

Code for Facility, Technical and Inspection Code for Manufacturing of Transition Fittings for Gases

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Code for Facility, Technical and Inspection Code for Manufacturing of Transition Fittings for Gases

1. General

1.1 Scope

This Code applies to the facilities, technology and inspection for manufacturing of transition fittings or T.F which connects metal pipe to polyethylene pipe installed in city gas or liquefied petroleum gas facility or one connects metal pipe to polyethylene pipe (hereinafter referred to as "joints") among the piping joints in conformity to the Enforcement Regulation of the Safety Control and Business Regulation of Liquefied Petroleum Gas Act (hereinafter referred to as "Enforcement Regulation"), Table 3, No.8 and Table 7, No.4-h. <Revised on December 10, 2015>

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 Gas Act"), Article 33-2 in accordance with the Safety Control and Business Regulation of Liquefied Petroleum Gas (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 December 10, 2015>

1.3 Reference Codes and Standards

1.3.1 Inspection standard for new technology products

In case the Minister of Trade, Industry and Energy accepts that new joint manufacturing and inspection methods developed through technology development do not conform to the standards for facilities, technology and inspection in conformity to this Code but do not hinder safety control in accordance with the Enforcement Regulation, Table 7, No. 5-a, such manufacturing and inspection methods of those joints may apply only to them. <Revised on May 15, 2009>

1.3.2 Manufacturing registration standard for foreign products <Newly established on August, 13, 2012>

The "foreign manufacturing facility standards and manufacturing technology standards" specified in the Enforcement Regulation, Article 17-3, proviso of Clause 3 mean the detailed standards specified in the Act, Article 45. <Revised on December 10, 2015>

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 which 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 which 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 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 range of joints 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.

2. Manufacturing Facility Standard

2.1 Manufacturing Facilities

A person who intends to manufacture joints shall be furnished with the following manufacturing facilities to manufacture the joints in accordance with this manufacturing technology standard. However, if the licensing authority accepts that it is necessary to utilize the manufacturing facilities of specialist parts companies or use the parts manufactured by them for quality improvement, their manufacturing facilities may be utilized or their products may be used.

(1) Welding facilities and painting facilities <Revised on August 19, 2011>

(2) Drilling facilities · outside diameter machining facilities · inside diameter machining facilities · threading machines

(3) Pipe cutting facilities <Revised on August 19, 2011>

(4) Power assembly facilities

(5) Polyethylene cover facilities (restrictive to when polyethylene cover applies) <Established on

August 13, 2012>

2.2 Inspection Facilities

2.2.1 A person who intends to manufacture joints shall be furnished with inspection facilities in conformity to the following standard to check on and maintain the product performance.

2.2.1.1 In order to perform self inspection in conformity to the safety control regulation, the kinds of inspection facilities shall be as follows.

- (1) Dimension measurement facilities as vernier calipers · micrometers · thread gauges etc.
- (2) Gas resistance performance testing facility <Revised on August 19, 2011>
- (3) Tensile tester
- (4) Pressure-proof test facility
- (5) Durability test facility
- (6) Gas tightness test facility
- (7) Thermostatic bath
- (8) Pinhole tester (restrictive to when polyethylene cover applies) <Established on August 13, 2012>
- (9) Insulation resistance tester (restrictive to when polyethylene cover applies) <Established on August 13, 2012>
- (10) Stell ball impact tester (restrictive to when polyethylene cover applies) <Established on August 13, 2012>
- (11) Peeling speed tester (restrictive to when polyethylene cover applies) <Established on August 13, 2012>
- (12) Other facilities and appliances required for inspection

2.2.1.2 The capacity of 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 in conformity to the High-Pressure Gas Act, Article 28 (hereinafter referred to as "Korea Gas Safety Corporation")

(2) Test and inspection agencies authorized in accordance the High Pressure Gas Act, Article 35 (hereinafter referred to as "Inspection agencies")

(3) Test and inspection agencies authorized in accordance with the Framework Act on National Standards

3. Manufacturing Technology Standard

3.1 Design (currently not used)

3.2 Material

The materials of joints shall conform to the following provision to secure their safety.

3.2.1 Materials of joint shall conform to KS M 3514 (polyethylene pipe for gases) or be equivalent to its chemical substance and mechanical characteristic.

