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BUREAU OF INDIAN STANDARDS

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MANUAL FOR CERTIFICATION

OF

LPG GAS BURNING APPLIANCES
(IS 4246; IS 4473; IS 4760 AND IS 11480)

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C O N T E N T S

A P P E N D I C E S

FOREWORD

Bureau of Indian Standards has published four Indian Standards for domestic LPG Burning Appliances namely IS 4246 Domestic gas stove for use with LPG, IS 4473 Domestic gas ovens for use with LPG, IS 4760 Domestic cooking ranges including Grillers for use with LPG and IS 11480 Domestic grillers for use with LPG. All the products are under Voluntary certification.

The Standards IS 4246 was first published in 1967 and revised in 1972, 1978, 1984 and IS 1992. Since then many suggestions were received for improvement and with the result Amendments 1, 2 and 3 were issued. The latest Standard is a revision to incorporate the amendments issued and the suggestions received from time to time. In the latest standard gas consumption by volumetric method, test for Strength, rigidity stability and flame failure device have been modified and is published as IS 4246:2002 (Fifth revision).

The Standard IS 4473 was first published in 1967. Since then many suggestions were received for its improvement and with result, Amendment No. 1, 2 and 3 were issued. The latest Standard is a revision to incorporate the amendments issued and the suggestion received from time to time and is published as IS 4473:2002 (First revision). Amendment number 1, July 2004 has been issued after its publication.

The Standard IS 4760 was first published in 1968 and revised in 1979 and in 1992. Since than many suggestions were received for its improvement and with the result three amendments were issued. The latest standard is a revision to incorporate the amendments issued and the suggestions received from time to time. In the revised standard requirements relating to griller range has been included and published as IS 4760:2002 (Third revision).

The Standard IS 11840 was first published in 1985. The latest standard is a revision to incorporate amendments issued and suggestions received from time to time. A test for limiting the temperature of the flame at a specified height and marking clause is modified to incorporate the declared efficiency when it is higher than 68 percent. The latest standard has been published as IS 11480:1998 (First revision).

In view of different approaches followed by different BO's, a strong need was felt for formulation of a sector specific manual for ensuring uniform operation of Certification of LPG Burning appliances.

This manual provides General Guideline for various aspects related to Certification of the above product. Efforts have been made to incorporate major decision in this manual; however the provision of ISS, STI and policy guidelines would prevail over the manual, in case of any difference in interpretation.
This manual is to be used along with relevant Indian Standards and STI amended/revised from time to time.
This document is intended for internal use by BIS officers only.

Suggestions for any improvement in the manual may be sent to CMD for consideration.

SCOPE

This manual deals with the operation of BIS Certification marking Scheme for Domestic LPG stove, Gas ovens, grillers and Domestic cooking ranges including Grillers for use with Liquefied Petroleum Gases as per the relevant Indian Standards, Design of components and their materials, performance test and quality control parameters are almost similar for all the above referred appliances. Additional requirements where ever applicable have been indicated separately.

INTRODUCTION

The use of Domestic LPG burning appliances in India has increased manifold during the last preceding years. Since these burning appliances operate with LPG, the appliance has to be very safe while working on them, as such quality control of different components assumes a significant role during their acceptance and assembly with respect to design parameters, workmanship and finish, durability and toughness and interchangeability. This also ensures that the performance of the end product conforms to relevant Indian Standards.

Introduction to Liquefied Petroleum Gas (LPG)

The term Liquified petroleum Gas (LPG) applied to those hydrocarbons, the chief components of which consist of propane, propylene, butane, butylene and iso-butane or mixture thereof in any ratio. These hydrocarbons can be liquified under moderate pressure, at normal temperature but they are gaseous under normal atmospheric condition. LPG is a colorless liquid which readily evaporates in to gas. It has no smell, although it will normally have an odour added (Ethyl Mercaptan) to detect the leakage. It can burn when it is mixed with air and when it meets a source of ignition. It is heavier than air so it tends to sink towards the grounds. Its net calorific value may be taken as 10900 kcal/kg for the purpose of calculation of thermal efficiency of burning appliances. Over the years Liquified petroleum Gas has become very popular as a domestic fuel compared to other fuels because it is convenient, smokeless, time saving and economical. This is the reason it has created a demand of LPG utilization in Domestic sector for cooking. In the recent past, it has created a demand in industrial and automobile sector also. At the same time it requires great attention to safety while using it, because the gas forms an explosive mixture and may be dangerous in case of leakage from the appliance.

SECTION I

Product Description

Domestic Gas Stove for use with LPG

An assembly of one or more burners forming a separate unit allowing direct control between the flame or hot gases from the burners and the vessel above them. It consist of a main chassis made of CRC sheet nickel chromium plated/painted, cast iron, vitreous enameled or stainless steel sheets etc. on which various components are mounted. A gas manifold runs along the length of the chases from which tapping are given to each burner through gas cocks/gas taps for regulating the flow of gas to the burners. A gas injector jet is mounted on the outlet of gas cock. Suitable knobs are proved on the spindle with indications, provided on indicating plate regarding 'OFF', 'ON' and 'SIM'. The gas released through the gas cock goes into the mixing tube and mixes with air and then flows to burner top, where the gas air mixture is ignited to produce a ring of flame.

In the recent past with the arrival of modular kitchen, kitchen hobs are in uses which are fitted on the working platform of the kitchen with operational knobs on top or side or in front of the body. The principle of working remains the same.

A typical fig. may be given by MDD-I.

Domestic Grillers for use with LPG

An appliance for cooking food by means of radiant heat produced from the burning of LP gas Domestic griller with either one or two boiling burners and grill enclosure with grill burner or as a griller alone are being made in CRC sheets nickel chrome plated, painted and stainless steel bodies. The principal of operation of working of LPG griller is same as of LPG stoves.

A typical fig. may be given by MDD-I

Domestic gas ovens for use with LPG

This is an appliance for baking and roasting of food items. With the availability of bottled LPG in big cities for cooking purpose, more and more gas ovens are being accepted for household use for their better and quicker service. The oven consists of a enclosure with oven/baking tray, over burners and an oven door. These may be of following types:

a, **Directly heated oven** – In this, burners are situated inside the oven space and the product of combustion circulate inside the oven space.

b, **Indirectly heated oven** – In this, the burners are situated out side the oven space and the product of combustion do not enter into it.

c, **Semi Directly heated oven** – In this burners are situated outside the oven space but product of combustion pass in to it.

A typical fig. may be given

Domestic cooking Range including griller for use with LPG

This is heavy duty cooker designated for domestic or commercial cooking. It may have top burners, grillers, ovens (Thermostatically controlled), a deep well cooker or any combination there of. These may be following types:

a, **Top or surface range** – A unit designated for installation in, or on a counter top. It may have top burners, a griller, a deep well cooker, or any combination there of.

b, **Oven range** – A range designed for installation in a cabinet, wall or partition or for a installation on a counter. It may be a separate oven, may be equipped with a griller that uses the oven burner, or the oven may serve as a griller unit with a burner in the upper portion of the oven.

c, **Griller Range** – May have an open top or enclosed, may have a separate griller.

d, Combination of (a), (b) or (c) above or any other domestic cooking device that may be designed for similar installation.

A typical fig. may be given.

Principle of operation of LP Gas appliances

In all the LP Gas appliances, LP Gas premixed with air is burnt at a suitable place, where heat energy is required. The principle of operation is illustrated by a typical drawing shown in Fig____ .

LP gas is supplied to the burner at a standard pressure at 30gf/cm^2. The gas passes through an orifice which directs it in a straight jet of stream down the centre of the mixing tube. The velocity of the gas stream creates a partial vacuum and the atmospheric pressure forces air into the mixing tube where the gas and air are thoroughly mixed. The gas-air mixture is burnt as it leaves the burner head through the suitable openings which are usually referred to as ports. The air which is drawn into the mixing tube is not enough for complete combustion and the additional amount needed is supplied at the burner head where each individual flame is surrounded by air. This means, air enters into combustion in two distinct ways i.e. the air which is premixed with the gas inside the burner is called primary air while the air which supplied oxygen to the outer part of the flame is known as secondary air. The burner flames have two parts, an inner cone and an outer mantle. Partial combustion of the gas with primary air is represented by the small inner cone of the flame. Further combustion takes place in the outer mantle which surrounds the inner cone.

Characteristics of L P Gas Domestic Burner

1. It should provide uniform heat distribution over the area to be heated.
2. It should be capable of completely burning the gas.
3. There should be no lifting of flames away from ports.
4. It should provide ready ignition with flame traveling from port to port over the entire burner rapidly & positively.
5. It should operate quietly during ignition, burning and extinction.
6. It should be of substantial construction to withstand severe heating and cooling for the life of heating appliances.

Characteristics of good flame of L P Gas Domestic burner

A medium hard and sharp flame is satisfactory in case of LP gas domestic stoves. The flame should meet all the following requirements and if these are achieved, satisfactory combustion may be expected.

