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# BULLETIN

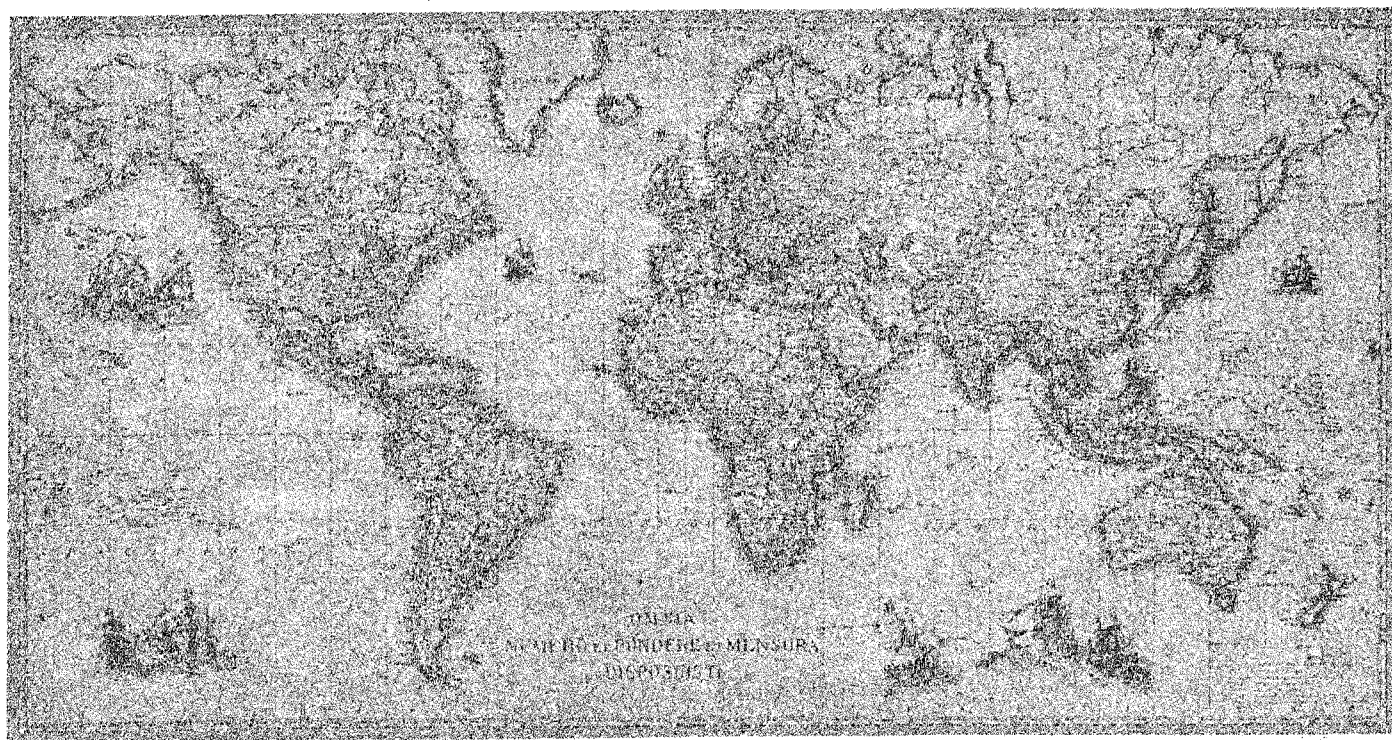
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**BULLETIN**  
de  
**L'ORGANISATION INTERNATIONALE de MÉTROLOGIE LÉGALE**

**SOMMAIRE**

	Pages
AUSTRALIE — Intercomparison of the pressure standards of the CSIRO Division of Applied Physics and the Materials Research Laboratories of Australia par J.I. GOSLING, D.J. HATT et D.B. PROWSE .....	3
SUEDE — Directions for Swedish verification officers concerning sampling inspection of prepacked commodities .....	10
The Structure and the Function of a National Service of Legal Metrology Final report by SP 25-Sr 2 (SRI LANKA) .....	19
<b>INFORMATIONS</b>	
Conseil de la Présidence 1981 .....	32
Membres du Comité : INDONESIE .....	33
INSYMET 82, INFOTERM, ILAC .....	33
CEE (Nations Unies) Flow Measurement Courses (United Kingdom) .....	34
Manuel de Pesage / Handbook of Weighing .....	35
Réunions .....	36
<b>DOCUMENTATION</b>	
Centre de Documentation : Documents reçus au cours du 3 <sup>e</sup> trimestre 1981 .....	37
Recommandations Internationales : Liste complète à jour .....	42
Etats membres de l'Organisation Internationale de Métrologie Légale .....	45
Membres actuels du Comité International de Métrologie Légale .....	46

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**AUSTRALIE**

**INTERCOMPARISON of the PRESSURE STANDARDS  
of the CSIRO DIVISION of APPLIED PHYSICS  
and the MATERIALS RESEARCH LABORATORIES  
of AUSTRALIA**

by **J. I. GOSLING**

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*RESUME — Le nouveau manomètre interférométrique installé aux Materials Research Laboratories a été comparé à l'étalon primaire de pression d'Australie, en utilisant comme instrument de transfert, un manomètre à piston libre. L'accord constaté entre les deux étalons était de  $2 \cdot 10^{-5}$  en valeur relative.*

*SUMMARY — The interferometric manometer recently brought into operation at the Materials Research Laboratories (MRL) has been compared with the primary pressure standard at the CSIRO Division of Applied Physics (CSIRO). Because the CSIRO primary pressure standard is a short-range barometer for use in the ambient pressure range, the two instruments could only be compared over this pressure range. A gas-operated, free-piston, pressure gauge was used as the transfer instrument. Agreement between the two pressure standards was obtained to 2 in  $10^5$ .*

## **1. Description of the Instruments**

### **(a) CSIRO Primary Standard Barometer**

This is a fundamental instrument with the configuration of a « siphon » barometer [1]. It consists of two cylindrical reservoirs, approximately 60 mm diameter, mounted on the same vertical axis, at a vertical separation of approximately 750 mm. They are connected by a small bore thick wall glass tube and each reservoir is provided with a pair of optically flat windows. A scale ruled on glass is mounted immediately behind one pair of windows and is viewed across the mercury surface by means of a telescope. One of the optical systems is shown schematically in Figure 1.

The glass scale is fabricated from soda glass and consists of a length of glass of approximate dimensions  $810 \times 25 \times 6$  mm and having two polished and aluminised glass plates of approximate dimensions  $150 \times 12 \times 3$  mm and  $20 \times 12 \times 3$  mm assembled with an epoxy cement one near each end, upon which the scales are ruled. On the smaller plate, three lines, 0.05 mm apart, are ruled, the central line being the zero of the scale. On the larger plate, the scale is ruled at every 0.5 mm from 650 mm to 780 mm, every 5 mm being numbered. The scale was calibrated initially in 1965.

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To enable readings be related with the mercury surface positions both sets of telescope, optical micrometer, scale and light source can be moved vertically relative to each mercury surface.

In 1969-70 the instrument was given a major overhaul in an attempt to isolate the cause of a systematic discrepancy between it and a Fortin barometer with had been calibrated at NPL, England. Several modifications were made, and an error of 30  $\mu\text{m}$  discovered in the scale. This error was a result of the aluminised scale plates moving relative to each other and must be associated with the cement used to fix them to the backing plate. By 1973 a further change of 2  $\mu\text{m}$  had occurred, but measurements indicated that the rate of change had decreased dramatically.

When the horizontal plane through a scale graduation is not more than a certain maximum distance from the horizontal mercury surface, two images of the graduation line may be seen in the eyepiece, one formed by direct vision and the second by reflection of the line in the horizontal mercury surface. Simple geometry indicates that the plane of the mercury surface will be equidistant between these two images. The magnification of the optical system has been arranged so that a factor of 2 is accounted for and enables the mercury surface to be read directly on the graticule as a displacement from the direct image of the scale marking.

Initially the zero of the scale is set to coincide with the plane of the mercury surface. This utilizes one of the graduations 0.5 mm adjacent to the zero graduation mentioned above.

For the column height reading, the second optical system is used to set one of the scale images to the zero of the graticule. The position of the other image, relative to the graticule, then measures the displacement of the plane of the mercury surface from the scale line. A typical reading is shown in Figure 2, where the mercury surface displacement from the scale division is 0.636 mm.

As would be expected with an instrument of this nature, vibration of the mercury surface is the major cause of problems in reading the instrument, with vibration of the upper surface always being more severe. Thus the instrument is read by setting on the upper surface and reading the position of the lower surface.

Another major source of uncertainty involves the temperature gradient of the mercury column. This is measured relative to a calibrated precision mercury-in-glass thermometer which is mounted in a dewar flask in distilled water, with five copper-constantan thermocouple reference junctions. The temperature of the mercury column is measured at five points using these thermocouples.

Since the scale is nominally correct at a reference temperature of 20 °C, barometer readings have to be corrected to standard conditions. It can be shown [2] that the temperature correction ( $C$ ) is given by :

$$C = \frac{(\beta - \alpha)t + 20\alpha}{1 + \beta t} R_t \quad (1)$$

where  $R_t$  = barometer reading at  $t$  °C with index correction applied,

$t$  = mean temperature of the mercury column,

$\beta$  = cubical coefficient of thermal expansion of mercury per °C,

$\alpha$  = linear coefficient of thermal expansion of the scale per °C.

In addition to this correction the usual gravity correction must be applied.

#### (b) MRL Interferometric Manometer

This instrument and its operation have been described elsewhere [3, 4], so only a very brief description will be given here. It is a U-tube manometer in which the two mercury surfaces act as the mirrors for a Michelson type interferometer. A stabilized laser is used as the light source, and fringes are counted as the two mercury surfaces

move relative to each other. Pressure is obtained from the fringe counts by the usual equation for a hydrostatic column

$$P = \rho gh \quad (2)$$

where  $h$  is obtained from the fringes counted by the interferometer. The instrument is considered to have an overall uncertainty of  $\pm 2$  parts in  $10^6$  at 100 kPa.

### (c) The Transfer Instrument

Three transfer instruments were used in this series of intercomparisons. They were gas-operated free-piston pressure gauges manufactured by CEC [5], two owned by CSIRO and the other by MRL. A free-piston pressure gauge establishes pressure by means of a force applied to a known area. The effective area of these instruments can be obtained from either the measured geometry of the piston and cylinder, or by calibration with pressure standards. It is the latter method which is adopted here. These instruments have a reproducibility of 1-2 parts in  $10^5$  and are easily transportable, as only the piston/cylinder combination needs to be transferred between laboratories.

## 2. Results

### (a) MRL CEC with the Interferometric Manometer

The piston/cylinder combination of the CEC gauge of nominal area  $8.1 \times 10^{-5} \text{m}^2$  was compared with the interferometric manometer over the range 11 - 101 kPa. From this comparison, it is possible to obtain the effective area  $A_e$  and the effective mass  $M_e$  of the piston/carrier assembly by fitting the values to an equation of the form :

$$P = (M + M_e)g/A_e \quad (3)$$

where  $M$  is the true mass added to the piston/carrier assembly,  $g$  is the local value of the acceleration due to gravity, and  $P$  is the pressure obtained from the interferometric manometer. The results obtained are set out in Table 1.

### (b) MRL CEC with CSIRO Primary Pressure Standard

In June 1976, the MRL CEC gauge was taken to Sydney and compared with the CSIRO primary pressure standard. The results are given in Table 2.

The CSIRO primary pressure standard has a readability of 0.66 Pa, but due to the effects of temperature and repetition of setting, the uncertainty is considered to be 1.3 Pa. Thus, by combining these the overall uncertainty for the intercomparison was found to be 1.9 Pa.

### (c) CSIRO CEC#1 with the Interferometric Manometer

At the end of June 1976 the CSIRO CEC#1 gauge was taken to Melbourne for comparison with the interferometric manometer. Two independent sets of measurement were made and the results are given in Table 3.

