

Code for Facilities, Technology and Inspection for Manufacturing of Cast Iron Gas Burners

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History of Establishment and Revision of KGS Code

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Code for Facilities, Technology and Inspection for Manufacturing of Cast Iron Gas Burners

1. General

1.1 Scope

1.1.1 This Code applies to the facilities, technology and inspection for manufacturing of cast iron gas burners burning liquefied petroleum gas or city gas (hereinafter referred to as "cast iron burners") which come under the following (1) to (2) among the burners in conformity to the Enforcement Regulation of the Safety Control and Business of Liquefied Petroleum Gas Act (hereinafter referred to as "Enforcement Regulation"), Table 3, No. 10 and Table 7, No.4-j:

- (1) The total heat input rate is not over 232.6 kW (200,000 kcal/h), and
- (2) The working gas pressure is not over 30 kPa.

1.1.2 The combustors excluded from the gas appliances subject to license in conformity to the Enforcement Regulation, Table 7, No.5-b are as follows:

- (1) Gas torches used for welding and cutting,
- (2) Dryer combustors used in casting sand dryers, printing ink dryers, concrete dryers, etc.,
- (3) Furnace combustors for heat treatment furnaces or heating furnaces used as metal heat treatment furnaces, glass and ceramic furnaces, atmosphere gas furnaces, etc.,
- (4) Melting furnace combustors used in metal melting, glass melting, etc.,
- (5) Combustors attached to gas canisters of which internal volume is less than 100 mL, and
- (6) Other combustors acknowledged by the Minister of Trade, Industry & Energy to be free from any problem in safety control.

1.2 Validity of Code

1.2.1 This Code has passed the deliberation and resolution by Gas Technical Standards Committee (Bill No. 2018-9, November 23, 2018) in conformity to the High Pressure Gas Safety Control Act (hereinafter referred to as "High-pressure Act"), Article 33-2 in accordance with the Safety Control and Business of Liquefied Petroleum Gas Act (hereinafter referred to as "Act"), Article 45, Clause 1, has been approved by the Minister of Trade, Industry & Energy (Notification No. 2018-607 of the Ministry of Trade, Industry & Energy, December 13, 2018), and is valid and effective as the

detailed standards in conformity to the Act, Article 45, Clause 1.

1.2.2 Conformity to this Code is deemed to conform to Table 7 of the Enforcement Regulation in accordance with the Act, Article 45, Clause 4. <Revised on November 4, 2015>

1.3 Reference Codes and Standards

1.3.1 Inspection standard for new technology products

In case the Minister of Trade, Industry & Energy acknowledges that the new manufacturing and inspection methods of cast iron gas burners developed through technology development do not meet the standard for facilities, technology and inspection in conformity to this Code in accordance with the Enforcement Regulation, Table 7, No. 5-a but do not hinder safety control, such manufacturing and inspection methods of those gas appliances may restrictively apply only to them. <Revised on May 15, 2009>

1.3.2 Registration standard for manufacturing of foreign products <Newly established on June 26, 2012, Revised on November 4, 2015>

The "foreign manufacturing installation standards and manufacturing technology standards" specified the Enforcement Regulation, Article 17, proviso of Clause 3 mean the detailed standards specified in the Act, Article 45.

1.4 Definitions

The terms used in this Code are defined as follows:

1.4.1 "Regular quality inspection" means the performance inspection performed by taking samples from products manufactured in mass production to check whether the products which are to undergo production stage inspection are the same products manufactured as those that have undergone design stage inspection.

1.4.2 "Routine sample inspection" means the inspection performed to check on the basic product performance by taking samples from the same products manufactured in the same production lot for the products to undergo product identification inspection.

1.4.3 "Occasional quality inspection" means the inspection performed by taking samples without

any advance notice from products produced in mass production in order to check whether the products which have undergone production process inspection or comprehensive process inspection are being manufactured in the same way as those that have undergone design stage inspection.

1.4.4 "Process identification audit" means the audit conducted to check on the conformity of quality system operation to the manufacturing and self-inspection processes required for manufacturing of the products which have undergone design stage inspection.

1.4.5 "Comprehensive quality control system audit" means the audit conducted to check on the conformity of quality system operation for the whole manufacturing process of cast iron gas burners such as design, manufacturing and self-inspection.

1.4.6 "Type" means the unit of products distinguishable in their construction, material, capacity and performance.

1.4.7 "Process inspection" means production process inspection and comprehensive process inspection.

1.5 Application of Codes and Standards

Matters necessary for the materials, construction and dimensions, performance and other technical standards of cast iron gas burners not covered in this Code shall conform to relevant Korean Industrial Standards (KS).

2. Manufacturing Installation Standard

2.1 Manufacturing Facilities

A person who intends to manufacture cast iron gas burners shall be furnished with the following manufacturing facilities to manufacture the cast iron gas burners in accordance with this manufacturing standard. However, in case the licensing authority recognizes that it is necessary to utilize the facilities of specialist parts companies which manufacture the parts or to use the parts manufactured with them for quality improvement, those facilities may be utilized or those parts

may be used.

- (1) Drilling machines, presses, tube benders, casting processing machines,
- (2) Surface treatment and painting facilities,
- (3) Ultrasonic cleaning facilities (for cast iron gas burner cocks and governors only)
- (4) Gas welding machines or electric welding machines, power assembly jigs and tools for cast iron gas burner assembly

2.2 Inspection Facilities

2.2.1 A person who intends to manufacture cast iron gas burners shall be furnished with the following inspection facilities required to check on and maintain product performance.

2.2.1.1 The kinds of inspection facilities shall be sufficient for the self-inspection in conformity to the safety control regulation and include the followings:

2.2.1.1.1 Kinds of inspection facilities that must be furnished

- (1) Dimension measurement facilities such as vernier calipers, micrometers, thread gauges, etc.,
- (2) Surface temperature gauges, and
- (3) Carbon monoxide meters and carbon dioxide meters.

2.2.1.1.2 Kinds of inspection facilities that shall be furnished when required

- (1) Liquefied petroleum gas or city gas immersion test facilities,
- (2) Pressure-proof test facilities,
- (3) Gas tightness test facilities,
- (4) Safety device operation test facilities,
- (5) Durability test facilities,
- (6) Test gas supply facilities,
- (7) Insulation resistance testers and withstand voltage testers,
- (8) Heat input measurement facilities,
- (9) Barometers,
- (10) Voltage regulator and power consumption wattmeter
- (11) Vibration testers
- (12) Thermal efficiency measurement facilities, and
- (13) Other necessary inspection facilities and tools.

2.2.1.2 The capacity of the inspection facilities shall match the product production capacity of the

relevant manufacturing plant.

2.2.2 Notwithstanding 2.2.1, in case the test and inspection of design stage inspection items are ordered to one of the following authorized agencies to be performed or a lease contract for test and inspection facilities required for design stage inspection items is awarded to one of the following authorized agencies, the relevant test and inspection facilities among the inspection facilities in 2.2.1 shall be deemed to have been furnished.

- (1) Korea Gas Safety Corporation (hereinafter referred to as "KGS" or "Korea Gas Safety Corporation) in conformity to the High-pressure Act, Article 28
- (2) Test and inspection agencies authorized in accordance the High-pressure Act, Article 35 (hereinafter referred to as "test and inspection agencies"), or
- (3) Test and inspection agencies authorized in accordance with the Framework Act on National Standards

3. Manufacturing Technology Standard

3.1 Materials

The metal parts of a cast iron gas burner shall be made of the materials in conformity to the following standards for its safety. <Revised on January 3, 2011>

3.1.1 The materials of the parts in contact with gas, drip pans and water pans shall have sufficient corrosion resistance in their service conditions or be coated for corrosion protection. <Revised on January 3, 2011>

Table 3.1.1 Metallic Materials with Corrosion Resistance <Revised on November 17, 2014 and January 9, 2017>

Materials	Standards for Corrosion Resistant Metallic Materials
Castings	KS D6008
Die castings	KS D6005, KS D6006
Stainless steels	KS D3534, KS D3535, KS D3536, KS D3576, KS D3698, KS D3702, KS D3705, KS D3706
Surface treated steels	KS D3544
Aluminum and aluminum alloys	KS D6701, KS D6713, KS D6759, KS D6761, KS D6763

Copper and copper allows	KS C3101, KS C3102, KS C5101, KS D5201, KS D5301, KS D5545
Other materials	Materials which have passed salt water spray test

3.1.2 The casting material shall be grey cast iron of which strength, hardness and serviceability conform to SPS-KFCA-D4301-5015 (Grey Iron Castings)¹⁾. <Newly established on January 3, 2011, Revised on February 10, 2017>

3.2 Construction and Dimensions

A cast iron gas burner shall be of a construction and dimensions in conformity to the following standard for its safety, serviceability and exchangeability.

3.2.1 A cast iron gas burner shall not be directly coupled to a gas cylinder.

3.2.2 The opening direction of the handle of a rotary cock or valve for gas or water service shall be counterclockwise. However, in the case of nozzle cocks for cast iron gas burners and bidirectional multi-function rotary cocks, this provision does not apply. <Revised on May 15, 2009>

3.2.3 A cast iron gas burner provided with a pilot burner shall be of a construction of which main burner gas circuit is not opened unless the pilot burner is ignited.

3.2.4 A cast iron gas burner provided with an air supply fan and an exhaust gas fan shall be of a construction of which fans are operated before its ignition and its gas circuit is automatically cut off if the fans are stopped.

3.2.5 A cast iron gas burner shall be fitted with a cast iron burner nozzle cock. However, in case a flame supervision device is fitted or the nozzle is fitted to the burner port, this provision does not apply. <Newly established on January 3, 2011>

3.2.6 The nozzle cock shall be of a construction in which one handle opens and shuts one gas passage. However, this provision does not apply if a flame supervision device is fitted. <Newly established on January 3, 2011>

1) Substitute standard of Korea Foundry & Casting Association in conformity to the civilianization policy of national standards sponsored by Korea Agency for Technology and Standards

3.2.7 The nozzle cock shall be certified in accordance with the relevant Korean Industrial Standard or the relevant standard of Korea Gas Safety Corporation. However, this provision does not apply if a flame supervision device is fitted. <Newly established on January 3, 2011>

3.2.8 Each part of a cast iron gas burner shall be of a construction which is made in consideration of safety and durability against gas leakage, fire, etc. and which is free of breakage or deformation detrimental to its service during its normal transportation, installation and service. The cast iron gas burner shall conform to the followings <Newly established on January 3, 2011>

3.2.8.1 The operation of each part shall be smooth and reliable.

3.2.8.2 A cast iron gas burner in its normal installation state shall not be easily moved or toppled by its operation or use and be provided with a gas connector.

