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# **PAKISTAN STANDARD**

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## **GAS APPLIANCES - GENERAL REQUIREMENTS**



**PAKISTAN STANDARDS SPECIFICATION  
FOR  
GAS APPLIANCES – GENERAL REQUIREMENTS  
OIL & GAS BURNING APPLIANCES TECHNICAL COMMITTEE**

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# **Pakistan Standard Specification**

## **For**

### **GAS APPLIANCES - GENERAL REQUIREMENTS**

**0. Foreword:**

- 0.1** This Pakistan Standard has been adopted by the Authority of the Pakistan Standards & Quality Control Authority, (National Standards Body of Islamic Republic of Pakistan), after the draft prepared by the Mechanical Technical Committee (MTC-18) for “Oil & Gas Burning appliances which has been approved and endorsed by the National Standards Committee on Mechanical on 28.02.2017
- 0.2** This Standard was first formulated in 2008; in the preparation thereof, assistance was taken from the Sui Southern Gas Company Limited (SSGCL) / Sui Northern Gas Pipelines Limited (SNGPL) which are acknowledged with thanks.
- 0.3** Keeping in view the suggestions from the manufacturers, specialists, technologists and utilizing agencies, it has been felt necessary to revise the prevailing version.
- 0.4** This revised version of PS: 4860 has been adopted after taking into consideration the views and the suggestions of manufacturers, specialists, technologists and utilizing agencies. It is hoped that user will find it well in line with the technical barriers to trade agreement (WTO/TBT).
- 0.5** This standard is subject to periodical review in order to keep pace with development in technology. Any suggestion for improvement will be recorded and placed before the concerned Committee in due course.

**DEFINITION:**

**Domestic Gas Cooking Ranges:** Domestic Cooking Ranges are equipped with oven for cooking and baking. Baking oven is equipped with two or more oven racks, oven pan may be provided with the cooking range. Thermostat is install to control the temperature of baking compartment and of grill box (if provided), griller pan may be provided with the cooking range. Electric operated mechanism is installed in grill portion to rotate the stuff for proper grilling. Cooking Ranges may be used with Natural Gas/Liquid Petroleum Gas (LPG).

**Gas Water Heater:** It's technical name is "Automatic storage type gas water heaters" and commercial name is "Geyser".it have water storage vessels, flue & drat hood or vent connector, automatic gas shut off system (Thermostat/Regulator), pressure relief valves, burner and automatic pilot.

**Gas Fired Room Heaters--- Vented Type:** Vented Type Heaters are for installation at drawing rooms, dining rooms, living rooms and bed rooms. It should be installed under the draft hood. Vented type Room Heaters should have provision of vent for fixing of flue pipe.

**Unvented Type:** Un-vented heaters are for installation at public places, drawing rooms, dining rooms, living rooms, corridors but not in Bed Rooms.

**Semi Vented Type:** Semi- vented room heaters should be installed in a chimney opening into atmosphere or on the out wall of a room such that a part of products of combustion are vented out the atmosphere. Semi- vented room heaters are for installation at public places, drawing rooms, dining rooms, living rooms, corridors but it also cannot be used in Bed Rooms.

**Domestic Gas Stove:** This type of gas stove is used domestically for cooking purpose. It consist of frame, burners, tray, mild steel or brass nipples, trivet, tap etc. Domestic Gas Stove may be used with Natural Gas/Liquid Petroleum Gas (LPG).

**1. SCOPE:**

**1.1** These requirements shall apply to all domestic and commercial gas appliances for use with Natural Gas having a gross calorific value between 850-1150 Btu/Cuft supplied at a pressure not exceeding 14" W.C. (Water Column).

**1.1.2** These requirements when applied to any specific appliance will be read in conjunction with the relevant sub-sections.

Appliances approved after fulfilling construction and performance requirements shall be constructed entirely of new, un-used parts and materials.

**2. CONSTRUCTION REQUIREMENTS**

**2.1 CONSTRUCTION AND ASSEMBLY:**

**2.2** Construction of an appliance shall be in accordance with reasonable concepts of safety, substantiality and durability. Component parts shall be secured against distortion, warp-age or other damage and support to maintain a fixed relationship between essential parts under normal and reasonable condition of handling and usage, so as to assure continued compliance with these requirements. Parts not permanently secured shall be designed so that they cannot be incorrectly assembled or improperly located when removed and replaced during cleaning and servicing.

**2.3** General Construction and assembly shall be of a neat and workman like character with parts well fitted and all bolts or other fasteners drawn up tightly to give rigidity. Any exposed edges of the appliances which might reasonably be brought in contact with the hand during normal usage or adjustment of the appliance shall be smooth.

**2.4** Joints of heating surfaces in appliances shall be of durable and rigid construction such as welded, brazed, machined and bolted and shall not depend primarily on cement for tightness.

Appliances shall be so constructed that they cannot be tipped by any reasonable pressure or pull. This condition shall not apply to fixe appliances.

**2.5** Thermostats, orifices, burner ignition devices, oven and grill door springs, air shutters, or other accessories and controls which may require cleaning, repair or adjustment in the field shall be readily accessible from the front of the appliance without necessity of disconnecting it from the gas supply.

No special tools shall be required for making adjustments.

If it is necessary to remove the manifold, panel, or oven bottom, to make adjustments on thermostats, orifices, burner ignition devices, or air shutters, such removal shall be accomplished without the necessity of manipulating tools within any burner compartment.

**2.6** Construction of an appliance shall be such that when installed in accordance with manufacturer's instructions, the combustion air supply shall be in same pressure zone as the draft hood relief opening on appliances equipped with draft hoods and the same as the vent outlet on appliances not equipped with draft hoods.

**2.7** Ample clearance shall be provided to afford easy manipulation of standard tools when connecting the appliance to the house piping.

**3. MATERIALS:**

- 3.1 Special materials of construction will be as specified for each individual appliance.
- 3.2 Materials shall be of such composition that they cannot disintegrate to the extent that particles will separate and drop upon the burner and affect combustion.
- 3.3. The body of an appliance shall not show discoloration or deterioration.

**4. METHOD OF TEST:**

- 4.1 Before any performance tests are applied under these requirements, the appliances shall be adjusted at the manufacturer's specified rating and operated for these requirements at the increased test pressure for a minimum period of 5 hours. At the end of this period, appliances shall not show discoloration or deterioration.

Material used in the construction shall be suitable for temperatures to which it will be exposed in use.

**5. PRIMARY AIR CONTROL:**

- 5.1 Air shutter when used shall be designed to have effective protection against being clogged by dust or line etc. and shall be located so that these are readily accessible for adjustment.

**6. MAIN BURNERS:**

- 6.1 The designs and materials used in the construction of an appliance burner shall be such that the burner will not sag, distort, melt, exhibit appreciable corrosion or damage to any protective coating, sufficient to expose the base metal during any of the tests therein or under the specific requirements, or when the burner is operated with the flame burning within the mixture tube or burner head.

**7. METHODS OF TESTS:**

- 7.1 This test shall be conducted at increased test pressure. Gas to the burner shall be ignited in such a manner that it will burn within the mixture tube or burner head and shall continue to burn there for 30 minutes. If the flame cannot be maintained within the mixture tube or burner head, the gas rate to the burner shall be reduced to a point where it can be so maintained.

At the end of this test, as well as conclusion of all performance tests specified herein, the burner shall be carefully examined for evidence of sagging, distortion, and melting, appreciable corrosion, damage to protective coating sufficient to expose base metal or leakage of gas.

- 7.2 The burner shall be a single casting or of an equally gaslight and durable construction.
- 7.3 Burners shall be mounted so that they will not move out of their proper operating Position.

Provisions shall be made to permit observation of main and pilot flame when the manual valve is being operated.

- 7.4 Burners shall be easily removed for repair and cleaning.
- 7.5 Orifice fitting shall be readily accessible for adjustment and positively secured to prevent misalignment with burner mixture tube.

**8. AUTOMATIC PILOTS AND PILOTS:**

- 8.1 Separate pilots when provided for ignition of main burner will have a rate which shall not exceed 2000 Btu/hr.
- 8.2 Automatic pilots when provided shall comply with reasonable concepts of safety and durability.
- 8.3 Pilot burners when provided shall be placed so that they can be easily seen and lighted.
- 8.4 Pilot when provided shall be supported in such a manner that their position relative to the main burner is fixed.
- 8.5 Pilot assemblies when provided shall be constructed so that it is impossible to direct the pilot flame in other than the correct direction. Pilot assembly's construction should not allow it to crack, crease or carbonize to such an extent as to interfere with proper function of pilot.

**9. MANUAL GAS VALVES:**

- 9.1 Twelve production samples of each valve shall be submitted for examination.
- 9.2 Valves shall be capable of holding an air pressure of 5 PSIG for one hour without showing any leakage.

**10 METHOD OF TEST:**

- 10.1 Five samples of each type of valve shall be subjected an air pressure of 5 PSIG from the inlet side with the valve in "close" position. These will be tested for leakage with soap water after on hour. Four out of five shall be required to show no leakage.
- 10.1 Latching type valve of 3/8" pipe size and larger shall be capable of withstanding a torque of 75 inch-pound applied against the latching means without damage which could result in the plug becoming unseated.
- 10.2 Valves shall be capable of supporting the following weights suspended from the extreme outlet and without deformation, breakage or leakage:--

| <u>NOMINAL PIPE SIZE</u> | <u>WEIGHT</u> |
|--------------------------|---------------|
| 1/8" Ø                   | 50 lb.        |
| 1/4" Ø                   | 65 lb.        |
| 3/8" Ø                   | 80 lb.        |
| 1/2" Ø                   | 100 lb.       |
| 3/4" Ø                   | 125 lb.       |
| 1" Ø                     | 150 lb.       |



**10.3 METHOD OF TEST:**

Five samples of each type of valve shall be subjected to the tests specified, four out of which shall be required to comply. Valves (main burner or pilot) shall be screwed into a rigidly supported extra heavy pipe manifold so that they will be in apposition similar to that prevailing in service. The weight specified above shall than be suspended from the extreme outlet end of the valve without shock. At the end of 15 minutes weight shall be removed, the valve examined for deformation and breakage and subjected to an air pressure equivalent to 6.00 inches of mercury column for 5 minutes.

**10.4** Valve (main burner & pilot) shall be capable of withstanding without deformation, breakage, or leakage, the following turning effort exerted to screw the valve into a conventional manifold:--

| <u>NOMINAL PIPE SIZE</u> | <u>TURNING EFFORT</u> |
|--------------------------|-----------------------|
| 1/8" Ø                   | 135 in-lb.            |
| 1/4" Ø                   | 175 in-lb.            |
| 3/8" Ø                   | 225 in-lb.            |
| 1/2" Ø                   | 300 in-lb.            |
| 3/4" Ø                   | 450 in-lb.            |
| 1" Ø                     | 600 in-lb.            |

**10.5 METHOD OF TEST:**

Five samples of each type of valve shall be subjected to the tests specified, four out of which shall be required to comply.

A tool which fits snugly about the body of the valve, or to a section of the shank, if such a section is provided, shall be utilized to apply the turning force. The measured torque specified above shall be applied to the completely assembled valve in fitting it into an extra heavy pipe manifold of suitable size or into a suitable pipe fitting. After the force has been applied for 15 minutes, it shall be released, the valve removed and examined for deformation and breakage and then subjected to leakage test as given in Section 10.

**10.6** Valve having an outlet designed for orifice fittings, shall be capable of withstanding following impacts without cracking or breaking:--

| <u>NOMINAL PIPE SIZE</u> | <u>IMPACT</u> |
|--------------------------|---------------|
| 1/4" Ø                   | 10 ft-lb.     |
| 3/8" Ø                   | 15 ft-lb.     |
| 1/2" Ø                   | 20 ft-lb.     |

**10.7 METHOD OF TEST:**

Valve under test shall be supported by securing it to a close pipe nipple of extra strong schedule 80 pipe or a standard weight pipe coupling mounted on a rigid surface so that the free length of nipple or coupling is not greater than 1". Outlet and of the valve shall have assembled to it through a fitting of the type for which designed. The test device shall be arranged so that the centre line of contact between the striking weight and the outlet side of the valve body will be as far from the centre line of the plug as the distance from centre line of the plug to the centre line of the wrench grip on the inlet connection. For valve having an outlet shorter than inlet, the centre of impact shall be 1/4 inch from extreme outlet end.

The valve shall then be struck four successive impacts at right angles to longitudinal centre line of outlet side, the valve being turned 90° between each impact. The valve shall then be examined visually for cracks or breakage. Four out of five valves withstanding this test would be considered satisfactory.

- 10.8** Valve as received, at the end of this test shall comply with leakage test as described in Section 10 and shall completely open and close on application of a torque not exceeding amounts specified in table below, after being continuously operated through 1000 cycles:--

| <u>NOMINAL PIPE SIZE</u> | <u>MAX. TORQUE</u> |
|--------------------------|--------------------|
| 1/4" Ø                   | 15 in-lb.          |
| 3/8" Ø                   | 20 in-lb.          |
| 1/2" Ø                   | 25 in-lb.          |
| 3/4" Ø                   | 35 in-lb.          |
| 1" Ø                     | 45 in-lb.          |

- 10.9** Valves shall be constructed so that they can be readily taken apart for repair, adjustment and lubrication.
- 10.10** The construction of locking and latching type of valves would be such that the rotator and stator parts cannot be assembled incorrectly, unless such incorrect assembly would permit no gas to flow.
- 10.11** The direction of "ON/OFF" position of valve should be clearly marked.
- 10.12** Gas valves shall be located or constructed so that they will not be liable to accidental change of setting.
- 10.13** A separate gas valve shall be supplied to control gas to the pilot burner, unless the main burner and pilot have a flame failure safety device, which automatically cuts off gas supply to main burner and pilot in case of flame failure.
- 10.14** Pilot burner valves shall be easily distinguishable from other valves.
- 11. GAS SUPPLY LINES:**
- 11.1** Mild steel pipe utilized to supply gas to the burners shall comply with B.S.S. 1387 Class B, PS\_\_\_\_\_.
- 11.2** Ends of pipe and tubing shall be carefully reamed to remove obstructions or burrs.
- 11.3** Bent supply piping shall have the bends smoothly made without appreciable reduction in the cross-sectional area; shall reveal no imperfections occasioned by the bending process; shall be annealed, if necessary, to remove all internal stresses; and shall be thoroughly cleaned inside to remove all loose particles.
- 11.4** Gas supply piping and tubing shall be adequately supported and shall be removable.
- 11.5** Gas supply piping to which connections are made for burners, pilots, lighters, or other branch supply lines shall be supported to prevent turning or displacement in making connections to the building piping or during the ordinary handling of the appliance.
- 11.6** Fittings and connections shall be leak proof.
- 11.7** The threads will comply with B.S. 21 for tapered threads.
- 11.8** The inlet connection of the gas appliance will be located at a standard height from the floor / platform level.

**12. ORIFICE AND ORIFICE FITTINGS:**

- 12.1 Orifice fitting shall be positively secured to prevent misalignment with the burner Mixing tube.
- 12.2 Orifice spuds and orifice spud holders shall be constructed of metal melting at not less than 800° F (427°C).

**13. VENTING:**

- 13.1 The design of vented appliances shall be such that products of combustion from all burners are carried out of the appliance through a single flue outlet.

**14 INSTRUCTIONS:**

- 14.1 Lighting instructions shall be furnished on all appliances.
- 14.2 Lighting instructions shall be permanently affixed to the appliance on a manifold in a location easily read by person lighting the appliance.
- 14.3 On appliances design such that space does not permit proper location of lighting instructions, these instructions may be furnished on a metal tag attached to the appliance.

**15 MARKING**

Each appliance shall be indelibly marked with the following

- i. Manufacturer's name or trade mark (embossed)
- ii. Knob's "on" and "off" position.
- iii. Country of origin.
- iv. Gas input rating
- v. Thermal Efficiency

Brochure with instruction for use shall be provided in national and English language.

It may also be marked with the PS Mark.

NOTE – The use of PS Mark is governed by the provision of the Pakistan Standards and Quality Control Authority Ordinance Act-VI of 1996, and the rules and regulations made under the ordinance. Products bearing PS Mark are protected with the guarantee that they have been produced to comply with requirements of the relevant standard under a well defined system of inspection, testing and quality control during production. Particular governing conditions under which a license for the use of the PS Mark may be granted to manufacturers, may be obtained from the (PSQCA) Pakistan Standards and Quality Control Authority.

**16. PACKING:**

It shall be packed in accordance with the best prevalent trade practice or as agreed between the manufacturer and purchaser taking care of safety requirement during handling, transit and storage.

The supplier shall also supply on instruction card giving the following information.

- i) Brief instructions for installation and regulation which include piping and fitting of terminal, if any.
- ii) Instruction for the correct operation of the appliance.
- iii) Manufacturers name and address.
- iv) Guarantee period, serviced or repair, and replacement of parts.

**17. PERFORMANCE REQUIREMENTS:**

**17.1 GENERAL:**

**17.2** These requirements cover approval of all appliances as described in Section 1.1.

**18. TEST PRESSURE AND BURNER ADJUSTMENT:**

**18.1** Unless otherwise stated, each test specified herein shall consist of three tests, one at normal pressure (Standard Gas Supply Pressure), one at reduced pressure (0.5xnormal pressure) and one at increased pressure (1.5 x normal pressure).

**18.2** Burners shall be adjusted to their Btu ratings at normal pressure, unless otherwise specified herein. All adjustments shall be within plus or minus 5% of the manufacturer's hourly Btu input rating. When primary air control is provided, it shall be set to give good flame. The adjustments will remain unchanged throughout the tests.

**19. BURNER OPERATING CHARACTERISTICS:**

**19.1** Burner flame shall not flash back:--

- a) Upon immediate ignition at normal test pressure.
- b) Two to five seconds delay in ignition (two to twenty-second delay in ignition in the case of domestic cooking ranges).
- c) When gas valve is adjusted to deliver 25% of normal rating.
- d) As a result of the operation of an automatic control when set for the lowest quantity of gas as it will deliver at normal test pressure.

**19.2** Burner flames shall carry to all ports and burn on all ports.

**20. METHOD OF TESTS:**

After burner adjustment the gas shall be shut off and appliance be allowed to cool to approximately room temperature. The gas shall then be ignited at one point and flame shall travel to all burner ports and burn at all the ports.

**20.1** When ignition is made in a normal manner, flame shall not flash outside the combustion space.

- 20.2** Burners shall not expel gas through air opening in the mixer faces:--
- a) At increased test pressure.
  - b) When burner valves are adjusted to deliver 25% of normal rating.
  - c) Is a result of the operation of an automatic control when set for the lowest quantity of gas it will deliver at normal test pressure.

**21. PILOT OPERATING CHARACTERISTICS:**

- 21.1** Pilot flames shall ignite the gas at the main burner(s) without delay.
- 21.2** Continuously burning pilot flame shall not be extinguished when gas to main burner(s) is turned "OFF" or "ON" in a normal manner, either manually or by automatic devices.
- 21.3** Pilot shall show no carbon deposition during the tests, when adjusted in accordance with manufacturer's instructions.
- 21.4** Burners shall operate without depositing carbon.
- 21.5** The arrangement of burners, burner valves, and ignition means shall be such that with only the ignition means in operation, the gas from any burner or combination of burners shall be effectively ignited without delay, ignition flash back, or danger to the appliance under any condition of test specified herein.
- 21.6** Burners and pilots shall ignite, operate and extinguish without undue noise.

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