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TECHNICAL SPECIFICATION VEHICLES FOR BULK CNG TRANSPORT

ENARGAS

ENTE NACIONAL REGULADOR DEL GAS

TECHNICAL SPECIFICATION
VEHICLES FOR BULK CNG TRANSPORT

SECTION 1 - GENERAL

1.1. PURPOSE

This Standard is intended for regulating the design, construction, tests, authorization and periodic inspections of the units for road bulk CNG transport in groups of cylinders.

1.2. SCOPE

This standard shall apply to those types of vehicles used for bulk CNG transport in tubes operating at a 200 bar M maximum working pressure

1.3. APPLIED DOCUMENTATION

For preparing this specification, the following was considered:

- Law 24.449 – Traffic and Road Safety .
- Regulatory Decree of Traffic and Road Safety Law Nr. 779/95.
- Resolution of the Public Works and Transportation Secretariat Nr. 195/97 about Traffic and Road Safety
- ASME: American Society for Testing Materials. Section VIII, Division 1.
- Technical Specification PA N° 355-00 "Control of Steel Surfaces Cleaning". (Included in Standard GE-N1-108 3rd. Revision 1992 "Piping and Fittings Corrosion Resistant Coatings").
- IRAM-IAP A 5165 Standard "Measuring instruments. Circular scale Bourdon type gauges".
- Standard for bulk CNG transport in groups of cylinders or tubes (GE-N 1- 142 Standard, October 1992 - Draft).
- Threads Standards: DIN 477; UNI 339; BS 341; ANSI B1.8; ANSI-CGA V-1 (former ANSI B 57-1); IRAM 2539.
- ISO 8501-1 Standard 1988 "Steel surfaces conditioning before application of paints and related products – Assessment of surface cleanliness” .
- IRAM 2526 Standard "Steel cylinders for permanent gases ".

- Recommended Practice IAP-CA 3.01 by the Argentine Petroleum Institute.

- Racolta delle norme per l'approvazione e la revisione dei recipiente per gas compressi, liquefatti e disciolti. CIRC. MIN Serv 6 n 122/1958 Italy.

- SAE standard J 514f Hydraulic tube fittings.

- SAE standard J 516a Hydraulic hose fittings.

1.4. DEFINITIONS

- FLAME ARRESTER: Device that prevents flame or sparks propagation outside the exhaust pipe.

- CHOCKS: wedge-shaped plugs made of wood or other material of similar characteristics for preventing semi-trailer displacement.

- SAFETY DEVICE: Allows the elimination of containers overpressure.

- AUTHORIZED ENTITY: Ente Nacional Regulador del Gas (ENARGAS) or any other appointed by it.

- EQUIPMENT: Assembly of containers, manifolds, valve systems and instruments mounted on a semi-trailer.

- CNG: Compressed Natural Gas.

- CERTIFICATION ORGANIZATION (CO): Organization accredited by the Authorized Entity for planning, coordination, administration and integral execution of works related to the approval and granting of the certificate of quality for gas industry products, guaranteeing compliance of the technical, efficiency and safety aspects as well as reasonable use of energy and environment protection included in those standards that the Authorized Entity considers applicable.

- CONTAINER: Seamless steel tank manufactured according to ASME Code, Section VIII Div. 1 or other recognized Standard, for a water capacity higher than 1000 liters and hot-forge process for closing ends.

- TECHNICAL REPRESENTATIVE (TR): Engineer whose title enables him to act in this respect. He shall be competent and experienced in the design, construction, operation and inspection of containers subject to pressure in gas installations. He will be the responsible person for the design, construction and/or operation of the transportation equipment. Such professional shall be

registered at the pertinent Professional Association and enabled by a Distribution Licensee as first class installer.

- SEMI-TRAILER: vehicle so constructed that some part of its weight rests upon the vehicle that tows it.

- TRUCK TRACTOR AND SEMITRAILER: Unit made up of tractor and semitrailer.

- TRACTOR: Motor vehicle used for towing other vehicles.

- SUPPORT LEGS: Device enabling to keep semitrailer in horizontal position when tractor is withdrawn.

