

Draft SRI LANKA STANDARD 451:20XX

**Draft SPECIFICATION FOR
DOMESTIC LOW PRESSURE
GAS STOVES FOR USE WITH LIQUEFIED
PETROLEUM GAS (LPG)
(First Revision)**

SRI LANKA STANDARDS INSTITUTION

**Draft Sri Lanka Standard
SPECIFICATION FOR
DOMESTIC LOW PRESSURE GAS STOVES FOR USE WITH LIQUEFIED
PETROLEUM GAS (LPG)**

**DSLS 451 : 20XX
(First Revision)**

Gr. X

**SRI LANKA STANDARDS INSTITUTION
No.17, Victoria Place
Off Elvitigala Mawatha
Colombo 8
SRI LANKA**

CONTENTS

TITLE	PAGE
FORWORD.....	4
1 SCOPE.....	5
2 REFERENCES	5
3 DEFINITIONS.....	5
4 STOVE TYPES	6
5 MATERIAL TYPE REQUIREMENTS	6
6 CONSTRUCTION REQUIREMENTS.....	7
7 PERFORMANCE REQUIREMENTS	10
8 TEST METHODS.....	12
9 SAMPLING AND CRITERIA FOR CONFORMITY	24
10 MARKING.....	25

Draft Sri Lanka Standard
SPECIFICATION FOR
DOMESTIC LOW PRESSURE GAS STOVES FOR USE WITH LIQUEFIED
PETROLEUM GAS (LPG)
(First Revision)

FORWARD

This standard was approved by the Sectoral Committee on Materials, Mechanical Systems and Manufacturing Engineering and authorized for adoption and publication as a Sri Lanka Standard by the council of the Sri Lanka Standards Institution on 2022-XX-XX.

This standard which prescribes requirements and methods of sampling and testing for LPG Stoves that use Liquid Petroleum Gas as fuel, designated to operate on low pressure supply of gas, intended for domestic use, was first published in 1979. This is the first revision of the standard.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed or calculated, expressing the result of a test or an analysis shall be rounded off in accordance with **SLS 102**. The number of significant figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

In the preparation of this standard the assistance derived from the publications of Badan Standardisasi Nasional , BSN, (Indonesian National Standard, SNI), Buureau of Indian Standards and European Committee for Standardization (CEN-CENELEC) are gratefully acknowledged.

1 SCOPE

This Standard specifies the requirements for materials, construction, performance, sampling and criteria for conformity, test methods, safety requirements, marking for the use of single or multiple burner type low pressure Liquefied Petroleum Gas stoves for domestic use, having built-in mechanical or electrical lighters. Stoves without built-in lighters is also covered in this standard, provided that external lighters can be used safely.

2 REFERENCES

EN 30-1-1	Domestic cooking appliances burning gas fuel
EN 484	Dedicated liquefied petroleum gas appliances - Independent stoves, including those incorporating a grill for outdoor use
IS 4246	Domestic gas stoves for use with Liquefied Petroleum Gas (LPG)-specification
IS 5116	Domestic and Commercial Equipment for use with LPG-General requirement
JIS S 2147	Portable gas cookers with LPG cartridge
SNI 7469	Two and three burner type low pressure gas stoves with lighters
SLS 102	Presentation of numerical values
SLS 428	Random sampling method
SLS 712	Liquefied Petroleum Gas (LPG) (As propane, Butane mixture)

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

- 3.1 low-pressure gas stoves:** A stove operated with Liquefied Petroleum Gas (LPG) fuel supplied through a hose and a low-pressure regulator
- 3.2 low-pressure LPG:** LPG having a pressure between 1.9 kPa (19.0 mbar) and 3.2 kPa (32.0 mbar).
- 3.3 tabletop:** A type of stove which is placed on a table during the use.
- 3.4 cooktop (built-in hob):** Burners built into or fixed on the top of a cabinet or other surface.
- 3.5 knob/ button:** A tool to operate the stove by turning on and off the lighter and regulating the flow of gas to the gas valve with a rotary, press, slide, touch or a combination.
- 3.6 lighters:** Ignition system that works mechanically, electrically or as an external device.
- 3.7 the burner and the stand:** The place of internal flame consists of burner head, burner, burner holder, and burner chimney, which can be separated or in one unit. An air regulator system can or cannot be used for the burner chimney.

- 3.8 gas valve:** A tool to regulate the amount of gas flowing out of the burner.
- 3.9 grid:** Holder for supporting cooking utensils.
- 3.10 stove body:** The part of the stove which consists of the top, the bottom, the front, the side, the back or a combination, or is a single body stove.
- 3.11 main gas pipe:** Pipe that delivers gas to the gas valve.
- 3.12 flame lift:** The distance from the burner to the bottom of the flame, when the flame is not attached to the burner
- 3.13 backfire:** Propagation of flame backward into the burner room or the burner stand.
- 3.14 liquefied petroleum gas:** Narrow boiling range mixture of hydrocarbons consisting of propane, propylene, butanes and butylenes, individually or in specified combinations, with limited amounts of other hydrocarbons (such as ethane) and naturally occurring, petroleum-derived non-hydrocarbons.

4 STOVE TYPE

There are two types of stoves covered under this standard:

1. Table top
2. Cooktop/ built in hob

Stove can consist of one or many burners. Stove may consist of burner, burner stand, grid, gas valve, lighter, main gas pipe, and stove body (*See* Figure 1 and Figure 2).

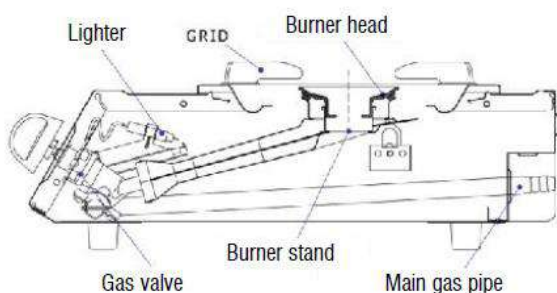


FIGURE 1: Table top stove

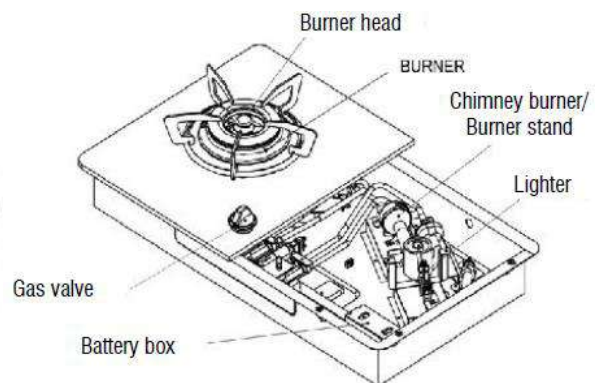


FIGURE 2: Cooktop/ built in hob stove

5 MATERIAL REQUIREMENTS

5.1 Materials used in the LPG cookers shall be designed to withstand mechanical, chemical and thermal effects including melting of parts under normal operation and maintenance conditions.