### (d) MRL CEC with CSIRO CEC#1

The MRL CEC gauge was taken to CSIRO and the two gauges were inter-compared by means of the technique of cross floating at ambient pressure. The results were unsatisfactory because of the pressure effect due to rotation which was observed subsequently and has been reported elsewhere [6], and also because the temperature of each gauge was not determined adequately.

### (e) CSIRO CEC#2 with CSIRO Primary Standard

Just prior to the move of CSIRO from the Chippendale site to the new complex at Lindfield, several comparison readings were taken by comparing a new (second)

CEC gauge, which had been previously calibrated against the MRL Interferometric Manometer, with the CSIRO Primary Standard barometer. The results are given in Table 4.

### 3. Discussion

Two other interlaboratory comparisons of pressure standards have been reported recently. These were between the NPL (UK) and CEV (France) [7], and between CEV (France) and VNIIMS (Soviet Union) [8]. Both used a Crouzet Manometer type 10 as the transfer standard, and either free-piston pressure gauges (NPL, VNIIMS) or the Jaeger-BIPM interferometric barometer (CEV) as the standards. In the NPL-CEV comparison, the uncertainty associated with the two standards for absolute pressure calibration at 100 kPa (1000 mbar) was  $\pm 8$  Pa ( $\pm 0.08$  mbar). For the CEV-VNIIMS comparison, the VNIIMS standard conformed to its uncertainty of  $\pm 5.3$  Pa ( $\pm 0.053$  mbar). Considering that physically different types of standards were used, the agreement in these comparisons is excellent.

In our case, the pressure standards are mercury columns and the transfer standards free-piston pressure gauges. The two standards are quite different in concept, construction and method of determining the height of the mercury column, so that the maximum difference between any two readings (Table 2) of 2.13 Pa is considered to be excellent agreement.

The results obtained in (e) show a marked improvement in the scatter of the discrepancies, although only four sets were obtained. It is believed that this may be due to an improvement in the performance of the CEC gauge after additional precautions were taken, particularly concerning magnetic and temperature effects.

The comparisons have shown that the CEC free-piston pressure gauge is an excellent transfer standard, with only the piston and cylinders needing to be transferred between laboratories. They also suggest that further work needs to be done to realise the full potential of the free-piston gauge as a reliable transfer standard.

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Table 1

Quantity	Value at 20 °C	Standard Deviation (15 degrees of freedom)
$M_e$	84.8652 g	1.8 in $10^5$
$A_e$	$8.06391 \times 10^{-5} \text{m}^2$	3.1 in $10^6$
Accuracy of the pressure generated by the CEC	11 to 100 kPa	4.5 in $10^6$ (at 100 kPa)

Table 2

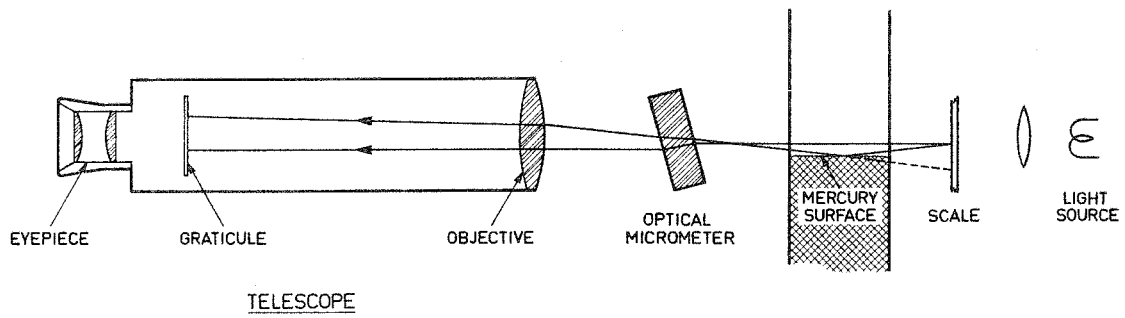
Nominal Pressure kPa	CSIRO (PPS) — MRL (CEC) Pa
100	— 0.93 + 0.13 + 0.26
90	— 1.60 — 1.87 — 0.26 0.0
Average Value	— 0.61 (6.1 in $10^6$ )

Table 3

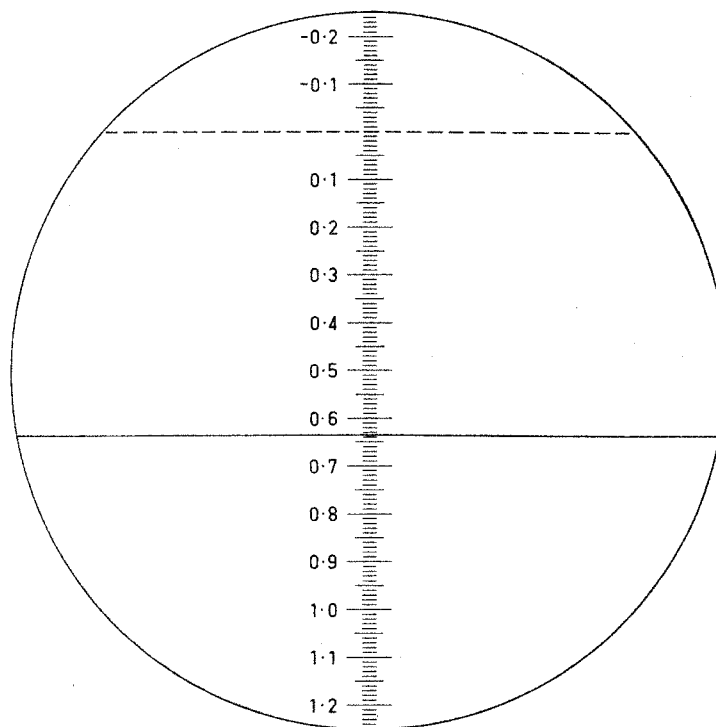
Measurement	Quantity	Value	Standard Deviation (3 degrees of freedom)
1	$M_e$	85.0597 g	3.5 in $10^5$
2		85.0585 g	3.8 in $10^5$
1	$A_e$	$8.06424 \times 10^{-5} \text{m}^2$	6.0 in $10^6$
2		$8.06422 \times 10^{-5} \text{m}^2$	6.2 in $10^6$
1	Uncertainty in the pressure generated by the CEC over 11-110 kPa	0.56 Pa	
2		0.56 Pa	

Table 4

Nominal Pressure kPa	CSIRO (PPS) — CSIRO (CEC#2) Pa
100	— 0.80
	— 0.13
	— 0.27
	— 0.53
Average Value	— 0.44 (4.4 in $10^6$ )



OPTICAL SYSTEM  
FIG. 1



FIELD OF VIEW  
FIG. 2

**SUEDE**

**DIRECTIONS for SWEDISH VERIFICATION OFFICERS  
CONCERNING SAMPLING INSPECTION  
of PREPACKED COMMODITIES**

*La Suède nous a communiqué la traduction anglaise ci-dessous des instructions en vigueur dans ce pays pour la vérification légale d'articles préemballés (SP-FOR 1974:5).*

*The following is an English translation of the instructions for legal inspection of prepacked goods as applied in Sweden (SP-FOR 1974:5).*

**Introduction**

According to paragraph 2 of the Swedish law (1971:1081) on the measurement of volume and weight, the correctness of information about weight or volume on pre-packaged commodities shall be inspected using random sampling methods. Such inspections may be made at the manufacturer, importer, packager, wholesaler and retailer. According to paragraph 7 of the Government Decree (1973:85) on the measurement of volume and weight, etc., Statens provningsanstalt (\*) is authorized to carry out inspection in accordance with paragraph 2 of the law. Inspection of foodstuff shall be done in consultation with Statens livsmedelsverk (\*\*).

**Definitions**

*Pre-packaged commodity* — Commodity which has been packaged before the time of delivery to the customer and which is intended to be opened by the customer (SFS 1971:1081, par. 1).

*Lot* — Number of pre-packaged commodities of the same kind manufactured in running sequence and under the same conditions ;

for inspection at the manufacturer or packager, the size of a lot is limited to the number of commodities packed in one hour ; however at least 150 units ;

for inspection at importers, wholesalers and retailers, a lot is limited to the packaged commodities belonging to a single delivery ; however, 10 000 units at the most. In lots of less than 150 units 100 % inspection should be used.

*Sampling* — That part of a lot chosen at random for inspection of the net quantity of pre-packaged commodities.

*Defectively packed commodity* — Commodity which has a minus error greater than the specified limit.

*Defective lot* — Lot of pre-packaged commodities whose average quantity is less than the stated one, or a lot of pre-packaged commodities containing a larger number of defectively packed commodities than permitted.

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(\*) The National Testing Institute.

(\*\*) The National Food Administration.

## Validity

These directions are valid for pre-packaged commodities which are labelled with information about volume or weight, where the labelling shall indicate the net volume or the net weight of the contents at the time of packaging. These directions are not valid for commodities with volume less than 25 millilitre or more than 25 litre or with weight less than 25 gram or more than 25 kilogram.

## Labelling

The lot may contain pre-packaged commodities labelled either with varying net quantities or with constant net quantities. The inspections are limited to net weight or net volume of the entire contents of the packages. Surveillance of labelling is the responsibility of Statens livsmedelsverk.

## Rules for sampling of pre-packaged commodities

Quantity information about commodities in a lot is inspected by sampling with the following purposes : verification that the net volume or net weight for the commodities of a lot in average agrees with the indicated net volume or net weight, and verification that indicated quantities of the individual packages are within permissible limits.

In judging the latter requirement, it shall be considered whether the commodities are easy or difficult to pack as well as the size of labelled quantity.

Commodities difficult to pack are those labelled with constant net quantity and characterized by the fact that they

- are liquid products,
- require considerable technical efforts in flowing or feeding at a constant rate,
- contain several components of various densities or in various physical states, and which require several operations during packaging,
- are subjected to post-processing after filling such as heat treatment, during which the weight is irregularly affected,
- consist of components of large unit weight ; that is commodities which are in pieces or grains whose unit weights are of the same or larger magnitude than the tolerances applicable to commodities easy to pack according to the table below.

Other types of commodities labelled with a constant net quantity, as well as lots containing commodities labelled with varying net quantities are considered easy to pack.

## Maximum permissible deviations

The quantity specified for pre-packaged commodities is acceptable if 97.5 % of the packages do not have at 20 °C higher negative deviations than those below, unless otherwise has been indicated for special products.

Quantity g or ml	Negative tolerances			
	Goods easy to pack		Goods difficult to pack	
	% of quantity	g or ml	% of quantity	g or ml
25— 50	4.5	—	9	—
50— 100	—	2.25	—	4.5
100— 200	2.25	—	4.5	—
200— 300	—	4.5	—	9
300— 500	1.5	—	3	—
500— 1 000	—	7.5	—	15
1 000—10 000	0.75	—	1.5	—
10 000—15 000	—	75	—	150
15 000—25 000	0.5	—	1.0	—

### Modification concerning poultry products

The deviation tolerance on prepacked whole poultry is at maximum minus 5 % of indicated net weight.

However the average weight of the lot shall not be less than indicated net weight.

### Modification concerning bakery products

Prepacked bakery products will be considered as being within accepted limits if 97.5 % of the packages do not have higher negative deviations than indicated below.

Quantity		Negative tolerance	
g		% of quantity	g
25—	50	13.5	—
50—	100	—	6.75
100—	200	6.75	—
200—	300	—	13.5
300—	500	4.5	—
500—	1 000	—	22.5
1 000—	10 000	2.25	—

However the average weight of the lot shall not be less than indicated net weight.

## Sampling methods

### Place for inspection

Inspection of prepackaged commodities at the manufacturer or packager should be done close to the time of packaging. Imported commodities are inspected at the stores of the importer, wholesaler or retailer.

### Principles for determining the quantity

The weight of pre-packaged commodities is measured with the aid of suitable scales approved by Statens provningsanstalt ;

the volume of a pre-packaged goods is either measured directly using a graduated standard volume measure or, indirectly, by weighing and then measuring the density of the product.

