Weights and Measures

Information Booklet

WEIGHTS
AND MEASURES
OFFICE

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The Weights and Measures Office (WMO) safeguards the interests of consumers and businesses by ensuring a uniform and accurate system of weights and measures in Singapore. The WMO is an office overseen by Enterprise Singapore.

Visit **www.weightsandmeasures.gov.sg** for more information.

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1.0 Preface

This information booklet serves as a guide to the **Weights and Measures Act** and its related regulations. Having a uniform and accurate weights and measures system is important to all consumers and traders. As the national body for legal metrology, the Weights and Measures Office (WMO) is an office overseen by Enterprise Singapore that is responsible for regulating weighing and measuring instruments for trade and the net content of pre-packaged goods under the **Weights and Measures Act**.

The WMO reserves the right to revise the booklet and introduce new requirements as and when the need arises.

Users are advised to obtain the latest version of this booklet from the website www.weightsandmeasures.gov.sg.

We appreciate any feedback so that improvements to this booklet could be made. Please send your feedback to:

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2.0 Introduction to the Weights and Measures Act

Ensuring Accurate Weights and Measures in Singapore

Accurate trade and measures are important to ensure consumers and businesses get what they pay for when buying goods that are weighed, measured, or pre-packed. The Weights and Measures Act assures fair trade by ensuring that a uniform and accurate system of weights and measures is used in Singapore. The WMO, as the implementer of the Act and its related regulations, is responsible for the legal metrology of weighing and measuring instruments used for trade[1]. This includes the mass, length and volumetric measurements of food, fuel and other essential commodities including pre-packaged goods.

To carry out its functions, the WMO performs the following activities:

- Designating **Authorised Verifiers (AVs)** (qualified private sector companies) of weighing and measuring instruments for trade use
- Ensuring that weighing and measuring instruments provided by AVs and registered suppliers are of approved patterns (types suitable for trade use), and meet the required standards
- Inspecting weighing and measuring instruments for trade use for inaccuracies and signs of tampering
- Inspecting pre-packaged goods or goods sold by weight or measure for short weight or measure
- Investigating complaints on weights and measures matters

[1] Use for trade refers to transactions involving the transferring/ rendering of money's worth by reference to a certain quantity of goods exchanged, or where there is payment in respect of any toll or duty.

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We would like to draw your attention to the following sections of the Weights and Measures Act:

Requirement	**Penalty**
Section 7(2) Weighing or measuring instruments for trade use must be passed as fit for use, affixed with stamp and an Accuracy label	Liable on conviction to a fine up to $2,000 and the weighing and measuring instrument forfeited.
Section 14(1) Weighing or measuring instrument shall not be false or unjust	Liable on conviction to a fine up to $5,000 and/or imprisonment up to 3 months, and the weighing and measuring instrument forfeited.
Section 18(1) Units of measurement on any package, price list or advertisement for sale of goods shall be expressed as a unit of the Metric System	Liable on conviction to a fine up to $2,000
Section 19(1) No person shall sell any goods by weight or other measurement or by number, deliver to the buyer a lesser quantity than that purported to be sold or than corresponds with the price charged.	Liable on conviction to a fine up to $5,000 and/or imprisonment up to 3 months.

3.0 Key Aspects of the Weights and Measures Act

3.1 Weighing and Measuring Instruments for Trade Use

Examples of prescribed[2] instruments for trade use are:

Weighing instruments	Measuring instruments
- Non-automatic weighing instruments such as spring scales, electronic scales, weighbridges etc.	- Flow meters - Fuel dispensing pumps - Linear measures

3.2 Metric System of Units

Under the Weights and Measures Act, all transactions, advertisements, and/or displaying of goods for sale with reference to any weight or measure should use the metric system of units.

Below are examples of metric units commonly used in trade measurements:

Measurement by:	Weight	Volume	Length
Metric Units:	Kilogram, Gram, Milligram, Carat (metric)	Litre, Millilitre	Kilometre, Metre, Centimetre, Millimetre

For other metric units of measurement, refer to First Schedule of the Weights and Measures Act, also appended in Appendix B.

3.3 Verification Seals and Accuracy Labels

The verification system requires that weighing and measuring instruments for trade use in Singapore are **pattern approved**[3], **registered with the WMO**, and thereafter **verified by AVs**. This ensures that buying and selling of goods based on weights or measures are accurate.

All new or repaired instruments which have been verified by AVs as accurate and fit for trade use are sealed either with:

- the plastic verification seal;
- tamper-evident paper adhesive seals bearing the letters “RS” (Republic of Singapore) and Republic Shield with a verification number; or
- a cable-lock seal (used in specific industries only)

[2] Prescribed weighing or measuring instruments are described in Regulation 3 of the Weights and Measures Regulations 2005
[3] Instrument that has been tested against a set of recognised standards to ensure it conforms to the requirements to be used for trade.

and affixed with an Accuracy Label as shown below.

