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मानक

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Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

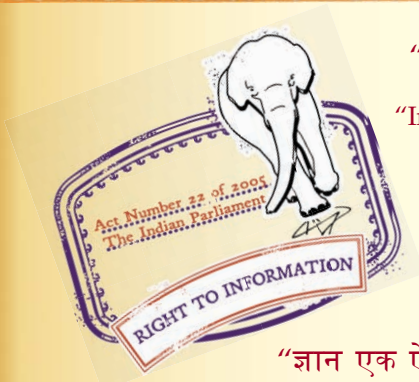
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 2787 (2006): Oil Pressure Heaters [MED 26: Oil Burning Appliances]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
तेल दाब हीटर — विशिष्टि
(तीसरा पुनरीक्षण)

Indian Standard
OIL PRESSURE HEATERS — SPECIFICATION
(*Third Revision*)

ICS 75.160.20; 97.040.201

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

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Oil Burning Appliances Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1964 and revised in 1979 and 1986. In this revision, following major changes have been made:

- a) Amendment Nos. 1 to 3 has been incorporated.
- b) One more typical flame ring has been incorporated.
- c) Construction requirements of 'Pricker' and interchangeable parts added.
- d) Finish clause has been modified.
- e) Provision of declaration of higher thermal efficiency has been introduced.
- f) Marking of oil consumption and thermal efficiency has been added in marking clause.
- g) Spanner for nipple has been added in the accessories packed with each oil pressure heater.
- h) Sampling plan has been modified.

The composition of the Committee responsible for the preparation of this standard is given in Annex G.

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.

AMENDMENT NO. 2 SEPTEMBER 2010
TO
IS 2787 : 2006 OIL PRESSURE HEATERS -
SPECIFICATION

(Third Revision)

[Page3, clause 10 (j)]-Delete.

[Page3, clause 11.1 (d)]-Delete.

(ME 26)

AMENDMENT NO. 1 JUNE 2009
TO
IS 2787 : 2006 OIL PRESSURE HEATERS — SPECIFICATION

(Third Revision)

(Page 2, clause 7.5.1, line 2) — Substitute ‘Acrylonitrile-Butadiene Rubber (NBR)’ for ‘neoprene’.

Indian Standard

OIL PRESSURE HEATERS — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirements and tests for four types of oil pressure heaters, burning pressurized kerosene oil under a normal working pressure not exceeding 200 kN/mm² (2 kgf/cm²).

NOTE — 1 kgf/cm² = 98.066 kN/m².

2 REFERENCES

The standards given in Annex A contain provisions, which through reference in this 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 agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated at Annex A.

3 TERMINOLOGY

For the purpose of this standard, the nomenclature of the different types of oil pressure heaters and their components shall be as indicated in Fig. 1 to Fig. 10.

4 DESIGNATION, TYPES AND FUEL CAPACITIES

4.1 Oil pressure heaters shall be of the following four types depending upon the number of burners and the minimum fuel capacities:

Types	No. of Burners	Minimum Capacity of Fuel Tank ml
1	1	1 400
2	2	1 400
3	3	2 400
4	4	2 400

4.2 The capacity shall be measured by filling oil to the maximum through oil filter cap. The volume of oil that the fuel tank should hold in actual use should not be more than 94 percent of the capacity (*see also* 7.4).

5 MATERIALS

5.1 The materials used in the manufacture of different parts shall be such that they would ensure safe handling and good performance of the oil pressure heaters throughout its reasonable life.

5.2 Fuel Container

The top and bottom of the fuel container shall be made from annealed brass sheet, 1.2 mm thick having a minimum copper content of 60 percent (*see* IS 410). The finished thickness of sheet at any place shall be not less than 1.00 mm for top and 1.05 mm for bottom.

5.3 Fuel feed pipe and pump tube shall be made from seamless brass tube (*see* IS 407).

5.4 Typical material that are commonly used in the manufacture of other components are given in Annex B.

6 SHAPE AND DIMENSIONS

6.1 A typical design of the oil pressure heater is shown in Fig. 1. The leading dimensions and mating dimensions of important components shall be as given in Fig. 2 to Fig. 10.

6.2 Oil pressure heater shall be made in sizes according to its capacities given at 4.

7 CONSTRUCTION

7.1 General

7.1.1 The construction of the oil pressure heater shall be such as to withstand the performance tests laid down in 9. The fuel container shall be stress-relieved after fabrication but before soldering. This shall be tested by the mercurous nitrate test as given in IS 2305.

7.1.2 The general assembly of the complete appliance shall be firm on its base. The bottom of the container shall be securely fixed to the top as shown in Fig. 2 or in any similar manner provided the joint can withstand the pressure test as laid down in 9.1.

7.1.3 Oil pressure heaters, both when full of fuel or when empty, shall be capable of being tilted in any direction to an angle of 15° from the vertical, without overturning on being released.

7.1.4 The mating of the threaded components shall be of free class fit. The detachable components shall be interchangeable.

7.2 Pump

The pump shall be of sound construction and shall be capable of developing and retaining a pressure

of 200 kN/m² (2 kgf/cm²) (*see* 9.1.1). The pump washer and non-return valve shall be removable.

7.3 Pressure Release Screw

7.3.1 The fuel container shall be fitted with a pressure release screw for releasing the pressure inside the container quickly and safely.

7.3.2 The outlet hole in the socket of the release screw shall be directed downwards at an angle of $45 \pm 5^\circ$.

7.4 Oil Filler Cap Assembly

The oil filler cap assembly shall be leak proof at an air pressure of 250 kN/m² (2.5 kgf/cm²) (*see* 9.1.1) and the safety pressure and bursting pressure tested in accordance with 9.1.2 and 9.1.3 respectively. The filler opening shall be so located that when oil is filled in the fuel container up to that level, it should not be more than 94 percent of the total capacity of the fuel container.

7.5 Washers

7.5.1 The washer for oil filler cap shall be made from neoprene or other equally suitable material, which is resistant to heat and kerosene oil. It shall not become tacky or swollen when kept immersed in kerosene oil at 60°C for 24 h continuously and shall be capable of giving leak-proof seal after the above test.

7.5.2 The pump washer shall be made from curried buffalo leather and shall be treated to avoid hardening and cracking.

7.6 Pricker

The pricker shall have a steel wire of diameter 0.05 mm less than the diameter of the nipple hole and shall be fixed in a steel strip/tin plate strip.

