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**TECHNICAL SPECIFICATION  
CNG PACKAGED COMPRESSION  
AND STORAGE AND OTHER  
ENCLOSED EQUIPMENT, NOT  
REQUIRING PERIMETER WALL**



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# TECHNICAL SPECIFICATION CNG PACKAGED COMPRESSION AND STORAGE AND OTHER ENCLOSED EQUIPMENT NOT REQUIRING PERIMETER WALL

## Part 1 – General Aspects

### 1.1. PURPOSE

To determine the design, manufacturing, installation and certification requirements that packaged and enclosed equipment must comply with for CNG compression and storage (hereinafter “equipment”) in addition to the ones determined by the regulations in force, so as to allow their installation without requiring a perimeter wall as set forth in point 2-2 “Equipment - compressors and/or storage enclosures and gas dispensers” GE-N1-118, its amendments or related standards.

### 1.2. SCOPE

The requirements of this specification apply to packaged CNG storage and compression and enclosed equipment that shall be installed in refueling stations for a relative maximum working pressure (gauge pressure) of 25 MPa (250 bar), and a CNG maximum storage volume of 2 m<sup>3</sup> water capacity, including all the operating and safety systems described in this specification.

### 1.3. DEFINITIONS

For the purpose of this Specification, the following definitions are provided:

#### 1.3.1. Enclosure:

Cabinet integrating the equipment and housing the rest of the parts that may include the measuring bridge.

#### 1.3.2. Compartment

Inner compartment of the equipment enclosure physically delimited by partition walls.

##### 1.3.2.1. Compartment classified as potentially hazardous:

A compartment containing one or more potential sources of natural gas leaks, or in case of not containing them, it is located next to a compartment with potential sources of natural gas leaks.

##### 1.3.2.2. Compartment not classified as potentially hazardous:

Any compartment not containing potential sources of natural gas leaks and not located next to another compartment containing them.

**1.3.3.** Internal fire:

Fire produced inside the enclosure.

**1.3.4.** External fire:

Fire produced outside the enclosure.

**1.3.5.** Open fire:

Any element capable of producing sparks or flames, either permanently or temporarily.

**1.3.6.** Non combustible material:

Material that even when exposed to oxygen and heat does not produce fire.

**1.3.7. Supplier**

Entity registered in ENARGAS Registry of Qualifying Licenses (RMH), responsible for the equipment and for ensuring that quality management is enforced. The definition is applied to equipment manufacturers and importers.

**1.3.8.** CA:

Certifying authority accredited by ENARGAS according to ENARGAS Resolution 138/95.

**1.3.9.** ENARGAS:

National Gas Regulating Authority.

**1.3.10.** RMH:

ENARGAS Registry for Qualifying Licenses.

**1.4. BACKGROUND**

This Specification has been drafted based on the following backgrounds:

- API RECOMMENDED PRACTICE 520 «Sizing, selection and installation of pressure Relieving Systems in Refineries, Parts I and II»;
- GE-N1-118 «Regulation for CNG Refueling Stations»;
- GE-N1-141 «Compression equipment for CNG refueling stations»;
- IRAM IAP IEC SERIES 79 "Electric material applicable to explosive gaseous atmospheres ";
- IRAM 121 "Coating tests. Salt Spray (Fog) test ";

- IRAM 2444 “Protection Degrees of electric equipment enclosures”;
- LAW 19587 “Occupational Hygiene and Safety” and regulatory decrees;
- NFPA 52 «Compressed Natural Gas (CNG) Vehicular Fuel Systems» editions 1992 and 1995;
- NFPA 70 "US National Electrical Code (NEC)" Sec. 500 to 504;
- NZS 5425 «Code of practice for CNG COMPRESSOR AND REFUELING STATIONS» PART 1, PART 2;
- Resolution N° 195/97 of the National Secretariat of Public Works and Transport.

### 1.5. PROJECT BASIS

The following resistance capacities shall be considered for the development of this Specification in order to reach with this equipment a safety level similar to the one supplied by reinforced concrete perimeter wall:

- 1 - Fire;
- 2 – Internal explosion; and
- 3 – External damage.

