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# *Indian Standard*

# SPECIFICATION FOR STAINLESS STEEL ROAD MILK TANKERS

## *( First Revision )*

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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# *Indian Standard*

# SPECIFICATION FOR STAINLESS STEEL ROAD MILK TANKERS

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# *Indian Standard*

# SPECIFICATION FOR STAINLESS STEEL ROAD MILK TANKERS

# *( First Revision )*

## 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 30 July 1976, after the draft finalized by the Dairy Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

**0.2** The road milk tankers are used to transport by road pre-cooled milk in bulk form. The tankers are designed to be mounted on trucks or built on a semi-trailer. Pre-cooled milk is held in these tankers within the required temperature limits for long hauls. The capacity and the type of tanker has to be decided on the basis of the volume of the milk to be moved, the distance to be covered, the weather condition and the road regulations.

**0.3** The purchaser is also required to make arrangements for the truck chassis or the semi-trailer, get the drawings and axle loads approved by the local transport authorities, as well as arrange to mount the tanker thereon.

**0.4** The overall dimensions of the road milk tanker with accessories shall not in any way infringe the local transport authority regulations in force from time to time.

**0.5** This standard covers the tanks made from stainless steel only. Another standard for tanks made of different materials may be formulated later when sufficient data on their suitability are available.

**0.6** This standard contains clauses **6.3.1**, **8.6**, **11.2** and **11.3** which call for agreement between the purchaser and the supplier.

**0.7** This standard was first issued in 1963. The various provisions of that standard have come under review of the Dairy Equipment Sectional Committee from time to time in view of the multiplicity of capacities and designs due to increased usage of road milk tankers in the country. The present revision has been taken up with a view to bringing the standard up-to-date. In this revision, typical figures and dimensions of road milk tankers have been included, most desirable capacities have been specified and the various requirements have been made more elaborate. While preparing this revision, Amendment No. 1 to IS : 2492-1963 has also been taken into consideration.

**0.8** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## 1. SCOPE

**1.1** This standard prescribes the requirements of tanks and fittings for road milk tankers with inner tanks fabricated from stainless steel.

**1.1.1** This standard does not cover specification for the truck chassis or semi-trailer, its running gear or its accessories or any parts thereof.

## 2. GENERAL DESCRIPTION

**2.1** The tanks shall consist of the inner vessel, insulation outer casing, fittings and mountings, and supports for mounting the tank on the truck chassis or semi-trailer.

## 3. CAPACITY

**3.1** The nominal brimful capacity of rigid truck chassis-mounted tanks shall be 8 000 to 8 500 litres, depending on the use of single compartment, double compartment and triple compartment.

**3.2** The nominal brimful capacity of the semi-trailer mounted tanks shall be 12 500 to 13 000 litres depending on the use of single compartment, double compartment and triple compartment.

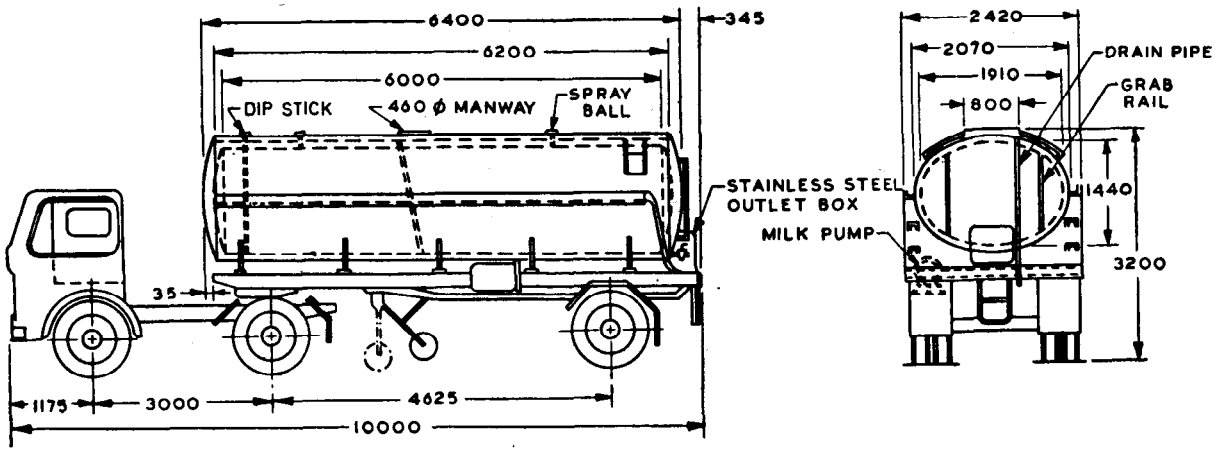
## 4. SHAPE

**4.1** Inner vessel and outer casing shall be of horizontal cylindrical, elliptical shape with dished or conical ends. The mountings should be such that each compartment shall have a positive slope towards its outlet for ensuring complete drainage of the contents from the compartment.

## 5. DIMENSIONS

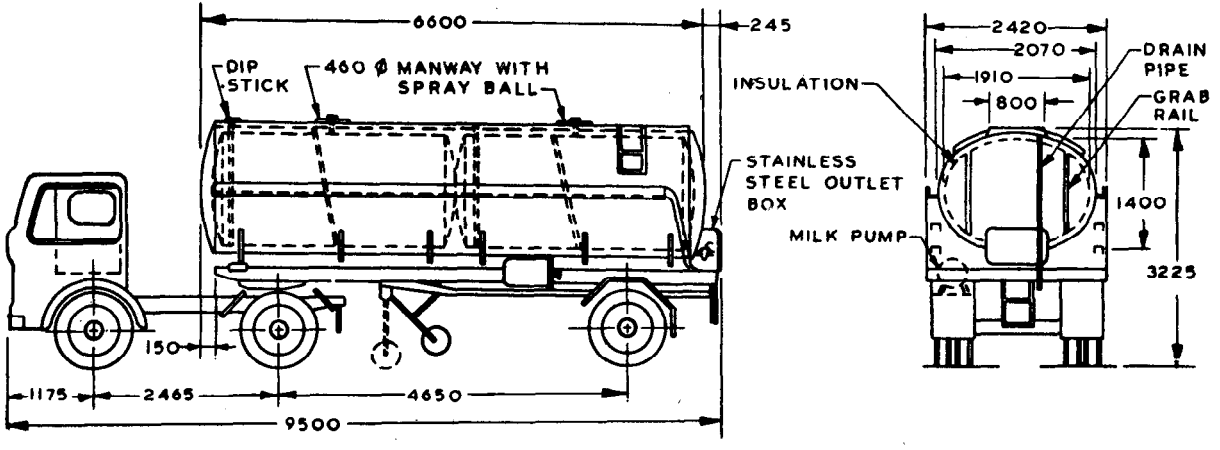
**5.1** The typical dimensions and general arrangements of semi-trailer-mounted road milk tankers having single, double and triple compartments are given in Fig. 1, 2 and 3 respectively.

*Rules for rounding off numerical values (*revised*).



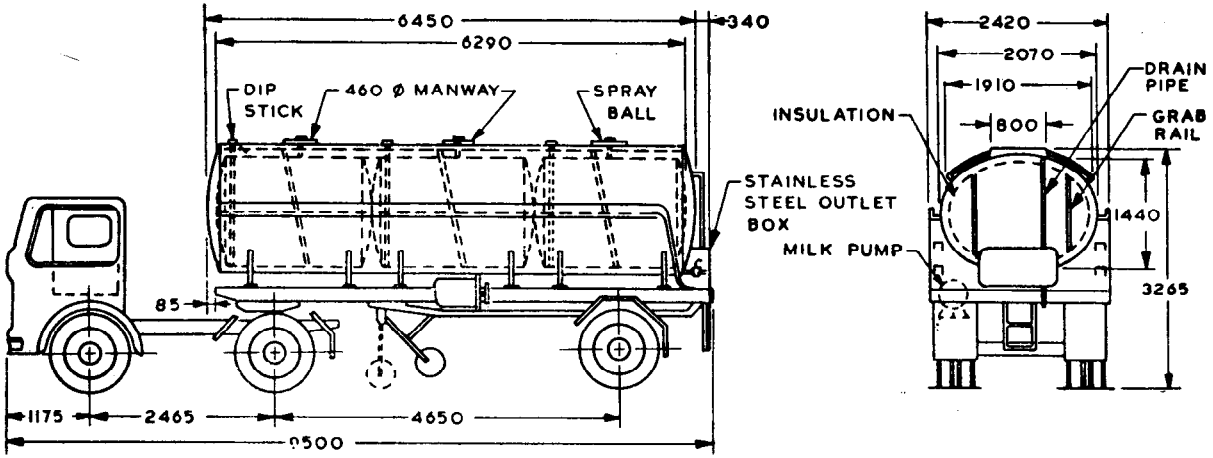

All dimensions in millimetres.

FIG. 1 SEMI-TRAILER-MOUNTED ROAD MILK TANKER WITH SINGLE COMPARTMENT




All dimensions in millimetres.

FIG. 2 SEMI-TRAILER-MOUNTED ROAD MILK TANKER WITH DOUBLE COMAPRTMENT




All dimensions in millimetres.

FIG. 3 SEMI-TRAILER-MOUNTED ROAD MILK TANKER WITH TRIPLE COMPARTMENT

**5.1.1** The mass distribution for semi-trailers of single, double and triple compartments are given in Tables 1, 2 and 3 respectively.

**5.2** The typical dimensions and general arrangement of truck chassis-mounted road milk tankers having single, double and triple compartments are given in Fig. 4, 5 and 6 respectively.

**TABLE 1 MASS DISTRIBUTION FOR SEMI-TRAILER-MOUNTED ROAD MILK TANKERS WITH SINGLE COMPARTMENT**

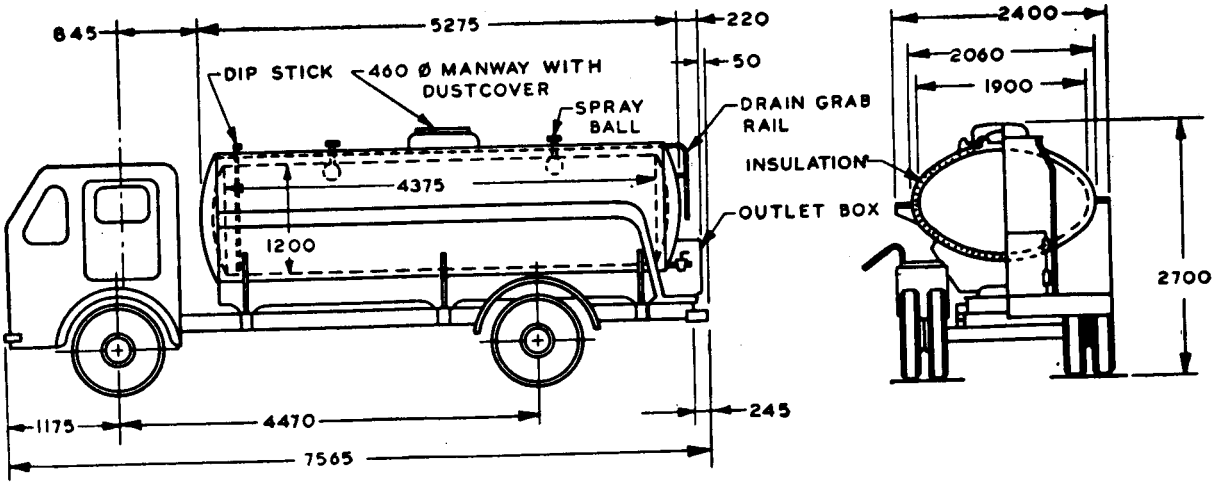
( *Clause* 5.1.1 )

| Sl No. | Item | Mass, kg | | | |
|---|---|---|---|---|---|
| | | Tractor Front Axle | Tractor Rear Axle | Trailer Axle | Total |
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Tractor with cab, crews, tools, etc | 2 620 | 1 640 | Nil | 4 260 |
| ii) | Trailer and fifth wheel | 70 | 765 | 1 680 | 2 515 |
| iii) | Empty tank & milk pump | 110 | 1 175 | 1 410 | 2 695 |
| iv) | Pay load of 13 000 litres of milk | 540 | 5 840 | 7 010 | 13 390 |
| v) | Total mass | 3 340 | 9 420 | 10 100 | 22 860 |
| vi) | Maximum load recommended by tractor & trailer manufacturers | 4 064 | 8 128 | 8 128 | 18 288 |
| vii) | Overload, percent | Nil | 15·85 | 24·31 | 25·00 |

**TABLE 2 MASS DISTRIBUTION FOR SEMI-TRAILER-MOUNTED ROAD MILK TANKERS WITH DOUBLE COMPARTMENT**

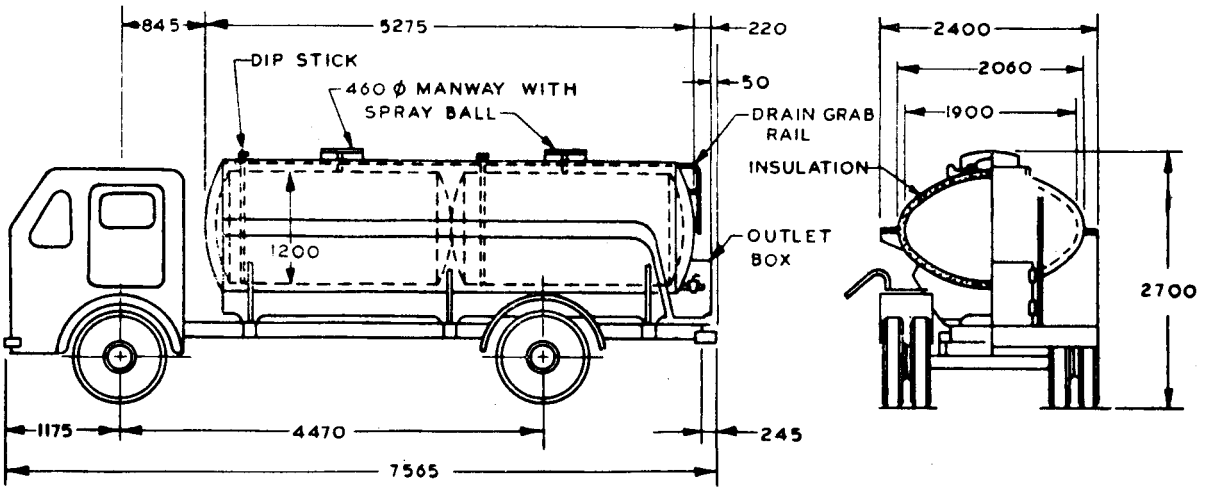
( *Clause* 5.1.1 )

| Sl No. | Item | Mass, kg | | | |
|---|---|---|---|---|---|
| | | Tractor Front Axle | Tractor Rear Axle | Trailer Axle | Total |
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Tractor with cab, driver, tools, etc | 2 490 | 1 640 | Nil | 4 130 |
| ii) | Trailer with fifth wheel | 60 | 745 | 1 680 | 2 485 |
| iii) | Empty tank & milk pump | 130 | 1 300 | 1 570 | 3 000 |
| iv) | Pay load of 13 000 litres of milk | 585 | 5 745 | 6 905 | 13 235 |
| v) | Total mass | 3 270 | 9 430 | 10 160 | 22 860 |
| vi) | Maximum load recommended by tractor trailer manufacturers | 4 264 | 8 128 | 8 128 | 18 288 |
| vii) | Overload, percent | Nil | 16·06 | 24·97 | 25·00 |



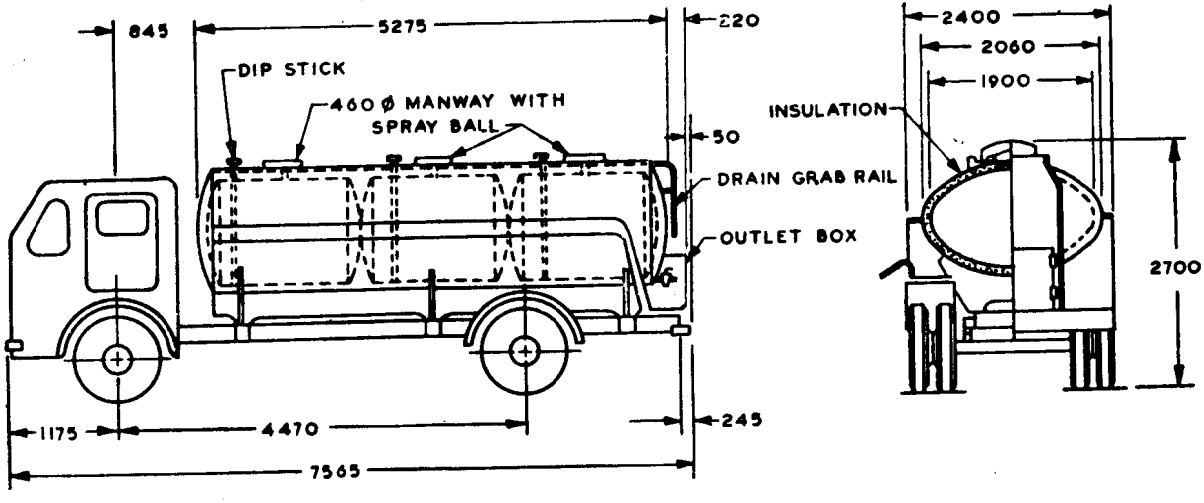

All dimensions in millimetres.

FIG. 4 TRUCK CHASSIS-MOUNTED ROAD MILK TANKER WITH SINGLE COMPARTMENT




All dimensions in millimetres.

FIG. 5 TRUCK CHASSIS-MOUNTED ROAD MILK TANKER WITH DOUBLE COMPARTMENT




All dimensions in millimetres.

FIG. 6 TRUCK CHASSIS-MOUNTED ROAD MILK TANKER WITH TRIPLE COMPARTMENT

TABLE 3 MASS DISTRIBUTION SEMI-TRAILER-MOUNTED ROAD MILK TANKERS WITH TRIPLE COMPARTMENT

( *Clause* 5.1.1 )

| Sl No. | Item | Mass, kg | | | |
|---|---|---|---|---|---|
| | | Tractor Front Axle | Tractor Rear Axle | Trailer Axle | Total |
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Tractor with cab, driver, tools, etc | 2 480 | 1 640 | Nil | 4 120 |
| ii) | Trailer and fifth wheel | 60 | 745 | 1 680 | 2 485 |
| iii) | Empty tank and milk pump | 140 | 1 365 | 1 640 | 3 165 |
| iv) | Pay load of 12 500 litres of milk | 650 | 5 640 | 6 790 | 13 080 |
| v) | Total mass | 3 355 | 9 395 | 10 110 | 22 860 |
| vi) | Maximum load recommended by tractor and trailer manufacturers | 4 064 | 8 128 | 8 128 | 18 288 |
| vii) | Over load, percent | Nil | 15·6 | 24·4 | 25·0 |

## 6. MATERIAL

**6.1** The inner vessel, manhole rim, manhole door, outlets and outlet valves, pressure and vacuum relief valves and internal ladder, if any, shall be made of stainless steel of Grade 07Cr18Ni9 of IS : 6911-1972*.

**6.1.1** The pressure and vacuum relief valves may also be made of rubber conforming to the requirement prescribed in **6.4**.

**6.2** The mild steel plates for construction of outer casing ( outer vessel ) shall conform to IS : 226-1975† or equivalent.

**6.2.1** The external ladder, tank supports, lifting hooks, hinges, bolts and nuts, etc, should be made from structural steel ( *see* IS : 226-1975† ).

**6.3 Insulation** — The insulation may be of glass wool or of plastic foam material or of any other suitable insulating material. However, the quality and thickness of the insulating material shall be such as to prevent in 24 hours a temperature-rise of not more than 2°C in the tank full of water when the difference between the temperature of water and that of the atmosphere is not more than 35°C. The insulating material should not be affected if the tank is sterilized by steam. The above temperature-rise shall not take into consideration the sensible heat that may be stored in the empty tank at the time of filling. Before recording the temperature, the

*Specification for stainless steel plate, sheet and strip.

†Specification for structural steel ( standard quality ) (*fifth revision* ).

water shall be gently agitated to make the temperature uniform within the tank.

**6.3.1** The material for insulation shall be as agreed to between the purchaser and the supplier.

**6.4** Material used for sealing shall be rubber of non-toxic, stable and non-absorbent quality and shall have smooth surface and shall not deteriorate when in contact with milk and cleaning agents. The rubber used should preferably be acrylonitrile butadiene copolymer ( NBR ) of type B3 or poly-chloroprene of type C3 of IS : 6450-1971*.

## 7. THICKNESS

**7.1** In both the types of tankers the thickness of the mild steel used for outer vessel shall not be less than 3 mm and the thickness of stainless steel for inner vessel shall not be less than 2 mm.

## 8. FITTINGS

**8.1 Vent** — One or two holes drilled in the outer vessel preferably at the bottom to act as breather vent for air temperaure in between the inner and outer vessel to provide protection during expansion or contraction according to temperature variations.

**8.2 Manhole** — A circular top manhole of a diameter not less than 450 mm shall be provided for each compartment. The manhole cover shall be hinged to manway rim and be of quick-release type. The cover shall be fitted with pressure and vacuum relief valves which are of easily cleanable type. The manhole shall also be provided with a dust cover of hinged and quick-release type. The dust cover shall be provided with a locking device.

**8.3 Tank Supports** — These shall be designed to suit the truck chassis or semi-trailer and shall be welded on either side of the tank for anchoring the complete tank to the supports of truck chassis or semi-trailer.

**8.4 Outlets** — One outlet of diameter 63·5 mm ( *see* IS : 3382-1965† ) shall be located at the bottom of each tank compartment with the discharge pipes of stainless steel with sufficient slope ending in 63·5 mm stainless steel two m-way valve of sanitary design ( preferably flanged type on one end and having union and liner on another ). Outlet valves shall be suitably housed in stainless steel boxes with padlock doors. Arrangements shall also be made for drainage of water from the boxes.

**8.5 Cleaning Devices** — Each compartment should have cleaning devices capable of cleaning the entire inside of the tank. These may be of spray ball or rotating turbine type in sanitary construction.

*Specification for rubbers for dairy industry.

†Specification for stainless steel milk pipes and fittings.

**8.6 Other Optional Fittings** — If desired by the purchaser, a sanitary milk pump with innerconnecting fittings, a roll of food quality rubber hose pipe with end fittings, hose rack, calibrated dip stick of stainless steel for measurement of volume, walk way and drainage tray ending in drain pipe to remove spilt milk as well as detergents, grab handles, side ladders on either side, supports, and electric light fittings shall be provided.

## 9. CONSTRUCTION

**9.1** The inner vessel shall be of welded construction with all inner welds ground smooth and polished to sanitary dairy finish. All corners shall have a radius of not less than 35 mm ( except the connection points between the inner and outer tanks at manhole, cleaning device, etc ) and ends other than those dished to shell, which shall have a radius of 6 mm. The ends shall be sufficiently stiffened in order to cope with the braking impacts. Adequate locking shall be provided between the inner and the outer vessel to prevent relative movement between the inner and the outer vessels.

**9.2** In case of non-fireproof insulating material being used, the welding of the outer vessel, when carried out in position at the time of assembly, should be done with special precaution so that the insulating material is not damaged. This may be done by suitable asbestos or fibre glass or other fireproof insulating materials with suitable thicknesses backing up the welded positions.

**9.3** The inner vessel and all attachments made from stainless steel shall preferably be welded by the inert gas arc welding process using argon as the shielding gas. The filler rods and the bare electrodes for this process shall conform to grade S-B01 of IS : 5856-1970*.

## 10. FINISH

**10.1** All internal welds of inner vessel shall be ground smooth and all internal surfaces polished to a smooth finish.

**10.2** All welds of the outer casing, wherever accessible, shall be ground. Welds on tank supports shall be cleaned. All surfaces shall be painted with an anti-rust primer, using non-corrosive filler where required. Two final coats of synthetic enamel paint shall be applied on the outer casing. The colour of the paint shall be as approved by the purchaser.

**10.3** All the welds on the outside surface of the inner vessel shall be suitably descaled.

**10.3.1** Inside of the outer casing shall be given proper anticorrosive treatment. The outer surface of the inner tank should also be given an anticorrosive treatment before applying the insulation.

*Specification for corrosion and heat-resisting chromium-nickel steel solid welding rods and bare electrodes.

## 11. TESTS

**11.1** The inner vessel after grinding the welds and finishing the surface prior to the application of insulation shall be tested for water tightness by subjecting it to a hydraulic pressure of 34 kPa* ( 0·35 kgf/cm$^2$ ) for 5 minutes.

**11.2** Radiographic test at the joints may be carried out as agreed to between the purchaser and the supplier ( *see* IS : 1182-1967† and IS : 4853-1968‡ ).

**11.3** The quality of the welds shall be tested by the dye penetration method ( *see* IS : 3658-1966§ ) and the acceptance limits may be as agreed to between the purchaser and the supplier.

## 12. MARKING

**12.1** The tank shall be marked legibly and permanently with the following particulars:

a) Manufacturer's name or trade-mark or initials,

b) Manufacturer's identification, and

c) Capacity of the tank.

**12.1.1** Each tank may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*100 kPa = 1·019 7 kgf/cm$^2$.

†Recommended practice for radiographic examination of fusion welded butt joints in steel plates ( *first revision* ).

‡Recommended practice for radiographic examination of fusion welded circumferential joints in steel pipes.

§Code of practice for liquid penetrant flaw detection.

# INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

**Base Units**

| QUANTITY | UNIT | SYMBOL |
|---|---|---|
| Length | metre | m |
| Mass | kilogram | kg |
| Time | second | s |
| Electric current | ampere | A |
| Thermodynamic temperature | kelvin | K |
| Luminous intensity | candela | cd |
| Amount of substance | mole | mol |

**Supplementary Units**

| QUANTITY | UNIT | SYMBOL |
|---|---|---|
| Plane angle | radian | rad |
| Solid angle | steradian | sr |

**Derived Units**

| QUANTITY | UNIT | SYMBOL | DEFINITION |
|---|---|---|---|
| Force | newton | N | 1 N = 1 kg.m/s$^2$ |
| Energy | joule | J | 1 J = 1 N.m |
| Power | watt | W | 1 W = 1 J/s |
| Flux | weber | Wb | 1 Wb = 1 V.s |
| Flux density | tesla | T | 1 T = 1 Wb/m$^2$ |
| Frequency | hertz | Hz | 1 Hz = 1 c/s (s$^{-1}$) |
| Electric conductance | siemens | S | 1 S = 1 A/V |
| Electromotive force | volt | V | 1 V = 1 W/A |
| Pressure, stress | pascal | Pa | 1 Pa = 1 N/m$^2$ |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