

THE WEIGHTS AND MEASURES ACT

ORDER
(under section 5A)

The Weights and Measures (Conversion of Unit of Measurement) Order, 1998 L.N. 346/98

REGULATIONS
(under section 22)

The Weights and Measures (Testing) Regulations, 1986 L.N. 147/D/86
38/89

The Weights and Measures (Prohibition of Non-Metric Measuring Equipment for Trade) Regulations, 1998 L.N. 34A/98

The Weights and Measures (Measurement of Petroleum and Oil Fuel for Trade) Regulations, 2004 L.N. 110a/2004

ORDER
(under First Schedule to Act)

The Weights and Measures (International Definitions) Order, 1976 L.N. 176/76
57B/77

THE WEIGHTS AND MEASURES ACT

ORDER
(under section 5A)THE WEIGHTS AND MEASURES (CONVERSION OF UNIT OF
MEASUREMENT) ORDER, 1998*(Made by the Minister on the 15th day of June, 1998)*

L.N. 342/98

1. This Order may be cited as the Weights and Measures (Conversion of Unit of Measurement) Order, 1998.

2. On or before the 1st day of September, 1998, the units of measurement used in the industries specified in the Schedule shall be converted to metric units. Schedule.

SCHEDULE

(Paragraph 2)

Industries Converting to Metric Units of Measurement

1. The building and engineering construction industries.
2. The fuel, power, transport and communications industries.
3. The manufacturing and processing industries.
4. The mineral extraction and natural resources industries.
5. The public relations and information industries.
6. The agricultural, land and fisheries industries.
7. The retail industry, except in—
 - (a) public markets as defined in section 130 of the Kingston and St. Andrew Corporation Act; and
 - (b) markets to which the Parochial Markets Act applies.

(Cap. 275)
1953 Edtn.

THE WEIGHTS AND MEASURES ACT

REGULATIONS
(under section 22)

THE WEIGHTS AND MEASURES (TESTING) REGULATIONS, 1986

*(Made by the Minister on the 15th day of July, 1986)*L.N. 1471D/86
Amdt:
L.N. 38/89

1. These Regulations may be cited as the Weights and Measures (Testing) Regulations, 1986.

2. In these Regulations—

“automatic weighing machine” means a machine in which special self-acting machinery is introduced to effect an automatic feed, the rapid weighing of given loads, the registration and summation of loads, and other similar purposes or some of these purposes;

“beam scale” means any equal-armed weighing equipment, the pans of which are below the beam;

“capacity” means, in relation to a weighing equipment, the maximum load which the equipment is constructed to weigh;

“counter machine” means any equal-armed weighing equipment of a capacity not exceeding one hundredweight, the pans of which are above the beam, and includes, together with the ordinary type, such equipment as are specially designed for counter use, and which do not exceed the said capacity;

“dead-weight machine” means any weighing equipment similar in principle of construction to a counter machine but of a capacity of one hundredweight or more, and includes—

- (a) such an equipment with the weighing platform near to the ground and with the connecting stays or hooks above the beam, and commonly known as a low pattern machine or cotton machine;
- (b) such an equipment with the weighing platform at any convenient height and with the connecting stays or hooks below the beam, and commonly known as a high pattern machine or single machine;

- (c) such an equipment which combines the characteristics of the equipment described in paragraphs (a) and (b), and commonly known as a double machine.

3. These Regulations shall apply to all weighing or measuring equipment for sale or for use for trade for the measurement of length, volume, capacity and mass, including but not limited to the following classes—

- (a) linear measures;
- (b) liquid capacity measures;
- (c) dry capacity measures;
- (d) beam scales;
- (e) balances;
- (f) counter machines;
- (g) spring balances;
- (h) steelyards;
- (i) dead-weight machines;
- (j) platform weighing machines;
- (k) weighbridges;
- (l) crane weighing machines;
- (m) automatic weighing machines,

but does not apply to any weighing or measuring equipment—

- (i) for use by the public for weighing a person;
- (ii) for use only for weighing coins for currency notes for the purpose of determining their number.

4. Any person who has any weighing or measuring equipment which he intends to sell or to use for trade shall, before he so sells or uses that equipment for trade, give to the Bureau notice in writing—

- (a) of his intention to sell or use the equipment for trade;
- (b) specifying the equipment and the place at which the equipment is kept.

5.—(1) As soon as may be after the Bureau receives a notice under regulation 4 the Bureau shall cause an inspector to visit the place specified in the notice and test the equipment by means of such standards and testing equipment as he considers appropriate, and in accordance with the provisions of Parts II and III of the Act.

(2) Upon completion of the test—

- (a) the person who presented the equipment for testing shall pay to the Bureau a fee calculated according to the formula set out in the Schedule, or a fee of \$25, whichever is the greater;

Schedule.