- TUBE: Cylindrical container.

1.5. TECHNICAL DOCUMENTATION

The constructor shall submit before the CO, at least two copies of the following documentation signed by its TR.

1- Note requesting project approval specifying the attached documents.

2- Note of TR appointment.

3- Detailed plan of the entire unit, specifying dimensions, distances between axles, maximum load per axle with empty containers and containers full of product. Load distribution shall comply with the regulations of the authorities having jurisdiction.

4- Containers plan specifying fittings location.

5- Electrical installation plan.

6- Other plans with the necessary details, at CO criteria.

7- Technical report about the equipment manufacturing process.

8- Materials (including fittings and valves). Certificates of physic-chemical testing and certificates of components approval.

9- Calculation report of containers, verification of supporting structure, containers safety system, weights, specification of safety device.

10- Booklets and technical specifications sheet of fittings, valves and instruments.

11- List of tests and laboratories where they are carried out.

12- Technical data of the tractor: Manufacturer, maximum towing capacity and maximum allowable load per axle, by catalog or certified by the respective technical organization for each manufacturing plant, characteristics of tires, fifth wheel and king pin, etc.

13- Operation and maintenance manual.

Once approved, CO shall return one copy sealed on every page together with the pertinent proof of approval.

1.6. APPROVAL AND AUTHORIZATION. EQUIPMENT AND TRACTOR

The CO shall be responsible for the approval and authorization of bulk CNG transport equipment and authorization of tractor-semitrailer unit. These steps supplement the requirements of any other national, provincial or municipal organization.

Trailers for bulk CNG transport shall not be authorized

1.7. AUTHORIZATION

Prior to mounting, containers shall be tested according to what is stipulated by the pertinent standards.

Once mounting is finished, the unit shall be inspected. At least, the following tests shall be carried out, but inspection may perform any other test deemed convenient:

- Pneumatic test at working pressure, checking with soapy water or other adequate means the lack of pressure leaks in openings, valves, fittings, etc.

- Complete visual inspection, controlling surfaces, weldings, cleanliness, threads adjustment, linearity and perpendicularity, manifold construction, etc. so as to verify compliance with standards and art rules.

- Weight control of each axle, according to the regulations in force.

- Control of the electrical system, checking operation of each circuit, connections correct assembly, sections of conductors used and any other control required for the inspection in each case.

- Visual inspection of fifth wheel and king pin according to the stipulations set forth in point 5.4.

Tests shall be carried out according to the guidelines set forth by the manufacturing standards applied and by the authorities having jurisdiction.

Modifications included during construction and after approval shall be authorized by the CO.

1.8. INSPECTION

1.8.1. The CO shall assign an exclusive and unalterable identification number to each equipment authorized. The Company responsible for that unit shall ensure that such number is painted in black, in the top half of the front and rear part of the equipment, in 150 mm height and 30 mm width characters. Those numbers shall be repainted when necessary for permanent clear legibility.

1.8.2. On the chassis, in a readily visible area, an identifying data plate shall be placed. It shall include at least, the following:

- Equipment manufacturer.
- CO Mark or symbol.
- Approval number.
- Authorization date.
- Re-authorization frequency.
- Space for engraving successive re-authorization dates (at least four).
- Working pressure.
- Test pressure.
- Total empty weight.
- Total loaded weight.

1.8.3. Data indicated by the pertinent approval standard shall be engraved in each container. Such identification shall be used in all the documents concerning the equipment approval.

Regardless of the previous statement, it is advisable to identify each container with a number readily visible from the floor, facilitating its identification. Correspondence between this number and the identification required in the previous paragraph must be recorded.

SECTION 2 - CONTAINERS

2.1. REQUIREMENTS

Containers to be installed on the semitrailer shall be type approved and once installed they may not be modified or altered without previous authorization and later approval and re-authorization by the CO.

2.2. APPLICABLE STANDARDS

Specifications or standards listed in 1.3, last edition shall be applicable.