7.7 Interchangeable Parts

The following parts shall be interchangeable in the same type of oil pressure heaters:

- a) Burner,
- b) Nipple,
- c) Flame ring,
- d) Preheating cup,
- e) Oil filler cap,
- f) Pressure release screw,
- g) Oil cap plug,
- h) Pump valve,
- j) Pump washer, and
- k) Pump cap.

8 FINISH

The fuel container and other brass parts shall be finished bright. The residues of solder flux and similar

corrosives shall be removed during manufacture to prevent later corrosion. Shield plate shall be gold lacquered or zinc passivated, pump rod, nut and washer when made of mild steel, may be tin plated (*see* IS 1359) or cadmium plated (*see* IS 1572) or zinc passivated.

9 TESTS

9.1 Pressure Test

9.1.1 Maximum Working Pressure Test (Air Pressure Test)

The fuel container fitted with pump valve, burner or burners and oil cap, shall withstand an internal air pressure of 250 kN/m² (2.5 kgf/cm²) and shall not show any sign of leakage or deformation.

9.1.2 Safety Pressure Test

The fuel container, without burner or with burners and pump valve shall be subjected to an internal hydraulic pressure of 600 kN/m² (6 kgf/cm²) for a period of 10 min. The container shall not show any sign of leakage or any appreciable deformation.

9.1.3 Bursting Pressure Test

When the container selected in 9.1.2 is further subjected to a hydraulic pressure of 1 000 kN/m² (10 kgf/cm²), it shall neither burst nor unduly distort. Slight leakage of the hydraulic fluid shall be permissible, provided the pressure is capable of being maintained for duration of not less than 5 min.

9.2 Thermal Efficiency

When tested in accordance with the method described in Annex C the thermal efficiency of the oil pressure heaters for each burner shall be not less than:

- a) 55 percent for heater with roarer type burner, and
- b) 58 percent for heater with silencer type burner.

Thermal efficiency may be declared, if it is more than 60 percent for heater with roarer type burner and 62 percent for heater with silencer type burner.

9.3 Surface Temperature and Fuel Temperature Test (Type Test)

The surface temperature of any part of the heaters that may be necessary to touch during its operation as well as the maximum fuel temperature attained during 3 h continuous operation of the heaters, shall not exceed 60°C, when measured in accordance with method prescribed in Annex D.

9.4 Combustion Efficiency Test (Type Test)

When tested in accordance with the details laid down

in Annex E, the ratio of carbon monoxide and carbon dioxide in the ratio of exhaust gases of each burner, while burning at a pressure of 140 kN/m^2 (1.4 kgf/cm^2) shall not exceed 0.02.

9.5 Test for Resistance to Draught (Type Test)

There shall be no extinction of the flame on the burners while operating at a pressure of 140 kN/m^2 (1.4 kgf/cm^2), when the oil pressure heaters is placed in a normal (not localized) current of air with a velocity of 2 m/s , as measured with a rotating vane anemometer. The location of the oil pressure heaters relative to neighbouring walls and the direction of the draught shall be varied to correspond to likely conditions of oil pressure heaters installation.

9.6 Fuel Consumption

Each oil pressure heaters shall give within ± 15 percent of the manufacturers specified fuel consumption, in g/h.

10 INSTRUCTIONS

Instructions for safe use of oil pressure heaters and general information shall be supplied with the each heater. These shall include the following:

- Prior to lighting the oil pressure heaters, ensure that all the components are undamaged and properly assembled in accordance with the design;
- Fill kerosene oil in the container (through a funnel with filter) not exceeding the bottom level of faucet of oil filler assembly. Do not use fuel other than kerosene oil;
- Heat the heater adequately by spirit or kerosene-soaked external heater and then pump the air moderately to obtain a uniformly spread blue and stable flame;
- Clean the clogged burner regularly to get the required flame;
- Reduce the flame, just enough to keep the contents boiling, once the boiling conditions have reached;
- Maximum oil consumption rate, in g/h;
- Minimum thermal efficiency;
- Total oil filling capacity, in litres; and
- Thermal efficiency above than the specified when declare may use green level.

11 MARKING

11.1 Each oil pressure heaters shall be marked by stamping or otherwise with the following information:

- Type,
- Name or recognized trade-mark of the manufacturer or the supplier,
- Oil consumption rate, in g/h with a tolerance of ± 15 percent (stickers may be used), and
- Thermal efficiency above than the specified when declared in accordance with 9.2 may use green label.

11.2 BIS Certification Marking

The oil pressure heaters may also be marked with the Standard Mark.

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

12 PACKING

12.1 Each oil pressure heater shall be packed in cardboard box together with the instruction sheet and the following accessories:

- One spanner (for tube type burner only);
- One spanner for nipple;
- One preheating cup;
- A packet of three prickers suited to the type of burner;
- One washer each for pump, oil-filler cap and burner;
- Funnel;
- Manufacturer's instructions for use; and
- Flame ring (*see* Fig. 10).

12.2 Each oil pressure heater shall be packed in fully assembled condition.

13 SAMPLING

Sampling and acceptance criteria for oil pressure heaters shall be as agreed to between the purchaser and the supplier. Recommended scheme for the same is given in Annex F.