3.2.2 Material of metallic pipe used for joint shall conform to KS D 3562 (carbon steel pipes for pressure service), KS D 3564(carbon steel pipes for high pressure pipes) or has equivalent or higher level of chemical substance and mechanical characteristic. However, for head area, KS D 3631(carbon steel pipes for fuel gas piping) can be used.

3.2.3 Nonmetal material used for joint shall be gas resistant. <Revised on August 19, 2011>

3.3 Thickness (currently not used)

3.4 Construction and Dimensions

Joints shall be of a construction and dimensions conforming to the following standards to secure their safety, convenience and exchangeability.

3.4.1 Internal and external surface of joint shall be free of flaw, peeling, twist or rust that is detrimental to use.

3.4.1.1 In case pipe area is coated with polyethylene, coating shall be applied evenly and be free from flaws or foam. <Established on August 13, 2012>

3.4.2 Cross-section of jointing parts shall be circular, the thickness is uniform and both sections shall be perpendicular to axis of joint.

3.4.3 Pipe shall be painted or applied with polyethylene cover to prevent corrosion. <Revised on August 13, 2012>

3.4.4 Polyethylene pipe dimension of joint shall conform to KS M 3514 (polyethylene pipe for gases).

3.4.5 Steel pipe dimension of joint shall conform to KS D 3562(carbon steel pipes for pressure service), KS D 3564 (carbon steel pipes for high pressure pipes), KS D 3631 (carbon steel pipes for fuel gas piping). <Revised on August 19, 2011>

3.4.6 O ring shall be inserted to the connection between steel pipe and polyethylene pipe to maintain tightness. <Established on August 19, 2011>

3.4.7 In case polyethylene cover is applied to prevent corrosion of steel pipe, dimension shall follow standard below. <Established on August 13, 2012>

3.4.7.1 Thickness of cover shall follow Table 3.4.7.1 below.

Table 3.4.7.1 Thickness of polyethylene coat

Nominal diameter (A)	Cover thickness (mm)
≤ 100	≥ 1.8
$100 < \text{ to } \leq 250$	≥ 2.0
$250 < \text{ to } \leq 500$	≥ 2.2
$500 < \text{ to } \leq 600$	≥ 2.5
$600 <$	≥ 3.5

3.4.7.2 Distance from the steel pipe end to cover shall not be less than 50 mm. Uncovered part shall be painted.

3.5 Fabrication (currently not used)

3.6 Welding (currently not used)

3.7 Heat Treatment (not applicable)

3.8 Performance

Joints shall have performances in conformity to the following standard to secure their safety and convenience.

3.8.1 Product performance

3.8.1.1 Pressure-proof performance

Pressure-proof test shall be performed with a pipe or joint by filling water and applying a pressure of up to 3.4 MPa (0.6 MPa at production stage inspection) at the test temperature of $(23 \pm 2)^\circ\text{C}$, and the joint

shall not rupture nor dislocate.

3.8.1.2 Tightness performance

Tightness test shall be performed with a joint by blocking both end of joint under pressure no less than 0.4MPa and maintaining the condition for more than 1 minute at the temperature of $(23 \pm 2)^{\circ}\text{C}$, and there shall not be any leakage.

3.8.1.3 Durability performance

Durability test shall be performed with a joint by giving pressure of 0.94MPa and maintaining the condition for more than 170 hours at the temperature of $(80 \pm 2)^{\circ}\text{C}$, and the joint shall be free of any abnormality.

3.8.1.4 Polyethylene coating performance <Established on August 13, 2012>

In case the surface of steel pipe is coated with polyethylene, it shall have performance conforming to standard stated below.

- (1) Perform pinhole test on the coated surface with voltage of 10,000 V ~ 12,000 V and it shall be free of any abnormality.
- (2) Insulation resistance of non-coated pipe and coated surface shall not be less than 5 MΩ at DC 1 kV.
- (3) Peeling test shall be conducted as follows.
 - (3-1) Cut coated steel pipe with the width of 50mm.
 - (3-2) Cut the coating of the specimen longitudinally and peel one side of it for 20mm in the circular circumference direction.
 - (3-3) Hang steel ball of 15.7kg on the peeled coating and peeled length for 1 minutes shall be less than 10mm.

