

BUREAU OF INDIAN STANDARDS

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भारतीय मानक मसौदा

**द्रवित पेट्रोलियम गैसों के लिए प्रयुक्त
सिरामिक बर्नर वाले घरेलू गैस चुल्हे — विशिष्टि**

Draft Indian Standard

**DOMESTIC GAS STOVES WITH CERAMIC BURNER FOR USE
WITH LIQUEFIED PETROLEUM GASES — SPECIFICATION**

ICS 75.160.30, 97.040.20

Domestic and Commercial Gas Burning
Sectional Committee MED 23

Last date for receipt of
Comments is **31 July 2024**

FOREWORD

(Formal clauses to be added later)

This standard has been formulated to prescribe requirements for domestic gas stoves with ceramic burner for use with LPG. It provides construction, performance and general requirements of these gas stoves.

This standard is one of a series of Indian Standards on various domestic and commercial gas burning appliances (pressure type) used with LPG. General requirements of this equipment are covered in IS 5116 : 2020 ‘General requirements for domestic and commercial equipment for use with LPG (*fourth revision*)’ which is a necessary adjunct to this standard. Should, however, any deviation exist between the requirements given in IS 5116 and those of this standard, provisions of the latter shall apply. Other standards published so far in this series are IS 4246 : 2002 ‘Domestic gas stoves for use with Liquefied Petroleum Gases — Specification (*fifth revision*)’ IS 4473 : 2002 ‘Domestic gas ovens for use with liquefied gases (*first revision*)’, IS 4760 : 2002 ‘Domestic cooking ranges for use with liquefied gases (*third revision*)’, and IS 11480 : 2023 ‘Domestic grillers for use with liquefied gases (*second revision*)’.

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 shall be rounded-off in

Doc: MED 23 (26038)WC
July 2024

accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard

Draft Indian Standard**DOMESTIC GAS STOVES WITH CERAMIC BURNER FOR USE
WITH LIQUEFIED PETROLEUM GASES — SPECIFICATION****1 SCOPE**

1.1 This standard covers construction, operation, safety requirements and tests for domestic gas stoves with metallic bodies with ceramic burner intended for use with liquefied petroleum gas at 2.942 kN/m² (30 gf/cm²) gas inlet pressure.

1.2 For Convenience, this standard has been divided into three sections as follows:

- a) Section 1 Construction
- b) Section 2 Performance
- c) Section 3 General

2 REFERENCES

The standards listed below 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 edition of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 1070 : 2023	Reagent grade water — Specification (<i>fourth revision</i>)
IS 5116 : 2020	General requirements for domestic and commercial equipment for use with LPG (<i>fourth revision</i>)
IS 6480 : 2022	Glossary of terms relating to domestic and commercial gas burning appliances (<i>second revision</i>)
IS 13432 (Part 1) : 1992	Gas leak detector for use with low pressure liquefied petroleum gas burning appliances – Specification : Part 1 Mechanical type
IS 554 : 1999	Pipe Threads Where Pressure-Tight Joints are Made on the Threads - Dimensions, Tolerances and Designation (<i>fourth revision</i>)
IS 2553 (Part 1) : 2018	Safety glass — Specification: Part 1 Architectural, building and general uses (<i>fourth revision</i>)
IS 14900 : 2018	Transparent float glass — Specification (<i>first revision</i>)
IS 6506 : 1972	Methods for thermal shock tests on glassware

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 6480 shall apply.

SECTION 1 CONSTRUCTION

4 GENERAL

4.1 The construction of all the parts of the equipment shall be sound and of a high standard of workmanship and appropriate finish. The construction shall ensure durability and shall comply with the safety requirements.

4.2 Rivets, fastening screws, plugs, etc, shall not lead into gas passages, except where adequate provision has been made to ensure permanent gas-tight joints.

4.3 No Pressure regulator shall be included as a part of the stove.

5 MATERIALS

5.1 Fittings and materials shall comply where specified with the relevant Indian Standard and shall be appropriate with the conditions arising in the part of the appliance in which they are used. The appliance shall be free from swarf, grit, and other foreign matters. Wherever practicable rigid metal tubing shall be used for internal gas supplies integral with the appliance. If flexible tubing is used, it shall not be fitted on the outlet side of any control which is capable of cutting off the gas completely, except where screwed metal connections are fitted. The use of low pressure rubber or plastic tubing fitted or pushed on the nozzle is not recommended.

5.1.1 Plastic components which are liable to heating (for example, tap handles push buttons, etc.) shall be free of fissures, distortion, blemishes and discoloration and shall not show signs of ageing when tested as given in Annex B of IS 5116.

5.2 Surface of Glass or Glass Ceramic

Toughened glass top, if provided, shall meet the following requirements.

5.2.1 Toughened glass, if provided, shall meet the following requirements:

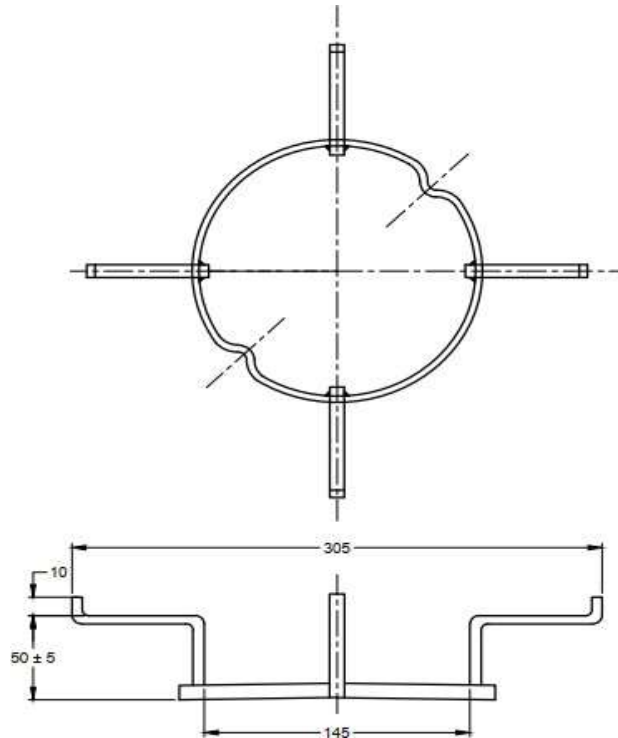
- a) Compliance to all the applicable requirements as per IS 2553 (Part 1).
- b) The thickness of the glass shall be atleast 6 mm nominal with tolerance as per IS 14900.
- c) Toughened glass top including their edges or corners shall not have fissures or scratches.
- d) An adhesive tape of glass fibre with Aluminium foil of minimum thickness as 0.13 mm, having temperature resistance of 120°C for one hour, shall be pasted on toughened glass with no visible wrinkles. The test has to be conducted after the pasting of adhesive tape with aluminium foil and tested as follows: 'Adhesive tape with foil shall be pasted on a fully toughened glass sample of size 1 feet × 1 feet and heated to 120 °C for one hour. The adhesive tape shall not burn or peel off.'

e) The following instructions for safe use of glass top gas stove shall be printed on the toughened glass. The instructions shall be properly readable. The following instructions shall also be printed in the instruction manual provided.

- 1) Bati/Tandoor/inverted vessel or similar utensils shall be used only with bati stand provided with the glass top gas stove.
- 2) Do not pour water on the glass when it is hot.
- 3) Do not keep hot vessels on the glass surface.
- 4) Do not hammer the glass.