The CO may accept other codes, specifications or standards from recognized countries technologically developed and experienced in the use of CNG, if the comparative technical analysis carried out by the TR proves them similar as regards safety and efficiency.

2.3. VERIFICATIONS

2.3.1. WALL THICKNESS

If no protective coating is applied, minimum container wall thickness shall not be less than the design thickness stated in the respective standard.

2.3.2. ADDITIONAL REQUIREMENTS FOR HORIZONTAL CONTAINERS

Except otherwise stated according to the standard applied, the addition of twice the maximum tensile strength due to bending plus fibers longitudinal tension due to the hydrostatic test shall not exceed 80% of the steel minimum yield strength.

$$2\ S_F + SL \leq 0{,}8\ S_{LFU}$$

The maximum tensile strength due to bending shall be determined by:

$$S_F = M\ C/I$$

Where:
S_F= Tensile strength [MPa]
M= Bending moment $= q\ l^2/\ 8$ [Nmm]
I= Moment of inertia $= 0{,}04909\ (D^4 - d^4)$ [mm^4]
C= Tube radius $= D/2$ [mm]
q= unit weight of water full tube, at hydrostatic test pressure [N/mm]
l= Tube length [mm]
D= External diameter [mm]

d = Internal diameter [mm]

Maximum longitudinal tension due to hydrostatic pressure shall be determined according to:

$SL = A_1 P/A_2$

Where:
A1= Internal area of tube cross section [mm^2]
A2= Metal area of tube cross section [mm^2]
P= hydrostatic test pressure [MPa]
SL= Longitudinal tension [MPa]

2.4. CONTAINERS THREADED CONNECTION

Containers shall be fitted with conical, internal and metric threads according to: DIN 477; UNI 339; BS 341; IRAM 2539, or non-metric ones according to ANSI-CGA V-1 (former ANSI B.57.1).

The connecting valve shall be fitted with an external, conical thread of the same type and diameter of container one and it shall comply with the same standard applied to the container thread.

2.5. DESIGN PRESSURE

Design pressure shall be determined based on the defined service conditions and shall comply with the statements included in the container approval standard.

2.6. CORROSION PROTECTION

The whole external surface of the container shall be prepared and painted according to points 2.6.1 and 2.6.2 so as to avoid corrosion damages

2.6.1 SURFACE PREPARATION

Before applying a coating, the steel surface shall be free from dust, grease, oil and any other foreign matter. For their elimination, solvents, detergents or special products for the coating to be applied shall be used.

Then, blasting process shall be applied to the equipment (sand blasting may be applied to fittings) to obtain a "near white metal", level Sa 2 1/2 stated in ISO 8501-1 Standard.

After cleaning, roughness profile shall range between 75 and 100 microns.

Lastly, Technical Specification P.A N° 355-00 shall be complied with so as to verify that there are no signs of dust resulting from the blasting process before applying coating.

2.6.2. PAINT APPLICATION

Unless otherwise stated, paint application shall comply with the paint manufacturer's recommendations.

Supplementary products such as diluents, solvents, etc shall be those recommended by the manufacturer of the selected paint. Paint shall only be applied when the ambient and surface temperature ranges between 5°C and 65°C and the maximum relative humidity does not exceed 65 %. Materials shall be applied in uniform and smooth layers, without marks, droppings, uncovered areas, etc. Paint shall only be applied after complying with instructions of point 2.6.1.

Not later than 12 hours after cleaning, two coats of very different colored zinc chromate primers shall be applied on the external metal surface. Before recoating, an interval equal to its hard drying time shall elapse.

Then, glossy white synthetic enamel shall be applied. It shall not be recoated until the first application dries out. Finishing paint shall be applied 24 hours after the last coating of zinc chromate primer.

Other procedures and specifications shall only be considered after submission and analysis in order to determine if they are similar or better than the ones applied.

2.7. CONTAINER OPENINGS

Openings on containers ends shall be used as inspection points.

2.8. SAFETY DEVICE

Each container shall be fitted with safety valves, no more than two, to withstand dynamic effects, and with capacity such as to allow adequate venting.

