GE 1 – 115

ON-ROAD COMPRESSED NATURAL GAS (CNG) FUEL SYSTEMS

Issued by M.O.S.P. (Ministry of Works and Public Utilities)
ENERGY SECRETARIAT
GAS DEL ESTADO

Regulations

Definitions and terminology

Specifications and procedures for all registered categories of Manufacturers and Importers

1. REGULATIONS

1.1 GENERAL

These regulations apply to every organization registering at Gas del Estado Manufacturers and Importers Registry so as to take part in the development of on-board CNG fuel systems, according to the stated categories. For those categories, the regulations apply for manufacturers and importers and in order to be registered, they shall comply with section 4 included therein. Such regulations are covered by this documentation.

Besides, they shall comply with other obligations that will be indicated in these subsections in each case. Firstly, it is important to take into account the glossary to be used hereinafter including if applicable the specific responsibilities and obligations.

1.2 DEFINITIONS

1.2.1 On-board CNG Fuel System (CNG Fuel System)

Compressed natural gas system comprising cylinder (or cylinders) with its valves and safety devices, high pressure tubing, connecting fittings, pressure regulator, necessary valves (excess flow, check, fuel, etc.), flexible low pressure tubing or connection, gas-air mixer-carburetor, solenoid valves with their corresponding contacts, cables and selector switch, pressure gauges and mounting and fastening devices fitted on road vehicles to be propelled alternatively either with liquid fuel or CNG fuel dedicated.

1.2.2 On-board CNG Fuel System Supplier (CNG Fuel System Supplier)

1.2.2.1 Physical or legal entity with enough civil, technical, economic and financial responsibility complying with the requirements for the registration in Gas del Estado Manufacturers and Importers Registry, enabled to assemble the on-board CNG fuel system.

1.2.2.2 The CNG Fuel System Supplier shall request the Gas del Estado approval of the full CNG fuel system through a university professional empowered to act in his capacity, accredited by the appropriate Professional Association, and he shall be the technical responsible of the on-board CNG fuel system and its components, cylinder or cylinders and carburetor fittings, which approval was previously granted to the manufacturers and/or importers registered in Gas del Estado Manufacturers and Importers Registry. Components shall be approved provided they comply with safety requirements according to the standards and specifications issued by Gas del Estado and/or those that Gas del Estado considers applicable, provided that those regulations are issued by a technologically developed country experienced in the CNG application.

1.2.2.3 The CNG fuel system may be supplied to third-party Installers or to the CNG Fuel System Supplier owned installation workshops, when the corresponding approved CNG equipment is identified with the corresponding code number granted by Gas del Estado.

1.2.2.4 CNG fuel system shall work considering:

1.2.2.4.1 Assembly and configuration of the components working as a system.

1.2.2.4.2 Adaptation to the vehicle model or models that will be propelled with CNG fuel system, assuring its correct performance. To this effect, the components supplier shall ensure and the CNG Fuel System Supplier shall corroborate the intrinsic aspects for due performance through

suitable testing, following guidance of GAS DEL ESTADO safety requirements when the corresponding prototypes were approved.

1.2.2.5 CNG Fuel System Supplier responsibilities:

1.2.2.5.1 To obtain initial approval of the CNG fuel system according to the standards in force and any successive approval, when modifications may adversely affect the aspects set forth specifically in the respective standard.

1.2.2.5.2 To guarantee, for legal purposes, the correct performance of the CNG system, its safety and vehicle components that may be adversely affected when mounting the system on-board.

1.2.2.2.5.3 To provide an exploded view and list of components (including make and specific number) of each system duly identified to avoid mistakes and trial and errors during the installation. To update and provide approved similar parts in case replacements and repairs of CNG fueled vehicles are needed.

1.2.2.5.4 To provide the necessary technical information for the correct selection, installation and use of the CNG Fuel System.
To write and hand out with each CNG equipment, a user manual with plain, accurate and complete instructions about the use and maintenance of converted vehicles, also including CNG characteristics, safety, parking and emergency recommendations (see GE 1-119). It shall highlight the importance of annual controls and five-yearly re-qualifications of CNG equipment as indicated by steel cylinders standards.

The guarantee mentioned in 1.2.2.5.2 including the guarantee of the Installer as regards the installation of the CNG equipment, shall be attached.

1.2.3 CNG Fuel System Components Manufacturer

1.2.3.1 Physical or legal entity with enough civil, technical, economic and financial responsibility that complies with the requirements for the registration in the Gas del Estado Manufacturers Registry, and manufactures components for CNG equipment to be used in motor vehicles.

The CNG Fuel System Components Manufacturer shall be represented by a university professional empowered to act in his capacity, accredited by the appropriate Professional Association. He shall be the technical responsible before Gas del Estado for administrative issues and for the technical aspects of the products manufactured and subject to approval.

1.2.3.2 CNG Fuel System Components Manufacturer responsibilities:

1.2.3.1 To obtain the initial approval of each component or part according to the standards in force and any successive approval, when modifications may adversely affect the aspects set forth specifically in the respective standard.

1.2.3.2 To verify the quality of components during and after standardized manufacturing processes and to carry out the tests indicated in the respective standards and those required for evidencing their good and safe operation, using own installations and / or equipment or else, testing them in recognized laboratories and / or institutes according to what is set forth in the tables included in these specifications.

1.2.4 Importers of components and/or CNG fuel systems including components for CNG Filling Stations

1.2.4.1 Physical or legal entity with enough civil, technical, economic and financial responsibility complying with the requirements for the registration in Gas del Estado Importers Registry that imports components or CNG fuel systems and/or components for compression and filling stations.

The company shall be represented by a university professional empowered to act in his capacity, accredited by the appropriate Professional Association. He shall be the technical responsible before Gas del Estado for administrative issues and for the technical aspects of the imported products both when requiring the approval of types and of successive imported batches, ordered and purchased based on the previously approved type.

1.2.4.2 Importer responsibilities:

1.2.4.2.1 To request the approval of imported prototypes

1.2.4.2.2 To control, certify and guarantee the quality of the batch components. Certificates of quality assurance issued by internationally recognized foreign Laboratories, Institutes or similar entities and /or recognized domestic entities may be accepted. Gas del Estado shall accept the tests certificates issued by National or Foreign Institutes, as expressly set forth below, for each component of a CNG equipment or components of supplementary installations, when: they credit experience based on previous certifications, except in the case of internationally recognized institutes (for example: Underwriter Laboratories – U.L, United States; T.N.O.: Institutevoor Wegtrenoportmiddlen, Holland; A.N.C.C.: Associazione Nazionale per il Controllo della Combustione, Italy; I.N.T.I.: Instituto Nacional de Tecnología Industrial, Argentina).

If necessary, the importer shall have its own facilities as mentioned in the tables included in these specifications.

1.2.5 Technologically developed country experienced in the use of CNG

This concept includes those countries that manufacture on-board CNG fuel system components, according to their own design and technology.

1.2.6 On-board CNG Fuel System Installer (Installer workshop or Installer)

1.2.6.1 Physical or legal entity with enough civil, technical, economic and financial responsibility that installs an approved CNG fuel system supplied by a CNG Fuel System Supplier, to convert vehicles originally using liquid fuel in their propulsion system.

CNG installations may be applied for bi-fuel (liquid fuel – CNG) or CNG fuel dedicated (propelled with only CNG).

1.2.6.2 Installer obligations:

1.2.6.2.1 To be contractually related to CNG Fuel System Suppliers for the purpose of:

a. Being provided with CNG fuel systems

b. Receiving permanent technical assistance regarding installation, maintenance and repair service.

c. Being provided with replacement parts.

1.2.6.2.2 To install only CNG approved fuel systems according to the CNG Fuel System Supplier's instruction guide and subject to the relevant safety standards specifications in force in the country.