5.2 The following general conditions shall be considered with respect to materials used in construction of the LPG gas cookers.

The nature and state of the surface of materials that may come into direct contact with food, if any, shall be such that they cannot contaminate or degrade food.

Such surfaces shall be:

- corrosion-resistant;
- non-toxic;
- non-absorbent (except when technically or functionally unavoidable)

and shall not:

- transfer undesirable odours, colours or taste)to the food;
- contribute to the contamination of food nor have any adverse influence on the food.

The quality and thickness of materials used in the construction of the appliance shall be such that the constructional and operational characteristics are not altered in use.

Materials containing asbestos shall not be used in the construction of the appliance.

5.3 The base metal plates used for construction of the stove body shall have minimum thickness of 0.5 mm.

5.4 The stove top surfaces made of glass or ceramic shall withstand without any mechanical defects such as rupture, cracks or other visible failure when tested according to clause **8.4.5**.

5.5 Construction materials susceptible for corrosion shall be manufactured with corrosion resistance materials or coated with acceptable nontoxic coating and shall satisfy the conditions when tested according to clause **8.6**.

5.6 Coating on the grid must be resistant to heat, non-toxic and not easily peel off, tested in accordance with clause **8.4.4**.

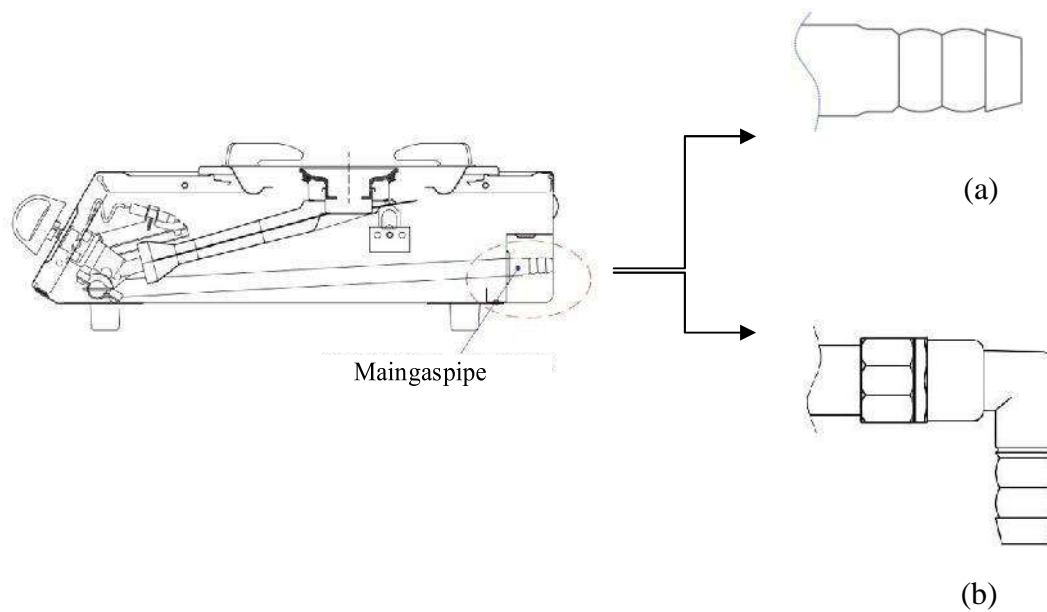
5.7 The burner material must be resistant to heat and shall not change its shape, after being tested according to **8.11** and there shall not be any mechanical defect such as rupture, cracks or other visible failure.

6 CONSTRUCTION REQUIREMENTS

6.1 The parts of the stove may consist of burner/s, burner stand, grid, gas valve, lighter, main gas pipe, stove body, glass top, a power supply mechanism in case of an electrical lighter.

6.2 No pressure regulator shall be included as a part of the stove.

6.3 For easy and safe installation, connecting end of the main gas pipe to the gas supply hose shall be constructed, with a protruding section having a minimum length of 20 mm from the side, back or bottom (built in hob type) of the stove body. The protruding section can be straight or L- shaped as shown in Figure 3.



**FIGURE 3 : Possible configuration of the protruding end of the main gas pipe.
 (a) straight (b) L-shaped**

6.4 The stove shall comply to all visual test for surface irregularities given in clause **8.5**, and the flame is still blue and the installation of electrical components must be neatly installed, tested according to clause **8.5**.

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

6.6 Construction requirements of the burner/s

6.6.1 The construction of the burners and the assembly shall allow their dismantling from the supports easily with or without the use of tools. (See Figure 4 for guidance).

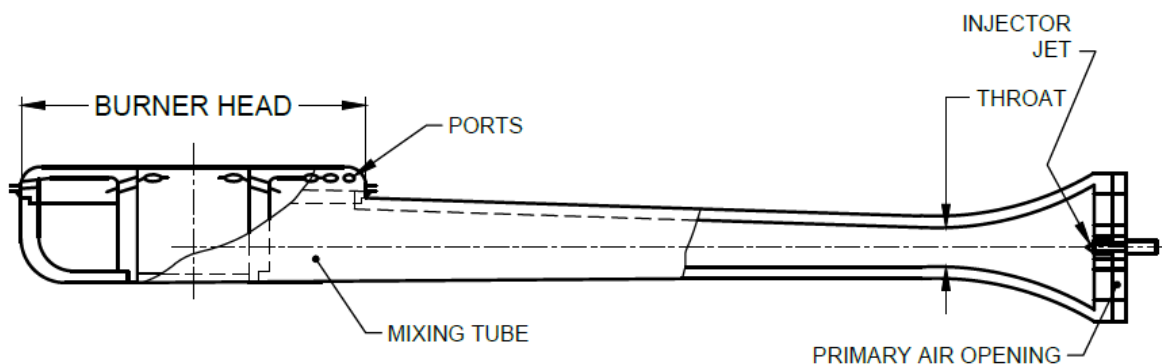


FIGURE 4: Typical burner assembly

6.6.2 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.

6.6.3 The tightness of the joints in the burner assembly shall not depend upon adhesives or any kind of packing.

6.6.4 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 figure 5*).

6.6.5 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.