- (b) if the equipment which is tested satisfies the requirements of the Act, the inspector shall give to the person who presented the equipment for testing a statement in writing to the effect that the equipment is passed for sale or for use for trade, as the case may require;
 - (c) the inspector shall make a record of the test and deliver it to the Bureau.
6. Any person who—
- (a) contravenes the provisions of regulation 4; or
 - (b) forges, alters or defaces a statement in writing referred to in sub-paragraph (b) of paragraph (2) of regulation 5,

shall be guilty of an offence and be liable on summary conviction before a Resident Magistrate to a fine not exceeding two thousand dollars and in default of payment to imprisonment for a term not exceeding twelve months.

SCHEDULE (Regulation 5 (2))

Formula for calculation of fee

(Salary per annum of inspector)

$$\text{Cost per man-hour} = \frac{\text{—————}}{\text{(No. of hours per annum worked) (for Bureau)}} \times \text{factor}$$

Note: The factor is based on the cost of the Bureau's operations during the last financial year preceding the date of the test.

THE WEIGHTS AND MEASURES ACT

REGULATIONS
(under section 22)THE WEIGHTS AND MEASURES (PROHIBITION OF NON-METRIC
MEASURING EQUIPMENT FOR TRADE) REGULATIONS, 1998

(Made by the Minister on the 15th day of June, 1998)

L.N. 34A/98

1. These Regulations may be cited as the Weights and Measures (Prohibition of Non-Metric Measuring Equipment for Trade) Regulations, 1998.

2.—(1) No person shall import into Jamaica any weighing or measuring equipment designed to be used for the purpose of trade unless the Bureau notifies the person of its approval of the equipment in writing.

(2) No person shall import any non-metric weighing or measuring equipment for which the Bureau has not issued an approval.

(3) A person who is desirous of importing into Jamaica any weighing or measuring equipment designed to be used for the purpose of trade shall provide the Bureau, in advance of the importation, with a certificate in relation to the equipment from the appropriate certifying body in the country of origin of the equipment.

(4) In paragraph (2) “non-metric weighing or measuring equipment” means equipment which indicates in imperial units, or in both imperial and metric units.

3. No person shall use for the purpose of trade or have in his possession for use for the purpose of trade any weighing or measuring equipment the unit of which is denoted in a unit other than the units specified in the First Schedule to the Act.

4. A person who contravenes regulation 2 or 3 commits an offence and is liable on conviction in a Resident Magistrate’s Court to a fine not exceeding two thousand dollars and in default of payment to imprisonment for a term not exceeding twelve months or to both such fine and imprisonment.

THE WEIGHTS AND MEASURES ACT

REGULATIONS
(under section 22)THE WEIGHTS AND MEASURES (MEASUREMENT OF PETROLEUM
AND OIL FUEL FOR TRADE) REGULATIONS, 2004

(Made by the Minister on the 1st day of September, 2004)

L.N. 1106/2004

[15th day of November, 2004]

PART I. Preliminary

1. These Regulations may be cited as the Weights and Measures (Measurement of Petroleum and Oil Fuel for Trade) Regulations, 2004. Citation.

2. In these Regulations— Interpretation.

“API formula” means the formula set out in Schedule 1; Schedule 1.

“bulk storage” means a volume of petroleum fuel in excess of 500 litres stored in a storage tank or any other container;

“bulk storage carrier” means—

(a) a vehicle on which is placed a tank used for the carriage of petroleum fuel; and

(b) an individual chassis or trailer on which is mounted a tank used for carriage of petroleum fuel;

“Bureau” means the Bureau of Standards;

“dipstick” means a rod of specified length and cross sectional dimensions or any other length-measuring instrument approved by the Bureau, which, after calibration of the compartment or tank in which it is used, is utilized to indicate the quantity of liquid in it;

“gross volume” or “quantity” means the volume of the product, usually measured by a meter or dipstick, at ambient temperature;

*THE WEIGHTS AND MEASURES (MEASUREMENT OF PETROLEUM
AND OIL FUEL FOR TRADE) REGULATIONS, 2004*

“meter” means a measuring device which measures the quantity or volume of a liquid;

“net volume” has the meaning ascribed to it in the API formula;

“petroleum fuels” means “petroleum” and “oil fuel” as defined respectively in section 2 of the Petroleum and Oil Fuel (Landing and Storage) Act;

“probe” means a device which is inserted in the compartment or tank and which is used to determine the height of the liquid therein;

“storage tank” means a container, whether above ground or underground, used for bulk storage in a particular location; any storage tank calibrated by the Bureau shall be considered as a means of measure;

“tank truck or tanker wagon” means a bulk storage carrier of a type used for the transporting of liquid fuels;

“temperature adjusted volume” means the gross volume corrected to the volume at the standard or reference temperature using the API conversion tables and shall be the volume used for all transactions of bulk petroleum products;

PART II. Measurement of Petroleum Fuel

3. The gross volume of petroleum fuel in bulk storage carriers shall be determined by use of one of the following methods—

- (a) the manual method;
- (b) the mechanical or electronic method;
- (c) any, or both of the methods listed in (a) and (b); or
- (d) any other method approved by the Bureau.