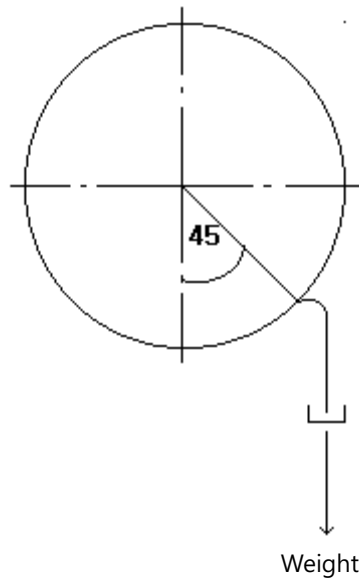


Figure 3.8.1.4 Example of peeling strength test

(4) Give minimum impact energy which is $5 \text{ J} \times \text{K}$ for minimum coating depth to the coated part of pipe joint, which is required to repeat 10 times and perform pinhole test. It shall be free of any abnormality.

Diameter (D)(mm)	K
$D > 219.1$	1.00
$76.1 < D \leq 219.1$	0.85
$D \leq 76.1$	0.70

3.8.2 Material performance

3.8.2.1 Tension resistance performance

Joint shall be free of fracture at connection part when a junction is pulled at a speed of $(100 \pm 10) \text{ mm/min}$ at $(23 \pm 2)^\circ\text{C}$.

3.8.2.2 Gas resistance performance <Established on August 19, 2011>

Nonmetal component of joint shall be free from any abnormality as softening or expansion and the rate of mass change shall be $(-8 \sim 5) \%$ when it is put in isooctane and maintained for 70 hours at

(40~50) °C.

3.8.2.3 Polyethylene coating material <Established on August 13, 2012>

In case pipe is coated with polyethylene, coated material shall be equivalent to material specified in following table.

Item	Reference value
Density (g/cm ³)	≥0.915
Tensile strength (kN/cm ²)	≥1.18
Hardness (H _D)	≥40
Softening point (°C)	≥85
Elongation at fracture (%)	≥200
Stress cracking (%)	80% shall be free from crack

3.9 Marking

Joints shall be marked in accordance with the following standard for their safe use.

3.9.1 Product marking

Items to be marked on the joint shall be as follows.

- (1) Name or symbol of manufacturer
- (2) Maximum working pressure
- (3) Nominal diameter
- (4) Date of manufacturing or lot number <Revised on December 13, 2018>
- (5) Use
- (6) Warranty period
- (7) Others

3.9.2 Acceptance marking

Joints shall be marked with an acceptance mark as follows to be identified as those accepted in the inspection in conformity to the Act, Article 39, Clause 2. <Revised on December 10, 2015>

3.9.2.1 The acceptance mark shall be as Figure 3.9.2.1. <Revised on 11.8.19>



Figure 3.9.2.1

3.9.2.1.1 The size of the acceptance mark shall be 15 mm (width) by 15 mm (height).

3.9.2.1.2 The colors of the acceptance mark shall be silver-white on its background and black in its letters.

3.9.2.2 In case joints are manufactured by an integrated production process, the acceptance mark may be marked in their production process.

4. Inspection Standard

4.1 Kinds of Inspections

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

4.1.1 Manufacturing facility inspection

The manufacturing facilities of a person who intends to manufacture joints in accordance with the Act, Article 36, Clause 2 shall undergo inspection when the installation or modification of the joint manufacturing facilities has been completed. <Revised on December 10, 2015>

4.1.2 Product inspection

A person who manufactures or imports joints in accordance with the Act, Article 39, Clause 1 shall undergo inspection in accordance with the followings to check on and maintain their performance.

However, in the case of gas appliances specified by the Enforcement Decree of the Act, the inspection may be omitted in whole or in part. <Revised on December 10, 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 an 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 product type for the first time.
- (2) A gas appliance importer imports a specific product type for the first time.
- (3) The material or construction of the product of which type has undergone design stage inspection is changed and the performance of the product is changed.
- (4) The product type has undergone design stage inspection but five years have elapsed from its last design stage inspection date.

