IS 2094 (Part 3) : 1999
(Superseding IS 4198)
Edition 1.1
(2000-03)

भारतीय मानक

बिटुमेन (तार) और इमल्शन के लिए हीटर — विशिष्टि

भाग 3 इमल्शन

Indian Standard

HEATER FOR BITUMEN (TAR) AND EMULSION — SPECIFICATION

PART 3 EMULSION

(Incorporating Amendment No. 1)

ICS 91.220.75.140

BUREAU OF INDIAN STANDARDS
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Price Group 3

Construction Plant and Machinery Sectional Committee, HMD 18

FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee, had been approved by the Heavy Mechanical Engineering Division Council.

Construction Plant and Machinery Sectional Committee had published the following Indian Standards:

IS 2093 : 1974	Specification for distributors for hot tar and bitumen (*first revision*)
IS 2094 : 1996	Heaters for bitumen (tar) and emulsion — Specification (*second revision*)
IS 4198 : 1967	Specification for emulsion spraying machine for roads

The above standards are related to the same subject and, therefore, the Sectional Committee while revising IS 2093 and IS 4198 decided that the revision of these standards be made as Part 2 and Part 3 respectively of IS 2094 and the existing IS 2094 : 1996 be treated as Part 1 of IS 2094. As per the decision, the standards now covered under IS 2094 shall be as under:

IS 2094 (Part 1)	Heater for bitumen (tar) and emulsion — Specification : Part 1 Bitumen heaters
IS 2094 (Part 2)	Heaters for bitumen (tar) and emulsion — Specification : Part 2 Bitumen sprayers
IS 2094 (Part 3)	Heaters for bitumen (tar) and emulsion — Specification : Part 3 Emulsion

Further, it was decided to withdraw the standards IS 2093 and IS 4198.

Distributors and sprayers for tar, bitumen and bitumen emulsion are key items of equipment in the pavement construction work, such as grouting, surface dressing and tack coats. The essential function of mechanical sprayers is to apply the binder evenly to a sprayer in accurately measured quantities and to continue to do so during the application of entire load irrespective of change of gradient and direction. Very accurate and even distribution of emulsion may not be possible with hand-sprayers, although reasonably uniform results may be obtained with such sprayers by proper control and supervision. This standard covering hand-sprayers and mechanical sprayers for bitumen emulsion has been prepared with a view to assisting the users in obtaining sprayers capable of distributing emulsions uniformly to the specified standard and having satisfactory mechanical efficiency.

This standard includes a number of requirements which are at the option of the purchaser. For the sake of convenience to the purchaser and the supplier, requirements to be specified by the purchaser while making an enquiry or placing an order for emulsion sprayers have also been listed in Annex A.

In the formulation of this standard due weightage has been given to International Standards and practices prevailing in different countries and also practices in this field in our country. This standard has taken considerable assistance from BS : 3136-1959 'Emulsion spraying machines for roads', issued by the British Standards Institution.

This edition 1.1 incorporates Amendment No. 1 (March 2000). Side bar indicates modification of the text as the result of incorporation of the amendment.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HEATER FOR BITUMEN (TAR) AND EMULSION — SPECIFICATION

PART 3 EMULSION

1 SCOPE

This standard (Part 3) lays down the requirements regarding materials, design, construction, capacity and performance criteria for mobile and transportable machines for spraying emulsions in the surface treatment and grouting or semi-grouting of roads.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard.

IS No.	*Title*
554 : 1985	Dimensions for pipe threads where pressure tight joints are required on the thread (*third revision*)
3117 : 1965	Specification for bitumen emulsion for roads (anionic type)

SECTION 1 GENERAL

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Emulsion

An emulsion of bitumen complying with the requirements of IS 3117 or an emulsion of bitumen or tar of a type accepted within the industry for application to surface dressing, grouting, retread, tack-coat, mist spray, curing concrete or concrete slip-coat.

3.2 Rate of Spread

The number of square metres of road surface covered by one litre of emulsion.

3.3 Mobile Sprayer

Sprayer which may be either a trailer or a self-propelled vehicle, capable of travelling considerable distances on the road at speed up to the statutory limits, as well as comparatively short distances at a low speed while in action.

3.4 Transportable Sprayer

Sprayer intended for travelling short distances at low speed and which would normally be carried to any distant side on another vehicle.

4 TYPES

4.1 The sprayers shall be of the following types. They may be mobile or transportable.

4.1.1 *Hand-Spraying Unit*

a) Tanks and spraying equipment for hand spraying, with manually operated or mechanically operated pressure systems; or

b) An appliance which would allow for hand-spraying, with manually operated or mechanically operated pressure system directly from the emulsion drum.

4.1.2 *Mechanical Hand-Spraying Unit*

Mechanical tank spraying units provided with a series of nozzles fixed to a transverse header holding emulsion under pressure.

5 CAPACITY

5.1 The capacity of the sprayers shall be indicated by the capacity of the tank or the drum containing the emulsion to be sprayed. The sprayer shall have the following nominal capacities such as 200, 300, 500 and 1 000 litres.

5.1.1 Sprayers of other capacities may be supplied by mutual agreement between the purchaser and the supplier.

5.1.2 The actual capacity of the sprayer shall be at least 10 percent greater than the nominal capacity.

6 TANKS

6.1 When the sprayer is fitted with a tank to which the emulsion is transferred before spraying, the tank shall conform to the requirements of **6.1.1** and **6.1.5**.

6.1.1 The tank shall be totally enclosed so that the emulsion cannot be contaminated accidentally, and shall be so constructed as to prevent the emulsion from coming into contact with loose rust, scale, jointing, lagging or other substance likely to cause coagulation.

6.1.2 The tank filling opening shall be fitted with an efficient cap and a strainer of mesh size not greater than 5 mm which is readily accessible for cleaning.

6.1.3 The tank shall have a dipstick clearly marked with the serial number of the tank to which it prolongs. The dipstick shall fit into a guide or be positively located by other means, and shall be calibrated and clearly marked to show the contents of the tank at any level with an accuracy of ± 1 percent of the nominal capacity.

6.1.4 When a pressure tank is employed, this shall comply with the relevant safety regulations for pressure vessels.

6.1.5 A barrel hoist shall be fitted when required by the purchaser.

7 COMPLIANCE WITH INDIAN STANDARDS

All materials used in the construction of sprayers shall comply with appropriate Indian Standards. Pipe unions and screw thread shall comply with the requirements of IS 554.

8 ROADWORTHINESS

8.1 Transportable sprayers may be fitted with iron rubber or pneumatic tyres and the four wheels shall be run on plain bearings. An efficient hand operated parking brake shall be provided.

8.2 All sprayers shall comply with the relevant road traffic regulations.

9 MARKING

9.1 Each sprayer shall have firmly attached to it a plate bearing the following particulars:

a) Manufacturer's name or trade-mark,

b) Nominal capacity of the tank,

c) Tank serial number, and

d) Year of manufacture.

9.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained form the Bureau of Indian Standards.

SECTION 2 ADDITIONAL REQUIREMENTS FOR SPRAYING EMULSION

10 PUMPING SYSTEM

10.1 Following two types of pumping system may be used:

a) Hand operated piston pumps or geared pumps, and

b) Power driven pumps diesel engines as primemover.

10.2 Pumping system shall be capable of giving minimum output 0.3 kg/10 m^2 and maximum output 1 kg/10 m^2.

10.3 The pump, if fitted, shall be of a type which does not cause breakdown of the emulsion by excessive shearing between moving parts with small clearance. The pumping system shall be so designed that there are no visible pulsations at the spray nozzles.

10.4 To assist in clearing the system, provision shall be made either for pumping air through the nozzle pipe or for admitting air to it at the pump end. An additional device for drawing in the emulsion left over in the spray-bar may also be provided, if required by the purchaser.

11 STRAINER

A strainer, in which the maximum dimension of any aperture is not more than half the minimum dimensions of the smallest aperture or passage in the nozzle, shall be provided in the pipe system between the tank and the nozzle. The strainer shall be easily removable for cleaning.

12 FLEXIBLE PIPE AND SPRAY PIPE

The flexible pipe and spray pipe shall be not less than 12 mm bore. The flexible pipe shall be not less than 3 m long and shall be made of a material that will resist deterioration from the solvents used for cleaning. The pipe and its union shall be capable of withstanding four times the maximum pressure that can be developed in the system.

13 SPRAY LANCE

The spray lance shall be fitted with a shut-off valve between the pump and the spray nozzle and with a suitable handle to facilitate manipulation.

14 SPRAY NOZZLE

The spray nozzle shall be of a type which delivers the emulsion or bitumen in fine spray of well-defined shape.

15 PRESSURE GAUGE

When a pressure tank is incorporated in the machine a suitable gauge reading to at least double the normal working pressure, shall be fitted.

16 TEST FOR UNIFORM DISTRIBUTION OF EMULSION

16.1 When tested by a method which complies with the general requirements described in

Annex B, the amount of binder collected on any strip of surface 5 cm wide within the effective width, the length of the strip being parallel to the direction of travel of the sprayer, shall not differ from the average amount over the effective width by more than 15 percent. Further, the mean of the amount of emulsion collected in any group of four adjacent trays shall not vary by more than 10 percent from the means within the effective spraying width.

16.2 For the purpose of calculating the average amount collected, the effective width shall be the whole sprayed width less 15 cm at each side.

16.3 The amount of emulsion received on the 15 cm margin at either side of the effective width of the spray shall be neither less than 50 percent nor more than 100 percent of the mean amount per 15 cm of the effective width sprayed.

17 INSTRUCTION

Instructions shall be supplied with each sprayer to enable the operator to ensure that the specified rate of spread is obtained.

ANNEX A

(*Foreword*)

INFORMATION TO BE SUPPLIED WITH AN ENQUIRY OR ORDER

A-1 Information with regard to the following requirements which are at the option of the purchaser shall be supplied to the manufacturer while making an enquiry or placing an order for sprayers for emulsion:

a) Type (*see* **3.1**), also stating whether it should be mobile or transportable;

b) Nominal capacity (*see* **4.1**);

c) Whether a barrel hoist is required (*see* **5.1.5**); and

d) Whether a device for drawing in emulsion left over in the spray-bar is required (*see* **9.4**).

ANNEX B

(*Clause* 16.1)

TEST FOR UNIFORMITY OF TRANSVERSE DISTRIBUTION OF EMULSION (DEPOT TRAY TEST)

B-1 GENERAL

B-1.1 This annex lays down the method for testing uniformity of distribution of emulsion across the surface being sprayed. Various methods for determining the transverse uniformity of distribution have been developed the essential requirements of which are the following:

a) The conditions prevailing during the test are comparable with those, occurring during normal operations as regards:

1) temperature of emulsion,

2) viscosity of emulsion,

3) height of the nozzle orifice above the test surface,

4) pressure in the distribution system, and

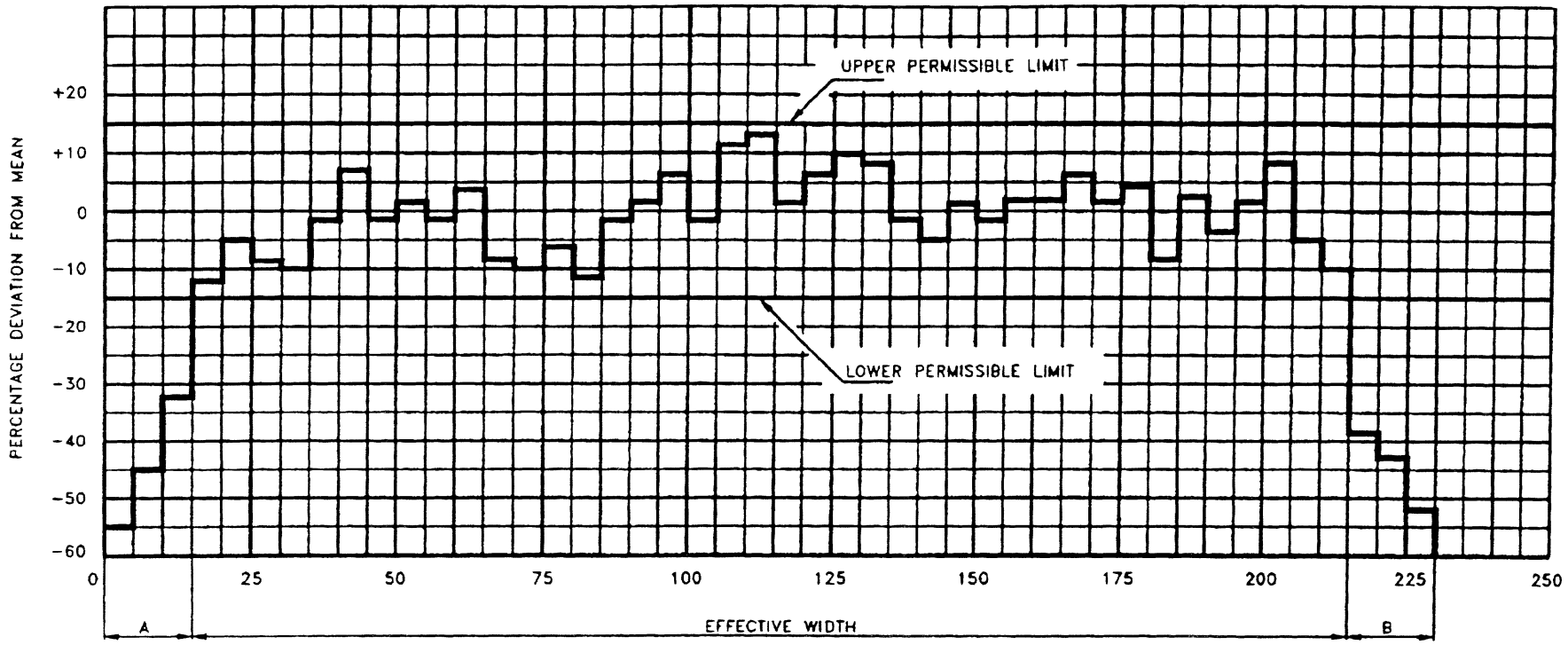
5) speed of operation of mechanical distributing gear when applicable.

b) The test surface is divided into strips of equal width, usually 5 cm; the length of the strips being parallel to the direction of travel of the sprayer.

c) The test is so arranged that the sprayer can operate for a sufficient period to obtain the normal working conditions, and when this has been achieved, the test surface is exposed to the discharge for suitable period.

d) The amount of emulsion delivered on each 5 cm strip is then measured and the results expressed as a percentage deviation from the mean for all the 5 cm units over the effective width. The effective width is defined as the sprayed width less 15 cm margin at each side.

e) The results of the test are recorded in the form indicated in Fig. 1. A suitable record card is shown in Fig. 2.



NOTE — The emulsion falling on widths *A* and *B* is ignored in calculating the mean distribution.

FIG. 1 TYPICAL RESULTS OF TEST FOR UNIFORMITY OF TRANSVERSE DISTRIBUTION OF EMULSION

CON-TAINER NO.	DIP	DEVIATION FROM MEAN	
	mm	mm	mm
1			
2			
3			
4			
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6			
7			
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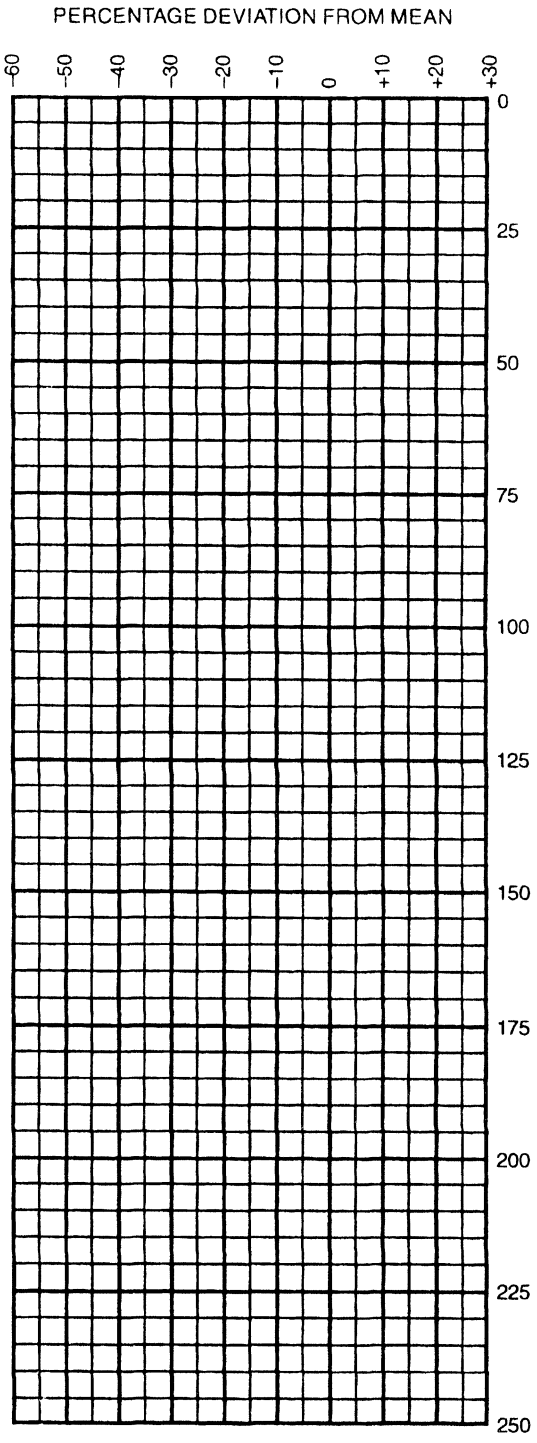

TOTAL .....

MEAN .....

EFFECTIVE WIDTH .....

LITRES/MINUTE .....

DATE OF TEST .....

EMULSION .....

SPRAY TEMPERATURE .....

PRESSURE .....

SPRAY HEIGHT .....

DURATION OF TEST .....

SIGNATURE ETC. .....

FIG. 2 RECORD CARD FOR TEST FOR TRANSVERSE DISTRIBUTION OF EMULSION

B-1.2 Spraying machines are tested with those grades of emulsion for which they are to be used.

B-2 DEPOT TRAY TEST

B-2.1 The apparatus consists of a wheeled trolley carrying a set of removable containers. Each container is 5 cm wide, 0.9 m long and 15 cm deep, made of 0.900 mm thick mild steel sheet, and of approximately 7 litres capacity. The containers extend to a width 15 cm greater than the full spray width of the sprayer, therebeing six containers in 30 cm of spray width. The rim of each container is lipped on one side in order that the containers will overlap and prevent binder from escaping. Before each test, the containers are examined for damage likely to affect results and are replaced, if necessary.

B-2.2 The trolley runs on steel rails fastened to the top of 1 350 litre catch tank (2.9 + 0.9 + 0.6 m) the rails being horizontal and parallel to the sides of the tank and sufficiently long to allow the trolley to lie clear of the spray before the test. The top rim of each container, when fitted on the trolley, is parallel to the rails and the same distance below the nozzles or distributing gear as of the road surface under normal working conditions.

B-2.3 The sprayer is backed into position with the spray-bar over the catch tank, precaution being taken to see the spray-bar is horizontal and at right angles to the rails. The trolley and containers rest on the rails clear of the spray hood. A short preliminary spray is made to ensure that all nozzles are functioning and the sprayer is otherwise in normal working condition.

B-2.4 The trolley and containers are then pushed underneath the sprayer and spraying is commenced, and maintained for a period of time sufficient almost to fill the containers. The trolley is then withdrawn to the previous position.

B-2.5 The depth of binder in each container is measured by dipping with a steel rule graduated in millimetres. Each container is dipped in the same position, a convenient place being about 30 cm from one end. Dipping is to commence when the froth has settled.

B-2.5.1 If dips can be read with the ruler in position, the ruler is wetted with paraffin to give a flat meniscus, alternatively, if the ruler has to be withdrawn in order to read off the tip, it is dampened with soft soap solution to ensure a clear line of demarcation.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

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