1. The burner flame should be entirely blue with no trace of yellow when the utensil is placed on the burner.
2. The inner cone of the flame should be clearly defined.
3. Each individual flame should burn at the port and not lift above it.
4. The outer mantle of the flame should be well defined without lifting or streaming.
5. The flame should ignite readily over the entire burner.

DESIGN ASPECT

Design for maintenance of LPG appliances has been specified in Cl. 6 of IS 5116. Apart from this, “Design for maintenance” requirements of different LPG burning appliances have been specified in Cl. 6 0f IS 4246, Cl. 6.2 to 6.5 of IS4473, Cl 6.2 to 6.9 0f IS 4760 and Cl. 6.2 to 6.8 of IS 11480.

The design aspects of the important components are given below:

Burner configuration

The proper design of the burner head is one of the important factors necessary for satisfactory combustion. A careful study of the parameters such as port size, port spacing, and port angle, number of port rows and shape of the burner head should be carried out while finalizing its design. The temp. of burner head should not exceed 357°c (675°F) because high temp. influence flash back, noise of extinction, yellow tipping etc. The

burner design should allow an even distribution of mixture flow to the port area. There fore burner head volume should be adequate to assure an even conversion of velocity pressure in the mixing tube to static pressure in the burner head. The construction of the burners and the assembly shall allow their dismantling from the support easily with or without the use of tools. See fig. 5 of IS 5116 for guidance. Other design aspect are detailed in cl.10 of IS 5116 in general and in cl. 11.2 & 11.3 of IS 4246, in cl. 11.2 to 11.5 of IS 4473 and in cl. 11.2 to 11.5 of IS 4760.

Injector Jet

The injector jet shall be fixed calibrated type and it shall not be possible to loosen them without the use of tools. It shall be made of metal, with or without ceramic tip. The melting point of the metal shall not be less than 650° c. The burner rated capacity should be taken into consideration for the purpose of determining the orifice size of the injector jet. This size of the jet in litres per hour of flow of LPG at STP condition shall be impressed upon it. The dimension of the injection jet shall be as per cl. 9.1 of IS 5116.

Gas Taps

The appliance shall have at least one tap for each burner. All tape shall close in same direction. The direction of rotation of a tap knob from off-on-simmer shall be anticlockwise. All taps should lock in “off” position. Other design aspect are detailed in cl. 8 of IS 5116.

Pan support / Burner support

The design of pan support has been specified in cl. 12 of IS 4246, cl. 16 of IS 4760, cl. 12 & cl. 17 of IS 11480.

Other design aspect

Design aspects of other components of LPG burning appliances are specified in cl. 11 to 18 of IS 5116. Also refer cl. 14.2of IS 4246 for gas inlet connection, cl. 12, cl 13, cl. 14, cl. 15, cl. 16.2 to 16.6, cl. 17.2 of IS 4473, cl. 17, cl. 18, cl. 19, cl.20, cl. 21, cl.22, cl. 23, cl. 25 and cl. 26 for IS 4760, and cl. 13, cl. 14, and cl. 16 for IS 11480.

Major reason of product failure, possible cause & remedy

Sl No.	Trouble	Possible cause	Remedy
1.	Yellow flame or yellow Tipped flame	Lack of primary air. Gas injector jet drilling size too large, not drilled straight, its fitment, obstruction in mixing tube.	a) Clean the burner mixing tube thoroughly, if blocked with dust. b) Check injector jet orifice drilling to make sure gas stream enters center of mixing tube. c) Check injector jet orifice diameter d) Gas injector jet orifice too close to the burner mixture throat – rectify. e) Check gas cock is mounted straight.
2.	Orange flame	Due to dust particles or other foreign matter in to the burner	Clean the burner mixing tube thoroughly with brush and blow out with air.
3.	Lifting flame	Too much primary air or burner ports crowded beyond capacity	a) Reduce amount of primary air b) Install smaller injector jet orifice if burner is operated beyond capacity.
4	Soft lazy flame or floating flame	Lack of secondary air	a) Size of the primary air hole needs to be corrected. b) Check for adequate space between burner and surface being heated c) Check vent passage for abstraction
5.	Flash back i.e. flame burns inside the mixing tube.	- Burner ports too large or too shallow - Burner head too hot - Too much primary air	a) Replace burner if ports are too large or too shallow b) Reduce the burner

			head temp. by redesigning the burner. c) Reduce primary air if possible.
Note: Some times while lighting the burner with manual lighter, spark goes in to the burner head through burner ports and gas starts burning inside the mixing tube. This is not a defect of flash back. It is advised to change the angle of lighter for lighting the gas.			

6.	Delayed ignition or slow lighting	- Improper port spacing - Too much primary air	a) Check port spacing and change burner if not correct. b) Reduce primary air supply.
7.	Odour	**Gas odour** – Leak in burner, Leak through gas cock, Leak through joints, Lack of secondary air. Leak from LPG delivery tube specially where it is fitted on the nozzle of the appliances.	- Check for leaks in the burner - change - Check gas cock leak & change - Check all the joints - Check the distance between burner top & vessel which is to be heated. - Check the LPG tube condition – if very old – change - Cut the portion of LPG tube which is on the nozzle & refit the LPG tube on the nozzle.
8.	Noise	**Flame noise** – High primary aeration High velocity flow through ports Turbulence & poor mixing of air **Injector jet orifice noise** – A burr in the orifice or a badly out of round orifice (Improper reaming). **Air inspiration & mixing noise –** Extreme roughness of the internal surface of mixing tube. A metal projection in to the air stream. Improper distance between orifice	a, Reduce primary aeration b, Increase burner port size to reduce velocity c, Increase number of burner ports d, Increase port depth a, Eliminate the imperfection in the orifice a, Smoothen the internal surface of mixing tube or change it b, Check the distance between orifice & throat and readjust

		& throat. **Ignition noise** – Delayed ignition, Flash back of flame Noise, when gas is brough to 'SIM' – **flash back** Noise of extinction	Apply remedies suggested at (5) & (6) Increase simmer flow rate Apply remedies suggested at (5)
9.	Flame extinguishing when brought to 'SIM'	- Simmer size of gas cock is less - Grease blocked the simmer hole	a, Increase simmer size b, Open the gas cock & clean it – remove the blockage from simmer hole c, Ensure the use of proper grease in proper quantity
10.	Soot formation (Tiny particles of unburned carbon)	Lack of primary air	Ensure required air for complete combustion of the LP Gas

Note: 1. Installation of operation & servicing of LPG burning appliances have been given at Annex III (Page).

SECTION II

Product Standards

The following Indian Standards cover the LP Gas burning appliances.

1. IS 4246 Domestic Gas Stove for use with LPG. This Standard read with IS 5116 lays down requirements of construction, operation, safety requirements and tests for Domestic gas stoves with metallic bodies intended for use with LPG at 2.942 kn/m2 (30 gf/cm2) gas inlet pressure. for convenience, this standard has been divided in to three sections i.e. construction, performance and General.

2. IS 4473 Domestic Gas Ovens for use with LPG. This Standard specifies construction, operation, safety requirements and tests for Domestic ovens of capacity not exceeding 100 dm3, intended for use with LPG at 2.942 kn/m2 (30 gf/cm2) gas inlet pressure. For convenience, the standard have been divided in to three sections i.e. construction, performance and general. In addition to the relevant requirements given in IS 5116 and in cl. 4, cl.5, cl.6, cl.7, cl.10, cl.15, cl.16 and cl.18 of IS 5116, additional requirements have been specified in "CONSTRUCTION". In performance also in addition to relevant requirements given in IS 5116 & IS 4246 additional requirements have been specified for resistance to draught, thermostat, oven heat distribution Victoria sandwich cake baking test and for surface temperature.

3. IS 4760 Domestic Cooking Ranges including Grillers for use with LPG. This Standard specifies construction, operation safety requirements and tests for domestic cooking ranges including grillers, for burning gas at a rate not exceeding 1500 g/h, intended for use with LPG at 2.942 kn/m2 (30gf/cm2) gas inlet pressures.

For convenience, standard has been divided into three section i.e. construction, performance and general. In addition to the relevant requirement given in IS 5116 & in cl.5, cl.6, cl.7, cl.10, cl.15 & cl.18 of IS 5116, additional requirements have been specified in "CONSTRUCTION". In performance also, in addition to the relevant requirements given in IS 5116 & 4246, additional requirements have been specified for thermostat, oven heat distribution, Victoria sandwich cake baking test, toasting performance and for surface temperature.

4. IS 11840 Domestic Grillers for use with LPG. This Standard specifies construction, operation, safety requirements and tests for Domestic grillers with or without top burners for burning gases at a rate not exceeding 1000 g/h, intended for use with LPG at 2.942 kn/m2 (30 gf/cm2) gas in let pressure. For conveniences, Standard ha been divided in to three sections i.e. construction performance and general.

The requirements of IS 5116 & IS 4246 are applicable in general. In addition to the relevant requirements given in cl.4, cl.5, cl.6, cl.7, cl.10, cl.16 of IS 5116, additional requirements have been specified. In construction which includes grill trays, grill design

etc. In performance requirements, additional test for Toasting performance has been specified.

Referred Standards

The following Indian Standards have been referred to, in the LPG Burning Appliances Standards.