Plastic seal

Tamper-evident paper adhesive seal

Accuracy Label

A weighing or measuring instrument will not be passed as fit for trade use if

- There are reasonable grounds to believe that the instrument is not suitable for that particular trade purpose
- It is not operating within the **Maximum Permissible Errors (MPE)** specified for the prescribed instrument.

The ACCURACY Label is valid for 12 months. Subsequent re-verification of the weighing or measuring instrument is required thereafter (Chapter 4.2).

Maximum Permissible Errors

The Maximum Permissible Errors (MPE) refers to the maximum difference between the indication of an instrument and the corresponding true value allowed by regulation. The details of the MPE for the instruments mentioned above are available in Appendix C.

Unstamped or Unjust Instruments

If the seal is broken or an instrument is not accurate, the trader must immediately stop using the instrument. The instrument should be sent to an AV for verification.

Disqualification (Cancellation) of Stamps

A six-pointed star is used to indicate the obliteration of a stamp that has been previously marked or impressed on a weighing or measuring instrument:

Stamps are cancelled under the following circumstances:

- When any weight, measure, weighing or measuring instrument falls outside the MPE;
- When any weight, measure, weighing or measuring instrument has been damaged and cannot be adjusted properly;
- When there is evidence that the weighing or measuring instrument has been tampered with.

No person should use for trade, any weight, measure, weighing or measuring instrument in which the stamp has been obliterated.

Notice Issued by the WMO to Correct and Stamp Instrument

The WMO may issue notices to any person or company in possession of any weighing or measuring instrument to be used for trade, requiring them to have the instrument submitted for verification within a specified period indicated in the notice.

3.4 Key points to note for weighing and measuring instruments

Traders shall ensure that their weighing or measuring instruments are:

- accurate at all times;
- zeroed before goods are weighed or measured;
- sent for periodic verification to prevent short weights or measures;
- affixed with the Weights and Measures verification seal at all times;
- affixed with a valid Accuracy Label at all times;
- situated such that a visual reading of the recorded or indicated weight or measurement of goods can be easily seen by the consumers e.g. with the use of electronic dual-faced indicator type of instruments.

Additionally, the weighing or measuring instruments should be:

- installed and used in suitable environmental conditions e.g. weighing scales should be used on level ground;
- cleaned and free from foreign particles on the weighing or measuring areas, e.g. weighing pan, dispenser nozzles;

4.0 Technical Requirements

4.1 Registration of Approved Patterns of Weighing and Measuring Instruments

Weighing or measuring instruments which are manufactured for use for trade purposes, must have in their instruction or operation manuals/leaflets, a statement advising users to seek approval from their national weights and measures authority before these instruments can be used for trade purposes.

Anyone intending to supply weighing or measuring instruments for use for trade shall register the approved patterns with the WMO before they can be used in Singapore. Please refer to Appendix D for the Registration Process of Weighing and Measuring Instruments for trade use.

The following are the crucial information needed for completing the online application on the Consumer Product Safety Accuracy (CPSA) system for the registration of weighing and measuring instruments:

A. Company Information

(i) Name of the company applying for the approval and registration;

(ii) Address of the company; and

(iii) Name and designation of the person appointed by the company to be in-charge of submission of application as well as to liaise with the WMO.

B. Instrument Information

(i) Type of the instrument to be registered;

(ii) Brand name/ make and identification/ designated type of the instrument;

(iii) Maximum capacity and accuracy class of the instrument (state the various ranges of the instrument);

(iv) Name of manufacturer;

(v) International Organisation of Legal Metrology (OIML) Certificate of Conformity/ Pattern Evaluation Certificate Number;

(vi) Certificate issuing body; and

(vii) Pattern Evaluation/ Test Report Number.

C. Ensure the following documents are attached

(i) Copy of the endorsed OIML Certificate of Approval/ Pattern Evaluation Certificate;

(ii) Copy of the endorsed Pattern Evaluation/ Test Report(s);

(iii) Circuit Diagram (block diagram is acceptable) of the power supply (supported with key component part list or descriptions);

(iv) Photographs of external view, rating label/ markings and internal view with key components;

(v) Weights and Measures Sealing Provision (supported with diagrams and/or photographs); and

(vi) User or Service Instruction Manual (with safety and calibration/ adjustment instructions).

The metrological, technical and construction requirements for registration and approval, testing and examining procedures of weighing and measuring instruments are based on international practices established by International Organisation of Legal Metrology (OIML).

The WMO may accept pattern approval certificates and test data issued by other national authorities if it can be ascertained that the weighing or measuring instrument was tested in accordance with the relevant OIML recommendations.

Only weighing and measuring instruments with approved patterns registered with the WMO, shall be verified and used for trade purposes in Singapore.

