point weights at test load •L;

(i) the following indications :

- indication at zero (I_0);
- indication of test load (I_L);

(j) calculate :

- initial zero error E_0;
- error at test load (E_L);

(k) change in location

and apply all necessary corrections resulting from variations of temperature, pressure, etc. between the various measurements.

Immediately repeat steps 1 and 2 four more times and determine and record the average value of the error for the five tests.

Subsequent measurements

After observing the time between measurements requirement repeat the test sequence 1 to 2 once recording the data above unless :

(a) either the result is outside the maximum allowable variation; or

(b) the range of the five readings of the initial measurement is more than 0.1 d, in which case continue four more times repeating steps 1 and 2 recording the data above and determine and record the average value of the error of the five tests.

The measurements shall continue until there are at least 8 measurements except where the difference of the results indicates a trend more than half the allowable variation specified, the measurements shall be continued until the trend comes to rest or reverses itself, or until the error exceeds the maximum allowable variation.

EIGHTH SCHEDULE

SPECIFICATIONS FOR MEASURING INSTRUMENTS

[See *Rule 13*]

General requirements

(a) A measuring instrument shall be of such material, design and construction as to ensure, under normal working conditions, the following requirements :—

(i) accuracy is maintained,

(ii) operating parts continue functioning satisfactorily, and

(iii) adjustment remains reasonably permanent.

(b) A measuring instrument shall not be stamped unless it is complete with all parts and attachments concerned with the operation of measurement and delivery.

(c) Where an instrument has interchangeable or reversible parts, their interchange ability or reversal shall not affect the accuracy of the instrument.

(d) Every measuring instrument of fixed type shall be so installed that the viewer can readily obtain a clear and unobstructed view of the indication of measurement and delivery.

(e) The design and construction of measuring instrument shall be such as would prevent, as far as possible tampering with the accuracy of the instrument either by inadvertent use or otherwise.

PART I

VOLUMETRIC CONTAINER FILLING MACHINES

1. Description

(a) A volumetric container filling machine shall consist of a basin or basins, the capacity of each of which shall depend on the

capacity of the containers, which is intended to be filled. The operation shall consist of first filling the machine to the required level and then emptying out the contents into the container or containers.

(b) The machine shall have any one or more of the following capacities :—

1, 2, 5, 10, 15, 20, 50, 100 and 200 litres.

2. General requirements

(a) The design of the filling machine shall be such that the measured quantity shall be entirely drained out on opening of the delivery valve.

(b) The basin shall be provided with adequate sight glasses, observation windows, cut-off valve or other means indicating clearly that the basin or basins are properly filled.

(c) The basin shall be provided with a suitable device such as a displacer to enable adjustment of the capacity of the basin.

(d) Every flexible hose for discharging liquid from the basin together with the rigid delivery pipe which empties itself on discharge, shall be so arranged as to provide for ready and adequate drainage of the liquid.

(e) The filling machine shall be rigidly fitted on a stand.

(f) The walls of the basin shall be strong enough as not to cause any appreciable deflection due to the pressure of the liquid.

3. Tests

(a) A volumetric container filling machine shall be tested under the actual working conditions with a suitable liquid preferably the one which the instrument is intended to deliver.

(b) Before checking a volumetric container filling machine, the inside of the basin or basins and the discharge hose and pipe shall be wetted by filling the machine and emptying.

(c) For testing volumetric container filling machines check measure of appropriate capacity shall be used.

(d) The check measure shall be tested, for accuracy, against a working standard capacity measure of appropriate capacity and accuracy.

(e) The procedure for testing the accuracy of volumetric container filling machines shall be as follows :—

(i) The machine shall be filled to the full capacity.

(ii) The contents of each container of the machine shall be measured with a check measure/measures and the quantity so measured will indicate whether the capacity is within or beyond the maximum permissible error.

(iii) If the capacity is beyond the maximum permissible error, the container shall be adjusted until the errors are brought within the permissible limits; and the test shall be repeated until the filling machines give two consecutive deliveries within the maximum permissible error.

4. Maximum permissible error

Capacity	*Error in excess only*
10 litres and above	0.1 per cent
below 10 litres	0.2 per cent

5. Sealing

The volumetric container filling machines shall be provided by the manufacturer with a plug/plugs or stud/studs of such soft metal to receive the stamp or seal of the verifying authority. Such plug/plugs or stud/studs shall be provided in a conspicuous part of the machine and shall be made in such a manner as to prevent its removal without obliterating the seal/seals. The adjusting device also shall be properly sealed so as to avoid any tampering of capacity.

PART II

BULK METERS

1. General

(a) This Part deals with the accuracy requirements for bulk meters used in petroleum trade.

(b) Bulk meters shall not have a capacity below 100 litres.

2. Definitions

(a) *Pressure drop*—The difference between the inlet and outlet pressures of the meter is the pressure required to force liquid through the meter and overcome its resistance to movement.

(b) *Hydraulic slip or slippage*—That quantity of liquid which passes through the meter without causing any registration.

(c) *Flow range*—That portion of the meter's total flow capacity in which it operates to meet the required degree of accuracy in measurement.

3. Types and construction

(a) Bulk meters used for measuring liquid petroleum products shall be positive displacement meters in which the liquid under a positive pressure head causes the measuring elements in the meter to rotate, reciprocate or otherwise move through and defined volumetric displacement before the liquid passes from the meter. This movement is interpreted through a train of gears on a register as a measure of liquid volume.

(b) Meters differ widely in construction, but in general they may be divided into the following two main classes :

(i) Capillary seal meter—Capillary seal meters which may either be of reciprocating, rotary or other types are sealed with a thin film of the liquid being measured and are usually characterized by a relatively low pressure-drop.

(ii) Packed or mechanical seal meter—'Packed or mechanical seal meters' which are always of the reciprocating piston type are sealed by a suitably designed piston ring or washer to prevent 'slip' or leakage. They have a higher pressure-drop than capillary seal meters.

(c) Capillary seal meters are generally preferable for installation where gravity discharge is essential. Both 'packed' and capillary seal meters are suitable for pressure discharge.

(d) Meters are usually constructed of aluminium, aluminium alloys, bronze, brass or gun metal and stainless steel or special steels for certain small components. Carbon bearings and carbon vanes are also used since they operate satisfactorily without lubrication.

(e) Meters are sometimes fitted with automatically or manually operated temperature compensating devices. These devices correct the expansion or contraction of the liquid being measured with change of temperature and directly indicate the volume which the liquid would occupy at a standard temperature. The devices are satisfactory when the liquid temperature remains substantially constant; but when marked fluctuations in temperature occur, they should be used for accurate measurement only when their response to temperature change is very rapid.

4. Meter installation

The installation of the bulk meter has a direct bearing upon its operation and such characteristics as the rate of flow and accuracy may be seriously affected if it is not correctly installed. It is, therefore, essential that where possible the layout be based on the following :

(i) Meters shall be protected by a strainer or filter and an air eliminator fitted as close to the inlet as possible so as to remove all particles which are injurious to the meter and which might impair its accuracy. They shall not be at a lower level.

(ii) The pipe work shall be so arranged that the strainer, air separator and meter cannot be accidentally drained.

(iii) All pipe work and fittings shall be cleaned and flushed out to remove scale and foreign matter before installing the meter.

(iv) The meter shall be mounted securely on a horizontal base using rubber mounting pads to reduce shock and vibration where these are likely to occur.

(v) Inlet and outlet pipe work shall not exercise strain on the meter body. Acute bends, toes and elbows shall be avoided as far as

possible.

(vi) The layout shall be so designed as to facilitate removal of the meter without unnecessarily disturbing the pipe work and sufficient space shall be provided to allow for meter calibration, cleaning and small servicing requirements.

(vii) If pipe jointing compounds are used, these shall be applied to the male parts not to female. It is vital not to allow any compound to enter the meter.

(viii) The meter shall be located so that the register is clearly readable by the operator from the control point.

(ix) Flow control valves, when fitted, shall be installed adjacent to the outlet of the meter. If a valve is installed on the inlet side, it shall be located at a sufficient distance on the upstream side to ensure a uniform steady flow through the meter when the valve is throttled.

(x) Pulsating flow, such as that caused by piston pumps, shall be avoided, if this is not possible to achieve, a surge tank or alleviator should be installed upstream of the meter(s).

(xi) Meters shall not be installed on the function side of pumps.

5. Tests

(a) All meters shall be tested under conditions which duplicate normal operating conditions as closely as possible particularly in respect of rates of flow and the product involved.

(b) Before commencing checking of a meter, the meter shall be run for several minutes to ensure that all units are functioning smoothly.

(c) For testing of meters, a proving tank shall be used. The capacity of the proving tank shall be sufficient in size to contain at least one minute's flow through the meter at its normal operating rate when used for bulk loading. The proving tank shall be tested against the working standard capacity measure of appropriate capacity.

(d) The procedure for testing shall be as follows :—

(i) After all connections have been made fill the proving tank once with the full quantity in order to wet all surfaces, to fill the discharge hose and to ascertain that there are no leaks in the connection;

(ii) Empty the proving tank and close the outlet valve after it is completely drained;

(iii) Set the meter dial to zero reading;

(iv) Fill the proving tank through the meter to a point where the meter dial records the capacity of the proving tank. If the meter is fitted with an automatic presetting device, set this to deliver the capacity of the proving tank;

(v) Note the reading on the graduated gauge glass of the proving tank, which would show that the meter is, within or beyond the maximum permissible error;

(vi) If it is beyond the maximum permissible error, adjust the meter until the errors are brought within the permissible limits;

(vii) Repeat steps (ii), (iii), (iv) and (v) until the meter gives two consecutive deliveries within the maximum permissible error.

(viii) If the meter has been found to give accurate measure in the initial test itself, make at least one more test to check the accuracy recorded.

6. Maximum permissible error

(a) The errors shall not exceed ± 0.1 per cent for any quantity discharged.

(b) The bulk meter shall be complete with all parts and attachments concerned with the operation of measurement and delivery.

7. Marking

(a) Every bulk meter shall be conspicuously, clearly and prominently marked with the following indications :—

(i) registering capacity;

(ii) name or registered trade mark of the manufacturer;

(iii) identification number.

(b) The bulk meter shall be provided with a plate fastened in a prominent place to receive the markings mentioned in (a) above and to receive the stamp of the Legal Metrology Officer's seal.

8. Sealing

Every bulk meter shall be provided with a suitable sealing arrangement to receive the stamp or seal of the verification authority.

PART III.

WATER METERS (DOMESTIC TYPE)

1. General

This Part applies to water meters intended for metering potable cold water with threaded end connections and of nominal sizes upto and including 50 mm. The part applies to both wet dial and dry dial meters.

2. Terminology

(i) *Nominal pressure*

The internal pressure, expressed in MPa corresponding to the maximum permissible working pressure.

(ii) *Flow rate*

The volume of water passing through the water meter per unit of time; the volume being expressed in litre and the time in hours, minutes or seconds.

(iii) *Flow delivered*

The total volume of water which has passed through meter in a given time.

(iv) *Maximum flow rate, qmax*

The highest flow rate at which the meter can function over limited periods without damage and without exceeding the maximum permissible errors and the maximum permissible value for loss of pressures, expressed in kl/h.

(v) *Nominal flow rate, Q_n*

Half the maximum flow rate, Q_{max}; expressed in kl/h. At the nominal flow rate Q_n, the meter should be able to function in normal use, i.e. in continuous and intermittent operating conditions, without exceeding the maximum permissible error.

(vi) *Minimum flow rate, Q_{min}*

The lowest flow rate at which the meter is required to give indications within the prescribed maximum permissible error. It is determined in terms of Q_n.

(vii) *Flow rate range*

The range limited by the maximum and the minimum flow rates (Q_{max} and Q_{min}). The range is divided into two zones called upper and lower zones, separated by the transitional flow rate Q_t.

(viii) *Transitional flow rate, Q_t*

The flow rate which divides the upper and lower regions of the flow range and the rate at which the maximum permissible errors become discontinuous.

(ix) *Pressure loss*

The pressure loss caused due to the presence of the water meter in the pipe line.

(x) *Water Meter-Dry Dial*

Meter in which the counter mechanism is isolated from water flowing through the meter.

(xi) *Water Meter, Wet-Dial Type*

Meter in which the complete counter unit is in contact with water flowing through the meter.

3. Nominal Sizes

Water meters shall be of the following nominal sizes :

15 mm, 20 mm, 25 mm, 40 mm and 50 mm.

The nominal size of the water meter shall be denoted by the nominal bore of its end connections.

4. Classes of Water Meters

The water meters are classified as Class A and Class B based on the maximum verification scale interval and metrological characteristics.

5. Materials and Manufacture

(1) *General :*

Water meters and their parts, especially parts coming in continuous contact with water shall be made of materials resistant to corrosion and shall be non-toxic and non-tainting. Use of dissimilar metals in contact under water shall be avoided as far as possible in order to minimize electrolytic corrosion.

(2) *Construction :*

The meters shall be constructed in such a way as to—

(i) give long service and guarantee against any fraud or tampering; and

(ii) conform with the provisions of these rules.

(3) *Body :*

The body shall be free from all manufacturing and processing defects, such as blow-holes and spongy structure and shall not be repaired by plugging, welding or by the addition of materials. The internal shape of the body shall ensure smooth flow of water and easy dismantling.

(4) *Registration Box :*

The registration box of dry-dial water meters shall be provided with one or two escape holes for minimizing the accumulation of condensed water. In the case of magnetic driven type or where the registration box and cap are integral with the body, no escape hole shall be provided.

(5) *Cap :*

Where the cap and registration box are integral, the material for cap shall be the same as used for registration box. The cap shall be so designed and fixed to the registration box as to avoid entry of water and dirt. The transparent window which covers the dial shall be inserted from the inside into the cap. The protective lid shall be secured by a robust hinge or other suitable method of robust construction. Cap ring where applicable should be of the same material as of the cap.

(6) For dry type water meters, the transparent window covering the dial shall be provided with a wiper on the inner side for wiping off condensed water.

(7) *Connections :*

The meter casing shall be fitted in the pipe line by means of two cylindrical nipples or tailpieces with connecting nuts which shall be provided with each meter. The internal diameter of the nipple where it connects the pipeline shall be equal to that corresponding to the nominal size of the meter.

(8) *Strainers :*

Water meters shall be provided with strainers. Strainers shall be of a material which is not susceptible to electrolytic corrosion. They shall be of corrosion resistant materials. They shall be rigid, easy to remove and clean and shall be fitted on the inlet side of the water meter. It shall be possible to remove and clean the strainer in such a way as not to permit disturbing the registration box or tampering with it. The strainer shall have a total area of holes not less than twice the area of the nominal inlet bore of the pipe to which the meter is connected. However in the case of meters provided with internal strainer, involving opening of the registration box for cleaning, an additional external strainer shall be fitted on the inlet side satisfying the above requirements.

(9) *Impellers and pistons :*

Impeller and impeller shaft assembly shall rest on a self-lubricating, lubricating with low frictional resistance.

(10) Rotary or oscillating pistons in the case of semi-positive type meters shall be of non-absorbent material, such as vulcanite or ebonite. Pistons shall be accurately finished and shall operate freely.

(11) Impeller or Measuring Chamber:

The impeller or measuring chamber shall be of a corrosion resistant material and shall be rigid and shall not change its form as a result of internal stresses or with use.

(12) Gears and pinions :

Gears and pinions shall be so constructed properly and smoothly mesh with each other and shall be firmly fitted on their shafts.

(13) Bearings :

Impeller bearings shall be suitably ground and polished. The shape of the impeller bearing shall be such as to prevent the penetration of particles of sand and to preclude the deposit of anything in solution or suspension in water and to facilitate the washing way of such deposits by the water flow. The shafts of the gears shall revolve freely in their bearings. The length of the bearings shall ensure their effective operation.

(14) Counter :

The non-reversible counter shall be of the circular multi-pointer pattern with all pointers reading clockwise or straight reading cyclometer type or a combination of pointer and cyclometer. The rollers of the counters shall be made of specially suitable for the purpose and shall be self-lubricating. The pointers made of suitable materials shall be soldered to the spindle.

(15) Dial :

The dial shall be of vitreous enamel powder coated on copper or plastics ensuring indestructible marking and good legibility.

(16) Regulator :

Every meter shall be provided with a regulator. The regulator accessible from outside shall be operated by a key without dismantling the meter and not without breaking the seal. The internal regulating device shall not be accessible from outside.

(17) Location of Serial Number :

The serial number of the meter shall be clearly indicated on the screw cap or in any other suitable place.

(18) Frost Protection Device :

Meters liable to be damaged by frost when so ordered by the purchaser shall be protected with suitable frost protection device.

6. Indicating device

(1) Indicating device shall be able to record 9999 kl (minimum) for meter size of 15, 20, and 25 mm and 99999 kl (minimum) for size 40 and 50 mm and shall thereafter indicate zero.

(2) The indicator shall allow, by simple juxtaposition of its various constituent elements, a reliable, easy and unambiguous reading of the volume of water measured, expressed in litres. The volume is indicated by one of the following systems :—

(i) the position of one or more pointers or circular scales;

(ii) reading of a row of in-line consecutive digits in one or more apertures;

(iii) a combination of these two systems.

(3) The kilolitres and its multiples shall be indicted in black and sub-multiples of the kilolitres in red. This colour coding applies to the pointers on circulars scale type indicting devices and to the drum in in-line digit indicting devices. The actual or apparent height of the digits on the drums shall not be less than 4 mm.

(4) For digital indicators the visible displacement of all digits shall be upward in value. The advance of any given digital unit shall be completed while the digit of the immediately next lower value describes the last tenth of its travel.

(5) The drum showing the digits of lowest value may move continuously. The whole number of kilo-litres shall be clearly indicated.

(6) Indicators with pointer shall be non-reversible and rotate in a clockwise direction. The value in litres for each scale division shall be expressed as 10n, wherein n is a positive or

negative whole number or zero, thereby establishing a system of consecutive decades. Each scale shall be either—

(i) graduated in values expressed in litres, or

(ii) accompanied by a multiplying factor (x.001, x.01, x0.1, x1, x10, x1000, etc.)

(7) In both cases (dial and digital indicators)—

(i) the unit symbol 'KILO-LITRES' shall appear either on the dial or in the immediate vicinity of the digital indication;

(ii) fastest-moving visible graduated element, the control element, the scale interval of which is known as the "scale interval", shall move continuously.

(8) The length of scale interval shall be not less than 1 mm and not more than 5 mm. The scale shall consist—

(i) either of lines of equal thickness not exceeding one quarter of the distance between the axes of two consecutive lines and differing only in length, or

(ii) of contrasting bands of a constant width equal to the length of the scale division.

(9) The width of the pointer index tip shall not exceed one quarter of the distance between two scale divisions, and in no case shall it be greater than 0.5 mm.

(10) Value of Scale Division

(i) Value of scale interval for Class 'A' and Class 'B' meters shall be as given in Table 1.

TABLE 1

VALUE OF SCALE INTERVAL

Meter Size	*Maximum Value of Scale Interval in litre*	
	Class A	*Class B*
15	0.2	0.2
20	0.5	0.2
25	1.0	0.5
40	2.0	1.0
50	2.0	2.0

(ii) *Accelerating Device*

The use of an acceleration device for increasing the speed of the meter below Q_{min} is prohibited.

7. Technical characteristics

(1) Pressure tightness

A meter shall be able to withstand constantly without defects in its functioning, leakage, seepage through the walls or permanent deformation, the continuous water pressures of (i) 1.6 MPa for 15 minutes, and (ii) 2 MPa for 1 minute, when tested in accordance with the procedure described in Annexure A.

(2) Loss of pressure

Loss of pressure through the meter when determined in accordance with the procedure described in Annex. A shall not exceed 0.025 MPa at the nominal flow rate Qn and 0.1 MPa at the maximum flow rate, Q_{max}.

Note : Nominal flow rate Q_n shall be taken as per Table 2 and maximum flow rate Q_{max} as twice the nominal flow rate.

(3) Temperature suitability

This test shall be carried out in accordance with the procedure described in Annexure A. This test is to be carried out for Model approval only.

8. Metrological characteristics

(1) Metering accuracy

The maximum permissible error in the metering accuracy, when determining as per the procedure described in Annexure A shall be as under :—

(i) In the lower region of flow, Q_{min} (inclusive) to Q_t (exclusive) $\pm$ 5%

(ii) In the upper region of flow, Q_t (inclusive) to Q_{max} (inclusive) $\pm$ 2%

Note : Value of Q_{min}, Q_t and Q_{max} for the three classes of water meters are given in Table 2.

(2) Minimum starting flow

The minimum flow at which the meter starts registering shall be as given in Table

TABLE 2

NOMINAL FLOW, MINIMUM STARTING FLOW RATE, TRANSITIONAL FLOW RATE AND MAXIMUM FLOW RATE VALUES

Meter Size	*Nominal Flow rate Qn kl/h*	*Minimum Starting Flow rate Qmin 1/h*		*Transitional Flow rate Qt in l/h for*		*Maximum Flow rate Qmax kl/h*
		Class A	*Class B*	*Class A*	*Class B*	
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
15	1.5	60	30	150	120	3
20	2.5	100	50	250	200	5
25	3.5	140	70	350	280	7
40	10	400	200	1000	800	20
50	15	600	300	1500	1200	30

2 for the two classes of water meters. The test shall be carried out in accordance with the procedure described in Annexure A.

(3) Tests during verification

(i) Loss of pressure

(ii) Metering accuracy

(4) Model approval tests

In addition to all tests mentioned for verification, the following additional tests shall be carried out :—

Constructional details, Pressure tightness, Life test (Accelerated Endurance test, Temperature suitability test) and temperature suitability test. It shall be carried out in accordance with the procedure described in the Annex. A.

(5) After the meter has undergone the life test, they shall again be subjected to metering accuracy test and pressure tightness test and the meter shall be deemed satisfactory only when their performance fulfils the requirements.

9. Marking

Each water meter shall be marked with the following information :—

9(i) Manufacturer's name or trademark,

9(ii) Nominal size of the meter,

9(iii) Direction of flow of water on both sides of the meter,

9(iv) Accuracy class,

9(v) Serial number,

9(vi) Model approval number, and

9(vii) Year of manufacture.

10. Sealing

Sealing holes shall be provided with a suitable sealing arrangement to receive the seal of the verification authority and the meter shall be sealed in such a manner as to render it impossible to obtain access to the measuring unit without breaking the seals. The sealing wire shall be rust-proof.

ANNEXURE 'A'

FLOW TESTS

1. Metering Accuracy Test

(1) After preliminary running and setting, allow the water to pass through the meter in such a way that flow rates corresponding to the values given in Table 2 for Qmax, Qt, Qmin and Qn are achieved. This may be accomplished by manipulating the inlet valve or outlet valve for finer adjustment. For each of the flow rate the reading on the meter(s) shall be compared with the volume collected in the measuring tank. The test shall be carried out at least at three intermediate rates, coverihg the above ranges.

(2) The error shall then be computed as under :—

$$\text{Percent error} = \frac{V_i - V_c}{Vc} \times 100$$

Where

V_i = Volume of water collected in the water tank, and

V_c = Volume of water indicated on individual meter.

Metering accuracy shall also be calculated and reported separately for the following discharges :—

(i) Q_{max},

(ii) Q_t, and

(iii) Q_{min}

Notes :

1. The metering accuracy test at Qn may be done if required by the purchaser.
2. Recording of volume of water in the meter at Qmin shall be deemed as meter complying with the 'minimum starting flow test'.

2. Loss of Pressure Test at Q_n and Q_{max}

This test may be carried out concurrently with the metering accuracy test at Q_n and Q_{max}.

The meter shall be tested for loss of pressure within the meter at nominal flow rate Q_n and maximum flow rate Q_{max}. The loss of pressure should not exceed 0.025 MPa and 0.1 MPa respectively at the above two stages. (For value of Q_n and Q_{max}).

The pressure loss within the meter may be measured with the help of manometer or differential pressure gauge or pressure gauges provided each at up-stream and down-stream.

While the meter(s) are being tested for accuracy at Q_n and Q_{max}, the readings between the up-stream and down-stream in the pressure gauges P_1 and P_2 or manometers shall be taken for the purpose of computing the value of loss of pressure within the meter. In case one meter is being tested the difference between the pressure gauge reading of P1 and P2 or the differential pressure shown by the differential pressure gauge/manometer shall be the loss of pressure within the meter.

In case loss of pressure is being measured for more than one meter at a time, the difference between the readings of P_1 and P_2 be divided by number of meters to obtain the loss of pressure in an individual meter. This, however, shall contain the line loss(es) contributed by the connecting pieces between the two meters. For an accurate approach line loss(es) may be measured by joining the up and down-stream spacers/pipe faces together in the absence of the meter/s (carefully avoiding protrusion into the pipe bore or misalignment of the two faces), and measuring the pipe pressure loss/line losses of the measuring section for each test at appropriate flow rates.

While computing loss of pressure, across 1 or N number of meters tested in series, the loss registered by spacers/pipes in line losses be subtracted from the total value of pressure loss registered by difference between the readings of pressure gauge at up-stream and down-stream to obtain the value of loss of pressure across 1 or N number of meters.

3. Pressure Tightness Test

The meter(s) shall be subjected to hydrostatic continuous water pressure of—

(1) 1.6 MPa for 15 minutes, and

(2) 2.0 MPa for 1 minute.

Note : Only when the meter has qualified for (1) above, it should be subjected for the test for (2) above.

After mounting the meter(s) on the test bench, the pump or the pumping medium should be switched on to let the water flow through the meter(s) and the air is purged out of the system. The down-stream valve should then be closed. The pressure shall then start building up and should be maintained at the above value for the given time. The meter should withstand constantly the above pressure without defects in its function, leakage, seepage or permanent deformation.

Note : The meter(s) may be tested individually or in series.

4. Test equipment for Temperature Suitability Test

For carrying out the temperature suitability test, a container of appropriate dimensions fitted with heating elements, and temperature control device to maintain temperature at 45°C ± 1°C shall be used.

5. Temperature Suitability Test

As a general rule, at least one meter shall be put to temperature suitability test every three months and records maintained. The meter for test may be selected at random.

The meter which has qualified the technical and metrological characteristics, shall be taken and placed in the test equipment meant for temperature suitability test maintained at 45°C ± 1°C. It should be kept there for 10 hours. While the meter is immersed in water dust cap or device stopping entry of water inside wet chamber of the meter be removed.

After 10 hours of continuous immersion at 45°C ± 1°C the meter shall be taken out and kept for some time in the open to acclimatize it at the ambient temperature. It shall then be rested again for flow test and pressure tightness test. They shall be deemed satisfactory if their performance after the temperature suitability test satisfies the above requirements.

Note : In case any material/design changes are carried out, this test shall be performed and checked for satisfactory performance before introducing the change(s) on mass scale production.

6. Test equipment for Life Test

The test equipment shall consist of the following :—

(a) A centrifugal pump along with regulating valves capable of delivering water at the rate of Q_n through two water meters in series,

(b) A suitable horizontal test bench, and

(c) A pressure gauge of appropriate range.

7. Life Test (Accelerated Endurance Test)

Two unopened meters in each size and class, selected at random shall be subjected to the life test every six months, in accordance with the requirements specified in Table.

Note : Meter(s) may be tested individually or in series.