The requirements indicated herein aim at providing the equipment redundant safety systems and special characteristics in their construction.

#### 1.5.1. Fire resistance

Possible accidents caused by fire and their consequences, shall be analyzed.

The equipment enclosure shall not reduce its capacity of containing or avoiding horizontal fuel or fire propagation within the time frame indicated in point 4.3.1.

The equipment structure shall collapse at a temperature higher than 350°C. The temperature to activate the CNG storage automatic venting systems shall not exceed 110°C.

#### a) *Internal fire*

In cases of internal fire in which the fire extinguishing system fails or the extinguishing power is not enough to put out the fire, the equipment shall be fitted with three redundant safety systems that shall prevent the burst of parts subjected to pressure:

- 1 An overpressure automatic vent valve with rooftop overpressure discharge in a safe area, in case of a pressure increase in the CNG storage;
- 2 An automatic vent system of stored CNG, activated by fusible plugs close to it with rooftop venting in a safe area;

- 3 A manual vent system of the vessels subjected to pressure, activated from a remote and safe area located outside the equipment so as to allow its activation in case of internal fire.

**b) External fire**

In case of external fire, the equipment's surface temperature rise shall activate a fire extinguishing system inertizing the interior of potentially hazardous compartments; gas automated vent systems shall also be activated, according to the indications in a) and the equipment's risk of exploding and affecting the surrounding installations shall disappear.

**1.5.2. Explosion Resistance:**

The compartment housing the compression or storage equipment shall be designed to resist a minimum internal pressure (MIP) according to the indications of Part 2, Construction Requirements, point 2.4

**1.5.3. External damages:**

The equipment installation shall be fitted with guardrails of adequate mechanical resistance to protect it from potential vehicle impact.

The equipment access operation shall bear an automatic control that shall not allow operations that may pose a risk to third parties.

**1.6. NOTICES**

The supplier must inform the equipment purchaser of its technological innovations according to the requirements of CNG standards in force, notwithstanding the requirements of the Distribution licensee for the area where the equipment is installed.

Before operating the equipment, the Technical Representative of the Refueling Station shall submit a note to the firefighters of the area about the equipment characteristics, fire potential and all data required by them so as to facilitate the actions plan in case of a fire. Firefighters shall also be provided with a copy of the Emergency plan and Safety Manual indicated in 7.1.17.

## Part 2 – Construction requirements

### 2.1. MATERIALS

The equipment shall be constructed with new material, fit to comply with the requirements of this Technical Specification.

### 2.2 CORROSION PROTECTION

Components used in the equipment construction (piping, vessels, fittings, enclosure, etc) shall be weather resistant. Metallic materials used and their corresponding systems of corrosion protection shall withstand a Salt Spray (Fog) test according to standard IRAM 121 with a 5% sodium chloride water solution (CINa) (5g ±1g of CINa/100g of solution) at 35°C ± 1°C for 240 hours, without showing corrosion or deterioration of the applied coating.

### 2.3. PROTECTION AGAINST INTENTIONAL DAMAGE

The equipment construction shall be such as to prevent the operation and access of unauthorized persons through efficient safety systems (locks, access passwords, etc.).

### 2.4. RELIEF HATCH DOORS

The design of the compartment housing the compression equipment, storage equipment or both shall be such as to withstand a minimum inner gage pressure (MIP) of 10<sup>4</sup> Pa (0,1 bar).

The compartment shall include zenithal openings or hatch doors, with a minimum free area of 60% of the compartment area that shall not allow internal pressure to exceed a 0.8 PIM: 8 x 10<sup>3</sup> Pa (80 mbar).

Its design shall be such to ensure the relief hatch door return to original position after an eventual internal deflagration (explosion).

#### 2.4.1. Verification test:

The hatch door shall be subjected to a perpendicular load in an inward- outward direction, on the point affected by the load resulting from internal pressure.

Load intensity in kg shall be equal to 0.1 of the useful area in cm<sup>2</sup>

During load exertion, correct hatch door operation must be ensured.

### 2.5. FIRE EXTINGUISHING SYSTEM

Compartments housing compressor and storage equipment must include a fire extinguishing system interlocked on the equipment operating safety system. The extinguishing device shall be class BC type.

