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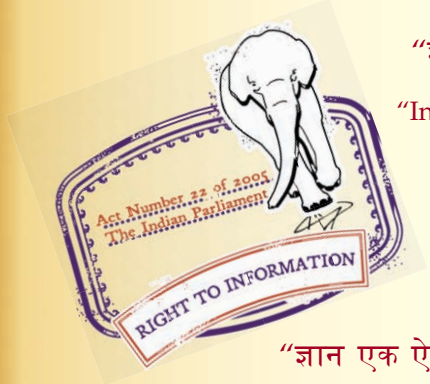

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Indian Standard

SPECIFICATION FOR INDUSTRIAL WHITE OILS

(First Revision)

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(First Revision)

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(*Continued on page* 11)

Indian Standard

SPECIFICATION FOR INDUSTRIAL WHITE OILS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 14 July 1978, after the draft finalized by the Lubricants and Related Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 This specification was published in 1957 and subsequently it was amended in 1963 and 1966. It is now being revised in order to reflect the better quality of the material now generally available in the market. In this revision the title of the specification has been changed and medium and heavy types of white oils have been included. All the requirements given in the standard have been modified and additional characteristics such as relative density, odour, cloud point, carbonizable substances, stability test, and copper strip corrosion test have also been incorporated. In addition a UV absorption test has been prescribed in order to make the specification more stringent.

0.3 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 and methods of sampling and test for white oils, suitable for various industrial purposes.

2. TYPES

2.1 There shall be three types of white oils, namely, light, medium and heavy.

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

3. REQUIREMENTS

3.1 Description — The material shall be a transparent colourless oily liquid, free from fluorescence by daylight, odourless and tasteless.

3.2 Solubility — The material shall be practically insoluble in water and alcohol and shall be soluble in chloroform, solvent ether, and petroleum solvents.

3.3 The material shall also comply with the requirements given in Table 1 when tested according to the appropriate method prescribed under appendices to this standard and 'P' series of IS : 1448* reference to which is given in col 6 and 7 of the table.

4. PACKING AND MARKING

4.1 Packing – The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

4.2 Marking — Each container shall be suitably marked with the following information:

a) Name and type of the material,
b) Name of the manufacturer,
c) Batch or code number, and
d) Net mass.

4.2.1 Each container may also be marked with the Standard Mark.

4.2.2 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 Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

5. SAMPLING

5.1 Representative test samples of the material shall be drawn as prescribed in IS : 1447-1966†.

5.2 Number of Tests — Test for all the characteristics given in 3 shall be carried out on the the composite sample.

*Methods of test for petroleum and its products.
†Methods of sampling of petroleum and its products.

TABLE 1 REQUIREMENTS FOR INDUSTRIAL WHITE OILS

(*Clause* 3.3)

Sl No.	Characteristic	Requirement for			Method of Test, Ref to	
		Light	Medium	Heavy	Cl No. of Appendix A	'P' of IS : 1448*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Kinematic viscosity, at 37·8°C, cSt	30 *Max*	31 to 63	64 *Min*	—	P : 25
ii)	Relative density at 20/20°C	←——0·815 to 0·910——→			—	P : 32
iii)	Odour				—	—
	a) At room temperature	←————None————→			—	—
	b) When heated at 95° to 98°C for half an hour in a water-bath	Not objectionable and not reminiscent of sulphur compounds			—	—
iv)	Cloud point, °C, *Max*	←————5————→			—	P : 10
v)	Pour point, °C, *Max*	←———— −3————→			—	P : 10
vi)	Flash point (PMC), °C, *Min*	←————150————→			—	P : 21
vii)	Acidity and alkalinity	←—To pass the test—→			A-2	—
viii)	Saponification value, mg of KOH/g, *Max*	←————0·5————→			—	P : 55
ix)	Colour (Saybolt chromometer), *Min*	←————+25————→			—	P : 14
x)	Sulphur and sulphides	←—To pass the test—→			A-3	—
xi)	Carbonizable substances	←—To pass the test—→			A-4	—
xii)	Ash, percent by mass, *Max*	←————0·01————→			—	P : 4
xiii)	Copper strip corrosion test at 100°C for 3 hours	←Not worse than No. 1→			—	P : 15
xiv)	Ultra violet (UV) absorbance				—	P : †
	a) At 275 nm	←————0·3 *Max*————→				
	b) At 295-299 nm	←————1·0 *Max*————→				
	c) At 300-400 nm	←————0·8 *Max*————→				
xv)	Stability test	←—To pass the test—→			A-5	—

*Method of test for petroleum and its products.