3.2.8.3 Burner ignition shall be able to be checked with the eye, mirror or annunciator lamp from the place where the ignition operation is performed.

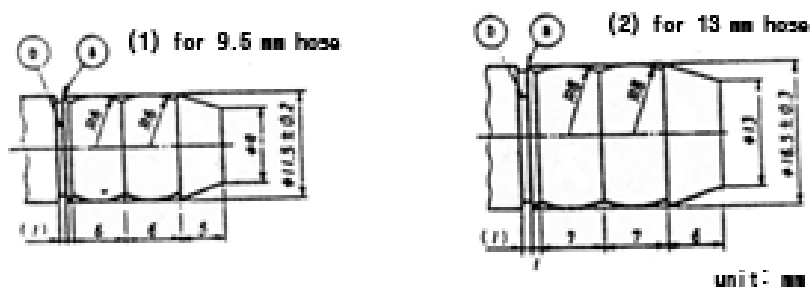
3.2.9 The parts in contact with gas shall conform to the following standard <Newly established on January 3, 2011>:

3.2.9.1 The gas passage shall be gas-tight and the gas tightness shall not be impaired by normal transportation, installation and service.

3.2.9.2 The connections shall be firmly made by welding or screw tightening or with bolts and nuts and be gas-tight.

3.2.10 The threads of the gas connector (inlet side threads of the gas connector integrated with the hose connector) shall be the pipe threads in conformity to KS B0222 and shall be free from loosening or deformation which may impair gas tightness. <Newly established on January 3, 2011>

3.2.11 The shape and dimensions of the hose connector used in the gas connector shall be one of those in Figure 3.2.11 and be free of loosening or deformation which may impair gas tightness due to repeated hose connection and disconnection. <Newly established on January 3, 2011>



Remarks:

1. Part ㉓ shall be chamfered.
2. Part ㉔ shall be grooved, and the grooved part shall be painted in red.
3. The part to be inserted for reinforcement may be rounded.
4. The unspecified tolerance shall conform to KS B ISO 2768-1, Coarse Class. However, radius R and the value in () are for reference.

Figure 3.2.11 Shape and Dimension of Hose Connectors

3.2.12 In principle, the gas connector shall be exposed to the outside or located in a place to be easily noticed from the outside. <Newly established on January 3, 2011>

3.2.13 The nozzle shall be located in a place where it will not be easily clogged with adhering dust, motes or foreign materials and shall not be easily clogged. <Newly established on January 3, 2011>

3.2.14 The set position of the air register shall not be changed in its normal service condition and the air register of which handle controls the air flow shall be smoothly operated and the set position shall not be changed by itself. <Newly established on January 3, 2011>

3.3 Devices

A cast iron gas burner shall be provided with the devices in conformity to the following standard for its safety and serviceability:

3.3.1 Power failure safety device

A cast iron gas burner of which gas circuit is opened or shut with AC power shall shut off the gas circuit when the power is out and shall be provided with a safety device which prevents the gas circuit from being automatically opened or makes it reignited when the power is on again. However, this provision does not apply to a cast iron gas burner of which pilot flame is not

extinguished when power is out.

3.3.2 Head wind prevention device (not applicable)

3.3.3 Flame supervision device

A cast iron gas burner shall be provided with a flame supervision device.

3.3.4 Other devices

3.3.4.1 Governor

A cast iron gas burner provided with a ceramic burner shall be provided with a governor.

3.4 Performance

A cast iron gas burner shall have the performances in conformity to the following standard to secure its safety and serviceability:

3.4.1 Product performance

3.4.1.1 Gas tightness performance

The internal leakage through the gas valve of the gas passage of a cast iron gas burner shall not be over 70 mL/h and there shall be no external leakage when the gas valve undergoes gas tight test performed at an air (or nitrogen) pressure not less than 1.5 times the normal pressure. However, in case the gas tightness test is difficult to be performed, the test may be replaced with leak test in the ignited state. <Revised on January 3, 2011>

3.4.1.2 Durability performance

3.4.1.2.1 The cock and electric ignition device shall be free of gas leakage and maintain their normal function after a 12,000-cycle cyclic test performed at a switching speed of 2 to 20 times a minute by means of air (or nitrogen) pressure. <Revised on January 3, 2011>

3.4.1.2.2 The flame supervision device and hose connector shall be free of gas leakage and maintain their normal function after a 1,000-cycle cyclic test by means of flames or simulation signals for the flame supervision device and a 1,000-cycle cyclic test by reciprocating movements at the maximum rotation angle at a speed of 5 to 10 times a minute for the hose connector. <Revised on January 3, 2011>

3.4.1.2.3 The governor shall be free of gas leakage and the change in regulated pressure shall not exceed $[0.05P(\text{regulated pressure before the test})+0.03]$ kPa after a 30,000-cycle cyclic test performed at a switching speed of 2 to 20 times a minute by means of air (or nitrogen) pressure.
<Revised on January 3, 2011>

3.4.1.3 Vibration resistance performance

A cast iron gas burner shall be free of gas leakage and pass the normal combustion state test after one-hour vibration test performed in its packed state at a vibration frequency of 600 cycle/min, with an amplitude of 5 mm in up-and-down and right-and-left directions for 30 minutes respectively.

3.4.1.4 <Deleted on January 3, 2011>

3.4.1.5 <Deleted on January 3, 2011>

3.4.2 Material performance <Newly established on January 3, 2011>

The materials of the parts through which gas passes, drip pan and water pan shall be incombustible materials which are not be melted when maintained for no less than one hour in a furnace of which temperature is 500°C (350°C for the gas connector part other than threads). However, gas-tightening materials such as packings and seals are excluded.

3.4.3 Operating performance

3.4.3.1 Electric ignition performance

The electric ignition system shall successfully ignite no less than 8 times when operated 10 times and shall not successively fail twice or more to ignite.

3.4.3.2 Heat input performance

The tolerances of the total heat input of a cast iron gas burner and the heat input of each burner shall be within $\pm 10\%$ of their indicated values.

3.4.3.3 Temperature rise performance <Newly established on January 3, 2011>

Except for the construction in which the nozzle is fitted to the burner port, the temperature rise of each part of the combustor shall conform to the following standard:

3.4.3.3.1 The normal temperature rise of each equipment part shall conform to Table 3.4.3.3.1:

Table 3.4.3.3.1 Normal Temperature Rise Standard

Measured Part		Temperature
Parts touched by the hand during operation	Metal, ceramic and glass	≤60℃
	Others	≤70℃
Parts in danger of being touched by the hand		≤140℃
Parts of cock body through which gas flows		≤85℃
Surface of ignition unit (inclusive of piezoelectric sensor)		≤85℃
Surface of dry battery		≤55℃
Surface of hose connector (exclusive of screw connector)		≤60℃
Wooden wall surfaces at the back of, on the sides of and on top of a combustor and the bottom wood platform		≤100℃

3.4.3.3.2 The abnormal temperature rise shall not be over 135℃ on the wooden wall surfaces at the back of, on the sides of and on top of a combustor and the bottom wood platform under the combustor.

3.4.3.4 Combustion state performance <Newly established on January 3, 2011 >

The combustion state performance shall conform to the following standard in a windless condition:

3.4.3.4.1 The flames shall be certainly propagated and be free from explosive ignition.

3.4.3.4.2 The burner other than the enclosed type burner shall be free from lifting when visually checked after 15 seconds from its ignition.

3.4.3.4.3 The flames shall not be extinguished when visually checked after 15 seconds from the burner ignition.

3.4.3.4.4 The flames shall be uniform.

3.4.3.4.5 The burner shall not backfire until 30 minutes after the burner ignition when visually checked. However, the check shall be made after 15 seconds in routine sample inspection.

3.4.3.4.6 The combustion noise shall not be over 60 dB(A) and the explosion noise at flame

extinguishment not over 80 dB(A). However, the burner of a construction in which the nozzle is fitted to the burner port is excluded.

3.4.3.4.7 The CO concentration (volumetric %) (hereinafter referred to as "CO %") in theoretical dry combustion gas shall not be over 0.14%.

$$CO = CO_a \times \frac{CO_{2max}}{CO_{2a} - CO_{2t}}$$

However, in case the components of the test gas is known, CO concentration and CO₂ concentration in the dry combustion gas may be measured and calculated by the following formula:

$$CO = CO_a \times \frac{O_{2t}}{O_{2t} - O_{2a}}$$

where,

CO: CO concentration in theoretical dry combustion gas (volumetric %)

CO_a: measured CO concentration in dry combustion gas (volumetric %)

O_{2t}: measured O₂ concentration in supply air inlet atmosphere (dry state) (volumetric %)

O_{2a}: measured O₂ concentration in dry combustion gas (volumetric %)

CO_{2max}: CO₂ concentration in theoretical dry combustion gas (volumetric %)

CO_{2a}: measured CO₂ concentration in dry combustion gas (volumetric %)

CO_{2t}: measured CO₂ concentration in supply air inlet atmosphere (dry state) (volumetric %)

3.4.3.4.8 Soot shall not be generated.

3.4.3.4.9 The flame of the pilot burner shall not be extinguished or backfire.

3.4.3.4.10 The electrode shall not be always in touch with yellow flames.

3.4.3.5 Flame supervision device

The opening and closing times of the valve of the flame supervision device shall conform to Table 3.4.3.5:

Table 3.4.3.5 Opening and Closing Times of Flame Supervision Device Valve

Valve opening time	≤10 seconds
Valve closing time	≤60 seconds

3.5 Heat Treatment (currently not used)

3.6 Marking

A cast iron gas burner shall be marked in accordance the following provisions so that it can be safely used.

3.6.1 Product marking

A nameplate and a handling instruction marking shall be attached to each cast iron gas burner in a conspicuous place by an un-detachable method, and the nameplate shall be marked with the followings:

- (1) Name of combustor (cast iron gas burner),
- (2) Type (Model No.) of the manufacturer,
- (3) Type of gas burnt (burnable gas group for city gas) and working gas pressure,
- (4) Heat input: kw (kg/h for liquefied petroleum gas, kcal/h for city gas),
- (5) Manufacture number (lot number) and date of manufacturing (import date for imported products) <Revised on December 13, 2018>
- (6) Warranty period and use,
- (7) Name or symbol of manufacturer (name of importer for imported goods),
- (8) <Deleted> ,
- (9) Rated voltage (V) and power consumption (W) (only for cast iron gas burners using electricity).