The stored capacity of extinguishing fluid for autonomous extinguishing systems shall not be less than 2 kg of carbon dioxide every 1 m<sup>3</sup> of the room volume to be protected.

The amount of stored extinguishing fluid shall be permanently monitored. The equipment shall not operate if this fluid is below the system minimum extinguishing capacity.

The extinguishing system shall be automatic and shall also allow manual and remote activation from a safe area located outside the equipment, in case of internal fire.

The extinguishing system shall operate automatically, maximum 30 seconds after compartment temperature of any of the compartments requiring protection exceeds 110°C. Its operation shall not be manually interrupted.

Sensors shall be strategically located.

The activation of the extinguishing system shall:

- Shut down the equipment,
- Shut off external electric power supply,
- Prevent restart up with the operation of the equipment until the extinguishing system has recovered, and
- Activate a remote acoustic / optical alarm located such as to be readily visible and audible to refueling station personnel.

The extinguishing system shall continue operating even if the external electric power supply is cut off.

The extinguishing system and its components of recognized quality shall be certified by a pertinent Certification Organization.

#### **2.5.1.** Verification test:

Precautions shall be taken to guarantee correct development of the test.

The test shall be performed with the equipment in full operation, applying heat on the sensors so as to allow them to reach a minimum temperature of 110°C

It shall verify the following:

- Sensor temperature activation;
- Response time activation of the extinguishing systems;
- Discharge of stored extinguishing fluid;
- Equipment shut down;

- Later start up with the operation shall not be possible until the extinguishing system has recovered so as to continue operating; and
- Remote activation.

## 2.6. EXPLOSIVE MIXTURE DETECTORS

The room housing the compression or storage equipment shall include an explosive mixture detection system in continuous operation, with luminous and sound signaling that shall activate when 10% of the lower explosion limit is reached (LEL).

There shall be at least two sensors, strategically located in the system. Their calibrations shall be verified at the time intervals determined by the supplier. They shall block the equipment's gas outlet when 20% maximum of the LEL for natural gas in air is reached, or else when the sensor fails. Equipment re start up with the operation shall require manual reassembly.

Detection system construction shall include components of recognized quality certified by a recognized Certification Organization.

### 2.6.1. Verification test:

The following shall be verified with reference gas and the equipment in full operating conditions:

- Detection of explosive mixture once it reaches 10% LEL;
- Equipment shut down once it reaches 20% LEL; and
- That equipment re starts up requiring manual reassembly.

On the other hand, a sensor failure shall be simulated and equipment shut down shall be verified.

## 2.7. GAS TIGHTNESS

The compartments shall comply with the following tests:

### 2.7.1. Verification test:

The system shall be pressurized with an electric fan and fumes shall be produced inside it with a smoky substance with all its ventilation openings blocked.

If the inner manometer static pressure is of at least 100 Pa (1 mbar, 10 mmca) during the test, the smoky substance shall not leak through the room's perimeter walls or access doors.

## 2.8. ENCLOSURE

The enclosure shall not bear building structures.

**2.8.1. Access doors:**

The access doors or openings into the compression and storage compartment shall include inter locking devices so as to prevent the following:

- a) Door opening while the compression equipment is in operation,
- b) Equipment start up with enclosure doors open, and
- c) Horizontal projection of any part of the compression or storage system outside the equipment during maintenance; when the equipment includes a transitory program deactivating the interlocking devices necessary to comply with the requirements stated in a) and b) (under the responsibility of the Technical Representative of the supplying or operating company), so as to allow the necessary maintenance and control procedures, determined by the supplier in the Installation, Operation and Maintenance Manual, and perform the corresponding repairs. Compressed Natural Gas delivery to dispensers shall be shut off during this stage.

The equipment shall record the initiation and termination date and time of the transitory program activation (TPA). The time elapsed during activation may be recorded instead of the TPA termination data. This record shall be made available to the Inspection Authority (Certification Organization, Distribution Licensee, etc.)

**2.8.2. Ventilation side openings:**

Ventilation side openings of the compression or storage room shall be designed such as to prevent horizontal propagation of explosion waves, distributed and oriented so as to avoid any type of risk.