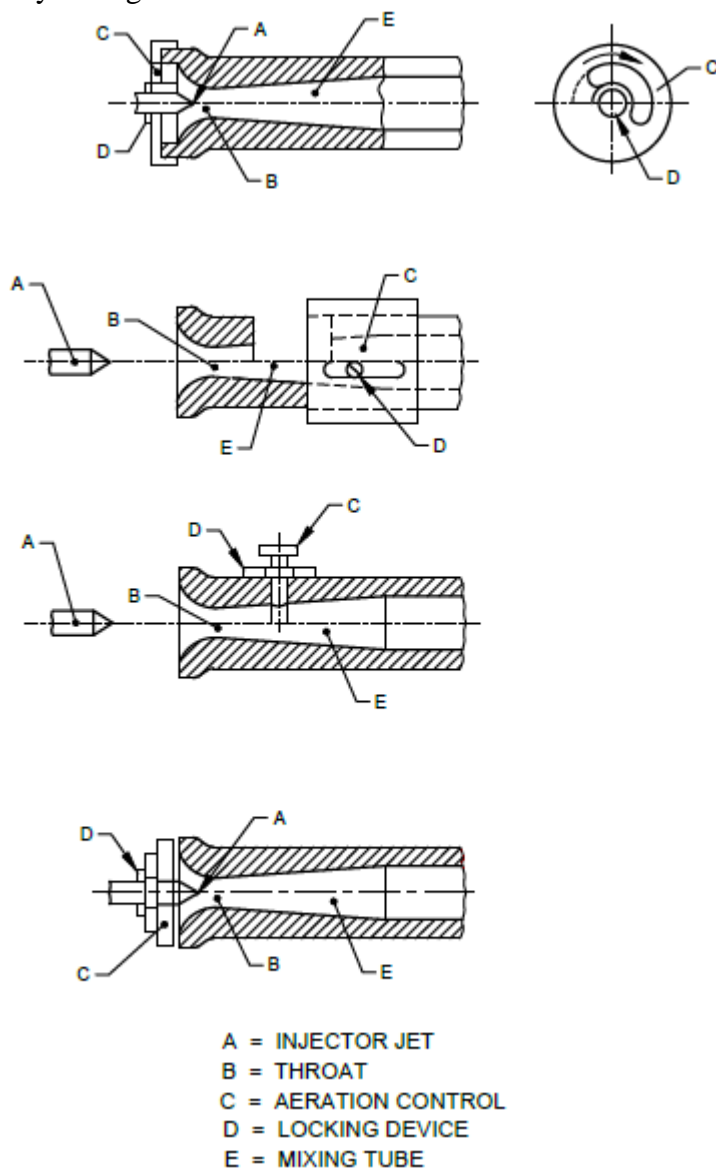


FIGURE 5: Primary Air Controls

7. PERFORMANCE REQUIREMENTS

7.1 Stability

When vessels are placed on the stove they shall not be easily rolled or shifted when tested in accordance with clause **8.3**.

7.2 Strength

7.2.1 Product unit must have the strength to support the load during the usage. There shall be no crack, or permanent deflection on the stove, when tested in accordance with clause **8.4**.

7.2.2 In terms of construction, the stove unit does not change when it is carried out by displacement, shocks and other things that can cause disruption of product function and the emergence of leaks in gas line equipment, testing in accordance with clause **8.7** and clause **8.8**.

7.3 Cleaning the Stove

7.3.1 Components that need regular maintenance, especially grids and burner, should be easily cleaned without the need for special equipment to release them, and must be returned properly and correctly without difficulty in re-installation. Testing is in accordance with clause 8.5.3.

7.3.2 Parts or sides of the component should not have any sharp edges, protrusions which can cause injury when handling and cleaning the product unit. Testing is in accordance with clause 8.5.4.

7.4 Safety requirements

This stove shall be used in Sri Lanka only with Liquefied Petroleum Gas (LPG) upto maximum of 30 percent by volume of propane in the butane propane mixture as define in SLS 712:2021.

7.4.1 The stove in the closed gas valve position shall not leak LPG to the atmosphere, when tested in accordance with clause 8.8.

7.4.2 The flame on the burner must not be extinguished due to spillage when cooking, which results in the closure of the flame hole on the burner, testing is carried out on each burner in accordance with clause 8.1.6.

7.4.3 Parts of the stove which the user potentially touch willfully or accidently shall not exceed temperature of 80°C, testing in accordance with clause 8.2.1 and clause 8.2.2.

7.4.4 The stove must be able to work at a minimum gas pressure of 1.9 kPa (19 mbar) and a maximum of 3.2 kPa (32 mbar) for LPG, testing in accordance with clause 8.10.

7.4.5 Hoses and other assembly components containing LPG shall comply to the **SLS 1172** standards.

7.5 Gas inlet pipe

The profile of the gas inlet pipe to the stove (gas pipe) is in accordance with Figure 6. The surface temperature of the pipe due to heat propagation must not exceed 80 ° C tested in accordance with clause 8.2.3.

(Units in mm, tolerance of 10% for dimensions that are not declared tolerant)

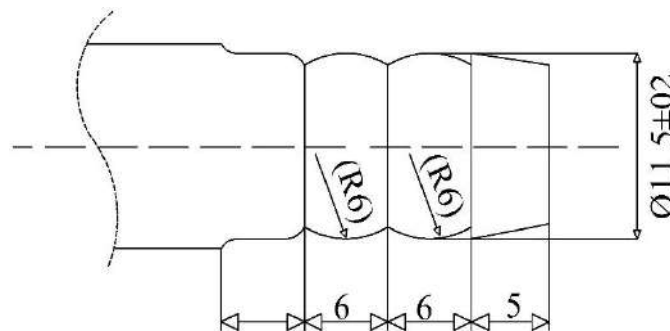


FIGURE 6: Schematic example of a gas inlet end profile from hose to stove (gas pipe)

7.6 Gas valve and lighter

7.6.1 Each gas valve and mechanical and electrical lighters must be able to show the same performance (not leaking and the lighter still functioning properly). The minimum mechanical light resistance is 10,000 strokes, tested in accordance with clause 8.9.2a. For the durability of electric lighters it is capable of sprinkling sparks for a minimum of 24 hours, tested according to clause 8.9.2b.

7.6.2 The gas valve should be leak proof, and it shall be tested in accordance with clause 7.6.1, clause 8.8 and clause 8.9.1.

7.6.3 The valve opening system can be a button shaped with a rotary system that is counter-clockwise or button shaped with a press system and lists the maximum and minimum gas openings. The mechanical lighters must be integrated with the gas valve and work together to start a flame when the gas valve is open. Testing is in accordance with clause 8.5.5.

Below is an example of an indicator that shows the position of the maximum and minimum gas valve openings:

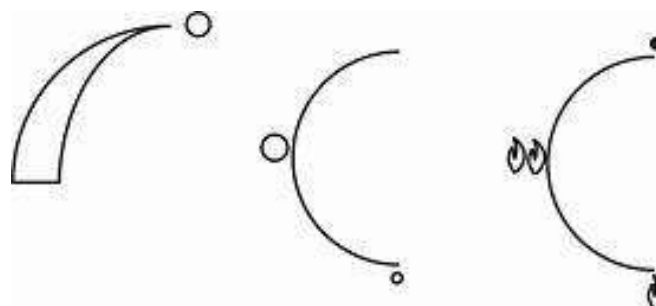


FIGURE 7: Examples of labeling of valve rotary system

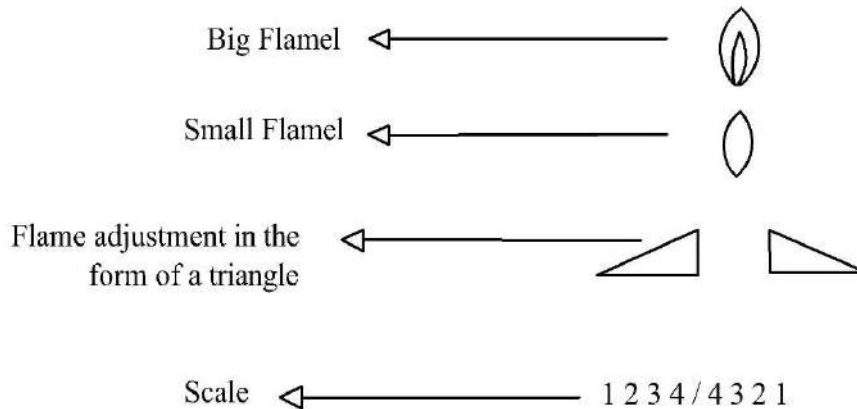


FIGURE 8: Examples of labeling of valve press system

7.6.4 The use of an electric lighter can be integrated or separated from the gas valve counterclockwise and includes the maximum and minimum gas openings and / or other automatic buttons. Testing is in accordance with clause 8.5.5.