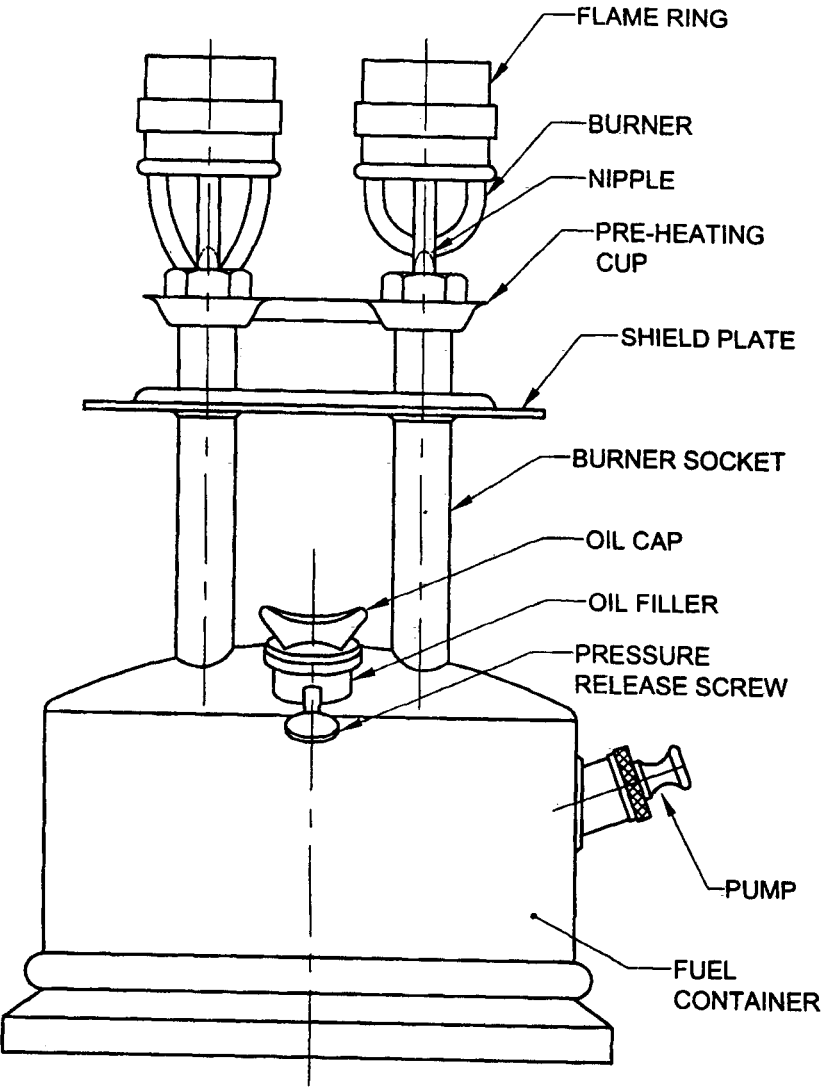
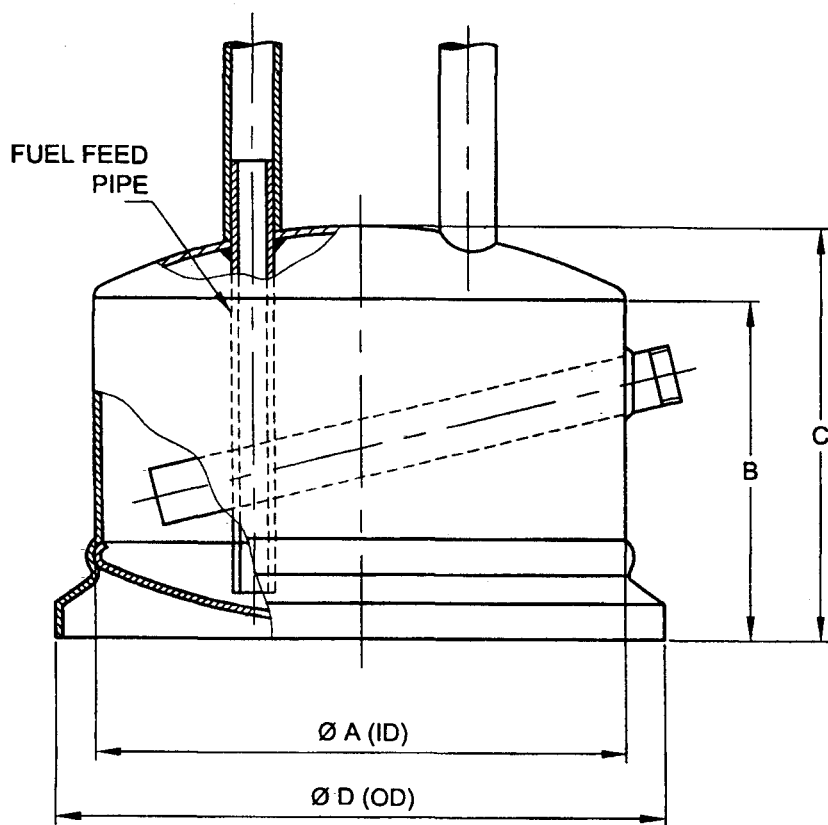


FIG. 1 MULTI-BURNER OIL PRESSURE HEATER



TYPES	ØA ±2	B +5 -0	C +5 -0	ØD ±2
1 AND 2	160	90	105	176
3 AND 4	180	112	127	200

All dimensions in millimetres.