1.	IS 2	Rules for rounding off numerical values
2.	IS 292	Leaded brass ingots and casting
3.	IS 319	Free cutting leaded brass bars, rods & section
4.	IS 410	Cold rolled brass sheets, strips and foil
5.	IS 554	Dimensions for pipe threads where pressure tight joints are required on threads
6.	IS 617	Aluminium and aluminium alloy ingots and casting for general engineering purpose
7.	IS 694	PVC insulated cables for working voltages upto and including 1100 Volts
8.	IS 1070	Reagent grade water specification
9.	IS 1239(Pt 1)	Mild steel tubes, tubulars and other wrought steel fitting: part 1 Mild steel tubes
10.	IS 1264	Brass gravity die casting (Ingot & casting) white bread.
11.	IS 1483	White bread
12.	IS 1458	Railway bronze ingots and casting
13.	IS 2305	Method of mercurous nitrate test
14.	IS 2501	Copper tubes for general Engg. purpose
15.	IS 3043	Code of practice for earthing
16.	IS 3203	Method of testing local thickness of electroplated coating
17.	IS 3488	Brass bars, rods and section suitable for forging
18.	IS 4246	Domestic gas stove for use with LPG
19.	IS 4454(Pt 4)	Steel wires for cold formed springs: Part 4 stainless spring steel wire for normal corrosion resistance
20.	IS 4473	Domestic gas ovens for use with LPG
21.	IS 4760	Domestic cooking ranges including grills for use with LPG
22.	IS 5116	General requirements for domestic and commercial equipment for use with LPG
23.	IS 6009	Method for evaluation of results of accelerated corrosion test
24.	IS 6480	lossary of terms relating to domestic and commercial gas burning appliances.
25.	IS 6910	Method of testing corrosion resistance of electroplated and anodized aluminium coating by acetic acid salt spray (ASS) test
26.	IS 6912	Copper and copper alloys forging stock and forging
27.	IS 7608	Phosphor bronze wire for general engineering purposes
28.	IS 13432(Pt 1)	Gas leak detector for use with low pressure LPG

burning appliances specification Part 1: Mechanical type

29. IS 13432(Pt 2) Gas leak detector for use with low pressure LPG burning appliances : part 2 Electronic type

Notes:

a, Standards at S.No 1, 8, 22, 24, 28 & 29 are the referred standards for IS 4246.
b, Standards at S.No. 1, 2, 3, 4, 12, 17, 22 && 24 are the referred standards for IS 4473
c, Standards at S.No. 1, 8, 11, 22 & 24 are the referred standard for IS 4760
d, Standards at S.No. 1, 11, 18, 20, 21, 22 & 24 are the referred standard for IS 11480
e, Standards at S.No. 1, 3 to 7, 9, 10, 13 to 16, 19 & 23 to 27 are referred standards for IS 5116. However standards referred at S. No. 3, 4, 6, 10, 14, 19, 26 & 27 are for guidance only for the material of components of the gas taps.

Referred standards used for assistance

Following standards have been referred from which assistance has been derived in preparing the specific product standards

1. S.I 432 Specification for domestic hot plate for use with petroleum gases, issued by standards institute of Israel – for IS 4246
2. BS 5386(Pt 3) Specification for domestic cooking appliances burning gas Part 3: Grillers and toasters, issued by British Standards Institution – for IS 4246
3. BS 2491 Specification for domestic cooking appliances for use with LPG, issued by British Standard Institution - for IS 4473, IS 4760
4. BS 5314 (Pt 3) Specification for gas heated catering equipments part 3 Grillers & toasters issued by British Standards Institution for IS 11480
5. EN 30 Domestic cooking appliances burnings gas published by European committee for standardization – For important deviations between EN 30 and corresponding Indian Standards IS 4246, IS 4473, IS 4760 & IS 11480.
6. BS 5314 (Pt 2) Specification for boiling burners, issued by the British Standards Institution - for IS 5116.

Components and Materials used in general

A typical list of commonly used components & its raw material in the trade in listed below:

Name of component	Material
Body	- Stainless steel - CRC sheet nickel chromium plated or painted or vitreous enameled - Cast iron
Mixing tube	- Mild steel - Al. Alloy
Burner Head/Burners	- Mild steel - Cast Iron - Brass
Main gas Rail	- Mild steel tubes (Galvanized)
Nozzle & Plug	- Electroplated free cutting brass or Mild steel
Gas taps	- Brass - Al. Alloy (Pl. refer IS 12012 also)
Injector jet	- Brass
Pan support	- Cast iron - Mild steel
Drip Tray	- Mild steel Ni/Cr plated or painted or vitreous enameled - Stainless steel
Knobs	- Bakelite
Legs	- Moulded rubber - Moulded rubber with metallic covering
Oven tray	- Stainless steel
Baking tray	- Stainless steel
Grill tray	- Stainless steel
Grid	- Stainless steel
Spill tray	- Stainless steel
Glass for doors	- Toughened glass - Heat Resistant

Section III

Manufacturing Processes and controls

All the Indian Standards do not prescribes any specific process for the manufacturing of the LPG burning appliances. However requirement for material, design for maintenance, workmanship & finish and design aspect of different components have been specified in the relevant standards. In fact manufacturing process of the LPG burning appliances is essentially an assembly process of different components. These products are very sensitive for safety point of view to the house hold hence entire process of manufacturing right from acceptances of components to the packing needs to be carried out under very strict quality control condition. A typical manufacturing process of LPG appliances involves the following steps:

i, Procurement/collection of components
ii, Removal of defective material found in visual/dimensional/other requirement specified in the standards for raw material
iii, Assy. of gas carrying parts and its inspection for soundness
iv, Assy. of all the components
v, Carry out all the tests as per relevant standards
vi, Packing and despatch

A typical process flow chart for LPG stove has been given in Annexure IV (Page)

Essential equipments/machinery for assembly units

Each applicant/licensee should be adequately equipped with the following;

a, Racks and bins for storage of components

b, Assy. tables covered with rubber mats

c, Compressor, pressure gauges and regulator

d, Measuring instruments Micrometer and vernier calipers with required least count

e, Thread Gauges – 1/8" BSP Plug and Ring gauges
¼" BSPT Plug and Ring gauges
MS/IBA Plug and Ring gauges

f, Surface plate and spirit level

g, Gauges and fixtures for mixing tubes – for diameter of burner head of location of

air hole and mixing tube fixing hole

For Burner tops – for burner top dia for its fitment on burner head

For gas pipe – for the location of gas cocks bushes and pipe length.

For pan support – for its taper and rattling requirements.

h, Drilling machine

i, Portable drilling machine where injector jet are finished by machine.

j, Reamers of required sizes depending on rating of burner

k, small grinder machine

l, Bench vice

m, Set of screw drives, files, pliers set, spanners etc.

SECTION IV – 1

Inspection and testing of raw material, in process material and Final product

Domestic LPG stoves, LPG ovens, LPG grillers and domestic cooking ranges are basically assembly of various components. Raw material of this trade, are the components supplied by vendors except that in some cases manufacturer may also be making few components of their own. Hence quality control of the brought out components is the most important function in the production of gas burning appliances. A drawing of each component should be available so that the components could be inspected after receipt for its acceptance or rejection. The details with respect to material and design for the components like Body, Burners, Pan support, Mixing tube, Knobs etc. which have not been specified in the standard should be indicated in each drawing. A copy each of the drawing should be obtained from the applicant/ licensee for reference to the design of the appliance being approved for certification. The quality of the components should be verified with respect to drawings during preliminary inspection and later on during periodic inspection.

The main components in the assembly of gas appliances have been listed below. Since most of the components are bought out components therefore it would be desirable to conduct regid inspection of the components as per the guidelines of the relevant STI. The Go and NO Go gauges and fixtures may also be used where ever feasible.