1.2.6.2.3 To keep a record of converted motor vehicles including any observation set forth by the regulations

1.2.6.2.4 To affix the sticker in converted motor vehicles with the legend: "GAS Propelled"

1.2.6.2.5 To hand out to the owner of the CNG vehicle the "Driving and Maintenance Manual" provided by the CNG Fuel System Supplier. The Installer shall additionally hand out to the

vehicle owner an installation guarantee plus the one provided by the CNG Fuel System Supplier for the CNG Fuel System supplied.

To write and hand out the pertinent certificate to the motor vehicle owner, as indicated below.

1.2.6.2.6 To service motor vehicles with defective installation, before guarantee expires.
To make the repairs (adjustment and/or change of components) in motor vehicles using CNG in their propulsion system, only with approved components.

1.2.6.2.7 To keep an adequate record of repairs.

1.2.6.2.8 To collaborate with the competent authority in the annual inspections of motor vehicles converted to CNG (see specifications)

1.2.7 Manufacturer of CNG fuelled motor vehicles

1.2.7.1 Manufacturing plant operating according to Law Nr. 21932 or one superseding it, that produces motor vehicles fitted with specific components for using CNG in their propulsion system, either as dedicated (only CNG) or bi-fuel (liquids – CNG) motor vehicles

1.2.7.2 Manufacturers activities and obligations

1.2.7.2.1 The requirements included in the definitions stated above must be complied with by the manufacturers for acting according to one or more definitions, incorporating the necessary changes to avoid repetitions.

1.2.7.2..2 Components to be used shall be approved if they are supplied by the CNG Vehicle Manufacturer like an On-Board CNG Fuel System Supplier or using full approved On-Board Fuel System when directly assembling it in a production line.

1.2.7.2..3 The standards set forth for each activity shall be applied to each of the activities performed by the manufacturer.

2. DEFINITIONS AND TERMINOLOGY

2.1 CNG – COMPRESSED NATURAL GAS

2.2 BI-FUEL SYSTEM
Conversion kit (making up a CNG fuel system) enabling the motor vehicle to be propelled either with liquid fuel according to its original design or with CNG.

2.3 CNG FUEL SYSTEM
Conversion kit assembled as a fuel system consisting of different components through which gas flows, fitted for bi- fuel use to the vehicle original carburetor, consisting of high pressure storage cylinders, valves, tubing, couplings, pressure regulator, solenoid valves, cables and selector switch, flexible fuel line and mixer.

2.4 CNG CYLINDERS
Cylindrical containers made of manganese steel or low alloy steel – nickel chrome or nickel chrome molybdenum – or alloy aluminum with composite liner.
Steel cylinders are manufactured as of billets, seamless tubes or deep drawn discs and for a water capacity of: 30, 40, 50, 60 and 150 liters (applying specifications D.O.T. 3 A and 3.A.A., cylinders of up to 453 l of water capacity may be manufactured). Canadian C.T.C specification is equivalent to US D.O.T specification.

Italian specifications issued in DM of 9-12-1925 and successive ones, allow manufacturing of cylinders of up to 150 l water capacity.

2.4.1 Aluminum cylinders with composite wrapped cover
Cylinders manufactured as of a seamless aluminum alloy tube with tapered ends.
The cylinder is wrapped with a polyester resin impregnated glass filament and subject to curing and other special treatments.

These containers shall comply with the specifications contained in US D.O.T.-E 8725 or in special permit 1465, Revision number 1 of Commission Canadienne des Transports, Canada.

2.5 D.O.T. = Regulation of Départament of Transportation – US. Department of Transport Regulations, specifying the manufacturing of cylinders and requirements for interstate transportation.

2.6 C.T.C. = Regulations for the Transportation of Dangerous Goods by rail, Canada. D.O.T. equivalent.

2.7 D.M. – Italy- = Ministry Decrees.
In Italy, the institutes responsible for cylinder approval and control are: I.G.M.C and A.N.C.C.

2.7.1 I.G.M.C: Inspettorate Generale per motorizzazzione civile: General Inspection for civil motor vehicles - is responsible for portable cylinders.

2.7.2 A.N.C.C: Associazione Nazionale per el Controllo della Combustione: National Association for Combustion Control - is responsible for fixed cylinders.

2.8 SAFETY DEVICES IN CNG CYLINDERS

Mechanisms for protecting the cylinders from sudden burst when exposed to fire or to any other factor that may produce internal overpressure.

2.8.1 Pressure relief valve
Usually a spring-loaded valve placed in large containers (mostly, tanks for fixed installations) that opens the outlet and vents to the atmosphere in case of overpressure and closes it when the pressure in the container returns to normal values (for which the valve has been rated)

2.8.2 Burst disc and fusible plug
Safety device placed at the end of CNG cylinders which length exceeds 1.65 m (valve threading area is not considered), and consisting of a burst disc and a fusible plug. The disc is so designed and rated as to burst at a higher pressure than the hydrostatic test pressure of the cylinder, but lower than its burst pressure. The fusible plug operates at 100 ± 4°C, when consequences of fire are worse than overpressure.
This combination operates by melting or rupture, discharging all the gas content from the cylinder.
(Regardless of the cylinder length, its valve must be fitted with this combined safety device). The disc must burst at a pressure of 340 bar ± 10%.

2.9 ASME CODE: Code of the American Society of Mechanical Engineers that lays down all the aspects related to calculations, tests and use of fixed pressure vessels.

2.9.1 Section VIII - Div I: Specifies the calculation and tests of pressure vessels of any size and type, for permanent installations specially manufactured and not exposed to direct fire.

2.10 BI-FUEL SERVICE STATION
Facilities where liquid and gaseous fuels may be supplied from dispensers, lubricants may be sold and services like vehicle water supply, compressed air, greasing and car wash may be provided. In rural stations, greasing and car wash services are not mandatory; however, they must be equipped with a ramp or other installation for the mechanical inspection of the motor vehicles.

2.10.1 Single-fuel Service Station
Same as 2.10 for liquid fuels or only for CNG

2.10.2 Bi-fuel dispensing outlet
Facility for dispensing liquid and gaseous fuels through dispensers, and lubricants supply

2.10.2.1 Single fuel dispensing outlet
Same as 2.10 exclusively for liquid fuels or for CNG

2.10.3 Consumer Owned dispensing outlet
Installation for dispensing fuels (liquid or gaseous, or liquid and gaseous) through dispensers located inside industrial, commercial, public agencies and other establishments, for servicing only vehicles related to their activities.

2.11 OPEN FLAME OR SPARKS
Permanent or sporadic potential cause of sparks or flames.

2.12 PARTY WALL
Wall that limits neighboring properties.

2.13 FIRE PLAN
Plan specifying the roles of the CNG filling station personnel, including its supervisor or manager, in case of a fire.

2.14 EXPLOSION-PROOF
Installation constructed such that in case of internal gas explosion, it does not propagate outside. Explosion-proof electrical installations shall comply with US National Electricity Code (N.E.C.), and the equipment and appliances shall comply with the applicable Underwriters Laboratories (U.L) specifications and I.R.A.M standards.

2.15 CNG DISPENSER
Installation made up of a measurement system and other components necessary for filling vehicle cylinders with CNG.

2.16 UL American Institute of standardization and testing of elements and hazardous substances.

2.17 CNG STORAGE TANKS
Cylindrical vessels with at least 1,000 liters water capacity constructed in compliance with A.S.M.E. Code, Sec. VIII, Div. I, and similar specifications.

2.18 CNG CYLINDER STORAGE BANKS
Detachable set of cylinders with 50 or more liters water capacity, mounted vertically or horizontally, fixed and secured on a specially manufactured structure in which all the vessels are connected to a manifold for operating as a whole.

2.19 CNG PACKAGED COMPRESSION AND STORAGE
Compression and storage systems usually mounted together on a metallic structure with or without a protective shelter.

3. SPECIFICATIONS AND PROCEDURES

3.1 FOR THE MANUFACTURING OF CNG CYLINDERS

3.1.1 CNG cylinders to be mounted on motor vehicles as part of the CNG equipment shall be manufactured such as to operate at a normal working pressure of 200 bar M at 21 ± 1º C.

