GOVERNMENT OF ZAMBIA

STATUTORY INSTRUMENT NO. 55 OF 2021

The Metrology Act, 2017
Act No. 6 of 2017)

The Metrology (Measuring Instruments) Regulations, 2021

ARRANGEMENT OF REGULATIONS

Copies of this Statutory Instrument can be obtained from the Government Printer, P.O. Box 30136, 10101 Lusaka. Price K76.00 each.

16. Knife edge
17. Automatic measuring instrument for mass
18. Test Load
19. Beam scale
20. Counter machines
21. Crane scale
22. Platform machine and weigh bridge
23. Selfindicating measuring instrument for mass
24. Spring balance
25. Accuracy class

PART IV

MEASURE OF VOLUME AND LENGTH

26. Volumetric measures
27. Transportable measuring tank
28. Construction and installation of bulk flow meter
29. Calibration device
30. Quantity indication
31. Quantity marking on dispensing pump
32. Graduation on bulk flow meter
33. Numbering on bulk flow meter
34. Prerequisite to testing bulk flow meter
35. Maximum permissible error for bulk flow meter
36. Securing bulk flow from unauthorised adjustment
37. Liquid measuring device
38. Automatic measuring instrument for volume
39. Liquid dispensing pump
40. Zero setting dispensing pump and mechanism
41. Calibration device or dispensing pump
42. Price indication for dispensing pump
43. Graduation for dispensing pump
44. Numbering on dispensing pump
45. Discharge indicator for dispensing pump
46. Sight glass of measuring for volume
47. Swing arm and drainage of hose
48. Length of hose of dispensing pump

PART 1

PRELIMINARY

IN EXERCISE of the powers contained in Section 59 of the Metrology Act, the following Regulations are made:

Title

1. These Regulations may be cited as the Metrology (Measuring Instruments), Regulations 2021.

Interpretation

2. In these Regulations, unless the context otherwise requires—

"accuracy" means the behaviour or technical quality of a measuring instrument showing its ability to indicate with sufficient exactness, the true magnitude to be measured;

"adjusting" means to set or compensate a measuring instrument or the embodiment of a measure in a way that minimises the indicated value deviation from the actual value or that the deviation remains within the tolerance limits;

"automatic zero setting" means an automatic zero setting device which enables the device to correct zero point or soiling of load receivers without manual intervention;

"beam scale" means an equal armed measuring instrument for mass, whose pan is below the

beam;

bulk flow meter" means a measuring instrument designed to measure volume of liquids at a minimum flow rate of delivery equal to or more than one hundred litres per minute;

Acalibration@ means an operation required for the purpose of determining—

(a) the value of the error of a weight or measure;

(b) other metrological property of that weight or measure including the actual weight or measure; or

(c) in the case of certain principal mathematics, the corresponding volume of the quantity to be measured or the use of a weight or measure as a standard;

"calibration device" means a device that can be used to calibrate a measuring instrument;

"compartment" in relation to a transportable measuring tank, means a subdivided portion of that tank;

"counter poise" means a weight piece used in ratio counting or weighing operation;

"crane machine" means—

(a) a suspended equal armed compound lever measuring instrument for mass fitted with a load hook suspended from a knife edgeand provided with poise moving over graduated scales to indicate weight; or

(b) a suspended selfindicating hydraulic or spring actuated measuring instrument for mass;

"discrimination" means the ability of a measuring instrument for mass to react to small variations of load specified in these Regulations;

"dead weight machine" means an equal armed measuring instrument for mass of a capacity exceeding fifty kilogrammes whose pan or platform is above the beam;

'difference chart" in relation to a measuring instrument for mass, means a chart on which, by means of a pointer or other indicator, an excess or deficiency of a pre-determined weight is indicated;

"error" in relation to an instrument, means the extent to which an instrument indicates an excess or deficiency of a standard weight or measure;

"fabric measuring instrument" means a measuring instrument designed and constructed to measure and indicate the length of fabric or other material passing through that fabric measuring instrument;

"liquid measuring device" means a measuring instrument for volume provided with a measuring chamber designed for filling barrel, bottle, drum or other container with predetermined quantity of

liquid for dispensing liquid in small quantities from bulk;

liquid dispensing pump" means a measuring instrument for volume designed to measure liquids at the flow rate of delivery of less than one hundred litres per minute;

'measuring instrument" has the meaning assigned to the word in the Act;

"OIML" has the meaning assigned to the abbreviation in the Act;

"platform machine" means a measuring instrument for mass, other than a weighbridge, used to determine the mass of a load supported on a platform not exceeding five thousand kilogrammes load capacity;

"self-indicating measuring instrument" means a measuring instrument for mass, other than a spring balance, on which the whole or part of the weight of the goods weighed is indicated by means of a pointer moving over a chart or by means of a chart moving in relation to a fixed pointer;

"sensitivity" in relation to a measuring instrument for mass, means the actual weight which causes the beam or steelyard to turn;

"spring balance" means a mechanical measuring instrument for mass in which the weight is determined by the extension or compression of the spring, which is indicated by a pointer on a dial or by a moving graduated scale;

"steelyard" means

(a) a suspended unequal armed single lever measuring instrument for mass, whose shorter arm of which carries a load hook suspended from a knife edge with the longer arm is provided with a poise moving over a graduated scale to indicate weight; or

(b) a steelyard provided on a platform machine or weighbridge or other similar measuring instrument for mass as the context requires.

"transportable measuring tank" means a container suitable for use as a volume measuring device for liquids fixed on a truck or on a rail car or detachably connected to it which may be subdivided into several measuring compartments;

"verification mark" means a sticker, stamp or seal placed on a measuring instrument to show proof that the instrument is verified;

"wall beam means an unequalarmed multilever measuring instrument for mass designed to be affixed to a wall, having a load hook suspended from a knife edges on the lower lever, and provided with poise moving over graduated scales to indicate weight; and

"weighbridge" means a measuring instrument for weighinga load carried by a vehicle where the load and vehicle are supported on rails or platform either of which is linked to a system of levers or loadcells.

PART II

Requirements for Measuring Instruments

Verification mark

3. (1) A verification mark of a design approved by the Agency shall be placed on a measuring instrument.

(2) Where a verification mark approved under these Regulations, is removed from a verified measuring instrument**,** the measuring instrument shall be considered to be unverified.

(3) A person, other than a metrologist who removes a verification mark, from a measuring instrument without permission from the Agency commits an offence and shall on conviction be liable to a fine not exceeding fifteen thousand penalty units.

(4) The Metrologist may, where a person admits the commission of an offence under subregulation (3) summarily demand from a person payment of a fine not exceeding fifteen thousand penalty units.

Rejection mark

4. A rejection mark of a design approved by the Agency shall be placed on a measuring instrument that does not comply with these Regulations.

Capacity marking

5. (1) The capacity of a measuring instrument shall be conspicuously stamped on a beam, steelyard or on a metal plate permanently secured on a prominent part of the measuring instrument.

(2) The capacity of a fabric measuring instrument shall be clearly and conspicuously stamped on the measuring instrument.

(3) The denomination of a weight shall, except where the small size of it renders it impracticable, be clearly and conspicuously stamped on the upper surface of the weight.

(4) The capacity of a measure shall, unless otherwise prescribed, be clearly and conspicuously stamped on the outside of the measure or on a metal plate permanently secured.