4.1.2.2 Production stage inspection

The joints 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 2 months
		Routine sample inspection	Type	At every application
Production	Items satisfying the conformity	Regular quality	Type	Once every 3

Process Inspection	requirements of quality system for production process/self inspection process	inspection		months
		Process identification inspection	Item	Once every 3 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 6 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 same type products 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 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 one 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 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 one 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 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 is performed 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(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, who have failed process inspection or 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 which is performed once every 3 months and comprehensive quality control system audit which is 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 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 one 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 of 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 facility inspection

The manufacturing facility inspection of joints shall be performed on the following items in accordance with the Enforcement Regulation, Table 7 to check whether the 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

Inspection of joints shall be classified into design stage inspection and production stage inspection, and each inspection shall be separately performed in accordance with the Enforcement Regulation, Table 7 to check whether the joints are manufactured in accordance with the manufacturing standard:

4.3.2.1 Design stage inspection

The inspection items of design stage inspection to check whether the joints 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 an authorized test and inspection agency

is submitted, the design stage inspection of that part may be exempted.

- (1) Conformity of materials in accordance with 3.2
- (2) Conformity of construction and dimensions in accordance with 3.4
- (3) Conformity of performance in accordance with 3.8
- (4) Conformity of marking in accordance with 3.9

4.3.2.2 Production stage inspection

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

4.3.2.2.1 Product identification inspection

(1) Regular quality inspection

- (1-1) Conformity of construction and dimension in accordance with 3.4
- (1-2) Conformity of pressure-proof performance (0.6 MPa) in accordance with 3.8.1.1
- (1-3) Conformity of tightness performance (0.4 MPa) in accordance with 3.8.1.2

(2) Routine sample inspection

- (2-1) Conformity of construction in accordance with 3.4
- (2-2) Conformity of marking in accordance with 3.9

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 Items of Process Identification Audit and Comprehensive Quality Control System Audit
 <Revised on December 10, 2015>

Classification		Audit Item	Application	
			Process Identification Audit	Comprehensive Quality Control System Audit
General matters	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 appropriate quality system and review of operation results	○	○
	Human Resource	Maintenance of appropriate qualification of employees affecting quality	○	○
	Facility & Equipment	Securement of facilities and equipment conforming to product requirements and quality control	○	○
Design	Design & Development	Securement of design and development system conforming to product requirements		○
		Verification of product design through analysis of effects of potential troubles and assessment of reliability, and supply of output results		○
		Check on feasibility of design and development and operation of change procedure		○
Manufacturing	Purchase	Maintenance of appropriate management system for purchased materials	○	○

		Reflection of evaluation of suppliers to purchase policy		○
	Production	Possession of production process conforming to product requirements and verification of implementation	○	○
		Possession of acceptance criteria for process approval	○	○
		Verification of process management capability utilizing statistical technique		○
		Operation of control plan and work guidelines		○
		Preventive and forecast maintenance and operation of production tool management system		○
		Operation of systems for handling and storage of materials and products	○	○
Self-Inspection		Inspection Method & Procedure	Maintenance of methods and procedures for inspection to secure product conformity	○
	Maintenance of the 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 procedure for record management		○	○
	Analysis of measurement system			○
	Self inspection of whole items of design stage inspection (once a year)		○	
	Self inspection of whole items of design stage inspection (twice a year)			○
	Correction & Preventive		Management of nonconformity items and operation of preventive measures for recurrence prevention	○

	Measures			
	Internal Audit	Possession of capability to maintain system conformity	○	○
Obligation	Acceptance Marking	Maintenance of documented management regulation for acceptance marking	○	○
		Maintenance of separate documented regulation for manufacturing acceptance marks		○
	Safety Control	Prevention of accidents due to flawed products and circulation of nonconforming products	○	○
Others		Other matters related to maintenance of safety	○	○

4.4 Inspection Method

4.4.1 Manufacturing facility inspection

The inspection method of manufacturing facilities is checking whether manufacturing facilities and inspection facilities conforming to 4.3.1 are fully furnished. In case all required facilities are fully furnished, the inspection results shall be deemed acceptable.

4.4.2 Product inspection

4.4.2.1 Design stage inspection

The inspection method of design stage inspection shall conform to the standard established by the president of Korea Gas Safety Corporation to judge whether each inspection item conforms to the manufacturing standard.

4.4.2.2 Production stage inspection

The inspection method of production stage inspection shall conform to the followings for each inspection item to clearly 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 be one lot.

(1-2-2) The number of test specimens to be 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 of acceptance or rejection

(2-1) Product identification inspection shall be performed by performing both of 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 of acceptance or rejection**(2-1) Judgment of acceptance or rejection on process inspection applicants**

Judgment of 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 of acceptance or rejection on regular process inspection

Judgment of acceptance or rejection on the production process inspection performed once every 3 months and the comprehensive process inspection performed once every 6 months shall be made 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 of acceptance or rejection on occasional quality inspection

Judgment of acceptance or rejection on 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 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 3 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 3 months and the comprehensive process inspection performed once every 6 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 3 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 3 months from the date of the nonconformity notification issued by Korea Gas Safety Corporation.

(4) Suspension or change of 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 6 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 where 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 a gas appliance manufacturing plant conforms to the requirements of undergoing process identification audit or comprehensive quality control system audit.</p>
2. General <Revised on December 10, 2015>	
A. Organization	
(1)	The manufacturing plant shall have organizations which have 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 executed and maintained.
(3) 【Comprehensive】	<p>Research and development organizations including the followings shall be maintained to study various trouble forms which can appear in design process or after extended use and to reflect them to the design.</p> <p>(a) Person and personnel in charge of research and development</p> <p>(b) Appropriate facilities and equipment required for research and development</p>
B. Quality Control	
(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 integrity of the system shall be maintained and the system shall be updated through continuous improvement.
(3)	<p>The top management shall present the implementation evidences for 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) <Established on 15.12.10>	Documents necessary to quality system shall be managed and documented procedure necessary to management of followings shall be established. (a) Approval, review, renewal and approval (b) Identification of document (latest editions, outsourced documents etc) and distribution management (c) Prevention of misuse of nullified documents
C. Human Resources	
(1)	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: (a) Decision on qualification of personnel (b) Education and training to satisfy qualification requirements and assessment of its effectiveness (c) Maintenance of appropriate records of qualification matters
(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】	Following facilities, equipment and business environment required to conform to the product requirements shall be determined, secured and maintained: (a) Buildings, business places and utilities (b) Process equipment (hardware and software) (c) Supporting services (transportation, communication, etc.)
(2) 【Interval】	The sites shall be maintained in neatly arranged and clean conditions to conform to the requirements of products and manufacturing process.
(3) 【Comprehensive】	The means to minimize potential hazards to employees shall be manifested in design, development and manufacturing activities.
3. Design	
A. Design and Development	
(1)	Design and development capability shall be secured to materialize products conforming to the 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 potential failure mode effect analysis and reliability results (b) Characteristics of products, and specifications when required

	<p>(c) Measures to prevent mishandling of products, if applicable</p> <p>(d) Definition of products including drawings or mathematical basic data</p> <p>(e) Review results of product designs</p>
(3) 【Comprehensive】	<p>The output of process design shall be provided in a form verifiable for the requirements, be approved before its distribution, and include the followings:</p> <p>(a) Drawings, and specifications when required</p> <p>(b) Flow diagram and layout of manufacturing process</p> <p>(c) Analysis results such as potential failure mode effect analysis, etc.</p> <p>(d) Control plan</p> <p>(e) Work manuals</p> <p>(f) Acceptance criteria for process approval</p> <p>(g) Methods of detection of product/process nonconformity and feed back</p>
(4) 【Comprehensive】	<p>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.</p>
(5) 【Comprehensive】	<p>Changes in design and development shall be easily grasped and their records shall be maintained. Changes shall be reviewed, verified, checked for their appropriateness, and approved before their implementation, when applicable.</p>
4. Manufacturing	
A. Purchase	
(1) 【interval】	<p>Inspection or other activities required to ensure that purchased materials satisfy their specified purchase requirements shall be determined and implemented.</p>
(2)	<p>Suppliers shall be selected on the basis of their capability to supply materials conforming to the specified purchase requirements. The selection standard shall be established and all records related to the selection shall be maintained.</p>
(3) 【Comprehensive】	<p>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.</p>
B. Production	
(1)	<p>The manufacturer shall plan and implement production in the managed conditions including the followings:</p> <p>(a) Use of work manuals as required</p> <p>(b) Use of appropriate equipment</p> <p>(c) Measurement</p> <p>(d) Application of acceptance standard for judgment of process approval</p>