Component	Requirement to be checked	Inspection Level	Remarks
Body/ Chasis	Workman ship & finish Cl. 7.1 of 5116	100%	Shall show no defect such as pin holes, blisters, Roughness & the surface Shall also be free from sharp Edges, burrs, dent etc.
	Minimum thickness as per Drawing	One out of every 50 Bodies or Less received In a Consignment	If one sample fails, two more be checked. Both should pass, otherwise consignment to be rejected
	Nickel chromium plating Thickness. Cl. 7.3.1 and 7.3.2 of IS 5116	-do -	In case of failure consignment shall be rejected
	Corrosion Resistance Cl.7.3.3 of IS 5116	- do -	In case of failure suitable every month action be taken with

		Concerned electroplate	
	Vitreous – enamelled test Cl. 7.2 & Annex E of IS 5116	Two out of each consignment	In case of failure consignment should be rejected
	Resistance to abrasion cl.7.4.1 of IS 5116	one out of each consignment, each batch in one month	If one sample fails, two more be checked. Both should pass otherwise consignment to be rejected and the matter may be taken up with the supplier.
Mixing tube	- Workmanship finish & of durable construction	100% visual undertaking to be obtained	Rejected to be scrapped Test certificate may be obtained
	- Material should be as per declaration		Rejected to be scrapped
	- Dimensions as per drawings	100% by gauges/ fixture	
	- Location & Dia. of air hole	-do -	-do –
Burners	- Workman, finish & Durable construction	100% Visual	Rejected to be scrapped
	- Material should be as per declaration which should include melting point as per CL. 5.5 of IS 5116	Undertaking to be obtained for material	Test certificate to be obtained
	- Dimensions as per drawing	100% by gauge/ fixture	Rejection to be scrapped
	- Griller burners where food is placed under it shall be of non corrosive material	undertaking to be obtained for material	-
	- Design requirement as per Cl. 10.1 to 10.5 of IS 5116	Each burner to be checked	Rejected to be scrapped
	- provision to protect the centre flame as per	-do-	-do-

	Cl. 11.2 of IS 5116			
	- Requirement of Cl.11.3 of IS 4246	-do-	-do-	
Gas rails	- Centre Distance between Bushes	100% by fixtures	-do-	
	- Total length	-do-	-do-	
	- Threads as per Cl. 17.3 of IS 5116	100% from each consignment	If one piece fails, twice the number of samples shall be drawn. If any further sample fails consignment shall be rejected	
	- Pipe/tube used for main gas rail shall be as per Cl. 18.4 of IS 5116			
Nozzle and Plug	- Nozzle dimension as per Fig. 7 of IS 5116			
	- Plug dimension as per drawing submitted			
	- Threads as per Cl.17.3 of IS 5116			
Gas taps	- Design requirement as per Cl. 8.1 to 8.6, 8.8 to 8.12 and Fig. 2 & 3 of IS 5116	100%	Defective gas taps to be rejected	
	- Thread as declared	100%	-do-	
	- Dimension as per Fig.4 of IS 5116	upto 250 - 1 251 – 500 – 2 510 & above – 3	If any one of the sample fails, twice the number of sample shall be drawn. If all sample conforms the consignment shall be accepted otherwise rejected	
	- Mercurous Nitrate tuf as per IS 2305	Upto 500 pcs – 1 > 500 – 2	If any sample fails consignment shall be rejected	
Injector jet	- Dimension and material As per Cl. 9.1 & 9.1.1 of IS 5116 and threads as	100% of each consignment of sample to be drawn. If all samples	If one pc fails, twice the number	

passes, the consignment be accepted otherwise	Declared		shall be rejected
	- Stamping of size of jet as per Cl. 9.2 of IS 5116	-do-	-do-
Pan support	- Design requirement as Per cl. 12.1 & cl.12.1.1 of IS 4246	-do-	Defective pieces to be rejected
	-Taper of prongs	100% by gauges	-do-
	- Location & tightness of pins	-do-	-do-
Drip tray	- Shall be made of non Corrosive material or Finished & treated to Resist corrosion	100%	-do-
	- Workmanship & finish as per Cl.7.1 of IS 5116	-do-	-do-
	- Relevant requirements to resist corrosion as per Cl. 7.2, 7.3 & 7.4 of IS 5116	Frequency & acceptance as applicable to body/chasis	
Knobs	- Shall have no defect such as Pin holes, blisters, roughness etc.	100% each consignment	Defective to be rejected
	- Should have adequate strength and should not break in normal use	100% of each consignment	-do-
Legs	- Shall have smooth finish & shall Have no defects such as pin holes Blisters, roughness etc.	100%	-do-
Oven trays **Baking trays** **Grill trays** **Grid**	- Declaration for non corrosive material to be taken & verified accordingly	100%	-do-
Spilt tray	- Design as per drawing	100%	-do-
Glass for Grill/ Oven door	- As per declaration & Design as per drawing. - should be heat resistant	100%	-do-
Spring, Screw, **Bolts, Nuts, Pipes, pins etc.**	- Shall be of corrosion resistant material or treated to resist corrosion Cl. 8.3 of IS 4246	100%	-do-

Note:

1. General requirements of 4.1, 4.2 & for different component shall be as given in Cl. 5.1 of IS 5116.

2. All copper & copper alloy parts shall pass the mercurous nitrate test (season cracking test) as per IS 2305 in order to ensure that the material used is stress free. One sample upto 500 component and two for components 501 & more.

3. Plastic components which are liable to heating (for example, tap handles, push buttons, etc.) shall be free of fissures, distortion, flemishes and discoloration and shall not show sign of aging when tested as given in Annex B of IS 5116. Sample frequency one for each consignment for aging test and 100% for visual.

4. Non metallic materials normally in contact with the gas shall not change is weight or volume by more than 15 percent after being immersed in pentane or LPG for 72 h at 200m temp, when tested according to Annex – D of IS 5116. Sample frequency shall be one component from each consignment.

5. In case any of the components are made in house, details of production and inspection should be maintained by the applicant/licensee for verification of inspecting officers of the Bureau.

6. IO should verify during periodic inspection that the components are being inspection as per the guidelines given above.

7. All components should be stored properly in racks / bins suitable places. The components should bear the identification mark of the supplier so that rejected pieces may be returned to the concerned vender. Rejected components should be placed separately preferably with Red colour Code.

SECTION IV – 2

List of the tests to be carried out on Final Product

The frequency of tests and sample size shall be as per relevant scheme of testing and inspection of the product. Tests of 1S 4246 have been taken as bench mark and hence comparision have been between the tests of 1S 4246 and test of other burning appliances. With this, addition requirements wherever specified for the particular product has also been indicated against each product.

For IS 4246

(a) Construction requirements: - Genenral cl. 4
- Material cl. 5
- Design for maintenance cl. 6
- Rigidity of stability – cl. 7
- Workmanship of finish – cl. 8
- Gas Taps – cl. 9
- Injector Jet – cl. 10
- Burners – cl. 11
- Burner Pan support – cl. 12
- Gas soundness – cl. 13
  (Test checks that all gas caring components of the stoves are free from gas leak)
- Gas in let Connection – cl. 14
- Strength of Rigidity – cl. 15

(b) Performance Requirements - Gas consumption – cl. 17
(checks the correctness of the injection jet to ensure the rate of gas consumption is within designed limits)
- Ignition and flame Travel – cl. 18
  (Ensures easy travel of flame all around the burners)
- Flame stability – cl. 19
- Noise control cl. 20
- Flash Back – cl. 21
(This avoids possible accidents due to flame getting extinguished allowing the to escape through the burners)
- Formation of soot – cl. 22
- Resistance to draught – cl. 23
  (This is an essential test which ensures safety)
- Combustion test – cl. 24
  (checks the burner designe)
- Five hazard of limiting temperature test – cl. 25
  (Essential for safety)
- Thermal efficiency Test – cl. 26
  (This is a test for the conservation of energy)

For 1S 4473

(a) Construction Requirement

- General cl. 4 (same as IS 4246)
  (Additional requirement as per cl. 4.2.)
- Material cl. 5 (same as IS 4246)
  (Additional requirements as per cl. 5.2)
- Design for maintenance – cl. 6 (same as IS 4246)
- Rigidity and stability – cl. 7 (same as IS 4246)
  (Additional requirements as per cl. 7.2, 7.3 & 7.4).
- workmanship & finish (same as IS 4246)
  (Additional requirements as per cl. 8.1, 8.2, & 8.3).
- Gas Taps cl. 9 (same as 1S 4246)
- Injecter Jet – cl. 10 (same as IS 4246)
- Burners – cl. 11 (same as IS 4246)
  (Additional requirement to be as per 11.4 & 11.5)
- flue outlet – cl. 12
- Doors – cl. 13
- Over Flame Inspection – cl. 14
- Insulation – cl. 15
- Gas thermostat – cl. 16
- Gas inlet connection – cl. 17 (same as IS 4246)
- Gas soundness – cl. 18 (same as in IS 4246)
- Strength of Appliance – cl. 19.1

(b) Performance requirement

- Ignition and flame stability – cl. 21
- Resistance to draught – cl. 22
- Thermostat – cl. 23
- Oven Heat distribution – cl. 24
- Victoria sandwich cake baking test – cl. 25
- Combustion test – cl. 26 (same as in IS 4246)
- Surface temperature– cl. 23 of IS 5116, IS 4246 & cl. 27.2, 27.3 of IS 4473).

IS 4760

(a) Construction Requirement

- General cl. 4 (same as in IS 4246)
- Material cl. 5 (same as in IS 4246)
  Additional requirement to be as per cl. 5.2, 5.3 & 5.4.
- Design for maintenance – cl. 6 (same as in IS 4246 except distance between the centre of burners not required) Additional requirement as per cl. 6.6 & 6.7.