7.6.5 At the maximum flame position the quality of flame must be maintained with a minimum efficiency of 50% in each burner, testing in accordance with clause 8.12.

7.6.6 At the minimum flame position, the flame may not extinguish, testing in accordance with clause 8.1.4.

7.6.7 At the position maximum flame, the flame may not extinguish, when blown by the wind at a speed of 3 m/s, testing in accordance with clause 8.1.5.

7.6.8 In the absence of built in lighters, an external safe lighter should be used in a safe manner.

7.7 Burner

7.7.1 The burner material must be resistant to heat and not change form, after being tested according to clause 8.11 and must comply with clause 8.5.6.

7.7.2 When turning on the stove, there should not be a lifting flame from the burner head and when it is turned off it must not occur backfire into the burner, testing in accordance with clause 8.1.2 and clause 8.1.3.

7.7.3 The color of the flame core does not turn reddish yellow when used, testing in accordance with clause 8.1.7.

7.7.4 At the time of use, the burner and burner stand may not emit odors or conditions that are harmful and disturbing health, testing in accordance with clause 8.5.2.

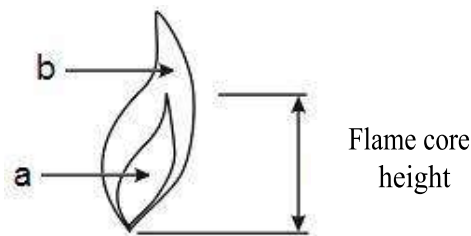
8. TEST METHODS

8.1 Flame Test

8.1.1 Tests have to be carried out using LPG with a pressure of 2.75 ± 0.05 kPa (27.5 ± 0.5 mbar) for each burner separately.

8.1.2. There should be no backfire greater than 70 dB measured from a distance of 1m at an angle of 30° from the flat plane, using a sound meter, when the burner is quickly turned off after keeping it on at maximum position for 5 minutes. (Background noise?)

8.1.3. Flame does not fly or lift from the lip of the burner hole exceeding $\frac{1}{4}$ the height of the core of the flame.



Caption:

a = core of flame

b = flame

FIGURE 9 : Form of flame

8.1.4 Flame may not extinguish, when the gas valve is at the minimum position or at the smallest flame.

8.1.5 At the maximum flame position, the flame shall not extinguish when the wind blows at a speed of 3 ± 0.2 m/s (Test set up has to be decided and included)

8.1.6 Heat a 220 mm diameter vessel (See figure 10 on page 24) filled with water (full water to touch the vessel's lips). Having set the burner to its maximum position, allow the water to boil for 1 minute. Water spills that occur shall not cause the flame to extinguish.

8.1.7 Turn on the stove for 10 minutes at its maximum position. The color of the flame core must be blue; it should not turn reddish yellow.

8.2 Temperature rise test

8.2.1 Tests have to be carried out using LPG with a pressure of 2.75 ± 0.05 kPa (27.5 ± 0.5 mbar) for each burner separately.

8.2.2 Surfaces that may be in contact with hands shall not exceed 80°C during the operation.

8.2.3 Measurements are carried out for a period of 0.5 hours, when heating vessels with diameter of 260 mm and height of 160 mm, containing 6.1 kg of water on each burner, with burners set to their maximum positions.

8.2.4 The temperature shall be measured during the test period within the area around the knob and the front side of the stove body as shown in **Figures 12.a** and **12.b**.

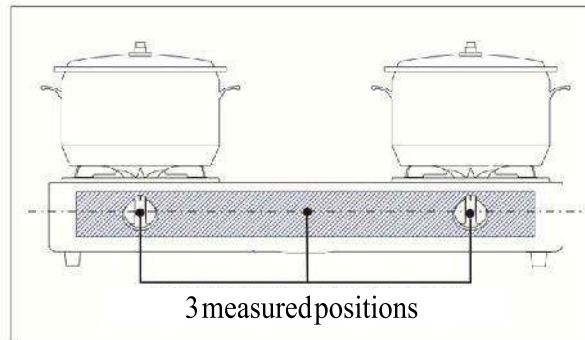


FIGURE 12.a: Temperature rise test of the table top stove

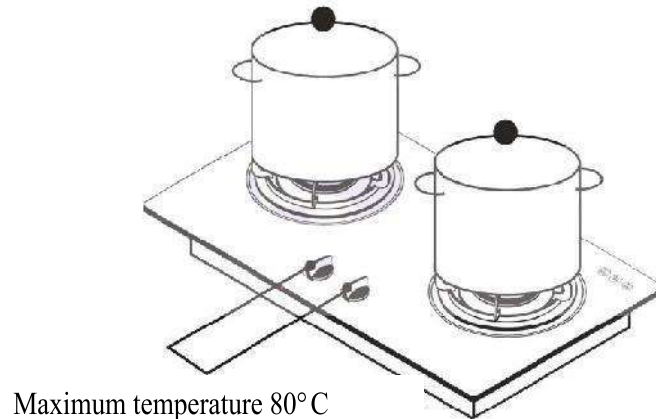


FIGURE 12.b: Temperature rise test of the cooktop/ built in hob stove

8.2.5 Testing of heat propagation in the pipe is carried out on the main gas pipe with measurements carried out by heating a vessel with a diameter of 260 mm, height 160 mm, containing 6.1 kg of water, ignited during 0.5 hours. The temperature measurement area on the main gas pipe is in the 10 mm position from the gas inlet end profile from the hose to the stove according to Figure 13.a and Figure 13.b.

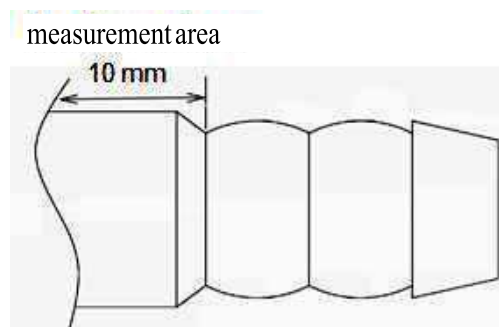


FIGURE 13.a : Heat propagation test on a straight-shaped pipe

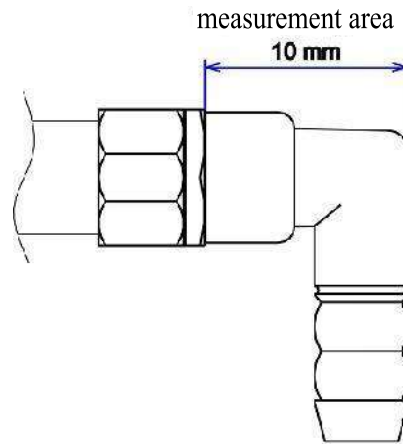


FIGURE 13.b : Heat propagation test on an L-shaped pipe

8.3 Stability test

8.3.1 When supporting vessels with a diameter of 200 mm and height of 130 mm in a plane with a slope of 10° from a flat plane, neither stove nor shift can be rolled out, excluded for the smallest diameter burner in one unit of three stove and does not apply to the type of cooktop/ built in hob stove.

- Place the stove on an inclined plane (10° from the flat plane);
- Place the vessel with the size specified above on the grid of the stove;
- The vessel and stove should not shift, fall or roll.

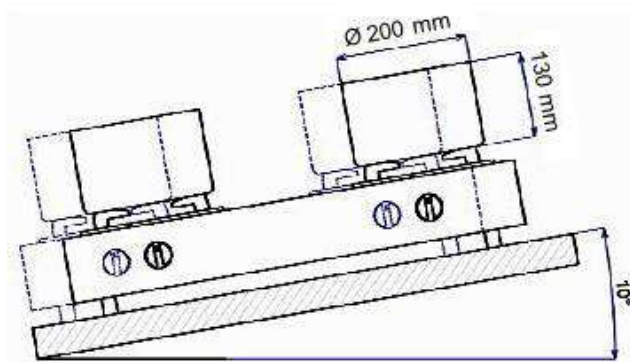


FIGURE 14: Stability test of the stove

8.3.2 When the stove supports a vessel with a diameter of 200 mm and a height of 130 mm containing water up to 10 mm high from the lip of the vessel in a flat field, then the vessel is shifted, its position as far as 15 mm from the center of the stove, vessel and stove may not fall or be rolled, excluded for the smallest diameter burner in one unit of a three to five-burner stove:

- a) Place the stove on a flat table;
- b) Place the vessel of the size specified above and contain water as high as 120 mm from the bottom of the vessel on the grid of the stove;
- c) Slide the position of the vessel from the center of the grid with an offset of 15 mm to the outside;
- d) The vessel and stove must not fall or be rolled over.

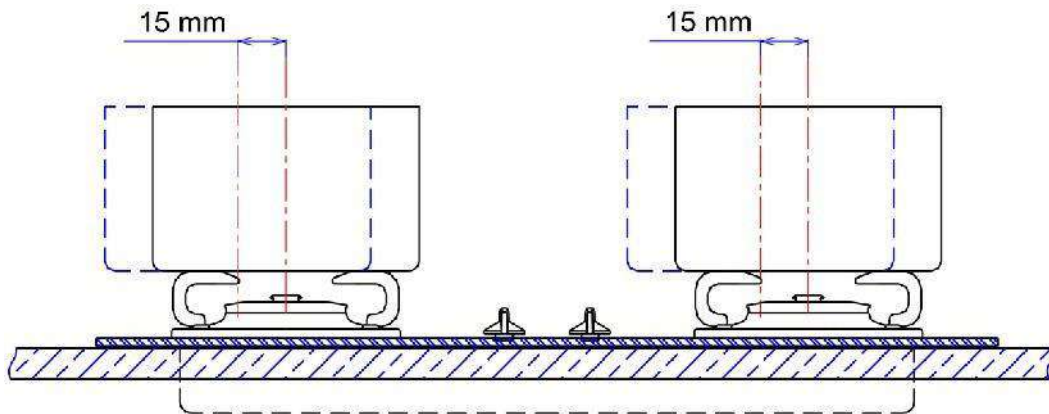


FIGURE 15: Position of the stove with a vessel

8.3.3 Condition of stove without vessel

8.3.3.1 Stability test without load

8.3.3.1.1 Place the stove in a flat area, measure the gap of the grid against the vessel, the maximum gap is 1 mm.

8.3.3.1.2 For the table top stove, also measured the gap between the stove legs with a flat plane, the maximum gap is 2 mm.

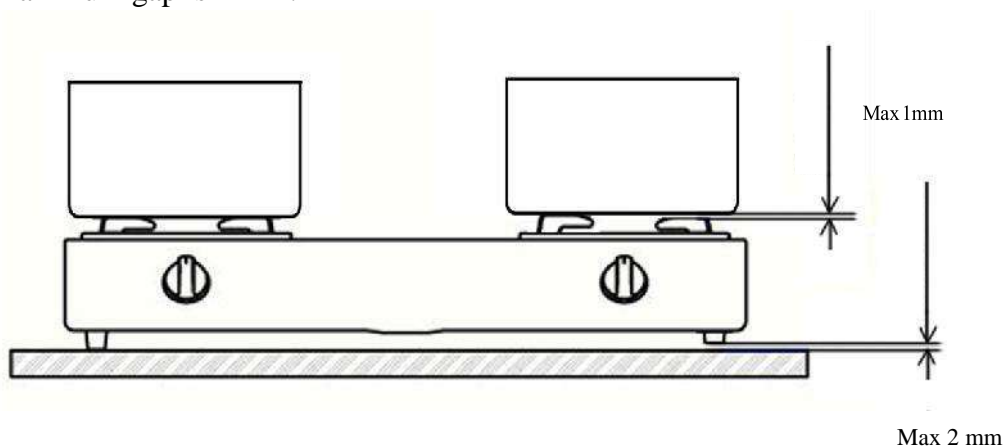


FIGURE 16 : Schematic gap of grid and stove legs on table top stove

Max 1mm

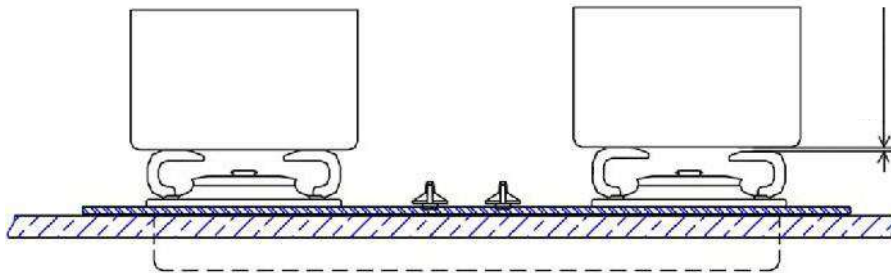


FIGURE 17 : Schematic gap of grid on cooktop/ built in hob stove

8.4 Strength test

8.4.1 A load of 20 kg is applied on each grid for 15 minutes simultaneously. After the load is removed there should not be a permanent deflection greater than 2 mm. It is not applicable to the smallest diameter in one unit of three to five - burner stove:

- (a) Place the stove on a flat table;
- (b) Determine 6 (six) points on each flat plane of the stove (top plate) and measure its position using a dial gauge that has a resolution of 0.05 mm or better (see Figure 18);
- (c) An evenly distributed load of 20 kg is applied simultaneously on each grid for 15 minutes;
- (d) After the load is removed, measure the displacement at predetermined points using the dial gauge;
- (e) At all points, the deflection shall not exceed 2 mm, with respect to the original position (see Figure 19).