3.1.2 Argentine manufacturing of steel cylinders shall comply with I.R.A.M 2526 standard, when applicable.

3.1.2.1 Argentine manufacturing of Class A steel cylinders shall also comply with the specifications of Annex # 1 to this Part.

3.1.2.2 Argentine manufacturing of Class B steel cylinders shall also comply with the specifications of Annex # 2.

3.1.3 The pertinent specifications for Argentine manufacturing of alloy aluminum cylinders with composite cover shall be timely drafted.

3.1.3.1 Standards and / or specifications from countries experienced in the design and construction of CNG cylinders for updating technological development not covered by specifications of points 3.1.2.1 and 3.1.2.2 may be applied.

3.1.4 The registered manufacturer shall submit the necessary prototypes for qualification testing in Gas del Estado laboratories or in those determined by Gas del Estado.

When the prototype is approved and the approval number is assigned, the manufacturer is authorized to produce cylinders based on the approved type, after requesting a permit. This shall be carried out in batches consisting of maximum two hundred units or less, if Gas del Estado so requires it.

3.1.5 The approval number shall be valid for five years as of the date it has been granted.

During such period, cylinders design or type of steel used must not be modified.

After five years, the following tests and verifications must be carried out on each cylinder: hydrostatic test, measurement of permanent volumetric expansion, verification of tare, ultrasonic thickness measuring, inspection of general condition and corrosion level.

The cylinder shall only be used for five years more if its condition and the tests values are acceptable and meet the standards requirements.

3.1.6 Before starting production, the manufacturer must inform in a note, the tons or meters of material deemed necessary for his manufacturing technology attaching a certificate of the pertinent plant indicating the steel quantitative chemical composition, Brinell hardness, and any other data required by the manufacturing standard in force.

Data not provided by the steel plant may be determined by a local testing institute or by the cylinder manufacturer, as the case may be.

3.1.7 Once the specifications of subsection 3.1.6. are complied with, the manufacturer may produce cylinders based on the approved type, carry out the controls and methods of test stated in the following tables for type approval and production control.

TABLE # 1
NATIONAL MANUFACTURING OF TYPE "A" CYLINDERS
TABLE OF APPROVAL TESTS FOR TYPE CYLINDER

OPERATION OR TEST TYPE	CARRIED OUT BY THE MANUFACTURER OR BY CERTIFICATION	CRITERIA TO BE FOLLOWED BY GAS DEL ESTADO, AUTHORITY GRANTING THE APPROVAL
1. Standard steel quantitative chemical composition	By certificate of manufacturing plant	Gas del Estado accepts certificate. Verifies when deemed convenient
2. Brinell hardness, when required by the standard	By manufacturing plant or institute certificate	Gas del Estado will accept certificate. It reserves the right of verification.
3. Tests of physical properties on specimens	Carried out by the manufacturer or, optionally at an Institute, submitting certificate.	Cylinder from which specimens will be taken out shall be submitted. Gas del Estado will determine the need of doing tests.
4. Internal inspection and thicknesses measurement.	Carried out by the manufacturer	Verified at inspection.
5. Once cylinder is finished and heat treatment performed	Manufacturer will carry out non-destructive examination for detecting cracks or flaws	Gas del Estado may verify it
6. Control of dimensions. Tare. Volume (in liters water capacity)	Carried out by the manufacturer	Gas del Estado may verify it
7. Hydrostatic test at 1.5 times working pressure (300 bar)	Carried out by the manufacturer	Gas del Estado will verify the test
8. Measurement of volumetric expansion at 300 bar and permanent expansion once pressure is released (**≤ 10%** of the total)	Carried out by the manufacturer	Gas del Estado will verify the test
9. Hydrostatic pressure burst test up to burst	Carried out by the manufacturer or by an Institute	Gas del Estado accepts test value according to the manufacturer or Institute
10. Tapered thread according to ANSI B 57.1 or DIN 477 UNI 339, BS 341 IRAM 2539	Control with caliper thread carried out by the manufacturer	Gas del Estado will verify it
11. Marking data: a. Approval number b. Tare c. Water capacity d. Working pressure in Bar e. Test pressure f. Date of approval g. Manufacturing date h. Manufacturer i. For CNG	Carried out by the manufacturer	Gas del Estado will verify it
12. Pneumatic leak test. Cylinders closed by spinning or plugged	Carried out by the manufacturer	Gas del Estado will verify the test

TABLE # 2
TESTS FOR CLASS "A" CYLINDERS MANUFACTURED ACCORDING TO THE APPROVED TYPE

OPERATION OR TEST TYPE	**CARRIED OUT BY THE MANUFACTURER OR BY CERTIFICATION**	**CRITERIA TO BE FOLLOWED BY GAS DEL ESTADO, AUTHORITY GRANTING THE APPROVAL**
Report of batch data and quantitative chemical analysis of representative sample	Manufacturer's note and plant's certificate	Gas del Estado accepts note and certificate.
1. Brinell hardness, when required by the standard	Plant's certificate	Gas del Estado accepts certificate.
2. Tests of physical properties on specimens	Carried out by the manufacturer with sample cylinder taken out from 1 cylinder every 100 manufacturers	Gas del Estado may verify by itself or by third parties or by inspection of batch permits.
3. Tests numbers 4, 6, 7, 8, 10 and 12 of table #1 Test number 5	Carried out by the manufacturer on each manufactured cylinder. On each cylinder, if the manufacturing process so requires	Gas del Estado may verify by itself or by third parties or by inspection of batch permits.
4. Operation item 11, table # 1	Carried out by the manufacturer	Verified at Inspections and when Gas del Estado grants the approval
5. Test number 9. Table # 1	Carried out by the manufacturer according to his criteria and manufacturing technology. Optionally, at Institutes with identical criteria	Gas del Estado will verify this test at the plant when deemed convenient (initially, one test would be performed annually)

TABLE # 3
NATIONAL MANUFACTURING OF CLASS "B" CYLINDERS
TABLE WITH APPROVAL TESTS FOR CYLINDER TYPE

OPERATION OR TEST TYPE	CARRIED OUT BY THE MANUFACTURER OR BY CERTIFICATION	CRITERIA TO BE FOLLOWED BY GAS DEL ESTADO, AUTHORITY GRANTING THE APPROVAL
1. Quantitative chemical analysis of alloy steel used	Certificate of manufacturing plant	Gas del Estado accepts certificate. It may verify when deemed necessary.
2. Brinell hardness, when required by the standard	Certificate of manufacturing plant or institute	Gas del Estado accepts certificate.
3. Tests of physical properties on specimens	Carried out by the manufacturer or, optionally, at the Institute, submitting certificate.	Cylinder from which specimens will be taken out shall be submitted. Gas del Estado will determine the need of doing tests.
4. Crushing test on a finished cylinder	Carried out by the manufacturer or, optionally, at an Institute, submitting certificate.	Cylinder for test will be submitted, and test implementation shall be decided.
5. Cylinder internal inspection and thicknesses measurement	Carried out by the manufacturer	Verified at inspections.
6. Once cylinder is finished and heat treatment performed	Manufacturer will carry out non-destructive examination for detecting cracks or ruptures	Gas del Estado may verify it
7. Control of dimensions. Tare. Volume (in liters water capacity)	Carried out by the manufacturer	Gas del Estado may verify it
8. Hydrostatic test at 1.5 times working pressure (300 bar)	Carried out by the manufacturer	Gas del Estado will verify the test
9. Measurement of volumetric expansion at 300 bar and permanent expansion once pressure is released (**≤ 10%** of the total)	Carried out by the manufacturer	Gas del Estado will verify tests
10. Hydrostatic pressure test up to burst	Carried out by the manufacturer or, optionally, by an Institute	Gas del Estado accepts test value according to the manufacturer or Institute
11. Tapered thread according to ANSI B 57.1 or DIN 477 UNI 339, BS 341 IRAM 2539	Control with caliper thread carried out by the manufacturer	Gas del Estado will verify it
12. Marking data: a. Approval number b. Tare c. Water capacity d. Working pressure in Bar e. Test pressure f. Date of approval g. Manufacturer number h. Manufacturer i. For CNG	Carried out by the manufacturer	Gas del Estado will verify it
13. Pneumatic leak test at 200 bar inspecting the end closed by spinning. A localized test shall be	Carried out by the manufacturer	Gas del Estado will verify the test

performed. Due to lack of equipment, a general test may be carried out with air or inert gases after the Hydrostatic Test.		