(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 philosophy 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 potential failure mode effect analyses 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 work 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 maintenance of equipment, tools and gauges (c) Availability of replaceable 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 December 10, 2015>
5. Self-Inspection	
A. Inspection Method and Procedure	
(1) 【interval】	The manufacturer shall determine the inspections to be performed, and check whether products conform to specified requirements. Inspections shall be performed in relevant stages of production process.
(2) 【interval】	The evidences 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 guarantee effective results: (a) Measurement equipment shall be calibrated or verified to the measurement standard 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 states (c) Protection from manipulation which may invalidate measurement results (d) Protection from damage or deterioration during handling, maintenance and storage
(5) 【interval】	The records of calibration and verification results shall be maintained, and the measured values shall be taken in calibrated states.
(6) 【Comprehensive】	Changes in measurement systems indicated in the results of measurement and test in each form shall be analyzed by a statistical method.
(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, December 10, 2015>
(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 authorized in accordance with KS Q ISO IEC 17025 or equivalent standard <Revised on November 17, 2014>
B. Corrective and Preventive Measures	
(1) 【interval】	It shall be assured that uncomformable products and suspicious products are identified and separately managed.
(2)	Measures shall be taken to prevent recurrence of unconformity, and the followings shall be specified in the written procedure: (a) Review of unconformity (inclusive of customer complaints) (b) Determination, implementation and recording of corrective measures
(3)	The effectiveness of the quality system shall be continuously improved through 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 potential causes of unconformity to prevent its

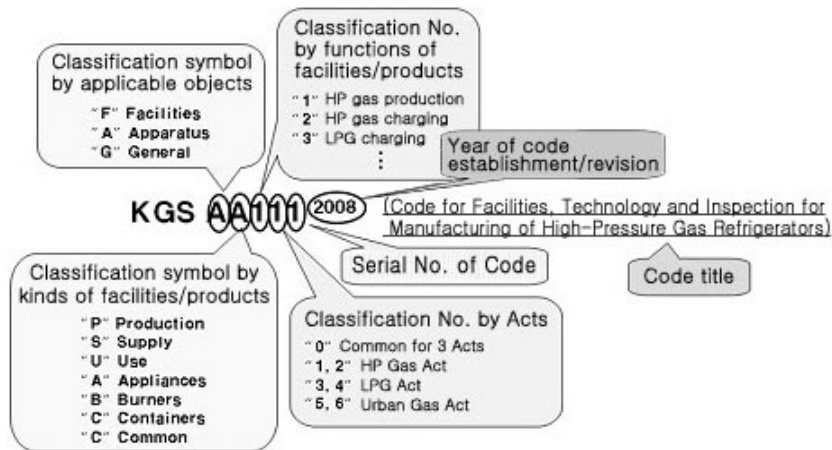
	occurrence.
C. Internal Audit	
(1)	The manufacturer shall conduct internal audits at planned intervals to check whether the quality system is effectively implemented and maintained.
(2)	Responsibility for and requirements of planning and implementation of audits, assurance of independence of audit, report of audit results and maintenance of records shall be specified in the written procedure.
6. Obligations <Revised on December 10, 2015>	
A. Acceptance Marks	
(1)	The manufacturer shall maintain a written management regulation on acceptance marks (certificates or stamps), and the records of awards, utilization, keeping and withdrawal of acceptance marks shall be updated and maintained. 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 misuse of acceptance marks (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 nonconformity 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 nonconformity case in the sampling inspection undergone by the manufacturer.
C. Others	
(1)	When any case which may cause quality deterioration of products or serious harm to the users 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 paragraph is applicable only to the objects of comprehensive process inspection.
2. **【Interval】** means that the paragraph is applicable to the inspection according to its inspection interval.
3. Paragraphs without any mark are common provisions for production process inspection and comprehensive process inspection.

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		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	General (G)	Common (C)	GC1xx	Basic matters	
		GC2xx			Common matters		