They shall include protections providing them with similar impact resistance to that of the enclosure external walls.

**2.8.3. Impact Resistance:**

External walls of the enclosure shall withstand impact loads with kinetic power equal to or higher than 1,200 J, according to the following test.

**2.8.3.1. Verification test:**

A Prototype of the same dimensions and materials as the panel subjected to test shall be constructed and rigidly mounted on the equipment. The apex of a spherical shaped conic body with a radius not higher than 20 mm shall impact its most critical area with a power of 1,200 J.

The impact shall not pierce, detach or fragment the panel material.

**2.8.4. Resistance to bullet impact:**

Enclosure external walls shall withstand the perpendicular impact of 9 mm caliber bullets, shot from 5 m.

**2.8.4.1. Verification test:**

A Prototype of the same dimensions and materials as the panel subjected to test shall be constructed and rigidly mounted on the equipment.

The impact shall not pierce, detach or fragment the tested panel material.

**2.8.5.** If fire is detected on the surface of the enclosure or compartments affecting the material resistance, verifications shall be performed on the equipment before re-start up, to ensure that it is fit for operation and does not pose any type of public risk.

**2.9. ELECTRIC DEVICES**

Electric devices installed in a compartment not classified as potentially hazardous shall at least comply with one of the following:

- 1) The compartment shall include a “p” protection mode (positive pressurization).
- 2) The compartment shall:
  - a) Be tight as regards the surrounding compartments, with an IP 53 minimal mechanical protection, and
  - b) Not be located on gas lines, and
  - c) Count with an explosive mixture detection system of the same characteristics as the ones indicated in 2.6.
- 3) Include a type “d” electrical protection mode (explosion proof cover) or a “p” type one (positive pressurization).

**2.10. OIL STORAGE**

Oil storage of hydraulically activated compressors located inside the enclosure shall be externally protected by a thermal isolation of non-combustible and non-hygroscopic material. Its thermal conductivity shall be lower than 0.05 kcal/hm°C, and fuse point higher than 1,000 °C (e.g. ceramic wool).

**2.11. OIL PAN**

The equipment shall include a pan or container with enough capacity to contain compressor or motor lubrication or hydraulic fluid spillage in case of system failures or for maintenance purposes.

The pan shall include a manual drainage so as to facilitate fluid discharge.

## 2.12. MECHANICAL VENTILATION

The compartment housing the compression or storage equipment shall include a mechanical ventilation system discharging air to a safe area and shall include luminous signaling in case of system failure, guaranteeing at least 300 hourly air renewals in the ventilated compartment; the system shall be electrically interlocked with the equipment shut down and shut off gas inlets and outlets by means of at least two independent flow sensors operating in the same way.

## 2.13. CONNECTIONS

Fittings, expansion joints, flexibles, etc. of recognized quality integrating the equipment shall be used to connect ancillary services to piping.

Natural gas inlet and CNG outlet equipment connections shall be firmly secured to their structure so as to withstand the minimum stresses indicated below, applied on flanges or connection couplings:

- 800 N force applied longitudinally to the connection; and
- 250 Nm moment applied on the connection in the most adverse conditions.

## 2.14. GAS VENTING LINE

Discharge connections of the CNG equipment circuit pressure relief and venting devices shall be bypassed to a rigid steel tubing with rooftop discharge in a safe area, outside the enclosure. Noises shall be treated according to the indications of the local Authority in this regard.

Layout shall aim at minimizing risks of rupture or damage caused by enclosure collapse or fire.

The venting system shall be designed such as to vent the CNG maximum stored volume in no less than 12 minutes, and to withstand the stresses produced during gas venting.

It shall not discharge on open fire.

## 2.15. GAS PRESSURE RELIEF SYSTEM

The equipment shall include a pressure relief safety system, fusible plug type (CSA S 1.1 type 9) and at least two independent sensors guaranteeing complete venting of CNG stored volume.

The system must relieve the upper and lower parts of the different CNG storage areas, and shall activate maximum 60 seconds after ambient temperature of any of the compartments exceeds 110°C.