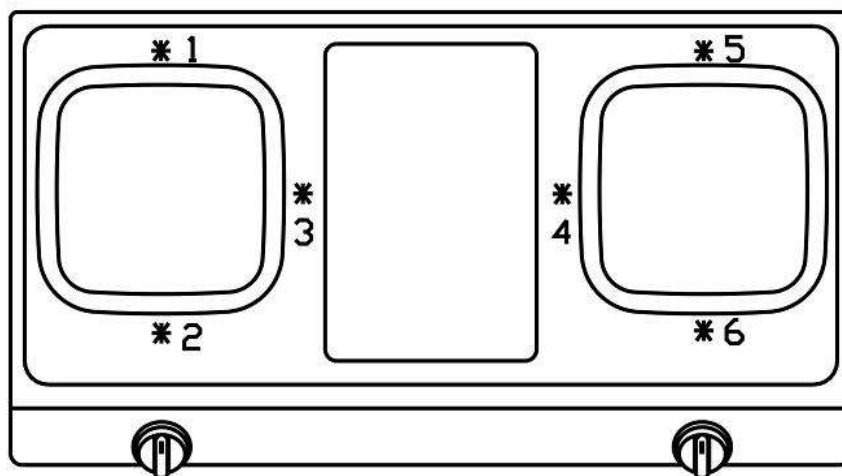


FIGURE 18: Position of the stove deflection measurement

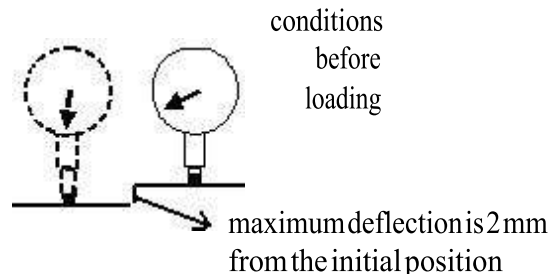


FIGURE 19 : Strength test of the stove

8.4.2 A load of 6.1 kg of water containing in a 260 mm diameter vessels is applied on each grid, and ignited for 0.5 hours simultaneously at maximum flame. Once cooled, there shall be no permanent deflection greater than 1 mm. Not applied to the smallest burner in a three-burner stove:

- a) Place the stove on a flat table;
- b) Determine 6 (six) points on the flat plane of the stove (top plate) and measure its position using a dial gauge that has a resolution of 0.05 mm or better;
- c) A load of 6.1 kg of water containing in a 260 mm diameter vessels is applied on each grid then turn it ON for half an hour at maximum flame;
- d) After 30 minutes the load is removed and let the stove cool down;
- e) Then, measure the displacement at predetermined points using the dial gauge
- f) At all points, the deflection shall not exceed 1 mm with respect to the original position

8.4.3 After being tested according to clause 8.4.1 and 8.4.2, visually, there shall not be any broken or cracked parts that could potentially interfere with the performance of the stove.

8.4.4 Strength of the grid coating

The stove grids are loaded with 260 mm diameter vessels containing 6.1 kg of water, and turned on for 1 hour at maximum flame. Observe the changes in grid coating and the coating shall not peel off and there shall not be any burning smell.

8.4.5 Strength test of material that made of glass or ceramic:

- a) Impact test

Glass or ceramic panels are tested by dropping a weight of 1.8 kg from a height of 152 mm 10 times. The test load is made of an aluminum-based pan-shaped diameter between 108 to 130 mm. The fall of the load on the specimen must be flat with the surface of the test object, it shall not be tilted so that there is no pressure concentration at one point (see Figure 20).

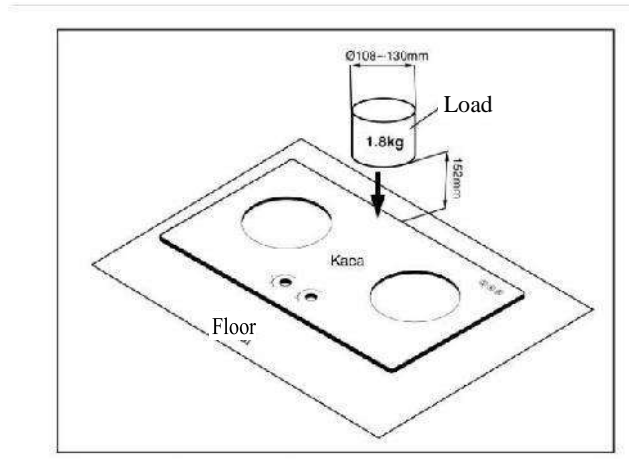


FIGURE 20 : impact test

b) Thermal shock test

The stove is ignited for 30 minutes at maximum flame, by heating a 260 mm diameter vessel containing 6.1 kg of water on all burners. Then pour 500 ml of water at room temperature evenly on the glass / ceramic surface.

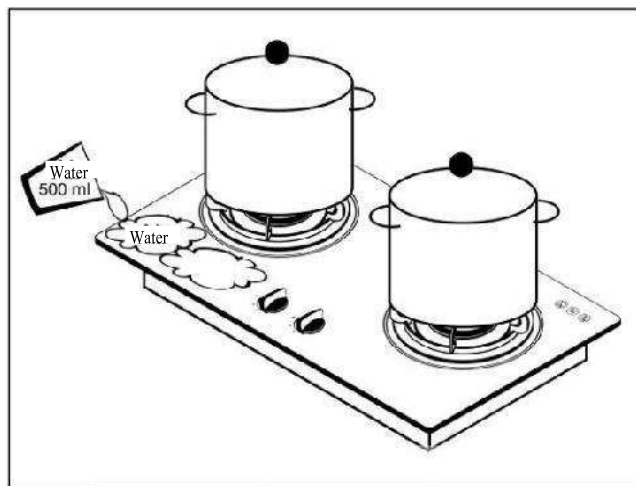


FIGURE 21: Thermal shock test

8.5 Physical observation test

- 8.5.1 During this test the construction of the stove is observed visually, touching/feeling and by the smell where applicable.
- 8.5.2 Materials that may be in contact with flame or exposed to heat shall not be flammable or peeled off due to heat. Such materials shall not produce a sharp odor when turned on for the first time for a period of 5 minutes and or after the stove is turned off.
- 8.5.3 Components that need regular maintenance, especially grids and burner, should be easily cleaned without the need for special equipment to release them, and must be returned properly and correctly without any difficulty in re-installation.
- 8.5.4 Corners or sides of the component must not have a sharp angle or surface that is

dangerous and has the potential to cause injury.