Measurement using Positive Displacement Meter

4.—(1) The gross volume of petroleum fuel in a bulk carrier shall be determined using the following:

- (a) at the loading rack, a bulk meter approved by the Bureau;
- (b) on a tank truck, a meter approved by the Bureau.

(2) The bulk meter mentioned in paragraph (1) (a) shall be installed in accordance with the procedures set out in Schedule 2.

(3) The bulk meter mentioned in paragraph (1) (b) shall be installed in accordance with Schedule 3.

Measurement
of petroleum
fuel.

Determination
of quantity
by use of
Positive
Displacement
Meter.

Schedule 2.

Schedule 3.

Calibration of Positive Displacement Meter

5.—(1) The Positive Displacement Meter shall be of a type which is affected only minimally by disturbances upstream and shall be equipped with a calibrator.

Testing and calibration of Positive Displacement Meter.

(2) A positive Displacement Meter shall be calibrated in accordance with the Open Volumetric Prover Method or the Master Meter Method or both methods.

(3) Where the Open Volumetric Prover Method is used to test a Positive Displacement Meter, the meter shall be tested by dispensing a quantity of petroleum fuel at given rates of flow into a test measure of known quantity and accuracy.

Open Volumetric Prover Method.

(4) The capacity of the test measure referred to in paragraph (3) shall be such that it can accommodate at least one minute's flow from the meter at normal flow rate.

(5) Where bulk meters are being tested using the Open Volumetric Prover Method this test shall be done every six months or at such intervals as the tester thinks necessary or the Bureau may require.

(6) Where the Master Meter Method is used to test a Positive Displacement Meter, the master meter shall be connected in series with the meter to be proved and both devices shall be operated at the desired flow rates to purge the system and equalize the pressure.

Master Meter Method.

Checking for Leaks

6.—(1) Before calibration of the meter, the tester shall check to ascertain whether there are leaks in the system, using—

Calibration process.

- (a) the Standing Start-and-stop Method described in paragraph (2) to (5);
- (b) the Running Start-and-stop Method described in paragraph (6) to (9); or
- (c) such other method whether it originates locally or from overseas, approved by the Bureau.

(2) Where the Standing Start-and-stop Method is employed—

- (a) the flow of liquid through the master meter and the meter under test shall be stopped; and
- (b) the readings on both meters shall be recorded.

Standing-Start and-stop Method.

(3) The flow shall be started through the two meters simultaneously by opening a valve on the down stream side of the meters to give the desired flow rate.

(4) When a sufficient time has elapsed, to provide a satisfactory proof of the meter under test, the same valve shall be closed, thereby halting the flow of liquid through both meters.

(5) The tester shall note the meter readings as well as the pressure and temperatures in such form and manner as may be prescribed.

Running
Start-and-
stop Method.

(6) Where the Running Start-and-stop Method is employed, the valve down stream both meters is opened until the desired flow rate is achieved.

(7) After flow through both meters has been in progress for a specified time, the meter readings shall be taken.

(8) Flow through both meters shall be continued for a period of time; at which time the meter readings as well as pressure readings shall be once again recorded and the valve shall then be reclosed.

Adjustments Using Positive Displacement Meter Method

(9) Where the open volumetric prover method is used, if the difference between the quantity collected in container and the quantity registered on—

- (a) a bulk meter, exceeds pre-determined tolerance of 0.05% of the amount;
- (b) a retail meter, exceeds a pre-determined tolerance of 0.3% of the amount,

the meter under test shall be adjusted so that the difference is brought within tolerance.

Adjustments
using master
meter
method.

(10) Where a master meter is used as a prover, if the difference between the readings of the master meter and that of the meter under test exceeds a predetermined tolerance, then the meter shall be adjusted so that the difference is either less than the tolerance or zero.

Seal

Sealing.

(11) After adjustment of the meter under test is completed, the Bureau shall place tamper-detectable seals in the meter adjuster.

Certification

Certification.

(12) The Bureau on being satisfied with results of test shall issue a certificate confirming the calibration.

Concurrence
in reading of
meters.

(13) Where another register is used by electrical impulse in conjunction with the meter register, the readings on both shall be synchronized.

Certification of Tanker Wagons

7.—(1) Every owner of a tanker wagon whether—

Certification
of tanker
wagons.

- (a) a non-detachable unit, that is to say, a truck as defined under section 11 of the Road Traffic Act, and
- (b) a detachable unit, that is to say, an articulated motor vehicle as defined under section 11 of the Road Traffic Act, shall submit the unit to be certified by the Bureau.

(2) No tanker wagon shall be certified by the Bureau unless it conforms to the specification set out in Schedule 4.

Schedule 4.

(3) The certification of a detachable unit shall not be completed until both tank and chassis are certified.

Certification
of non-
detachable
unit.

(4) Each detachable unit shall be fitted with a permanent identification mark or serial number which shall appear on the tank and certificate.

Certification
of detachable
units.

(5) If any act or event occurs which may or does cause an alteration of the volume of the compartment, then the owner/agent of the tanker wagon shall have the compartment re-certified by the Bureau of Standards before any further use. The frequency of re-certification of the volume on a routine basis shall be prescribed by the Bureau of Standards.

Re-
certification.

Measurement and delivery of Fuel to Tanker Wagon

8.—(1) On completion of loading, the volume by meter reading shall coincide with the volume indicated on the compartment, which is established by the Bureau. In addition, the depth of the liquid in the compartment shall coincide with the depth appearing on the certificate issued by the Bureau and also that appearing on the compartment. This measurement should not vary by more than the tolerance specified in section 13(4).

Measurement
of fuels in
compartment.

(2) When the required gross quantity is placed in each compartment the level of product in each compartment shall be verified by a method approved by the Bureau.

9.—(1) The fuel placed in each compartment of a tanker wagon at the loading rack shall be measured by a custody transfer meter certified by the Bureau.

Measurement
by meter.

(2) The temperature and API gravity of the product as arrived at by a method approved by the Bureau shall be recorded so that the net quantity at standard temperature of 15°C (60°F) can be calculated.

(3) The quantity of fuel placed in a compartment may also be established by determining the mass of the fuel and dividing by its density.

Measurement
by weight.

(4) When the required gross quantity is placed in each compartment, a measurement which indicates the level of the liquid in the compartment shall be taken by a measuring device approved by the Bureau.

Certification of
tanker wagon
compartment prior
to use.

10.—(1) Fuel shall not be placed in any tanker wagon compartment which has not been certified by the Bureau as a means of measure.

Schedule 4.

(2) The Bureau will only certify a tanker wagon when all compartments satisfy all the criteria in Schedule 4.

(3) At the completion of the certification exercise, the Bureau shall issue a certificate to the owner of the vehicle.

(4) The owner of the vehicle or the operator of the vehicle shall ensure that the certificate is placed at a conspicuous point in the cab of the vehicle.

Certification of Storage Tanks

Certification of
storage
tanks.
Schedule 5.

11. Certification of storage tanks as a means of measurement shall be done in accordance with the provisions of Schedule 5.

Verification of Quantity at Point of Delivery

Verification
of quantity
at point of
delivery.

12.—(1) The fuel placed in a storage tank shall be measured by one of the following methods as approved by the Bureau of Standards.

- (a) Method A, use of transfer meter;
- (b) Method B, use of T-bar, calibrated dipstick or probe;
- (c) Method C, use of a storage tank;
- (d) By such other method as the Bureau may approve.

Method A.

13.—(1) After the arrival of a tanker wagon at a point of delivery, the fuel in all compartments shall be allowed to settle for at least ten minutes.

(2) The dipstick or probe for each compartment shall be used to establish the gross quantity of liquid in each compartment.

(3) When the dipstick or probe is used, the height of the liquid in the compartment shall be determined and consequently the gross quantity is established.

(4) The height of the liquid as determined by the dipstick or probe shall not differ from the height certified by the Bureau, by—

- (a) ± 0.5 cm for compartments with capacity up to 2,500 litres;
- (b) ± 0.25 cm for compartments with capacity over 2,500 litres and up to 4,600 litres;

- (c) $\pm 0.13\text{cm}$ for compartments with capacity over 4,600 litres, or by such other differential as the Bureau may from time to time establish.

(5) The dipstick or probe for each compartment shall be used to establish the gross quantity of liquid in each compartment where the tanker wagon compartment is considered as a means of measure in accordance with Schedule 5.

Schedule 5.

(6) The product carried in the compartment shall be deposited in the storage tank.

(7) The initial quantity in the storage tank shall be determined immediately before the delivery from the tanker wagon.

Method B.

(8) The fuel shall be then deposited in the storage tank and the product allowed to settle for five minutes.

(9) The quantity in the tank shall again be determined.

(10) The difference between the quantities shall be considered to be the quantity delivered if the storage tank is considered to be the means of measure.

(11) A flow meter approved by and certified by the Bureau shall be used.

Method C.

(12) On the arrival of the tanker wagon at the point of delivery, a flow meter shall be attached to the outlet pipe in order to measure the liquid.

(13) If such a device is already attached to the outlet pipe, that device shall be used to measure the liquid.

(14) The meter is then reset or the totalizer indication read and the liquid is passed through the meter.

(15) After delivery through the meter is made the tester shall record—

- (a) the quantity delivered and the final totalizer indication;
- (b) the difference between both totalizer indications, that is the opening and closing totalizer indications, is then to be found.

14.—(1) The petroleum fuel being delivered to the retail consumer shall be measured by the meter of the relevant pump.

Product at point of delivery to retail customer.

(2) Quantity delivered shall be clearly displayed by the pump.

(3) The owners of the petrol pumps shall ensure that these devices are properly serviced, calibrated and tested at periods not exceeding six months.

(4) These devices shall also be certified (for accuracy at least once annually by the Bureau).

Offences.

15.—(1) Any person who violates any provision of this Act or Regulations promulgated pursuant thereto shall be guilty of a misdemeanor and upon conviction shall be subject to a fine of not more than Two Thousand dollars (\$2,000.00) or imprisonment for not more than twelve (12) months or both.

SCHEDULE 1

(Regulation 2)

API Formula

The API Formula is:

VCF = Volume at base or reference temperature (T)

$\frac{V_T}{V}$ = density of liquid at any temperature (t)

V = density of liquid at base or reference temperature (T)

$$= \frac{\rho}{\rho_T}$$

VCF = Volume Correction Factor for adjusting liquid volume at temperature T to volume at 60°F (15.6°C)

VCF = $\exp[-\alpha_T \Delta t(1+0.8\alpha_T \Delta t)]$ (1)

where

VCF - volume correction factor for any liquid

exp - the base of natural logarithm (2.718281828.....)

α_T - the cubical coefficient of the thermal expansion per unit degree of temperature of the liquid at a standard temperature. See equation (2).

t - observed temperature of the liquid

T - Reference or standard temperature (60°F or 15.6°C).

Δt = t-T(°C)

The value of α_T for entry in equation (1) is obtained from

$$\alpha_T = \frac{(K_0 + K_1 \rho_T)}{\rho_T^2} \dots\dots\dots (2)$$

where

K_0 and K_1 are constants given in Table 1 for the different liquid groups

ρ_T - liquid density (kg/m³) at the standard temperature T.

NOTE: It is not necessary to use this formula explicitly to calculate the volume correction factor and hence the volume at the reference or base temperature given that at any other temperature as tables with correction factors are available for use. These tables are API 2540, Tables 6A and 6B. The volume correction factor (VCF) can be found from these tables for a given liquid API and temperature.

SCHEDULE 1, *contd.*

Calculation Using API Formula

Fuel Oil

API Gravity is 14.5 at 15.6°C

$$\begin{aligned} \text{Specific Gravity (SG)} &= 141.5 / (131.5 + \text{API}) = 141.5 / (131.5 + 14.5) \\ &= 0.969178 \end{aligned}$$

$$\text{Density } (\rho) = 969.18 \text{ kg/m}^3$$

A sample of fuel oil has a density of 969.18 kg/m³ at standard temperature 15.6°C. Calculate the Volume Correction Factor (VCF) which should be applied to its observed value at an ambient temperature of 35°C and calculate its volume at standard temperature of 15.6°C if observed volume at 35°C is (i) 2273 (ii) 4546 litres.

Computations

Given (ρ_T) the density of 969.18 kg/m³ at 15.6°C and using the appropriate table and formula we obtain.

Cubical expansion coefficient of liquid at standard temperature (T).

$$\alpha_T = \frac{(K_0 + K_1 \rho_T)}{(\rho_T)^2}$$

$$\alpha_T = (186.9696 + (0.4862 \times 969.18)) / (969.18)^2$$

$$\alpha_T = 0.000701 \text{ per } 1^\circ\text{C}$$

$$\text{VCF} = \exp [-\alpha_T \Delta t (1 + 0.8 \alpha_T \Delta t)]$$

$$\begin{aligned} &= \exp [-0.000701 \times 20 \times (1 + (0.8 \times 0.000701 \times 20))] \\ &= 0.985923 \end{aligned}$$

(The value from the API/ASTM Table 6b for Petroleum Products (page 65) gives the VCF corresponding to 35°C as 0.9863).

The volume at the standard temperature given ambient temperature of 35°C and a measured volume 2273 litres is (0.985923 x 2273) litres = 2241 litres.

The volume at the standard temperature given ambient temperature of 35°C and a measured volume 4546 litres is (0.985923 x 4546) litres = 4482 litres.

THE WEIGHTS AND MEASURES (MEASUREMENT OF PETROLEUM
AND OIL FUEL FOR TRADE) REGULATIONS, 2004

SCHEDULE 1, *contd.*

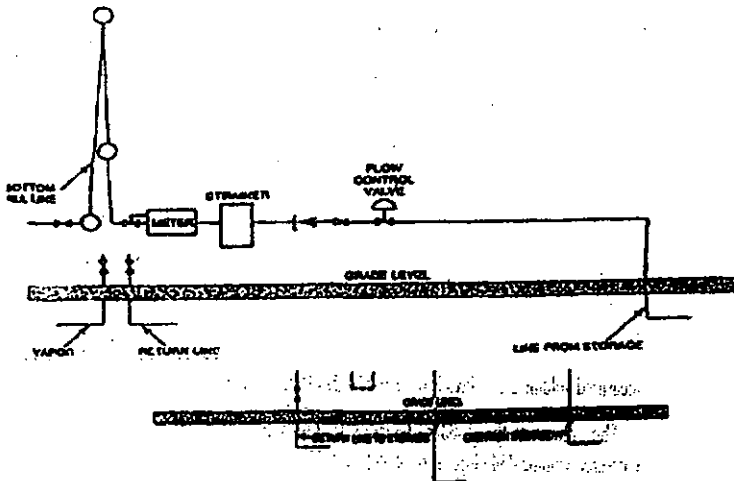
TABLE 1

Petroleum Liquid Groupings	Density Limits For Application (kg/m ³ at 15.6 °C/60 °F)	API Gravity (at 15.6 °C/60 °F)	Constant for Equation 2 K ₀	Constant for Equation 2 K ₁
Crude Oils	611.2 — 1075.4	100 — 0	613.9723	0.0
Products—Gasoline	653.5—779.3	85—50	346.4228	0.4388
Products—Jet Fuels	779.3—839.3	50—37	594.5418	0.0
Products—Fuel Oils	839.3—1075.4	37—0	186.9696	0.4862

Temperature limits for application

Density (kg/m ³)	API gravity (at 15.6 °C/60 °F)	Temperature Limits	
		°C	°F
611.2—779.3	100 — 50	(-18) to 93	0 to 200
779.3—824.7	50 — 40	(-18) to 121	0 to 250
824.7—1075.4	40 — 0	(-18) to 149	0 to 300

Figure 2 — Installation Diagram — Metered Tank Truck Loading Rack
(Top Loading) (See Appendix 1 and 1A)



NOTE: All sections of line that may be blocked between valves should have provision for pressure relief.

SCHEDULE 1, *contd.*

Figure 2 — Installation Diagram — Metered Tank Truck Loading Rack
(Bottom Loading) (See Appendix 1 and 1B)

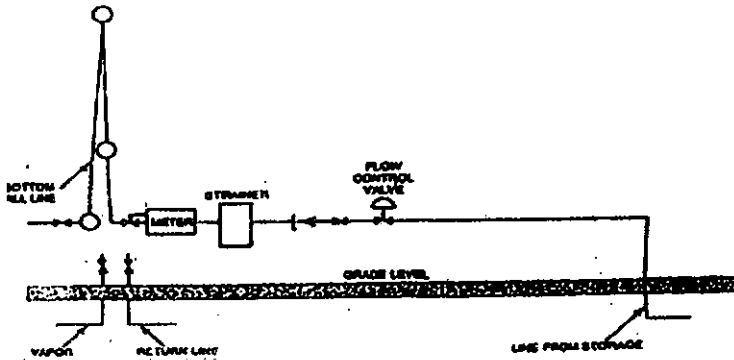
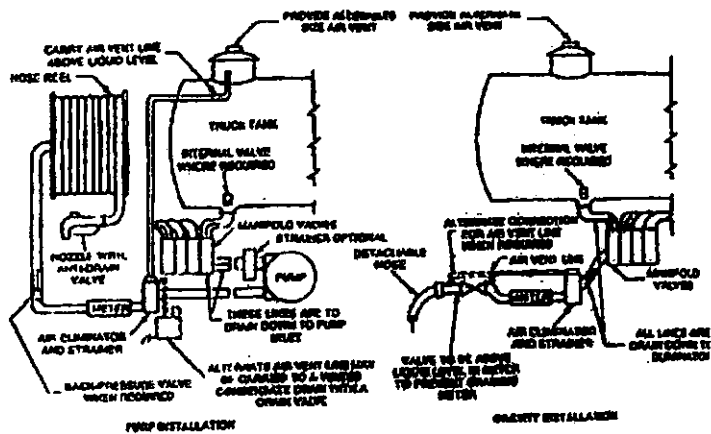


Figure 3 — Installation Diagram — Tank Truck Metering Equipment
(Excluding Liquefied Petroleum Gas) (See Appendix 2)



*THE WEIGHTS AND MEASURES (MEASUREMENT OF PETROLEUM
AND OIL FUEL FOR TRADE) REGULATIONS, 2004*

SCHEDULE 2

(Regulation 4 (2))

Installation of Meters on Loading Racks using Top or Bottom Loading

Loading piping shall be designed to prevent drainage of liquid from the meter, and to ensure that the terminus of undelivered liquid will occur at the same point in the piping every time the flow through the meter is stopped by closing the normally used loading valve.

Figures 1 and 2 are schematic diagrams of typical meter installations at loading racks for low-vapour-pressure liquids which relates to top and bottom loading.

The recommendations for bottom loading island and truck equipment (Figure 3) are described in Recommended Practice 1004, Bottom Loading and Vapor Recover for MC 306 Tank Motor Vehicles. During bottom loading the loader is not required to be on top of the truck. However, since the filling of the vehicle compartment cannot be observed by the truck loader, the meter shall be equipped with a device preset to shut off the flow of product after a predetermined amount has been metered. Also, an overfill shutdown system should be provided in the event that too large a volume enters the preset device or that the vehicle compartment was not empty before loading commenced.

SCHEDULE 3

(Regulations 7 (3) and 12)

Installation of Meters on or to Bulk Storage Carriers

Figure 3 is a schematic diagram, which embodies the essential items of metering systems installed on tank trucks. All such installations shall include adequate gas (air or vapour) elimination equipment. Special consideration should be given to the design of tank outlet connections equipped for gravity delivery to minimize the entrance of air in the case of deliveries by gravity through a downstream side of the meter. In deliveries by truck pump, with delivery hose permanently attached to meter outlet and with the hose remaining liquid-filled, the air or vapour eliminator vent shall be piped to the top of the truck compartment, or to a suitable condensate tank.

Truck meters fed by a pump shall be equipped with back-pressure valves, or other suitable means, where an added back-pressure is required to make the air eliminator operate effectively and to keep the meter full of liquid.

To prevent drainage of the meter, gravity truck meters must be installed so that the outlet drain level is at a higher elevation than the body of the liquid in the meter.

Meters shall be installed in such a manner as to minimize the effect of vibrating strains and the possibility of mechanical damage.

SCHEDULE 4

(Regulations 7 (2), 10(2) and 13(5))

*Specification for Bulk Storage Compartment
Specification*

The compartment is a dipstick measuring system which is defined as any measuring equipment comprising a compartment with a datum surface and an associated dipstick with a datum face. The majority of such systems are used for delivery of petrol. For dipstick measuring system to function correctly it is important that the compartment is designed correctly.

Notes on Compartment Design

The following notes give guidance on some aspects of compartment design:

1. No air should be trapped on filling or liquid retained on emptying. This point must be considered in the design of battles and stiffeners.

SCHEDULE 4, *contd.*

2. Dividers between compartments should be designed to minimize deflection. The effect on liquid level will be greater on small compartments adjacent to large compartments. The liquid level should not alter by more than 3 mm when the adjacent compartments are empty or full. Compartments will be calibrated and tested using water, which is denser and more stable than hydrocarbon fuels.
3. Compartments should be symmetrical where possible. The direction of curvature of dividers should therefore be considered accordingly.
4. The dipstick and diptube should lie as near as practicable to the longitudinal and transverse centre lines of the compartment to minimize the effect of tanker tilt on the dipstick reading. Dipstick storage tubes, where fitted, should be positioned away from the transverse centre line of the compartment to avoid confusion.
5. The dipstick should reach to within 20mm of the bottom of the compartment below the diptube and should also show a wet dip when the compartment contains ½% of its nominal volume of liquid. Where necessary, dip sumps should be provided in compartments with sloping bottoms.

Principles of Construction of Dipstick

1. The cross-section area should not exceed 5cm, that is 25% of the minimum cross-sectional area of the dipstick guide tube.
2. The dipstick guide tube should have a continuous slot and is preferred to regularly spaced holes.
3. The dipstick should have a handle.
4. The compartment number and the tanker wagon code or licence number should be marked on either side of the blade at the cross-piece end.
5. The number on the dipstick should not extend more than 50% of the distance below the lower edges of two adjacent scale marks.
6. The bottom two and top three major scale divisions may be subdivided, providing that all the subdivisions are of equal value, are numbered and do not contravene the 50% rule.
7. A dipstick calibrated with only a maximum capacity should only be used for full compartment deliveries.

Manner of Use

1. The dipsticks should be accurately marked in units of length and the product level in each compartment should be determined by the use of the dipstick. The level would then be compared against a certified calibrated chart.
2. The liquid in the compartment should be allowed to settle before the dipstick is inserted.
3. The dipstick should be inserted slowly in the liquid in order to obtain a correct indication of height or quantity.

*Requirements under which the Bureau of Standards
will Certify a Tanker Wagon Compartment as a
Means to Measure Fuel for Use in Trade*

1. All compartments shall be fitted with operable internal (foot) valves.
2. The compartment shall be able to be completely drained so as to prevent any entrainment of liquid in the pipeline.

SCHEDULE 4, *contd.*

3. An entrainment test should then be done on the compartment with a small test measure (a 20 litre measure is suggested) which has a valid certificate issued by the Bureau of Standards.
4. After the entrainment test is passed, an amount of liquid is placed in the compartment. If the liquid is placed in increments, each level of liquid should be marked on the dipstick. In the case where the total quantity is transferred in one draft then only one mark is required.
5. A certificate will then be issued by the Bureau and will give particulars of the tanker wagon, identify the location of the compartment on the tanker wagon and quote the quantity established by calibration and the height at which that quantity is found. The height of the liquid in each compartment and the quantity found at that height is then to be clearly marked near the hatch of the compartment.
6. If any act or event occurs which may or does cause an alteration of the volume of the compartment then the owner or operator of the tanker wagon shall be required to have the tanker wagon re-certified by the Bureau before any further use of the compartment.

SCHEDULE 5

(Regulation 11)

Certification of Storage Tanks as a Medium Means of Measurement

1. Storage tanks shall be installed in accordance with existing applicable guidelines.
2. The owner shall present to the Bureau documentary evidence showing that the tank is not leaking.
3. Any storage tank to be used as means of measure shall be certified by the Bureau. The certification of these tanks shall be carried out by the Bureau or an agency accredited by the Bureau. Owners of these tanks shall inform the Bureau that they wish to have the tanks recertified if this is required before the prescribed period elapses. Recertification shall be done at intervals as prescribed by the Bureau.
4. Upon completion of the test—
 - (a) the person who presented the equipment for testing shall pay to the Bureau a fee calculated according to the formula set out in the Schedule below:

SCHEDULE

Formula for Calculation of Fee

$$\text{Cost per man hour} = \frac{\text{Salary per annum of inspector}}{\text{No. of hours per annum worked for Bureau}} \times \text{factor}$$

Note: The factor is based on the cost of the Bureau's operations during the last financial year preceding the date of the test.

- (b) If the equipment which is tested satisfies the requirement of these Regulations the Bureau shall issue a certificate.
5. The certificate shall include the levels at which various volumes of liquid are to be found.
6. The system can then be considered as a means of measurement and be used to determine the gross quantity of liquid removed or deposited as well as the amount in the custody of the owner/operator.

THE WEIGHTS AND MEASURES ACT

ORDER

(under First Schedule to Act)

THE WEIGHTS AND MEASURES (INTERNATIONAL DEFINITIONS)
ORDER, 1976

(Made by the Minister on the 31st day of May, 1976)

L.N. 176/76
Amdt:
L.N. 57B/77

1. This Order may be cited as the Weights and Measures (International Definitions) Order, 1976.

2. The metre, litre, kilogram, ampere, ohm, volt, watt and second shall for the purposes of measurements of length, capacity, mass, electricity and time have the meanings respectively assigned to each unit in the Schedule, being the meanings appearing to the Minister to reproduce in English the international definitions of or resolutions on the said units in force at the 31st day of May, 1976.

Schedule.

**THE WEIGHTS AND MEASURES (INTERNATIONAL DEFINITIONS)
ORDER, 1976**

SCHEDULE

(Paragraph 2)

DEFINITIONS OF UNITS OF MEASUREMENT

Measurement of Length

METRE

The metre is the length equal to 1 650 763.73 wavelengths in vacuum of the radiation corresponding to the transition between the levels $2p_{10}$ and $5d_5$ of the krypton 86 atom.

(General Conference of Weights and Measures held in Paris in 1960).

Measurement of Capacity

LITRE

The litre is a special name for the cubic decimetre (dm^3) that is to say 1 litre = dm^3 exactly.

(General Conference of Weights and Measures held in Paris in 1964).

Measurement of Mass

KILOGRAM

The kilogram is the unit of mass represented by the mass of the international prototype kilogram.

(General Conference of Weights and Measures held in Paris in 1901).

Measurement of Electricity

AMPERE

The ampere is the constant current which, if maintained in two straight parallel conductors of infinite length and of negligible circular sections and placed 1 metre apart in vacuum, will produce between the conductors a force equal to 2×10^{-7} M.K.S. units of force per metre of length.

(General Conference of Weights and Measures held in Paris in 1948).

OHM

The ohm is the electrical resistance between two points of a conductor when a constant difference of potential of 1 volt applied between the two points produces in the conductor a current of 1 ampere, the conductor not being the seat of any electromotive force.

(General Conference of Weights and Measures held in Paris in 1948).

VOLT

The volt is the difference of electrical potential between two points of a conducting wire carrying a constant current of 1 ampere when the power dissipated between these two points is equal to 1 watt.

(General Conference of Weights and Measures held in Paris in 1948).

WATT

The watt is the power which gives rise to the production of energy at 1 joule per second.

(General Conference of Weights and Measures held in Paris in 1948).

Measurement of Time

SECOND

The second is the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom.

(Thirteenth General Conference of Weights and Measures held in Paris in 1967).

NOTE—The reference in relation to each definition to a General Conference of Weights and Measures is a reference to the General Conference of Weights and Measures (convened by the International Bureau of Weights and Measures) at which that definition was recognised.