- Rigidity and stability – cl. 7
- Workmanship and finish – cl. 8
(same as in 154246) Additional requirement as per 8.2, 8.3 & 8.6.
- Gas tap – cl. 9 (same as in IS 4246)
- Injecter jet – cl. 10 (same as in IS 4246)
- Burners – cl.11 (same as in IS 4246)
Additional requirements as per cl. 11.4 & 11.5.
- Draught Diverter – cl. 12
- Flue outlet – cl. 13
- Poilets – cl. 14
- Flame failure device – cl. 15
- Burner Pan support – cl. 16 (same as in IS 4246)
- Spillage collection – cl. 17
- Grill Design – cl. 18
- Cooking Range doors – cl. 19
- Over flame inspection – cl. 20
- Insulation – cl. 21
- Gas thermostat – cl. 22
- Gas inlet connection – cl. 23 (same as in IS 4246)
- Gas soundness – cl. 24 (same as in IS 4246)
- Strength. Of Appliances – cl. 25
- Plate Rack – cl. 26

(b) Performance Requirement - Gas consumption cl. 28 (same as in IS 4246)

- Ignition & Flame Stability, cl. 29
(same as in IS 4246)
- Noise control, Cl.30 (same as in IS 4246)
- Flash back, cl. 3l. (same as in IS 4246)
(Additional requirement as in cl. 31.2 & 31.3)
- Formation of soot, cl.32 (same as in IS 4246)
- Resistance to drought, cl.33 (same as in IS 4246)
(Additional requirement as per cl. 33.2 & 33.2.1)

- Thermostat, cl.3.4 (same as in IS 4473)
- Over heat distribution, cl.35
- Victoria Sandwitch cake baking test for Ovens, cl. 36 (same as in IS 4473)
- Toasting performance on grillers, cl. 37
- Combustion, cl. 38 (same as in IS 4246 & 4473)
- Surface temperature, cl. 39 (same as in IS 4246)
(Additional requirements to check the surface of

the body as given in cl. 39.3)

- Thermal efficiency of boiling burners, cl.40 (same as in IS 4246)

For IS 11480

a) **Construction requirement**

- General, cl. 4 (same as in IS 4246)
- Material, cl.5 (same as in IS 4246)
  Additional requirement are as per el. 5.2,5.3 & 5.4
- Design for maintenance, cl.6
  (same as in IS 4246 except the distance the centre of the burners)
  Additional requirement are as per cl. 6.5 and 6.6.
- Rigidity and stability cl.7 (same as in IS 4246)
- Workmanship & finish, cl.8
- Gas Taps, cl. 9 (same as in IS 4246)
- Injector get, cl.10 (same as in IS 4246)
- Burners, cl.11 (same as in IS 4246)
- Burner support, cl. 12.
- Grill Tray, cl. 13
- Grill design, cl. 14
- Gas soundness, cl. 15 (same as in IS 4246)
- Strength test, cl. 16
  (same as in IS 4246 except the weight to be put on the griller)
- Pan support, cl.17 (same as in IS 4246)

b) **Performance Requirement**

- Gas consumption, cl. 20 (same as in IS 4246)

  Additional requirement as per cl. 20.4 for grill burner.
- Ignition, Flame travel and flame stability, cl 21.1 an 21.2 to 2.4 (same as in IS 4246)
- Noise control cl. 22 (same as in IS 4246)
- Flash Back, cl. 23
  Requirement of grill burner shall be as per cl. 23.1
  Requirement of top burner shall be as per cl. 21 of IS 4246.
- Resistance to drought, cl. 24 (same as in IS 4246)
- Performance test for grillers Cl.25
  (Same as in IS 4760)
- Combustion, Cl. 26, (Same as in IS 4246 & IS 4760)
- Fire hazard and limiting temp. test, Cl. 27
  (Same as in IS 4246)

- Thermal efficiency test, Cl. 28
(Same as in 1S 4246)

Test Methods

1. Material finish

For the test method material finish Cl. 7.2 to 7.4 of IS 5116 may referred. Relevant standards have been given in under referred standard heading in the beginning of the manual.

2. Copper & Copper alloy,Plastic Components and Non Metallic Materials Normally In Contacts With LPG

For test method for plastic components, copper & copper alloy parts and non metallic materials normally in contact with LPG, Cl. 5.1.1, 5.3 & Cl. 5.4 of IS 5116 way be referred.

3. Gas consumption

The rating/gas consumption of LP Gas i.e. the glow of gas through injector jet at 30 gf/cm2 is give by manufacturer for each burner as their declared value in kcal/h., this also means that the declared value is at standard temp. and pressure (STP) i.e. at 27 ^{0} C & 760 mm hg. First the air consumption in terms of litre/h is measured in the existing temperature and pressure condition in the lab with the help of a wet gas meter. Then the same air consumption is converted at STP by multiplying the following correction factor:

$$\text{Correction factor} = \frac{(H+22.06-v)\,(300)}{760\,(R.T.+273)}$$

Where H - Barometric Height in mm of mercury
22.06 - Equivalent mercury column of 300 mm water column
v - water vapour pressure at room temp.
300 - (STP temp. + 273) in Kelvin
R.T - Room temp. when checked from the thermometer of gas flow meter.

Note – Water vapour pressure from 25 ^{0} C to 30 ^{0} C has been given the appendix
- Leveling of the flowmeter shall be done before use with the help of leveling screws available with the flow meter and using sprit level.
Thereafter, using 0.75 as multiplying factor, the value of air flow at STP so obtained is converted to flow of LPG at STP.
Then with the help of relations one litre of LPG = 2.46 g and net calorific value of 10900 kcal/kg, rating/ gas consumption of burners in kcal/h and in g/h is calculated according to the requirement.

4. Resistance to draught

Now a days digital type anemometers are in use and in general Lutron Brand is available in the market. First the appliance is installed corresponding to the likely condition of its installation. Rotating vane is placed on the burner to be tested. The distance of running small table fan, which will rotate the rotating vanes of the anemometer, is adjusted in such a way so that current of air with a velocity of 2 m/s is obtained on the anemometer. It should be ensured that no out side air current should affect the velocity of air. The rotating vane is removed from the burner, fan is stopped & burner is lighted. The fan is again started and is this condition there shall he no extinction of the flame on the burner operating at maximum consumption.

5. **<u>Calibration of Gas flow meter</u>**

1. Level the flow meter. Connect the flow meter outlet to a calibration bottle (air tight jar) full of water. Inlet of flow meter is open to atmosphere. The jar should have a stop cock for the release of water.

2. Ensure that all joints are sound
3. Initially remove a small quality of water to purge the system and allow the flow meter reading to come to rest.
4. Note the initial reading of the flow meter.
5. Now release 3 litres of water into a graduated jar and note the final reading of the flow meter. The volume shown by the flow meter should be equal to the volume of water released from the calibration bottle. If not so, adjust the level of distilled water in the flow meter. If volume shown by the flow water is more then put some water into flow meter and if less, then take out some water from the flow meter which should be equal to the difference in reading.

6. Now the flow mete is calibrated to the required accuracy of ± 0.5 percent. For this purpose, graduated jar should have a minimum graduation of 10 ml.

SECTION IV - 3

TEST EQUIPMENTS

Many of the testing equipments required for tesing of the LPG burning appliances are common. The equipments required test wise for complete testing of LPG stove as per IS 4246 are being listed below. Additional testing equipments required for LPG ovens, LPG cooking ranges and LPG grillers are given separately where ever required.

S.No.	Name of the test	Equipment & its detail	Frequency of CALI.
1.	**Design for maintenance**	Flame testing enclosure	
2.	**Rigidity and stability**	to accommodate the	
3.	**Ignition and flame Travel**	Appliance	
4.	**Flame stability**	Levelled Surface Plate	
5.	**Noise control**		
6.	**Strength and Rigidity test**	- Surface plate - Steel grommets - Dial gauge 0-10mm, L.C. 0.01 mm with Magnetic base - Steel plate – width – 100mm, Thickness 20mm, Length – equal to length of the body - Weight @ 25 kg/ burner with Minimum of 50 kg as shown in fig – 1 of Annex.C of 1S 4246 - Steel scale – 24" & 36"	
7.	**Gas Soundness**. **For gas**	- Compressor with suitable pipe line fitted with Pressure Gauge range – 0-1 kgf/Cm2 LC – 0.02 kgf/Cm2 and regulator - Water tank with adequate capacity -Trays for keeping Accepted/not accepted Manifold separately.	
-	**For assembled stove**	- Compressed air with Pressure Gauge 0-1 kgf/cm2, LC 0.02 and Regulator	

- Bubble leak indicator Fig. 9, Annex J of 1S 5116

- Suitable LPG tube for connecting.

8. **Gas consumption test** - Wet gas flow meter dial type with counter and thermometer, Range – 0-3l, LC -0.02 l.

- Water manometer
- Barometer with mercury
- Stop watch 0-15 minute ,LC – 0.1 second
- Compressed air free from oil/impurities
  (Preferably Air cylinder)
  Or
  Compressor with Air tank, Air filter, regulator
  And pressure gauge
- Calibration bottle for wet gas flow meter

9. **Burner Pan support** - Aluminum pan 100mm dia 125 mm dia

10. **Flash Back** - Aluminum vesset – suitable
  Size to cover the pan support
  Fully – Generally 240 mm – two no.s

11. **Soot formation** - Aluminium vessel- Dia – 150mm – Twonos

12. **Resistance to draught** measure - Rotating vane Anemometer to
  Current of air velocity 2 m/s
- Small table fan

13. **Combustion test**

- Aluminium pan 190mm dia
- Collecting Hood fig. 3
  Annex. E of IS 4246
- Orsat Apparatus for CO_2 , Accuracy 0.5 percent of the volume of sample
- CO Tubes
- CO tube Aspirator, Accuracy 0.001 percent of the volume of the sample

14. **Fire Hazard & Limiting temp** - Apparatus as per fig.11 Of Annex M of IS 5116.