TABLE # 4
TESTS FOR CLASS "B" CYLINDERS MANUFACTURED ACCORDING TO THE APPROVED TYPE

Test method or operation	**Carried out by the manufacturer or by certification entity**	**Criteria to be followed by Gas del Estado, authority granting the approval**
1. Report of batch data and quantitative chemical analysis of representative sample	Manufacturer's note and steel tube mill's certificate	Gas del Estado accepts note and certificate.
2. Brinell hardness, when required by the standard	Steel tube mill's certificate	Gas del Estado accepts certificate.
3. Tests of physical properties on specimens	Carried out by the manufacturer with specimens taken out from 1 cylinder out of 100 manufactured or certificated.	Gas del Estado may verify by itself or by third parties or by inspection of batch permits.
4. Crushing test on a finished cylinder	Carried out on 1 cylinder out of 100 manufactured, by the manufacturer or by certification	Same as previous one
5. Operation and tests numbers 5, 6, 7, 8, 9 and 11.	Carried out by the manufacturer on each manufactured cylinder. Number 6 must be performed when the manufacturing process so requires.	Same as previous one
6. Test number 10 - Table # 3	Carried out by the manufacturer, according to manufacturing criteria and technology. Optionally, at institutes	Gas del Estado will verify this test at the plant when deemed convenient. Initially, one test would be performed annually.
7. Marking data according to 12 Table # 3	Carried out by the manufacturer on each manufactured cylinder	Gas del Estado will carry out the verification
8. Test number 13 Table # 3	Carried out by the manufacturer on each cylinder when it corresponds	Gas del Estado may verify by itself or by third parties or by inspection of the batch permits.

3.2 FOR THE IMPORT OF CYLINDERS

3.2.1 Imported steel cylinders for CNG shall operate at a normal working pressure of 200 bar M at 21 ± 1º C. Preferably, they shall comply with requirements of IRAM 2526 Standard as applicable together with the attachments included in annexes 1 and 2 to this document.

3.2.1.1 Other codes, specifications or standards from countries of recognized technological development and experienced in the use of CNG may be accepted by Gas del Estado, after a comparative technical analysis performed by the Technical Representative of the import company proves the similarity with the specification stated in 3.2.1

3.2.1.1.1 The tapered thread of imported cylinders may comply with the standard of the country of origin.

3.2.1.2 Before importing cylinders, the registered import company shall submit types approved in the country of origin for Gas del Estado verification.

3.2.1.3 Once Gas del Estado approves the imported type and the pertinent approval number is granted, the company shall be ready to import "cylinder batches" which shall be marked according to item 12 of Table # 3, so as to obtain batch permits.

Furthermore, certifications, controls and/or tests shall be carried out as indicated above. Those certificates shall be signed by the Technical Representative of the import company.

3.2.1.3.1 For type approval, Gas del Estado shall accept the certifications issued by internationally recognized Institutes and those of the exporting country, for the items: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12 and 13 of table # 3.

The importer shall carry out the control stated in items 7 and 11 of said table.

Gas del Estado shall act according to what is stated in the preceding tables.

3.2.1.3.2 For authorizing batches of cylinders based on the approved type, it shall submit certificates of the country of origin for items: 1, 2, 3, 4, 5, 6, 8, 9 and 13 of table # 3.

Item 5 of table # 3, thicknesses measurement, shall be verified by the importer, by ultrasonic procedure, on the samples he determines.

Items 7, 11 and 12 of table # 3 shall be verified by the importer.

Item 10 of table # 3 shall be performed at a local institute, as frequent as the undersigning professional considers necessary.

Gas del Estado shall act according to what is stated in the preceding tables.

3.2.2 Imported Aluminum composite hoop wrapped cylinders and subsequent special treatment shall comply with:

i. US D.O.T. E 8725 regulation and shall be approved in that country by a competent Institute and based on updated requirements.
ii. Or, they shall comply with special permit number 1465, revision number 1 of the Commission Canadienne des transports, Canada and shall be approved in that country by a competent Institute and based on updated requirements.

Besides, the importer shall attach the manufacturing technical specifications and recommendations for mounting and use, for periodical controls and any other type of information derived from the experience in the use of those containers in motor vehicles using CNG in their propulsion system.

3.3 FOR THE MANUFACTURE OF CNG FUEL SYSTEM FITTINGS

3.3.1 As regards construction and safety, design of the carburetion system fittings shall comply with the requirements and the tests specified for each of them in standard GE number 1-117.

3.3.2 Those fittings that based on their function must ensure a flow at minimum rate; and those that besides the flow of rate, must regulate the discharge pressure, will be designed and tested such as its manufacturer guarantees accuracy of the specification figures supplied, so that the on-board CNG Fuel System Supplier may, in turn, recommend and guarantee their installation in motor vehicles using CNG in their propulsion system.

3.3.3 In the following tables, the tests for prototype approval are described. The criteria to be followed by Gas del Estado, the controls to be carried out by the manufacturers or, else by local Laboratories or Institutes in serial manufacturing and the inspections and/or controls of the competent authority are described.

TABLE # 5
TESTS ACCORDING TO GE Nr. 1 – 117 FOR
MANUAL VALVES TO BE INSTALLED IN CNG CYLINDERS

Test method or operation	**TYPE APPROVAL**		**SERIAL MANUFACTURING**	
	Carried out by the manufacturer or at a domestic Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or at a domestic Institute**	**By Gas del Estado**
Nr. 1 – The valve set in an open position and with the outlet is placed on a muffle at 120ºC during 24 hours. Immediately, after withdrawing it, pneumatic leak test is carried out at a pressure of 300 bar with air or inert gases.	Optionally, by the manufacturer or by local Institute	Gas del Estado accepts certificate or manufacturer's report and shall perform the test if deemed necessary.	At the manufacturer's criteria according to its manufacturing technology, he shall perform control at his facilities or at private Institute and shall record them in worksheets	Gas del Estado shall periodically inspect manufacturing facilities and shall check the worksheets and manufacturing processes.
Nr. 2 – Same as Nr. 1 but the valve is exposed to -40ºC in a cryogenic chamber	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 3 – same as Nr. 1, but the valve is subject to corrosion test following the specifications of ASTM D 117 standard, as stated in subsection 1.5 of GE Nr. 1 – 117, Part II. Then, pneumatic leak test at 300 bar is carried out.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 4 – Same as Nr. 1, but the valve is exposed to vibration test as specified in subsection 1.6 of GE Nr. 1 – 117,	Same as previous one	Same as previous one	Same as previous one	Same as previous one

Part II. Then, pneumatic leak test at 300 bar is repeated.				
Nr. 5 – Same as Nr. 1, but brass valves are tested with mercurous nitrate solution according to what is set forth in item 1.11 of GE Nr. 1 – 117 standard, Part II. Then, pneumatic leak test at 300 bar is repeated.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
NOTE: Air pressure tests must be performed after hydrostatic pressure tests				
Nr. 6 – 7 – 8 – 9 – 10 Tests 1, 2, 3, 4, 5 are repeated with the valve inlet in closed position	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 11 – Hydrostatic pressure test at 500 bar, with valve inlet in closed position. The test is repeated with the inlet in open position. In both tests, valve outlet shall be plugged	It must be carried out by the manufacturer before pneumatic leak tests are carried out by him or by third parties	Same as previous one	For the sake of safety, during the manufacturing process, the manufacturer must test every unit at a hydrostatic pressure not lower than 300 bar and according to the standard, when he deems it necessary	Same as previous one
Nr. 12 – Non-metallic synthetic immersion test according to subsection 1.14, GE Nr. 1 – 117 Standard, Part II, on rings, pads, etc.	By Laboratory or local Institute certificate	Same as previous one	Certified at the Institute. Frequency of these controls shall be at manufacturer's criteria	Same as previous one
Nr. 13 – Comparison of measures, weights and other construction characteristics with the plan and technical specifications.	Carried out by the manufacturer	Gas del Estado will perform verifications	Control at the manufacturing plant according to his own criteria and responsibility. He shall prepare worksheets	Same as previous one
Nr. 14 – Verification that incorrect assembly is not possible	Carried out by the manufacturer	Gas del Estado will perform verifications	Same as previous one	Same as previous one