The valve discharge free area, or the addition of both areas provided there are two, shall be at least 20 cm^2 every 30 m^3 or fraction of container's capacity.

Valve shall automatically open at a pressure of 0.9 to 1 time the container test pressure.

Each valve shall be fitted with a burst disc which shall burst at the same pressure

stated above. Valve operation shall not be hindered by any potential fragment.

CO must certify that valve and disc construction material and design are adequate for natural gas use and their operating conditions comply with their quality requirements.

Spring shall be designed such as to allow direct mounting on the valve.

The valve shall be constructed as of stainless material or it shall be protected with corrosion protective coating such as epoxi paint or galvanized (zinced, cadmium plating, etc.).

Stem, washer, nut and locknut or cotter shall be stainless steel.

Valve stem guide shall have space enough for avoiding stem seizing.

Valve shall discharge outdoors and upwards. Bonnets shall protect them from rain and dirt.

It shall bear permanently and legibly the following:

- Name of the manufacturer or trade mark.
- Calibration pressure in bar or kg/cm^2.
- Air flow in m^3/min at 15°C and atmospheric pressure. The word **Air** shall follow the minimum flow value.
- Month and date of adjustment or calibration.

SECTION 3 - INSTALLATION PIPING AND FITTINGS

3.1. GENERAL ASPECTS

3.1.1. Installation materials shall be approved for the specific working conditions according to a recognized standard and shall comply with the requirements set forth by the standards included in 1.3.

3.1.2. Only standardized fittings shall be used for branching and bypassing. Temperature-Pressure rating shall meet the extreme working temperatures and pressures.

3.1.3. Specifications of welding procedures shall be submitted for approval. Qualification of such procedures shall be included therein.

3.1.4. Welders qualified by the pertinent authorities shall weld the pipes.

3.1.5. Piping minimum thickness (min.):

shall be calculated as follows:

$$e = \frac{P\ D}{2\ S + 0{,}8\ P} + C$$

$$e\ min = \frac{e}{e_1}$$

Where:
e: calculated thickness in mm
e min.: minimum thickness with manufacturing tolerance in mm
P: Design pressure in MPa
D: Piping external diameter in mm
S: material tensile strength = SR /4 in MPa
SR: Material breaking strength in MPa
C: allowable corrosion in mm
e_1: Manufacturing tolerance = 0.875

In case of threaded piping, threaded area minimum thickness shall not be less than the minimum calculated thickness.

3.1.6. Cast iron valves and fittings are not allowed.

3.2. MATERIALS

3.2.1. PIPING

Only seamless steel piping shall be used.

3.2.2. WELDING FITTINGS

Forged carbon steel fittings shall be used

3.2.3. TUBES AND UNIONS (FITTINGS)

They shall be stainless steel and connect the containers to the manifold. They shall be fit to withstand the working pressure and their maximum nominal diameter shall be 1/2" .

3.3. VALVES

Valves shall be selected according to a catalog or to the manufacturer's certification whereby their design and operating characteristics shall be included.

3.3.1 If there are two manifolds, one for filling the containers and the other one for discharging:

3.3.1.1. EXCESS FLOW VALVE

Shall be installed at the outlet of the discharge manifold.

Its size and calibration shall ensure its automatic shut off in case a pipe or hose breaks during discharge.

3.3.1.2. CHECK VALVE

Shall be installed at the inlet of the filling manifold

It shall prevent the return flow of gas in the containers during filling operations in case a pipe or hose breaks.

3.3.1.3. MANUAL VALVE

A fast closing, " quarter turn" valve shall be provided.

At least one shall be placed in each container, one at the inlet and one at the outlet of the filling and discharge manifold, respectively. When the manual valve is closed, the relief device shall not remain isolated from the container.

3.3.2. In case there is only one manifold for filling and discharging the containers, the valves stated in 3.3.1.1. and 3.3.1.2 shall be replaced by, at least, two (2) valves of the ones included in 3.3.1.3; one of them shall be remotely actuated. They shall be installed in series near the filling and discharge point.