3.6.2 Acceptance marking

A cast iron gas burner shall be marked with an acceptance mark to be easily identified as a cast iron gas burner which has passed the inspection in accordance with the Act, Article 39, Clause 2. <Revised on November 4, 2015>

3.6.2.1 The acceptance mark shall be as shown in Figure 3.6.2.1.



Figure 3.6.2.1 Acceptance Mark

3.6.2.1.1 The size of the acceptance mark shall be 30 mm (width) by 30 mm (height).

3.6.2.1.2 The colors of the acceptance mark shall be silver white on its background and black in

its letters.

3.6.2.2 In case cast iron burners are manufactured in a continuous manufacturing process, their acceptance marks may be marked in their manufacturing process.

3.6.3 Enclosure of manual

A cast iron gas burner shall be provided with its handling manual (inclusive of installation method) for its safe use.

4. Inspection Standard

4.1 Kinds of Inspections

Gas appliance inspections are classified into manufacturing installation inspection and product inspection.

4.1.1 Manufacturing installation inspection

The manufacturing facilities of a person who intends to manufacture cast iron gas burners in accordance with the Act, Article 36, Clause 2 shall undergo manufacturing installation inspection when the installation or modification of the cast iron gas burner manufacturing installation has been completed. <Revised on November 4, 2015>

4.1.2 Product inspection

A person who intends to manufacture or import cast iron gas burners in accordance with the Act, Article 39, Clause 1 shall undergo the following inspections in order to check on and maintain the performance of the cast iron gas burners. However, inspection of the gas appliances specified in the Decree of the Act may be omitted in whole or in part. <Revised on November 4, 2015>

4.1.2.1 Design stage inspection

In case a product comes under one of the following cases in accordance with the Enforcement Regulation, Table 7, the product shall undergo design stage inspection. However, in case the test report certified by Korea Gas Safety Corporation or another authorized test and inspection agency is submitted, the design stage inspection of the relevant part may be exempted.

- (1) A gas appliance manufacturer manufactures a specific type of product for the first time.
- (2) A gas appliance importer imports a specific type of product for the first time.
- (3) The material or construction of the products of which type has undergone design stage

inspection is changed and the performance of the products is changed.

- (4) The type of a product has undergone design stage inspection but five years have elapsed from its last inspection date.

4.1.2.2 Production stage inspection

Cast iron gas burners of which type has passed design stage inspection in accordance with the Reinforcement Regulation, Table 7 shall undergo production stage inspection in accordance with the following provisions. In this case, one of product identification inspection, production process inspection or comprehensive process inspection in conformity to Table 4.1.2.2 may be selected as the production stage inspection and be performed depending on self-inspection capability and quality control capability.

Table 4.1.2.2 Kinds, Units and Intervals of Production Stage Inspections

Kind of Inspection	Object	Composition Item	Inspection Unit	Interval
Product Identification Inspection	Items other than the objects of production process inspection or comprehensive process inspection	Regular quality inspection	Type	Once every two months
		Routine sample inspection	Type	At every application
Production Process Inspection	Items satisfying the conformity requirements of quality system for production process/self-inspection process	Regular quality inspection	Type	Once every three months
		Process identification audit	Item	Once every three months
		Occasional quality inspection	Representative type	Twice a year or more often
Comprehensive Process Inspection	Items satisfying the conformity requirements of quality system for total process (design, manufacturing and self-inspection)	Comprehensive quality control system audit	Item	Once every six months
		Occasional quality inspection	Representative type	Once a year or more often

4.1.2.2.1 Product identification inspection shall be performed as follows:

- (1) Product identification inspections are classified into regular quality inspection and routine sample inspection and each inspection shall be separately performed. In this case, routine sample inspection is performed when the product has passed regular quality inspection.
- (2) Products of which type has passed the inspection in accordance with (1) shall undergo regular quality inspection once every two months. However, regular quality inspection is omitted for the products of the same type of which manufactured or imported quantity does not exceed 20 units a month.
- (3) Routine sample inspection shall be performed in accordance with (1) for the type of products

whenever the application for their inspection is made.

4.1.2.2.2 Production process inspection shall be performed as follows:

- (1) Production process inspections shall be classified into regular quality inspection, process identification audit and occasional quality inspection, and each inspection or audit shall be separately performed.
- (2) The process identification audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.
- (3) Occasional quality inspection shall be performed twice a year or more often without prior notice on the product items which have undergone regular quality inspection and process identification audit.
- (4) Occasional quality inspection shall be performed for the representative type of products by the same method as that of regular quality inspection.
- (5) A person who has undergone production process inspection may apply for product identification inspection as required.

4.1.2.2.3 Comprehensive process inspection shall be performed as follows:

- (1) Comprehensive process inspections shall be classified into comprehensive quality control system audit and occasional quality inspection, and each audit or inspection shall be separately performed.
- (2) The comprehensive quality control system audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.
- (3) Occasional quality inspection shall be performed once a year or more often without prior notice on the products which have undergone comprehensive quality control system audit.
- (4) Occasional quality inspection shall be performed for the representative type of products by the same method as that of regular quality inspection.
- (5) A person who has undergone comprehensive process inspection may apply for product identification inspection as required.

4.2 Object Audit of Process Inspection

4.2.1 Application for audit

A gas appliance manufacturer who has a 3-month or longer gas appliance manufacturing experience in accordance with Appendix A may apply for production process inspection or

comprehensive process inspection.

4.2.2 Audit method

The audit shall be conducted for the persons who are to undergo process inspection, who have failed process inspection or who apply for process re-inspection in accordance with 4.4.2.2.2(5).

4.2.2.1 Audit of new applicants, persons who failed process inspection and persons who apply for re-inspection

The audit standard for process identification audit or comprehensive quality control system audit for the persons who apply for process inspection, persons who have failed process inspection or persons who apply for process re-inspection in accordance with 4.4.2.2.2(5) (hereinafter referred to as "process inspection applicants") shall conform to Appendix A.

4.2.2.2 Regular audits

In the case of process identification audit performed once every 3 months and comprehensive quality control system audit performed once every 6 months, the maintenance states of the quality system specified in Appendix A such as changes, process management, self-inspection and use of acceptance marks in the period are audited. The audit for production process inspection or comprehensive process inspection is performed as follows:

4.2.2.2.1 Comprehensive process inspections shall be classified into comprehensive quality control system audit and occasional quality inspection, and each audit or inspection shall be separately performed.

4.2.2.2.2 The comprehensive quality control system audit of the products of which audit is applied for shall be performed when the applicant has a 3-month or longer implementation experience of the quality system documented in accordance with Appendix A.

4.2.2.2.3 Occasional quality inspection shall be performed once a year or more often without prior notice on the products which have undergone comprehensive quality control system audit.

4.2.2.2.4 Occasional quality inspection shall be performed for the representative type of products by the same method as that of regular quality inspection.

4.2.2.2.5 A person who has undergone comprehensive process inspection may apply for product identification inspection as required.

4.2.3 Adjudication committee

Korea Gas Safety Corporation shall establish an adjudication committee as follows to deliberate the matters related to the judgment on acceptance or rejection of the results of production process inspection and comprehensive process inspection.

4.2.3.1 The adjudication committee shall be comprised of no more than 5 members including one chairperson.

4.2.3.2 The members of the committee shall be commissioned by the president of Korea Gas Safety Corporation from among persons who have extensive knowledge and experience in gas safety or quality control and persons who can represent consumers' right to secure open and aboveboard deliberation.

4.2.3.3 Necessary matters concerning the operation of the committee shall be prescribed by the president of Korea Gas Safety Corporation.

4.3 Inspection Items

4.3.1 Manufacturing installation inspection

The inspection of a cast iron gas burner manufacturing installation shall be performed on the following items in accordance with the Enforcement Regulation, Table 7 to check whether manufacturing facilities and inspection facilities are fully furnished:

- (1) Conformity of manufacturing facilities in accordance with 2.1, and
- (2) Conformity of inspection facilities in accordance with 2.2.

4.3.2 Product inspection

The inspections of cast iron gas burners in conformity to the Enforcement Regulation, Table 7 shall be classified into design stage inspection and production stage inspection, and each inspection shall be separately performed to check the conformity to the manufacturing standard:

4.3.2.1 Design stage inspection

The inspection items of design stage inspection to check whether the cast iron gas burners conform to the manufacturing standard are as follows. However, in case the test report on a part of which performance is certified by Korea Gas Safety Corporation or another authorized test and inspection agency is submitted, the design stage inspection of that part may be exempted.

- (1) Conformity of materials in accordance with 3.1
- (2) Conformity of construction and dimensions in accordance with 3.2
- (3) Conformity of devices in accordance with 3.3
- (4) Conformity of performance in accordance with 3.4
- (5) Conformity of marking in accordance with 3.6

4.3.2.2 Production stage inspection

The inspection items of production stage inspection by inspection kinds to check the conformity to the manufacturing standard are as follows.

4.3.2.2.1 Product identification inspection

(1) Regular quality inspection

- (1-1) Conformity of construction in accordance with 3.2
- (1-2) Conformity of gas passage tightness performance in accordance with 3.4.1.1
- (1-3) Conformity of electric ignition performance in accordance with 3.4.3.1
- (1-4) Conformity of combustion state performance in accordance with 3.4.3.4 (windless state; except for continuous noise and flame extinguishing noise)
- (1-5) Conformity of safety device operating performance in accordance with 4.5.4

(2) Routine sample inspection

- (2-1) Conformity of gas passage tightness performance in accordance with 3.4.1.1
- (2-2) Conformity of marking in accordance with 3.6
- (2-3) Conformity of combustion state performance in accordance with 3.4.3.4 (windless state; except for continuous noise and flame extinguishing noise) <Revised on May 15, 2009>

4.3.2.2.2 Production process inspection

(1) Regular quality inspection

The inspection items of regular quality inspection shall conform to 4.3.2.2.1(1).

(2) Process identification audit

The audit items of process identification audit shall conform to Table 4.3.2.2.

(3) Occasional quality inspection

The inspection items of occasional quality inspection shall conform to 4.3.2.2.1(1).

4.3.2.2.3 Comprehensive process inspection

(1) Comprehensive quality control system audit

The audit items of comprehensive quality control system audit shall conform to Table 4.3.2.2.