Nr. 15 – Verification of threads with standard boards	Carried out by the manufacturer	Gas del Estado will perform verifications	Control of each unit at manufacturing plant	Same as previous one
NOTE: For the previous tests. The valve shall have a plug instead of the device that includes fusible plug and burst disc				
Nr. 16 – On a valve with burst disc, applying hydrostatic pressure, verify the maximum pressure value that the disc withstands.	Carried out by the manufacturer	Gas del Estado will accept manufacturer's report and will perform the test if deemed necessary	Periodic control carried out by the manufacturer or at an Institute, according to the device supplier's responsibility. He shall prepare Worksheets	Same as previous one

CORRESPONDS TO TABLE # 6
TESTS ACCORDING TO GE 1 – 117 - FILLING VALVES FOR ON-BOARD CNG FUEL SYSTEM

All the tests and operations for this fitting shall be performed with the pertinent modifications and, according to the guidelines included in table # 5 for cylinder manual valves. Identical criteria shall be applied for approvals and controls.

TABLE # 7
TESTS ACCORDING TO GE 1 – 117 FOR PRESSURE REGULATORS TO BE INSTALLED IN ON-BOARD CNG FUEL SYSTEM

Test method or operation	**TYPE APPROVAL**		**SERIAL MANUFACTURING**	
	Carried out by the manufacturer or in a domestic Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or in a domestic Institute**	**By Gas del Estado**
Nr. 1 – Hydrostatic pressure test at 400 bar performed at 20 - 5º C and applied to the inlet of the regulator chamber with the outlet plugged. Then, with the valve seat in open position, a hydrostatic pressure twice the operating pressure downstream of the seat, or the upstream operating pressure, whichever the highest, is applied to the chamber located downstream of the seat. In the case of pressure regulators that contain more than one valve seat, the test is repeated with the valve seat in open position, and twice the value of the pressure downstream of the valve seat or the upstream pressure value, whichever the highest is applied.	Manufacturer MUST perform it	Gas del Estado will accept manufacturer's report and shall perform the test if deemed necessary.	For the sake of safety, during the manufacturing process, the manufacturer must test every unit at a hydrostatic pressure not lower than 250 bar and according to the standard when he deems it necessary. He shall prepare control worksheets	Gas del Estado will periodically inspect manufacturing facilities and check the worksheets and the installation as well as the manufacturing processes.
Nr. 2 – Shut off pressure test, according to item 1.4	Carried out by the manufacturer	Same as previous one	Carried out by the manufacturer on each unit. He will prepare worksheets.	Same as previous one
Nr. 3 – Corrosion resistance test, according to item 1.5 and then,	Optionally, at manufacturing facility or at local	Gas del Estado accepts report or certificate and, if	At the Manufacturing Facility or Institute,	Same as previous one

pneumatic leak test at 300 bar.	Institute	deemed necessary, it shall perform the test.	at manufacturer's criteria. He shall also decide frequency. He will prepare worksheets.	
Nr. 4 – Vibration resistance test according to item 1.6 and then, pneumatic leak test at 300 bar.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 5 – Regulator is placed in a muffle at 120ºC and then, pneumatic leak test at 300 bar.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 6 – Same as Nr. 5, but the regulator is frozen at -40ºC in cryogenic chamber.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 7 – Brass regulators are tested with mercurous nitrate, according to item 1.11 and then, pneumatic leak test at 300 bar.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 8 – Durability, according to item 1.8, complying with 100,000 opening and closing cycles. Then, pneumatic leak test at 300 bar at room temperature.	Same as previous one	Same as previous one	Same as previous one	Same as previous one
Nr. 9 – Non-metallic synthetic immersion test according to subsection 1.14 for non-metallic synthetic material of rings, diaphragms, pads, closures, etc.	Certified by Laboratory or Institute	Same as previous one	By Laboratory or Institute. Same as previous one	Same as previous one

CORRESPONDS TO TABLE # 8
TESTS ACCORDING TO GE 1 – 117 FOR CHECK VALVES

TO BE INSTALLED IN CNG FILLING SYSTEM
All the tests and operations for this fitting shall be performed with the pertinent modifications and, according to the guidelines included in table # 5 for cylinder manual valves.

Identical criteria shall be applied for approvals and controls.

TABLE # 9
TESTS ACCORDING TO GE 1 – 117 FOR SOLENOID VALVES

Test method or operation	**TYPE APPROVAL**		**SERIAL MANUFACTURING**	
	Carried out by the manufacturer or at a domestic Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or at a domestic Institute**	**By Gas del Estado**
Nr. 1 – Subjected to 100,000 opening and closing cycles. Then, pneumatic leak test at 250 bar according to item 1.8.2, Part II, GE 1 – 117 standard.	Optionally, by the manufacturer or Institute	Gas del Estado accepts certificate and, if necessary, it shall carry out the test	Manufacturer does the control at the manufacturing facility or Institute as frequent as he deems necessary. He will prepare worksheets	Gas del Estado will periodically inspect manufacturing facilities and check the worksheets and manufacturing processes.

TABLE # 10
TESTS ACCORDING TO GE 1 – 117 FOR FUEL SELECTOR SWITCHES

Operation or test type	**TYPE APPROVAL**		**SERIAL MANUFACTURING**	
	Carried out by the manufacturer or at a local Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or local Institute**	**By Gas del Estado**
Nr. 1 – Test according to item 1.8.3, Part II, 100,000 operating cycles.	Optionally, at the manufacturing facility or Institute	Same as previous one	Same as previous one	Same as previous one
Nr. 2 – Test according to item 1.12, Part II. Dielectric strength	Same as previous one	Same as previous one	Same as previous one	Same as previous one

TABLE # 11
TESTS ACCORDING TO GE 1 – 117 FOR PRESSURE GAUGES

Operation or test type	TYPE APPROVAL		SERIAL MANUFACTURING	
	Carried out by the manufacturer or in a local Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or local Institute**	**By Gas del Estado**
Nr. 1 – Hydrostatic pressure test. Working range 0-400 or 408 bar. Test pressure = 500 bar.	Carried out by the manufacturer	Gas del Estado accepts report and, if deemed necessary, it will perform test	During manufacturing process, each unit shall be tested at the maximum pressure displayed in the indicator. Worksheets.	Same as previous one

TABLE # 12
TESTS ACCORDING TO GE 1 – 117 FOR CNG FILLING HOSES

Operation or test type	TYPE APPROVAL		SERIAL MANUFACTURING	
	Carried out by the manufacturer or a domestic Institute	**By Gas del Estado, authority granting the approval**	**By the manufacturer or a domestic Institute**	**By Gas del Estado**
Nr. 1 – Hydrostatic pressure test at 800 bar	Carried out by the manufacturer	Gas del Estado accepts report and, if deemed necessary, it will perform test	For the sake of safety, during manufacturing process, each assembled hose shall be tested at 300 bar. At manufacturer's criteria according to C.P. standard.	Gas del Estado will periodically inspect manufacturing facilities and check the worksheets and manufacturing processes.
Nr. 2 – Verification of the device coupling the hose to the structure (tensile test)	Same as previous one	Same as previous one	Control frequency at manufacturer's criteria. He shall prepare worksheets.	Same as previous one
Nr. 3 – Cycling test on hose valve and pneumatic leak test at 300 bar.	Valves manufacturer's certificate according to tests Table # 5.	Same as previous one	Same as previous one	Same as previous one
Nr. 4 – Verification of the device coupling the fuel valves to the structure	Carried out by the manufacturer	Same as previous one	Same as previous one	Same as previous one
Nr. 5 – Non-metallic synthetic immersion test	Certificate of Laboratory or	Same as previous one	Same as previous one	Same as previous one

according to subsection 1.14 for non-metallic synthetic material in contact (rings, closure and inner lining of the hose)	Institute			

NOTE: parts and fittings not included in the previous tables (5 to 12 included) shall be tested according to their design, applying safety concepts comprised in GE 1 - 117 Standard. For example: for mixers, if they have moving parts, cycles, vibration test, corrosion test – according to material and/or superficial finishing – shall be performed.