4.2 Verification of Weighing and Measuring Instruments

To safeguard the interests of consumers and traders, weighing and measuring instruments are required to go through a periodic verification. The ACCURACY Label is valid for 12 months. Past its validity, a re-verification of the weighing or measuring instrument is required.

Any person using a prescribed instrument for trade must submit the instrument to an appointed AV. This ensures that the instrument is functioning correctly and sealed, so that subsequent signs of tampering would be evident. Please refer to Appendix E for the Verification Process of Weighing and Measuring Instruments.

The verification processes for various weighing and measuring instruments are detailed below in Appendix F. If deemed fit for use for trade after verification, the AV will affix the instrument with a stamp and an accuracy label.

4.3 Pre-Packaged Goods

For pre-packaged goods, suppliers and/or retailers should have their own systems or measures in place to ensure net content of the pre-packaged goods is as per stated on the package or label. Net content of a pre-packaged good refers to content of the product excluding any packaging materials such as, plastic wrappers etc.

Suppliers and/or retailers of such pre-packaged goods should also ensure the net content is indicated using the metric system of measurement as mentioned in Chapter 3.2 of this booklet.

Average Quantity System (AQS)

The AQS[4] is an internationally recognised sampling methodology to verify the net content of pre-packages. The AQS requirements may be referenced to verify if a batch of pre-packages fulfil both the average and individual pre-packages requirements.

A sampled batch would fulfil the AQS if:

(i) The average net content of the packages in a sampled batch is not less than the quantity stated on the packaging;

(ii) The number of non-standard pre-packages (exceeding the tolerable deficiency as prescribed in Table 2) in a sample taken from a sampled batch does not exceed the allowed number (c) as prescribed in Table 1; and

(iii) No pre-package has a net content that exceeds twice the tolerable deficiencies as prescribed in Table 2.

Table 1: Sample sizes and number of non-standard packages allowed

Number of packages in the lot of packages	Sample size	Number of non-standard packages allowed (c)
from 0 to 100	All	0
from 101 to 500	50	3
from 501 to 3,200	80	5
More than 3,200	125	7

[4] Details of the statistical and general principles of AQS can be found in International Organisation of Legal Metrology Recommendation-87 (OIML-R87).

Table 2: Amounts of error for packages labelled by mass or volume

Declared quantity (g or ml)	Tolerable deficiency (T)	
	Amount of error (% of declared quantity)	Amount of error (g or ml)
from 5 to 50	9	-
51 to 100	-	4.5
101 to 200	4.5	-
201 to 300	-	9
301 to 500	3	-
501 to 1,000	-	15
1,000 to 10,000	1.5	-
10,000 to 50,000	-	150
More than 50,000	1	-

Tables 1 and 2 above were extracted from the Weights and Measures (Defences under Section 19) Regulations 2005. Please refer to the online copy for the latest version.

Besides the above, businesses should also ensure they establish a system to control the production process, set up effective sampling, checking, and testing plans, as well as use only appropriate equipment for checks to ensure net content of each pre-packaged goods is as per stated on the package or label.

5.0 Legislated Fees

Any person using a prescribed instrument for trade must submit the instrument to an appointed AV for regular verification. Instruments will be tested for its fitness for use for trade, then sealed and affixed with a valid Accuracy Label. This service rendered is chargeable and a part of it is paid to the WMO.

The Weights and Measures (Fees) Regulations have been in force since 1984, and several amendments have been made since to pass on savings from process improvements to businesses. The WMO is committed to ensuring that the process of ensuring accurate weighing and measuring instruments is as business-friendly and cost efficient as possible.

The corresponding revised fees (from 1 May 2020) for the services and applications are as shown in the table.

s/n	Fee Type	Fee (excl GST)
Fees for AVs, Suppliers/Manufacturers of Instruments		
1	**Pattern Registration** *Registration of instrument pattern for evaluation as fit for trade use (excludes verification fee payable to AVs)*	$280
2	**AV Application and Renewal** *Apply to be an AV to conduct verification of instruments use for trade (renewable on an annual basis)*	$500
3	**General Administration**	
A	- *Certified true copy of an extract from the register (inclusive of GST).*	$31.50
B	- *Duplicate appointment letters, certified true copy of an extract from the register relating to AV or pattern approval (inclusive of GST).*	$5.25

s/n	Fee Type	Fee (excl GST)
Fees for Traders/Businesses Operating with Weights and Measures		
4	**Linear Measure** *Service rendered by the WMO for the testing and/or passing as fit for trade use for the purpose of supply of the linear measure (with scale marks where the distance between are indicated in metric units of length).*	$2
5	**Verification Report Submission** *Where the testing and/or passing of instrument as fit for trade is by an AV, the verification report is to be submitted and the fee payable to the Controller through the AV.*	
A	- Linear measure	$2
B	- Liquid measure	$3
C	- Flow meter and petrol pump	$30
D	- Instrument with weighing capacity not exceeding 1 metric ton	$3
E	- Instrument with weighing capacity exceeding 1 metric ton but not exceeding 30 metric tons	$25
F	- Instrument with weighing capacity exceeding 30 metric tons but not exceeding 60 metric tons	$500
G	- Instrument with weighing capacity exceeding 60 metric tons	$1,000

Appendix A – Definitions

Accuracy

The closeness between the result of the measurement and the true (conventional) value of the measured quantity.