3.4. FILLING AND DISCHARGE COUPLINGS

In the case of portable containers, couplings of hose and filling or discharge outlets shall be such as to allow fast disconnection

3.5. INTERCONNECTED CONTAINERS

Transported containers may be interconnected only if they are:

3.5.1. Structurally supported and joined by adequate means.

Safety relief devices in interconnected horizontal containers shall be designed such as to discharge to the atmosphere, upwards and without any restrictions so that gas discharge does not point to the containers or any other electrical element.

3.5.2. Each container shall be fitted with a manual valve with an open position indicator. Connections between the valve and the manifold according to 3.6. shall be flexible so as to prevent damage that can occur due to rigid connections.

3.6. MANIFOLD

One or two steel manifolds supported with appropriate fasteners that enable containers dismounting, withdrawal or replacement shall be installed.

The manifold shall not be subject to strains as structural support and it shall be fitted with elastic supports. Each container shall be connected to it as of manual valve by means of tubes and unions (fittings) according to 3.2.3.
It shall be fitted with a pressure relief safety valve and a gauge. They shall be adequate for their operation pressure and flow.

Inside it, maximum gas speed shall not exceed 25 m/s.

3.7. PRESSURE GAUGE

It shall be designed for a pressure rating equivalent to the working pressure. Working pressure shall be comprised within the mid third range of the pressure gauge. The quadrant minimum diameter shall be 100 mm readily visible and fit for operating in the open air. Connection shall have a manual and vent valve with restrictor orifice.

3.8. VALVE PROTECTION

Valves used for filling and discharge shall be protected by a metal structure or special cabinet for withstanding a 10,000 J body impact and adverse weather conditions. The enclosure shall vent to the atmosphere.

3.9. MATERIALS COMPATIBILITY

Material of the fittings directly mounted on the containers shall be electrochemically compatible with the container material.

SECTION 4 - CONTAINERS INSTALLATION

4.1. LOCATION OF CONTAINERS ON THE VEHICLE

Containers shall be located such that all the installed instruments, valves and controls are readily accessible.

Tubes shall be horizontally placed, longitudinally to the vehicle with the valves pointed directly towards the inside of the vehicle or else, valves, piping and other fittings shall be adequately protected against rollovers and impacts.

Containers portable structure shall be fixed to the semitrailer deck. It may be removed for maintenance or replacement.

4.2. CONTAINERS FASTENING

Each container shall be firmly mounted on the semitrailer to prevent direct contact with the other containers.

Supports and fastenings shall be designed such as to withstand 2g acceleration in each of the following directions:

1- In the direction of travel.
2- Transversely.
3- Vertically upwards.
4- Vertically downwards.

Note: Total weight implies that of fully loaded containers

Resulting strengths shall not exceed 60% of the material minimum yield strength. Containers shall not be a part of the semitrailer structure.

SECTION 5 - VEHICLE DEVICES AND COMPONENTS

5.1. GENERAL ASPECTS

The tractor and the equipment shall comply with the requirements stipulated in Law N° 24.449 – Traffic and Road Safety, its Regulatory Decree N° 779/95, the Resolution of Public Works Secretariat, Resolution of the Public Works and Transportation Secretariat Nr. 195/97 about Traffic and Road Safety, addenda and corrigenda and any other applicable national, provincial and municipal law.

In addition to the previous statements, the vehicle shall be fitted with the following components according to the product and load to be transported:

5.2. TIRES

Reconditioned tires are not allowed.

5.3. SUPPORT LEGS

The equipment shall be fitted with a system of retracting legs for withstanding its weight when the semitrailer is not coupled to the tractor.

5.4. COUPLING SYSTEM

5.4.1 FIFTH WHEEL

5.4.1.1 Design

It shall be adequately designed and made of stamped metal or forged steel. It shall withstand a load of at least 20,000 kg, evenly distributed. Its towing capacity shall be of 50,000 kg.

Kingpin locking mechanism shall be designed such as to prevent accidental disengagement of the unit and it shall bear a regular wear indicator.

Uncoupling may only be carried out manually and the system shall include a lever lock.