3.4 FOR THE IMPORT OF CNG FUEL SYSTEM FITTINGS

3.4.1 The set of fittings that with one or more cylinders constitute a full CNG Fuel System shall be approved at the country of origin complying with the requirements and specifications of local standards (or the ones listed in G E 1 – 117 standards).

The manufacturer or recognized Certification Institute certificate shall be attached to each approved component. Such certification will clearly detail the tests performed and the results obtained for each component.

Gas del Estado shall accept the certificates for types approval when the import company Technical Representative, guarantees in a technical report, that the certified results complied with the minimum safety requirements when tested according to the country of origin standards.

Furthermore, it shall be guaranteed that data reported for those components that provide regulated pressures and minimum flows are accurate.

The type of thread used in fittings set components may comply with the standard of the country of origin.

Availability of spare parts in case of eventual replacements must also be ensured.

3.4.2 Once the requirements are complied with and the types are approved, the company may import batches of sets or components and, the Technical Representative will sign the certificates and data supplied which, in each case, must comply with the specifications contained in the preceding tables 5 to 12, as regards manufacturing controls.

The corresponding marking required by GE 1 – 117 Standard in part I for each component must be complied with, especially as regards the approval number granted by Gas del Estado.

3.5 FOR ON-BOARD CNG FUEL SYSTEM SUPPLIERS

3.5.1 Besides the statements included in items 1.2.2 to 1.2.2.5.5 and in order to comply with the specifications of item 1.2.2.5.1, the CNG Fuel System Supplier must install, in a motor vehicle, the equipment subjected to approval, according to the specifications of GE 1 – 116 standard and the instructions included in the technical booklets of the approved components, after carrying out the required verifications stated in the preceding items.

A demo may be run at his facilities or else, at third parties' workshops that count with chassis dynamometers and other necessary tools and equipment for performing the controls of operation at simulated speed.

Instead of running a demo on a chassis dynamometer, it may be carried out at a driving circuit; in these cases, requirements of subsection 7) shall be optional.

The provisions of this Regulation also apply to CNG vehicle manufacturers.

When the authority granting the approval (Gas del Estado) is present, the following shall be shown:

1. That the stages for arrangement of the On-Board CNG Fuel System components are the most adequate ones as regards safety.
2. That the vehicle structure shall not be affected when the cylinders are filled.
3. That the connections are gas-tight and that no leaks are detected.
4. That there are no difficulties at ignition
5. That the alternative switch from one fuel to the other does not fail and that it is safe and quick.
6. That the operation with CNG at different speeds, alternatively pressing and releasing the acceleration pedal is correct and verifying that the components remain unaltered and that no risky displacements are produced, and that noise and performance are acceptable.
7. Exhaust gases temperature shall be measured at different speed patterns and in each of them, they shall be analyzed.

3.5.2 If the CNG equipment is from a technologically developed country with experience in its use, demos on every vehicle type and model in which such equipment may be installed, is not necessary. The catalogs of the country of origin are accepted and demo only on one of the vehicles for which it is recommended must be run.

3.5.3 Instructions, operations and maintenance manual

3.5.3.1 The following guidelines are intended to simplify the writing by the On-Board CNG Fuel System Supplier of the above mentioned manual, to be delivered to the installation workshop with each equipment and then, handed out to the owner of the vehicle in which the equipment is installed:

a) Gas characteristics and performance in internal combustion engines. Components characteristics and CNG fuel system operation.

b) Vehicle ignition and operation. How to select one fuel or the other in bi-fuel systems; advantages and disadvantages.
c) Recommendations when filling CNG in authorized service stations and procedures to be followed, also in case of emergency.
d) Where and how to park
e) Importance of regular inspections and checking joints air-tightness and parts integrity, detecting potential leaks by means of a soapy solution or of the adequate gas sniffer.

The manual shall warn about the risk and prohibition of using flares to detect leaks.

f) Where and who shall make the repairs
Obligations agreed by the parties.
g) Need and advantage of re-qualification and certificate updating. Date and places for making them.
h) Information about guarantees. Reminder about guarantee expiration after 2,500 km.
i) Recommendations and advices on spark plugs, use of lubes and any other important information.

3.6 FOR CNG FUEL SYSTEM INSTALLERS AND REPAIR WORKSHOPS

3.6.1 Besides the statements included in subsections 1.2.6. to 1.2.6.2.9, the following specifications apply:

3.6.2 Workshops shall have facilities and tools for installing (and for replacing parts in case of repairs) and the necessary elements and equipment for performing the tests indicated in standard GE 1-116.

3.6.2.1 Workshops shall have, at least:

a) Equipment for pneumatic leak test at 200 bar. Compressed air or inert gases may be used.

Eventually and until it is fully equipped, the initial test may be performed at the workshop at a lower pressure than the pneumatic leak test pressure, verifying gas-tightness of joints and couplings during initial load.

By doing so, the Installer shall be responsible for potential damages caused by leaks due to incorrect installation.

b) Pressure gauge with a range equivalent to the pneumatic leak test at high pressure.

c) Pressure gauges with a range equivalent to the pneumatic leak test at low pressure.

d) Standard pressure gauges or equipment for controlling pressure gauges according to b) and c).

e) Leak detector.

f) Caliper of threads used.

g) Torque meter, two units. One in use and the other for control.

3.6.3 Workshops shall be ventilated and correctly lighted (natural or artificial light) with no less than 250 lux.

The workshop area used for installation shall not be built with flammable material.

Workshops shall be equipped with fire extinguishers with 100 g of powder per each floor surface square meter.

Nevertheless, there shall be signs with the legend "Danger. Do not Smoke".

Both shall be readily visible and accessible.

3.6.4 The technical representatives shall require the workshop permit before it starts operating. To this effect, they shall submit to Gas del Estado, the following data:

a) Workshop address and registered name

b) Facilities plan

c) Municipal Permit expressly stating the activity to be developed: CNG equipment installation in vehicles.

d) Detailed list of main tools and testing equipment.

e) Type of registration and worksheets to be prepared

f) Copy of draft contract made with the On-Board CNG Fuel System Supplier, commercially and technically related to the Installer.

3.6.5 Gas del Estado shall inspect all aspects related to facilities and installation and repair operations, expressly stated or implied in these standards, in addition to controls on related issues ordered by national, provincial and / or municipal entities.

3.6.6 Qualified personnel trained on the specific issue by the technical representative of the CNG Fuel System Supplier (they shall have the evidence of training course attendance) shall mount the equipment on the vehicle.

3.6.7 Workshops shall install the CNG equipment supplied by the corresponding manufacturer, following his instructions and complying with the specifications included in the safety standard in force.

The motor vehicle condition shall be previously inspected in order to perform a smooth installation.

3.6.8 After the installation and verification of safety issues according to the standards in force, the Installation Workshop owner shall issue a guarantee to the name of the vehicle owner for the installation work. This guarantee shall supplement the On-Board CNG Fuel System Supplier's guarantee of quality and operation (both guarantees shall be included in the same worksheet, certified by the persons in charge).

The workshop's manager shall also deliver a certificate and the Instructions, operation and maintenance manual supplied by the manufacturer.

Initially, installation guarantee will be open until the vehicle covers the first 2,500 km, and shall be completed by the manager of the workshop that granted it, once all safety issues are supervised.

Eventually, guarantee may be closed at another workshop, by his holder, representing the same On-Board CNG Fuel System Supplier, provided he was previously informed about it and given enough reasons to account for it.

3.6.9 The certificate issued by the workshop's manager shall include all data about the vehicle and CNG Fuel System components, including individual number (granted by Gas del Estado to the pertinent manufacturers that complied with safety standards), so that it is easily identified and any unauthorized substitution is easily detected.

Likewise, installation date and dates for annual inspections (a maximum period of fifteen days shall be set for verification, once the term expires) as well as dates for five-yearly re-qualifications shall be indicated. The latter ones shall be exclusively set for steel cylinders containing CNG (if aluminum-alloy cylinders with composite liner had been mounted, re-qualification periods shall take place every two years as of their manufacturing date and/or use).

3.6.10 Local competent authority responsible for the circulation of motor vehicles using CNG in their propulsion system shall be empowered for requesting the user, the initial certificate and subsequent extensions, so as to verify that they have been equipped at authorized workshops and subjected to the annual control guaranteeing their safe condition.

Such certificates may also be requested at CNG service stations, before fuel provision.

3.6.11 Installation workshops shall keep control of:

a) Motor vehicles with a CNG Fuel System, but enabled for bi-fuel.

b) Motor vehicles modified for using only CNG in their propulsion system

c) Vehicles owners' registry.

d) Open guarantee up to 2,500 km and its closure.

e) Copy of the original and of the annually extended certificates (the original of the latter one shall be provided to the vehicle owner).

Five-yearly equipment inspections, especially of CNG cylinders shall be subjected to future standards timely drafted to this effect.

3.6.12 Guidelines for annual inspections

Before extending the certificate, installation workshops shall make the following verifications:

a) Check with the original certificate for verifying that CNG equipment installed on the vehicle is made up of the same original components.

b) Verify that the vehicle has the identification label for operating with CNG, handed out when authorization was granted.

c) Examine cylinders mounting verifying that they have not been altered, deteriorated by use or changed.

d) Ensure that each component is safely mounted, including high and low pressure tubing and that they are correctly located. Check corrosion status and level, if any.

e) Ensure that no ignition sources exist in the compartments and areas surrounding the installation.

f) Check there are no leaks in coupling

g) Check safe operation of shutdown devices

h) Check that system operates according to its original characteristics.

i) Check that vehicle's switchboard controls comply with the specific requirements.

j) Check that ventilation requirements in the different installation areas have been complied with.

3.6.13 Once completed the CNG installation, the installer must place on the vehicle rear a readily visible and indelibly label: "NATURAL GAS Propelled".

3.6.14 Cylinder re-qualification shall be performed after a collision so as to verify its condition and potential use. The safety of the cylinder and of the other components must be verified.

3.6.15 CNG vehicle user obligations

In the Instructions, operation and maintenance manual, the manufacturer shall highlight and inform the user, the inspections and/or re-qualification periods, recommending him to comply with the instructions on driving, parking, repair workshops and on eventual difficulties. The user shall be bound to follow such recommendations.

3.6.16 Maintenance of CNG Fuel System, mounted on vehicles.

3.6.16.1 Bi-fuel or dedicated motor vehicles with operation problems due to carburetion anomalies must be repaired in an installation workshop belonging to the brand of the On-Board CNG Fuel System Supplier, having the make of the fittings that integrate the equipment.

To this effect, authorized workshops shall follow the instructions provided by CNG Fuel System Suppliers, some of which are:

a) Do not make repairs affecting cylinders and fittings integrity.
They shall only change deteriorated tubing and fittings not working properly.

b) Before making any repair on the vehicle, ask the user about potential anomalies and check them, verifying if there are strange noises or if there appear any deficiency or lack of response when vehicle driving mode is changed.

c) Do not service more than 5 vehicles in areas of approximately 100 sq. mt.

d) Vehicle to be repaired shall not be placed near open flames or other combustible sources.

e) Eventually, in case of working with a torch close to the CNG cylinder, it must be previously emptied, burning the gas installed (burning stack) and inerting the container.

f) When leaks are detected in a vehicle, it shall not be in conditions to work again until they are eliminated. The system must be checked through a soapy solution or other efficient method and proved to be leakage free.

3.6.16.2 Repair workshops shall keep an adequate record of the repairs made and of all the components replaced in each CNG-equipped vehicle and the corresponding dates.

That record shall also include all data and certificate number for facilitating vehicle identification (these data shall be useful for statistical aims that may be required by the competent authority)

3.6.17 Repairs not made on the CNG system

3.6.17.1 Repairs not made on the CNG equipment, such as repairs of the vehicle's body and paint, etc. may be done at any workshop, but the vehicle owner shall recommend the workshop personnel to stick to the Instructions, operation and maintenance manual of the CNG equipment.

3.7 FOR THE MANUFACTURING OF CNG STORAGE TANKS

3.7.1 CNG tanks shall be designed for a working pressure of 250 bar M at 21 ± 1ºC, complying with the provisions of A.S.M.E. code, Section VIII – Div. I.

3.7.2 For design and manufacturing, other Standards, Codes or Specifications similar to the previous code, may be applied. This shall be included in a technical report written and signed by the technical representative of the manufacturer.

3.7.3 Identical criteria as the one indicated in 3.7.2. shall be applied for importers.

3.7.4 Gas del Estado shall keep a record for high pressure CNG storage tank manufacturers or importers and shall approve individually, each manufactured or imported tank.

3.7.5 Gas del Estado shall accept certificates from foreign or local Institutes or Laboratories, regarding quantitative composition of steel components; physical and mechanical tests on specimens, based on the code or specifications applied. This Company may request material or specimens at its own criteria.

3.7.6 The Manufacturer shall perform hydrostatic test at 1.5 times working pressure at his workshops or optionally, at a local Institute in the presence of Gas del Estado supervisor.

The importer shall act as in the second case previously stated.

3.7.7 Once the tank approval is granted, an identification plate shall be visibly and permanently placed. All characteristics identifying the vessel and its manufacturer shall be engraved on it, complying with the corresponding manufacturing Code or Specification applied.

3.8 PROJECT AND AUTHORIZATION OF COMPRESSION, STORAGE AND DISPENSING CNG INSTALLATIONS

3.8.1 For CNG installations devoted to service motor vehicles, the pertinent application shall be submitted before Gas del Estado, stating characteristics, location and pertinent project, including the following:

a) Location of land where the CNG dispensing outlet will be installed.

If the dispensing outlet is installed in a bi-fuel station, its characteristics and distances among its parts and the new installations shall be indicated.

b) Characteristics, capacity and pressure of CNG storage containers. Characteristics and number of compressors and dispensers.

c) Installation permit granted by the Energy Secretariat and by the competent municipal authority for a specific location.

d) Specifications report of the installations, including technical characteristics of all the elements to be installed and essential calculations.

e) A set of plans (two copies)

They shall include:

- General installation of storage piping, tanks and installation of cylinders, compressors, dispensers and ancillary services – their general distribution and minimum distances among the different components and their location related to constructions and neighboring buildings and municipal perimeters –

- When required by the installation type, distances to containers and pumps of liquid fuel installations.

- Location and type of safety components.

- Installation of motive power, lightning and earthing

3.8.2 Specifications reports and plans shall be signed by the technical representative in charge of the project and by the site owner, and by the natural gas commercializing company, as it may correspond.

The technical representative shall be registered at the corresponding professional association and his degree shall be such as to qualify him for projects of this type.

3.8.3 All the installation elements shall comply with international standards recognized for high pressure natural gas service or with the local standards, if available.

3.8.4 In case of imported elements, they shall comply with international standards recognized for CNG service, submitting the pertinent certificate of approval granted by the competent authority of the country of origin.

Furthermore, general and detailed plans of each element shall be submitted.

Gas del Estado shall inspect the components and, if necessary, carry out tests before their installation.