5.2.2 Additionally, the following points shall be complied with:

- a) The means used to hold the glass top of the gas stove shall not allow any stress or risk of mechanical change to the glass top. For example, screws used for assembly shall not come into contact with the glass top.
- b) When a pan support for an uncovered burner is in contact with the glass ceramic surface of the gas stove, the surface area of the pan support in contact with the glass ceramic surface shall be at least 25 mm².
- c) The distance between flat bottom of vessel and glass top shall be such that the temperature of the glass does not exceed 200 °C.
- d) A bati stand shall be provided as part of toughened glass gas stove for making Bati/Tandoor/inverted vessel etc.
- e) Thermal Shock test as per method D of IS 6506 shall be required. 't₁' value shall be 200 ± 5 °C and 't₂' shall be 15 ± 5 °C.
Procedure — Heat the oven and adjust the temperature to 200 ± 5 °C and place the glass specimen of size 1 feet × 1 feet for 30 minutes. Then remove the specimen and pour 1 litre - 1.1 litre of water steadily and uniformly on the glass surface at 15 ± 5 °C. There shall be no chip, crack or break in the glass.
- f) Stand for Bati/Tandoor/inverted vessel etc. shall be provided. The design of the Bati stand, Tandoor Maker, etc. shall be such that, it shall withstand the weight of the Bati, Tandoor etc and the temperature of the glass shall not go beyond 200 °C. The design referred as Fig. 1 is for reference. Any other design may be used, provided the condition of strength and temperature given above is satisfied.



All dimensions in millimetres.

FIG. 1 REFERENCE FIGURE FOR BATI/INVERTED VESSEL/TANDOOR MAKER STAND
(MATERIAL IS 4 MM THICK STRIP OF MS/SS)

5.3 Non-metallic materials normally in contact with the gas shall not change in weight or volume by more than 15 percent after being immersed in pentane for 72 h at room temperature when tested according to Annex D of IS 5116.

5.4 The main body of the burner (including mixer head, mixing tube and ceramic plate) shall be of substantial and durable construction. Metals and Ceramic having a melting point below 510°C shall not be considered acceptable for top burners while metals having a melting point below 800°C shall not be considered for oven griller or auxiliary burner or any other combination thereof.

5.5 The components of the gas taps shall be made of the following materials. Examples of suitable materials specified below are for guidance:

- | | |
|----------------------|---|
| a) Alloy LM 6, LM 20 | Bodies – Alloy 4600 and Alloy 4600 A of IS 617. |
| b) Alloy DCB 1 | Bodies (Die castings) – DCB 1 of IS 1264. |
| c) Alloy DCB 3 | Bodies (pressure Die castings) – DCB 2 of IS 1264. |
| d) Alloy CZ 122 | Bodies, plugs (hot pressure) Leaded brass of IS 6912. |
| e) Alloy CZ 121 | Bodies, Plugs & Nuts, etc. – Type I of IS 319. |
| f) Alloy En 56 | Series Springs (Stainless steel) – Grade 1 of IS 4454 (Part 4). |

- g) Alloy C 160, C 107 Tubes – Grade DHP and DPA of IS 2501.
- h) Alloy CZ 108 Washers – Alloy CuZn37 of IS 410.

5.6 Drip trays, if provided, shall be made of non – corrosive material or appropriately finished and treated to resist corrosion.

6 DESIGN FOR MAINTENANCE

6.1 The appliance, including all the component parts, shall be easy to clean and maintain in good working order. There shall be easy access to the accessories and controls for maintenance and adjustment.

6.2 The parts of the burner shall not become disconnected during the operation of the appliance. The burners shall be so spaced that the relative distance between the centers of the adjoining burner shall not be less than 180 mm.

6.3 Burners and parts of burners including ceramic of same rating, model and make, shall be interchangeable or replaceable without affecting performance.

6.4 Parts, which are intended to be removable by the user, shall be easy to replace correctly, and difficult to assemble incorrectly.

6.5 All nuts, bolts and fittings having spanner flats shall be capable of being moved by a suitable spanner or be readily accessible to an adjustable spanner.

7 RIGIDITY AND STABILITY

7.1 The appliance shall be so designed that it remains stable and shall not be easily overturned.

7.2 The appliance, if mounted on a cylinder or on a stand shall be so designed that it will not tip over when placed on a plane at an angle of 10° from the horizontal, with the container empty.

7.3 For cooking appliances, the design of the pan support shall be such that the assembly will remain stable when used with vessel of diameter from 150 mm to 250 mm’.

8 WORKMANSHIP AND FINISH

8.1 The finish of exposed parts shall be durable, easy to clean and not subject to excessive deterioration in normal use. Parts, which will come in contact with the foodstuff, shall be capable of being hygienically cleaned. The finishes shall, on visual examination, show no defects, such as pin-holes, blisters, roughness or exposed areas of metal, which give rise to unduly rapid deterioration in use. The finished components shall meet the requirements covered in **8.2** to **8.4**.

8.2 Vitreous enameled components shall meet the requirements as given in Annex E of IS 5116. The test shall be carried out on a specimen measuring 40 mm x 75 mm prepared from the same

base metal and enamels, as the components, and fired along with the components to ensure identical conditions.

8.2.1 A separate specimen shall be used for each test.

8.3 If the body of the stove is electroplated, the top flat surface shall have a coating of a minimum of 10 microns of nickel followed by 0.2 micron of minimum chromium. The coating shall be tested as per the requirements given in **8.3.1**, **8.3.2** and **8.3.3**.

8.3.1 The thickness of nickel plating shall be determined by BNF jet method or any other method, such as coulometric method as specified in IS 3203.

8.3.2 *Adhesion Test*

Cut a piece of a plated article. Hold it in a vice and apply a course filed to the cut edges in such a manner as to raise the deposit. There shall be no separation between the coating and the base metal and the coating shall continue to adhere to the base metal.

8.3.3 *Corrosion Resistance Test*

The plated article shall be subjected to the test for 12 h as covered in IS 6910. The rating shall be assigned using the methods described in IS 6009.

8.4 Paints or Similar Finishes for Gas stove Body

Surfaces finished in stoving paints or similar material shall conform to the following requirements:

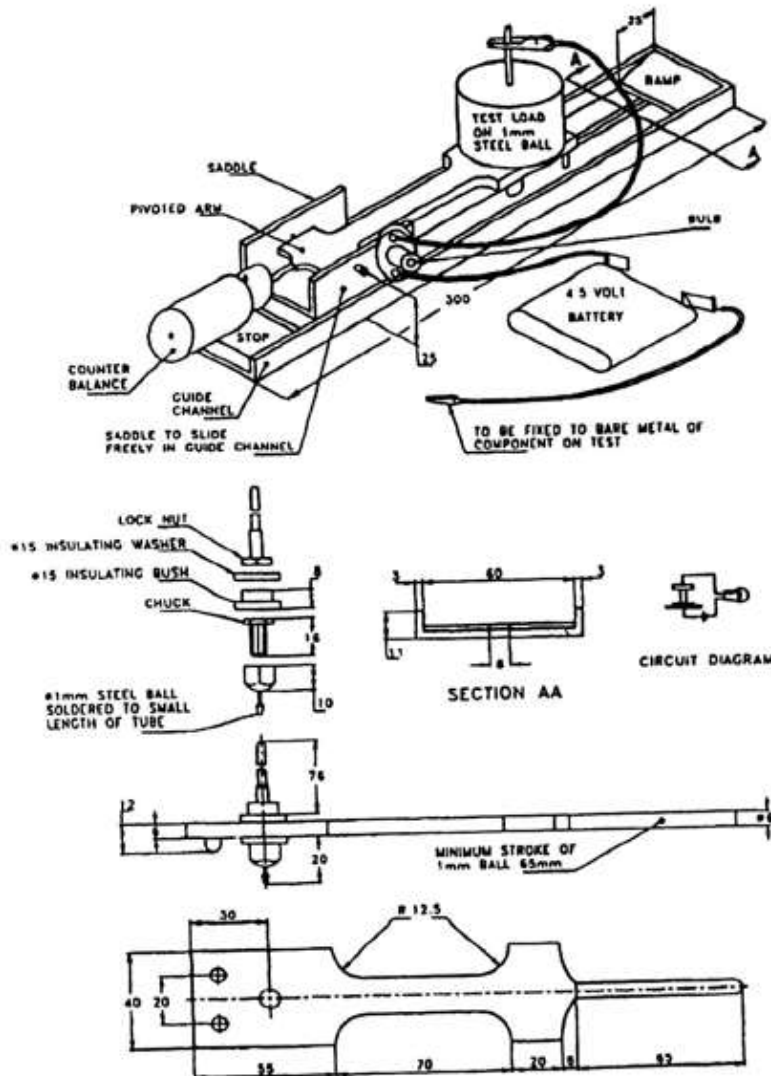
8.4.1 *Resistance to Abrasion*

Painted surface shall be tested for resistance to scratching as described below:

The apparatus required for this test shall be as per Fig. 2 with a 1 mm diameter steel ball fixed at the end of the counterpoised arm which is kept horizontal.