FIG. 2 FUEL CONTAINER

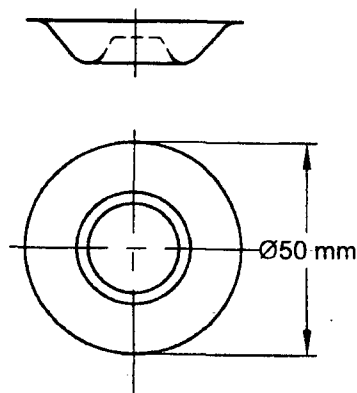


FIG. 3 PREHEATING CUP FOR
TYPE 1 HEATER

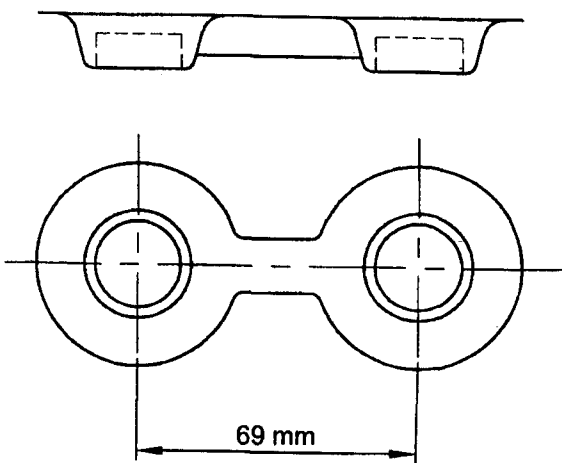


FIG. 4 PREHEATING CUP FOR
TYPE 2 HEATER

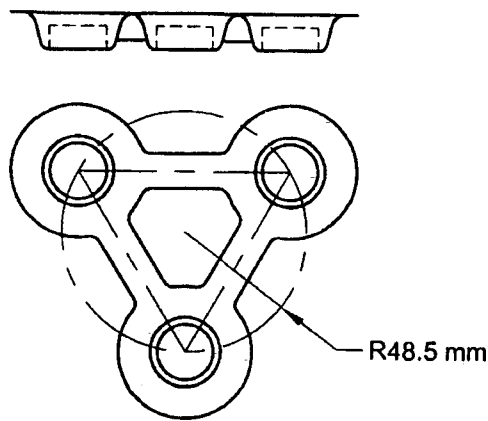


FIG. 5 PREHEATING CUP FOR
TYPE 3 HEATER

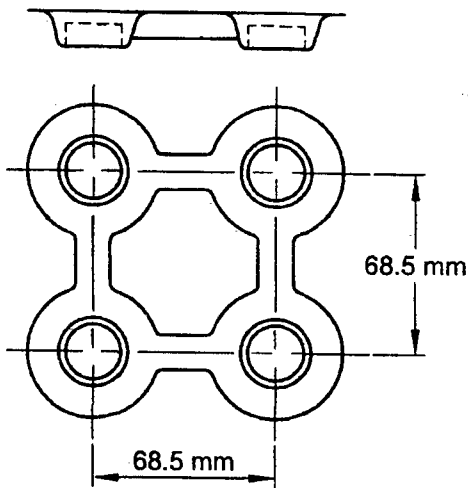
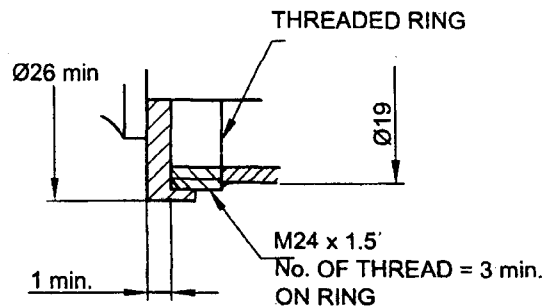
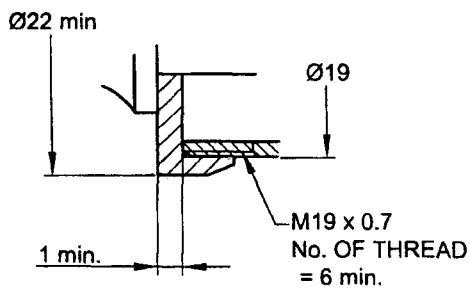
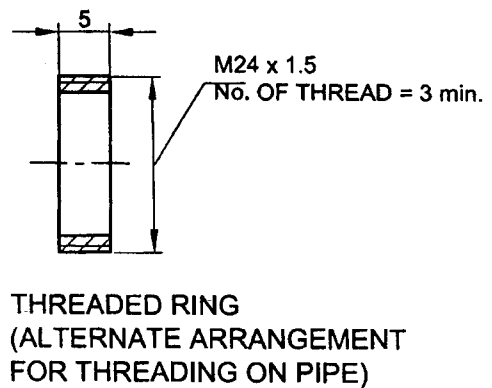
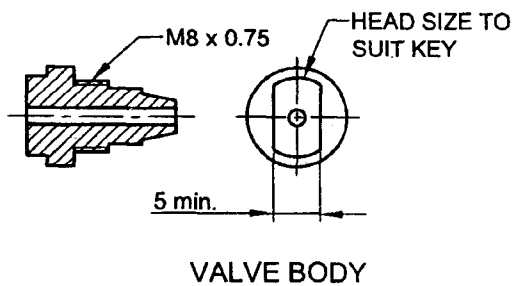
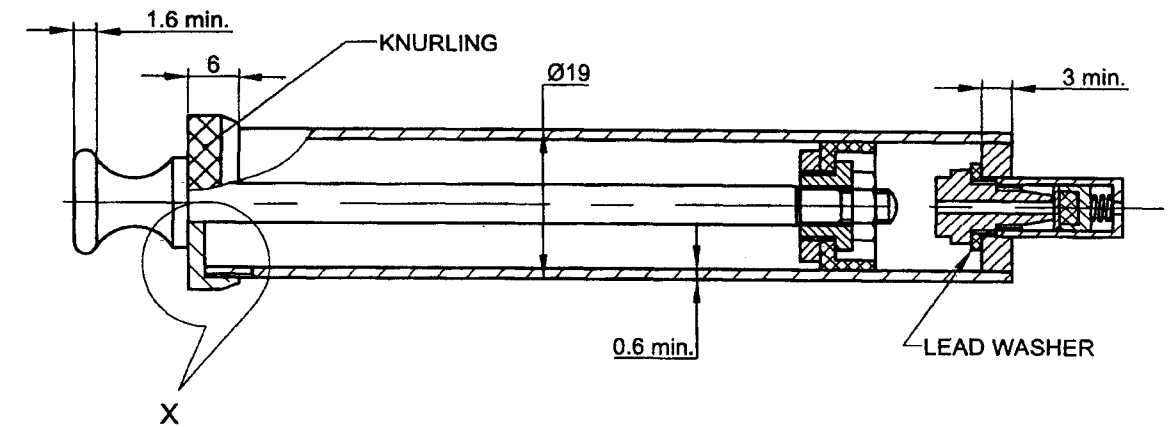
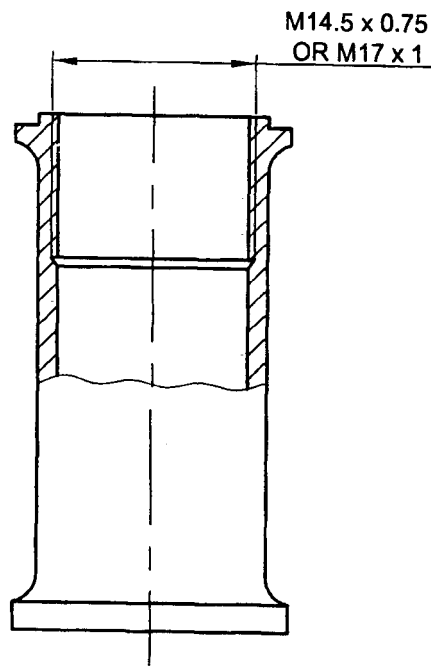


FIG. 6 PREHEATING CUP FOR
TYPE 4 HEATER



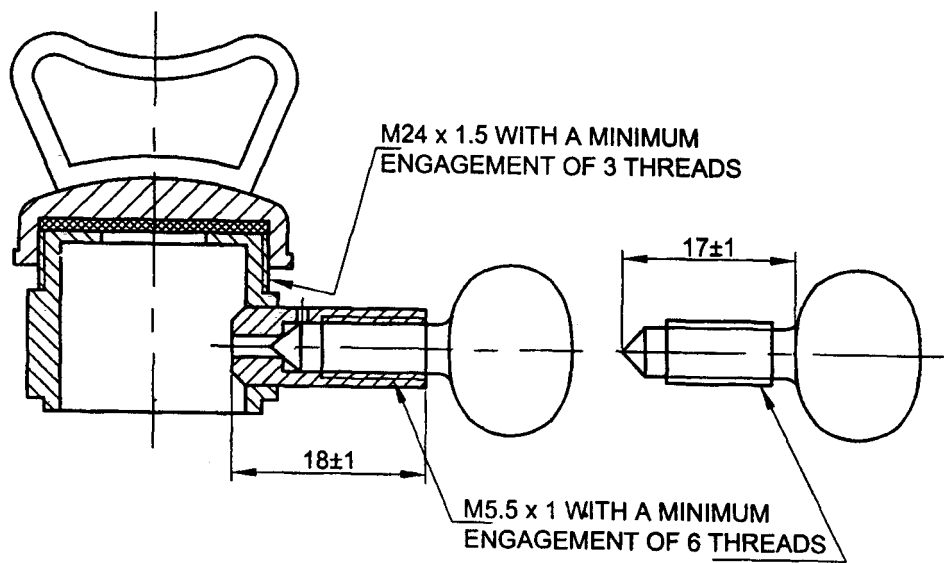
All dimensions in millimetres.

FIG. 7 PUMP ASSEMBLY



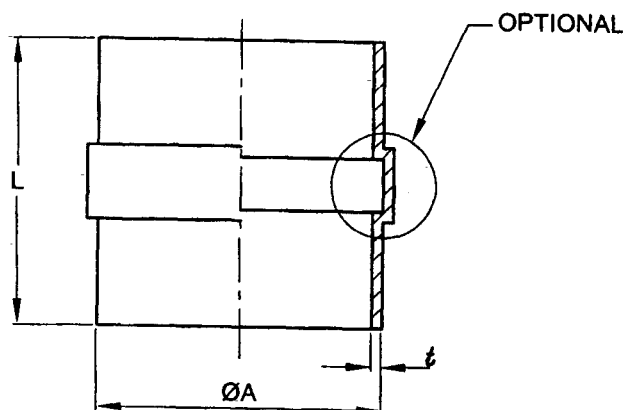
All dimensions in millimetres.

FIG. 8 BURNER SOCKET, TYPICAL



All dimensions in millimetres.

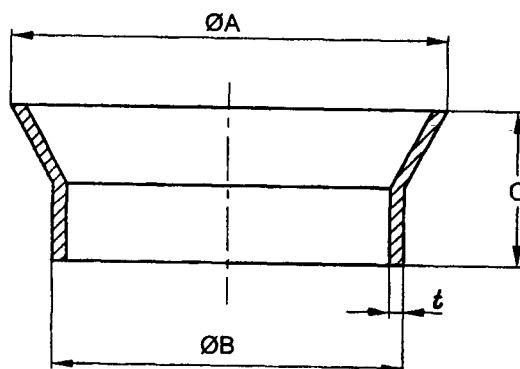
FIG. 9 OIL FILLER ASSEMBLY, TYPICAL



BURNER DESIGNATION AS PER IS 8808	ØA ±0.5	L ±1		WALL THICKNESS <i>t</i> , Min
1 H	41.5	42		0.70
2 H	51	51		1.00
3 H	69	70		1.25
4 H	79	80		1.25

All dimensions in millimetres.

FIG. 10A FLAME RING



HEATER CAPACITY IN MILLI LITRES	ØA ±0.5	ØB ±0.5	C ±0.5	WALL THICKNESS <i>t</i> , Min
1400	67	50	22	0.7
2400	86	68	30	1.0

All dimensions in millimetres.

FIG. 10B FLAME RING

ANNEX A*(Clause 2)***LIST OF REFERRED INDIAN STANDARDS**

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
280 : 1978	Specification for mild steel wire for general engineering purposes (<i>third revision</i>)	1459 : 1974	Specification for kerosene (<i>second revision</i>)
319 : 1989	Free cutting leaded brass bars, rods and sections — Specification (<i>fourth revision</i>)	1572 : 1986	Specification for electroplated coatings of cadmium on iron and steel (<i>second revision</i>)
407 : 1981	Specification for brass tubes for general purposes (<i>third revision</i>)	2062 : 1999	Steel for general structural purposes — Specification (<i>fifth revision</i>)
410 : 1977	Cold rolled brass sheet, strip and foil (<i>third revision</i>)	2305 : 1988	Method for mercurous nitrate test for copper and copper alloys (<i>first revision</i>)
422 : 1981	Specification for brass sheet and strip for the manufacture of utensils (<i>second revision</i>)	4170 : 1967	Brass rods for general engineering purposes
513 : 1994	Cold-rolled low carbon steel sheets and strips (<i>fourth revision</i>)	4905 : 1968	Methods for random sampling
1359 : 1992	Electroplated coatings of tin (<i>third revision</i>)	5522 : 1992	Stainless steel sheets and strips for utensils (<i>second revision</i>)
		8808 : 1999	Burners for oil pressure stoves and oil pressure heaters (<i>second revision</i>)

ANNEX B*(Clause 5.4)***MATERIALS COMMONLY USED IN THE MANUFACTURE OF COMPONENTS OF OIL PRESSURE HEATERS, OTHER THAN THOSE SPECIFIED IN CLAUSE 5.2 AND 5.3**

<i>Sl.No.</i>	<i>Component</i>	<i>Material</i>	<i>Recommended Specification</i>
i)	Burner socket	Wrought brass	IS 4170 or IS 407
ii)	Pump valve body and screw	Brass rod	IS 319 of Alloy designation CuZn40 of IS 4170
iii)	a) Pump rod, nut and washer	Brass rod or Mild steel rod	IS 319 or IS 280 or IS 2062
	b) Pump piston and nut	Brass rod	IS 319 or Alloy designation CuZn40 of IS 4170
iv)	Pre-heating cup and Flame ring	Brass sheet or Stainless steel or Mild steel, Zinc passivated	Alloy Designation CuZn37 of IS 410 or IS 422 or IS 5522 or IS 513

ANNEX C

(Clause 9.2)

TEST FOR THERMAL EFFICIENCY

C-1 THERMAL EFFICIENCY

Thermal efficiency of a oil pressure heaters may be defined as the ratio of heat actually utilized to the heat theoretically produced by complete combustion of a given quantity of fuel (which is based on the net calorific value of the fuel).

C-2 CONDITIONS FOR CARRYING OUT THERMAL EFFICIENCY TEST

C-2.1 Test Room Conditions

C-2.1.1 The air of the test room shall be free from draught likely to affect the performance of the oil pressure heaters. The temperature of the room shall be maintained between 25°C to 30°C.

C-2.1.2 At the start of the test, the oil pressure heaters and the kerosene in its container shall be at room temperature.