†Under preparation. Till such time procedure given under Appendix A of ASTM D 2008-1970 may be followed.

5.3 Criteria for Conformity — The material shall be taken to have conformed to this specification if the composite sample satisfies all the requirements specified in the standard.

APPENDIX A

(*Clause* 3.3, *Table* 1)

METHODS OF TEST FOR INDUSTRIAL WHITE OILS

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be used in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. TEST FOR ACIDITY AND ALKALINITY

A-2.1 Boil 5 g of the material with 10 ml of alcohol (90 percent) previously neutralized to litmus solution. The material shall be taken to have passed the test if the alcohol is neutral to litmus solution.

A-3. TEST FOR SULPHUR AND SULPHIDES

A-3.1 Mix 4 ml of the material with 2 ml of ethyl alcohol and 2 drops of a clear saturated solution of lead monoxide in solution of sodium hydroxide and heat at 70°C for ten minutes with frequent shaking. The material shall be taken to have passed the test, if the mixture remains colourless.

A-4. TEST FOR CARBONIZABLE SUBSTANCES†

A-4.1 Apparatus

A-4.1.1 *Test Tubes* — As shown in Fig. 1, of heat resistant glass fitted with a well-ground glass stopper, the stopper and the tube bearing identical and indestructible numbers. The tube shall be 140 ± 2 mm in length and between 14·5 and 15·0 mm in outside diameter, and shall be calibrated at the $5 \pm 0{\cdot}2$ ml and $10 \pm 0{\cdot}2$ ml liquid levels. The capacity of the tube with stopper inserted shall be between 13·6 and 15·6 ml. A rolled edge may be provided for suspending the tube on the cover of the water bath.

A-4.1.2 *Water Bath* — A water bath suitable for immersing the test tube above the 10 ml line and equipped to maintain a temperature of $100 \pm 0{\cdot}5$°C. The bath shall be provided with a cover of any suitable material with holes approximately 16 mm in diameter through which the test tubes may be suspended.

*Specification for water for general laboratory use (*second revision*).
†Adapted from ASTM D 565-45 reapproved 1973).

A-4.1.3 *Colour Comparator* — A colour comparator, of a suitable type for observing the colour of the acid layer in comparison with the reference standard colour solution. The size and shape of the comparator are optional, but the size and shape of the apertures shall conform to the dimensions prescribed in Fig. 1.

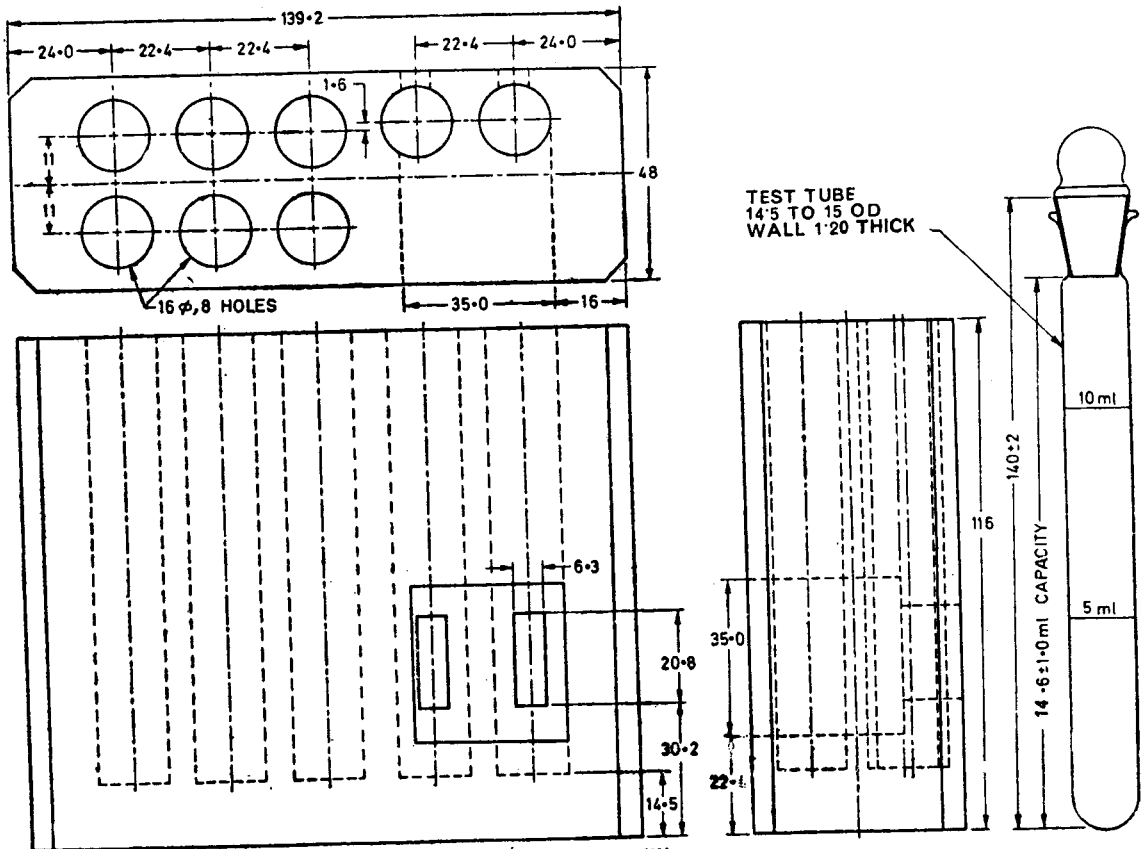
A-4.2 Reagents

A-4.2.1 *Concentrated Sulphuric Acid* — Nitrogen-free which is tested as follows:

> Dilute a small amount of the acid with an equal volume of water and superimpose 10 ml of the cooled liquid upon diphenylamine solution (1 g of diphenylamine in 100 ml of concentrated sulphuric acid). A blue colour should not appear at the zone of contact within 1 h. This test detects as little as 0·000 2 percent NO_3.

A-4.2.2 *Cobaltous Chloride Solution* — 0·5 N. Dissolve about 65 g of cobaltous chloride ($CoCl_2.6H_2O$) in enough of a mixture of 25 ml of hydrochloric acid and 975 ml of water to make 1 000 ml of solution. Transfer exactly 5 ml of this solution to a 250 ml Iodine flask; add 15 ml of sodium hydroxide solution (1 : 5) and 5 ml of hydrogen peroxide. Boil for 10 minutes, cool and add 2 g of potassium iodide (KI) and 20 ml of sulphuric acid (1 : 4). When the precipitate has dissolved, titrate the liberated iodine with 0·1 N sodium thiosulphate ($Na_2S_2O_3$) solution, using starch solution as an indicator. Each ml of sodium thiosulphate ($Na_2S_2O_3$) solution consumed is equivalent to 0·023 799 g of cobaltous chloride ($CoCl_2.6H_2O$) solution. Adjust the final volume of cobaltous chloride ($CoCl_2$) solution by the addition of dilute hydrochloric acid (mixture of 25 ml of hydrochloric acid and 975 ml of water) so that 1 ml contains 59·5 mg of $CoCl_2.6H_2O$.

A-4.2.3 *Ferric Chloride Solution* — 0·5 N. Dissolve about 55 g of ferric chloride ($FeCl_3.6H_2O$) in enough of a mixture of 25 ml of hydrochloric acid and 975 ml of water to make 1 000 ml of solution. Transfer exactly 10 ml of the solution to a 250 ml Iodine flask, add 5 ml of concentrated hydrochloric acid (relative density 1·19), 25 ml of water and about 3 g of potassium iodide (KI). Stopper and allow the mixture to stand for 5 minutes. Dilute the mixture with 50 ml of water and titrate the liberated iodine with 0·1 N sodium thiosulphate ($Na_2S_2O_3$) solution, using starch solution as an indicator. Each ml of 0·1 N sodium thiosulphate ($Na_2S_2O_3$) solution is equivalent to 0·027 03 g of $FeCl_3.6H_2O$. Adjust the final volume of ferric chloride ($FeCl_3$) solution by addition of dilute hydrochloric acid (mixture of 25 ml of hydrochloric acid and 975 ml of water) so that 1 ml contains 45·0 mg of $FeCl_3.6H_2O$.



All dimensions in millimetres.