8.4.2 *Method of Test*

Apply the apparatus to the surface under test and move the ball after loading with not less than 1.5 kg, at 3 to 4 cm/s relative to the surface. If the indicator bulb lights, the surface is deemed to have been penetrated. For metallic paints, a visual examination of the scratch is necessary in order to determine whether the film has been penetrated. The finish is deemed to have failed if the scratch has jagged edges, is greater than 1 mm width or penetrates the film. Clean the ball after each test and inspect frequently to verify that it is 1 mm sphere.



All dimensions in millimeters.

FIG. 2 PAINT SCRATCH TEST APPARATUS

8.4.5 Resistance to Heating

When the appliance is operated at its normal working pressure for a continuous period of 8 h with a pan filled with water placed on the burner, there shall be no appreciable change of color of any part of the stove and the finish shall not become tacky or show other signs of deterioration. This does not apply to parts, which come into direct contact with the flame. After the initial burning off period, there shall be no detachable odour from the flame when the stove is operated normally.

NOTE – Alternatively the body of the stove can be kept in an oven maintained at 80 ± 5 °C for 8 h for checking the conformity

8.5 Concealed Gas Supplies

Concealed tubular fittings liable to corrode shall be protected by bituminous paint or other equally protective material.

8.6 Screw, Nuts, Bolts and Springs

All springs and those screws, nuts and bolts which are visible or which are to be removed for maintenance shall be of corrosion – resistant material or treated to resist corrosion.

8.7 The external finished surfaces shall be easily cleanable.

9 GAS TAPS

9.1 The appliance shall have at least one tap for each burner.

9.1.2 The ‘ON’/’OFF’ and any fixed position of tap handles shall be clearly and durably indicated or shall be obvious by design or position (Fig. 3) Where it is not obvious which tap operates which burner, some indication shall be given. All taps shall close in the same direction. The direction of rotation of a tap knob (handle) from off-on-simmer shall be anti-clockwise. Taps shall be designed so that when placed in any position and viewed from a distance of 3 m. will definitely indicate whether the valve is open or closed or in an intermediate position.

9.1.3 Where taps are fitted with adjustable stops. There shall be means for locking the stops in position. If screws are used for this purpose, they shall not lead into gas passages.

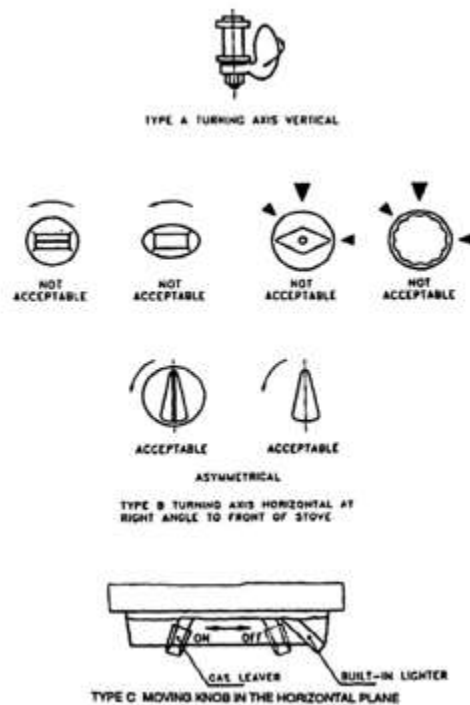


FIG. 3 TYPICAL TYPES OF TAP HANDLES

9.1.4 Preferably all taps (excluding pilot taps) position shall lock in the 'OFF' Position but in all cases it shall be impossible for any handle or tap to move accidentally, for example, by the weight of plugs or handle or when caught by clothing. If this requirement is satisfied by means of an automatic locking device, the tap shall be easy to operate with one hand.

9.1.5 Taps shall be so made that in normal use and with reasonable application of lubricant, the gas passages do not become blocked (*see* Fig. 4).

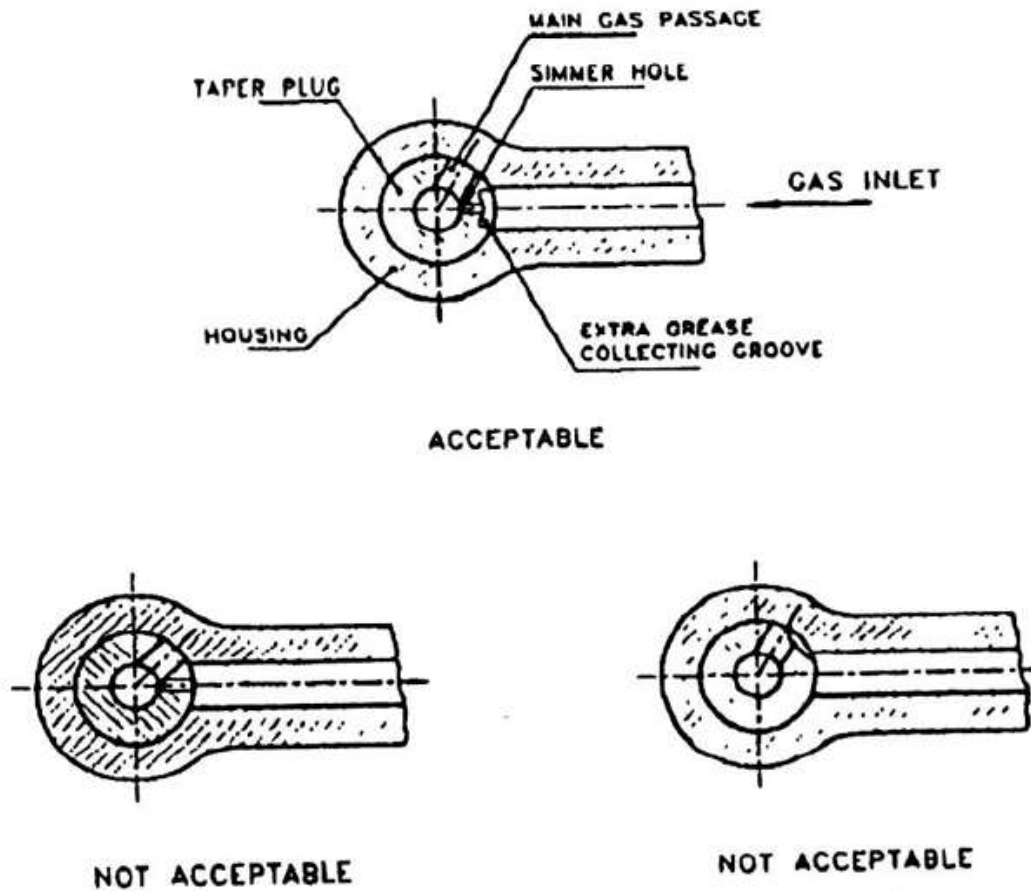


FIG. 4 SIMMER GAS-WAY IN TAPS (AXIAL FLOW)