#### **2.15.1. Verification test**

All the necessary precautions shall be taken to guarantee the safe development of the test.

The test shall be performed with the maximum stored gas volume. One or more heat sources shall be located in the compartment classified as potentially dangerous, allowing the sensors to reach at least 110°C.

Temperature and activation time shall be verified. It shall be ensured that stored gas has been completely vented.

### **2.16. ELECTRICAL INSTALLATION**

The equipment's electrical installation, including control and power panel wiring shall fully comply with the requirements of any of the following standards: NFPA 70 Sec. 500 to 504, or IRAM IAP IEC SERIES 79, according to its installation classification and location.

All groundings shall bear an equipotential connection, and their dimensions shall be such as to allow them to withstand the current of a protection fuse cut.

#### **2.16.1. Switch Panel:**

In case the equipment power or control switches are installed on the external surface of the enclosure, they shall include mechanical protection equivalent to at least IP 553 according to IRAM 2444.

### **2.17. DEPRESSURIZING CONTAINER**

If a gas depressurizing container is required during equipment shut down, it shall be included in the equipment, mounted on the enclosure and certified by a CO.

### **2.18. EQUIPMENT START UP SYSTEM**

The equipment system shall only start up automatically. Manual start up is not allowed.

### **2.19. MEASURING BRIDGE**

The measuring bridge shall comply with the requirements of the Distribution Licensee for the area where the equipment is installed so as to allow adequate mounting of the gas metering system.

## Part 3 – Installation Requirements

### 3.1. LOCATION

The enclosure shall only be installed outdoors (outdoors and in a clear open area) according to the minimum safety distances determined for compressor and storage compartments in point 1-2 of the Construction and Installation Requirements of standard GE-N1-118 or one superseding it.

The equipment shall not be installed under high voltage overhead lines or on storage warehouses or liquid fuel delivery tubing.

If the equipment includes a transitory Program activation as described in 2.8.1.c):

- The openings or doors for entering the compression and storage compartment from outside shall be oriented so as to avoid the projection of any of their parts to areas of public circulation whenever door openings do not comply with this requirement;
- Projection of compression or storage system components beyond the limits of the filling station site shall be avoided in urban areas. Furthermore, gas Distribution Licensee shall demand all necessary requirements to ensure compliance with this condition.

It shall be ensured that construction conditions determined by the National Law on Hygiene and Safety N° 19.587 Decree N° 351/79, annex VII, Chapter 18, Item 6, its related laws and amendments are complied with, as well as the Building Codes in effect, particularly those related to the separation of sectors posing fire risks, in order to preserve the equipment from heat effects of a close-by fire outside the enclosure (radiation, conduction and convection).

### 3.2. PERIMETER PROTECTION OF ENCLOSURES AND CONNECTIONS

The enclosure sides and connections which, due to their location, are liable to be impacted by inadequate maneuvers of vehicles or objects shall be mechanically protected.

This protection shall be placed at a minimum distance of 0.9 m from the enclosure, and shall be at least 0.8 m high.

The protection shall bear the impact of a vehicle weighing 20,000 N, with a translation speed of 3 m/s, applied on the most critical point.

Protection shall be adequate if the enclosure safety is not affected after the impact.

The equipment supplier shall specify the construction options in the Installation manual.

### **3.3. POWER SUPPLY**

Equipment electric power supply shall be through underground channels or trenches.

The system shall include a manual electric breaker with medium break fuses which nominal value shall not be higher than 120% of the equipment total nominal current including phase-out protection. It shall be installed more than 3 m away from the equipment in areas not classified as potentially hazardous.

### **3.4. ANCILLARY SERVICES SUPPLY**

Electric power supply of all the ancillary services required by the equipment shall be through underground channels or trenches.

### **3.5. NATURAL GAS FEED**

Natural gas service connection of the equipment installed on the ground floor shall be through underground channels or trenches.

### **3.6. CNG DELIVERY**

CNG delivery of the equipment installed on the ground floor to the dispensing islands shall be through underground channels or trenches.