(5) Where a measuring instrument is marked with that measuring instrument's capacity or denomination, the denomination of the measuring instrument shall be stated in full, or in an abbreviated manner set out in the Second Schedule.

Graduations balance

6. (1) A graduation on a measuring instrument shall be—

(a) indelible, clear, distinct and legible;

(b) except in respect of a graduated glass measure, uniformly spaced; and

(c) in the case of a denominated main graduation, distinguished by longer lines than the intermediate graduations.

(2) A graduation on a steelyard shall—

(a) consist of well defined notches, incised or embossed lines clearly indicating the position of the poise; or

(b) be cut, incised, or embossed in one plane, at the right angle to the steelyard and parallel to each other.

(3) A selfindicating measuring instrument for mass for shall have scale intervals not greater than the limit of error on initial verification as set out in the First Schedule.

PART III

Measuring Instrument for Mass

Compulsory metrological mark

7. (1) A measuring instrument for mass shall bear the following inscription marks:

(a) the manufacturer's mark, or name written in full; and

(b) metrological markings which shall include—

(i) indication of accuracy class in the form of a roman number in an oval;

(ii) maximum and minimum capacity;

(iii) verification scale interval "e" or "d";

(iv) type approval mark;

(v) serial number;

(vi) rated operating conditions; and

(vii) make and model.

(2) A descriptive marking shall be indelible and of a size, shape and clarity which allows easy reading.

(3) A measuring instrument for mass shall bear a provision for a seal or stamp.

(4) Where a seal is provided electronically by use of a password, that password shall be kept by the Agency.

Type approval evaluation

8. (1) In conducting type approval evaluation, the Agency shall assess compliance of measuring instrument for mass by evaluating —

(a) the metrological characteristics of the measuring instrument for mass;

(b) descriptive documents of the instrument set out in the First Schedule; and

(c) a test carried out on the measuring instrument for mass under Regulation 9(1).

(3) The Executive Director shall cause to be kept any confidential document received by the Agency for purposes of type approval of a measuring instrument for mass under subregulation (1).

(4) A suitability check shall be performed by the Agency to establish that the function of a measuring instrument for mass is performed correctly in accordance with the documents submitted.

Initial and subsequent verification of measuring instrument for mass

9. (1) A metrologist shall, at the initial verification of a measuring instrument for mass, perform the following procedures and tests, where applicable:

(a) measuring instrument for mass type approval status;

(b) visual inspection for metrological characteristics on all design components;

(c) errors of indication test;

(d) accuracy of zerosetting and tare devices test;

(e) repeatability test;

(f) eccentric loading test;

(g) discrimination test;

(h) tilt tests in case of mobile measuring instrument for mass; or

(i) sensitivity of nonselfindicating measuring instrument for mass.

(2) A measuring instrument for mass shall be subjected to a subsequent verification every after twelve months.

(3) A metrologist shall, during the subsequent verification of a measuring instrument for mass, perform procedures and tests as those carried out during the initial verification.

Permissible error limits for non-automatic measuring instrument for mass

10. The permissible errors for a measuring instrument for mass at an initial and subsequent verification carried out under regulation 9 are set out in the First Schedule.

In-service inspection

11. (1) A metrologist shall, during an in-service inspection, test a measuring instrument for mass and carry out any procedure and test conducted at an initial verification.

(2) Subject to subregulation, the maximum permissible error limit shall be twice that on initial verification.

Specification of steelyard and wallbeam

12. (1) A steel yard or wall beam shall—

(a) be made of wrought iron, steel or an approved metal beam and straight;

(b) provide for a stop to prevent excessive oscillation of the steelyard;

(c) have a load hook securely attached to a measuring instrument for mass;

(d) provide for end fittings securely attached to prevent the poise carrier riding off the steelyard;

(e) provide for a slow movement to avoid poise risk of injury to the notch; and

(f) provide for a stop to prevent the steel yard or wall beam from travelling behind the zero graduation.

(2) A wall beam shall provide for a—

(a) frame and bracket of adequate strength to support, without deflection, both the wall beam and the load equal to the capacity of the wall beam; and

(b) a range of balance not exceeding 0.5 percent of the capacity of the wall beam.

(3) The travel of the steelyard of a wall beam each way from the horizontal shall be not less than 10mm.

Test of steelyard and wall beam

13. A metrologist shall test a steelyard or wall beam at as many graduations as the metrologist considers necessary, and the measuring instrument for mass shall be correct whether the test is forward or backward.

Permissible error of steelyard and wall beam

14. The maximum permissible error required for a steelyard and wall beam shall not exceed a load or, the limit of error specified in the First Schedule.

Counterpoise weight

15. (1) A counterpoise weight shall—

(a) be marked in equivalent of 5kg, 10kg, 20kg, 25kg, 50kg, 100kg or 200kg;

(b) be made of corrosion resistant material;

(c) have one undercut adjusting hole containing fixed lead sufficient to cover adequately the hole, and with room to permit future adjustments;

(d) be made of brass if the counterpoise's actual weight is 100 grammes or less; or

(e) have a sealing provision.

(2) A counterpoise balance shall be used on a measuring instrument for mass bearing the same identification mark.

Knife edge

16. (1) A knife edge shall be firmly secured in position, properly aligned and bear the load throughout the entire length of the parts designed to be in contact.

(2) A knife edge and bearing shall be made of hardened steel, a gate or an approved material and the load carrying part shall not show scratches when tested by means of the application of a superfine smooth file.

Automatic measuring instrument for mass

17. (1) An automatic measuring instrument for mass shall be —

(a) securely fixed in position in which the automatic measuring instrument for mass shall operate;

(b) tested on site with the produce the automatic measuring instrument for mass is intended to weigh;

(c) fitted with seals to protect adjusting devices;

(d) marked with clear marks of identification on parts that require to be dismantled, for any purpose whatsoever but which marks give a clear indication of the parts which match on reassembly;

(e) provided with suitable means of extracting from any hopper or conveyor a load or sample delivery that the Agency may require for the tests; and

(f) marked with a stamp of verification on a lead plug in a conspicuous place on the beam, main body or frame of the instrument.

(2) A metrologist shall test an automatic measuring instrument for mass as many times as the metrologist considers necessary by using sample deliveries either at random or in sequence.

(3) A limit of error allowed on an automatic measuring instrument for mass shall be one scale interval at a load below 2000 scale intervals and for load exceeding 2000 scale intervals, the limit of error at initial verification shall be increased to two scale intervals.

Test load

18. (1) Subject to regulation 17, a test shall be carried out for all measuring instrument for mass at the following loads:

(a) zero load;

(b) maximum load, including if possible maximum additive tare loads;

(c) half load; or

(d) loads at which the method of balancing is modified by addition or subtraction of a unit weight.

(2) A selfindicating measuring instrument for mass shall, in addition to the tests under subregulation (1) be tested at—

(a) the capacity of selfindication if different from maximum load;

(b) the load at which the limit of error defined in paragraph (a) changes; or

(c) as many loads as the metrologist considers necessary in view of a particular construction.

Beam scale

19. (1) A beam scale shall be classified as follows:

(a) accuracy class I comprising precision balances provided with means of relieving all the knife edges and bearings and shall include single pan optical projection balances and balances with weight loading devices;

(b) accuracy class II comprising cream test beams and beam scales other than class I beam scales used for testing chemicals, drugs, fine seeds or precious metals or stones; or

(c) accuracy class III comprising beam scales other than class I or class II beam scales.

(2) A device for adjusting the balance of a beam scale shall be permanently secured and so attached that it shall not readily be tampered with.

(3) Where a beam scale is provided with a pointer moving across a graduated indicating plate or difference chart, the pointer shall travel beyond the extreme graduation on each side of the point of equilibrium or zero graduation except that if the chart is graduated on the heavy side, the pointer shall travel beyond the extreme graduation on that side and for a corresponding distance on the ungraduated side.

(4) A stamp of verification on a beam scale shall be stamped on a lead plug inserted in the beam immediately under or over the fulcrum knife edge or as near as is practicably possible or, where the beam is totally enclosed in the housing, on a lead plug securely fitted in a cup riveted to that housing.

Counter machines

20. (1) A counter machine's—

(a) support of the pan shall be of rigid structure; and

(b) centre fork shall be so secured to avoid twisting or getting out of place.

(2) A counter machine constructed on the Beranger principle shall—

(a) in the case of a closed Beranger, have —

(i) its working parts totally enclosed in a housing; and

(ii) parts which, where interchangeable, do not affect the balance when interchanged;

(b) in the case of an open Beranger have

(i) a capacity not exceeding 15kg;

(ii) a number stamped on any loose pan and on the frame or beam, which number shall commence with the final two digits of the year in which it was manufactured;

(iii) a weights pan of integral construction or securely fixed to the Beranger's cross by means of two or more rivets;

(iv) the support for the goodspan of welded or riveted construction and without holes in its upper surface;

(v) a frame of cast iron or mild steel, which stands level on a level plate without

rocking;

(vi) steel frame, not less than three spreaders between the two sides for a steel frame;

(vii) if the Beranger is provided with anchor links, links that are irremovable without the use of a mechanical appliance, and hardened taper pins as guard pins or securing the links where it is provided with another link; and

(viii) pans of a shape that no tipping of the pan occurs when weights equal to half the capacity of the machine are placed in any position on the other pan.

(3) Material used for purposes of balancing a counter machine shall be contained in a balance box which is—

(a) securely fixed to the under surface of a fixed weights pan or of the support for the weightspan; and

(b) capable of containing lead to a weight not exceeding one percent of the capacity of the machine.

(4) The travel of a beam of a counter machine, on each side from a horizontal position shall be, where the capacity of the machine is—

(a) not over more than 2kg and not less than 6mm;

(b) more than 2kg, but not exceeding 5kg, and less than 7mm;

(c) over 5kg and not over 10kg, not less than 8mm;

(d) over 10kg and not over 20kg, not less than 10mm; and

(e) over 20kg, not less than 12mm.

Crane scale

21. (1) The range of balance of a crane machine shall not exceed two percent of the capacity of the machine.

Platform machine and weighbridge

22. (1) A platform machine or weighbridge shall have—

(a) an upper surface or edge of the steelyard with a straight plane from the zero graduation to the nose-end;

(b) non-removable parts other than the counter balance to support the counterpoise weight;

(c) adequate stops to prevent any poise from travelling behind the zero graduation; and

(d) a load carrying rail whose distance from any other rail shall be not less than 10 mm, except that where the load carrying rails overlap or have an abridging piece, a gap of 5 mm shall be maintained between the overlapping parts.

(2) A weighbridge shall have—

(a) provision for adequate drainage and the pit kept free from any accumulation of water, mud or debris;

(b) its approaches smooth, straight and level for a distance of not less than the length of the platform at each end of the weighbridge;

(c) a building housing the chart or steelyard constructed to provide an operator a clear and unobstructed view of the entire platform;

(d) a protected platform that allow vehicles to pass on and off the platform at both ends;

(e) a foundation with strength to support, without change of position, both the mechanism and a load equal to the capacity of the weighbridge; and

(g) a provision for a readout indicator of measurement results output which are clearly visible to both the operator and the driver of the truck being weighed or trading parties.

(3) Where a platform machine or weighbridge is not provided with a tare beam the weight of any loose receptacle frame used in conjunction with the instrument shall be accurately compensated for by means of a counterpoise weight distinctive in shape from any ordinary counter poise weight belonging to the instrument and that compensating weight shall have the words "TARE WEIGHT" clearly and conspicuously stamped on its edge.

(4) The range of balance—

(a) in a platform machine, shall not exceed 0.5 percent of the capacity of the machine and shall be not less than oneeighth percent of that capacity each way from the centre of travel of the ball; or

(b) in a weighbridge shall be double the range permitted in a platform machine.

(5) The travel of a steelyard each way from the horizontal position shall be not less than 10mm for both the

platform machine and weighbridge.

(6) A platform machine and a weighbridge shall be tested for accuracy in accordance with regulation 9 and perform additional tests as required for electronic scales.

Self-indicating measuring instrument for mass

23. (1) The Agency shall ensure that self-indicating measuring instrument for mass meets the following specifications—

(a) in the case of a measuring instrument for mass whose weight indication is dependent on an extension of a spring, the spring of the self indicating measuring instrument for mass shall be isoelastic spring or a temperature compensating device incorporated;

(b) in the case of a measuring instrument for mass, other than a dormant platform machine, weighbridge, weighing instrument or selfindicating weighing instrument specifically designed for use in an out of level position, a circular spirit level or cross spirit level shall be provided;

(c) in the case of an error due to parallax, the error shall not exceed the value of the smallest subdivision; and

(d) the indicating wire or the extremity of the indicating pointer shall not exceed in width or thickness the width of any graduation, and the extremity of the pointer shall meet but not obscure the graduations.

(2) The graduations on the chart shall —

(a) in the case of a platform or weighbridge

(i) not exceed 0.8mm in width in a platform machine or weighbridge respectively; and

(ii) be not less than 3mm apart measured the centre to centre, whether or not the graduations are on opposite sides of a dividing line;

(b) in the case of a selfindicating measuring instrument for mass other than a platform machine or weighbridge—

(i) not exceed 0.4mm in width; and

(ii) be not less than 1.5mm apart,when measured from centre to centre, whether or not graduations are on opposite sides of the dividing line, except that a lens or other approved device may be fitted to the instrument for the purpose of magnifying the graduations for purposes of conformity with the provisions of this subregulation.

(3) Where a selfindicating ticket printing instrument is designed to print tickets or provided with digital read out, any indication at zero shall show either a true zero, or if the balance is incorrectly set, then a false balance shall be indicated or printed.

(4) A selfindicating ticket printing instrument shall have an efficient stop fraud device to prevent the printing operation being performed before the indicator has come to rest or to prevent the printing of a ticket showing a weight that does not correspond with the weight indicated.

Spring balance

24. (1) In a spring balance—

(a) the chart shall be made of white enamel, polished brass, or an approved material so protected that the graduation and other markings are clearly visible;

(b) the graduation on the chart shall not—

(i) exceed 0.8mm in width; and

(ii) be less than 3mm apart, measured from the centre to centre, whether or not the graduations are on opposite sides of a dividing line;

(c) where a temperature compensating device or isoelastic spring is incorporated, it shall be capable of compensating temperature variations of 10 degrees celsius in balance and at load;

(d) any ballbearing unit shall be protected against dust and dirt;

(e) the extremity of the indicating pointer shall not—

(i) exceed in width or thickness the width of any graduation; and

(ii) be more than 2mm from the chart;

(f) a suitable balancing device capable of adjustment only by use of a mechanical appliance shall be provided; and

(g) it be back balanced with a bag, sack, pan or other means of loading, which fact shall be clearly stated on the chart.

(2) The range of balance of a spring balance shall not exceed one percent of the capacity of that spring balance.

(3) The maximum permissible error shall be as set out in the First Schedule.

Accuracy class

25. The accuracy class for a measuring instrument for mass shall be as set out in the First Schedule.

PART IV

Measure of Volume And Length

Volumetric measures

26. (1) A measure of volume of a liquid for a commercial transaction, law enforcement, health, safety and environmental management shall—

(a) be of a denomination specified in First Schedule and have that denomination indelibly marked on the outside of the measure in figures or letters;

(b) be provided with subdivisions having intervals corresponding to figures one , two, or five divided or multiplied by ten as appropriate;

(c) be made of glass, aluminium, brass, bronze, copper, nickel, sheet iron, silver and steel including stainless steel tin plate, white metal or any approved material, except that for protection it may be anodised, electroplated, enamelled, galvanised, tinned or otherwise protected by an approved process;

(d) if made of brass, bronze or copper unless otherwise coated, have the inside surface well tinned with pure tine;

(e) if coated, have no sign of peeling;

(f) be made of hard and sufficiently thick material;

(g) not visibly deform during filling;

(h) not be seriously damaged or deformed;

(i) have no false bottom;

(j) if made of metal, not have a bottom rim deeper than necessary to protect the bottom of the measure;

(k) have no lip or retaining edge which increases its capacity by more than ten percent;

(l) if it has no tap, drain completely when tilted to an angle of thirty below the horizontal;

(m) if provided with a tap shall drain completely without prolonged dribble when the tap is open and the measure is levelled;

(n) have its capacity marked on the upper part of its body or on a metal place permanently secured to that upper part;

(o) if it is made of glass, and has the capacity defined by a line, have the capacity indelibly marked near that line;

(p) have the capacity clearly defined in accordance with subregulation (2);

(q) if it is a graduated glass measure, conform to subregulation (3); and

(r) have no greater error in excess or deficiency than the limit of error for its denomination or for the graduation concerned as set out in the First Schedule.

(2) The capacity of the measurement of volume other than a graduated glass measure shall clearly be defined as follows:

(a) with lip or retaining edge by the bottom of lip or retaining edge;

(b) glass measure not graduated by brim of measure or indelible line;

(c) any other type not graduated by the brim of measure.

(3) A graduated glass measure shall—

(a) be conical or cylindrical;

(b) have a level base at right angles to the axis of the measure; and

(c) have scale marks which are—

(i) parallel to the base of the measure;

(ii) not less than 1.5 mm apart; and

(iii) in the case of back scale marks on the same horizontal plane as the front scale marks when the base of the measure is horizontal.

(4) A measure made of glass or having a denomination below 50ml shall not be subject to regulations if that measure is used in a laboratory and conforms in shape, marking of denomination and limits of error to international standards, be subject to verification or stamping.

Transportable measuring tank

27. (1) A transportable measuring tank or compartment shall

(a) be of cylindrical or elliptical section;

(b) be fitted with a fixed quantity indicator or provided with a dip stick by means of which the liquid can be measured; and

(c) if an elliptical section, have the length of the major axis or not more than one and half times the length of the minor axis of the section.

(2) In a transportable measuring tank of compartment provided with bulkflow meter—

(a) the bulkflow meter shall be —

(i) of an approved type;

(ii) incorporate an air separator for nonregistration of air currents;

(iii) tested for accuracy by comparison with a master meter or any approved reference standard measure; and

(iv) sealed to prevent adjustable devices being tampered with;

(b) the ullage indicator shall —

(i) be made of rigid metal and not easy to bend;

(ii) be fixed rigidly so as to indicate on the longitudinal axis and under the dome centrally situated on the top of such tank or compartment;

(iii) clearly and distinctly indicate, by means of a disc of at least 50 mm in diameter, the height to which the tank or compartment must be filled in order to contain its marked capacity;

(iv) be adjustable and so constructed that it can be sealed so as to prevent any change in its position without the seal being broken; and

(v) not exceed a length of 70cm when measured from the rim of the tanker compartment to the disc.

(3) In the transportable measuring tank or compartment provided with a dipstick or Tshape measure —

(a) the tank or compartment shall have a guidetube for the dipstick or Tshape measure, fixed centrally so that the dip stick or Tshape measure indicates on the longitudinal axis;

(b) each dipstick or Tshape measure shall be—

(i) made of metal;

(ii) graduated to indicate the actual contents of the measure in centimetres and an appropriate table of capacity shall be carried on the vehicle and identified with the transportable measuring tank concerned;

(iii) indelibly stamped with a number which corresponds to a number similarly stamped on the tank or compartment so as to identify it with that tank or compartment; and

(iv) suspended from the upper rim of the guide tube by a metal cross bar or hilt.

(4) The volume of a transportable measuring tank or compartment shall exceed the marked capacity of the tank by not more than zero point one percent.

(5) A transportable measuring tank or compartment shall be tested—

(a) with the tank or compartment in level position;

(b) against standard measures or with a bulkflowmeter verified immediately prior to the testing of the transportable measuring tank or compartment; and

(c) if it is provided with an emergency valve for closing the delivery outlet, with the emergency valve open.

(6) The limit of error allowed on a transportable measuring tank compartment or dip stick is zero point one percent of capacity at the indication tested in excess or zero point zero five percent deficiency, provided that the fuel level above the quantity indicator or disc when the same is sealed shall not exceed two centimetres.

(7) The seal of verification shall be stamped—

(a) if the transportable measuring tank or compartment is fitted with a fixed quantity indicator, on a lead seal attached to the indicator; or

(b) if the transportable measuring tank or compartment is provided with a dipstick on the metal at the top and bottom of the dip stick.

(8) A transportable measuring tank or compartment shall be permitted for commercial transactions, law enforcement, health, safety and environmental management in fuel except that transportable measuring tank or compartment —

(a) is approved, verified and stamped by the verifying authority within errors not exceeding zero point one percent of the entire content of tank compartments;

(b) is used for one individual delivery of the entire content of one or more compartments; and

(c) is so positioned during delivery as to assume complete emptying of the compartments;

(9) Except where permitted in accordance with subregulation (2), no person shall sell or in a commercial transaction deliver fuel in bulk from a transportable measuring tank, except through a bulk flow meter, dipstick or ullage mark.

Act No. 12 of 2019

(10) A transportable measuring tank registered under the Energy Regulation Act, 2019 or any other written law whether used for local or foreign transportation shall be subject to these Regulations.

Construction and installation of bulk flow meters

28. (1) A bulk flow meter shall be constructed of aluminium alloys, bronze, brass, stainless steel or any suitable alloy capable to maintain the metrological performance and safety.

(2) A bulk flow meter shall have a device which removes from the liquid being measured particles which are injurious to the bulk flow meter and which may impair its accuracy and prevent air from passing through the meter to such an extent as to affect the accuracy of delivery.

(3) A bulk flow meter shall have a zero reset mechanism -

(a) where a flow control valve is fitted, installed at the outlet of the bulk flow meter, or where installed on the inlet side of the bulk flow meter, located at a sufficient distance on the upstream side to ensure a uniform steady flow through the bulk flow meter;

(b) a installed in a manner that the register is clearly readable by the operator from the control point and bulk flow meter shall not be installed on the suction side of the pump; and

(c) a installed in a manner that ensures safety of operation.

Calibration device

29. (1) A bulk flow meter shall be provided with a calibration device designed in a manner that permits adjustment of the ratio between indicated quantity and the

actual quantity of liquid passing through the bulk flow meter.

(2) Where a calibration device modifies the ratio in a digital manner, the consecutive value of the relationship shall not differ by more than 0.002 interval divisions.

Quantity indication

30. (1) A bulk flow meter shall be provided with an individual quantity indicator graduated in a manner that indicates possible deliveries and any other counting or totalising device that may be provided shall be arranged in order to avoid any possibility of confusion with the individual quantity indicator.

(2) Where a bulk flow meter is provided with more than one individual quantity indicator, the indicators shall give the same or equivalent quantity readings.

(3) A quantity indicator, shall be arranged in a manner in which the indication is only advanced by the flow of liquid through the measuring instrument and registration shall not take place when the supply of the liquid fails.

(4) Any electronic individual indicator shall be constructed in a manner that the indications of the quantity delivered up to the time of power failure, can be recalled on at least one display panel where the quantity indicator has more than one for a total time of at least five minutes over a period of at least thirty minutes after the power failure.

Quantity marking on dispensing pump

31. (1) An indication of volume on a dispensing pump shall be marked either in full or by means of one or other of the permissible abbreviation set out in the Second Schedule.

(2) The indication may be shown by figures only where the unit of measurement is boldly marked on the display panel of the instrument and the unit of measurement is in immediate association with figures from which confusion cannot arise from it.

(3) Where a bulk flow meter which is designed to deliver pre-determined quantities by using presetting devices, the position for the proper setting of each setting device shall be positively and accurately defined and marked and adequate provision against inadvertent displacement from this position shall be made.

(4) A delivery for which the quantity indicator is set shall be clearly and conspicuously indicated and shall automatically stop when the preset volume is delivered.

Graduation on bulk flow meter

32. (1) An indicating device on a bulk flow meter shall be graduated and numbered in numerical sequence in one direction.

(2) The graduations shall be straight and of uniform thickness and the thickness shall not exceed onefourth of the smallest scale division.

(3) The actual or optically magnified width of the smallest scale division shall not be less than 2 mm.

(4) The value of the scale division shall be equal to one, two or five litres or decimal multiple thereof.

Numbering on bulk flow meter

33. (1) A figure associated with a graduation line on an indicating device shall be uniformly placed in reference to that line and shall be as close to the line as practicable but not so close as to interfere with the accuracy of the reading.

(2) Where a measuring instrument is fitted with an analogue indicator, the actual or optically magnified height of the figures shall not be less than 4 mm.

(3) Where a measuring instrument is fitted with digital indicator, the figure shall not be less than 18 mm in height.

(4) A bulk flow meter used for preset deliveries and the height of the figures shall not be less than 9 mm.

(5) Where an indicator has an analogue scale only part of which is visible through an aperture or window, the size of an aperture measured parallel to the direction of the scale shall be at least equal to 1.5 times the distance between two numbered graduation lines.

Pre-requisite to testing bulk flow meter

34. A metrologist shall before testing a bulk flow meter ensure —

(a) that the bulk flow meter has been run for several minutes to ensure that all units are functioning smoothly;

(b) that safeguarding mechanism and other automatic devices are functioning satisfactorily;

(c) that in the case of a measuring instrument fitted with an automatic temperature compensator, the compensator has been disconnected so that the basic accuracy of the flow meter may be determined; and

(d) that in the case of an instrument used for the measurement of liquefied petroleum gas, that the vapour pressure between the prover and the supply transportable measuring tank or compartment is balanced.

Maximum permissible error for bulk flow meter

35. The maximum permissible error on a bulk flow meter shall be ascertained by at least one minute's run of an instrument and shall not exceed—

(a) on initial verification, zero point one percent of the quantity delivered in excess only; and

(b) on reverification or inspection, zero point one percent of the quantity delivered in excess or zero point zero five percent of the quantity delivered in deficiency.

Securing bulk flow meter from unauthorised adjustment

36. (1) A bulk flow meter shall be provided with suitable sealing arrangement to protect all adjustable parts affecting the quantity delivered or with alternative sealing arrangement that may be authorised by the Executive Director.

(2) A stamp of verification shall be placed on seals and sealing devices.

Liquid measuring device

37. (1) In a liquid measuring device, adequate provision to prevent the formation of air locks shall be made to ensure that there shall be no leakage and any valve shall work freely.

(2) A liquid measuring device shall be tested after any delivery hose or measure used in the test is flushed—

(a) by passing the liquid from the chamber into a standard measure, into the barrel, bottle, drum or other container and then into a standard measure; or

(b) where it is not practicable to test the liquid with standard measure, by ascertaining the netweight of the liquid delivered and converting weight into volume, basing the computations on the specific gravity or density of the liquid.

(3) The limit of error allowed on a liquid measuring device shall be zero point one percent in excess or zero point five percent deficiency of the quantity purported to be delivered.

(4) The limit of error allowed on a 35ml dispensing or measuring tap shall be 0.5ml in excess or 0.1ml deficiency only.

Automatic measuring instrument for volume

38. (1) An automatic measuring instrument for volume shall be—

(a) securely fixed in position in which it will operate;

(b) tested in situ with the liquid the automatic measuring instrument for volume is intended to measure; and

(c) be fitted with seals to protect all adjusting devices or have devices operate only with a special detachable key;

(e) marked with clear marks of identification on all parts that require to be dismantled for any purposes whatsoever, that give a clear indication of the matching parts which are to be matched on reassembly;

(f) tested at various heads and rates of delivery where these are not uniform.

(2) The limit of error allowed on an automatic measuring instrument for volume shall be—

(a) the maximum error in excess or deficiency of the amount to be delivered into the container of zero point one percent in excess or zero point zero five percent in deficiency; and

(b) such that the average error of sample deliveries does not exceed zero point one percent in deficiency.

Liquid dispensing pump

39. (1) A dispensing pump for use in the presence of a buyer shall not —

(a) have more than one outlet for measured liquid unless an automatic mechanism is provided to ensure that liquid can flow from one outlet at a time; and

(b) be installed in a manner that the nozzle or delivery outlet of the instrument delivers measured liquid fuel directly into any storage, transportable measuring tank or compartment of the instrument.

(2) A dispensing pump which forms part of a fixed installation shall be positioned in a manner that allows a buyer to readily obtain a clear and an unobstructed view of

(a) operations carried out by any person using the instrument to measure the liquid fuel being supplied to the buyer; and

(b) any device on the instrument which indicates the quantity supplied or the amount payable or the amount delivered, is being effected.

(3) Where a dispensing pump is connected to two or more fixed or transportable measuring tanks, suitable valves shall be fitted in each suction line or at the junction of the suction lines so that any line can be closed when the corresponding transportable measuring tanks or compartments are empty.

Zero setting dispensing pump and mechanism

40. (1) A dispensing pump, other than a piston or container type instrument, shall have a zero reset mechanism constructed in a manner showing that a delivery is completed and the solenoid valve deenergised.

(2) For the purposes of a manually operated instrument, the motor shall be switched off or the starter switch shall be in an off position it to prevent further delivery until individual sales indicator are reset to zero.

(3) Subregulation (2) shall not apply to any instrument intended for measurement of lubricating oils or other liquids of high viscosity.

(4) The starting mechanism of a measuring instrument shall constructed in a manner that prevents the delivery nozzle from being hung up in its normal position or what appears to be its normal position until—

(a) the solenoid valve is deenergized; or

(b) in the case of a manually operated instrument, when the motor is switched off or the starter switch is in the off position.

(4) A measuring instrument shall be constructed

in a manner that the reset mechanism cannot be operated while the solenoid valve is energised or in the case of a manually operated instrument, the motor is switched off or the starter switch is in the off position.

(5) The housing of every dispensing pump other

than a piston or container type instrument shall be constructed so as to permit ready access to the interior of the instrument for the purpose of inspection and stamping.

(6) For the purposes of this regulation, "normal position" means a nozzle of a measuring instrument which is properly located on the nozzle's hung up hook with that nozzle's spout in the holster.

Calibration device for dispensing pump

41. (1) A dispensing pump shall be provided with a calibration device designed in a manner that permits adjustment of the ratio between indicated quantity and the actual quantity of liquid passing through the meter.

(2) Where a calibration device modifies the relation in a digital manner, the consecutive value of the relationship shall not differ by more than 0.002 digital division.

(3) Adjustment of a measuring instrument by means of bypass valve on the meter shall not be permitted.

Price indication for dispensing pump

42. A liquid dispensing pump of the pricecomputing type shall display the words Aprice per litre@ on display panel and the indications of price.

Graduation for dispensing pump

43. (1) An indicating device on a dispensing pump shall be graduated and numbered in numerical sequence in one direction.

(2) A graduation shall be straight and of uniform

thickness not exceed one forth the smallest scale division.

(3) An actual or optically magnified width of the smallest scale division shall not be less than 2 mm.

(4) The value of the scale division shall be equal to one, two or five litres or decimal multiple or sub multiple.

Numbering on dispensing pump

44. (1) A figure associated with a graduated line on an indicating device shall be uniformly placed in reference to those lines and shall be as close to the lines as practicable but not so close as to interfere with the accuracy of the reading.

(2) The actual or optically magnified height of a figure shall not be less than 4 mm.

(3) Where an instrument is fitted with a digital indicator, the figure shall not be less than 18 mm in height.

(4) Where an indicator has an analogue scale, part of which is visible through an aperture or window, the size of the aperture measured parallel to the direction of the scale shall be at least equal to one hundred and five times the distance between two numbered graduation lines.

(5) Where a dispensing pump is fitted with a ticket printing mechanism, any letter, symbol or digit indicating the quantity, unit price and total price shall be-

(a) clear and legible;

(b) not less than 4 mm in height; and

(c) if the mechanism prints the total price on the ticket, printed and the words "total price" and price per litre shall appear in appropriate positions in letters of less than 3 mm in height.

Discharge indicator for dispensing pump

45. A dispensing pump, other than an instrument for the measurement of lubricating oil or other liquids of high viscosity, shall be fitted either—

(a) with a device to show that the container is properly filled or discharged; or

(b) with a device to show that the instrument is properly primed before use and that the liquid is flowing through the instrument.

Sight glass of measuring instrument for volume

46. (1) A measuring instrument for volume of the container type shall be provided with an adequate sight glass or observation window for the purpose of showing clearly that the container is properly charged and discharged.

(2) A measuring instrument for volume of the piston displacement type or flow meter type in which the flexible discharge hose is arranged to drain on delivery shall be fitted with an adequate sight glass for the purpose of

showing that the measuring instrument for volume is properly primed before use and shall bear adjacent to the sight glass a notice in one or other of the following forms indicating the priming level.

(3) A measuring instrument for volume in which the discharge hose remains permanently filled shall be fitted with an adequate sight glass incorporating a spinner motivated by flow of liquid.

(4) A notice with the words "sight glass" shall be exhibited adjacent to the sight glass.

Swing arm and drainage of hose

47. (1) Where a dispensing pump is provided with a swing arm or other form of rigid extension pipe, the arm or pipe shall be constructed to either

(a) empty the dispensing pump completely through the delivery outlet; or

(b) remain permanently filled up to the nozzle, in which case the sight glass shall be fitted at the highest point of the swing arm or extension pipe.

(2) A flexible discharge hose, together with any swing arm or extension pipe, which empties on delivery, shall be so arranged as to facilitate drainage of the liquid.

Length of hose of dispensing pump

48. (1) A dispensing pump shall not be fitted with a flexible discharge hose exceeding five metres in length.

(2) Subregulation (1) shall not apply to a dispensing pump used for the delivery of liquid fuel and lubricants to ships or aircraft.

Drainage of hose on dispensing pump

49. Except in the case of a dispensing pump in which the discharge hose remains permanently filled, every flexible discharge hose, together with any swing arm or extension pipe, which empties itself on delivery shall be arranged in a manner that provides for ready and adequate drainage of the liquid.

Nozzle for dispensing pump

50. Where the flexible discharge hose is—

(a) intended to be drained on delivery, the nozzle shall be of a form that does not trap any or part of the measured quantity when open; and

(b) intended to remain permanently filled with liquid, the nozzle shall function in a manner that prevents leakage of liquid when it is in a closed position and shall be constructed so as to permit smooth and even control of delivery of liquid and permit effective cut off.

Testing of dispensing pump

51. (1) A dispensing pump shall be tested using the liquid that the dispensing pump is intended to deliver or a liquid having similar characteristics.

(2) A dispensing pump shall not be tested unless—

(a) it is complete with the parts and attachments concerned in the operation of measurement and delivery; and

(b) the packing glands, coupling and joints are free from leaks.

(3) A dispensing pump intended to be permanently fixed in the position in which the dispensing pump is to be used shall be tested and stamped only when completely erected ready for use and installed at the place where it is to be used.

(4) Where a verified liquid dispensing pump is moved from its original location of verification, the verified liquid dispensing pump's certificate shall cease to be valid.

(5) A repair that shall result in replacement of any parts and attachments concerned in the operation of measurement and delivery of a liquid shall render that instruments certificate invalid.

Pre-requisite to testing dispensing pump

52. A metrologist shall before testing a dispensing pump ensure that—

(a) the dispensing pump is colour coded in accordance with the product being dispensed in line with the provisions of the Energy Regulation Act, 2019 or any other written law;

Act No. 12 of 2019

(b) liquid is passed through the instrument; and

(c) that any safeguarding interlock or limiting mechanism and other automatic devices are functioning satisfactorily.

Correct delivery within maximum and minimum flow rates

53. (1) A dispensing pump shall deliver correctly when it is operated at any speed between its minimum and maximum speed of operation.

(2) Where an instrument is found to have a maximum speed of operation lower than 40 litres per minute, the test at minimum speed shall be carried out at a rate of not less than twenty-five percent of the maximum speed obtained with the instrument.

(3) The speed of operation for any single delivery during testing shall be as uniform as possible.

(4) Where an instrument is connected to two or more storage transportable measuring tanks or compartments, any quantity of liquid delivered shall be within the maximum permissible error where —

(a) each suction line is opened in turn and the remainder closed; and

(b) where practicable, all suction lines are opened, regardless of the fact that some storage transportable measuring tanks or compartments may be empty.

(5) Subregulation (4) shall not apply to instruments arranged to blend liquids drawn from two or more storage transportable measuring tanks or compartments into a liquid which is then measured and delivered at a single delivery point.

Price computing for dispensing pump

Price computing for dispensing pump

54. A metrologist shall ascertain that any dispensing pump which is constructed in a manner that calculates and indicates price, number or any other dependent function of the quantity functions correctly.

Liquid for testing dispensing pump

55. (1) A person incharge of a dispensing pump, for the purposes of the performance of a test on a liquid by a metrologist, shall when requested by that metrologist provide that liquid for the purpose of verification.

(2) A liquid drawn from any transportable measuring tank or compartment for the purpose of the performance of a test shall, on conclusion of the test be returned to the transportable measuring tank or compartment from which it was drawn.

(3) A metrologist shall on the request of a person in-charge, of a dispensing pump furnish that person with a signed and dated statement of the quantity of liquid withdrawn from the transportable measuring tank or compartment and returned.

Leakage and priming

56. (1) A dispensing pump shall be tested for leakage.

(2) A dispensing pump shall be fully primed before a test for accuracy is undertaken.

(3) The speed of operation of any single delivery from dispensing pump shall be maintained as uniform as practicable.

Maximum permissible error

57. (1) The maximum permissible error on a dispensing pump shall not exceed on verification or inspection, zero point one percent in excess and zero point zero five percent deficiency of the quantity delivered.

(2) The dilation error of the delivery hose of a dispensing pump in normal conditions of use shall not exceed 50 ml.

Securing of dispensing pump from unauthorised adjustment

58. (1) A dispensing pump shall be provided with one or more plugs, seals or sealing material to protect adjustable parts affecting the quantity delivered.

(2) A stamp of verification shall be placed on the plugs, seals and sealing devices.

Measure of length

59. (1) A measure of length, other than callipers for use for commercial transactions, law enforcement, health, safety and environmental management shall—

(a) be made of brass, hardened steel, hard wood, woven tape or an approved material;

(b) be protected from corrosion;

(c) be subdivided only in all or any of metres, centimetres or millimetres;

(e) have all marks and inscriptions so arranged as not to interfere with the readings of lengths; and

(f) when tested in accordance with subregulation (2), not have a limit of error greater than the limit of error for its denomination or any intermediate value graduation set out in the First Schedule.

(2) A metrologist shall test a measure of length during verification—

(a) against a standard measure of length having errors not exceeding one third of the limits set out in the First Schedule;

(b) at a temperature of not less than 10°C but not exceeding 30° C; and

(c) in the case of a tape measure, while it is supported horizontally over its complete length and is subjected to the tensile force indicatedon that measure or if not indicated

(i) 50 Newtons in case of a metal measure; or

(ii) 10 Newtons in the case of a measure not made of metal.

(3) A metrologist shall not pass a measure of length during verification, if that measure other than callipers, does not conform to subregulation (1) or pass the tests in subregulation (2).

(4) A calliper measure for the measurement of thickness or diameter shall —

(a) be made of steel, steel alloy or an approved material;

(b) not have more play than is required for easy movement; and

(c) except that in the case of timber callipers, have a limit of error no greater than

(i) 0.2mm for a calliper measuring less than 200mm;

(ii) 0.5 mm for a calliper for measuring 200 mm or greater but not more than 500 mm; or

(iii) 1 mm for a calliper measuring 500 mm or more.

(5) Callipers other than those used for commercial transactions, law enforcement, health, safety and environmental management shall not be subject to verification.

Length measuring instrument for fabric

60. (1) A length measuring instrument for fabric shall—

(a) have measuring rollers when in position for measuring and be in true parallelism;

(b) have a braking device fitted which ensures nonregistration when the supply of fabric fails;

(c) have the rollers free when the length measuring instrument for fabric is reset;

(d) have die chart returning to zero either automatically or by operation of a special handle or device provided for that purpose when the length measuring instrument for fabric is reset; and

(e) have an indication by means of a graduation not less than

(i) 20 mm apart in the case of a graduation of a length value of 100 mm; or

(ii) 3 mm apart in the case of a graduation of a length value of 25 mm or by counters.

(2) A length measuring instrument for fabric shall be tested by passing the standard or the fabric normally measured by that length measuring instrument for fabric at right angles to the axis of measuring rollers.

(3) If it is necessary to remove the standard or fabric, during the test under subregulation (2) this shall be done when an integral number of meters of the standard or fabric has passed through a length measuring instrument for fabric and the standard or fabric shall be reinserted at the zero or initial graduation of the standard or fabric.

(4) A length measuring instrument for fabric shall be correct whether the test is forward or backward to ensure that

(a) a length measuring instrument for fabric if fitted with two charts, shows the same indication of length on both charts;

(b) any totalising meter functions properly and correctly;

(c) the parts work freely throughout the range of the fabric measuring instrument;

(d) there is no backlash in the mechanism; and

(e) any over run brake fitted shall bring the indicator to a halt immediately the standard or fabric used for test leaves the measuring roller.

(5) The limit of error allowed on a fabric measuring instrument is for each metre or portion thereof indicated, 2mm in deficiency or in excess.

(6) The stamp of verification shall be stamped on a lead plug inserted in a conspicuous and easily accessible part of a fabric measuring instrument, and a seal of verification shall be affixed where necessary to prevent access to the working parts or adjusting device without the seal being broken.

SCHEDULE

(*Regulations* 6,8,10,14,23,24,25,26,27 and 28)

TABLE 1

VERIFICATION SCALE

Type of instrument	*Verification scale interval e = d*
Graduated, with auxiliary indicating device	e is chosen by manufacturer according to requirement given in Table 2
Non-graduated	e is chosen by the manufacturer according to requirements in Table 2

TABLE 2

ACCURACY LEVELS

Accuracy Class	*Verification Scale interval e*	*Number of verification scale intervals n = Max/e*		*Minimum Capacity Min*
Special I	0.001 g < e	Minimum 50,000	Maximum -	100e
High II	0.001g < e < 0.05g 0.1 g < e	100 5,000	100,000 100,000	20e 50e
Medium III	0.1g < e < 2g 5g < e	100 500	10,000 10,000	20e 20e
Ordinary IV	5g < e	100	1,000	10e

NOTE: e is chosen by the manufacturer according to requirements below:

d < e <

10d e = 10k kg, k being a positive or negative whole number, or Zero. This requirement does not apply to an instrument of class I with d < 1 mg where e = 1mg.

TABLE 3

MAXIMUM PERMISSIBLE ERRORS ON INITIAL VERIFICATION

For Loads M expressed in verification scale intervals

Class I		*Class II*	*Class III*	*Class IV*
±0.5e	0 < m ≤ 50 000	0 < m ≤ 5000	0 < m ≤ 500	0 < m ≤ 50
±1e	50 000 < m ≤ 200 000	5000 < m ≤ 20 000	500 < m ≤ 2000	50 < m ≤ 200
±1.5e	200 000 < m	20 000< m ≤ 100 000	2000 < m ≤ 10 000	200 < m ≤ 1000

NOTE: The maximum permissible errors in service (inspections) shall be twice the maximum permissible errors on initial verification.

TABLE 4

LIMITS OF ERROR FOR WEIGHTS USED FOR TRADE

Weights used in trade	*Limits of error*	
	Trade weights	*Precision Weights*
	—	+0.5mg
10mg	—	0.5
20mg	—	0.5
50mg	—	1
l00mg	—	1
200mg	+10mg	1
lg	12mg	1
2g	15mg	1
5g	20mg	2
l0g	25rng	2
20g	30mg	3
50g	50rng	5
l00g	l00mg	10
200g	250mg	25
500g	500mg	50
1kg	1000mg	100
2kg	2500mg	250
5kg	5000mg	500
10kg	l0000mg	1000
20kg		

NOTE: MPE means (Maximum Permissible Error)

TABLE 5

LIMITS OF ERRORS ON SITE VERIFICATION OF WEIGHING INSTRUMENT

Maximum permissible errors for weights (mg)									
Nominal Value	Class E1	Class E2	Class F1	Class F2	Class M1	Class M1-2	Class M2	Class M2-3	Class M3
5000 kg			25000	80000	250000	500000	800000	1600000	2500000
2000 kg			10000	30000	100000	200000	300000	600000	1000000
1000 kg		1600	5000	16000	50000	100000	160000	300000	500000
500 kg		800	25000	8000	25000	50000	80000	160000	250000
200 kg		300	1000	3000	10000	20000	30000	60000	100000
100 kg		160	500	1600	5000	10000	16000	30000	50000
50 kg	25	80	250	800	2500	5000	8000	16000	25000
20 kg	10	30	100	300	1000		3000		10000
10 kg	5	16	50	160	500		1600		5000
5 kg	2.5	8	25	80	250		800		2500
2 kg	1	3	10	30	100		300		1000
1 kg	0.5	1.6	5	16	50		160		500
500 g	0.25	0.8	2.5	8	25		80		250
200 g	0.1	0.3	1	3	10		30		100
100 g	0.05	0.16	0.5	1.6	5		16		50
50 g	0.03	0.1	0.3	1	3		10		30
20 g	0.025	0.08	0.25	0.8	2.5		8		25
10 g	0.02	0.06	0.2	0.6	2		6		20
5 g	0.016	0.05	0.16	0.5	1.6		5		16
2 g	0.012	0.04	0.12	0.4	1.2		4		12
1 g	0.01	0.03	0.1	0.3	1		3		10
500 mg	0.008	0.025	0.08	0.25	0.8		2.5		
200 mg	0.006	0.02	0.06	0.2	0.6		2		
100 mg	0.005	0.016	0.05	0.16	0.5		1.6		
50 mg	0.004	0.012	0.04	0.12	0.4				
20 mg	0.003	0.01	0.03	0.1	0.3				
10 mg	0.003	0.008	0.025	0.08	0.25				
5 mg	0.003	0.006	0.02	0.06	0.2				
2 mg	0.003	0.006	0.02	0.06	0.2				
1 mg	0.003	0.006	0.02	0.06	0.2				

TABLE 6

LIMITS OF ERROR ON PRECISION WEIGHING INSTRUMENT FOR WEIGHING PRECIOUS METALS, PHARMACEUTICAL PRODUCTS, ETC.

Maximum Capacity equal to and lower than or greater than		*Limit of error (MPE)*
2g	50g	2mg
50g	100g	5mg
100g	200g	10mg
500g	1kg	50mg
1kg	5kg	100mg
2.5kg	-	200g
10kg	20kg	500g
20kg	100kg	1000g

TABLE 7

LIMITS OF ERROR FOR MEASURES OF CAPACITY

Capacity of Measure or Value of graduation	**Limit of error (MPE)**	
	Conical metal	**Other metal**
10ml	0.25ml	0.5ml
20ml	0.5ml	1ml
25ml	0.65ml	1.5ml
35ml	1ml	1.5ml
50ml	1.25ml	2ml
100ml	1.5ml	2.5ml
200ml	2.5ml	5ml
500ml	5.0ml	10ml
1 l	7.5ml	15ml
2 l	12.5ml	25ml
5 l	25.0ml	50ml
10 l	40.0ml	75ml
20 l	50.0	100ml
50 l or over	65.0ml	125ml
100 l or over	0.1% Capacity	0.2% capacity

NOTE: Measures other than metal measures may have an error in excess or deficiency of 5 times the allowances shown for comical measures.

TABLE 8

LIMITS OF ERROR ON CARAT METRIC WEIGHTS

Denomination	*Limit of error (MPE)*
0.1cm	0.2mg
0.2cm	0.2mg
0.5cm = (.1g)	0.5mg
1cm	1mg
2cm	1mg
5cm = (1g)	1mg
10cm	1mg
20cm	1mg
50cm = (10g)	2mg
100cm	2mg
200cm	5mg
500cm = (100g)	10mg

NOTE: This series of weights is limited and should be used only when precision metric weights are oat suitable.

TABLE 9

LIMITS OF ERROR ON MEASURES OF LENGTH

Denomination or values of graduation	*Limit of Error (MPE)*			
	End Measurement		*Line Measurement*	
	Long	short	Long	short
100m	-	-	20mm	20mm
60m	-	-	12mm	12mm
50m	-	-	15mm	15mm
30m	-	-	10mm	10mm
25m	-	-	8mm	8mm
20m	-	-	7.5mm	5.5mm
15m	-	-	5.5mm	5.5mm
10m	-	-	5.0mm	5.0mm
5m	-	-	2.5mm	2.5mm
4m	-	-	2.0mm	2.0mm
3m	3mm	1.5mm	1.5mm	1.5mm
2m	2mm	1.0mm	1.0mm	1.0mm
1.5m	1.5mm	0.8mm	0.8mm	0.8mm
1.0m	1mm	0.5mm	0.5mm	0.5mm
0.5m	0.8mm	0.4mm	0.4mm	0.4mm

TABLE 10

LIMITS OR ERROR OF MEASURING VOLUME

Capacity Measure or Value per graduation	Limits of error (MPE)
10ml	0.5ml
20ml	1ml
50ml	2ml
100ml	3ml
200ml	5ml
250ml	5ml
500ml	10ml
1 l	10ml
2 l	20ml
5 l	50ml
10 l	50ml
20 l or more	0.2%

TABLE 11

ABBREVIATIONS OF DENOMINATIONS OF MEASURES

Denomination	*Abbreviation*
Metric Carat	cm
Milligram	mg
centigram	cg
decigram	dg
Gram	g
kilogram	kg
Cubic Metre	cum or m
Cubic centimetre	cc or cm
Millimetre	mm
Centimetre	cm
Decimetre	dm
Metre	m
Millilitre	ml
Centilitre	cl
Litre	l

C. YALUMA,
Minister of Commerce
Trade and Industry

LUSAKA
11th May, 2021
[MCTI.64/9/1C]