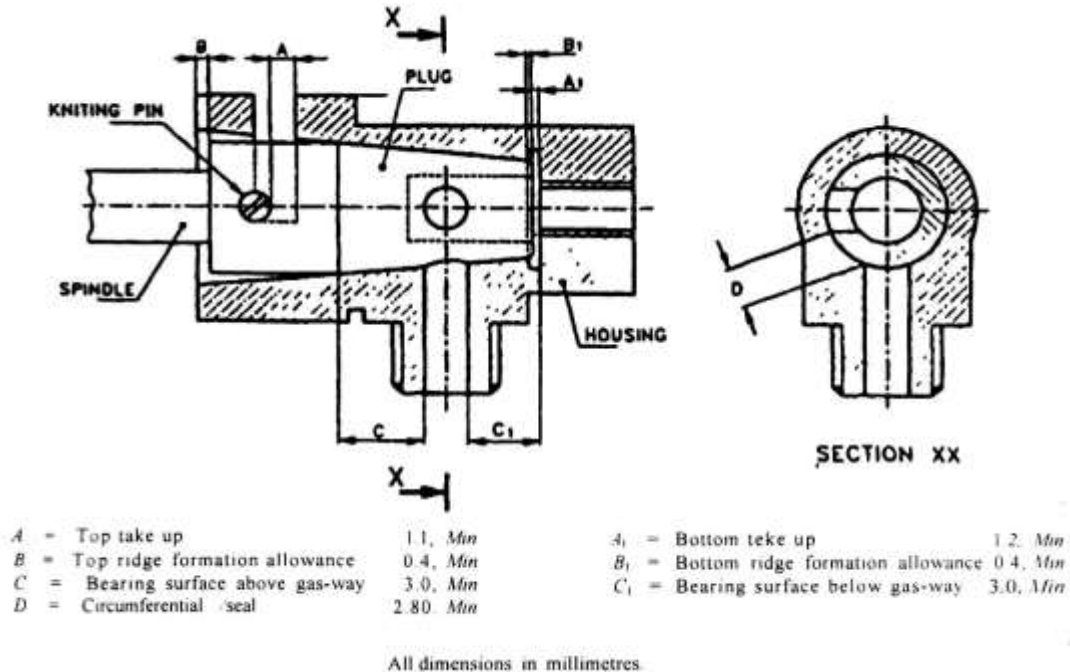


FIG. 5 DETAILS OF GAS COCK ALLOWANCES

9.1.6 Taps shall be lubricated with suitable grease, resistant to the action of the gas and capable of operating at the maximum temperature of 110 °C.

9.1.7 Each taper plug tap shall be spring-loaded to maintain a gas-tight fit. Helical springs fitted in taps and valves shall have flattened ends, which shall be rounded before fitting.

9.1.8 Taper plug taps shall have dimensional allowances when in 'OFF' position given in Fig. 5.

9.1.9 All controls or taps shall be easy to operate at all temperatures normally attained in use.

9.1.10 Screws nuts etc., which regulate the tension of taps valve or springs, shall not loosen in operation of the appliance. It shall not be possible to cause a leak during normal manual operation of tap.

9.1.11 Screw-down valves shall be so designed that it is impossible to withdraw completely the valve stem in the normal operation of the tap.

9.1.12 Taps having an 'OFF' position shall have positive stops at the 'OFF' and simmer position except that special purpose taps (for appliance incorporating auto or self-ignition device), for example, taps with simmering position in between 'OFF' and 'ON' may have a movement beyond the simmer position with a positive stop.

9.1.13 Simmer flame shall be obtained by fixed simmer orifice.

9.1.14 The niting means adopted shall be sufficiently robust to withstand normal use without distortion or damage.

10 INJECTOR JETS

10.1 The injector Jets shall be fixed calibrated type and it shall not be possible to loosen them without the use of tools. The dimensions of the injector Jet shall conform to the following requirements:

- a) Across flats 6 mm, Min
- b) Projection from the face of mounting 6 mm, nominal; and
- c) Threads M 5, 1BA or any other suitable threads .

10.1.1 Injector Jet shall be made of metal, with or without ceramic tip. The melting point of the metal shall not be less than 650 °C.

10.2 The size of the Jet in litres per hour of the flow of LPG at STP conditions shall be impressed upon it.

11 BURNERS

11.1 The construction of the burners and the assembly shall allow their dismantling from the supports easily with or without the use of tools (*see* Fig. 6 for guidance) .

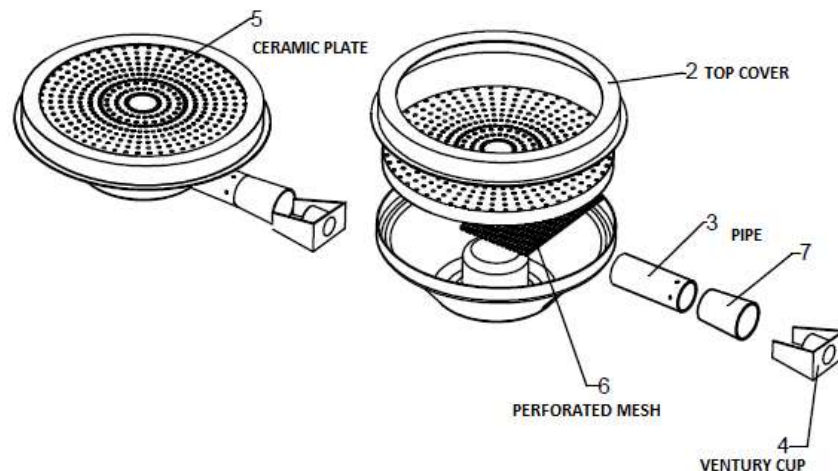


FIG. 6 TYPICAL BURNER ASSEMBLY

11.2 The burner supports shall be rigid and shall be fixed in their place. Their construction shall ensure the stability of the burners and shall prevent their undue movement in a horizontal plane.

11.3 The tightness of the joints between the ceramic plate and its peripheral metal cover shall ensure leak-proofness by use of suitable high temperature resistant glass wool / adhesives.

11.4 If primary air regulators are used, they shall be so designed that they are not easily maladjusted by the user and the construction shall be such that primary air adjustment can be made with the burner in place (see Fig. 7).

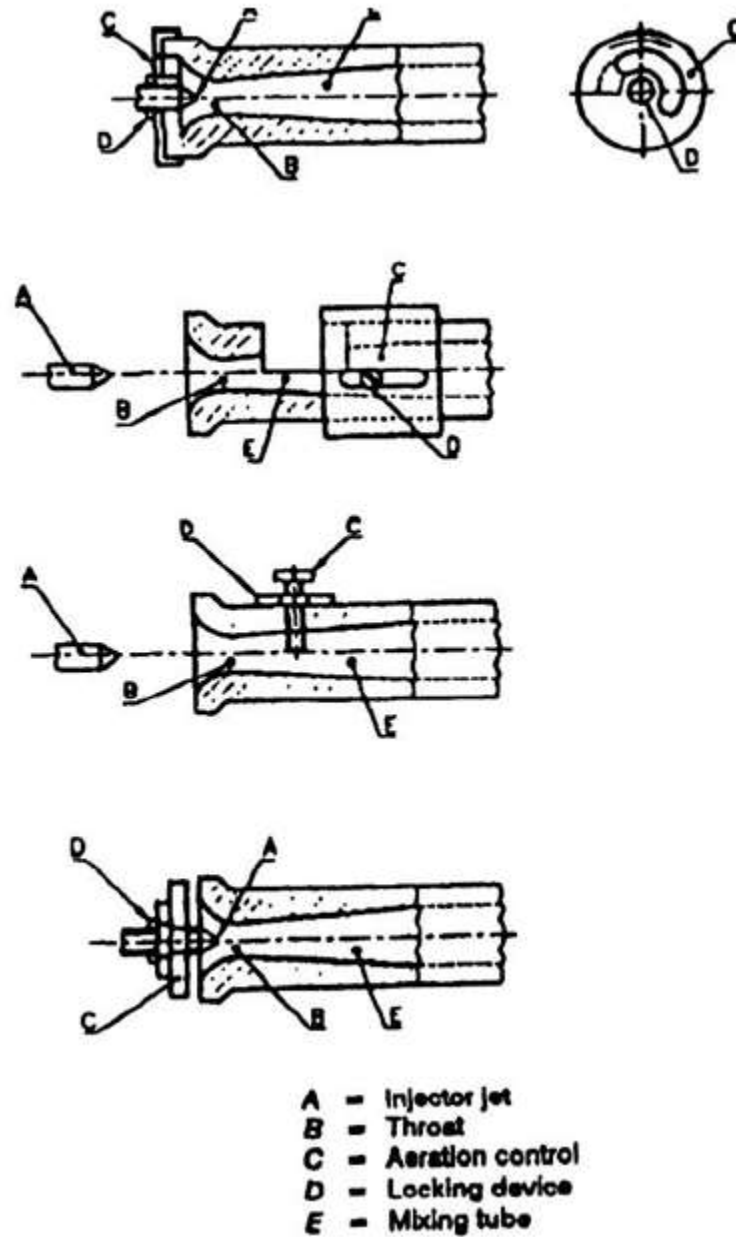


FIG. 7 PRIMARY AIR CONTROLS

11.5 If the burner is made and assembled in two or more parts they shall be so designed to provide proper self-locating arrangement so that they are always re-assembled to its original design preventing any maladjustment in their assembly. This shall also be applicable for primary air regulators.