The inaccuracy of measurement in determining the net quantities may not exceed 20 % of the tolerance permitted for the commodities.

As previously mentioned, a lot may contain pre-packaged commodities which are labelled either with constant net quantity or with varying net quantity. Therefore, when checking the quantity of filling, the following alternatives are possible :

1. Lot containing commodities labelled with constant quantity
  - a) determination of net volume by means of gross and tare weighings (non-destructive testing, see inspection procedure 1)
  - b) determination of net volume by means of gross and tare weighings and measuring the density of the product (non-destructive testing, see inspection procedure 2)
  - c) determination of net quantity (weight or volume) (destructive testing, see inspection procedure 3)
2. Lot containing commodities labelled with varying net quantities
  - a) determination of net weight by means of gross and tare weighings (non-destructive testing, see inspection procedure 4)

- b) determination of net weight by means of opening the package (destructive testing, see inspection procedure 5)

The methods described in 1c and 2b are used only when there are large variations in tare weight (see below).

### Sampling

Pre-packaged commodities to be included in the inspection are drawn at random from the lot. The probability of each pre-packaged unit being included in the sample shall be the same.

For this inspection, a single sampling plan is used, meaning that usually only one sample is drawn from a lot.

The size of the sample selected for determination of gross and net quantity, respectively, shall include 32 units. The same number of units shall be used for the determination of tare weight.

### Symbols used

- $y_j$  = measured gross weight of the  $j$ th package in the sample.  
 $x_j$  = measured net quantity of the  $j$ th package in the sample.  
 $z_j$  = measured tare weight of the  $j$ th package in the sample of packaging.  
 $\bar{y}$  = mean value of the gross weight of the packages in the sample.  
 $\bar{x}$  = mean value of the net quantity of the packages in the sample.  
 $\bar{z}$  = mean value of the tare weight of the packages in the sample.  
 $f$  = failure (error) limit, that is the specified net quantity minus the permissible negative deviation.  
 $m_o$  = specified net quantity of pre-packaged commodities belonging to a lot containing units labelled with a constant net quantity.  
 $s_b^2$  = estimator of the variance of the gross quantity, or of the difference between gross weight and indicated net weight.  
 $s_t^2$  = estimator of the variance of the tare weight.  
 $s_n^2$  = estimator of the variance of the net quantity or of the variance of the difference between measured net weight and indicated net weight.  
 $s$  = estimator of the standard deviation for the difference between gross and tare weight.  
 $s_v$  = estimator of the standard deviation for the difference between gross and tare volume.  
 $u_j$  = net quantity indicated on pre-packaged commodities  $j$  of a lot labelled with varying net quantities.  
 $\bar{u}$  = mean value of the indicated net quantity of a lot labelled with varying net quantities.  
 $\rho$  = density of the product.  
 $v_j$  = calculated volume of the pre-packaged commodity  $j$  of the sample.  
 $\bar{v}$  = mean value of the calculated volumes of the pre-packaged commodities in the sample.

### Inspection procedures for lots containing commodities with constant net quantity

**PROCEDURE 1** : determination of net weight by gross and tare weighings as follows :

- a) Measure the gross weights,  $y_j$ , of the 32 units of pre-packaged commodities.

Calculate the mean value  $\bar{y}$ .

$$\bar{y} = \frac{\sum_{j=1}^{32} y_j}{32}$$

Calculate the variance of the gross weights,  $s_b^2$ .

$$s_b^2 = \frac{\sum_{j=1}^{32} (y_j - \bar{y})^2}{31} = \left[ \frac{\sum_{j=1}^{32} y_j^2}{31} - \frac{\left( \sum_{j=1}^{32} y_j \right)^2}{32} \right] / 31$$

b) Weigh 32 units of empty packages.

Calculate the mean value,  $\bar{z}$ .

$$\bar{z} = \frac{\sum_{j=1}^{32} z_j}{32}$$

Calculate the variance of the tare weight,  $s_t^2$ .

$$s_t^2 = \frac{\sum_{j=1}^{32} (z_j - \bar{z})^2}{31} = \left[ \frac{\sum_{j=1}^{32} z_j^2}{31} - \frac{\left( \sum_{j=1}^{32} z_j \right)^2}{32} \right] / 31$$

c) Calculate  $q$  defined as

$$q = \frac{s_t^2}{s_b^2 - s_t^2}$$

If  $q \geq 0.09$ , the determination of net weight should be done in accordance with procedure 3, or the inspection should be limited to the determination whether the labelled quantity for the lot corresponds to the average (see point e below).

d) Limit for defective fraction.

If the number of defective units exceeds 2, the lot is considered to be unacceptable.

e) Determination of average weight.

In order to determine if the average weight is acceptable the standard deviation  $s$  for the difference between gross weight and tare weight is first to be calculated.

$$s = \sqrt{s_b^2 + s_t^2}$$

Then calculate the ratio,  $\frac{(\bar{y} - \bar{z} - m_0) \cdot \sqrt{32}}{s}$

The lot is considered unacceptable if  $\frac{(\bar{y} - \bar{z} - m_0) \cdot \sqrt{32}}{s} < -2.7$

The number 2.7 is derived from the  $t$ -distribution such that the probability of rejecting a correct lot does not exceed 0.5 %.

If the value of  $q$ , according to c above, exceeds the limit given (0.09), the inspection may be limited to the above determination of average weight, providing the packages are difficult to open. However if  $q > 1$ , direct measurements of net weight are to be made for controlling the labelled average quantity.

**PROCEDURE 2** : determination of net volume by measuring product density and gross and tare weights as follows :

a) determination of product density ( $\rho$ ).

This is either measured directly using a hydrometer or indirectly by using a standard-volume measure and weighing a known volume of the product.

Information about the density obtained from the packager may be used in calculating the volume of the contents.



However, the inaccuracy of the volume determination due to errors in the value of the density, are not to exceed 5 % of the relevant failure limit in the table. Special care must be taken in measuring the density of viscous products, foaming products or liquid products that contain gas and when measuring the bulk density of solid products.

- b) Measure the gross weight,  $y_j$ , of 32 units of the pre-packaged commodities.

Calculate the mean value,  $\bar{y}$ .

$$\bar{y} = \frac{\sum_{j=1}^{32} y_j}{32}$$

Calculate the variance of the gross weight,  $s_b^2$ .

$$s_b^2 = \frac{\sum_{j=1}^{32} (y_j - \bar{y})^2}{31} = \left[ \sum_{j=1}^{32} y_j^2 - \frac{\left( \sum_{j=1}^{32} y_j \right)^2}{32} \right] / 31$$

- c) Weigh 32 units of empty packages.

Calculate the mean value,  $\bar{z}$ .

$$\bar{z} = \frac{\sum_{j=1}^{32} z_j}{32}$$

Calculate the variance of the tare weight,  $s_t^2$ .

$$s_t^2 = \frac{\sum_{j=1}^{32} (z_j - \bar{z})^2}{31} = \left[ \sum_{j=1}^{32} z_j^2 - \frac{\left( \sum_{j=1}^{32} z_j \right)^2}{32} \right] / 31$$

- d) Calculate  $q$  defined as

$$q = \frac{s_t^2}{s_b^2 - s_t^2}$$

If the value of  $q \geq 0.09$ , the determination of net quantity should be done in accordance with procedure 3 or the inspection should be limited to the determination whether the labelled volume for the lot corresponds to the average (see point f below).

- e) Limit for defective fraction.

$$\text{Calculate volume values } v_j = \frac{y_j - \bar{z}}{\rho}$$

If the number of defective units exceeds 2, the lot is considered to be unacceptable.

- f) Determination of average volume.

In order to determine if the average volume is acceptable the standard deviation  $s$  for the difference between gross and tare weights is first to be calculated.

$$s = \sqrt{s_b^2 + s_t^2}$$

$$\text{Then calculate } s_v = \frac{s}{\rho}$$

$$\bar{v} = \frac{\bar{y} - \bar{z}}{\rho}$$

$$\frac{(\bar{v} - m_o) \sqrt{32}}{s_v}$$

The lot is considered unacceptable if  $\frac{(\bar{v} - m_o) \sqrt{32}}{s_v} < -2.7$ .

The number 2.7 is derived from the *t*-distribution, such that the probability of rejecting a correct lot does not exceed 0.5 %.

If the value of *q*, according to *d* above, exceeds the limit given (0.09), the inspection may be limited to the above determination of average volume if the packages are difficult to open. However if *q* > 1, direct measurements of net volume are to be made for controlling the labelled average volume.

**PROCEDURE 3** : determination of net quantity (weight or volume) by opening the packages as follows :

- a) Weigh or measure the net contents,  $x_j$ , of 32 units of pre-packaged commodities after completely emptying the packages.

Calculate the mean value,  $\bar{x}$ .

$$\bar{x} = \frac{\sum_{j=1}^{32} x_j}{32}$$

Calculate the variance,  $s_n^2$ .

$$s_n^2 = \frac{\sum_{j=1}^{32} (x_j - \bar{x})^2}{31} = \left[ \sum_{j=1}^{32} x_j^2 - \frac{\left( \sum_{j=1}^{32} x_j \right)^2}{32} \right] / 31$$

- b) Limit for defective fraction.

If the number of defective units exceeds 2, the lot is considered to be unacceptable.

- c) Determination of average quantity.

In order to determine if the average quantity is acceptable the standard deviation,  $s_n$ , is first to be calculated.

$$s_n = \sqrt{s_n^2}$$

Then calculate the ratio,  $\frac{(\bar{x} - m_0) \sqrt{32}}{s_n}$

The lot is considered unacceptable if  $\frac{(\bar{x} - m_0) \sqrt{32}}{s_n} < -2.7$ .

The number 2.7 is derived from the *t*-distribution such that the probability of rejecting a correct lot does not exceed 0.5 %.

## Inspection procedures for lots containing commodities labelled with varying net quantities

**PROCEDURE 4** : determination of net weight by gross and tare weighings as follows :

- a) Measure the gross weights,  $y_j$ , of 32 units of pre-packaged commodities.

Calculate the mean value,  $\bar{y}$ .

$$\bar{y} = \frac{\sum_{j=1}^{32} y_j}{32}$$

Calculate the mean value,  $\bar{u}$ , of the labelled net quantities.

$$\bar{u} = \frac{\sum_{j=1}^{32} u_j}{32}$$

Calculate the variance of the difference between gross weight and labelled net weight,  $s_b^2$ .

$$s_b^2 = \frac{\sum_{j=1}^{32} [(y_j - u_j) - (\bar{y} - \bar{u})]^2}{31} = \left[ \frac{\sum_{j=1}^{32} (y_j - u_j)^2}{31} - \frac{\left[ \sum_{j=1}^{32} (y_j - u_j) \right]^2}{32 \cdot 31} \right]$$

b) Weigh 32 units of empty packages.

Calculate the mean value,  $\bar{z}$ .

$$\bar{z} = \frac{\sum_{j=1}^{32} z_j}{32}$$

Calculate the variance of the tare weight,  $s_t^2$ .

$$s_t^2 = \frac{\sum_{j=1}^{32} (z_j - \bar{z})^2}{31} = \left[ \frac{\sum_{j=1}^{32} z_j^2}{31} - \frac{\left( \frac{\sum_{j=1}^{32} z_j}{32} \right)^2}{31} \right]$$

c) Calculate  $q$  defined as

$$q = \frac{s_t^2}{s_b^2 - s_t^2}$$

If  $q \geq 0.09$ , the determination of net weight should be done in accordance with procedure 5, or the inspection should be limited to the determination whether the labelled quantity for the lot corresponds to the average (see point e below).

d) Limit for defective fraction.

If the number of defective units exceeds 2, the lot is considered to be unacceptable.

e) Determination of average weight.

In order to determine if the average weight is acceptable the standard deviation  $s$  for the difference between gross weight and tare weight is first to be calculated.

$$s = \sqrt{s_b^2 + s_t^2}$$

Then calculate the ratio,  $\frac{(\bar{y} - \bar{u} - \bar{z})\sqrt{32}}{s}$

The lot is considered unacceptable if  $\frac{(\bar{y} - \bar{u} - \bar{z})\sqrt{32}}{s} < -2.7$

The number 2.7 is derived from the  $t$ -distribution such that the probability of rejecting a correct lot does not exceed 0.5 %.