		- With temp. indicator range 0-200 and switch board connecting all points - Vessel with cover,Dia – 150 mm for each burner
15.	**Flame Temp Test**	- Thermo couple as described in cl. 25.2 of IS 4246 With temp indicator ,Range – 0-600.c - Stand for holding the thermo couple
16.	**Thermal Efficiency**	- Small LPG cyld. With 1 or 2 k.g. gas - Domestic LPG Cylinder - Variable press regulator - Weighing balance 5 kg. – accuracy 0.1 g With std. weights. - Mercury in glass Thermo meter 0-110.C L.C. 0.5.C - Water manometer - Aluminium Pan as per Table 1 of Annex F Of 1S 4246 with Lid and stirrer As per F – 2 (g) of Annex F of 1S 4246 - Pan Balance 10 kg, accuracy 1 g. - Distilled water
17.	**Nickel – chrome Finish test (For ni-Cr plated Body)**	- Cleaning and stripping reagents for chromium Thickness as per IS 3203 - Glass rings for Cr- test - Stop watch - BNF jet apparatus for Ni-Testing - Required Cleaning & stripping reagents for Nickel thickness as per IS 3203 - Taper stand for holding the body - Salt spray chamber As per IS 6910 - Digital ph indicator - Vice for Ni-Cr plated piece - Coarse file.
18	**Resis. to Abrasion test**	- Paint scratch test Apparatus as per

Fig. 1 of 15 5116

19.	**Test for enameling (Annex. E of IS 5116**)	-	Dropper bottle or medicine dropper
		-	Watch glass 25 mm is diameter With fire polished edge.
		-	Soft cotton towel
		-	Acetone
		-	Citric acid solution
		-	Cleaner solution
		-	Electric over for 26+1.c
		-	Graphite drafting pencil 3B
		-	Apparatus as per Fig. of 1S 5116 For impact resistance test
		-	Aluminium ball dia.20 plus minus 1mm And weight 10g (min)
		-	Electirc over 0-250.c Thermo statically controlled L c 5.C
		-	Water container with 5 mm dia tubular Outlet
20.	**Mercurous nitrate Test.**	-	cleaning and testing Reagents as per IS 2305
		-	Magnitying glass 10 x (min)
21.	**Air conditioner**		For maintaining proper
22.	**Heat convectors**		testing temp. in the lab

23. Glass wares like measuring cylinders, measuring flask, Beakers, funnels, filter paper etc.

Frequency of calibration or whenever instrument goes out of order i.e after repair

Pressure Gauges	-	Six monthly
Temp. indicators	-	Yearly
Gas flow meter	-	Self calibrated before use
Thread gauges	-	once in a year
Anemometers	-	once in a year

Additional test equipments for domestic gas oven for use with LPG IS 4473 pl. see test facility for IS 4246 for the tests which are common is both.

Sl.No. Name of the test Equipment required with details.

1. **Rigidity & Stability** - Leveled Platform
   - Weight 3 kg.

2. **Workman ship & finish** - Electric oven 0 --500.c thermostatically controlled. LC 50 ^{0}C

2. **Testing of Doors**
   - Sprit level for drop door horizontality
   - Gauge for checking 100 degree. opening for side hinged door
   - weight 10 kg. with Bottom area 30.cm2 for door opening downwards (Cl.13.2.1 a)
   - Solid support as shown in fig 2 (a)
   - Weight 20 kg. with Width 100mm. &
   - Length as per fig. 2 (b) for door Opening down wards

   - Weight 20 kg
   Uniformly applied for door opening side ways As per fig. 2 (c)

3. **Strength of appliance** - 50 kg. weight , Uniformly applied On top of the appliance

4. **Thermostat testing**
   - Blackened copper sphere As per fig. 3 of 1S 4473
   - Adequate temp. Indicator

5. **Oven heat distribution**
   - Blackened copper sphere as per fig. 3
   - Stop watch
   - Temp indicate 0-350.c Lc 1.c
   - weighing balance
   - Small LPG cylinder

6. **Victoria Sandwich Cake Baking test`** - Ingredient for Cake as per cl. 25.1 of IS 4473
   - Glass bowls of required size
   - Wooden spoon
   - Tins for Cake Dia 180mm & 230 mm

7. **Combustion test** - Hood for oven as per fig. 5 of Annex D

8. **Surface temp** - Suitable thermocouple and temp indicator.

Additional test equipments required for domestic cooking ranges including grillers for use with LPG 1S 4760. Please see test facilities for 15 4246 and 154473 for the tests which are common is all.

1.	**Rigidity and stability**	- Leveled platform - Weight 3 kg
2.	**Work man ship & finish**	- Electric oven 0-500.c Lc – 50.C thermostatically controlled
3.	**Drought Diverter to Be tested for resistance to Draught**	- Facility as per Annex F of 15 5116
4.	**Test for flame failure Device**	- Stop watch
5.	**Spillage collection**	- Measuring cylinder 500 ml.
6.	**Cooking range doors**	- Sprit level for drop door Horizontality - Gauge of Checking 100 degree Side hinged door opening - Weight 10 kg with base Area 30 cm2 for door opening door words - Solid support as per Fig. 3 (a)
This is not applicable For cooking ranges (a) 4 (c) covered under cl. – 1.1.1 of IS 4760		- Weight 20 kg. Shaped as per fig. 3 (b) for door Opening downwards - Weight 20 kg. to be placed according to fig. 3 (c) for door opening sideway.
7.	**Strength of appliance** applied on	- 100 kg. weight to be uniformly top of appliance - Apparatus as per fig 6 of Annex C - Dial gauge 0 – 10mm, Lc – 0.01 mm
8.	**Toasting performance** or any	- White bread conforming to 1S1488 good Quality bread one day old 12 mm thick - knife

- LPG gas cylinder
- Gas flow meter
- Stop watch & steel scale 12”

Additional test equipment required for domestic grillers to use with LPG as per IS 11480. Please see test facilities for IS 4246, 4473 & 4760 for the test which are common in all.

1**. Workman ship & finish** - Arrangement for heating the component with protection coating of external surface to 150.c

2. **Strength test** - 50 kg load if the distance between two top burners is up to and including 400mm

- 75 kg. load of the above distance is more than 400 mm.

SECTION V

Certification Criteria

Liquefied petroleum gas burning appliances comes under voluntary certification. However public sector coin companies insist on using stove and other burning appliances conforming to Indian standards and bearing standard marks.
Although, to ensure safety of the consumers, the Govt. of India has mode compulsory certification in case of LPG cylinder, valves & regulators.

For the purpose of certification of LPG burning appliances, the operational guidelines as given under operational manual for product certification, Nov. 2004, are to be followed. However specific details as relevant to burning appliances are given below.

Scheme of testing & inspection

The latest STI for IS 4246 is DOC: STI/4246/11 April 2003
The latest STI for IS 4760 is DOC: STI/4760/5 June 1994 with Amd. No. 1 & 2
The latest STI for IS11480 is DOC : STI/11480/3 July 2004 with and no. – 1
STI for IS 4473 is not yet made.

Control Unit

Appliance having same design, material of burners, same burners ratings manufactured during a day shall constitute a control unit for the purpose of scheme of testing and inspection.

The STI with its amendments are attached at annex. for ready reference

The other related document such as marking fee, testing charges, list of bus and out side approved labs are laps by circulation and also on BIS intranet.

Check list for scrutiny of application for grant of license and red form

DOCUMENTS AND INFORMATION TO BE SUBMITTED ALONG WITH THE APPLICATION FOR GRANT OF LICENCE UNDER BIS PRODUCT CERTIFICATION SCHEME

1. Document authenticating establishment of the firm, such as Registration by company Registrar or State Authority or Memorandum of Article in case Applicant Firm is a limited Company Or Partnership Deed in case the applicant firm is under Partnership.

2. Certificate from concerned regulatory agencies like Central insecticides Board (CIB) Chief Controller of Explosive (CCE) and Drug Controller etc. as applicable.

3. SSI Certificate in case firm is a small scale unit.

Or

The manufacturing unit who are in small scale but are unable to get SSI certificate and desire concessional marking fee shall submit a certificate about the amount of investment in the plant and machinery from a chartered accountant if the amount does not exceed the amount as fixed by the govt. the firm will be treated as SSI.

In case of such unit the firm will also submit a letter to BIS indicating the reason why they are unable to obtain SSI registration.