3.8.5 Installation works shall not start without the pertinent project approval granted by Gas del Estado.

3.8.6 When required by the competent authority, the installer shall submit the necessary information, so that Gas del Estado may determine the status of the installation components.

3.8.7 Inspections.

3.8.7.1 Before installations conditioning, they shall be inspected and enabled by Gas del Estado.
The installer's technical representative and an authorized representative from the commercializing company, as it may correspond, shall be present.

3.8.7.2 Gas del Estado shall inspect, as regards the issues concerned to it, CNG dispensing and service stations whenever it deems necessary, for verifying their perfect operational status, being empowered to close CNG installations if they do not meet the required safety standards.

4. TECHNICAL DOCUMENTATION

4.1 FOR CYLINDER MANUFACTURERS

a) Application indicating the standards used for cylinder manufacturing, its size, volumetric capacity in water liters, tare (without valve).

b) Specifications report and manufacturing procedures. Materials and their characteristics.

c) Treatment and controls

d) Calculation report

e) Analysis of materials and tests of specimens – certificates according to tables # 1 and 3.

f) Test results or certificates according to tables # 1 and 3.

g) General and specific plans with references

Documentation shall be submitted in duplicate in separate folders. Plans shall comply with I.R.A.M. standards for technical drawing.

4.2 FOR CYLINDERS IMPORTER

a) Application indicating standard used in cylinder manufacturing in the country of origin, its size, volumetric capacity in water liters, tare (without valves).

b) Copy of the original standard, its Spanish translation and technical report of texts issued by the technical representative together with its comparison with the standard in force in the country.

c) Specifications report and manufacturing procedures. Materials and their characteristics.

d) Treatments and controls

e) Certificates as specified in item 3.2.1.3.1 and tests and results stated in the same item.

f) General and specific plans, with references

Documentation shall be submitted in duplicate in separate folders. Plans shall comply with I.R.A.M. standards for technical drawing.

4.3 FOR FITTINGS MANUFACTURER

a) Application indicating the fitting submitted for approval.

b) Specifications report and manufacturing procedure. Operation.

c) Materials, treatments and controls.

d) Tests result and accepted certificates according to the attached tables and referring to the fitting considered.

e) Plan of the whole set and breakdown including parts, sizes and tolerances.

f) A photograph of the fitting.

g) Once approved, he shall submit the technical booklet.

Documentation shall be submitted in duplicate in separate folders. Plans shall comply with I.R.A.M. standards for technical drawing.

4.4 FOR FITTINGS IMPORTER

a) Application stating the fitting submitted for approval, indicating standard used in the country of origin and the entity that granted the original approval.

b) Copy of the country of origin standard, its Spanish translation and a technical report drafted by the technical representative guaranteeing the fittings safety and operation, when required.

c) Specifications report and manufacturing procedure. Materials and their characteristics.

d) Tests certificates, accepted by Gas del Estado in the corresponding tables, based on the fitting. Tests performed according to those tables.

e) General plan and equipment breakdown or equivalent technical booklet, with measures and materials.

f) A photograph of the fitting.

4.5 FOR CNG FUEL SYSTEM SUPPLIER

a) Application of the CNG Fuel System submitted for approval.

b) List of components, with description of parts, trade name/manufacturing label, approval individual number and other identification data.

c) A general scheme with the components arranged in the way to be installed in the recommended vehicle model, and identification method for each of them. Corresponding instructions. Booklet for each element.

d) Description of the equipment packaging ready for sale.

e) A copy of the instruction manual from the Technical Representative of the CNG Fuel System Supplier aimed at the installer's qualified personnel.
f) A copy of the manual to be delivered with each CNG Fuel System Kit.

g) The guarantee text to be delivered to the user with each CNG Fuel System Kit.

4.6 FOR TANKS MANUFACTURER

a) Application stating sizes and characteristics of the tank submitted for approval, design and manufacturing specifications.

b) Comparative analysis of specifications, together with report in the original language and its translation into Spanish, as it may correspond.

c) Specifications report and manufacturing procedure, materials and their characteristics.

d) Analysis of materials and tolerances (certified)

e) Treatments and controls.

f) Calculation report.

g) General plan and different views of the component. Plan with marking lettering.

h) Worksheets with the result of specimen test, according to the specification used (certified).

Documentation shall be submitted in duplicate in separate folders.

4.7 TANKS IMPORTER

The statements included in 4.6 shall apply.

ANNEX Nr. 1

CNG STEEL CYLINDER, CLASS "A"

1. For manufacturing and test, I.R.A.M. 2526 standard shall be used, as applicable, as well as
2. the attached addenda.

NOTE: For a better understanding, each items of the points previously stated shall be detailed.

Scope
(added)

a) Maximum volumetric capacity for CNG cylinders that may be manufactured with these specifications shall be of 450 l. (measured in water at 20 ± 1ºC).

Definitions
(added)

a) CNG cylinder weight is the weight measured when the cylinder is free from fittings.

Valve protection
(added)

a) Valve protection for CNG cylinders shall comply with the specifications stated in the corresponding subsections of GE 1-116 standard.

Markings and labeling
(added)

CNG cylinders shall be marked as indicated in the I.R.A.M. standards previously stated and with:

a) Approval number granted by Gas del Estado.

b) CNG

Cylinder paint
(added)

a) It must be yellow painted: V/3 according to I.R.A.M 1054.

Expansion
(added) CNG cylinders shall be submitted to the following test:

After undergoing the most adequate heat treatment, each cylinder shall be hydrostatically tested and container expansion shall be measured according to G 1/3 or G 4.
Pressure value shall be 1.50 times the normal working pressure (200 bar). Total volumetric expansion shall be measured at the indicated pressure, and once released, permanent volumetric expansion shall be measured which, in no case, shall be higher than 10% of total expansion, previously measured.

Gas-tightness: Pneumatic leak test in a localized area for verifying closure end through spinning.

Threads: According to clarifications included in the pertinent tables.

Failure in tested equipment
(added)

If during hydrostatic pressure testing in CNG cylinders, the test has to be interrupted because a failure was detected, the same cylinder may be used, after curing the failure but, test pressure shall be increased by 2% of the value stated in "Expansion E".

Supplementary indications
(added)

a) About material properties

Apart from physical properties, quantitative chemical composition of steel used shall also be submitted, including tolerances for each element and according to types of steel used in countries experienced in the manufacturing and use of CNG cylinders.

b) Verification of ruptures

Intermediate manganese steels used for manufacturing class "A" cylinders may be heat treated at a temperature of at least 621ºC. When this procedure is followed during the manufacturing process, each cylinder shall be subject to a test with magnetic particles so as to detect flaws produced during the cooling process.

c) Hydrostatic pressure of CNG Cylinder until burst

1) An installation similar to the one stated in I.S.O. 4705 standard shall be used.

2) This test shall be performed for type approval (the cylinder area in which the burst opening is produced and its shape shall be shown in a drawing).

3) For manufacturing control, a burst shall be produced in one cylinder randomly chosen per each 2000 manufactured cylinders or when the material used corresponds to melts that differ from the one used in the previous verification.

d) Safety devices

Class "A" steel cylinders shall bear one safety device, or two, one at each end, of the following types and in the cases stated:

d1) CNG cylinders which length exceeds 1.65 m (valve threading area is not considered) shall bear a safety device consisting of a burst disc, tared for acting at a pressure of 340 bar ± 10% and a fusible plug melting at a nominal temperature of 100ºC ± 4ºC.

d2) CNG cylinders which length exceeds 1.65 m. shall bear a safety device at both ends: one on the valve as case described in d1) and another threaded part in a perfectly gaged opening in the cylinder end and operating behavior identical to the ones described.

ANNEX Nr. 2

CNG STEEL CYLINDER, CLASS "B"

Standard I.R.A.M 2526 shall be used as generally and specifically applicable for items identified as class "B". Furthermore, all Annex Nr. 1 addenda, for class "A" are applicable to type "B" cylinders, save subsection b) of supplementary indications.