(2) Occasional quality inspection

The inspection items of occasional quality inspection shall conform to 4.3.2.2.1(1).

Table 4.3.2.2 Audit Items of Process Identification Audit and Comprehensive Quality Control System Audit

<Revised on January 8, 2016>

Classification		Audit Item	Application	
			Process Identification Audit	Comprehensive Quality Control System Audit
General	Organization	Securement of organizations with appropriate technical and business capability	○	○
		Possession of a research or development organization to reflect the causes of potential troubles to product design		○
	Quality System	Operation of an appropriate quality system and review of operation results	○	○
	Human Resource	Maintenance of appropriate qualification for employees affecting quality	○	○
	Facilities & Equipment	Securement of facilities and equipment in conformity to product requirements and quality control	○	○
Design	Design & Development	Securement of a design and development system in conformity to product requirements		○
		Verification of product design through analysis of the effects of potential failures and assessment of reliability, and results of output supply		○
		Check on the feasibility of design and development and operation of change procedure		○
Manufacturing	Purchase	Maintenance of an appropriate management system for purchased materials	○	○
		Reflection of the evaluation of suppliers to purchase policy		○
	Production	Possession of a production process in conformity to product requirements and verification of the implementation	○	○
		Possession of acceptance criteria for process approval	○	○
		Verification of process management capability using a statistical technique		○
		Operation of control plan and guidelines for works		○
		Operation of systems for preventive and forecast maintenances and management of production tools		○
		Operation of systems for handling and storing materials and products	○	○
Self-Inspection	Inspection Method & Procedure	Maintenance of methods and procedures for inspection to secure product conformity	○	○
		Maintenance of acceptance criteria for tally data sampling at zero defect level		○
		Maintenance of traceability for determination	○	○

		of measuring devices and guarantee of effective results, and maintenance of a procedure for record management		
		Analysis of measurement system		○
		Self-inspection of the whole items of design stage inspection (once a year)	○	
		Self-inspection of the whole items of design stage inspection (twice a year)		○
	Corrective and Preventive Measures	Management of unconformity items and operation of preventive measures for recurrence prevention	○	○
	Internal Audit	Possession of capability to maintain system conformity	○	○
Obligation	Acceptance Marking	Maintenance of a written management regulation for acceptance marking	○	○
		Maintenance of a separate written regulation for manufacturing acceptance marks		○
	Safety Control	Prevention of accidents due to faulty products and circulation of unconformity products	○	○
Others		Other matters related to maintenance of safety	○	○

4.4 Inspection Method

4.4.1 Manufacturing installation inspection

The inspection of a manufacturing installation is to check whether the manufacturing facilities and inspection facilities in conformity to 4.3.1 are fully furnished. In case all required facilities are fully furnished, the inspection shall be deemed acceptable.

4.4.2 Product inspection

4.4.2.1 Design stage inspection

Design stage inspection shall be performed in accordance with the followings to judge whether each inspection item conforms to the manufacturing standard.

4.4.2.1.1 The type of cast iron gas burners and the working pressure range by heat inputs shall be checked with the documents submitted by the manufacturer.

4.4.2.1.2 The corrosion-resistant materials shall be checked with the documents submitted by the manufacturer.

4.4.2.1.3 Other inspection methods of design stage inspection shall conform to what the

president of Korea Gas Corporation specifies.

4.4.2.2 Production stage inspection

The inspection method of production stage inspection shall conform to the followings for each inspection item to judge whether the item is manufactured in accordance with the manufacturing standard.

4.4.2.2.1 Product identification inspection

(1) Sampling

(1-1) The number of test specimens for regular quality inspection shall be two.

(1-2) The sampling standard for routine sample inspection shall be as follows:

(1-2-1) The same products manufactured in the same production unit shall form one lot.

(1-2-2) The number of test specimens taken from the lot formed in accordance with (1-2-1) shall conform to Table 4.4.2.2.1(1).

Table 4.4.2.2.1(1) Number of Test Specimens for Routine Sample Inspection

Number of Products Forming 1 Lot	10 and less	11 to 100 inclusive	101 to 300 inclusive	301 to 700 inclusive	701 to 3000 inclusive	3001 and over
Number of Test Specimens	All	10 or over	15 or over	20 or over	25 or over	1/100 of quantity applied for inspection

(2) Judgment on acceptance or rejection

(2-1) Product identification inspection shall be performed by performing both regular quality inspection and routine sample inspection, and the products which have passed both inspections shall be deemed acceptable.

(2-2) Routine sample inspection shall be performed on sampled test specimens. All the products in the lot which has passed the inspection shall be deemed acceptable, and all the products in the lot which has failed the inspection shall be deemed rejected.

4.4.2.2.2 Process inspection

(1) Sampling

The number of test specimens for the regular quality inspection and occasional quality inspection of production process inspection and comprehensive process inspection shall be two.

(2) Judgment on acceptance or rejection

(2-1) Judgment on acceptance or rejection for process inspection applicants

Judgment on acceptance or rejection on production process inspection or comprehensive process inspection for process inspection applicants shall be as follows. In this case, previous inspection

results shall be valid until the decision of the adjudication committee meeting.

(2-1-1) Korea Gas Safety Corporation shall prepare the report on the results of regular quality inspection and process identification audit or comprehensive quality control system audit and submit it to the adjudication committee.

(2-1-2) The adjudication committee shall deliberate the submitted report and determine its acceptance or rejection. In this case, if it is judged that part of quality system shall be complemented according to the deliberation results, conditional acceptance may be granted.

(2-1-3) In case a product has passed regular quality inspection by types and process identification audit for the item, the product shall be deemed to have passed production process inspection.

(2-1-4) In case a product has passed comprehensive quality control system audit, the product shall be deemed to have passed comprehensive process inspection.

(2-2) Judgment on acceptance or rejection for regular process inspection

Judgment on acceptance or rejection for the production process inspection performed once every three months and the comprehensive process inspection performed once every six months shall be as follows:

(2-2-1) Korea Gas Safety Corporation shall perform regular quality inspection and process identification audit or comprehensive quality control system audit and determine the acceptance or rejection.

(2-2-2) In case a product has passed regular quality inspection by types and process identification audit for the item, the product shall be deemed to have passed production process inspection.

(2-2-3) In case a product has passed comprehensive quality control system audit, the product shall be deemed to have passed comprehensive process inspection.

(2-3) Judgment on acceptance or rejection for occasional quality inspection

Judgment on acceptance or rejection for occasional quality inspection shall be made by Korea Gas Safety Corporation by performing the inspection by the same method as that of regular quality inspection.

(3) Treatment of inspection results

(3-1) Treatment of inspection results of process inspection applicants

The results of the production process inspection or comprehensive process inspection of a process inspection applicant shall be treated as follows:

(3-1-1) In case the inspection results are accepted in their deliberation, Korea Gas Safety Corporation shall issue the acceptance notification to the applicant.

(3-1-2) In case the inspection results are conditionally accepted in their deliberation, the treatment shall conform to the followings:

(3-1-2-1) The applicant shall submit the complement results of the quality control system to Korea Gas Safety Corporation within one month.

(3-1-2-2) Korea Gas Safety Corporation shall review the submitted complement results, and

accept the inspection results if it is confirmed that the complement has been completed.

(3-1-2-3) In case the applicant who has been conditionally accepted fails to submit the complement results within the time limit, Korea Gas Safety Corporation shall reject the inspection results.

(3-1-3) In the case of rejection in deliberation, it shall be treated as follows:

(3-1-3-1) Korea Gas Safety Corporation shall notify the details of nonconformity to the applicant and then perform product identification inspection.

(3-1-3-2) In case an applicant who has been notified the nonconformity intends to undergo production process inspection or comprehensive process inspection, the applicant may apply for production process inspection or comprehensive process inspection after three months from the date of the nonconformity notification issued by Korea Gas Safety Corporation.

(3-1-3-3) Applicants who have failed comprehensive process inspection may convert the inspection to production process inspection.

(3-2) Treatment of results of regular process inspection

Treatment of the results of the production process inspection performed once every three months and the comprehensive process inspection performed once every six months shall be as follows:

(3-2-1) In case the inspection results are accepted, Korea Gas Safety Corporation shall inform the applicant of the acceptance of production process inspection or comprehensive process inspection.

(3-2-2) In case the inspection results are rejected, Korea Gas Safety Corporation shall inform the applicant of the details of nonconformity, withdraw the conformity notification and then perform product identification inspection.

(3-2-3) In case an applicant who has been notified the nonconformity intends to undergo production process inspection or comprehensive process inspection, the applicant may apply for production process inspection or comprehensive process inspection after three months from the date of the nonconformity notification issued by Korea Gas Safety Corporation.

(3-3) Treatment of results of occasional quality inspection

The results of quality inspections performed occasionally shall be treated as follows:

(3-3-1) In case a manufacturer or an importer fails occasional quality inspection, Korea Gas Safety Corporation shall inform the manufacturer or importer of the details of nonconformity and then perform the second occasional quality inspection.

(3-3-2) The number of test specimens for the second occasional quality inspection shall be twice the number of test specimens for the first occasional inspection.

(3-3-3) In case the manufacturer or importer fails the second occasional quality inspection, the products shall be rejected, product identification inspection shall be performed and collection inspection shall be performed for the relevant type.

(3-3-4) In case an applicant who has been notified the nonconformity intends to undergo production process inspection or comprehensive process inspection, the applicant may apply for

production process inspection or comprehensive process inspection after three months from the date of the nonconformity notification issued by Korea Gas Safety Corporation.

(4) Suspension or change of the kind of inspection

In case a person who is subject to production process inspection or comprehensive process inspection in accordance with the Enforcement Regulation, Table 7, No.3 intends to suspend production of an inspection object item for no less than six months or to change the kind of inspection, the person shall notify the matter to Korea Gas Safety Corporation and return the acceptance notification.

(5) Process re-inspection

In case a person intends to undergo production process inspection or comprehensive process inspection in accordance with the Enforcement Regulation, Table 7, No.3-b and comes under one of the following cases, the person shall undergo production process inspection or comprehensive process inspection again.

(5-1) The location of the business place is changed,

(5-2) A production item is added,

(5-3) Three years have elapsed from the acceptance date of production process inspection or comprehensive process inspection. However, in case a relevant gas appliance item is added, the period shall be the remaining period of the existing item.

4.5 Other Inspection Standards

4.5.1 Inspection of imported products

In principle, inspection of imported products shall be performed in a place which the importer wants, and the costs and expenses required for inspection such as equipment and materials shall be borne by the applicant.