4. Process Flow Chart indicating the Manufacturing process and quality assurance plant being followed.

5. Documents of any other certification for Product/System.

6. **Details of Components/Raw Materials used in Manufacturing of the product:**

Raw Material/ Component	Name of Supplier	Whether ISI Marked (Yes/NO)	With Supplier's Test Cert. (Yes/No)	Arrangement of testing (when received without ISI Mark or test certificate

7. **List manufacturing machinery :**

Date of Installation	Manufacturing Machinery/ Equipment	Make	Capacity	Number (S)	Remarks

8. **List of Test Equipment:**

Date of Installation	Test Equipment	Least Count & Range) (Where applicable)	Validity of Calibration where required (Indicate date)	Reference of clauses (s) of ISS for use of equipment	Remarks (Indicate number (s) when m0ore than one)

9. Drawing of the Product and its components duly numbered , stamped and signed by the firm.

10. Qualification and Experience details of Q.C. and Testing Personnel employed (not consultants)

11. Undertaking from QCI to the effect that he has left the earlier job and will continue in the new place of posting.

12. Copy of the appointment letter with photo of the QCI duly accepted by him.

13. Test report from an independent laboratory indicating conformance of the product to Indian Standard and / or a test report of your own laboratory using test method referred therein.

14. Broad Layout Plan of the Manufacturing Premises
15. Location plan of manufacturing unit.
16. Pay Order/Demand Draft in favour of Bureau of Indian Standards payable at New Delhi.

a) Rs. 1000/- + 10.2 % as service tax & education cess (Application Fee)
b) Rs. 4000/- + 10.2 % as service tax & education cess (Preliminary Inspection Charges)

NOTES :

* Application to be submitted in duplicate duly stamped and signed by proprietor / partner/ MD / authorized signatory of the firm indicating name, designation.
* Authority letter in favour of one partner by other partners, who will deal with BIS.
* Clearly indicate product variety to be covered (type/grade/Declared rating etc. related IS)
* In case of shifting of manufacturing premises, BIS shall be informed.
* Mention complete office and factory address.
* Give details of previous application for this product if applied earlier. State whether application was closed/rejected with reason.
* Give details of licence held earlier if any. State whether licence was cancelled /expired with reason.
* Give details of any legal case filed by BIS if any. State whether convicted by court at any time in such chases.
* All Visits / Inspections till grant of licence are chargeable @ Rs 3000 plus service tax per day per person after preliminary inspection.
* Testing charges of sample (s) is to be paid at the time of drawl of sample.
* Submit undertaking with respect to acceptance of STI, Marketing fee, brand name declaration and other terms and conditions of grant of license in prescribed reformat at the time of preliminary inspection.
* The application is liable to be rejected, if the information submitted by you along with your application is found to be incorrect.

* If the documents are in language other than English/Hindi, a translation in English/Hindi should be provided.

Preliminary Inspection

In general during preliminary inspection the five is not in regular production there fore few stone grillers/oven/cooking range should be got assembled by the inspecting officer in his presence with a purpose to verify the manufacturing capability of the firm. The sample should also got tested for some basic requirements of construction. (Which includes design for maintenance , workmanship & finish, gas soundness, gas in let connection, strength & rigidity etc.) and performance (which includes ignition & flame travel flame stability, noise control, flash back, soot formation etc.) to verify the competence of quality control personnel and working condition of test equipment. A part from this test records of component inspection with respected to there relevant drawing and acceptance and test report of the lot offered should also be verified before drawl of sample for independent testing.

Apart from the above following parameters should be highlighted in the report

(i) Whether applicant is an assembly unit or makes same of the component of its own.

(ii) Names of the suppliers of components indicating the material of each component and the identification mark given on the component.

(iii) Availability, adequacy and competence of the quality control personal compared to production level.

(iv) Proper lay out of assembly shop, lab w.r.t. the lay out submitted by the firm and adequacy of the working / testing space should be highlighted.

(v) It may be ensured that the gas manifold are assembled in house and not purchased from vendors in assembled condition.

(vi) Provision in the laboratory for maintaining the test room condition between 25-30^{o}.c by the use of air conditioner in summer and heating arrangement in winter.

Minimum Requirement of Quality Control staff

The quality control in charge should be minimum Diploma in Engg. / Science graduate with sufficient experience / compliance to operate the BIS certification scheme in the firm. He may be assisted by other quality person having necessary experience / competence. The number of quality control person will depend on the production level of the firm. Adequacy of same will be assessed by the visiting respecting officer and he should specify the same in his preliminary inspection report.

Drawl of sample for Independent Testing

A separate sample is to be drawn for each “TYPE” of appliance. For definition of type please see the relevant STI with cl.6.1 & cl.6.2.1 for IS 4246, cl.5.1 & 5.21 for IS 4760 and cl.7.1.1 & cl.8.1 for IS 11480.

With the sample of the product following also drawn for independent testing. A typical example of LPG stove is given below :--

1. Pipe – for threads as declared & for pipe thickness.

2. Gas cock 2 no. for threads as declared and for mercurous nitrate test (IS 2305) if the gas cock is made up of forged brass and for dimension.
3. Jet, 2 NOS. ----------do----------
4. Nozzle –plug-for threads as declared.
5. A set of mixing tube and burner top for inter changeability test & mercurous nitrate test (B/T only).
6. Two stove bodies if they are Nicr Plated / painted for finish test.
7. Three vitreous enameled test pieces 40mm x 75mm for finish test it the body or other part are vitreous enameled.

Declared values should also be obtained for following, while drawing the sample for independent testing.

For Rating of Burners

Single Burner	:	2064 K-cal / h Total gas consumption -189g/h
Double Burner	:	Big Burner 2064 K-cal/h (77yb) Small Burner 1554kdph (50lb) Total gas consumption – 332g/h
Three Burner	:	2X Big Burner 2064 k-cal/h (77mb) each 1X small Burner 1554 k-cal/h (58gh) Total gas computation - 521 g/h
Four Burner	:	2X Big Burner 2064 k.cal/h (774h) each 2X small Burner 1554 k-cal/h (58h) each Total gas computation – 664 g/h

For Threads

Pope	-	¼ BSPT, 1/8 BSP
Gas Cock	-	1/8 BSP, M5/IBA
Jet	-	M5/1BA
Nozzle Plug	-	¼ BSPT

For Material

Total Stove body Stainless steel/Nicr Plated/Painted/Vitrous enamelled

Drip Tray – Stainless Steel/ Vitrous enamelled/ Miled Steel/ Nicr Plated

Nosle/Plug Brass/Mild steel/Nicr Plated

Pipe - Mild steel suitably treated to rasist corrosion

Gas Cock M Jet – forged brass IS 319 Grade 1

Typical Sample Size

One represented sample of product along with samples of components as related above.

Typical description of LPG stove sample

Double burner domestic gas stove for use with LPG stainless steal body cast iron mixing tube brass burner top with/without SS drip tray with extra component & with burner ratings big burner 2064 k.cal/h (77l/h)
Small Burner 1554 k.cal/h (58l/h)
Total gas consumption – 332 g/h

Declaration for rating of burners, for threads used in the components, for material used, should also be indicated in the test request

Masking of Sample

As for as possible, sample should be sent with out the firm's identification marking. Rating plate if affixed shall be removed.

Selection of laboratory for testing

Policy guidelines circulated for the purpose of selection of lab have to be followed.

Scope for the license to be granted

License should not be granted with open scope. The grant of license shall clearly include the following typical example of LPG stove is given below.

i) Number of Burners.
ii) Material of body/chassis
iii) Material of mixing tube of burner top.
iv) Material of drip tray (if available)
v) Rating of individual burner in K-cal/h
vi) Total gas consumption in g/h
vii) Reference of drawing numbers of 2,3 of 4

Extension of scope of license (inclusion of variety)

No change in the design of any type of appliance shall be made with out the prior approval of BIS the changes may be with respect to critical factors namely gap

between top burners and pan, design of burners w.r.t number of hole about the diameter, injector get, primary air opening, type of appliance body and its finish material and design of burners etc. in case any change is made, the bis shall be in informed and sample of new changed design shall be offered for testing to BIS. The modified appliance shall be marked after the sample has been found conforming to the standard and permitted to do so by the BIS. This has been Clearly stated on relevant STI

Guidelines for inclusion of new varieties of LPG stove in license.

During operation of license it is noticed in general that the licenses are different varieties of LPG Stove with the number of modification other than the drawings submitted by then member of request are also received for the inclusion of new variation of LPG stoves following are the modification which are observed in general.

1) change in the dimension of the nobodies of the stoves i.e. either change in the length breadth or height.

2) Inclusion of drip tray in the stove body.
3) Change of pan support from cast iron to sheet metal and vice-versa
4) Inclusion of nickel chrome body or stainless steel body and vice-versa.
5) Straight body to taper body and vice-versa.
6) Change of burner topes from cast iron to brass and vice-versa.
7) Change in the mixing tube from the conventional type.
8) Change in rating or any other design of LPG stoves.
9) Change number of burner of the LPG stove.

In cases where three is no change in the declared values. Of the gas flow rates and thermal efficiency (sl.no. 5,6,7 & 8) which involves change in the design of the stoves. The inclusion may be agreed on the basis of independent testing.

Against Sl. No. 4 if the LPG stove with stainless steel body is covered, the inclusion of nickel chrome body may be agreed after the independent test reports is available for the nickel chrome testes on LPG stove body and if the license covers LPG stoves with nickel chrome body. The inclusion of SS body LPG stoves be done on the basis of the strength test conducted in the factory.