## Part 4 – Tests for type approval

### 4.1. EXPLOSION (DEFLAGRATION) TEST

A) It shall be performed with 9% natural gas mix in air at atmospheric pressure and room temperature.

B) The mix volume shall fully occupy the actual free volume of the CNG compression and storage compartment (hereinafter “compartment”).

C) The following components shall be installed inside the compartment with the plugged CNG outlet to dispensers, and shall be mounted according to the type subject to approval and pressurized at working pressure:

- Pressure relief system,
- All the natural gas conduits associated to storage, at 250 bar
- Fire extinguishing system, and
- At least, one CNG storage cylinder.

D) Compartment's tightness shall be ensured by plugging all the ventilation grids with non structural means (e.g. paper).

E) The compartment shall include plugs, installed in the upper, mid and lower third of the room, each of them supplying the necessary power to ignite the mixture indicated in A), and operating simultaneously.

The plugs shall be remotely operated so as to allow the operator to work safely.

F) The amount of gas required to comply with point A) shall be injected through at least five inlets, located such as to improve mix homogeneity.

G) Once the natural gas inlet has been completed within a short time frame so as to avoid gas the separation of gas from air contained in the compartment, the plugs shall be activated until the air/ gas mix ignition indicated in A) is produced.

H) A special dye shall be used so that:

- The area of influence of the expansion wave inside the enclosure is readily visible, and
- The results of the test are not altered.

I) Pressure peaks resulting from the expansion wave shall be recorded whenever possible and the relation with the design pressure of the enclosure shall be verified.

J) Once the explosion is over, the following shall be verified:

- That no fragments were produced in the enclosure,

- That no distortions or damages were produced in the storage gas pressure relief systems or fire extinguishing systems altering their operation, or that such systems were activated as a result of an explosion, and
- That gas pipes and connections to storage area remain tight at 250 bar.

#### 4.2. VERIFICATION OF STORED GAS VENTING

Once the explosion test described in point 4.1 is completed, discharge time of gas stored at 250 bar shall be verified.

This verification shall be performed with all CNG storage cylinders loaded at 250 bar, mounted according to the type subject to approval.

Cylinders shall be mounted on the enclosure used for the rupture test described in 4.1., and the pressure relief systems of stored gas shall not be altered.

It must be ensured that venting of all the gas stored at 250 bar is performed within the time set forth in point 2.14.

#### 4.3. FIRE RESISTANCE TEST

##### 4.3.1. Localized fire:

A Venturi type, induced draught high pressure burner shall be mounted inside the CNG compression and storage equipment. It shall bear 1.5 to 3 kg/cm<sup>2</sup> working pressure and shall include a 3 mm injector diameter.

The primary air record shall be regulated until a stoichiometric combustion or slight air excess is attained.

At this stage, a log of the temperatures recorded on the axis shall be drawn so as to determine the resulting maximum flame temperature.

The burner's installation shall be such that generated flame shall bear perpendicular incidence on one of the internal sides of the enclosure, on the resulting maximum temperature point.

Gradual temperature increase shall be gauged on the point of flame impact, until stabilization. From that moment on, the enclosure shall be exposed to flames for thirty minutes (30), and time metered.

Once the 30 minute flame exposure is over, the enclosure shall preserve its flame containing capacity.

**4.3.2. Uniform fire:**

A pan shall be placed on the enclosure floor. Its size and characteristics shall be similar to oil pans of the type subject to approval.

The pan shall be filled with enough liquid fuel to contain the maximum calorific capacity of the lubrication oil used.

A water layer shall be maintained, wherever possible, between the pan base and the liquid fuel, so as to prevent significant pan distortions.

Once all the previous indications have been implemented, the fuel contained in the pan shall be subjected to total combustion.

Temperature shall be gauged at the locations of the fire extinguishing system temperature sensors.

Once the combustion process is over, the enclosure shall preserve its capacity to contain the flame (in a horizontal direction) inside it.

Temperature at sensor locations must reach calibration values of those sensors and the time it takes to reach such temperature shall be calculated.