5.4.1.2 Fixing

The fifth wheel structure shall be fixed to the tractor frame with supports.

Fixing shall be carried out by anchorage to the chassis duly performed such as to withstand potential stresses.

For adequate distribution of the load on the axles, the correct fifth wheel location shall be considered as its displacement from its center is directly related to the tractor performance.

Likewise, maximum allowable loads on the tractor axles shall be considered. They shall not exceed those settled by the manufacturer and by the authority having jurisdiction.

Screws for fifth wheel fixing shall comply with ASTM A 193 Gr. B7 specifications and nuts shall comply with ASTM A 194 Gr. 2H specifications.

5.4.2. KING PIN

King pins shall be forged and fixed by welding or any other adequate means for withstanding stresses and operations of the vehicle.

They shall comply with the requirements of SAE J 133, SAE J 700 B or SAE J 848 A specifications and shall be made of SAE 8620 steel or equivalent.

Kingpin fixing structure shall be made of adequate material and
shall withstand the strains of the different traveling conditions.

The kingpin shall bear the manufacturer's name or logotype and month and year of manufacture readily visible at the head.

Minimum diameter shall be 88.9 mm (3.1/2").

5.5 ELECTRICAL CONNECTION BETWEEN THE TRACTOR AND SEMITRAILER

It shall be made of extra-flexible cord, protected with flexible piping. Multiple connecting plugs shall be perfectly isolated; jack shall be installed by the side of the power supply.

5.6. ELECTRIC ACCUMULATOR'S QUICK DISCONNECTION

A device for quick disconnection shall be placed readily accessible as near to the battery as possible (not more than 600 mm).

5.7. BATTERY

Nominal tension shall not exceed 24V.

If batteries are not located under the vehicle engine hood, they shall be enclosed in a metal box which lid shall be internally isolated or secured in a steel structure as near to the cabin as possible.

Terminals shall be protected from accidental short circuits by acid-resistant caps.

5.8. GROUNDING

An electrical connection between the metal structure and the ground shall be provided. It shall be a metal mesh dragged and in contact with the ground

Metal of containers, chassis and axles shall be connected by cable bridges or electrolytic copper strip ensuring electrical continuity of parts and of tractor and semitrailer.

A butterfly nut screw or any other element, preferably made of brass shall be available for grounding before loading or discharge operation.

5.9. CHOCKS

Each vehicle shall be fitted with at least four (4) chocks sized according to the vehicle weight and wheels diameter, for avoiding unit displacement when parked and when loading or unloading.

5.10 SPARKING ELECTRICAL ELEMENTS

Alternator, manifolds, relays and fuses shall be located in front of a flame arrester or they shall bear a lid or cap perfectly adjusted.

5.11 COMBUSTION GASES EXHAUST SYSTEM

The exhaust system includes the muffler and the exhaust pipe. Its discharge shall be located far from the containers and out of the chassis or unit's resistant structure conveniently located far from any maneuvering place

" Free exhaust" systems which take the muffler out of the circuit shall not be used.

The exhaust pipe shall end at a flame arrester which may be dismounted and shall be mandatory for entering the Loading and Discharge Sites. A flame arrester shall be fitted to each vehicle for a better adjustment between the element and the exhaust pipe.

5.12 WARNING SIGNALS

Warning signals fitted to the vehicles shall not be of open flame to be used in case of emergency. Besides the elements required by the regulations in force, each unit shall be fitted with:

a) Two intermittent orange tight portable lights, and separated from the vehicle electrical installation.

b) Warning signs.

5.13 WORDING AND PAINTING

5.13.1 TEXT

5.13.1.1 "DANGER – EXPLOSIVE – COMPRESSED NATURAL GAS – FLAMMABLE GAS" shall be painted on both sides, rear and front part of the vehicle in black print letters, at least 75 mm height on a yellow background.

5.13.1.2 Likewise, in both sides, the name of the unit owner shall be readily visible. Its colors shall contrast with the background color.