For the inclusion of different burners (i.e. S/B or double or three burner) the sample be drawn for independent testing.

Where the licensee offers large varieties of the stoves for inclusion the licensee may be advised to prepare minimum of 10 samples for each variety for testing either in factory or for independent testing.

For the varieties of the stoves covered under sl. No. 1, 3 no endorsement is necessary in the license whereas for all other inclusions, the necessary endorsement may be carried out in license.

Procedure of inclusion of variety when licensee declares thermal efficiency 68 percent and above.

For this purpose guidelines as given in Annex A of STI/4246/1 of IS 4246 shall be followed.

Periodic Inspection

A) Frequency of Periodic Inspection

Minimum two periodic inspection an operative year should be carried out seeing it importance to consumer safety. Frequency of periodic inspection should be uniform ally spread through out the period

During the periodic inspection at least three samples should be drawn from stock and production lines at random and the same should be subjected to the testing for construction requirement and for flames. Requirement as per relevant standard. In addition, tests for performance requirements should also be carried out on one sample in such a way that all the tests are conducted during the operating year.

B) Records of testing and inspection

During periodic inspection it should be ensured during periodic inspection it should be ensured that the firm have carried out all the tests as per the frequency of STI and necessary records are maintained. In case same type appliance is manufactured with different brand names, separate records need not be maintained. In such a case a column for the brand name send introduce in the records

It shall also be ensured that frequency of test is maintained for each type of appliance and sepret records shall be maintained as per STI

C) Component Inspection Records.

This record should contain the details of component received w.r.t. their supplier Dt. Of receipt, Quantity receipt, quantity accepted and the basis on which the component has been accepted the test carried out as per the requesting of STI for the acceptance of the component may be in corporate in the same records.

D) Production and Dispatch recodes

A simple record of production and dispatched may also be maintained on the following format.

Date/month opening stock production total dispatch balance.

E) Information required for filing up periodic inspection Performa.

During periodic inspection following information should also be verified/collected.

1) Activity going on during the visit
2) Complete raw material details
3) Month wise production since last inspection
4) Marked stock available
5) Variation test results
6) Calibration details of the instruments
7) List of consignees with complete address
8) Action taken by the firm on the discrepancies pointed out during last inspection it any.
9) Any change in management/Quality control setup

F) Periodic inspection/market sample

Sample for independent testing of the appliance should be drawn in such a way so that all the verities of license are drawn and tested in independent laboratory. For this, variety drawn from market becomes very important. Sample should be packed in a plain card board box and all the marking details should be removed from the appliance as far as possible.

G) Factory test report

The test report performance being used by central lab should be used for reporting complete/partial testing, for the purpose of inclusion of new variety on factory testing basis/for carrying out factory testing for routine periodic inspection/for resumption of marking purpose.

For stop marking/ROM

For consideration of stop marking/resumption of marking the guidelines provided in OMPC Should be followed for the purpose of Stop marring following may be taken as minor failures.

Main gas rail thickness
Dim – of gas tap except threads
Dim of jet except threads
Dim nozzle except threads
Finish requirements of body/drip tray
Strength and rigidity of body
Noise control

For the purpose of resumption of marking when the ROM is done on factory testing basis all the test shall be carried out in factory due to which stop marking was impose.

SECTION VI

ANNEXURE I

Water vapour pressure

Temperature (0.C)	Vapour Pressure (mm Hg)
25.0	23.756
25.5	24.471
26.0	25.209
26.5	25.964
27.0	26.739
27.5	27.535
28.0	28.349
28.5	29.184
29.0	30.043
29.5	30.923
30.0	31.824

ANNEXURE II

The points listed below, will help in the efficient utilization of LP-gas.

(i) Keep all the things chopped and ready before lighting the burner of the stove.

(ii) Put a lid on the vessel to retain heat inside and consumption of fuel is less.

(iii) Bring the appliance to 'SIM' when contents in the vessel reaches boiling point.

(iv) A vessel of 250 mm dia is ideal for cooking. Narrow vessel waste gas especially when the flame licks the sides.

(v) Flat bottomed vessels should be used as these help in proper consumption of LP-gas.

(vi) Small burner should be used at most of lime as it saves fuel.

(vii) Burner ports and mixing tubes should be cleaned regularly.

(viii) Appliance should not be used in an unventilated area as it lowers the efficiency.

ANNEXURE III

Installation

The four essential parts of s LP-Gas appliance installation are gas cylinder, pressure regulator, gas tube and the appliance. The appliance should be so located as to be readily accessible for operation & servicing. Its installation should be such that its operation does not create a hazard to persons or properly. The room in which the appliance is to be installed should be adequately ventilates but free from perceptible draught for satisfactory combustion of LP-Gas.

Operation

(i) While lighting the burners, keep the operating knob of the appliance at 'OFF' position. First open the valve of the regulator, light the match stick or lighting over the burner port and then turn the knob of the appliance to 'ON' position.

(ii) While shutting off the appliance, first close the gas regulator valve and then turn the appliance knob to "OFF" position.

(iii) The flexible rubber tubing should be properly laid and sharp beads should be avoided.

(iv) The gas cylinder should not be tilled to horizontal position.

(v) Incase of any difficulty live leakage etc. shut off the regulator & appliance and call the gas dealer.

(vi) Ensure to close the regulator valve at might after use or when leaving the premises for a long duration.

The Derputy Director General (Marks),
Bureau of Indian Standards,
Manak Bhavan,
9 B.S. Zafar Marg,
New Delhi

Sub: **Preparation of Sectoral Manual**

Dear Sir,

Please refer to your letter No. CMD/3:10 on the above mentioned subject.

I hereby give my consent to take up the work with regard to preparation of Sectoral Manuals.

My discipline of work is Chemicals/Petroleum & Petrochemicals. In addition, I had worked for about nine years as Director, MDD-I and therefore very much familiar with the products dealt under MDD-I such as LPGStoves etc. I can also take up the work with regard to any subject being dealt by MDD-I.

Thanking you,

Yours faithfully

(M.A.U. Khan)
Ex-Deputy Director General(Marks)
122, Sidhartha Enclave,
Ashram, New Delhi-110014

Tel. No. 26345115
Mobile: 9810561495

Date: 14 July 2005

CURRICULAM VITAE

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Date of Birth	1st January 1944
Nationality	INDIAN
Contact Address	122, Siddhartha Enclave Ashram, New Delhi – 110014
Tel. No.	26345115 (Residence) 9810561495 (Mobile)
Educational Qualification (AMU);	M.Sc (Chemistry) from Aligarh Muslim University Aligarh (U.P.)
Specialization in	M.Sc.(Tech.) Oils; Fats & Waxes from Harcourt Buttler Technological Institute (HBTI); Kanpur (U.P.) Petroleum Technology.
	Diploma in Mass Communication from Bhartiya Vidya Bhawan, New Delhi.
INTERNATIONAL	Post Graduate Diploma – International Course in Industrial Quality Control from BOUWCENTRUM EDUCATION-ROTTERDAM NETHERLANDS.
	Certificate Course – THE ASSESSMENT OF QUALITY MANAGEMENT SYSTEMS (ISO-9000) from NIGEL BAUER & ASSOCIATES, UK.
Professional Trainaing	i) Managerial Effectiveness – MDI Gurgaon ii) Finance for Non-Finance Executive – IPA iii) EEC Experts – Workshop on Quality Systems iv) Quality System Awareness v) SQC & Quality Systems vi) ISO 9000-2000 Transitional Auditors Training Course
Foreign Visits Committee	i) Represented India on ISO/TC28 International For Petroleum Products at Rome; Norway; and Tokyo.

ii) Represented India on Free Trade Agreement with Bangladesh at DHAKA.
iii) Netherlands & UK – Study
iv) Saudi Arabia – HAJ & UMRA
v) No. of other Western European Countries such as France, Belgium, Germany, Greece and Egypt etc.- Holiday.

Professional Experience

Joined Indian Standards Institution (ISI) – Now Bureau of Indian Standards (BIS) in 1966 as Assistant Director and Retired as Deputy Director General (Marks) – ALL INDIA CHIEF OF CERTIFICATION ACTIVITIES in December 2003.

i) Around 25 years experience in Standards Formulation for Chemical Industry with specilization in Petroleum Products;
Lubricants; Fuels and Speciality Products – Responsible for Formulation of more than 400 standards on these products.

ii) Around 15 years experience in Product Certification of Chemical and Food Industry and Quality Management System
ISO 900; Environmental Management System ISO 14000; HACCP;
Occupational Health and Safety Management and HallMarking of
Gold.

Membership of

i) Member Society of Standard Engineers, SEI
ii) Member India International Centre, IIC
iii) Member National Sports Club of India, NSCI
iv) Member Central Govt. Officers Institution, CSOI
v)Life Member India Islamic Cultural Centre, IICC
vi) Member Netherlands Alumini Association
vii) Member Aligarh Old Boys Assocation.
viii) Member South Delhi Senior Citizens Forum
ix) Member Executive Committee – Consumers Forum Regd.

(M.A.U. Khan)