## Part 5 – Documentation and Marking

### 5.1. TECHNICAL DOCUMENTATION

Supplier shall provide the following documentation with the equipment:

**5.1.1.** Equipment's technical data worksheets.

**5.1.2.** Manual of Installation, Operation and Equipment periodic maintenance, written in Spanish and including, for example, the controls of safety systems determined by manufacturers, suppliers and Certification Organization described in this Technical Specification.

**5.1.3.** Emergency Plan and safety manual.

**5.1.4.** CNG storage cylinders' approval certificates, issued by a CO.

**5.1.5.** Certificates of equipment approval, according to the approved type, issued by a CO.

### 5.2. MARKING

The equipment shall bear a marking plate made of weatherproof material that shall be mechanically affixed on the external cover of the enclosure, readily visible and shall at least include the following data, engraved or embossed with fonts not smaller than 8 mm:

**5.2.1.** Supplier's trade name and RMH (Registry of Qualifying Licenses) number.

**5.2.2.** Supplier's address and telephone number.

**5.2.3.** Country of origin.

**5.2.4.** Date of manufacture.

**5.2.5.** Series number.

**5.2.6.** Maximum gas supply pressure (in bar).

**5.2.7.** Minimum gas supply pressure (in bar).

**5.2.8.** Maximum CNG storage pressure: 250 bar.

**5.2.9.** CNG storage capacity (in water liters).

**5.2.10.** Electrical voltages and frequencies.

**5.2.11.** Installed Power.

**5.2.12.** Identification logo of the approved type, according to Res. ENARGAS 138/95.

**5.2.13.** Operating parameters required for ancillary services.

### **5.3. WARNING SIGNS**

The equipment shall bear the following safety signs on each of the external sides of the enclosure. The letters' height shall not be lower than 25 mm.

**5.3.1.** NO SMOKING;

**5.3.2.** HIGH PRESSURE NATURAL GAS;

**5.3.3.** CNG STORAGE AND COMPRESSION UNIT;

**5.3.4.** ACTIVATE IN CASE OF EMERGENCY (Located on the CNG vent valve manual activation system, and on the emergency shut down, indicating open and closed position);

**5.3.5.** MEASURING BRIDGE AND NATURAL GAS REGULATION (Located on the measuring and regulation compartment);

**5.3.6.** UN number United Nations (1971) and risk code (4) according to Resolution 195/97 of the Public Works and Transport Secretariat (SOPT).

## Part 6 – Periodic Controls

### 6.1. PERIODIC CONTROLS

Equipment shall be subjected to periodic tests, in compliance with the requirements of standard GE-N1-118 or one superseding it, and according to the supplier's instructions, and other requirements detailed herein.

The supplier's or operating company's Technical Representative (TR) shall perform the tests and report the tests and results to the CO.

Fire extinguishing periodic controls of the system shall be performed according to the suppliers' recommendations.

The additional test plan required by this specification shall be performed according to the corresponding protocols and shall at least include the following:

#### 6.1.1. Monthly controls:

Access doors interlocking, according to 2.8.1.

#### 6.1.2. Half yearly controls:

Operating shut down and start up devices calibrations.

#### 6.1.3. Annual controls:

Temperature activated venting system.

Compartments gas tightness.

#### 6.1.4. Other controls:

Additional controls determined by manufacturers, suppliers and organisms certifying the safety systems described in this Technical specification.

## Part 7 – Certification requirements

### 7.1. TYPE CERTIFICATION

The equipment supplier shall provide the CO with at least the following documentation signed by the Technical Representative. The CO shall keep a copy.

**7.1.1.** Note requesting equipment certification, indicating identification data according to standard GE-N1-141 or the one superseding it.

**7.1.2.** Submission of all the equipment circuits' flow charts: natural gas, extinguishing fluid, coolers, pneumatic, electrical, hydraulic, ventilation, explosive mixture detection and gas venting.

**7.1.3.** Specific plans of views and cuts, marking dimensions on, allowing clear identification of the equipment, including list of parts indicating materials, surface finishes, heat treatments, etc., according to IRAM technical drawing, or a recognized international standard, including company label and plan and revision number.

**7.1.4.** Specification report of the regular start up and shut down systems, indicating operating parameters and report of emergency shut down systems indicating safety parameters.