4.5.2 Partial omission of inspection

4.5.2.1 In case a person who undergoes production process inspection or comprehensive process inspection adds inspection items, part of process identification audit or comprehensive quality control system audit may be omitted.

4.5.2.2 In case a person whose quality assurance system has been certified by a certification body authorized in accordance with the Quality Management and Safety Control of Industrial Products Act applies for production process inspection or comprehensive process inspection, part of process identification audit or comprehensive quality control system audit may be omitted.

4.5.3 Disposal of rejected products (not applicable)**4.5.4 Detailed inspection standards**

Other detailed matters necessary for design stage inspection and production stage inspection shall conform to what the president of Korea Gas Corporation specifies.

Appendix A General Standard for Operation of Quality Control System for Gas Appliance Manufacturing Plants

1. Introduction	
	<p>A. This standard has been established so that gas appliance manufacturers may produce safe and reliable products through production process inspection and comprehensive process inspection in production stage inspections in accordance with the Enforcement Regulation, Table 7, No.3-b-2)-b).</p> <p>B. This standard consists of general, design, manufacturing, self-inspection and obligations, and is intended to be used to assess whether the quality control system of the gas appliance manufacturing plant conforms to the requirements of undergoing production process inspection or comprehensive process inspection in production stage inspections.</p>
2. General <Revised on January 8, 2016>	
A. Organization	
(1)	The organization shall be an organization which has technical and business capability to produce products satisfactory to customers and statutory requirements.
(2)	The top management shall guarantee that processes and procedures required for quality control system have been established and are being implemented and maintained.
(3) 【Comprehensive】	<p>Research and development organizations including the followings shall be maintained to study various failure forms which can appear in design process or after extended use and reflect them to design.</p> <p>(a) Person in charge of research and development and personnel</p> <p>(b) Appropriate facilities and equipment required for research and development</p>
B. Quality System	
(1)	The manufacturer shall establish, document and implement a quality control system in accordance with the requirements of this standard.
(2)	When any change in the quality control system is planned and made, the safety of the system shall be maintained and the system shall be updated through continuous improvement.
(3)	<p>The top management shall present the evidences of development and implementation of the quality control system and continuous improvement of its effectiveness through the followings:</p> <p>(a) Establishment of quality policy and quality target</p> <p>(b) Implementation of management review (effectiveness of quality system and improvement of products)</p>
(4) <Newly established on January 8, 2016>	<p>Documents necessary for the quality system shall be managed and a documented procedure necessary for the management of the followings shall be established:</p> <p>(a) Approval, review, renewal and re-approval of documents</p> <p>(b) Identification of documents (newest version, outsourced documents, etc.) and their distribution and management</p> <p>(c) Prevention of misuse of expired documents</p>
C. Human Resources	
(1)	<p>Persons affecting product quality shall be qualified on the basis of appropriate educational background, training, expertness and experiences, and the manufacturer shall implement the followings in accordance with the written procedures:</p> <p>(a) Decision on the qualification of personnel</p> <p>(b) Provision of education and training to satisfy qualification requirements and assessment of its effectiveness</p> <p>(c) Maintenance of the appropriate records of qualification matters</p>

(2) 【Comprehensive】	In the case of persons in charge of design and development of products, it shall be assured that they are skillful with the tools and in the techniques to satisfy and apply the design and development requirements.
D. Facilities and Equipment	
(1) 【Interval】	Facilities, equipment and business environment required to conform to the product requirements shall be determined, secured and maintained. (a) Buildings, business places and utility (b) Process equipment (hardware and software) (c) Supporting services (transportation, communication, etc.)
(2) 【Interval】	The sites shall be maintained in a neatly arcast iron gas burnerd and clean condition to conform to the requirements of products and manufacturing process.
(3) 【Comprehensive】	Means to minimize potential hazards to employees shall be manifested in design, development and manufacturing activities.
3. Design	
A. Design and Development	
(1) 【Comprehensive】	Design and development capability shall be secured to materialize products in conformity to product requirements.
(2) 【Comprehensive】	The output of product design shall be provided in a form verifiable for the requirements, be approved before distribution, and include the followings: (a) Analysis results such as failure mode effect analysis and reliability results (b) Characteristics of the product, and specification when required (c) Measures to prevent malfunctioning of the product, if applicable (d) Definition of the product including drawings or mathematical basic data, and (e) Review results of product design.
(3) 【Comprehensive】	The output of process design shall be provided in a form verifiable for the requirements, be approved before distribution, and include the followings: (a) Drawings and specifications when required (b) Manufacturing process flow diagram and layout (c) Analysis results such as failure mode effect analysis, etc. (d) Control plan (e) Work manual (f) Acceptance criteria for process approval (g)Methods for detection of product/process unconformity and feed back
(4) 【Comprehensive】	The appropriateness of design and development shall be checked, and the records of the results of appropriateness check and all necessary measures shall be maintained.
(5) 【Comprehensive】	Changes in design and development shall be able to easily grasped and the record shall be maintained. Changes shall be reviewed, verified, checked for their appropriateness and approved before their implementation, when applicable.
4. Manufacturing	
A. Purchase	
(1) 【interval】	Inspection or other activities required to ensure that purchased materials satisfy their specified purchase requirements shall be determined and implemented.
(2)	Suppliers shall be selected on the basis of their capability to supply materials in conformity to the specified purchase requirements. The selection standard shall be established and all records related to the selection shall be maintained.
(3) 【Comprehensive】	Suppliers shall be regularly evaluated, their evaluation results shall be reflected in the purchase policy, and the management methods of suppliers shall be accordingly differentiated.
B. Production	

(1)	The manufacturer shall plan and implement production in the management conditions including the followings: (a) Use of work manuals as required (b) Use of appropriate equipment (c) Measurement (d) Application of acceptance standard for judgment of process approval
(2) 【interval】	The manufacturer shall identify the states of products in connection with the measurement requirements in manufacturing stages.
(3) 【Comprehensive】 【interval】	The manufacturer shall identify the states of products in connection with the measurement requirements and traceability in manufacturing stages.
(4) 【interval】	Work preparation shall be verified whenever the work is initially started, the material is replaced or the work is changed.
(5) 【Comprehensive】	An appropriate statistical technique for each process shall be determined before mass production and be included in the control plan. Basic concept such as distribution and process capacity shall be utilized in the overall organization.
(6) 【Comprehensive】	The manufacturer shall establish and maintain the control plan in consideration of analysis results such as failure mode effect analysis in products and manufacturing processes.
(7) 【Comprehensive】 【interval】	Written work manuals shall be prepared for all personnel affecting product quality. These manuals shall be readily available for reference on working sites.
(8) 【Comprehensive】	The manufacturer shall grasp major processes and provide resources for preservation of machines, equipment, jigs and tools, and develop an overall preventive maintenance system. The system shall include the followings: (a) Planned maintenance activities (b) Packing and preservation of equipment, tools and gauges (c) Availability of spare parts for major manufacturing equipment (d) Documentation, evaluation and improvement of maintenance activities (e) Identification specifying the states of production, repairs or disposal <Revised on January 8, 2016>
5. Self-Inspection	
A. Inspection Method and Procedure	
(1) 【interval】	The manufacturer shall determine the inspections to be performed and check whether the products conform to the specified requirements. The inspections shall be performed in relevant stages of production process.
(2) 【interval】	The evidence that inspected products conform to the acceptance criteria shall be maintained. The person who approves the shipment of the products shall be specified in the record.
(3) 【Comprehensive】 【interval】	The acceptance criteria for tally data sampling shall be of zero-defect.

(4) 【interval】	Measurements shall be made in such a way as to meet the requirements, and the measurement equipment shall be as follows to assure effective results: (a) Measurement equipment shall be calibrated or verified to the measurement standards traceable to the international or national standard at specified intervals or before application. In case such standards are not available, the bases for such calibration or verification shall be recorded. (b) Identification to judge the calibrated state (c) Protection from any manipulation which may invalidate measurement results (d) Protection from damage or deterioration during handling, maintenance and safekeeping
(5) 【interval】	The records of calibration and verification results shall be maintained, and the measured values shall be used in calibrated states.
(6) 【Comprehensive】	Changes in measurement systems indicated in the various results of measurement and test shall be analyzed by statistical methods.
(7) 【interval】	The manufacturer shall inspect the whole items of design stage inspection once a year or more often and maintain the records.
(8) 【Comprehensive】 【interval】	The manufacturer shall inspect the whole items of design stage inspection twice a year or more often and maintain the records. <Revised on November 17, 2014, January 8, 2016>
(9) 【Comprehensive】	The manufacturer's laboratory shall be included in the quality system documentation by specifying the following technical requirements: a) Appropriateness of personnel, equipment and facilities b) Capability to accurately conduct tests in accordance with relevant specifications c) External laboratories to be authorized in accordance with KS Q ISO IEC 17025 or an equivalent standard <Revised on November 17, 2014>
B. Corrective and Preventive Measures	
(1) 【interval】	It shall be assured that unconfirmable products and suspicious products are identified and separately managed.
(2)	Measurements shall be taken to prevent recurrence of nonconformity and the followings shall be specified in the written procedure: (a) Review of nonconformity (inclusive of customer complaints) (b) Determination, implementation and recording of corrective measures
(3)	The effectiveness of quality system shall be continuously improved through the utilization of quality policy, quality target, audit results, data analyses, corrective measures, preventive measures and management review.
(4)	Preventive measures shall be taken to remove the potential causes of nonconformity to prevent its recurrence.
C. Internal Audit	
(1)	The manufacturer shall conduct internal audits at planned intervals to check whether the quality system is effectively implemented and maintained.
(2)	Responsibility for and requirements of planning and implementation of audits, guarantee of the independence of audit, report of audit results and maintenance of records shall be specified in the written procedure.
6. Obligations <Revised on January 8, 2016>	
A. Acceptance Marking	

(1) 【interval】	The manufacturer shall maintain a written management regulation on acceptance marking (certificates or stamps), the record of receipt, use, safekeeping and disposal of the acceptance marks shall be immediately updated and maintained, and the management regulation shall include the followings: (a) Handling of acceptance marks (certificates or stamps) by authorized persons only (b) Use of acceptance marks subject to the approval of top management/management representative and in accordance with the planned procedure. (c) Record of the use of acceptance marks in detail (d) Establishment of a plan to prevent the misuse of acceptance marks, and (e) Safekeeping of acceptance marks to prevent their damage or robbery
(2) 【Comprehensive】 【interval】	The regulation on manufacturing of acceptance marks shall be separately documented, and all matters related to the manufacturing and change of acceptance marks shall be recorded and updated.
B. Safety Control	
(1)	For recent one year, the manufacturer shall be free from any accident due to product defects and there shall be no unconformity case in the sampling inspection undergone by the manufacturer.
(2) 【Comprehensive】	For recent three years, the manufacturer shall be free from any accident due to product defects and there shall be no unconformity case in the sampling inspection undergone by the manufacturer.
C. Others	
(1)	When any case which may cause the quality deterioration of products or serious harm to the user breaks out, the manufacturer shall take appropriate measures.
(2)	When there is any important change in the operation of the manufacturer's quality system, the manufacturer shall inform Korea Gas Safety Corporation of the change within 15 days.