5.13.2 SIGNALING

5.13.2.1 Standardized signs shall be placed for warning that the unit carries hazardous load.

They shall be on both sides, front and rear part of the unit.

They shall be readily visible and adequately supported such as not to block the view to the units' legends.

They shall be located such as to be visible even when water and dirt are expelled by the wheels.

5.13.2.2 They shall also bear the emergency response number - 4- and the number of United Nations hazardous materials list in accordance with the legislation in force.

SECTION 6 TRANSPORT VEHICLE

6.1. LOAD DISTRIBUTION

Maximum load transmitted to the pavement shall not exceed the one allowed by the authorities having jurisdiction according to the regulations in force.

6.2. TOWING CAPACITY

The tractor towing capacity shall be suitable for the weight to be transported. Thus, WEIGHT-POWER ratio set forth by the authorities having jurisdiction and the manufacturer's specifications shall be complied with.

6.3. KING PIN

It shall be analyzed according to the stipulations included in 5.4.2. Fastening method (welding) shall be verified and constructive details specified.

6.4. FIFTH WHEEL

Mechanism for supporting and coupling the semitrailer to the tractor. All characteristics such as brand, type, material, etc. shall be submitted.

6.5. SEMITRAILER CONTROL

Chassis structure shall be checked according to the acting loads, considering the following:

6.5.1. DESIGN REQUIREMENTS

Semitrailers shall be designed and constructed such as to withstand the acting loads stated in **6.5.1.1; 6.5.1.2 and 6.5.1.3**.

Resulting strengths shall not exceed the maximum yields strength of the materials considered.

Design shall always consider fatigue aspects.

6.5.1.1. Longitudinally in each direction:

Loads of two (2) times the weight of the higher part of the vehicle fully loaded.

6.5.1.2. Vertically downwards:

Loads of two (2) times the weight of the higher part of the vehicle fully loaded.

6.5.1.3. Vertically upwards and transversely:

Loads equivalent to the higher part of the vehicle fully loaded.

6.5.2. DIMENSIONS

Center of gravity shall not be higher than 2.40 m and the roof load shall not be higher than 4.10 m.

Width between suspension springs shall not be less than 900 mm in order to achieve the essential and necessary stability at the allowed highway speed. Pneumatic suspension semitrailers shall be preferred as long as they do not exceed 3 or 4 tilt degrees with a transversal acceleration of 0,3 G.

6.5.3. STRUCTURAL STIFFNESS

Semitrailer structural stiffness shall be suitable for the load weight and requirements, and shall be resistant to any type of vehicle impact or rollover.

Stiffness shall be provided to each group of containers or else, the semitrailer shall be reinforced at floor level and above the level of the components containing high pressure gas.

SECTION 7 TESTS

7.1. PERIODIC TESTS

Bulk CNG transport units shall be subjected to the periodic tests indicated hereinafter and to those required by the Traffic Law (Mandatory technical Inspection).

The Technical Representative of the Constructor or Operator shall be responsible for carrying out the tests. He shall inform the CO about the tests and their results.

Unless otherwise stated by the standard for container approval, the stipulations of 7.1.4. shall be considered for five yearly tests.

Test plan shall be carried out according to the following:

7.1.1. MONTHLY

- Manual valves:
Verify there are no leaks and that they operate correctly.
- Remote control:
Verify its correct operation.
- Check and flow excess valves:
Verify their correct operation
- Safety valve:
Verify there are no leaks and that calibration has not expired.

7.1.2. HALF-YEARLY

Coupling system shall be inspected thoroughly so as to verify potential wear, cracks or ruptures of the assembly components; therefore, the inspection shall include:

7.1.2.1. King pin

Throat diameter and perpendicularity between kingpin and fifth wheel (tolerance: +/- 1°, according to SAE J 700 b) shall be verified.

The kingpin shall be replaced when it does not comply with these dimensional and geometrical requirements and when there are failures, wear or ruptures.

Its integrity shall be verified with penetrating dyes or magnetizing particles.

7.1.2.2. Fifth wheel

The condition of the fifth wheel and its fastening device surface which is in contact

with the kingpin shall be verified.