Adjustment

Alteration of the measurement parameters to bring the dispenser within the allowable maximum permissible errors permitted when the dispenser is in use.

Automatic weighing instrument

Instrument that does not require the intervention of an operator during the weighing process.

Content of a pre-package

Actual quantity of product in a pre-package.

Instrument

Instrument as used in this Information Booklet, means a weighing and measuring instrument.

Instrument test report

Based on the performance of a module or a complete instrument and may or may not take into account the pattern approval specifications.

Initial verification

The verification of a new instrument, which does not bear the Weights and Measures verification mark.

Load receptor

The part of an instrument intended to receive the load.

Mass

The amount of matter of an object, regardless of location.

Maximum Permissible Error (MPE)

Maximum difference, positive or negative, allowed by regulation between the value indicated on an instrument and the corresponding true value. This is determined by reference standard weights when the instrument is at zero, with no-load and in the reference position.

Non-automatic weighing instrument

Instrument that requires the removal of the load from the weighing area of the weighing instrument during the weighing process. For example, to obtain the result by depositing on or removing the load to be measured from the weighing pan or platform.

Nominal quantity (Q_n)

Quantity of product in a pre-package declared on the label by the packager.

Non-standard package

A package enclosing goods that contains less than the quantity stated on the package or a label attached to it, where the deficiency is more than the amount of error prescribed (in Table 2: Amounts of error for packages labelled by mass or volume) but not more than twice that prescribed amount of error.

Pattern of an instrument

The definitive design of an instrument of which all the components affecting its metrological properties are suitably defined.

Pre-package

Combination of a product and the packing materials in which it is pre-packed.

Pre-packaged good

Single item for presentation as such to a consumer; consisting of a product and the packing material into which it was put before being offered for sale and in which the quantity of product has a predetermined value, whether the packing material encloses the product completely or only partially, but in any case in such a way that the actual quantity of product cannot be altered without the packing material either being opened or undergoing a perceptible modification

Price-computing instrument

Instrument that calculates the amount to pay on the basis of the indicated mass and the unit price.

Repeatability

The ability of an instrument to provide results which agree with each other when the same load is deposited several times and in a practically identified way on the load receptor under reasonably constant test conditions.

Re-verification

Any verification of a weighing or measuring instrument which follows the initial verification, because the seal/stamp is no longer valid due to conditions such as:

- Repairs or adjustment to the instrument
- The seal/stamp has been removed
- The user makes a request

The re-verification involves an examination of an instrument carried out by an AV with the aim of checking that the instrument has not been modified and errors do not exceed the MPE permitted for re-verification.

Sample lot (also called a batch or inspection lot)

Definite quantity of pre-packages produced at one time under conditions that are presumed to be uniform and from which a sample is drawn and inspected to determine conformance with specified criteria for acceptance or rejection of the inspection lot as a whole.

Sample size (n)

Pre-packages taken from an inspection lot and used to provide information that will serve as the basis for a decision on the conformance of the inspection lot.

Stamping

All operations for the purpose of applying to an instrument should indicate that it conforms to the requirements of verification and re-verification. It can be a stamp plug, a stamping label or a wire seal.

Standard weight

A mass which is verified against a reference standard weight and is used to verify ordinary weighing instruments of a lower accuracy than itself.

Tolerable deficiency (T)

Deficiency in the quantity of product permitted in a pre-package.

Trade Use

Use for trade refers to transactions involving the transferring or rendering of money's worth by reference to a certain quantity of goods exchanged, or where there is payment in respect of any toll or duty.

Verification

The examination of an instrument by an AV in order to indicate that the instrument conforms to the requirements outlined in this Information Booklet.

Weighbridge

A weighing instrument that is of a high capacity and has a platform through which the weighing instrument is capable of determining the mass of a vehicle on the ground.

Weighing instrument

An instrument that serves to determine the mass of a body by using the action of gravity on this body. The instrument may also be used to determine other quantities, magnitudes, parameters or characteristics related to mass. According to its method of operation, a weighing instrument may be classified as automatic or non-automatic.

Appendix B – Metric Units System of Measurement

Extracted from the First Schedule of the Weights and Measures Act. Please refer to the online copy for the latest version.