[Remarks]

1. 【Comprehensive】 means that the provisions are applicable only to the objects of comprehensive process inspection.
2. 【Interval】 means that the provisions are applicable to the inspections to be performed in accordance with their inspection intervals.
3. Provisions without any mark are common provisions for production process inspection and comprehensive process inspection.

Appendix B General Test Conditions for Cast Iron Gas Burners

B1. Laboratory Condition

Item	Condition
Temperature in laboratory	The temperature in the laboratory shall be $(20 \pm 15)^{\circ}\text{C}$ and temperature variation during test shall be $\pm 5\text{K}$.
Indoor humidity	The humidity in the laboratory shall be $(65 \pm 20)\%$.
Indoor atmosphere	Carbon dioxide shall not be over 0.2% and carbon monoxide 0.002% in the indoor atmosphere.
[Remarks] In principle, the temperature measurement in the laboratory shall be made in four locations in front of, in the rear of, on the right of and on the left of the equipment which are about 1 m from the equipment while the mercury bulbs of the temperature gauges are fixed at a height almost same as that of the top of the equipment (a height of 1.5 m if the height from the floor is over 1.5 m), and the arithmetic average value shall be deemed to be the room temperature. However, the mercury bulbs of the temperature gauges shall not be directly affected by combustion gas or radiation heat from the equipment.	

B2. Test Gas Standard <Revised on May 20, 2013>

B2.1 The volumetric component ratio of the test gas shall be as indicated in Table B2.1 on the basis of 15°C and 101.3 kPa.

Table B2.1 Volumetric Component Ratio of Test Gas

Gas Group	Kind of Test Gas	Component (volumetric %)						Combustibility			
		Hydrogen	Methane	Propane	Butane	Nitrogen	Air O ₂ 21% N ₂ 79%	Gross heating value MJ/m ³ N	Specific Gravity (air=1)	Webber Index (WIs) MJ/m ³ N	MCP
City Gas	1	-	87.0	13.0	-	-	-	45.16 (40.90)	0.682	54.69 (49.53)	37.5
	2	23.0	66.0	11.0	-	-	-	38.07 (34.33)	0.550	51.34 (46.29)	44.1
	3	-	96.5	-	-	3.5	-	36.46 (32.82)	0.569	48.32 (43.50)	35.3
	R ^b	-	96.0	4.0	-	-	-	40.05 (36.13)	0.594	51.97 (46.89)	36.5
	S	Gas of which maximum combustion speed (MCP) is over 35.0 to 44.0 inclusive and of which WI is over 48.80{51.50} to 53.56{56.52} MJ/m ³ inclusive									
Liquefied Petroleum Gas	Propane	-	-	100.0	-	-	-	95.65 (87.99)	1.550	76.83 (70.69)	41.0
	Butane	-	-	-	100.0	-	-	126.21 (116.47)	2.079	87.54 (80.78)	38.0

	S	P, B or their mixed gas
^b In case the WI of supply gas is within $\pm 1\%$ of the Webber Index of R gas, the manufacturer may use it as test gas for quality control.		

[Remarks]

1. In case the condition of city gas "S" is within the range of the gas group [WI and combustion speed (replaced by the value of MCP)] and "S" is designated as test gas, the supply gas of the gas group may be used.
2. The WI depending on the heating value and specific gravity of test gas (1, 2, 3 and R of city gas and P and B of liquefied petroleum gas) shall be within $\pm 1\%$ of a value in the above table.
3. The combustion and measurement standard condition of test gas is 15/15°C, 101.3 kPa and the values in () are low heating values for reference.
4. The values in { } of S gas are the values of WI for commercial transaction and are the reference values for 15/0°C, 101.3 kPa.
5. MCP is calculated by the following formula:

$$MCP = \frac{\sum(S_i f_i A_i)}{\sum(S_i f_i A_i)} (1 - K)$$

where,

MCP: maximum combustion speed

S_i : combustion speed of combustible gas in the gas in the following table; a value indicated in the table

f_i : coefficient related to each combustible gas in the gas; a value indicated in the table

A_i : content of each combustible gas in the gas (mol %)

K: attenuation coefficient; a value calculated by the following formula:

$$K = \frac{\sum A_i}{\sum (\alpha_i A_i)} \left\{ \frac{2.5CO_2 + N_2 - 3.77O_2}{100 - 4.77O_2} + \left[\frac{N_2 - 3.77O_2}{100 - 4.77O_2} \right]^2 \right\}$$

where,

α : correction factor of each combustible gas in the gas; a value indicated in the table

CO_2 : content of carbon dioxide in the gas (mol %)

N_2 : content of nitrogen in the gas (mol %)

O_2 : content of oxygen in the gas (mol %)

B2.2 Indication method of test gas conditions

The conditions of the test gases used in this technical standard are indicated with the kind and pressure of test gases and the test gas conditions in each paragraph of this technical standard is indicated with "kind and symbol of test gas – pressure and symbol of test gas".

(1) In the case of liquefied petroleum gas

Kind of test gas

Symbol	Kind of Test Gas
P	Propane
B	Butane

Pressure of test gas (unit)

Symbol	Pressure of Test Gas (kPa)
1 (maximum pressure)	3.3
2 (standard pressure)	2.8

S	Propane, butane or any of mixed gases of these gases	3 (minimum pressure)	2.3
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(2) In the case of city gas

Kind of test gas

Symbol	Kind of Test Gas
1	Gas prone to incomplete combustion
2	Gas prone to backfire
3	Gas prone to extinguishment
R ^b	Gas of which performance is tested
S	Any of 1, 2, 3 or R

Pressure of test gas (unit)

Symbol	Pressure of Test Gas (kPa)
1 (maximum pressure)	2.5
2 (standard pressure)	2.0
3 (minimum pressure)	1.0

B2.3 Test gas conditions by combustion state test items

Test Item		Test Gas Condition	
		Liquefied Petroleum Gas	City Gas
Flame propagation		P-2	S-2
Lifting		P-1	3-1
Extinguishment		P-1 & P-3	3-1 & 3-3
Flame uniformity		S-2	S-2
Backfire		P-3	2-3
Continuous noise		P-1	S-1
Extinguishing noise		P-2	S-2
CO %		B-1	1-1
Soot generation		B-1	1-1
Contact with yellow flame		B-1	R-1
Flame overflow		B-1	R-1
Flame stability of pilot burner	Extinguishment	P-1 & P-3	S-1 & S-3
	Backfire	P-3	2-3
Flame stability of burner	Extinguishment	P-1 & P-3	S-1 & S-3
	Backfire	P-3	S-3
	Flame overflow	B-1	S-1

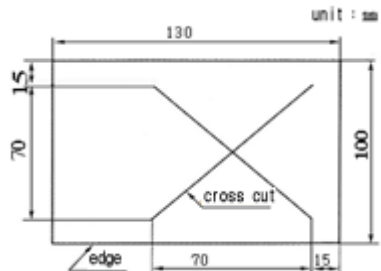
B3. Size of Test Pans by Heat Input of Cast Iron Gas Burners

Heat Input	Nominal Size (cm)	Diameter (mm)	Depth (mm)	Roundness of Bottom	Mass (g)	Mass of Water (when thermal
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kW	LPG (kg/h) City Gas (kcal/h)				(curvature radius) (mm)		efficiency is measured)
≤1.26	0.090≤ 1,080≤	14	140	64	20	130	0.65
1.26 < to ≤1.60	0.090<0.115≤ 1,080<1,380≤	16	160	73	23	155	1.0
1.60 < to ≤2.02	0.115<0.145≤ 1,380<1,740≤	18	180	82	26	190	1.4
2.02 < to ≤2.44	0.145<0.175≤ 1,740<2,100≤	20	200	91	29	250	2.0
2.44 < to ≤2.93	0.175<0.210≤ 2,100<2,520≤	22	220	100	32	300	2.7
2.93 < to ≤3.49	0.210<0.250≤ 2,520<3,000≤	24	240	109	35	380	3.5
3.49 < to ≤4.19	0.250<0.300≤ 3,000<3,600≤	26	260	118	38	470	4.4
4.19 < to ≤5.23	0.300<0.375≤ 3,600<4,500≤	28	280	128	41	585	5.6
5.23 <	0.375< 4,500<	30	300	137	44	720	6.9
<p>Note:</p> <ol style="list-style-type: none"> 1. The heat input shall be the value of the heat input of each burner in the handling manual specified by the manufacturer. 2. The pans of which nominal sizes are 14 to 30 cm inclusive shall be used in combustion state test, normal temperature rise test and thermal efficiency test while the pans of which nominal sizes are 20 to 32 cm inclusive shall be used in oversized pan use state test and abnormal temperature rise test. 							

Appendix C Test Methods for Cast Iron Gas Burners

C1. Salt Water Spray Test <Revised on November 17, 2014>

Metallic Material	Salt water test shall be conducted in a salt water spray laboratory in conformity to KS D 9502, 2 (Equipment) and 8 (Spray Room Condition) by spraying the salt water in conformity to 6 (Preparation of Salt Solution for Test) by the test method in conformity to 13.(1) (Area Method).
Paint Film	<p>In the case of a metallic material of which surfaces are treated for corrosion protection, cross cuts shall be made as shown in Figure C1 by applying a pushing pressure of 5 N with a knife and the edges of the test specimen (size: 130 x 100 mm) shall be sealed and tested for the time period specified in KS B 8102 in the above test condition. The area outside the 2.5 mm width of the cross cut lines and the 10 mm width of the specimen edges shall be checked to see whether there is any rust or blistering.</p> <p>Next, after the specimen has been washed in water and dried in the room condition for 24 hours, a piece of 12 mm wide adhesive cellophane tape in conformity to KS T 1058 shall be attached to the cross cut line. It shall be checked whether there is any peeling in the area outside the 2.5 mm width of the cross cut line when the tape is pulled away perpendicularly to the painted surface.</p>  <p>Figure C1. Test Specimen for Salt Water Spray Test on Paint Film</p>

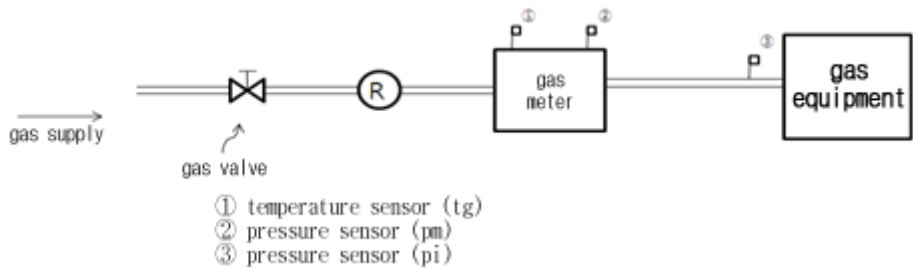
C2. Electric Ignition Function Test

Test Condition	The voltage as the power source condition shall be 70% of the nominal voltage (indicated voltage) for dry batteries and 90% of the rated voltage at the rated frequency for household power source. The test condition shall be P-1 and P-3 for liquefied petroleum gas and R-1 and R-3 for city gas.
Test Method	<p>The ignition operation shall be repeated 10 times by the ignition method specified in the handling manual or by the followings, and the number of times of ignition and flame overflow to outside the casing as well as whether there is any explosive ignition shall be checked.</p> <p>a) Preliminary tests shall be performed several times in advance.</p>

	<p>b) The temperature of the electric ignition device and burner shall be near the room temperature for every ignition operation.</p> <p>c) In principle, one cycle of ignition operation and ignition speed shall be as follows depending on the ignition source construction:</p> <ol style="list-style-type: none"> 1) In the piezoelectric ignition mode, one operation shall be counted as one cycle for single ignition type, and the speed of one cycle of ignition operation shall be about 0.5 to 1 second. 2) In the piezoelectric ignition mode, one cycle shall be counted as one time for the continuous rotary type, and the speed of one cycle of ignition operation shall be the same as that of 1). 3) In the continuous discharge ignition mode or heater ignition mode using dry batteries or a household power source, maintaining in an "ignition" position for 2 seconds shall be counted as one cycle. 4) After the on-off operation has been repeated 12,000 times at a speed of 2 to 20 cycles a minute, electric ignition performance and whether there is any problem in its use shall be checked.
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C3. Heat Input Rate Test <Revised on March 25, 2013>

Test Condition	The test gas condition shall be P-2 for liquefied petroleum gas and R-2 for city gas.
Test Method	<p>a) The equipment shall be installed as shown in C3.</p> <p>b) The test gas shall operate the equipment at its maximum heat input rate as its standard gas and at the standard pressure (R-2, P-2).</p> <p>c) The gas pressure of the water column gauge ② shall be matched to the standard pressure.</p> <p>d) When the heat input rate becomes constant, the measurement shall be started. When the difference between the values measured consecutively is not over 2%, the arithmetic average value shall be obtained.</p> <p>e) The heat input rate in a dry condition at a temperature of 15°C, standard gas pressure and an atmospheric pressure of 101.3 kPa shall be calculated by the following formula:</p> $Q_c = Q \times \frac{1000}{3600} \times V \times \sqrt{\frac{101.3 + P_g}{101.3} \times \frac{P_a + P_g}{101.3} \times \frac{288}{273 + t_g} \times \frac{d}{d_r}}$ <p>where</p> <p>Q_c: heat input rate corrected to gross heating value condition (101.3 kPa, 15°C and dry gas) (kW)</p> <p>Q: gross heating value of dry reference gas at 15°C and 101.3 kPa (MJ/m³)</p> <p>V: volumetric gas quantity measured through the gas meter in the humidity, temperature and pressure conditions (m³/h)</p> <p>P_g: gas pressure in the gas meter (kPa)</p> <p>P_a: atmospheric pressure at the time of test (kPa)</p> <p>t_g: gas temperature in the gas meter (°C)</p>

	<p>d : density of test gas d_r: density of reference gas</p> <p>f) In case a wet type gas meter is used, the density of gas shall be changed from d to d_h and the value shall be corrected by the following formula:</p> $d_h = \frac{d(P_a + P_g - P_s) + 0.622P_s}{P_a + P_g}$ <p>where, P_s is saturated steam pressure and is calculated as follows:</p> $P_s = 10^\alpha \text{ kPa} \left(\text{where, } \alpha = 7.203 - \frac{1735.74}{t_g + 234} \right)$ <p>g) The accuracy (%) of the measured heat input rate against the indicated heat input rate is calculated by the following formula:</p> $\Delta Q_c = \frac{Q_c - Q_r}{Q_r} \times 100$ <p>where, ΔQ_c: accuracy of measured heat input rate against indicated heat input rate (%) Q_c: measured heat input (kW) Q_r: indicated heat input (kW)</p>  <p>Figure C3. Heat Input Rate Measurement System</p>
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C4. Normal Temperature Rise Test

Test Condition	<p>(1) The test equipment shall be installed in a state specified for the test equipment in relation to the thermometric plates as shown in Figure C4.</p> <p>(2) The maximum room temperature in the temperature rise test shall be 35°C.</p> <p>(3) The test gas for the temperature rise test of each equipment part shall be S-2 for liquefied petroleum cast iron gas burners or R-2 for city cast iron gas burners. In addition, the test gas for the temperature rise test of wooden walls and wooden floors around the equipment and exhaust gas temperature test shall be S-1 for liquefied petroleum gas cast iron burners or R-1 for city gas cast iron burners.</p>
Test Method	<p>(1) The cock shall be adjusted so that the heat input rate of the range part burner will be 1/2 of the indicated heat input rate. In addition, the cast iron gas burner which is provided with a temperature controller and of which</p>

- temperature can be set shall be set at the maximum temperature.
- (2) The grill shall be in a state adjusted for maximum heat input rate. However, the burner of the cast iron gas burner combined with a grill shall be in the state for use of the grill.
 - (3) In case an electric heater is attached, it shall be set to and operated at the maximum temperature. However, in case the manufacturer specifies that the cast iron gas burner and the electric heater shall not be used at the same time, the setting shall conform to the method specified by the manufacturer.
 - (4) The temperature measurement time shall be 30 minutes after burner ignition for the each part of the equipment and 60 minutes after burner ignition for the wooden wall, etc. around the equipment.

Temperature Measurement Time

Time			
Ignition	30 minutes		60 minutes
	Each part of equipment	Wooden wall, etc.	

Measuring point

Measuring point

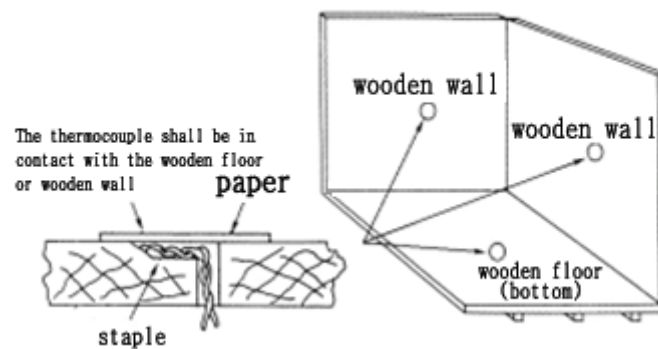


Figure C4. Surface Temperature Measurement of Wooden Floor and Wooden Walls
[Note]

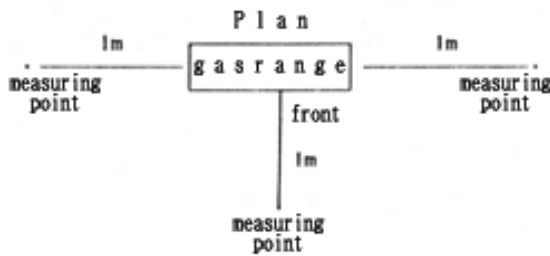
1. The materials of the wooden floor and wooden walls shall conform to relevant Korean Industrial Standards or equivalent standards and shall be made of 5 to 7 sheets of sufficiently dried plywood. The surface of the wooden floor shall be finished with varnish and the surface of the wooden walls with non-gloss black paint.
2. The sizes of the wooden floor and walls shall be sufficient for the dimensions of the equipment.
3. Thermocouples shall be installed at equal distances of about 10 cm and the

	<p>cable of the installed thermocouple shall be exposed about 1 cm.</p> <p>4. The insulated part of the thermocouple shall be fixed by stapling and the joints of the thermocouples shall be in contact with the surface of black radiation heat penetration adhesive tape Class 3 (KS T 1055) treated for non-gloss.</p> <p>5. The type of the thermocouple shall be T-type [copper · constantan (C-C)] and the diameter of the element wire shall be 0.65 mm.</p>
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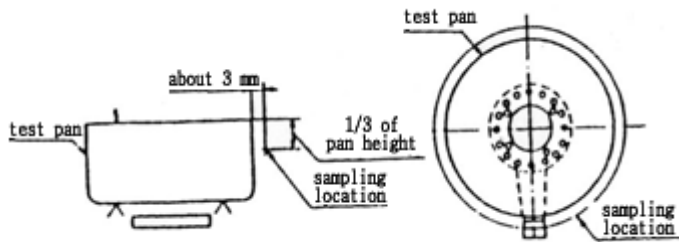
C5. Abnormal Temperature Rise Test