C-2.2 Test Kerosene

The kerosene to be used in conducting the test shall conform to IS 1459.

C-2.3 Setting of the Oil Pressure Heaters

The oil pressure heaters whose efficiency is to be determined shall be fitted with a burner of corresponding designation. Prior to the test, the oil pressure heaters shall be checked and examined to ensure that all components are undamaged and properly assembled according to the manufacturer's instruction. The oil pressure heaters shall be lighted and allowed to burn for a period of 10 min at a working pressure of 100 kN/m² to 200 kN/m² (1 kgf/cm² to 2 kgf/cm²) during which a blue flame shall be obtained. Now a pan containing water shall be placed on the oil pressure heaters and the pressure shall be readjusted to get a maximum blue and stable flame.

In the manner prescribed above, the oil pressure heaters shall be operated at the maximum blue flame, height for two periods of approximately 2 h each during which it shall be observed for any abnormal performance or leakage. (This may be done in draught free room.)

C-3 METHOD OF TEST

C-3.1 Fuel Consumption Test

The oil pressure heater whose efficiency is to be determined shall be filled with kerosene up to three-

fourths of its capacity. The oil pressure heaters shall be lighted and brought up to working pressure within 5 min. After burning for 5 min, the lighted oil pressure heaters shall be weighed on a sensitive balance with an accuracy of 1 g. The oil pressure heaters allowed to burn for 1 h with an aluminium pan having sufficient water in it. At the end of 1 h, weight of the burning oil pressure heaters shall be noted after removing the aluminium pan. The difference in the initial and final weight of the burning oil pressure heaters shall give the kerosene consumption rate, in gram per hour. A suitable pan for corresponding fuel consumption rate for the oil pressure heaters under test shall be selected in accordance with Table 1.

C-3.2 A cylindrical flat-bottomed aluminium pan (selected according to fuel consumption rate as given in Table 1) provided with an aluminium lid shall be used for this purpose. The lid shall have two holes, one for inserting the cork for holding a thermometer and the other for the stirrer (made of aluminium wire) required for stirring the water.

C-3.3 The pan along with the lid and the stirrer shall be weighed first and then filled with the required amount of water (as given in Table 1). The initial temperature of the water shall be kept within $\pm 2^\circ\text{C}$ of the actual room temperature. The fuel container of the oil pressure heaters shall be connected to a pressure gauge and the fuel container filled to nearly three-fourths of the capacity. The oil pressure heaters shall be lighted and an average working pressure shall be maintained. After burning the oil pressure heaters for 5 min, weight the oil pressure heaters, time and initial temperature of the water in the pan (t_1) shall be noted. The pan shall be covered with a lid fitted with a test quality mercury thermometer having an accuracy of 0.5°C , inserted into the cork in such a way that the bulb of the thermometer is immersed to half the depth of the water in the vessel. The free end of the stirrer shall come out of the lid.

C-3.4 The pan shall be placed on the oil pressure heaters after the initial weighing of the oil pressure heaters and the stop-watch shall be started immediately. As soon as the temperature of the water reaches $90 \pm 1^\circ\text{C}$ (t_2), the stop-watch shall be stopped. The oil pressure heater shall be weighed again after 1 h of its previous weighing.

NOTE — Care should be taken to maintain the same average working pressure throughout the test and to stir the water gently during heating.

Table 1 Aluminium Vessels for Thermal Efficiency Test
(Clause C-3.1)

Consumption Rate at Thermal Efficiency Test Pressure	Pan Diameter (External) ±5 percent	Pan Height (External) ±5 percent	Total Pan Mass with Lid ±10 percent	Mass of Water in Pan
g/h	mm	mm	g	kg
(1)	(2)	(3)	(4)	(5)
151-180	245	130	632	4.8
181-200	260	140	750	6.1
201-240	285	155	853	7.7
241-270	295	165	920	9.4
271-300	320	175	1 100	11.4
301-330	340	185	1 200	12.5
331-360	350	195	1 310	14.0
361-390	370	200	1 420	16.0
391-420	380	210	1 530	18.0
421-450	400	215	1 640	20.0
451-480	410	225	1 750	22.0
481-510	420	230	1 860	24.0
511-540	435	240	2 000	26.5
541-570	450	245	2 130	29.0
571-600	460	250	2 240	31.0
601-630	470	255	2 320	33.0
631-660	480	260	2 440	35.0
661-700	490	265	2 520	38.0
701-750	500	270	2 650	41.0
751-800	510	275	2 720	44.0
801-850	530	280	3 050	47.0
851-900	540	285	3 190	50.0
901-950	550	290	3 330	53.0
951-1 000	560	300	3 480	57.0

C-3.5 In case an hourly fuel consumption obtained during the test as per C-3.4 falls above the highest or below the lowest limit of the range of kerosene consumption rate, on the basis of which the pan was selected earlier, then the test should be repeated with a pan based upon fuel consumption obtained during test as specified in C-3.4. The average of thermal efficiency calculated as per C-3.4 and C-3.5 would give thermal efficiency of the oil pressure heater.

C-4 CALCULATION

Thermal efficiency of the oil pressure heaters shall be calculated as follows:

- Heat gained by vessel = $M \times 0.214 (t_2 - t_1)$ kcal
- Heat utilized for heating water = $m \times 1 \times (t_2 - t_1)$ kcal
- Total heat utilized = $(M \times 0.214 + m) (t_2 - t_1)$ kcal

$$\text{d) Heat produced by fuel} = \frac{X \times T \times 10\,500}{60} \text{ kcal}$$

$$\text{e) Thermal efficiency} = \frac{\text{Heat utilized}}{\text{Heat produced}} \times 100$$

$$= \frac{(M \times 0.214 + m) (t_2 - t_1) \times 60 \times 100}{X \times T \times 10\,500}$$

where

M = mass of the vessel complete with lid and stirrer, in kg;

t_1 = initial temperature of water, in °C;

t_2 = final temperature of water, in °C;

X = mass of fuel consumed in 1 h, in kg; and

T = time taken to heat the water to $90 \pm 1^\circ\text{C}$, in min; and

m = mass of water in the pan, in kg.

NOTE — Specific heat of aluminium is 0.214. Net calorific value of kerosene is 10 500 kcal/kg.

ANNEX D

(Clause 9.3)

METHOD OF MEASUREMENT OF SURFACE TEMPERATURE AND FUEL TEMPERATURE

D-1 PREPARATION OF OIL PRESSURE HEATERS

The oil pressure heater shall be tested with the fuel container containing approximately 75 percent of the amount of fuel, which it would hold when full. The oil pressure heaters shall be lit and run at the full output (at a working pressure of 140 kN/m² to 200 kN/m²) for 1 h before starting the measurement of temperature, with the vessel containing water placed over it.