If the value of  $q$  according to point c above, exceeds the limit given (0.09), the inspection may be limited to the above determination of average weight if the packages are difficult to open.

However, if  $q > 1$ , direct measurements of the net weight are to be made for controlling the labelled average quantity.

**PROCEDURE 5** : determination of net weight by opening the packages as follows :

a) Weigh the net contents of 32 units of pre-packaged commodities after completely emptying the packages.

Calculate the mean values,  $\bar{x}$  and  $\bar{u}$ .

$$\bar{x} = \frac{\sum_{j=1}^{32} x_j}{32} \quad \bar{u} = \frac{\sum_{j=1}^{32} u_j}{32}$$

Calculate the variance  $s_n^2$  of the difference between the measured net weight and the labelled net weight.

$$s_n^2 = \frac{\sum_{j=1}^{32} [(x_j - u_j) - (\bar{x} - \bar{u})]^2}{31} = \left[ \sum_{j=1}^{32} (x_j - u_j)^2 - \frac{\left[ \sum_{j=1}^{32} (x_j - u_j) \right]^2}{32} \right] / 31$$

b) Limit for defective fraction.

If the number of defective units exceeds 2, the lot is considered to be unacceptable.

c) Determination of average weight.

In order to determine if the average weight is acceptable the standard deviation  $s_n$  is first calculated.

$$s_n = \sqrt{s_n^2}$$

Then calculate the ratio,  $\frac{(\bar{x} - \bar{u})\sqrt{32}}{s_n}$

The lot is considered unacceptable if  $\frac{(\bar{x} - \bar{u})\sqrt{32}}{s_n} < -2.7$

The number 2.7 is derived from the *t*-distribution such that probability of rejecting a correct lot does not exceed 0.5 %.

# The STRUCTURE and the FUNCTION of a NATIONAL SERVICE of LEGAL METROLOGY

FINAL REPORT BY SP 25-Sr 2 (SRI LANKA)

*Nous publions ci-dessous le rapport final, en langue anglaise, de l'étude effectuée par SRI LANKA dans le cadre du Secrétariat-rapporteur SP 25-Sr 2 Pays en voie de développement : Structure et fonctionnement d'un Service national de métrologie légale. Ce rapport décrit les étapes de planification d'un service. Les annexes donnent des exemples de cette planification.*

## Preamble

- The existence of a National Service of Legal Metrology presupposes
- the Legal recognition in the country of a system of measurement units
  - the existence of a National Law on Metrology.

This document therefore is based on these premises and reference is directed to International Document No. 1 « Law on Metrology » and International Document No. 2 « Legal Units of Measurement », in the event that this infra-structure is not set up. The document itself is divided into two parts. The first part setting out the different stages of planning that have to be carried out to set up such a service and the second part (Annexes A, B, C) consisting of three models taken from a Developing Country analysing the requirements of basic Legal Metrology Offices for controlling measuring instruments used in general commercial transactions.

## 1. Introduction

An analysis is made of the need for a National Metrology Service in a National Economy for its technological and social development and the means of setting up a Service of Legal Metrology.

Since measurement implies the recognition and the use of a system of measurement units, it is assumed that this will be the International System of Units with the adoption of those units which are outside SI, but permitted for use with it, as may be deemed necessary.

## 2. Establishment of a national metrology laboratory

2.1. The following studies should be made :

- 2.1.1. Estimate of current measurement capabilities of the measurements performed in the country (see Annex A for notes on method).
- 2.1.2. Estimate of measurement capabilities to be achieved.

2.2. The following points will have to be considered :

- 2.2.1. Resources.
- 2.2.2. Availability of suitable competent staff.

2.2.3. Projection of level of measurement accuracy required over the next 10 to 15 years in relation to the development programmes of the country.

2.2.4. Further training of technical specialists in the field of metrology.

This could be considered in two stages.

The first, a short intensive restricted programme in the National Metrology Laboratories of another country to enable them to pick up calibration techniques etc., so as to make them operative.

The second stage which will follow after a few years of active metrological work in their country. It will entail the obtaining of a requisite post graduate qualification in metrology.

2.2.5. Purchase or manufacture of necessary standards of measurement and equipment for the National Metrology Laboratory.

In purchasing these standards the hierarchy of standards necessary for the country would be according to the results of studies obtained under point 2.1.

Consideration should be paid to the use of the existing facilities in the neighbouring countries of the region where it is practical to do so.

NOTE : It is necessary that this National Laboratory be the centre for the Service of Legal Metrology and the Metrology offices in the country.

### **3. Law on metrology**

3.1. This could initially be a part of a Law on Units or could form a separate set of laws. Where a country is starting afresh it would be better to have them separate. In drafting the Law, OIML International Document No. 1 should be used against the background of the accepted principles of Law in the Country (\*).

3.2. The first of these laws should be a law relating to measuring instruments used in commercial transactions.

3.3. Other aspects are dealt with in paragraph 5.

### **4. Establishment of a service of Legal Metrology (first phase - weights and measures service)**

4.1. The establishment of Metrology offices in the country.

The number will depend on :

(a) the size of the country — the extent and the population.

(b) number of commercial establishments and the types of weighing and measuring apparatus used by them.

4.2. The purchase or manufacture of verification agents standards. The nature of the standards to be acquired depend on :

(a) the sectors of commercial transactions which are to be controlled and supervised.

(b) the kind of measurement devices which are used in these sectors.

4.3. The setting out of procedures for verification agents.

4.4. Recruitment and training of verification agents (\*).

4.5. The drafting of rules setting out technical and metrological specifications for weights, measures and weighing and measuring instruments.

## 5. Extension of the law on metrology to the state control of other measuring devices

5.1. This would depend on the priorities for the extension of the metrology service which each country will have to decide on for itself.

These areas could be for example, the control of measuring instruments used in the following fields :

- (a) the checking of contents of prepacked commodities ;
  - (b) the levying of taxes on excisable goods ;
  - (c) public health ;
  - (d) the hire of motor vehicles and control of vehicular traffic ;
  - (e) the protection of the environment, etc.
- 5.2. Once priorities are established as to the kinds of measuring devices to be subjected to the procedures of State Control, a decision will have to be made as to which State Institution will carry out the task — i.e. whether this would be done directly by the service of Legal Metrology or by another State Institution. This is a matter which lies strictly within the purview of each country.
- 5.3. Laws and regulations setting out the metrological and other technical characteristics for the measuring devices to which state control is to be applied (based on relevant OIML Recommendations) (\*).
- 5.4. Establishment of physical standards or standard methods for the calibration of these measuring devices (\*).
- 5.5. Setting out of procedures for calibration (\*).
- 5.6. Instructions to verification agents or other personnel who will perform the calibration (\*).

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(\*) In liaison with the competent OIML Pilot and Reporting Secretariats.

## Annex A

### Example of the planning of a Local Verification Bureau

#### A.1. INTRODUCTION

This particular model is for a small district which is primarily agricultural, in that it raises two crops, rubber and tea, but both of which require processing at the plantation itself.

#### A.2. PARAMETERS

##### A.2.1. Demographic

Extent	1988 square kilometres
Population	361 000
No. of administrative sub-divisions	: 6
Principal Towns	1 (Extent 10.4 square kilometres Population 31 000)

##### A.2.2. Production

The area is predominantly agricultural, the principal crops being :

(a) Tea	8 113 ha
(b) Rubber	8 213 ha
(c) Coconut	8 115 ha
(d) Paddy	6 890 ha
(e) Others	8 803 ha

Of these crops only the first two use a complex manufacturing process which require a factory. In all the processes the principal quantity measured is that of mass. Although temperature and humidity are also measured, the verification of these instruments are not being considered for the present.

The maximum capacity of the weighing instruments used are in the region of 500 kg. Each tea or rubber unit has a series of instruments of different types and capacities.

All other crops too require weighing instruments except in the case of paddy where the producer will use a volume measure, but transactions will be done either by volume or by weight.

##### A.2.3. Trade

The bulk of the trading activities are those of the distribution of food and other necessities. The principal cash crops, tea and rubber, would in the main be sent to the Capital City by larger producers. Produce dealers service the smaller holdings. There are two separate categories of trade, the first is that of general trade and the other that of the specialised trade, that of Jewellers, Chemists, etc. The latter is a much smaller but important aspect as jewellery is used not only for ornamental purposes but also represents savings.

The general trade uses the following measuring instruments and this list will hold for some time in the future.

- (a) Weighing instruments up to a capacity of 1 000 kg
- (b) Measures of volume up to a capacity of 20 litres
- (c) Measures of length
  - (1) Metre sticks (for textiles)
  - (2) Tapes (20 m and 30 m for timber etc.)
- (d) Petrol pumps.



#### A.2.4. Trade Practices

Most of the trading practices involve a direct measurement at the time of transaction, generally in the presence of the purchaser or the agent. Prepacked commodities will in general be those packed in other districts, although there will be a small number of local producers of confectioneries and beverages like tea and coffee, who put out packs locally. The volume is small at present but could increase.

#### A.2.5. Data on number of Trades premises and weights, measures, etc. in use

1. No. engaged in general trade : 2 800 (approximately)
2. No. of petrol filling stations : 4
3. No. of specialised trade premises : 33  
(Jewellers, Chemists, etc.)

#### A.2.6. Number of weights and measures, etc.

1. Weights (general) : 17 000 (approximately)
2. Measures of length (1 metre) : 800
3. Measures of length greater than 1 metre : 50
4. Measures of volume (liquid) : 3 500
5. Measures of volume (dry) : 2 700
6. Weighing instruments : 3 370
7. Petrol pumps : 10
8. Jewellers and Chemists weights : 250
9. Jewellers and Chemists balances : 50

### A.3. THE FUNCTIONING OF THE VERIFICATION BUREAU

#### A.3.1. The functions of the Bureau are based on a number of assumptions :

A.3.1.1. that the National Metrology Law requires annual verification  
and

A.3.1.2. that stamping tours will be arranged, setting up temporary stamping centres in the various sub-divisions of the district to which equipment will be transported and the verification agent will stay at the centre for a number of days. The duration of the stay being dependant on the quantum of work. There are exceptions :

- (i) jewellers and chemists weights and balances will be tested only at the Verification Bureau ;
- (ii) special tours will be arranged for the verification of platform type weighing instruments above 100 kg at site and for petrol pumps.

A.3.1.3. a verification agent would visit on inspection at least 75 % of the premises on one occasion on routine surprise inspection.

A.3.1.4. that all complaints by the public would be investigated as quickly as possible.

#### A.4. LOCATION OF VERIFICATION BUREAU, STAFF, EQUIPMENT

Location — The verification bureau should be located in the principal town of the district, since the work will be heaviest there. The Bureau should consist of :

- (a) a Laboratory for keeping a complete set of standards, storage for additional standards, a testing area for weighing machines, an office for the Inspectors, a waiting area for the public, toilet, and garage for a vehicle. The floor area

is based on the following staff : One Supervising Officer and two Verification Agents plus two assistants. The Supervising Officer should be a Verification Agent who has after a certain period of service been promoted to this grade.