Test Condition	<p>(1) The test equipment shall be installed in the state specified for each cast iron gas burner in relation to the thermometric plates which are for normal temperature rise test condition as shown in Figure C4.</p> <p>(2) The maximum room temperature in the temperature rise test shall be 35°C. However, the maximum room temperature in the temperature rise of the windings shall be 30°C</p> <p>(3) The test gas condition shall be S-1 for liquefied petroleum gas or R-1 for city gas.</p>
Test Method	<p>(1) The installation state of the test equipment shall be the same as that of normal temperature rise test.</p> <p>(2) The range burner shall be in a state of maximum heat input rate and a test pan of which hole diameter (60±10 mm) is larger than that of the specified test pan in Appendix C (if such the pan cannot be placed, the maximum pan that can be placed) shall be used, and the center of the test pan and that of the burner shall be matched.</p> <p>(3) The water pan for the grill shall not be filled with water.</p> <p>(4) The burner for the gas range combined with a grill shall be in the state for the use of the grill.</p> <p>(5) In case an electric heater is attached, it shall be set and operated at the maximum temperature. However, in case the manufacturer specifies that the cast iron gas burner and the electric heater shall not be used at the same time, the setting shall conform to the method specified by the manufacturer.</p> <p>(6) In the case of temperature measurement of an abnormal case, the measurement time shall be from burner ignition until the temperature of the thermometric part has passed the set value and remains unchanged (1 hour maximum). However, in case the overheat prevention device (limited to to the burner provided with an overheat prevention device) is activated and the main burner gas passage is closed, the highest temperature ever reached shall be measured.</p>

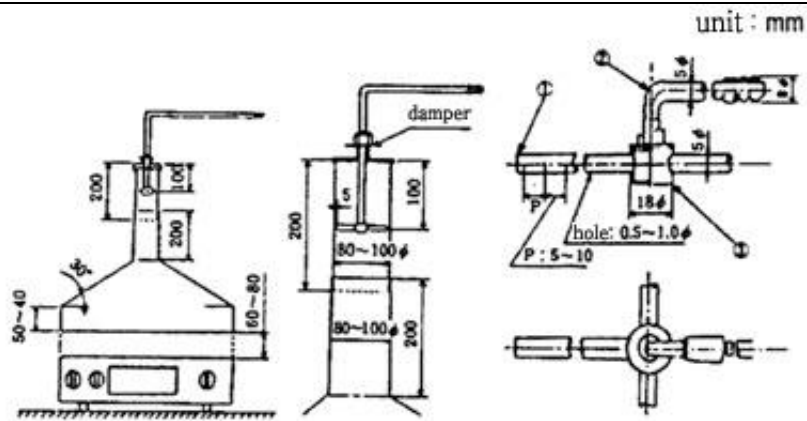
C6. Noise Measurement Test

Continuous Noise Extinguishing Noise	<p>Continuous noise and extinguishing noise shall conform to the followings.</p> <p>(a) The maximum continuous noise including combustion noises shall be measured in three locations marked in the following figure which are separated by one meter from the three centers of the outer surfaces of the gas range when all the burners are ignited.</p> <p>(b) When all the burner appliance valves are manually closed as fast as possible after 30 minutes from burner ignition and flames are extinguished, the explosive noise shall be measured.</p> <div style="text-align: center;">  <p>The diagram is a plan view of a gas range. A central rectangle is labeled 'gas range'. Three lines extend from the center of each side of this rectangle to points labeled 'measuring point'. Each line is labeled '1m'. The top line is labeled 'front'.</p> </div> <p style="text-align: center;">Figure C6. Measuring Points of Noises</p>
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C7. Measurement Test of CO Concentration in Theoretical Dry Combustion Gas

Test Condition	After 15 minutes from burner ignition, the combustion gas of the burner shall be sampled as uniformly as possible as shown in the followings. The test gas shall be S-1 for liquefied petroleum gas or 1-1 for city gas.
Test Method (for the range part with heat input rate not over 6.8 kW)	<p>(1) The combustion gas shall be uniformly sampled in the sampling locations along the full circumference by means of the test pan in conformity to the heat input rate and the sampler in the figure below.</p> <div style="text-align: center;">  <p>The diagram shows a side view and a top view of a test pan. The side view shows a rectangular pan with a height of 'about 3 mm' and a 'sampling location' at '1/3 of pan height'. The top view shows a circular pan with multiple 'sampling location' points around its circumference.</p> </div>
Test Method (for the range part with heat input rate over 6.8 kW or quasi-)	(2) Combustion exhaust gas shall be sampled from the overall area of the combustion exhaust gas discharge part by means of a sampler suitable to the exhaust gas discharge part to have an average outcome as long as possible.

low-
pressure)



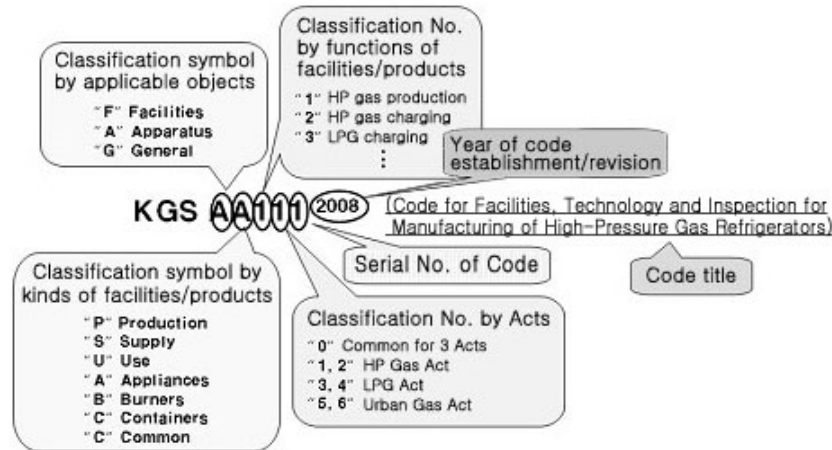
Combustion Gas Sampling Device

C8. Flame Supervision Device Operation Test

Test Gas Condition	<p>(1) Valve opening time: The test gas shall be P-3 for liquefied petroleum gas or R-3 for city gas.</p> <p>(2) Valve closing time: The test gas shall be B-1 for liquefied petroleum gas or R-1 for city gas.</p>
Test Method	<p>1) Valve opening time The time until the valve of the safety device is opened after the burner is ignited by turning the cock handle is measured.</p> <p>2) Valve closing time The burner is ignited and then extinguished after 15 minutes from its ignition. Gas or air is supplied to the pilot burner while the burner is left in an extinguished state, and the time from the burner extinguishment until the valve of the safety device is shut off is measured.</p>

Symbol and Serial Number System of KGS Codes

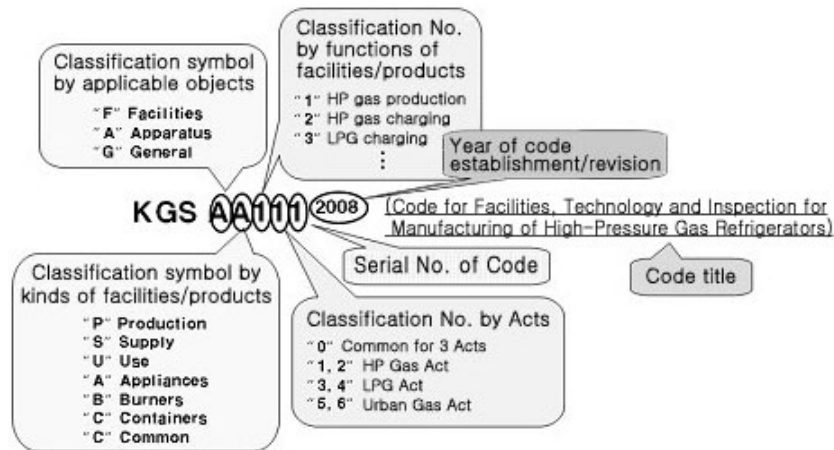
Korea Gas Safety Codes (KGS Codes) are the codes of detailed standards for technical matters such as facilities, technology and inspection stipulated in gas-related laws and regulations and are the technical standards in gas safety areas deliberated and resolved to be adopted by the gas technical standards committee, and approved by the Ministry of Knowledge Economy.



Classification		Symbol	Facility	Classification		Symbol	Facility
Apparatus (A)	Appliances (A)	AA1xx	Refrigerators	Facilities (F)	Production (P)	FP1xx	High-pressure gas manufacturing facilities
		AA2xx	Piping			FP2xx	High-pressure gas filling facilities
		AA3xx	Valves			FP3xx	LP gas filling facilities
		AA4xx	Pressure regulators			FP4xx	City gas wholesales manufacturing facilities
		AA5xx	Hoses			FP5xx	City gas general manufacturing facilities
		AA6xx	Alarm & shutoff devices		FS1xx	High-pressure gas sales facilities	
		AA9xx	Other appliances		FS2xx	LP gas sales facilities	
	Burners (B)	AB1xx	Boilers		FS3xx	LP gas complex supply facilities	
		AB2xx	Heaters		FS4xx	City gas wholesales supply facilities	
		AB3xx	Cast iron gas burners		FS5xx	City gas general supply facilities	
		AB9xx	Other burners		Use (U)	FU1xx	High-pressure gas storage facilities
	Containers (C)	AC1xx	Tanks			FU2xx	High-pressure gas burning facilities
		AC2xx	Cylinders			FU3xx	LP gas storage facilities
		AC3xx	Cans			FU4xx	LP gas burning facilities
		AC4xx	Composite containers			FU5xx	City gas burning facilities
		AC9xx	Other containers	General (G)	Common (C)	GC1xx	Basic matters
			GC2xx			Common matters	

Symbol and Serial Number System of KGS Codes

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Classification		Symbol	Facility	Classification		Symbol	Facility
Apparatus (A)	Appliances (A)	AA1xx	Refrigerators	Facilities (F)	Production (P)	FP1xx	High-pressure gas manufacturing facilities
		AA2xx	Piping			FP2xx	High-pressure gas filling facilities
		AA3xx	Valves			FP3xx	LP gas filling facilities
		AA4xx	Pressure regulators			FP4xx	City gas wholesales manufacturing facilities
		AA5xx	Hoses			FP5xx	City gas general manufacturing facilities
		AA6xx	Alarm & shutoff devices		Supply (S)	FS1xx	High-pressure gas sales facilities
		AA9xx	Other appliances			FS2xx	LP gas sales facilities
	Burners (B)	AB1xx	Boilers			FS3xx	LP gas complex supply facilities
		AB2xx	Heaters			FS4xx	City gas wholesales supply facilities
		AB3xx	Ranges			FS5xx	City gas general supply facilities
		AB9xx	Other burners		Use (U)	FU1xx	High-pressure gas storage facilities
	Containers (C)	AC1xx	Tanks			FU2xx	High-pressure gas burning facilities
		AC2xx	Cylinders			FU3xx	LP gas storage facilities
		AC3xx	Cans			FU4xx	LP gas burning facilities
		AC4xx	Composite containers			FU5xx	City gas burning facilities
		AC9xx	Other containers		Common (C)	GC1xx	Basic matters
				General (G)		GC2xx	Common matters