8.5.5 Gas flow intensity should be clearly indicated in accordance with Figure 7 and Figure 8.

8.6 Rust resistance test

The test object taken from the body of the stove is crossed as shown in Figure 22 with a sharp knife on both sides, soaking the specimen about half into a 3% salt (NaCl) solution (at ambient temperature) in vessel. With a depth of approximately 70 mm from the lower end of the scratch, and soaked for 100 hours. Observe bubbles at a distance of 3 mm from scratches on the outside of both sides and after being removed, then wash with water and dry. There is no possibility of rust exceeding 3 mm from scratches on both sides.

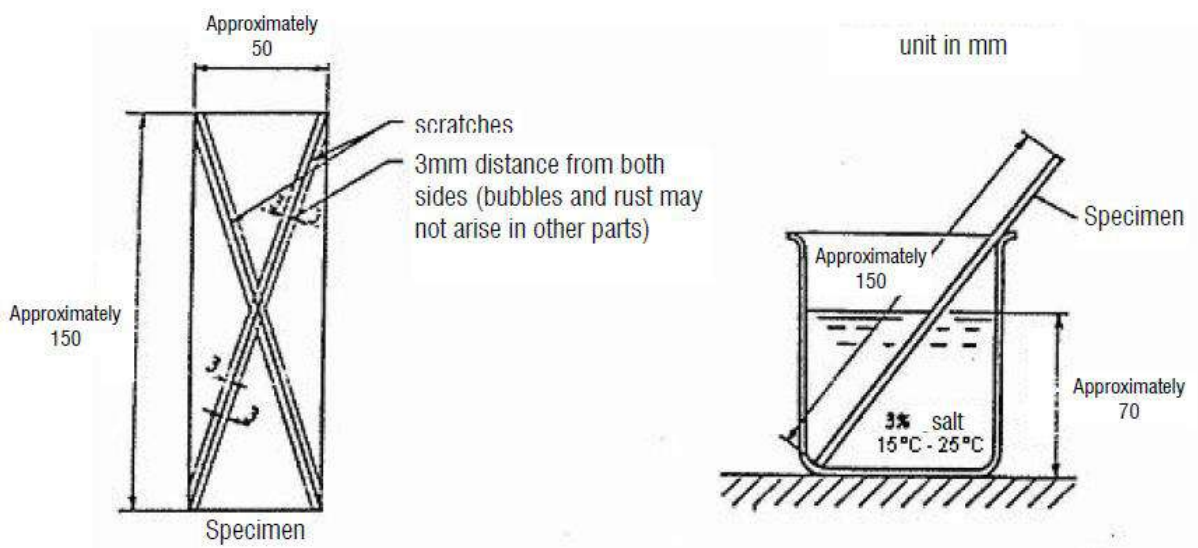


FIGURE 22 : Rust prevention test

8.7 Drop test

The stove is put in the packaging complete with the accessories. Lift the stove flat the surface as high as 30 cm from the flat plane, and then drop it freely as much as 1 time as shown in Figure 23. The floor surface must be hard, not lined with wood, carpet, foam, or the like that can absorb impact effects.

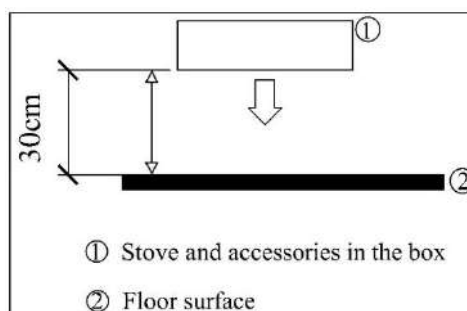


FIGURE 23 : Drop test

After drop test, the stove may not be dented, bolt is not released or its connection (weld or rivet), does not leak (still meets clause 8.8), and the flame is still blue.

8.8 Leak test

- a) Close the valve;
- b) Enter pressurized air of $420 \text{ mm H}_2\text{O} \pm 1 \text{ mm H}_2\text{O}$ into the gas pipeline;
- c) Close the air valve;
- d) Leave for 2 minutes;
- e) Observe the U pipe containing water:
 - For an inner diameter of 6 mm, there should be no reduction in pressure of 41 mm H₂O per minute.
 - For an inner diameter of 6.5 mm, there should be no reduction in pressure of 35 mm H₂O per minute.
- f) The total leakage rate must not exceed 0.07 liters / hour.

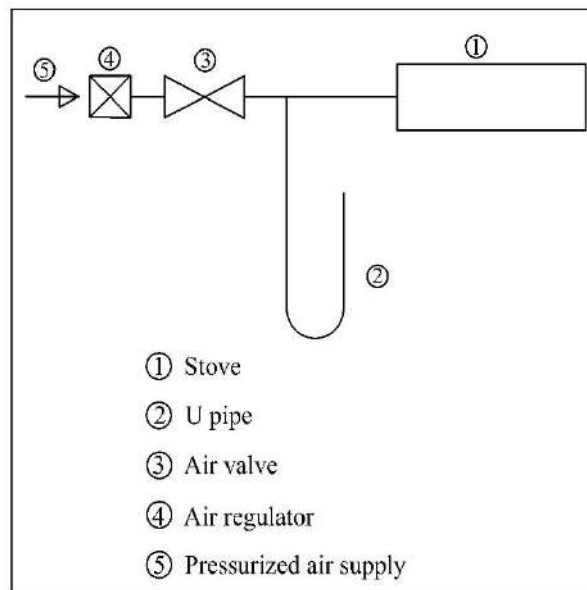


FIGURE 24: Stove leak test

8.9 Gas valve and lighter resistance test

8.9.1 The gas valve is opened and closed as many as 10,000 times at intervals of every 2,000 cycles carried out leak tests according to clause 8.8.

8.9.2 Lighters

a) The test mechanical lighters are carried out in conjunction with the gas valve (according to

clause 8.9.1) as much as 10,000 times at intervals of every 2 000 light cycles must still function properly.

b) Electric lighters with separate or integrated systems of gas valve testing are carried out by pressing the lighter button for at least 24 hours with a DC current source and the lighter must still function properly.

8.10 Gas pressure test

a) Gas pressure is minimal

Give 200 mm H₂O LPG gas with maximum propane percentage 30% pressure to the stove; turn on the stove for 10 minutes, observe the flame:

- Flame must be blue;
- There is no flame lift;
- There is no backfire.

b) Maximum gas pressure

Give pressure of 330 mm H₂O LPG gas with maximum propane percentage 30% to the stove; turn on the stove for 10 minutes, observe the flame:

- Flame must be blue;
- There is no flame lift;
- There is no backfire.

8.11 Measurement of heat input

Tests have to be carried out using LPG with a pressure of 2.75±0.05 kPa (27.5± 0.5 mbar) for each burner separately.

a) Measure the weight of the LPG cylinder before the test starts.

b) Keep the burner turned ON for 1 hour at it's maximum position;

c) Calculate the initial mass of the LPG cylinder minus the final mass of the LPG cylinder, so that the stove gas flow rate (kg / hour) is obtained.

d) The heat input of the stove is calculated by the formula given as follows.

$$Q_n = \frac{1000 \times M_n \times H_s}{3600}$$

- | | |
|-------|---------------------------------------|
| Q_n | - heat input (kW) |
| M_n | - flow rate of LPG (kg / hour) |
| H_s | - LPG calorific value = 49.14 MJ / kg |

e) The difference in calculated heat input rate shall be within ± 10% of the manufacture's specified value.