FIG. 1 COLOUR COMPARATOR AND TEST TUBE

A-4.2.4 *Cupric Sulphate Solution* — 0·5 N. Dissolve about 65 g of cupric sulphate ($CuSO_4.5H_2O$) in enough of a mixture of 25 ml of hydrochloric acid and 975 ml of water to make 1 000 ml of solution. Transfer exactly 10 ml of this solution to a 250 ml Iodine flask, add 50 ml of water, 4 ml of acetic acid, and 3 g of potassium iodide (KI). Allow the mixture to stand for 5 minutes, then titrate the liberated iodine with 0·1 N sodium thiosulphate ($Na_2S_2O_3$) solution, using starch solution as an indicator. Each ml of 0·1 N sodium thiosulphate ($Na_2S_2O_3$) solution is equivalent to 0·02497 g of $CuSO_4.5H_2O$. Adjust the final volume of copper sulphate ($CuSO_4$) solution by the addition of dilute hydrochloric acid (mixture of 25 ml of hydrochloric acid and 975 ml of water) so that 1 ml contains 62·4 mg of $CuSO_4.5H_2O$.

A-4.2.5 *Reference Colorimetric Solution* — Prepare a reference standard pale amber solution for colour comparison by mixing together 1·5 parts of cobaltous chloride ($CoCl_2$) solution, 3·0 parts of the ferric chloride ($FeCl_3$) solution and 0·5 parts of the copper sulphate ($CuSO_4$) solution. Measure 5 ml of this mixture into a test tube as specified in **A-4.1.1**. This pale amber reference standard shall then be overlaid with 5 ml of white oil.

A-4.3 Procedure

A-4.3.1 Clean a test tube with a chromic acid cleaning solution, rinse with tap water followed by distilled water, and dry in an oven at 105°C for 1 h.

A-4.3.2 Fill the test tube to the 5 ml mark with concentrated sulphuric acid (*see* **A-4.2.1**). Then add the oil to be tested to the 10 ml mark, insert the stopper loosely, and place the test tube in position in the water bath at 100 $\pm$ 0·5°C.

A-4.3.3 After the test tube has been in the water bath for 30 seconds loosen the stopper sufficiently to release any pressure and reinsert, remove the test tube from the bath quickly, hold with a finger over the stopper, and give three vigorous, vertical shakes over an amplitude of about 127 mm, shaking (*see* Note) the test tube quickly and at a rate corresponding to 5 shakes per second. Repeat every 30 seconds. Do not keep the test tube out of the bath longer than 3 seconds for each shaking period.

NOTE — A shaking machine may be employed provided the results that can be obtained agree with those obtained by the prescribed manual agitation.

A-4.3.4 At the end of 10 minutes from the time the test tube was first placed in the bath, remove the test tube and allow to stand in the room for not less than 10 minutes nor more than 30 minutes. Note any discolouration of the oil layer. Place the test tube in the colour comparator and compare the acid layer with 5 ml of the standard colorimetric solution and 5 ml of the sample of white oil in a test tube that has been shaken vigorously for 10 seconds and allowed to stand just long enough for the contents to separate into two layers.

A-4.3.5 The material shall be reported as passing the test only when the oil layer shows no change in colour (*see* Note) and when the acid layer is not darker than the reference standard colorimetric solution.

NOTE — A bluish haze in the oil layer should not be interpreted as a change in colour.

A-4.3.5.1 If the oil layer is discoloured or if the acid layer is darker than the reference standard colorimetric solution, the material shall be reported as not passing the test.

A-5. TEST FOR STABILITY

A-5.1 Place 125 ml of the material in a 250 ml beaker under an UV lamp (220 V; 200 to 300 W) in a suitable dark cabinet so that the bulb is between 230 to 300 mm of the top layer of the oil and expose it for a total period of 6 hours. At the end of the test, check the colour of the oil sample, the material shall be taken to have passed the test if the colour of the exposed oil is not darker than 20 saybolt.

(*Continued from page* 2)

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[*Page* 5, *Table* 1, *Sl No.*(i) *and* (vi), *col* 2, 3, 4 *and* 5] — Substitute the following for the existing entries:

'

(2)	(3)	(4)	(5)
Viscosity at 40°C, cSt	28 Max	29 to 60	61 Min
Flash point (COC), °C, *Min*	←	160	→

'

(PCD 4)

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