12 PAN SUPPORT

12.1 The design of the pan supports shall be such that it is practicable to support a pan of 100 mm diameter over at least one top burner without the use of loose rings and such that 125 mm diameter vessel remains stable over each burner. Prongs of the support shall have suitable taper to accommodate round bottom pans.

12.1.1 Loose pan support shall be so designed that it is not possible to place them firmly in other than proper position

12.1.2 The material of the Pan support shall be metallic.

13 GAS SOUNDNESS

13.1 All gas carrying parts of the appliance shall be sound and these parts when connected to form a complete assembly shall also be sound against any gas leakage. The complete assembly shall also be sound against any gas leakage. The complete assembly shall be checked at 14.71 kN/m² (approx. 150 gf/cm²). The details of test are given in Annex J of IS 5116.

13.2 Gas Leak Detector

13.2.1 The stove may be provided with gas leak indicator. If gas leak indicator is provided, it shall conform to the requirements of IS 13432 (Part 1).

14 GAS INLET CONNECTIONS

14.1 Nozzles shall be machined from free cutting brass, MS, SS, Zinc or any other suitable metal.

14.2 Where nozzles for flexible tubing are fitted, they shall be so positioned as to facilitate fitting of the tubing and also to prevent heating of the tubing to more than 60°C. Shape of nozzles is given in Fig. 8.

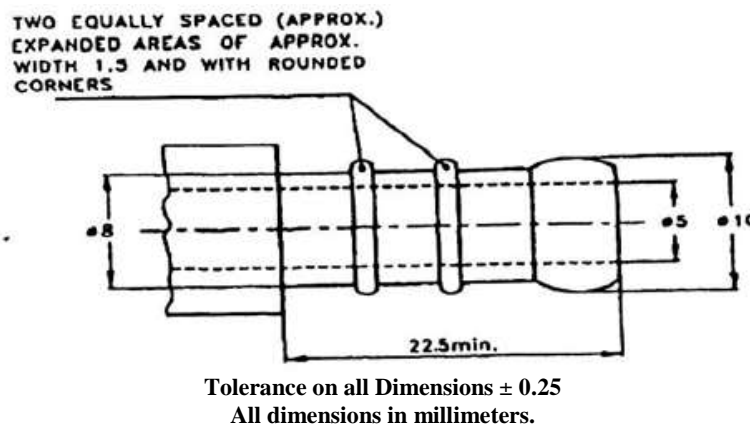


FIG. 8 NOZZLE FOR 6.4 MM BORE TUBING

14.3 Screwed gas inlet and outlet connections shall conform to IS 554 taper external thread.

14.4 The pipe/tube used for main gas rail shall be of mild steel. The wall thickness of main gas rail shall be 1.60 mm minimum. The external surface of the gas rail shall be treated to resist corrosion. Any other connection made from the main gas rail shall be only metallic.

14.5 The position of the gas inlet shall allow connection to a gas supply on either side of the appliances. Inlet connection at the rear or bottom is also permitted. For either side of connection, it shall be possible to change gas inlet from one side to the other side easily by standard tools.

15 STRENGTH AND RIGIDITY

When tested as specified in Annex A, the vertical resultant deflection of the top surface measured at the centre of length of the body, shall not exceed 2 mm and the distance between the opposite sides (lengthwise and widthwise) shall not change by more than 5 mm.

SECTION 2 - PERFORMANCE

16 GENERAL CONDITIONS OF TEST

16.1 During the tests the initial adjustment of appliance shall not be altered unless specifically required in the test procedure. The appliance shall be adjusted and operated in accordance with the instructions given on or issued with the appliance. Before any tests are made the appliance shall be operated at its full working temperature for a sufficient period to remove any temporary protective coating, which might interfere with observations. The gas connections and system up to and including the burners shall be examined for leaks before and after test. The performance test results shall not be valid unless the system is sound. The appliance shall be at room temperature at the start of each test unless otherwise stated.

16.2 The room in which tests are conducted shall be adequately ventilated but free from perceptible draughts. The gas/air shall be supplied to the appliance through a control valve, an adjustable pressure regulator and an accurate meter with a pressure gauge on its inlet. A pressure gauge shall be fitted to the inlet of the appliance and additional water manometer to any pressure test points on the appliance. The gas/air pressure shall be measured correct to 2.5 mm water gauge at the inlet to the appliance and controlled so that any variation does not exceed 2.5 mm water gauge.

16.3 Except where otherwise stated, the appliance shall satisfy the performance requirements using LPG. Wherever the combustion characteristics of burners are concerned, each burner shall be tested separately and in all possible combinations with other burners. This procedure shall be used for appliance with up to four burners. For appliance with larger number of burners, the test procedure becomes impossibly long and discretion shall be exercised to eliminate tests on combinations of widely separated and which are fitted in appliance of open construction are unlikely to interfere with the combustion of each other.

17 GAS CONSUMPTION

17.1 Each burner assembly under separate 'ON/OFF' control shall give ± 8 percent of the manufacturers' specified gas consumption in l/h or heat input in kcal/h at 2.942 kN/m² (30 gf/cm²) gas inlet pressure when measured by volumetric method with a wet gas meter using compressed air (Free from oil/impurities) (27 °C and 760 mm. mercury). Thereafter using 0.75 as multiplying factor, the value of air flow at STP so obtained to be converted to flow of LPG at STP.

NOTE — For this test, 1 litre of LPG = 2.46 g

17.1.1 When tested for gas consumption, the apparatus shall be set up as given in Annex B. The measurement of volume shall be made with a wet gas flow meter and with minimum consumption of 6 litres or volume displacement of two revolutions of the drum whichever is higher.

17.1.2 Multi burner appliances (namely, appliances having more than one burner) shall give within + 5 and -15 percent of the declared total gas consumption in m³/h or heat input in kcal/h at 2.942 kN/m² (30 gf/cm²) gas inlet pressure with commercial LPG and with all the taps turned on.

17.2 It shall be possible to reduce the consumption rate of each burner to the following extent by providing a fixed simmer orifice in the gas tap

- a) For burners up to 50 l/h gas rate, 35 percent of the rated capacity; and
- b) For burners above 50 l/h gas rate, 22 l/h or 26 percent of the rated capacity whichever is higher.

17.2.1 Appliances incorporating piezo-electric ignition shall, however, be exempted from **17.2**.

17.3 When the gas consumption of a burner is reduced to simmer as described in 17.2, the burner shall not extinguish or form soot when tested with commercial LPG at 2.942 kN/m² (30 gf/cm²) gas inlet pressure.

18 IGNITION AND FLAME TRAVEL

18.1 There shall be easy and safe access for lighting and relighting each burner by a match stick / gas lighter and it shall be easy to see that the burner is lighted. Where the burner or burners are lighted by automatic ignition (battery or flint-operated) or by a pilot flame, it shall not be possible for gas to be admitted to the main burner without being smoothly ignited by the pilot flame. Each burner shall be at room Temperature at the beginning of the test and shall be tested in turn.

18.2 When the burner is ignited from a pilot flame and/or by an electric/electronic method, the ignition shall be smooth at pressure from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²) with the burner tap turned full 'ON' and ignition shall be effected without undue delay after turning on taps.

18.3 When flame failure devices are used, it shall conform to **Clause 14** of IS 5116.

19 IGNITION STABILITY

19.1 It shall be possible to operate the appliance with taps fully open at gas inlet pressure from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²) without the burner extinguishing and without formation of soot.

20 NOISE CONTROL

The ignition of the burner, their operation and turning 'OFF' shall not give rise to excessive noise during all the operations.