**7.1.5.** Functional description of alarms and signaling of operating and safety shut down.

**7.1.6.** Fire extinguishing system: distribution and operating parameters drawing

**7.1.7.** Calculation report of venting systems and verification of discharge flow and stress resistance.

**7.1.8.** Unifilar drawings of equipment electrical operating, control and safety circuits. Components list indicating brands and types. Specification report of the operation of components included in the drawings and calculation report of the electrical installation.

**7.1.9.** Diagrams of electrical interconnection of blocks, detailing connections in terminals.

**7.1.10.** Certificates of conformance with standards, issued by a pertinent authority, showing the way in which electrical material installed in compartments classified as potentially hazardous are protected.

**7.1.11.** Specifications report of gas circuit calculations.

**7.1.12.** Certifications of the fire extinguishing system standards conformance, issued by a competent authority.

**7.1.13.** Welding procedures, according to the applicable code or standard, guaranteed by a licensed and certified welding inspector according to standard IRAM-IAS U 500-169.

**7.1.14.** Certificates of compressor and storage cylinders approval.

**7.1.15.** Quality guarantee manual applied to manufacturing, control, commercialization and post sale service processes, drafted based on ISO 9000 quality and quality assurance management system or other equivalent national or foreign quality systems.

**7.1.16.** Equipment installation, operation and periodic maintenance manuals, written in Spanish and including control of safety systems determined by the manufacturer, suppliers and certification organizations included in this Technical Specification.

**7.1.17.** Emergency Plan and Safety Manual, guaranteed by the Firefighters Superintendence of the Argentine Federal Police.

**7.1.18.** Plans of prevention, operation and identification signs that shall be included in the equipment, in full compliance with the requirements of standard GE-N1-118 or one superseding it, ENARGAS Resolution 138/95 and this Technical Specification.

**7.1.19.** Periodic controls protocols.

## **7.2. CERTIFICATION OF MANUFACTURED UNITS.**

The equipment shall be certified for one year during which the manufacturer shall provide the CO, every six months, at least the following documentation signed by the Technical Representative so as to assess equipment's performance and determine preventive or corrective actions required on the installed equipment and on the certification Technical Specification.

- a) Equipment installation address.
- b) Accidents or fires arising from the equipment's installation and operation.
- c) Corrective actions applied to accidents recorded according to the previous point.
- d) Report on the performance of equipment's safety and control systems, observed at periodic controls or operating in the event of an accident

The equipment supplier shall provide the CO with at least the following documentation signed by the Technical Representative, together with the documents approved according to 7.1, so as to perform the comparative controls, based on the approved type:

**7.2.1.** Note requesting certification of the units that integrate the batch of the equipment to be certified.

**7.2.2.** Equipment operating calibration values: regular start ups and shut downs; safety parameters values.

**7.2.3.** Components list indicating: brands, types, nominal size.

**7.2.4.** Certificates of conformance with the standards of electric material installed in rooms classified as potentially hazardous and of fire extinguishing system components, issued by competent authorities.

**7.2.5.** Certificates pressure relief safety valve calibration.

**7.2.6.** Certificates of compressors and storage containers approval.

**7.2.7.** Welding procedures, according to the applicable standard or code, guaranteed by a welding inspector, qualified and certified through standard IRAM-IAS U 500-169.

**7.2.8.** List of welders and welding operators qualified and certified by a recognized Authority according to IRAM-IAS U 500-138, in compliance with the standard in force for welding procedures.

**7.2.9.** Radiographic report of pipes and containers weldings, issued by a licensed radiologist according to the corresponding IRAM-CNEA standard, in full compliance with the application codes or standards.

**7.2.10.** Report of gas circuit Hydrostatic test.

**7.2.11.** Report of functional verification of operating and safety controls.

**FORM FOR PROPOSALS ON THE TECHNICAL SPECIFICATION FOR CNG  
PACKAGED COMPRESSION AND STORAGE AND ENCLOSED  
EQUIPMENT - REVISION: 3**

Company:

Technical Representative:

Address:

Zip code:

Telephone:

Page:

Point:

Paragraph:

Quote:

Proposal:

Substantiation for proposal:

Signature:

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Title: