead of kilograms. Greater familiarity with the kilogram alone would persuade them to ask for their requirements in that unit.

The metric system had to be introduced in the teaching of subjects like arithmetic in schools and only that system used in all examples and illustrations. Although the metric system had been adopted in their transactions by industry, the products of industry continue to be designed in the inch-pound system. The numerous products of industry had to be redesigned in the metric system.

The role of the Conference of Controllers of Weights and Measures, he pointed out, was to pool experience and to secure uniformity of enforcement procedure throughout the country. The Conference would have its utility even after the metric system was firmly established in the country.

Shri P. N. Nayer, Secretary, Standing Metric Committee, thanked the Minister for inaugurating the Conference and the Rajasthan Government for the arrangements

made for the Conference and for the accommodation of delegates.

The following are some of its recommendations:

(1) Enforcement of Metric Commercial Weights

(a) *In areas where other weights were illegal*
Metric commercial weights had been purchased by almost all the traders in these areas. They were being used in trade by most traders with fixed establishments. Certain squatters and hawkers, however, continued to use old weights. Inspectors should pay repeated visits to markets where non-standard weights were in use and seize any such weights found in the possession of traders.

The Weights and Measures Administration had so far relied on persuasion to bring metric weights in use. It was over 18 months since the use of seer and maund weights became illegal. There was no longer any reason to show leniency to traders who continued to use non-standard weights. Controllers might prosecute recalcitrant traders who ignored warnings and used non-standard weights against the law.

(b) *In other areas*

Weights other than metric weights would become illegal in these areas on 1 April 1962. There would be a very large demand for metric commercial weights on that date. Manufacturers and dealers should be induced to hold substantial stocks of metric weights.

Traders should buy new weights now when they were plentiful and cheap instead of waiting till April 1962.

(2) Enforcement of Capacity Measures

Capacity measures other than metric measures would become illegal over specified areas in all the States on 1 April 1962.

The manufacture of metric capacity measures had begun and no difficulty was

anticipated in the supply of a sufficient number of liquid measures for trading purposes. The National Physical Laboratory had offered to verify and certify one set of measures for every manufacturer of capacity measures who sought this assistance from the laboratory.

(3) Enforcement of Metric Length Measures

The use of length measures other than metric measures would become illegal in trade throughout the country on 1 October 1962. The manufacture of metric length measures had begun and substantial stocks had already been built up. No difficulty was anticipated in the supply of commercial length measures for trading purposes.

(4) Organisation for Enforcement

Type of Organisation

The Weights and Measures Organisation should be considered as a technical Organisation manned by persons with technical qualifications and training in their specialized fields. It should be a separate Department of the State Government.

Inspectors, Deputy Controllers and the Controller should be wholetime officers without any responsibility not connected with weights and measures. The Department should be directly under the administrative control of the State Government.

Controllers

The Controller was the head of the Organisation and his duties were not of a routine nature. The Controller should be a wholetime officer of the status of a head of Department. He should have a Deputy Controller (in larger States), or an Assistant Controller (in smaller States) to assist him at headquarters.

Deputy Controllers

The Organisation would need, besides a Deputy Controller at headquarters, one

Deputy Controller for every Division or a group of districts to supervise the field work.

Assistant Controllers

The Organisation should have one Assistant Controller at the district level to supervise the work of the Inspectorial Unit.

Inspectorial unit

The Inspectorial unit was the basic administrative unit for the enforcement of weights and measures. Every such unit should consist of one Inspector of Weights and Measures, one Manual Assistant (semi-skilled) and a Peon. [Where the work load justified it, as for instance in the metropolitan areas, Clerks might be attached to the unit].

The jurisdiction of an Inspectorial unit might be 2 to 3 Taluks, depending on the size of the Taluk, or a Revenue Sub-Division. In Metropolitan areas, the jurisdiction of a unit might be limited to an area with about 3,000 establishments.

Inspectors directly recruited should be Graduates, preferably in Science or Engineering.

Laboratory

There should be a Laboratory attached to the office of the Controller under a Technical Officer of the status of an Assistant Controller. The Technical Officer would be responsible for the testing of secondary standards and balances, routine repair and maintenance of equipment and training of staff. He would be assisted by one or two Maintenance Supervisors. The Supervisors would be trained at the Bombay Mint. The duration of the training would be 3 months.

(5) Amendments to Act and Rules

(a) Central Act

The Eleventh General Conference of Weights and Measures had redefined the metre in terms of wavelengths of light emitted by Krypton 86 in place of the length

between two lines on a platinum iridium bar. The definition of the second was also slightly modified to make it more accurate.*

Both these units have been defined in the Standards of Weights and Measures Act, 1956. In view of the changes effected by the Eleventh General Conference, it is necessary to amend the Act so as to bring it in line with the latest advances in the field of metrology. Another new unit—the nautical mile—will be introduced in the Standards of Weights and Measures Act, 1956. This internationally recognised unit is to be used as the unit of length in navigation by sea or air and is equal to 1852 metres.

(b) State Enforcement Acts and Rules

In the light of the experience of enforcement gained by the States during the past few years it was found necessary to make some legal and technical changes in the State Enforcement Acts and Rules. The more interesting of these are given below:

A new provision to be made in the State Enforcement Act relates to defining what is meant by the term 'Use for transactions in trade or commerce.' The term was vague and led to difficulties in deciding whether certain transactions like paying wages for work done on the basis of units of weight or measure, tolls and duties, fees for storage of weighed or measured commodities and many others would come under the purview of the State Acts. The proposed new definition would have wide scope and cover a number of commercial transactions besides those mentioned above.

Another provision prescribes tolerances to be allowed on the net weight or measure contained in a sealed package or container. Thus a bag of sugar weighing one quintal

*The resolutions adopted by the Eleventh General Conference of Weights and Measures have been published in *Metric Measures* (September 1961, January 1962).

would have a tolerance of ± 0.1 percent (100 grams), while a cement bag should weigh within ± 2 percent of its nominal weight (50 kg) at the factory and within ± 3 percent in retail trade. Tea packs of 500 g, 200 g and 100 g and chests packed at places other than tea gardens would be allowed an error of 1 percent at the place of packing. Many other commodities would also be covered by this provision.

Traders henceforth might be required to exhibit conversion tables in a conspicuous place in their establishments. The implementation of this provision in the Enforcement Rules would facilitate transactions and help the consumer and trader to assess quantities and prices satisfactorily.

Upto now only bullion and carat weights had to be verified after every 12 months to ensure sufficient accuracy in transactions. In the light of experience gained it is now being provided that besides bullion and carat weights, weighing instruments used by factories for commercial transactions and all commercial measuring instruments wherever used should be got verified and stamped after every twelve months. Other commercial weights, measures and instruments would have to be verified after every 24 months.

(6) Weights, Measures and Instruments Manufactured in one State for Sale in Another

There was no legal bar to a weight, measure, etc. manufactured in any State being sold throughout the country provided it complied with the requirements of the Rules in the States. The Rules should not be used to impede free commerce in weights, measures and instruments within the country. Manufacturers should be permitted to appoint reputed licensed dealers as their selling agents in States other than their own.

(7) Verification of Secondary Standard Measures: Table of Weights of Distilled Water

A table of weights of distilled water of volumes corresponding to the capacities of

the secondary standard measures at different temperatures was necessary for the periodical verification of the standard measures. The National Physical Laboratory would draw up a table and send copies to Controllers.

Metric System in Timber Trade

A meeting of the Chief Conservators of Forests of the States, the Inspector-General of Forests (Ministry of Food and Agriculture), and Director of the Forest Research Institute, Dehra Dun and representatives of the Ministry of Railways, Directorate General of Supplies and Disposals, Indian Standards Institution, and the Ministry of Commerce and Industry was held in New Delhi on 19 December 1961 to consider the adoption of the metric system in the measurement of timber and timber products.

The metric system of standard units of length had been brought into force from 1 October 1961 with a one year period of transition. The continued use of yard and its multiples and submultiples would cease completely from October 1962 and it would be illegal to use any units other than the metre, square metre and the cubic metre and their secondary units in the measurement of timber and timber products.

The meeting was held to draw up a programme for adoption of these units in the timber trade in a smooth and orderly way. The following recommendations were made:

Date of Adoption

The metric system has to be adopted in transactions in timber and timber products

from 1 October 1962. From that date in all transactions, prices and quantities should be expressed in terms of metric units, namely, the metre, square metre, the cubic metre and the secondary units derived from them. The Forest Departments of State Governments and the trade should be advised to provide themselves in time with metric tapes and other measuring instruments and conversion tables.

The metric system should be adopted, as early as possible, in technical and scientific work. The Forest Research Institute, Dehra Dun, and the Forest Departments of State Governments would initiate necessary studies immediately.

Measurement of Timber**(1) Units of Measurement**

- (a) *Girth* should be measured in metres and centimetres correct to the nearest centimetre.
- (b) *Length* should be measured in metres accurate to 5 centimetres. Every length measurement should be rounded off to the next lower 5 centimetres before it is recorded.
- (c) *Volume* should be expressed in cubic metres to the second decimal place. It should be rounded off by the ordinary rule of rounding off.

(2) *Class Intervals* : Measurements of diameter, height and girth should be recorded with the following class intervals: Diameter.....Class interval of 1 decimetre (i.e. 10 cm). Girth.....Class interval of 3 decimetres (i.e. 30 cm). Height.....Class interval of 1 metre, 3 metres or 5 metres, as may be convenient.

(3) *Breast Height Measurements* : The present practice is to measure the diameters and girths of trees at a height of 4 feet 6 inches (1.37 metres). If future measurements are made at a different height, the data would not be comparable with the recorded data of the past. Breast height measurements should, therefore, continue to be made at a height of 1.37 metres.

(4) *Calculation of Volume* : The practice of calculating volumes of logs using the 'quarter girth' formula may be continued. The Indian Standards Institution would compile tables on the lines of Mercer and Nandlal's tables for use by the trade for estimating volumes of round and sawn timbers in cubic metres from dimensions in metres.

(5) *Specifications for Sawn Timbers* : The Indian Standards Institution would recommend dimensions for sawn timber in rational metric units. These would be circulated to Forest Departments of the State Governments and to the trade at least two to three months before 1 October 1962. The Railways would circulate specifications in metric units for sleepers to Forest Departments and the trade.

Metric System in Engineering Industries

THE Sixth Indian Standards Convention was held in Kanpur from 25 December to 30 December 1961. One of the sessions was devoted to 'Introduction of Metric System in Engineering Industries'. The session was presided over by Shri K.V. Venkatachalam, Joint Secretary, Government of India, Ministry of Commerce and Industry, New Delhi. In all eight papers, listed in Appendix 1, were presented in the session and the discussion occupied the entire morning session on 30 December 1961.

In his opening remarks, the Chairman said that the most complex aspect of the metric reform was in relation to the design and production aspects of the engineering industry. He then briefly indicated the

progress of the reform. He said that the use of metric weights would become compulsory all over India from April 1962, that of length measures from October 1962 and of capacity measures from April 1963. The metric system had now been adopted by all the Government departments and large government undertakings like the Railways, Posts and Telegraphs, Customs and Excise Departments, Ports, etc. Most of the organized industries, like the cotton and jute textiles, petroleum products, iron and steel, cement, paper, engineering etc. had adopted it in their transactions.

So far as the engineering industry was concerned, he said it was realised that in the matter of production and design the

change-over would have to be gradually and carefully planned. Engineers had been accustomed to the foot-pound system. Ideas and concepts had to be reoriented to the metric system. It would also take some time to redesign products to conform to the metric system. Till then the industry would have to continue to work with drawings and specifications on the foot-pound system side by side with metric units. Until complete redesigning and manufacture of products was carried out in metric units, it could not be said that the industry had adopted the metric system fully. In the meanwhile, however, the metric system had to be progressively utilised and metric standards used.

In the field of standardization, the Indian Standards Institution had revised some 72 percent of the old standards using metric units while new standards were fully metric. Many basic standards required by the engineering industry had already been made available in the metric system and a number of auxiliary standards had been completed or were being progressed. In view of the progress of standardization, the stage had now come when a beginning could be made with the adoption of these standards in various engineering activities.

The Chairman, however, sounded a note of warning that for the sake of interchangeability mere conversion of inch to metric dimensions should not be resorted to. Such a compromise would not do full justice to the metric system whose advantages were likely to be thrown away thereby. It was, therefore, necessary to introduce the metric system rationally in all our day-to-day work.

The Chairman then took up the question of production of materials to metric dimensions. The availability of raw materials to the new standards would determine the pace of adoption of the metric system. Already

steel was available in metric dimensions and steel re-rollers had decided that from April 1962 they would switch over production to metric dimensions. Products of non-ferrous metals like copper, zinc, etc. were already available in metric dimensions. As and when these materials became available, designers would have to use them. There were a few manufacturers producing drills, tapes, scales, woven metallic tapes, etc. to conform to the new Indian Standard specifications. By and large, the demand for these had not risen as expected, probably because of the vicious circle of producers not starting manufacture unless there was adequate demand and consumers wanting to be assured about availability before ordering. This vicious circle had to be broken and as more and more demand came from indentors the suppliers would start meeting this demand. Most of the larger Government organisations like the Railways and Defence Services had set up metric cells for selection of materials according to national standards. Major Engineering Associations at Calcutta have also set up their cells wherein problems arising in conversion to metric system were discussed and suitable lead given to the members.

The Chairman proposed that other engineering institutions, big or small, likewise should have small metric cells to discuss the problems of conversion and devise suitable remedies to the problems that arise. It would have to be left to each individual industrial unit to devise its own policy for conversion, after taking into consideration its own needs, the nature of its activity and the availability of materials. No general guide could be given as the problem varied from industry to industry. A few small units, perhaps, could combine and form a study group which would facilitate understanding of problems and coordination of efforts.

The Chairman also recommended to large organisations like the Railways, the Defence Services, the Military Engineering Services, Central Public Works Departments and others that they should revise their departmental specifications to conform to the Indian Standard specifications as quickly as possible. Indian Standards were now in the metric system and their adoption by these organisations would give a lead to the smaller ones and thus quicken the pace of adoption of the metric reform.

So far as training of men was concerned, the Chairman said, metric units had to be cultivated in the minds of men who actually worked with the machines. In-plant training would be necessary and organisations would have to impart it to their workers, skilled and semi-skilled, and even to personnel engaged in drawing offices and tool rooms. The problem of training appeared vast at first sight, but once undertaken it was generally found that the metric system was easy to work with, less time consuming and less cumbersome. A start could be made in the use of materials, measuring instruments etc., in the metric system and in a very little time, by usage, sufficient knowledge would have been acquired. In design offices greater effort would be necessary. Both the foot-pound and the metric systems would have to exist for a few years until the entire design and production work was carried out in metric units. It was here that intensive training was needed and the metric cells could arrange some courses for the benefit of their personnel.

In the case of machinery also the adoption of the metric system gave rise to some problems. Machine tools now produced in the inch-pound dimensions would have to be converted or certain alterations made. New dials and gauges would have to be fitted and measuring apparatus changed. By and large,

however, the changes were not of a major nature.

The Chairman also suggested that in advertisements of machinery and products published in newspapers, periodicals and technical magazines, the use of metric dimensions and units should be encouraged.

He then threw open the papers for discussion.

Discussion

The discussion showed that there was a general desire that in the standards that India adopted, a place should not be found for odd sizes which might have been converted from inch dimensions. Even if such dimensions were non-preferred, the demand might build up around them and later on they would tend to become the accepted sizes to the detriment of preferred sizes. To avoid such a danger the adoption of the metric system should mean the adoption of a pure rational metric series, not vitiated by expediency.

A few suggestions were also made for enlarging the paper; 'Notes for Training in Metric System for Engineering Industries', prepared by the Engineering Subcommittee of the Standing Metric Committee. It was suggested that a list of approved abbreviations of metric units should be incorporated in the 'Notes'.

It was also pointed out that a number of production units were having collaboration with British and American counterparts. The designs used were in the foot-pound system. With the metric change-over, it might be difficult for these units to discard the designs of the collaborators. In such cases, it was suggested that conversion to metric units might continue until such time as new designs were developed, which would be wholly in metric system. The example of Heavy Electricals Ltd., Bhopal, was cited.

A great deal of emphasis was laid on the necessity of changing over early in the field of technical education.

It was also brought out by Shri Lalchandani that conversion of machine tools did not involve any major changes and metric machine tools could be used for inch-dimensioned products in future, if necessary.

Shri Varshneya and Shri Mohile highlighted the ease with which metric system could be adopted in architectural designs and concrete structures.

Summing Up

The Chairman, summarising the discussion, said that the question as to who should start the use of the metric system earlier, the manufacturer or the consumer, had been asked very often. He felt that the larger consumers should do it first. If the Railways, public sector projects and bigger engineering concerns begin asking for their requirements in metric units, a demand would be built up and the suppliers would be forced to change over. At the same time, suppliers should also study the problems involved and be pre-

pared to supply according to requirements. In his opinion progress should be achieved by both the consumers and the suppliers, so that the gap between the supply and demand would be reduced.

In the field of technical education, a programme had already been laid down so that the change-over to the metric system would begin in 1962 and be completed by 1965. The main problems were the recalibration of equipment and preparation of necessary textbooks. The first problem was comparatively easily solved but the question of textbooks was somewhat difficult. A number of Institutes of Technology had been set up in the country with the help of countries using the metric system. They could, perhaps, help in preparing suitable textbooks. Translation or adaptation of Continental textbooks may have to be undertaken to serve the immediate needs. In the meanwhile, Indian experts should get ready to write textbooks to suit the change-over.

After a vote of thanks the session concluded at 1 p.m.

APPENDIX I

List of Papers Presented

- | | |
|--|------------------|
| (1) Planning for Change-over to Metric System in Design and Manufacture in Engineering Industry. | |
| (2) Notes for Training in Metric System for Engineering Industries | |
| (3) Utilisation of Present and Future Machine Tools for Production in Metric and Inch Terms. | M.W. Lalchandani |
| (4) Introduction of Metric System in Indian Telephone Industries Limited | D.A. Chelliah |
| (5) Progress Made by Joyti Limited for Changing Over to Metric System | M.W. Lalchandani |
| (6) Introduction of Metric System in the Field of Building, Architecture and Town Planning. | P.D. Chawla. |
| (7) Problems of Change-over to Metric System in Building Industry | J.K. Varshneya |
| (8) Metric System in the Manufacture of Precast Concrete Products | N.H. Mohile |

News & Views

Recent Notifications

(1) Corrigendum

S.O. No. 197 dated 10th January 1962.

In the Ministry of Commerce and Industry Notification published in the Gazette of India Part-II-Section 3-Sub-section (ii) dated 3rd December, 1960 as S.O. 2874 dated the 25th November, 1960, the following corrections shall be incorporated :—

In Table II (Acres and Cents to Hectares and Areas upto 100 acres) appearing on pages 3406-3411.

For the exist- ing figures against	Acres	Cents	Read	Hectares	Ares
"	2	40		0	97.12
"	2	50		1	1.17
"	5	10		2	6.39
"	7	20		2	91.37
"	7	90		3	19.70
"	12	50		5	5.86
"	13	50		5	46.32
"	14	40		5	82.75
"	20	40		8	25.56
"	22	0		8	90.31
"	25	50		10	31.95
"	26	90		10	88.60
"	30	0		12	14.05
"	32	10		12	99.04
"	46	20		18	69.64
"	47	90		19	38.44
"	55	30		22	37.91
"	55	40		22	41.95
"	59	90		24	24.06
"	66	80		27	3.29
"	72	30		29	25.87
"	91	0		36	82.63
"	93	20		37	71.66

(The original Notification, after due correction was published in *Metric Measures*, March 1961, pp. 23—28. and May 1961, p.44).

(2) Ports and Shipping

S.O. No. 255 dated 16th January 1962.

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. S.O. 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 eighteen months", the words "for a period of two years" shall be substituted.

Antarctic Region

A team of Soviet scientists lead by Dr. Alexander Afansiev will study seismic phenomena at Vostok, the Soviet Research Station at the South Magnetic Pole—the "Pole of Cold"—in November 1962.

Already the scientists have collected data about climatic phenomena which would be published. The temperature in the region ranges from 40 degrees centigrade to minus 90 degrees centigrade. On the basis of calculations, it was stated that the Antarctic Region contained 40 million cubic kilometres of ice. If the entire ice were to melt, it would raise the level of water in the seas all over the world by 70 metres.

Book Review

A GUIDE TO THE METRIC SYSTEM : by Professor V.V.L. Rao, Principal, Engineering College, Anantpur, Andhra Pradesh; published by Asia Publishing House, Contractor Building, Ballard Estate, Bombay-1, pp. 64, 1961, Price : Rs. 6.00

Professor V. V. L. Rao needs no introduction to academic circles. During a career spread over a number of years, Professor Rao has taught a variety of subjects like electrical engineering, physics, electronics and radio engineering. He is deeply interested in the different systems of units and has studied the subject thoroughly with particular reference to the metric system.

At present, the adoption of the metric system in technical institutions is of topical interest, and his latest book 'A Guide to the Metric System' should be a welcome addition to publications of this nature. The Guide is intended particularly to meet the needs of the staff and students of various institutions in India where conversion from the existing system to the metric system will be a daily necessity. The tables in this book cover a very wide range from mathematics to physics and from civil and mechanical engineering to electrical and telecommunication engineering.

There are some 70 comprehensive conversion tables useful alike to engineers, scientists and students who can readily refer to this book for conversion from the existing system to the metric system. The subtle differences between the CGS and MKS systems, which the author calls the new metric system, have been clearly indicated. It is to be emphasised that the two systems, the CGS and MKS are

not in any way different from each other, the essential difference between the two being that the MKS system deals with practical units and adopts the units defined internationally whereas the CGS system uses units defined long back. There is the same fundamental relationship between the various units in the two systems.

The 70 tables published include the usual conversion of linear measures, square measures, volumetric measures, capacities, weights, stresses, pressures etc. In Table 32, showing values for accurate calculations, the equivalent of an inch had been given as 2.539956 cm. Similarly, a lb is given as 0.4535923 kg. So far as India is concerned, these values should be 2.54 (exactly) and 0.4535923 kg as the latter have been prescribed in the Standards of Weights and Measures Act, 1956. A few minor errors in abbreviations are also noticed, e.g., kilometre is given as Km instead of km. The abbreviation of newton is 'N' and not Nw. The abbreviation for Deca is da, not 'D'. In spite of these minor errors, the book is a very useful compendium of all tables required by technologists and students.

Interesting features of this Guide include the explanation of the fundamental principles of the units of force, work and power. The speciality of the MKSA system, wherein the watt and the joule are the units of power and energy common to both mechanical and electrical units, has been highlighted. Similarly, the relative magnitudes of the three forces,

*See *Metric Measures*, September 1961, pp. 23-24

newton, kg (force) and 1 lb (force) and of the erg, joule and the foot-pound are explained in an interesting manner.

Numerous tables of units used in electromagnetism, both electromagnetic and electrostatic units of electricity, the table of General Constants and a fairly exhaustive table of the MKSA and British Units for electric quantities are included in this valuable Guide.

It is hoped that this publication will meet

the immediate demand of people in technological institutions in the present context of the adoption of the metric system in engineering colleges and polytechnics from the coming academical year in the first and second years of their respective courses, and for other classes in the subsequent years, the programme being completed by 1964-65.

The book is very well got up by the Asia Publishing House.

Readers' Forum

You and Metric Units

(Shri Joginder Singh Bakshi, Inspector, Weights and Measures, Yamunanagar (Distt. Ambala), Punjab has sent the following which would be of interest to all the people. It will be remembered that Shri Bakshi has written *A Hand Book of Metric Weights & Measures*. This was reviewed on page 33 of *Metric Measures*, Vol. 4 No. 2 (March 1961) Issue.—Editor.

Metric weights have now come into compulsory use in the notified areas throughout the country. Old weights of seers and pounds have been replaced by metric weights.

Now that there is legal compulsion to carry out transactions in metric weights, traders are obliged to use new units. A few traders who stealthily use old type weights cause annoyance in the markets and they are to be prosecuted in the court and punished with heavy fines.

The superiority and simplicity of the metric system lies in its decimal steps. It is a little confusing in the beginning for a common trader and a layman to use these steps. Even if transactions are done completely in new units and in terms of rational metric weights he finds difficulty in working out prices and quantities of commodities. This is more so with frac-

tions of the new units. All this leads to irritating calculations and leaves the purchaser baffled. Traders and consumers would be saved a good deal of trouble if they get guidance on how to transact conveniently in terms of the new units.

To facilitate calculations a few workable formulas are given here with illustrations. They may be useful in every day transactions.

Weights

1. *As many Rupees per quintal so many Naye Paise per kilogram.*

For example: The rate of wheat is Rs. 53.00 per quintal. To calculate the value of 12 kilograms. Directly the value of one kilogram is 53 nP and so price of 12 kg = $12 \times 53 \text{ nP} = \text{Rs. } 6.36$.

2. *As many Rupees per kilogram so many Naye Paise per 10 grams.*

For example: Cashewnuts are Rs. 9.00 per kilogram. Calculate the value of 50 grams—Directly the price of 10 grams is 9 nP and so the price of 50 grams is 45 nP.

(b) If the rate of chillies is Rs. 4.00 per kilogram and a customer asks for chillies worth 12 nP. Directly the value of 10 grams is 4 nP and as such he can claim 30 grams for 12 nP.

3. *As many Naye Paise per kilogram one tenth so many Naye Paise per 100 grams.*

For example: If tomatoes are 80 Naye Paise per kilogram, calculate the value of 300 grams—Directly the price of 100 grams = $80/10 = 8$ nP. Therefore, the price of 300 grams = 24 nP.

4. *As many Rupees per 10 gram as many Naye Paise per 100 milligram.*

For example: If the rate of gold is Rs. 120.00 per 10 gram, find the value of 700 milligrams—Directly the price of 100 milligrams is Rs. 1.20 and so the price of 700 milligrams is $7 \times 1.20 = \text{Rs. } 8.40$

Capacity and Length Measures.

What applies to weights is also true for capacity and length measures.

5. *As many Naye Paise per litre one tenth so many Naye Paise per 100 millilitres.*

For example: If the rate of milk is 80 nP per litre calculate the value of 400 millilitres—Directly the value of 100 millilitres is $80/10 = 8$ nP.

Therefore, the price of 400 millilitres is = 32 nP.

6. *As many Rupees per metre as many Naye Paise per centimetre*

For example: The rate of worsted cloth is Rs. 24.00 per metre, calculate the value of 40 cm. The price of one cm is 24 nP as such the price of 40 cm = $40 \times 24 = 960$ nP = Rs. 9.60.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur).

Indian Standard for Split Cotter Pins (IS: 549—1961)

The Indian Standards Institution has just published IS: 549—1961 Specification for Split Cotter Pins (Revised), which covers requirements and tests for ferrous and non-ferrous split cotter pins.

Consequent to the decision of the Government of India to change over to the metric system, the 1954 edition of this standard has

been revised on the basis of the latest document of the International Organisation for Standardization, as far as dimensional requirements are concerned. The method of designation has been modified and changes have also been made in the requirements as regards materials, packing etc.

Price : Rs. 1.50

Indian Standard for Dimensions of Ends of Bolts and Screws (IS: 1368—1962)

The Indian Standards Institution has just published IS: 1368—1961 Dimensions of Ends of Bolts and Screws, which gives the dimensions of ends of bolts and screws of

STANDARDS NEWS

thread diameters 1 to 39 produced by cutting or rolling processes.

In line with the decision of the Government of India to change over to the metric system of weights and measures, this Institution has decided to adopt the metric screw threads as recommended by the relevant Technical Committee of the International Organization of Standardization. A series of Indian Standards relating to screw threads and threaded fasteners is being issued, and this standard is a necessary adjunct to the Indian Standards for threaded fasteners.

Price : Re. 1.00

Indian Standard for Aluminium Milking Pails (Hooded Type)—(IS: 1792—1961)

The Indian Standards Institution has just published IS: 1792—1961 Specification for Aluminium Milking Pails (Hooded Type), which prescribes the quality and dimensional requirements for aluminium milking pails (Hooded type) of 10—, 15— and 20—litre capacities.

An ideal milking pail has to be designed in such a way as to prevent dust, chaff and other undesirable foreign substances from getting into the milk at the time of milking. This standard has been drawn up after giving due consideration to this point.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

Price : Rs. 1.50

Indian Standard for Dimensions for Milling Cutters (IS: 1831—1961)

The Indian Standards Institution has published IS: 1831—1961 Dimensions for Milling Cutters. This standard lays down dimensions for various types of milling cutters. It also specified dimensions and tolerances for keys and keyways, tenons and cross slots for drives.

Milling cutters are used for removing metal and also to obtain formed profiles. In this standard a number of types and sizes of milling cutters, which are useful for general engineering purposes, is included.

Metric system has been adopted in India and all dimensions appearing in this standard have been given in this system.

Price : Rs. 6.50

Indian Standard for Reamers (IS: 1836—1961)

The Indian Standards Institution has just published IS: 1836—1961 Specification for Reamers. This standard relates to the commonly used types of reamers, namely, parallel hand and machine reamers, chucking reamers with parallel and taper shank, socket reamers for Morse tapers with parallel and taper shank, taper pin hand and machine reamers, machine bridge reamers, and shell reamers.

Reamers are tools for finishing drilled holes to close tolerances required for precision assemblies. In this standard a number of types and sizes of reamers used for general engineering purposes has been included.

Metric system has been adopted in India and all dimensions in this standard have been given in this system.

Price : Rs. 5.00

Indian Standard for Dimensions for Shank Diameters and Driving Squares for Rotating Tools (IS: 1850—1961)

The Indian Standards Institution has just published IS: 1850—1961 Dimensions for Shank Diameters and Driving Squares for shanks and dimensions for external and internal squares provided for rotating small tools.

Squares are provided on the shank ends of small tools, such as reamers and screwing taps for holding and driving. In some cases, an internal square is provided.

Price : Rs. 1.50

Indian Standard for Studs (IS: 1862—1961)

The Indian Standards Institution has just published IS: 1862—1961 Specification for Studs, which covers the requirements of precision grade studs intended for use in steel and cast iron.

Pursuant to the decision of the Government of India to adopt metric system of weights and measures throughout the country, the Indian Standards Institution has recognized the metric screw thread. The Institution is engaged in making available various standards on threaded fasteners based on the metric screw thread, and this standard is one of a series of such standards, other standards in the series being :

IS: 1363—1960 Specification for black Hexagonal Bolts (6 to 39 mm) with Nuts and Black Hexagonal Screws (6 to 24 mm).

IS : 1364—1960 Specification for Precision, and Turned Hexagonal Bolts (6 to 39 mm) with Nuts and Hexagonal Screws (6 to 39 mm).

Price : Rs. 2.50

Draft Indian Standard for :

- (1) Structural Steel (Ordinary).
- (2) Structural Steel (Draft Revision of IS: 226—1958) and
- (3) High Tensile Structural Steel (Draft Revision of IS: 961—1957)

The Indian Standards Institution has prepared three draft Indian Standards Specifications for Structural Steel (Ordinary), Structural Steel, and High Tensile Structural Steel.

Draft Standard for Structural Steel (Ordinary) relates to the so-called "untested steel" being marketed in the country, and covers two grades of steel in the form of plates, sections and bars (round, square, hexagonal, flat etc.).

Draft standard for structural steel covers requirements for two grades of steel (A and ASW) for steel plates, sections and bars (round, square, flat, hexagonal, etc.) for use in structural work. This standard was first issued in 1950 and was subsequently revised in 1955 and 1958. In this third revision, the yield strength of steel has been increased based on the past experience and steel has been classified according to its chemical composition.

High tensile steels are a specific class of steels in which enhanced mechanical properties, and in most cases increased resistance to atmospheric corrosion, are obtained by the incorporation of low proportions of one or more alloying elements besides carbon. These steels are generally intended for application where saving in weight can be effected by reason of their greater strength, and atmospheric corrosion resistance. This standard covers the requirements of High Tensile Structural Steel (including fusion welded quality) used in bridges and general building construction. This standard was first issued in 1957 and in this revision the tensile strength and yield stress values have been revised.

These draft standards will be circulated shortly to interested producers, consumers, and technologists for eliciting technical comments and will be open for comments for a period of three months from the date of circulation. The comments will be taken into consideration before the draft standards are finalized.

Draft Indian Specification for Steel Tubes for Structural Purposes (IS: 1161—1958)

The Indian Standards Institution has prepared a draft revision of IS: 1161—1958 Specification for Steel Tubes for Structural Purposes.

IS: 1161 which was published in 1958, specifies the requirements for plain carbon

steel tubes for structural purposes and does not cover tubes required for pressure purposes. With a view to rationalizing the sizes and weights of tubes used in this country, the sizes and weights of tubes for structural purposes have been kept the same as those specified in IS: 1239—1958 Specification for Mild Steel Tubes and Tubulars (draft revision of which is under circulation). The erratum issued earlier has also been incorporated in this revised standard.

This draft revision (which is in English) will be circulated shortly to interested producers, consumers and technologists for eliciting technical comments and will be open for comments for a period of three months from the date of circulation. The comments will be taken into consideration before the draft standard is finalized.

Draft Indian Standard for Mild Steel Tubes and Tubulars (IS: 1239—1958)

The Indian Standards Institution has prepared a draft Revision of the Indian Standard Specification for Mild Steel Tubes and Tubulars, IS: 1239—1958.

IS: 1239, which was first published in 1958, specifies the requirements for three classes of mild steel screwed tubes and tubulars and plain-end steel tubes, designated as 'Light', 'Medium' and 'Heavy'. In this draft revision, it has been clarified that tubes conforming to this standard are suitable for conveying gas, water and steam. In the case of tubes suitable for steam services, the maximum temperatures and pressures up to which they are suitable are also indicated.

This standard covers the requirements of welded and seamless, screwed and socketed mild steel tubes and tubulars and of plain-end steel tubes, suitable for screwing to pipe-threads conforming to IS: 554—1955 Specification for Pipe Threads for Gas List Tubes and Screwed Fittings, of nominal bores ranging from 6 to 160 mm. Three grades of

thicknesses have been included in this standard which are designated as 'Light', 'Medium' and 'Heavy'.

This draft standard (which is in English) will be circulated shortly to interested producers, consumers and technologists for eliciting technical comments for a period of three months from the date of circulation. The comments will be taken into consideration before the draft standard is finalized.

Draft Indian Standard Specification for Slotted and Castle Nuts and Hexagon Socket Head Cap Screws

The Indian Standards Institution has prepared two draft Indian Standard Specifications, one for Slotted and Castle Nuts, and the other for Hexagon Socket Head Cap Screws.

Draft Standard for Slotted and Castle Nuts deals with commonly used types of castle and slotted nuts made in three grades of accuracy, in the diameter range 4 to 39 mm. The socket head cap screws specified in draft standard for Hexagon Socket Head Cap Screws are employed in machine tool and allied industries and only the precision grade of cap screws has been included keeping in view the demand in the country. These two standards belong to a series of Indian Standards being prepared by ISI on metric screw threads and fasteners.

These draft standards will shortly be put into wide circulation to all interests concerned for eliciting technical comments which will be given due consideration before finalizing the drafts as Indian Standards.

Draft Indian Standard for Taper Keys and Keyways

With a view to ensuring the interchangeability to plain taper keys, component commonly used in transmission of power, the Indian Standards Institution has prepared a draft Indian Standard Specification for Taper Keys and Keyways.

This draft standard covers the dimensions and tolerances for plain taper keys and

keyways for various shaft diameter ranges, and specifies the material for keybars and preferred lengths of keys for various cross-sections.

The draft will be circulated shortly to interested producers, consumers and technologists for eliciting technical comments, which will be taken into consideration before finalizing the draft as an Indian Standard.

Draft Dimensional Standards for :

- (1) Sizes and Thicknesses of Aluminium and Aluminium Alloy, Sheet and Strip,
- (2) Sizes of Wrought Aluminium and Aluminium Alloy, Plate,

(3) Sizes of Round Aluminium and Aluminium Alloy, Drawn Tube, and

(4) Diameters of Drawn Aluminium and Aluminium Alloy Wire.

The Indian Standards Institution has prepared four draft dimensional standards on the subject mentioned above. These draft standards have been prepared with a view to simplifying and rationalizing the various metric sizes of aluminium and aluminium alloy wrought products.

These draft standards will shortly be circulated.

(Contd. from p. 13)

It would be preferable to have a Central Training Institute where the Inspectors of all the States could be trained. If this is not practicable, 2 or 3 centres may be set up at suitable points in the country.

In addition to training Weights and Measures Inspectors, the experts also recommend that it is necessary to build up a corps of Weights and Measures Engineers. These Engineers would be specialised in weighing and measuring instruments. Persons with a degree of Bachelor in Science and Technology should be selected for training. Initially 10 or 20 qualified Engineers may be sent for training to France.

An important recommendation is that the Controllers and Inspectors of Weights and Measures should not under any circumstances be saddled with responsibilities not connected with weights and measures enforcement in the country. It is also necessary, according to them, that the Inspectors should be supplied with well equipped staff cars. It is not necessary to give each Inspector a staff car, but one car could be used in turn by a number of Inspectors for inspection and verification. Such a provision will also ensure efficiency of verification and is important for surprise inspection and checks.

Licensed Manufacturers, Dealers and Repairers of Weights and Measures(18)

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 eighteenth 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 the *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 of the Union Territory. The issues of the *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 940 manufacturers, 3512 dealers, 779 repairers. The details of published information are as follows :

Sl. No.	State/Union Territory	Licensees		
		Manu- facturers	Dealers	Repairers
1.	Andhra Pradesh	40	84	31
2.	Assam ..	11	44	16
3.	Bihar ..	20	69	34
4.	Delhi ..	22	76	19
5.	Gujarat ..	107	544	132
6.	Himachal Pradesh	1	28	1
7.	Kerala ..	27	354	81
8.	Madhya Pradesh	115	496	9
9.	Madras ..	79	210	37
10.	Maharashtra ..	95	163	185
11.	Manipur ..	9	85	5
12.	Mysore ..	75	399	41
13.	Orissa ..	14	17	1
14.	Punjab ..	36	150	26
15.	Rajasthan ..	16	69	18
16.	Tripura ..	1	9	0
17.	Uttar Pradesh	207	515	88
18.	West Bengal ..	65	200	55
		940	3,512	779

HIMACHAL PRADESH (3)

In the November 1960 and March 1961 issues of 'Metric Measures' lists of licensed manufacturers, dealers and repairers in Himachal Pradesh Administration were published. The following is a list of Dealers subsequently licensed under the Rajasthan Weights and Measures (Enforcement) Act, 1958 as extended to the Union Territory of Himachal Pradesh and Rules framed thereunder.

Dealers

Sl. No.	Name and Address of Dealer	Details of articles sold
(1)	Gobind Ram Anant Ram, Gohar Bazar, Bilaspur	Weights and Measures.
(2)	Goel Bros., Hardware Merchants, Dogra Bazar, Chamba	Cast iron weights, brass weights 50g to 10g.
(3)	Jagan Nath Prem Sagar, General Merchant, Chowari Bazar, Tehsil Bhatiyat, District Chamba.	Weights and Measures.
(4)	Multi-Purpose Co-operative Society, Banikhet, District Chamba.	Weights and Measures.
(5)	Munshi Ram Roshan Lal, General Merchant, Theog, Mahasu District.	Cast Iron and Bullion Weights.
(6)	Nand Lal & Sons, Gandhi Chowk, Mandi	Cast Iron, Brass & Bullion Weights, Conical capacity measures.
(7)	Paras Ram Devi Dass, Bhaujraru, Tehsil Tissa, District Chamba.	Weights and Measures.
(8)	Partap Chand Milkhi Ram, Hardware Merchants, Theog, District Mahasu.	Cast Iron Weights, Brass Weights, Beam Scales class C. & D. Metre.
(9)	Sharma Bros., The Mall, Solan, Mahasu District	Weights, Beam Scales.
(10)	Tara Chand, Kasumpti Bazar, Mahasu District	Cast Iron and Brass Weights, Beam Scales C. & D. Capacity Measures, Metre.
(11)	Wadhawa Mal Hari Chand, Chowgan Bazar, Chamba ..	Weights, capacity and length measures, beam scale.

KERALA (7)

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

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of articles manufactured
(1)	K. Chellappan Achary, Palaparambu Madom, Cullen Road, Mullackel, Alleppey.	Beam Scales (Class C. & D.).
(2)	Malabar Fisheries Company, Chaliyam P.O., (Via) Feroke	Capacity Measures.
(3)	HTW & NLWI Concern, Vellayil, Calcutta	Capacity Measures (Liquid and Dry).
(4)	T. T. Mohamed Koya, The Best Ox Brand Steel Trunk Works, Calicut.	Do.
(5)	Mukunda Agricultural Implements and Steel Trunk Works, Near Karimbana Bridge, Badagara.	Do.
(6)	V. Palani Achari, Ulladamparambu, Alleppey	Beam Scales.
(7)	Palliveed Industries, Tobacco Street, Calicut	Do.
(8)	Praveen Industries, P.O. Kadalundi, Via Feroke ..	Capacity Measures (Conical and Dry).
(9)	C. K. Sankunni Nair, Cloth Bazar Road, Ernakulam ..	Capacity Measures (Conical Type).

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	K. Abdul and Brothers, Stationery Merchant, Main Bazar, Taliparamba.	Weights, Measures, Weighing and Measuring Instruments.
(2)	A. S. Aboobacker sait, Hardware Merchant, Marakada Road, Chalai, Trivandrum.	Weights, Measures, Weighing and Measuring Instruments.
(3)	M. Abdulsalam, Salam General Stores, Nedumangad P.O. Trivandrum District.	Weights, Measures, Weighing and Measuring Instruments.
(4)	P. Achutha Bhaktha, Merchant, Feroke, Nileswaram P.O.	Weights, Weighing and Measuring Instruments.
(5)	P. K. Antony, Hardware Stores, Main Road, Pudukad	Weights and Measures.
(6)	Ahmed and Brothers, Camp Bazar, Cannanore	Weights, Measures, Weighing and Measuring Instruments.
(7)	K. S. Balakrishnan Nair, Kudukail House, Chemmanathukara, Vaikom.	Weights, Measures, Weighing and Measuring Instruments.
(8)	Bharath Repairing and Sales Corporation, Cannanore	Weights, Measures, Weighing and Measuring Instruments.
(9)	Bhima and Brothers, Jewellers, Mullackal, Alleppey ..	Bullion Weights
(10)	Bhaktha Brothers, Hardware and General Merchants, Kasargod.	Weights and Measures.
(11)	K. P. Chacko, Hardware Merchant, Edathuva	Weights, Measures, Weighing and Measuring Instruments.
(12)	K. V. Chandy, Hardware Merchant, Thiruvalla	Weights, Measures, Weighing Instruments.
(13)	M. M. Chacko, Jewellers, Changanacherry	Weights and Weighing Instruments.
(14)	S. Damodara Pai, Hardware Merchant, Alleppey	Weights, Measures, Weighing and Measuring Instruments.
(15)	Edathil Kadiri and Sons, Merchants, Manantoddy, P.O.	Weights, Measures, Weighing and Measuring Instruments.
(16)	K. K. Gopalan Nair, Jayachandra Hardwares, Alleppey	Weights, Measures, Weighing and Measuring Instruments.
(17)	P. S. George, General Merchants, Edathua	Weights, Measures, Weighing and Measuring Instruments.
(18)	A. Hassankunju, Hardware Merchants, Kayamkulam ..	Weights, Measures, Weighing and Measuring Instruments.
(19)	Hilal Traders, Main Road, Tellicherry	Weights, Measures and Weighing Instruments.
(20)	Hajee K. Beeran and Company, Merchants, Payyannur	Weights, Measures, Weighing and Measuring Instruments.
(21)	M. A. M. Haneefa and Brother, Brass Vessel Merchants, Chalai, Trivandrum-I	Weights, Measures, Weighing and Measuring Instruments.
(22)	Hameedia General Stores, Nedumangad	Weights, Measures, Weighing and Measuring Instruments.
(23)	Industrial Sales Agencies, Kottayam	Weights, Measures, Weighing and Measuring Instruments.
(24)	V. J. Ittiavira, Iron Merchant, Ponkunnam	Weights, Measures, Weighing and Measuring Instruments.
(25)	M. Ismail Kunju, Ismail Stores, Nedumangad	Weights, Measures, Weighing and Measuring Instruments.
(26)	V. P. Janardhana Shenoi, General Merchant, Muttatheyili, Shertallay.	Weights, Measures, Weighing and Measuring Instruments.
(27)	V. Janardhanan Pillai, Hardware Merchant, Ambika Stores, Attingal.	Weights, Measures, Weighing and Measuring Instruments.
(28)	K.A.S. Jainudeen and Company, General Merchants, Chowghat.	Weights, Weighing, and Measuring Instruments.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(29)	T.T. Joseph, Hardware Merchant, Kandassankadavu ..	Weights and Measures.
(30)	K. Kesava Reddiar, Gold and Jewellery Merchant, Main Road, Quilon.	Bullion Weights and Weighing Instruments.
(31)	Keloth Moidu Hajee, Thirumana Bazar, Villiappally ..	Weights, Measures, Weighing and Measuring Instruments.
(32)	K.K. Kunju Marakar and Sons, Hardware Merchants, Jews Street, Ernakulam	Weights, Measures, Weighing and Measuring Instruments.
(33)	M.V. Kunju Palu, C/o, M.D. Vareeth, Hardware Merchant, High Road, Trichur.	Weights and Measures.
(34)	P.V. Kurian, Hardware Merchant, Athirampuzha ..	Weights and Measures.
(35)	Kerala Hardwares, New Bazar, Alleppey ..	Weights, Measures, Weighing and Measuring Instruments.
(36)	Kovoor Brothers, Hardware Merchants, Thiruvella.	Weights and Measures.
(37)	Kalathil Gopi, Pradeep Industries, Chowghat ..	Weights and Measures.
(38)	T.T. Mathew, Hardware and Stationery Merchant, Market Road, Irinjalakuda.	Weights, Measures, Weighing and Measuring Instruments.
(39)	M.A. Moideen, Sheriif Stores, Hardware Merchant, Big Bazar, Palghat.	Weights, Measures, Weighing and Measuring Instruments.
(40)	E. Muthuswamy and Brothers, Swamy Jewellery, Big Bazar, Palghat.	Bullion Weights and Weighing Instruments.
(41)	P.J. Mathew, Kaithakam Mart, Kottayam ..	Weights, Measures, Weighing and Measuring Instruments.
(42)	K. Mohan Das and Brothers, Hardware Merchant Big Bazar, Alleppey.	Weights, Measures, Weighing and Measuring Instruments.
(43)	P. Madhavan Thampi, Brass Vessel Merchant, Chalai, Trivandrum	Weights and Measures.
(44)	P.L. Mathew, Hardware Merchant, Kanjirappally ..	Weights, Measures, Weighing and Measuring Instruments.
(45)	C.M. Mammu, General Merchant, Cannanore P.O.	Weights and Measures.
(46)	K.K. Mathai and Sons, Hardware Merchants, Changanacherry.	Weights and Weighing Instruments.
(47)	N. Maideen Kannu, Merchant, Chalai, Trivandrum ..	Weights, Measures, Weighing and Measuring Instruments.
(48)	T.M. Mohammed Abdul Khadar, Chalai, Trivandrum ..	Weights, Measures, Weighing and Measuring Instruments.
(49)	M.K.M. Maluk Mohammed, Hardware Merchant, Chalai, Trivandrum.	Weights, Measures, Weighing and Measuring Instruments.
(50)	P. Mammoo, Stationery Merchant, Villiappally, Via. Badagara	Weights, Measures, Weighing and Measuring Instruments.
(51)	M.A. Mohammed, Brass Vessel Merchant, Chalai, Trivandrum.	Weights, Measures, Weighing and Measuring Instruments.
(52)	S. Nainar Pillai, Hardware Merchant, Muttam Bazar, Shertallai.	Weights, Measures and Weighing Instruments.
(53)	G. Narayana Pai, C/o. G.N. Pai and Company, Hardware Merchant, Kottayam.	Weights, Measures, Weighing and Measuring Instruments.
(54)	T. M. Ouseph and Sons, Hardware Merchants, Kandassankadavu.	Weights, Measures, Weighing and Measuring Instruments.
(55)	Peeyer and Sons, Kottayampil, Koothuparamba, Tellicherry	Weights, Measures, Weighing and Measuring Instruments.
(56)	Pallikkandy Uommarkutty and Brothers, Camp Bazar, Cannanore.	Weights, Measures, Weighing and Measuring Instruments.
(57)	A.P. Packery, Hardware Merchant, Taliparamba ..	Weights, Measures, Weighing and Measuring Instruments.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(58)	Paul and Mathew, Jewellers, Trichur ..	Bullion Weights and Weighing Instruments.
(59)	M. Raghunath, Vaman Baliga, Car Street, Manjeshwar ..	Weights and Measures.
(60)	D. Rama Pai, Usha Hardwares, New Bazar, Alleppey ..	Weights, Measures, Weighing and Measuring Instruments.
(61)	D. Raghavendra Kamathy, Mohan Hardware Stores, Shertallai.	Weights, Measures, Weighing and Measuring Instruments.
(62)	K.V. Raman, Copper and Brass Vessel Merchant, Main Bazar, Payyannur.	Weights, Measures, Weighing and Measuring Instruments.
(63)	K. Rajappan Achary, Raja Brother Jewellers, Mullakkal, Alleppey.	Weights, Measures, Weighing and Measuring Instruments.
(64)	K. Rajarathinam, Hardware Merchant, Mannarghat ..	Weights, Measures, Weighing and Measuring Instruments.
(65)	T.O. Rappai, General Merchant, Kandassankadavu, Trichur	Weights and Measures.
(66)	T.V. Sadasivan, Merchant, Mannarghat, Palghat ..	Weights, Measures, Weighing and Measuring Instruments.
(67)	M. Sadananda Pai and Company, Tellicherry ..	Weights, Measures, Weighing and Measuring Instruments.
(68)	V. Shira Shenoi, Hardware Merchants, Tellicherry ..	Weights and Measures.
(69)	South India Central Stores, Mundakkayam ..	Weights, Measures, Weighing and Measuring Instruments.
(70)	W.S.M. Sulaiman, Wavoo Sons, Jewellers, Thirunakkara, Kottayam.	Weights and Weighing Instruments.
(71)	N.P. Thomas, Stationery and Hardware Merchant, Athirampuzha, P.O. Kottayam	Weights, Measures, Weighing and Measuring Instruments.
(72)	Thottan Kunjippalu Rappai and Sons, Jewellers, Trichur	Bullion Weights and Weighing Instruments.
(73)	T.A. Varghese, Hardware Merchant, Market Road, Irinjalakuda.	Weights, Measures, Weighing and Measuring Instruments.
(74)	L.N. Venkitarama Gouder and Sons, Hardware Merchants, Palghat.	Weights, Measures and Weighing Instruments.
(75)	Venugopal Stores, Hardware Merchants, West Gate, Vaikom	Weights and Measuring Instruments.
(76)	B. Yahia Firm, Hardware Merchant, Camp Bazar, Cannanore	Weights, Measures, Weighing and Measuring Instruments.

Repairers

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	P.K. Abdul Karim, Thattakatta, thekethil Voedu, Karunagappally.	Weights, Measures and Beam Scales.
(2)	P. M. Abdul Khadar, Hardware Merchant, Main Road, Tellicherry.	Weights and Beam Scales.
(3)	Alleppey Metal Industries, Near Stone Bridge, Alleppey ..	Weights, Measures and Beam Scales (Class C&D).
(4)	Ambalaparambil Ayyappan, P.O. Kadalundi ..	Weights and Beam Scales.
(5)	Arumughom Achary, Thayil Veedu, Alleppey ..	Weights, Measures and Beam Scales (Class C & D).
(6)	A.P. Ayyappan, P.O. Kadalundi, (Via) Feroke ..	Beam Scales.
(7)	Aruna Foundry and Engineering Works (Private) Limited, N.S.M. Mount P.O., Kottayam.	Platform Machines.
(8)	A.P. Ayyappan, P.O. Kadalundi, (Via) Feroke ..	Beam Scales (Classes C&D).

Repairers (Contd.)

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(9)	Bharat Repairing and Scales Corporation, Cannanore ..	Beam Scales.
(10)	Bismilla Hardware Stores, Big Bazar, Palghat ..	Beam Scales.
(11)	C.K. George, Cheriya-kottackal House, Kalloopara P.O. ..	Platform Machines.
(12)	Kalathil Gopi, Pradeep Industries, Ghowghat ..	Beam Scales.
(13)	Hilal Traders, Big Bazar, Calicut	Weights and Beam Scales.
(14)	Hamson Industries, Pappinasseri	Beam Scales.
(15)	K.M. Haneefa, Kizhakkekallazhi Veedu, Edava ..	Beam Scales (Classes C&D).
(16)	M.A.M. Haneef and Brother, Brass Vessel Merchants, Chalai, Trivandrum.	Beam Scales (Classes C&D).
(17)	V.J. Joseph, Near English Church, Kozhikode-1 ..	Weights and Beam Scales.
(18)	Jayaraj Foundry and Engineering Works, Millar Road, Tellicherry	Platform Machines and Beam Scales.
(19)	K. Kesavan Achary, C/o. Trivandrum Gold, Silver and Jewellers, Association, Chalai, Trivandrum.	Beam Scales.
(20)	P.C. Kelappan and Sons, Thavam, Pazhayangadi, Cannanore	Beam Scales.
(21)	Mukunda Agrl. Implements and Steel Trunk Works, Badagara, Trivandrum.	Beam Scales.
(22)	M.K. Mohammed Naina, Barkath Metal Industries, Chalai, Trivandrum.	Beam Scales.
(23)	Mather Stores, P.B. No. 2, Trivandrum	Beam Scales (Classes C & D).
(24)	P. Madhavan Thampi, Brass Vessel Merchant, Chalai, Trivandrum.	Do.
(25)	Mighty Scale Company, Kurancherry, Wadakkandherry (Cochin).	Weighing Instruments.
(26)	P. Natarajan, Biscuit Block, Chalai, Trivandrum ..	Beam Scales, (Classes C & D).
(27)	P. B. Natarajan Chertiyar, Selva Industries, Shertallai. ..	Weights, Measures and Beam Scales.
(28)	Popular Industries, Robinson Road, Calcutta-1 ..	Weights and Beam Scales.
(29)	Palliveetil Mammed Koya and Brothers, 9/88, Tobacco Street, Calicut.	Platform machines and Beam Scales.
(30)	Palani Achary, Ulladan Parambu, S. D. Puram, P.O. Alleppey.	Beam Scales (Classes C & D).
(31)	P. N. and Sons, Kottayampri, Koothuparamba, Tellicherry.	Beam Scales.
(32)	Palghat District Rice Mill Owners' and Rice Merchants Association, Palghat.	Platform Machines.
(33)	P. Ramachandran Achary, Parakkudi Veedu, T.C. 30/267, Kuttikkadu, Manacaud, Trivandrum-9.	Beam Scales and Platform Machines.
(34)	P. Raghavan Unni Nair, 2/104 A, Cur Road, Tirur ..	Weights and Beam Scales.
(35)	A. L. Rodrigues, Metal Merchant, Jalur Road, Kasargode.	Do.
(36)	Scales and Services, Ramanarayana Building, Logam's Road, Tellicherry.	Platform Machines.
(37)	W. B. Sivanandan, Prop: "Weights and Measures", Near 3rd Rly. Gate, Kozhikode.	Beam Scales.
(38)	Scales Repairing Workshop, Wadakkechanthrapadi, Manjeri.	Weights and Beam Scales.
(39)	K. N. Sreedharan Nair, T. C. 749/23, Perumthanni, Trivandrum.	Beam Scales.
(40)	Southern Scales Services, Melamuri, Palghat-1 ..	Weighing Instruments.
(41)	Southern Scales Services, Royal Lunch Home, Fort Road, Cannanore.	Do.

Repairers (Contd.)

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(42)	A. Shahul Hameed, Manacaud, Kallathumukku, Trivandrum.	Beam Scales (Classes C & D).
(43)	K. Shanmughom Achary, Roduvila Veedu, Thottakkadu, Attingal.	Do.
(44)	A. Shahul Hameed, Kadayaravilakam, Thaiveedu, Balarapuram.	Do.
(45)	S. Shahul Hameed, Hardware Merchant, Main Road, Attingal.	Do.
(46)	M. Thankappan Pillai, Kuzhivila Veedu, Kattakkada ..	Do.
(47)	Western Scales and Services, 9/88, Tobacco Street, Calcutta-1.	Weighing Instruments.

CANCELLATIONS

The following dealers licenses have since been cancelled by the Controller of Weights and Measures, Kerala :—

	Reference
(1) V. M. Mammeo, Hardware Merchant, Cloth Bazar Road, Ernakulam.	Item No. 26 on page 24 of November 1960, <i>Metric Measures</i> .
(2) K. R. Narayanan, Karippayyil House, General Merchant, Market Road, Ernakulam.	Item No. 60 on page 41 of January 1961, <i>Metric Measures</i> .
(3) T. M. Ouseph, Hardware Merchant, Kandassankadu, Trichur Dist.	Item No. 20 on page 43 of September 1961, <i>Metric Measures</i> .
(4) A. S. Mani, V. P. Vilas, Parry & Co., Junction, Quilon	Item No. 54 on page 41 of January 1961, <i>Metric Measures</i> .
(5) Oorampalli Engg. Works, Mudakkal West, Quilon.	

MADHYA PRADESH (5)

In the May and July, 1960 and January and May, 1961 issues of Metric Measures lists of manufacturers, dealers and repairers of Weights and Measures in Madhya Pradesh State were published. The following is a list of manufacturers, dealers and repairers subsequently licensed under the Madhya Pradesh Weights and Measures (Enforcement) Act, 1959:

Manufacturers

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(1)	Anil Metal Industries, 1047, Lane Gaushala, Agra ..	Weight.
(2)	Bapulal Panna, Kothari Pipalia Mandi, Mahavir Factory, Mandsaur.	Weights and Measures.
(3)	Bhilai Engineering Corporation Private Limited, Post Box 31, Bhilai Steel Plant, Bhilai.	Weights and Measures.
(4)	Bhilai Engineering Works, Industrial Estate, Bhilai ..	Weights and Measures.
(5)	Bilaspur Iron and Steel Works, Tar Bhar Naka, Bilaspur.	Measures.
(6)	Bilaspur Sheet Metal Works, Near Pratap Talkies, Bilaspur.	Weights, Capacity Measures.
(7)	Ganga Iron and Steel Works, Canal Road, Harpalpur, (District Chhatarpur).	Measures.

Manufacturers (Contd.)

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(8)	Gopal Prasad and Sons, 887, Barha Bhai Street, Belanganj, Agra.	Brass Weights.
(9)	Indore College, Industries, Siyaganj, Indore	Measures and Measuring Industries.
(10)	Iron and Brass Foundry, New Delhi, Ujjain	Weights.
(11)	Jawahar Tin Factory, Bhutta Bazar, Ratlam	Measures, Weighing and Measuring Instruments.
(12)	Mahavir Metal Industries, Karera, Bazar, Ratlam	Weights.
(13)	Universal Engineering and Scientific Works, 33, Kingsway Cantonment, Jabalpur.	Weights.
(14)	Union Iron and Steel Works, Industrial Estate, Indore	Weights and Measures.
(15)	Seth Narayandass, Cotton Ginning and Pressing Factory, Mandasaur.	Weights, Measures, Weighing and Measuring Instruments.
(16)	Raipur Metal Products Private Limited, Khamtari, Raipur-Bilaspur Road, Raipur.	Weights and Measures.
(17)	Superintendent, Gun Carriage Factory, Jabalpur	Weights.
(18)	Solanki Work Shop, Civil Station Road, Raipur	Weights.

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
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Bhopal Division

(1)	Abbas Husain, Jawahar Chowk, Bhopal	Weights.
(2)	Agrawal Agencies, Shop No. 2, Opposite Sindhi Cloth Market, Bhopal.	Weights and Measures.
(3)	Amritlal Nathu Rade, Betul	Measures, Weighing and Measuring Instruments.
(4)	Abdul Gaffar Ahmed, Kirana Merchant, Betul	Do.
(5)	Babulal Ramesh Chand, Hardware Merchants, Ganj-Basoda (District—Vidisha).	Do.
(6)	Bhagwandas Phool Chand Sahu, Kirana Merchants, Chowk Bazar, Sohagpur (District—Hoshangabad).	Weights and Measures.
(7)	Babu Ram Khilawan Ramdhin Jaiswal, Kirana Merchants, Sohagpur, (District—Hoshangabad).	Do.
(8)	Balmukand Ram Narain, Kirana Merchant, Piparia (District—Hoshangabad).	Weights, Measures, Weighing and Measuring Instruments.
(9)	Bhanwarlal Ballabhadass, General Merchant, Tagore Road, Khilchipur, (District—Raigarh).	Do.
(10)	Chandrabhan Jamna Parsad, Hoshangabad	Weights and Measures.
(11)	Chouthaji Tulsi Ram & Sons, Gandhi Chowk, Harda (District—Hoshangabad).	Do.
(12)	Durga Prasad Kanhiyalal Jaiswal, Kasera Bazar, Itarsi (District—Hoshangabad).	Do.
(13)	Gothi Bros, Sarafa Bazar, Itarsi, District—Hoshangabad	Weights Measures, Weighing and Measuring Instruments.
(14)	Gopi Krishan Kanhiyalal, Sarafa Market, Susner, (District—Shajapur).	Weights, Measures, Weighing and Measuring Instruments.
(15)	Hukum Chand Gendalal Jain, Narabada Road, Hoshangabad.	Weights and Measures.
(16)	Harlal Phoolchand Agrawal, Banapura (Tah—Seonimalwa), District—Hoshangabad.	Do.
(17)	Kalu Ram Suraj Mal Bhandari, Jawahar Marg, Rajgarh	Weights.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(18)	M. Gulam Hussain M. Yusufali, General Merchants, Basoda, (District—Vidisha).	Weights, Measures, Weighing and Measuring Instruments.
(19)	Mohsin Ali Fakhruddin, Hardware & Iron Merchant, Loha Bazar, Vidisha.	Do.
(20)	Mohammad Hussain M. Ahsan Ali, Rana Pratap Ward, Harda (District—Hoshangabad).	Weights and Measures.
(21)	Mohanlal Bhagirath Prasad Sharma, Sobhapur Road, Via-Piparia, District—Hoshangabad.	Weights, Measures, Weighing and Measuring Instruments.
(22)	Mohd. Haidar & Sons, Bareli, (District—Raisen)	Do.
(23)	Pt. Chander Bhanji Laxmi Narayan Joshi, Hardware Merchant, Sohagpur (District—H'bad).	Do.
(24)	Peerkhanji M. Salehmohamadji, Abdul Kalam Azad Road, Shajapur.	Weights, Measures, Weighing and Measuring Instruments.
(25)	Roop Chand Jeet Mal, Hardware Merchant, Chopad Bazar, Barasia, (District—Shore).	Do.
(26)	Shivdayal Rameshwar Dayal, Sarafa Bazar, Itarsi (District—H'bad).	Weights and Measures.
(27)	Ram Hari Ram Lohia, Iron Merchant, Hoshangabad	Weights.
(28)	Sh. Ram Das Agarwal, Gandhi Chowk, Harda (District—H'bad).	Weights and Measures.
(29)	Shyam Sunder, Dargar Stores, Bareli (District—Raisen)	Weights Measures, Weighing and Measuring Instruments.
(30)	The Madhya Pradesh State Co-operative Marketing Society Limited, Itarsi (District—Hoshangabad).	Do.
(31)	Tulsiram Ramchandra, General Merchant, Biaora (District—Rajgarh).	Do.
(32)	The Poorna Co-operative Marketing Association Limited, Bhainsdehi (Betul).	Do.
(33)	The Grain and Oil Seed Merchants Association, Itarsi	Do.

Gwalior Division

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Bhargava Bandhu, Pichhore, District—Shivpuri	Weights, Measures and Weighing Instruments.
(2)	Batta Mal Sampat Ram, Iron Merchants, Paret Chauraha, Bhind.	Weights and Measures.
(3)	Badri Nath and Sons, Sarafa Bazar, Lashkar (Gwalior)	Metric Measures.
(4)	Chhakkaram Gyasiram Gohad, (District—Bhind)	Weights, Measures and Weighing Instruments.
(5)	Dharmeshwar Nath Harihar Nath, Hospital Road, Morena	Weights.
(6)	Gopaldas Kashi Ram, Hardware Merchant, Ahok Nagar, (Guna).	Weights, Measures, Weighing and Measuring Instruments.
(7)	Ganga Ram Hari Shanker Diwan, Iron Merchants, Mandi, Sabalgarh.	Do.
(8)	Iron Association, Pichhore, (District—Shivpuri)	Do.
(9)	Kanhiya Lal S/o Ram Charan, Iron Merchant, Lahar (District—Bhind).	Do.
(10)	Lal Behari Gupta, Gohad (District—Bhind)	Weighing Machines.
(11)	Loyiya Iron and Steel Traders, Mandi Gandhi Ganj, (District—Bhind)	Weights, Measures, Weighing and Measuring Instruments.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(12)	Mool Chand Ayodhya Prasad, Dal Bazar, Laskar (Gwalior)	Weights, Measures, Weighing and Measuring Instruments.
(13)	Ratan Singh, Raghuwanshi, Grain-Merchant, Ashoka Nagar, (District—Guna).	Weights and Measures.
(14)	Ram Swarup Jagannath Jain, Iron Merchant, Lohia Bazar, Morena.	Weights, Measures and Weighing Instruments.
(15)	Sectaram Gangaram, Nakhera, Near Police Station, Gohad. (District—Bhind).	Weights and Measures.
(16)	Swroop Chand Manak Chand Jain, Mehgaon (District—Bhind).	Weights, Measures, Weighing and Measuring Instruments.
(17)	Shyam Lal Gendalal Jain, Kirana-Merchant, Khaniadhana, (District—Shivpuri).	Do.
(18)	Shukla Brothers, Kunjanpura, (District—Datia)	Do.

Jabalpur Division

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Abdul Kuyam Gulzar Husain, Budhwara Bazar, Seoni	Weights Measures, Weighing and Measuring Instruments.
(2)	Abhaya Kumar Ajit Kumar Jain, Cloth Merchant, Main Road, Balaghat.	Weights, Measures and Measuring Instruments.
(3)	Gupta Kirana Stores, Ranjhi Bazar, Jabalpur	Weights, Measures, Weighing and Measuring Instruments.
(4)	Gupta Hardware Merchant, Main Road, Balaghat	Weights.
(5)	Gokul Pd. Ramnarayan Agrawal, Medicine, General and Hardware Merchants, Mandla Fort, Mandla.	Weights, Measures, Weighing and Measuring Instruments.
(6)	Ganga Hardware Stores, Main Road, Katni	Weights and Measures.
(7)	Hamid Bhai Noor Bhai, Hardware Merchant, Katra Bazar, Sagar.	Do.
(8)	Kunjilal Kishanlal Agrawal, Nehru Road, Seoni	Weights, Measures, Weighing and Measuring Instruments.
(9)	Mohanlal Gopal Krishna Gupta, Tinbathi, Katra Bazar, Sagar.	Do.
(10)	Moolchand Vaidya, Sagar	Do.
(11)	Mohanlal Basudeo Pd., Sarafa Bazar, Hanuman Ganj, Katni	Iron and Brass Weighing Instruments.
(12)	Motilal Nemichand Jain, Narsinghpur	Weights, Measures, Weighing and Measuring Instruments.
(13)	Onkarchand Deegar & Co., Iron, Hardware and Timber Merchants, Near Shiv Talkies, Naya Bazar, Sagar.	Do.
(14)	Ramdas Satbhaya & Sons, Katra Bazar, Sagar	Do.
(15)	The Anand Agency, Katra Bazar, Sagar	Weights and Measures.
(16)	The Secretary, Rashtriya Tamrakar Udyog, Co-operative Society Ltd., Mandla.	Weights.
(17)	Vijaya Traders, 617, Gandhi Marg, Jabalpur	Weights, Measures, Weighing and Measuring Instruments.

Raipur Division

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Abdul Husain M. Allaum, Station Road, Raipur	Weights, Measures and Weighing Instruments.
(2)	Buwalal Ratanlal & Sons, Ganj Line, Rajnandgaon	Weights, Measures, Weighing and Measuring Instruments.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (18)

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(3)	Basakmal Sabaldas, Hardware Merchant, Sadar Bazar, Dhamtari, (District—Raipur).	Weights and Measures.
(4)	Ganpatlal Kaluram, Hardware and Kirana Merchants, Baloda Bazar, Raipur.	Do.
(5)	Harnarayan Mukundlal, Sadar Bazar, Rajnandgaon	Weights, Measures, Weighing and Measuring Instruments.
(6)	Harilal Jiv Raj, Sadar Bazar, Dhamtari, (District—Raipur)	Weights, Measures and Measuring Instruments.
(7)	Jayantilal & Co., 12 Ramdev Market, Raipur	Weights, Measures, Measuring and Weighing Instruments.
(8)	Janta Watch and Radio House, Cinema Line, Rajnandgaon	Do.
(9)	Jugal Kishore Musadilal, Hardware Merchant, Dongargarh, (Raipur).	Do.
(10)	Kanchadilal Kunjilal, Hardware Merchant, Baloda Bazar, Raipur.	Weights and Measures.
(11)	Loh Bhandar, Jagdalpur, (Bastar)	Do.
(12)	Mulla Hasanali Mulla Abdul Hussain, Azad Chowk, Sadar Bazar, P. Box 20, Rajnandgaon.	Weights, Measures, Measuring and Weighing Instruments.
(13)	Narendra Kumar and Co., Main Road, Jagdalpur	Do.
(14)	Narayan Pd. Ram Gopal, Kirana and Hardware Merchant, Gudrupara, Mahasamud, District—Raipur.	Weights and Measures.
(15)	Shambhoolal Ganeshlal, Hardware shop, Rajnandgaon	Do.
(16)	Shyam General Stores, Dudiari, Raipur	Do.
(17)	M.P. Hardware & Machinery Mart, Surana Bungalow, Station Road, Durg.	Weights, Measures, Weighing and Measuring Instruments.

Rewa Division

Sl. No.	Name and Address of Dealers	Details of Articles sold
(1)	Ali Husain, Seth Haji Mulla, Mazaffar Husain, Main Road, Shadhol.	Weights, Measures, Weighing Instruments.
(2)	Chandra Bhan Madan Mohan, Satana	Do.
(3)	Dashrat Prasad Rameshwar Pd., Chowk Bazar, Satana	Weights, Measures, Weighing and Measuring Instruments.
(4)	Gauri Shanker Ramdin, Hardware & Kirana Merchants, Harpalpur (District—Chattarpur).	Weights.
(5)	Har Prasad Ghasi Ram Lohia, Main Bazar, Tikamgarh	Weights, Measures and Weighing Instruments.
(6)	Lakhan Lal Raja Singh, Metric Weights Store, Khajuraha, District—Chhatarpur.	Weights.
(7)	Marketing Cooperative Society Ltd., Sidhi	Weights, Measures and Weighing Instruments.
(8)	Maganlal Goel, General Merchants, Sabji Mandi, Tikamgarh	Do.
(9)	Raj Hans Partners, Nagar Mandi, Tikamgarh	Weights and Measures.
(10)	Raja Ram Ganesh Pd. Lohia, Bara Bazar, Tikamgarh	Weights, Measures, Weighing Instruments.
(11)	Ram Bharosa Ram Dulare, Chohta Bazar, Rewa	Weights, Measures, Weighing and Measuring Instruments.
(12)	Ram Gopal Sunderlal, Janki Park, Rewa	Weights, Measures and Weighing Instruments.
(13)	Sunder Lal Lohia, Iron Merchant, Tikamgarh	Weights and Weighing Instruments.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
Bilaspur Division		
(1)	M/s. Asha Ram Govind Ram, Sadar Bazar, Raigarh	Weights, Measures and Beam Scales.
(2)	Anandilal Gahlot, Pendra Road, Bilaspur	Do.
(3)	Ajodhya Pd. Permishri Dass, Kirana and Oil Merchant, Raigarh.	Iron, Brass Weights and Measures.
(4)	Bhura Mal Hanuman Begas, Gattari, Naila, (Distt. Bilaspur)	Weights, Measures, Beam Scales and Measuring Instruments.
(5)	Bhura Mal Hanuman Begas, Gattari, Iron and Hardware Merchants, Akaltara (Distt.—Bilaspur).	Do.
(6)	Banarsilal Kishan Gopal, Hardware and Manikari Merchants, Sadar Bazar, Ambikapur.	Weights, Measures and Weighing Instruments.
(7)	Bhagwandass Ramdass and Co., Bara Bazar, Chirmiri (Distt.—Surguja).	Weights, Beam Scales and capacity Measures.
(8)	Banarsidass Samraj, Hardware and General Merchants, Sadar Road, Ambikapur (Distt.—Surguja).	Weights, Measures, Beam Scales and Measures.
(9)	Bhagwati Pd. Om Prakash, Hardware Merchants, Naila, (Distt.—Bilaspur).	Weights, Measures, Beam Scales and Measures.
(10)	Birendra Kumar Bose and Bros., General Merchants, V.P.O. Kurasia Colony (Distt.—Surguja).	Weights.
(11)	Bhagat Ram Shri Kishan Agarwal, Station Road, Kharsia, (Distt.—Surguja).	Weights Measures and Weighing Instruments.
(12)	Cooperative Marketing Society, Sakti (Distt.—Bilaspur)	Do.
(13)	Banarsilal Fathechand, Naila, (Distt.—Bilaspur)	Do.
(14)	Chotalal Shri Kishan Agrawal, Subhash Chok, Raigarh	Weights, Measures, Weighing and Measuring Instruments.
(15)	Chandulal Lakhiram, Shop No. 6, Garj Kharsia (Distt.—Surguja).	Weights, Measures and Weighing Instruments.
(16)	Devidittamal Amrik Singh, Sadar Bazar, Ambikapur (Distt.—Surguja).	Weights, Measures, Weighing and Measuring Instruments.
(17)	Ebrahim Bhai Musaji, Hardware Merchants, Sadar Bazar, Bilaspur.	Weights, Measures and Measuring Instruments.
(18)	E. Musekhan Kader Bhai, Sadar Bazar, Bilaspur	Weights and Measures.
(19)	Gohil Hardware Stores, Juna, Bilaspur	Weights, Measures and Weighing Instruments.
(20)	Gyan Chand Guglani, General Merchants, Sadar Bazar, Raigarh.	Weights and Measures.
(21)	G. Abdulla Bhay & Bros., General Merchants, Champa, (District—Bilaspur).	Weights, Measures and Weighing Instruments.
(22)	Hiradhar Vishnoolal Kesharwani, Akbargnj, Sarangarh, (District—Raigarh).	Do.
(23)	International Stores, Jashpur Nagar, (Distt.—Raigarh)	Weights
(24)	Jamnadas Kanhiyalal, Sadar Bazar, Raigarh	Weights and Measures.
(25)	Khaildas Shewaram, Budhwani Bazar, Bilaspur	Weights and Measures.
(26)	Kailash Pd. Sahu, Kirana Merchant, Jashpur Nagar, (Distt.—Raigarh).	Weights, Measures, Weighing and Measuring Instruments.
(27)	Lalman Santlal, Hardware and Iron Merchants, Sakti (Distt.—Bilaspur).	Weights, Beam Scales and Measures.
(28)	Laxminarayan Badri Pd., Hardware Merchant, Sadar Bazar, Champa (Distt.—Bilaspur).	Weights, Measures and Weighing Scales.
(29)	Mohar Singh Dalip Singh, Sadar Road, Ambikapur, Distt.—Surguja.	Weights, Measures and Weighing Instruments.
(30)	Mahabir Pd. Tara Chand Jain, Maila (Distt.—Bilaspur)	Weights, Measures and Measuring Instruments.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (18)

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(31)	Mulla Ahsan Hussain H.M. Abdul Hussain, Sadar Bazar, Bilaspur.	Weights, Measures and Scale Balances.
(32)	Maman Chand Ram Niwas Agrawal, Sadar Bazar, Raigarh	Weights and Measures.
(33)	Manoharlal Chunnilal Agrawal, Main Road, Dharamjaigarh (Distt.—Raigarh).	Weights, Measures, Weighing and Measuring Instruments.
(34)	M. Salim M. Haroon, Akaltara, Distt.—Bilaspur	Weights and Measures.
(35)	National Hardware Stores, Juna, (Distt.—Bilaspur)	Weights and Beam Scales.
(36)	Priyag Raj Agrawal, Sadar Road, Ambikapur (Distt.—Surguja).	Iron and Brass Weights.
(37)	Ram Kumar Agrawal, Pathalgaon, Distt.—Raigarh	Weights, Measures and Measuring Instruments.
(38)	Ram Nath Bhimsen, Kharsia, District—Raigarh	Iron and Brass Weights, Beam Scales and Measures.
(39)	Ram Lal Kashiram, Cement Stockist, Bilaspur	Weights.
(40)	Shah Uttam Chand Kalyanji, Sadar Bazar, Raigarh	Weights.
(41)	Swaraj Bhan Baij Nath Modi, Sarangarh Road, Raigarh	Weights, Measures and Beam Scales.
(42)	Santosh Singh Brij Mohan, Surya Bhawan, Narain Road, Juna (Distt.—Bilaspur).	Do.
(43)	Sher Singh Mohan Singh, Sadar Road, Ambikapur (Distt.—Surguja).	Weights, Capacity Measures and Weighing Instruments.
(44)	Shri Krishna Iron & Hardware Stores, Juna (Distt.—Bilaspur)	Weights, Measures, Weighing and Measuring Instruments.
(45)	Shanker Pd. Kasri, Mangli Bazar Road, Pendra Road, Bilaspur.	Weights, Measures and Measuring Instruments.
(46)	Ramji Stores, Kunkuri, (Tah-Jashpur, Distt. Raigarh)	Weights, Measures and Weighing Instruments.
(47)	Shiv Kumar Pawan Kumar, Hardware Merchant, Mahatma Ghandi Road, Korba (Distt.—Bilaspur).	Weights, Measures and Beam Scales.
(48)	Shankarlal Surajbhan, General Stores, Sakti, (Distt. Bilaspur)	Do.
(49)	The Raigarh Co-operative Marketing Society Ltd., Raigarh	Weights.
(50)	The Nutan Stores, Pendra Road, Bilaspur	Weights, Measures and Weighing Instruments.
(51)	Vallabhadas Ram Narayan Gupta, Subhash Chowk, Khilchipur, (Distt.—Raigarh).	Weights, Measures, Weighing and Measuring Instruments.

Indore Division

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Agrawal Loha Bhandar, 79, Siya Ganj, Indore	Weights, Weighing and Measuring Instruments.
(2)	Abdeali Fiadali & Brothers, Daulat Ganj, Indore	Weights, Measures and Measuring Instruments.
(3)	Abdulji Ismailji Dalal, Mandi Gate, Mandsaur	Weights and Measures.
(4)	Asgar Ali H. Tayab Bhai, Devi Sagar Road, Dewas	Weights.
(5)	Ali Hasan and Sons, Lokhandwalla, Near Cotton Market, Khandwa.	Weights and Measures.
(6)	Bhil Chand Mohanlal Parikh, Mahatma Gandhi Road, Anjad (Tah-Barwani, Distt. West Nimar).	Weights and Measures.
(7)	Bombay Fancy Stores, Jawad (Distt. Mandsaur)	Weights, Measures, Weighing and Measuring Instruments.
(8)	Bharat Stores, Sadar Bazar, Mandsaur	Brass and Iron Weights.

Dealers (Contd.)

Sl. No.	Name and address of Dealers	Details of Articles Sold.
(9)	Bhatia Brothers, Ranjit Chowk, Barwani (Distt. W. Nimar)	Weights, Measures, Weighing and Measuring Instruments.
(10)	Bharat Vastu Bhandar, Dalumodi Bazar, Ratlam	Weights and Measures.
(11)	Banarsidass Agrawal, 2, Dharmandi, Shivaji Marg, Dhar	Weights, Measures, Weighing and Measuring Instruments.
(12)	Badrilal Rambhujji Agrawal, Garoth (District-Mandsaur)	Weights, Measures, Weighing and Measuring Instruments.
(13)	Calcutta Hardware Stores, Ganj Bazar, Khandwa	Weights and Measures.
(14)	Choudhary Stores, Gandhi Chowk, Garoth (Distt-Mandsaur)	Weights, Measures, Weighing and Measuring Instruments.
(15)	Dawoodbhai Aladbhai, Ganj Bazar, Khandwa (Distt-East Nimar).	Weights and Measures.
(16)	Dwarkadass Munnalal, Harwada, (Distt.-Dhar)	Weights, Measures, Weighing and Measuring Instruments.
(17)	Fida Hussain Natha Bhai & Sons, Mandigate, Mandsaur	Weights, Measures, Weighing and Measuring Instruments.
(18)	Fida Hussain Jiwaji & Sons, Bombay Bazar, Khandwa, Distt.-East Nimar).	Weights and Measuring Instruments.
(19)	Govind Stores, Bijaj Khana, Dhar	Weights, Measures, Weighing and Measuring Instruments.
(20)	G. Ratanlal & Bros. Nagda Niwas, Bhagat Singh Marg, Khandwa, (Distt.-E. Nimar).	Weights, Measures, Weighing and Measuring Instruments.
(21)	Jai Hind Trunk Depot, Sadar Bazar, Mandsaur	Weights, Measures, Weighing & Measuring Instruments.
(22)	Jiwajee Ammijee, Bombay Bazar, Khandwa (Distt.-E. Nimar)	Weights, Measures, Weighing and Measuring Instruments.
(23)	Kailash Chandra Madanlal, Gandhi Road, Kharagone (Distt.-W. Nimar).	Weights and Measures.
(24)	Lachmanji Jagan Nath Saraf, Sadar Bazar, Dhar	Weights, Measures, Weighing and Measuring Instruments.
(25)	Laxminarayan Narayan, Itwariya Bazar, Barwani (Distt.W. Nimar).	Weights.
(26)	Mohanlal, 24, New Dewas Road, Opposite Malwa Mills, Gin. Indore.	Weights and Weighing Instruments.
(27)	Mulla Abdulah Adamjee and Co., Sarafa Bazar, Mandsaur ..	Weights, Measures, Weighing and Measuring Instruments.
(28)	Mohammad Hussain H.M. Kayum Bhai, Gandhi Road, Kharagone, (Distt.—W. Nimar).	Weights and Measures.
(29)	Motilal Babulal Chourasiya, Bombay Agra Road, Sendhwa (Distt.—W. Nimar).	Weights and Measures.
(30)	Nazar Ali Lukmanji, Hardware Merchant, Bombay Bazar, Khandwa.	Weights, Measures, Weighing and Measuring Instruments.
(31)	Noor Mohammad Allarkh, Hardware Merchant, Jaora (Distt-Rutlam).	Weights, Measures, Weighing & Measuring Instruments.
(32)	Nutan Stores, Bajaj Khana, Dhar	Weights, Measures, Weighing and Measuring Instruments.
(33)	Prabhat Trading Company, 21, Suja Ganj, Indore	Weights.
(34)	Prabhat Radio Services, Chowk Bazar, Burhanpur (E. Nimar)	Weights and Measures.
(35)	Pramod General Stores, Gopal Chowk, Ujjain	Weights and Measures.
(36)	Phool Chand Nemi Chand and Sons, Itwari Bazar, Barwani, (Distt. W. Nimar).	Weights, Measures, Weighing and Measuring Instruments.
(37)	Rajmal Sagarmal Chandani Chowk, Ratlam	Weights, Measures, Weighing and Measuring instruments.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (18)

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles sold
(38)	Ram Krishna Madanlal, Subhash Chowk, Tarana, (District Ujjain).	Weights, Measures, Weighing and Measuring Instruments.
(39)	Satya Narain Anil Kumar, 381, Jawahar Marg, Indore	Weights and Measures.
(40)	Salebhai Nomanali, Kirana Merchant, Gandhi Marg, Indore.	Weights, Measures, Weighing and Measuring Instruments.
(41)	Krishna Stores, Harsud, District-East Nimar	Weights.
(42)	Ram & Co., Lohar Road, Ratlam	Weights, Measures, Weighing and Measuring Instruments.
(43)	Shantilal Sugandhilal Jain, 188, Gandhi Marg, Alirajpur, (District Jhabua).	Weights.
(44)	Secretary, The Kirana Merchants Association, Khandwa, (District-E. Nimar).	Weights.
(45)	Vishnu Hardware Mart, Nai Sarak, Ujjain	Weights, Measures, Weighing and Measuring Instruments.
(46)	Ratanlal Chhaganlal Bazaz, Khana Jaora (District Ratlam)	Weights and Measures.
(47)	Jawarlal Chunnilal Manawar, Vallabh Marg, Manawar (District-Dhar).	Weights and Measures.

Repairers

Sl. No.	Name and address of Repairers	Details of Articles Repaired
(1)	Anandilal Vishnu Parsad Sharma, Rajnandgaon	Weights, Measures, Weighing and Measuring Instruments.
(2)	Bhagwanji Gula Bhai, Ganj Dabri, Baster	Beam Scales.
(3)	Jawahar Tin Factory, Bhutta Bazar, Ratlam	Weights, Measures and scale.
(4)	Jayantilal and Co., Ganjpara Bamboo Stall, Raipur ..	Weights, Measures, Weighing and Measuring Instruments.
(5)	Poonamchand Parmanand and Sons, Sajaganj, Indore ..	Do.

The following names of manufacturers and dealers in Madhya Pradesh whose names have appeared in July, 1960, January & May 1961 issues of *Metric Measures* may be deleted from the earlier lists.

Manufacturers

Serial No.	Name of Manufacturers	Page No.	S. No.	Reference to Issue of Metric Measures
(1)	Bhupendra Iron & Steel Works, Vinod Mills, Ujjain	43	7	January, 1961.
(2)	Rajaram & Brothers, Lessee Gwalior Maize Production, Mhow Neemuch Road, Limited, Mandsaur.	32	48	May, 1961.

Dealers

Serial No.	Name of Dealers	Page No.	S. No.	Reference to issue of Metric Measures
(1)	Rajni Tea House, Bonyani Gate Market, Indore	35	26	July, 1960.
(2)	Krishna Iron and Hardware, Siyaganj, Indore	38	17	July, 1960.
(3)	Indore Gram Udyog, Shakari Samiti, Gandhi Bhawan, Indore	35	18	July, 1960.
(4)	Radhakrishnan Chhogelal, Mhow	35	25	January, 1961.
(5)	Hiralal & Brothers, Station para Ganjpara, Raipur	46	2	January, 1961.
(6)	New M.P. Mechanical Industries, Station Road, Durg	46	6	January, 1961.
(7)	Inder Store, Station Road, Biaragarh, Bhopal.. ..	44	11	January, 1961.
(8)	Ramssh Iron Works, 41, Malharganj, Loharpatti, Indore	44	8	January, 1961.
(9)	Sehore Chemicals, Mandi, Sehore	33	26	May, 1961.
(10)	Manohar Brothers, Siyaganj, Indore	36	40	May, 1961.

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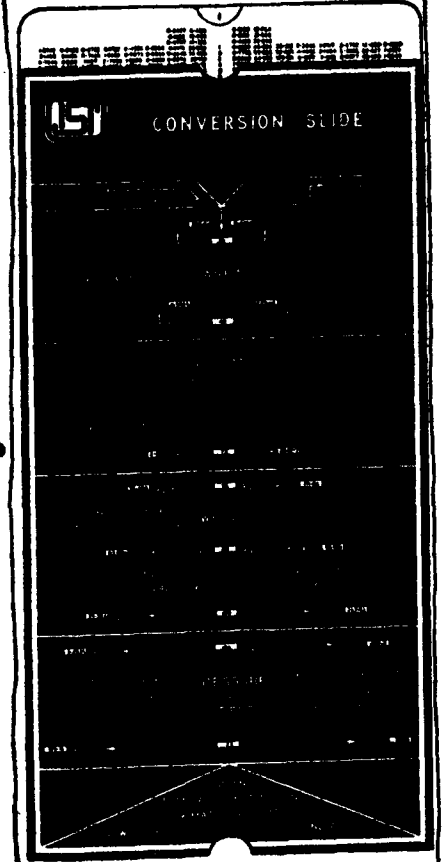
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Serial No.	Commodity	Metric Unit
(1) Gold		10 grams(g)
(2) Grocery and Confectionery	Biscuits, sweetmeats, cardamoms.	
Textiles and Textile Fibres	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufactures (when sold by weight).	
Paints & Chemicals	Paint (if sold by weight), indigo, liquid chlorine.	1 kilogram (kg)
Hides, Skins & Leather	Raw hides, leather (hides and skins).	
Metals	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	
Miscellaneous	Tea, meat, camphor tablets, mica.	
(3) Grains and Pulses	Rice, wheat, jowar, arhar, moong, masur, gram.	
Spices	Black pepper, mustard, chillies, dhania, dalchini, turmeric, betelnuts.	
Plantation Products	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured).	
Forest Products	Lac and lac products, gums, myrobalans, galnuts, soapnuts.	
Textiles & Textile Fibres	Raw jute, raw hemp, coir yarn.	1 quintal (q) (100 kilograms)
Oils, Oilseeds & Oilcakes	Vegetable oils, oilseeds, oilcakes.	
Non-Ferrous Metals	Aluminium: ingots, bars, blocks, slabs, billets. Lead: ingots, sheets and strips. Copper: ingots, blooms, slabs, cakes, tiles, bricks, billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles. Brass: ingots, rods, sections, pipes, sheets, strips, circles. Zinc: ingots, sheets, strips. Tin: blocks.	
Chemicals	Caustic soda, bleaching powder, glycerine, soaps, paper salt.	
Others	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind.	
(4) Minerals	Iron ore, manganese ore, bauxite, coal.	one metric tonne(t) (1,000 kilograms)
Iron & Steel	Pig iron, iron & steel manufactures, semis (billets for rerolling etc.).	1 metre (m)
(5)	Cloth (mill, handloom, silk, rayon and woollen cloth).	one square metre (m ²)
(6)	Jute carpets, coir mats and matings, sheet glass.	one cubic metre (m ³)
(7)	Timber.	one litre (l)
(8)	Paints (when sold by measure), spirits.	

Weights

(1) In place of the present units of seer, pound, rattal, viss etc, use the kilogram.

(2) In place of the tola, use the gram or 10 grams.

(3) In place of maund or corresponding unit, use the quintal *i.e.* 100 kg.

Capacity Measures

In place of seer or gallon or any other measure use the litre.

Length Measures

(1) Use the metre in place of yard or foot and the centimetre in place of inch.

Square Measures

(1) Use the square metre in place of square yard or square foot, and square centimetre in place of square inch.

Cubic Measures

(1) Use the cubic metre in place of cubic yard or cubic foot and cubic centimetre in place of cubic inch.

Packaging

It is advantageous if sizes of packages correspond to series of commercial weights and measures prescribed.

These are: 50 kg, 20 kg, 10 kg, 5 kg, 2 kg, 1 kg, 500 g, 200 g, 100 g, 50 g, 20 g, 5 g, 2 g, 1 g, and so on.

TYPICAL PRICING UNITS FOR RETAIL TRADE

Serial No.	Commodity	Metric Unit for Use
(1)	Foodgrains, cereals, pulses, spices, ghee, bread, vegetables, meat, fish, sweetmeats, tea, coffee, sugar, salt.	1 kg
(2)	Oil for cooking	1 kg or 1 litre depending upon prevalent practice.
(3)	Fruits	1 kg or number depending upon prevalent practice.
(4)	Milk	1 litre
(5)	Cloth and related materials	1 metre
(6)	Prepackaged materials	Preferably sizes corresponding to series of commercial weights and measures.

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metric measures

THE PUBLICATIONS DIVISION

ABBREVIATIONS FOR METRIC UNITS

(1) DECIMAL MULTIPLES AND SUBMULTIPLES

Prefix	Value in Terms of Unit	Abbreviation
kilo ..	1,000	k
centi ..	0.01 (10 ⁻²)	c
milli ..	0.001 (10 ⁻³)	m
micro ..	0.000 001 (10 ⁻⁶)	μ

(2) WEIGHTS

Denomination	Value	Abbreviation
tonne ..	1,000 kg	t
quintal ..	100 kg	q
kilogram ..	1 kg	kg
gram ..	1 g	g
milligram ..	1 mg	mg
carat ..	200 mg	c

(3) CAPACITY

kilolitre ..	1 000 l	kl
litre ..	1 l	l
millilitre ..	1 ml	ml

(4) VOLUME

cubic metre ..	m ³	m ³ or cu m*
cubic centimetre ..	cm ³	cm ³ or cu m*
cubic millimetre ..	mm ³	mm ³ or cu mm*

(5) LENGTH

kilometre ..	1 000 m	km
metre ..	1 m	m
centimetre ..	1 cm	cm
millimetre ..	1 mm	mm
micron ..	1/1 000 mm or 10 ⁻³ mm	μm

(6) AREA

square kilometre ..	1 000 000 m ²	km ² or sq km*
square metre ..	1 m ²	m ² or sq m*
square centimetre ..	1 cm ²	cm ² or sq cm*
square millimetre ..	1 mm ²	mm ² or sq mm*

(7) LAND MEASURE

are ..	1 00 m ²	a
hectare ..	100 a ²	ha
centiare ..	m ²	ca

*Both these abbreviations are current, but the first set should preferably be used. The former abbreviation is used internationally.

Rules for Abbreviations :

- (1) Do not make any change, such as addition of 's' to indicate plurality e.g. write 1 kg, 10 kg, 20g, 5 g, 10 t, 20 ml, 27 l, 165 km, 2mm, 100 cm³, 66 km²;
- (2) Do not capitalize the abbreviations. For example, do not write 1 Kg, 2 Kg, 20 MM, 50 MM, the right way is to write 1 kg, 2 kg, 20 mm, 50 mm, etc.
- (3) Do not use any other abbreviations except those given above.

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metric measures

(JOURNAL OF WEIGHTS AND MEASURES)

STANDING METRIC COMMITTEE
MINISTRY OF COMMERCE AND INDUSTRY

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metric measures

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Sixth Meeting of Standing Metric Committee

THE sixth meeting of the Standing Metric Committee was held in Udyog Bhavan, Ministry of Commerce and Industry at 11 a.m. on 17 March 1962. Shri Satish Chandra, Deputy Minister for Commerce and Industry, Government of India, and Chairman of the Committee presided. Representatives of the Ministries of Commerce and Industry, Communications, Defence, Education, Finance, Food and Agriculture (Department of Agriculture), Information and Broadcasting, Law, Scientific Research and Cultural Affairs, as also of Railway Board, Directorate General of Posts and Telegraphs and the Indian Standards Institution attended the meeting.

Two important recommendations were made by the Committee. First, the Standing Metric Committee be dissolved and secondly, a permanent organization be set up at the Centre to coordinate the work of enforcement of weights and measures in various fields.

Chairman's Opening Remarks

The Chairman, opening the meeting, said that the Standards of Weights and Measures Act, 1956, which became law in December 1956, gave 10 years for the complete adoption of the metric system in the country. Nearly half this period having passed, it was opportune to take stock of the progress achieved, and to make plans to complete the reform within the allotted time. The metric system had been brought into use in various fields, including Government departments, trade

and industry. The success achieved had been due to the cooperation of all concerned. Little use had to be made of the coercive provisions of the law. Government departments and public undertakings had adopted the metric system in transactions. Special mention might be made of the Railways, Posts and Telegraphs, Customs and Central Excise, and the Meteorological Department. The Indian Meteorological Department was the first organisation in the country to adopt the metric system. It did so on 1-7-1957, the date on which the international geophysical year began. The adoption of the new system was a very arduous task in undertakings performing commercial functions, like the P&T, and Railways, or those raising revenue, like the Customs and Central Excise. These departments had to refix rates in terms of metric units, buy and distribute metric weights to their establishments spread out all over the country, get weighing machines recalibrated and train their staffs at all levels. In converting postage rates, freight rates and the rates of customs and excise duties, care was taken to safeguard public revenues, and at the same time, avoid additional burdens on the tax payer. All major industries had also adopted the metric system in transactions. Raw materials and products were being bought and sold in terms of metric units. The steel industry had begun producing metric steel sections almost exclusively. Users of these sections were re-designing their products to facilitate substitution of inch sections.

In adopting the metric system, care had been taken to safeguard export markets in countries like Britain or the USA where trade and industry were being carried on in the foot-pound system. The tea and jute industries, for instance, continued to pack and invoice their products in the manner acceptable to their overseas customers.

The main purpose of the reform was standardisation of weights and measures in markets throughout the country. Previous attempts to do so were not successful because there was no organisation to enforce weights and measures. Enforcement organisations had been set up in the last 5 years. Nearly a thousand Inspectors of Weights and Measures had been recruited, trained and posted. The production of standard weights and balances of the kind used by Inspectors was an arduous task since they had to be of very high precision. The country had, however, become self-sufficient in Inspector's equipment. The production of millions of metric commercial weights and measures of capacity and length was another stupendous task. Manufacturers of weights and measures had been able to meet all demands.

In October 1958, the use of metric weights was permitted in selected areas. In October 1960, other weights were banned in these areas. Trade in these areas was conducted mainly by the use of metric weights. From April 1962, the use of weights other than metric weights would be illegal everywhere in the country. Metric length measures would be in force throughout the country from 1 October 1962, and metric capacity measures from 1 April 1963.

Much publicity had been conducted by the Publicity Departments of the Central and State Governments to familiarise the public with the new weights and measures. Thanks to this publicity, most people in the country knew what metric weights and measures were

although when buying things they often made their demands in seers. The publicity campaign should, therefore, not only continue but be intensified.

Decimal coinage and the metric system had yet to find their place in education, both general and technical. Approved textbooks in use mainly used the foot-pound and the indigenous systems in illustrations and exercises. It was necessary to make a thorough revision of the textbooks. A programme had been drawn up for the introduction of the metric system in technical education. Here again, the lack of books in English dealing with technical subjects using the metric system presented difficulties. Efforts were being made to get new books written, English books in use adapted or books in continental languages translated.

The Standing Metric Committee was set up in 1955 to advise Government on the form of legislation, phasing of the reform, publicity, and allied matters. These tasks had been completed, with a fair measure of success. He conveyed Government's appreciation of the services rendered by the Committee in implementing the reform of weights and measures. It was, however, time to consider whether there was need for the Committee to continue any longer. Although weights and measures was the responsibility of the States, the Government of India had a duty to ensure uniformity in enforcement procedure throughout the country, in the larger interest of trade and industry. For this purpose, the Government needed a small permanent organisation at the Centre. This organisation might also take over the residuary functions of the secretariat of the Standing Metric Committee, and advise State Governments and organisations of trade and industry during the remaining stages of the transition.

Discussion

In the discussion that followed, members expressed opinions on two main points:

SIXTH MEETING OF STANDING METRIC COMMITTEE

the work done in the introduction of the metric system in their fields and whether the Standing Metric Committee should continue to work in its present form.

While most of the Government Departments had already adopted the metric system in commercial transactions, the change-over in technical field would take some more years. Thus re-designing equipment, rolling stock, locomotives etc. would necessarily be slow.

A programme of adoption of the metric system in higher technical education had been drawn up and was to be put into effect soon. Production of textbooks was under study. Till the books became available, teachers would have to work from notes.

In school education progress had been made in the revision of textbooks. There were, however, difficulties of frequent changes in books etc. The need for drastic revision of arithmetic textbooks was realized. Taking all the difficulties into consideration, it was possible that arithmetic textbooks might be revised completely by the beginning of the academic year 1963-64.

Decimal coinage was vitally linked with the metric system. Although all denominations of old coins except one anna and one pice had been withdrawn, it had not been possible to replace these two coins because there was a very large demand for decimal coins. The Mints were working longer hours and still the demand could not be met. It was possible that the remaining old coins would be withdrawn after the middle of 1963.

On the future of the Standing Metric Committee, it was unanimously agreed that the Committee in its present form should be wound up. There was, however, need for a small permanent organization at the Centre to ensure uniformity of enforcement procedure and to maintain liaison with various Ministries, State Governments and international bodies on weights and measures.

The Committee noted with approval that enforcement of weights and measures had been lenient. The progress achieved had been largely through persuasion and not coercion. Weights and Measures Departments in the States had attempted to secure the objects in view through persuasion, keeping the legal powers in the background. Conferences of Controllers of Weights and Measures were being held every 6 months to coordinate enforcement.

Under the law, the adoption of the metric system had to be complete by 1966. This applied only to transactions of a commercial nature. It had no relevance to conversion to the metric system in engineering. The re-designing of all equipment in the country to the metric system by 1966 would, in any case, be impracticable. Further, equipment designed in the foot-pound system might yet continue to be installed in the country, when productive units were set up in collaboration with countries like Britain or the USA. Steps had, however, to be taken to re-design equipment manufactured in the country according to a phased programme. A sound beginning had already been made. The Indian Standards Institution would offer technical advice to industry in conversion. In technical education also, the inch-pound system had to be recognised for some time to come.

Progress had been made in the revision of school books as well. By middle of the year, weights other than metric weights would be illegal throughout the country. All transactions by weight in markets would be in metric weights. Children at school should not, therefore, have to continue learning their lessons in terms of weights which had disappeared from the country. By 1963-64, all books in arithmetic would have been re-written.

Although much progress had been made, much yet remained to be done. It was

clearly necessary to set up a permanent organisation at the Centre to ensure that the uniformity that had been achieved was not dissipated by States acting without consultation with each other or with the Centre. Such action might result in complete diversity in enforcement procedure. A permanent organisation would, therefore, be required even after the metric system was fully adopted in the country.

The Chairman, winding up the discussion said that very good progress had been made in the last 5 years. Metric weights and measures, the metre, the litre and the kilogram, were understood by the people. The task appeared stupendous in the beginning. But the country had turned the corner. He expected that very soon only metric weights and measures would be in use for trading purposes in the country.

The Standing Metric Committee used to meet frequently in the beginning, when there was plenty of work to be done. It advised Government in drafting legislation for adopt-

ing the metric system and on its enforcement. During the last 5 years, while there had been no meetings of the Committee, its earlier recommendations were being implemented by the Ministry of Commerce and Industry.

Summing up

Summing up the discussion, the Chairman said that the consensus of opinion among members was in favour of:

- (1) Dissolving the Standing Metric Committee. Inter-ministerial discussions and consultations might be arranged whenever necessary.
- (2) Setting up a small permanent organisation under the Ministry of Commerce and Industry to carry on the work of the secretariat of the Committee, and to coordinate enforcement procedure throughout the country. The organisation would have responsibilities even after the metric system was completely adopted in the country and had, therefore, to be permanent.

The Chairman thanked the members for their advice and assistance. The Committee could take pride in having successfully completed the task allotted to it.

Metric System in Forestry

K. P. SAGREIYA

President,
Forest Research Institute and Colleges,
Dehra Dun

CONSEQUENT on the decision of the Government of India to adopt the metric system of measurements in all spheres of

trade, research and public transactions, a change-over has necessarily been introduced in the field of forestry. It covers forestry

research, timber trade and forest management.

Use of Measurements in Forestry

The basic unit of forest is a tree. It plays a vital role in ameliorating the conditions

METRIC SYSTEM IN FORESTRY

of life by its utilization benefits, both direct and indirect. It is turned into various sizes and shapes to suit the fancy of the man and to various forms to serve his requirements, according to the capacity and capability of the tree and the utility of the species. The bulk of the tree is measured in terms of volume units. The girth (or diameter) and height of the tree are two main measurable attributes which closely define the volume of a tree. Incidentally, both are easy to measure and are largely relied upon to determine tree volume. An extension of this idea is found in so-called 'volume tables' in which the volume of various sized trees is detailed as a function of height and diameter or girth of the tree at a fixed height (e.g. Breast Height, i.e. 4.5 ft. above ground level). Therefore, the units required for the measurements of a tree must relate to girth (or diameter), height and volume.

The raw material from forests, particularly timber, in the first stage of conversion is formed into railway sleepers or rough beams, poles, props or round logs according to the demand and ease of transportation to depots and markets. Wood is also removed in the form of billets to be used as pulp wood or fuel. The purchaser converts the timber in this shape into various forms such as planks, beams, battens, blocks to suit his own requirements. The timber trade while dealing with the volume of wood recognises measurements of length, breadth and thickness for sawn timber and mid-girth and total length of logs and other round timber. The required

measurement units are, therefore, in respect of length, breadth, thickness and girth.

As a good manager of forests, a forester is required to know the composition and structure of forests under his charge. Quantitatively, he has to know the distribution of trees in his forest by diameter/girth classes, the growth rate of the various tree classes and similar other functions to assess the total growing stock, rate of increment and its future potentialities. All these determinations require standard measurement units.

Change-over to Metric Units

The change-over had to be considered in the light of the requirements suited to the various aspects of forestry, described above in brief. Excepting the practice in vogue to measure girth or diameter at breast height, namely, at a fixed height of 4.5 ft from ground level, which will continue to be measured at the same height i.e. at 1.37 metres in metric units, all other standards of British units have been changed into metric system in such a way that though they are not the exact conversions of the British equivalents, they are close enough to them. It, therefore, means a rational adoption of metric system without losing the continuity of the earlier measurements.

Metric equivalents for measurements in British units, given in the following table, have been prescribed on the basis of the consensus of opinion of the Heads of Forest Departments of all the States of the Indian Union.

METRIC EQUIVALENTS FOR MEASURES IN BRITISH UNITS

Measures	In British Units	Metric Equivalents
GENERAL		
Breast height for diameter measurement	4.5 feet	1.37 metres
Diameter class interval	4 inches	10 cm
Height	To the nearest foot	To the nearest decimetre
Height class	10 feet 5 feet	5 m, 3 m and 1 metre for large, medium and small trees respectively.

Metric Equivalents for Measures in British Units—Contd.

Measures	In British Units	Metric Equivalents
RESEARCH AND SAMPLE PLOTS		
Linear dimensions	To the nearest foot	To the nearest decimetre
Area of plot	In acres, up to 3 places of decimal	In hectares up to 3 places of decimal.
Diameter of trees	To the nearest 1/10th of an inch	To the nearest 2 mm
Girth of trees	To the nearest inch	To the nearest cm
Height of trees	To the nearest foot	To the nearest decimetre
Length of sections of sample tree ..	10 ft and the last section not exceeding 15 feet	3 metres and the last section not exceeding 4.5 metres.
Standard timber (stem & branch) ..	Over 8" diameter over bark	Over 20 cm diameter over bark.
Standard smallwood (stem & branch) ..	From 8" diameter over bark to 2" diameter over bark	From 20 cm diameter over bark to 5 cm diameter over bark.
Top diameter	The average of 100 biggest diameters per acre.	The average of 250 biggest diameters per hectare.
Bark thickness	To the nearest 1/10 of an inch	To the nearest mm
Diameter classification of the crop ..	By 1" diameter class in ordinary sample plots and 0.3" in thinning research plots.	By 2 cm for ordinary sample plots and 1 cm for thinning research plots.
Number of annual rings	Per inch	Per 2 cm
Height of seedling	(i) In inches (ii) In ft & inches	(i) In centimetres (ii) In decimetres & centimetres
Diameter of seedlings	To the nearest 1/10 of an inch	To the nearest mm
Basal area	In square feet	In square metres
Area	In acres	In acres, hectares
Volume	(i) In cubic feet (ii) In cubic feet & decimal	(i) In cubic metres up to two places of decimal. (ii) In cubic metres up to 3 places of decimal.

In order to visualise the magnitude of a cubic metre as compared to the cubic foot with which the trade has been so familiar till recently, the volume tables prepared of late give the volume figures in cubic metre by height and diameter classes in metre and centimetre classes respectively along with the volume figures in cubic feet by height

and diameter classes in feet and inch classes respectively. Special conversion tables and other tables in metric units have also been compiled and published as *Metric Equivalents for Measures in British Units, Conversion Tables and Tables in Metric Units for Use in Forest Mensuration in India*.

New Approach to Alcoholometry

D. DAS GUPTA

Assistant Director (Chemicals),
Indian Standards Institution,
New Delhi

(The transition period for the change-over to the metric system in the alcohol industry is now over. A number of problems which required solutions have been satisfactorily resolved, at least for the time being.)

In certain cases, as in alcoholometry, a temporary solution has been devised by converting the values of proof-gallons to proof-litres. This procedure will be followed until a thoroughly 'metric' solution, now under consideration of the Indian Standards Institution is ready. At this stage, therefore, it may be useful to review the progress of work on alcoholometry now being carried out by the ISI. This article indicates the various aspects of the work done in the ISI and it is hoped, would be useful to those concerned with the alcohol industry. —Editor)

THE term 'alcoholometry' has been defined in the *Chambers Technical Dictionary* as 'the quantitative determination of alcohol in aqueous solutions'. Mixtures of ethanol, (C₂H₅OH), loosely called alcohol, and water, are taxed in most countries of the world in amounts proportional to the quantity of ethanol present in the mixture. These taxes are realised in a few countries on the basis of weight of ethanol in 100 parts by weight of the mixture while in the large majority of countries it is by volume of ethanol contained in 100 volumes of the mixture at a given temperature. The yield from taxes is substantial and a small error in the determination of ethanol content would lead to a loss either to the State revenue or to the manufacturer or supplier.

In the modern industrial field ethanol has become one of the most important basic raw materials of the chemical industry and its importance is increasing day by day. It is, therefore, quite understandable that scientists and technologists of different countries have been paying so much attention to evolving correct and uniform methods for the determination of ethanol content in aqueous solutions.

Important Factors

The volumetric content of ethanol in an aqueous solution depends on three factors :

- (1) total volume of the solution,
- (2) its temperature, and
- (3) its ethanol content.

Of these factors the last i.e. the ethanol content in an aqueous solution can be determined by methods based on the density, refractive index, oxidation index, boiling point, etc. The simplest and the quickest of these methods, however, is the one based on the density of ethanol-water mixtures. This method has been universally adopted for most purposes.

Density varies with temperature. In the case of ethanol-water mixtures the density decreases with increasing ethanol content as ethanol is lighter than water. It is,

therefore, necessary to reduce density data of ethanol-water mixtures with ethanol content to a fixed reference temperature. Temperatures such as 15° C, 15.56° C (converted from the British temperature of 60° F) and 20° C have been adopted in many countries for this purpose. The adoption of these different temperatures has created complications in international trade. Efforts are, therefore, being made to adopt internationally a uniform reference temperature.

What applies to the need for a uniform reference temperature also applies to the methods and apparatus used for the determination of density. Hydrometers are generally used for the determination. Many kinds of hydrometers, commonly known as alcoholometers, devised to indicate the ethanol content in terms of percent by volume, percent by weight, proof strength etc., are being used at present. In this case also, therefore, the need for unification of scale, graduation, calibration temperature, etc., is being increasingly felt.

Current Practice in India

The British proof spirit system of expressing ethanol content of spirit and spirituous preparations has been in vogue in our country for revenue purposes for many years. Since ethanol is subject to revenue control of some kind or other throughout its existence as ethanol, trade and industry have largely followed the same system.

The proof spirit system is in essence a volumetric system. Instead of adopting 100 percent ethanol as the base reference, a comparatively dilute ethanol-water mixture of accurately known properties is taken as the standard of reference. This dilute mixture has a specific gravity of 12/13 at 51° F compared to water at 51° F. This is known as proof spirit *i.e.* 100 Proof. Mixtures richer in ethanol content than proof

spirit are termed 'overproof', while weaker mixtures are called 'underproof'. Ethanol of 100 percent purity works out to be approximately 75° F overproof (or 175 Proof) in this system. A liquid free from ethanol is naturally Zero Proof.

The proof strengths are determined by means of a set of instruments known as 'Sikes's hydrometers'. These hydrometers do not give the ethanol content directly or even the densities of the liquid directly. They indicate certain arbitrary values, which in conjunction with the temperature of determination can be converted into proof strength by means of appropriate tables.

Sikes's hydrometers are made of metal or glass. Only metal hydrometers are officially recognized in Britain. The need for hydrometers for use with very high strength ethanol-water mixtures at high temperature was felt in Britain and about 30 years ago the Sikes B (Metal) scale was introduced along with corresponding tables.

In our country, however, both metal and glass hydrometers with respective tables are in vogue. There does not appear to be any law or rule in our country prescribing that only metal or only glass hydrometers should be used. Sikes's A (glass) is also used to cover high strength of ethanol content at higher temperature.

The tables for use with glass Sikes's hydrometers (including Sikes A) were originally compiled many years ago by Sir C. H. Bedford (late) Director, Central Excise Laboratory for India on behalf of the Government of India. In the lower range of Sikes's hydrometers the values were obtained largely by experimental work. The results obtained with glass hydrometers and the corresponding tables are in agreement with those obtained with Sikes's metal hydrometers. The tables corresponding

NEW APPROACH TO ALCOHOLOMETRY

to the high strength at high temperature ranges of Sikes A were prepared by extrapolation as corresponding metal hydrometers and tables were not in existence and probably large quantities of high strength ethanol-water mixture were also not available.

The result was that after the large scale production of power alcohol was taken up in this country, it was noticed that at high temperatures the glass Sikes's A hydrometer gave results which were at variance with those obtained with the corresponding metal hydrometer, *i.e.*, Sikes's B. At higher temperatures, there is an apparently higher indication of ethanol content by Sikes's A. This discrepancy starts at about 20° C and progressively increases as the temperature rises. In view of this discrepancy and with increasing production of absolute ethyl alcohol and high strength ethyl alcohol in the country the need was felt for reviewing the existing Sikes's A tables for use with Sikes's A hydrometers and making them correct at higher temperatures or replace Sikes's system or proof spirit system with another system.

New Approach

The problem was referred to the Indian Standards Institution a few years back and was discussed thoroughly by the Alcohol and Allied Products Sectional Committee, CDC2, and later by the Panel set up to study the subject in detail.

The study received added importance with the adoption of the metric system in the country, since some of the tables now being used in the trade and industry also require recompilation.

After careful consideration of the problems it was recommended that since volumetric content of ethanol is an essential element in commercial transactions in the country, the method of expressing the percentage

of ethanol by volume using centesimal hydrometer and pycnometer methods should be adopted in the country.

As a corollary to this decision, it was considered necessary to adopt either 27° C (adopted by the Indian Standards Institution for atmospheric conditions for testing) 20° C, 15° C or any other suitable temperature as a standard reference temperature for the calibration of centesimal hydrometers and drawing up of temperature correction tables.

It is convenient and customary to use hydrometers at ambient temperatures. To make it possible to use hydrometers at ambient temperatures, it was essential to compile temperature correction tables so that by reference to such tables it would be possible to calculate the value at the standard reference temperature.

Lack of data and facilities in the country for drawing up such temperature correction tables at 27° C required that the study be based on the available literature and the practices being followed in various countries of the world, particularly those in vogue in Continental countries. It is worthwhile mentioning here that in order to fall in line with international practices our country has recently adopted 15° C as the standard reference temperature for the calculation of bulk quantities of petroleum and liquid petroleum products. It was also realized that centesimal hydrometers indicating percent by volume of ethanol at 15° C have to be imported from overseas countries till their production is started in the country.

After weighing all the factors, it was recommended that :

(1) 15° C be adopted as the standard reference temperature for calculating the volumetric content of ethanol in a mixture of ethanol and water, and

(2) the ethanol content of a mixture of ethanol and water at $t^{\circ}\text{C}$ be expressed as the number of parts by volume of ethanol at 15°C contained in 100 parts by volume of the mixture at $t^{\circ}\text{C}$.

The second recommendation may be illustrated by an example. A consignment was found to contain 5 000 litres of ethanol and water mixture at 20°C . Appropriate centesimal hydrometer (alcoholometer), when immersed in this mixture, indicated 94.00° at 20°C . On reference to the temperature correction tables, 92.40° was found as the corresponding figure at 15°C . This showed that the mixture at 20°C contains 92.40 litres of ethanol at 15°C per 100 litre of the mixture at 20°C . The taxable quantity of ethanol when calculated would, therefore, be

$$\frac{100 \times 92.40}{100} \text{ litres i.e. 4 620 litres.}$$

While hydrometers can conveniently be used for the measurement of ethanol content in bulk quantities of ethanol-water mixtures, the pycnometer method would have to be employed in the case of some of the pharmaceutical and other spirituous preparations for which very small quantities of samples are available.

On the basis of these recommendations, and taking tables currently used in France as the source material, various tables are now being compiled. Temperature correction tables for use with centesimal hydrometers and tables containing data at 15°C for specific gravity in vacuum, absolute density in air and volume in litres per 100 kg of ethanol-water mixture have been compiled on the basis of information and data available in *Guide Pratique D'Alcoometrie* adopted by

the Director General Customs, France and published by Librairie Administrative, P. Oudin, 27 rue Arsène-orillard Poitiers, Paris. Compilation of other tables specially for use with pycnometers is in progress.

Conclusion

As mentioned earlier, the existing tables used with Sikes's (A) glass hydrometer were found to give incorrect results with ethanol and water mixtures at high temperature and at high strength. Moreover, the concept of 'proof spirit' is not readily understandable and cannot be easily assimilated and translated into various calculations required for day-to-day work. The only advantage of the proof spirit system is its traditional use in the country.

The method of expressing the strength of aqueous solutions containing ethanol in terms of percentage by volume of ethanol is very simple, readily understood, and can be easily used for various calculations. The temperature correction tables are also expected to give more accurate results than the existing tables now being used with Sikes's(A) glass hydrometers for high temperature and high strength alcoholic solutions.

With the advent of the new era of industrialization the alcohol industry has made rapid strides. Alcohol is no longer regarded merely as a potable liquor but it is now a major basic industrial raw material for the chemical industries. It is considered that the adoption of the new system of alcoholometry in the country will be more convenient, practicable and rational from the point of view of the ever developing alcohol and other chemical industries.

Cloth Requirements in Metric Terms

(Length measures in the metric system were introduced all over the country from 1 October 1961. On 1 October 1962 their use will become compulsory. Already, prices are marked in terms of metres on cloth; mills which run their own retail shops are selling cloth in metric units. Khadi is sold in terms of the metre in many places. Within a few months all cloth will have to be sold in metres.)

The necessity of suitable conversions of the requirements of cloth for various types of clothes as also

of expressing dimensions of readymade wear in terms of the metric system is real.

The tables which follow list the requirements of cloth for various ordinary purposes in terms of the metre.

The tables have been drawn up in consultation with the interests concerned.

—Editor)

TABLE I—CLOTH REQUIREMENTS FOR MENS APPAREL

Sl. No.	Items	Measurements in Yards (width in inches)	Converted Measurements in metres (width in cm)	Suggested Measurements
(1)	(2)	(3)	(4)	(5)
1.	Coat (Woollen) Length	1 5/8 (54"-56") 1 3/4 (54"-56") 1 7/8 (54"-56") 2 (54"-56")	1.49 (137-142 cm) 1.60 (137-142 cm) 1.71 (137-142 cm) 1.83 (137-142 cm)	1.50 (135-145 cm) 1.60 (135-145 cm) 1.70 (135-145 cm) 1.85 (135-145 cm)
	Coat (Cotton)	3 (24"-36") 3 1/2 (24"-36") 3 3/4 (24"-36")	2.74 (61-91 cm) 3.20 (61-91 cm) 3.43 (61-91 cm)	2.75 (60-90 cm) 3.20 (60-90 cm) 3.40 (60-90 cm)
2.	Suit (Woollen)	3 (54"-56") 3 1/8 (54"-56") 3 1/4 (54"-56") 3 1/2 (54"-56") 3 5/8 (54"-56")	2.74 (137-142 cm) 2.86 (137-142 cm) 2.97 (137-142 cm) 3.20 (137-142 cm) 3.31 (137-142 cm)	2.75 (135-145 cm) 2.85 (135-145 cm) 3.00 (135-145 cm) 3.20 (135-145 cm) 3.30 (135-145 cm)
3.	Trousers (Cotton and silk)	2 3/4" (30") 3 (24"-36")	2.51 (76 cm) 2.74 (61-91 cm)	2.50 (75 cm) 2.75 (60-90 cm)
	Silk suit	6 (24"-36")	5.49 (61-91 cm)	5.50 (60-90 cm)
4.	Trousers (woollen)	1 3/8 (54"-56") 1 1/2 (54"-56")	1.26 (137-142 cm) 1.37 (137-142 cm)	1.25 (135-145 cm) 1.35 (135-145 cm)
	Coat silk	3 1/4 (24"-36")	2.97 (61-91 cm)	3.00 (60-90 cm)
5.	Trousers (silk)	3 (24"-26")	2.74 (61-91 cm)	2.75 (60-90 cm)
	Trousers (cotton)	1 5/8 (54"-56")	1.44 (137-142 cm)	1.45 (135-145 cm)
6.	Overcoat (cotton)	3-3 1/2 (24"-36")	2.74-3.20 (61-91 cm)	2.75-3.20 (60-90 cm)
	(Woollen)	2 1/2—2 3/4 (54"-56")	2.29-2.51 (137-142 cm)	2.30-2.50 (135-145 cm)
7.	Churidar Pyjama	1 1/4 (54"-56")	1.14 (137-142 cm)	1.15 (135-145 cm)
	(Woollen)	2 1/4 (36")	2.06 (91 cm)	2.05 (90-91 cm)
	(Cotton)			

Sl. No.	Items	Measurements in Yards (width in inches)	Converted Measurements in metres (width in cm)	Suggested Measurements
(1)	(2)	(3)	(4)	(5)
8.	Pyjama suit (cotton)	5 1/2 (30") 6 (30")	5.03 (76 cm) 5.49 (76 cm)	5.00 (75-76 cm) 5.50 (75-76 cm)
9.	Achkan (cotton)	5 1/2 (30")	5.03 (76 cm)	5.00 (75-76 cm)
10.	Sherwani (cotton) (woollen)	5 (30") 2 1/2—2 3/4 (54"-56")	4.57 (76 cm) 2.29-2.51 (137-142cm)	4.60 (75 cm) 2.30—2.50 (135-142 cm)
11.	Nehru waist coat	1 1/2 (30")	1.37 (76 cm)	1.35 (75 cm)
12.	(a) Salwar (b) Kameej	2 (45") 2 1/2 (45")	1.83 (114 cm) 2.29 (114 cm)	1.85 (114-115 cm) 2.30 (114-115 cm)
13.	Bushshirts, Manila etc.	2 1/2 (36")	1.83 (91 cm)	1.85 (90-91 cm)
14.	Half Pant	2 (36")	1.83 (91 cm)	1.85 (90-91 cm)
13.	Turban	5 (22") 6 (22") 7 (22")	4.57 (56 cm) 5.49 (56 cm) 6.49 (56 cm)	4.50 (55-56 cm) 5.50 (55-56 cm) 6.50 (55-56 cm)
16.	Lungi	2-2 1/2 (45"-50")	1.83-2.29 (114-127cm)	1.85-2.30 (115-130 cm)
17.	Dhoti	4 (52") 4 1/2 (52") 5 (45") 2-2 1/2 (45"-52")	3.66 (132cm) 4.11 (132 cm) 4.57 (114 cm) 1.83-2.29 (114-132cm)	3.75 (130-132cm) 4.10 (130-132 cm) 4.50 (114-115 cm) 1.85-2.30 (115-135 cm)
18.	Shirt (cotton) Half sleeve Full sleeve	2 1/2 (36") 3 (36")	2.29 (91 cm) 2.74 (91 cm)	2.30 (90-91 cm) 2.75 (90-91 cm)
19.	Dressing gown	2 3/4 (54"-56") 3 (54"-56")	2.51 (137-142 cm) 2.74 (137-142 cm)	2.50 (135-145 cm) 2.75 (135-145 cm)

TABLE II—CLOTH REQUIREMENTS FOR WOMEN'S APPAREL

1.	Salwar	3 (45")	2.74 (114 cm)	2.75 (114-115 cm)
2.	Kameej	2 (45") 2 1/4 (45")	1.83 (114 cm) 2.06 (114 cm)	1.85 (115 cm) 2.05 (115 cm)
3.	Sarees	5 (45"-48") 5 1/2 (45"-48") 6 (45"-48") 7 (46"-48") 8 (45"-48") 9 (45"-48")	4.57 (114-122 cm) 5.03 (114-122 cm) 5.49 (114-122 cm) 6.40 (114-122 cm) 7.32 (114-122 cm) 8.23 (114-122 cm)	4.60 (115-125 cm) 5.00 (115-125 cm) 6.50 (115-125 cm) 7.25 (115-125 cm) 7.25 (115-125 cm) 8.25 (115-125 cm)
4.	Blouses	3/4-1 1/4 (36"-45")	0.69-1.14 (91-114 cm)	0.70-1.15 (90-115 cm)
5.	Choli pieces	1/2—3/4 (36"-45")	0.46—0.69 (91-114 cm)	0.45—0.70 (90-115 cm)
6.	Petticoat	2 1/2 (36") 2 (45")	2.29 (91 cm) 1.83 (114 cm)	2.30 (90-91 cm) 1.85 (114-115 cm)
7.	Shawls	36" x 72" 40" x 80" 45" x 90" 54" x 100" 54" x 108"	91 cm x 183 cm 102 cm x 203 cm 114 cm x 229 cm 137 cm x 254 cm 137 cm x 274 cm	90 x 180 cm 100 x 200 cm 115 x 230 cm 140 x 250 cm 140 x 275 cm

CLOTH REQUIREMENTS IN METRIC TERMS

Sl. No.	Items	Measurements in Yards (width in inches)	Converted Measurements in metres (width in cm)	Suggested Measurements
(1)	(2)	(3)	(4)	(5)
8.	Chunni or Dupatta	2 1/4 (36"-45") 2 1/2 (36"-45")	2.06 (91-114 cm) 2.29 (91-114 cm)	2.05 (90-115 cm) 2.30 (90-115 cm)
9.	Skirt	2 1/2 (24"-36")	2.29 cm (61-91 cm)	2.30 (60-90 cm)
10.	Ladies short coat	2 (54"-56") 2 1/4 (54"-56")	1.83 (137-142 cm) 2.06 (137-142 cm)	1.85 (135-145 cm) 2.05 (135-145 cm)
11.	Ladies long coat	2 3/4 (54"-56") 2 1/2 (54"-56")	2.51 (137-142 cm) 2.29 (137-142 cm)	2.50 (135-145 cm) 2.30 (135-145 cm)
12.	Dressing Gown	3 (54"-56") 3 1/4 (54"-56")	2.74 (137-142 cm) 2.97 (137-142 cm)	2.75 (135-145 cm) 3.00 (135-145 cm)
13.	Ghagra	10 (36") 11 (36") 12 (36") 13 (36") 14 (36") 15 (36")	9.14 (91 cm) 10.06 (91 cm) 10.97 (91 cm) 11.89 (91 cm) 12.80 (91 cm) 13.72 (91 cm)	9.00 (90-91 cm) 10.00 (90-91 cm) 11.00 (90-91 cm) 12.00 (90-91 cm) 12.75 (90-91 cm) 13.75 (90-91 cm)

TABLE III—READY MADE GARMENTS

Sl. No.	Items	Measurement in inches	Converted Measurement in cm	Suggested Measurement cm
(1)	(2)	(3)	(4)	(5)
1.	Full Trousers			100
	Length	40" 41" 42" 43" 44"	102 104 107 109 112	102 104 106 108 110 112
	Waist	28" 30" 32" 34" 36" 38" 40" 42"	71 76 81 86 91 97 102 107	70 75 80 85 90 95 100 105 110
2.	Half Pants			42
	Length	16 1/2" 17" 17 1/2" 18"	41.9 43.2 44.5 45.7	43 44 45 46
	Waist	28" 30" 32" 34" 36" 38" 40" 42" 44" 46" 48"	71 76 81 86 91 97 102 107 112 117 122	70 75 80 85 90 95 100 105 110 115 120

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Sl. No.	Items	Measurements in inches	Converted Measurement in cm	Suggested Measurement cm
(1)	(2)	(3)	(4)	(5)
3.	Shirt Collar	13 1/2"	34	35
		14"	35.6	36
		14 1/2"	36.8	37
		15"	38.1	38
		15 1/2"	39.4	39
		16"		40
		16 1/2"	40.6	41
		17"	41.9	42
			43	43
				44
				45
4.	Coat Length	28"	71	70
		29"	74	72
		30"	76	74
				76
				78
				80
				82
		31"	79	
		32"	81	
	Chest	32"	81	80
		34"	86	85
		36"	91	90
		38"	97	95
		40"	102	100
		42"	107	105
		44"	112	110
		46"	117	115
				120
5.	Underwear (Katchhas)	36"	91	90
		38"	97	95
		40"	102	100
		42"	107	105
		44"	112	110
		46"	117	115
		48"	122	120
		50"	127	125
		52"	132	130
		54"	137	135
		56"	142	140
6.	Kulhas	20"	50.8	50
		20 1/2"	52.1	51
		21"	53.3	52
		21 1/2"	54.6	53
		22"	55.9	54
		22 1/2"	57.2	55
		23"	58.4	56
		23 1/2"	59.7	57
		24"	61.0	58
				59
				60
				61
7.	Bushshirts	32"	81	80
		34"	86	85
		36"	91	90
		38"	97	95
		40"	102	100
		42"	107	105
		44"	112	110
		46"	117	115
				120

CLOTH REQUIREMENTS IN METRIC TERMS

Sl. No.	Items	Measurement in inches	Converted Measurement in cm	Suggested Measurement cm
(1)	(2)	(3)	(4)	(5)
8.	Bandi (Jawahar)	32"	81	80
		34"	86	85
		36"	91	90
		38"	97	95
		40"	102	100
		42"	107	105
		44"	112	110
9.	Kurta	32"	81	80
		34"	86	85
		36"	91	90
		38"	97	95
		40"	102	100
		42"	107	105
		44"	112	110
10.	Pyjama	40"	102	100
		41"	104	102
				104
				106
				108
		42"	107	110
		43"	109	110
		44"	112	112
11.	Sola & Felt Hats	6 1/2"	16.5	16
		6 5/8"	16.8	16.5
		6 3/4"	17.1	17
		6 7/8"	17.5	17.5
		7"	18.1	18
		7 1/8"	18.7	18.5
		7 3/8"	19.1	19
				19.5
		7 1/2"	20.3	20
12.	Caps	18"	46	45
				46
		18 1/2"	47	47
		19"	48.3	48
				49
		19 1/2"	49.5	50
		20"	50.8	51
		20 1/2"	52	52
		21"	53.3	53
				54
		21 1/2"	54.6	55
		22"	55.9	56
		22 1/2"	57.2	57
		23"	58.4	58
		23 1/2"	59.7	60
		24"	61	61
13.	Ties Length	50"	127	126
				128
		51"	129.5	130
				132
		52"	132	134
				136
		53"	135	138
		54"	137.2	140

Sl. No.	Items	Measurement in inches	Converted Measurement in cm	Suggested Measurement cm
(1)	(2)	(3)	(4)	(5)
4.	Ghagra Length	40"	102	102
		41"	104	104
		42"	107	106
		43"	109	108
		44"	112	110
		45"	114	112
				114
5.	Rain Coats	38"	97	98
		39"	99	100
		40"	102	102
		41"	104	104
		42"	107	106
		43"	109	108
		44"	112	110
		45"	114	112
		46"	117	114
				116
				118
				120
CHILDREN'S WEAR				
1.	Children's frocks ..	12"	30	30
		14"	36	35
		16"	41	40
		18"	46	45
		20"	51	50
		22"	56	55
		24"	61	60
		26"	66	65
		28"	71	70
		30"	76	75
		32"	81	80
2.	Baby's Rain Coat ..	20"	51	50
		21"	53	52
				53
		22"	56	54
		23"	58	56
				58
		24"	61	60
				62
		25"	64	64
3.	Baby's socks	5"	12.7	12
		5½"	14.0	13
		6"	15.2	14
				15

CLOTH REQUIREMENTS IN METRIC TERMS

TABLE IV—HOUSEHOLD ACCESSORIES

Sl. No.	Items	Measurement in Yards/feet/inches	Converted Measurements metres (width in cm)	Suggested Measurements (cm)
(1)	(2)	(3)	(4)	(5)
1.	Blankets width			
	Length	50" × 84"	127 × 213	125 × 215
		52" × 86"	132 × 218	130 × 220
		54" × 88"	137 × 224	135 × 225
		56" × 90"	142 × 229	140 × 230
		58" × 92"	147 × 234	145 × 235
		60" × 94"	152 × 239	150 × 240
		62" × 100"	157 × 254	155 × 250
		64" × 104"	163 × 264	160 × 260
2.	Bed Covers	54" × 90"	137 × 229	135 × 230
		60" × 90"	152 × 229	150 × 230
		90" × 108"	229 × 274	230 × 275
3.	Bed Sheets	54" × 90"	137 × 229	135 × 230
		63" × 100"	160 × 254	160 × 250
		90" × 108"	229 × 274	230 × 275
4.	Pillow Covers ..	16" × 26"	41 × 66	40 × 65
		18" × 26"	46 × 66	45 × 65
		14" × 20"	36 × 51	35 × 50
5.	Sofa, Curtain & Tapestries Length ..	10 yds (46—48")	9.14 m (117—122 cm)	10 m (120 cm)
		14 yds (46"—48")	12.80 m (117—122 cm)	15 m (120 cm)
		18 yds (46"—48")	16.46 m (117—122)	15 m (120 cm)
		21 yds (46"—48")	19.20 m (117—122 cm)	20 m (120 cm)
6.	Towels (Mill Made & Handloom)	12" × 12"	30.5 × 30.5 cm	30 × 30
		16" × 25"	41 × 64 cm	40 × 65
		24" × 45"	61 × 114 cm	60 × 115
		22" × 36"	56 × 91 cm	55 × 90
		20" × 40"	51 × 102 cm	50 × 100
		22" × 44"	56 × 112 cm	55 × 110
		24" × 48"	61 × 122 cm	60 × 120
		27" × 54"	69 × 137 cm	70 × 140
		30" × 60"	76 × 152 cm	75 × 150
		47" × 80"	119 × 203 cm	120 × 200

TABLE V—MISCELLANEOUS REQUIREMENTS

Sl. No.	Items	Measurements in ft and inches	Converted Measurements metres cm	Suggested Measurements m/cm
(1)	(2)	(3)	(4)	(5)
1.	Durries	4' x 9'	1.22 x 2.74 m	1.20 x 2.75 m
		5' x 8'	1.52 x 2.44 m	1.50 x 2.50 m
		6' x 9'	1.83 x 2.74 m	1.80 x 2.75 m
		9' x 12'	2.74 x 3.66 m	2.75 x 3.75 m
		12' x 15'	3.66 x 4.57 m	3.75 x 5.50 m
		12' x 18'	3.66 x 5.49 m	3.75 x 5.50 m
		15' x 21'	4.57 x 6.40 m	4.50 x 6.50 m
2.	Coir Carpets & Kalin & Rugs	3' x 6'	0.91 x 1.83 m	0.90 x 1.80 m
		4' x 7'	1.22 x 2.13 m	1.20 x 2.00 m
		5' x 8'	1.52 x 2.44 m	1.50 x 2.50 m
		6' x 9'	1.83 x 2.74 m	1.80 x 2.75 m
		8' x 10'	2.44 x 3.05 m	2.50 x 3.00 m
		9' x 9'	2.74 x 2.74 m	2.75 x 3.75 m
		9' x 12' and Upto 12' width and to any length according to demand.	2.74 x 2.74 m Upto 3.66 m width and to any length according to demand.	2.75 x 2.75 m Upto 3.75 m width and to any length according to demand.
3.	Coir Mats or door mats	Size No.		
		0 22' x 12'	56 x 30 cm	55 x 30 cm
		1 24' x 14'	61 x 36 cm	60 x 35 cm
		2 27' x 16'	69 x 41 cm	70 x 40 cm
		3 30' x 18'	76 x 46 cm	75 x 45 cm
		4 33' x 20'	84 x 51 cm	85 x 50 cm
		5 36' x 22'	91 x 56 cm	90 x 55 cm
		6 39' x 24'	99 x 61 cm	100 x 60 cm
		7 42' x 26'	107 x 66 cm	105 x 65 cm
		8 45' x 28'	114 x 71 cm	115 x 70 cm
		9 48' x 30'	122 x 76 cm	120 x 75 cm
4.	Coir Matting			
	Width	18" (Rolls of 50 yd.)	46 cm (rolls of 45.72 m)	45 cm (50 m length)
		24"	61 cm	60 cm
		27"	69 cm	70 cm
		30"	76 cm	75 cm
		36"	91 cm	90 cm
		48"	122 cm	120 cm
		54"	137 cm	140 cm
		72"	183 cm	180 cm
5.	Rubber Matting	36" width (in rolls of 48'—60')	91 cm width (rolls of 14.63—18.29 m)	90 cm (15—20 m)
6.	Curtain cloth			
	Length	35 yd	32 m	32 m
		36	32.92 m	33 m
		37	35.83 m	34 m
		38	34.75 m	35 m
		39	35.66 m	36 m
		40	35.58 m	37 m
		41	37.49 m	38 m
		42	38.40 m	39 m
		43	39.32 m	40 m
		44	40.23 m	41 m
		45	41.15 m	42 m
	Width	46"	117 cm	118.5 cm
		47"	119 cm	120 cm
		48"	122 cm	122.5 cm

CLOTH REQUIREMENTS IN METRIC TERMS

Sl. No.	Items	Measurements in yards/feet/inches	Converted measurements in metres/cm	Suggested Measurements m/cm
7.	Plastic sheetings	36" (rolls of 50 yd.)	91 cm (rolls of 45.72 m)	90 (50 m rolls)
		48"	122 cm	120 "
		54"	137 cm	140 "
8.	Glass mats	40" x 72"	102 x 183 m	100 x 180 cm
		48" x 72"	122 x 183 cm	120 x 180 cm
9.	Floorings, width	36" (rolls of 50 yd.)	91 cm (rolls of 45.72 m)	90 cm (50 m rolls)
		44" (50 yd)	112 (45.72 m)	100 cm (60 cm rolls)
		48" (50 yd)	122 (45.72 m)	120 cm (50 m rolls)
		56" (50 yd)	142 (45.72)	140 cm
10.	Namdaz	4' x 6'	122 x 183 cm	120 x 180 cm
		3' x 5'	91 x 152 cm	90 x 150 cm
11.	Leather Suitcases			
	Length	10"	25.4	25
		12"	30.5	30
		14"	35.6	35
		16"	40.6	40
		18"	45.7	45
		20"	50.8	50
		22"	55.9	55
		24"	61.0	60
		26"	66.0	65
		28"	71.1	70
		30"	76.2	75
	Width	8"	20.3	20
		9"	22.9	22
		10"	25.4	24
		11"	27.9	26
		12"	30.5	28
		13"	33.0	30
		14"	35.7	32
		15"	38.1	34
		16"	40.6	36
		17"	43.2	38
		18"	45.7	40
				42
				44
				46
	Depth	4"	10.2	10
		4 1/2"	11.4	11
		5"	12.7	12
		5 1/2"	14.0	13
		6"	15.2	14
		6 1/2"	16.5	15
		7"	17.7	16
		7 1/2"	19.1	17
		8"	20.3	18
		8 1/2"	21.6	19
		9"	22.9	20
				21
				22
				23
	Holdalls			
	Width	27"	69	70
		30"	76	75
		33"	84	80
		36"	91	85
				90
	Length	60"	152	150
		64"	163	160
		68"	173	170
		72"	183	180
	Depth	4"	10	10
		6"	15	15

Government of India, Ministry of Steel, Mines and Fuel, (Department of Mines and Fuel).

(2) Capacity Measures

S.O. No. 742 dated 7th March 1962.

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 April 1962 as the date on which the provisions of said Act, in so far as they relate to units of capacity, 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 class of goods in respect of which, the said provisions have already come into force.

S.O. No. 743 dated 7th March 1962.

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. 742 dated the 7th March, 1962 the continuance of the use for a period of one year from the 1st day of April, 1962 of any unit of capacity which immediately before that date was in use in respect of the said areas.

(3) Amendment of S.O. 733.

S.O. No. 963 dated 30th March, 1962.

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 amendments in the Notification of the Government of India in the Ministry of Commerce and Industry No. S.O. 733 dated the 29th March, 1961. namely :—

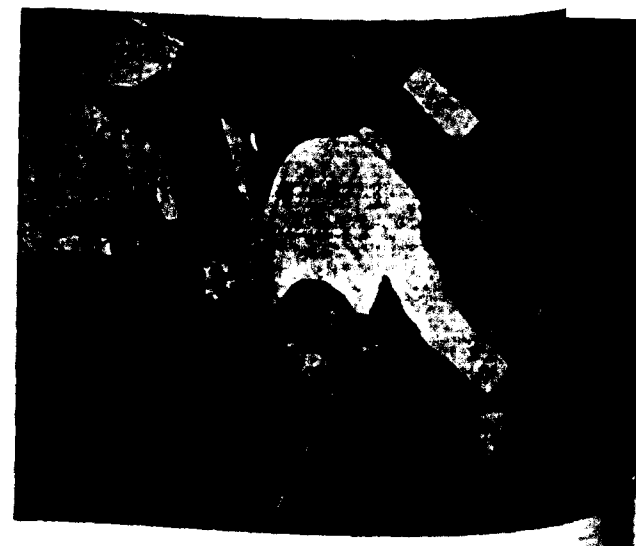
In the said Notification—

- (1) for the words "classes of undertakings of goods", the following shall be substituted, namely :—
"classes of undertakings or of goods (other than Government Departments) in so far as they undertake the survey of land or mines";
- (2) the following proviso shall be added at the end, namely :—
"Provided that, in respect of Government Departments in so far as they undertake the survey of land or mines, the Central Government permits the continuance in use of any such weight or measure upto and inclusive of 31st March, 1963".

Metric Stall in Madras Fair

The Department of Weights and Measures, Madras took part in the second National Agriculture Fair held at Madras between 14 January 1962 and 11 March 1962. In the Metric Stall were exhibited working standards of the Inspector as well as commercial weights, measures etc. produced by leading manufacturers of Madras city.

Fig. 1—Shri M. A. Manickavelu, Minister for Revenue and Health, Government of Madras, visited the Madras stall. Here he is seen examining capacity measures.



NEWS & VIEWS

Considerable publicity was given to the various steps taken to enforce metric weights and measures in the State.

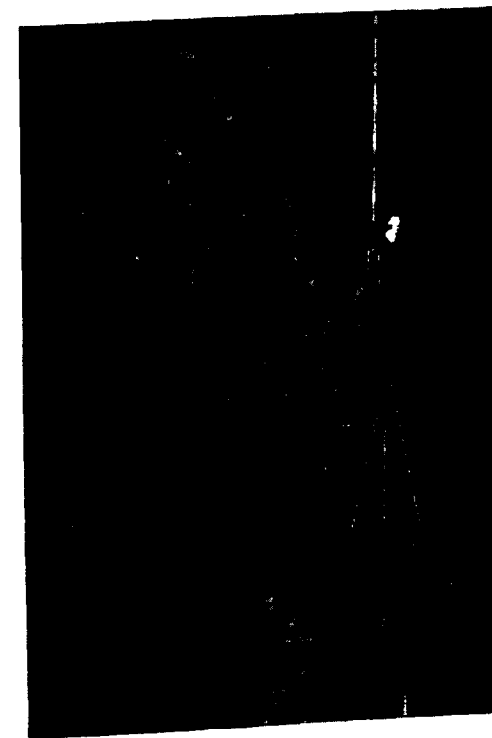


Fig. 2—Shri S. Moni, Controller of Weights and Measures, Madras, demonstrates the difference between Madras measures and litre measures. He is showing how salt when sold by measure is a loss to the public owing to difference in qualities.

More than 5 lakh people weighed themselves on the platform machine kept in the stall. The difference between the old units and new was demonstrated by actually weighing or measuring out commodities.

New Standard of Atomic Weights $^{12}_6\text{C}$

At a meeting (held in Montreal during 2-5 August 1961) of the Council of the International Union of Pure & Applied Chemistry, the new scale of atomic weights based on the carbon isotope 12, as proposed by the Commission on Atomic Weights, was adopted [J. sci. industr. Res., 20A (1961), 41]. The International Union of Pure and Applied

Physics had also adopted earlier (in 1960) the carbon-12 isotope as the reference species for the physical scale in preference to oxygen-16. Thus, all nuclidic masses and atomic weights and quantities and constants derived from them will henceforth be expressed on a common scale, for which the exact number 12 is taken as the relative nuclidic (atomic) mass of carbon isotope-12. A revised table of relative atomic masses based on the carbon 12 scale has been published in Information Bulletin No. 14B (September 1961) of the International Union of Pure & Applied Chemistry. (J. Sci. Industr. Res. 21A, Feb. 62, p 104).

Adoption of A-Size of Paper in Madras

It will be recalled that about a year ago, it was recommended by the Conference of Controllers of Printing and Stationery, Central and State, that the international standard sizes of paper be adopted.

Some States have already begun the change-over. The Printing and Stationery Department of Madras State is using A-series of paper for its publications. The following books have already been printed in the A-series of sizes as indicated :

Title	Size
(1) Instructions for Presiding Officers (English)	.. A5
(2) Gramanalam (Tamil)	.. A4
(3) Mezichelvam (Tamil)	.. A4
(4) Harijana Nalathurayum as Parijum	 A5

The printing was done in RA1 size of paper.

This is a welcome step and it is hoped that other States will also start using the international paper sizes shortly.

Metric System in Alcohol Industry

A meeting of Excise Commissioners of States, manufacturers of alcohol preparations

and others concerned was held in Udyog Bhavan on 19 March 1962 under the Chairmanship of Shri K. V. Venkatachalam, Joint Secretary, Ministry of Commerce and Industry, New Delhi.

Excise Departments in States have now adopted the metric system in the levy of duties except in Andhra Pradesh and Mysore where it will start from the beginning of their excise year, namely 1 October 1962 and 1 July 1962.

Some important recommendations were as follows :

Filling capacity of bottles for liquor : 750 ml, 600 ml, 500 ml, 375 ml, 300 ml, 250 ml, and 180 ml with a permissible error in filling —2 percent subject to a maximum of 7.5 ml.

Filling capacity of bottles for beer : 650 ml and 325 ml with a permissible error in filling of —2 percent. Bottles of sizes 26-2/3 oz, 22 oz, 13-1/3 oz, 11 oz, and 6-2/3, could be used for three years but should be filled to 750, 600, 375, 300 and 180 ml respectively. 24 oz and 12 oz bottles may be used if they can be filled to 600 and 300 ml. Filled bottles of above sizes in stock would be sold for two years. Permits issued till the date of in-

roduction would be valid even if quantities were given in gallons. Permits issued afterwards would show quantities in metric units. Only metric capacity measures should be used in the sale of spirits. It was also agreed that flow meters may be used to measure spirit in vats, storage tanks, etc.

Amendment of S.O. 1220

S.O. No. 1098, dated 5th April 1962— 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. S.O. 1220 dated the 30th May 1961, namely :—

In the said notification, the following proviso shall be added at the end, namely :—

“Provided that, in respect of any such undertaking in or any such department of Government of the State of Andhra Pradesh and the State of Mysore, the Central Government permits the continuance in use of any such weight or measures up to and inclusive of the 30th September 1962 and the 30th June 1962 respectively.”



Readers' Forum

Stainless Steel for Standard Weights

Dear Sir,

In your September 1961 (Vol. 4, No. 5) issue of *Metric Measures* you have noted, on page 28, a paper by S. J. Rosenberg and T. P. Royston, published January 1961 in *Materials Research & Standards*, in which it is said that a special stainless steel having a density of 8.4 grams per cubic centimetre has been developed for standard weights.

In order that you may be kept entirely current on our investigations of material for standard weights, we now wish to advise that the National Bureau of Standards is directing its attention to the development of a stainless steel having a density of 8.0 grams per cubic centimetre and providing high corrosion resistance, nonmagnetic qualities, workable yet reasonably hard surface, and other significant properties. We presently are experimenting with a special steel that has been produced under consumable electrode vacuum melting, is a completely stable austenite, and with hardness typical of austenitic steels. The composition (nominal) is :

Carbon	0.10%
Magnesium	1.5%
Silicon	0.5%
Chromium	20.0%
Nickel	25.0%
Molybdenum	2.25%
Copper	0.2%
Iron	Balance

This material appears to be eminently satisfactory for mass standards and further experiments will be conducted prior to its general use in the United States.

The 8.0 g/cm³ density is in line with present thinking of the National Physical Laboratory of England for mass standards of stainless steel.

M. W. Jensen,

Chief, Office of Weights and Measures,
National Bureau of Standards,
U. S. Department of Commerce,
Washington.

Section 5 Typical illustrations on welding, fasteners and structural steel work.

Section 6 Recommended abbreviations and graphs.

The Code is available both as a complete volume comprising all the sections and as individual sections with the objective of assisting such of the users who may be interested in purchasing only sections of interest to them.

The complete volume has been priced at Rs. 15.00 while individual sections are available at prices ranging from Rs. 3.50 to Rs. 8.00.

Indian Standard Specification for Water Meters (Domestic Type) (IS : 779—1961)

The Indian Standards Institution has published a revision of IS : 779 Specification for Water Meters (Domestic Type) (Revised) which covers inferential (horizontal-flow) and semipositive types of water meters with threaded end connections and of nominal sizes up to and including 50 mm. The specification applies to both wet-dial and dry-dial meters.

This specification which was first issued in 1956 has been revised to incorporate the improvements which have taken place since then.

Metric system has been adopted in India and all quantities and dimensions appearing in this standard have been given in this system; however, size designations have been given in fps units also for facilitating reference to other standards relevant to this specification.

Price: Rs. 3.00

Indian Standards Specification for Paper Sizes (IS: 1064—1961)

The Indian Standards Institution has just published a revision of IS : 1064 Specification for Paper Sizes, which prescribes the requirements of printing, writing, wrapping and casing paper sizes, machine-made and hand-made.

The purpose of this standard is to rationalize and reduce the number of paper sizes with a view to achieving uniformity in the papers to be used for correspondence, production of book pamphlets and other allied matters; to facilitate the manufacture and sale of paper; and to co-ordinate the sizes for business lettering, card index records, filing records and office furniture.

The standard which was originally published in 1957 covered only the trimmed sizes; and it has been revised so as to include the untrimmed sizes also.

It is hoped that producers and consumers of papers will now be able to adopt the metric sizes of paper which have been internationally recognized and have been found not only rational but also advantageous and economical in actual use.

Price: Rs. 2.00

Indian Standard for Substances of Paper and Pulp Board (IS: 1763—1961)

The Indian Standards Institution has published IS : 1763—1961 Specification for Substances of Paper and Pulp Board, which prescribes the substances in which paper (other than tissue) and pulp board shall normally be manufactured and stocked.

Paper and pulp board are being manufactured in a large variety of 'substances' and it is desirable to rationalize the series of substances so as to bring about a reduction of this uneconomical variety. The recommendation of the International Organization for Standardization to measure the substance by the weight in grams per square metre of the paper or board has been adopted in all Indian Standards for paper and board. This system involves least amount of calculation, does not depend upon the size or number of sheets in the ream and is in conformity with the country's change-over to metric system.

Price: Rs. 1.00

Indian Standard Specification for Self-Indicating and Semi-self-Indicating Counter Type Weighing Machines (IS: 1853—1961)

The Indian Standards Institution has published IS : 1853—1961 Specification for Self-Indicating and Semi-Self-Indicating Counter Type Weighing Machines which covers the requirements of self-indicating and semi-self-indicating counter type weighing machines.

This standard is one of a series of Indian Standards on commercial weighing machines being prepared at the instance of the Standing Metric Committee, Government of India, in connection with the introduction of metric system of weights and measures in the country.

Price: Rs. 1.50

Indian Standard Dimensions for Rolled Steel Bulb Plates (IS: 1863—1961)

The Indian Standards Institution has just published IS : 1863-1961 Dimensions for Rolled Steel Bulb Plates. This standard lays down the nominal dimensions of hot rolled steel bulb plates conforming to IS : 226-1958 Structural Steel (Second Revision) and IS : 961-1957 High Tensile Structural Steel. Structural properties of the sections as calculated on the nominal dimensions are also included.

This standard is one of a series of Indian Standards being published by ISI under the Steel Economy Programme, the object of which is to achieve economy in the use of steel by establishing rational, efficient and optimum standards for structural sections; formulation of standard codes of practice for the design and fabrication of steel structures; popularization of welding in steel construction; and co-ordination and sponsoring of experimental research relating to the production and use of structural steel which would enable the formulation and revision of specifications and codes of practice.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 1.50

Indian Standard Specification for Carbon Steel Bars, Billets, Blooms and Slabs for Forgings IS: 1875—1961

The Indian Standards Institution has published IS : 1875-1961 Specification for Carbon Steel Bars, Billets, Blooms and Slabs for Forgings, which prescribes the requirements for four grades of carbon steel bars, billets, blooms and slabs for forgings designated as Class 1, Class 2, Class 3 and Class 4.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system. However, for the sake of smooth change-over by December 1966, non-metric values have also been given wherever necessary.

Price: Rs. 2.00

Draft Indian Standard Tables for Alcoholometry

The Indian Standards Institution has circulated for comments draft Indian Standard Tables for Alcoholometry. The draft standard gives two tables, one containing temperature correction data, and the other including data at 15°C for specific gravity in vacuum, absolute density in vacuum and density in air and volume in litre corresponding to 100 kg (in air) of a mixture containing ethanol and water. The temperature correction tables have been based on a reference temperature of 15°C. With the help of these tables, it will be possible to obtain the percentage by volume of ethanol at 15°C in a particular mixture of ethanol and water from hydrometer readings taken at any temperature (0° to 14° C) other than 15°C. Examples have been given in the standard to illustrate the use of these tables.

The British Proof Spirit System of expressing ethanol content of spirits and spiri-

tuous preparations has been in vogue in our country for revenue purposes for many years; the trade and industry have followed the same system. With the adoption of metric system in the country and in view of other factors, it was found desirable to change-over to the method of expressing the percentage of ethanol by volume using centesimal hydrometers (alcoholometers) and pycnometers.

It is hoped that the adoption of this new system of alcoholometry in the trade and industry will be more convenient, practicable and rational.

Draft Indian Standard Tolerances for ISO Metric Screw Threads (1.6 To 300 mm) and Gauging Practice for Metric Screw Threads

The Indian Standards Institution has circulated for comments the following two draft Indian Standards :

- (a) Tolerances for ISO Metric Screw Threads (1.6 to 300 mm)
- and
- (b) Gauging Practice for Metric Screw Threads.

Based on the work of International Organization for standardization (ISO), an Indian Standard Dimensions for Screw Threads for General Purposes (Diameter Range 0.25 to 39 mm) was published in 1959 (IS : 1362—1959). As a result of further work at the ISO level, it has now been possible to prepare a draft Indian Standard Tolerances for ISO Metric Screw Threads (Diameter Range 1.6 to 300 mm) which will assist in obtaining the dimensions for the thread diameters covered in IS : 1330-1958 General Plan for Metric Screw Threads with ISO Profile (Diameter Range 0.25 to 300 mm).

The gauging practice outlined in the draft Indian Standard Gauging Practice for Metric Screw Threads will assist in gauging the screw threads of the dimensions given in the draft Standard Tolerances for ISO Metric Screw Threads (1.6 to 300 mm.). These two drafts, when published as Indian Standards, are expected to meet practically all the requirements of metric screw threads that will be used in the country.

CONTROLLERS IN STATES

Please note the following CHANGES :

Assam

Shri G. Sharma,
Controller of Weights and Measures,
Gauhati,
Assam.

Laccadive, Minicoy and Amindivi Islands

Shri M. Ramunni,
Administrator,
Laccadive, Minicoy and Amindivi
Islands,
Kozhikode.

Madras

Shri S. Moni,
Controller of Weights and Measures,
37, Spur Tank Road,
Madras-31.

The following are the TELEGRAPHIC addresses of Controllers of Weights and Measures in States.

- (1) Kerala 'METRIC' KERALA
- (2) Gujarat 'DIRIND' AHMEDABAD
- (3) Maharashtra 'DINDUSTRY' BOMBAY

Licenced Manufacturers, Dealers and Repairers of Weights and Measures (19)

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 Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the nineteenth 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 the *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 993 manufacturers, 4353 dealers, 930 repairers. The details of published information are as follows :

Sl. No.	State/Union Territory	Licensees		
		Manufac-turers	Dealers	Repairers
(1)	Andhra Pradesh	40	84	31
(2)	Assam	11	44	16
(3)	Bihar	20	69	34
(4)	Delhi	28	93	20
(6)	Gujarat	109	578	132
(6)	Himachal Pradesh	1	28	1
(7)	Kerala	40	389	116
(8)	Madhya Pradesh	115	496	9
(9)	Madras	79	828	126
(10)	Maharashtra ..	95	163	185
(11)	Manipur	14	85	5
(12)	Mysore	75	399	41
(13)	Orissa	14	17	1
(14)	Punjab	36	150	26
(15)	Rajasthan	43	206	44
(16)	Tripura	1	9	0
(17)	Uttar Pradesh	207	515	88
(18)	West Bengal ..	65	200	55
		993	4353	930

DELHI (7)

In the July and September 1959 and March, May and September 1960, and January 1961 issues of *Metric Measures*, lists of licensed manufacturers, dealers and repairers of weights and measures in Delhi area were published. The following is a list of manufacturers, dealers and repairers subsequently licensed by the Delhi Administration.

Manufacturers

Sl. No.	Name and address of Manufacturer	Details of Articles Manufactured
(1)	Ashoka Metal Works, 6663, Ahata Kidara, Bara Hindu Rao, Delhi.	Brass Weights (bullion and non-bullion) and metre measures.
(2)	Banarsi Dass Dev Raj, 261, Kamla Market, New Delhi.	Conical Capacity Measures.
(3)	Jai Bharat Engineering Co-operative Industrial Society Ltd., Tarzon House, 29/15, New Rohtak Road, New Delhi.	(a) Conical cap, Measures, Metric brass weights and beam scales Class C and D (b) Cylindrical capacity measures, (c) Metre measures.
(4)	Jansons Patent Scale Industries, IV/625 Vishwas Nagar, Delhi-Shahdara.	Non-flexible metre measures.
(5)	Raj Manufacturing Co. 44, Meenakshi Garden, Tilak Nagar, N. Delhi.	Conical Capacity Measures.
(6)	The Shahadra Aluminium Factory, G.T. Road, Delhi-Shahdara.	Milk Measures (Cylindrical Type)

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Banarsi Dass Dev Raj, 261, Kamla Market, New Delhi	Weights, Measures and Instruments for weighing or measuring.
(2)	Bhagwan Dass Aggarwal, 282/1, Subash Market, Kotla-Mubarikpur, New Delhi.	Weights, Measures and Instruments for weighing or measuring.
(3)	Dalip Singh and Sons, 3726, Faiz Bazar, Darya Ganj, Delhi.	Weights, Measures and Instruments for weighing or measuring.
(4)	Delite Paint and Hardware Store, Roop Nagar, Near Petrol Pump, Delhi.	Weights, Measures and Instruments for weighing or measuring.
(5)	Dayal Singh Sons (Regd.) 117, Kamla Market, New Delhi.	Weights, Measures and Instruments for weighing or measuring.
(6)	Himmat and Co., 4047, Ajmeri Gate, Delhi-6	Weights, Measures and Instruments for weighing or measuring.
(7)	Khanna Iron Stores, 6518, Fatehpuri, Delhi	Weights, Measures and Instruments for weighing or measuring.
(8)	Kundan Lal Nathi Mal, 2890/1, Bahadar Garh Road, Teliwara.	Weights, Measures and Instruments for weighing or measuring.
(9)	S. Lall Singh Kesar Singh (Hardware Merchant) Bazar-Sirkiwala, Delhi.	Weights, Measures and instruments for weighing or measuring.
(10)	Mittal Paint and Hardware Stores, A/4/2 Main Road, Krishna Nagar, Delhi.	Weights, Measures and Instruments for weighing or measuring.
(11)	Paul Light House, 49, Subash Nagar, New Delhi	Weights, Measures and Instruments for weighing or measuring.
(12)	Roshan Lal Prem Sagar, 21, Outram Lines, Kingsway-camp, Delhi.	Weights, Measures and Instruments for weighing or measuring.
(13)	Raja Ram Ved Prakash, 111, 115, Chhota Bazar, Shahdara	Weights, Measures and Instruments for weighing or measuring.
(14)	Sher Singh Ganga Pershad, 3556, Chawri Bazar, Delhi	Measures and Measuring Instruments.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(15)	Shiv Nath Rai Kanshi Ram, 386, Main Bazar, Subzimandi, Delhi.	Weights, Measures and Instruments for weighing or measuring.
(16)	Sunder Dass and Sons, 2336, Teliwara, Delhi-6	Weights, Measures and Instruments for weighing or measuring.
(17)	M/s Swastic Metal Works, G.T. Road, Delhi-Shahdra	Weights, Measures and Instruments for weighing or measuring.

Repairers

Sl. No.	Name and Address of Repairers	Details of Articles Repaired.
(1)	Ascharaj Lal and Co. 31100, Main Road, Shadipur, West Patel Nagar, N. Delhi.	Beam Scales Class C and D, Metric Weights other than bullion weights.

Delete the following Licences :**Manufacturers**

- (1) Adarsh Engineering Works, 16/2522, Gali No. 8, Beadon Pura, Karol Bagh, New Delhi.
- (2) A. K. Corporation (P) Ltd., F. 18, Najafgarh Road, D.L.F. Area, Delhi.
- (3) Moudgil Metal Industries, 2020, Chaparwala Kuan, Karol Bagh, New Delhi.

- (4) Dewan Chand Kaura Mal, VII/5055, Bazar Sirkiwala, Delhi.
- (5) Kapila Brothers, Kapila Buildings, 3999—4000, Naya Bazar, Delhi.
- (6) H. C. Sen and Co., Fountain, Delhi.

Repairers

- (1) Adarsh Engineering Works, Shop No. 2522, Gali No. 8, Beadon Pura, Karol Bagh, New Delhi.
- (2) Chawla Metal Works, G.T. Road, Shahdra.
- (3) Parbhat Repairing Works, 4486, Gali Jatwali, Pahari Dhiraj, Delhi.
- (4) Trilok Singh Vij and Sons, 63, Gaffar Market, Karol Bagh, New Delhi.

Dealers

- (1) Adarsh Engineering Works, 16/2522, Gali No. Beadon Pura, Karol Bagh, New Delhi.
- (2) Banwari Lal Radha Kishan, 3635, Chawri Bazar, Delhi.
- (3) Chaman Lal Kesho Nath, Iron and Hardware Merchant, 1959 Lal Kuan, Delhi.

GUJARAT (4)

In the March, September and November 1961 issues of *Metric Measures* lists of manufacturers, dealers and repairers in Gujarat 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)	Maniar and Company, Outside Sarangpur Gate, Ahmedabad.	Measures (Tankers for Tank Carts).
(2)	Jainulbhai Abdulkadar and Co., Mota Bazar, Choksi Gali, Navsari.	Conical Litre Measures, Non-Flexible metre measures.

Dealers

Sl. No.	Name and address of Dealers	Details of Articles Sold
(1)	Abbasbhai Taherali Ahmedabadwala, Cinema Road, Chevali Sheri Naka, Surat.	Weights, Measures, Weighing and Measuring Instruments.
(2)	Abdulhusein Badrudin and Co., Moti Bazar, Gondal ..	Weights, Measures, Weighing and Measuring Instruments.
(3)	Ajit Industries, Badi Para Main Road, Rajkot ..	Weights, Measures, Weighing and Measuring Instruments.
(4)	Amiji Sulemanji and Sons, Bazar, Kalawad (Sitla) ..	Weights, Measures, Weighing and Measuring Instruments.
(5)	B. R. Herman and Mohatta (India) Pr. Ltd., C/o Shri Jeevandas Damani, 106, Near Police Gate, Maninagar, Ahmedabad.	Weights, Measures, Weighing and Measuring Instruments.
(6)	Bhagvanbhai Raghubhai Mistry, Nava Para, Ghogha Road, Bhavnagar.	Weights, Measures, Weighing and Measuring Instruments.
(7)	Bhikhabhai Fulabhai Luhar, Kava Bhagol, Jambusar, Dist.-Baroda.	Weights and Measures, Weighing and Measuring Instruments.
(8)	Chhapiwala Hardware Store, Kamalpura Road, Nani Bazar, Palanpur. Dist. Banaskantha.	Weights and Measures, Weighing and Measuring Instruments.
(9)	Chinubhai Prabhulal Amin Pathak Chawl, Pilaji-Gunj, Mehsana.	Weights and Measures, Weighing and Measuring Instruments.
(10)	Dharamji Keshavaji Panchal, Behind Bazar, Dhandhuka, Dist. Ahmedabad.	Weights and Measures, Weighing and Measuring Instruments.
(11)	Dhirajlal B. Shah, Sheth G.T. Road, Mandvi (Kutch)	Weights and Measures, Weighing and Measuring Instruments.
(12)	Durilabhai Narottambhai Patel, Nana Parsiwad, Bulsar, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(13)	Gandhi Brothers, Old Shak Pith, Near Mahajan's Vanda, Mahuva.	Weights and Measures, Weighing and Measuring Instruments.
(14)	Gandhi Brothers, Lokhand Bazar, Bhavnagar ..	Weights and Measures, Weighing and Measuring Instruments.
(15)	Girdharlal J. Dodia, Via Vanda, Sultanpur ..	Weights and Measures, Weighing and Measuring Instruments.
(16)	Hasmukhlal Bhavarlal and Co., Near Jai Daharasher, Benda, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(17)	Harkchand Getagi and Co., Sardarbag, Bardli, Dist. Surat, Bardoli.	Weights, Measures, Weighing and Measuring Instruments.
(18)	I. N. Mistry, Opp. Parsichawl, Vyara, Dist. Surat ..	Weights and Measures, Weighing and Measuring Instruments.
(19)	Jay Hind Hardware Stores, Bazar, Dhansura, Dist. S.K.	Weights and Measures, Weighing and Measuring Instruments.
(20)	Kantilal Chhotalal Mody, Opp. Paravadi, Balashinor, Dist. Kaira.	Weights and Measures, Weighing and Measuring Instruments.
(21)	Kheralu Vepari Mandal, Bazar, Kheralu, Dist. Mehsana	Weights and Measures, Weighing and Measuring Instruments.
(22)	Luhar Chhaganlal Narandas, Gondra Chowk, Kodinar ..	Weights and Measures, Weighing and Measuring Instruments.
(23)	Maganlal Narnji Desai, Jalalpura Rd., Navsari, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(24)	Mohanlal Bhavanidas, Kansara Bazar, Vapi, Dist. Surat	Weights and Measures, Weighing and Measuring Instruments.
(25)	Mohanlal Bhavanidas Kansara, Main Road, Bulsar, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(26)	Mohanlal Jagsibhai Shah, Dhanera, Dist. Banaskantha	Weights and Measures, Weighing and Measuring Instruments.
(27)	Noorbhai Ganibhai, Rajula City ..	Weights and Measures, Weighing and Measuring Instruments.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (19)

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(28)	Ramanlal and Brothers, Juan Bazar, Idore, Dist. S.K. ..	Weights and Measures, Weighing and Measuring Instruments.
(29)	Saifuddin Abdulhusein Katabjiwala and Sons, Virbhadra Rd., Lunawada, Dist. Panchmahals.	Weights and Measures, Weighing and Measuring Instruments.
(30)	Saifce Hardware Merchant, Dudhia Talao Rd., Navsari, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(31)	Sukhlal Devchand and Co., Bazar, Dharampur, Dist. Surat.	Weights and Measures, Weighing and Measuring Instruments.
(32)	The Indian Iron Industries, Ravdi Bazar, Sindhkaped Market, Shop No. 15, Ahmedabad-2.	Weights and Measures, Weighing and Measuring Instruments.
(33)	Valibhai Rasulbhai Meman, Bazar, Vadali, Dist. Sabar-kantha.	Weights and Measures, Weighing and Measuring Instruments.
(34)	Yahyabhai and Co., Opp. Engineer's Office, Jam-nagar.	Weights and Measures, Weighing and Measuring Instruments.

KERALA (8)

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

Manufacturers

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(1)	Alleppey Metal Industries, Near Stone Bridge, Alleppey.	Beam Scales (C & D Class) only.
(2)	Carpenters-cum-Blacksmiths Co-operative Society, Panan-gad, Trichur.	Dry Measures only.
(3)	Carmel Industrial Institute, North Road, Arnathukara, Trichur-3.	Conical Measures only.
(4)	Chavara Block Artisans Industrial Co-operative Society Ltd., Thevalakkara, Quilon District.	Conical & Dipping Type Liquid Measures.
(5)	Gemini Metal Co., Quilon ..	Capacity Measures (Liquid & Dry).
(6)	Hamson Industries, Pappinisseri, Cannanore District ..	Beam Scales (C & D Class) only.
(7)	Joseph Rodrigues & Sons, Metal Merchants, Jallor Road, Kasargod.	Dry Measures only.
(8)	M. K. Mohammed Naina, Bharakath Metal Industries, Chalai, Trivandrum-1.	Dry Measures only.
(9)	The Mulanthuruthy Iron & Steel Industries Co-operative Society, Mulanthuruthy, Ernakulam.	Beam Scales (C & D Class) only.
(10)	M. K. Nambiar & Co., Kallai Road, Calicut ..	Conical & Dry Measures.
(11)	Popular Industries, Robinson Road, Calicut-1 ..	Dry & Conical Measures.
(12)	Sabu Metal Industries, Malapallipuram, Chalakudy Trichur District.	Conical, Dry & Dipping Type Liquid Measures.
(13)	P. Velayudhanasari, Kottungal Shop, Avalukunnu Jn., Alleppey.	Beam Scales (C & D Class) only.

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	S. K. Aboobacker Hajee, Universal Stores, Camp Bazaar, Cannanore.	Weights & Weighing Instruments.
(2)	B. Aboobacker Kunju, Hardware & Paint Merchant, Big Bazaar, Quilon.	Weights, Measures, Weighing & Measuring Instruments.
(3)	P. A. Balakrishnan, General Merchant, Palayam Road, Calicut-1.	Weights & Measures, Weighing & Measuring Instruments.
(4)	Bhagavathi Perumal Pillai, S. P. Central Stores, Balarampuram.	Weights & Measures, Weighing & Measuring Instruments.
(5)	Calicut Metal Mart, Near New Bus Stand, Calicut-1 ..	Weights & Measures, Weighing & Measuring Instruments.
(6)	C. K. Chathukutty, Ramachandra Stores, Palayam Road, Kozhikode.	Weights & Measures, Weighing & Measuring Instruments.
(7)	Gemini Metal Co., Quilon	Weights & Measures.
(8)	India Iron Foundry, Cochin	Weights, Measures, Weighing & Measuring Instruments.
(9)	G. Janardhana Pai, Hardware Merchant, Alleppey ..	Weights, Measures, Weighing & Measuring Instruments.
(10)	Jayaraj Foundry & Engg. Works, Mallar Road, Tellicherry.	Weights & Measures, Weighing & Measuring Instruments.
(11)	Jeevan Industries, Kottayam	Measures & Measuring Instruments.
(12)	Kurian Varghese, Hardware Merchant, Mattancherry ..	Weights & Weighing Instruments.
(13)	P. K. Kesava Pillai, Usha Metal, Mavelikara	Weights, Measures, Weighing & Measuring Instruments.
(14)	A. D. Kuriappan & Sons, General Merchants, Trichur	Weights, Measures, Weighing & Measuring Instruments.
(15)	P. Kunji Koya, Munikketagem, Edigara, Kozhikode-3.	Weights, Measures, Weighing & Measuring Instruments.
(16)	Karnataka Traders, Cannanore Road, Calicut-1 ..	Weights, Measures, Weighing & Measuring Instruments.
(17)	G. P. Moideen, Metal Merchant, Robinson Road, Calicut	Weights & Measures, Weighing & Measuring Instruments.
(18)	T. J. Mammen, Thekkuveetil, Vadakkekara Village, Chennannur.	Weights, Measures, Weighing & Measuring Instruments.
(19)	A. S. Mathai & Sons, Hardware Merchant, Changanassery.	Weights & Weighing Instruments.
(20)	Metrol Trading Syndicate, Bazaar Road, Mattancherry	Weights, Measures & Weighing Instruments.
(21)	M. Mohammed Ismail, Hardware & Tobacco Merchant, Kattakadai.	Weights, Measures, Weighing & Measuring Instruments.
(22)	Palliveetil Mammed Koya & Bros., Bazaar Road, Cannanore.	Weights & Measures, Weighing & Measuring Instruments.
(23)	S. K. Padamanabha Shenoy, Merchant, Methala Village, Cranganore Taluk.	Weights, Measures, and Weighing Instruments.
(24)	A. Ramaswamy, Govt. Contractor, T. C. 17/86, Karamanai, Trivandrum-2.	Bullion Weights and Weighing Instruments.
(25)	P. Ramachandran, Hardware Merchant, Balarampuram.	Weights, Measures, Weighing and Measuring Instruments.
(26)	Haji N. P. Soopi & Bros., Stationery Merchants, Payyannur	Weights, Measures, Weighing & Measuring Instruments.
(27)	U. B. Sivadasan, Proprietor, Weights & Measures, Calicut.	Weights, Measures, Weighing & Measuring Instruments.
(28)	A. Syed Mohammed, Thunduvila Veedu, Kohinoor Hardwares, Attingal.	Weights, Measures, Weighing and Measuring Instruments.
(29)	Tharayil Hardware Mart, High Road, Trichur	Weights and Measures.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (19)

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(30)	C. M. Thomas, General Traders, Kalaketty, Kanjirapilly.	Weights, Measures and Weighing Instruments.
(31)	C. Thannu Pillai, Rice & Grains Merchant, Sabhapathi Koil Street, Chalai, Trivandrum.	Weights, Measures, Weighing and Measuring Instruments.
(32)	Usman Koya, Proprietor, Scales Repairing, Pandikada Road, Manjeri.	Weights, Measures, Weighing and Measuring Instruments.
(33)	K. P. Vareed & Sons, Hardware Merchant, Chalakudy Village, Chalakudy.	Weights, Measures, Weighing & Measuring Instruments.
(34)	Zahida Crockery Stores, Alumkadavu, Ernakulam ..	Weighing Instruments only.
(35)	P. Zainudeen, Proprietor, Calicut Tin Works, S. M. Street, Calicut-1.	Weights, Measures, Weighing and Measuring Instruments.

Repairers

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	M. Aboobacker, Hardware Merchant, Tellicherry ..	Beam Scales (C & D Class) only.
(2)	S. A. Abdul Kadir, Kalluvettankuzhi Veedu, Karette, Chirayinkil Taluk.	Beam Scales (C & D Class) only.
(3)	Avery Co. of India (P) Ltd., Thamarakulam Road, Quilon.	All type of weighing machines,
(4)	M. D. Antony & Sons, Merchant, Market Road, Trichur	Beam Scales (C & D Class) and Weights and Measures.
(5)	A. N. Appu, C/o Mercantile Industries, Market Road, Irinjalkuda.	Beam Scales (C & D Class) and Weights and Measures.
(6)	M. N. Balakrishnan Nair, Gurukkal Veedu, Cherakkara, P. O., Tellicherry.	Beam Scales (C & D Class) only.
(7)	N. Bhaskaran Achari, Vadakkedathu House, Kuripuzha, Perinad, Quilon.	Beam Scales (C & D Class) only.
(8)	A. B. Cheekutty, Binny, Engineering Industries, Palluruthy, Cochin.	Platform Scales only.
(9)	K. P. Chacki, Kunnasseril, Kaduthuruthy, P.O., Kottayam Dist.	Beam Scales (C & D Class) only.
(10)	K. Chellappan Achari, Palaparambu, Madom, Mullackal, Alleppey.	Beam Scales (C & D Class) only.
(11)	V. Chellappan, Villayil Vilakom Veedu, Karamanai, Trivandrum-2.	Beam Scales (C & D Class) only.
(12)	Hilal Traders, Main Road, Tellicherry	Beam Scales (C & D Class) only.
(13)	Jose Zacharia, Madakacheril, Edathua P.O.	Beam Scales (C & D Class) only.
(14)	P. R. Karunakaran Nayar, Sasidharamandiram, Ettumanoor.	Beam Scales (C & D Class) only.
(15)	B. Kannu Achari, Swaminath Industries, Chenthitta, Trivandrum.	Platform Machines & Salter's Spring Balances.
(16)	C. Kunhamoo & Co., Hardware Merchant, Tellicherry ..	Beam Scales (C & D Class) only.
(17)	P. N. Moorthy, Swamy Natha Industries, Vadayattukotta, Quilon.	Beam Scales (C & D Class) only.
(18)	Mighty Scales Co., Vadakkancherry, Cochin	Platform Scales only.
(19)	A. S. Mony, Money Industries, Virakupura Street, Fort, Trivandrum.	Platform Scales only.
(20)	Mukunda Agri. Implements & Steel Trunk Works, Badagara	Metric Measures & Beam Scales.
(21)	C. K. Mukundan, Mukunda Agri. Implements & Steel Trunk Works, Badagara.	Beam Scales (C & D Class) only.
(22)	P. M. Mani, Sreekrishna Stores, Warriam Road, Ernakulam	Beam Scales (C & D Class) only.

Repairers (Contd.)

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(23)	P. S. S. Narayana Swamy Nadar, Flour Mill, Kovilvattom Road, Ernakulam.	Platform Scales only.
(24)	R. K. Obi, Hindustan Scales Service, Cockalai, Trichur District.	Beam Scales (C & D Class)
(25)	Pallivettil Mammed Koya & Bros., 9/88, Tobacco Street, Calicut.	Weights, Measures, Weighing & Measuring Instruments.
(26)	P. C. Paily, Victory Engg. Foundry Works, Chungom, Alleppey.	Weights, Measures, Weighing & Measuring Instruments.
(27)	T. T. Pylunny, Royal Smiths, Kunnankulam	All kinds of instruments.
(28)	P. K. Raghunathan, Parathum Veedu, Palluruthy, Cochin-5.	Beam Scales (C & D Class) only.
(29)	P. Ramachandran, Hardware Merchant, Balaramapuram	Beam Scales (C & D Class) only.
(30)	M. N. Raghavan, S. N. Oil Mills, Chungom, Alleppey	Beam Scales (C & D Class) only.
(31)	K. Ramer, Babu Engg. Works, Court Road, Ponnani	Weights & Weighing Instruments except Platform Scales.
(32)	Scales & Services, Market Road, Cochin-2	All types of weighing instruments.
(33)	A. Shamsudeen, Mangathu, Puthen Veedu, Kilimanoor P.O.	Beam Scales (C & D Class) only.
(34)	V. Thankappan Achary, Ulladan Parambu Thiruvampady, Alleppey.	Beam Scales (C & D Class) only.
(35)	Tholath Iype Ittoop Guruvayur Road, Kunnankulam	Beam Scales (C & D Class) only.

II. The licences detailed below may be deleted

Sl. No.	Licence No.	Name and Address of the Licencee
(1)	D. 55	T. J. Varkey & Family, Irinjalakuda.
(2)	D. 31	Money's Corporation (P) Ltd., T. C. 21/834, Sreekantheswaram, Trivandrum-1.
(3)	D. 65	S. Ibrahim & Co., Chalai, Trivandrum.
(4)	D. 197	S. Velayudhan Pillai, Maveli, Chavara P.O., Quilon.
(5)	D. 195	Saraswat Corporation (P) Ltd., 12/75, Palliarkavu Road, P. B. No. 143, Cochin-2.
(6)	D. 115	M. A. Gopalan, Stationery—Hardware Merchant, Kizhakambalam, Ernakulam.
(7)	D. 223	K. K. Abdul Kadir, Merchant, Municipal Market, Ernakulam.
(8)	D. 246	G. S. Pai & Co., Jewellers, Broadway, Ernakulam.
(9)	D. 201	A. R. Cockalingom Chettiar & Sons, Market, Alwaye.
(10)	D. 186	V. P. Davis, General Merchant, Cochin-2.
(11)	D. 25	P. V. Aippo & Sons, Alwaye.
(12)	D. 185	P. H. Chidambara Iyer, 15/8885, 70 ft. Rd., Ernakulam.
(13)	D. 89	R. Varer & Sons, Jewellers, Kozhikode.
(14)	D. 107	M. Raghavan, Stationery Merchant, Kozhikode-7.
(15)	D. 111	Union Stores, Kakkodi, Kozhikode.
(16)	D. 179	Devi & Co., Big Bazar, Calicut-1.
(17)	D. 110	Sukumaran, Kodai Amsom, Kozhikode.
(18)	D. 221	K. C. Kuruvilla, Tobacco Merchant, Chengannur.
(19)	D. 117	P. M. Samuel, Hardware Merchant, Pathanathitta.
(20)	D. 141	C. P. Aboobacker, News Agent, Calicut.
(21)	D. 152	P. K. Pilo, Bonny & Co., Count Road, Calicut.

MADRAS (6)

In the November 1959 and March, September and November 1960, and January 1961 issues of Metric Measures, lists of Manufacturers, dealers and repairers of weights and measures were published. The following is a further list of dealers since licenced by the Government of Madras under the Madras Weights and Measures (Enforcement) Act, 1958. (The list of manufacturers as also repairers will be published in due course.)

Dealers

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| <p>(1) S. K. Abdul Azeez, 3, Sambudoss Street, Madras-1.</p> <p>(2) S. K. M. Abdul Ghani, M/s India Hardware Stores, Bazar St., Virudhachalam.</p> <p>(3) O. K. Abdul Gany Rowther, 16, South Fort St., Virudhachalam.</p> <p>(4) Ayyanediymmal, M/s Saraswathi Stores, Hardware and Paint Merchant, Arni.</p> <p>(5) A. Abdul Lathief, Paint and Hardware Merchants, 149-A, No. 2, Road, Mayavam.</p> <p>(6) K. A. Abdul Khadersons, Hardware Merchants, 73, Big Bazaar, Street, Mannargudi.</p> <p>(7) A. K. Abdul Lathief, 77, Gandhiji Road, Tanjore Dist.</p> <p>(8) O. K. Abdul Gani Brother, Iron and Hardware Merchants, Bazaar St., Peeraroorani, Tanjore Dist.</p> <p>(9) S. K. M. Abdul Gani Routhier, Bazar Street, Perambapur.</p> <p>(10) Abdul Kader and Sons, No. 7, Angappa Naiken Street, P.B. No. 29, Madras-1.</p> <p>(11) J. Abdul Majeed, 15/38 Maria Thotham, N. H. Road, Coimbatore.</p> <p>(12) S. M. Abdul Rahiman, No. 119, North Veli Street, Madurai.</p> <p>(13) H. Abdul Rahi, Proprietor, Nov and Sons, 33, Chinna Kaizier Street, Chidambaram.</p> <p>(14) Abdul Rasheed Khan, S/o Mathar Rowther, Messers Kassuri Store, 5/57, Gandhijee Road, Paramakudi.</p> <p>(15) M. Abdul Subhan Sahib, 22, Big Bazar Street, Tirupathur, (N.A.).</p> <p>(16) B. A. Abdul Salem, Proprietor, Dillagi Stores, Shevapet, Salem-2.</p> <p>(17) A. V. Abdullahoy and Co., No. 319, Linghi Chetty Street, Madras.</p> <p>(18) S. K. S. Abdul Sathar, S/o Syed Abdul Khadar, 54, Sivanbada Street Lane, T. V. Malai, N.A. Dist.</p> <p>(19) A. Adham Sahib, 260, Big Bazar, Kumbakonam.</p> <p>(20) P. T. V. S. Ahmmed, 372, West Bazar, Tirunelveli pettai-4.</p> <p>(21) V. A. Aiyandar and Sons, 29, 30 and 31, Elukadal Agraharam, Madurai.</p> <p>(22) M. Ahamad Rowther, 102, Azad Road, Vijayapuram, Tanjore Dist.</p> <p>(23) C. Akasaperumal Pillai, N.M.C. No. 6/796, Kottar, Nagercoil.</p> | <p>(24) A. Amaldoss, Stamping Clerk, Taluk Office, Mudukuiathur.</p> <p>(25) A. Ambiga and Brothers, 29, Thandavaraya-gounder, St. Villappadi, Vellore, N. A. Dt.</p> <p>(26) V. A. Ammer Batcha and Co., Kumbeswar South, Kumbakonam.</p> <p>(27) R. T. Amirthalinga Nadar, No. 148, North Car Street, Tiruchendur.</p> <p>(28) Anandabadmanabhan Prop., Prakash Trading Company, Iron and Hardware Merchants, Salem-2.</p> <p>(29) G. Annathurai, Big Bazar Street, 1/67/2, Tirumayalam, Madurai Dist.</p> <p>(30) S. Anthomswamy, Solomon Foundry, Nagapathinam.</p> <p>(31) M. S. Annamalai Chettiar and Sons, 14-15, Ramalinga Mudaliar Road, Vijaiyapuram, Tiruvavur.</p> <p>(32) K. A. T. A. Annamalai Nadar, Hardware and Paint Merchants, 113/High Road, Tirunelveli Junction.</p> <p>(33) L. Annaiya Chettiar and Sons, 141, Bazaar Street, Pollachi.</p> <p>(34) A. Anantha Nadar, Kalikkaulai, Vilavankode, Taluk.</p> <p>(35) Andhra Scientific Co., Ltd., 4, Blacker's Road, Mount Road, Madras-2.</p> <p>(36) A. K. M. Andukoudam Chettiar and Sons, No. 24/9, Big Bazaar St., Paramakudi, Ramnad Dist.</p> <p>(37) S. K. Arjunan, C/o Karuppaiah Pillai (MS), 108, Puthitope Road, Madurai-10, Shop 29, Tahsildar pathvasal St., Madurai.</p> <p>(38) Aruldoss and Brother, Jayankondam, Tiruchirapalli Dist.</p> <p>(39) S. Arunachalam, Vadasery, Nagercoil.</p> <p>(40) Anthalingam Metal Industries, 650, Adyar Street, Kandinagar, Ootacamand.</p> <p>(41) S. Anthoniswamy, Prop. Solomon Fdy., Nagapathinam.</p> <p>(42) T. B. Arumugam, 1-A Telegraph Abboy Naidu Lane, Kondithope, Madras-1.</p> <p>(43) S. V. Arabaha Rowther and Sons, No. 413/1, Dundigal Road, Oddanchatram.</p> <p>(44) R. Apparswamy, 103, Mannady Street, Madras-1.</p> <p>(45) Arcot Dorairajan, Pro. Sheffield Scales Co., 42, Coral Merchant Street, Madras-1.</p> |
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Dealers (Contd.)

- (46) N. Arumugam Pillai, Hardware and Paint Merchants, No. 82, Swami Sannathi, Tenkasi.
- (47) V. Arthanari Mudaliar, 186, Netaji Road, Erode.
- (48) G. Audikesavalu, The Madurai General Mills Stores, 12 Town Hall Road, Madurai.
- (49) Avery Company of India Private Ltd., 16-17 Armenian St., Madras-1, Branch at 6/135, Trichy Road, P.B. No. 215, Coimbatore-1.
- (50) Ayyanediymmal, M/s Saraswathi Stores, Hardware and Paint Merchant, Arni.
- (51) Azad Commercial Corporation, Hardware Merchants, No. 183, Abdul Rahman Road, Koothanathur.
- (52) R. Anthoniswamy, S/o C. Alice Thevar, Mission Hill, Coonoor R.S.
- (53) S. R. S. Balakrishna Nadar Sons, No. 41, Tenkasi Road, Rajapalayam.
- (54) G. P. Balakrishnan Chettiar, Bazaar Street, Gobichettipalayam, Coimbatore.
- (55) K. Balasubramanyam, Hardware Merchants, 18, West Sannadhi Street, Chidambaram.
- (56) C. Bashiam, Selvi Industries, 145, Oppanakasast Bharat Mechanical and Engineering Works, Coimbatore, Keelayur, Tirukkoilur: Shop, Hospital Road, Tirukkoilur.
- (57) M. Bakhusudeen, 114, Big Bazaar St., Tirumangalam, Madurai Dt.
- (58) M. Baliah Nadar, M/s Dhinakaran Stores, 1/146, North Car Street, Tiruchandur.
- (59) Barevi Engineering Works, 37, French Chopal Road, Tuticorin.
- (60) M. Baliah Nadar, M/s Dharakaran Stores, 1/146, North Car Street, Tiruchandur.
- (61) D. Bahi, 2163, Sivayar Garden, 1st Street, Tanjore.
- (62) Bahi Shoe Mart, No. 3, Main Bazar, Salem.
- (63) K. P. Beskarapandiam, Big Bazaar St, Tirumangalam.
- (64) K. M. Batcha, Caltex Dealer and General Merchant, 59, Bazaar Street, Wandiwash, North Arcot Dist.
- (65) A. Bhaghat and Co., Hardware Merchants, Sevapet, Salem-2.
- (66) P. Bhakthavatchalam Naidu, 39, Vencatachala, Mudali St., Madras-3.
- (67) M/s A. Bharat and Co., Iron and Hardware Merchants, No. 185, Main Road, Sevapet, Salem-2.
- (68) T. N. Beemarajai, No. 26, Pullakottai Road, Virudhunagar, Ramnad Dist.
- (69) Bravi Engineering Works, 37, French Chafel Road, Tuticorin.
- (70) Brite Engineering Company, 199-B, Ward No. 25, Opposite to Police Quarters, Nagercoil.
- (71) B. J. Brothers, 703, Rangai Gowder St. Coimbatore-1.
- (72) Business Emporium, Hardware and General Merchants, Main Road, Methupalayam.
- (73) K. Chelladurai, Hardware Merchant, A. K. N. Perumal Street, Marthandam, Vilavancode, Taluk.
- (74) A. N. Chellappa, Hardware and Paint Merchant, No. 34, West Car Street, Tirunelveli Town.
- (75) Coimbatore Machinery and Metal Mart, 12/2A, Frazer Square, P.B. No. 303, Coimbatore.
- (76) Chiwanlal and Co., 6, Sunkurama Chetty St., Madras-1.
- (77) Chinaiah Stores, 352-C, Main Road, Melur.
- (78) T. Chakrapani Chetty, No. 18, Rasappa Chetty St., Madras-3.
- (79) C. Chandravaman, Musiri, Tiruchy Dist.
- (80) S. Chandrasekhara Gupta & Sons.
- (81) V. Chandra Prakasa Nader and Co., Hardware and Paint Merchants, Clock Tower, 58, Palakarai Road, Trichi-8.
- (82) Chandra Agencies, (Prop. T.R.N. Chandran), 12/71, V.C.V. Layow, R. S. Puram, Coimbatore-2.
- (83) S. Chelliah, S/400, G. Bungalow Street, Sankernpost, Tirunelveli Dist.
- (84) K. Chenniappan, S/o Shri P. Kamaraswamy, No. 89, Ward No. 2, Tiruchengode Road, Pallipalayam, P.O. Salan Dist.
- (85) C. Chidambaram Pillai, 31/8, Old Kanyavarpalayam, Madurai.
- (86) S. M. R. M. Chidambaram Pillai and Co., Kumbeswar South, Kumbakonam.
- (87) M. Chidambaram Nader, 162, Greatcotton Road, Tuticorin.
- (88) S. Chidambaram Pillai, Merchant, 48-A, North Car St., Dindigul.
- (89) S. K. S. Chinathurai Nadar, 268, Great Cotton Road, Tuticorin-1.
- (90) M. R. Chinayaraja, No. 203-A, Main Road, Ambasamudram, Tirunelveli Dist.
- (91) V. K. Chodanathan Hasur, Salem Dist.
- (92) M. Chockalingam Chettiar and Sons, Hardware and Paint Merchants, No. 2, Road, Mayuram.
- (93) P. M. Chokkanathan Chettiar, Saraswathi Store, 41-A, Bazar Street, Tindivanam.
- (94) N. Damodaran, Radhakrishna Nilayam, Railway Station Road, Trivellore.
- (95) N. Damodaran Radhakrishna Nilayam, Railway Station Road, Tiruvellore.
- (96) K. R. Damodaran, Gouri Scales, 1/2, Ellamankoil St., West Mambalam, Madras-17.
- (97) N. C. Dasappa, D. V. Sappa and Co., Mount Road, Coonoor R. S.
- (98) S. M. M. Danood Batcha Rowther, Kallakattar, South Karaikudi.
- (99) S. Desikan, S/o D. Sreenivasa Chettiar, 129, Car Street, Tiruvannamalai.
- (100) S. A. T. Devaraja Chettiar, 7/221, Big Bazaar Street, Paramakudi, Ramnad Dist.

Dealers (Contd.)

- (101) T. E. Dhanapal, 67, Laurance Road, Tirupapuliyur, S.A. Dist.
- (102) P. Dhanapal, Rasappa Chetty Street, Madras-3.
- (103) V. Dharmaiya Chetty, 10 and 11 Chetty St., Trivellore.
- (104) Nadar, M/s V. A. Kanda Nadar and Sons, 43, Amman Sannadhi St., Madurai.
- (105) G. Doraiswamy Mudaliar, 24-B Kasikara St., Tiruvallipuram, N. A. Dt.
- (106) E. Doraiswamy, The Madurai General Mill Stores, No. 27-C Mukurnalla Muthur Street, Madras-1.
- (107) P. Doraiswamy, S/o Peechimuthu Naidu, Good Shed Road, Pollachi.
- (108) Eastern Trading Co., 45, Linghi Chetti Street, Madras-1.
- (109) Eastern Trading Company, 156, B. South East St., Madurai.
- (110) M. Eduwalai Natar, 39, Vijaya Vigneswaramkoil, St., Choolai, Madras-7.
- (111) C. A. Gabakotwala and Co. (Private) Ltd., 18, Amarian Street, Madras.
- (112) T. S. Ganapathi Mudaliar, Sri Kumaran Timber Depot, 40-A Bazaar St., Tindivanam.
- (113) Gartie and Co. Private Ltd., 22, Errebalu Chetty St., Madras-1.
- (114) Geetha Scales, N. Sriramalu, 11, Devaraja Mudali St., Madras-3.
- (115) R. A. Ghani, No. 46, Bazaar Street, Nagore.
- (116) A. V. K. Gold Merchants Association, 46, South Avani Moola St., Madurai.
- (117) V. S. M. Gopala Krishnayyar and Sons, 181, East Gate, Madurai.
- (118) Govindarajulu, 69, Pedariarkoil Street, Madras-1.
- (119) R. Gopalakrishnan and M. G. Narasinhani, 18/919 Jawahar Bazaar, Hardware Merchants, Karur.
- (120) Gopala Krishna Pillai, 226, Bazaar Street, Villupuram.
- (121) Gordon Woodroffe and Co. (Madras) Private Ltd., 1/21, North beach Road, George Town, Madras-1.
- (122) B. Govindarajah and Company, Hardware Merchants, Pollachi.
- (123) P. Govindarajan, S/o Ponuswami Pillai, 108, Big Bazaar St., Needamangalam.
- (124) Shrimathi Gouhar John, Door No. 90, Ward 17, Janab Hakim Road, Coimbatore.
- (125) K. V. N. Gonnda and Co., Perudurai (Agent) Southern Roadways (Private) Ltd., T.V.S. Madurai.
- (126) Gudiyattam Hardware Mart, Munaff Buildings, Santhapet, Gudiyattam.
- (127) J. M. Gurunamasivayam, S/o P. V. J. Muni-swamy Chettiar and Co., Sevaganga Nadu Street, Jainkondacholapuram.
- (128) T. A. L. C. Guruswamy Nadar, Timber and Iron Merchants, P. B. No. 6, No. 112/10, Hospital Road, Ramanathapuram Dist.
- (129) A. Govinda Chettiar, Agent, Gandhi Ashram Khadi Bhandar, Mettur Dam Post, Salem Dist.
- (130) A. S. M. Guruswamy, No. 284, East Masi Street, Madurai.
- (131) V. V. Govindaswamy Nadar and Sons, Hardware and General Merchants, Arantangi, Tanjore Dist.
- (132) Hindustan Hardware and Paint Mart, 37-38, Rasappa Chetty Street, Madras-3.
- (133) Hussainbhai Hardware Syndicate, 102, Mount Road, Coonoor.
- (134) Honorary Secretary, The Rajapalayam Chamber of Commerce, Rajapalayam, Ramnad Dist.
- (135) Happy Stores, 203/205, East Bazaar Street, Udangudi, Christianagaram P.O. Tirunelveli.
- (136) Industrial Machine Tools Company, 25, P. P. V. Nandevanam St., Virudhunagar.
- (137) Isaac and Son, 329/2, Main Road, Rajagudi, Tirunelveli.
- (138) Ibrahim Stores, Big Bazaar, Pudukottai.
- (139) Jothi Engineering Works, B-3 and 4 Industrial Colony, K. Pudur, P.O. Madurai-7.
- (140) N. Jayaraman, Arunugam Tinker Works, No. 3, Kachaleesavara Fort St., Coimbatore.
- (141) S. Johnson, S/o Shri S. P. S. Dorai, C/o Shri Irudhayanathan Iron Shop, Big Bazaar, Ramanathapuram.
- (142) Jayanath Bros, 120, Purasawalkam High Road, P.B. 477, Madras-7.
- (143) P. C. Jayakumar, S/o Sri P. Kumaran, M/s. Jayakumar & Co., Chamundi Hall, Ettionues Road, Ootacamund.
- (144) Jayshree Engineering Works, Private Ltd., 154, Nainiappa Naicker St., Madras-3.
- (145) Jayshree Engineering Works, 1616-B, Bazulullah Street, T. Nagar, Madras-17.
- (146) Jayshree Engineering Works, (P) Ltd., 16, Bazul-lah Road, T. Nagar, Madras-17.
- (147) N. Jayaraman Chettiar & Bros., Bazaar Street, 6616.
- (148) V. Jagannath Chettiar & Co., 6/454, Amman Sannadhi, Paramakudi.
- (149) Kamak Janaki Ammal, Prop., The Vijaya Agencies, 14, D. North Car Street, Tirunelveli-1.
- (150) Kamak, Nataraja Nadar, No. 102, High Road, Tirunelveli, Jn., Tirunelveli.
- (151) Krishnamurthi Brother's Jewellers & Goldsmith Tools Merchants, Pudukottai.
- (152) A. Kuttubudheen, No. 312, East Masi Street, Madurai.
- (153) Kaliappa Nadar, Hardware Merchant, Sandai Bazar, Rajapalayam.
- (154) T.M.A. Kuppuswamy Chettiar and Sons, 2 & 10, Thottiamkuraru St., Madurai-1.
- (155) P. S. Khaya Mohideen, Noorjehan Industrial Works, Hardware Merchants, Pudukottai.

Dealers (Contd.)

- (156) K. P. Krishnamoorthy & Bros., Raji Poonnamal Road, Mahalipatti, Madurai-9.
- (157) S. Kandeswamy Pillai, No. 101, Bazaar Street, Uttamapalayam.
- (158) S. Kandeswamy Pillai, No. 101, Bazaar, Street, (a) Uttamapalayam.
- (158) G. Kuttalingam Brothers, Jewellers, Cape Road, Nagercoil.
- (159) V. Krishnaswamy, No. 4, Bazaar Street, Kaspas, Vellore.
- (160) R. Karnaiyan, Iron Works, No. 48, Kuruvian Tank Street, Tiruchi.
- (161) D. Kuppuswamy, Chelly & Company Hardware Paints and Electrical Phavapet Salem-2.
- (162) S. R. Krishnamoorthy, Chettiar, 13-A West Car Street, Chidambaram.
- (163) V. Krishnamurthi, C/o Sri O. N. L. Venkatrama Chethiar, 76, Bazaar, St., Bhuvanagiri.
- (164) D. Kollandai Chetty, S/o Sri R. N. Doraiswamy Chethiar, M/s. Srinivasa Medical Stores, 99, Gurukhal St., Tiruchengode.
- (165) S. Kannappa Pillai & Co., 4, Perumalmudali, St. Sowcarpet, Madras-1.
- (166) M. K. N. D. Kasiraja Nadar & Co., 373 to 375 Big Bazaar, Virudhunagar.
- (167) M. K. N. D. Kasiraja Nadar & Co., 248, East Masi St., Madurai.
- (168) Kanaipappa Chethiar Sons, T. S. No. 1298, Big Bazaar St., Nagapattinam.
- (169) Krishna & Co., No. 8, Mailam Chanthai, Tiruchi.
- (170) A.A. Krishna Rao, India Stores, Coimbatore-2.
- (171) T. K. Thondur Raja, Cumbun Road, Theni, Madura Dt.
- (172) K. P. Krishnamurthy, Chethiar, Karur.
- (173) Smt. Krishnammal, 11, Ansari, Street, Udumalpet.
- (174) B.A. Kandesami, Pappapatty, P.O. Dharmapuri, Salem Dist.
- (175) M. Kothaiporunal, 482, Big Bazaar St., Tiruchirappalli.
- (176) T. K. Krishnan, 111/112 Bazaar, St., Pollachi.
- (177) A. Krishnaswamy Raja Partner, Krishnam & Co., Rajapalayam.
- (178) S. S. Krishnaswamy Mudaliar, No. 18-19 Long Bazaar, Vellore.
- (179) P. V. Krishnan & Son, New Royal Engineering Works, 32/6 Katpadi Road, Vellore.
- (180) V. K. Krishnan, The South Zone Machine Works, 43, Commissary Bazaar, Vellore.
- (181) E. N. P. Kasiviswanathan Chettiar and Sons, Hardware Merchant, Shevapet, Salem-2.
- (182) C. Kuppuswamy, Gandhi Metal and Alloys, R. V. Industries, Avaram Palayan Road, Prelamedu, Coimbatore-3.
- (183) E. R. C. Krishna Chethiar, Hardware Merchants, 103, Big Bazaar Street, Dharpuram, Coimbatore Dist.
- (184) M. Krishnamurthy, Industry & Commerce, Publication, 154, Bazaar Street, Pollachi.
- (185) P. P. Krishnan, Merchant, N. M. C. No. 9/231, Cape Road, Kottar.
- (186) Karthikeyan & Co., Iron & Hardware Merchant, 129-130 Velayakara Street, Erode.
- (187) R. Krishnan C/o Sri L. Ramalinga Chethiar, 2, Sembamoorthy, Joshier Lane, Pollachi.
- (188) K. Kalanithi, Colombo Mart, 200/3 Market St., Sivaganga.
- (189) A. N. Kuppuswamy Chethiar, S/o Sri R. Natesa Chetty, V. Sambondan Pillai, S/o Shri Varadaraja Pillai, Kumbakonam, Kumbeswar Sannidhi.
- (190) Kitabhai & Co., S/o Mulla Jevajee, 10, Saigananaick St., P. E. 1643, Madras-1.
- (191) K. Kaliappan, Tiruppur Road, Udumalpet.
- (192) Smt. Kothaiammal, W/o Late G. Bangaruswami, Srivilliputhur.
- (193) M. Krishnamurthy Rao, S/o Sri P. V. Madhava Rao, No. 7, Trunk Road, Khadkpet, Vaniambade.
- (194) H. P. Lakshmana Rao, 33/6/3 Bazaar St., Miruchengode, Salem District.
- (195) A. S. A. N. Lakshmana Pathar, Iron Vessels Merchant, Big Bazaar Street, Kumbakonam.
- (196) Lakshmi Engineering Works, 138, Demollows Road, Perambur Barracks, Madras-12.
- (197) P. S. K. Lakshmanan, S/o, Sri P. S. Kaliappanadar, Tirunelveli Junction.
- (198) R. Lakshmanan, S/o Sri S. Ramakrishna Mudaliar, 26, Masilamani Street, Vellore.
- (199) Lakshmi & Company, Iron & Paint Merchants, Market St., Vijayapuram, Post, Tiruvavur.
- (200) H. P. Lakshmana Rao, 33/A/3 Bazaar St., Tiruchengode, Salem Dist.
- (201) B. Lakshminarayana Gupta, Door No. 18, Ward 3, Bazaar St., Mushiri, Trichi Dist.
- (202) T. Loganathan, No. 59, Nyniappa Naiker Street, Madras-3.
- (203) Latheef & Brothers, Hardware & Paint Merchants, Vijayapuram, Tanjore Dist.
- (204) S. Madaswamy Asari, Subramaniapuram Street, Tiruchendur.
- (205) A. Mohamed & Co., No. 313, Linghi Chetty Street, Madras-1.
- (206) Modern Coffee Works, No. 296, Jawahar Bazaar karur, Tiruchirappalli Distt.
- (207) Mune Krishnan Chetty, No. 2/135, Gandhi Road, Krishnagiri.
- (208) A. S. Moorthy, No. 11, A.N.K. Naicker Street, Alandur, Madras.
- (209) A. Muthuswamy Achary, No. 115/5 Muthu Pillai Street, Nanguneri.
- (210) K. A. Mohamed Jaffer, No. 101-A Ramalinga Mudaliar Road, Vijayapuram, Tiruvavur.
- (211) S. Muthuswamy Asari, No. 1436, Salem Road, Saukari.

Dealers (Contd.)

- (212) S. Mohideen, Maluk Mohamed Hameam Store, Kalivakkavila Vilavankode Taluk, Kanyakumari.
- (213) A. P. Marappa Chethiar, Brass Vessel Merchant, No. 36, Mani Bazaar, Ooty.
- (214) M. Paramasiwan & Son, Servakaram, Puthur, Street, Shencottah.
- (215) T. A. Marimuthu—4—17, West Bazaar Street, Gurusamipalayam, Salem Dist.
- (216) V. Mahadevan, Managing Partner, Gowri Corporation, Pattamangala Street, Mayuram.
- (217) Mustafa Kamal, 2/133, Seetha North St., Tirupathur, Ramnad Dist.
- (218) V. S. Meeran Pillai, Chetti Vilayathu Veedu, Thenagaputtam, Vilavankode Taluk, Kanyakumari Dist.
- (219) Masanandar & Co., 330, West Masi St., Madurai.
- (220) Mariappa Nadar, Hardware Merchants, Rajapalayam.
- (221) S. R. Muthuswamy Gounder, 88, F. 5/19, Palladam Road, Tiruppur.
- (222) M. S. Manickam & Co., Mill Road, Coimbatore.
- (223) N. Mohideen Khan Sahib Sons Timber, Tiles & Hardware Merchants, Tiruppur.
- (224) R. Manthirammoorthy Grocery Merchant, Kulathoor, Tirunelveli Dist.
- (225) P. H. Mohamed Nasiruddin, Palakarai Road, Tiruchi-8.
- (226) K. M. Mohammed Saheb & Co., No. 263, Linghi Chetty St., Madras-1.
- (227) Kuthu Baboothmull Mangilal, No. 14, Kasi Chetty St., Madras-1.
- (228) A. Mookiah Achary & Brother, Thiruthangal Road, Sivakasi.
- (229) K. M. S. Mohammed Yusuff Rowther, General Merchants, Arantangi.
- (230) P.S.G. Mill Stores, 42-A Mahal Vadampokki St., Madurai.
- (231) K. O. Mohideen & Brothers, Hardware Merchants, Vadaseri, Nagercoil, Kanyakumari Dist.
- (232) J. S. Mehta Precision Scales—Weights & Allied Agencies (Prop. Mehta & Bros. Bangalore-3) Sardar Bhavan, 73/83 Dovraj Mudali Street, Madras.
- (233) S. Muthu Asari, S/o Sri M. Subban Achari, 153, Railway Fieder Road, Sattar.
- (234) V. G. Subramanian, S/o Sri V. Gopala Thevar, 107, Rangakonar Street, Coimbatore.
- (235) Murugan Trading Company, 25, Arunachala Asari St., Salem-1.
- (236) N. M. M. Mohammed and Usuff, Messrs Manchi Abbas and Sons, High Road, Tirunelveli.
- (237) S. Manickavasagam Pillai, 5/4 Vellirani St., Puliangudi.
- (238) Modugan Govardhanan Chetty, 128, Stewartpels, Tiruttani.
- (239) K. P. B. Manian, M s. A.R.S. Stores, 69, Gandhi Road, Manuargudi.
- (340) Madras Scales Company, No. 11-A Noor Veeraswami Iyer St., Nangambakkam, Madras-6.
- (341) S. Mariadass, S/o Sri S. P. S. Dorai, 2/310 Gandhi Road, Paramakudi.
- (342) K. S. Mariappan, S/o Sri L. P. Sankaranarayanan, Main Road, Pathveeranpatti.
- (343) Madras Commercial Corporation Private Limited, 1/55 Mount Road, Madras-2 Shop 247, Angappa Naicken St., Madras-1.
- (344) C. C. Madhavan, Jaya Stores, Market, Ootacamund.
- (345) T. K. Muthia Pillai & Sons, Railway Cross Road, Mayuram.
- (346) E. Mohamed Hussain, No. 317, Block No. VIII Commercial Road, Ootacamund.
- (347) R. Michaelswamy, 1/10 Vincent Road, Kottavmedu, Coimbatore Dist.
- (348) Mysore Engineering Corporation, 79/10 Sembudoss St., Madras-1.
- (349) Massey's Prop : Rabindranath, Father's Name, Hanso Raj, 4B, 4C, North Railway Terminus Road, Royapuram, Madras.
- (350) M.A. Manicka Nadar & Co., 16, Great Cotton Road, Tuticorin.
- (351) B. Mohammad Ismail Sahib, Big Bazaar South Main St., Prp. Musthafamart, Iron Merchant.
- (352) Madaswamy Achari, S/o Adaikalam Achary, Muthu Pillai St., Nanguneri.
- (353) M. V. Mithuval Pillai, General Merchant, P. B. No. 94, Thandicamber Road, Dindigul.
- (354) R. Malayappan & Co., 1747/F2, High Road, Tirunelveli Town.
- (355) K. M. Malayandi Chettiar Sons, Brass & Vessel Merchants 83, Bazaar Street, Pollachi.
- (356) M. S. Mohammed Kasim, Prop M. S. Mohammad Kasim & Sons, 30, Manuady Street, Madras-1.
- (357) P. Munuswamy Naidu, 1/76, Govindappa Naicken Street, Madras-1.
- (358) A. Mohammed Ali, Hardware Merchants, Bazaar Street, Kuttalam.
- (359) S. Ranichavasagam, 148, Big Bazaar Street, Manargudi.
- (360) M. Padmanabhan, General Industries, Bus Stand, Thuckali Kalkulam Taluk, Kanyakumari Dist.
- (361) A. Munia Pillai, 26-C West Street, Madurai.
- (362) R. P. Narayanan, Sri Pachaiappan Mudaliar & Sons, Maligai, 62, Bazaar Street, Wandiwash.
- (363) P. Nagarajan, M/s. Dharaniraj Cottage Industries, 25/585 Rangia Gowder Street, Coimbatore-1.
- (364) R. Navaneetham, Thevar, Thevurpost, Kivalur, 1-6, A Santhai Post, Thevur.
- (365) Nimichand, 320, Main Bazaar, Ootacamund.
- (366) T. Narasimhalu Chetty & Company, 27 to 30-A, Rasappa Chetty Street, Madras-3.
- (367) K. Naina Mohamed Masisau, 101, Mannady Street, Madras-1.

Dealers (Contd.)

- (368) N. S. Natarajan Partner of M/s. M.K.N. Sivanandi Nadar & Sons, 91, East Masi Street, Madurai.
- (369) P. N. Natarajan, S/o Sri Nethappa Pillai, 7, Periakade Street, Tuticorin.
- (370) R. Nataraja Pillai, Eastern Street, Eranial (Shop at Monday Market).
- (371) M.A.C. Nataraja Nadar, S/o Sri P. Muthusethupathi Pillai, 321/1 Dindigul Palani Road, Oddanchatram.
- (372) N. Nattathambi, S/o Sri P. Muthusethupathi Pillai, 321/1 Dindigul Palani Road, Oddanchatram.
- (374) M. Narayanaswamy nayagar, S/o Sri Narasimhahe vayar, 195, Market Road, Arni.
- (375) M. Narayana Nambiar, S/o Sri Pythal Karur, No. 81/95-A Muviyankadu, Meth Street, Namakkhal.
- (376) R. Natarajan, 197, Market Road, Pollachi Town, Coimbatore Dt.
- (377) K. Narasimhachetty, 15, Bazaar St. Walajapet, N.A. Dt.
- (378) S. Nallaperumal & Sons, Cape Road, Part View, Nagercoil.
- (379) K. Natarajan, 6, Rosappa Chetty St., Madras-3.
- (380) A. V. S. Nataraja Mudaliar, 45-46 Tenkasi Road, Hardware Merchant, Rajapalayam, Ramnad Dist.
- (381) V. R. Nagendran & Bros, Iron & Hardware Merchants, No. 30/232 Fort Main Road, Shevapet, Salem-2.
- (382) Nadar Timber Depot, Prop. V.S.S. Sivakolindhu Nagar, No. 31, Pandi Road, Villupuram.
- (383) M. Nataraja Mudaliar, 9/15 Main Road, Bhavani.
- (384) C.P. Nainan Chettiar, Murugan Store, Mall Mill Road, Coimbatore.
- (385) S. Natesa Chettiar, 196, Big Bazaar St., Tiruchirappalli-8.
- (386) Nagaswamy Foundry, Subramaniapuram, Madurai-11.
- (387) M. Nambhoy & Co., Frazer Square, Coimbatore.
- (388) Natarajan Achary, Pallivasal, Koilpatti.
- (389) Nellai Hardware Stores, 114 Nelliappar High Road, Tirunelveli Junction.
- (390) G. S. Natarajan, No. 443, Taramangalam, Omalur Taluk, Salem Dist.
- (391) A. G. Nataraja Nadar, Iron Merchant, Usilampatti, Madurai Dist.
- (392) G. Nataraja Achary, No. 2392, Ellayanman Koil Street, Tanjore.
- (393) K. Nanjanda Naicker & Sons, No. 121, Rangai Gowder Street, Coimbatore-1.
- (394) S. V. Natarajan Chettiar, No. 296/5-4 Main Road, Vallioor, Tirunelveli Dist.
- (395) R. Nathamoony Chetty & Co., No. 32 Venkatachalam Mudali Street, Park Town Madras-3.
- (396) M. Natesan, No. 6/28-A Main Road, Mallasaisundram, (Tiruchengode Taluk).
- (397) M.K.M.N. Pandi Nadar & Co., 87 East Masi St., Madurai.
- (398) P. Palaniappa Chettiar, No. 384, Big Bazaar, Street, Tiruchi-8.
- (399) P. R. A. Ponnuswamy, Merchant, Palayakiraman St., Mukkudal.
- (400) Peirce Loshie & Co. Ltd., Race Course, Coimbatore-1.
- (401) Pakir Mohammed, Gandhi Road, Palni Town, Madurai Dist.
- (402) K.V. Pattabirama Chettiar, Kasturi Stores, 41, Big Bazaar Street, Dharapuram, Salem Dist.
- (403) M. Ponniah Chettiar, 5/11 Viaikal Street, Theni P.O., Madurai.
- (404) Parusuraman, 7/233, Big Bazaar, Paramakudi Post, Ramnad Dist.
- (405) S. K. Palaniswamy, D. 14/G/3, Avanashi Road, Tirupur.
- (406) P. C. Pulavar Shaik Dawood, 7, Pudumandapam, Madurai Dist.
- (407) V. Perumal Chetty and Sons, No. 3, Sringers Street, Madras.
- (408) A. V. Purushothamalu Naidu & Sons, 1 & 2 Fancy Bazaar, Market Square, Ootacamund.
- (409) Periyannadar, No. 5/178, V.O.C., Street, Sivaganga.
- (410) N. Pitchaimuthu, Hardware & Paint Merchants, 206, Mehur Road, Pollachi.
- (411) Panakatham & Sons, Murugan Stores, 80, East Masi Street, Madurai-1.
- (412) T. Pichiayan, C/o Thiagaraja Mudaliar & Sons, Hardware Merchants, Vijayapuram P.O. Tanjore Dist.
- (413) P. Pakriswamy Vandayar, Hardware Merchant, East Gate, Tanjore.
- (414) V. A. Palaniswamy Nadar & Sons, 15/15 Mill Road, Coimbatore.
- (415) V. Periakattan & Sons, General Hardware Paint & Trunk Merchant, 5 & 239, Big Bazaar Street, Dindigul.
- (416) R. Palaniappa Mudaliar, 185, Netaji Road, Erode.
- (417) V. O. P. Palaniswamy and Sons, 72 P. S. Chidambara Nadar Street, Virudhunagar.
- (418) K. Palaniappa Nadar, Sri, K. Karuppanna Nadar, Ammakannu Hardware Stores, 96, Gandhi Road, Palani.
- (419) C. Paudi, M/s. N. C. K. Chidambara Nadar, 297, East Masi Street, Madurai.
- (420) E. Purushotham, S/o Shri K. R. Ethirajunaidu, 15/13 Mill Road, Coimbatore.
- (421) V. A. Punaiyappa Nadar and Co., 247, East Masi Street, Madurai.
- (422) N. Ponunswamy Udayar and Sons, General Merchants, Bazaar St., Uludurpet.

Dealers (Contd.)

- (423) Paints and Hardware Mart, Commercial Road, Ootacamund.
- (424) K. Rajagopala Chetty and Sons, Hardware and Paint Merchants, Kallakurichi, South Arcot Dist.
- (425) A. S. K. Rathaswamy Nadar, No. 84/5, North Raja Street, Sivaganga, Ramanad Dist.
- (426) V. Rangaswamy Naicker, Ranipet Attur P.O. Salem Dist.
- (427) M. M. Rafi, Big Bazaar Street, Mayuram.
- (428) S. V. Naharathina Nadar, 2101, Teppaunarth Bazaar, Virudhunagar.
- (429) S. P. Raja Kannu, Nataraja Foundry, 82, T. T. P. Road, Vijayapuram, Tanjore Dist.
- (430) Ramachandran and Bros., 207, Big Bazaar, Tiruchirappalli.
- (431) D. A. Ranganathan Chetty, 119, Main Road, Shevapet.
- (432) L. M. Ramiah Pillai, 43, Big Bazaar St. Maunargudi.
- (433) A. K. M. Rangaraju Chettiar, 9/59 Bazaar St., Perundurai, Coimbatore Dist.
- (434) M. Ramalingam, 118 Bazaar St., Wandiwash.
- (435) S. S. P. Rajindran, P and R Rajeswari and Co., No. 361, Madurai Road, Aruppukottai.
- (436) A. R. T. V. Ramanathan Chettiar, Door No. 115, Silambani North Street, Devakottai, Ramanathapuram.
- (437) S. P. R. A. N. D. Rengasw., Raja, 106/11-IV, Sandhi Bazaar, Rajapalayam.
- (438) A. Ramalingam Chettyar, Chinnakadai Street, Tiruchirappalli.
- (439) Radha and Chalam, Hardware and Paint Merchants, No. 714-715, Raigai Gounder Street, Coimbatore.
- (440) D. Ramaswamy, No. 12-A, P. V. Koil Street, Udumalpet.
- (441) V. T. Raja and Co., D. 123, T. T. P. Road, Vijayapuram.
- (442) R. Ramakrishna and R. Varadaraja Partners Science Industrial Work 33/2 Katpadi Road, Vellore, Branch 278 Waltex Road, Madras-2.
- (443) A. Ramamurthi Chettiar, Dhanalakshmi Cottage Works, 41, Old Taluk Office, St., Tirukoilur.
- (444) R. Rangachari, Kanaan and Company, 53, Bazaar Street, Ayyampet post, Tanjore Dist.
- (445) Rajeswari and Co., Brass Vessel Merchants, 9, Uthama Varayagar Lane, Karaikudi.
- (446) S. Ramdass and S. Kandaswamy, S/o Shri Sundara Mudaliar, 164, For Main Road, Salem-2.
- (447) M. S. Ramamurthy, Iyer, Hardware Merchants, P. B. No. 1, 59, Pattamangalam Street, Mayavaram.
- (448) V. A. M. Rathinam and Bros., 13/14 Vysial Street, Coimbatore.
- (449) V. Rajagopala Iyer, Maligai Merchants, Azad Road, Vijayapuram, Tanjore Dist.
- (450) K. M. Ranganathan, 145, 146 and 147 Jawahar Bazaar, Karur, Trichi Dist.
- (451) T. S. Ramamoorthy (Partner) Minerva Agency, P.B. No. 149, Madurai.
- (452) N. Ramayya Nadar, 100, Big Bazaar, Dindigul.
- (453) P. Ramachandran, 8/3 Doraiswamy Ayyangar, Street, Ayyanavaram, Madras-23.
- (454) Rev. Father Dasan, Dabucida, St. Joseph's Technical Institute, 46/41 Palamcottah Road, Tuticorin.
- (455) M. M. Rajan, M/s. K. N. Mukantha Nadar, 453, Big Bazaar Street, Virudhunagar.
- (456) R. Rajarathnam, 105, New Tail Road, Ponnagaram, Madurai-10.
- (457) Raja J. Raju Chettiar, S/o Sri Raju R. Jayaram Chettiar, Hardware Merchant, 105, Big Bazaar St., Dharapuram.
- (458) V. S. Rajappan, S/o Sri A. Shunmugam Nadar, Managing Partner, M/s. The Kaka Foundry, Thiruthangal, P.O. Sivakasi.
- (459) R. Rengaswamy Naidu, Agent M/s. Sundarams Private Ltd., 63, Kanthapuram Street, Virudhunagar.
- (460) J. Radhakrishna Naidu, S/o Sri Jayaram Naidu, 25, T. B. Opp Railway Station, Tindivanam.
- (461) T. P. Radha Krishnan, No. 4 Ward No. 8 Nachiarkoil Road, Tiruchirappalli-3.
- (462) V. N. R. R. Ratnam, 935/4 Railway Feeder Road, Rajapalayam.
- (463) R. Ramakrishnan, S/o Raju Mudaliar, 33/2 Ramachandra Rao, Kumar Gimini Hardware Stores, Main Road, Coonoor.
- (464) M. Rathaiya Pillai, S/o Sri Malaiyandi Pillai, Dhanalakshini Stores, Main Road, Poravura.
- (465) T. S. Radhakrishna Chettiar and Sons 74, Salon Street, Ayyampet, Tanjore Dist.
- (466) Rajamony Nadar and Sons, 80 Palakkarai Road, Clock Tower, Tiruchirappalli.
- (467) A. R. M. K. Ramaswamy Chetty and Co. 32, Big Street, Kumbakonam Tanjori Dist.
- (468) V. Raju Naidu and Co., Timber Tiles and Hardware Merchants 15/6 Mill Road, Coimbatore.
- (469) P.C.S. Shaik About Khadar, B.A., Specialist in Scales.
- (470) R. S. Subbiah Nadar, S/o Sri R. Sudalanouppa Naidu, 79, Palakkarai Road, Trichy.
- (471) A. O. Somasundaram Chettiar, S/o Sri Alaganatha Chettiar, Drugist and Paint Merchants, Ayyankadai, Tanjore.
- (472) K. S. Srinivasan, Balaji Engineer Small Tools, 30, Gokhale Road, Madurai-2.
- (473) S. S. Sinnathurai Nadar, Hardware and Paint Merchant, 87, 88, S. N. High Road, Tirunelveli-1.
- (474) K. V. Semmalai Kander, A. S. Pachappan, Iron and Paint Merchant, Market Lane, Erode.

Dealers (Contd.)

- (475) A. R. M. Srinivasagam Achary and Sons, Nellai Jewellery House, 37, Koolakadai Bazaar, Tirunelveli Town-6.
- (476) R. Shanmugam, No. 112, Palladam Road, Tiruppur.
- (477) A. Srinivasa Chettiar and Sons, Thiruthuraiipoondy, Tanjore Dt.
- (478) Y. Shajehan, 57, Badaij Sahl St., Mount Road, Madras-2.
- (479) K. Sahasranamam (Partner) Cleamout Cottage, Gool Mohammed Road, Ootacamund.
- (480) T. S. Stanes and Co., Ltd., Post Box No. 12, Coimbatore.
- (481) S. Sankaran Achary, Bangalore Street, Sankarankoil.
- (482) T. R. T. S. Subramanian Chettiar, K. A. Shakoor, 15/51, Mania Thotham, N. H. Road, Coimbatore.
- (483) Surya and Co., 96, Chinna Chetty Street, Trichy-8.
- (484) N. Sachithanandam Pillai and T. V. Lakshman-swamy Pillai, General Merchants, Virudhachalam.
- (485) V. A. Sarangapani Pillai, Hardware and General Merchant, Pattukottai.
- (486) P. Shah and Co., No. 21, Linghi Chetty Street, Madras.
- (487) V. A. Srinivasa Pillai, Iron and Hardware Merchant, Mannargudi, Tanjore Dist.
- (488) Sha Mangilal Matha, No. 96, Narayana Mudali Street, Madras.
- (489) Sha Jettmal Ganmull, No. 2/2 Narayana Mudali Street, Madras-3.
- (490) Sha Poosaji Manjilal, No. 96, Narayana Mudali Street, Madras.
- (491) K. C. P. Sankaralinga Nadar and Bros., Srivilliputhur.
- (492) P. Subramaniam, Shevapet, Salem-2.
- (493) V. P. Sankaralinga Nadar and Sons, No. 250, West Masi Street, Madurai.
- (494) Saifu Hardware Mart, Hardware and Paint Merchants, Mill Road, Coimbatore.
- (495) P. Syed Mohammed, No. 619, Khullupattai Street, East Gate, Tanjore.
- (496) H. S. Shahul Haneed, Hadhed Street, Tirurithangode, Kalkumal Taluk Kanyakumari Dist.
- (497) K. Sadasivam Pillai Merchant, Monday Market, Neyyoor.
- (498) S. L. Sankara Kumaran Nadar and Sons, Thukkampalayam St., Kubakonam.
- (499) K. C. Sivashanmugam S/o Sri D. Ganapathy Patner, Bhuvaneswari Mill Stores, 27-B Mureenallamuthu.
- (500) V. A. S. Shunnuga Sundara Nadar and Bros., 43, Aman Saunadhi St., Madurai-1.
- (501) Secretary, The Kalkulam Co-op. Purchase and Sale Society Ltd., No. 2048, Kalkulam Taluk.
- (502) P. A. Subbaraja, S/o Sri A. Alaga raja, North Car St, Sankaravainarkoil.
- (503) M. S. Srinivasan, C/o Sri Seaha Iyengar, No. 9, Bharathi Theatre, Tiruchi T Road, Thuraiyur.
- (504) P. Subbiah, S/o Sri A. M. Perumalaidu, Thiruthangal.
- (505) S. Sugavanam, S/o Sri Swaminatha Iyer, Darmapuri.
- (506) V. S. Subbiar, Chockalingam Stores, Main Road, Natham, P. O. Madurai Dist.
- (507) A. P. Swamy, M/s A. P. S. and Co., 574 Main Road, Vathoor.
- (508) Sundarams Private Ltd., TVS Buildings, West Veli Street, Madurai.
- (509) R. Sundaramurthy, S/o Sri A. Ramachandra Sastrigal, No. 1, Big Bazar St., Ariyalul.
- (510) R. Subramaniam, S/o Sri K. P. Ramaswamy, Mudaliar Sivappa post, Salem Dist.
- (511) R. A. C. Sabapathi Vinayagar, S/o Sri R. A. Chidambara Moopanagar, M/s R. A. Chidambara No. 59-60 North Car Street Sivagiri.
- (512) V. M. Shaik Abdul Khader, S/o Sri V. Meera Sahib, 224 Thambuchetty St., Madras.
- (513) P. N. Somasundaram Chettiar, No. 383, Big Bazaar, Tiruchi.
- (514) M. Sankaralingam Pillai, No. 159-A, East Car Street, Tirunelveli.
- (515) Shanmugavel Asari, 22/9/8 Periasamikoil Street, Srivithipathur, Ramanathapuram.
- (516) T. Sundaram, No. 20, Kanaappa Nainar Street, Villupuram.
- (517) Stanes and Co. Ltd., Ghat Road, Coonoor.
- (518) Sridhar Stores, B-5 Sivapuri, Salem-4 Salem Dist.
- (519) Sethuraman Chetty, No. 382, Big Bazaar, Tiruchirappalli-8.
- (520) T. V. Sivaloganatha Nadar, Hardware Merchant, Nagapuram, P.O.
- (521) P. M. Syed, Mohamed and Brothers, 4/439, Gape Road, Hardware Merchants, Kottar.
- (522) M. S. P. Sivaswamy Nadar, Iron and Rice Merchants, Aruppu Kottai, Ramnad, Dist.
- (523) R. Seetharaman, Iron Vessel Merchants, 44 Yarnaiyadi, Kumbakonam.
- (524) C. Subramaniam, Mani Stores, Electricals and Hardware Goods, Rasipuram Post, Bazar St., Salem Dist.
- (525) R. Sankarrah Naidu, Shop Merchant, Mandapam, Tenkasi.
- (526) Sajuddis, Akberally (Partner) No. 34, Linghi Chetty St., Madras.
- (527) M. Sundaram Pillai, 17, Jawahar Bazar, Karur.
- (528) P. Sundaramoorthy Asdari, Modagur, P.O. Gingee Taluk.

Dealers (Contd.)

- (529) A. Swaminathan, S/o Sri Arumnga Achari, 49, Kamakshiamman Koil Street, Tiruvannamalai.
- (530) Subramanian and Co., 133 Valayaka Street, Erode.
- (531) S. K. Subramania Chethiar, S/o Sri Kuppu Venkatarama Chethar, Main Road, Sankariding, P.O. (Salem Dist.)
- (532) K. Subhasitham, Subhash Iron Implement Factory, Neduithapurajidom vedu, Kalia-kanila.
- (533) South Madras Agencies Private Ltd., 10 West Boulevard Road, Tiruchirappalli-8.
- (534) M. Subramani, S/o Sri K. Manuswami, 8 Bazaar St., Trivellore.
- (535) Southern Trading Co. Palakarai Turaiyur.
- (536) G. Sundaram Pillai, No. 8, New Market, Ootacamund.
- (537) P. S. Subbiah Nadar, 308, 309 East Masi St., Madurai.
- (538) M. A. Salam, 178, Nainiappa Naickar St., Madras-3.
- (539) S. K. R. and Co., 1A/2 Obla Subbior Lane, South Gate, Madurai.
- (540) M. Senthinathan, 9/238 Sannadhi St., Sri-vaikuntam, Tirunelveli Dist.
- (541) K. Srinivasan, 10, Mariamman Koil, Street, Tindivanam.
- (542) E. A. Shanmugam, Tool Merchant, Bangle Sellers Street, Erode.
- (543) T. Staves and Co., Dinaington, Kotagiri.
- (544) S. Syedmuhammed, Rowther Sons, 89, Mylam Chandai, Tiruchi-8.
- (545) K. A. Shukoor, 15/42 Maniathotam, N. H. Road.
- (546) P. S. C. Sundarammal and Co., 28, Vengaladaist, Madurai.
- (547) P. H. Sheik Allauddin Palakarai Road, P. B. 462, Tiruchirappalli.
- (548) A. Sahjumaiah Sahib, Sri Ameermiah Sahib, 47, Eazimar Pallivasal Main St., Madurai.
- (549) P. R. Sarangapani Chettiar and Sons, Sri Lakshmi Stores, 211-A Ward 13, Gandhi Road, Palani.
- (550) K. Sango, Merchant, 2/43, Middle Street, Tiruvadanai.
- (551) S. Srinivasan, 150-WI Siva ganga.
- (552) V. S. K. Sivanandhi Chettiar, 7/188 Big Bazaar, Paramakudi.
- (553) S. P. Subha Raja and Sons Hardware and Paint Merchants, Santhi Bazar, Rajapalayam, Ramnad Dist.
- (554) S. Y. Saiyed Yakub Hussain Sahib, 3-644 East Main Road, Thanjavur Dist.
- (555) S. A. T. Shanmuga Nadar, Railway Station Road, Tiru thuraiipoondi.
- (556) V. Setharaman, Proprietor, Sri Ganesh Hardware Mart, Sukali.
- (557) T. Sivagururiatha Pillai, 265, East veli Street, Madurai.
- (558) P. V. Stores, 3, Bunder Street, G. T. Madras.
- (559) Shifeddeen, Hardware and Paint Merchant, 77-A, West Car Street, Chidambaram.
- (560) Sethyanarayana Corporation, 56, Agraharam, Shevapet, Salem-2.
- (561) Sri S. Sivalingam Pillai, Merchants, 29/182, Cape Road, Kottar Nager Coil.
- (562) P. Sadasivan, P. Sadasivan and Brothers, 5, Thothiankinaru Street, Madurai-1.
- (563) J. Srinivasa Gupta, S/o Late R. Jayaram Chettiar, Hardware and Paint Merchant, 57-58, Big Bazaar Street, Dharapuram.
- (564) R. Subramaniam, Managing Partner, M/s R. S. Mani and Bros., No. 1, IVth Trust Grees Street, Mandavalipakkam, Madras-28.
- (565) Sankarakumara Nadar and Sons, 166, North Cotton Road, Tuticorin.
- (566) K. Santhubava Rowther and Sons Co., 301-302, Vysial Street, Coimbatore.
- (567) Sankara Kumara Nadar, 31-C, Palakarai Road, Trichi-8.
- (568) M. Subramanian, No. 5, Yanaikkal Madurai, Shanmugha Hardware Co., 4/1817, Neela South Street, Nagapattnam.
- (569) S. L. Sankara Kamaru Nadar, 397, W. G. C., Road, Tuticorin.
- (570) D. Suriah Chetty and Sons, Merchants and Contractors, Hosur Cattle Farm P.O., Salem Dist.
- (571) P. Seshchalam and Bros. 26 M. S. C. B. Road, Madras-1.
- (572) Thirupathi Raja, Hardware Merchant, 371/10, Mani Road, Koilpathi.
- (573) P. T. M. Thaapan and Co., Iron Merchants, 295, Big Bazaar, Dindigul.
- (574) K. C. Thangavelu, Chettiar, 92, Main Bazaar, Vellore.
- (575) P. N. Thanickachalam Chetty, No. 12, Gengaraman Street, P. T. Madras-3.
- (576) Tilak Industries, 28/1-A, Mooker Nallamuthu Street, Madras-1.
- (577) A. V. Thomas and Co. (India) Ltd., 2/21 First-lane beach, Madras.
- (578) V. P. Tirulai Chettiar, Shop at Vembadithalam Salem Town.
- (579) T. A. Tarijebali and Company, 294, Lingha Chetty St., Madras-1.
- (580) M. Thanikachalam, Sri Murugan Hardware, 31-32 West Car St., Chidambaram, South Arcot Dist.
- (581) A. S. Thirumalai Nambi Naidu, 5-A Mela Mada St., Tirunelveli.
- (582) Taybally Hardware and Mills Store, 180-181 Long Bazaar, Vellore, N. A. Dist.
- (583) Thavasimuthu Nadar and Sons, General Merchants, Kurumbur.

Dealers (Contd.)

- (584) G. Thamboswami, Secretary, Gandhiniketan Co-operative Village Industries Limited.
 (585) A. T. N. Thammanna Chettiar and Co., 348, Raja St., Coimbatore.
 (586) Thirunelakandar and Co., Shevapet, Salem-2.
 (587) T. Thangavelu Achary, P. S. C. Nadar St, Virudhunagar.
 (588) S. Thirumal Nadar, Maligai Hospital Road, Nazareth.
 (589) S. P. Thirumal Nadar and Co., 196-197 Kallukattai South, Karaikudi-1.
 (590) S. T. C. Thiruvadinatha Pillai and Bros., N. M. C. No. 5299 Cape Road, Nagercoil.
 (591) Union Company (Motor) (P) Ltd., H. O. 29 Mount Road, Madras-2) Garden Road, Ooty.
 (592) Unicorn Company (Accessories) Private Limited, No. 29, Mount Road, Madras-2.
 (593) P. V. Ukkuru, No. 15/139, Newab Hakum Road, Coimbatore.
 (594) F. V. Ukkuru, No. 335, R. G. St., Coimbatore.
 (595) K. V. Vaiyapuri Chettiar, Iron Merchants, 192, Netaji Road, Erode.
 (596) S. S. Vaiyagamuthu Nadar, No. 75, Swami Sannadhi, Madurai.
 (597) M. Viswanathan, Manager Raja Trading Corporation, 15, Mailam Sandhai, Tiruchirappalli-8.
 (598) Virudhunagar Industries, Works, Sales Office, Virudhunagar.
 (599) S. Viswanathan and K. B. Pattabiraman, Big Bazaar Street, Coimbatore.
 (600) V. Venkatesan, 27, Karuppa Gounder Street, Coimbatore.
 (601) R. Viswanatha Chettiar Sons, 116-11, Clock Bazaar Street, Dharapuram.
- (602) G. Venkatesa Pathar, Prop. M/s Venkatesa Bros. Moulding Works, 18, Pattai Bagyanatham Pillai Street, Kumbakonam.
 (603) B. Venkataraman, Novelty Stores, Neela East Street, Nagapattanam.
 (604) P. Vehiswamy, Tiruppur, Coimbatore Dist.
 (605) United Hardware Co., New Market, Ootacamund.
 (606) A. Vellaiswamy Nadar, 102/12 Main Road, Kovilpatti, Sri Murgan Industrial Works.
 (607) H. W. Venkatachalam Chettiar Sona, Krishnagiri, Salem Dist.
 (608) P. S. Venkoba sa-109-A, Chavadi St., Cheikpet, Kanchuperam.
 (609) K. S. T. R. Villayan Chettiar, Selvi Vaiyayar Street, Santapettai.
 (610) P. V. Venugopal Naidu, Bazaar Street, Polur North Arcot Dist.
 (611) T. Veera Naicher, No. 100 Mani Road, Kumarapalayam (via) Erode.
 (612) Veluswamy Pillai, Ria Millowner Vivakagar Vaikalkara Street, Manambuchavad, Thanjavur.
 (613) G. Venugopalan, No. 66, Old Hospital Road, Gobichettipalayam.
 (614) Vadaivodaimbal Store, 1-A, Genguraman St., Madras-3.
 (615) V. N. Venkataswamy Naidu, No. 318, Kankarajan St., Udumalpet.
 (616) K. Veerabadran, Partner, M/s Lingam and Co., No. 36, W. G. C. Road, Tuticorin.
 (617) Vazirbuu Trading Co., A 29 Periantha Mistry Street, Madras-1.
 (618) M. Yasuff and Bros., Hardware Merchant, Cape Road, Kottar NMC No. 30/142, Kanya Kumari Dist.

Repairers

- (1) Avery Company of India Private Limited, 16-17 Armenian st., Madras-1 Branch at 6/125 Trichy road, P.B. No. 215, Coimbatore-1.
 (2) G. K. Abdul Gani Rowther, S/o O. Khadersa rowther (Late) 16, Fort street (South) Virudhachalam.
 (3) R. Apparswamy, S/o Ramaswamy No. 1, Jeer Naick st, Madras-24 Office. 103, Mannady street, Madras-1.
 (4) Andhra Scientific company, Limited, 4, Blacker's road, Mount road, Madras-2.
 (5) Aurumugam, S/o Sadasiva Achary, Ediyam Tottam, Chidambaram.
 (6) Avery Company of India Private Ltd., 16/17, Armenian street, Madras-1.
 (7) T. B. Arumugam 1-A Telegraph Abboy Naidu Lane, Kondithope, Madras-1.
 (8) R. Aiyaswamy, Metric Weights Dealer, Bell Studio, Tiruvannamalai.
 (9) R. Ayyaswamy, No. 21/Asalamman Koil Street, Tiruvannamalai, North Arcot District.
 (10) S. Anthoniswamy, Solomon Foundry, Nagapattinam.
 (11) Amaan, No. 26, Nair Ayya Pillai Street, Royapettah, Madras-14.
 (12) P. Balakrishnan, S/o K. Kondiah Jyothi scale company, SI, Perumal Kovil Garden st, 5th Lane, Sowcarpet, Madras-1.
 (13) K. Balasubramaniam, 18, Mela sannadhi, Chidambaram.
 (14) Chelliah Achari, Bungalow Street, Sankarankoil, Tirunelveli Dt.
 (15) K. P. Darmalingam, No. 16, Asirvathapuram, Vth Line, Mannady, Madras.

Repairers (Contd.)

- (16) C. Doraivelu, 2/5, Ekambara Kumarayur Street, Periamet, Madras-3.
 (17) A. P. Dhayalan, No. 1, Parasiva Chetty Street, Park Town, Madras.
 (18) A. K. Dorairajan, No. 140, Choolai High Road, Madras-7.
 (19) Exel Industries, Velandipalayam, Coimbatore.
 (20) M. Elumalai Naicker, No. 202/1, Railway Station Road, Tiruvellore.
 (21) D. Elumalai, No. 37, Iyyappa Chetty Street, Mannady, Madras-1.
 (22) A. Gurunath, 15, Stringers Street, Madras-1.
 (23) P. Gopalan, S/o V. Pichayya, I, Acharappan Street, Madras-1.
 (24) S. S. Gnanamier, Musaffar Bungalow St., Tirupattur, Ramnad Dist.
 (25) G. Govindaraju, Sagayam Scale Service.
 (26) Ganapathy Mudaliar, Hardware Merchant, Bazaar Street, Tindivanam.
 (27) V. Govindarajan Pillai, No. 46, Kumara Koil Street, Guddalore, N.P.
 (28) E. S. Haji and Company, No. 12, Sembudoss Street, Madras.
 (29) T. E. Industries, Lessess, V. and M. Gopalakrishniyar and Sons, 36, Palam Station Road, Sellur, Madurai.
 (30) V. Janarthanan, 21, Thukkaram St. Manjakkuppam, Cuddalore, S.A. Dist.
 (31) S. M. A. Jabbar, Kolla Street, Nagore.
 (32) P. V. Krishnan and V. R. Subramaniya stpathi, Partners, New Royal Engineering Works, 32/6, Katpadi Road, Vellore.
 (33) C. Kumaraswamy, S/o C. Murugesu Mudaliar, 266, Mint Street, Madras-1.
 (34) R. Kuppuswamy, 17-A, Badrakaliamman koil St., Big Kancheepuram.
 (35) Krishnan Asari, 317/W3, Vadakkuvadi St., Sivaganga.
 (36) K. S. Kalimuthu, No. 28/28, Rangai Gowder Street, Coimbatore.
 (37) V. Krishnaswami, No. 31, Chakrapani South, Kumbakonam.
 (38) Latheef Sahib, Muhammedan St., Ulundurpet, S.A. Dist.
 (39) T. Loganathan, No. 49, Nyniappa Naicken Street, Madras-1.
 (40) A. S. S. Moorthy, 10, M. K. Naicker road, Alandoor, Madras-16.
 (41) V. M. Mohamood Shaik Dawood, 12-A, Dr. Niamathulla Sahib St., Triplicane, Madras-5.
 (42) S. Muthu Achari, S/o M. Subhan Achari, Bachamiyan St., Sattur.
 (43) Mighty Scales Company (1) A. V. Subramaniam (2) A. V. S. Jagannathan (3) T. N. Sundaravelu and (4) T. G. Shanmugam 123, Park Road, Erode.
 (44) K. Malakondaiah, S/o K. Kondiah Jyothi Scale Company, 51, Perumal Kovil Garden St., 5th Lane, Sowcarpet, Madras-1.
 (45) T. K. Munirathinam, S/o T. S. Kuppuswamy chettiar, 26, Bazaar Street, Tirukkalaikundram.
 (46) S. P. Muthuswamy Gounder, 88-F/5/19, Palladam Road, Tiruppur.
 (47) S. A. Mohammed Jakiria, Yagusam Jhaikal Street, Nagore.
 (48) Najmi Industries, 17, Singanna Naicker St., Madras.
 (49) K. Naina Mohamed Maricair, S/o Kadir Mohideen Mainan, 101, Mannady Street, Madras-1.
 (50) A. Nachimuthu, S/o A. V. Ayyasamy, A. V. M. Cloth Store, 28, Teppakulam St., Tiruchengode, Salem Dist.
 (51) V. A. Nilson, 2/11-A, Red Hills Road, Ikkadu, Trivellore.
 (52) S. Noor Mohammed, C/o A. S. K. Gani Bawa, Emaneswaram Post, Paramakudi, Ramana-thapuram.
 (53) P. Natarajan, 60, Chinnamman Koil Street, Chingleput District.
 (54) Natarajan Achary, S/o Pitchandi Achary, Pallivasal Street, Koilpatti.
 (55) V. Periathurai Achari, S/o V. Vadivel Achari, Gopalakrishna Engineering Works, 26, Padavattammankoil St., Panruti.
 (56) N. Ponnuswamy Udayar, Ulundurpet, S. A. Dist.
 (57) Ramanujam Naidu, Prop. Bharat Mechanical Engineering Works, Keelayur, Tirukkailur, South Arcot Dist.
 (58) S. D. Rajan, S/o Soundararaja Naidu, 15/409-A, Oppanakar Street, Coimbatore shop at Everest Scales Services, No. 7, Muthuvina-yakar kovil covur, Vysial Street.
 (59) M. V. Raman, Udayakumar Repair Works, 55, Nainiappa Naick St., Mannady Madras-1.
 (60) V. R. Raja Manickam Chettiar, No. 175, Bazaar Street, Vridhachalam.
 (61) K. Ramachandra Mudaliar, No. 11, Marappa Reddi Street, Tiruvellore.
 (62) P. Ramachandran, No. 8/3, Doraiswamy Ayyangar Street, Madras-23.
 (63) R. Ramdoss, No. 135, Sangalaneer Pilliar Koil Street, Madras-1.
 (64) A. K. Ram, No. 87, Pidariar Koil Street, George Town, Madras-1.
 (65) S. Rajagopala Naidu, A. I. Neela South Street, Nagapattinam.
 (66) T. Subramaniya Naicker, No. 2, Muthumari Chetty St., Mannady, Madras-1.
 (67) M. K. S. Shahabdeen, 6, Jaffer Syrang Street, Madras-1.
 (68) A. D. Swamy, 39, Lakshmiammankoil St., Perambur, Madras-11.
 (69) K. S. Srinivasan, Balaji Engineer and small tools, 30, Gohale Road, Madurai-2 (Office) Factory block CI-1, Industrial Colony, Madurai.

Repairers (Contd.)

- (70) T. S. Subramaniam, S/o T. Ethirajan, 95-A, Sannathi St., Tirupapuliyur.
- (71) M. S. Salem, S/o Abdul Kader sahib, 178, Nainiappa Naicken Street, Madras-3.
- (72) S. R. D. Swamy, 1/8, Selvi Vinayagarkoil St., Old Washermanpet, Madras-21.
- (73) S. Sivaprakasam, No. 32, Chella Pillaiarkoil St., Royapettah, Madras-14.
- (74) K. Srinivasan, C/o D. Sundaramoorthi, Tindivanam.
- (75) T. Sundaram, 20, Kannappa Nainar St., Villupuram.
- (76) Y. Shajahan, S/o Yusub Sahib, 57, Baday Sahi Street, Mount Road, Madras-2.
- (77) A. C. Swamy, No. 11, Subbaraya Naicken Lane, N.S.C.B. Road, Madras-1.
- (78) C. K. Sundaram, No. 617, Inspector, Subbaraya Naidu Street, Madras-21.
- (79) K. Sahasram (Partner) Cleamont Cottage, Gool Mohammed Road, Octacamund, Scales and Services.
- (80) Shanmugam Industries, Prop. E.T. Radhakrishna Chetty, No. 64/65 Nyniappan Naick Street, Madras-3.
- (81) Syed Umar (S) Bus Stand, Tin Works, Kalladukurichi.
- (82) P. Sundaramurthy Achary, Modayur P.O. Gingee Taluk.
- (83) S. Selvaraj, 47, Nainiappan Street, Madras-1.
- (84) S. Selvam, A. B. C. Thanjai Rayagipura Agraram, Kumbakonam.
- (85) K. M. Thiruvengadu Mudaliar, 8, Ibrahim sait street, Kondithope, Madras-1.
- (86) C. K. Thangavelu Achari, 22/B, Thoppaian St., Chidambaram.
- (87) A. T. N. Thammanna Chettiar and Company, No. 348, Raja Street, Coimbatore.
- (88) V. Venkatesan, S/o T. N. Venugopal, No. 27, Karuppa Gounder Street, Coimbatore.
- (89) Venu Pillai, Bazar Street, Panruti.

MANIPUR (2)

A list of manufacturers, dealers and repairers licensed was published in November 1962 issue of Metric Measures. The following is a list of manufacturers since licensed by Manipur Administration.

- (1) Associated Industrial corporation, 1278, Bharon Bazar, Agra.
- (2) Girishchandra Ghosh, 68, Clive St., Calcutta-7.
- (3) R. B. Industries, Fancy Bazar, Gaubati.
- (4) S. S. Iron Foundry, Laxmi building, Agra (India).
- (5) Janta Engineering Works, Jhajjar Road, Rohtak.

RAJASTHAN (2)

In the January 1962 issue of 'Metric Measures' a list of manufacturers, dealers and repairers of weights and measures in Rajasthan was published. The following is a further list of licensees since licensed by Government of Rajasthan under Rajasthan Weights & Measures Act, 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Abdul Rahman and Sons, Moti Chota, Udaipur	Brass Weights.
(2)	Allied Industries, Hawa Sarak, Jaipur South	Cast Iron and Brass Weights.
(3)	Arun Industries, Sansar Vila, M.I. Road, Jaipur	Brass, Bullion and Milligram Weights.
(4)	Ashu Industries, Bhagwan Ganj, Ajmer	Length
(5)	Bansilal Radhay Shyam, Bistiyon kabas, Jodhpur	Cast Iron, Brass and Bullion Weights.
(6)	Bajranglal Radhey Shyam, Bhopanganj, Bhilwara	Cast Iron, Brass Bullion Weights Length Measures.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (19)**Manufacturers (Contd.)**

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(7)	Bhanwari Lal Kansara, Ada Bazar, Jodhpur	Length Measures.
(8)	Bhantia Industries, Nagaur	Brass and Cast Iron Weights and Length Measures.
(9)	Bharat Industrial and Trading Co. Alwar	Cast Iron and Brass Weights.
(10)	Bharatpur Tamba Pital Utpadak Sah Samiti, Bharatpur.	Brass Weights.
(11)	Bhiyani Foundry and Engineering Works, Hanumangarh	Brass Weights.
(12)	Chandmal Verma, Kishanganj	Length Measures
(13)	Faiz Mohd. Khan, Chandiki Taksal, Jaipur	Brass Weights.
(14)	Ganesh Engineering Works, Beawar	Brass and Bullion Weights.
(15)	Ganesh Lal Ghanashyam Dass, Tambi, Chandpole, Jaipur	Cast Iron and Brass Weights.
(16)	Gulab Chand Chandmal Industries, Jodhpur	Brass, Bullion, Sheet Metal Weights.
(17)	Hukon Iron and Brass Foundry, Jaipur Road, Ajmer	Cast Iron, Weights and Length Measures.
(18)	Jagannath Pd. Hazarilal, Atalbundmandi, Bharatpur ..	Brass and Bullion Weights.
(21)	Kashav Engineering Foundry Works, Ratangarh	Cast Iron and Brass and Length and Capacity Measures.
(20)	Jindal Metal Works, Ratanada, Jodhpur	Brass Weights and Cylindrical.
(22)	Magan and Co., Nayaghat Road, Jaipur	Cast Iron and Brass Weights.
(23)	Mahalaxmi Foundry Works, Bhilwara	Brass and Bullion Weights.
(24)	Mistri Jamaluddin, Naya Kua, Bikaner	Length and Capacity Measures and Counter Machines.
(25)	Modern Engineering Works, Opp. Anand Cinema, Jodhpur.	Cast Iron Weights.
(26)	Mohan Foundry Works, Menerva Road, Jodhpur	Cast Iron and Brass Weights.
(27)	Mohan Industries, Srinagar Road, Ajmer	Length and Capacity Measures.
(28)	Muktsar Iron Store, Sri Ganganagar	Cast Iron and Brass Weights.
(29)	Popular Iron Foundry, Alwar	Cast Iron Weights.
(30)	Raj Band Manufacturing Co., Doongri Road, Jaipur ..	Cast Iron, Brass and Bullion Weights.
(31)	Rameshwarlal S/o Chand Mal Verma, Kishanganj	Length Measures.
(32)	Sharma Industries, Station Road, Ajmer	Brass Weights.
(33)	Shankar Lal and Co., Naya Kua, Bikaner	Brass and Bullion Weights and Length Measures.
(34)	Shanks and Harries, Roopangarh Road, Kishanganj	Cylindrical Measures.
(35)	Suresh Iron and Steel Works, Bharatpur	Brass Weights.
(36)	Vijai Metal Industries Road, Jaipur	Cast Iron Weights.

Please refer to lists published on pages 32 to 34 of January issue of 'Metric Measures'.

Manufacturers—Names of Manufacturers appearing at items, 1, 2, 4, 7, 9, 10, 11, 4 and 16 are no more the licensees and so their names have since been deleted from the list.

Dealers—Names of Dealers appearing at items 1, 5, 7, 15, 17, 18, 19, 22, 23, 24, 25, 29, 31, 32, 34, 39, 41, 43, 44, 48, 49, 50, 52, 56, 57, 58, 61, 63, 65, 67, and 68 are no more the licensees and so their names have also been deleted.

Repairers—Names of Repairers appearing at items 2, 5, 6 and 7 are no more the licensees and so their names have been deleted.

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	Abdul Gaffar and Co., Sri Ganganagar	Cast Iron, Brass and Bullion Weights, Length Capacity Measures, Beam Scales and Class C and D.
(2)	Abdul Rehman and Sons, Moti Chota, Udaipur	Brass Weights.
(3)	Abdul Taib Mulla Fida Hussain (Kota) Baran	Cast Iron, Brass and Bullion Weights, Length Capacity Measures and Counter Machines.
(4)	Agarwal Bartan Bhandar, Nagpur	Cast Iron and Bullion Brass.
(5)	Agarwal Brothers, Kishanpole, Jaipur	Brassweights, length measures and beam scales.
(6)	Allied Industries, Hawai Sarak, Jaipur South	Cast Iron and Brass Weights.
(7)	Albarali Hazi Ismile, Outside Hathipole, Udaipur	Cast Iron and Brass Weights length and capacity measures and beam scales Class C and D.
(8)	Arun Industries, Sansar Vila, M.I. Road, Jaipur	Brass, Bullion and Milligram weights.
(9)	Aratmal S/o Pesuram Kandoi Bazar, Jodhpur	Cast Iron & Bullion Brass Weights and Beam Scales Class B, C and D.
(10)	Ashu Industries, Bhagwanganj, Ajmer	Length Measures.
(11)	Ashumal Chotumal, Bhinmal	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(12)	Bahadur Singh Ghanshyam Das, Sri Ganganagar	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(13)	Baktawar Ram Shivanath Dauji Road, Bikaner	Cast Iron and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(14)	Bajrang Lal Radheyshyam Bophanganj, Bhilowara	Cast Iron Brass and Bullion Weights and Litre Measures.
(15)	Balotra Co-operative Marketing Society Ltd., Balotra	Cast Iron and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(16)	Bansilal Radheyshyam, Bhistiyon Ka Bas, Jodhpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures.
(17)	Bediram Phool Chand, Mohanpura, Indgarh	Cast Iron, Brass Bullion Weights and Capacity Measures, Beam Scales Class C and D.
(18)	Bharat Industrial and Trading Co. Alwar	Cast Iron and Brass Weights.
(19)	Bharatpur Tamba Pital Utpadak Sah Samiti, Bharatpur	Cast Iron and Brass Weights.
(20)	Bhagwari Pd. Laxmichand, Bharatpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(21)	Bhantia Industries, Nagaur	Brass and Cast Iron Weights and Length Measures.
(22)	Bhatia Ispat Udog Mandir, Rani	Cast Iron Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(23)	Bhanvar Lal Kamsara, Ada Bazar, Jodhpur	Brass and Cast Iron Weights and Length Measures.
(24)	Bhanwarlal Prem Chand, Deogarh	Cast Iron, Brass and Bullion Weights Length and Capacity Measures, Beam Scales and Counter Machines.

Dealers (Contd.)

Sl. No.	Name and Address of Dealer	Details of articles Sold
(25)	Bhatia Iron Store, Anaj Mandi, Ganganagar	Brass and Cast Iron Weights and Length and Capacity Measures.
(26)	Bhinmal Co-operative Marketing Society Ltd., Bhinmal	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(27)	Bhonri Lal Ramchandra, Choudhry, Ponsari Bazar, Alwar	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(28)	Bhiyani Foundry and Engineering Works, Hanumangarh	Brass Weights.
(29)	Bodumal Chopt Mal, Merta City	Cast Iron, Brass and Bullion Weights Length and Capacity Measures, Beam Scales and Counter Machines.
(30)	Buchiram Badri Pershad, Gangamandir, Bharatpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(31)	Chamgria Hardware Stores, Fatehpur	Cast Iron, Brass and Bullion Weights.
(32)	Chandmal Verma, Kisangarh	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales Class C.D.
(33)	Chandmal Rajmal Jain Mangrol (Kota)	Cast Iron, Brass and Bullion Weights and Beam Scales Class C. D.
(34)	Chaturbhuj Jagannath, Mewari Bazar, Beawar	Cast Iron, Brass and Bullion Weights Length and Capacity Measures, Beam Scales and Counter Machines.
(35)	Choturam Kishanram and Co., Sadar Bazar, Nagaur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(36)	Chunnilal Ganga Vishan, Sojat City	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(37)	Chunnilal Ram Chandra, Nakha	Beam Scale—Class C. D.
(38)	Damodar Prasad, Kalyan Sahai Iron Merchant, Dausa	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures and Beam Scales.
(39)	Deepak and Co., Chaura Rasta, 970, Jaipur	Weighbridges, platform machines, counter machines and Beam Scales Class A. B. C.
(40)	Desh Raj Haveli Ram Bhatia, Kota Road, Bundi	Cast Iron, Brass Weights, Beam Scales Class C.D.
(41)	Deva Ram Heera Lal, Nokha	Beam Scales Class C. D. and Counter Machines.
(42)	Bholaji Sohan Lal, Iron Merchant, Bhawanimandi	Length and Capacity Measures.
(43)	Fajal Hussain M. Abdul Hussain, Baran	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(44)	Faiz Mohd Khan, Chaudiki Taksal, Jaipur	Brass Weights.
(45)	Fazalalli Mulla Abdul Kadar and Co., Ramganjmandi	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(46)	Fakruddur Hazi Allabux Bhupalganj, Bhilwara	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(47)	Ganesh Dass Shankarlal Dakwala, Merta City	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scale sand Counter Machines.

Dealers (Contd.)

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(48)	Ganesh Ram Sohanlal, Dauji Road, Bikaner	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales Class B.C.D.
(49)	Ganeshlal Ghanshayam Dass Tambi, Chandpole, Jaipur	Cast Iron & Brass Weights.
(50)	Ganga Bux Radhaballabh, Sojat Road, Jodhpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales of Class and Counter Machines.
(51)	Ganesh Engineering Works, Beawar	Brass & Bullion Weights.
(52)	Ganganagar Kishan Marketing Co-operative Society Ltd., Ramganagar.	Cast Iron, Brass Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(53)	Gauri Shankar Rajendra Parshad, Sri Ganganagar	Cast Iron, Brass Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(54)	Gaurishankar Khendalwal, Chandi-ki-Taksal, Jaipur	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales, Class B.C.D.
(55)	Gulab Chand Chardma Industries, Jodhpur	Brass Bullion & Sheet Metal Weights.
(56)	Goyal Industries, Atalbund Mandi, Bharatpur	Cast Iron, Brass and Bullion Weights.
(57)	Gulab Chand Ramnarin, Kotla Bazar, Jodhpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(58)	Gulam Abbas, Gulam Hussain, Bundi	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales, Counter Machines.
(59)	Gupta & Co., Atalbund Mandi, Bharatpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales, Class B.C.D.
(60)	Hajibhura Daudllai, Tripolia Bazar, Jaipur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(61)	Hamirmal Sukh Raj, Beawar	Bullion Weights, Beam Scales and Counter Machines.
(62)	Hansraj Ganeshilal Iron Merchant, Sangaria	Cast Iron, Brass, Bullion Weights, Beam Scales and Counter Machines.
(63)	Hanumangarh Iron Metal Works, Hanumangarh	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(64)	Haroomal Dhannomal, Naya Bazar, Ajmer	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(65)	Hind General Store, Karauli	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(66)	Hind Co-operative Marketing Society Ltd., Hindaun, Dist. Sawai Madhopur.	Cast Iron, Brass, Bullion Weights, Beam Scales and Counter Machines.
(67)	Hukam Iron & Brass Foundry, Jaipur Road, Ajmer	Cast Iron Weights and Length Measures.
(68)	Hazi Firoz Khan Faiz Mohd. Gangasagar, Bikaner	Cast Iron, Brass, Bullion Weights and Counter Machines.
(69)	Hyder Hussain Fida Hussain, Khanpur (Jhalawar)	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(70)	Ibrahim Issaji, Bhopalganj, Bhilwara	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(71)	Ibrahim Mullah Ismaile, Ranganjmandi (Kota)	Cast Iron and Brass Weights and Beam Scales Class C. & D.
(72)	Indra & Co., Station Road, Jodhpur	Cast Iron, Brass Weights, Length and Capacity Measures, Spring balances and Counter Machines.
(73)	Ismailaji Sultanji, Baran (Kota)	Cast Iron and Brass Weights and Beam Scales Class C. & D.
(74)	Kaluram Tara Chand, Baran	Cast Iron, Brass, Bullion Weights and Beam Scales Class C. & D.
(75)	Kamal Supply Corpn. S.M.S. Highway, Jaipur	Capacity Measures.
(76)	Kanatraj Jauri Lal, Beawar	Bullion Weights, Beam Scales, and Counter Machines.
(77)	Kashi Ram Mathuram Dass, Iron Merchant, Nagaur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(78)	Kazi Firoj Khan Faiz Mohd., Gangasagar, Bikaner	Cast Iron, Brass, Bullion Weights and Counter Machines.
(79)	Karam Chand Manohar Lal, Baran Dist. Kota	Cast Iron, Brass, Bullion Weights, Capacity and Length Measures, Beam Scales and Counter Machines.
(80)	Kesrilal Lal Chand, Near Gangamandir, Bharatpur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(81)	Kekri Marketing Coop. Society, Kekri	Cast Iron & Brass Weights.
(82)	A. R. Khulki & Sons, Inside Sojat Gate, Jodhpur	Cast Iron, Brass Weights, Beam Scales Class C. & D.
(83)	Kashar Engineering Fdy. Works, Ratangarh	Cast Iron, Brass Length and Capacity Weights & Measures.
(84)	Krishanlal Jagdish Prasad, Sri Ganganagar	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(85)	Kirpa Ram Laxmi Narain, Dhanmandi, Sri Ganganagar	Length and Capacity Measures.
(86)	Krishna Iron Store, Danji Road, Bikaner	Cast Iron, Brass, Bullion Weights, Capacity and Length Measures, Beam Scales and Counter Machines.
(87)	Kurbanali & Abdul Hussain, Subhash Marg, Udaipur	Cast Iron, Brass Weights, Length Measures, Beam Scales Class C. & D.
(88)	Ladhulal Prem Chand, Bassi	Cast Iron & Brass Weights.
(89)	Laxmandass Ram Dass & Co., Sadar Bazar, Jodhpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(90)	Laxmi Iron Traders, Kotla Bazaar, Jodhpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(91)	Lal Chand Anoop Chand, Sadar Bazar, Phalodi	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(92)	Lal Chand Shyam Dass, Rakhi House, Jodhpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(93)	Lal Chand Mukand Lal, Iron Merchant, Semepur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(94)	Mahavir & Co., Mahi Darwaja, Nagaur	Cast Iron, Brass, Bullion Weights, Beam Scales and Counter Machines.
(95)	Mahiram Sriram, Tinpoha Bazaar, Jaipur	Cast Iron & Brass Weights.

Dealers (Contd.)

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(96)	Mangatrai Mannalal, Khetri	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(97)	Mansinghka Store, Bhilwara	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(98)	Mangaldass Wadhmal, Beawar	Cast Iron & Brass Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(99)	Mangal Manufacturing Co., Jalora	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(100)	Mital Brother, Sardarsahar	Cast Iron, Brass and Bullion Weights, Length & Capacity Measures, Beam Scales and Counter Machines.
(101)	Meghraj Dauraj & Durga Pershad, Near Rampuria College, Bikaner.	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales Class B. C. D.
(102)	Magan & Coy., Nayaghat Road, Jaipur	Cast Iron and Brass Weights.
(103)	Modern Engineering Works, Opp. Anand Cinema, Jaipur	Cast Iron Weights.
(104)	Motiram Mangalchand Jain, Madar Gate, Ajmer ..	Cast Iron & Brass Weights, Length Capacity and Measures, Beam Scales and Counter Machines.
(105)	Mohn Foundry Works, Minerva Road, Jodhpur ..	Cast Iron & Brass Weights.
(106)	Mohd. Ali Gulam Hussain, Jhalawar	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales, Class C & D.
(107)	Mistry Jamaluddin, Naya Kuan, Bikaner	Length and Capacity Measures, and Counter Machines.
(108)	Mitanand Jawala Pd., Fatehpur	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales of Class B.C.D.
(109)	Mohan Industries, Srinagar Road, Ajmer	Length & Capacity Measures.
(110)	Moolchand Gishulal Lohia, Beawar	Cast Iron and Brass Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(111)	Mull Gulam Abbas, Fazal Ali & Co., Jhalavapur ..	Cast Iron and Brass Weights Length, and Capacity Measures, Beam Scales and Counter Machines.
(112)	Moolraj Jai, Padampur, Sri Ganganagar	Length and Capacity Measures.
(113)	Mohammadi Store, Outside Hathipole, Udaipur ..	Cast Iron, Brass Weights, Length Measures, Beam Scales Class C.D.
(114)	Moti Ram Ram Saran Dass Dalmia, 73, Grain Market Sriganganagar.	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales & Counter Machines.
(115)	Mukatasar Iron Store, Sri Ganganagar	Cast Iron & Brass Weights.
(116)	Narain Lal Ballabh Pd., Hinduan Sarai, Madhopur Dist.	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(117)	Nathulal Ram Swarup, Iron Merchant, Sikar	Cast Iron, Brass & Bullion Weights, Length and Capacity Measures, Beam Scales of Class B.C.D.
(118)	Nazimuddin Mohd. Hussain, Baran (Kota)	Cast Iron & Brass Weights, and Beam Scales, Class C. & D.
(119)	Om Prakash Gupta, Sri Ganganagar	Cast Iron, Brass & Bullion Weights, Lengths and Capacity Measures, Beam Scales and Counter Machines.

Dealers (Contd.)

Serial No.	Name and Address of Dealers	Details of Articles Sold
(120)	Popular Iron Foundry, Alwar	Cast Iron Weights.
(121)	Parashuram Rormal, Goyal Bazar, Sri Ganganagar ..	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(122)	Pokarmal Hardwarimal, Bhilwara	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(123)	Precision Machinery Co., Ramganj Bazar, Jaipur ..	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Weigh-Bridges Platform Machines, Spring Balances, Counter Machines and Beam Scales.
(124)	Prasadi Lal Moti Lal, Bharatpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(125)	Purushottam Dass Shyam Sundaar, Bharatpur ..	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Measures.
(126)	Radha Krishan Ram Narain, Iron Merchant, Sikar ..	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales of Class B.C.D.
(127)	Radhaballabh Shivanarain, Village Piparcity ..	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
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(142)	Sanlal Tiwari, Nohar	Cast Iron, Brass, Bullion Weights, Beam Scales and Counter Machines.
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(145)	Secretary, Sarafan Sangh, Ajmer	Bullion Weights.
(146)	Sabhu Traders, Pokrauki Newali, Jodhpur	Weighbridges, Platform Machines, Counter Machines and Beam Scales.
(147)	Shan Dhanpatlal Laxmi Chand, Falna	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(148)	Shankar Lal Surajmal, Kherwara	Cast Iron, Brass Weights, Length Measures, Beam Scales Class C. D.
(149)	Sharma Industries, Station Road, Ajmer	Brass Weights.
(150)	Shauks and Harris, Roopangarh Road, Krishangarh	Cylindrical Measures.
(151)	Shanker Lal and Co., Naya Kua, Bikaner	Brass and Bullion Weights and Length Measures.
(152)	Shankarlal Sri Narain, Kadalganj, Alwar	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
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(160)	Tara Chand Fatehtal Jain Village Rakhab Deo	Cast Iron, Brass Weights, Length measures, Beam Scales Class C. D.
(161)	Tara Chand Banwarlal, Beawar	Bullion Weights Beam Scales and Counter Machines.
(162)	Usmanji Abdulghafoor, Near Somnath Temple, Pali	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.

Dealers (Contd.)

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(164)	Vijaya Metal Industries, Station Road, Jaipur	Cast Iron Weights.
(165)	Vasu Deo M. Sudwani, Bhopalganj, Bhilwara	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(166)	Vijai Laxmi Trading Co., Sikar	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales Class B. C. D.
(167)	Vijailal Narsingh dass Lohia, Tripolia, Jaipur	Cast Iron, Brass and Bullion Weights, Length and Capacity Measures, Beam Scales Class B. C. D. and Counter Machines.
(168)	Vasudeo Nabhar dass Bundi	Cast Iron and Brass Weights and Beam Scales, Class C. D.

Ajmer Division

Repairers

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(3)	Avery and Co., M. I. Road, Jaipur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Weigh Bridges, Platform Machines, Counter Machines.
(4)	Deepak and Co., 970 Chaura Rasta, Jaipur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(5)	Gordan Dass Krishan Ballabh, Fatehpurai, Beawar	Do.
(6)	Gupta and Co., Atalbund Mandi, Bharatpur	Do.
(7)	Jewan Ram Balu Ram, Pali Bazar, Beawar	Do.
(8)	Kalyan Tin Factory, Iron Merchant, Ajmer	Cast Iron Weights and Beam Scales.
(9)	Mohd. Ismile, Naya Bazar, Ajmer	Beam Scales and Counter Machines.
(10)	Mohd. Ismile, Luhar Mohalla, Beawar	Cast Iron and Brass Weights, Length and Capacity Measures, Beam Scales.
(11)	New Light Repairing Shop, Atalbunmandi, Bharatpur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines.
(12)	New India Scale Co., Tonk	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines, Weigh Bridges, Platform Machines, Counter Machines etc.

Repairers (Contd.)

Sl. No.	Name and Address of Repairer	Details of Articles Sold
(13)	Precision Machinery and Co., Ramganj Bazar, Jaipur	Cast Iron, Brass, Bullion Weights, Length and Capacity Measures, Beam Scales and Counter Machines, Weigh Bridges, Platform Machines, etc.
Bikaner Division		
(14)	Azad Trunk Factory Sri Ganganagar	(1) Cast Iron, Brass, Bullion Weights. (2) Length and Capacity Measures. (3) Beam Scales and Counter Machines.
(15)	Bhatia Iron Stores, Anajmandi, Sri Ganganagar	Do.
(16)	Bhadurchand Ghynshyam das, Sri Ganganagar	Do. and Platform Mach. and Weigh Bridges.
(17)	Dalmia Iron Industries, Sri Ganganagar	(1) Cast Iron, Brass, Bullion Weights. (2) Beam Scales and Counter Mech.
(18)	Muktsar Iron Stores, Sri Ganganagar	Do.
(19)	National Scale Works, Bikaner	(1) Cast Iron, Brass, Bullion Weights. (2) Length and Capacity Measures. (3) Beam Scales and Counter Machines.
(20)	Shankarlal and Co. Naya Bazar, Bikaner	(1) Cast Iron, Brass, Bullion Weights. (2) Beam Scales and Counter Machines.
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(25)	Inayat Hussain Razabali Kota	Do.
(26)	Naraindas Mangaldass, Ladpura Bazar, Kota	Do.
(27)	Nisar Hussain Ahsan Hussain, Kota	Do.
(28)	Om Prakash and Co., Rampura Bazar, Kota	Do.
Udaipur Division		
(29)	Janta Chair Co., Gulmandi, Bhilwara	(1) Cast Iron, Brass, Bullion Weights. (2) Length and Capacity Measures. (3) Beam Scales and Counter Mach.
(30)	Vasudeo M. Sadwani, Bhupalganj, Bhilwara	Do.

TYPICAL METRIC PRICING UNITS FOR WHOLESALE TRANSACTIONS

Serial No.	Commodity	Metric Unit
(1) Gold		10 grams(g)
(2) Grocery and Confectionery	Biscuits, sweetmeats, cardamoms.	1 kilogram (kg)
Textiles and Textile Fibres	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufacturers (when sold by weight).	
Paints & Chemicals	Paint (if sold by weight), indigo, liquid chlorine.	
Hides, Skins & Leather	Raw hides, leather (hides and skins).	
Metals	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	1 quintal (q) (100 kilograms)
Miscellaneous	Tea, meat, camphor tablets, mica.	
(3) Grains and Pulses	Rice, wheat, jowar, arhar, moong, masur, gram.	
Spices	Black pepper, mustard, chillies, dhania, dalcini, turmeric, betelnuts.	
Plantation Products	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured).	one metric tonne(t) (1,000 kilograms)
Forest Products	Lac and lac products, gums, myrobalans, galnuts, soapnuts.	
Textiles & Textile Fibres	Raw jute, raw hemp, coir yarn.	
Oils, Oilseeds & Oilcakes	Vegetable oils, oilseeds, oilcakes.	
Non-Ferrous Metals	Aluminium : ingots, bars, blocks, slabs, billets. Lead : ingots, sheets and strips. Copper : ingots, blooms, slabs, cakes, tiles, bricks billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles. Brass : ingots, rods, sections, pipes, sheets, strips, circles. Zinc : ingots, sheets, strips. Tin : blocks.	1 metre (m) one square metre (m ²) one cubic metre (m ³) one litre (l)
Chemicals	Caustic soda, bleaching powder, glycerine, soaps, paper salt.	
Others	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind.	
(4) Minerals	Iron ore, manganese ore, bauxite, coal.	
Iron & Steel	Pig iron, iron and steel manufactures, semis (billets for rerolling etc.)	one metric tonne(t) (1,000 kilograms)
(5)	Cloth (mill, handloom, silk, rayon and woollen cloth).	
(6)	Jute carpets, coir mats and matings sheet glass.	
(7)	Timber.	
(8)	Paints (when sold by measure), spirits.	one metric tonne(t) (1,000 kilograms)

Weights

(1) In place of the present units of seer, pound, rattal, viss etc., use the kilogram.

(2) In place of the tola, use the gram or 10 grams.

(3) In place of maund or corresponding unit, use the quintal i.e. 100kg.

Capacity Measures

In place of seer or gallon or any other measure use the litre.

Length Measures

(1) Use the metre in place of yard or foot and the centimetre in place of inch.

Square Measures

(1) Use the square metre in place of square yard or square foot, and square centimetre in place of square inch.

Cubic Measures

(1) Use the cubic metre in place of cubic yard or cubic foot and cubic centimetre in place of cubic inch.

Packaging

It is advantageous if sizes of packages correspond to series of commercial weights and measures prescribed.

These are : 50 kg, 20 kg, 10 kg, 5 kg, 2 kg, 1 kg, 500g, 200 g, 100 g, 50 g, 20 g, 5 g, 2 g, 1 g, and so on.

TYPICAL PRICING UNITS FOR RETAIL TRADE

Serial No.	Commodity	Metric Unit for Use
(1)	Foodgrains, cereals, pulses, spices, ghee, bread, vegetables, meat, fish, sweetmeats, tea, coffee, sugar, salt.	1 kg
(2)	Oil for cooking	1 kg or 1 litre depending upon practice.
(3)	Fruits	1 kg or number depending upon prevalent practice.
(4)	Milk	1 litre
(5)	Cloth and related materials	1 metre
(6)	Prepackaged materials	Preferably sizes corresponding to series of commercial weights and measures.

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metric measures

THE PUBLICATIONS DIVISION

ABBREVIATIONS FOR METRIC UNITS

(1) DECIMAL MULTIPLES AND SUBMULTIPLES

Prefix	Value in Terms of Unit	Abbreviation
kilo	1,000	k
centi	0.01 (10 ⁻²)	c
milli	0.001 (10 ⁻³)	m
micro	0.000 001 (10 ⁻⁶)	μ

(2) WEIGHTS

Denomination	Value	Abbreviation
tonne	1,000 kg	t
quintal	100 kg	q
kilogram	1 kg	kg
gram	1 g	g
milligram	1 mg	mg
carat	200 mg	c

(3) CAPACITY

kilolitre	1 000 l	kl
litre	1 l	l
millilitre	1 ml	ml

(4) VOLUME

cubic metre	m ³	m ³ or cu m*
cubic centimetre	cm ³	cm ³ or cu m*
cubic millimetre	mm ³	mm ³ or cu mm*

(5) LENGTH

kilometre	1 000 m	km
metre	1 m	m
centimetre	1 cm	cm
millimetre	1 mm	mm
micron	1/1 000 mm or 10 ⁻³ mm	μm

(6) AREA

square kilometre	1 000 000 m ²	km ² or sq km*
square metre	1 m ²	m ² or sq m*
square centimetre	1 cm ²	cm ² or sq cm*
square millimetre	1 mm ²	mm ² or sq mm*

(7) LAND MEASURE

are	1 00 m ²	a
hectare	100 a ²	ha
centiare	m ²	ca

*Both these abbreviations are current, but the first set should preferably be used. The former abbreviation is used internationally.

Rules for Abbreviations :

- (1) Do not make any change, such as addition of 's' to indicate plurality e.g., write 1 kg, 10 kg, 20g, 5g, 10 t, 20 ml, 27 l, 165 km, 2mm, 100 cm³, 66 km²;
- (2) Do not capitalize the abbreviations. For example, do not write 1 Kg, 2 Kg, 20 MM, 50 MM, the right way is to write 1 kg, 2 kg, 20 mm, 50 mm, etc.
- (3) Do not use any other abbreviations except those given above.

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Modular Coordination in Building Industry

J. K. VARSHNEYA

Deputy Director (Metric),
National Buildings Organisation,
New Delhi

THE reduction of the cost of building construction has been a challenge for decades. This challenge has been met to a great extent by 'modular coordination' of dimensions in the building industry. The concept of modular coordination has become a potent tool for higher productivity in the building industry.

Modular coordination is achieved by the establishment of a common denominator or 'module' for the sizing of components, which reduces production costs of materials by reduction in the variety of building components and lessens building costs by elimination of unnecessary on-site modifications. By simplification and rationalization of dimensioning and detailing, drawing office costs are also reduced.

Modular coordination utilizes the qualities, quantities and economies flowing from mass production. It is a system of prefabrication and interchangeability of parts which minimizes the amount of high-salaried, skilled labour needed for assembly purposes at the building site. The industrially produced building parts must, however, fit into each other on the building site. They must be so made that they can be fitted in a number of different combinations so as to allow freedom for creative architecture. Factory

made units must be fitted into a general dimensional system with a common denominator—the basic module. The object of modular coordination is, therefore, to allow advanced standardization and industrialization of the production of building parts, and secondly to remove their production from the unfavourable building site conditions, to suitable factories, where conditions are more suitable for rational production. That is why modular coordination is basically an industrial tool.

Historical Survey

Fred Heath, an engineer experienced in masonry products, originated in 1925 the idea of coordinating building materials through the use of a 4 inch grid.

Later on, Albert F. Bemis, a manufacturer whose hobby was the study of housing, broadened the basis of the concept by introducing the 4 inch cube. According to his theory, any building could be made up of a series of the basic 4-inch cubes or its multiples and no waste would result if the construction materials were standardized on the basis of the 4 inch multiple and if architects' plans were dimensioned to correspond with it.

After Mr. Bemis died in 1936, his successors formed the Modular Service Association at

the suggestion of the American Standards Association (ASA).

In 1938 the ASA set up Project A-62, for 'the coordinating of dimensions of building materials and equipment'. In 1941 the ASA published a pamphlet, ASA Project A-62, presenting the four-inch cubical module, as a basis for investigation and trial. On September 14, 1945, the ASA formally approved the 4 inch module as an American standard unit suitable for dimensional co-ordination.

The idea of modular coordination gained ground in the USA, and many Associations connected with housing and buildings supported it. The concept appealed to engineers outside the USA and in a short while a number of countries took it up.

Ultimately, after considerable study in both the metric and non-metric countries, responsible organisations in each of the participating countries contracted with the European Productivity Agency to proceed with the work. The British Standards Institution was designated as the technical secretariat. The result of the theoretical work was the publication of 'Modular Co-ordination in Building', Project No. 174, by the European Productivity Agency in August 1956.

The Module

The module is a unit of size internationally agreed upon for the coordination of dimensions. The size recommended is 10 cm where the metric system is used and 4 inches where the foot-pound system is used. The module may be applied to width, depth or height of any material or the building itself as a whole.

The module has three distinct functions:

- (1) It is the basic modular size.

- (2) It simplifies and interrelates component sizes.

- (3) It is also the basic increment of size in the modular reference system.

In designs based on this system, components which are based on the module or its multiples would be used for all purposes. So the basic increment of size in planning and component manufacture would be identical. The particular components selected by the architects could then be easily fitted and simply related to individual design. In this way coordination between standard industrial supply and individual design demand would be assured.

The 10 cm basic module is the most convenient basis for standardization of building products because:

- (1) It is large enough for manufacturers to turn out a reduced number of stock sizes and still satisfy consumer demand.
- (2) It is small enough to allow ample freedom and flexibility in architectural design and equipment layout.

Modular System of Tolerances

The modular dimension of a component includes the dimension of the component as well as its joint. To achieve it in practice, a modular system of tolerances has been devised, on the basis of engineering conventions for limits and fits.

In evolving this system, it has been kept in mind that components have to be dimensioned for manufacture even before their actual positions in any building are known. All dimensions are, therefore, related to modular planes and not to adjoining components.

Modular plane is the reference plane in a modular reference system.

MODULAR COORDINATION IN BUILDING INDUSTRY

The *minimum deviation* is the smallest allowable gap between a component and the modular plane (for erection, it is convenient to assume a gap equal to half the deviation on each side of the component between it and two modular planes) taking into account the need for jointing material, if any.

The *maximum component measurement* is the difference between the modular size and the minimum deviation. Any component larger than this should be rejected in the factory by quality control.

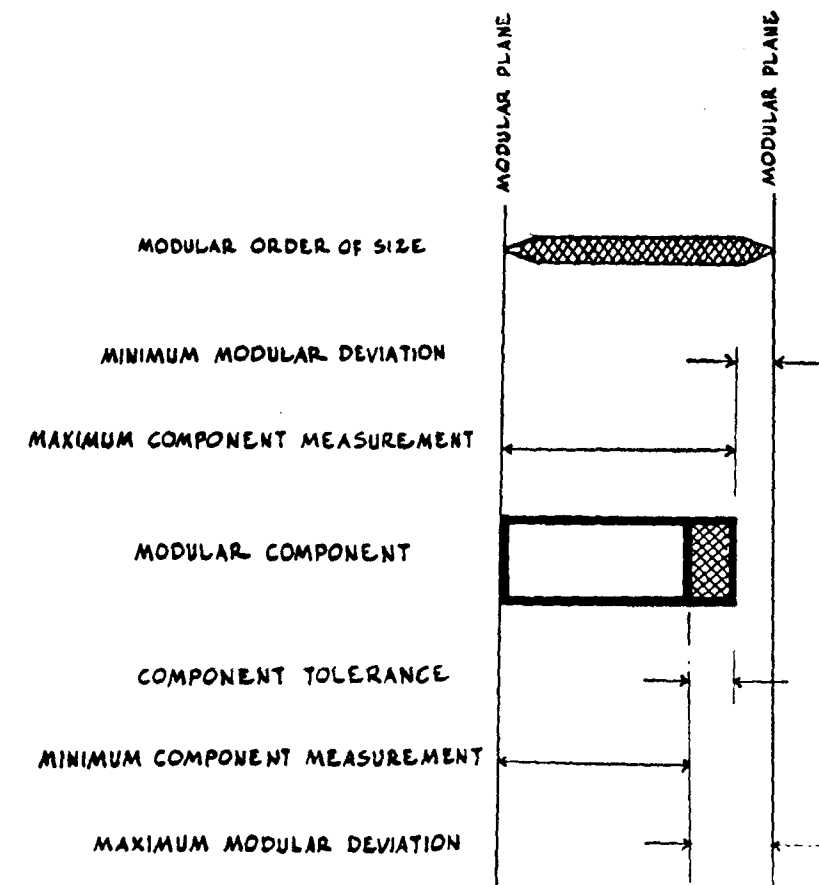
The *maximum deviation* is the largest allow-

able gap between a component and the modular plane.

The *minimum component measurement* is the difference between the modular size and the maximum modular deviation. Any component smaller than this should be rejected.

The *component tolerance* is the difference between the maximum and minimum component measurements which is the same as that between the minimum and maximum modular deviations.

These tolerances are shown in Fig. 1.



MODULAR SYSTEM OF TOLERANCES

FIG. 1.

Definition of Terms

Term	Definition	Term	Definition
Dimensional coordination:	Coordination of dimensions to enable components to be used together in a building without modification.	Actual dimension	Dimension of a unit or component taken after completion by direct measurement. This is equal to work dimension $\pm$ tolerance.
Modular coordination:	Dimensional coordination using a module.	Application in Design of Buildings	
Module:	The common unit of measure particularly specified for dimensional coordination.	All buildings should be so dimensioned that walls, floors, openings in walls and floors, placing of equipment, pipe connections, etc., are coordinated by an imaginary modular square grid laid over plans, elevations and sections.	
Basic module:	A fundamental module whose value is fixed to coordinate the sizes of components with the greatest flexibility and convenience. The basic module adopted is 10 cm.	Horizontally, in the case of walls whose nominal thickness is a multiple of the module, the modular grid should be laid so as to coincide with the modular surface of the unfinished wall. In the case of walls whose nominal thickness is not a multiple of the module, the grid should be so laid as to coincide with the central lines of the walls. Partitions of non-modular dimensions should be placed on a centre line basis so as not to disturb the grid arrangement. Doors, windows and other openings should be located so as to fit into the modular reference system.	
Modular reference system:	A reference system in which a module is used.	In the vertical plane, the modular grid should be so laid as to coincide with the modular surface of the structural floors, finishing not being taken into consideration. The height of the storey, measured from floor to floor should be modular. In the placing of doors and similar openings, a clearance of 4 cm for floor finishing should be provided and the height of shutters adjusted accordingly. Sills, lintels, ventilators, etc., should be placed so as to fit into the modular grid.	
Planning module:	A dimension which is a multiple of the basic module used in the preparation of designs for buildings. The planning module adopted by the Indian Standards Institution is 100 cm.	Advantages of Modular Coordination	
Modular dimension:	A dimension which is a multiple of the basic module.	<i>(1) To the architect</i>	
Modulated dimension:	Dimension fixed on a modular basis which is not necessarily a modular dimension.	Modular coordination is a boon to architects as it simplifies architectural design and	
Work dimension:	A dimension specified or set out on a drawing against which the actual measurement of the finished work may be compared.		
Nominal dimension:	The dimension by which a component is designated for convenience.		

reduces drafting time which the architect can gainfully employ in creative architecture and better planning of services. One example will illustrate this point. In an office in which a number of school buildings based on the use of steel frames were being designed, 114 sheets of drawings were found to be needed for the steel work for the first school.

When a modular scheme has been developed, it was found that 33 sheets of drawings of component parts were necessary, following which each school required only one general layout drawing, so that 41 sheets of steel work drawings were adequate for eight schools although these varied considerably in layout. It appears probable, therefore, that when a modular system is adopted and is used by drawing-office staff, the preparation of plans and working drawings would be much simplified. It would no longer be necessary fully to dimension such drawings, since the use of the grid would indicate sizes of, and often the position of, the various components.

It would permit easier substitution of alternative materials and changes in specifications without replanning.

(2) To the Contractor

If the modular system is used the coordination of materials and components results in quicker, easier and accurate quantity surveying, because modular coordination eliminates the necessity of preliminary interpretation of each architect's individual system. It ensures easier and more economical field erection with a reduction in field cutting and consequent reduction in damage to materials and components.

Modular coordination holds waste of materials to a minimum by reducing (i) cost of purchase (ii) cost of labour used in cutting off the waste materials and (iii) the cost of disposing waste. Cutting and patching

are greatly diminished. Saw time on facing materials is reduced almost a 50 per cent. Squeezing and stretching of mortar joints would not be required and engineering layout time would be easily reduced by 35 per cent. The rate of actual laying is definitely increased. It increases productivity of labour.

To the contractor, it means more efficient methods on the job and less construction time, with consequent lower cost.

(3) To the manufacturer

It provides a rational basis for the standardization of building material sizes on a national rather than a regional or local basis. In the coordination of sizes of building materials, the grid provides a guide to the manufacturers in determining the sizes of their products. Manufacturers are able to reduce the number of stock sizes of building products and still satisfy consumer demand for flexibility.

The introduction of new designs and standards would be easier and manufacturers would know that such modifications would fit into existing plans or future requirements.

It simplifies manufacturing process since they do not have so many sizes to make.

To the manufacturer, it results in reduced warehouse space, reduced packaging costs and better size and quality control.

Modular Coordination in India

The Indian building industry which is on the threshold of immense expansion is in a unique position to adopt the technique of modular coordination which is a very potent tool for higher productivity in the building industry. This has already been realized in India and considerable work on the standardization of building products based on modular coordination has been

done by the Indian Standards Institution. It is expected that as the programme for the adoption of the metric system in the building industry gets into full swing in a year or two, the field application of modular coordination would become a reality.

A few examples of Indian Standard sizes of various components would show the range of the coverage of the work of the Indian Standards Institution. It is expected that most of the components would be standardized shortly and codes for their utilization laid down.

DIMENSIONS OF PRINCIPAL BUILDING MATERIALS

Type of Material	Modular Dimensions	Work Dimensions
Building bricks (IS: 1077—1957)	20×10×10 cm 20×10×5 cm	19×9×9 cm 19×9×4 cm
Stones (IS: 1127—1957 and IS: 1128—1957)	20×20×20 cm 40×20 or 30×20 or 30 cm 150×150×5 cm	19×19×19 cm 39×19 or 29×19 or 29 cm 149·5×149·5×5 cm
Tiles (IS: 1237—1959)	20×20 cm 30×30 cm	19·85×19·85 cm 29·85×29·85 cm
Metal doors and windows (IS: 1033—1957)	210×60 cm 90×60 cm	207·5×57·5 cm 87·5×57·5 cm
Timber doors and windows (IS: 1003—1957)	190×80 cm 210×90 cm	187·5×77·5 cm 207·5×87·5 cm

Conclusion

It is now clear that modular coordination plays a vital role in building productivity and reduction in building costs. In the context of Five-year Plans, when large sums are being spent on building construction, the economies achieved by employing this technique will be significant. In the meantime, a vigorous programme of the application of the concept of modular co-ordination is needed. A vigorous campaign to popularize modular coordination is essential. An Indian Modular Society should be formed on the pattern of British Modular Society with the collaboration of National Buildings Organisation, Indian

Standards Institution, National Productivity Council, Builder's Association of India and the Indian Manufacturers' Association. This Society should propagate the concept of modular coordination. Lecture courses should be arranged, popular literature published on the subject and engineering institutions asked to incorporate it in the syllabus for architecture. It will also be helpful if in the proposed 'Building Centre' of the National Buildings Organisation, a small block, planned on modular system and constructed with modular materials, is built. In this block, the plans and the entire data regarding construction should be exhibited for the reference of architects, builders, engineers and manufacturers.

Metric System in French Usage

GUY KNOCHE

French Economic and Technical Bulletin,
France

PART I—TEXTILE INDUSTRY

IN the chapter entitled 'Industrie textile', the French 'Annuaire de Statistique Industrielle' gives a list of the various textiles products in tonnes (1,000 kilogram), whether they be yarn or woven fabrics. Such statistics are drawn up for the sake of unification and facilitate comparisons of production figures of different textiles.

This simplification, however, is the result of intricate calculations, for at the source statistics covering various textile products are supplied in a somewhat diversified form, fairly often in metres but, particularly where fabrics are concerned in square metres, as widths differ according to quality.

Count of Yarn

At the spinning stage, the fineness of yarns is usually identified by a number called the count.

For cotton yarns (supplied to weavers in bobbins of several thousand metres), the count is equal to the number of thousand metres (kilometres) of the yarn contained in a weight of 500 grams. Thus, a number 5 yarn means a yarn 5,000 metres (or 5 kilometres) of which are contained in 500 grams.

For woollen yarns the numbering is derived from a similar principle. In this case,

however, the count represents the number of thousand metres (kilometres) of the yarn contained in one kilogram.

For hemp and jute, the unit of length for yarns is the lea, or 'echevette'. A lea consists of 274 metres (300 yards) of yarn.

For natural silk, the international standard adopted by France to facilitate commercial transactions is the Italian numbering system: the count indicates the weight in half-decigrams (0.05 gram) of 450 metres of yarn (or decigrams per 900 metres of yarn). This also applies, by analogy, to artificial fibres.

Woven Fabrics

In woven fabrics, the width of the pieces is rather important. The length of fabrics is variable and depends primarily on transportation facilities. For cotton fabrics the maximum width is 120 centimetres (1.20 metre). It corresponds to the description 4/4. On this basis, the so-called 3/4 fabric has a width of 90 centimetres. The current width for woollen fabrics is 140 centimetres (1.40 metres). Other fabrics whose woven width is 80 centimetres are also used.

The goods sold by the manufacturer to a wholesaler are later cut at the retailer's and sold to customers in lengths corresponding to various uses.

For instance, a man's three piece suit (jacket, waistcoat and trousers) generally requires 3.50 metres of material, the width being 140 centimetres. For a woman's suit (jacket and skirt), size 44, 3.20 metres of material are needed if the width is 90 cm but only 1.95 metres if the width is 140 centimetres.

The textile industry is extremely diversified and measurements are dependent on the final use. The only measuring units used are those of the metric system—the metre and its most usual submultiple, the centimetre.

PART 2—DAIRY INDUSTRY

France produces an average of 200 million hectolitres (*i.e.* 20,000,000 litres) of cow's milk per annum, which represents an annual average of 2,000 litres per animal. This means that, dealing with a liquid product, dairy statistics must necessarily use units of capacity, the litre, or where a statement in litres would call for very high numbers, the hectolitre. The same units are used for measuring sheep's and goat's milk.

Sale of Ordinary Milk

Milk, when sold to consumers in its original form (but, of course, after necessary processing to ensure that the product supplied is free from harmful germs) is delivered in terms of the litre. The retailer, who receives the milk in 10 or 20 litre cans, sells it in retail per litre or fraction of a litre. For this he uses a number of small cylindrical containers.

But this form of sale, formerly very prevalent, is now being rapidly replaced by more modern methods. Milk is being sold in pre-packed form. The simplest is the bottle (so-called on account of its shape) containing either one litre or half a litre. These bottles

contain pasteurized milk. They are sealed in the factory so that no handling is required on the part of the retailer. Recently, specially processed cardboard containers have appeared on the market; they are pyramidal in shape, which facilitates their stacking and transportation. These cartons contain a half-litre or one litre.

Thus, for the sale of ordinary milk, the litre is the only unit used, either directly or through one of its submultiples. As the litre is practically equivalent to one cubic decimetre (or 1,000 cubic centimetres), the half-litre corresponds to 500 cubic centimetres and so on.

Sale of Other Forms of Milk

Modern technology has enabled milk to be marketed in forms other than its original State, *e.g.* as evaporated and condensed milk (sweetened or unsweetened) and dried milk.

Evaporated or plain condensed milk (which is milk from which part of its natural water content has been removed) is sold in cylindrical tin-plate cans with a sealed lid, thus ensuring perfect conservation. The unit for sale is then no longer that of capacity, but of weight the gram. The unsweetened condensed milk content of cans is expressed by its net weight (*i.e.* not including the weight of the can itself). The net weight of milk in such cans is 170 or 410 grams.

This is also true of sweetened condensed milk which is sold either in cans or in tubes. In cans the net weight is 400 grams, and in tubes (of which two sizes exist) 175 and 330 grams.

Finally, dried milk is sold in various forms and in cans of different contents. The quantity of milk contained in the can is expressed by its net weight, —one kilogram, five hundred grams, etc.

Sale of Butter and Cheese

About one-third of the milk produced in France is used for making butter. The butter manufactured in creameries is marketed in two forms—blocks weighing 10 kilograms which the retailer divides up into submultiples of the kilogram, *i.e.* 500 grams, 250 grams, or in packets in the shape of oblong paralleli-pipeds, the net weight of butter which corresponds to the submultiples.

So far as cheese is concerned the situation is more complicated. As the foremost cheese producer in the world, France makes several hundred varieties which are distinguished not only by the region where they are produced and their taste, but also by their form which extends, for instance, from that of the Comte gruyere in the shape of solid wheels weighing 35 to 50 kilograms, and measuring 40 to 70 centimetres in diameter and 8 to 13 centimetres in thickness, to the small goat's milk cheese weighing barely 100 grams. Simplification is, therefore, necessary in the retail trade: fairly small cheeses are sold by the piece, while others are sold by weight. The customer, for instance buys a 'camembert' but 200 grams of gruyere.

Finally, certain special dairy products are sold in different forms. One of them is yoghurt, sold in pots containing 125 cm³ (small size) or 250 cm³ (large size). Other soft uncured cheeses are sold in boxes containing two, three or six items.

PART 3—LAND MEASURES

The area of France is about 5,50,000 square kilometres. To measure such vast areas, the square kilometre is obviously the most appropriate unit. But it is a unit which represents a large area and is, for example, too large a unit to be easily used in agriculture. If it was applied, very small fractions of the

square kilometre would necessarily have to be used which would lead to great inconvenience.

Consider, for instance, that the average area of a French farm is 0.142 square kilometre, of which the plough-land is 0.047 square kilometre, of which again 0.0217 square kilometre is reserved for growing cereals, etc. This becomes more and more complicated.

Another suitable unit was, therefore, evolved. This unit which is reserved for agriculture, and fits perfectly into the body of the metric units, is the *are*, which is equal to 100 square metres and has a multiple, the *hectare* (100 ares, or 10,000 square metres), and a submultiple, the *centiare* (1/100th of an are, or 1 square metre). It should be noted that the submultiple and multiple are expressed by means of the usual prefixes: hecto = 100 times more; centi = 100 times less (*e.g.* hecto = 100 litres; centimetre = 1/100 metre).

Thanks to these agrarian units, calculations relating to agricultural areas become extraordinarily simple. In the example given earlier, the average area of a farm is 14.2 hectares, the area of the plough-land is 4.7 hectares and that devoted to cereal cultivation is 2.17 hectares. The second figure after the decimal point, representing centiares, that is to say square metres, is of sufficient precision for the usual measurements.

This precision, is necessary because a farm, even of about average size, very seldom consists of a single piece of land. It is often made up of several pieces separated from one another by variable distances. In one village, for instance, each farmer may own a certain number of fields distributed over its whole extent and more particularly suitable for growing wheat, beets, grapes,

etc. In this way mixed farming is instituted, which necessitates a fairly accurate evaluation of the different areas to within one square metre and this can be done by using the centiare as a unit.

How are these areas measured? The various holdings, in a commune are shown on a general plan of the commune—the 'cadastre' or land register—where each landowner can see exactly where his piece of land ends and where his neighbour's begins. This plan was drawn up on the basis of accurate measurements made on the site by specialists called 'arpenteur' (surveyors). The term 'arpenteur' comes from the noun 'arpent', a land measure of old-time France used before

the metric system. Its value varied according to the region from 42 to 51 ares. To measure land these 'arpenteurs' or surveyors use a 'chaîne d'arpenteur', which is a surveyor's chain consisting of 10 jointed links in the shape of bars joined to one another, each measuring one metre: Thus, the surveyor's chain is 10 metres long, and a square, the four sides of which could be measured in one operation, would have 10 metres sides and an area of 100 square metres, which is exactly the definition of the are.

The yields of cultivated plants are usually measured in quintals per hectare, the quintal (100 kilograms) being the unit adopted in agriculture for the expression of weight.

Metric Arithmetic in Schools

THE metric system of weights and measures is now being used in progressively larger areas in the country in the commercial and industrial fields. In fact, the compulsion to use only metric weights and none other has become effective all over India from April 1962. Since then resort to weights other than metric has exposed the user to prosecution and punishment. Similar compulsion to use length measures will start from October 1962, and for capacity measures from April 1963. Thus by April 1963, all commercial transactions would have to be carried out using metric units.

The use of weights and measures affects everyone of us throughout life in one way or another. Every day we enter into many small transactions in which calculations of

money and weights or measures have to be carried out. We are able to do these quickly because of our knowledge of arithmetic. If the system of coinage and weights changes, we have to relearn the mode of calculations in the new system. This process of relearning had to be practised in India of just ten years ago as one travelled from North to South or East to West, because there were numerous systems of weights and measures prevalent in the country. Adults had perforce to do it. What was worse was that children had to learn many of these by heart; it is little wonder that many of them developed distaste for arithmetic.

Facilities of Calculations

One of the important reasons for the adoption of the metric system was the

facility of calculations, particularly in conjunction with decimal coinage. It has been proved in Western countries that considerable time in schools is saved, if arithmetic is taught in the decimal system. Some estimates go even as high as to claim a saving of 20 percent of the student's time. Even if such an estimate may be too high, there is no doubt that the saving of time is substantial.

Now that the metric system is being used in ever larger fields in everyday life, there is no reason for the arithmetic education of children to continue in terms of the old weights and measures, most of which would be going out of use within a year's time. It is necessary to revise thoroughly the curriculum for school arithmetic and rewrite the textbooks, so that only the metric system is taught right from the lowest to the highest class (i.e. I-XI). The British system, being an international system, may be taught for the sake of additional knowledge in the last few years of the student's school career.

Past Efforts

After about four years of work, it may now be said that the replacement of old weights and measures and coinage by the metric system and decimal coinage in school arithmetic is not far off.

As is well known, the introduction of metric weights was begun in India in selected areas from October 1958 and their use became compulsory in these areas from October 1960. Simultaneously the Education Departments of the States were also advised to add an additional chapter to the present arithmetic textbooks to acquaint the students with the essentials of the metric system and its calculations.

The Government of India on its part prepared a 'Manual for Teachers' and supplied

it to the State Governments and educational institutions about 4 years ago. This was used by many authors to write additional chapters on the metric system.

It was intended that when the adoption of the metric system was taken up on a national scale, the textbooks could be drastically revised to reflect the 'metric atmosphere' in the country. The State Governments were informed to alter the curriculum and rewrite textbooks.

The process of alteration was, however, very slow and the change in the country's coinage and weights and measures has not yet been fully reflected in school education. In most textbooks an additional chapter was added to introduce the metric system and a few examples set. The use of seers and maunds, pounds and ounces, vissees and palams and annas and pies went on. The metric system was merely an additional system to be learnt and was a new burden for the children.

There were many reasons for this state of affairs. One school of thought maintained that as long as old weights and measures and coinage were in use or were to be seen in the bazaars, the teaching of arithmetic should lay due emphasis on them. Others felt that there were too frequent changes in textbooks. Whatever the reasons, the net result was that the teaching of metric system was not given its due place.

Survey of Textbooks

A quick factual survey was recently carried out by the Ministry of Commerce and Industry to ascertain how far the new coinage and the metric system of weights and measures had come into use in school textbooks in arithmetic. The situation in States and Union territories was as shown below:

(1) *Andhra Pradesh*

New coinage was predominantly used in exercises. There were special chapters on the metric system. About 10 to 40 percent of the exercises used the metric system. Books were to be revised in 1962-63.

(2) *Assam*

The use of the metric system and the new coinage in textbooks was negligible. There were descriptive chapters on the new coinage, but in exercises, values were mainly specified in rupees, annas and pies.

(3) *Bihar*

Only old coinage was used in books for classes upto VII. In books for classes VIII and IX, about 40 percent of the exercises used new coinage. There were separate Chapters on the metric system, but no use was made of the metric system in exercises.

(4) *Delhi*

New Coinage was almost exclusively used in exercises. Separate chapters on the metric system were included in most of the books. Metric weights and measures were used in 20 to 50 percent of exercises.

(5) *Gujarat*

Old coinage and old weights and measures were used almost exclusively in exercises. A few books contained separate chapters on the metric system.

(6) *Himachal Pradesh*

Both old and new coinage were used. There were separate chapters on the metric system. About 10 to 50 percent of exercises used the metric system.

(7) *Kerala*

New coinage was used predominantly in exercises. There were chapters on the metric system, but exercises in the old systems were

mainly used. A small proportion of exercises estimated at 10 to 20 percent used the metric system. Books were to be revised in 1962-63.

(8) *Madhya Pradesh*

Very little use was made of either the new coinage or new weights and measures. Books were to be revised in 1962-63.

(9) *Madras*

New coinage was used predominantly in exercises. There were special chapters devoted to the metric system. The metric system was used in a proportion of the exercises, ranging from 5 to 20 percent.

(10) *Maharashtra*

Very little use was made even of the new coinage, not to speak of weights and measures. No use was made of metric weights and measures in exercises. There were separate chapters devoted to the metric system in some books.

(11) *Mysore*

New coinage was used predominantly in exercises. There were separate chapters on the metric system. Metric weights and measures were used in 10 to 15 percent exercises. Books were to be revised in 1962-63.

(12) *Orissa*

Both the old and the new coinage found place in exercises. A small proportion of exercises, roughly estimated at 5 percent, used metric weights and measures.

(13) *Punjab*

Both old and new coinage were used in exercises. There were separate chapters on the metric system in some books. Metric weights and measures were used in an estimated 10 to 50 percent exercises.

(14) *Rajasthan*

Both new and old coinage were used in exercises upto Class V. Books for classes VI and XI used the new coinage predominantly. There were separate chapters on the metric system in some of the books. Use was made of the metric system in exercises for classes VI and VII.

(15) *Uttar Pradesh*

Both old and new coinage were used in exercises in books for classes II to V and X and XI. Only old coinage was used in books for VI to VIII. There were chapters on the metric system in books for classes III to VIII, classes upto V, and X and XI. A proportion of the examples used metric weights. No use was made of metric weights and measures in books for classes VI to VIII.

(16) *West Bengal*

The 'Kishalaya', Parts I, II and III meant for classes III, IV and V was published by the Director of Public Instruction. Part I had been adequately revised. In Parts II and III, while some space had been devoted to the metric system, a large proportion of the exercises was in the old systems. Books for secondary classes were recommended by the Board of Secondary Education. Some of these books had special chapters on the metric system and the new coinage; but old coinage and weights and measures were used predominantly in exercises.

Recent Steps

It is obvious that textbooks need much more drastic revision than has been attempted in any State so far. The extent of teaching in schools is largely determined by the textbooks in use. Until the textbooks are revised, school children will continue to be taught by reference to weights and measures which have become illegal in the country and are no longer in use.

In order to give the revision of curricula and textbooks an urgency, the question was referred to the All-India Council for Secondary Education which met on 16 and 17 April 1962 in New Delhi. The All-India Council for Secondary Education, on which are represented the Education Departments of the States and the Centre, made a number of recommendations. Some of the important ones are summarised below:

- (1) In all illustrations and exercises in textbooks, values should be given exclusively in rupees and naye paise. The only exceptions should be a special chapter for teaching foreign currencies and coinage, as for instance, pound, shilling and pence or dollar and cents.
- (2) Instruction in weights and measures should begin with the metric system.
- (3) Decimals should be taught at as early a stage as possible to facilitate the study and use of the decimal system of weights and measures.
- (4) No use should be made of any weights and measures other than metric weights and measures in illustrations and exercises. The only exceptions would be a special chapter devoted to the teaching of the foot-pound system in higher classes.
- (5) No weights and measures other than the metric weights and measures should be taught in the primary classes. The foot-pound system, which is an international system, may be taught at a later stage, that is, the secondary or higher secondary. A separate chapter may be devoted to the teaching of this system.
- (6) Brief reference to Indian weights and measures like the maund, seer,

bigga and the like may, if necessary, be made in books for the more advanced classes.

- (7) All textbooks, particularly in arithmetic, as also in subjects like geometry elementary science, home science and geography, must be revised as suggested above. The revision must be complete and the revised books brought into use by the beginning of the academic year, 1963-64.
- (8) Emphasis should be laid on the need to introduce as early as possible new books using entirely the metric system because when metric weights and measures alone were to be used in the country, it was wasteful to teach the school children any other system of weights and measures.
- (9) To facilitate the replacement of existing textbooks, among other things, literature on the subject should be circulated among the States, and the States should have an exchange of curricula and textbooks.

The Future

The above recommendations should now be implemented with zeal and speed. No time should be lost in devising suitable curricula and arrange the writing of new textbooks to take account of the new situation. The textbook writers on their part may require some guidance if a uniform treatment of the subject is to be ensured in all the States. To help the teachers in this work, the Ministry of Education has undertaken to publish a handbook for guidance of textbook writers. The first part relating to classes I to VI has been completed and will be shortly published; the second part is in an advanced stage of preparation.

The work of change in arithmetic teaching is now gathering momentum. This should be maintained. The children should be taught the metric system in the right manner so that they can use it in its proper form in later life. The success of the metric reform is ensured if school children are taught the right way to use it.

News & Views

Recent Notifications

- (1) *Length Measures in Pondicherry*
No. S.O. 956 dated 28th March 1962.

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) as applied to the State of Pondicherry by the Standards of Weights and Measures

(Application to the State of Pondicherry) Order, 1958, the Central Government hereby appoints the 1st day of April, 1962 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 throughout the State of Pondicherry.

NEWS & VIEWS

No. S.O. 957 dated 28th March 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), as applied to the State of Pondicherry by the Standards of Weights and Measures (Application to the State of Pondicherry) Order, 1958, 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. 956, dated the 28th March, 1962, the continuance of the use for a period of six months from the 1st day of April, 1962, of any unit of length which immediately before that date was in use in respect of the said areas.

(2) Amendment to Alcohol Industry Notification

No. S.O. 1098, dated 5th April, 1962.

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. S.O. 1220, dated the 30th May, 1961, namely :

In the said notification, the following proviso shall be added at the end, namely :

"Provided that, in respect of any such undertaking in or any such department of Government of the State of Andhra Pradesh and the State of Mysore, the Central Government permits the continuance in use of any such weight or measure up to and inclusive of the 30th September, 1962.

No. S.O. 1395 dated 3rd May 1962.

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 Notification of the Government of India in the Ministry of Commerce and Industry S.O. 1222, dated the 30th May, 1961, namely :

In the said notification, for the words 'not exceeding one year' the words 'not exceeding sixteen months' shall be substituted.

Electricity Output

The total electricity produced by the public utility power stations in India in October 1961 was 1,592.9 million kWh, of which 1,344.8 million kWh were sold to ultimate consumers.

Corresponding figures for October 1960 were 1,408.3 million kWh and 1,134.7 million kWh and for October 1951, these were 504.9 million kWh and 412.8 million kWh respectively.

Handbook of Weights and Measures in Hindi

Shri J. S. Bakshi, who published 'A Handbook of Weights and Measures' (reviewed in *Metric Measures* March 1961 issue on page 33) has now brought out its Hindi edition, under the title 'Metric Naaptol ki Pustak'. The 'Pustak' priced at Rs. 1.50 is available from Shri J. S. Bakshi, 455, Model Town, Yamuna Nagar, Ambala District, Punjab.

Do's and Don'ts—from U.S.A.

A National Weights and Measures Week is celebrated every year in the U.S.A. from 1-7 March. It is promoted locally, Statewise and nationally. The dates March 1-7 commemorate the anniversary of the enactment of the first Weights and Measures Law by the Congress, namely 2 March 1779.

The aim of the National Weights and Measures is to acquaint all sections of society with the nature of this essential Government service which is provided for the protection of the public and the business

interests from incorrect quantity determination in buying and selling transactions.

All the available media of publicity are utilised for the purpose. Thus there are articles in newspapers and programmes over radio and television. Pamphlets are issued as also public addresses delivered by experts in the field.

One of the pamphlets, the material for which has been published in the *Scale Journal*, January 1962 issue, gives a number of guiding points to assure 'getting what is paid'. Some of the do's and don'ts are equally applicable in India, particularly now when the compulsion to use verified and stamped weights and measures is being enforced throughout the country. They are as follows :

(1) Trade with merchants who have sealed weighing and measuring devices.

(2) Order by weight, rather than by 'box', 'piece', 'thirty cents worth', etc., unless you know definitely how much you are getting in these quantities.

(3) Never take less than you are entitled to in goods, any more than you would in money.

(4) It is required by law that most commodities have the net weight or count of the contents definitely expressed on the package or container. Net weight is the actual weight of the contents, and does not include the box, can, bottle, etc. Liquid commodities likewise, must show the fluid content.

(5) Be wary of 'bargains'. Sometimes they aren't.

(6) When buying from hucksters, vendors and peddlers, unless you are acquainted with them and know them to have an established residence, be very careful to

weigh all purchases. Make a note of their license number so that they may be identified and located, should the occasion warrant action against them.

(7) Don't be afraid to watch the weighing of your purchases. It is for your protection that the law requires the merchant's scale to be visible to consumers at all times. There is no difference in principle between short changing and short weighing. You take a loss either way.

(8) When commodities are placed in a carton or tray, or on paper, for weighing, be sure that you are not charged for the weight of this carton, tray or paper.

(9) The indicator or pointer on the scale must rest at zero mark when the scale is not in use. Periodically, the Weights and Measurements Department checks this setting, as well as the accuracy of the scale, but inspectors cannot be everywhere at all times. Before your purchase is weighed, see that the pointer rests at the zero mark.

(10) Gasoline pump meters also must start operating from the zero setting. If they don't, something is wrong.

(11) Keep an eye on fuel oil deliveries. Metering of this product must begin at zero.

(12) Don't hesitate to notify the Department of Weights and Measures if you think you are being cheated. Your co-operation will help in seeing that everyone gets a fair deal.

The Second International Conference of Legal Metrology

The second International Conference of Legal Metrology was scheduled to come off in Vienna from 11 to 18 June 1962. The General Conference is the supreme body which determines policy and is held every six years; the first was in 1956, when the International Organisation for Legal Metrology came into existence.

During the last six years, the Organisation has done much work. This work along with the future programme would come up for consideration at the second Conference. According to the agenda for the Conference after the formal opening, the President and the Vice-President of the Conference would be elected and the agenda approved. The President would report on the activities of the Organisation. The Conference would then ratify admission of new members and discuss possibilities of further increase in membership.

Progress of technical projects under study by Member States would be reviewed. Projects which may be in advanced stages of preparation would be discussed with a view to making international recommendations, if the progress justified such a step. The achievements of the Centre of Documentation would be examined and directives issued.

An important point relates to the project for a Model Service of Legal Metrology which could be recommended to countries desirous of setting up Departments of Weights and Measures and those that are developing them.

The Organisation has been publishing a quarterly *Bulletin of International Organisation of Legal Metrology*. The progress of the *Bulletin* would be reported and directives issued.

The International Organisation of Legal Metrology (OIML) has liaison with other international bodies such as the UN, UNESCO, the International Committee on Weights and Measures, International Organisation for Standardisation, International Electrotechnical Commission, the European Community and the International Union of Pure and Applied Physics. A report

on the activities of these bodies in relation to legal metrology would be presented.

The Conference would also discuss the situation of the Organisation regarding personnel, location and equipment.

After considering the report on the financial position for the period 1956-62, the Organisation would determine the rights of new entrants and take up the budget for 1963-69. The subscriptions to be paid by members during the next six years would also be fixed.

A report on the legal status of the Organisation of French territory would be considered.

The International Committee of Legal Metrology would be constituted and new members elected. The question of amendment of the International Convention of Legal Metrology would also receive attention.

A report on the recommendations of the Conference would be published in a subsequent issue of *Metric Measures*.

Poll on Metric System in USA

The analysis of over a thousand replies to a questionnaire widely circulated by the 'American Committee for Introducing the Metric System in USA' shows that 90 per cent of American scientists and technicians think that it would be advantageous to go over completely to the metric system, and that the cost would not be prohibitive if a fairly long period is provided for the change over. This has been revealed in an article in the journal of the national standards body of Switzerland. (VSM/SNV Normen Bulletin, Vol. 10, No. 5, p. 37, (1961))

The questionnaire was published in the periodicals of several American organisations including the Society of Civil Engineers,

the Society of Mechanical Engineers, the Institute of Radio Engineers, the Association for the advancement of Science, the Society of Military Engineers, the Geophysical Union, and the Society of Photogrammetry. The questions included and the analysis of replies received were as under :

Question	Answer
(i) What is the approximate percentage of units, (Metric, British and others) used in your firm ?	Metric, 45 per cent British, 52 per cent others, 3 per cent
(ii) Would it be advantageous if a complete change-over to the metric-system were brought out ?	Yes, 90 per cent
(iii) What should be the duration of the transition period ?	Average 22 years, the range being 18 to 29 years
(iv) Should Centigrade scale be adopted for temperature ?	Yes, 90 per cent
(v) Do you think the American foreign trade suffers as a consequence of the use of British units ?	Yes, 68 per cent
(vi) Do you think that the introduction of the Metric system is unavoidable ?	Yes, 68 per cent
(vii) Do you think that the cost of change-over would be prohibitive if a long change-over period is provided ?	No, 92 per cent

How to Purchase
In an article 'Gram, Kilogram and Quintal' appearing in *Industrial Bulletin*, published by the Government of Maharashtra (March 1962 issue), Shri V. M. Pednekar, Deputy Director of Industries (Weights and Measures), Maharashtra, has suggested rationalised conversion of weights and measures for use in transactions. They appear eminently suitable for everyday use and are given for use.

If you have been buying before		Ask now for
Weights		Weights
1 tola (equivalent to 11.66 g)	10 grams	
100 tolas (equivalent to 1166 g)	1 kilogram (=1000 g)	
1/16 seer or chatak (equivalent to 117 g)	100 grams	
1/4 seer or pao (equivalent to 233 g)	200 grams	
1/2 seer (equivalent to 467 g)	500 grams	
1 seer (equivalent to 930 g)	1 kilogram (=1000 g)	
2 1/4 seers (equivalent to 2.33 kg)	2 kilograms	

If you have been buying before		Ask now for
(ISI Bulletin, March-April 1962, p. 89)		
5 seers (equivalent to 4.66 kg)	5 kilograms	
10 seers (equivalent to 9.33 kg)	10 kilograms	
20 seers (equivalent to 18.66 kg)	20 kilograms	
1 maund (equivalent to 37 kg)	40 kilograms	
2 1/4 maunds (equivalent to 93 kg)	1 quintal (=100 kg)	
1 oz. (equivalent to 31 g)	30 grams	
1 lb (equivalent to 454 g)	500 grams	
2 lb (equivalent to 907 g)	1 kilogram (=1000 g)	
7 lb (equivalent to 3.17 kg)	3 kilograms	
14 lb or stone (equivalent to 6.35 kg)	5 kilograms	
28 lb or quarter (equivalent to 12.70 kg)	10 kilograms	
56 lb (equivalent to 25.40 kg)	20 kilograms	
112 lb or cwt (equivalent to 51 kg)	50 kilograms	
1 ton (equivalent to 1016 kg)	1000 kilograms (= tonne)	
If you have been buying before		Ask now for
Capacity		Capacity
1 pao seer (equivalent to 233 ml)	200 millilitres	
1/2 seer (equivalent to 469 ml)	500 millilitres	

1 seer (equivalent to 930 ml)	1 litre (=1000 ml)
1 maund (equivalent to 371)	40 litres
1 fluid oz (equivalent to 28.4 ml)	30 millilitres
1 pint (equivalent to 0.57 l)	500 millilitres
1 quart (equivalent to 1.14 l)	1 litre (=1000 ml)
1 gallon (equivalent to 4.54 l)	5 litres

Length	Length
1 foot (equivalent to 304 mm)	300 millimetres
1 yard (equivalent to 914 cm)	1 metre (=1000 mm)
50 feet (equivalent to 152.24 m)	15 metres
100 feet (equivalent to 30.48 m)	30 metres
1 furlong (equivalent to 201 m)	200 metres
1 mile (equivalent to 1609 m)	1 kilometre (=1000 m)

Sixth Conference of Controllers of Weights & Measures
The sixth Conference of Controllers of Weights and Measures would be held in Rajaji Hall, Madras on 6th to 9th August 1962.

A number of points are scheduled to be discussed in the Conference. Some of the important ones are given below :

- (1) Review of the progress in implementing the fifth Conference of Controllers.
- (2) Review of progress in enforcing metric weights and measures :

The use of metric weights has become compulsory all over the country from April 1962. The various difficulties that may have cropped up would be discussed. From October 1962, the use of length measures would be compulsory and the steps

to be taken to enforce them successfully would be considered. The use of capacity measures has become compulsory in certain areas and their use is permissible all over the country. The steps to be taken to meet the various requirements would be gone into.

(3) An important point concerns the discussion on the present state of Enforcement Organisation in the States. It will be recalled that the fifth Conference of Controllers had suggested a certain pattern of Organisation to the States. Review of the present position would be taken up in the Conference.

- (4) Publicity.
- (5) Enforcement of weights and measures in the petroleum industry.

(6) Discussion on the Report submitted by M. Francis Viaud and M. Louis Krach on the administration of Weights and Measures Organisation.

(A short summary of the more important recommendations was given in the March 1962 issues of *Metric Measures*; on pages 10-13 and 30).

(7) The denominations of small weights which should be stamped and the manner of their stamping.

(8) Various subjects proposed by the Controllers.

A report on the Conference would be published in a subsequent issue of *Metric Measures*.

Readers' Forum

(A tendency has been noticeable on the part of traders in many areas to price and weigh out commodities in terms of the seer and pao but to use metric weights for the transaction. The legal implications of this practice are analysed below by discussing a recent case—*Editor*).

Use of Standard Units

Sir,

A wholesale vegetable dealer in Delhi had surreptitiously slipped a stone piece in the heap of the commodity placed in the goods pan. The other pan contained a weight of 5 kg. This ruse was detected. The trader thus attempted to deliver short to the extent of the stone piece placed in the goods pan. Further no unit other than metric is legal for any trade transaction. Section 7 of Rajasthan Weights & Measures (Enforcement) Act, 1958 as extended to the Union Territory of Delhi, clearly lays down that only standard weights shall be used. Moreover, Section 32 of the Act says :

Whoever in selling any article by weight or measure delivers or causes to be delivered to the purchaser less than what is purported to be sold, if the deficiency exceeds the prescribed limit of error, be punishable with fine which may extend to three hundred rupees.

Section 7 of the Act, which prohibits the use of non-metric units was also applied simultaneously in this case. The use of Section 7 was to provide a two-pronged attack on the case, so that the offender might not find it convenient to take shelter under the plea that he was delivering 5 seers. The maxi-

mum penalty under Section 7, read with Section 23, is Rs. 2,000. For obvious reasons, preferring a lighter punishment under Section 32, the offender confessed his guilt of short delivery and was convicted by the Court. From this particular case the desirability of taking the two Sections together will be clear.

Another offence of a slightly different nature came to light during raids conducted at wholesale vegetable markets. The habit of quoting rates per 5 seers or per $2\frac{1}{2}$ seers and seeking their equivalents in the new series often led traders to a clever contrivance of suspending 6 chhatak of a load (when 5 seer of a commodity is to be weighed against 5 kg) or of 3 chhatak (when $2\frac{1}{2}$ seer is to be weighed against $2\frac{1}{2}$ kg) from the end of the beam supporting the goods pan. This interconversion defeats the very purpose of the reform i.e., of simplifying calculations. Besides, it exposes the dealers to legal action for disregard of Section 29 of the Act, which reads :

Whoever fraudulently uses any standard weight or measure or weighing or measuring instrument which he knows to be false shall be punishable with imprisonment for a period which may extend to one year or with fine or with both.

One fails to understand, why the traders, instead of learning the basic metric units, their multiples and submultiples and correlating them to rupees and naye paise, labour through wrong channels that create more confusion and complications. It

should be remembered that 100 nP. make a rupee and one thousand grams make a kilo.

This inclination towards interconversion is carried down to the level of retail trade also; 70 g placed in the goods pan against 1 kg and 30 g against 500 g to make 1 seer and $\frac{1}{2}$ seer respectively, are practices finding favour with some of the retail traders. Use of stones of equivalent weight is also not uncommon.

The Organisation of Weights and Measures, Delhi, is taking steps against such evils. Inspectors have been detailed to carry out surprise raids and inspections to liquidate

such pockets. The local wholesale and retail trade associations have been informed to persuade their members to give up such practices lest the latter should be penalised. The case cited above has been brought to the notice of the members of the Fruit and Vegetable Merchants' Association through a handbill issued by the Association at the request of the Organisation of Weights and Measures. Besides this, press communications issued from time to time, radio broadcasts and telecast performances are serving as constant reminders to traders. The public have also been requested to ask for their requirements in terms of metric units exclusively.

School Atlas*

THE Survey of India has recently brought out a new School Atlas 'with the aim of placing in the hands of our students a compilation of authentic geographical information through maps of India and other countries as derived from reliable sources within the country'.

There has been keen demand for an authentic atlas, particularly giving maps of the various regions of India, for the past few years. In spite of many atlases brought out by various publishing agencies, this need was still felt by students of geography and allied subjects. This publication of the Government of India is, therefore very timely.

*SCHOOL ATLAS—Published on behalf of the Ministry of Scientific Research & Cultural Affairs Government of India, under the direction of the Surveyor General of India, Dehra Dun; First Edition; 1961; pp 62; price Rs. 5-00

The atlas is comprehensive and contains 77 maps, 19 illustrations and other very useful information.

Metric Units Used

What is interesting is that all the maps are based on the metric system. Distances, heights of mountains, lengths of rivers, areas under various crops, temperatures and other similar data are all given in the metric system.

There is a current impression that besides arithmetic, there are no other subjects which would have to be taught in terms of the metric system. That this impression is not fully correct is apparent on a glance at this atlas.

A few examples from this atlas would illustrate this point. The very first table in the atlas gives distances of principal cities in the world and timings. The following short

extract from this table would indicate how we have now to revise our ideas about distances between cities in the world :

TABLE I
DISTANCES OF PRINCIPAL CITIES OF THE WORLD AND TIMINGS

S. No.	Name of City	Name of Country	Standard Time* When it is noon at Delhi	†Distance from			
				Delhi	Bombay	Madras	Calcutta
			h m	km	km	km	km
(1)	Cairo	U.A.R. (Egypt)	08 30	4,420	4,350	5,350	5,690
(2)	Canberra	Australia	16 30	10,320	10,000	8,980	9,040
(3)	Colombo	Ceylon	12 00	2,430	1,530	680	1,960
(4)	Djakarta	Indonesia	14 00	5,010	4,660	3,640	3,780
(5)	Geneva	Switzerland	07 30	6,350	6,720	7,740	7,640
(6)	Kabul	Afghanistan	11 00	990	1,770	2,620	2,280
(7)	Karachi	Pakistan	11 30	1,090	890	1,910	2,180
(8)	Katmandu	Nepal	12 00	790	1,600	1,690	650
(9)	London	U.K.	06 30	6,710	7,200	8,190	7,960
(10)	Moscow	U.S.S.R.	09 30	4,360	5,050	5,990	5,540
(11)	New York	U.S.A.	01 30	11,740	12,530	13,450	12,730
(12)	Paris	France	07 30	6,590	7,020	8,030	7,820
(13)	Peking	China	14 30	3,780	4,760	4,620	3,270
(14)	Rangoon	Burma	13 00	2,340	2,480	1,760	1,040
(15)	Singapore	Singapore	14 00	4,140	3,900	2,900	2,890
(16)	Tokyo	Japan	15 30	5,820	6,720	6,400	5,120

*Mid-day at Delhi has been taken as the Indian Standard time (not Local Mean Time) of 1200 hours. Similarly timings at world cities are given in terms of the Standard Time of their countries/zones, instead of Local Mean Time of the cities.

†Distances are given to nearest 20 km.

There are other tables which would be of interest not only to students but even to those who wish to add to their general knowledge. One such table indicates the times for sunrise and sunset at 15 day intervals at

Delhi, Bombay, Madras and Calcutta.

The item 'Some Useful Information About India' is so richly informative that it deserves to be given in full.

SOME USEFUL INFORMATION ABOUT INDIA

Length of land frontiers of India	15,200 km	North to South (Distance between the Northernmost tip ($\lambda=37^{\circ} 06'$, $L=74^{\circ} 42'$) of Kashmir to Cape Comorin ($\lambda=8^{\circ} 04'$, $L=77^{\circ} 33'$))	3,200 km
Length of Indian coast-line (including Goa 160 km)	5,700 km	Area of India	3,263,300 km ²
Length and Breadth of the Mainland of India :		Area of Sikkim*	7,100 km ²
West to East (Distance between Westernmost tip of Gujarat ($\lambda=23^{\circ} 37'$, $L=68^{\circ} 07'$) to the Easternmost tip of Assam ($\lambda=28^{\circ} 01'$, $L=97^{\circ} 25'$))	3,000 km	Area of Bhutan*	40,200 km ²
		Area of Foreign Possessions (Portuguese)	4,200 km ²

(*States attached to India by special treaties).

Area of Individual States of India

(1) Andaman & Nicobar Islands	8,300 km ²
(2) Andhra Pradesh	274,700 km ²
(3) Assam	219,900 km ²
(4) Bihar	174,000 km ²
(5) Delhi	1,500 km ²
(6) Gujarat	187,100 km ²
(7) Himachal Pradesh	28,200 km ²
(8) Jammu & Kashmir	222,800 km ²
(9) Kerala	38,900 km ²
(10) Laccadive, Minicoy & Amin-divi Islands	30 km ²
(11) Madhya Pradesh	443,400 km ²
(12) Madras	129,800 km ²
(13) Maharashtra	307,500 km ²
(14) Manipur	22,300 km ²
(15) Mysore	192,200 km ²
(16) Orissa	155,800 km ²
(17) Pondicherry	500 km ²
(18) Punjab	121,900 km ²
(19) Rajasthan	342,300 km ²
(20) Tripura	10,500 km ²
(21) Uttar Pradesh	293,800 km ²
(22) West Bengal	87,900 km ²

Besides these useful tables, there is a chart showing comparative heights of mountains and lengths of rivers. Many of us may know the heights of mountains and lengths of rivers in feet and miles. How many of us, however, are aware of the metric figures for these ? The atlas supplies ready made answers. The following information tabulated from the chart would interest every one of us.

TABLE 2
HEIGHTS OF MOUNTAINS

Name of Mountains	Height in Metres
Mount Everest	8848
Mount K ²	8611
Kanchanjunga	8598
Dhaulagiri	8172
Nanda Devi	7817
Aconcagua (South America)	7035
Kedarnath	6940
Mount McKinley (North America)	6187
Kilimanjaro (Africa)	5895
Mount Blanc (Europe)	4810
Erebus (Antarctica)	4054
Anai Mudi	2695
Kosciusko (Australia)	2234

(Note—The above length and area figures are approximate).

TABLE 3
LENGTHS OF RIVERS

Name of Rivers	Length in Kilometres
Nile (Africa)	6690
Amazon (South America)	6280
Missouri-Mississippi (America)	6260
Ob (Asia)	4150
Yangtze (Asia)	4000
Murray (Australia)	3370
Volga (Europe)	3700
Indus	2900
Brahmaputra	2900
Ganga	2510
Godavari	1450
Narmada	1290
Krishna	1290
Mahanadi	890
Cauvery	760

Among the maps of the world are those indicating the annual rainfall, ocean currents, isobars and winds, isotherms etc. Physical and political maps of the continents are included.

The section dealing with maps of India and its States is the largest. Besides the political and physical maps, other maps show road and air routes, Railways and sea routes, soils, population, forest and irrigated areas, archaeology and tourism, annual average rainfall, isobars and prevailing winds, temperature, geology and principal minerals, crops and industries. Besides these, maps of various regions of India are also included. The map of 'The Great Himalaya' is interesting.

An exhaustive index to place names rounds off an excellent atlas of 62 pages.

The atlas has been printed beautifully and the clarity of presentation is commendable. It is a publication which deserves to be among the books of school and college students and others who are interested in the geography of India and the world.

For the amount of information it contains, the price of Rs. 5.00 does not appear to be high.

JL

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Book Review

ADOPTION OF METRIC SYSTEM IN INDIA

Five Years of Progress (English)—Government of India, Ministry of Commerce and Industry; January 1962; pp. 53. Price Rs. 0.25. (Available from the Manager of Publications Old Secretariat, Delhi-8).

This pamphlet is a review of the progress achieved in five years in the introduction of the metric system of weights and measures in India.

The Government of India decided to adopt the metric system of weights and measures and decimal coinage in April 1955. By December 1956, the Standards of Weights and Measures Act, 1956 was put on the Statute Book and the introduction of decimal coinage begun in April 1957. Area-wise and industry-wise introduction of metric system was begun in October 1958 and the compulsion to use metric weights has become legally effective all over the country from April 1962. Measures of length and capacity for general transactions would have to be compulsorily used by April 1963. Many industries have already changed over to the use of metric weights and measures in their transactions. Against this background it would be interesting to review the progress made.

Decimal coins were first introduced in April 1957. Since then till 30 June, 1961, some 4391.3 million coins have been put in circulation as follows :

50 nP	..	..	..	..	22.8 million
25 nP	..	..	..	..	185.4 million
10 nP	..	..	..	..	610.8 million
5 nP	..	..	..	..	690.5 million
2 nP	..	..	..	..	963.3 million
1 nP	..	..	..	..	1918.5 million
Total	..	..	..	..	4391.3 million

All the old coins except the one paisa and the anna have been withdrawn. It is expected that the anna and paisa coins would be withdrawn from circulation by the middle of 1963.

The pamphlet, which runs into 15 chapters, then discusses the various provisions of the Standards of Weights and Measures Act, 1956, the reasoning behind the adoption of international nomenclature of weights and measures, and the steps taken to introduce uniform laws in this field in all the States. The States had to establish organisations for the proper enforcement of weights and measures. The Inspectors of Weights and Measures had to be provided with standard weights, measures and balances while the public had to be supplied crores of commercial weights and measures.

The initial introduction of weights began in October 1958 in selected areas in the country and in certain well-organized industries. By 1962, considerable progress had been achieved and use of metric weights became compulsory all over the country while length measures would be compulsory from October 1962 and capacity measures from April 1963. Metric weights and measures were introduced not only in transactions but also in their products in industries such as cotton textiles, jute, iron and steel, engineering, heavy chemicals, cement, fertilizers, refractories, copper, aluminium, rubber, coir, sugar, vanaspati, paint, biscuit, soap, drugs, tea, coffee, salt, paper, petroleum, woollen goods, tobacco, alcohol and many others.

BOOK REVIEW

The Railways, Posts and Telegraphs, Customs and Excise, Meteorology have now adopted the metric system in all their dealings. A programme has been laid down for a three stage change-over in the field of building architecture and town planning. Land surveys, printing and stationery, ports, transport etc., have started the change-over to the metric system.

Unless correct units are used for transactions in trade, the adoption of the metric system would not be complete. A whole chapter is devoted to these units. Similarly, the change-over in the field of education has also been given a prominent place. Publicity has to play an important part in the change-over and it finds due place.

In the chapter on 'Task Ahead', an analysis has been made of what has been achieved and what remains to be done. It has been brought out that what has been achieved has to be stabilised, maintained and further progress assured. Metric habits have to be made a part of life of every person in the country. It is also necessary to expand the field covered by the Weights and Measures Departments so as to undertake more intricate jobs like the standardisation of water meters, electric meters, taxi meters etc. With the industrialisation of the country the responsibilities of the Weights and Measures Departments would increase because weights and measures are the very basis of every industry. The task, therefore, would have to be extended into the future for a very long time and co-ordinated Centrally.

The pamphlet is a timely summary of the achievements so far in the adoption of metric system. On reading it, one feels that India has made much more progress in this field than was predicted for it by many. The expectation that the change-over would create utter confusion has been belied and the prophets who predicted that vast sums of

money would have to be spent on the change-over have also been proved incorrect. A reform, which is of such a magnitude that it touches every human being throughout his life on earth, is being effected with the minimum of confusion. Industries have been able to make the change-over, particularly in the commercial branches, with little dislocation of production. In the engineering and design fields, the change-over is bound to take more time. It will also have to be carried out systematically so as to keep the cost low.

The rapid industrialisation of the country requires more and more machines and new methods of weighing and measuring would have to be standardised and enforced in future. There would be need for Central guidance in all those matters. It is to be hoped that such guidance would be available in the future.

The pamphlet is written in a simple and direct language and should be read by everybody who wants to keep himself abreast of the metric reform.

THE TEACHING OF MATHEMATICS

(English)—(A Guide Book for Teachers of Standards I to VII), published by S.I.T.U. Publication Ltd. for the S.I.T.U. Council of Educational Research Madras-28; 1962; pp. 140; Price: Rs. 3.00.

This Bulletin is described as 'A Report containing principles and methods of teaching, the syllabus reshaped to suit the introduction of Decimal Coinage and Metric Measures and Weights, units, etc., etc.' This explanation gives ample indication of the scope of the subject it covers.

The adoption of the metric system has now become a settled fact and in another year, it will be legally compulsory to use only metric weights and measures. Elementary arithmetic is always oriented towards the daily needs of the people, and so has to reflect changes that have taken place. The change-over in education, however,

is not easy because it is necessary to plan it out so that the children are taught the subject in the right manner. The syllabi are to be changed and textbooks written to suit the metric requirements.

Earlier the syllabus of school arithmetic was changed by the Inter-State Board of Anglo-Indian Education (see *Metric Measures*, March 1961, pp. 14-19). The present effort is the second. A group of teachers have discussed the problem and presented their results for consideration through this Bulletin. It is a timely addition to the books on teaching of arithmetic with particular reference to the adoption of the metric system.

The Bulletin is divided into six sections. The first section gives broad aims and objects and the present mathematics syllabus with special reference to metric system and decimals. The second section deals with the four Rules applied to decimals, the third deals with 'method—decimal basis of the number system' and the fourth, which is the most comprehensive, lays down a detailed syllabus for standards I to VII (aims, objectives, skill, etc.); a special section of it deals with approximation, significant digits and contracted method etc. The fifth section is on evaluation while the sixth section gives reports of Sub-committees. There are eight appendices giving various tables, vocabulary, symbols suggested, relating problems to life, errors likely to be committed by pupils and so on.

The Bulletin rightly emphasises that the stress should not be taken away from fractions and laid on decimals. Right from the beginning numerous examples are given illustrating how decimal teaching can be carried out with the help of decimal coinage and metric weights and measures. A comprehensive syllabus running into over 50

pages is a testimony to the depth of which the subject has been studied by the group of teachers.

One of the recommendations is that the new textbooks should be brought out early and authorities should create conditions favourable for the production of such textbooks. It is also recommended that the traditional method of introducing decimal through fractions should be given up and children should be made to think in decimals and greater emphasis should be laid on decimals as the metric system is purely a decimal system. It should be feasible to begin the decimal system in standard III and teach it on the basis of new system of money.

On going through the Bulletin one is inclined to agree with most of the recommendations made. There is, however, one about which there could be two opinions. In the syllabus that is prescribed the use of the British units as also acquaintance with the older units like the viss and the seer and the like, is also considered essential.

It is not clear why students should at all be taught the British or old Indian systems in classes up to VII. Perhaps, it may be desirable not to teach any of these up to even one or two years later *i.e.*, up to IX. Even then, only British system, being an international system, may be taught for the sake of acquaintance in the last one or two years of the school career of the student.

In the use of decimals, it may be desirable to introduce the practice of putting a zero before a decimal fraction, for example, 0.2 and not .2. It is also necessary that in setting examples, proper units like kilo, quintal, tonne etc., should be used. The use of appropriate abbreviations for the various metric units is extremely desirable and it is gratifying that this has been done in a large measure in this Bulletin although at places this has not been done.

The study is exhaustive, the recommendations are practicable except as indicated earlier and it would be desirable that State

Governments take note of the syllabus that has been prescribed and take steps to devise their own syllabus early.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur).

Indian Standard for Cold Formed Light Gauge Structural Steel Sections (IS: 811-1961)

The Indian Standards Institution has published an Indian Standard Specification for Cold Formed Light Gauge Structural Steel Sections (IS: 811-1961), which lays down the nominal dimensions, weight and geometrical properties for cold formed light gauge structural steel section for normal applications. To assist the designers to evolve other sections, illustrative procedures are given in an appendix to the standard. Tolerances on profile and ordered lengths are also specified.

This standard is one of a series of Indian Standards being published under the Steel Economy Programme. The object of this programme is to achieve economy in the use of structural steel by establishing rational, efficient and optimum standards for structural sections; formulation of standard codes of practice for the design and fabrication of steel structures; popularization of welding in steel construction; and co-ordination and sponsoring of experimental research relating to

the production and use of structural steels which will enable the formulation and revision of standard specifications and codes of practice.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 5.50

Indian Standard for Set Squares for Use of Drawing Offices (IS: 1561-1962)

The Indian Standards Institution has published an Indian Standard Specification for Set Squares for Use of Drawing Offices (IS:1561-1962). This standard covers requirements for two types of fixed angle set squares, namely, (a) 45 degree—45 degree, and (b) 60 degree—30 degree complementary angles; commonly used by cartographers, surveyors and engineers.

Metric System has been adopted in India and all values given in this standard have been given in this system.

Price : Re. 1.00

Indian Standard for Person Weighing Machines (IS : 1854-1961)

The Indian Standards Institution has published IS: 1854-1961 specification for Person Weighing Machines, which covers the requirements of the person weighing machines.

This standard is one of a series of Indian Standards on commercial weighing machines, being prepared at the instance of the Standing Metric Committee, Government of India, in connection with the introduction of metric system of weights and measures in the country.

Price : Rs. 1.50
Indian Standard for Thread Cutting Dies (IS: 1859-1961)

The Indian Standards Institution has published IS:1859-1961 Specification for Thread Cutting Dies, which covers the requirements of thread cutting and thread finishing dies for metric threads with coarse and fine pitches for general engineering purposes, and pipe threads.

Price : Rs. 2.00
Indian Standard for Test Chart for Lathes (IS: 1878-1961) (Upto 800 mm Swing Over Bed)

The Indian Standards Institution has published an Indian Standard Test Chart for Lathes (Upto 800 mm Swing Over Bed) (IS: 1878-1961), which prescribes the limits of accuracies for lathes upto 800 mm swing over bed.

The quality of the machine tools in general and of lathes in particular, manufactured by the leading manufacturers in the country, has considerably improved in the last few years and is comparable to lathes of the high quality manufactured in industrially advanced countries. After taking into consideration the manufacturing practices prevailing in the country and in particular with the better organized manufacturers, it was decided to recognize limits of accuracy as detailed in this standard. It is hoped that within a short time a much larger number of manufacturers would be able to supply freely lathes complying with the requirements of this standard.

This standard is the first of a series of Indian Standards that have been planned

to cover the types of machine tools that are being manufactured or the manufacture of which is at advanced stages of planning. Work on preparing similar test charts for milling machines, drilling machines and planing and shaping machines has also been initiated.

Price: Rs. 3.00
Indian Standard for Malleable Cast Iron Pipe Fittings (IS: 1879-1961)

The Indian Standards Institution has published an Indian Standard Specification for Malleable cast Iron Pipe Fittings (IS:1879-1961), which covers malleable cast iron pipe fittings screwed in accordance with IS:554-1955 Specification for pipe Threads for Gas List Tubes and Screwed Fittings (Tentative). The dimensions specified (centre-to-face, face-to-face and centre-to-centre) are essential for interchangeability. Dimensions which are not included in the standard are left to the discretion of the manufacturer depending on the end use of the fittings.

Out of a range of types and sizes of fittings of more than 2,000 items which had been standardized by various countries of the world, the International Organisation for Standardization (ISO) through its Technical Committee concerned after prolonged efforts started in 1952, has, with the agreement of the participating countries, chosen 638 malleable cast iron fittings, which are necessary for general use and which are being manufactured in mass production. These rationalized types and sizes of fittings have been covered in an ISO Recommendation. With a view to assisting the industry in India to fall in line with the practice followed in other countries of the world, the Sectional Committee of ISI responsible for the preparation of this standard has decided to base it on the ISO Recommendation mentioned above.

Metric System has been adopted in India

and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 5.00
Indian Standard for Boiler Rivets (IS: 1928-1961) (12 to 48 mm Diameter)

The Indian Standards Institution has published an Indian Standard Specification for Boiler Rivets (12 to 48 mm Diameter) (IS: 1928-1961), which prescribes the requirements for boiler rivets, 12 to 48 mm in diameter.

This standard, which is one of a series of Indian Standards being prepared by the Institution on metric screw threads and fasteners, deals with mild steel rivets intended for use in construction of boilers, the question of preparing a similar standard for high tensile rivets for boiler construction is under consideration.

Metric System has been adopted in India and all dimensions and quantities in this standard have been given in this system.

Price: Rs. 2.00
Indian Standard for Overall Internal Heights for Lathe Tool Posts (IS: 1995-1962)

The Indian Standards Institution has published IS: 1929-1961 Indian Standard Specification for Rivets for General Purposes (12 to 48 mm Diameter), which prescribes the requirements for mildsteel and high tensile steel rivets, 12 to 48 mm in diameter, for general purposes.

This is one of a series of Indian Standards being prepared by the Institution on metric threads and fasteners.

Metric system has been adopted in India and all dimensions and quantities in this standard have been given in this system.

Price: Rs. 2.50
Indian Standard for Rivets for General Purposes (IS: 1929-1961) (12 to 48 mm Diameter)

The Indian Standards Institution has published an Indian Standard Overall Internal Heights for Lathe Tool, Posts (IS: 1995-

1962). This standard prescribes the overall internal heights for lathe tool posts with reference to the horizontal axis of the lathe for various heights of the tool shanks, and is largely based on the relevant recommendation formulated by the International Organization for Standardization.

Metric system has been adopted in India and all the dimensions in this standard have been given in this system.

Price: Re. 1.00
Indian Standard for Building Bricks Doc-BDC 30 (546)/-

The Indian Standards Institution has circulated for comments the following two drafts Indian Standards Specification on building bricks :

(1) Specification for Heavy-Duty Burnt-Clay Building Bricks Doc:BDC 30 (609)

This draft standard covers dimensions, quality and strength of heavy duty burnt clay building bricks.

Heavy-duty bricks (also known as "engineering bricks" are required for masonry in heavy engineering works such as bridge structures, industrial foundations, multi-storeyed buildings, etc. In view of a large number of such works being undertaken in the Third Five Year Plan and also subsequently, the need for manufacture of heavy-duty bricks on a large scale has been felt.

(2) Specification for Burnt Clay-Perforated Building Bricks/Doc:BDC 30 (546)/-

This draft standard lays down the essential requirements regarding dimensions, strength, bulk, density, etc. of perforated bricks and is intended to serve as a guide for control of their quantity in manufacture and use.

Perforated bricks are characterized by advantages such as weight, less fuel consumption in manufacture compared to common bricks, improved thermal insulation, etc. As a result of the extensive programme of building construction undertaken in this

country, the need for increased supply of bricks is keenly felt by the building trade; and while the bricks industry steps up its production to meet this growing demand; it is but appropriate that improved and special types of bricks are also introduced for use by builders in addition to the common bricks.

Perforated brick is an important example among these special types. At present, perforated bricks are being used in large quantities in several countries abroad and are found to be suitable for single-storeyed as well as for multi-storeyed constructions and for lowcost housing.

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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 Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the twentieth 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 the *Metric Measures* as this work progresses etc.

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

An analysis of the licenses, including the present list, shows that the total number of licensees in 14 States and 4 Union Territories is 1035 manufacturers, 4484 dealers and 968 repairers. The details of published information are as follows :

Licensed Manufacturers, Dealers and Repairers of Weights and Measurers (20)

Sl. No.	State/Union Territory	Licensees		
		Manu- facturers	Dealers	Repa- rers
(1)	Andhra Pradesh ..	40	84	31
(2)	Assam	16	97	28
(3)	Bihar	20	69	34
(4)	Delhi	28	93	20
(5)	Gujarat	109	578	132
(6)	Himachal Pradesh ..	1	28	1
(7)	Kerala	40	389	116
(8)	Madhya Pradesh ..	115	496	9
(9)	Madras	79	828	126
(10)	Maharashtra ..	101	163	185
(11)	Manipur	14	85	5
(12)	Mysore	104	471	165
(13)	Orissa	14	17	1
(14)	Punjab	38	156	28
(15)	Rajasthan	43	206	44
(16)	Tripura	1	9	0
(17)	Uttar Pradesh ..	207	515	88
(18)	West Bengal ..	65	200	55
		1,035	4,484	968

ASSAM (3)

In the March and September 1961 issues of Metric Measures, lists of manufacturers, dealers and repairers licensed by the Government of Assam were published. The following is a list of manufacturers, dealers and repairers of weights and measures since licensed under the Assam Weights and Measures (Enforcement) Act, 1960:

Manufacturers

Sl. No.	Name and Address of the Manufacturer	Details of Article manufactured
(1)	Assam Industries, P.O. Hojai, Dist. Nowgong	Weights, Measures, Weighing and Measuring Instruments.
(2)	India Wire Products, Makam Road, Tinsukia	Weights, Measures, Weighing and Measuring Instruments.
(3)	Shyam Steel Construction Company, Haifergaon, P.O. Nowgong.	Weights, Measures, Weighing and Measuring Instruments.
(4)	Steels Work Limited, Commercial Building, Tezpur	Weights, Measures, Weighing and Measuring Instruments.
(5)	Tinsukia Steel and Wire Manufacturing Co., Udyonagar, Tinsukia.	Weights and Measures, Weighing and Measuring Instruments.

DEALERS OF WEIGHTS AND MEASURES,
WEIGHING AND MEASURING INSTRUMENTS

(1) Amolakchand Labhchand, Mankachar, Goalpara.	(16) Ganesh Ram Sharma & Co., A.T. Road, Jorhat.
(2) Amolakchand Murlidhar, General Merchants & Commission Agents, Dohmukh Road, Sibsagar.	(17) Goalpara Motor Cycle Co., Goalpara.
(3) Assam Hardware Agency, Hardware Merchants, Netaji Subhas Road, Dhubri.	(18) Gordhanlal Ashalall, Dhekiajuli, Darrang.
(4) Assam Industries, P.O. Hozai, Dist. Nowgong.	(19) Hanuman Hardware Stores, Golaghat.
(5) Avery Company of India (P), Lakhtokia Road, Gauhati.	(20) Hindustan Hardware Stores, Gara Ali, Jorhat.
(6) Banahi Lal Jagal Kishore, Jorhat.	(21) Hojai Marketing Co-operative Society Ltd., P.O. Hojai, Nowgong, Hojai.
(7) Budhmall Indur Chand, Sibsagar.	(22) India Wire Products, Tinsukia.
(8) Bharat Hardware Stores, Jorhat.	(23) Jaskaron Sohanlal (P) Ltd., Jorhat.
(9) Bhawaram Jodhraj & Co., Dibrugarh, Lakhimpur.	(24) Karla & Co., G.S. Road, Shillong.
(10) K. C. Bairagi & Sons, P.O. Bilashipara, Goalpara.	(25) Kharagchand Ramnath & Co., A.T. Road, Dibrugarh.
(11) Chandi Stores, Bokakhat.	(26) Khubchand Agarwalla, Haiborgaon, Nowgong.
(12) Dhubri Hardware Stores, Netaji Subhas Road, Dhubri.	(27) Kilburn & Co., Pvt. Ltd., Tezpur, Darrang.
(13) Director, Trade & Industry Pvt. Ltd., Tezpur, Darrang.	(28) Krishanlal Mahabir Prasad, Tarabari Hot, Kamrup.
(14) Durga Nath Pant & Bros, Dhubri.	(29) Lachminarayan Satyanarayan, Golaghat.
(15) Gajanand Chachan, G.S. Road, Shillong (U.K. Jaintia Hills)	(30) Lakhmi Narayan Sarojmal, P.O. Golaghat.

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (20)

Dealers (Contd.)

(31) Mahabir Prasad Krishanlal & Co., Marwari Road, Dibrugarh.	(43) Ranglar Bagarie, Harbargaon, Nowgong.
(32) Matri Bhandar, Dhubri.	(44) Sarada Stores, Shrikrishan Sarada Road, Haila Kandi.
(33) Maya Ram Bhagwan Das, Siding Bazar, Tinsukhia, Dist. Lahiripur.	(45) Sharma & Co., Gar Ali, Jorhat.
(34) Modern Store, Dhubri.	(46) Shyam Steel, Construction Company, Nowgong.
(35) Murlidhar Megharaj, Marwaripatty, Sibsagar.	(47) Sobhagmal Ghoramal, A.T. Road, Nowgong.
(36) Narayan Store, Fancy Bazar, Gauhati.	(48) Sita Ram Kishanlal, Barpota Road, Kamrup.
(37) National Enterprise (India), Promtala, Silchar.	(49) K. B. Stores, Main Road, Tezpur, Darrang.
(38) Niranjana Chittaranjan, Abhayapuri, Goalpara, G. T. Roy & Sons, Dhubri, Dist. Goalpara.	(50) Sudhir Chandra Das & Sons (India) P. Ltd., Fancy Bazar, Gauhati.
(39) Pirdan, Chhaganall, Sibsagar.	(51) Sukhalal Sankar, Marwaripatty, Sibsagar.
(40) Prabhat Chandra, Roy, Karimganj, Cachar.	(52) Tinsukia Stool & Wire Manufacturing Co., Udyonagar, Tinsukia.
(41) Radhyashyam Agarwalla, Assam Iron Stores, Baiborgaon, Nowgong.	(53) Town Stores, Dhubri.
(42) Ramakrishan Shree Gopal, A.T. Road, Jorhat.	

REPAIRERS OF WEIGHTS AND MEASURES,
WEIGHING AND MEASURING INSTRUMENTS

Repairers

(1) Assam Industries, P.O. Jojai, Dist. Nowgong.	(7) Md. Maniruddin, C/o B.O.C. (I.T.) Ltd., Digboi.
(2) Burdeswar Koch, B.O.C. (I.T.) Ltd., Digboi.	(8) Sihotia Steel Trunck & Bucket Factory, Fancy Bazar, Gauhati.
(3) Chamanlal David, Caltex (India) Ltd., Pandu (Assam).	9. Shyam Steel Construction, Co., Sanchoa, Nowgong.
(4) J. C. Gogai, C/o B.O.C. (I.T.) Ltd., Digboi.	(10) Tinsukia Steel and Wire Manufacturing Co., Udyonagar, Tinsukia.
(5) Hanuman Industries, Fancy Bazar, Gauhati.	(11) K. C. Trunck & Bucket Factory, Gauhati, Fatashil.
(6) R. B. Industries, Fancy Bazar, Gauhati.	(12) Wazir Ali, C/o The Depot Supdt., B.O.C. (I.T.) Ltd., Badarpurghat, Dist. Cachar.

MAHARASHTRA (4)

The list of manufacturers of Weights and Measures in Maharashtra State published in Metric Measures of November 1960, January 1961 and January 1962 stands cancelled. The following is a complete and revised list of manufacturers licensed under the Bombay Weights and Measures Enforcement Act, 1958 in the State of Maharashtra:

Manufacturers

Sl. No.	Name and Address of the Manufacturer	Details of Articles manufactured.
(1)	Abbasbhai Yusufali Dohadwala, Sunder Galli, Near Hanuman Mandir, Hains Road, Byculla, Bombay-11.	Conical (Litre) Measures.
(2)	Avery Company of India (Private) Ltd., 16, Dougal Road, Ballard Estate, Bombay-1.	Weights, Measures, Weighing and Measuring Instruments.
(3)	Associated Commercial Mfg. Enterprises (Private) Ltd., Janmabhoomi Chambers, 29, Fort Street, P.B. No. 1895, Bombay-1.	Measuring Instruments (Hand Operated Petrol Pumps).
(4)	Adarsh Engineering Private Ltd., Shivaji Road, P.O. Shrirampur, District Ahmedabad.	Weights.
(5)	V. S. Amberkar and Sons, 22-23, Mohamadi Market, Dr. Babasaheb Ambedkar Road, Lalbaug, Bombay-12.	Linear Wooden Measures.
(6)	A. Z. and Sons, 373, Bapty Road, Bombay-8	Conical (Litre) Measures.
(7)	Arvind and Suresh Engineering Works, Near Agaram Devi, Subash Road, Nagpur.	Cast Iron Weights.
(8)	Bharat Litre Mfg. Works, 43, Suleman Kasam Mitha Chawl, Round Gate, Duncan Road, Bombay-8.	Conical (Litre) Measures.
(9)	Bharat Scale Co., 200, Janjekar Street, Bombay-3	Beam Scale and Counter Machine.
(10)	Bansilal and Co., Main Road, Nasik City	Beam Scales.
(11)	Bharat Home Industries, C/o United Casting, E-2131, Vikram Nagar, Kolhapur.	Cast Iron Weights.
(12)	Bajarang Metal Works, Itwari Bazar, Nagpur-2	Brass Weights.
(13)	Behre Mullaji Shop, 'Street Lamp Works' Bhandara Road, Itwari, Nagpur.	Conical (Litre) Measures.
(14)	P. S. Banarse Industries, (India) Private Ltd., Badnera Road, Amravati.	Weights.
(15)	Central Metal and Wire Products, 60, Lamington Road, Opp. Maratha Mandir, Bombay-8.	Weights.
(16)	Chari's Scales, 6, Kalyan Building, 8, Khetwadi Lane, Bombay-4.	Beam Scale and Brass Weights.
(17)	Chawara Engineering Works, Balaghat Road, Gondia (S. E. Rly.).	Commercial Cast Iron Weight.
(18)	M. K. Chavan and Sons, Tiwandha, Nasik	Weights.
(19)	L. M. Chaudhary, 123, Gold Finch Peth, Sholapur	Weights.
(20)	Damle Iron Works, Baliram Peth, Jalgaon	Weights.
(21)	Dawoodbhai Kaderbhai, Tajna Peth, Akola	Beam Scales
(22)	Ebrahim Mulla Abdultayeb, 69, Sarang Street, Bombay-3	Beam Scales and Counter Machines.
(23)	Esaji Gulamhussain, 203, Janjekar Street, Bombay-3	Beam Scales and Counter Machines and Brass Weights.
(24)	Everest Tapes, Swastik House, Block No. 7, 382, Lamington Road, Bombay.	Measuring Tapes.
(25)	Fidali Gulamali, 163, Janjekar Street, Bombay-3	Beam Scale and Counter Machine.
(26)	C. P. Foundry Works, Kamptee Road, Pilinadi, P.O. Bezonbagh, Nagpur.	Weights and Measures.
(27)	Fakruddin Abdulhusain, 72, Bapti Road, Mirza Chawl, Bombay-3.	Conical (Litre) Measures.

Manufacturers (Contd.)

Sl. No.	Name and Address of the Manufacturer	Details of Articles manufactured
(28)	Gothi Iron and Metal Works Ltd., Shingada Tank, Nasik	Weights.
(29)	Ganesh and Co., 24, 1st Pathan Street, Bombay-4	Weights.
(30)	Hindustan Scale Co., 186-88 Janjekar Street, Bombay-3	Beam Scales and Counter Machines.
(31)	Hind Litres Manufacturer, 25/9, Kazipura Bombay-8	Conical (Litre) Measure.
(32)	Hakamchandishwardas, 167, Gurwar Peth, Poona-2	Conical (Litre) Measure.
(33)	Imperial Iron Works, 6th Kumbharwada, Kharwa Galley, Bombay-4.	Weights.
(34)	Jayashree Metal Corporation, Kumbharwada Cross Lane, D'Souza Street, Vadgadi, Bombay-3.	Weights.
(35)	A. A. Katawala, 194, Janjekar Street, Nimakwala Building, Bombay-3.	Beam Scales and Counter Machines
(36)	Khandelwal Udyog, Khandelwal Bhawan, 166, Dr. Dadabhai Naoroji Road, Fort, Bombay.	Commercial C. I. Weights.
(37)	Kolte Engineering Workshop Bargaon Road, Wardha	Weights.
(38)	Krishna Co., 738, Shukrawar Peth, Poona-2	Weights.
(39)	Laxmi Engineering Works, 197, Corner of Grant Road, Bombay-8.	Weights.
(40)	Lullubhai Amichand Private Ltd., 48/50 Kansara Chawl, Bombay-2.	Conical (Litre) Measures.
(41)	Larsen and Toubro Ltd., I.C. House, Dougall Road, Ballard Estate, P.B. 278, Bombay-1.	Measuring Instruments (Petrol Pumps).
(42)	Libra Industries, 10, Sussex Road, Byculla, Bombay-27	Weighing Instruments.
(43)	Luhar Rana Trikam Marwane, 4th Kumbharwada, Dadabhai Parsi Chawl, Shop No.1, Bombay-4.	Weights and Beam Scales, Linear Measures.
(44)	Mehta Boghani Metal Works, Devkaran Nanji Bldg., 17-B, Horniman Circle, 3rd Floor, Fort, Bombay.	Weights.
(45)	Munshi Sufi, 154, Janjekar Street, Bombay-3	Conical (Litre) Measures.
(46)	Mohd. Siddik Tinwala, 94, Ripon Road, Ramzan Building Bombay-11.	Conical (Litre) Measures.
(47)	Mohd. Farooq Gallenwalla, Khetwadi, Meher Bazar, Bombay-4.	Conical (Litre) Measures.
(48)	Mercantile and Industrial Development Co., Private Ltd., National House, 6, Tulloch Road, Apollo Bunder, Bombay-1.	Measuring Instruments (Petrol Pumps) Etc.
(49)	Mansukhlal Narandas, Chandwadkar Lane, Nasik City	Weights.
(50)	A.M. Master and Co., 179/81 Janjekar Street, Bombay	Beam Scales and Counter Machines.
(51)	Mulji V. Narsi, Udyognagar, Sion, Bombay-22	Weighing Instruments (Counter Machines).
(52)	N. J. Mehta and Co., 10, Keshavji Road, Old Chinch Bunder Road, Laxmi Niwas, Bombay-9.	Beam Scales.
(53)	Mercury Iron and Steel Co., Private Ltd., Engineers Founder and contractors, Globe Mills Passage Cross Lane, Bombay-13.	Cast Iron weights.
(54)	Mistilal Motilal, 71, Sarang Street, Bombay-3	Beam Scales and Counter Machines. Linear Measures.
(55)	Mulji Lakhmidas and Co., 193, Janjekar Street, Cutlery Bazar, Bombay-33.	Beam Scales and Counter Machines.
(56)	M.R. Metal Work, Building No. 9-10-14, Chamar Lane, Room No. 19, Byculla, Bombay-27.	Brass Weights.
(57)	Modern Foundry and Machine Works Ltd., Station Road, Ahmednagar.	Weights.
(58)	Mistry Ramji Devji Katewala, Tajna Peth, Akola	Beam Scales.

Manufacturers (Contd.)

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(59)	Mohamed Ismail Tin Factory, Near O.S. Mills Compound, Water Tank, Nanded.	Conical (Litre) Measures.
(60)	Misrilal Motilal, Rangraj Lane, Chowk, Aurangabad ..	Beam Scales.
(61)	National Metal Industries, 15-A, Parel Village Road, Bombay-8.	Weights & Measures.
(62)	M. Nazir and Sons, Haji Kasam Chawal, Duncan Road, Cross Lane, Bombay.	Weights & Weighing Instrumen
(63)	Nadirshaw and Bros, Silver Talkies Building, Khetwadi Back Road, Bombay-4.	Cast Iron Weights.
(64)	M.M. Nasib, 18/2 Kamathipura, Bombay-8	Conical (Litre) Measures.
(65)	National Scale Traders, 199, Janjekar Street, Bombay-3	Beam Scales and Counter Machines.
(66)	New Honesty Engineering Works Pelodia Manzil, Dimtimkar Road, New Nagpada, Bombay-8.	Counter Machines.
(67)	Oriental Metal Pressing Works, Private Ltd., 131, Worli, Bombay-18.	Weights & Measures.
(68)	Pas Tin Works, Haji Cassum Chawl No. 29, Shop No.11, Small Kazipura, Two Tanks, Bombay-8.	Conical (Litre) Measures.
(69)	Patil Iron and Brass Works, Panchavati, Nasik	Weights.
(70)	Parvat Revji Mistry, Malegaon Motor Stand, Panchavati, Nasik.	Beam Scales.
(71)	Patel Industries, Mhasrul Tek, Old Tambat Lane, Nasik	Weights.
(72)	Prabhat Foundry, 689, Sadashiv Peth, Poona-2	Commercial C.I. Weights.
(73)	S.M. Phataty, 262, Chatti Galli, Sholapur	Beam Scale Linear Measure.
(74)	Pimple Mechanical Works, Bassim Motor Stand, Akola (M.S.)	Weights.
(75)	Ram Mills Ltd., Fergusson Road, Parel, Bombay-13	Weights.
(76)	Ripon Road Iron Foundry, Lamington Road, North Allana Compound, Opp. Agripada Police Station, Bombay-11.	Weights.
(77)	Rajabali Abdulhussain Tinwala, 1st Paraiwada, Vithalbhai Patel Road, Bombay-4.	Conical (Litre) Measures.
(78)	Reliable Iron and Mechanical Works, Pipe Line, Vakola, Santacruz, Bombay-55.	Weights.
(79)	Rajkamal Scale Co., 154, Janjekar Street, Nimakwala Building, Bombay-3.	Beam Scales and Counter Machines. and Brass Weights.
(80)	V.D. Rojani, 142, Upper Duncan Road, Bombay-8 ..	Weights
(81)	Rajkamal Iron and Metal Works, Gandhinagar Road, Kopergaon, Taluka Kopergaon, Distt.	Commercial C. I. Weights.
(82)	Ravindra Works, Gandhi School Road, C, No. 2, New Shukrawari, Nagpur.	Commercial C.I. Weights.
(83)	Saple's Scale Manufacturing Private Ltd., 180-B, Gaiwadi, Girgaum Road, Bombay-4.	Weights and Weighing Instruments.
(84)	Steel Industries of Hindustan Private, Ltd., Magazine Street, Darukhana, Bombay-10.	Weights.
(85)	Siesta Industrial and Trading Corporation, Bail Bazar, North Kurla, Bombay-70	Cast Iron Weights.
(86)	Standard Mechanical and Iron Works, 197, Janjekar Street, Cutlery Bazar, Bombay-3.	Weights and Beam Scales and Counter Machines, Linear Measures.
(87)	Sarda Iron Industries, Opp. Nav Bharat Press, Ghat Road, Nagpur-2	Commercial C. I. Weights.
(88)	Snehal Trading Corporation, 49, Khoka Bazar, Bombay-3	Beam Scales and Counter Machines.
(89)	Sama and Juha United Works, Kopergaon Estate Compound, Love Lane, Shade No., 4, Byculla, Bombay.	Conical (Litre) Measures.

Manufacturers (Contd.)

Sl. No.	Name and Address of the Manufacturer	Details of Articles Manufactured
(90)	B. G. Shinde and Co., 735, Shukrawar Peth, Poona-2	Weights, Weighing Instruments Linear Measures.
(91)	Swastik Iron Works, Ghat Road, Nagpur-2 ..	Weights.
(92)	Tahira Industries (India) Private Ltd., 19/21, Manohardas Street, Bombay-1.	Measuring Instruments (Petrol Pumps)
(93)	Union Metal Works, 14-D, Kurla Industrial Estate, Near Mahindra and Mahinda Std., Agra Road, Ghatkopar, Bombay-77.	Weights and Measures.
(94)	D.L. Vaid, 202, Cutlery Bazar, Bombay-3	Brass and Bullion Weights and Beam Scales and Counter Machines.
(95)	Victory Industries, 215-A Ripon Road, Bombay-8 ..	Conical (Litre) Measures.
(96)	Vidarbha Engineering Industries, Abhayankar Road, Sitabuldi, Nagpur-1.	Weights.
(97)	G. B. Wagh and Co., Laxmi Bhuwan, 547, Delisle Road, Bombay-11.	Counter Machines.
(98)	Wafadar Metal Industries, 446-E, Shahupuri, Kolhapur	Commercial Cast Iron Weights.
(99)	Yande Iron Works, 268, Sadashiv Peth, Poona-2	Cast Iron Weights.
(100)	Y. M. G. Industrial Works, 2015, Yeshpushpa Rajarampuri 6th Lane, Kolhapur.	Cast Iron Weights.
(101)	Zenith Textile Engineering Co., 250, Ripon Road, Bombay-8.	Weights.

MYSORE (5)

In the March, May and November 1960 and May 1961 issues of Metric Measures lists of licensed manufacturers, dealers and repairers of weights and measures in Mysore State were published. The following is a list of manufacturers, dealers and repairers subsequently licensed by the Government of Mysore under the Mysore Weights and Measures (Enforcement) Act, 1958.

Manufacturers

Sl. No.	Name and address of manufacturer	Details of articles manufactured
(1)	Aryavart Engineering Works, Khairnagar, Meerut, U.P.	Commercial Weights Measures, Weighing and Measuring Instruments.
(2)	Adabala Sayanarayana & Sons, Dowlaishwaram, Port, East Godavari, Andhra Pradesh.	Beam Scales.
(3)	Associated Scales Industries, Tara Bhavan Station Road, Savarkundla.	Beam Scales.
(4)	Dey's Weighing Scales & Engineering Works, 223, Belihas Road Howrah, West Bengal.	Weighing Instruments excluding Beam scales
(5)	Elacette Industries, Opp. Central Studio Ltd., Trichy Road, Singanallapur, Coimbatore-5.	Weights & Weighing Instruments.
(6)	Eastern Scales (P) Ltd., 12, Gurusaday Road, Calcutta-19	Weighing Instruments.
(7)	C. P. Foundry Works, Kamptee Road, Pilinadi, P.O. Bezonbagh, Nagpur-4.	Weights & Measures.
(8)	A. Gurunath, 15, Strangers Street, Madras-1	Weights, Measures, Weighing and Measuring Instruments.
(9)	Gopal Prasad & Sons, 887, Baral Bhai Street, Belanganj, Agra.	Cast Iron & Brass Weights.

Manufacturers (Contd.)

Sl. No.	Name and Address of the Manufacturer	Details of Articles Manufactured
(10)	Hilal Consumer Goods, 14-4-270 Joshiwadi, Begum Bazar, Hyderabad, A.P.	Litre Measures.
(11)	Jain Industries, Naiki Mandi, Agra	Cast Iron Brass & Bullion Weights of all denominations.
(12)	E. G. Katawala, 203, Cutlery Bazar, Bombay-3	Beam Scales & Counter Machines.
(13)	Krone Industries, No. 6, 5th Cross Cubbonpet, Bangalore-2.	Linear Measuring Metres and Half Metres.
(14)	B. B. Lahoti, Hardware Merchant, Jamkhandi, Bijapur Distt.	Linear Measuring Metres and Half Metres.
(15)	Lallubhai Amirchand (P) Ltd., 225/29, Tardeo Road, Bombay-7.	Cylindrical (Capacity) Measures.
(16)	Marwadi Moulding Factory, Kasarhatta Road, Hyderabad-3	Cylindrical dipping Type Measures.
(17)	Mehta Brothers, 1827-1 2nd Cross Road, Melleshwaram, Bangalore-3.	Linear Measuring Metres and Half Metres.
(18)	Mighty Scale Company, Kuranchari, Hadakanchari, (Cochin).	Platform Machines.
(19)	Mulji V. Narsi Metal Pressing & General Engineering Works, Udhaynagar, Sion, Bombay-22.	Counter Machines.
(20)	Pioneer Electric Corporation, 53, Vijai Nagar, Colony, Agra.	Brass, Bullion and Cylindrical Weights
(21)	Prathibha Industries, 163, North Vijai Nagar Colony, Agra.	Commercial & Bullion Weights.
(22)	Rajkamal Scale Company, 154, Janjekar Street, Bombay	1. Beam Scales Class B.C. & D. 2. Counter Machines. 3. Linear Measures.
(23)	Sangameshwar Engineering Works, Station Road, Gadag	1. Beam Scales Class 'C'. 2. Counter Balance. 3. Linear Measuring Metre and half Metre.
(24)	P. Sheshachalam & Bros., No. 26, Nethaji Subhas Chandra Bose Road, Madras.	Weights.
(25)	Shanta Fijaya Chin Factory, Pandya Street, Savarkundla (Gujarat).	Beam Scales.
(26)	Star Metal Works, Begum Bazar, Hyderabad	Litre Measures.
(27)	Swastik Metal Works, G. T. Road, Shahdra, Delhi-32	Cylindrical capacity Measures.
(28)	L. C. Thakkar, Hitikal Sal, Hubli	Linear Measuring Metre and Half Metre.
(29)	D. L. Vaid, 202, Cutlery Bazar, Bombay-3	Brass and Bullion Weights & Beam Scales of Class B.C.D. & Counter Machines.

DEALERS OF WEIGHTS AND MEASURES,
WEIGHING AND MEASURING INSTRUMENTS

(1) Aspinwall & Co., Ltd., P. B. No. 19, Mangalore.	(5) Bhimeenappa & Bros., General Merchant, Harpanahalli.
(2) Asha Trading Company, 130, Avenue Road, Bangalore.	(6) Bajpe Enterprises, 41/2, St. John's Church Road, Bangalore-1.
(3) B. C. Angadi, Brass, Copper & Hardware Merchant, Bailhongal, Bijapur, District.	(7) Brothers Stores, Main Road, Kollegali.
(4) V. Alimeda, Dealer in Weights & Measures, Subhas Road, Dharwar.	(8) Buddappa, S/o Thippaiah, C/o Jon Mahmed, Old Myderwadi Road, Shop No. 11-2-100, Raichur.

Dealers (Contd.)

(9) Chidambaram Stores, 8th Cross, Temple Road, Malleswaram, Bangalore.	(28) N. Lakshmaiah Setty & Sons, Hardware Merchants, M. G. Road, Chennapatna.
(10) Chandran & Co., Post Office Road, Mercara.	(29) Mathai V. Poovan, Hardware Merchants, Sidapur, Coorg.
(11) Chandarana Brothers, Mission Street, Mangalore.	(30) Mangalore Estate Supplies, General Hardware Merchants, Mudigere, Chikmagalur Dist.
(12) General Industrial & Engineering Co., No. 6 Sri Narasimharaja Road, Bangalore-2.	(31) Mahabub Saheb Mujawar, General Merchant, Market Road, Bailhongal, Belgaum District.
(13) M.G. Gaikwad, Mahaveer Road, Bijapur.	(32) Mysore Coffee Curing Work Ltd., Chikmagalur.
(14) G. Guddappa, General Merchant, C/o Mallanna, Chitradurga Road, Davangere.	(33) Mysore Pieces Goods, Merchants Association, Soji Street, Mysore.
(15) Gautham Stores, Hardware & General Merchants, H-121, Yerrappa Block, Srirampur, Bangalore-21.	(34) B. Muniswamyachar, C. T. Street, Nagaratpet, Bangalore-2.
(16) G. R. Honakalse & Sons, Contractor, Main Road, Bijapur.	(35) M. L. Manjiah Setty & Sons, Merchants, P. B. No. 3, Chikmagalur.
(17) Hon. Secretary, Sharof Association, Thambakpet, Davangere.	(36) Navajivan Stores, Main Road, Bantawala (S.K.)
(18) K. S. Hussain Sahib, Modern Bedding Stores & Cycle Mart, New Market, Robertsonpet, K.G.T.	(37) C. Narayana Chowdry, C/o Caltex Agents, Bangalore Road, Bellary.
(19) R. K. Haje Abdul Hakh, Hardware & General Merchant, M. G. Road, Chikmagalur.	(38) National Industries, Poona, Bangalore Road, Davangere.
(20) M. N. Hussien & Co., (Bangalore) 127/A Commercial Street, Bangalore-1.	(39) Nagappa, S/o Mallayya, Near Hanuman Talkies, Raichur.
(21) S. M. Kichiah Setty, Prop : Sri Rama Narayana Stores, G.T. Street, Kolar.	(40) Nagaraja Setty, Prop : Vinayaka Stores, General Merchant, Hosadurga.
(22) A. R. Kandagal, C/o O.G.D. Teli Venkatapeth, Bagalkot.	(41) M. H. Naik & Brothers, Weights & Measures Dealers, Davangere.
(23) Kolkars Metal Ware, Car Street, Udipi.	(42) B. Nanjunda Setty & Sons, S.V.O.C. Agents & Merchants, Nelamangala P.O.
(24) Kalappa Bhemappa Kutte, Bazar Road, Bailhongal, District Belgaum.	(43) Orient Traders, No. 1003/B Benke Nawab Street, Mandi Mohalla, Mysore.
(25) Kanaka General Stores, Hardware & Paints Merchants, T. Narasipur.	(44) K. Panduranga Vasudeva Kudva, Panemangalore, S.K.
(26) C. G. Kudathine, Hardware Merchants, Kushtagi, Raichur District.	(45) Paruthi, C/o Panchaxary Shadaksarimath, Gajipur, Gulbarga.
(27) Lal Mohamed Sagardaranja, Yadgir, Gulbarga District.	(46) F. Raja & Co., 20, Godown Street, Bangalore-2.

Dealers (Contd.)

- | | |
|---|--|
| (47) Ramaiah Setty,
Prop : Sri Ganapathi Stores,
Tiptur. | (60) Syed Jamaludding,
C/o K. M. Motor Service,
Mosa Saheb, Bangalore Road,
Bellary District. |
| (48) P. Shanthappa,
Hardware Merchant,
Vijayalaxmi Road,
Davangere City. | (61) Thibbadevi Grainage,
Prop : Thammiah Gowda,
Chamarajanagar. |
| (49) P. A. Siddappa & Sons,
General Merchant,
1st Cross Road, Robertsonpet,
K.G.F. | (62) K. Teerthappa,
General Merchant, Lingsugar,
(Chavani). |
| (50) G. B. Sreevarma & Sons,
Iron, Hardware & Paint Merchant,
Ashok Road,
Mysore. | (63) K. Thimmaiah,
S/o Laxmaiah,
C/o Tuka Tikkanna,
Kirana Shop, Thimmapurpeth,
Raichur. |
| (51) M. Srinivasa Charlu & Co.,
P. B. No. 542,
28, Sri Narasimharaja Road,
Bangalore. | (64) A. V. Thomas & Co., India Ltd.,
10, Richmond Road,
Bangalore. |
| (52) Subbiah Setty & Sons,
B. 45, New Tharagupet,
Bangalore-2. | (65) B. Vajrappa,
Hardware Merchant,
Good-shed Road,
Davangere. |
| (53) Salar Masood Saheb & Sons,
Hardware & Paint Merchant,
Ashoka Road, Mysore. | (66) Venkata Swamy & Sons,
Hosamane Extension,
Shimoga. |
| (54) Sharanappanavar,
Copper, Brass & Hardware Merchant,
Baillhongal,
Belgaum District. | (67) Virupanapa Basvantapa,
Uppin, General Merchant,
Sureban, Ramdurg,
District Belgaum. |
| (55) Sha Misrimal Babulal & Co.,
Gandhi Bazaar, Shimoga. | (68) Volety Venkataramaiah
Setty & Sons, Sidlagatta,
Kolar District. |
| (56) Shivabasava Stores,
Prop: Chandrashekarpa,
Anabasapa Nelovegi,
Hardware Merchant,
Gandhi Road, Haveri. | (69) Vithalji & Company,
Bunder Road, P. B. No. 7,
Mangalore. |
| (57) Sivapuram Rangaiah Setty & Sons,
Car Street,
Bellary. | (70) Volkart Brothers,
Coffee Curing Works,
P. O. Box 12, Mangalore-1. |
| (58) Sugar Chemical & Fertilisers,
Market Road, Sagar. | (71) R. Veerabadraiah & Bros.,
C/o Jayadeva Hostel,
Chitradurga. |
| (59) Sunrise Industries,
5th Main Road,
Srirampuram, Bangalore. | (72) Willam D' Souza,
Copper & Brass Merchant,
Dodapet, Malavally,
Mandya District. |

REPAIRERS OF WEIGHTS AND MEASURES AND WEIGHING
AND MEASURING INSTRUMENTS

Repairers

- | | |
|---|--|
| (1) Almedia Engineering,
Subhas Road, Dharwar. | (4) Bajpe Enterprises,
24/A St. John's Church Road,
Bangalore-1. |
| (2) K. Abdul Wahab Scales,
Repairing Workshop,
131, Chandni Chowk Road,
Bangalore. | (5) Bharat Engineering Works,
Main Road, Puttur (S.K.) |
| (3) M. D. Amir Ali Maniyar,
Ganj Road, Gulbarga. | (6) Gurupadappa Sogirappa,
Laxmeshwar, Hattikal-sal,
Hubli. |

Repairers (Contd.)

- | | |
|--|---|
| (7) Jai Hind Vegetable Stall,
and Jain Hanuman Cycles,
Chikpet, Mercara. | (16) M. H. Naik Brothers,
Repairing Workshop,
Jubelepet, Davangere. |
| (8) T. T. M. Kotrabasaiah,
Merchant, P.O. Hamsagar via Hospet,
Bellary District. | (17) National Iron Industries,
No. 7, Matinagar,
Bangalore. |
| (9) Karnatak Iron, Works,
29/1 Sri Jayachamarajendra Road,
Bangalore-2. | (18) N. S. Paruthi Repairing Workshop,
Gajipur,
Gulbarga. |
| (10) S. M. Khadanpur,
Hattikal-sal, Hubli. | (19) Saijoo & Co.,
67, Old Bamboo Bazaar Road,
Bangalore. |
| (11) Kanara Scales Centre,
No. 41, Aga Abdulla Street,
Richmond Town,
Bangalore-1. | (20) Sangameshwar Repairing Works,
Prop : M. V. Punganur.
Savanur,
Dharwar District. |
| (12) M. Krishna Swamy Mysore State
Scale Service, No. 1567,
3, Nagappa Block,
Bangalore-21. | (21) N. Srikantaiah & Sons,
42-A, Cemetery Road,
Bangalore. |
| (13) Krone Industries,
Prop : Mir Noorul Hussain,
C/13, New Bamboo Bazar Road,
Bangalore-2. | (22) Syed Ahmed Works,
D. No 66/4 Old Bether Road,
Davangere. |
| (14) Madar Rajesab Mulla,
Gokak Falls, Bellary. | (23) Uberai Trading Co.,
No. 26/1 Lalbagh Road,
Bangalore-1. |
| (15) Mehta Brothers,
1827/1, 2nd Cross,
Malleswaram,
Bangalore. | (24) Venkateswar Scale Repairer,
Prop : Sri K. Thimmaiah,
Mohialla Machivadi,
Raichur. |

PUNJAB (13)

In the July and September, 1959, March, May, July, September and November, 1960 and March, May, July, November, 1961 and January 1962 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 and dealers subsequently licensed by the Government of Punjab under the Weights & Measures (Enforcement) Act, 1958.

Manufacturers

- | | |
|--|--|
| (1) Mittal Industrial Corporation,
Kessar Ganj Road,
Ludhiana. | (2) Popular Industries, Main Road,
Banga (Jullundur). |
|--|--|

Dealers

- | | |
|--|---|
| (1) Bali Ram Nobat Rai,
Main Bazar, Moga. | (4) Ram Chander Verma
S/o Bhola Ram Verma, Rohtak. |
| (2) Beni Mal Puran Chand,
Mandi Bazar, Faridkot. | (5) Ram Gyaneshwar Dass,
Bazaar Sarai Chopta, Bhiwani. |
| (3) Diwan Chand Waryam Chand,
G. T. Road, Karnal. | (6) Sadhu Ram Banwari Lal,
Pilu Khera (Sangrur). |

Repairers

- | | |
|---|---|
| (1) Harbans Tank Engineering Works,
Gurdaspur Road, Pathankot. | (2) Indian Scale Industries, Kali Bari Road,
Ambala Cantt. |
|---|---|



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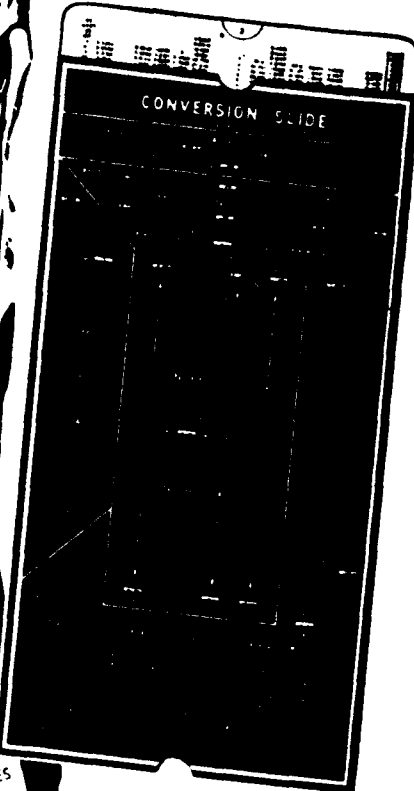
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TYPICAL METRIC PRICING UNITS FOR WHOLESALE TRANSACTIONS

Serial No.	Commodity	Metric Unit
		10 gram(g)
(1) Gold		1 kilogram (kg)
(2) Grocery and Confectionery	Biscuits, sweetmeats, cardamoms.	
Textiles and Textile Fibres	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufacturers (when sold by weight).	
Paints & Chemicals	Paint (if sold by weight), indigo, liquid chlorine.	
Hides, Skins & Leather	Raw hides, leather (hides and skins).	
Metals	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	
Miscellaneous	Tea, meat, camphor tablets, mica.	
(3) Grains and Pulses	Rice, wheat, jowar, arhar, moong, masur, gram.	
Spices	Black pepper, mustard, chillies, dhania, dalcchini, turmeric, betelnuts.	
Plantation Products	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured).	
Forest Products	Lac and lac products, gums, myrobalans, galnuts, soapnuts.	1 quintal (q) (100 kilograms)
Textiles & Textile Fibres	Raw jute, raw hemp, coir yarn.	
Oils, Oilseeds & Oilcakes	Vegetable oils, oilseeds, oilcakes.	
Non-Ferrous Metals	Aluminium : ingots, bars, blocks, slabs, billets. Lead : ingots, sheets and strips. Copper : ingots, blooms, slabs, cakes, tiles, bricks billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles. Brass : ingots, rods, sections, pipes, sheets, strips, circles. Zinc : ingots, sheets, strips. Tin : blocks.	
Chemicals	Caustic soda, bleaching powder, glycerine, soaps, paper salt.	
Others	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind.	
(4) Minerals	Iron ore, manganese ore, bauxite, coal.	
Iron & Steel	Pig iron, iron and steel manufactures, semis (billets for rerolling etc.)	
(5)	Cloth (mill, handloom, silk, rayon and woollen cloth).	1 metre (m)
(6)	Jute carpets, coir mats and mattings, sheet glass.	one square metre (m ²)
(7)	Timber.	one cubic metre (m ³)
(8)	Paints (when sold by measure), spirits.	one litre (l)

Weights

(1) In place of the present units of seer, pound, ratal, viss etc., use the kilogram.

(2) In place of the tola, use the gram or 10 grams.

(3) In place of maund or corresponding unit, use the quintal i.e., 100kg.

Capacity Measures

In place of seer or gallon or any other measure use the litre.

Length Measures

(1) Use the metre in place of yard or foot and the centimetre in place of inch.

Square Measures

(1) Use the square metre in place of square yard or square foot, and square centimetre in place of square inch.

Cubic Measures

(1) Use the cubic metre in place of cubic yard or cubic foot and cubic centimetre in place of cubic inch.

Packaging

It is advantageous if sizes of packages correspond to series of commercial weights and measures prescribed.

These are : 50 kg, 20 kg, 10 kg, 5 kg, 2 kg, 1 kg, 500g, 200 g, 100 g, 50 g, 20 g, 5 g, 2 g, 1 g, and so on.

TYPICAL PRICING UNITS FOR RETAIL TRADE

Serial No.	Commodity	Metric Unit for Use
(1)	Foodgrains, cereals, pulses, spices, ghee, bread, vegetables, meat, fish, sweetmeats, tea, coffee, sugar, salt.	1 kg
(2)	Oil for cooking	1 kg or 1 litre depending upon prevalent practice.
(3)	Fruits	1 kg or number depending upon prevalent practice.
(4)	Milk	1 litre
(5)	Cloth and related materials	1 metre
(6)	Prepackaged materials	Preferably sizes corresponding to series of commercial weights and measures.

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metric measures

THE PUBLICATIONS DIVISION

ABBREVIATIONS FOR METRIC UNITS

(1) DECIMAL MULTIPLES AND SUBMULTIPLES

Prefix	Value in Terms of Unit	Abbreviation
kilo	1,000	k
centi	0.01 (10^{-2})	c
milli	0.001 (10^{-3})	m
micro	0.000 001 (10^{-6})	μ

(2) WEIGHTS

Denomination	Value	Abbreviation
tonne	1,000 kg	t
quintal	100 kg	q
kilogram	1 kg	kg
gram	1 g	g
milligram	1 mg	mg
carat	200 mg	c

(3) CAPACITY

kilolitre	1 000 l	kl
litre	1 l	l
millilitre	1 ml	ml

(4) VOLUME

cubic metre	m^3	m^3 or cu m^*
cubic centimetre	cm^3	cm^3 or cu cm^*
cubic millimetre	mm^3	mm^3 or cu mm^*

(5) LENGTH

kilometre	1 000 m	km
metre	1 m	m
centimetre	1 cm	cm
millimetre	1 mm	mm
micron	1/1 000 mm or 10^{-3} mm	μm

(6) AREA

square kilometre	1 000 000 m^2	km^2 or sq km^*
square metre	$1m^2$	m^2 or sq m^*
square centimetre	$1 cm^2$	cm^2 or sq cm^*
square millimetre	$1 mm^2$	mm^2 or sq mm^*

(7) LAND MEASURE

are	1 00 m^2	a
hectare	100 a	ha
centiare	m^2	ca

*Both these abbreviations are current, but the first set should preferably be used. The former abbreviation is used internationally.

Rules for Abbreviations

- (1) Do not make any change, such as addition of 's' to indicate plurality e.g., write 1 kg, 10 kg, 20 g, 5g, 10t, 20 ml, 27 l, 165 km, 2mm, 100 cm^3 , 66 km^2 ;
- (2) Do not capitalize the abbreviations. For example, do not write 1 Kg, 2 Kg, 20 MM, 50 MM; the right way is to write 1 kg, 2 kg, 20 mm, 50 mm, etc.
- (3) Do not use any other abbreviations except those given above.

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metric measures

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metric measures

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Working Standard Balances : Part 2—General Specifications

B. R. DHURANDHAR

Saple's Scale Manufacturing Co., (P) Ltd.,
Bombay

PART 1 dealt with guiding factors in the design of working standard balances used by the Inspector of Weights and Measures for the verification of commercial weights. The various factors were analysed and discussed. In this Part it is intended to outline the considerations that led to the establishment of a general specification for working standard balances. The present Weights and Measures (Enforcement) Rules of the States prescribe mainly the capacities, sensitivity and beam length. Many important details of design are left to manufacturers.

Inspector's Duties and Needs

The requirements of the balances to be used by the Inspector would naturally have to be such as would render the instruments useful to him in the normal range of his activities. It is, therefore, necessary to consider briefly the nature of his duties and the requirements of the instruments he would have to use.

The Inspector of Weights and Measures has to carry out his duties in either urban areas or rural areas. He normally has to verify weights, measures and weighing and measuring instruments in 2,500—3,000 shops or commercial establishments. The verification of ordinary weights has to be done

once in two years but that of bullion weights every year. Besides, he has to undertake frequent inspections of weights during the interval between two successive verifications to ensure that only weights which are correct within the allowed errors are being used in commercial transactions.

In rural areas, the traders are spread over a large area and the Inspector has to undertake frequent tours to verify weights, measures etc. during the specified period and to inspect them in the interval. This means that he has to be on tour for many days at a stretch. He has also to carry his equipment around including standard weights and balances. When he is on tour he would require balances which could be transported easily in trains, buses, bullock-carts, and in some mountainous areas, even by mule pack. His balances, should, therefore, be such that they would not be affected by the hazards and bumpings of transport. If the Inspector has to do his work quickly and efficiently, the balances should be capable of being easily assembled in his camp and ready for use within a short time.

If the Inspector has to cover urban areas, the shops are situated in comparatively very small areas and the traders can easily and conveniently bring their weights to the

Inspector's office for verification. In fact, in many cities the traders prefer to bring the weights to the Inspector's office so as not to disturb their routine of trade. So he generally has a permanent establishment in the locality assigned to him and he sets up a small verification laboratory. In this case, the balances do not have to be transported and are kept in the laboratory and operated by the Inspector. It is, therefore, possible to have the balances fixed in the laboratory, in a glass or wooden case, if so desired.

The Inspector thus requires two types of balances, one type for outdoor use in rural areas *i.e.* portable and another for indoor use in urban areas *i.e.* stationary.

Influence of Bullion Weights

On his balances the Inspector would verify and weigh cast iron, ordinary brass, bullion and carat weights. The first three types of weights are commonly used in cities as well as in rural areas. Carat weights are mostly used in very large cities as their use is restricted to the weighing of real pearls, diamonds and the like.

In drawing up specifications, it has to be borne in mind that the Inspector's balances would be used for weighing bullion weights in villages also. Bullion weights are used not only for weighment of gold but also of silver and silverware. Silver is often weighed out in large quantities—much larger than gold. A brick of silver may weigh upto 30 kg while the maximum weight of a gold bar is 1 kg. A number of bricks of silver are sometimes weighed at a time. Besides the bullion trade, doctors, chemists, vaidyas, perfumers, jari workers and others also use bullion weights. These weights, which have a wide range from 20 kg to 1 mg, find their use in different trades and have to be adjusted with great care and accuracy.

The enforcement laws of the States provide that unlike ordinary weights of cast iron and brass, bullion weights should be checked every year in order to maintain accuracy in dealings of commodities which are normally expensive. The Inspector's balances should, therefore, be of such precision and sensitivity that they can be used for the weighment and verification of bullion weights.

No Discrimination

The point has often been raised whether in view of the accuracy expected in bullion weights and to reduce the cost of the Inspector's equipment and to make it simpler, the users of such weights in rural areas should be required to go to the Inspector's permanent laboratory at his headquarters to have their weights verified.

This argument has its roots in the practice in many Western countries where the users of high precision or bullion weights are expected to take them to the Inspector's headquarters for verification every year. This saves the touring Inspector the responsibility of carrying sensitive balances and he can use rougher instruments. It is argued that if the Indian Inspector in the rural area also has to verify only ordinary weights of cast iron or brass, he could use ordinary beam scales of Class C like the ones prescribed for weighing rice, wheat etc. or simple steelyards as is done in some of the Western countries. If the Inspector's equipment is thus simplified, the expenditure on equipment would also be lowered.

This argument appears reasonable at first sight. A scrutiny of the pattern of the bullion trade in the West, however, reveals the fallacy. In the West, bullion traders in rural areas are almost non-existent. Most of these traders are concentrated in the large cities and even village folk go to the

nearest city to buy gold and silverware or ornaments.

In India, the villager is very conscious about the purchase of gold and silver, either in the chip form or as ornaments. In fact, he prefers to buy gold or silver with his savings rather than invest them in any securities or other bonds. It is not uncommon to see village belles going about with anklets of silver, each weighing as much as 500 grams. The villager normally has his ornaments, particularly of silver, made by the village goldsmiths in his presence.

The Indian villager is also a shrewd person. If he finds that the Inspector who comes to his village, verifies only cast iron and brass weights but not bullion weights because his equipment has to be cheap, he would rapidly lose faith in the verification process. He would not understand why the Government cannot give better equipment to the Inspector and let him verify all types of weights during his tour. Moreover, he believes more in what he can see, than in what he cannot. So, even if his goldsmith did go to the city and have his weights verified, he would still suspect the authenticity of the goldsmith.

What about the goldsmiths and other users of bullion weights? They would be seeing the weights of other traders verified but they would themselves be expected to carry their weights even 50 kilometres to the Inspector's Office and back. There would be delays and they may not be able to get their work done in one day. They would then feel harassed. They would also grumble about the Government's discrimination in verifying the weights of other traders on the spot in the villages but not theirs.

In a newly independent, developing country like India such a grouse about a new and

far-reaching reform is not desirable. The benefits of the facilities that the Government provides should be taken directly to the people rather than expecting the people to undertake long journeys and tedious waiting to derive benefits from them.

From whatever angle one looks at the problem, the conclusion is inescapable that in the present economic and trade conditions in India and the pattern of our bullion trade, the Inspector should verify bullion weights also when he goes on tours to villages and rural areas.

The first requirement, therefore, of the Inspector's balance can now be established. The Inspector need not carry two types of equipment—one for verifying cast iron weights and another for bullion weights. There need be only two types of balances more or less of the same specification: one for use in urban areas where the balances are fixed in the laboratory and another set which can be transported easily, assembled quickly and operated accurately.

Capacities

Having examined the fundamental factors which have a vital bearing on the type of equipment the Inspector requires, it is now necessary to lay down capacities of the balances. The capacities would have to be related with the denomination of weights. The heaviest commercial weight is 50 kg while the smallest is 1 mg. A single balance of 50 kg capacity cannot meet the requirements. It is also desirable that the balance should be used for the weighing of the least number of weights commensurate with its ability to weigh, so as not to overload it and damage it. On consideration of these factors and on the basis of scientific facts, the four capacities shown in Table 1 were laid down.

TABLE 1
CAPACITIES OF BALANCES

Capacity (1)	Number of Weights to be Verified (2)
50 kg	50 kg } 20 kg } Three pieces 10 kg }
5 kg	5 kg } 2 kg } Four pieces 1 kg }
200 g	500 g } 200 g } 100 g } Six pieces (& carat 50 g } weights up to 20 20 g } carats) 10 g } 5 g }
2 g	Remaining weights from 2 g to 1 mg (eleven pieces; carat weights)

It will be noticed that balances used for heavy weights handle a comparatively smaller number of weights, while the balance with the lowest capacity handles the largest number of weights. This is in keeping with scientific practice.

TABLE 2
PERMISSIBLE ERRORS FOR THE VERIFICATION AND INSPECTION OF VARIOUS TYPES OF WEIGHTS

Denomination of Weights (1)	Maximum Permissible Errors							
	Coarse C. Iron	Grade Weights	Medium Grade Brass Weights		Bullion Brass Weights		Commercial Carat Weights	
	Excess mg (2)	Def. mg (3)	Excess mg (4)	Def. mg (5)	Excess mg (6)	Def. mg (7)	Excess mg (8)	Def. mg (9)
50 kg	20 000	10 000	—	—	—	—	—	—
20 kg	10 000	5 000	—	—	500	250	—	—
10 kg	5 000	2 500	—	—	250	125	—	—
5 kg	3 000	1 500	—	—	150	75	—	—
2 kg	1 600	800	—	—	80	40	—	—
1 kg	1 000	500	250	125	50	25	—	—
500 g	600	300	150	75	30	15	—	—
200 g	400	200	100	50	20	10	—	—
100 g	320	160	80	40	16	8	8.0	4.0
50 (40) g	—	—	60	30	12	6	6.0	3.0
20 g	—	—	50	25	10	5	5.0	2.5
10 g	—	—	40	20	8	4	4.0	2.0

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5 (4) g	—	—	30	15	6	3	3.0	1.5
2 g	—	—	20	10	4	2	2.0	1.0
1 g	—	—	10	5	2	1	1.0	0.5
500 (400) mg	—	—	8.0	4.0	1.6	0.8	0.8	0.4
200 mg	—	—	6.0	3.0	1.2	0.6	0.6	0.3
100 mg	—	—	4.0	2.0	0.8	0.4	0.4	0.2
50 (40) mg	—	—	2.0	1.0	0.4	0.2	0.2	0.1
20 mg	—	—	2.0	1.0	0.4	0.2	0.2	0.1
10 mg	—	—	1.0	0.5	0.2	0.1	0.1	0.05
5 (4) mg	—	—	0.4	0.2	0.2	0.1	0.1	0.05
2 mg	—	—	0.2	0.1	0.2	0.1	0.1	0.05
1 mg	—	—	0.1	0.05	0.1	0.05	0.1	0.05

The balance should be so sensitive as would enable it to weigh out the deficiency tolerance of the smallest weight to be weighed on it. Thus, for example, on the 50 kg balance, the smallest weight weighed would be 10 kg. The most stringent accuracy for a 10 kg weight is for bullion weights and the permissible error in deficiency is 125 mg. So the roughest sensitivity for this balance should be at least 125 mg, if a deflection of just one division is to be obtained. In order to make it possible to have a larger deflection so that it could be read easily the sensitivity was ultimately made finer and brought to 100 mg. Similar considerations were applied to the other three balances.

Table 3 indicates the sensitivity in milligrams per division prescribed for each type of balance.

TABLE 3			
SENSITIVITIES OF BALANCES			
Capacity	Deficiency Tolerance on		Sensitivity in mg per division
	Highest Weight	Lowest Weight	
(See Table 2)			
50 kg	10,000 mg	125 mg	100
5 kg	75 mg	15 mg	10
100 g	10 mg	1.5 mg	1.0
2 g	1.0 mg	0.05 mg	0.02

It will be seen that the sensitivity to be prescribed for balances is the maximum that can

be laid down for the particular balance. It is not desirable to refine the sensitivities of the balances further, because an Inspector has to weigh on an average 150 to 200 weights every day. If the balance is over-sensitive he may not be able to do his work quickly and efficiently.

Beam Length

The third important factor is the beam length. The beam is the most important part of the balance. The beam should neither be too long nor too short. It should be such that, in an outdoor balance, it could be accommodated easily in a box. It should also be capable of being suspended from a tripod when assembled. This box again should be of such dimensions that it can be safely carried in the type of transport available to the Inspector. Taking all these factors into consideration, the following beam lengths were prescribed.

TABLE 4 BEAM LENGTHS	
Capacity	Beam Length
50 kg	750 mm
5 kg	250—300 mm
200 g	150—200 mm
2 g	120—150 mm

Other provisions in the Weights and Measures (Enforcement) Rules require that the balances should be of the outdoor or indoor type, the reason for which has already been

stated, and should be constructed of non-magnetic materials and be robust in construction. They should also be capable of being easily assembled. It is also provided that outdoor balances should be fitted in suitable carrying cases and smaller ones should have glass cases. Portable balances of 5 kg and below should be fitted into one

carrying case for ease of transport. The details of manufacture, like materials, beam shape, knife-edges, bearings, pan dimensions, suspension arrangements and so on are left to manufacturers.

It is intended to discuss the design aspects of working standard balances in the next article.

Conversion of Workshop Machine Tools & Measuring Devices

D. SITARAM RAO

Workshop Superintendent,
Delhi Polytechnic,
Delhi

It will be recalled that at a Conference of representatives of various universities and engineering and technical institutions held on 23 October 1960, a programme of change-over to the metric system in higher technical education was worked out. (See *Metric Measures*, Jan. 61, pp. 19—21).

The phased programme envisaged the adoption of the metric system in teaching in the first and second year classes from the academic session 1962-63. The third and fourth year classes would follow in 1963-64, the programme being completed in 1964-65.

The change-over in the workshops of technical institutions is an important aspect of the change-over. In order to assess the cost of a change-over in workshops, studies were carried out by some organisations. In this article are presented the results of a study of the changes required and the cost

involved with specific reference to the equipment available in the engineering workshop of the Delhi Polytechnic. The workshop is capable of training 135 students.

The scheme of conversion is discussed in three parts :

Part—I : Lathes.

Part—II : Drilling, Shaping and Milling Machines.

Part—III: Measuring Appliances and Tools.

PART—I : LATHES

There are 14 lathes in the Delhi Polytechnic Workshops with belt drive, the drive being taken from a motor fixed in the lower part of the leg of the lathe. There is a three-stepped cone pulley for effecting the change of speed. These lathes are provided with a train of gears to suit various thread-cutting speed ranges.

Of the various jobs for which a lathe can be used, turning to specified diameters is

the most important. The performance of this operation does not require any conversion on the lathe itself, but the tool travel at right angles to the axis of the job is controlled by a dial which is at present graduated in the British system. This dial is to be replaced by one graduated in the metric system. The movement of this travel is guided by manual operation and hence the extent to which the tool will travel per revolution of the rotating dial can be worked out in metric system and a new dial graduated in the metric system provided as follows :

At present one complete revolution = $\frac{1}{4}$ " travel (125 divisions)

So each division = $\frac{1}{4} \times \frac{1}{125} = 1/1000$ ".

Altered Dial

Divide the dial into 127 parts. Each division will represent 0.025 mm tool travel and so 4 divisions will represent a tool travel of 0.1 mm.

Similarly for the compound slide whose dial is at present divided into 125 divisions, each division representing $1/1000$ ", the altered dial is divided into 127 divisions, each division representing 0.025 mm.

The other important operation on the lathe, namely, thread-cutting, involves the following changes in the gear-train of the lathes for conversion to metric system. The gear-train on this particular type of lathe has 12 gears. By a combination of several of these at a time, threads ranging from 4 to 40 per inch can be obtained. The object in conversion is to obtain corresponding pitches in the metric system. This can be done by providing further additions to the gear-train to enable the altered gear-train to yield an ultimate thread-cutting speed which will cut threads standardized in the metric system. On this particular set of lathes this has been achieved by providing an additional set of 12 gears per lathe, the number of teeth on

these being 18, 20, 24, 26, 28, 36, 100, 127/100 and 72/18.

For example : to obtain a metric pitch of 1.0 mm (per thread) the gear-train on this lathe would be 40, 127, 100 and 100.

Gear train ratio :
$$\frac{\text{Driver } 8 \quad 40 \quad 100}{\text{Driven } 25.4 \quad 127 \quad 100} = \frac{8 \times 40 \times 100}{25.4 \times 127 \times 100}$$

Similar provision has been made to cut 33 metric pitches ranging from 0.2 mm to 6 mm.

Cost Data (Manufacture of Gears)

(a) Turning & Milling

- (1) Number of additional gears required per lathe : 12
(4 cast and 8 cut from steel rounds)

Rs.

- (2) Cost of pattern-making :
4 gear blank patterns @ 3 Rupees each .. 12.00
Cost of pattern for one bracket .. 21.00

TOTAL COST .. = 33.00

So cost of pattern making for 15 lathes 33.00
Distributed per lathe 2.20

- (3) Casting charges for 4 gears weighing 15 kg @ 0.65 Re/kg 9.75
(4) Casting one C.I. bracket 4 kg @ 0.65 Re/kg 2.60
(5) Cost of material for 8 steel gears @ 60 nP/kg for 6 kg 3.60
(6) Turning and milling (labour charges) for (3) and (4) above (labour at Rs. 6/day for $3\frac{1}{2}$ days) 21.00
(7) Turning and milling (labour charges) for (5) above (labour 3 days @ Rs. 6/day) 18.00
(8) 3 Sleeves with bolts nuts 2 days @ Rs. 6/day 12.00
(9) Labour charges of one helper 8 days @ Rs. 3 per day 24.00

93.15

Overhead charges @ 17½% .. 18.63

111.78
say 112.00

(b) <i>Dials & Indexing</i>	Rs.
Cost of making and indexing 3 dials @ Rs. 10 per dial.	30.00
17½% overheads (say 1/5)	6.00
So dials and indexing charges	36.00
(c) <i>Machine—Hour charges</i>	
Hourly rate for lathe 0.75 Re/ hour	
Hourly rate for milling machine @ Rs. 1.25/hr. (hourly rate includes deprecia- tion, electrical power, P.O.L. and tooling).	
Lathe hours = 30	
Milling hours = 20	
So machine-hour charges for lathe	22.50
& machine-hour charges for milling machine	25.00
Total machine-hour charges	= 47.50
Totalling up the cost data :	
(a)—Turning & Milling ..	= 112.00
(b)—Dials & Indexing ..	= 36.00
(c)—Machine-Hour Charges	= 47.50
Total Conversion Charges/	
Lathe	= 195.50
say	= 196.00

A difficulty encountered in conversion needs mention here. In thread-cutting, the tool is required to trace back its path to deepen the groove. This is normally made possible by the provision of a thread-chasing dial which is geared off the lead screw. In the conversion of this lathe, a similar provision is not possible and hence a reversing switch is provided. The precaution to be taken is that the reversing switch has to be altered from the 'forward' to the 'backward' position just at the end of the forward travel. By suitably training the operator in this work, it is possible to avoid an over-run of the tool beyond the limit of the thread-cut portion.

Alternatively, the lead screw of the machine itself will have to be changed to the metric

pitch; this change would need further alterations of the saddle and other parts. These drastic alterations would make the conversion complicated and costly. Hence we adopted the device of providing a reversing switch. So including the cost of the reversing switch, estimated at Rs. 50 per switch, the cost of conversion works out to Rs. 246 (196+50).

PART—II—DRILLING, SHAPING & MILLING MACHINES

Drilling Machine

Apart from lathes which are a 'must' for any machine shop laid out for training purposes, the workshop must have at least a few drilling machines, a couple of shaping machines and one milling machine.

The drilling machine is usually a bench drill capable of taking in drills up to diameter of $\frac{1}{4}$ "– $\frac{3}{4}$ ". The drill shanks are of common standards both in the metric and the existing systems, as also the corresponding sockets in the drilling machines. Therefore, even with the drills in the metric diameters, there is no major conversion involved in the bench drill.

In some drilling machines there is a vertical scale parallel to the axis of the drill, which will have to be replaced by a metric scale. The replacement is estimated to cost Rs. 10 per machine, whether done within the workshop or outside.

Shaping Machine

There is no major conversion involved in this machine except to change into metric units the scale indicating the extent of horizontal travel. This change will cost approximately Rs. 10 per machine.

Milling Machine

The conversion of the milling machine presents some peculiar problems. A large variety of cutters are used on this machine

CONVERSION OF WORKSHOP MACHINE TOOLS & MEASURING DEVICES

and the cutters have standardised characteristics in the FPS system. The new cutters in the metric system are designed for metric bores to suit metric arbors, though as a transitional measure inch arbors are provided at present. The conversion of the milling machine, therefore, involves change of arbors and sleeves into sizes as standardised in the metric system. This is a long-range measure. For immediate use metric cutters with standard inch bores are available commercially. The manufacture of metric arbors to the degree of precision required is beyond the competence of a normal training institution and it is advisable to purchase metric arbors and sleeves in one standard size. One set of arbor and sleeves is likely to cost Rs. 1,500.

PART III—MEASURING APPLIANCES & TOOLS

One of the important aspects of metric conversion is the change-over of the measuring appliances and tools from the existing ones. Most of the existing measures have to be scrapped and to that extent the salvage value of the existing measures is negligible. The expenses for the new measures have to be a fresh investment. Taking into account the normal shop capacities for training, the following provision has to be made:

Nature of Shop	Training Capacity (Seats)
Fitting Shop	30
Carpentry	30
Machine shop	15
Smithy	15
Welding	15
Sheet Metal	15
Foundry	15
	135

Based on the above strength the following quantities of measures are recommended :

	@	=Rs.
Steel scales		
150 mm	60	1.75
300 mm	60	3.50
Brass scale : 300 mm ..	15	5
Wooden scale folding type :		
500 mm	10	4
Contraction scale : 500 mm	18	45
Vernier callipers : 150 mm	5	100
Depth gauge (micrometer) : (0-150 mm)	2	125
Height gauge (0 to 300 mm)	2	250
Feeler gauge	5	6.50
Radius gauge (upto 25 mm)	5	25.50
Screw pitch gauge	5	18
Micrometers (outside) :		
0 to 25	30	60
25 to 50	15	85
50 to 75	5	90
75 to 100	3	110
Micrometers (inside) : 60 mm to 200 mm	1	
Sine Bar 125 mm	1	
Slip gauges (workshop grade) (about 65 pieces)	one set	
Combination set (300 cm) ..	2	165
Vernier gear tooth calliper (2 to 20 mm)	1	
Dial indicators	2	100
Vernier bevel protractor ..	1	
		9,710.00

A lump sum provision should be made in respect of drills, reamers, taps, dies and milling cutters as these are in varied sizes and are also designed to meet different types of needs. It would, therefore, be impracticable to list out and evaluate these items. The proposed lump sum provision is Rs. 8,000. The total estimated expenditure under 'measuring appliances and tools' is Rs. 17,710.00.

Metric System for Payments in Mining Industry

GUY KNOCHE

French Economic and Technical Bulletin,
Paris

VARIOUS methods exist for determining a miner's pay, and in the most complicated cases, which are also the most frequently encountered, the use of the metric system would considerably simplify the calculations involved.

The miner can receive a fixed salary. This is the simplest case. This salary is calculated on the basis of hours worked or by the day and a simple multiplication enables the pay to be determined immediately. For example, should the hourly rate be fixed at 1.4965 NF and should the working week consist of 42½ hours, the basic wage would come to 1.4965×42.5 or 63.60 125 NF, rounded off to 63.60 NF as the centime, or hundredth part of the new franc is the smallest monetary unit in current use.

Many other items, which we will return to later, have evidently to be added to this basic wage.

Payment for Piecework

Other cases, which are not quite so simple, are encountered when dealing with piecework. Here one has to evaluate the quantity of work carried out. In this case, one of the simplest methods is to count the number of tubs which have been filled by the miner throughout the day. Having fixed the rate per tub in advance, one may arrive quite

easily at the basic wage by means of an elementary multiplication.

A more complicated, but widespread, case is payment on the basis of 'volume dug'. Let us take a numerical example.

Suppose, for example, that a miner is working in a seam 1.37 metres high and 1.63 metres wide.

If he advances 3.23 metres in his working day and his work be paid (basic salary) at the rate of 1.57 NF per cubic metre dug, then his basic pay for the day in question is quite easily arrived at, as follows :

(1) Volume dug :

$1.37 \times 1.63 \times 3.23 = 7.212913$ cubic metres. This volume is calculated exact to the nearest cubic centimetre, and, taking into consideration the monetary unit, this figure can be rounded off to 7.213 cubic metres.

(2) Remuneration :

$1.57 \times 7.213 = 11.32441$ NF, rounded off to 11.32 NF.

If, now, we consider the same calculation using a system such as that which is in use in Great Britain, our data becomes :

Height of cut : 5 ft. 4 in.
Width of cut : 4 ft. 6 in.
Day's advance : 10 ft. 7 in.

METRIC SYSTEM FOR PAYMENTS IN MINING INDUSTRY

Pay rate : 1 shilling and nine pence per cubic yard.

Several complicated calculations will have to be carried out to work out the day's pay.

First, that of the volume dug :

$5'4'' \times 4'6'' \times 10'7'' = 64'' \times 54'' \times 127'' = 438,912$ cubic inches = 254 cubic feet = 9 cubic yards 11 cubic feet.

Finally, that of the remuneration, which ultimately works out to 16 shillings and 5 5/9 pence.

And all this is just for the basic wage. There are many other items which are added to this. For example, an hourly indemnity, given in France in NF, a production bonus (paid yearly), a results bonus (paid weekly according to a fixed percentage per week each time), a shoring bonus (calculated on the basis of timbers placed), a 'lunch basket'

bonus (an indemnity for meals taken inside the mine), bonuses, where applicable, for difficult working conditions, an indemnity for mineshaft drilling (worked out generally according to the number of metres drilled), a housing indemnity etc. At the same time, the theoretical gross salary which is arrived at by the addition of the various above items has to be reduced by various dues ; social security (worked out as a percentage of salary upto a certain ceiling), retirement pay (also a percentage), etc.

Drawing up the miner's wagesheet is thus quite a complicated operation. However, it presents no particular difficulty so long as the decimal metric system is used. This is by no means the case when at one and the same time a measuring and a monetary system neither of which is decimal has to be used.



Maharashtra Syllabus for Mathematics

(The use of the metric system of weights and measures is now becoming compulsory in many areas in the country and within a year or so all transactions would have to be carried out in terms of the metric system.

In view of these rapid changes, it is necessary that the education of the younger generation should be oriented towards the practical use of the metric system. With this aim in view, the mathematics syllabi for schools are being revised to bring in the use of the metric system, eliminate the old, and emphasise the teaching of decimals rather than that of fractions as was done earlier. The States have now started revisions of their syllabi.

The revised syllabi for mathematics for Standards I—VII adopted by the Government of Maharashtra is published here.—*Editor*)

Standard I

- (1) Counting, (forward and reverse orders), understanding, reading and writing numbers upto 100 with the help of concrete objects. Understanding of units and tens in numbers of two digits.
- (2) Recognition of Indian coins (New).
- (3) Oral addition and subtraction of any two numbers from 1 to 9.
- (4) Written addition and subtraction of two numbers of two digits provided there is no figure on hand.
- (5) Easy problems in addition and subtraction involving one step.
- (6) Multiplication tables upto 10×10 .

Standard II

- (1) Revision of the work done in Standard I—Both oral and written.

Addition and subtraction of numbers (Horizontal as well as vertical).

- (2) Recognition, understanding and writing of numbers upto 1,000 with particular attention to the place value of digits.
- (3) Addition and subtraction of three digits with the concept of figure on hand.
- (4) Multiplication of numbers of not more than two digits by a multiplier of one digit.
- (5) Knowledge of table of time :

24 hours	..	1 day
7 days	..	1 week
30 days	..	1 month
12 months	..	1 year
- (6) Introduction of division verbally through activity method.
- (7) Problems in addition and subtraction involving one or both.
- (8) Multiplication tables upto 15×10 .
- (9) Easy problems in multiplication involving multiplication of a number of two digits with a one digit number.

Standard III

- (1) Revision of the work done in Standard II.
- (2) Recognition, understanding and writing of numbers upto one lakh (1,00,000).

- (3) Multiplication tables upto 25×10 and 30×10 .
- (4) Multiplication of numbers of two or three digits by a number of not more than two digits.
- (5) Division of numbers of not more than four digits by a number of not more than two digits.
- (6) Resolving numbers of not more than two digits into two factors. (This should be taught through the interrelation of multiplication and division).
- (7) Simple problems in multiplication or division or both.
- (8) The following tables of time, length, weight and capacity :—

(a) 60 seconds	= 1 minute
60 minutes	= 1 hour
(Telling time from the clock)	
(b) 100 centimetres	= 1 metre
1000 metres	= 1 kilometre
(c) 1000 grams	= 1 kilogram
(d) 1 litre	= 1000 millilitres

These should be introduced by demonstration.

- (e) Idea of a dozen.
- (9) Compound addition and subtraction involving tables learnt.

Standard IV

- (1) Revision of the work done in Standard III.
- (2) Reading and writing of numbers upto and including crores.
- (3) Consolidation of skill in the four processes.
- (4) (a) Introduction of simple fractions like $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and $\frac{1}{10}$.
(b) Preparing tables of halves and quarters.

- (c) Introducing the idea of decimals with reference to writing money, addition or subtraction of money.

- (5) Introduction of the L.C.M. of one-digit numbers.
- (6) Introduction of the unitary method and solution of simple problems (not involving fractions) on:
 - (a) Profit and loss,
 - (b) Calculation of simple interest on sums involving multiples of 100 only;
 - (c) Rates, taxes and wages.
- (7) Simple problems involving units of the metric system done in Standard III.
- (8) Elementary postal information such as purchase of cards, envelopes, stamps etc. upto 100 nP.
- (9) Recognising and drawing of geometrical figures—a rectangle, a square, a circle and a triangle using stencils.

Standard V

A—Arithmetic

- (1) Revision of the work done in Standards I to IV.
- (2) Prime numbers, factors, divisibility of numbers by 2, 3, 5, 9, 10 and 11, L.C.M. and G.C.M. of numbers of not more than three digits.
- (3) Similar and dissimilar fractions and four operations in simple fractions and their simplification (not involving more than four fractions).
- (4) Simple problems in proportion by fractional method direct and inverse.
- (5) Further problems on profit and loss, problems on simple interest, involving calculation of interest, amount and principal.

- (6) Complete tables of the metric system (of length, weight and capacity).
- (7) Four fundamental operations of decimal fractions.
- (8) Areas of rectangular figures: Problems on areas of rectangular figures involving estimate of costs.

B—Geometry

I—Demonstrational

- (1) Concept of a point, concept of a straight line (no definitions).
- (2) Concept of an angle—a right angle, a straight angle and angles about a point (4 right angles).
Idea of acute and obtuse angles.
- (3) Two straight lines becoming parallel to each other.

II—Practical

- (1) Drawing of a straight line of a given length.
- (2) Drawing right angles with set squares.

Standard VI

A—Arithmetic

- (1) Revision of the work done in Standard V.
- (2) Averages—simple problems.
- (3) Percentage (to be interrelated with decimal fractions).
- (4) Simple interest involving calculations of rate and time.
- (5) Preparing and verifying bills and receipts—simple examples on shopping.
- (6) Postal information : money orders and parcels.
- (7) Column-graphs—reading and preparing.

B—Geometry

Practical

- (1) Revision of work done in Standard V.

- (2) The use of a protractor to measure and draw angles.
- (3) The circle and its parts and their relations—use of the pair of compasses.
- (4) Construction of a triangle given three sides.

Demonstrational

- (1) The properties of adjacent angles, vertically opposite angles, supplementary and complementary angles and angles on two parallel straight lines by a transversal; sum of the angles of a triangle.
- (2) The sum of any two sides of a triangle is greater than the third side (definition of a straight line).

Standard VII

A—Arithmetic

- (1) Revision of the work done in Standard VI.
- (2) Simple examples on time, transport and speed, work and wages.
- (3) Proportion and proportional parts—simple problems: partnership.
- (4) Compound interest—period not exceeding three years, calculating compound interest half-yearly. Use of a table for finding compound interest for a period of more than 3 years.
- (5) Bank accounts and their operations.
- (6) Square and square-roots by factorisation.
- (7) Areas of triangles and circles.
- (8) Cubic measure—Volume of rectangular objects.
- (9) Maintenance of household accounts—preparation of cash accounts of school activities.

B—Geometry

Demonstrational

- (1) Properties of different types of triangles based on angles and sides.
- (2) Congruency of triangles.

Practical

- (1) Construction of triangles given two sides and the included angle; one side and two angles. Construction

of a right-angled triangle, given hypotenuse and one side.

C—Algebra

- (1) Use of symbols to represent numbers (Algebra as shorthand arithmetic).
- (2) Solving simple problems and equations.
- (3) Simple useful formulae and examples based on them.

Change to the Metric System in U. K. ?

(The following Statement on the possibilities of the change-over to the metric system has been published in the May 1962 issue of *BSI News*, pp. 11-14. The Statement indicates a 20-year programme of change-over to the metric system, if the Government directs the change-over.

About a year ago the British Standards Institution (B.S.I.) set up a special committee to assess trends towards the use of the metric system in British industry and to recommend the steps which the B.S.I. should take. The findings of this Committee, whose members were drawn from B.S.I.'s Executive Committee and Export Panel, have led to the following Statement by the B.S.I. It is being circulated widely to British trade and industry, with a view to examine the case for a change to the metric system industry by industry and a conclusion reached.

The Statement of the B.S.I. published above, was discussed at the 1962 Standards Engineers' Conference held in London on 15 and 16 May 1962. It was organised by the British Standards Institution in conjunction with the Institution of Production Engineers. This account of the discussion is taken from the June 1962 issue of *BSI News*, pp. 27-28.

It is hoped that the Statement would be of interest to readers of "*Metric Measures*".—Editor)

IT is evident that an increasing volume of opinion in this country regards a change to the

metric system as essential and even inevitable, though it does not minimize the costs and the difficulties, which to the country as a whole and to some industries in particular would be formidable. These costs and difficulties would, however, increase rather than diminish as time goes on.

From the point of view of the United Kingdom's export trade as a whole, the use of the metric system and of metric standards will be increasingly demanded by our trade not only with Europe—whether we are members of the Common Market or not—but also, and perhaps even more significantly, with markets in the developing countries in Asia, South America and elsewhere, which are of major importance as providing growing outlets for our future trade. These countries lean towards the metric system rather than the inch/lb system. In view of this and despite the continuing importance of the U.S.A. and Commonwealth markets, a decision within a relatively short time in favour of a change, to be made over a defined

period, is increasingly advocated. Clearly the time required for a change would vary from industry to industry and would have to be planned and phased according to their needs, but it is only on the basis of a firm assumption of a general move *which nothing less than a Government directive could induce*, that most individual industries could or would take any decisive action, or even discuss the problem realistically with their customers and suppliers. Only on this basis could replacement of tools and plant be planned economically.

Should Change be Dependent on Parallel Action by the U.S.A.?

A major question is whether a decision to change should be made dependent on parallel decisions by the inch-using Commonwealth countries and the U.S.A. with whom there has for long been close co-operation on basic engineering practice. Many of those who support a change in principle make this a condition; others argue the contrary and in particular suggest that we should not await a decision from the U.S.A. which, because of its relative self-sufficiency, can afford to go much more slowly than we can. There appears to be considerably greater interest in the matter in the U.S.A. now than for some time. Certainly it would be very desirable to have consultations with the U.S.A. and Commonwealth. Some Commonwealth countries are considering the possibility of a change and would welcome a clear view from the United Kingdom.

Education for the Metric System

One of the first essential steps in making a change would be the encouragement of metric and decimal thinking. This would be one result of any early decision to adopt a decimal coinage which should be followed promptly by an appropriate education programme. One consequent measure which

might follow quickly would be the use of parallel inch/lb and metric scales in new weighing and measuring equipment and similarly, of course, of inch/lb and metric measures in relevant British Standards.

Considerations Relevant to B.S.I. Action

There are a number of considerations to be borne in mind in determining the action to be taken by the B.S.I. on the assumption of a change :

- (a) Some British Standards—for example, where tolerances are wide—could be expressed in the metric system by simple conversion, without altering significantly the methods of manufacture; these would be the first to change. Particular efforts could be made to secure in international standards committees a single series of sizes in such cases.

Nevertheless it is clear that in many cases a change to metric units, if it is to achieve its objective, will involve changes in sizes and in engineering design, as well as extensive retooling. In such cases the standards and the industries concerned could only change over a much longer period.

- (b) In mechanical engineering it is not infrequently the case that the greater technical experience is in inches, and inch standards are more developed and complete than metric standards; some are also common practice between the United Kingdom, U.S.A. and Canada. It is accepted that at the present time there are a number of cases where no internationally agreed metric standards exist, but there is an accelerating programme to secure them.

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- (c) On the other hand there are performance and quality standards accepted by metric countries to which this country must approximate more closely if we are not to lose trade; it is argued that the use of metric dimensions will help towards this and that also we shall be in a better position to influence the international agreement if we are talking in metric terms.

Action by B.S.I.

The action to be taken by B.S.I. on the assumption of a change to the metric system within, say, 15 to 20 years, would be on the lines indicated below; some of the steps will in any event be called for in relation to the increasing use of metric measures by some sections of industry and the proposals should be looked at with that in mind.

- (1) A plan for the translation of British Standards into the metric system would be drawn up (see the preliminary study, relating action by B.S.I. to the general sequence of change.)
- (2) Greater efforts would be made to secure a single international recommendation for dimensional series, even if this meant in some cases acceptance of a metric series. The corresponding sizes recommended by the Committee* on Scientific Principles of Standardization, as finally agreed, would be pressed for whenever they had a chance of being acceptable. Other countries should be reminded that their co-operation towards reaching agreement on such series would make a general change

*An advisory committee of the International Organisation for Standardization (ISO).

by the United Kingdom more rapid and would help all round. Agreement in the international standards bodies might be facilitated by putting a target date for implementation a few years ahead.

- (3) Where two series now exist in international recommendations B.S.I. would publish the metric series as a British Standard as well as the inch series, for use by those who wished to work to metric in a transitional period.
- (4) In other cases where metric standards are urgently needed in particular industries they would be prepared and issued as a matter of priority.
- (5) In the first stage British Standard not issued in fully metric form would show metric as well as inch/lb values; some more precise conversion might be required than is at present the practice.

PRELIMINARY STUDY

(The following, which is an appendix to the Statement as published, is a preliminary study of the action which might be taken over 20 years.)

Many differing views have been expressed as to the time that would be needed to effect a substantial change-over to a fully metric system. Periods as widely separated as 5 years and 50 years have been suggested as the minimum time in which such a change could be effected and there may be some merit in examining a tentative time-table for the various stages that would have to be gone through. To do this it is necessary to fix some time period and a figure of 20 years has been taken to see how far the necessary stages could be fitted into such a period

Years 0—3 The movement would have to be triggered off by a Government pronouncement and this would be preceded and followed by many top level consultations amongst leading industrial bodies, consultative councils and the like. Educational authorities, professional societies and institutions, trade unions, trade associations, chambers of commerce and many others would need to be brought into these consultations; a period of three years is allowed for this preliminary work of initiating the change and preparing a national plan for it to be effected smoothly.

Years 3—5 Once the initial decisions had been taken at national level and an overall skeleton plan prepared, the way would be clear for major groups and bodies, and later for individual companies, to work out their own programme within the overall plan. A period of two years is provided for this planning.

Years 3—5 Meanwhile stocks would be allowed to run down, dates would be set for terminating near-to-obsolete lines of manufacture and some new designs would be initiated in metric dimensions.

Years 0—3 Parallel with all this the B.S.I. would be considering the formidable task of revising say 1,500 B.S., most of which would be needed in their new form (N.B.S.) before industry could make a real start in changing over their production. Some preliminary planning by B.S.I.

would clearly be essential and a period of three years is allowed for this.

The revision of standards would raise other awkward problems, for example: is a $\frac{1}{8}$ in long object to be redefined as an exact conversion 19.05 mm, as a rounded figure 19 mm, or as a more conventional metric figure 20 mm? Problems such as this would arise not once but many times in every single British Standard to be revised. Though some general rules for revision could be framed, most of these decisions would have to be taken individually on their merits.

Years 3—5 Considerable additional staff would have to be recruited and trained by B.S.I. and the experience of the Indian Standards Institution would give a valuable clue as to the size of staff needed and the time required to get the revisions under way. A period of a further two years is allowed for this.

Years 5—15 At the end of the first 5-year period it is assumed that the movement is well under way and a further 10 years is allowed to complete the task of revising the whole 1,500 or more B.S. which include dimensional data.

Years 5—10 Concurrently industry would be tackling the problem vigorously. By the end of the first five-year period there would be some N.B.S. available—few industries would get very far until the appropriate N.B.S. were published. New metric designs

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would be coming forward and some of the commoner components would be available in metric dimensions for incorporation in the new designs. Market research would have revealed how far trade conditions called for a vigorous policy or a policy of more gradual change.

Years 10—15 In the 10th-15th year period production in metric dimensions would be gaining momentum. Many of the commoner components would now be available

in metric form and N.B.S. would be available for most products.

Years 15—20 The final period from the 15th-20th year would be the time to take stock of the position and to note how far the movement had progressed. This is an irreversible movement, so efforts would now have to be made from Government levels downwards to convince laggards that they must move with the times. A date should be set for making inch measure non-preferred.

TENTATIVE 20-YEAR PROGRAMME

Preparation of Policy	Years
Government pronouncement	0
Industrial consultations and planning	0—3
Revision of education programme (with necessary reprinting) and implementation	1—4
Technical literature, handbook, data sheets, charts, etc., reprinted and on sale	2—5
New measuring instruments, dials, gauges, become available or old ones are converted	2—4
B.S.I. Programme	
Formulation of general policy and programme	0—3
Major revision commences	3—
Revision substantially complete	—15
Industrial Action	
Stocks run down, detailed planning, etc.	3—5
New designs coming forward	5—
N.B.S. becoming available	—5
New components becoming available	—10
Metric production gathering momentum	10—15
Efforts to expedite the movement and to eliminate old units.	15—20

CHANGE TO METRIC STANDARDS ?

Delegates had before them the newly-published B.S.I. leaflet, 'Change to the metric system?'* and Mr. T.R.B. Sanders (B.S.I.'s engineering adviser), introducing a discussion on this statement, made it clear that neither he nor the B.S.I. was advocating a move for or against such a change. The object of

issuing the leaflet was to provoke discussion within industry.

'It is, however, an undoubted fact that more and more people are beginning to think that some change is inevitable,' he continued. Factors leading to this kind of thinking were our possible entry to the European Common Market, plus the fact that the developing countries of Africa, Asia and South America

*Text published above.

looked to metric measures in developing their standards. Certainly it was felt that the prospects for our export trade would be enhanced if we were to go metric.

Looking at the pros and cons, Mr. Sanders emphasized, 'It has not yet been proved that we should necessarily sell our goods abroad more easily just because they were made in millimetres. Other factors such as quality and after-sales service might well be much more important'.

There was the question of whether action in the U.K. should be dependent on a parallel change in the United States. Certainly there was no indication yet of any serious general move to the metric system on the other side of the Atlantic.

So far as Commonwealth countries were concerned, though India would welcome Britain going metric, such countries as Canada, Australia and New Zealand would be loath to see any departure from the degree of standardization which had been achieved with the United States through A.B.C.—America, Britain, Canada—standards co-operation.

'What we need most at the present time is leadership', Mr. Sanders averred. But he saw little likelihood of Government guidance in the immediate future.

He suggested that the next stage should be for each industry and each company within an industry to examine the problems objectively to see how they were affected. All B.S.I.'s major committees were being invited to give consideration to the questions posed in the new pamphlet. In the light of their response, it might perhaps be possible to produce a better pamphlet, one with more definite proposals in time for next year's conference.

Mr. Sanders went on to say that even if we were to go metric it was not always the

case, particularly in mechanical engineering, that suitable Continental standards existed. Sometimes there were several Continental standards and choosing even the best of these might still mean giving up a great deal of good practice contained in Anglo-Saxon techniques.

Should there be a decision in favour of a change it would of necessity be a very gradual change with the rate of progress varying from industry to industry.

Meanwhile, he wondered whether more could not be done to promote the adoption of 'corresponding' inch-metric sizes in cases where tolerances were reasonably large. Criticism in Britain of such a development was directed mainly against the proposals where tolerances had to be very tight.

In the discussion which followed a Netherlands delegate, Mr. van Rooij (senior standards engineer, Philips Electrical Industries Ltd.) said that standardization of necessity meant a sacrifice on many occasions. He put forward a plea for Britain to go metric as a contribution towards European unity.

But Mr. Orton (Stewarts and Lloyds Ltd.) thought that when the B.S.I. pamphlet spoke of an increasing volume of opinion favouring a change to the metric system, what was really meant was the 'volume of noise' of pro-metric supporters.

From Mr. A. J. Wilde (regional standardization engineer, Central Electricity Board) came the view that our entry into the European Common Market would not be nearly such a leisurely business as had been suggested. 'We will have to sell a lot more to Europe and this will mean working to European standards which are based on the metric system. Events may overtake us unless we take prior action,' he warned.

From Mr. A. C. Hutchinson (engineering consultant, W. Allen Sons & Co. Ltd.)

NEWS & VIEWS

came what he termed 'a spanner in the works', since he maintained that from the engineering viewpoint there was no such thing as a single metric system. B. S. 350 listed conversion factors in no fewer than four different metric systems.

In reply, another Netherlands delegate contributed the information that the 'official' metric system now being adopted on the Continent was the MKS (metre, kilogramme, second) system.

Support for the metric system came from Mr. W. J. Robinson (standards engineer, Rubery Owen & Co. Ltd.) while Dr. M.A. Champney (chief quality engineer, De Havilland Aircraft Co. Ltd.) pointed to the

fact that the pharmaceutical and large sections of the chemical industry in general had already gone over to the MKS system. Mr. C.A.J. Martin (executive director, Crompton Parkinson Ltd.) doubted whether we should wait for a lead from the United States and Commonwealth—they were probably waiting for a lead from us.

Mr. Sanders, replying, said that one thing we certainly could not afford, whether or not we went metric, was two sets of inch measurements. He pointed out, in conclusion, that firms which would not be able to go metric if the United States did not change were those making American machinery—such as earth-moving equipment—under licence from American firms.

News and Views

Recent Notifications

(1) Ports and Shipping

S.O. No. 2376 dated 24th July, 1962.

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. S.O. 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 two years', the words 'for a period of three years' shall be substituted.

(2) Capacity Measures in Jammu & Kashmir

S.O. 2374 dated 24th July, 1962.

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 1st day of August, 1962 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 all the areas in the State of Jammu and Kashmir except in those classes of undertakings or those classes of goods in respect of which the said provisions have already come into force.

S.O. 2375 dated 24th July, 1962.

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 all the areas in the State of Jammu and Kashmir referred to in the notification of the Government of India in the Ministry of Commerce and Industry No. S.O. 2374 dated the 24th July, 1962 except in respect of the classes of undertakings and goods referred to in that notification, the continuance of the use, for a period of one year from the 1st day of August, 1962 of any unit of capacity which, immediately before that day, was in use in the State of Jammu and Kashmir.

A Stainless Steel for Standard Weights

The 'National Bureau of Standards Technical News Bulletin' (March 1962, page 49), has published the following information regarding stainless steel which could be used for standard weights :

For many years brass has been used as the principal material for the standard weights maintained by the various States as reference standards. Brass is non-magnetic—a prime requisite—and it has a density of 8.4 g/cm³, the weight per unit volume long established in this country for standards of mass. However, it is not an ideal material since it tarnishes and is thus subject to changes in weight. A study has therefore been made at the Bureau to develop a nontarnishable alloy for physical standards of mass.*

In the study, conducted by S. J. Rosenberg and T. P. Royston of the thermal metallurgy laboratory, it was recognized that commercial austenitic stainless steel—which is

highly corrosion-resistant—could meet the non-magnetic but not the density requirement, since its weight per unit volume is about 7.9 g/cm³. Of the various heavy elements that might increase the density, tungsten appeared the most promising, even though it could promote the formation of ferrite and hence cause an undesirable increase in permeability. It was anticipated, however, that austenite stability could be maintained by using steels containing a 2-to-1 ratio of nickel and chromium.

In the experiments, several stainless steels of this composition were combined with tungsten by melting in a laboratory induction furnace, and the metal was poured in the form of 1.5-in.-diam. bars. A 4-hr homogenizing annealing treatment at 2,000°F preceded hot working by forging and swaging, in which rods of 0.6 in. diameter were produced. The rods were then cut into 6 in. long specimens for chemical and spectrochemical analysis.

The results of the analysis showed that one of the steels had the characteristics desired for standard weights. Its principal constituents, in percentages by weight, are as follows : carbon 0.09; manganese 1.7; silicon 1.55; nickel 32.4; chromium 16.2; tungsten 9.9. The density of this steel as hot worked is 8.42 g/cm³ and its magnetic permeability is 1.008.

After this work was initiated, international proposals were made to set the density of mass standards at 8.0 g/cm³. A steel of this density, having the other characteristics necessary for reference standards, has recently been produced commercially. It is now being investigated for possible future use, should the 8.0 g/cm³ density criterion eventually be adopted.

* For further technical details, see *A stainless steel for standard weights* by S. J. Rosenberg and T. P. Royston, ASTM Materials, Research and Standards 1, 21 (1961).

NEWS & REVIEWS

Special Session for Training and Education of Engineers in Metric System

Under the Standards of Weights and Measures Act, 1956, metric system is being progressively introduced in various fields in the country. Metric weights are already compulsory throughout the country, and by the end of 1963 only the metric units of weights, capacity and length would be legal in the whole of India.

Metric system has been adopted by various undertakings, both in public and private sectors. In the field of engineering, however, the change-over to the new system has to be gradual and carefully planned. For this, there is an imperative need for education and training of engineers so as to effect a smooth change-over in planning, designing and production.

Metric system has not yet found its appropriate place in technical and engineering education, but more and more attention is now being paid to this important aspect of the metric reform. At a conference called by the Union Ministry of Commerce and Industry, the question of adopting metric system in higher technical education was fully discussed by the Principals of technical institutions in India and it was unanimously recommended that the metric system be introduced in higher technical education by stages so as to complete the change-over by the end of 1964-65.

With a view to highlighting the importance of training and education of engineers in metric system in disseminating information on the subject, the Indian Standards Institution has decided to hold a Technical Session entitled 'Training and Education of Engineers in Metric System (S-9)' during the Seventh Indian Standards Convention

to be held at Calcutta from 28 January to 2 February 1963. About 500 delegates consisting of engineers, technologists, scientists and research workers, business executives, policy makers and others concerned, drawn from industry and trade, research, technological and engineering institutions, Government departments and others are expected to participate in the Session.

▲ The Technical Session will discuss important subjects related to training and education of engineers in metric system, including among others, conversion of curricula to metric system, writing and publishing of new textbooks, re-editing of old books and teaching notes. Discussions will also take place on the need for training engineers and teachers of engineering to think in metric terms, to become familiar with metric materials, and adept in the use of designs, codes, methods of conversion, etc. and on ways and means of promoting such training.

The following topics will illustrate the scope of the Session :

- (i) Adoption of metric system in engineering education.
- (ii) The problem of textbooks in metric system.
- (iii) In-plant training programmes for engineering and supervisory personnel, particularly those engaged in design offices.
- (iv) Standard specifications and availability of metric materials, tools, etc.
- (v) Conversion of designs to metric system.

Organisations and individuals interested in the subject are invited to attend the Session and to contribute original and thought-provoking papers not exceeding 2,500 words.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur.)

Indian Standards for Slotted Countersunk Head Machine Screws (IS : 1365—1962).

The Indian Standards Institution has published an Indian Standard Specification for Slotted Countersunk Head Machine Screws (1.6 to 20 mm) IS : 1365—1962, which covers the requirements of countersunk head machine screws of diameter range 1.6 to 20 mm for coarse and fine pitches.

The metric screw thread system with ISO profile has been recognized in India. All threaded fasteners, particularly those required in the engineering industry for general applications shall consequently, have the metric screw thread. To meet the immediate demands of the industry, the Institution is engaged in preparing specifications for the more common types of threaded fasteners. The screws of the cheese and round head type form subject of a separate specification.

Price : Rs. 2.00

Indian Standard for Metric Diagonal Scale (IS : 1562—1962).

The Indian Standards Institution has issued a series of specifications on metric scales with a view to helping the cartographers, surveyors and engineers for changing to the metric system. The Indian Standard Specification for Metric Diagonal Scales (IS : 1562—1962) is fifth in the series. The

following four standards covering metric scales have already been published ;

IS : 1480—1960 Metric Scales for General Purposes

IS : 1481—1961 Metric Steel Scales for Engineers.

IS : 1482—1960 Metric Scales for Use with Drafting Machines

IS : 1491—1959 Metric Scales for Architectural Purposes.

This standard deals with metric diagonal scales used for measuring or setting off distances upon geometrical and other drawings, maps, plans, etc. with correctness aimed at upto one-hundredth part of a millimetre.

Price : Rs. 3.00

Indian Standard for Aluminium Milk Cans (IS : 1825—1961).

The Indian Standards Institution has published an Indian Standard Specification for Aluminium Milk Cans (IS : 1825—1961), which prescribes the requirements for aluminium milk cans of a rated capacity of 10, 20, 30, 40 and 50 litres for collection and distribution of fluid milk.

An ideal milk can has to be designed in such a way that it should transport its contents safely without spillage and with minimum of churning. It should also withstand rough handling, occupy minimum of space on trucks or lorries, allow a high degree of sterilization and should also facilitate cleaning. Further it should be light and durable. This standard has been drawn up giving due consideration to all these points.

Metric system has been adopted in India and all quantities and dimensions appearing in this standard have been given in this system.

Price : Rs. 2.50

Indian Standard for Rolling and Cutting Tolerances for Hot Rolled Steel Products (IS : 1852—1962).

The Indian Standards Institution has just published an Indian Standard Specification for Rolling and Cutting Tolerances for Hot Rolled Steel Products (IS : 1852—1962). The standard lays down rolling tolerances for structural steel sections including beams, channels, angles, tee bars and bulb angles; bars other than rivet bar; flats; plate and strip; cutting tolerances for plate, strip and other hot rolled steel products have also been specified.

Tolerances for metal products followed in this country hitherto are based mostly on the British practice. It was felt that more detailed tolerances were necessary especially in view of the decision of the Government of India to adopt the metric system of weights and measures. The formulation of this new standard for tolerances coinciding as it does with the production of structural sections and other steel products in metric dimensions is most opportune. All quantities and dimensions in this standard have been given in this system.

Price : Rs. 3.50

Indian Standard for Aluminium Doors, Windows and Ventilators (IS : 1948—1961).

The Indian Standards Institution has published an Indian Standard Specification for Aluminium Doors, Windows and Ventilators (IS : 1948—1961). The Standard covers the requirements regarding material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs, complete with fittings, ready for being fixed into the buildings.

The sizes of aluminium doors, windows and ventilators and other requirements and details specified in the standard are identical to those of steel doors, windows and ventilators, an Indian Standard for which has already been published.

Price : Rs. 5.00

Indian Standard for Plain Washers (IS : 2016—1962).

The Indian Standards Institution has published an Indian Standard Specification for Plain Washers (IS : 2016—1962), which deals with plain washers of the following types:

- Machined washers, for precision and turned grade hexagonal bolts and screws,
- Punched washers for hexagonal head, screws and bolts, and
- Punched washers for round and cheese head screws.

Following the recognition of the metric screw thread with ISO profile, the Indian Standards Institution is making available standards on screw threads, bolts, nuts and accessories. The commonly used plain washers have been covered in this standard. Spring washers and other special types will be covered by a separate specification.

Metric system has been adopted in India and all values which appear in this standard have been expressed in this system.

Price : Rs. 2.00

Draft Indian Standard for Straight Sided Splines for General Engineering Use.

With a view to rationalize the production and to ensure the interchangeability of straight sided splined shafts and hubs used extensively in automobile and other industries, the Indian Standards Institution has prepared a draft Indian Standard Dimensions for Straight Sided Splines for General Engineering Use.

This draft standard covers the dimensions and tolerances of 6, 8 and 10 equi-spaced straight sided splines for general engineering use, for shaft diameter range 11—125 mm in light and medium duty series.

The draft will be circulated shortly, for eliciting technical comments.

Revised Indian Standard for Tee and Strap Hinges (IS : 206—1962).

The Indian Standards Institution has published a revision of the Indian Standard Specification for Tee and Strap Hinges (IS : 206—1962), which lays down requirements for material, manufacture, dimensions and finish of mild steel tee and strap hinges that are commonly used in general building construction.

This standard was first issued in 1950 as tentative standard and was made firm in 1956. Consequent upon the adoption of metric system of weights and measures by the Government of India, the standard has now been revised specifying various dimensions of tee and strap hinges in metric units. To cater for special needs of the consumers, two more classes of tee hinges, has been introduced in this revision.

Price : Rs. 2-00

Revised Indian Standard for Wood Screws (IS : 451—1961).

The Indian Standards Institution has published a revision of the Indian Standard Specification for Wood Screws (IS : 451—1961) which covers mild steel and brass wood screws used in buildings and furniture, and for other general purposes.

This standard was first published in 1953 specifying dimensions and other requirements of wood screws in fps system. Consequent on the adoption of metric system of weights and measures by the Government of India, this standard has now been revised specifying sizes of wood screws in metric system, in

order to enable the wood screw manufacturers to change-over smoothly to the metric system by 1966.

Price : Rs. 2-50

Revised Indian Standard for Mild-Steel Wire Nails (IS : 723—1961).

The Indian Standards Institution has published the revision of Indian Standard Specification for Mild Steel Wire Nails (IS : 723—1961). The standard specifies the dimensions and tolerances of mild steel round wire nails of the following types with suitable illustrations:

- (a) Plain head nails
- (b) Lost head nails (lost head brads)
- (c) Clout, slate or felt nails
- (d) Extra large head felt nails
- (e) Roofing nails (convex head, chisel point)
- (f) Panel pins
- (g) Lath nails
- (h) Wall nails
- (j) Cut-lath nails (cut tacks)
- (k) Round wire dowells with double diamond points (dowell pins).

This standard was first issued in 1956 specifying the shank diameters of different types of mild steel wire nails in SWG, lengths in inches and packing requirements in pounds. In the revised version the shank diameters and lengths have been specified in millimetres and the packing requirements in kilograms.

Draft Indian Standard for Bright Bars for Threaded Components (Doc : SMDC 1 (353)).

The Indian Standards Institution has prepared a draft Indian Standard Specification for Bright Bars for Threaded Components, Doc: SMDC 1(353).

This draft standard prescribes the sizes and tolerances of bright bars for the manufacture of threaded components.

While special consideration has been given to cover round and hexagonal bright bars required for the threaded fastener industry, the requirements regarding square bars have not been included in the draft specification as they are not used in the threaded fastener industry to any appreciable quantities.

This draft standard (which is in English) will be circulated shortly for comments.

Draft Indian Standard for Structural Quality Hot Rolled Carbon Steel Sheet and Strip (Doc : SMDC 5 (372)).

The Indian Standards Institution has prepared a draft for Structural Quality Hot Rolled Carbon Steel Sheet and Strip; Doc: SMDC 5(372) Revision of IS: 1079—1958.

This standard was first issued in 1958. The modifications made in the revised draft relate to the inclusion of two more grades of steel and designation of steel according to IS: 1762—1961 Code for Designation of Steel. Besides, all dimensions and quantities appearing in this revised standard, have been given in metric system.

The draft standard covers the requirements for five grades of hot rolled carbon steel sheet and strip intended for the manufacture of cold formed structural members and for other general engineering purposes. The five grades are designated as 0—1079, St 34—1079, St 42—1079, St 50—1079 and St 52—1079 respectively. The grades St 34—1079, St 42—1079 and St 50—1079 (surface descaled) included in the draft are of guaranteed weldable quality. For spot welding, only St 34—1079 steel is recommended as spot welding becomes increasingly difficult with carbon in excess of 0.15 per cent.

Indian Standard for Cold Rolled Plain Carbon Steel Sheets (Doc. : SMDC 5 (387)).

The Indian Standards Institution has prepared a draft for Cold Rolled Plain

Carbon Steel Sheets; Doc: SMDC 5(387)—Revision of IS: 513—1954.

This standard was first issued in 1954 as a tentative Indian Standard. The main modification made in the draft revision relates to the inclusion of two additional types of steel sheets in order to cater to the requirements for rapid industrial development in the country. Extra deep drawing quality steel sheets, which are now being used considerably in the automobile and other industries, have also been covered in the revised draft. Besides, all dimensions and quantities appearing in this revised draft have been given in the metric system.

The draft standard covers the requirements for cold rolled plain carbon steel sheets required for panelling, enamelling, deep drawing and for general engineering purposes. All types of sheets included in this standard are of guaranteed weldable quality and are suitable both for fusion and spot welding.

The draft revision provides for cold rolled steel sheets to be supplied in any of the three finishes, viz., dull, smooth and bright. As separate Indian Standard Specifications for Galvanized Steel Sheet (Plain and Corrugated) (IS : 277—1951) and Black Plate for Tinning and Tinplate (IS: 597—1955) have already been published, galvanized and tinned finishes have been excluded during revision.

As special qualities of steel sheets are available in a variety of types and finishes, the purchaser can get the best type of material by furnishing the manufacturer with the fullest possible information on the purpose for which the sheets are required. The information will generally be of assistance to the manufacturer in deciding the type and finish most suitable for a specified purposes.

This draft standard (which is in English) will be circulated shortly for eliciting technical comments.

Draft Indian Standard for Steel Tubes for Automobile Cycle and Motor Cycle Purposes [Doc. : SMDC 22 (316) and 22(317)]

The Indian Standards Institution has prepared the following draft Indian Standard Specifications:

- (i) Steel Tubes for Automobile Purposes, Doc: SMDC 22(316)
- (ii) Steel Tubes for Cycle and Motor Cycle Purposes, Doc: SMDC 22 (317)

These draft Standards prescribe the requirements for the following three types of tubes:

- (a) Cold Drawn Seamless Steel Tubes (CDS).
- (b) Electric Resistance Butt-Welded Steel Tubes (ERW), and
- (c) Cold Drawn Electric Resistance Butt-Welded Steel Tubes (CEW).

When finalized, these Standards will considerably assist the indigenous production of steel tubes, the demand for which has greatly increased with the rapid rise in the production of cycles and automobiles in this country.

These draft standards (which are in English) will be circulated shortly for eliciting technical comments.

CORRECTIONS

Please refer to Tables for *Cloth Requirements in Metric Terms* appearing on pages 13—23 of May 1962 issue of *Metric Measures*. The following corrections may please be incorporated:

Table I Cloth Requirements for Men's Apparel

- (1) Item 5 Trousers (Cotton) in Col. 4 for 1.44 please read 1.49, and in Col. 5 for 1.45 please read 1.50
- (2) Item 13 Bush-Shirts, Manila etc., Col. 4 for 1.83 please read 2.29, and in Col. 5 for 1.85 please read 2.30
- (3) Item 15 Turban, in Col. 4 for 6.49 please read 6.40

Table II—Cloth Requirements for Women's Apparel

- (4) Item 3 Sarees, in Col. 5 for 4.60 please read 4.50, in Col. 5 for 6.50 please read 5.50, in Col. 3 for 7(46"—48") please read 7(45"—48") and in Col. 5 against 7 yards for 7.25 please read 6.50

Table III—Ready Made Garments

- (5) Item 3 Shirt, Collar, in Col. 4 for 34 please read 34.3, and in Col. 4 for 43 please read 43.2

- (6) Item 11 Sola and Felt Hats, in Col. 4 for 18.1 please read 17.9, for 18.7 please read 18.1, for 19.1 please read 18.7, and for 20.3 please read 19.1.

- (7) Item 12 Caps, in Col. 4 for 46 please read 45.7

- (8) Item 15 Socks, in Col 4 for 26.8 please read 26.7

Boy's Wear

- (9) Item 2 Half Pants, length, in Col. 4 for 30 please read 30.5

- (10) Item 3 Shirts, neck, in Col. 4 for 30 please read 30.5

- (11) Item 5 Socks, in Col. 3 for 6½ please read 6½.

Children's Wear

- (12) Item 2 Baby's Rain Coat, in Col. 5 please delete 53

Table V—Miscellaneous Requirements

- (13) Item 1 Durries, against size 12'×15' for 3.75×5.50 m please read 3.75×4.50 m

- (14) Item 2 Coir Carpets and Kalin and Rugs, against size 9'×9' in Col. 5 for 3.75 please read 2.75, against size 9'×12' in Col. 4 for 2.74×2.74 m read 2.74×3.66 m and against Col. 5 for 2.75×2.75 m please read 2.75×3.75 m.
- (15) Item 6 Curtain cloth, width, in Col. 5, please read 118 cm, 120 cm, 122 cm for 118.5 cm, 120 cm, 122.5 cm.
- (16) Item 9 Floorings, width, in Col. 5 for 100 cm please read 110 cm, and for 60 cm please read 50 m.

- (17) Item 11 Leather Suitcases, width, 14" in Col. 4 for 35.7 please read 35.6, and
- (18) Against Depth 7" in Col. 4 for 17.7 please read 17.8.

The letter published in *Readers' Forum* in the July 1962 issue of *Metric Measures* is by Shri H. L. Mehandru, Controller of Weights and Measures, Delhi.

In the Table of Abbreviations, please read cu cm as abbreviation for cubic centimetre, and 100 a for 100a² against hectare.

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Licensed Manufacturers, Dealers and Repairers of Weights and Measures (21)

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 the Weights and Measures (Enforcement) Acts in their respective jurisdiction. This is the twentyfirst 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 the *Metric Measures* in which previous lists appear are also shown suitably.

An analysis of the licenses, including the present list, shows that the total number of

licensees in 14 States and 5 Union Territories is 1,172 manufacturers, 4,707 dealers and 1,096 repairers. The details of published information are as follows:

Sl. No.	State/Union Territory	Licensees		
		Manufacturers	Dealers	Repairers
(1)	Andhra Pradesh	101	194	54
(2)	Assam	16	97	28
(3)	Bihar	20	69	34
(4)	Delhi	28	93	20
(5)	Gujarat	109	578	132
(6)	Himachal Pradesh	1	28	1
(7)	Kerala	40	489	116
(8)	Madhya Pradesh	115	496	9
(9)	Madras	79	828	126
(10)	Maharashtra	101	163	185
(11)	Manipur	14	85	5
(12)	Mysore	104	471	165
(13)	Orissa	87	17	3
(14)	Pondicherry	2	12	2
(15)	Punjab	39	157	29
(16)	Rajasthan	43	206	44
(17)	Tripura	1	9	0
(18)	Uttar Pradesh	207	515	88
(19)	West Bengal	65	200	55
		1,172	4,707	1,096

ANDHRA (5)

In the September 1961 issue of Metric Measures, a list of licensed manufacturers, dealers and repairers of Weight and Measures for the year 1961 was published. The following is a list of manufacturers, dealers and repairers licensed for the year 1962 under the Andhra Pradesh Weights and Measures (Enforcement) Act 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Adabala Satyanarayana & Sons, Dowlaishwaram, E. Godavari.	Beam Scales.
(2)	Asian Industries (Prop. Mohd. Yousaf Qadri, 3-2-29/2 Niboli Adda Station Road, Kachiguda, Hyderabad.	Brass Weights.
(3)	Andhra Ratna Iron Foundry, Near Addanki Gate, Ongole, Guntur.	Cast Iron Weights.
(4)	Andhra Scientific Co. P. Ltd., Cantonment Road, Masulipatnam.	Bullion Weights and Weighing Instruments.
(5)	Asiatic Machinery Corporation P. Ltd., Howrah ..	Weighing Instruments.
(6)	Avery Co. of India P. Ltd., Hindi Road, Extension, Calcutta	Weights Measures, Weighing and Measuring Instruments.
(7)	Bharat Moulding (Partners, 1 M.M. Babu (2) Bharat Chand (3) Veer Malappa) 21-2-194, Charkaman Tanksal, Hyderabad.	Brass Weights.
(8)	Baba Industries, Trunk Road, Cuddapah	Conical type measures.
(9)	Bharat National Foundry, Motia Khan, New Delhi	Cast Iron Weights.
(10)	Central Metal Works, Prop. Sri Serferaj Khan) 15-1-453, Feel Khana, Hyderabad.	Brass Weights & Measures.
(11)	Deccan Porcelan & Enamel Works, 2707, Bakaram, Mushirabad, Hyderabad.	Cast Iron Weights.
(12)	Durga Foundry Works, Kothawada, Warangal	Cast Iron Weights.
(13)	Federation & Industrial Cooperatives Ltd., Bachir Bagh, Hyderabad.	Land Measuring Chains
(14)	General Purpose Engg. Works, Shop. Tadepalligudam, W. Godavari.	Cast Iron Weights Bullion Weights.
(15)	Goyal Industries, Mon Bhavan, 3681, Sultan Ganj, Agra	Brass Weights.
(16)	Hyderabad Iron & Steel Works, P.B. No. 10, Industrial Area, Azamabad, Hyderabad.	Cast Iron Weights and Land Measuring.
(17)	S.K. Industries, Bakaram, Musheerabad, Hyderabad ..	Cast Iron Weights.
(18)	S. & P. Industries, Factory Units, Industrial Estate, Warangal	Cast Iron Weights.
(19)	India Iron Foundry, Sultan Ganj, Agra	Cast Iron Weights.
(20)	S.K. Iron Foundry & Engg. Co., Rambagh, Agra	Cast Iron Weights.
(21)	Jamsheed Iron & Steel Co., Siddiamber Bazar, Hyderabad ..	Conical Measures.
(22)	Jeevan Nagi & Sons, River Bank, Savarkondla	Beam Scales.
(23)	Jeevanlal (1929) Ltd., P. B. No. 1389, 127 Mint Street, Madras.	Dipping Type Capacity Measures.
(24)	Kanka Durga Iron Works, Jagannaikapur, Kakinada ..	Beam Scales.
(25)	Jaya Krishna Iron & Industrial Works, Dowlaishwaram ..	Beam Scales.
(26)	L. Karson Ramji & Sons, Savarkondla	Beam Scales.
(27)	Luhar Jiva Gopal, Savarkondla Saurashtra, Gujarat ..	Beam Scales.
(28)	Luhar Mulji Naran, Savarkondla, Saurashtra	Beam Scales.
(29)	Luhar Kanji Ranchod, Siddipura, Savarkondla	Beam Scales.
(30)	Misrila Motilal, Topkhana Qadeem, Osmangunj, Hyderabad	Brass Weights, Linear Measures & Weighing Instruments.
(31)	Marwadi Moulding Factory, Kasaratta Road, Hyderabad ..	Cylindrical Dipping Type Measures.

Manufacturers (Contd.)

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(32)	A. M. Master & Co., Janjekar Street, Bombay	Beam Scales & Counter Machines.
(33)	Majestic Metal Works, Mittikasher, Begum Nazar, Hyderabad	Brass Weights & Measures.
(34)	Mighty Scales Co., Kuranchery, Wada, Kancheri Railway Station, Kerala.	Platform Weighing Scales.
(35)	National Metal Industries, 15-A Parel Village Road, Parel, Bombay.	Cylindrical Type Measures.
(36)	Oriental Metal Pressing Works, 131, Worli, Bombay ..	Weights, Measures, Weighing & Measuring Instruments.
(37)	Pappu Veeranna & Sons, Dowlaishwaram, E.G.	Cast Iron Weights & Beam Scales.
(38)	Pandu Ranga Engineering & Moulding Works, Railway Feeder Road, Tadepatri, Ananthapur.	Cast Iron Weights.
(39)	Raiz & Brothers, 134-138, Near Post Office, Sadar Bazaar, Delhi-6.	Brass Weights, Scales, Platform Machines, Counter Scales.
(40)	Shree Ranganayaka Iron Works, Dowlaishwaram, E. Godavari	Beam Scales.
(41)	Raj Kamal & Co., Bombay, Kumarwada 4th Lane, Bombay	Beam Scales, Counter Scales & Length Measures.
(42)	Star Metal Works, Joshiwada, Raja Dhan Rajgriji Meth, Begum Bazar, Hyderabad.	Measures.
(43)	Sectarama Engg. Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(44)	Shree Krishna Iron Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(45)	Swamy Alivelu Industries, Lakkavaram Post, Razole, E.G.	Weights.
(46)	Sadanand Engineering Works, 19/1 Industrial Areas, Azamabad, Hyderabad.	Beam Scales.
(47)	Safe Scale Co., 22-6-257, Kali Kaman, Hyderabad ..	Brass Weights.
(48)	Surya Engineering Works, Industrial Estate, Warangal ..	Cast Iron Weights.
(49)	Sivarama Engineering Works, P.B. No. 116, Sangadigunta, Guntur.	Iron Weights.
(50)	Standard Foundries (Prop. K. N. Vithavi) P.B. No. 16, Nizamabad.	Cast Iron Weights.
(51)	Scientific Engineering Home P. Ltd., Bashir Bagh, Hyderabad	Land Measuring Chains.
(52)	Swami Engineering Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(53)	Saraswathi Iron Balance Works, Dowlaishwaram, E. Godavari	Beam Scales.
(54)	Shanta Vijaya Chain Factory, Pandyal Street, Savarkondla	Beam Scales.
(55)	Shree Ram Mills Ltd., Fergusson Road, Lower Parel, Bombay-13.	'SRM' Cast Iron Weights.
(56)	Taj Industries (Prop. Mohd. Jamaluddeen) 5-5-274/7 Behind Gandhi Bhavan, Nampalli, Hyderabad.	Brass Weights and Conical Type Measures.
(57)	Technical Appliance Co., 16-7-739, Osmanpura, Hyderabad	Land Measuring Chains.
(58)	Venkateswara Iron Works, Dowlaishwaram, E. Godavari ..	Beam Scales.
(59)	Venkateswara Light Casting Works, 1-7-176, Bakaram Hyderabad.	Cast Iron Weights.
(60)	D. L. Vaid, 202, Cutlery Bazar, Bombay-3	Beam Scales.
(61)	Watan Weight Works, Behind Canara Bank, Pathargatti, Hyderabad.	Brass Weights & Metre Measures and Counter Scales.

Dealers

(1) The Avery Co. of India P. Ltd., 889, Post Office Road, Hyderabad.	(4) Abdul Kareem Maniyar, Iron Fabricator & Hardware Merchant, Adoni, Kurnool.
(2) Arvapalli Balakrishna Ega, Ramula, Kaman Bazaar, Khammam.	(5) Annavarapu Rana Subba Rao, Gopal Reddy Street, Main Road, Tenali.
(3) S. K. Abdul Wahab, Wahab Chowk, Tenali (Guntur Dist.).	(6) Amara Purshotham, B. Venkata Rao & Co., Post Box No. 105, Morispet, Tenali (Guntur Dt.).

Dealers (Contd.)

- (7) N. Abdul Aziz Sons, Main Bazaar, Adoni (Kurnool).
- (8) Andhra Scientific Company, Cantonment Road, Masulipatnam.
- (9) Bangaruvenkata Suryanarayana Rao, Main Road, Palkot, West Godavari Dt.
- (10) K. Baswaraju, Railway Feeder Road, Yellamanchelli, Visakhapatnam Dt.
- (11) Baba Industries, Post Box No. 62, Christian Lane, Cuddapah.
- (12) Bandalapalli Lakshminarayana Setty Sons, Iron & Steel Merchants, Dharmavaram, Ananthapur Dt.
- (13) Battula Jagga Rao Sons, Nalam Bheemaraju Street, Rajahmundry, E. Godavari Dt.
- (14) Bethireddy Gani Reddy, Todd Market, Tadepalligudam, West Godavari District.
- (15) Central Metal Works, 15-1-457, Feel Khana, Hyderabad.
- (16) Chunduru Gopalakrishna Murthy, General Merchants, Main Bazaar, Repalli, Guntur Dt.
- (17) Chittuluru Pedda Venkata Subbaiah and Co., Rasool Bazaar, Kurnool Dt.
- (18) Cheetirala Subba Ramaiah Gupta, Main Bazaar, Proddutur, Cuddapah Dt.
- (19) The City Central Fancy Stores, Main Road, Rajahmundry, East Godavari.
- (20) Colluru Venkanna & Sons, Timber Tiles, Hardware Merchant, Visakhapatnam.
- (21) Deccan Porcelain and Enamel Works Ltd., 2707, Bakaram Musheerabad, Hyderabad.
- (22) Dawood Baig Sahib, No. 58, Pattabhi Market, Masulipatnam, Krishna Dt.
- (23) Danty Govindiah, Suryanarayana & Brothers, Hindu Pur, Ananthapur.
- (24) Everest Company, (Prop. Harigopal Munda), Kumar Galli, Nizamabad.
- (25) The Federation of Industrial Cooperatives Ltd., Bashir Bagh, Hyderabad.
- (26) Gudivada Bhavannarayana, Hazariwari Street, Guntur.
- (27) Grandhi Chenchayya, Kotla Bazar, Chirala, Guntur Dt.
- (28) Grandhi Maridayya & Sons, Main Road, Anakapalli P.O., Visakhapatnam Dt.
- (29) Gelli Krishna Murthee Fir, Main Road, Vijayawada, Krishna Dt.
- (30) I.A.E.C. Hyderabad Ltd., Gunfoundry, Hyderabad.
- (31) Hardware Merchant Prop. Chitkeshahvisanadha Narsimlu, Bada Bazaar, Nirmal.
- (32) S. K. Industries, Begum Bazaar, Mittika Sher, Hyderabad.
- (33) Jamsheed Iron and Steel Company, Siddiamber Bazaar, Hyderabad.
- (34) Konduri Veerabhadra Rao, Tadepalli, Gudem, West Godavari.
- (35) Kesari Hardware Stores, Tilak Road, Gudivada, Krishna Dist.
- (36) K. Jagannadha Rao, Hardware & Paint Merchant, Main Road, Visakhapatnam.
- (37) Khaja Muslehuddink, Old Beat Bazaar, Warangal.
- (38) Janyavula Ramachandra Rao & Co., Powerpet, Elore, W. Godavari.
- (39) Janta Dealers (Prop. Mohd. Yousuf Hussain), Siddipet.
- (40) Jeewanlal (1929) Ltd., 127, Mint Street, P.B. No. 1389, Madras.
- (41) Kota Pullaiah & Sons, 23-12-51, Hazariwari Street, Guntur Dt.
- (42) K. Krishna Murthy, Old Beat Bazaar, Warangal.
- (43) Karana Venkatchalam, Main Bazaar, Jammalamadugu, Cuddapah.
- (44) Ketala Rama Mohana Rao, Iron Merchant, Kolla Bazaar, Vijayanagaram, Visakhapatnam.
- (45) Kolesetty Maduleti Chetty, 7/198, Sunderchar-yulu Street, Proddutur, Cuddapah.
- (46) Kovur Ramaiah Chetty, 13/3 Ghandi Bazaar, Ananthapur.
- (47) Korukonda Seetharamaswamy, Main Road, Kakinada, E. Godavari.
- (48) Kollapara Suryasatyanarayana, Narsapur, East Godavari.
- (49) Karumuri Perumallu & Sons, Bheemavaram, W. Godavari.
- (50) Lakshmi Iron Stores, Main Road, Dudivada, Krishna Dt.
- (51) Misrilal Motilal, Topkhana Quadeem, Opp. Osman Ganj, Hyderabad.
- (52) Majestic Metal Works, Mittikasher, Begum Bazaar, Hyderabad.
- (53) K. Markandeyulu, M. Kollaiah & Co., Broker Bazar, Guntur Dt.
- (54) Menti Subha Rao, Main Road, Bheemavaram (W. Godavari).
- (55) Marella Venkata Ramanaiah Sons, Iron Merchants, B.K.M. Street, Cuddapah.
- (56) Mohd. Khasim Ali, Jammalagada, Nalgonda Dt.
- (57) Mohisin Brothers, Mohsin Manzil, Harbour Road, Visakhapatnam.
- (58) Neerella Bapanaiah, Post Office Road, Vinukonda, Guntur Dt.
- (59) Nagavarapu Butchy Abbi Son, Main Road, Rajahmundry, East Godavari Dt.
- (60) Prakash & Co., 12-1-111, Main Road, Narsaraopet, Guntur Dt.
- (61) Pappu Veeranna & Sons, Dowlaishwaram, East Godavari Dt.
- (62) Paluri Narayana Murthy, Iron and Steel Merchant, Railway Station Road, Anakapalli.
- (63) Penugonda Kamaraju & Sons, Iron and Hardware Merchant, Tuni, East Godavari District.
- (64) Pullakandam Pullaiah Son Firm, Hardware Merchant, Kaman Bazaar, Khammam, Khammam Dt.

Dealers (Concl.)

- (65) Rameshchandra Amrutlal, Shroff Bazaar Ward 13, Door No. 640, Adoni, Kurnool Dt.
- (66) Raghu Cottage Industries, Main Road, Bapatla, Guntur Dt.
- (67) Ramakrishna Hardware Co., Hazariwari St., Guntur Dt.
- (68) C. Rama Moorthy, C/o Burmah Shell 'B', Nellore Dt.
- (69) Raja Weights & Measures (Prop. Sri Venkadara Subbarayudu Setty), Jammalamdugu, Cuddapah.
- (70) Revuri Satyanarayana & Sons, Rajaji Street, Kakinada, East Godavari Dt.
- (71) G. Ramanaiah Nayudu, 10/32 Santhapet, Nellore.
- (72) Scale Adjusting Services, Topkhana Qadeem, Osmanganj, Hyderabad.
- (73) Syed Mohiuddin, Market Road, Mahaboobnagar.
- (74) Syed Hussain Scale Centre, Market Road, Mahaboobnagar.
- (75) Swamy Engineering Works, Swamy Alevulu Industries, Lakkavaram Post, Rozole, East Godavari Dt.
- (76) M.S. Sayasaiah & Co., Main Road, Visakhapatnam.
- (77) Syed Ibrahim, S/o Syed Ahmed, Kothaguda Suryapet, Nalgonda Dt.
- (78) C. Suryanarayana, G.V. Satyanarayana & Co., Main Road, Vijayawada.
- (79) Sadanand Engineering Works, 19/1 Azamabad, Hyderabad.
- (80) Suggala Laksh Satyanarayan, Jangammnapet, Tenali, Guntur Dt.
- (81) Shaik Azeez Mohiuddin, Iron Manufacturing Works, Harding Street, Ongole, Guntur Dt.
- (82) Saggu Venkatanarayana Chetty & Co., Jewellers Diamond Hall, Nandyal.
- (83) D. Satyanarayana Setty, General Merchant & Commission Agent, Gandhi Bazar, Ananthapur Dist.
- (84) Satyanarayana Iron & Steel Works (Prop. G. Brahmaiah), Trunk Road, Kavali Nellore.
- (85) Sekhar & Company, Main Road, Elore, West Godavari.
- (86) Sriraja Suryanarayana, 14 11 Ghandi Bazaar, Ananthapur.
- (87) N. V. Subbaiah, Mundi Merchant, Jammalamadugu, Cuddapah.
- (88) Shaik Masthan & Brothers, Peer Saheb Street, Bhimavaram, West Godavari Dt.
- (89) Syed Nazir Ahmed, C/o Dr. Mohd. Sultan Mohiuddin, Kandukur, Nellore Dt.
- (90) Sivarama Engineering Works, K.M.S. Gupta, P. A. Chowdry & Co., P.O.B. No. 116, Sangadigunta, Guntur.
- (91) Sitha Ramanjaneya Engineering Works, Dowlaishwaram, Post Office, East Godavari.
- (92) Tommanna Bapanaiah & Sons, Main Road, Vijayawada, Krishna District.
- (93) Tripuramalla Viswanadham, South Street, Vinukonda, Guntur Dt.
- (94) Thodupnunoori Badraiah, Osmanganj, Karcemnagar.
- (95) Thatha Chinnavenkata Subbaiah Sreshtty Sons, Harding Street, Ongole, Guntur.
- (96) Thatha Padmanabaiah & Sons, Harding Street, Ongole, Guntur.
- (97) Thoatepu Satyanarayana Murthy, Door No. 7-30-50, Main Road, Rajamundry (E. Godavari Dt.).
- (98) T. L. Vishwanathah & Bros., Post Box No. 4, Hindpur, Ananthapur.
- (99) Vijay Iron Mart, Main Bazar, Adoni, Kurnool Dt.
- (100) Vikkalam Pullaiah Setty, Ghandi Bazaar, Ananthapur Dt.
- (101) Vijaya Weights & Measures (Prop. D.V. Ramaiah), Allagadda Post Office, Kurnool Dt.
- (102) Vetcha Gangaraju Sons, 18-245, Main Road, Rajamundry, E. Godavari Dt.
- (103) K. Veeraiah, Afzal Ganj, Hyderabad.
- (104) Venkadari Subbarayadu Chetty & Co., 17/201, Mundi Bazaar, Cuddapah.
- (105) Viruturi Gopalakrishnaiah, 14/194, Main Bazaar, Proddutur, Cuddapah Dt.
- (106) Vithani Industrial Works, (Prop. K. N. Vithani) Near Railway Gate, Nizamabad.
- (107) Vomina Subramanayam & Sons, 10/94, Shanthapet, Nellore.
- (108) Yagnaiah & Sons, Park Road, 10/365, Vijayawada.
- (109) Yella Subbarayudu, Kalvakollu Street, Amabapuram, (H.O. Kothapeta) East Godavari Dt.
- (110) G.S. Yoganadham, 13/111, Market Street, Chittor.

Repairers

- (1) Avery Co. of India P. Ltd., Post Office Road, Hyderabad.
- (2) Andhra Scale Centre, 11-6-629, Nampally Road, Hyderabad.
- (3) Azeez Mohiuddin, Iron and Manufacturing Works, Harding Street, Ongole.
- (4) Anjanaya Weights and Measures Depot, Vinayaka Street, Tenali.
- (5) ACMY Company (Prop. Mohd. Kamaruddin) B. B. Bazaar, Shop No. 23-1-868, Near Mirjumla Tank, Hyderabad.

Repairers (Contd.)

(6) Abdul Wahab, Wahab Chowk, Tenali (Guntur).	(15) Jagdamba Repairing Works, Chowk Maidan Khan, Charminar East, Hyderabad.
(7) Annavarapu Rama Subba Rao, Gopala Reddy Street, Main Road, Tenali, Guntur Dt.	(16) Koduru Veeranjana Varaprasad Rao, Kothapet, Tenali.
(8) Bharat Scale Repairing Shop, Mandi Bazaar, Warangal.	(17) Misrilal Motilal, Opposite Osmanganj, Quadeem Topkhana, Hyderabad.
(9) Bombay Scale Adjusting Centre, (Prop. Mohd. Khaza Moinuddin) Puranihaveli, Hyderabad.	(18) Bombay Scale Adjusting Centre, (Prop. Mohd. Khaza Moinuddin) Puranihaveli, Hyderabad.
(10) Balaji Metal Works, (Prop. Padala Ramaswamy) Suryanarayanapuram, Kakinada (E. Godavari)	(19) Scale Adjusting Services, Opposite Osmanganj, Quadeem Topkhana, Hyderabad.
(11) Chitirala Venkateswarlu, 13-2-10, Main Road, Narasaraopet (Guntur).	(20) Star Scale Services, Khasba Bazaar, Khammam.
(12) Dawood Baig, Pattabhi Market Road, Shop No. 58, Masulipatnam (Krishna Dt.).	(21) Tripuramall Viswanadham, South Street, Vinukonda, Guntur Dt.
(13) Everest & Co., Mumar Galli, Nazamabad.	(22) A. V. Thomas & Co. (India) Ltd., 2/21, First Line Beach, Madras-1.
(14) I.A.E.C. Burmah Shell Building, Gunfoundry, Hyderabad.	(23) United Scale Centre (Prop. D. Yadgiri Raj) Sultan Shahi, House No. 22-4-416, Tajnaka, Hyderabad.

ORISSA (6)

In the March, July and November 1960 and March 1961 issues of Metric Measures lists of licensed manufacturers, dealers and repairers of weights and measures in Orissa State were published. The following is a list of manufacturers, dealers and repairers of weights and measures subsequently licensed under the Orissa Weights and Measures (Enforcement) Act, 1958.

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	Agrawala Iron Works, Motilal Nehru Road, Agra	Cast Iron Metric Weights.
(2)	Avery Co. of India (Pvt.) Ltd., Avery House, 28/2, Waterloo Street, P.O. Box No. 377, Calcutta-1.	Weights, Measures, Weighing and Measuring instruments.
(3)	Agrawal Tin Manufacturing Company and Engineering Works, Sultanganj, Agra.	Cast Iron Metric Weights.
(4)	Associated Industrial Corporation, 81, North Vijainagar, Agra.	Brass Bullion and Brass Commercial Metric Weights and Dipping type cylindrical measures.
(5)	Bharat National Foundry, Motiakhana, New Delhi	C. I. Metric Weights.
(6)	B. C. Iron Foundry, Sultanganj, Agra	Cast Iron Metric Weights.
(7)	Bharati Scale and Engineering Company, 4/1 Haldaspara Lane, Khurut, Howrah, West Bengal.	Weighing Machines.
(8)	Balanga Iron Works, At P.O. Balasore	Cast Iron Metric Weights.
(9)	C. P. Foundry Works, Kampti Road, Bezon Bag, At/P.O. Nagpur.	Cast Iron Metric Weights.
(10)	Kohinoor Aluminium Products Ltd., Industrial Estate, Rourkella-4.	Dipping type cylindrical measures and pouring type cylindrical measures.
(11)	N. N. Karmarkar, S/o Wooma Charan Karmakar, 208, Harison Road, Calcutta.	Class 'C' and 'D' Beam Scales.
(12)	Krishna Iron Foundry, Freeganj, Agra	Cast Iron Metric Weights and Brass Bullion and Brass Commercial Weights.
(13)	Mallamal Ramporsad, Belanganj, Agra.	Cast Iron Metric Weights.
(14)	Multan Engineering Works, 1773, Mirjuma, Lalkuan, Delhi-6	Dipping type cylindrical measures and pouring type cylindrical measures and conical measures.

Manufacturers (contd.)

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(15)	National Iron Foundry, Motilal Nehru Road, Agra ..	Cast Iron Metric Weights and Flat Cylindrical Brass Metric Weights.
(16)	National Foundry and Rolling Mills Ltd., Nayabazar, Cuttack.	Cast Iron Metric Weights.
(17)	National Industrial Cooperative Corporation Ltd., P. O. Jatni, Dist. Puri.	Cast Iron Metric Weights.
(18)	New Orissa Engineering Works, Khetrajpur District, Sambalpur.	Flat Cylindrical Brass Commercial and Brass Bullion Weights.
(19)	Oriental Metal Pressing Works (P) Ltd., P.B. No. 6556, Bombay-18 (131-Worli).	Dipping type cylindrical capacity measures and pouring type cylindrical measures.
(20)	Rourkella Machine Tools, Rourkella, Industrial Area, Rourkella-4.	Cast Iron Metric Weights.
(21)	Riaz and Brothers, Sadar Bazar, New Delhi	Brass metric weights and dipping type cylindrical measure and conical measures.
(22)	Seetharam Engineering Works, P. O. Dawalisharam, Dist. East Godavari, Andhra Pradesh.	Beam Scales.
(23)	Standard Steel and Iron Foundry, Laxmi Mills Building, Jeoni Mandi, Agra.	Cast Iron Metric Weights.
(24)	Satish Chandra Das and Co., 113, Khangrapatti Street, Calcutta.	Brass Bullion and commercial metric weights and class 'B' weighing scales.
(25)	R. K. Tiwari, Proprietor, Orissa Agricultural Industries, Khetrajpur, Sambalpur.	Cast Iron Metric Weights.
(26)	Utkal Metal Industries, Khetrajpur, District Sambalpur	Flat Cylindrical Brass Weights and Flat Cylindrical Bullion Weights.
(27)	D. L. Vaid, 215-Ripon Road, Bombay-8	Brass Bullion and Brass Commercial Metric Weights.

Dealers (Licensed for Weights, Measures, Weighing & Measuring Instruments)

(1) Abba Hossion Saleemohd., At/P.O. Rajgangpur.	(17) Dhaniram and Sons, College Square, Cuttack-3.
(2) Avery Co. of India P. Ltd., Station Road, Calcutta-3.	(18) Dhenkaval Regional Cooperative Marketing Society, Dhenkanal.
(3) Bhuramal Rungta, P.O. Khetrajpur, District Sambalpur.	(19) Eppili Linga Raju, Chetrapur, Ganjam.
(4) Bhagwan Ram Ram Raja Ram, College Square, Cuttack-3.	(20) Fakir Chowdhury, Sakhihopal.
(5) Baboolal Gupta, for 'Ispat Udyog', P.O. Rairangton, Dt. Mayurbhanj.	(21) Giridharilal Kedia, Jharsuguda, Sambalpur.
(6) Birdi Chand Rameswar, Dolmandap Sahi, Puri.	(22) Gopikrishna Dey, Motiganja Bazar, At/P.O. Balasore, Dt. Balasore.
(7) Biswanath Misra, At/P.O. Nayagarh, Dt. Puri.	(23) Gaurang Charan Kar, Kendrapara.
(8) Bhanjanagar Regional Cooperative Marketing Society, Bhanjanagar.	(24) Gobind Prasad Rambilas, Main Road, Sambalpur.
(9) Bijay Bhandar, Phulbani.	(25) P. K. Gosh, Puri.
(10) Biharilal Omprakash, Rourkella-1.	(26) Hadu Tarai Ranglal, Biramitrapur.
(11) Bargarh Regional Cooperative Marketing Society, At/P.O. Bargarh, Dt. Sambalpur.	(27) Hadu Subudhi and Lakkon Subudhi, Kharuda Street, Big Bazaar, Barhampur, Dt. Ganjam.
(12) Bharataram Kandu, Ranihat, Cuttack-3.	(28) Jeypore Regional Cooperative Marketing Society, Bhanjanagar.
(13) Chandrakant Jayantilal, Nayasarak, Cuttack-2.	(29) Jayakrishna Pattanaik, Attagarh.
(14) Dwarka Prasad Sharma & Brothers, At/P.O. Bali Sahi, Dt. Puri.	(30) Khandelwal Iron and Steel Co., At/P.O. Baripada, Dt. Mayurbhanj.
(15) Dinanath Dubey, Khetrajpur, Sambalpur.	(31) Khubram Asharam, Bolangir.
(16) Digambar Bhanj, Haladiagarh, Haladia, Puri.	(32) Khalli Panda, Balugaon.
	(33) Kedarnath Agarwalla, Biramitrapur, Sundergarh.

Dealers (contd.)

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| (34) Kishorelal Agarwala for "Ramanand Chandra-bhan" Talcher, Dhankawal. | (54) T. Panchunath Patro for 'Prajnanandhu Stores', Bus Stand, At/P.O. Aska, Dt. Ganjam. |
| (35) Laxminarayan Choudhury for Orissa Scientific Co., Opp. High Court, Cuttack-2. | (55) Raghunath Rath, Tata Street, Bijapur, P.O. Berhampur, Dt. Ganjam. |
| (36) Murlidhar Gopalkrishan (P) Ltd., Post Box No. 18, (Arad Bazar), At/P.O./Dt. Balasore. | (56) Remeshwarlal Khandelwal At Motiganj Bazar, Balasore. |
| (37) Manoharlal Agarwala for 'Suresh Stores' At/Rajagangpur, Sundargarh. | (57) Rasiklal & Co., Keonjhar. |
| (38) Mahadeoprasad Krishna Prasad, College Square, Cuttack-3. | (58) Ramotar Agarwalla, At/P.O. Jatni, Dt. Puri. |
| (39) Mohamad Haji and Co., At/P.O. Angul, Dt. Dhenkanal. | (59) Ramji Jagajiban, Dhenkanal. |
| (40) Mungelal Rameshwarlal, Kantabanji, Dt. Bolangir. | (60) Ruliram Agarwal, Tililagarh, Bolangir. |
| (41) Munglal Gupta, Kesinga. | (61) Raghunath Singh Mishra, Nayagarh, Puri. |
| (42) Mishra and Partner, Ranihat, Cuttack. | (62) Sundergarh Regional Cooperative Marketing Society Ltd., Dt. Sundergarh. |
| (43) Manilal Doshi, Motiganja Bazar, Dt. Balasore. | (63) Sreeram Sitaram Rangali, Sambalpur. |
| (44) R. C. Nandi and N. K. Nandi, Purna Bazar, P.O. Bhadrak, Dt. Balasore. | (64) Sahu and K. H. Sahu, At/P.O. Talcher, Dt. Dhenkanal. |
| (45) Narsingh Trading Co., Raigarh, Sambalpur. | (65) State Cooperative Marketing Society, Cuttack. |
| (46) Nanagaram Agarwala Khetrajpur, Sambalpur. | (66) Satrugan Industries, Betnoli. |
| (47) Nowrangpur Regional Cooperative Marketing Society, Nowrangpur | (67) Sabudhi Hardware Stores, Asha. |
| (48) Narayan Sahoo, Bolagarh, Puri. | (68) Sadanand Subudhi & Partner, Main Road, Beokampur. |
| (49) Nandakrishore Padhi, Paralakhemendi. | (69) Sitaram Dunkuram, Angul. |
| (50) Orissa Hardware Stores, Sambalpur. | (70) United Supply Agency, Western Tower, House No. 14, Market Building, Bhubaneswar. |
| (51) Puskarlal Hariprasada, At/P.O. Baripada, Dt. Mayurbhanj. | (71) Utkal Agency, Sambalpur. |
| (52) S. Pal Chowdhury Buxi Bazar, Cuttack. | (72) G. Venkataraju & P. Janardhan Rao, Big Bazar, Berhampur. |
| (53) Punjab General Stores, Bhubaneswar. | (73) Utkal Traders' Union, Baripada. |

Repairer

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	Avery Company of India Private Ltd., Cuttack-3	Weights, Measures, Weighing and Measuring Instruments.
(2)	Orissa Agricultural Industries, Firm Road, Sambalpur	Weights, Measures, Weighing and Measuring Instruments.

PONDICHERY (1)

The following is a list of Manufacturers, Dealers and Repairers licensed under the Madras Weights and Measures (Enforcement) Act, 1958, as extended to the State of Pondicherry.

Manufacturers

Sl. No.	Name and Address of Manufacturers	Details of Articles Manufactured
(1)	Rajan Engineering Enterprises, West Boulevard, Pondicherry	Conical measures and length measures.
(2)	Swamy Foundry, 232, Bis, West Boulevard, Pondicherry	Conical measures and length measures.

Dealers

Sl. No.	Name and Address of Dealers	Details of Articles Sold
(1)	N. A. Arumuga Mudaliar, Bharathi Street, Pondicherry	All types of weights and measures.
(2)	S. K. Annamalai Chetty, No. 94, Bharathi Street, Pondicherry	All types of weights and measures.
(3)	Ananda Emporium, Duplex Street, Pondicherry	Weighing Instruments only.
(4)	Batchu Paparao, S/o Vincanna, Yanam	All types of weights, measures, weighing and measuring instruments.
(5)	B. K. Chappan Nair, Merchant, Mahe	All types of weights, measures, weighing and measuring instruments.
(6)	Grinde Manicka Chetty Son, 56, Duplex Street, Pondicherry	Weighing instruments only.
(7)	Grandy Somaganapahy Rao, S/o Latchmaya, Grand Bazaar Street, Yanam.	All types of weights, measures, weighing and measuring instruments.
(8)	Honesty Society, 73-A, Mission Street, Pondicherry	All types of weights, measures, weighing and measuring instruments only.
(9)	R. S. Krishna Chetty & Bros., 41, Thirunallar Road, Karaikal	All types of weights, measures, weighing measuring instruments.
(10)	P. V. Muniswamy Chetty Sons, No. 92, Bharathi Street, Pondicherry.	All types of weights and measures.
(11)	Metal Ware House, 86, Duplex Street, Pondicherry	All types of weights, measures and weighing instruments.
(12)	V. S. Muthuramalinga Chetty and Brothers, Market, Karaikal	All types of weights measures and weighing instruments.

Repairers

Sl. No.	Name and Address of Repairers	Details of Articles Repaired
(1)	Avery Company of India Private Limited, 16-17, Armenian Street, Madras-1.	All types of weighing instruments and weights.
(2)	T. Natesa Achari, 78, Gandhi Road, Pondicherry	Weighing instruments only.

PUNJAB (13)

In the July and September 1959, March, May, July, September and November 1960 and March, May, July, November 1961 and January 1962 issues of Metric Measures, lists of manufacturers, dealers and repairers of weights and measures in Punjab were published. The following is a list of manufacturers, dealers and repairers subsequently licensed under Punjab Weights and Measures (Enforcement) Act, 1958:

Manufacturer

Sl. No.	Name and Address of Manufacturer	Details of Articles Manufactured
(1)	S. K. Engineering Works, Regd., G. T. Road, Batala..	Cast Iron Weights 100 g to 50 Kg. Ordinary Brass Weights 10g to 50g (Standard Capacities)

Dealer

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(1)	Ganpat Ram Harbans Lal Kaithal	Weights, Measures, Weighing and Measuring Instruments.

Repairer

Sl. No.	Name and Address of Repairer	Details of Articles Repaired
(1)	Eleka Industries, Rainak Bazar, Jullundur City	Weights, Measures, Weighing Bea-scales, Platform Machines.

New 15-Year CUMULATIVE TIME DEPOSIT Savings Scheme

With effect from 1st June, 1962, a new 15-year account with a maximum monthly deposit of Rs. 300 has been introduced. The existing limit of monthly deposits in the 10-year account has also been increased to Rs. 200 with effect from the same date.

INCOME-TAX REBATE

As in the case of life insurance premia and contributions to Provident Funds, the deposits made in the 10 and 15-year accounts will be eligible for earning a rebate on Income-Tax, subject to the overall limit of Rs. 10,000 or $\frac{1}{4}$ of income, whichever is less.

TAX-FREE INTEREST

The deposits in the 10 and 15-year accounts earn a return of 3.8 and 4.3 per cent, compound interest, free of income-tax.

Further particulars from the nearest Post Office Saving Bank.

SAVE REGULARLY WITH CUMULATIVE TIME DEPOSITS
5-YEAR/10-YEAR AND THE NEW 15-YEAR ACCOUNTS

TYPICAL METRIC PRICING UNITS FOR WHOLESALE TRANSACTIONS

Serial No.	Commodity	Metric Unit
(1) Gold		10 grams(g)
(2) Grocery and Confectionery	Biscuits, sweetmeats, cardamoms.	1 Kilogram (kg)
Textiles and Textile Fibres	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufacturers (when sold by weight).	
Paints and Chemicals	Paint (if sold by weight), indigo, liquid chlorine.	
Hides, Skins & Leather	Raw hides, leather (hides and skins).	
Metals	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	
Miscellaneous	Tea, meat, camphor tablets, mica.	1 quintal (q) (100 kilograms)
(3) Grains and Pulses	Rice, wheat, jowar, arhar, moong, masur, gram.	
Spices	Black pepper, mustard, chillies, dhanial, dalcchini, turmeric, betelnuts.	
Plantation Products	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured).	
Forest Products	Lac and lac products, gums, myrobalans, galnuts, soapnuts.	
Textiles & Textile Fibres	Raw jute, raw hemp, coir yarn.	
Oils, Oilseeds & Oilcakes	Vegetable oils, oilseeds, oilcakes.	
Non-Ferrous Metals	Aluminium : ingots, bars, blocks, slabs, billets. Lead : ingots, sheets and strips. Copper : ingots, blooms, slabs, cakes, tiles, bricks billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles. Brass : ingots, rods, sections, pipes, sheets, strips, circles. Zinc : ingots, sheets, strips. Tin : blocks.	
Chemicals	Caustic soda, bleaching powder, glycerine, soaps, paper salt.	
Others	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind.	
(4) Minerals	Iron ore, manganese ore, bauxite, coal.	one metric tonne(t) (1,000 kilograms)
Iron & Steel	Pig iron, iron and steel manufactures, semis (billets for rerolling etc.)	
(5)	Cloth (mill, handloom, silk, rayon and woollen cloth).	1 metre (m)
(6)	Jute carpets, coir mats and matings, sheet glass.	one square metre (m ²)
(7)	Timber.	one cubic metre (m ³)
(8)	Paints (when sold by measure), spirits.	one litre (l)

Weights

(1) In place of the present units of seer, pound, rattal, viss etc., use the kilogram.

(2) In place of the tola, use the gram or 10 grams.

(3) In place of maund or corresponding unit, use the quantal i.e., 100 kg.

Volume Measures

(1) In place of seer or gallon or any other measure use the litre.

Length Measures

(1) Use the metre in place of yard or foot and the centimetre in place of inch.

Square Measures

(1) Use the square metre in place of square yard or square foot, and square centimetre in place of square inch.

Cubic Measures

(1) Use the cubic metre in place of cubic yard or cubic foot and cubic centimetre in place of cubic inch.

Packaging

It is advantageous if sizes of packages correspond to series of commercial weights and measures prescribed.

These are: 50 kg, 20 kg, 10 kg, 5 kg, 2 kg, 1 kg, 500 g, 200 g, 100 g, 50 g, 20 g, 5 g, 2 g, 1 g, and so on.

TYPICAL PRICING UNITS FOR RETAIL TRADE.

Serial No.	Commodity	Metric Unit for Use
(1)	Foodgrains, cereals, pulses, spices, ghee, bread, vegetables, meat, fish, sweetmeats, tea, coffee, sugar, salt.	1 kg
(2)	Oil for cooking	1 kg or 1 litre depending upon prevalent practice.
(3)	Fruits	1 kg or number depending upon prevalent practice.
(4)	Milk	1 litre
(5)	Cloth and related materials	1 metre
(6)	Prepackaged materials	Preferably sizes corresponding to series of commercial weights and measures.

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metric measures

THE PUBLICATIONS DIVISION

ABBREVIATIONS FOR METRIC UNITS

(1) DECIMAL MULTIPLES AND SUBMULTIPLES

Prefix	Value in Terms of Unit	Abbreviation
kilo	1000	k
centi	0.01 (10^{-2})	c
milli	0.001 (10^{-3})	m
micro	0.000 001 (10^{-6})	μ

(2) WEIGHTS

Denomination	Value	Abbreviation
tonne	1000 kg	t
quintal	100 kg	q
kilogram	1 kg	kg
gram	1 g	g
milligram	1 mg	mg
carat	200 mg	c

(3) CAPACITY

kilolitre	1 000 l	kl
litre	1 l	l
millilitre	1 ml	ml

(4) VOLUME

cubic metre	m^3	m^3 or cu m^*
cubic centimetre	cm^3	cm^3 or cu cm^*
cubic millimetre	mm^3	mm^3 or cu mm^*

(5) LENGTH

kilometre	1 000 m	km
metre	1 m	m
centimetre	1 cm	cm
millimetre	1 mm	mm
micron	$1/1\ 000\ mm$ or $10^{-3}\ mm$	μm

(6) AREA

square kilometre	1 000 000 m^2	km^2 or sq km^*
square metre	1 m^2	m^2 or sq m^*
square centimetre	1 cm^2	cm^2 or sq cm^*
square millimetre	1 mm^2	mm^2 or sq mm^*

(7) LAND MEASURE

are	100 m^2	a
hectare	100 a	ha
centiare	m^2	ca

*Both these abbreviations are current, but the first set should preferably be used. The former abbreviation is used internationally.

Rules for Abbreviations

- (1) Do not make any change, such as addition of 's' to indicate plurality e.g., write 1 kg, 10 kg, 20 g, 5g, 10 t, 20 ml, 27 l, 165 km, 2 mm, 100 cm^3 , 66 km^2 ;
- (2) Do not capitalize the abbreviations. For example, do not write 1 Kg, 2 Kg, 20 MM, 50 MM; the right way is to write 1 kg, 2 kg, 20 mm, 50 mm, etc.
- (3) Do not use any other abbreviations except those given above.

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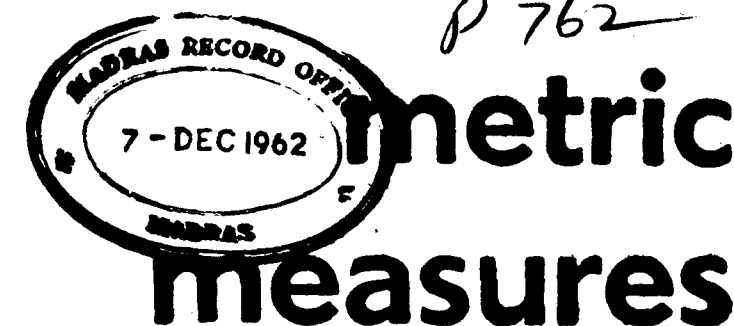
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Metric Reform in Madras

S. MONI

Controller of Weights & Measures,
Madras

AS elsewhere in India, the reform of weights and measures in Madras State has also had a chequered career. The need for uniformity of weights and measures had been realised all along, but half-hearted attempts of successive rulers in South India without reference to conditions prevailing outside their territory made these attempts infructuous.

As in the North, commercial weights in Madras State were for long based on multiples of local coins issued by various rulers from time to time. And when, with the advent of the British rule, a compromise was attempted between the Imperial system and the old weights and measures, new sets of values came to be attached to old local units, without a change of local names. The standardisation attempted by the British Government only added to the confusion of weights and measures which were based on traditional values or peculiarities caused by trade practices. Under these conditions the efforts of the Government of Madras to evolve uniformity out of the confusion by legislation were doomed to failure. The last such attempt was in 1948. The chief local units continued viz., the carat, tola, palam, seer, viss, maund, kundu, kandy and the thulam but the contents of many of these weights and measures varied from district

to district and even within local areas, though the names remained unaltered.

The Madras Weights and Measures (Enforcement) Act, 1958, is thus the first effective step to introduce uniformity in weights and measures, through the adoption of the metric system, giving up all attempts to correlate new and old weights.

Under this Act the Madras Government introduced metric weights in four districts, viz., Madras City, Chingleput, South Arcot and North Arcot from 1-10-1958 with the option to use old weights for two years i.e. the use of only the metric weights became compulsory there from 1-10-1960. Metric weights were introduced optionally in the remaining nine districts from 1-4-1960, and compulsorily from 1-4-1962. Metric capacity measures were introduced in the districts of Madras, South Arcot, North Arcot and Chingleput from 1-4-1961, in Salem, Tanjore, Tiruchirapalli and Ramanathapuram from 1-10-61 and in the remaining districts from 1-4-62. Their use became compulsory in the first two stages from 1 April and 1 October 1962 respectively. They will become compulsory throughout the State from 1 April 1963. Linear measures were introduced in the whole State from 1-10-61 and their use has become compulsory from 1-10-62.

Organisation

The Organisation to enforce the Madras Act was established in 1958 with a Special Officer under the administrative control of the Board of Revenue, with five Inspectors in the four districts selected for enforcement. The Weights and Measures Department became a separate Department early in 1960. The strength of the Inspectors was increased to 34 for the State in 1960 and a full time Controller was appointed in the senior time scale of the I.A.S. To conform with the pattern of organisation approved by the Fifth All India Controllers Conference, the field staff has been recently increased.

The implementation of a reform of this magnitude is a complicated, arduous and prolonged task. It requires trained technical personnel. The 'Stamping Smith' attached to the Taluk Officers, who stamped weights and measures according to rough standards (but not weighing and measuring instruments) prescribed under the Madras Weights and Measures Act, 1948, and collected a nominal fee, had to be replaced by qualified Inspectors trained to handle precision equipment. These Inspectors had to acquire a sound knowledge of the working of various types of complex weighing machines. It took almost a year to get the first batch of half a dozen Inspectors trained in Bombay and put them in position.

Difficulties of Trade and Public

The apathy of the public and the trade in the early stages of the reform had to be overcome by persuasion and propaganda. To the small trader, the investment on a new set of cast iron weights was an added burden, not to mention the stamping fees. To the common man, the kilogram and the calculations that went with the conversion of the old units appeared burdensome. Added to this was the difficulty in securing

within a short time a sufficient number of weights for use in trade.

In fact, in the early stages manufacturers had to be assured of a steady demand for metric weights. Leading firms engaged in foundry work had to be approached many times and persuaded to take up manufacture of metric weights and measures. It was much later that a Manufacturers' Association was formed.

To eliminate delays and ensure uniformity in prices of weights supplied to Government Departments rates were fixed for supplies to Government Departments. The market prices of weights and those fixed for supply to Government Departments do not differ much at present, though due to scarcity of raw materials and a sudden spurt in the demand there was an increase in prices in April and May 1962. We have enough manufacturers of metric weights at present. The need for price control no longer exists as weights have been purchased both by the trade and Government Departments. To check high prices a fairly liberal policy of getting weights from other States was followed.

There are not enough manufacturers of beam scales in this State. So a liberal policy of allowing imports from other States is followed. Instruments in use are also stamped. Of late, local manufacturers are coming forward and it is hoped that in a few months the position would ease considerably.

Capacity measures are available in sufficient numbers. The use of 'dry measures' for retail sale of foodgrains is a peculiar feature of Madras State. But there is still some difference of opinion among the public as well as the trade whether the struck measure for dry grains should be finally accepted. Enforcement of struck dry measures will be done cautiously.

Persuasion and Propaganda

To start with, one trade after another was taken up for enforcement of weights; the grocery, mutton and bullion trades being the first and firewood the last. Traders were approached through Trade Associations to the maximum extent possible. The Chambers of Commerce and Trade Associations co-operated with the authorities.

On the whole, the enforcement of weights and measures has been satisfactory and the response has been quick, both from the trade and the public. But care has been taken not to force the pace so far as weighing instruments are concerned. The enforcement of metric weights is being carried out first and inconvenience to the trade and confusion to the public avoided by not insisting on a complete change-over regarding beam scales simultaneously. Though many existing beam scales are sub-standard, particularly in Class 'C', in view of the paucity of good 'C' class beam scales and lack of manufacturers, some leniency had necessarily to be shown in this case.

As the Controller of Weights and Measures was also an Ex-officio Secretary of the Board of Revenue, the co-operation of the Revenue staff was easily obtained for persuasion and propaganda work in the early stages. As sugar was a controlled commodity, enforcement of metric weights in dealings in sugar was easy and this gave considerable publicity to the reform in 1959. Co-operative societies and regulated markets were also approached to change over to the metric system. The Triplicane Urban Co-operative Society of Madras City, a leading consumers' co-operative society in the State, gave a lead to retail traders in the city. The Department also took upon itself to supply weights to Government Departments in the beginning so that private bodies having contact with Government Departments may

switch over. All these measures helped to quicken the pace of the metric reform during a rather difficult period.

To keep up the momentum, officials of the Revenue Department of the grade of Tahsildars and Deputy Tahsildars were also empowered to exercise within their jurisdiction the powers of Inspectors of Weights and Measures under section 17 of the Madras Weights and Measures (Enforcement) Act, 1958, except physical verification of commercial weights with working standards. Quite recently, officers of the Agricultural Department have also been empowered to exercise the same powers within regulated markets.

Along with persuasion and propaganda work, the Inspectors of Weights and Measures undertook a survey of trading establishments and also the number of weights, measures etc., to be replaced owing to the change-over. The survey was initially taken up in the districts of Madras, Chingleput, South Arcot and North Arcot from December 1958 onwards, and was extended to the remaining nine districts in 1960. A resurvey of trading establishments was also undertaken and this opportunity was availed to assess the progress of enforcement, besides collecting data regarding the quarter and the year of stamping of metric weights and instruments used by them. The information gathered during resurvey was brought into a census register which will be useful for future work.

Publicity

A State Publicity Advisory Committee has been set up with representatives of the concerned Departments participating in its work.

The General Committees of District Development Committee under the Chairmanship of the Collector in each district review the progress of the enforcement of the

metric system and also help in publicity. The Assistant Controllers of Weights and Measures assist this committee.

This Department participates in all the Exhibitions held in the State. An Audio-Visual Publicity van of this department moves throughout the State including rural areas and makes announcements through a loudspeaker and exhibits films on the metric system. The Department has conducted three Publicity Weeks in 1959, 1961 and 1962. The last one was celebrated throughout the State with the active cooperation of District Collectors and Panchayat Unions.

In addition to various press advertisements and press releases issued both by the Director of Advertising and Visual Publicity and the State Government, this Department has issued considerable publicity material, like conversion tables, brochures, calendars, paper bags, posters, book marks etc.

Progress Achieved

The progress achieved so far may be summarised as follows:

(i) Verified and stamped up to 31-8-62	
(1) Weights	18,27,455
(2) Capacity measures (including dry measures)	2,42,018
(3) Linear measures	13,977
(4) Beam scales	52,404
(5) Other weighing instruments	5,956
(6) Measuring instruments	612
(ii) Licences granted	
(1) Manufacturers	165

(2) Dealers	732
(3) Repairers	152

(iii) Approximate monthly production capacity

(1) Weights	
(a) Cast iron	40,000
(b) Brass including bullion	10,000
(2) Capacity measures :	
(a) Pouring, dipping and conical measures	25,000
(b) Dry measures (other than aluminium)	12,000
(c) Linear measures	4,000
(d) Beam scales	2,000

(iv) Revenue Collected

1959-60	1960-61	1961-62
Rs. 12,936.34	Rs. 1,69,918.97	Rs. 3,11,100.85

(v) Articles seized and detained upto 31-8-62

(1) Weights	66,616
(2) Capacity measures	10,094
(3) Weighing instrument	654

The progress of enforcement of metric system in Government Departments, especially Departments like Public Works, Highways, Irrigation, Education etc., is proposed to be reviewed at meetings of concerned Heads of Departments once in every period of six months.

The response from the trading community and the public has been satisfactory and the change-over is being effected smoothly. With the same amount of co-operation from the trade and the public when switching over to capacity and linear measures, it is hoped that metric reform in this State will be implemented according to schedule.

Sixth Conference of Controllers

THE Sixth Conference of Controllers of Weights and Measures was held in Madras on 7, 8 and 9 August 1962.

The Conference was inaugurated by Shri V. Ramaiah, Minister for Public Works and Revenue, Madras. Shri K. V. Venkatachalam, Joint Secretary, Ministry of Commerce and Industry, New Delhi, presided. It was attended by Controllers of Weights and Measures in States and Union Territories and by representatives of the Ministries of Commerce and Industry, Finance (the Government of India Mint at Bombay and Calcutta), as also the Indian Standards Institution and the National Physical Laboratory.

Opening Remarks

Shri Moni, Controller of Weights and Measures, Madras, welcomed the delegates on behalf of the Madras Government. He thanked them for selecting Madras as the venue of the Sixth Conference. The Conference was a forum in which representatives of State Organisations responsible for enforcement of weights and measures met periodically to pool experience, exchange ideas and to devise means for a smooth transition to the metric system of weights and measures. The object of the reform of weights and measures was to secure public welfare by ensuring that only accurate and certified weights, measures and instruments were used for trading in the country. The metric system of weights and measures was being instituted throughout the country replacing the diverse weights and measures previously in use. One of the main

problems was to educate the public in the new system.

Inaugural Address

Shri Ramaiah, inaugurating the Conference, stressed the importance of standardizing weights and measures throughout the country. At one time, as many as 431 systems of weights were in vogue in the country. These had to be replaced by one system in the interest of trade and industry. The metric system was chosen for adoption throughout the country because of its many advantages. Over 85 percent of the world was already following the metric system. One could say that the ideas on which the system had been evolved had their origin in India. In 1956, Parliament enacted legislation to adopt the metric system. The enforcement of the new system was bound to be a difficult and complicated task. People throughout the country had to be made familiar with the system. Older people particularly were bound to find it difficult to get accustomed to a new system of weights and measures. Inspectors of Weights and Measures had, therefore, to function also as Public Relations Officers. It was their duty not only to enforce the use of the new weights and measures but to educate the public in it. The task called for perseverance, conviction, sympathy and tact.

The success of the reform depended on two parties—the trading community and public. Often the consumer insisted on transactions in the old system even after the trader had replaced his old weights. Traders

could not be blamed if they tried to satisfy customers by conducting business in the old units. Enforcement should, therefore, be tempered with understanding and sympathy. The public and the trading community in Madras had reacted favourably to the new system. The Government appreciated the difficulties of the trade and had allowed them sufficient time for the change. Little use had to be made of the penal provisions of the law. The Department of Weights and Measures had been strengthened to cope with its heavy responsibility. A precision laboratory would be set up in a year or two. The metric system, and the Government's programme for introducing it, had been publicized through all available media. Manufacturers of weights and measures had played their part by supplying new weights to the trading community at reasonable prices. He was confident the Conference would prove useful to Weights and Measures Departments in solving their problems and wished it success. He also thanked the Standing Metric Committee for the guidance it had given to Weights and Measures Organisations in the States.

Chairman's Speech

Shri Venkatachalam thanked the Minister for his advice to the Conference. It would be followed meticulously. In 1956, Parliament enacted legislation to adopt the metric system. It allowed a transitional period of 10 years for the complete replacement of existing weights and measures. Many people considered this period far too short. There were others who thought that such a reform should be put through quickly, that new weights and measures should be enforced throughout the country simultaneously, and that a long transitional period should not be allowed.

Earlier attempts to standardize weights and measures in the country had ended in failure. There was, therefore, much scepticism about the success of the new attempt.

There was no experience to guide Government in the reform. True, some States had experience in enforcing weights and measures; but there was no recent experience to guide the country in replacing its system of measurement in trade, industry, engineering and technology.

The first requisite was legal sanction for changing the system of measurement. Parliament had enacted a law for adopting the new system and State Governments passed laws for enforcing it. The State Governments had also set up competent Organisations for enforcing weights and measures. One of the main causes of failures of previous attempts had been the lack of such Organisations. There were now about 1,000 fully trained Inspectors of Weights and Measures working in the field. They had been equipped with standard weights, balances and other instruments for verifying traders' weights. The manufacture of standard weights and measures, balances and other equipment had been developed in India during the last 5 years.

Half the transitional period of 10 years allowed by the law was now over. A review of the progress achieved during the last 5 years gave room for reasonable satisfaction. The achievements had been substantial. Certain major tasks had been completed. The metric system had been adopted in all their transactions by organised industries, Government departments and public undertakings like the Railways and Posts and Telegraphs. Metric weights had come into use in trade in all the urban areas and over considerable rural areas. There was no doubt they would soon be in exclusive use everywhere. It would be reasonable to expect that by the end of 1963 metric weights and measures would have replaced other weights and measures in trade and industry throughout the country.

The transition to the new system had been relatively smooth. This was largely due to the

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free co-operation accorded by trade and industry. Programmes for adopting the new system were drawn up in close consultation with representatives of the trades and industries concerned. In many cases the programmes had been suggested by representative associations of trade and industry. He congratulated the representatives of the State Enforcement Organisations on their creditable achievement.

The task was, however, far from over. Three main tasks remained to be completed. First, the metric system had to be brought into full use in general and technical education. School books, particularly in subjects like arithmetic, had to be completely revised. Good progress was being made in this direction. Secondly, publicity had to be continued and intensified to make the man in the street familiar with the metric system. Thirdly, the metric system had to be adopted in the design of the various products of industry. This was bound to take time and might have to be spread over a number of years.

Shri P.N. Nayer, thanked the Minister for inaugurating the Conference and the Madras Government for the arrangements made for holding the conference and for accommodation of the delegates.

The following is a brief summary of some of the more important recommendations of the Conference :

(1) Enforcement of Metric Weights

Metric weights had come into almost exclusive use in areas where they were first introduced in October 1958. In other areas, a very large proportion of trading establishments had replaced seer and maund weights by metric weights. Trade was carried on mainly by the use of metric weights.

Sustained efforts would be continued over the next 6 months to eliminate non-standard weights still in use. Inspectors would go

round the markets and seize such weights wherever they were found in use or in the possession of traders.

(2) Enforcement of Metric Capacity Measures

Metric capacity measures were progressively coming into use in the areas where they had been introduced by law. No shortage of measures had been reported from any part of the country.

Non-metric capacity measures would be seized wherever they were found in use or in the possession of traders in areas where it was illegal to use them.

(3) Enforcement of Length Measures

The use in trade of length measures other than metre length measures would become illegal throughout the country from 1 October 1962. Licensed manufacturers and dealers were building up stocks of metric length measures.

(4) Enforcement Organisations in the States

(a) Personnel

Since the last Conference, there had been general strengthening of Enforcement Organisations in most of the States. Weaknesses were being remedied.

(b) Equipment

The Weights and Measures Departments had been supplied with sufficient numbers of working standard weights, capacity measures, Inspectors' balances, stamping seals, tools and other equipment to meet essential needs. Over 400 working standard length measures had been supplied by the Mint. The number was expected to rise to nearly 450 before October. The production of secondary capacity measures would be augmented and that of secondary standard length measures would be taken up as soon as the raw material became available. Specifications for secondary standard balances were ready and production would be started shortly.

(5) Publicity

Publicity would continue to be carried out through the various media. A new documentary film with commentary in all languages was under production.

An interesting recommendation for the readers of *Metric Measures* and *Metric Maaptol* is that special numbers should be published after every Conference.

(6) Dispensing Pumps at Consumers' Premises

All pumps installed at consumers' premises could not be treated as non-commercial measuring instruments. Such pumps were used by transport undertakings and other large consumers for distribution of oil. Persons employed in distribution were accountable for the quantities received by them and distributed through the pumps. Such pumps should, therefore, be treated as commercial measuring instruments and offered for verification and stamping by Weights and Measures Inspectors.

(7) Stamping of Small Weights

The smallest weight which could be stamped fully was of the denomination 50 mg. All commercial weights from 50 mg and above would be stamped with all the three stamps. Weights of 20 mg would be stamped with one stamp only, i.e. the date stamp. Weights of 10 mg and below would not be stamped at all. If they were contained in a box, the box would be stamped and certified. If there was no box, the weights would be authenticated by a certificate of verification.

(8) Standardization of Peg Measures

The Ministry of Commerce and Industry would set up a committee to recommend, (a) the sizes of metric peg measures to be used in selling liquors, and (b) the sizes, graduations and other particulars of glass beaker measures to be used in retail trade in liquor.

(9) Amendment of the States Weights & Measures (Enforcement) Acts

A draft Weights and Measures (Enforcement) Amendment Bill has been recommended to State Governments by the Ministry of Commerce and Industry. The following further amendment was proposed to State Governments :

Ban on Use and Possession of Non-standard Weights and Measures

The States Weights and Measures (Enforcement) Acts did not give sufficient powers to Controllers and Inspectors to ban the use or possession of non-standard weights, measures or to seize them when found in the possession of traders. The Act should be amended making the use or possession for use in commercial transactions of non-standard weights, measures or instruments, an offence and to give powers to Inspectors to seize any such weight, measure or instrument found in trading premises and to prosecute the persons using them or in whose possession they were found.

(10) Amendment of the States Weights & Measures (Enforcement) Rules

The Ministry of Commerce and Industry had circulated draft amendment to the Weights and Measures (Enforcement) Rules, based on the recommendations of the 4th and 5th Conferences. The following further amendments were recommended to the State Governments :

(a) 'A' Class Beam Scales

'A' Class beam scales should be used in commercial assays and in dharm kantas for verifying the weight of bullion and precious stones.

(b) Seizure of Weighing Instruments

Provision should be made to give Inspectors the power to seize weighing instruments of all kinds, including platform machines, which

have not been stamped under the provisions of the Act and the Rules.

(c) Period of Verification

All measuring instruments, and all weights, measures and weighing instruments used in factories and in the trade in bullion and precious stones, should be verified once every year. All other weights, measures and weighing instruments should be verified once every two years.

(d) Commercial Metre Measures

Commercial metre measures graduated at every centimetre could also be recognised and their use in trade permitted.

(e) Folding Rules

The Indian Standards Institution's specifications for folding rules should be incorporated, with suitable modifications, in the appropriate Schedule to the Rules.

To ensure uniformity of enforcement procedure, the draft Rules circulated by the Ministry of Commerce and Industry should be adopted by the States without any change in substance. If, for any special reasons in any State, it is necessary to make a change, the Central Ministry of Commerce and Industry should be consulted in advance. The Ministry would place the suggestion before the following Conference.

(11) Amendment of the (Central) Standards of Weights & Measures Rules, 1958

Rule 4(1) should be amended by adding a proviso that reference standard length measures, if manufactured from nickel steel, should be verified at intervals of not more than 10 years.

(12) Weights, Measures and Instruments Manufactured in one State for Sale in Another

Every manufacturer of weights, measures or weighing and measuring instruments should obtain a licence from the Government of the State in which he had his manufacturing establishment. He need not obtain a licence from

the Government of any other State where his products might have a market.

A licensed manufacturer of one State might sell and deliver weighing machines other than beam scales directly to a user in any other State. He should, however, send advance intimation to the Inspector of Weights and Measures in whose jurisdiction the user's establishment is situated.

Commercial weights, measures and beam scales should not be sold by a licensed manufacturer of a State directly to users in another State. They should be sold only to agents appointed in consultation with the Controller of the State in which they are to be used. The agent should be a licensed dealer in that State.

(13) Weights, Measures and Instruments used in Stores Departments of Industrial Establishments

These weights, measures and instruments could not be regarded as non-commercial since persons employed in the Stores Departments were accountable for the stores for whose weighment or measurement the machines were used. They should, therefore, be verified and stamped by Inspectors.

(14) Control of More Complicated Instruments

(a) Electric Meters

The verification of meters for measuring electrical energy was complicated and involved the use of elaborate equipment. In the present stage of development, it was not practicable for Weights and Measures Departments in this country to attempt this task.

(b) Water Meters

The Indian Standards Institution had been approached to suggest a simple method for the verification of water meters.

(c) Gas Meters

The International Organization of Legal Metrology was studying methods for the verification of gas meters. The results of these studies should be awaited.

(d) *Taxi Meters*

The Indian Standards Institution's Sectional Committee on Weights and Measures had set up a Sub-committee to recommend specifications and a method for the verification of taxi meters. The Sub-committee had collected data on the methods being followed in other countries. The Sub-committee was likely to make its recommendations in time for consideration at the next Conference.

(15) *Recognised Abbreviations for Metric Units*

Government Departments as well as private and public undertakings should be advised to use only recognised abbreviations for the metric units of weights and measures. While specifying quantities, prices, rates, etc. in records and correspondence, the abbreviations used should be the recognised ones.

(16) *Delegation of Powers Under Weights and Measures Laws to Officers Other Than Weights and Measures Inspectors*

The periodical verification and stamping of weights, measures and instruments under the provisions of the Weights and Measures laws should be the exclusive responsibility of Weights and Measures Inspectors. The power to inspect weights, measures and instruments, might in special circumstances be exercised by other officials like Excise Inspectors in Excise controlled shops or Agricultural Marketing Inspectors. They should not, however, be declared Inspectors under the Weights and Measures (Enforcement) Acts. They might inspect weights and measures in the shops dealing in Excisable goods under the powers they already enjoy under the Excise Acts and Rules.

(17) *Machines Converted to Metric System—Recognition of Non-Standard Capacities*

Many machines converted to the metric system did not conform to the Rules in regard to capacity. The continued use of these machines should be permitted till the end of

their lives. The Controller should, at his discretion, write down the capacity of any such machine to the next lower capacity recognised by the Rules.

(18) *Verification of Weights, Measures, etc. to be in the Vicinity of the Traders' Premises*

A sufficiently large number of stamping centres should be set up to enable stamping being carried out at or near the premises. Mobile verification units should be organised, where necessary.

(19) *Licensing of Importers of Measuring Instruments*

An importer should have a licence under the Weights and Measures (Enforcement) Act if he wanted to sell the machines he imported. The importer should take out a licence from the Government of the State in which he had his business establishment. He should get all weights, measures and instruments intended for sale to persons within the State, verified and stamped by Inspector before delivery to the customers.

Weights, measures and instruments imported for commercial use should conform to the specifications in the Weights and Measures (Enforcement) Rules. It was the responsibility of the importer to ensure that only machines which complied with the Rules were imported.

(20) *Verification of Weights of 10 g and below*

Weights of 10 g and below could not be adjusted to correct errors. They should, therefore, be rejected outright if found to be in error beyond permissible limits.

(21) *Net Weight of Material in Baby Food Containers*

The Indian Standards Institution should suggest limits of errors to be permitted in the net weights.

(22) *Standardization of Forms and Registers*

The Conference agreed in principle that forms and registers to be maintained by manufacturers, repairers, dealers, Inspectors

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and Controllers in the various States should be standardized.

(23) *Inspectors' Manual*

The Ministry of Commerce and Industry should compile a comprehensive Manual for Inspectors.

(This is an important recommendation from the point of view of the daily work of the Inspectors and would be a valuable tool in ensuring uniform application of the weights and measures laws of the country. The field to be covered by this Manual is vast as it will have to deal with the verification practice and other instructions for items ranging from ordinary cast

iron weights to the latest weighing and measuring instruments required in commercial transactions. It should not, therefore, be expected that the Manual would be ready in the very near future. —Editor)

(24) *Study Tours of Inspectors*

Selected Inspectors and supervisory officers of the Weights and Measures Departments should be given the opportunity to visit other States and study the work of enforcement there.

(25) *Seventh Conference of Controllers*

The next Conference should be held in Bhopal in January 1963.

French Experts' Report Considered

IT will be recalled that two French Experts M. Francis Viaud, General Engineer and Head of the French Department of Measuring Instruments, and M. Louis Krach, Chief Engineer of Measuring Instruments, France, were deputed by the French Government to visit India during November and December 1960.

The Experts submitted their report to the Government of India and the summary of it was published in the March 1962 issue of *Metric Measures*. The recommendations of the Experts were considered prior to the Sixth Conference of Controllers of Weights and Measures at Madras, on 6 August 1962. The main recommendations of the Experts and the views of the Conference on them are given below. In the following account the recommendations of the Experts are given first and the views of the Conference are given in smaller type.

(1) *Definition of the Litre*

The definition given in the Standards of

Weights and Measures Act, 1956, should be amended. Litre may be defined as equivalent to 1 cubic decimetre.

The present definition of the litre may be retained for the time being, pending revision of the international definition by the General Conference of Weights and Measures.

(2) *Period of Verification of Reference Standards*

Reference standards need be verified once in every 10 years only. Since these standards are not subject to much wear and tear, they retain their accuracy for fairly long periods. There is no need, therefore, to verify them once every 5 years.

There is no assurance that reference standards would retain their accuracy for as long a period as 10 years. They should, therefore, continue to be verified every 5 years. Meanwhile, the National Physical Laboratory will keep a few sets of reference standards under continuous observation, and study their behaviour during the next 5 years. After the initial verification of all the reference

standard weights issued to the States is complete the question may be reviewed.

The period of verification of reference standard length measures manufactured from nickel steel should be 10 years.

(3) Adoption of the Specification in Indian Standards in Laws on Weights and Measures

The specifications in the standards should not be mechanically adopted in the laws. They should be examined by the Weights and Measures Authorities, and adopted to the requirements of the law.

The recommendation was accepted. Indian Standard specifications have in the past been adopted in substance except in rare cases, where for practical reasons, it was found necessary to modify them.

(4) Representation of Controllers in Committees Drawing up Standards on Weights, Measures and Instruments

Controllers of Weights and Measures are not sufficiently well represented in these Committees. As a result, the Committees are dominated by the manufacturers of weights, measures and instruments. The interests of the users and the public go by default. At least half the members of these Sectional Committees should be representatives of Weights and Measures Departments.

The Sectional Committee should have one member representing the Weights and Measures Department of each of the main regions of the country.

(5) Improvement in Techniques of Manufacture of Commercial Weights

Documents on the manufacture of weights and measures in France will be sent to the Agra Smelters' Association. After they study these documents, a small study team of smelters may visit manufacturing establishments in France. Later, a French Foundry Expert may visit India to advise Indian manufacturers in improving their techniques.

Manufacturing techniques are sufficiently well developed in India, and it is not necessary to send a delegation of manufacturers to France.

(6) Uniformity in Enforcement Laws and Procedure

There must be uniformity throughout the country in regard to measuring instruments and their control.

Uniformity has been achieved in regard to weighing and measuring instruments, thanks to the adoption of Indian Standard specifications suitably adapted in the light of experience.

(7-8) Prior Approval of Designs of Weights, Measures and Instruments

In some States, manufacturers are required to secure prior approval by the Weights and Measures Authorities of the design of weights, measures, or instruments they manufacture. There is no such control in other States. Such control is necessary, and must be exercised on manufacturers throughout the country. Every manufacturer must be compelled to submit the designs to the Weights and Measures Authorities in advance for approval. After approval they might manufacture a few specimens. Scale manufacture must be allowed only after the specimens are examined and found satisfactory. A permanent Organisation should be set up under the Standing Metric Committee to examine and approve designs and samples. This Organisation will be advised by a Committee in which Controllers as well as the Indian Standards Institution will be represented. Technicians of this Organisation would keep in close touch with the Enforcement Organisations in the States, to ensure uniformity in Enforcement procedure. Where material differences are reported by these technicians, they would be brought to the notice of the Advisory Committee or the Controllers' Conference.

Training of Weights and Measures Engineers

In addition to Weights and Measures

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Inspectors, it is also necessary to build up a Corps of Weights and Measures Engineers. These Engineers will be specialists in weighing and measuring instruments. Persons with a Degree of Bachelor in Science or Technology should be selected for training. Initially 10 to 20 Engineers having these qualifications might be selected, and sent to a training Institution in France Since a working knowledge of French is essential if they are to benefit by these courses in France, they should first learn French in India and if necessary, in France.

A French Engineer from the Weights and Measures Department will be deputed to India for 2 or 3 years to supervise the training of Weights and Measures Engineers, and to advise Government on the control of more complicated weighing and measuring devices.

The time is not ripe for setting up such an Organisation. The question may be reviewed after 3 years. Meanwhile, information may be collected from the U.K., France and other countries, on the practice they follow, in the examination and approval of type designs of weighing and measuring instruments.

(9) Initial Verification of Weights, Measures & Instruments

Initial verification of all weights, measures and instruments may be carried out at the place of manufacture. This verification should be accepted throughout the country. Where the weights are used in another State, the Enforcement Authorities there must not insist on the same weights, measures or instruments being verified again.

This is not practicable under the laws in force and the circumstances prevailing in this country.

(10) Duplicate Weights of the Denominations 20 kg, 2 kg, etc.

Many traders do not buy the duplicate weights, but are content with sets holding

single weights of 2 kg, 200 g, etc. Propaganda should be carried on to induce the users of weights to buy complete sets with 2 weights each of the denominations 2 kg, 200 kg, etc.

The recommendation is accepted in principle. Publicity is being carried out to induce traders to provide themselves with duplicate weights of 2 kg and 20 kg.

(11-14) Verification of Commercial Weights

Steelyards may be used for verifying commercial weights of the denominations 5 kg and above. Equal armed beam scales may be used for the smaller weights. The following type of steelyards and beams are recommended :

Types	Denominations of weights for which this type will be used	Sensitivity		Accuracy
		mg	per division	
Steelyard	50 kg 20 kg (exceptional)	2,000		2,000
Steelyard	20 kg & 10 kg 5 kg (exceptional)	500		500
Equal armed beams	5 kg to 500 g 200 g (exceptional)	50		50
Equal armed beams Assay Balance Type	200 g to 1 g	1		1

Verification of Bullion Weights

Bullion weights are to be considered as precision weights. They are comparable with working standard weights in regard to the accuracy demanded. The same equipment and procedure may be used, therefore, in verifying bullion weights and working standard weights. They should be verified in the laboratory against secondary standard weights using secondary standard balances.

Inspector's Balances

The Inspector's balances now in use are far too sensitive for verification of ordinary commercial weights. They had to be of such high accuracy because they are also used in verifying bullion weights. It is wasteful to use balances of the precision required for bullion weights to verify ordinary commercial weights. Ordinary commercial coarser balances and steelyards of the types recommended in para (11) above. Bullion weights may be verified using secondary balances.

Balance Supplied by the Firm of 'Testut'

These balances are precision balances, and must be used for the verification of secondary standards, working standards and bullion and carat weights. They must not be taken from place to place. They must be used with a good deal of care by very well trained staff.

In the circumstances of our country, bullion weights cannot be verified against secondary standard weights. They must be verified against working standard weights by the Inspectors. The balances to be used by Inspectors must be sensitive enough for the purpose. The specifications laid down in the Rules for these balances have been found adequate. Steelyards would not be adequate for verifying bullion weights. Further, steelyards of the kind required are not manufactured in India.

(15) Working Standard Capacity Measures

The working standard measures in use are metal cylinders, with height and diameter equal. This type was used in France when the metric system first came into use in that country. It has since been superseded by standard measures made of glass and with graduated necks. Using the glass measures, it is easy to read out the error of the measure tested on the graduated neck. With the metal cylindrical measures, an instrument like the pipette may have to be used for measuring the error.

Glass standards of the kind proposed will be more convenient to use. But metal cylindrical standards have been manufactured and distributed. They may, therefore, continue to be used. The question may be reviewed after 5 years.

(16) Non-flexible Metre Measures

The metre measures in use in India are marked at every centimetre for the first 10 centimetres only. The rest of the length is marked at intervals of 5 centimetres only. It is preferable to mark the metre bar at every centimetre throughout its length.

The recommendation is accepted in principle. Metre measures marked at every centimetre would also be accepted. The Rules would be amended accordingly.

(17) Folding Rules

The use of folding rules must be encouraged. Specifications should be drafted and included in the Rules.

The recommendation is accepted. Indian Standard specifications for folding rules would be incorporated, with suitable modifications, in the Rules.

(18) Survey Chains

Survey chains have gone out of use in France. Surveyors use steel tapes instead. In India also, survey chains must be replaced gradually by steel tapes of length 100 metres or so.

The suggestion is impracticable. Steel tapes would have to be imported. On the other hand, chains are manufactured in India.

(19) Complicated Measuring Instruments

The use of more complicated measuring instruments like liquid meters, gas meters, and electric meters is bound to increase as the country develops industrially. Specifications and verification procedure for such instruments must be drawn up. Personnel must be trained for the control of these instruments.

FRENCH EXPERTS' REPORT CONSIDERED

The recommendation is accepted in principle.

20) Training of Staff in Government Departments

Controllers and Inspectors of Weights and Measures should help other Departments of Government in training staff on the metric system and its use.

The recommendation is accepted.

(21) Metric System in Administrative Documents

All administrative documents should be drafted in metric units only.

The Controllers of Weights and Measuring will contact the departmental heads to assess how far non-metric units are still in use in the work of Government departments. They will send brief reports to the Ministry of Commerce and Industry. They will also try to induce departmental heads to do away with the old units as expeditiously as possible.

The State Government may be advised to instruct sub-Registrars to induce document writers to use metric units to the fullest extent possible, in the documents registered by them.

(22) Training of Inspectors

Inspectors are being trained at Institutions in Patna, Bombay and Lucknow. The Institution at Patna gives more advanced training than the two others. Training in none of the Institutions is, however, sufficiently advanced or comprehensive. The syllabus should include the following :

(i) General

(a) *Composition*—It should enable those receiving training to draft reports in clear and precise languages.

(b) *Law*—General laws of the country, special laws on weights and measures, legal procedures, etc.

(c) Mathematics.

(d) Mechanics including strength of materials.

(e) Physics.

(f) Chemistry.

(g) Electricity.

(ii) *Special Course on Weights & Measures*

(a) Weighing (current devices).

(b) Capacity measures.

(c) Length measures.

(d) Volume measurement.

(e) Gauging (tank lorries, tank wagons, etc.).

(f) Liquid meters.

(g) Electricity meters.

(h) Gas meters.

The minimum qualification for a person selected for training should be University degree. The length of the training course should be about one year. It should not, in any case, be shorter than 6 months. It would be preferable to have one Central Training Institution for all the States. If this is not practicable, 2 or 3 Centres may be set up for the whole country.

The standard of training of Inspectors must be improved. A Committee may be set up to devise a course of training for Inspectors and supervisory personnel employed in Weights and Measures Departments.

(23) Inspectors and Controllers to be whole-time officers

Controllers and Inspectors of Weights and Measures should not be saddled with duties or responsibilities not connected with weights and measures enforcement.

The recommendation is accepted in principle.

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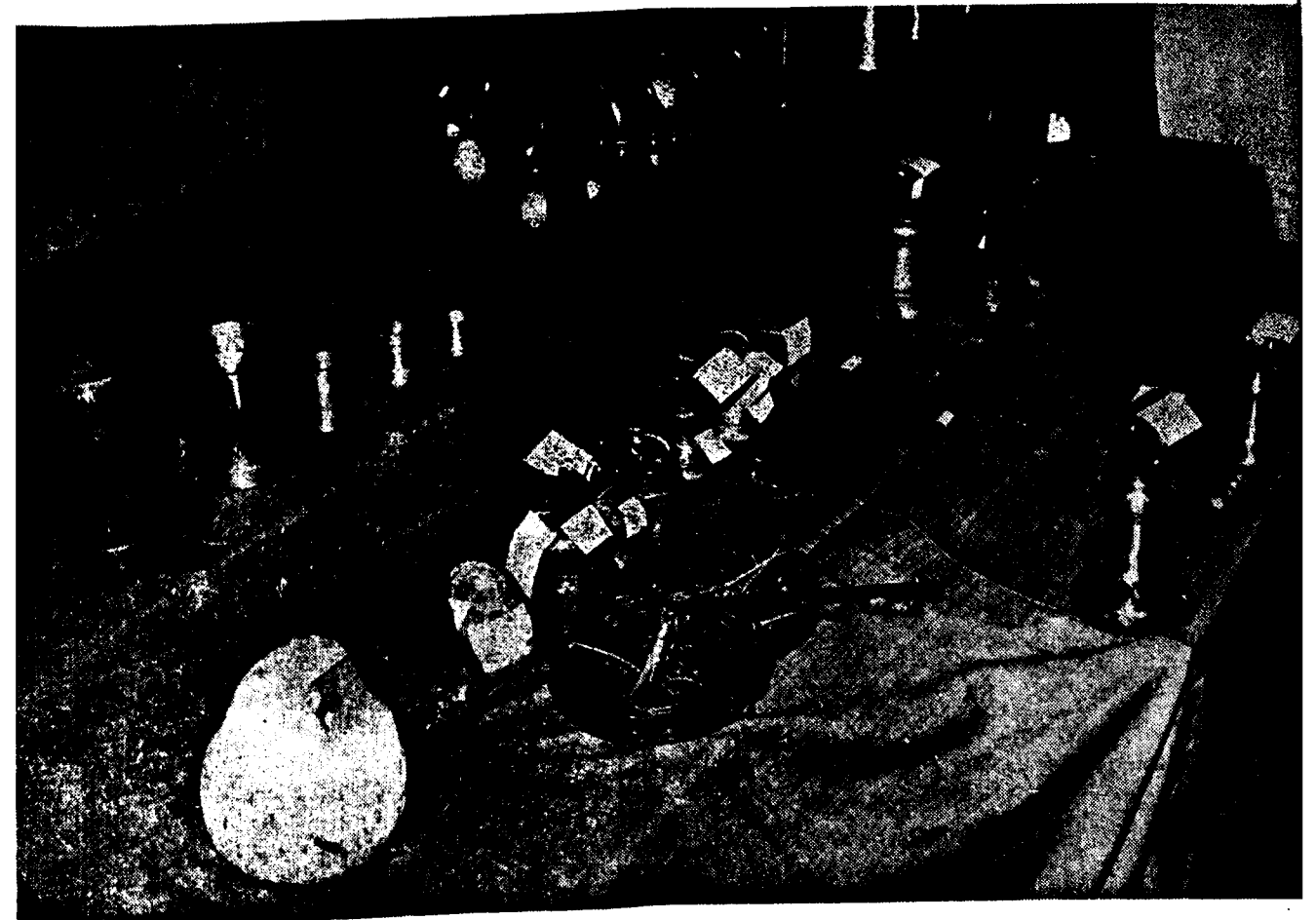
The Sixth Conference of Controllers was inaugurated by Shri V. Ramaiah, Minister for Public Works and Revenue Madras, on 7 August 1962 at Rajaji Hall, Madras. The photograph above shows the Minister inaugurating the Conference. Others in the Picture are (L to R) Shri P. N. Nayer Secretary, Standing Metric Committee, Shri K. V. Venkatachalam Joint Secretary, Union Ministry of Commerce and Industry Shri S. Muni Controller Weights and Measures Madras.



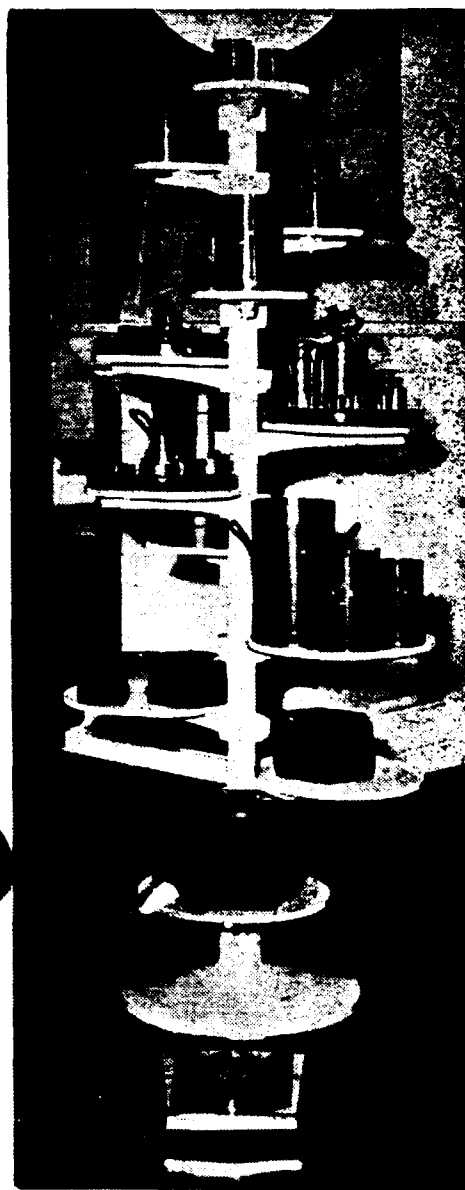
Controllers of Weights and Measures in the States and Union Territories and representatives of some of the Central Ministries attended the Conference. The inaugural session was also attended by prominent citizens of Madras connected with weights and measures. The above picture shows a section of the gathering at the inaugural function.



After the inauguration the Conference took up the discussion of the various points on the agenda. This picture shows the Conference in session on 7 August 1962.



An exhibition of weights and measures, old and new, was held in Rajaji Hall at the same time as the Conference. Picture shows various types of old weights and measures which were in use in the Madras area prior to the introduction of metric system. Large stone weights are seen in the foreground. In the glass case are kept old working standard weights.



A section of the exhibition displayed some of the new metric commercial weights and measures manufactured in Madras State. These are shown in the picture above.



In the exhibition was also shown a crude but interesting type of steelyard used in village bazaars. It consists of a wooden rod, to one end of which is attached a pan. Grooves are made on the rod and each groove indicates a certain weight. When the steelyard is balanced as shown above the weight of the material is read off from the grooves.

Amending Weights & Measures Laws

THE weights and measures laws passed by the Centre and States are now being enforced all over the country in many fields of trade and industry. Within a few years the metric system would cover every sphere of activity where weights and measures are used. After centuries of chaos in the domain of weights and measures, India is now practising a single system all over the land. This has been possible because uniform laws are being enforced throughout the country by the States and the Union Territories.

When the Enforcement laws were originally drafted the field covered was comparatively narrow because of lack of experience. Since then Weights and Measures Organizations have been set up in States and Union Territories. Four years of active enforcement have shown that the laws require amendments if they are to fulfil their purpose adequately.

The Constitution of India lays down in its Seventh Schedule, Union List, Entry 50, that 'establishment of standards of weights and measures' shall be a Union subject, while Entry 29 of the State List prescribes 'weights and measures except establishment of standards' as State subject. These provisions are interpreted to mean that the Centre should lay down the standards of weights and measures, while the States should enforce them. To give effect to this provision, the Centre enacted the Standards of Weights and Measures Act, 1956, and

issued Rules under it. The Act recognised the metric system as the basis and defined the standard metric units as recommended internationally by the various General Conferences of Weights and Measures.

In order to achieve unity of enforcement it was necessary that States should enact uniform legislation. In consultation with the States, therefore, were evolved Model Weights and Measures (Enforcement) Bill and the (Enforcement) Rules under it. The States adopted these with minor modifications.

The Central law has now been in active use for the last 6 years. During this time there have been changes in the international definition of the metre and the second. In the field of enforcement also new experiences have been gained and a number of changes have become necessary in the State (Enforcement) Acts and Rules. The amendments required were discussed thoroughly in the last three Conferences of Controllers. The more important amendments are discussed here.

The Central Act

The Eleventh General Conference of Weights and Measures adopted in October 1960 a new definition of the metre and slightly changed the definition of the second.* In order to keep the Standards of Weights and Measures Act, 1956, in step with international developments, it is necessary that

*See *Metric Measures*, September 1961, pp. 22-23.

the definitions prescribed for these two units should also follow the international trend.

One more unit, the nautical mile, equal to 1852 metres, is used and recognised internationally as the unit of distance for navigation by sea and air. It is proposed to be introduced in the Act so as to permit its use.

Amendments to introduce these changes will be placed before Parliament shortly.

State (Enforcement) Acts

In the State (Enforcement) Acts, a provision is being made to define 'commercial transactions'. Such a definition was not previously included in the State Acts. The necessity for it arose because in implementing the Act, it was found that there were many transactions which would have to come under the purview of the (Enforcement) Act. A few examples are transactions involving the collection of tolls and duties, payment of wages on the basis of weight or measure, as for instance, the wage paid to a tea worker on the basis of weight of leaves plucked, or hire charges of various types like cold storage and so on. A suitable definition to cover all such transactions is likely to be introduced shortly.

By another amendment the provision relating to a special set of working standard weights for the verification of bullion and carat weights has been deleted; on experience it was found practicable to compare bullion and carat weights with the ordinary working standard weights which have now been provided to the Inspectors of Weights and Measures.

A third amendment refers to the provision that no person can manufacture, repair or sell any commercial weight or measure or any weighing or measuring instrument without a licence from the State Government. Past experience has shown that it is difficult

to enforce the use of standard weights and measures for commercial purposes unless the manufacture and sale of non-commercial weights is also brought under control. The amendment will, therefore, prohibit the manufacture or sale of non-commercial weights without a licence from the State Government.

The Weights and Measures (Enforcement) Acts do not provide sufficient powers to ban the use or possession of non-standard weights etc. or to seize them when found in the possession of traders. The Act is proposed to be amended to make this an offence and to give powers to Inspectors to seize such non-standards weights, measures and instruments found in trading premises and to prosecute persons possessing or using them.

State (Enforcement) Rules

So far as the Rules are concerned, the amendments are far more extensive and some new rules have been devised and the schedules changed considerably.

The amendments were necessitated by a number of practical reasons. The applicability of the (Enforcement) Rules was being tested every day all over the country in the bazars, industries and markets. The experience gathered over 4 years has established the necessity to amend the Rules so as to make them more effective for enforcement.

Secondly, the schedules for various types of weights and measures and weighing and measuring instruments were based on Indian Standards that were available at that time. During the last two years, the Indian Standards Institution have published in the sphere of legal metrology, a number of standards, amended some and revised a few. All these changes had to be reflected in the Rules, and the schedules had to be extensively changed. Among the new subjects covered mention may be made of woven

metallic tapes, steel tapes, surveying chains, person weighing machines, self-and-semi-self indicating counter type weighing machines, petrol dispensing pumps and calibration of tank lorries.

Among the amendments to the Rules the following are the more important :

- (1) It is now proposed that
 - (a) all bullion and carat weights, and beam scales used with them,
 - (b) all measuring instruments and
 - (c) weights, measures and weighing instruments used in factories should be stamped once in a period of every 12 months. All others should be stamped at least once in a period of 24 months. A weighing or measuring instrument which has been verified and stamped *in situ*, would have to be re-stamped if it is removed and re-erected before the expiry of the verification period.

(2) Specifications for metric weights, measures and weighing and measuring instruments have been substantially altered. It is, therefore necessary to safeguard those that are already in use and which conform to the original Rules passed in 1958-59 i.e. before amendment. The following amendment gives protection to the users of such metric weights etc.

Notwithstanding anything contained in rule—, any weight, measure or weighing or measuring instrument which has been once verified and stamped in accordance with the rule then in force may, where the State Government has by notification in the official Gazette specified a period in this behalf within that period, be reverified and stamped in accordance with the rules which were in force at the time of the first verification and stamping ;

Provided that the period so specified shall in no case exceed ten years and may be different for different classes of weights, measures or weighing or measuring instruments.

(3) It is proposed to empower the Inspectors to seize unstamped weighing instruments of all types.

(4) The limits of error which may be tolerated in the net weight or measure of an article sold or offered for sale in sealed packages or containers will be laid down in a new schedule. Examples are :

Commodity	Permissible error
(i) <i>Raw Cotton</i>	
Packed in standard bales of 180 kg ..	± 5 kg
(ii) <i>Cotton yarn</i>	
Full bale of 180 kg ..	± 5 kg
$\frac{1}{4}$ bale of 135 kg ..	± 3.75 kg
$\frac{1}{4}$ bale of 90 kg ..	± 2.50 kg
$\frac{1}{4}$ bale of 45 kg ..	± 1.25 kg
(iii) <i>Cement</i>	
at factory ..	± 2 percent
in retail trade ..	± 3 percent
(iv) <i>Tea</i>	
Retail packages of 500 g, 250 g & 100 g ..	± 1 percent at the place of packing.
Chest packed at places other than tea gardens ..	± 1 percent at the place of packing.
The net weight of packages or chests of tea shall be verified only at the place of packing.	
(v) <i>Jute Cloth</i>	
Length of jute cloth ..	± 0.5 percent
(vi) <i>Paint</i>	± 1 percent

Among the important amendments to the Schedules the following may be mentioned :

(1) It is now proposed to provide adjusting holes in secondary standard weights from 10 kg upto 100 grams.

(2) Specifications for working and secondary standard length measures have been incorporated.

(3) The specification for carat weights has been replaced by a new specification wherein the dimensions of the carat weights have been given after due experiments.

(4) Cylindrical type of measures can now be fitted with a suitable handle, so that it can be used in the hot and boiled milk trade. The use of rivets for securing the handle to the measure has been banned because of the possible danger to health

on account of dirt accumulation in the crevices.

(5) Wooden commercial length measures of 1 metre and 0.5 metre have been recognised. If so, desired, it is permitted to mark the one metre and 0.5 metre rods of metal or wood at every centimetre. Folding rules will also be brought under the law.

(6) Specifications for woven metallic tape measures used by engineers and for steel tape measures have been included. Similarly a specification for surveying chains also now forms part of the schedules.

(7) Substantial revision of the various types of commercial weighing machines have been made by the Indian Standards Institution. These relate mostly to permissible errors and sensitiveness. Dimensions of the various classes of beams will be laid down. As a result, the following specifications will be replaced by new ones :

- (i) General Requirements for Weighing Instruments
- (ii) Beam Scales
- (iii) Counter Machines

- (iv) Steelyards
- (v) Platform Weighing Machines
- (vi) Spring Balances
- (vii) Weighbridges
- (viii) Crane Weighing Machines.

The specification for automatic weighing machine remains unaltered for the time being. Two new specifications, one for various types of person weighing machines and another for self-indicating and semi-self-indicating counter type weighing machines have now been added.

(8) A new Schedule is being added to cover various types of measuring instruments. It will cover :

- (i) General Requirements for Commercial Measuring Instruments.
- (ii) Dispensing Pumps.

The amendments to the State Weights and Measures (Enforcement) Acts and Rules, it is hoped, would be carried out shortly. It is also expected that the amendments would make the law more effective and ensure a fair deal to everybody in the vast field of commercial transactions.

Training Students in France

(This article is reproduced from *Monthly Review* (July 1962, pp. 161-162). It is a report by J. Norris, Esq. F.I. W.M.A., Secretary to Educational Services Committee of the Institute of Weights and Measures Administration in Britain.

Recently a Committee has been established under the Chairmanship of Shri Triguna Sen, Jadavpur University to consider the various requirements for the training of Inspectors of Weights and Measures in India. It is hoped that this comparative assessment of training of Inspectors in Britain and France would be of interest to many in India.— *Editor*)

A report recently published in the French Journal, *Bulletin de L'Organisation Internationale de Metrologie Legale* sets out in some detail the organisation and functions of the College of Metrology established by the French Government.

The purpose of the college is to provide for the professional training of three grades in the weights and measures service, technical assistants, inspectors, and engineers and the various courses laid down appear to be most comprehensive.

A Governing Council consisting of members nominated by the Minister of Industry is responsible for the general direction of the college and is concerned with the funds necessary for its maintenance, the syllabus, the appointment of staff, the equipping of and work to be carried out at the college and in general any matters referred to it by the Minister of Industry or the Director of the College. This Council meets at least once a year and may appoint a permanent sub-committee to deal with day to day matters of administration.

The personnel in charge of the actual running of the College are, a Director, a Deputy Director, Professors in charge of courses, Tutors, and Demonstrators in charge, under the supervision of the professors, of practical and experimental work. These consist of both full time and part time employees and are appointed by the Minister of Industry.

Instruction at the College covers three stages corresponding to three classes of official:

- First stage— trainee technical assistants
- Second stage— trainee inspectors
- Third stage — pupil engineers

and the length of the courses fixed for each stage is six months, one year and two years respectively.

The College accepts students for each of the three grades mentioned above and also, under certain conditions, outside and foreign students but these latter receive no grant from public funds nor can they acquire the status of public official. Students are admitted to the College by competitive examination and all studies are terminated by a statutory examination. Whilst undergoing training students receive a salary and, where necessary, a grant. This does not apply however to outside and foreign students. Students attend lectures, do practical work and visit scientific and industrial establishments and the standard reached is estimated on the basis of classwork and the result of the examination at the end of the course.

The teaching staff of the College is made up as follows:

In the section 'Engineers'—University lecturers, engineers from nationalised or private industry, members of the engineering side of the weights and measures service;

In the section 'Inspectors'—engineers from the weights and measures service;

In the section 'Technical Assistants'—engineers and divisional inspectors from the weights and measures service.

The College is directed by a Chief Engineer from the weights and measures service assisted by an Engineer and the Governing Council.

Trainee Technical Assistants

Candidates for admission must be between 18 and 27 years of age (those who are already officials may be up to 35 years of age).

The entrance examination comprises: Dictation, French Grammar, Arithmetic, Algebra, Geometry, Trigonometry, Mechanics, Physics, Technical Drawing.

The length of training is 18 months; 6 months in the College and 12 months in a testing office.

The College syllabus covers:—

Measurement in units of measure; terminology; general errors; numerical calculations.

Measurement of length measures; metric apparatus.

Surface measurement mechanical measurement of surfaces.

Measurement of Volume Solids-measurement of capacity; apparatus of measurement; Liquids-measurement of capacity, measuring apparatus; measuring containers—(gauging reservoirs, simple operations). Gas-gasometers (outlines).

Measurement of mass weight; weighing machines (Simple and complex).

Measurement of Electrical energy Energy meters (outlines).

Technology Metals and alloys used in the making of measuring instruments.

Technical Drawing
Public and Penal
Law

Ordinances relating to units of measure and the control of measuring instruments.

Trainee Inspectors

Candidates must be at least 22 and not more than 30 years old, (if they are already officials the limit may be extended to 35 years). They must hold a degree in Science (General Mathematics, or Mathematics, Physics and Chemistry) or an Engineering Diploma or have been eligible for the entrance examination to one of the National Colleges.

The entrance examination comprises:—

Written: French Grammar; Mathematics (Geometry, Trigonometry, Algebra and Analysis); Integral and Differential Calculus, Analytic Geometry, Mechanics; Physics (Weight, Hydrostatics, Gas Pressures, Heat, Thermodynamics, Optics, Magnetism, Electrostatics, Electrodynamics, Electromagnetism, Electrotechnics);

Oral: Geometry, Trigonometry, Algebra Analysis, Integral Calculus, Mechanics, Physics, Electricity, Technology, Machine Drawing.

The length of the course is 18 months; 12 months at the College and 6 in a testing office.

The syllabus can be summarised as follows:—

Mathematics .. Numerical Calculus, Outlines of probable Calculus.

Physics .. Liquid mechanics; Thermodynamics; Theory of electricity; Electrotechnics; Electronics.

Normalisation .. Terminology

Measurement in General Units of measurement, errors.

Measurement of Length Length measures, metric apparatus.

Measurement of Angles

Surface measurement Mechanical measurement of surfaces

TRAINING STUDENTS IN FRANCE

Measurement of Volume Solids-measurement of capacity; apparatus of measurement. —Liquids-measurement of capacity; volumetric apparatus; measuring containers (gauging tanks and reservoirs). —Gas-Gasometers.

Measurement of Masses Weight; Weighing apparatus: non-automatic apparatus, automatic or semi-automatic apparatus, apparatus weighing by constants, totalling apparatus, apparatus for measuring amounts of alcohol, apparatus for measuring density.

Measurement of Time Outlines of chronometry.

Measurement of Gas Pressures Apparatus for measuring gas pressures, Systems of releasing pressure.

Measurement of Electrical Energy Apparatus of measurement.

Measurement of Temperature and Heat (Outlines)

Optical measurement (Outlines)

Resistance of Matter General Principles; Flexibility, friction, compression; Application of weighing apparatus of leverage; Outlines of calculation on heterogeneous constructions (e.g., arms of reinforced concrete for suspension bridges).

Technology Metals and alloys used in the fabrication of measuring instruments; wood.

Machine Drawing

Public and Penal Law

Ordinances relating to units of measurement and to the control of measuring instruments.

Pupil Engineers

Pupil Engineers are recruited:

In the proportion of one-third from amongst the students at the Polytechnic College;

In the proportion of one-third, by competitive examination open to former students of the Engineering College and to holders of a degree in Science (not over 30 years of age);

In the proportion of one-third by competitive examination open to Inspectors

in the Weights and Measures Service (not over 40 years of age.)

The examination comprises:

Written: French Grammar, General Mathematics, Rational Mechanics, General Physics, Electricity, Machine Drawing;

Oral: General mathematics, Rational Mechanics, General Physics, Electricity, Technology.

The level is approximately that of the various parts of the degree of Science.

The course lasts two years and the College syllabus may be summarised as follows:

Mathematics .. Imaginary, Complex Interruption, Tensile Calculus, Symbolic Calculus, Calculus of Probability, Statistical Control, Rational Mechanics;

Physics .. Fluid Mechanics, Thermodynamics, Optics, photometry, Acoustics, Electrotechnics, Electronics, Modern Physics, Nuclear Physics.

Normalisation .. Terminology.

Measurement in General Units of measurement; Properties of measuring apparatus; preparation and execution of measurements; Errors.

Various measurements More detailed study of the subjects indicated previously for inspectors.

Precision measurements

Resistance of matter Metal and alloy .. Assaying of metals. technology

Machine Drawing
Public and Penal
Law

Ordinances relating to units of measure and to the control of measuring instruments.

It is obvious that the purpose of the College is to turn out a highly trained official for the weights and measures service and we have nothing to correspond to it in this country. Apart from what the Institute has been able to do, training here is largely a matter for the individual to acquire his knowledge and experience from what sources are available to him. These vary in different

parts of the country and some students have greater opportunities than others.

Whilst much has been done by the Institute in various ways such as Conference and Branch papers, week-end schools, and contributions to *The Monthly Review*, it seems fair to say that the French system should produce a more highly trained official at least from a technical point of view, than his opposite number in the United Kingdom. The French College is Government sponsored and government adminis-

tered however, designed to train men for a government service, and the position is different where administration is in the hands of local authorities.

One praiseworthy feature of the scheme is that, other than those students recruited directly from the Polytechnic College, entry to the College is by competitive examination and it should therefore be possible for a person of ability to rise to the top of his profession.

Length Measures Compulsory from October 1962

(The use of length measures for various purposes has become compulsory from 1 October 1961. Cloth and other commodities which used to be sold by the yard and its subunits will now be sold by the metre and the centimetre. Metric Measures has been publishing many tables. In the May 1962 issue we published a comprehensive table indicating the requirements of cloth for various purposes. In this issue, three useful tables relating to length measures are being published. —Editor)

CONVERSION TABLE FOR PRICES
YARD TO METRE

(Conversion Factor used : 1m = 1.09361 yard)

nP/yard	nP/m	nP/yard	nP/m	nP/yard	nP/m	nP/yard	nP/m	nP/yard	nP/m
1	1	21	23	41	45	61	67	81	89
2	2	22	24	42	46	62	68	82	90
3	3	23	25	43	47	63	69	83	91
4	4	24	26	44	48	64	70	84	92
5	5	25	27	45	49	65	71	85	93
6	7	26	28	46	50	66	72	86	94
7	8	27	30	47	51	67	73	87	95
8	9	28	31	48	52	68	74	88	96
9	10	29	32	49	54	69	75	89	97
10	11	30	33	50	55	70	77	90	98
11	12	31	34	51	56	71	78	91	100
12	13	32	35	52	57	72	79	92	101
13	14	33	36	53	58	73	80	93	102
14	15	34	37	54	59	74	81	94	103
15	16	35	38	55	60	75	82	95	104
16	17	36	39	56	61	76	83	96	105
17	19	37	40	57	62	77	84	97	106
18	20	38	42	58	63	78	85	98	107
19	21	39	43	59	65	79	86	99	108
20	22	40	44	60	66	80	87	100	109

LENGTH MEASURES COMPULSORY FROM OCTOBER 1962

Rs/Yard	Rs/m	Rs/Yard	Rs/m	Rs/Yard	Rs/m	Rs/Yard	Rs/m	Rs/Yard	Rs/m
1	1.09	11	12.03	21	22.97	31	33.90	41	44.84
2	2.19	12	13.12	22	24.06	32	35.00	42	45.93
3	3.28	13	14.22	23	25.15	33	36.09	43	47.03
4	4.37	14	15.31	24	26.25	34	37.18	44	48.12
5	5.47	15	16.40	25	27.34	35	38.28	45	49.21
6	6.56	16	17.50	26	28.43	36	39.37	46	50.31
7	7.66	17	18.59	27	29.53	37	40.46	47	51.40
8	8.75	18	19.68	28	30.62	38	41.56	48	52.49
9	9.84	19	20.78	29	31.71	39	42.65	49	53.59
10	10.94	20	21.87	30	32.81	40	43.74	50	54.68

CONVERSION TABLE FOR LENGTH MEASURES
GIRAH TO CENTIMETRE YARD TO METRE

Conversion Factor : 1 inch = 2.54 centimetres m = metre (s) cm = centimetre (s)									
Girah	Cm	Girah	Cm	Yards	m	cm	Yards	m	cm
1	6	11	63	1	1	91	20	18	29
2	11	12(½yd)	69	2	2	83	30	27	43
3	17	13	74	3	3	74	40	36	58
4(½yd)	23	14	80	4	4	66	50	45	72
5	29	15	86	5	5	57	60	54	86
6	34	16(yd)	91	6	6	49	70	64	01
7	40			7	7	40	80	73	15
8(½ yd)	46			8	8	32	90	82	30
9	51			9	9	23	100	91	44
10	57			10	10	14			

16 Girah = 1 yard
One Metre = 100 Centimetres = 17½ Girah = 39.37 inches.
NOTE:- This table indicates only equivalents of girah and yard. For actual requirements of cloth for apparel, see the next table

CLOTH REQUIREMENTS IN METRIC TERMS

Sl. No.	Items	Measurements in yards (width in inches)	Recommended Metric Measurements m/cm
Men's Apparel			
(1) Coat (cotton) ..	..	3 (24"-36")	2.75 (60-90 cm)
(2) Suit (woollen) ..	..	3½ (54-56")	3.20 (135-145 cm)
(3) Trousers (Cotton and silk)	..	3 (24"-36")	2.75 (60-90 cm)
Silk suit ..	..	6 (24"-36")	5.50 (60-90 cm)
(4) Trousers (cotton) .	..	3 (24"-36")	2.75 (60-90 cm)
(5) Achkan (cotton) ..	..	5½ (30")	5.00 (75-76 cm)
(6) Sherwani (woollen) ..	..	2½ (54"-56")	2.30 (135-142 cm)
(cotton) ..	..	5 (30")	4.60 (75 cm)
(7) Bushshirts, Manila etc	..	2½ (36")	2.30 (90-91 cm)
(8) Turban ..	..	5 (22")	4.50 (55-56 cm)
	..	7 (22")	6.50 (55-56 cm)
	..	4 (45")	3.75 (130-132 cm)
(9) Dhoti ..	..	4½ (52")	4.10 (130-132 cm)
	..	5 (45")	4.50 (114-115 cm)
(10) Shirt (cotton)	..	2½ (36")	2.30 (90-91 cm)
Half Sleeve ..	..	3 (36")	2.75 (90-91 cm)
Full Sleeve ..	..		
Women's Apparel			
(1) Salwar ..	..	3 (45")	2.75 (114-115 cm)
(2) Kameej ..	..	2 (45")	1.85 (115 cm)
	..	2½ (45")	2.05 (115 cm)
(3) Sarees ..	..	5 (45"-48")	4.50 (115-125 cm)
	..	5½ (45"-48")	5.00 (115-125 cm)
	..	6 (45"-48")	5.50 (115-125 cm)
	..	7 (45"-48")	6.50 (115-125 cm)
	..	8 (45"-48")	7.25 (115-125 cm)
	..	9 (45"-48")	8.25 (115-125 cm)
	..	1 (36")	0.90 (90 cm)
(4) Blouses ..	..	12½ (36")	2.30 (90-91 cm)
(5) Petticoat ..	..		

News & Views

Recent Notifications

(1) Area

S.O.No. 2940 dated 24th September 1962.

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), as in force in India and as applied to the State of Pondicherry, the Central Government hereby appoints the 1st day of October 1962 as the date on which the provisions of the said Act, in so far as they relate to units of area, shall come into force in the whole of India except the State of Jammu and Kashmir and in the State of Pondicherry, except in relation to transactions of those classes of undertakings or those Government departments in respect of which the said provisions have already come into force.

S.O. No. 2941 dated 24th September 1962.

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), as in force in India and as applied to the State of Pondicherry, 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. 2940 dated the 24th September 1962 the continuance of the use—

- (a) in the case of transactions relating to and involving the area of land, for a period of three years,
- (b) in the case of any other transaction, for a period of six months, from the first day of October 1962 of any

unit of area which immediately before that date was in use in respect of similar transactions in the said areas.

(2) Volume

S.O.No. 2942 dated the 24th September 1962

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), as in force in India and as applied to the State of Pondicherry, the Central Government hereby appoints the 1st day of June, 1962 as the date on which the provisions of the said Act, in so far as they relate to units of volume, shall come into force in the whole of India except the State of Jammu and Kashmir and in the State of Pondicherry, except in those classes of undertakings or those Government Departments in respect of which the said provisions have already come into force.

S.O.No. 2943 dated 24th September 1962

In exercise of the powers conferred by section 14 of the Standards of Weights and Measures Act, 1956 (89 of 1956), as in force in India and as applied to the State of Pondicherry, 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. 2942 dated the 24th September 1962 continuance of the use for a period of six months from the 1st of October, 1962, of any unit of volume which immediately before that date was in use in respect of the said areas.

NEWS & VIEWS

(3) Prices of Various Varieties of Paper & Paper Board

No. Ch. (1)-17 (130)/60 dated the 21st June 1962.

In their Resolution No. Ch. (1)-41 (79)/59, dated the 27th November, 1959, the Government of India had *inter alia* announced fair ex-works ceiling prices of various varieties of paper and paper board to take effect from 1st January, 1960.

The manufacturers of paper have represented that these prices should be increased on account of various factors leading to a higher cost of production. After considering all relevant aspects it has been decided to give an *ad hoc* increase of 6 (Six) nP. per kilogram for all the varieties of paper. On this basis the prices for the various varieties of paper have now been fixed as under:

	Fair Ex-works price nP. per kilogram	Civil selling price nP. per kilogram*
1. White printing	132	155
2. Uubleached Printing	125	147
3. Offset/Cartridge	132	155
4. Antique-Laid/Wove	132	155
5. Cream-Laid/Wove	137	161
6. Imitation Art	132	155
7. Art Paper	201	230
8. Chromo Paper	176	203
9. Ledger Paper— Account Book	132	155
Azurelaid	139	162
10. Banks & Bonds	150	174
11. Typewriting	157	183
12. Manifold/Airmail	195	223
13. Duplicating	132	155
14. Poster Paper	132	155
15. Kraft	120	142
16. Wrappers	117	139
17. Cover Paper	132	155
18. Match Paper	126	149
19. Blotting Paper	145	169
20. Pulp Board	132	155
21. Duplex Board	132	155
22. Ticket Board and Triplax Board	130	153
23. Art Board	189	217
24. Chromo Board	164	189

(Exclusive of excise duty, State Govt. or Local Levies). It has also been decided that the rebate on reels hitherto allowed by the Paper Industry be discontinued. The prices and discontinuance of rebate mentioned above will come into force with immediate effect.

High Finish for Laboratory Weights

The National Bureau of Standards is working out a method for achieving a smooth hard finish on stainless steel, a material which is now becoming popular for laboratory weights. It is based on the diamond burnishing technique evolved by Hull. Specimens of stainless steel cylindrical bars, when subjected to this technique, gave surface finishes which met the requirements for laboratory weights. They had a hard surface finish with an average smoothness to within 3 micro inches (0.75 microns). Long-term tests are now under way to investigate the suitability of the diamond burnishing method for fabricating scientific reference mass standards. (*NBS Technical News Bulletin*, June 1962, pp. 70-71)

Metric System for UPSC Examinations

It is understood that the Union Public Service Commission will use both the foot-pound-system and the metric system for the examinations to be held during the period 1965-70. From 1970 onwards, only the metric system would be used.

Metric System in Building Industry

In compliance with the recommendation of the Conference on Adoption of Metric System in Building, Architecture and Town Planning held in September 1960, the Central P.W.D. has undertaken the preparation of various types of Specifications in metric system. So far, the Central P.W.D. has brought out two documents: the first one relating to Specifications in Metric System for Works at Delhi sub-head 'Brick Work', and the second one deals with Delhi Schedule of Rates 1955 in Metric Units. These books are available at Rs. 2.50 and Rs. 5 respectively, from the Financial Adviser to the Chief Engineer, Central P. W. D., L-Block, New Delhi.

Book Review

METRIC CONVERSION TABLES FOR EVERYDAY USE (English) published by Publications Division, Ministry of Information and Broadcasting, Old Secretariat, Delhi, 6; August 1962; Price Re. 0.60; pp. 52.

The use of the various metric weights and measures is gradually becoming compulsory in India. The use of metric weights has become compulsory from 1 April 1962, that of metric length measures from 1 October 1962 while only metric capacity measures will be used on an India-wide scale from 1 April 1963. In the wake of these changes it is necessary that people should become familiar with the conversion of weights to assess their requirements in the new units and that of prices to judge the fairness of the conversion of prices. There have been cases where traders have charged higher prices for commodities sold in metric units than warranted by straight conversion. This book that Publications Division has brought out on behalf of the Ministry of Commerce and Industry is, therefore, timely.

There are 40 tables in this book, divided into 4 sections. The first section relates to the pricing units for wholesale and retail transactions and the correct abbreviations to be used for metric units. These tables are important because trade all over India should use rational metric units for transactions. The units prescribed for wholesale and retail trade should find use in the trade carried out in every village, town and city. Abbreviations indicated here should also be rigorously followed if confusion about meaning is to be avoided.

The second section tabulates the conversion of weights and measures of one type to another. It comprises 19 tables and covers the whole range of the normal day-to-day requirements of conversion of weights and measures. A long table of requirements of cloth for various types of apparel as also recommended sizes for ready-to-wear dresses has also been included.

The Third section consisting of 15 tables is devoted to the conversion of prices from non-metric units to metric units. This section will be found useful not only by the average consumer but also by the retail and wholesale traders.

The fourth section deals with tables of the international paper sizes which have been recommended for use in future as also the sizes to be used for various types of publications.

The book has been very well printed and the tables are easy to read. The tables are bound to prove useful to all who have to enter into commercial transactions, which means everybody above the age of 10 years. For the price, the book is cheap.

OUR MODEL ARITHMETIC: BOOK-I

(English) K. Suryanarayanan, Principal and T. Rajagopalan, Vice-Principal of the M.E.A. Higher Secondary School, New Delhi; published by Cambridge Publishing House, Kasturi Niwas, Rehgarhpura, New Delhi-5; 1962; pp. 208; price Rs. 2.75.

The success of the adoption of metric system is directly proportional to the extent to which we are quickly able to train the

younger generation in the proper use of metric system for daily requirements as also in subjects they learn in schools and colleges. It is, therefore, necessary that students should start on the correct approach to the metric system as early in their life as possible, if we have to derive the maximum benefits from the new system. The use of the correct units in commercial transactions, their relation to currency and their applicability in daily life are all a part of arithmetic. It is, therefore, necessary to start the students as early as possible in their life on the study of the metric system in their school career.

The present book, which is intended for class VI or its equivalent standard, is, therefore, welcome. The authors who are themselves experienced teachers, have taken great care to use only the metric system of units and that too rationally, in this book. The introduction of the various metric units has been done in a very easy manner and correct abbreviations have been used. The subject has been introduced logically and precisely.

This book represents a laudable effort in the introduction of the metric system in school textbooks and is, therefore a step in the right direction. The book has been printed well, the important points being given in bold letters to catch the eye. It is sure to prove useful.

It is hoped that in the very near future,

the authors will undertake the task of writing textbooks for higher classes as well.

BHAGIRATH—EIGHTH ANNIVERSARY NUMBER

Bhagirath, a magazine sponsored by the Central Water and Power Commission, Ministry of Irrigation and Power, has brought out its July 1962 issue as its Anniversary Number. With this issue the monthly enters the ninth year of its publication. This issue contains well illustrated articles of national and international importance by eminent people in the field.

Bhagirath has been in the forefront in using metric units in the articles published in its pages. The FPS units are also given by it for information. *Bhagirath* is thus doing an excellent job of taking the metric system to the engineers and others working in the field of irrigation and power.

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

M/s. Sahu Cement Service has published a booklet called *Design of Prestressed Concrete Structures*. The book is meant for a Post Graduate Course and is very brief and simple. It gives formulas and methods for practical calculations for design engineers.

It is gratifying to see that throughout this booklet only the metric system has been used for all calculations. It is hoped that M/s. Sahu Cement Service will bring out their future publications using only the metric system.

Standards News

(Indian Standards which have a particular bearing on the change-over to the metric system are indicated here. Copies would be available from the Indian Standards Institution, Manak Bhavan, 9 Mathura Road, New Delhi or their Branch Offices at Bombay, Calcutta, Madras and Kanpur.)

Indian Standard Protractors for Use of Drawing Offices (IS: 1563-1962)

The Indian Standards Institution has published an Indian Standard Specification for Protractors for Use of Drawing Offices (IS: 1563-1962), which covers requirements for three types, namely, circular, semi-circular, and rectangular protractors, commonly used by cartographers, surveyors and engineers for measuring angles or laying out angles of given values and checking angular works.

Metric system has been adopted in India and all the values in this standard have been given in this system.

Price: Rs. 2-50

Revised Indian Standard for Glass Liquor Bottles (IS: 1662-1962)

The Indian Standards Institution has published a revision of Indian Standard Specification for Glass Liquor Bottles (IS: 1662-1962), which prescribes the requirements and the methods of test for glass liquor bottles.

This standard was originally published in 1960 prescribing three sizes of liquor bottles in rationalized metric units, and was intended to cover the needs of all types of liquor and beer. However, the requirements for liquor bottles and beer bottles being different, it was decided to cover them in separate standards. A few more additional sizes in the range have been

included in order to meet the needs of industry in respect of liquors and beers of every type used both for internal and export markets.

With a view to enabling the packers of the liquor to retain the individuality of the shapes and dimensions of the bottles used by them, the same have not been specified in this standard.

Price: Rs. 2-00

Indian Standard for Schedule of Unit Weights of Building Materials (IS: 1911-1961)

The Indian Standards Institution has published an Indian Standard Schedule of Unit Weights of Building Materials (IS: 1911-1961), which lays down unit weights of materials and parts or components used in building construction. The unit weights of other materials that are likely to be stored in a building are also specified in this standard for the purpose of load calculations.

Structural calculations for any building involve a knowledge of the weights of various building materials and weights of materials that are likely to be housed or stored in the building. This standard aims to guide the designer in regard to the weights of building materials, building components and stored materials that are encountered during the course of normal building design.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

Price: Rs. 6-00

Indian Standard for Equivalent Metric Units for Quantities in Mechanical Engineering (IS: 1926-1961)

The Indian Standards Institution has published

Indian Standard Equivalent Metric Units for Quantities in Mechanical Engineering (IS: 1926-1961). The standard lays down the equivalent metric units for various dimensions and quantities met with in the mechanical engineering field and hitherto expressed in fps units.

Pursuant to the decision of the Government of India to introduce a uniform system of weights and measures based on the metric system, different Government departments, major industries and trade interests are proceeding to change over to the metric system in their respective spheres of operation. The Indian Standards Institution has already published a series of Indian Standards for metric weights and measures and for interconversion of inch and metric units. This Indian Standard prescribes the equivalent metric units for various quantities in mechanical engineering which have hitherto been expressed in the fps system. In the choice of these units, two important considerations have been kept in mind, namely, the new unit chosen should be rational and it should have a direct understandable relationship with the basic unit.

Price: Rs. 4-00

Indian Standard for Steel Rivet and Stay Bars for Boilers (IS 1990-1962)

The Indian Standards Institution has published an Indian Standard Specification for Steel Rivet and Stay Bars for Boilers (IS: 1990-1962).

Metric system has been adopted in India and all quantities and dimensions appearing in this standard have been given in this system. Corresponding non-metric values have also been given, wherever necessary, for the sake of smooth changeover by December 1966.

Price: Rs. 1-50

Indian Standard for Dimensions for shaft Height for Driving and Driven Machines (IS: 2031-1962)

The Indian Standards Institution has published (IS: 2031-1962) Indian Standard

Dimensions for Shaft Height for Driving and Driven Machines, which cover the heights (from 25 to 1 600 mm), tolerances on height and parallelism for shafts of driving and driven machines.

Manufacture of prime movers as diesel engines, electric motors, etc. has been established in the country and these machines are coupled to other driven machines, such as generators, pumps, agricultural implements, etc. To ensure that the designs are worked out making interchangeability possible amongst different makes of machines the need for formulating an Indian Standard on the heights of shaft for driving and driven machines was felt necessary.

Price: Re. 1-00

Indian Standard for Butter Tins (IS:2034-1961)

The Indian Standards Institution has published an Indian Standard Specification for Butter Tins (IS: 2034-1961), which prescribes the requirements of round open top containers manufactured from tinplate for packing 200 g and 400 g of butter.

With the development of dairy industry in the country the production and distribution of butter is expected to increase considerably with possibilities of export also. At present, butter is being packed and marketed in a large variety of tinplate containers in non-metric capacities, in addition to the paper packages. Rationalization of the sizes of these tins and their dimensions in metric units will assist standardization work in connected industries and will result in an overall economy. It is also considered necessary to prescribe other requirements so as to ensure the delivery of the product in good condition to the consumers. The Union Ministry of Food & Agriculture, therefore, desired the formulation of an Indian Standard giving preferred sizes and dimensions in metric units of the butter tins and prescribing other essential requirements.

Metric system has been adopted in India and all quantities and dimensions in this standard are given in this system. However, non-metric values to which the industry has been accustomed have also been given in brackets, wherever necessary.

Price: Re 1.50

Indian Standard for Square Tins for General Purposes (IS : 2087-1962)

The Indian Standards Institution has published an Indian standard Specification for Square Tins for General Purposes (IS : 2087-1962) which prescribes the requirements of square built up tins manufactured from tinplate.

Square built up tins are used for packing vanaspati confectionery and a variety of other products. With the introduction of the metric system of weights and measures in India, it has become necessary to recommend a rationalized series of square tinplate containers in the metric system for packing these products. In formulating this standard, the technical committee responsible for its preparation has kept in view the current trade practices followed in the country in this field.

Each tin in this standard is designated with a tin-reference number for ease of reference. Containers of three classes are prescribed in this standard depending on the use they will be put to and suitable tests for the three classes are also given.

Metric system has been adopted in India and all units and dimensions appearing in this standard are given in this system. Non-metric equivalents to which the industry is used are also given in brackets for facilitating smooth changeover by December 1966.

Price: Rs. 2.00

Indian Standard for Glass Beer Bottles (IS: 2091-1962)

The Indian Standards Institution has published an Indian Standard Specification for Glass Beer Bottles (IS: 2091-1962), which

prescribes the requirements and the methods of test for glass beer bottles.

An Indian Standard Specification for Glass Liquor Bottles (IS: 1662) was originally published in 1960 to cover liquor bottles as well as beer bottles and to provide a rationalized range of nominal capacities in the metric system common to both. Subsequently, it was decided to formulate a separate specification for glass beer bottles and hence, this standard has been issued.

With a view to enabling the packers of liquor to retain the individuality of the shapes and dimensions of the bottles used by them the same have not been specified in this standard. Due consideration has also been given to the current trade practices in prescribing the sizes and tests for glass bottles.

Price: Rs. 2.50

Indian Standard for Steel Billets, Bars and Sections for Boilers (IS: 2100-1962)

The Indian Standards Institution has published an Indian Standard Specification for Steel Billets, Bars and Sections for Boilers (IS: 2100-1962) which covers the requirements for two grades of plain carbon steel billets, bars (other than rivet and stay) and section for boilers.

Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system. Corresponding non-metric values are also given wherever necessary, for the sake of smooth changeover by December 1966.

Price: Rs. 2.00

Draft Indian Standard for Recommendations for Modular Co-ordination Applied to R.C.C. Framed Structures (Doc: BDC 10 (564))

The Indian Standards Institution has prepared a draft Indian Standard Recommendations for Modular Co-ordination Applied to R.C.C. Framed Structures Doc : BDC 10 (564), which provides guidance for using the system of modular planning; it deals

with the layout and preferred dimensions of R.C.C. structural members like Columns, Beams, Slabs, etc. which may be laid at site in such a way that standard modular components will go into spaces, recesses and openings provided in the structure, with minimum cutting and wastage.

Building industry until now has been employing methods which involve a lot of site cutting of building materials and components resulting in waste and increased building costs. This draft standard is an attempt to rationalize dimensions of R.C.C. structural members with a view to achieving economy in building.

The draft standard will be circulated shortly to all interests concerned for eliciting technical comments.

Draft Indian Standard for Parallel Keys and Keyways for Machine Tools

With a view to ensuring interchangeability of the keys used on machine tools, the Indian Standards Institution has prepared a draft Standard Specification for Parallel Keys and Keyways for Machine Tools. Parallel key is a commonly used component required for positive transmission of power.

The draft standard prescribes the dimensions and tolerances for parallel keys for machine tools suitable for shaft diameter range 10 to 170 mm and the material for key bars.

This draft standard will be circulated shortly to interested producers, consumers and technologists for eliciting technical comments.

Draft Indian Standard for Boundary Dimensions for

Ball and Roller Bearing for General Engineering purposes (Doc: EDC 39 (574))

Standardization of bearings in the past been mainly the result of the demand for dimensional interchangeability among the bearings manufactured by different manufacturers. However, it has been realized that for satisfactory performance the bearings should also satisfy, in addition to dimensional interchangeability, the basic minimum running accuracies.

To ensure the interchangeability and running accuracies, the Indian Standards Institution has prepared a draft Indian Standard Boundary Dimensions for Ball and Roller Bearings for General Engineering Purposes, Doc : EDC 39 (574), which prescribes boundary dimensions, tolerances and running errors of ball and roller bearings,

The draft standard will shortly be put into wide circulation to manufacturers, consumers, technologists and other interested for their critical comments and suggestions for improvements.

Draft Indian Standard for Baby Weighing Machines (Doc: EDC 41(679))

The Indian Standards Institution has prepared draft Indian Standard Specification for Baby Weighing Machines Doc : EDC 41 (679), which covers the requirements for baby weighing machines.

The draft standard will shortly be issued into wide circulation to the interested producers, consumers, technologists and others concerned for eliciting technical comment.

CORRECTION

Shri V. P. Gokhale, Principal, Government College of Agriculture, Parbhani has pointed out an error which may be corrected as follows :

On p. 20 of July 1962 issue of *Metric Measures*, read '1/16 seer or chhatak (equivalent to 58 grams) 50 grams' for the present entry.

Licensed Manufacturers, Dealers and Repairers of Weights and Measures (22)

Metric Measures has been publishing a series of lists of manufacturers, dealers and repairers and weights and measures, weighing and measuring instruments licensed by the Governments in the various States and Union Territories under the Weights and Measures (Enforcement) Act in their respective jurisdiction. This is the twenty-second 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 States or Union Territory. The issues of the *Metric Measures* in which previous lists appear are shown suitably.

An analysis of the licensees, including the present list, shows that the total number of licensees in 14 States and 5 Union Territories is 1,190 manufacturers, 4,680 dealers, and 1,100 repairers. The details of published information area as follows:

Sl. No.	State/Union Territory	Licensees		
		Manufacturers	Dealers	Repairers
(1)	Andhra Pradesh	101	194	54
(2)	Assam	16	97	28
(3)	Bihar	20	69	34
(4)	Delhi	28	93	20
(5)	Gujarat	115	625	139
(6)	Himachal Pradesh	1	28	1
(7)	Kerala	52	415	123
(8)	Madhya Pradesh	115	496	9
(9)	Madras	7	828	126
(10)	Maharashtra	101	163	185
(11)	Manipur	14	85	5
(12)	Mysore	104	471	165
(13)	Orissa	87	17	3
(14)	Pondicherry	2	12	2
(15)	Punjab	39	157	29
(16)	Rajasthan	43	206	44
(17)	Tripura	1	9	0
(18)	Uttar Pradesh	207	515	8
(19)	West Bengal	65	200	55
		1,190	4,680	1,110

LICENSED MANUFACTURERS, DEALERS & REPAIRERS OF WEIGHTS & MEASURES (22)

GUJERAT (5)

In the March, September and November 1961 and May 1962 issues of *Metric Measures* lists of manufacturers, dealers and repairers in Gujarat were published. The following is a list of manufacturers, dealers and repairers subsequently licensed under the Bombay weights and Measures (Enforcement) Act, 1958:

Manufacturers

Sl. No.	Name / Address of the Manufacturers	Details of Articles Manufactured
(1)	Abbasbhai Taherali Ahmedabadwala, 4/871, Chevli Sheri-Naka, Station Road, Surat.	Conical Capacity Measures.
(2)	Dhanji Mavji Luhar, Zinzuda Gate, Savarkundla	Beam Scales Class C.
(3)	Dodia Iron Works, Opp. Padshah Pole, Relief Road, Ahmedabad.	Non-Flexible Metre Measures.
(4)	Khodidas Zinabhai Luhar, Near Rajpipala Sub-Jail, Rajpipla, Dist. Broach.	Beam Scales Class C. & D.
(5)	Manji Pole Luhar, Zinzuda Gate, Savarkundla	Beam Scales Class C.
(6)	S. V. Pathak, Jamadarpada, Savarkundla	Beam Scales Class C.

Dealers

Sl. No.	Name/Address of the Dealers	Details of the Articles Sold.
(1)	Akbarali Rasulji, Opp. Gandhiji's Statue, Bulsar, Dist. Surat.	Metric Commercial Weights, Measures, Weighing & Measuring Instruments.
(2)	Anilkumar & Co. Madhavpur (Ghed) P.O. Keshod	Weights, Measures, Weighing & Measuring Instruments.
(3)	Bahadarji Fakiraji Khatri, Near Post Office, Bodeli, Dist. Baroda.	Weights, Measures, Weighing & Measuring Instruments.
(4)	Bhagwanbhai Bhudarbhai Thakkar, Bazar, Harij, Dist. Mehsana.	Do.
(5)	Chotalal Dalsukhbhai Panchal, Station Road, Waghodia, Dist. Baroda.	Do.
(6)	Chandulal Laxmichand Doshi, Bazar, Vadali, D.S.K.	Do.
(7)	Chunilal Jeshaji, Bazar Vyara, Dist. Surat	Do.
(8)	Dhansukhlal Pitamberdas Modi, Unai, Dist. Surat	Do.
(9)	Dahyalal Manilal Shah, Nava Bazar, Idar, Dist. Sabarkantha.	Do.
(10)	Dahyalal Joitaram Panchal, Mator, Vadnagar, Dt. Mehsana.	Do.
(11)	Dineshchandra Chhotalal Modi, Kala Vasudev Chachare, Vadnagar, Dist. Mehsana.	Do.
(12)	Fulchandras Pursottamdas Mehta, Bazar Kalol, D.P. Mahals	Do.
(13)	Ghanchi Hasam Umat & Bros., Near Old Bus Stand, Mandvi (Kutch).	Weights, Measures & Weighing Instruments.
(14)	Gokaldas Sunderji, Bazar, Manavadar	Do.
(15)	Gunvantrai & Bros., Tana (Via Sihor)	Weights, Measures, Weighing & Measuring Instruments.
(16)	Haidarali Taiyabli, Nava Bazar, Miyagam-Karjan, Dist. Baroda.	Weights, Measures & Measuring Instruments.
(17)	Hajimulla Abdul Hussein Haji Salemanji & Sons, Outside Murila Gate, Kalavad. (Sitla).	Weights, Measures, Weighing & Measuring Instruments.
(18)	Jadav Electric Repairing Works, Thondaly Compound, Bachubhai's Street, Junagadh.	Weights, Measures, Weighing & Measuring Instruments.

Dealers (Contd.)

(1)	(2)	(3)
(19)	Janta Hardware Stores, Malpur, Dist. Sabarkantha.	Weights, Measures, Weighing & Measuring Instruments.
(20)	Jethalal, Keshavlal Panchal Bazar, Mehmedabad, Dist. Kaira.	Do.
(21)	Jivabhai Bhijibhai, Gandhi Bazar, Mehmedabad Dist. Kaira.	Do.
(22)	Kadarbhai Haji Amibhai Meman, Ghee-Kanta Bazar, Radhanpur, Dist. Banaskantha.	Do.
(23)	Kanaiyalal Nagindas Shah, Kacheri Road, Pavi Jetpur, Dist. Baroda.	Do.
(24)	Kanchanal Mahasukhlal Shah, Timba-Road, D.P. Mahals.	Do.
(25)	Kasturbhai Narsinghbhai Soni, Bhavsarwad, Nadiad, Dist. Kaira.	Do.
(26)	Luhar Dhanj Mavji, Zinzuda Gate, Savarkundla	Weights, Measures & Weighing Instruments.
(27)	Luhar Mulji Naran, Manibhai Road, Savarkundla	Weights, Measures, Weighing & Measuring Instruments.
(28)	Lallubhai Mithabhai & Co. Lokhandwala, Bodeli, Dist. Baroda.	Weights, Measures, Weighing & Measuring Instruments.
(29)	Lallubhai Maganlal & Sons, Sadar Bazar, New Deesa, Dist. Banaskantha.	Do.
(30)	Madhusudan Morarji & Co., Bazar, Malia Hatina	Weights, Measures, Weighing & Measuring Instruments.
(31)	Makwana Iron Works, Oad Wada, Savarkundla	Weights, Measures, Weighing & Measuring Instruments.
(32)	Mistry Karsan Jeram & Co., Nadi Kantha, Savarkundla.	Weights, Measures & Weighing Instruments.
(33)	Mullah Amarbhai Noorbhai & Sons., Moti Bazar, Gondal	Weights, Measures, Weighing & Measuring Instruments.
(34)	Narottamdas Madhavji Oil Mill, Station Road, Unjha, Dist. Mehsana.	Weights, Measures, Weighing & Measuring Instruments.
(35)	Prafulchandra Narbheram & Co., Station Road, Bagasara.	Weights, Measures, Weighing & Measuring Instruments.
(36)	Ramdas M. Nathadwarawala, Bank Road, Baroda	Weights, Measures, Weighing & Measuring Instruments.
(37)	Rameshchandra & Bros., Bazar, Mansa, Dist. Mehsana	Do.
(38)	Ranchhoddas Vithaldas Kansara, Bazar, Umbargam, Dist. Surat	Do.
(39)	Rasiklal & Co., Nehru Road, Jamjodhpur	Weights, Measures, Weighing & Measuring Instruments.
(40)	Shah Amratlal Panachand & Co., Opp. Court, Malia Hatina.	Weights, Measures & Weighing Instruments.
(41)	Shankarlal Mohanlal Choksi, Kapad Bazar, Sidhpur, Dist. Mehsana.	Weights, Measures, Weighing & Measuring Instruments.
(42)	Vajlal Premji & Bros., Jamandorana	Weights, Measures, Weighing & Measuring Instruments.
(43)	S. J. Shrimankad & Co., Para Bazar, Rajkot	Do.
(44)	Sutar Devshi Bhimji, Vanda (Via-Savarkundla)	Weights, Measures & Weighing Instruments.
(45)	Vadilal Ambalal Shah, Bazar, Haldharvas, Dist. Kaira.	Weights, Measures, Weighing & Measuring Instruments.
(46)	Vyas Chhotalal Kalyanji, Old Vegetable Market, Dharangdhra.	Weights, Measures, Weighing & Measuring Instruments.
(47)	Vithaldas Pitambardas Kansara, Sardar Vallabhbhai Patel Road, Vapi, Dist. Surat.	Weights, Measures, Weighing & Measuring Instruments.

Repairers

Sl. No.	Name/Address of the Repairer	Details of the Articles Repaired
(1)	Chhabildas Zinabhai Mistry, Sonifalia, Abrama, Dist. Surat.	Weights, Measures, Weighing & Measuring Instruments.
(2)	Dahyalal Jotiram, Panchal Mator, Vadnagar, Dist. Mehsana.	Do.
(3)	Kansara Ramji Byanji, Kansara, Bazar, Anjar	Weights, Measures, Weighing & Measuring Instruments.
(4)	Luhar Dhanji Mavji, Zinzuda Gate, Savarkundla.	Do.
(5)	Luhar Vallabhdas Raghavji, Shroff Bazar, Saredi Pith Dela, Bhavnagar.	Do.
(6)	Mistry Hira Rana, Near Ahir Bhuvan, Janata Chowk, Junagadh.	Do.
(7)	Mistry Jadav Naran, Amratvel Gate, Savarkundla	Do.

KERALA (9)

In the November 1959, March and November 1960 and January and September 1961 and May 1962 issues of Metric Measures lists of licensed manufacturers, dealers and repairers of weights and measures in Kerala State were published. The following is a list of manufacturers, dealers and repairers subsequent licensed by the Government of Kerala under Kerala Weights and Measures (Enforcement) Act, 1958:

Manufacturers

Sl. No.	Name and Address of Manufacturer	Details of Article Manufactured
(1)	M. Aboobacker, Thamaravelli House, Danapady Haripad Kathigapally Taluk.	Dry Measures (2 litres and below)
(2)	Balaram & Co., Popully P. O., Palghat	Half Metre Length Measure only.
(3)	S. Chellppan Pillai, National Metal Industries, Mundakkal Middle Ward, Quilon.	Conical & Dry Measures.
(4)	Eavi Industries, Ankamaly, Ernakulam.	Dry Measures
(5)	K. R. Karthikeyan, Agricultural Implements, Market Road, Ernakulam.	Dry Measures
(6)	K. P. Kani Rowther, Tin Manufacturing Co., Athirampuzha.	Dry Measures.
(7)	M. V. Kunjippaly, High Road, Trichur	Dry Measures.
(8)	P. B. Nadarajan Chettiar, Selva Industries, Shethalai	Dry Measures (2 litres and below)
(9)	Prasanna Metal Industries, South Paravoor, Quilon	Conical & Dry Measures.
(10)	Southern Metal Industries, Mannar, Chengannur, Alleppey, District.	Dry, Pouring and Dipping Type Measures.
(11)	A. Subramonian Asari, Muthupurayidam, Thiruvampady, Alleppey.	Beam Scales (C & D (Classes) only.
(12)	Venus Metal Industries, Cloth Bazaar Road, Ernakulam	Conical Measures.

Dealer

Sl. No.	Name and Address of Dealer	Details of Articles Sold
(1)	Abraham Varghese, Hardware Merchant, Ponkunnam P.O., Kottayam.	Weights, Measures, Weighing & Measuring Instruments.
(2)	P.H. Abdul Kader, Hardware Merchant, Baliapatanam, Cannanore.	Weights, Measures, Weighing & Measuring Instruments.
(3)	Associated Engineering Corporation Ltd., Kozhikode	Weighing Instruments.

Dealers (Concl'd.)

(1)	(2)	(3)
(4)	Aspinwall & Co., Ltd., Post Box No. 2, Cochin-2	Weights, Measures, Weighing & Instruments.
(5)	P. R. Gangadhara Panicker, Hardware & Paint Stores, Peroorkada, Trivandrum-5.	Weights, Measures, Weighing & Measuring Instruments.
(6)	General Stores, Kattoor, Trichur	Weights, Measures, Weighing & Measuring Instruments.
(7)	E. M. Haneefa, Iyla Gunny Store, Chinnakada, Quilon ..	Weighing Instruments.
(8)	Kerala State Co-operative Marketing Federation Ltd., P.B. No. 80, Beach Road, Calicut.	Weighing Instruments.
(9)	K. C. Mathew, Kadasseril Stores, Erumely, Kottayam ..	Weights, Measures, Weighing & Measuring Instruments.
(10)	Marikar & Co., Ltd., No. 21, Bazaar Munnar P.O., High Range, Kottayam.	Weights, Weighing and Measuring Instruments.
(11)	N. T. Paul, Hardware Merchant, Njattathuvayilli Stores, Kanjirapally.	Weights, Measures, Weighing & Measuring Instruments.
(12)	Punier Kurien Mudamthadathil House, Mannanam, Arpookara P.O., Kottayam.	Measures
(13)	G. R. Prabhu & Sons, Paper & Office Stationers, K.K. Road, Kottayam.	Weights, Measures, Weighing & Measuring Instruments.
(14)	Thomas & Chandy, Stationery Merchants, T. B. Road, Kottayam.	Weights & Weighing Instruments.
(15)	Secretary, T.C.D.S. Ltd., No. 4, Puthenohanthai, Trivandrum.	Weights, Measures, Weighing & Measuring Instruments.
(16)	Western Medical Stores, Musaliar Buildings, Quilon ..	Weights & Measuring Instruments.

Repairers

Sl. No.	Name and Address of the Repairers	Details of Articles Repaired
(1)	Jeevan Industries, Kottayam	Platform Machines and Beam Scales
(2)	Metric Scale Industries, Mukundapuram Taluk, Irinjalakuda.	Platform Machines.
(3)	A. Moosa, Arimbrathodiyil House, Jubili Road, Parinthalmanna P.O.	Beam Scales C & D Classes.
(4)	A. K. Rahem, Pazhayasala Street, T. C. 32/817, Aryasala, Trivandrum.	Beam Scales & Platform Machines.
(5)	K. Ramakrishnan Kartha, Painter, C1-172, Perinthalmanna Town, Palghat.	Beam Scales C & D Classes.
(6)	M. K. Rabindranath, Empire Hotel Building, Volkart Lane, Tellicherry.	Platform Machines only.
(7)	On J. Thomas, Nedumpunchayil, Vadavatoor, Vijayapuram, Village, Kottayam Taluk.	Beam Scales C & D Classes.

The following licences of Dealers granted under Kerala Weights & Measures (Enforcement) Act, 1958 are cancelled as the licensees have not applied or the renewal for the year 1962-63:

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|---|---|
| (1) K. J. Jacob, Jacob's Engineering Works, Thampanoor, Trivandrum. | (5) Chavara Block Artisans Industrial Co-operative Society Ltd., Thevalakara, Quilon. |
| (2) Jayaraj Foundry & Engineering Works, Maller Road, Tellicherry. | (6) Bharat Repairing & Sales Corporation Pan-chayat, Court Road, Cannanore. |
| (3) Saint Jos Casting Industries, Palarivattom P.O., Ernakulam. | (7) C.T. Joseph, Cheevali House, Bolghaty, Ernakulam. |
| (4) Joseph Rodrigues & Sons, Metal Merchants, Jalloor Road, Kasargod. | (8) R. Bhaskaran Nair, Radhakrishna Motor Works, Quilon. |

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| (9) M. S. Damodaran, Manjummel House, Palluruthy P.O., Ernakulam. | (42) Sulaiman, C/o V. M. Ibrahim, Cycle Shop, Ernakulam. |
| (10) N. A. Lonappan Sons, Hardware Merchant, High Road, Trichur. | (43) A. Krishna Bhat, Hardware Merchant, Cloth Bazaar, Ernakulam. |
| (11) C. K. George, Cheriakottakkal House, Kalloppara, Thiruvalla Taluk. | (44) A. Balakrishna Iyer & Co., Iron Merchant, Ernakulam. |
| (12) Jayaraj Foundry & Engineering Works, Maller, Tellicherry. | (45) S. S. Sheriff, Sheriff Building, Punalur, Quilon Dt. |
| (13) Scales & Services, Ramanarayana Buildings, Logan's Road, Tellicherry. | (46) K. Chandrasekhara Pillai, General Merchant, Market Jn., Kottarakara P.O. |
| (14) Bharath Repairing & Sales Corporation, Cannanore. | (47) P. Alikutty, Hardware Merchant, Quilandy, Kozhikode Dt., |
| (15) M. K. Mohammed Naina, Bharkath Metal Industries, Chalai, Trivandrum. | (48) Kamath & Co., Hardware Merchant, Swamimadom Road, Cannanore. |
| (16) Mather Stores, P.B. No. 2, Trivandrum. | (49) M. P. Kunhi Kannan, General Merchant, Court Road, Badagara. |
| (17) K. Kesavan Achari, Gold, Silver & Jewellers' Association, Chalai, Trivandrum. | (50) Venkiteswara Stores, Hardware Stores, Tripunithura. |
| (18) S. Shahul Hameed, Hardware Merchant, Main Road, Attingal. | (51) Mulanthuruthy Iron & Steel Industrial Co-operative Society, Tippunithura. |
| (19) Hilal Traders, Main Road, Tellicherry. | (52) M. S. Pailo, Proprietor, Cochin Stores, Alwaye. |
| (20) A. B. Cheekutty, Proprietor, Binny Engineering Industries, Cochin-5. | (53) Mookan Devassy Ouseph & Sons, Mattancherry, Cochin. |
| (21) P. K. Raghunathan, Parathumveedu, Cochin-5. | (54) A. P. Balan, Chirakkara, Tellicherry. |
| (22) P. N. Moorthy, Swamynath Industries, Vadamukotta, Quilon. | (55) K. K. Varghese, Hardware Merchant, Malappally West Alleppey. |
| (23) Mighty Scale Co., T. C. 92/1410 A, Uma Buildings, Chalai, Trivandrum. | (56) Krishna Kini, N., Logan's Road, Tellicherry, Cannanore. |
| (24) A. S. Mony, Mony, Industries, Virakupura Street, Fort, Trivandrum. | (57) C. V. Murugesan Mahalakshmi, G. S. Tools Store, Mullakkal, Alleppey. |
| (25) Avery Co. Ltd., Thamarakulam Road, Quilon. | (58) K. A. Abraham & Co., Hardware Merchant, Ponkunnam P.O., Kottayam. |
| (26) C. K. Mukundan, Mukunda Agricultural Implements & Steel Truck Works, Badagara. | (59) K. Bava, National Stores, Court Road, Tirur. |
| (27) M. N. Raghavan, S. N. Oil Mills, Chungom, Alleppey. | (60) C. A. Galiakotwal & Co., (P) Ltd., Cloth Bazaar, Ernakulam. |
| (28) V. Chellappan, Vizhayil Vilagom Veedu, Karamana, Trivandrum-2. | (61) T. C. Koshy (Thoppil), Merchant, Puramattom. |
| (29) K. Narayana Pillai, Allunkal Puthen Veedu, Nedumangad. | (62) P. K. Brothers, Huzur Road, Calicut. |
| (30) P. Viswanathan Chettiar, Baby Mandiram, Venjaramoodu. | (63) K. K. Kunjammarakkar & Son, Hardware Merchant, Ernakulam-1. |
| (31) K. A. Chami Achari, Majestic Industries, Karamanai, Trivandrum. | (64) K. S. Balakrishnan Nair, Kudukail House, Chemanathukara, Vaikom. |
| (32) K. C. Kesavan, Kelezhath Parambu, Trikanarvattom, Ernakulam. | (65) P. Mammoo, Stationery Merchant, Villiapaly, Badagara. |
| (33) M. V. Kunji Palu, High Road, Trichur. | (66) Bharat Repairing & Scales Corporation, Cannanore. |
| (34) P. M. Imbichi Koya, Hardware Merchant, Near Railway Gate, Kozhikode-1. | (67) K. A. S. Jainudeen & Co., General Merchants, Chowghat. |
| (35) Y. N. Shenoy, Hardware Merchant, Andoor. | (68) M. Abdul Salam, Salam General Store, Nedamangad P.O. |
| (36) M. Maithen Kunju, Churkasseri & Co. Karunagapally. | (69) Kovoor Bros., Hardware Merchants, Thiruvalla. |
| (37) T. P. Lonappan, Industrial Training Corporation, Chittoor, Palghat. | (70) K. V. Chandy, Hardware Merchant, Thiruvalla. |
| (38) K.P.G. Menon, Construction House, Ottapalam | (71) C. H. Mammu, General Merchant, P.O. Cannanore. |
| (39) Syed Mohammed, Hammeed Sons, General Merchants, Alleppey. | (72) V. Shiva Shenoy, Hardware Merchant, Tellicherry. |
| (40) M. V. Urumese, Kerala Hardware Stores, Market Road, Alwaye. | (73) Hilal Traders, Main Road, Tellicherry. |
| (41) Irikkandiyur Producers'-cum-Consumers' Co-operative Society, No. F. 1254, Tirur. | (74) A. P. Packer, Hardware Merchant, Taliparambu. |
| | (75) M. M. Chacko, Jewellers, Changanacherry. |
| | (76) S. Damodara Pai, Hardware Merchant, Alleppey. |

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| (77) T. M. Mohammed Abdul Kadir, Chalai, Trivandrum. | (84) Gemini Metal Co., Quilon. |
| (78) M. Ismail Kunju, Ismail Stores, Nedumangad P.O. | (85) U. B. Sivadasan, Proprietor, Weights & Measures, Calicut. |
| (79) Ahmed & Bros., Camp Bazaar, Cannanore. | (86) P. Kunji Koya, Minikketagam, Ediagara, Kozhikode. |
| (80) M. A. Mohammed, Brass Vessel Merchant, Chalai, Trivandrum. | (87) M. Mohammed Ismail, Hardware & Tobacco Merchant, Kottakada. |
| (81) S. K. Abubaker Hajee, Universal Stores, Camp Bazaar, Cannanore. | (88) K. Velayudhan Pillai, Hardware Merchant, Attingal. |
| (82) P. K. Kesava Pillai, Usha Metals, Mavelikara. | (89) S. Damodara Pai & Sons, Hardware Merchant, Kovilvattom Road, Ernakulam. |
| (83) C. P. Moideen, Metal Merchant, Robinson Road, Kozhikode. P.O. | (90) Shashi Mehta, 11/247, Mattancherry, Cochin. |



DEAL *Only* IN METRIC LENGTHS

With the compulsory use of metric linear measure throughout the country from 1st October, 1962, transactions are now in terms of the metre.

Here are some equivalents of standard garment lengths. Familiarity with the new unit will help you to give up thinking in terms of yards.

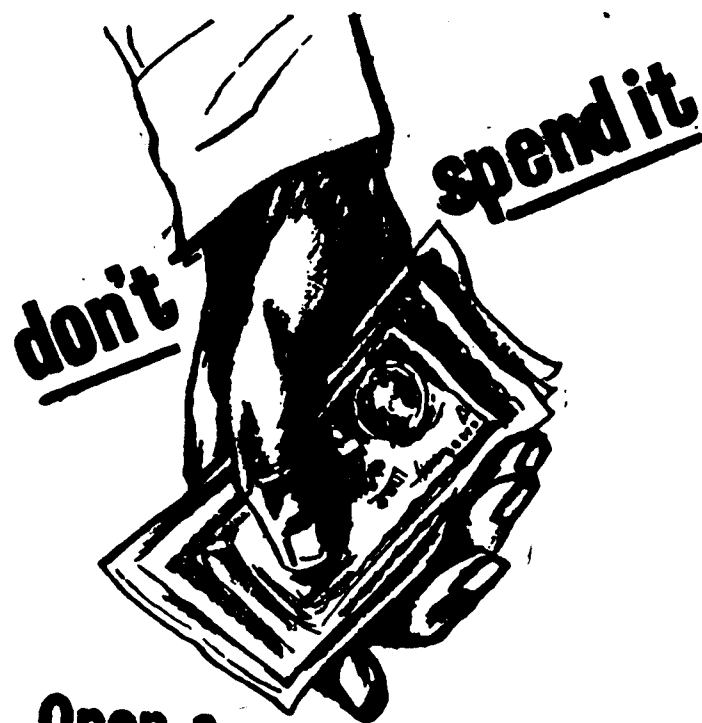


SHIRT	: 2 metres and 75 centimetres (2.75 metres) instead of 3 yards
COAT	: 2.75 metres
TROUSERS	: 2.75 metres } instead of 3 yards each
BLOUSE	: 0.90 metre instead of 1 yard

A Sari of 6 yds. will be 5½ metres in length.

1 Metre = 1 yd. and 3¼ inches
If a yard of cloth cost Re. 1.00 nP., a metre of the same cloth will cost Re. 1.09 nP.

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SIMPLICITY & UNIFORMITY
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INCOME TAX REBATE ALLOWED

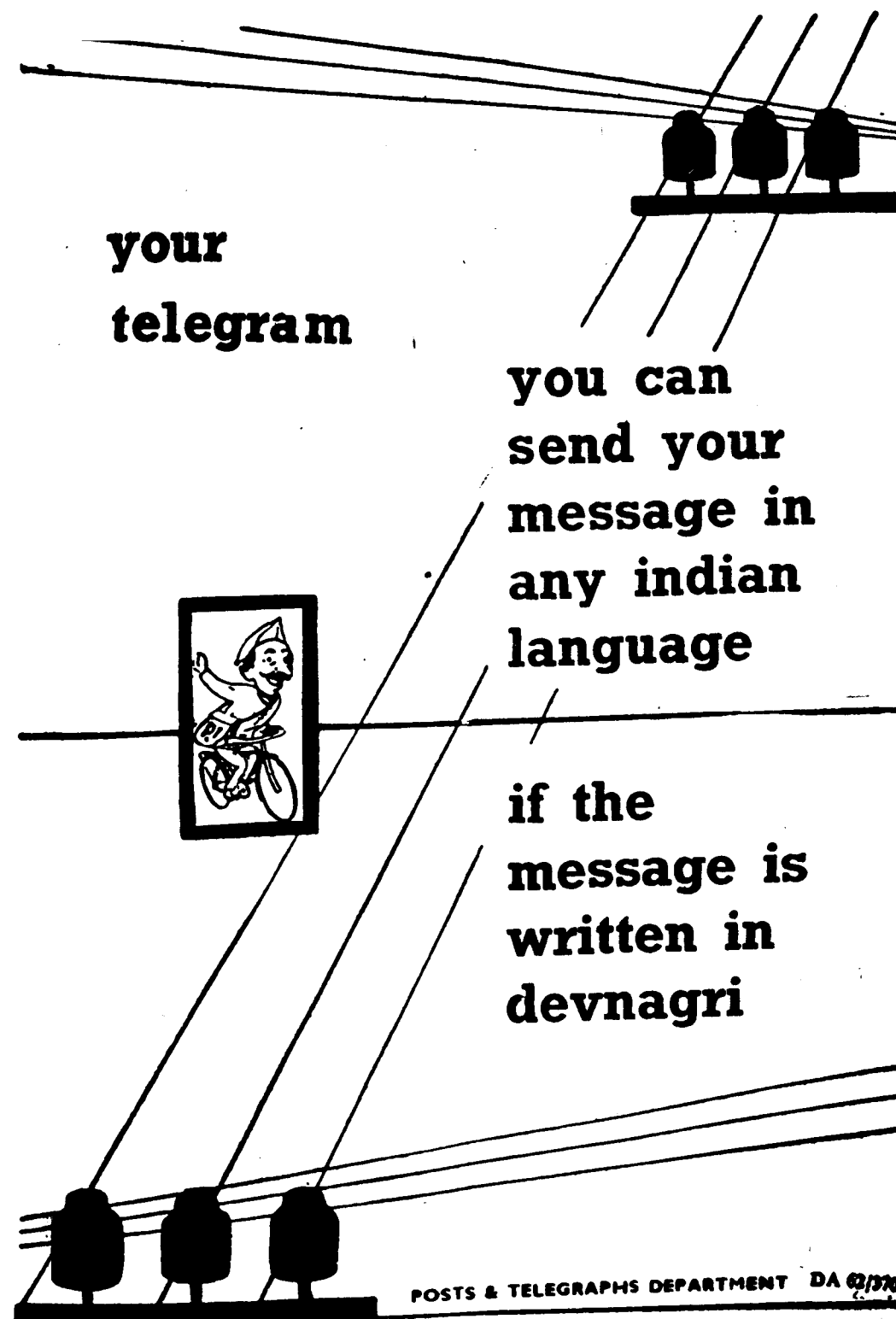
Deposits in the 10 and 15-Year Accounts of the **CUMULATIVE TIME DEPOSIT SCHEME** are allowed to earn a rebate of income-tax as in the case of Life Insurance premia and contribution to Provident Fund. In addition the deposits earn tax free compound interest of 3.8 and 4.3% per annum on 10 and 15-Year Accounts respectively.



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TYPICAL METRIC PRICING UNITS FOR WHOLESALE TRANSACTIONS

Serial No.	Commodity	Metric Unit
(1) Gold		10 grams (g)
(2) Grocery and Confectionery	Biscuits, sweetmeats, cardamoms.	1 kilogram (kg)
Textiles and Textile Fibres	Cotton yarn, damaged and seconds cloth, raw silk, rayon, silk yarn, raw wool, wool manufactures (when sold by weight).	
Paints and Chemicals	Paint (if sold by weight), indigo, liquid chlorine.	
Hides, Skins & Leather	Raw hides, leather (hides and skins).	
Metals	Silver, aluminium sheets, strips and circles, copper and brass wires and utensils.	
Miscellaneous	Tea, meat, camphor tablets, mica.	
(3) Grains and Pulses	Rice, wheat, jowar, arhar, moong, masur, gram.	
Spices	Black pepper, mustard, chillies, dhania, dālchini, turmeric, betelnuts.	
Plantation Products	Rubber, cashewnuts, cashew kernels, tobacco (raw and manufactured).	
Forest Products	Lac and lac products, gums, myrobalans, galnuts, soapnuts.	
Textiles & Textile Fibres	Raw jute, raw hemp, coir yarn.	1 quintal (q) (100 kilograms)
Oils, Oilseeds & Oilcakes	Vegetable oils, oilseeds, oilcakes.	
Non-Ferrous Metals	Aluminium : ingots, bars, blocks, slabs, billets. Lead : ingots, sheets and strips. Copper : ingots, blooms, slabs, cakes, tiles, bricks, billets, blisterbars and wirebars, rods, sections and pipes, plates, sheets and strips, circles. Brass : ingots, rods, sections, pipes, sheets, strips, circles. Zinc : ingots, sheets, strips. Tin : blocks.	
Chemicals	Caustic soda, bleaching powder, glycerine, soaps, paper salt.	
Others	Sugar, gur, ice, fish, sugarcane, vegetables, tamarind.	
(4) Minerals	Iron ore, manganese ore, bauxite, coal.	
Iron & Steel	Pig iron, iron and steel manufactures, semis (billets for rerolling etc.)	
(5)	Cloth (mill, handloom, silk, rayon and woollen cloth).	1 metre (m)
(6)	Jute carpets, coir mats and mattings, sheet glass.	one square metre (m ²)
(7)	Timber.	one cubic metre (m ³)
(8)	Paints (when sold by measure), spirits.	one litre (l)