DEFINITIONS OF UNITS OF MEASUREMENT (METRIC UNITS)

PART I

Measurement of Length

Kilometre	=	1000 metres
Metre	=	The metre as defined under the Convention of the Metre 1875
Decimetre	=	1/10 metre
Centimetre	=	1/100 metre
Millimetre	=	1/1000 metre.

PART II

Measurement of Area

Hectare	=	100 ares
Dekare	=	10 ares
Are	=	100 square metres
Square metre	=	A superficial area equal to that of a square each side of which measures one metre
Square decimeter	=	1/100 square metre
Square centimeter	=	1/100 square decimeter
Square millimeter	=	1/100 square centimetre.

PART III

Measurement of Volume

Cubic metre	=	A volume equal to that of a cube each edge of which measures one metre
Cubic decimeter	=	1/1000 cubic metre
Cubic centimeter	=	1/1000 cubic decimeter

PART IV

Measurement of Capacity

Hectolitre	=	100 litres
Litre	=	1/1000 cubic metre
Decilitre	=	1/10 litre
Centilitre	=	1/100 litre
Millilitre	=	1/1000 litre.

PART V

Measurement of Mass or Weight

Metric ton	=	1000 kilograms
Quintal	=	100 kilograms
Kilogram	=	The kilogram as defined under the Convention of the Metre 1875
Hectogram	=	1/10 kilogram
Gram	=	1/1000 kilogram
Carat (metric)	=	1/5 gram
Milligram	=	1/1000 gram.

Appendix C – Maximum Permissible Error of Weights

Extracted from the Second Schedule of the Weights and Measures Regulations 2005. Please refer to the online copy for the latest version.

MAXIMUM PERMISSIBLE ERROR UPON TESTING OF
WEIGHING OR MEASURING INSTRUMENTS

MEASUREMENT OF LENGTH

Length Measures

Purported value	Testing and passing as fit for use for trade End measure Maximum permissible error in excess or deficiency millimeters	Testing and passing as fit for use for trade Line measure Maximum permissible error in excess or deficiency millimeters
1 centimetre	—	1
1 decimetre	—	1
1 metre	1	1
2 and 3 metres	2	2

Notes:

1. An end measure is a length measure which has the principal scale marks formed by 2 end surfaces or edges of the measure.

2. A line measure is a length measure which has the principal scale marks formed by 2 lines, holes or marks.

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MEASUREMENT OF VOLUME

Capacity measures

Purported value	Testing and passing as fit for use for trade Maximum permissible error in excess or deficiency millilitres
1 millilitre	0.03
2 millilitres	0.06
5 millilitres	0.15
10 millilitres	0.3
20 millilitres	0.6
25 millilitres	0.75
30 millilitres	0.9
50 millilitres	1.5
100 millilitres	3
200 millilitres	6
250 millilitres	7.5
500 millilitres	15
1 litre	30
2 litres	60
2.5 litres	75
5 litres	150
10 litres	300
15 litres	450
20 litres	600
25 litres	750

30 to 300 litres	...	...	...	...	...	...	At the rate of 3% per litre

Oil dispensing pumps

	Testing and passing as fit for use for trade	In-service inspection
Quantity Delivered	Maximum permissible error in excess or deficiency	Maximum permissible error in excess or deficiency
	millilitres	millilitres
250 millilitres	0.75	1.25
500 millilitres	1.5	2.5
1 litre and above	At the rate of 0.3% per litre	At the rate of 0.5% per litre

Flowmeters

	Testing and passing as fit for use for trade	In-service inspection	Repeatability
Accuracy Class	Maximum permissible error in excess or deficiency	Maximum permissible error in excess or deficiency	
0.3	0.2%	0.3%	0.12%
0.5	0.5%	0.5%	0.2%

Notes:

1. The Accuracy Classes for flowmeters are as follows:

   (*a*) Class 0.3 refers to flowmeters used in pipework and includes truck loading and terminal meters; and

   (*b*) Class 0.5 refers to flowmeters for general use for trade.

2. The percentages specified refer to the actual volume measured against the standard.

WEIGHING INSTRUMENTS

Non-automatic weighing instrument

Accuracy Class	Load (expressed in units of kilograms)	Maximum permissible error in excess or deficiency (expressed in units of grams or kilograms depending on e)	
		Testing and passing as fit for use for trade	In-service inspection
Class I	from 0 to 50,000	0.5(e)	1(e)
	over 50,000 up to 200,000	1(e)	2(e)
	over 200,000	1.5(e)	3(e)
Class II	from 0 to 5,000	0.5(e)	1(e)
	over 5,000 to 20,000	1(e)	2(e)
	over 20,000	1.5(e)	3(e)
Class III	from 0 to 500	0.5(e)	1(e)
	over 5,000 to 2,000	1 e)	2(e)
	over 2,000	1.5(e)	3(e)
Class IV	from 0 to 50	0.5(e)	1(e)
	over 50 up to 200	1(e)	2(e)
	over 200	1.5(e)	3(e)

Notes:

1. Load refers to a mass of known quantity applied to the load receptor for the purposes of testing or inspection.

2. e is the value, expressed in units of mass, of the scale interval used on the instrument.