21 FLASH BACK

21.1 A vessel having diameter suitable to cover the pan supports duly filled with water, shall be placed on the burner under test. The tap of the burner shall be turned 'ON' and gas shall be allowed to flow through the burner at full rate, with taps fully opened and gas lighted. After half an hour, the flame shall be immediately reduced to simmer and then brought back to full size. The operation shall be repeated five times. No flash back shall occur during the test. This applies for all pressures from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²).

22 FORMATION OF SOOT

22.1 A vessel having diameter suitable to cover the pan supports duly filled with water, shall be placed on the burner and the burner lighted at 'ON' position of the tap for one hour. After the test, no soot (unburned carbon) shall be deposited on the burner and on the bottom of the vessel. This applies for all pressures from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²).

23 RESISTANCE TO DRAUGHT

23.1 There shall be no extinguishing of any of the burners operating at maximum consumption when the appliance is placed in a general (not localized) current of air with a velocity of 2 m/s, as measured with a rotating vane anemometer. The location of the appliance relative to neighboring walls and the direction of the draught shall be varied to correspond to likely conditions of appliance installation. This applies for all pressures from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²).

24 COMBUSTION

24.1 When tested according to the method laid down in Annex C, the carbon monoxide/ carbon dioxide ratio of the exhaust gases of any burner, operating at any consumption at which the burner is stable at gas inlet pressure from 2.452 kN/m² to 3.432 kN/m² (25 to 35 gf/cm²), shall not exceed 0.02. It shall also be possible to obtain the required carbon monoxide/carbon dioxide ratio with the pan supports reversed or put in any other possible position or with a large skirted vessel placed over any burner. This test need not be performed on burners with a gas rate of less than 20 l/h at 2.942 kN/m² (30 gf/cm²) gas inlet pressure.

24.2 The carbon dioxide and carbon monoxide content of the products of combustion shall be determined by the methods capable of giving accuracy of 0.5 percent and 0.001 percent, respectively, of the volume of the sample.

25 FIRE HAZARD AND LIMITING TEMPERATURES

25.1 In addition to the relevant requirements given in **23** of IS 5116, requirements given in **25.2** shall apply. The requirement shall be tested by the method given in Annex E.

25.2 With burner lighted at full 'ON' position. The temperature at any point in a plane at a height of $H \pm 20$ mm from the top of the pan support shall not exceed 500°C , H is the pan height corresponding to the gas rate of the burner as shown in Column 3 of table 1 under Annex D. This test shall be performed on each burner. Thermocouple made from 0.5 mm diameter wire and placed in the centre of a stainless steel tube having outside diameter 10 mm Max and closed at the end along with temperature indicator shall be used for the measurement of the temperature.

26 THERMAL EFFICIENCY

When tested by the method as specified in Annex D, the Thermal efficiency shall be at least 70 percent for each burner with a pan supported correctly on the Pan supports. For this test, the net calorific value of the gas shall be employed. Thermal efficiency may be declared, if it is 74 percent and above.

SECTION 3 GENERAL

28 INSTRUCTIONS

28.1 The appliance shall be accompanied by an instruction card giving the following information:

- a) Brief instructions for installation and regulation which include piping and fitting of terminal, if any;
- b) Rating of the burners in l/h or kcal/h (with commercial LPG) Instructions for the correct
- c) operation of the appliance;
- d) Total Gas Consumption in m^3/h
- e) The words 'For use with commercial LPG at 2.942 kN/m^2 (30 gf/cm^2);
- f) Country of origin.
- g) Thermal efficiency of 74 percent and above, when declared in accordance with 26 may use green label.

29 MARKING

29.1 Each appliance shall be legibly and indelibly marked with the following:

- a) Manufacturer's name and/or initials or registered trade-mark;
- b) Total gas consumption in g/h (with commercial LPG);
- c) Rating of the burners in kcal/h (with commercial LPG);
- d) Any special instructions for the safe use of the appliance;
- e) The words 'For use with commercial LPG at 2.942 kN/m^2 (30 gf/cm^2 approximately)':

- f) Country of origin; and
- g) Thermal efficiency of 74 percent and above, when declared in accordance with **Clause 26**.

29.2 BIS Certification Marking

29.2.1 The gas stoves may also be marked with the Standard Mark.

29.2.2 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

30 PACKING

The gas stoves shall be packed as agreed to between the purchaser and the supplier, taking care of safety requirements as such during handling and transit to protect against damages.

ANNEX A
(Clause 15)

STRENGTH AND RIGIDITY TEST

A-1 PROCEDURE

A-1.1 The rubber support (grommet) if any, shall be removed and replaced with identical metal supports. The pan support and burner shall be removed and the distance between the sides of the appliance body being tested shall be measured.

A reference reading at the top surface of the body at the centre of the width shall be taken. A load of 250 N (25 kg) per burner shall be applied at the top surface subject to a minimum load of 500 N (50 kg) for a single burner stove. The load shall be applied without impact to a strip of steel having 20 mm thickness, 100 mm width and as long as the length of the appliance (*see* Fig. 9). This strip shall be placed in the centre of the top surface of the appliance and its length parallel to the front. The load shall be maintained for five minutes after which the measurement for deflection at top surface of body (at the centre of the width just in front of the strip) shall be taken with the load in position.

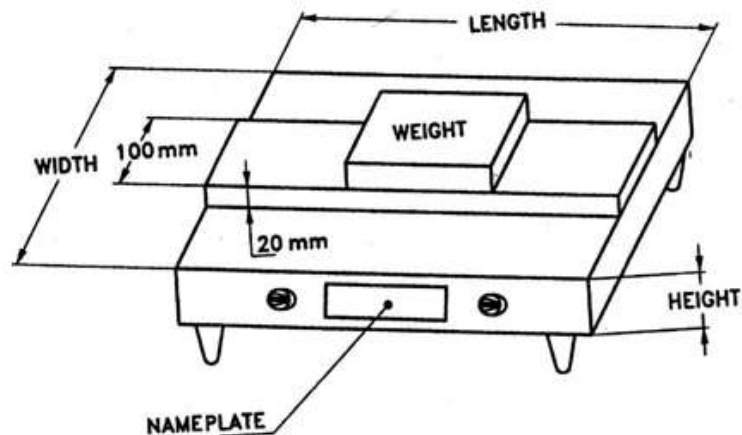


FIG. 9 STRENGTH TEST

ANNEX B
(Clause 17.1.1)

GAS CONSUMPTION TEST

B-1 PROCEDURE

B-1.1 The stove shall be set in accordance with 16 with the addition of a suitable device for measuring gas consumption. The wet gas meter, which is an instrument commonly used for this purpose, shall be set up in series with stove under test (*see* Fig. 10).

B-1.1.1 Clean and dry air shall be passed at 2.942 kN/m^2 (30 gf/cm^2) inlet pressure through the stove for a few minutes to purge the system of air and to establish the gas pressure required. Only one burner of the appliance shall be tested at a time and during the test all gas delivered to the stove as per Fig-10 shall flow through the jet of the burner being tested.

B-1.2 Temperature of the room during the test shall be between 25°C and 30°C .

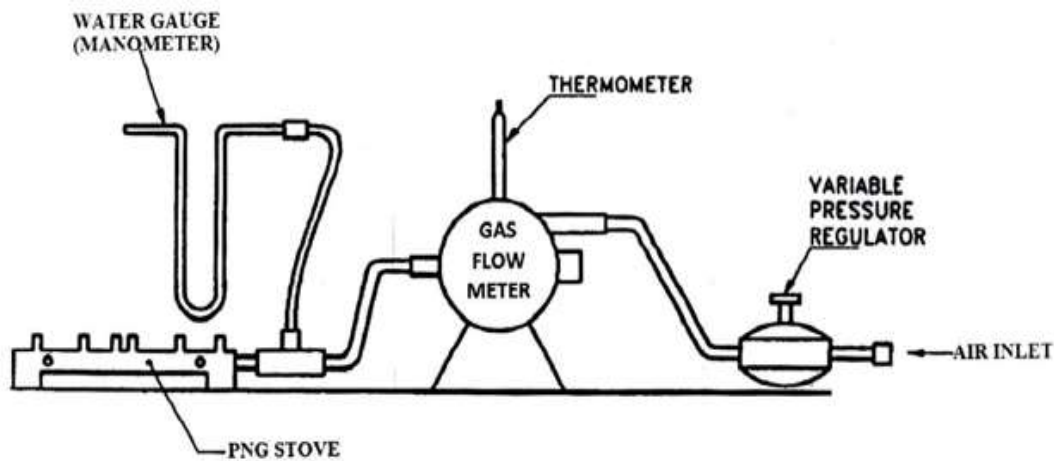


FIG. 10 TEST SET-UP FOR GAS CONSUMPTION

ANNEX C
(Clause 24.1)

**TEST METHOD FOR DETERMINATION OF
CARBON MONOXIDE/CARBON DIOXIDE RATIO**

C PROCEDURE

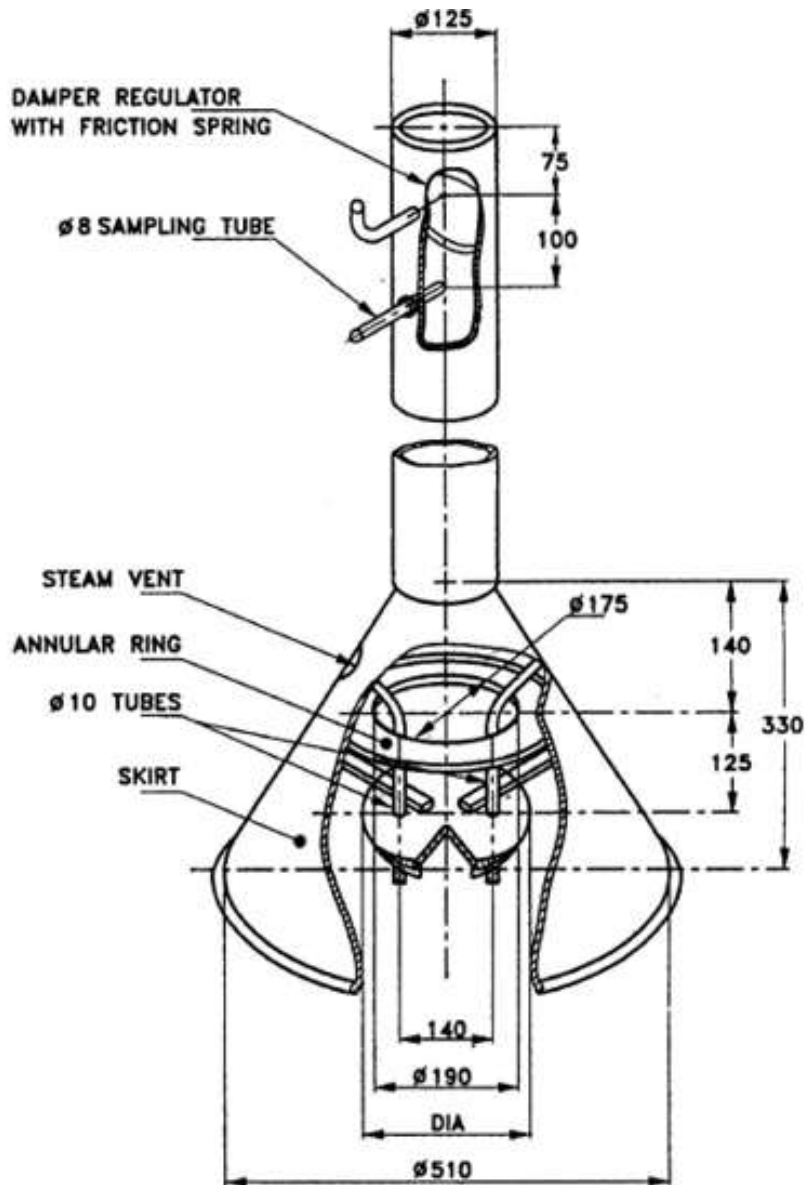
C-1.1 The appliance shall be set-up in accordance with 16. Before starting the test, a pan of 190 mm diameter and of suitable height and containing water sufficient for the test shall be placed over the burner. In addition, a collecting hood (*see* Fig. 11) suitable for the burners under examination shall be obtained.

C-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 products of combustion. Also, it shall be such that the sample collected represents the whole of the combustion gases and not those from any particular point.

When using this hood, the damper provided shall be set or additional flue pipe added, so that spillage of the flue gases around the skirt is just prevented. With the sample hood in position over the burner under investigation, gas at inlet pressure of 2.942 kN/m^2 (30 gf/cm^2) shall be admitted and the burner operated for a 5 minutes before sampling is commenced. The reason for this being that during the first few minutes the burner is warming up and the proportion of carbon monoxide may be high. However, this is not dangerous provided the burner works satisfactorily after heating up.

C-1.2 Any of the Instrumental/recognized methods having the prescribed accuracy may be used for gas analysis. For carbon monoxide, it is recommended that co-indicator of prescribed accuracy or iodine pentoxide method or catalytic method, for example, Drager method, the Katz method or infrared analysis methods may be used. Carbon dioxide may be tested with an Orsat apparatus/Haldane apparatus / infrared analysis or any instrumental method.

C-1.3 Each burner shall be examined with gas at 2.452 kN/m^2 to 3.432 kN/m^2 (25 to 35 gf/cm^2) inlet pressure. It shall also be noted that each burner is tested separately or with all the possible combination of the other burners operating.



To correspond with pan dia. given in table 1
(All dimensions in millimeters)

FIG. 11 HOOD FOR BURNER

ANNEX D
(Clause 25.2 and 26)

THERMAL EFFICIENCY

D THERMAL EFFICIENCY TEST

D-1 The test shall be carried out by weighing the gas used. The gas shall be taken from a bottle containing LPG weighing up to 5 kg. The bottle shall be fitted with an ‘On/Off’ valve and shall be connected to a regulator which, in turn, shall be connected to a pressure gauge and to the appliance. A second ‘On/Off’ gas valve shall be inserted in the gas ways upstream of the regulator as near as possible to the gas bottle. The LPG Cylinder to be placed on a weigh scale of 0.1g accuracy all through the test. A typical layout of set-up necessary for this test is shown in Fig. 12.

D-1.2 The gas shall be passed at 2.942 kN/m² (30 gf/cm²) inlet pressure through the stove for a few minutes to purge the system of air and to establish the gas pressure required. Only one burner of the appliance shall be tested at a time and during the test all gas delivered to the stove shall flow through the jet of the burner being tested. A vessel of 220 mm diameter containing 3.7 kg of water to be placed on the burner under test and the burner to be ignited in Full On condition for 5 minutes. After completion of 5 minutes, the 220 mm diameter vessel to be removed and immediately the test pan as selected and loaded with water in accordance with the requirements given in Table 1 to be placed centrally on the burner under test. Before placement of test pan on the burner under test, the temperature of the water t_1 contained in the test pan shall be noted and recorded as long as it remains constant.

The measurement of the gas consumption begins from this point. The reading of the LPG Cylinder to be recorded as initial gas content. The water shall be allowed to warm up to about 80 °C when stirring is commenced and continued until the end of the test. The burner shall be put off when the temperature of water reaches 90 °C ± 1 °C. The stirring shall be continued and the maximum temperature t_2 shall be noted.

Next, the valves on the bottle and the gas line shall be closed. The reading of the LPG Cylinder is to be recorded as final gas content. The difference between the initial and final gas content in the LPG Cylinder is the mass of gas (M kg) used during the period taken for the water to heat up. Thermal efficiency shall be calculated by the following formula:

$$E = \frac{100(G + W)(t_2 - t_1)}{MK}$$

Where:

- E = thermal efficiency of the burner in percent,
- G = quantity of water in the vessel in kg,
- W = water equivalent of the vessel complete with stirrer and lid,
- t_2 = final temperature of water in °C,
- t_1 = initial temperature of water in °C,
- M = gas consumption in kg, and
- K = calorific value of the gas in kcal/kg

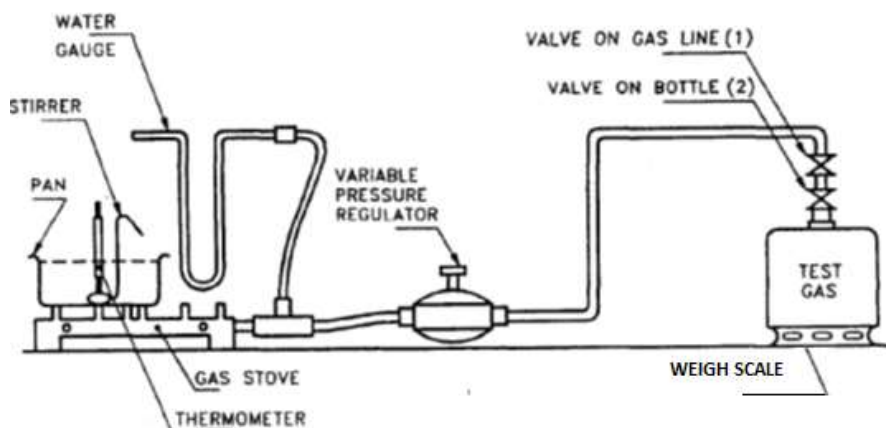


FIG 12 TEST SET-UP FOR THERMAL EFFICIENCY BY WEIGHT

Table 1 Aluminum Pans for Thermal Efficiency Test
 (Annex E-4.2.1)

Gas rate at STP l/h (1)	Pan Diameter (external) mm±5% (2)	Pan Height (external) mm±5% (3)	Total pan mass with LID g± 10% (4)	Mass of water in Pan kg (5)
Up to 50	260	140	750	6.1
Above 50	285	155	853	7.7

NOTES —

- 1) Distilled water (*see* IS 1070) shall be used for test.
- 2) The pan shall be cylindrical with flat bottom.
- 3) The finish of the pan bottom from inside shall always be bright.

D-1.3 In performing the thermal efficiency test, the following points shall be noted:

- a) The set-up shall be carefully checked for leak, before and after the test. If a leak is found after the tests, the results shall be cancelled and the test repeated.
- b) The room shall be free from draught.
- c) The initial temperature of the room shall be between 25 °C and 30 °C.
- d) The water temperature shall be within ± 2 °C of the actual room temperature,
- e) The net calorific value of gas is to be used. If this is not determined experimentally, the value may be taken as 10 900 kcal/kg for calculation.
- f) At the start of the test, the burner shall be at room temperature.
- g) The temperature of the water shall be measured by means of a thermometer / Temperature Indicator with accuracy of 0.5° C, the bulb/sensor of which is immersed to half the depth of the water in vessel.

- h) Stirring shall be effected by means of a horizontal loop of approx 3 mm Aluminum metal rod attached to an upright, which passes through a approx 6 mm, hole drilled in lid.
- j) This test need not be performed on burners with a gas rate of less than 20 l/h at 2.942 kN/m² (20 gf/cm²) inlet pressure.
- k) Specific heat of aluminum is 0.214.
- m) For conducting thermal efficiency test, gas from the commercial cylinder (bottle) of LPG, the first two-thirds of which has been allowed to evaporate (to waste or in vapour withdrawal use), the remaining one-third shall be used for test. The use of last 1 or 2 kg of gas shall be avoided as this may contain heavy ends.

ANNEX E
(Clause 25.1)

E-1 METHOD FOR MEASUREMENT OF FLOOR, WALL AND CEILING TEMPERATURES

E-1.1 Apparatus

E-1.1.1 The apparatus shall consist of a wooden floor with side and back walls (*see* Fig. 13). The floor shall be approximately 5 cm thick and consist of a 2.5 cm layer of pine below a 2.5 cm layer of any timber with natural colour nearing white or off-white finished in clear varnish with a thickness of building paper between them. Both the side and back walls shall be of 2.5 cm pine and painted dull black. The apparatus shall be large enough to accommodate almost any appliance, and the side wall shall be detachable so that measurement can be made if necessary against both sides of the appliance.

E-1.1.2 Thermocouples shall be embedded in each panel at 15 cm intervals and in such a way that the Junctions are fixed in position 2 mm from the wood surface. They shall be conveniently inserted in holes of 8 mm diameter with a thermo junction bent at a right angle and sealed in position with insulating cement. It shall be necessary to arrange for successive readings to be made from each thermo junction, a convenient method of doing this is to connect all terminals of one sign to a single terminal and each terminal of the opposite sign to a separate terminal of a switchboard. Temperature shall be measured using these thermo junctions.

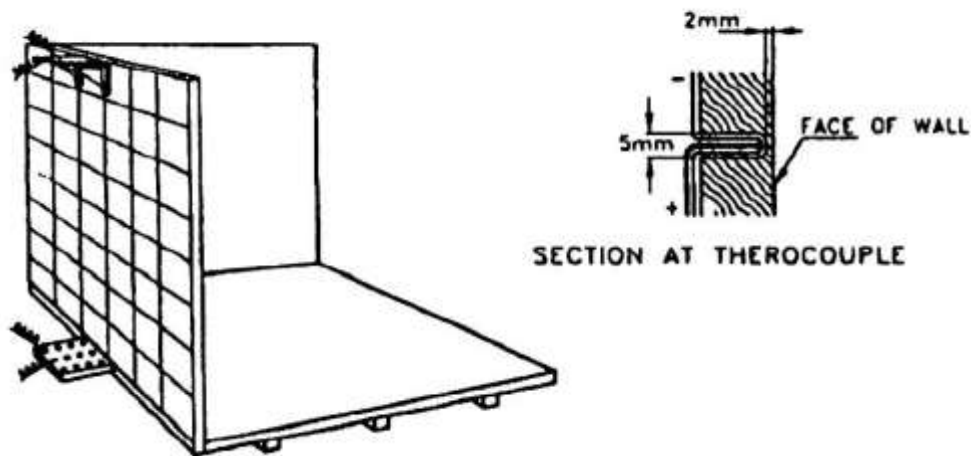


FIG-13 FIRE HAZARD APPARATUS

E.2 Procedure

E-2.1 Before commencing tests with a new apparatus, dry it out thoroughly either by previous test or by heating it for 24 h with an appliance in position and operating at maximum gas rate in order

to dry out the wood and secure reproducible results. This procedure is not necessary in subsequent tests.

Appliances installed on or near walls and floor as intended for normal use shall not give rise in operation to wall, floor or ceiling temperature in excess of 65 °C above the room temperature after 2 h operation. This requirement shall be tested by the method given in **23.1** of IS 5116.

E-2.2 Arrange the appliance under examination so that it is as close as possible to the side and back walls of the apparatus described in E-1, taking note of the manufacturer's installation instructions. Light all the burners and place a 15 cm diameter vessel (with lid) containing about 2 kg water on each top burner. As soon as the water in the vessel boils, reduce the gas rate so that it is Just kept boiling. Measure the floor and wall temperatures at the Junctions most affected by the heat of the appliance after 2 h of operation and at any intermediate time from the initial lighting if it is considered that certain local temperatures have been reached a maximum.

This test shall be performed on each burner. Thermocouple made from 0.5 mm diameter wire and placed in the centre of a stainless steel tube having outside diameter 10 mm Max and closed at the end along with temperature indicator shall be used for the measurement of the temperature.

E.3 Ceiling Temperature

Raise the back panel and use the side panel as 'ceiling' resting on the top edge of the raised back panel and support at front edge by convenient stand. Operate the appliance as described in **23.1** of IS 5116 and record the temperature on the ceiling panel supported 1 m above the top of the appliances.

E.4 Surface Temperatures

When operated as described in **23.1** of IS 5116, no portion of the surface of the appliance, other than a working surface, likely to be accidentally touched shall exceed 120 °C (working surfaces include pan supports, oven flue outlets, grill covers and plate racks).

E-4.1 Surfaces which is normal use have to be touched for short periods (for example, tap handles), shall not have a temperature exceeding 60 °C.

E-4.2 The temperature of synthetic rubber diaphragm in gas carrying components shall not exceed BOX.

E-4.2.1 With burner lighted at full 'ON' position, the temperature at any point in a plane at a height of $H \pm 20$ mm from the top of the pan support shall not exceed 500 °C, H is the height corresponding to the gas rate of the burner as shown in col 3 of Table 1.