- (b) Offices and waiting rooms etc. 25 m<sup>2</sup>
- Laboratory and stores 50 m<sup>2</sup>
- Garage 20 m<sup>2</sup>

## A.5. EQUIPMENT

### A.5.1. Laboratory Standards

- (a) Set of verification agents standards of mass : 20 kg - 1 mg
- (b) Sets " " 100 g to 1 mg
- (c) Set of metric carat weights 100 carat to 0.01 carat
- (d) Verification Agents balances (portable) 25 kg
- (e) " " 5 kg
- (f) " " 50 g
- (g) " " 2 g
- (h) Verification Standards of volume 5 litre, 2 litre, 1 litre
- (i) " (glass) 500 ml ; 200 ml ; 100 ml ; 50 ml
- (j) " Cylindrical glass measures 200 ml and 100 ml
- (k) " Pipettes 100 ml to 5 ml
- (l) " Standard metre tape
- (m) " " 15 metre tape
- (n) 15 cast iron test weights of 20 kg plus one set of test weights 10 kg to 10 g
- (o) Accessories

### A.5.2. Field Standards

- (a) Set of standard weights 20 kg to 1 mg
- (b) " " 100 g to 1 mg
- (c) Sets of verification agents volume standards, 5 litre, 2 litre, 1 litre, and 500 ml
- (d) Set of subdivided glass standards 200 ml and 100 ml
- (e) Set of pipettes 100 ml to 5 ml
- (f) Verification agents metre tape
- (g) Portable beam scale 20 kg
- (h) " " 3 kg
- (i) 15 cast iron test weights of 20 kg and one set from 10 kg to 100 g
- (j) Petrol standards 20 litre, 10 litre, 5 litre, 2 litre
- (k) Glass measures for oil 1 litre, 500 ml, 200 ml
- (l) Accessories

### A.5.3. Inspection

- (a) Portable weighing instruments (OIML Class III) capacity 5 kg
- (b) Test measures
- (c) Metre tape  
(Portable standards for field equipment too could be used for this purpose when the need arises)
- (d) Vehicle : 1 tonne passenger/goods van

#### A.6. PROCEDURE OF WORK FOR VERIFICATION OF ADMINISTRATION

The work will be organised as follows :

- A.6.1. The Verification Bureau will be open throughout the year providing facilities to any trader to have their measuring appliances tested and certified. It will also have a planned programme of work for the principal town and the surrounding villages up to a radius of 7 kilometres.
- A.6.2. 18 temporary centres will be held throughout the year to service the other traders. This will consist of 20 tours.  
The verification agent will spend a total of 75 working days at these centres.
- A.6.3. Three stamping tours per year to test and certify weighing instruments of capacity of 250 kg or greater used in district. This will take up 15 working days.
- A.6.4. One stamping tour per year to test and certify measuring instruments for liquid fuel.

Note : In each instance the ideal solution would be to notify each trader/user individually, but this is a costly and time consuming process. Hence other means of official notification prevalent in a country could be used.

#### A.7. INSPECTIONS

Each verification agent should spend at least 6 days on inspections of measuring appliances per month. On these occasions specific complaints could be looked into or a separate number of days set apart for this well.

#### A.8. REPORTING

Verification Agents should be provided with forms for reporting the nature and quantum of work done each day. These forms will be sent for scrutiny and evaluation by the Supervising Officer who in turn should summarize the data for inclusion in a national information pool. The forms should be simple and explicit and reduce to a minimum paper work. Each verification agent however should maintain a diary/log book which will indicate the details of the work done by him. This will be scrutinised at periodic intervals by the Supervising Officer.

#### A.9. MAINTENANCE AND CARE OF STANDARDS

A manual for the use and the maintenance and care of equipment should be provided to each verification agent. The Supervising Officer should at intervals of 3 - 4 months check on the condition of the equipment and the performance of the balances. The Supervising Officer should arrange for the periodic verification of the standards against the Regional Secondary Standards before the period of validity expires. The quantum of equipment specified makes it possible for this to be done in rotation so that all times the officers will have access to a set of standards, provided they are sent in rotation.

## Annex B

### Model II

#### B.1. INTRODUCTION

The District which has been chosen as Model II is primarily Agricultural with the emphasis on growing of a cereal, namely paddy and a commercial agricultural crop — i.e. coconut. In both instances, there is very little processing of the finished product unlike in the case of tea and rubber.

#### B.2. PARAMETERS

##### B.2.1. Demographic

Extent : 4 776 Square kilometres  
Population : 1 137 000  
No. of administrative sub divisions : 13  
Principal towns : 2 (Extent 10.4. square kilometres  
4.1. square kilometres respectively)

##### B.2.2. Production

(a) Tea 367 hectares  
(b) Rubber 6 245 »  
(c) Coconut 156 746 »  
(d) Paddy (major season) 56 788 hectares  
(e) Paddy (minor season) 36 100 »  
(f) Miscellaneous Agricultural Crops :  
(major season) 14 752 hectares  
(minor season) 16 623 »

The extents under tea and rubber are too insignificant to have any effect on the kind of measuring equipment used in this District particularly as the holdings for each particular crop would be in the nature of small holdings. Hence green tea leaves will be sold to larger processing units and in rubber the basic processing will be done and the sheet sold to a dealer. In both cases the producer will only use a weighing machine of low capacity.

In the case of coconut, the product is sold by number unless the coconut kernel is dried when it is sold by weight. Similarly there are other products like coconut fibres which again are sold by weight.

Paddy the major agricultural crop again does not require much processing, only milling and here again the units of transaction are those by volume or mass. Transactions by volume are being replaced by that of weight and with the change to metric they will cease.

Although the state purchasing organisations use moisture meters for the measurement of moisture content of paddy, this is not considered a part of the study as in the case of latex-o-meters and humidity-meters in Model I. They form part of the next stage of development.

##### B.2.3. Textiles

The District has two major textile mills and a number of small scale hand looms and power looms. However, in one of the textile mills there is a weigh-bridge, but this has not been taken into account as it is to be considered as part of work of « weigh-bridge testing unit » which will form part of Model III.

Hence the maximum capacity of the weighing instrument used in these need not exceed 500 kg.

##### B.2.4. Trade

The trade categories are very similar to that of Model I.

### B.2.5. Trade Practices

They are identical to that of Model I.

### B.2.6. Data on number of trades premises and weights, measures, etc. in use

- (a) 1. No. engaged in general trade (approximately) : 9 000
- 2. No. of Petrol filling stations : 45
- 3. No. of specialised trade premises : 250  
Jewellers, Chemists
- (b) No. of Weights and Measures in the District :
  - 1. No. of weights : 60 000
  - 2. No. of measures of length (1 metre) : 1 800
  - 3. No. of measures of volume (liquid) : 4 100
  - 4. No. of measures of volume (dry) : 6 300
  - 5. No. of weighing instruments : 12 000
  - 6. No. of petrol pumps : 125
  - 7. No. of jewellers and chemists weights : 1 500
  - 8. No. of jewellers and chemists balances : 300

### B.3. FUNCTIONS OF THE VERIFICATION BUREAU

The functions are the same as in Model I.

### B.4. LOCATION OF VERIFICATION BUREAU, STAFF, EQUIPMENT

The location again is the principal town in the District and the conditions for the laboratory and equipment are the same except that there will have to be additional standards and additional staff.

Using the same criteria as in Model I seven Verification Agents are needed for adequate coverage. In addition there will need to be an officer in the supervisory grade as in the case of Model I, plus a senior officer who would be responsible for the planning and administration. Although there are 7 Verification Agents, the number of sets of verification standards could be as follows :

- (a) Four sets of verification agents standards of mass, length and volume for General Trade together with balances and other equipment ;
- (b) One set of verification agents standards and balances for testing Jewellers and Chemists weights ;
- (c) Two sets of standards for testing petroleum standards ;
- (d) Two sets of standards for checking weighing instruments up to a capacity of 1 tonne.

In all instances specifications for these are available in OIML Recommendation Numbers 25, 40, 41, 43, 47.

### **Procedure of work for verification of Commercial Weighing and Measuring Instruments**

The procedures will be the same as given in Model I. However since the area is much larger and the number of measuring instruments used larger, more temporary centres will have to set up over a year. In this instance there will be a need to have :

- (a) 32 Temporary Stamping Centres
- (b) 4 Stamping tours to test and certify weighing instruments of capacity up to 1 tonne
- (c) 2 Stamping tours to test and certify measuring instruments for liquid fuel.

The procedure for inspections and reporting will be the same as for Model I.

## Annex C

### Model III

#### C.1. INTRODUCTION

The District which was chosen for Model III has within it the Capital City of the Country and surrounding it a dense conurbation of suburbs as well as commercial and industrial establishments. The Capital City has not been considered as a separate unit, because, firstly in the previous models it was postulated that there would be a weigh-bridge testing unit in the centre. This unit will be considered within this model and as the number of weigh-bridges within the Capital City alone is not large enough for it to have a separate unit, it will operate for the whole country. Secondly, the largest number of manufacturers of weights and weighing instruments have their establishments outside the limits of the Capital City, but the maximum use of facilities and services could be utilised if they are considered together. Finally the testing of packaged products again is considered as a single unit, for the city and the district.

#### C.2. PARAMETERS

##### C.2.1. Demographic

Extent	2 093.40 km <sup>2</sup>
Population	2 972 000
No. of Administrative Districts	19
No. of Municipalities in District	3
No. of Urban and Town Councils	25

##### C.2.2. Production

C.2.2.1. Tea	353 ha
Rubber	25 726 ha
Coconut	48 234 ha
Paddy (Major Season)	23 967 ha
Paddy (Minor Season)	10 523 ha
Misc.	11 334.431 ha

##### C.2.2.2. Industry

Note : These figures represent only the industries approved by the Ministry of Industries. They are put into two categories : the first, denoted as 'L' being those which have an annual turn-over of U.S. \$ 50 000 and the second denoted as 'S' which have a turn-over of less than this amount.

It does not include a large number of small industries which have not been approved by or registered with the Ministry of Industries.

##### (a) Manufacture of Food, Beverage and Tobacco

'L'	=	15
'S'	=	119

##### (b) Manufacture of Textiles, Weaving apparels and Leather Products

'L'	=	20
'S'	=	580

(c) Manufacture of Wood and Wood Products	'L'	=	—
	'S'	=	101
(d) Manufacture of Paper and Paper Products : Printing and Publishing	'L'	=	50
	'S'	=	217
(e) Manufacture of Non-metallic Mineral Products other than those of Petroleum	'L'	=	4
	'S'	=	98
(f) Base Metal Industries	'L'	=	4
	'S'	=	11
(g) Manufacture of fabricated Metal Products Machinery and Equipment	'L'	=	54
	'S'	=	348
(h) Other Manufacturing Industry	'L'	=	1
	'S'	=	75

Note : These data are based on a Report from Ministry of Industries and Scientific Affairs for the year 1978

#### C.2.2.3. Manufacture of Weights, Measures of Length and Volume

No. of manufactured units tested and stamped by Inspector	
1. Weights	180 711 (both Metric and British)
2. Linear measures	1 285 (metric measures only)
3. Volume measures	2 012 (metric measures only)
4. Weighing instruments	8 946 (both Metric and British)

Note : These figures are based on data obtained from the Measurement Standards and Services Division of the Department of Internal Trade for the year 1979-80.

#### C.2.3. Agriculture

The extents under Tea, Rubber and Coconut are too small to have any effect on the type of measuring equipment used in the district. Paddy, as in the case of Model II has some effect and that is in the number of weighing instruments that will increase as the number of volume measures used decrease. In the data given under point C.2.2.3. for the manufacture of volume measures only 79 of the 2012 measures manufactured are for the measurement of grain.

The effect of Industry in that region is two-fold, the first is that the commercial and industrial operations use weigh bridges and secondly, light engineering industry uses gauges of different kinds for engineering metrology. The former is provided for in this study but the latter as in the case of moisture meters etc. will form the part of the next stage of development.

#### C.2.4. Trade and trade practice

The categories are similar to those of Model I and Model II except that a number of trade establishments large and small do pack food and

other items in containers for sale to the public. In addition since the city also contains the main port, all importers of pre-packed goods distribute these goods from the Capital City. This adds a new dimension to the work of the Verification Bureau.

C.2.5. Data on number of trade premises and weights and measures etc. used in trade premises

(a) No. engaged in General Trade	approx. 26 000
No. of Petrol Filling Stations	400
No. of Specialised trade premises (Jewellers, Chemists etc.)	2 000
(b) No. of weights, measures, weighing and measuring instruments in district.	
1. No. of weights	143 000
2. No. of dry measures	36 000 (*)
3. No. of liquid measures	13 101
4. No. of linear measures	4 420
5. No. of weighing machines (other than weigh bridges)	25 347
6. No. of weigh bridges	75

C.3. THE FUNCTIONING OF THE VERIFICATION BUREAU

This will be the same as for Model I with the addition of the following additional facilities.

- C.3.1. The establishment of a Weighbridge — Testing Unit (for the whole country). Special tours will be arranged.
- C.3.2. The establishment of a unit to handle the testing of flowmeters for petroleum products in the City and the District (combined). Here again special tours will be arranged.
- C.3.3. The establishment of a unit to check prepacked goods at factories and warehouses of importors.
- C.3.4. The provision of facilities to manufacturers of weights measures and weighing instruments to have these tested and stamped before sale.

C.4. LOCATION OF VERIFICATION BUREAU, STAFF, EQUIPMENT

- C.4.1. Unlike in the case of the Verification Bureau in models I and II there is a need for a unit at the Centre with at least two smaller units, one in the city itself to meet the requirements of the trading establishments in the city, and one about 25 km away from the city, which will handle the needs of the traders and that these units will be smaller and have less equipment.
- C.4.2. The Verification Bureau should consist of the following.

C.4.2.1. Central Unit

- (a) Laboratory for keeping sets of Standards, a testing area for weighing machines, provision for testing fine balances. Special area for testing and stamping of manufactured weights and measures, separate section for testing packaged products. Offices for the Inspectors, waiting area for Public, toilets and

(\*) These are mainly cylindrical Quart and 1/2 Pint measures of volume used by the retail trade to sell rice. They will be completely done away with metrication when rice will be sold only by weight.



garages for vehicles. The floor area is based in the following staff, one Supervising Officer, 3 Senior Verification agents and 7 Verification Agents and their assistants.

(b) Garage for vehicle of weighbridge testing Unit.

(c) Space :

Laboratory and stores	75 m <sup>2</sup>
Offices and waiting rooms	40 m <sup>2</sup>
Garages	50 m <sup>2</sup>

#### C.4.2.2. Sub-office in City

(i) To consist of 1 Senior Verification Agent and 5 Verification Agents.

(ii) Space as for model I.

#### C.4.2.3. Sub-office in District

(a) Staff : To consist of 1 Senior Verification Agent, 3 other Verification Agents.

(b) Space as for Model I.

### C.5. EQUIPMENT

C.5.1.1. The basic equipment that will be needed is the same as that specified in points A.5.1. to A.5.3. in model I, except that the number of sets of equipment in points A.5.2. and A.5.3. will have to be increased.

C.5.1.2. A Weighbridge Testing Unit consisting of a heavy lorry fitted with 500 kg roller weights. The vehicle will be fitted with a motor driven small hoist for lifting the roller weights.

C.5.1.3. A series of weighing instruments and volume measures for checking packaged commodities at factories etc. The weighing instruments should have the accuracy of OIML class III and should be sufficient to cover the range of the packaged products in the market.

#### C.5.2. Sub-office in the Capital City

2 sets of equipment as in points A.5.1. and A.5.3. of Model I.

#### Sub-office in the District

1 set of equipment as in point A.5.1. and

3 sets of equipment as in points A.5.2. and A.5.3. of Model I.

## INFORMATIONS

### CONSEIL DE LA PRESIDENCE 1981

Le Conseil a commencé par une vaste consultation qui a permis aux participants de présenter leurs points de vues sur l'OIML, ses buts, ses méthodes de travail, et d'envisager la manière d'accroître son efficacité malgré l'actuelle pénurie de moyens matériels et financiers, qui résulte de la situation économique mondiale.

Parmi les points ayant fait l'objet de discussions, on notera en particulier :

- plus grande utilisation, par exemple, des normes de l'ISO et de la CEI comme bases des Recommandations de l'OIML,
- meilleure planification des travaux,
- recherche de méthodes nouvelles de vérification, mieux adaptées aux technologies modernes,
- extension des Recommandations aux « méthodes de mesurage » et non pas seulement aux instruments et à leur vérification,
- efforts dans des domaines peu explorés (santé, pollution...),
- étude approfondie de l'activité des Services nationaux de métrologie,
- efforts accrus en faveur de l'information,
- réorganisation de l'activité tournée vers les pays en développement.

Le Bureau a été chargé de faire l'analyse de toutes les propositions qui seront discutées plus en détail lors de la prochaine réunion du Comité (mars 1982).

Le Conseil a ensuite examiné, entre autres, la situation administrative et financière de l'Organisation, le travail des divers Secrétariats Pilotes et Rapporteurs, l'état de la collaboration avec les Institutions Internationales à buts connexes.

Il a également été informé de l'état d'avancement des travaux sur le « Système de Certification OIML », ainsi que des résultats de diverses enquêtes, en particulier celle relative à la mise en application des Recommandations de l'OIML dans les législations des Etats Membres (voir Bulletin de l'OIML n° 83, juin 1981).

A l'issue des deux journées de travail, M. BIRKELAND a remercié ses collègues pour leur participation positive et le vif intérêt manifesté à l'égard de l'avenir de l'OIML.

Il les a conviés à une réception donnée en l'honneur de M. et Mme van MALE, et à laquelle ont participé d'anciens membres du Comité et du Bureau : M. COSTAMAGNA, M. et Mme VIAUD, M. et Mme GOLDNER, M. et Mme ALLWRIGHT, Mme HOU-DUIN, M. GOUZIL. Le Bureau International des Poids et Mesures et le Bureau National de Métrologie étaient représentés respectivement par M. et Mme QUINN et M. PRIDEL.

A cette occasion, M. BIRKELAND a évoqué l'activité incessante et le rôle joué par son prédécesseur, M. van MALE, dans le développement de l'OIML.

## MEMBRES DU COMITE

L'Ambassade d'INDONESIE à Paris nous a fait connaître la désignation de Monsieur R. HAROEN comme nouveau Directeur de la Métrologie au Ministère du Commerce et des Coopératives en remplacement de Monsieur SOEPARTO qui cesse également de représenter son Pays au Comité International de Métrologie Légale. Nous remercions à cette occasion Monsieur SOEPARTO de la collaboration qu'il a bien voulu nous accorder et nous présentons nos meilleures salutations à son successeur, Monsieur HAROEN.

## INSYMET 82

Il est prévu que le 6e International Symposium on Metrology, INSYMET 82, ait lieu à BRATISLAVA, en septembre 1982. Ce Symposium s'ouvre sur un vaste nombre de problèmes, concernant principalement les mesures de pression, débit, radiations ionisantes et matériaux de référence.

Pour tout renseignement, s'adresser à :

DOM TECHNIKY ESVTS  
Jolana Kalinayová  
Skultétyho ul. 1  
88130 BRATISLAVA  
Tchécoslovaquie

## INFOTERM

Ce centre d'information international pour la terminologie a été créé en 1971, dans le cadre des activités d'UNESCO. Cet Organisme a pour but de rassembler toute information sur la terminologie et édite un journal, Infoterm News qui peut être obtenu par l'intermédiaire du :

Centre for Terminology  
Osterreichisches Normungsinstitut  
Leopoldgasse 4  
Postfach 130  
A — 1021 WIEN, Autriche

Les comptes rendus sur les symposiums Infoterm comprenant, entre autre, un « International Bibliography of Standardized Vocabularies » peuvent être obtenus de :

Saur Verlag K 6  
Postfach 711009  
8000 MUNCHEN 71  
Rép. Féd. d'Allemagne

## ILAC

Cet Organisme nous signale la parution, en juillet 1981, de son répertoire intitulé : International Directory of Testing Arrangements and Testing Laboratory Accreditation Systems. Celui-ci peut être obtenu auprès de l'Editeur :

IMS World Publications Ltd  
37, Queen Square  
LONDON WC 1 N 3BL — Grande-Bretagne

## **CEE (Nations Unies)**

Un Séminaire sur l'utilisation présente et future des instruments de précision dans les industries mécaniques et électriques se tiendra du 20 au 24 septembre 1982 à Dresde (République démocratique allemande), sous les auspices du Groupe de travail des industries mécaniques et électriques et de l'automatisation de la Commission économique pour l'Europe des Nations Unies (CEE).

La participation au Séminaire est ouverte aux personnes intéressées des pays de la CEE agréées par leur gouvernement et d'autres pays Membres de l'ONU, ainsi qu'aux représentants des institutions spécialisées et des organisations internationales, intergouvernementales et non gouvernementales participant normalement aux activités de la CEE.

Le programme du Séminaire abordera les thèmes suivants :

- Structure et fonctionnement des systèmes de garantie de la qualité utilisant des instruments de mesure de précision ;
- Conception, fabrication et utilisation des instruments de mesure de précision ;
- Application des techniques du traitement des données pour les systèmes : opérateur/instrument de mesure/fabrication ;
- Systèmes de mesure pour les machines-outils.

De plus amples renseignements peuvent être obtenus auprès de la

Division de l'Industrie  
Commission économique pour l'Europe des Nations Unies  
Palais des Nations  
CH-1211 GENEVE 10, Suisse.

## **FLOW MEASUREMENT COURSES**

When the National Engineering Laboratory held its first course on Flow Measurement in March 1977, few people would have predicted it would prove so popular that there would still be a demand for it 4 years later. More than 350 people have so far attended it.

The majority of the lecturers are members of the Laboratory's Flow Measurement Division, which has a unique international reputation in this subject. The object of the five-day course is to transfer some of this expertise to industry and, in particular, provide in-depth information on flowmeters. The course consists not only of lectures but also of « hands on » practical sessions and numbers are therefore limited to 40 to enable individual tuition to be given to delegates.

The fiscal aspects of flow measurement are clearly related to Legal Metrology and among those attending the 9th course in the series earlier this year were students representing the Legal Metrology administrations of Jamaica, Mauritius, Kenya and Zambia. The next Flow Measurement Course will be held from 2-6 November 1981 and the Spring 1982 course from 10-14 May 1982.

Details of the courses can be obtained from

Conference Section  
National Engineering Laboratory  
East Kilbride  
Glasgow G75 0QU  
United Kingdom  
Telephone : 03552 20222 Extension 2154

**MANUEL DE PESAGE**  
**KEMÉNY T. : Mérlegtechnikai Kézikönyv**  
**Műszaki Könyvkiadó, Budapest, 1981**

Un ouvrage volumineux sur la technique du pesage (680 pages) vient de paraître en langue hongroise. Le rédacteur — et l'auteur des trois quarts du texte — M. KEMENY — est connu dans les milieux spécialisés comme secrétaire de TC 3 « Mesurage de force et masse » de la Confédération Internationale de la Mesure IMEKO et comme chef d'un bureau d'études à Budapest.

L'introduction donne un court résumé de quelques principes et de la terminologie, suivi par la classification des instruments de pesage.

La première partie du livre (chap. 3-7) se rapporte à la présentation des différents systèmes de pesage et leurs éléments : Systèmes mécaniques, instruments de pesage électroniques, hydrauliques et pneumatiques, ensuite les dispositifs imprimeurs.

Dans la deuxième partie (chap. 8-18), les importants groupes d'instruments de pesage sont traités d'une façon plus descriptive. Les chapitres de cette partie sont les suivants : Balances de précision, balances de ménage, de santé et de poste, balances de commerce, ponts-bascules, pesage de véhicules, bascules à grue, balances à réservoir, balances de dosage et trieuses pondérales, systèmes de dosage programmés, instruments de pesage totalisateurs continus.

Etant donné que le livre s'adresse, tout d'abord, aux utilisateurs des instruments de pesage, tous les chapitres donnent une classification des instruments, leurs caractéristiques principales, une description des modèles les plus répandus. Les questions de mise en service, d'entretien, de contrôle et vérification sont abordées, et les données nécessaires pour faire la commande énumérées.

L'ouvrage est illustré par 1 131 figures. La liste de la littérature utilisée et recommandée se compose de 450 références. Les décisions des organisations internationales, entre elles, les Recommandations Internationales de l'OIML sont souvent indiquées ou citées.

Le tirage du volume s'élève à 1 750. Il faut espérer qu'une traduction permettra à cet ouvrage de valeur de sortir de son isolement linguistique.

**HANDBOOK OF WEIGHING**  
**KEMÉNY T. : Mérlegtechnikai Kézikönyv**  
**Műszaki Könyvkiadó, Budapest, 1981**

A thick volume on weighing technology (680 pages) has just been published in the Hungarian language. The editor, who is also the author of three-quarters of the text, Dr KEMENY, is well known among specialists of this field as the secretary of TC 3 « Measurement of force and mass » of the International Measurement Confederation IMEKO and as the head of a development bureau at Budapest, Hungary.

In the introduction of the work, a brief summary of some principles and a terminology are given, followed by a classification of weighing machines.

The first part of the book (chapters 3 through 7) deals with various weighing systems and elements thereof : Mechanical weighing systems, electronic, hydraulic and pneumatic scales, and printing devices.

In the second part (chapters 8 through 18), the most important groups of weighing machines are discussed in a more descriptive way. The chapters of this part are the following : Precision balances, household, medical and post-office scales, weighers for commerce, weigh-bridges, weighing of vehicles, crane weighers, container weighers, bagging scales and check-weighers, programmable batch weighing systems, integrating conveyor belt weighers.

As the book is intended, above all, for users of weighing instruments, in each chapter weighing devices are classified, their main characteristics discussed, and the most frequently used models described in detail. Problems of installation, of maintenance, of checking and verification are discussed, and data necessary for ordering the correct type of weigher enumerated.

The volume is illustrated by 1 131 figures. The list of recommended literature contains 450 references. Decisions of international organisations, among them the International Recommendations of OIML are frequently indicated and quoted.

The size of the Hungarian edition amounts to 1 750 copies. One can only hope that a translation will permit this valuable book to get out of its linguistic isolation.

F. PETIK

## REUNIONS

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Groupes de travail	Dates	Lieux
SP 18 - Sr 1 Humidimètres pour grains de céréales et graines oléagineuses	6-8 oct. 1981	PARIS FRANCE
SP 5 - Sr 16 Compteurs d'eau	26-27 oct. 1981	ALEXANDRIA (VIRGINIA) U.S.A.
SP 1 - Sr 1 Vocabulaire de Métrologie Légale - Termes Fondamentaux	début 1982 (provisoire)	—
SP 14 Acoustique et vibrations	} 23-24 fév. 1982	BRAUNSCHWEIG REP. FED. D'ALLEMAGNE
SP 14 - Sr 1 Sons et bruits		
SP 14 - Sr 2 Audiomètres		
SP 14 - Sr 3 Vibrations mécaniques et chocs		
SP 26 - Sr 4 Instruments de mesure bio-électriques	24-30 mai 1982 (provisoire)	ROSTOV U.R.S.S.
SP 5 - Sr 1 Mesurage des volumes et liquides. Terminologie	} sept. 1982 (provisoire)	LONDRES ROYAUME-UNI
SP 5 - Sr 2 Schémas de hiérarchie des étalons de volume		
SP 5 - Sr 3 Mesures de volumes de laboratoires		
Séminaire OIML : Dispositifs électroniques incorporés dans les instruments de pesage et mesurage de volumes de liquides et de gaz	21-25 sept. 1981	BORAS SUEDE
Conseil de Développement	22-23 mars 1982	PARIS FRANCE
Dix-huitième Réunion du Comité International de Métrologie Légale	24-26 mars 1982	PARIS FRANCE

## CENTRE DE DOCUMENTATION

### Documents reçus au cours du 3e trimestre 1981

BUREAU INTERNATIONAL DES POIDS ET MESURES — BIPM

Le Système International d'Unités (SI) 4e édition, 1981

ORGANISATION DES NATIONS UNIES POUR L'EDUCATION, LA SCIENCE ET LA CULTURE —  
UNESCO

Final report : Regional Latin American Seminar on Metrology (Sao Paulo, Brazil,  
1-5 Dec. 1980)

ORGANISATION INTERNATIONALE DE NORMALISATION — ISO

ISO Normes (en français et en anglais)

- ISO 31/0-1981 : Principes généraux concernant les grandeurs, les unités et les symboles
- ISO 31/12-1981 : Paramètres sans dimension
- ISO 31/13-1981 : Grandeurs et unités de la physique de l'état solide
- ISO 835/1-1981 : Verrerie de laboratoire - Pipettes graduées - Partie 1 : Spécifications générales
- ISO 835/2-1981 : Verrerie de laboratoire - Pipettes graduées - Partie 2 : Pipettes sans temps d'attente
- ISO 835/3-1981 : Verrerie de laboratoire - Pipettes graduées - Partie 3 : Pipettes avec temps d'attente de 15 s
- ISO 835/4-1981 : Verrerie de laboratoire - Pipettes graduées - Partie 4 : Pipettes à souffler
- ISO 1770-1981 : Thermomètres à tige d'usage général
- ISO 1771-1981 : Thermomètres à échelle protégée d'usage général
- ISO 1925-1981 : Equilibrage - Vocabulaire
- ISO 3680-1981 : Peintures, vernis, produits pétroliers et assimilés - Essai de point d'éclair par tout ou rien - Méthode rapide à l'équilibre
- ISO 5982-1981 : Vibrations et chocs - Impédance mécanique d'entrée du corps humain
- ISO 6070-1981 : Tables auxiliaires pour générateurs de vibrations - Méthodes de description des caractéristiques
- ISO 6142-1981 : Analyse des gaz - Préparation des mélanges de gaz pour étalonnage - Méthodes pondérales
- ISO 6143-1981 : Analyse des gaz - Détermination de la composition de mélanges de gaz pour étalonnage - Méthodes par comparaison
- ISO 6144-1981 : Analyse des gaz - Préparation des mélanges de gaz pour étalonnage - Méthodes volumétriques statiques
- ISO 6326/2-1981 : Analyse des gaz - Détermination des composés soufrés dans le gaz naturel - Partie 2 : Méthode par chromatographie en phase gazeuse avec détecteur électrochimique pour la détermination des composés soufrés odorants
- ISO 6556-1981 : Verrerie de laboratoire - Fioles à filtrer
- ISO/TR 6567/1-1981 : Analyse des gaz - Dosage du dioxyde de carbone - Partie 1 : Principes directeurs pour le choix des méthodes
- ISO 6706-1981 : Matériel de laboratoire en plastique - Eprouvettes graduées cylindriques
- ISO 6711-1981 : Analyse des gaz - Vérification des mélanges de gaz pour étalonnage par méthode de comparaison

CONFERENCE INTERNATIONALE SUR L'AGREMENT DES LABORATOIRES D'ESSAIS — ILAC

Actes de la Conférence sur l'Agrément des Laboratoires d'essais (CIALE/ILAC 80)  
Paris, 27-31 Oct. 1980

V International Laboratory Accreditation Conference (ILAC) from 26th to 30th October  
1981 :

Doc No. I : Antecedents and Resolutions (April 1981)

Doc No. II : Organization and Programme of the conference

ASSOCIATION EUROPEENNE DE LIBRE-ECHANGE — EFTA

Compulsory technical regulations : List of competent bodies in EFTA countries, Geneva -  
Mars 1981

COMMONWEALTH SCIENCE COUNCIL - CSC

Nouvelle publication périodique reçue

Commonwealth Currents depuis juin 1981

REPUBLIQUE FEDERALE D'ALLEMAGNE

Richtlinie für die Kalibrierung von Beschleunigungsmessgeräten im Rahmen des Deutschen  
Kalibrierdienstes vom 1-4-1981

REPUBLIQUE DEMOCRATIQUE ALLEMANDE

Amt für Standardisierung, Messwesen und Warenprüfung

Ordnungen, Rundschreiben, Informationen :

V8 (August 1980) Information Betriebliches Messwesen :

Rahmenfunktionspläne für ausgewählte Funktionen im betrieblichen

Standards (TGL) :

31533 (5-80) : Prüfschemata für Messmittel ; Gestaltung

31534 (5-80) : Prüfvorschriften für Messmittel ; Gestaltung

31542/15 (6-80) : Staatliche Etalons ; Staatliches Etalon der Einheit des Druckes  
Absoluter Druck  $10^{-6}$  bis 1000 Pa

31543/08 (6-80) : — ; Messmittel für den Druck Absoluter Druck  $10^{-6}$  bis 1000 Pa

31542/15 (6-80) : — ; Staatliches Etalon der Einheit der Induktivität

31542/19 (6-80) : — ; Staatliches Etalon der Einheit der Luftfeuchte

31543/19 (6-80) : — ; Messmittel für die Luftfeuchte ; Prüfschema

31542/20 (1-80) : — ; Spezialnormal für elektrische Wechselspannungen der Fre-  
quenz 50 Hz im Bereich von 1 bis 700 kV

31543/20 (1-80) : — ; Messmittel für die elektrische Wechselspannung der Fre-  
quenz 50 Hz im Bereich 1 bis 700 kV ; Prüfschema

31542/21 (1-80) : — ; Staatliches Etalon der Einheit des Winkels für die Drehung  
der Polarisationssebene

31543/21 (1-80) : — ; Messmittel zur Bestimmung des Winkels für die Drehung  
der Polarisationssebene ; Prüfschema

31542/22 (1-80) : — ; Staatliches Etalon der Einheiten der Energiedosis von  
Quantenstrahlung

31543/22 (1-80) : — ; Messmittel der Energiedosis von Quantenstrahlung ; Prüf-  
schema

31542/23 (1-80) : — ; Staatliches Etalon der Einheiten von Beschleunigung,  
Geschwindigkeit und Auslenkung bei mechanischen Schwingungen im Frequenz-  
bereich von 10 Hz bis 12,5 KHz

31543/23 (1-80) : — ; Schwingungsmessmittel ; Prüfschema

31542/28 (6-80) : — ; Staatliches Etalon der Einheit der Länge

31543/28 (6-80) : — ; Messmittel für die Länge ; Prüfschema

ASMW - Vorschriften Messwesen (VM)

160/01 (1. Abl., 4-75) : Masse ; Nichtselbsttätige Waagen ; Allgemeine Eich-  
vorschrift

160/08 (5-80) : — ; — ; Genauigkeitsklasse 3, Seilzugwaagen, Eichvorschrift

170 (9-80) : Spannung ; Normalelemente ; Beglaubigungs und Sonderprüfvorschrift



- 196/01 (2-80) : Volumen ; Kaltwasserzähler ; Zulassung- und Eichvorschrift  
 253/01 (2-80) : — ; Balgengaszähler ; Zulassungs- und Eichvorschrift  
 422 (3. Ergänzung, 12-80) : — ; Volumenzähler und Volumenmesseinrichtungen mit Volumenzähler für Flüssigkeiten ausser Wasser ; Zulassungs- und Eichvorschrift  
 496 (7-80) : Prüflehren für Rechenlehren ; Beglaubigungsvorschrift  
 1257 (19-80) : Volumen ; Volumenmesseinrichtungen für Milch ; Zulassung- und Eichvorschrift  
 1252 (4-80) : Elektrischer Widerstand ; Gleichstrommesswiderstand ; Beglaubigung, Sonderprüfung  
 1253 (4-80) : — ; Gleichstrom- Widerstrandmessbrücken ; Beglaubigungs- und Sonderprüfvorschrift  
 Zurückziehungen von ASMW/DAMW - Vorschriften  
 TGL RG 1055 (1-80) : Härtenormalplatten ; Technische Forderungen ; Beglaubigung

#### ETATS-UNIS D'AMERIQUE

##### National Bureau of Standards

- Sixty-sixth National Conference on Weights and Measures (July 13-17, 1981 - St. Louis, Missouri)  
 NBS Handbook 133 : Checking the Net Contents of Packaged Goods (C.S. Brickenkamp, S. Hasko, M.G. Natrella - June 1981)