8.12 Measurement of efficiency

- a) Tests have to be carried out using LPG with a pressure of 2.75 ± 0.05 kPa (27.5 ± 0.5 mbar) for each burner separately.
- b) Set the burner to its maximum position
- c) In order to get the stove to operating conditions, preheat a 200 mm diameter vessel containing 3.7 kg of water for 10 minutes.
- d) Having set the burner to its maximum position, heat a vessel filled with water according to the dimensions specified in **Table 1** and **Figure 10** below, with the lid closed.
- e) Record the temperature of water until it reaches to 90 ± 1 °C.
- f) Calculate the efficiency with the formula given below.

$$\eta = \frac{4.186 \times 10^{-3} \times M_e \times (t_2 - t_1) \times 100}{M_c \times H_s}$$

η	-Stove burner's efficiency in percent
M_c	-Mass of LP Gas burnt
H_s	-Gross calorific value of LP Gas=49.14 MJ/kg
t_2	-is the final temperature, the highest point measured after the flame of the burner is turned off (when the water reaches $90^\circ \text{C} \pm 1^\circ \text{C}$)
t_1	-is the initial temperature= $20^\circ \text{C} \pm 0.5^\circ \text{C}$
M_e	-is the water equivalent of the pan filled as indicated below.

The mass M_e is made up of:

$$M_e = M_{e1} + 0.213M_{e2}$$

Where

M_{e1} is the volume of water put into the pan

M_{e2} is the mass of aluminium corresponding to the pan covered by its lid (the mass M_{e2} to be taken into account shall be the mass measured):

All masses are expressed in kilograms.

TABLE 1 - Determination of the diameter of the vessel and the mass of water in each burner. Thickness $0.5 \text{ mm} \pm 0.1 \text{ mm}$

Heat input to the burner (kW)	Vessel diameter, D (mm)	Height, h (mm)	Minimum mass of water (kg)
1.16 ~ 1.64	220	140	3.7
1.65 ~ 1.98	240	150	4.8
1.99 ~ 4.20	260	160	6.1
4.21 ~ 4.50	280	170	7.2
4.51 ~ 4.80	300	180	8.3

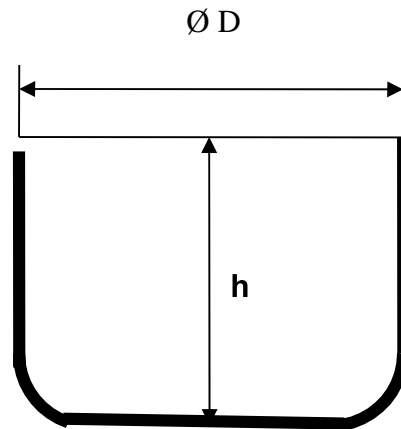


FIGURE 10 : Dimensions of the aluminum vessels

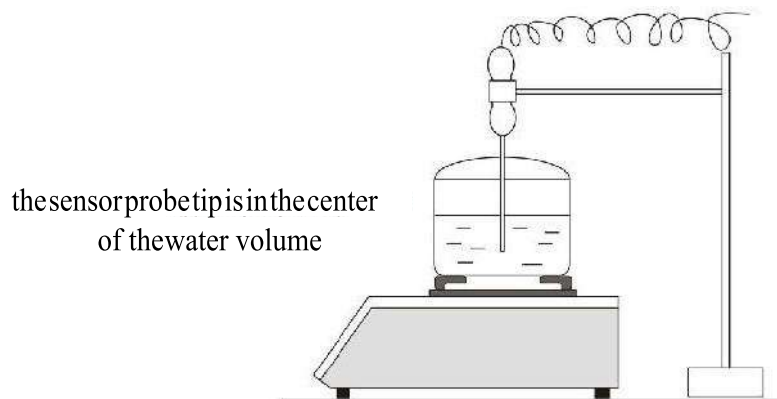


FIGURE 11: Efficiency testing

9 SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Lot

Not more than 500 stoves of the same type and construction, from one manufacturer, submitted at one time for inspection and testing.

9.2 Scale of sampling

From the lot take at random a sample of the size shown on column 2 of Table 3 relative to the appropriate lot size shown in column 1, To ensure random selection of samples random number tables shall be used.

TABLE 3 - Sampling scheme

Lot Size (1)	Sample Size (2)
Less than 51	1
51 to 100	3
101 to 200	6
201 to 500	10

9.3 Conformity to standard

The stove shall be declared as conforming to the requirements of this standard if it meets all requirements in clauses 5, 6 and 7 of this standard.

If a part of the requirements are not met, a retest can be conducted from the same lot.

10 MARKING

10.1 Marking on product

The appliances shall be marked indelibly with the following information in a conspicuous place.

The letters used for the markings shall not be smaller than 8 points (Grade 12).

- a) Model name of the appliance
- b) Year and month of production or its abbreviation
- c) Production number or lot number
- d) Manufacturer's name or its abbreviation
- e) Maximum % of propane that this stove can use
- f) Rated power of each burner
- g) Working pressure
- h) Country of Origin
- i) Any special instruction for the safe use of the appliance

j) The packaging materials shall comply to appropriate Sri Lanka labelling and environmental standards including instruction for disposal

10.2 Operation and Installation Instruction

The following information shall be provided with the stove in the form of an instruction leaflet or by any other means. It should be available in all three languages applicable to Sri Lanka.

10.2.1 Operation marking

Information should include specifications including recommended standards for assembly components, using stove for the first time operation guide and safety instruction.

Markings regarding operations such as ignition, extinction and adjustment shall be given on conspicuous parts of the appliance by an indelible means, so as to provide simple and concise instructions for respective operations.

10.2.2 Installation marking

Information should include installation including assembly, suitable vessel types, maintenance and cleaning including tools, frequency and trouble shooting guide.

The marking of the following information shall be given at an appropriate position of the appliance, If, due to limitation of space, the marking of use instructions cannot be given on the appliance body, it may be given on a conspicuous part of the cylinder.

The user instructions before usage.

- a) Notice requesting users to follow the instruction manual
- b) Notice requesting users to confirm lighting up, ignition and extinction
- c) Matters regarding improper use
 - 1) Cautions against misuse
 - 2) Matters regarding ignition, extinction and other operations of the appliance
 - 3) Matters regarding ventilation
 - 4) Matters regarding maintenance and cleaning
 - 5) Other matters to be noted including other assembly parts (LPG cylinder, regulator and gas hose)
- d) Matters regarding attachment and detachment of cylinders, gas hose and regulator with clear instruction on time and method of replacement
- e) For other appliances than gas stoves, caution against using other parts than accessories attached to the appliance
- f) For other appliances than gas stoves, warning against boil drying (not applicable to appliances which comprise a net or other component and are designed to be used without water)