The fifth wheel fastening elements nuts adjustment shall be checked.

The flat condition of the fifth wheel shall be verified.

7.1.2.3. Fire extinguishers

General condition, load and pressure of fire extinguishers and their expiration dates shall be checked.

7.1.3. ANNUALLY

7.1.3.1. Fast coupling shall be controlled (potential wear).

7.1.3.2. Gauges shall be checked according to the Recommended Practice IAP-CA-3.01. Control date shall be engraved in a non-corrosive or rust-proof plate, adequately fixed.

7.1.3.3. Piping and fittings condition shall be checked.

7.1.3.4. Each safety valve shall be controlled:

Good condition shall be verified and a pressure test for checking its operation and calibration shall be carried out.

Control date shall be engraved in the body or in a non-corrosive or anti-rust plate, adequately fixed.

CO shall control verification.

7.1.4. FIVE YEARLY

A complete assessment of the unit, containers and other components shall be performed.

7.1.4.1. Once container external paint is removed and surface cleaned, the main defects shall be inspected and assessed. The inspector may determine the need of verifying other aspects besides the ones indicated.

Usually, the most common defects that may affect containers service life are:
a) Dents
b) Gouges
c) Dents containing gouges
d) Cracks
e) Blisters
f) Lamination

g) Wear
h) Distorted circular section
i) Marking defects
j) Corrosion

7.1.4.2. Definition of defects and refusal limits are included in GE-N1-144 Standard of GAS DEL ESTADO or a future standard superseding it.

7.1.4.3. Containers thicknesses shall be controlled by ultrasonic test and resulting thicknesses shall not be less than the design minimum thickness.

7.1.4.4. If during an external visual inspection there are signs of internal corrosion or pollution, or if a thorough inspection is necessary, the container shall be internally inspected.

An inspection lamp, luminous enough to identify any defect listed in 7.1.4.1. shall be used.

Any container in which internal corrosion or dirt signs were detected shall be adequately cleaned avoiding damage to the container. After cleaning, inspection shall continue.

7.1.4.5. Containers shall be hydrostatically tested at the pressure settled in the standard for approval.

7.1.4.6. After pressure test, containers shall be adequately dried.

It shall be internally inspected so as to ensure it is dry and pollutant-free.

7.1.4.7. Other non-destructive examinations at the CO request.

7.1.4.8. If pertinent verification results are satisfactory, the unit shall be reauthorized for five years more.

7.2. PERIODIC TESTS AND EXAMINATIONS

The authorized entity or the CO may require periodic tests when it is suspected that unit safety may have been weakened as a result of a repair, modification, accident or in case the initial features of the container have been altered.

7.3. GENERAL REQUIREMENTS FOR FIVE-YEARLY TEST

7.3.1. Five yearly tests shall be carried out not later than 15 days after expiration of the pertinent authorization, based on the last test date indicated in the Stock Sheet included in ANNEX 1.

If those tests are not carried out on the expiration date, the unit shall be disqualified.

In case they cannot be carried out within the specified term, the Operator shall consider the possibility of controlling the containers in advance, so as to test them in periods of reduced demand.

7.3.2. Tests shall comply with 7.3.1 and shall be audited by the CO. The TR shall sign every page.

7.3.3. In case one of the tests included herein is not carried out or not informed to the CO within the foreseen term, the unit shall be disqualified until the requirements are complied with.-

ANNEX 1
STOCK SHEET

....., ...
(Place) (Date)

(NAME OF CERTIFICATION ORGANIZATION)

We hereby detail our truck tractors and semitrailers for bulk CNG transport currently in use:

UNIT N°	Vehicle Type	TRACTOR					CONTAINERS			
		Make	Model	Number of			Manufacturer	Nr.	Capacity (water liters)	DATE LAST TEST
				Chassis	Engine	Plate				

UNIT NR.	UNIT MAINTENANCE CONDITION	NOTES

GENERAL NOTES:
.....
.....
.....
.....

Technical Representative:
Signature:
Print:
License number:

Owner:
Signature:
Print: