भारतीय मानक

सड़कों के लिए बिटुमेन पायस (धनायनी टाइप) — विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

BITUMEN EMULSION FOR ROADS (CATIONIC TYPE) — SPECIFICATION

(First Revision)

First Reprint MARCH 1997

ICS 75.140

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

October 1995

Price Group 4

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Bitumen, Tar and Their Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This Indian Standard was first published in 1978. The revision is necessitated as a result of inclusion of some new tests and deletion of obsolete ones and incorporating Amendment No. 1.

In this revision the storage period has been increased from 90 days to one year. The requirement for 'Binder content' has been deleted as the same is represented by the requirement for 'Residue by evaporation' (Tests on residue), which has been upgraded. Precision clauses have been incorporated in the methods of tests for the requirements of 'Residue on sieve' and 'Stability to mixing with cement'. Test method for 'Particle charge' requirement has been changed. The requirement 'Stability to mixing with coarse aggregate' has been deleted and a new requirement 'Coating ability and water resistance' has been incorporated. The requirement for 'Solubility', using carbon disulphide, has been deleted.

Most bituminous binders used in the construction of roads are viscous semisolids at normal temperature. Therefore, these require to be brought to a fluid state by heating, by dilution with solvent or by emulsifying before being applied in thin film. Use of emulsions facilitates not only flow at atmospheric temperature but also application to damp road surfaces and wet aggregates.

Bitumen emulsions are dispersions of very fine bitumen particles in an aqueous medium. They are easy to handle and find a wide application in road construction and maintenance; soil stabilization; grouting; tack coating; surface dressing; seal coating; premixing; dust laying and in various other special circumstances where cold application of bitumen is desirable.

Bitumen emulsions may be of anionic type or cationic type. Bitumen emulsions for roads of anionic type are covered in IS 3117 : 1965 'Specification for bitumen emulsion for roads (anionic type) (*under revision*)', and this standard covers bitumen emulsions of the cationic type for roads. The choice of the type of emulsion for a particular situation would depend upon types of aggregates, climatic conditions, environmental conditions, etc.

For the guidance of the users, the recommended uses of different types of cationic emulsions covered in this standard are given in Annex A.

In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

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 shall be the same as that of the specified value in this standard.

Indian Standard

BITUMEN EMULSION FOR ROADS (CATIONIC TYPE) — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the physical and chemical requirements of bitumen emulsions (cationic type) for roads.

2 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in the text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards listed below:

IS No.	*Title*
73 : 1992	Paving bitumen (*second revision*)
269 : 1989	Specification for 33 grade ordinary Portland cement (*fourth revision*)
334 : 1982	Glossary of terms relating to bitumen and tar (*second revision*)
460 : 1985	Test sieves
1201 : 1978	Methods of testing tar and bituminous materials; sampling (*first revision*)
1203 : 1978	Methods for testing tar and bituminous materials — Determination of penetration (*first revision*)
1208 : 1978	Methods for testing tar and bituminous materials — Determination of ductility (*first revision*)
1216 : 1978	Methods for testing tar and bituminous materials — Determination of solubility in carbon disulphide or trichloroethylene (*first revision*)
3117 : 1965	Specification for bitumen emulsion for roads (anionic type)

3 TERMINOLOGY

3.1 For the purpose of this standard, the definition given in IS 334 : 1982 and the following shall apply.

3.2 Cationic Emulsions

An emulsions in which the cation of the emulsifier is at the interface with the bitumen particle; an emulsion in which the particles are positively charged and the aqueous phase is acidic. Breaking of these emulsions occurs by neutralization of charge.

4 MATERIALS

4.1 Any suitable grade of bitumen as given in IS 73 : 1992 with or without addition of suitable flux, may be used.

4.2 Any emulsifying agent or any other ingredient, which either quality-wise or quantity-wise, is likely to effect or harden the residue bitumen beyond the limits specified under Sl No. (ix) of Table 1 shall not be used.

5 TYPES

Emulsified bitumen shall be of the following three types:

a)	Rapid Setting	Type RS
b)	Medium Setting	Type MS
c)	Slow Setting	Type SS

6 REQUIREMENTS

6.1 Bitumen emulsion shall be homogeneous. Within one year after manufacture it shall show no undispersed bitumen after thorough mixing.

6.2 The physical and chemical requirements of the three types of emulsions shall comply with the requirements specified in Table 1.

7 SAMPLING

7.1 For the purpose of testing, the size of the sample and the sampling procedure from drums, barrels or bulk supply shall be as described in IS 1201 : 1978 subject to the following:

a) *From Drums or Barrels* — The content of drum or barrel from which the sample is to be taken shall be thoroughly mixed by

rolling the container to and fro for a period of 2 to 3 minutes, successively in opposite direction, allowing at least five revolutions of the container in each direction and then up-ending the container through two revolutions first in one direction and then in the opposite direction.

b) *From Bulk* — Where practicable, bulk delivery of bitumen emulsion shall be agitated by forced circulation or air agitation, before sampling.

c) The sample of bitumen emulsion shall be drawn within 24 hours after delivery and tested within 7 days from the date of drawing, unless otherwise specified.

7.1.1 *Preparation of Samples*

Before carrying out any of the tests, the sample shall be mixed by gentle shaking to ensure uniformity.

7.2 If the single sample from a single run fails to fulfil the test requirements under **6**, sample shall be drawn on the basis of **7.1** for testing in the same manner. If these samples conform to requirement of **6**, the lot shall be accepted otherwise the lot shall be rejected.

8 TESTS

Unless specified otherwise, tests shall be carried out as described by methods referred to in Table 1.

9 MARKING

9.1 Each container shall be legibly and indelibly marked with the following:

a) Indication of the source of manufacture;
b) Month and year of manufacture;
c) Type;
d) Batch number; and
e) Date of expiry.

9.1.1 *BIS Certification Marking*

The container may also be marked with the Standard Mark.

9.1.1.1 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 the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 1 Physical and Chemical Requirements of Bitumen Emulsion (Cationic Type)
(*Clauses* 4.2, 6.2 *and* 8)

Sl No.	Characteristics	Type of Emulsion			Method of Test, Ref to
		RS	MS	SS	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Residue on 600-micron IS Sieve (percent by mass, *Max*)	0.05	0.05	0.05	Annex B
ii)	Viscosity by Saybolt Furol Viscometer, seconds				Appendix A of IS 3117 : 1965
	At 25°C	—	—	20-100	
	At 50°C	50-400	50-400	—	
iii)	[1]Coagulation of emulsion at low temperature	Nil	Nil	Nil	Annex C
iv)	Storage stability after 24 h, percentage, *Max*	1	1	1	Annex D
v)	Particle charge	Positive	Positive	Positive	Annex E
vi)	Coating ability and water resistance				Annex F
	Coating, dry aggregate	—	Good	—	
	Coating, after spraying	—	Fair	—	
	Coating, wet aggregate	—	Fair	—	
	Coating, after spraying	—	Fair	—	
vii)	Stability to mixing with cement (percentage coagulation)	—	—	2	Annex G
viii)	Miscibility with water	Nil	Nil	Nil	Annex H
ix)	Tests on residue:				Annex J
	a) Residue by evaporation, percent, *Min*	65	65	57	
	b) Penetration 25°C/100 g/5 sec	60-210	60-210	60-210	
	c) Ductility 27°C/cm, *Min*	75	75	75	
	d) Solubility : In trichloroethylene, *Min*	97.5	97.5	95.7	

[1] This requirement shall be applicable only under situations where the ambient temperature is below 15°C.

ANNEX A

(*Foreword*)

RECOMMENDED USE OF CATIONIC EMULSION

A-1 The recommended uses of three types of emulsified bitumens of the cationic type are given below:

Type	*Recommended Uses*
RS	A quick setting emulsion used for surface treatment, penetration macadam and tack coat.
MS	A medium setting emulsion used for plant or road mixes with coarse aggregates substantially all of which is retained on 2.36 mm IS Sieve and practically none of which passes 75 micron IS Sieve, and also for surface dressing and penetration macadam.
SS	A slow setting emulsion used for plant or road mixes with graded and fine aggregates, a substantial quantity of which passes a 2.36 mm IS Sieve, and a portion of which may pass a 75 micron IS Sieve, slurry seal treatment, etc.

ANNEX B

(*Table* 1)

METHOD FOR DETERMINATION OF RESIDUE ON SIEVING ON 600-MICRON IS SIEVE

B-1 APPARATUS

B-1.1 600-Micron IS Sieve — A circular sieve approximately 100 mm in diameter and 40 mm height.

B-1.2 Metal or Glass Dish — A small metal or glass dish about 110 mm in diameter (such as a clock glass).

B-1.3 Oven — A well ventilated oven thermostatically controlled to 100 to 110°C.

B-1.4 Balances — One of capacity 250 g and accuracy of 0.01 g and one of capacity 10 kg and accuracy of 1 g.

B-1.5 Container — A clean, weighed, 4 litre container.

B-2 MATERIALS

B-2.1 Solution — A 2 percent sodium oleate solution of N/10 hydrochloric acid.

B-2.2 Solvents — Xylene and acetone.

B-3 PROCEDURE

B-3.1 Wash the sieve with xylene and then with acetone. Place it in the dish, dry in the oven at 100 to 110°C for one hour, cool and weigh, together with the dish, to the nearest 0.01 g(W_1). Remove the sieve from the dish and moisten with the solution. Remove uniformly the 4-litre sample by gentle agitation and strain immediately through the sieve into the clean,dry, weighed container (W_4). Sieve the low and high viscosity emulsion at room temperature and 50°C respectively. When whole of the emulsions has been passed through the sieve, remove the sieve and weigh the container to the nearest 1 g (W_2). Wash the sieve repeatedly with appropriate solution until the washings are no longer discoloured and then wash with distilled water until free from solution. Place the sieve in the small dish to dry for 2 hours in the oven at 105 ± 5°C. Cool and reweigh together to the nearest 0.01 g (W_3).

B-4 CALCULATIONS

$$\text{Percentage retained } \frac{W_3 - W_1}{W_2 - W_4} \times 100$$

where

W_1 = mass in g of sieve and small dish;
W_2 = mass in g of container and emulsion;
W_3 = mass in g of sieve, small dish and residue; and
W_4 = mass in g of container.

B-5 REPORT

The percentage of mass retained, as calculated under **B-4**, shall be reported.

B-6 PRECISION

The duplicate test results should not differ by more than the following:

Sieve Test, Percent Retained	*Repeatability, Percent*	*Reproducibility, Percent*
0 to 0.5	0.03	0.08

ANNEX C

(*Table* 1)

METHOD FOR DETERMINATION OF COAGULATION OF EMULSIONS AT LOW TEMPERATURE

C-1 APPARATUS

C-1.1 Glass Boiling Tube — 150 mm long and 25 mm in internal diameter, provided with a cork and central hole 13 mm in diameter.

C-1.2 Sieve — 600-micron IS Sieve.

C-1.3 Beaker — Two, 600 ml capacity.

C-1.4 Water-Bath — Thermostatically controlled.

C-2 MATERIALS

C-2.1 Solution — A 1-percent solution of cetrimide (a mixture of alkyltrimethyl ammonium bromide) in N/10 hydrochloric acid.

C-2.2 Solvents — Xylene and acetone.

C-3 PROCEDURE

C-3.1 Wash 600-micron IS Sieve with xylene, acetone and distilled water. Moisten the clean sieve with cetrimide. Pass some of the emulsions through the sieve and introduce 20 ml of sieved emulsion into the boiling tube. Bring the emulsion by plunging the tube into the water at 30°C and stir gently with the thermometer until temperature of the emulsion is constant. Remove the tube from warm water and plunge into the beaker containing iced water at the bottom of which crushed ice is retained by a piece of wire gauge. During the cooling process stir slowly. Lower the temperature of water, by adding common salt, to −1 to −1.5°C so that the temperature of the emulsion is reduced to 0°C. At 0°C discontinue stirring and transfer the tube to another beaker with a freezing mixture at a temperature of −3 to −4°C and allow the emulsion to remain quiscent for 30 minutes. Remove the tube from the freezing mixture without disturbance and allow the temperature of the content to rise spontaneously to room temperature. Moisten the sieve with cetrimide and pass the emulsion through the sieve. Wash the tube free from emulsion and other residue with cetrimide and pass the washings through the sieve. The coagulated bitumen, if any, will be retained on the sieve.