3. The Accuracy Classes of non-automatic weighing machine are as follows:

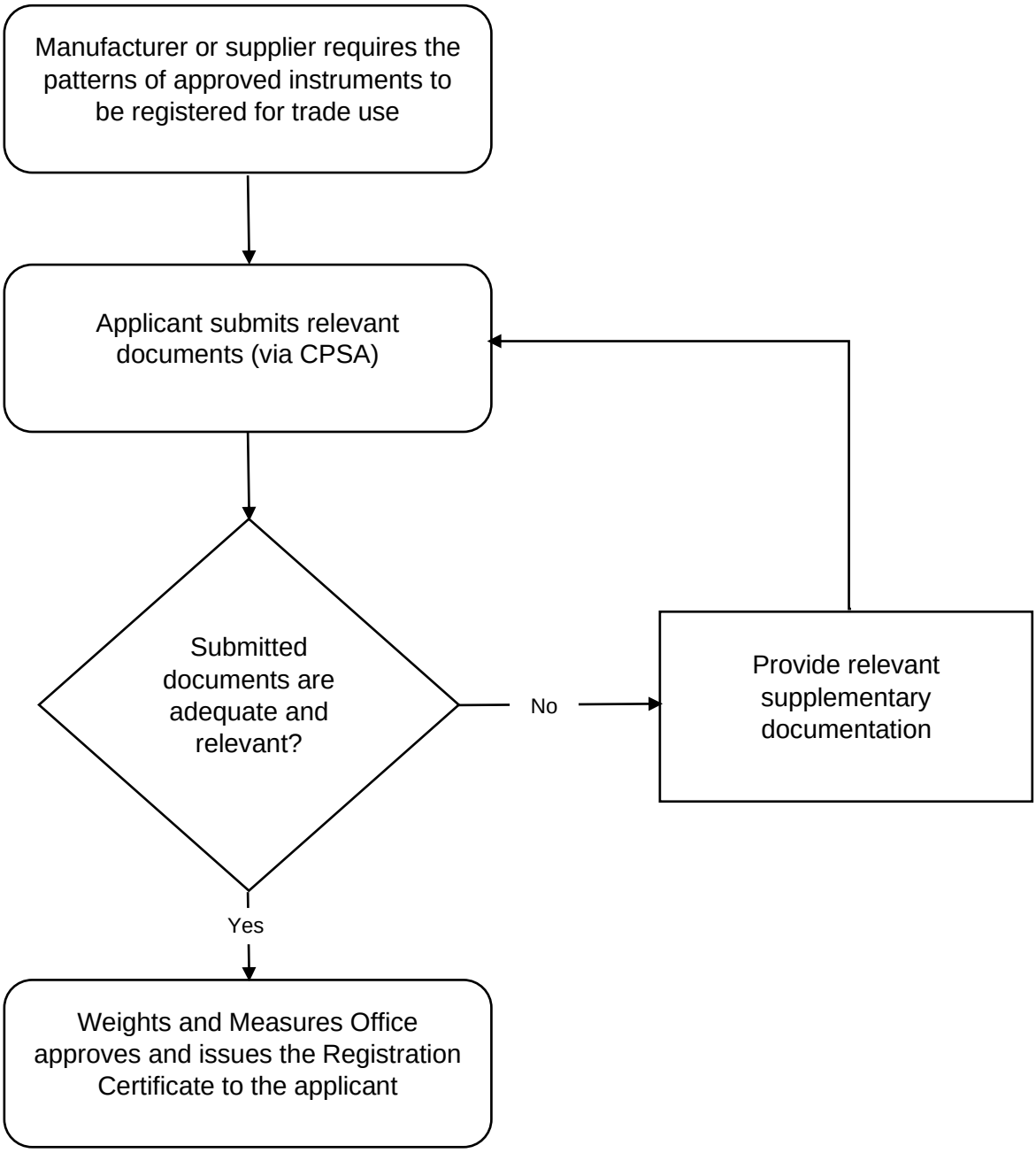
   (*a*) Class I refers to non-automatic weighing machines of special accuracy;

   (*b*) Class II refers to non-automatic weighing machines of high accuracy;

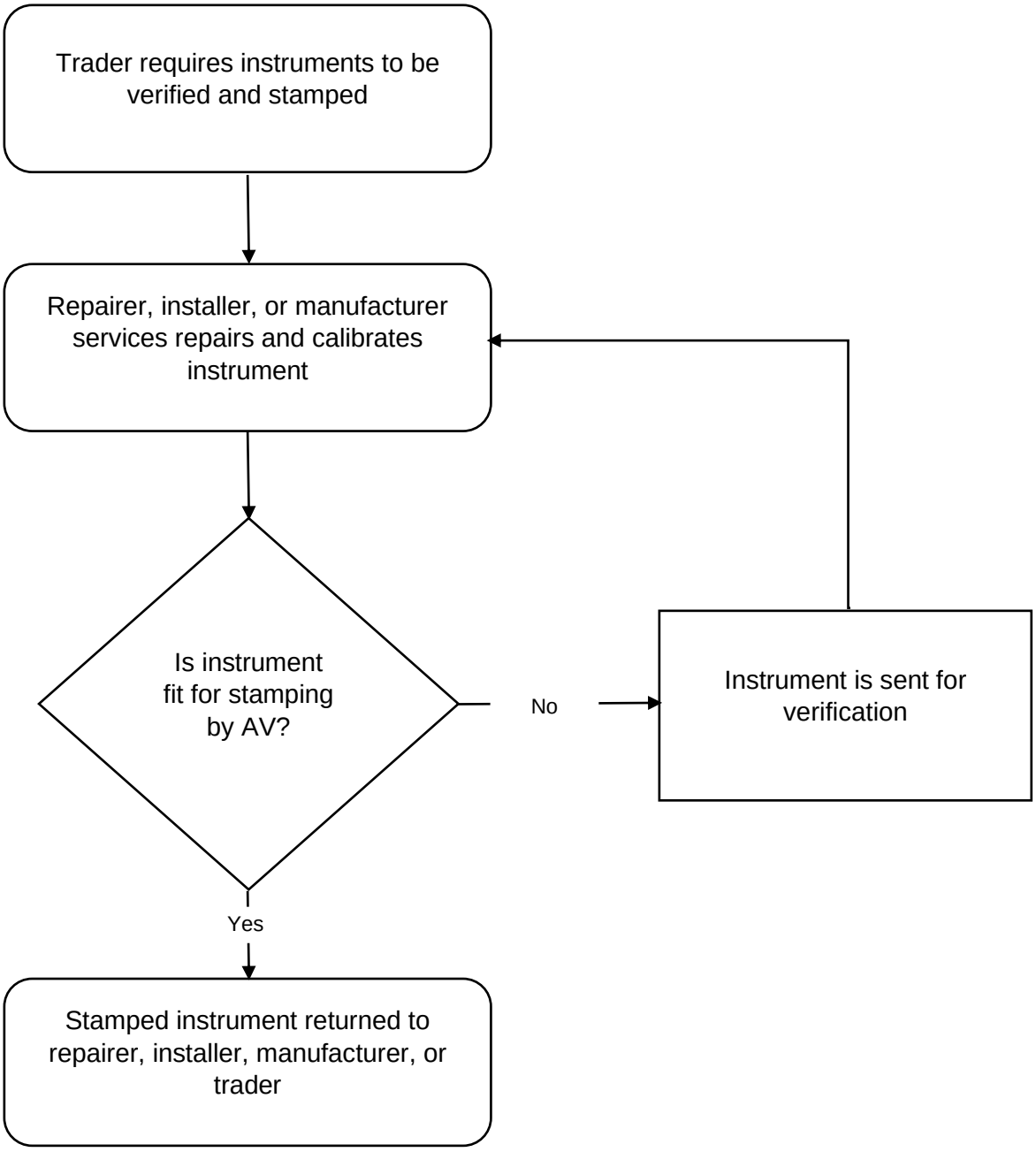
   (*c*) Class III refers to non-automatic weighing machines of medium accuracy; and

   (*d*) Class IV refers to non-automatic weighing machines of ordinary accuracy.

Appendix D – Registration Process of Approved Patterns of Weighing and Measuring Instruments



Appendix E – Verification Process of Weighing and Measuring Instruments



Appendix F – Detailed verification procedures for weighing or measuring instruments

Weighing Instruments

The AV or the user of the weighing instruments may use the following sequence of procedures based on the **OIML R76** to verify or to inspect a weighing instrument already in service.

- Allow electronic instrument to warm up for about half an hour;
- Check the documentation and note if supplementary tests are required;
- Inspect instrument and make a note of the instruments' metrological characteristics;
- Conduct a repeatability test. During the repeatability test for a mechanical instrument, check the accuracy of the zero-setting device;
- Conduct eccentric loading to check that the readings for the same load, when placed at various points of the instrument's weighing area, are within the MPE;
- Check the accuracy of zero setting;
- Determine the loads for the weighing test, then carry out the weighing test. You can combine the weighing test and discrimination test during one or more of the test loads during the weighing test;
- Conduct the tare setting test on electronic instruments;
- Conduct a price indication test during the weighing test; and
- Carry out any other test to complete the verification, or re-verification of instrument.