#### AUTRICHE

##### Bundesamt für Eich- und Vermessungswesen

- Amtsblatt für das Eichwesen : Nr 1 à 4/1981  
 Eichgebührenverordnung 1981 - Vergütungen für Beglaubigungen und Vergütungen im Physikalisch-technischen Prüfungsdienst vom 20-1-1981  
 Änderung der Eichvorschriften für Nichtselbsttätige Waagen der Genauigkeitsklasse (Handelswaagen) vom 16-4-1981  
 3. Änderung der Eichvorschriften für Wasserzähler (mit Erläuterungen) vom 6-5-1981  
 Mitteilung Nr 38 über das Zeitsignal des Bundesamtes für Eich- und Vermessungswesen (BEV), 1981

#### DANEMARK

##### Dansk Institut for Proving og Justering

- Dantest : Arsberetning 1980

#### ESPAGNE

##### Comision Nacional de Metrologia y Metrotecnica

- 21428 Orden de 15-9-1980 por la que se dispone la aprobacion de la Norma Metrologica Espanola referente a « Jeringuillas medicas de materia plastica para usar una sola vez » (B.O. del E. - Num. 240, Oct. 1980)

#### FRANCE

##### Réglementation

- Décision ministérielle n° 81.1.01.900.0.0 du 28-1-1981 : Agrément des appareils équipant les installations thermiques - Appareils de mesure en continu de l'indice de noircissement  
 Arrêté du 17-2-1981 relatif aux trieuses pondérales automatiques  
 Arrêté du 4-2-1981 : Commission Industrie-Administration pour la mesure (CIAME)  
 Circulaire n° 81.1.01.401.0.3 du 6-3-1981 : Contrôle en service des ensembles de mesurage utilisés pour le ravitaillement en gaz de pétrole liquéfiés des véhicules routiers

## JAPON

Japan Society for the Promotion of Science  
The current Status of Scientific Research Activities in Japan - 1980 (in English)

## PAYS-BAS

Dienst van het IJkwezen  
IJKwetgeving I : Aanvulling Nr. 28 (Juli 1981)

## PORTUGAL

Direcção-Geral da Qualidade  
Catalogo das Normas Portuguesas, 1981

## POLOGNE

Polski Komitet Normalizacji, Miar i Jakości  
Dziennik Normalizacji i Miar : Nr 1 à 7/1981

## SUEDE

Statens Provningsanstalt  
Svensk Mätplatskalender, 1981

## URSS

Gosudarstvennyj Komitet Standartov Soveta Ministrov SSSR  
Vypusk 8 : Usoversenstvovanie pnevmaticheskikh priborov dlja razmernogo kontrolja  
(A. Ja. Rostovyh, 1976)  
Vypusk 213 (273) : Issledovanija v oblasti izmerenij davlenija (L.M. Zaks ..., 1977)  
Vypusk 215 (275) : Issledovanija v oblasti magnitnyh izmerenij (E.N. Ceurini, 1978)  
Vypusk 216 (276) : Issledovanija v oblasti teplovyh izmerenij (B.N. Olejnika, O.A. Serseeva)  
Vypusk 218 (278) : Issledovanija v oblasti izmerenij geometricheskikh velicin (V. Ja. Baras, L.M. Zaks, 1977)  
Vypusk 222 (282) : Issledovanija v oblasti gazoanaliticheskikh izmerenij (D.O. Gorelika ; Ju. I. Aleksandrova, 1978)  
Vypusk 223 (283) : Issledovanija v oblasti mehanicheskikh izmerenij (E.F. Dolinskoso, 1978)  
Vypusk 224 (284) : Issledovanija v oblasti izmerenij massy (N.A. Smirnov, 1978)  
Vypusk 323 (292) : Issledovanija v oblasti elektricheskikh izmerenij (T.B. Rozdestvenski, 1979)  
Vypusk 233 (293) : Issledovanija v oblasti magnitnyh izmerenij (E.N. Ceurini, 1979)  
Vypusk 234 (294) : Issledovanija v oblasti fiziko-himicheskikh izmerenij (B.V. Sesmakova, 1979)

State System for ensuring the uniformity of measurements :

- Gost 8.044-80 : Diamond indentors of the hardness testing machines for metals and alloys
- Gost 8.095-73 : State primary standard and all-union verification schedule for means measuring magnetic induction
- Gost 8.107-81 : State special standard and state verification schedule for means measuring absolute pressure in the range from  $1.10^{-8}$  to  $1.10^3$  Pa
- Gost 8.120-74 : State special standard and state verification schedule for means measuring pH

- Gost 8.408-80 : Checking squares. Methods and means of verification
- Gost 8.410-81 : State verification schedule for means measuring plasma temperature of 10 000-15 000 K in the visible and ultraviolet
- Gost 8.411-81 : Lever micrometers with 0.002 mm division value. Methods and means of verification
- Gost 8.413-81 : State special standard and all-union verification schedule for means measuring radiation field parameters of antenna systems with operating dimensions of apertures from 0.40 to 0.75 m at the frequency range from 8.2 to 40.0 GHz
- Gost 8.414-81 : State special standard and all-union verification schedule for means measuring radiation field parameters of antenna systems with operating dimensions of apertures from 1.5 to 3.0 m at the frequency range from 2.5 to 40.0 GHz
- Gost 8.415-81 : State special standard and all-union verification schedule for means measuring intensities, ratio distributions and phase shift angle in apertures field of antenna systems with operating dimensions from  $3 \times 3$  to  $6 \times 12$  m<sup>2</sup> at the frequency range from 2.5 to 4.0 and 8.2 to 12.0 GHz
- Gost 8.416-81 : State special standard and all-union verification schedule for means measuring phase shift angle within frequency range from 2.5 to 3.5 GHz

# RECOMMANDATIONS INTERNATIONALES

de la

## CONFERENCE INTERNATIONALE DE METROLOGIE LEGALE

R.I. N°	Secrétariats	Année d'édition
— Vocabulaire de métrologie légale (termes fondamentaux) (édition bilingue français/anglais)	Pologne	1978
1 — Poids cylindriques de 1 gramme à 10 kilogrammes (de la classe de précision moyenne)	Belgique	1973
2 — Poids parallélépipédiques de 5 à 50 kilogrammes (de la classe de précision moyenne)	Belgique	1973
3 — Réglementation métrologique des instruments de pesage à fonctionnement non automatique	R.F. d'Allemagne et France	1978
4 — Fioles jaugées (à un trait) en verre	Royaume-Uni	1970
5 — Compteurs de volume de liquides (autres que l'eau) à chambres mesureuses	R.F. d'Allemagne et France	*
6 — Prescriptions générales pour les compteurs de volume de gaz	Pays-Bas et R.F. d'Allemagne	1978
7 — Thermomètres médicaux à mercure, en verre, avec dispositif à maximum	R.F. d'Allemagne	1978
8 — Méthode étalon de travail destinée à la vérification des instruments de mesurage du degré d'humidité des grains	R.F. d'Allemagne	1970
9 — Vérification et étalonnage des blocs de référence de dureté Brinell	Autriche	1970
10 — de dureté Vickers		
11 — de dureté Rockwell B		
12 — de dureté Rockwell C		
13 — Symbole de correspondance	B.I.M.L.	1970
14 — Saccharimètres polarimétriques	R.F. d'Allemagne	1978
15 — Instruments de mesure de la masse à l'hectolitre des céréales	R.F. d'Allemagne	1970
16 — Manomètres des instruments de mesure de la tension artérielle	Autriche	1970
17 — Manomètres - manovacuumètres - vacuumètres « indicateurs » à éléments récepteurs élastiques à indications directes par aiguille et échelle graduée (catégorie instruments de travail)	U.R.S.S.	*
18 — Pyromètres optiques à filament disparaissant	U.R.S.S.	1970

\* En cours de publication.

19 — Manomètres - manovacuumètres - vacuomètres « enregistreurs » à éléments récepteurs élastiques à enregistrements directs par style et diagramme (catégorie instruments de travail)	U.R.S.S.	*
20 — Poids des classes de précision E <sub>1</sub> E <sub>2</sub> F <sub>1</sub> F <sub>2</sub> M <sub>1</sub> de 50 kg à 1 mg	Belgique	1973
21 — Taximètres	R.F. d'Allemagne	1973
22 — Alcoométrie	France	1973
— Tables alcoométriques	France	1975
23 — Manomètres pour pneumatiques	U.R.S.S.	1973
24 — Mètre étalon rigide pour Agents de vérification	Inde	1973
25 — Poids étalons pour Agents de vérification	Inde	1977
26 — Seringues médicales	Autriche	1973
27 — Compteurs de volume de liquides autres que l'eau — Dispositifs complémentaires	R.F. d'Allemagne et France	1973
28 — Réglementation « technique » des instruments de pesage à fonctionnement non-automatique	R.F. d'Allemagne et France	1981
29 — Mesures de capacité de service	Suisse	1973
30 — Mesures de longueur à bouts plans	U.R.S.S.	1981
31 — Compteurs de volume de gaz à parois déformables	Pays-Bas	1973
32 — Compteurs de volume de gaz à pistons rotatifs et compteurs de volume de gaz à turbine	R.F. d'Allemagne	1973
33 — Valeur conventionnelle du résultat des pesées dans l'air	B.I.M.L.	1973
34 — Classes de précision des instruments de mesurage	U.R.S.S.	1974
35 — Mesures matérialisées de longueur pour usages généraux	Belgique et Hongrie	1977
36 — Vérification des pénétrateurs des machines d'essai de dureté	Autriche	1977
37 — Vérification des machines d'essai de dureté système Brinell	Autriche	1977
38 — Vérification des machines d'essai de dureté système Vickers	Autriche	1977
39 — Vérification des machines d'essai de dureté système Rockwell B,F,T — C,A,N	Autriche	1977
40 — Pipettes étalons pour Agents de vérification	Inde	1977
41 — Burettes étalons pour Agents de vérification	Inde	1977
42 — Poinçons de métal pour Agents de vérification	Inde	1977
43 — Fioles étalons graduées en verre pour Agents de vérification	Inde	1977
44 — Alcoomètres et aréomètres pour alcool	France	1977

\* En cours de publication.

45 — Tonneaux et futailles	Autriche	1977
46 — Compteurs d'énergie électrique active à branchement direct	France	1978
47 — Poids étalons pour le contrôle des instruments de pesage de portée élevée	R.F. d'Allemagne et France	1978
48 — Lampes à ruban de tungstène pour l'étalonnage des pyromètres optiques	U.R.S.S.	1978
49 — Compteurs d'eau (destinés au mesurage de l'eau froide)	Royaume-Uni	1977
50 — Instruments de pesage totalisateurs continus à fonctionnement automatique	Royaume-Uni	1980
51 — Trieuses pondérales de contrôle et trieuses pondérales de classement	Royaume-Uni	1980
52 — Poids hexagonaux — Classe de précision ordinaire — de 100 grammes à 50 kilogrammes	Belgique et Royaume-Uni	1980
53 — Caractéristiques métrologiques des éléments récepteurs élastiques utilisés pour le mesurage de la pression	U.R.S.S.	*
54 — Echelle de pH des solutions aqueuses	U.R.S.S.	*
55 — Compteurs de vitesse, compteurs mécaniques de distance et chronotachygraphes des véhicules automobiles — Réglementation métrologique	Pologne	1981
56 — Solutions-étalons, reproduisant la conductivité des électrolytes	U.R.S.S.	1981
57 — Ensembles de mesurage de liquides autres que l'eau équipés de compteurs de volumes — Dispositions générales	R.F. d'Allemagne et France	*

## DOCUMENTS INTERNATIONAUX

adoptés par le

**Comité International de Métrologie Légale**

D.I. N°

1 — Loi de métrologie	BIML	1975
2 — Unités de mesure légales	BIML	1978
3 — Qualification légale des instruments de mesurage	BIML	1979
4 — Conditions d'installation et de stockage des compteurs d'eau froide	Royaume-Uni	1981

Note — Recommandations internationales et Documents internationaux peuvent être acquis au Bureau International de Métrologie Légale, 11, rue Turgot, 75009 PARIS.

\* En cours de publication.

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(\*) Note : Cette liste ne comprend pas les Membres d'Honneur décédés.

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