C-4 REPORT

Report the emulsion as 'passed' if no coagulation takes place.

NOTE — If the emulsion is exposed to temperature below 4°C during storge/transportation the following additional criteria shall apply:

a) Subzero temperature −17.8°C

b) Freezing and thawing cycle shall be repeated three times

c) After the third cycle the emulsion shall be examined for homogeneity.

ANNEX D

(*Table* 1)

METHOD OF DETERMINATION OF STORAGE STABILITY

D-1 APPARATUS

D-1.1 Cylinders — Two 500-ml glass cylinders, with pressed or moulded glass bases and cork or glass stoppers, having an outside diameter of 50 ± 5 mm and having 5-ml graduations.

D-1.2 Glass Pipette — A 6-ml syphon glass tube pipette.

D-1.3 Balance — capable of weighing 500 g within ± 0.1 g.

D-1.4 Glass Beakers — Three glass beakers of 600 or 1 000-ml capacity, made of borosilicate glass.

D-1.5 Glass Rods — with flame polished ends, 6.4 mm in diameter and 178 mm in length.

D-1.6 Oven — Thermostatically controlled, capable of maintaining temperature of 163 ± 2.8°C.

D-2 PROCEDURE

D-2.1 Bring the bitumen emulsion to room temperature (21 to 27°C). Place a 500-ml representative sample in each of the two glass cylinders. Stopper the cylinders and allow them to stand undisturbed, at laboratory air temperature (21 to 27°C), for 24 hours. After standing for this period, remove approximately 55-ml from the top of the emulsion by means of the pipette or syphon without disturbing the rest. Thoroughly mix each portion.

D-2.2 Weigh 50±0.1 g of each sample into separately weighed 600 or 1 000-ml glass beakers,

each beaker having previously been weighed with the glass rod (*see* **D-1.5**). Adjust the temperature of the oven to 163 ± 2.8°C. Then place the beakers containing the rods and sample in the oven for 2 hours. At the end of this period remove each beaker and thoroughly stir the residue. Replace in the oven for 1 hour, then remove the beakers from the oven, allow to cool to room temperature, and weigh, with the rods (*see* Note).

NOTE — Care shall be taken to prevent loss of bitumen from the beaker through foaming or spattering or both. For this reason, 1 000-ml beakers are recommended. Also, the placing of beakers and emulsion samples in a cold or warm oven and bringing the oven and sample up to a temperature of 163°C together is permissible. If preferred, preliminary evaporation of water may be accomplished by careful heating on a hot-plate, followed by oven treatment at 163°C for 1 hour.

D-2.3 After removal of the sample, syphon off the next 390-ml (approximate) from each of the cylinders. Thoroughly mix the emulsion remaining in the cylinders and weigh 50 ± 0.1 g into separate weighed 600 or 1 000-ml glass beakers. Determine the bituminous residue of these samples in accordance with **D-2.2**.

D-3 CALCULATION

Calculate the storage stability as the numerical difference between the average percentage of bituminous residue found in the two top samples and that found in the two bottom samples.

D-4 PRECISION

D-4.1 Duplicate determinations by the same operator shall not be considered suspect if the determined values differ by more than 0.5 percent.

D-4.2 Reproducibility

The values reported by each of the two laboratories representing the arithmetic average of duplicate determinations shall not be considered suspect values if the reported values differ by more than 0.6 percent.

ANNEX E

(*Table* 1)

METHOD FOR DETERMINATION OF PARTICLE CHARGE

E-1 APPARATUS

E-1.1 Current Source — A 12 V battery.

E-1.2 Rheostat — of 2 000 ohm capacity.

E-1.3 Ammeter — of 0.1 ampere capacity.

E-1.4 Stainless Steel Plates — Two, 25 mm × 75 mm size.

E-1.5 Glass Container — of 500 ml capacity.

E-2 PROCEDURE

Take sufficient quantity of a representative sample of bitumen emulsion in the glass container. Immerse two stainless steel plates 25 mm × 75 mm which are connected to a 12 volts battery circuit through a switch, a rheostat and an ammeter, to a depth of 25 mm and mark the + Ve and – Ve plates. Close the switch and adjust the rheostat so that the current in the circuit is more than 4 mA. Open the circuit after 30 minutes and remove the plates. Gently wash the plates if necessary with distilled water to remove unbroken emulsion and then examine.

E-3 REPORTING

An appreciable layer (continuous opaque film) of deposited bitumen on the negative plate (cathode) with a relatively clean bitumen free positive plate (anode) indicates a cationic emulsion of positively charged particles.

ANNEX F

(*Table* 1)

COATING ABILITY AND WATER RESISTANCE

F-1 APPARATUS

F-1.1 Mixing Pan — A whole enamelled kitchen pan with handle, of approximately 3-litre capacity.

F-1.2 Mixing Blade — A putty knife with a 30 mm × 90 mm steel blade with rounded corners. A 254 mm kitchen mixing spoon may be used as an alternative.

F-1.3 Sieves — Standard sieves of 19 mm and 4.75 mm conforming to IS 460 : 1985.

F-1.4 Constant Head Water Spraying Apparatus — An apparatus for applying tap water in a spray under a constant head of 775 mm. The water shall issue from the apparatus in a low velocity spray.

F-1.5 Thermometer — It shall be of the mercury-in-glass type nitrogen filled, with the stem made of

lead glass or other suitable glass. It shall be engraved and enamelled at the back and provided with an expansion chamber and glass ring at the top. The bulb shall be cylindrical, made of suitable thermometric glass. The dimensions, tolerances and graduations of the thermometer shall be as follows:

Range	−2°C to 80°C
Graduation at each	0.2°C
Longer lines at each	1°C
Figures at each	2°C
Immersion, mm	Total
Overall length	378 to 384 mm
Length of graduated portion	243 to 279 mm
Length of bulb	9 to 14 mm
Bulb diameter	No larger than stem diameter
Stem diameter	6.0 to 7.0 mm
Distance from bottom of bulb to 0°C	75 to 90 mm
Scale error, *Max*	0.2°C

F-1.6 Balance — Capable of weighing 1 000 g within ±0.1 g.

F-1.7 Pipette — of 10 ml capacity.

F-2 MATERIALS

F-2.1 Aggregate — Standard limestone aggregate shall be a laboratory washed and air cooled aggregate graded to pass 19 mm sieve and retained on 4.75 mm sieve.

F-2.2 Calcium Carbonate — Chemically pure precipitated ($CaCO_3$) shall be used as a dust to be mixed with the standard aggregate.

F-2.3 Water — Tap water of not over 250 ppm $CaCO_3$ hardness for spraying over the sample.

F-3 SAMPLE

The sample shall be representative of the bitumen emulsion to be tested.

F-4 PROCEDURE FOR TEST WITH WET AGGREGATE

F-4.1 Carry out the test at 24 ± 5.5°C.

F-4.2 Weigh 460 g of the air dried/graded limestone aggregates in the mixing pan.

F-4.3 Weigh 40 g of $CaCO_3$ dust in the mixing pan and mix with the 460 g of aggregate for approximately one minute by means of a mixing blade to obtain uniform film of dust on the aggregate particles. The total weight of aggregate shall be 465 g.

F-4.4 Pipette 9.3-ml of water to the aggregate and $CaCO_3$ dust mixture into the mixing pan and mix thoroughly to obtain uniform wetting.

F-4.5 Weigh 35 g of bitumen emulsion into the aggregate in the pan and mix vigorously with the mixing blade for 5 minutes by a back and forth motion in an elliptical path of the mixing blade or spoon. At the end of the mixing period, tilt the pan and permit any excess emulsion not on the aggregate to drain from the pan.

F-4.6 Remove approximately one half of the mixture from the pan and place it on absorbent paper and evaluate the coating.

F-4.7 Immediately spray the mixture remaining in the pan with tap water from the constant head water spraying apparatus to cover the mixture. The distance from the spray head to the sample shall be (305 ± 75 mm). Then carefully pour off the water. Continue spraying and pouring off the water until the overflow water runs clear. Carefully drain off the water on the pan. Scoop the mixture from the mixing pan on to absorbent paper for evaluation of coating retention in the washing test.

F-4.8 Evaluate the mixture immediately by visual estimation as to the total aggregates surface area that is coated with bitumen.

F-4.9 Report the evaluation by visual estimation of the coating of the aggregate surface area by bitumen after the mixture has been surface air dried in the laboratory at room temperature. A fan may be used for drying if desired.

F-5 REPORTING OF TEST RESULTS

F-5.1 Evaluate and report the following information for tests with both dry and wet aggregates.

F-5.2 At the end of the mixing period record the coating of the total aggregate surface area by the bitumen emulsion as 'good' 'fair' or 'poor' where a rating of 'good' means fully coated by the bitumen emulsion excessive of pinholes and sharp edges of the aggregates, a rating of 'fair' coating applies to the condition of an excess of coated area over uncoated area and a rating of 'poor' applies to the condition of an excess of uncoated area over coated area.

F-5.3 After spraying with water record the coating of the total aggregate surface area by the bitumen as 'good', 'fair' or 'poor'.

F-5.4 Comments about the results of the test may be included in the evaluation.

ANNEX G

(*Table* 1)

STABILITY TO MIXING WITH CEMENT

G-1 APPARATUS

G-1.1 Sieves — A 1.40 mm IS Sieve approximately 100 mm in diameter and 40 mm in height and 150-micron IS Sieve approximately 200 mm in diameter.

G-1.2 Metal Dish — A round-bottomed metal utencil of approximately 500-ml capacity.

G-1.3 Steel Rod — A steel rod with rounded ends 13 mm in diameter.

G-1.4 Balance — 250 g capacity accurate to 0.1 g.

G-1.5 Graduated Cylinder — of 100-ml capacity.

G-1.6 Shallow Pan — of 100 mm diameter and of about 50-ml capacity.

G-1.7 Oven — A well-ventilated oven controlled at 110°C.

G-2 MATERIAL

G-2.1 Ordinary portland cement conforming to IS 269 : 1989. It shall be kept in sealed container and not exposed to atmosphere before use.

G-3 PROCEDURE

G-3.1 Make up the water content of the emulsion to 50 percent by adding extra water if necessary. Pass the cement through 150-micron IS Sieve and weigh 50 g into the metal dish. Weigh the 1.40 mm IS Sieve and shallow pan to nearest 0.1 (W_1). Add 100-ml of emulsion to the cement in the dish and stir the mixture at once with the steel rod with a circular motion making about 60 revolutions per minute. At the end of one-minute mixing period add 150-ml freshly boiled distilled water at room temperature and continue stirring for 3 minutes. Maintain the ingredients at a temperature of approximately 25°C during mixing. Pour the mixture through the weighed 1.40 mm IS Sieve and rinse with distilled water. Place the sieve in the weighed pan, heat in the oven at 110°C until dry and weigh to nearest 0.1 g(W_2).

G-4 CALCULATION

$$\text{Coagulation value} \frac{W_2 - W_1}{W_3} \times 100$$

where

W_1 = mass in g of weighed sieve and pan,

W_2 = mass in g of the sieve and pan and the material retained on them, and

W_3 = mass in g of binder in 100-ml of diluted determined according to Annex J.

G-5 REPORT

Report the coagulation value as percentage to the nearest whole number.

G-6 PRECISION

The duplicate test results shall not differ by more than the following:

Cement Mixing Mass, Percent	*Repeatability Mass, Percent*	*Reproducibility Mass, Percent*
0 to 2	0.2	0.4

NOTE — Ordinary portlant cement conforming to IS 269 : 1989 shall be used.

ANNEX H

(*Table* 1)

METHOD FOR DETERMINATION OF MISCIBILITY WITH WATER

H-1 PROCEDURE

Gradually add 150-ml distilled water, with constant stirring to 50-ml of emulsion in a 400-ml beaker at a temperature of 20 to 30°C. Allow the mixture to stand for 2 hours and examine it for any appreciable coagulation of the bitumen content of the emulsion.

ANNEX J

(*Clauses* 6.2, G-4 *and Table* 1)

METHOD FOR DETERMINATION OF RESIDUE BY EVAPORATION

J-1 APPARATUS

J-1.1 Glass Beakers — low form of 1 000-ml capacity made of borosilicate glass.

J-1.2 Glass Rods — With flame polished 6.4 mm in diameter and 177.7 mm in length.

J-1.3 Balance — of 500 g capacity and accurate to ± 0.1 g.

J-1.4 Oven — Thermostatically controlled at a temperature of 163 ± 2.8°C.

J-2 PROCEDURE

Weigh 50 ± 0.1 g of thoroughly mixed emulsion into each of three beakers each of which has previously been weighed with the glass rod. Place the beaker along with the rod in the oven at 163 ± 2.8°C for 2 hours. At the end of this period remove each beaker and stir the residue thoroughly. Replace in the oven for another one hour then remove and cool at room temperature, weigh the beakers along with the rods.

J-3 CALCULATION

J-3.1 Residue, percent $= 2 (A - B)$

where

A = mass of beaker, road and residue g; and

B = tare mass of beaker and rod, g.

J-3.2 Take the average of three values obtained for residue, percent.

J-4 TESTS ON RESIDUE

J-4.1 Penetration — Determine penetration on a sample of the residue in accordance with IS 1203 : 1978.

J-4.2 Ductility — Determine the ductility on a representative portion of the residue in accordance with IS 1208 : 1978.

J-4.3 Solubility in Trichloroethylene — Determine the solubility in trichloroethylene on a representative sample of the residue in accordance with IS 1216 : 1978.

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.

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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 Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc: No. PCD 6 (1173)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Dee Kay Printers, New Delhi, India

AMENDMENT NO. 1 MAY 2002
TO
IS 8887 : 1995 BITUMEN EMULSION FOR ROADS (CATIONIC TYPE) — SPECIFICATION

(First Revision)

[*Page* 2, *Table* 1, *Sl No.* (vii), *col* 2] — Substitute 'Stability to mixing with cement (percentage coagulation), *Max*' *for* 'Stability to mixing with cement (percentage coagulation)'.

[*Page* 2, *Table* 1, *Sl No.* (ix) (d), *col* 5] — Substitute '97.5' *for* '95.7'

(*Page* 3, *clause* **B-6**) — Substitute the following for the existing:

'**B-6 PRECISION**

The duplicate test results shall not differ by more than the following:

Sieve Test, Percent Retained	*Repeatability, Percent*	*Reproducibility, Percent*
0 to 0.05	0.02	0.04

(*Page* 4, *clause* **C-4**, *Note*, *line* 2) — Substitute 'storage' *for* 'storge'.

(*Page* 4, *clause* **D-1.2**) — Substitute '60 ml' *for* '6-ml'.

(*Page* 4, *clause* **D-1.5**) — Substitute the following for the existing:

'**D-1.5 Glass Rods** — With flame polished ends, 6.5 ± 0.5 mm in diameter and 175 ± 5 mm in length.'

(*Page* 6, *clause* **F-4.3**, *line* 1) — Substitute '4' *for* '40'.

(*Page* 6 , *clause* **F-4.3**, *line* 6) — Substitute '460' *for* '465'.

(*Page* 8, *clause* **J-1.2**) — Substitute the following for the existing:

'**J-1.2 Glass Rods** — With flame polished ends, 6.5 ± 0.5 mm in diameter and 175 ± 5 mm in length.'

(*Page* 8, *clause* **J-3.1**, *line* 3) — Substitute 'rod' *for* 'road'.

(PCD 6)

Reprography Unit, BIS, New Delhi, India