Verifying instruments greater than one tonne and use of standard weights:

- When verifying instruments with maximum capacities greater than one tonne, additional weights may be used together with the standard weights.
- The standard weights could be one tonne or 50% of the maximum capacity (whichever is greater). Standard weights used must be verified – annually.
- Take for example the verification of a weighbridge with a maximum capacity of 40 tonnes, first 20 tonnes can comprise of standard weights (verified annually) and the remaining 20 tonnes can be made up of other constant weights.

Measuring Instruments

Oil dispensing pumps

AVs are allowed to break the seals on oil dispensing pumps (i.e. fuel dispensers) to carry out repairs using the following procedure:

- Take three readings from each nozzle using a verified standard tank measure;
- Disconnect any metering unit(s) that are beyond the MPE;
- Padlock the pump after breaking the seal and keep the keys to prevent the operator from using the pump. A signboard/sticker is required to be displayed prominently to indicate the pump is under repair/service;
- The repairers or AVs will repair the pump. If repairers conduct the repairs, they need to arrange a verification appointment with an AV. One day before the appointment, the repairer must submit the break-seal report together with the last weights and measures stamping plates to the AV;
- Indicate the operator's name, location, pump number, pump product grade, weights and measures verification number and the pump volume totaliser reading (at the time of seal breakage) in the break-seal report; and

Flowmeter Proving

All flowmeters should be verified or proved annually. This can be:

- Verified on site, with reference to a:
    - Prover loop or proving tank certified by an authorised meter proving company or AV, or
    - Master meter which for this purpose, is defined as a meter proved against a certified prover loop or proving tank using the same fluid (or one of similar viscosity and density).
- Proved in a calibration laboratory:
    - The verification of the flowmeter may be conducted either by gravimetric / volumetric method, or with a master meter, or other suitable methods, provided that the following requirements are met:
        - The uncertainty (at a 95% confidence level) in determining the error of the flow meter under test should not exceed one-third of the maximum permissible error to be applied;
        - The flow rate is not above the maximum or below the minimum level of operation;

- Conducted within the normal operating range of pressure and temperature.

Subsequent meter proving period may be extended depending on actual operating constraints, and/or capabilities of local proving set-ups. Zero verification should be performed regularly till the next verification or proving.

For details on the requirements on accuracy, repeatability, and proving standards, refer to Appendix G.

Appendix G – Accuracy, Repeatability, and Proving Standards for Flowmeter Proving

Accuracy

- For class 0.3 meters (such as meter systems in pipework and truck loading and terminal meters), the prescribed MPE is ± 0.2% of the measured quantity for initial verification and ± 0.3% of the measured quantity for in-service inspection.
- For class 0.5 meters (such as meters used generally for trade), the prescribed MPE for initial verification and in-service inspection is ± 0.5% of the measured quantity.
- Two or three points of test flow rates should be chosen within a specified flow range including a point of normal flow rate.
- At least three test runs for each test flow rate should be conducted.

Repeatability

- For class 0.3 meters, three consecutive results must lie within a band of ± 0.12% of the measured quantity. Individual results must be within the MPEs stated above.
- For class 0.5 meters, three consecutive results must lie within a band of ± 0.2% of the measured quantity. Individual results must be within the MPEs stated above.

Proving Standards

- All methods, procedures concerning calibration, facilities on *volumetric proving* should be in line with the international code of practice or any standards which are acceptable by the WMO.
- All methods, procedures concerning calibration, facilities on *gravimetric proving* should be aligned with OIML or any standards which are accepted by the WMO.
- Measuring instruments used for testing equipment for a custody transfer should be periodically calibrated by comparing with the following standards which are traceable to the international standards (Refer to Tables 1 and 2 below).

Table 1: Volumetric Standards

Type of volumetric standards	**Validity of calibration**
Proving tank (permanently in a fixed location)	Five years
Proving tank (portable, movable or mobile)	One year
Pipe prover or compact prover	One year
Master meter	One year

Table 2: Gravimetric Standards

Type of gravimetric standards	**Validity of calibration**
Mass standard (class E2)	Three years
Weighing balance	One year

Based on the reports issued, AVs will check and authorise the proving reports, issue verification certificates and affix seals or stamps and approve the meters as fit for trade use.

Appendix H – Summary of Updates

No.	Chapter	Changelog (only main changes will be highlighted)
1	N/A	Updated the office implementing the Weights and Measures Act and Regulations as the Weights and Measures Office. Editorial changes to overall content including updating the website name from www.enterprisesg.gov.sg to www.weightsandmeasures.gov.sg
2	Appendix F and G	Previous Chapter 4 “Verification of Weighing and Measuring Instruments” moved to Appendix F and G.