D-2 PROCEDURE

D-2.1 The temperature of all parts of the oil pressure

heaters which may be necessary to touch during its operation shall be measured by using a mercury bulb thermometer. The temperature of each such part shall be measured thrice every 30 min to get three concordant readings. While measuring the temperature, the thermometer shall be covered with a felt pad and kept in contact with that part for sufficient period of time until maximum temperature is reached.

D-2.2 During the operation of the oil pressure heaters under D-2.1, the maximum temperature of fuel in the container shall also be recorded. The final reading shall be taken at the end of 3 h running operation.

ANNEX E

(Clause 9.4)

TEST FOR COMBUSTION EFFICIENCY

E-1 EQUIPMENT

E-1.1 The oil pressure heaters shall be tested with its fuel container filled with kerosene to nearly three-fourths of its capacity. Before starting the test, a suitable vessel containing water sufficient for the test shall be placed over the burner. In addition, a gas collecting hood (see Fig. 11) suitable for oil pressure heaters under examination shall be used.

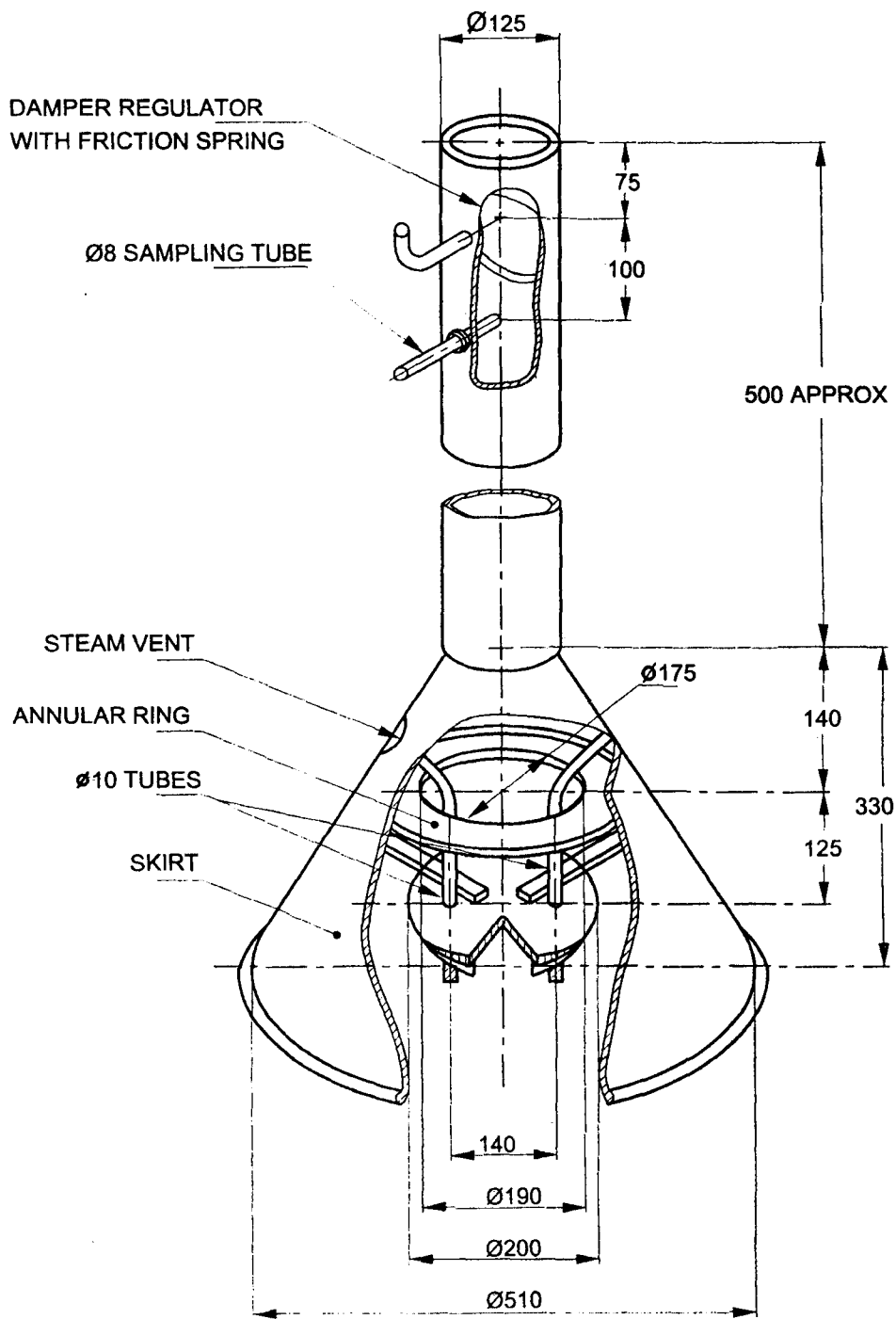
E-1.1.1 The hood shall be so designed that while not interfering in any way with the normal combustion of the burner it collects a fairly high proportion of the flue gases. Also, it shall be such that the sample collected represents the whole of combustion gases and not those from one particular point. When using the hood, the damper provided shall be set so that spillage of the flue gases around the skirt is minimized.

E-2 PROCEDURE

F-2.1 With the hood in position over the oil pressure heaters under investigation, the oil pressure heaters shall be lit and run at full output for a few minutes till a stable flame is achieved. Then a sufficient number of samples shall be collected.

E-2.2 The flue gas shall be analyzed by using any of the recognized methods. For carbon monoxide, it is recommended that co-indicator of prescribed accuracy or the iodine pentoxide method or catalytic method, namely Drager method, the Katz method or infra-red analysis method may be used. Carbon dioxide may be tested by using Orsat apparatus, or Haldane apparatus, or by the infra-red analysis.

E-2.3 The carbon monoxide and carbon dioxide content of the product of combustion shall be determined by the methods capable of an accuracy of 0.001 percent and 0.5 percent, respectively, of the volume of the sample.



NOTE — All the dimensions specified are optional.

All dimensions in millimetres.

FIG. 11 HOOD FOR BURNER

ANNEX F*(Clause 13)***SAMPLING SCHEME AND CRITERIA FOR CONFORMITY FOR
OIL PRESSURE HEATERS****F-1 LOT**

F-1.1 In any consignment, all oil pressure heaters of the same designation, type, fuel capacity and manufactured from the same materials under essentially similar conditions of production shall be grouped together to constitute a lot.

F-1.2 Each lot shall be inspected separately to ascertain its conformity or otherwise to the requirements of this standard.

F-2 SELECTION OF SAMPLES

F-2.1 The number of samples to be selected at random from a lot shall depend upon the size of the lot and shall be in accordance with col 2 and col 3 of Table 2.

F-2.2 The oil pressure heaters to be selected from the lot shall be chosen at random and in order to ensure the randomness of selection, IS 4905 shall be followed.

F-3 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY**F-3.1 Inspection for Shape, Dimensions, Construction and Finish**

All the oil pressure heaters selected according to **F-2.1** and col 3 of Table 2 shall be first inspected for shape, dimensions, construction and finish. Any oil pressure heaters failing in one or more of the above characteristics shall be considered as defective. The lot shall be considered as conforming to the requirements of these characteristics, if the number of defective oil pressure heaters in the sample does not exceed the permissible number of defectives given in col 4 of Table 2.

F-3.2 Testing for Internal Air Pressure

The oil pressure heaters in the sample having passed the requirements of **F-3.1** shall be subjected to internal air pressure test in accordance with 9.1. The lot shall be considered as conforming to the requirements of internal air pressure test, if none of the sample oil pressure heaters fails in the test.

F-3.3 Testing for Safety Pressure and Bursting Pressure

From the oil pressure heaters inspected/tested under **F-3.1** and **F-3.2** and found conforming to the requirements of above mentioned characteristics, a sub-sample of the size given in col 5 of Table 2 shall be selected at random and subjected to safety pressure test and subsequently to bursting pressure test in accordance with 9.1.2 and 9.1.3. A oil pressure heaters failing to satisfy either safety pressure test or bursting pressure test or both, shall be considered as defective. The lot shall be declared as conforming to the requirements of safety pressure and bursting pressure if the number of defective oil pressure heaters as obtained above does not exceed the permissible number of defectives given in col 6 of Table 2.

F-3.3.1 For lots of sizes less than 1 000 oil pressure heaters, if one of the oil pressure heaters in the sub-sample is found failing for bursting pressure test, a further sub-sample of the same size as indicated in col 5 of Table 2 may be selected from the oil pressure heaters inspected/tested under **F-3.1** and **F-3.2** and found conforming to the relevant requirements. The oil pressure heaters in this sub-sample may be subjected

Table 2 Sample Size and Criteria for Conformity*(Clauses F-2.1, F-3.1, F-3.3 and F-3.3.1)*

Sl No.	No. of Oil Pressure Heater in the Lot	No. of Oil Pressure Heater to be Selected in the Sample	Permissible No. of Defective Oil Pressure Heaters	Sub-Sample Size	Permissible No. of Defective in the Sub-Sample
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 50	8	0	3	0
ii)	51-90	13	0	5	0
iii)	91-150	20	1	5	0
iv)	151-280	32	2	8	0
v)	281-500	50	3	8	0
vi)	501-1 200	80	5	8	0
vii)	1 201-3 200	125	7	13	1
viii)	3 201 and above	200	10	13	2

to bursting pressure test. The lot shall be declared as conforming to the requirements of bursting pressure test, if none of the oil pressure heaters in the second sub-sample is found failing.

F-3.4 From the sample oil pressure heaters inspected/ tested under **F-3.1** and **F-3.2**, five oil pressure heaters for lot sizes up to 500, ten oil pressure heaters for lot

sizes 501 to 3 000, and fifteen oil pressure heaters for lot sizes above 3 000 shall be selected at random and subjected to thermal efficiency, surface temperature and fuel temperature test. The lot shall be considered as conforming to the requirements of these two tests only, if all the above tested oil pressure heaters pass the requirements of these tests.

ANNEX G*(Foreword)***COMMITTEE COMPOSITION****Composition of Oil Burning Appliances Sectional Committee, ME 26**

<i>Organization</i>	<i>Representative(s)</i>
Indian Institute of Petroleum, Dehra Dun	SHRI V. K. VERMA (<i>Chairman</i>) SHRI U. K. JAISWAL (<i>Alternate</i>)
Ashok Iron & Steel Fabricators Pvt Ltd, Rajkot	SHRI V. V. BARCHHA SHRI HARKISHORE V. VARCHHA (<i>Alternate</i>)
Centre of Technology for Sustainable Development, Faridabad	DR S. P. SRIVASTAV SHRI R. K. PAULASTYA (<i>Alternate</i>)
Darshna Udyog, Rajkot	SHRI RAM H. BARCHHA SHRI VINODRAI V. BARCHHA (<i>Alternate</i>)
Directorate General of Supplies and Disposals, New Delhi	SHRI S. C. CHADHA SHRI V. K. VERMA (<i>Alternate</i>)
Gorani Industries Ltd, Indore	SHRI ANIL GORANI SHRI SANJAY GORANI (<i>Alternate</i>)
Indian Oil Corporation Ltd, Faridabad	SHRI S. P. DUBEY SHRI R. MAHAPATRA (<i>Alternate</i>)
Ministry of Defence (DGQA), New Delhi	SHRI G. TRIVEDI SHRI S. R. BAJPAI (<i>Alternate</i>)
Office of the Development Commissioner (SSI), New Delhi	SHRI R. L. GARG SHRI M. B. JAYAKUMAR (<i>Alternate</i>)
Petroleum Conservation Research Association, New Delhi	SHRI A. K. GOEL DR ABHAY SHARMA (<i>Alternate</i>)
Premier Industrial Corporation, Coimbatore	SHRI R. SHYAM SUNDER SHRI R. SIVA KUMAR (<i>Alternate</i>)
Servals Automation Pvt Ltd, Chennai	SHRI P. MUKUNDAN SHRI THIYAGARAJAN (<i>Alternate</i>)
The Bombay Light & Stove Merchant's Association, Mumbai	SHRI MAHESH D. BAKHAI SHRI G. Y. KAPASI (<i>Alternate</i>)
The South India Kerosene Wick Stove Manufacturers Association, Madurai	SHRI C. KASI SHRI T. CHIDAMBARAM (<i>Alternate</i>)
BIS Directorate General	SHRI C. K. VEDA, Scientist 'F' and Head (MED) [Representing Director General (<i>Ex-officio Member</i>)]

Member Secretary
SHRI T. V. SINGH
Director (MED), BIS

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