

HOSES FOR CNG DISPENSERS

INSTRUCTIONS FOR THEIR INSTALLATION, USE AND

CONTROL

Foreword

This document shall be considered by the Filling Station when receiving, installing, using and maintaining hoses for CNG dispensers.

It shall be used to instruct users about the necessary cares to be taken so to properly store, use and maintain hoses, as well as the adequate controls imposed when deciding on their replacement.

Safety considerations

This document includes safety considerations. It must be carefully complied with during every stage, from hoses' reception, storage, installation, use, maintenance and control, since the inadequate use, improper installation or maintenance of hoses or assemblies may cause body injuries or material damage. Its compliance reduces the chances of failure of any component or the system, thus reducing the risks of damages.

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1. Purpose

To provide guidelines for the reception, storage, installation, use, maintenance and control of hoses for CNG dispensers.

2. Background information

2.1 SAE Publications:

SAE J 1273 Rev. December 2002: Guideline for the selection, dispatch, manufacturing, installation, replacement, maintenance and storage of hoses and assembled hoses for systems with power transmission fluids.

SAE J 514: Hydraulic connectors.

SAE J 517: Hydraulic hose.

SAE J 1927: Damage analysis for assembled hydraulic hoses.

2.2 Report of Transport Gas Committee – Professional Association of Mechanical and Electrical Engineering (COPIME).

2.3 Resolution ENARGAS N° 2767/2002.

2.4 NAG Standards:

NAG 415 (former GE-N1-115)

Regulations. Definitions and terminology. Specifications and procedures. Technical documentation to be filled in for all categories registered in Manufacturers and Importers' records.

NAG 418 (former GE-N1-118)

Regulations for CNG filling stations.

NAG 441 (former GE-N1-141)

Compression equipment for CNG filling stations.

3. Definitions

They are sequentially listed so as to help understand the last definition in relation to the previous ones.

For the purpose of this document, it shall be understood as:

3.1 Hose: Flexible conductor to be used in CNG dispensers.

3.2 Hose terminal or Terminal: Connector pressed on a hose end.

3.3 Hose assembly: Hose with pressed terminals on both ends.

3.4 Abrasion: Mechanical wear of external cover, produced by rubbing it against the floor and sharp surfaces, excoriations, external cover cuts, among others.

3.5 Hose failure: Event in which the hose does not comply with safety and efficiency requirements.

3.6 Hose service life: Period of time during which a hose complies with the necessary requirements to be used in safe conditions, without the need of replacing it.

4. Safety considerations: In points 4.1 to 4.3, some potential conditions and situations that may cause body injuries or material damages are considered. Besides, there are instructions on how to avoid them. The following list is not exhaustive.

The information given in this document shall be included in the training courses of yard operators in the filling station, maintenance personnel and other persons working with CNG hoses.

4.1 Gas leak: Pressurized gas leak may cause severe body damage and other risks (see 4.3).

Thus:

- ❖ Avoid gas leak, particularly in dispensing areas. Therefore, hoses must be depressurized before dismounting them from the gas dispenser. Besides, all connections must be secured before pressurization.
- ❖ Comply with the instructions on the correct operation, safety standards and training programs.

4.2 Hose blow off (“lash”): If a pressurized hose assembly separates, the terminals may be thrown at a very high speed, and the loose hose may shake and strongly injure people and damage surrounding installations.

The correct terminal pressed to the hose shall be verified. Besides, its physical condition shall also be verified, according to point 7.2.k., making the pertinent corrections, if necessary—including the possible installation of a suitable protection—. In both cases, the replacement shall be made when necessary, according to the action criterion defined at the end of said Point 7.2.

4.3 Fire and explosions caused by high pressure natural gas: Natural gas release at high pressure may cause blaze o may explode once in contact with an ignition source.

The gaseous fluid path shall not be opened if any motor vehicle electrical component is still running. If once the path is opened (by instinct, by mistake or any other reasons), some electrical component starts working, sparks generation shall be avoided. Thus, power supply shall not be cut until the gas stops flowing out.

5. Hose selection – Service life

Different factors, such as, hose adequate selection for use conditions, correct hose mounting with its connectors, correct hose installation in the dispenser, proper use and maintenance and periodic controls influence hose service life in safe conditions.

5.1 Temperature: If hose specified temperature values are exceeded, its service life shall be significantly reduced.

Gas temperature shall be verified when coming out of compression equipment. Such temperature shall not be greater than that admissible by the regulations in force.

Contact with hot surfaces shall be avoided.

5.2 Environmental conditions: They may cause hose and terminal degradation. The most common factors considered, among many others, are the following:

- a. Temperature (see Point 5.1).
- b. Chemicals: Hose cleaning with aggressive chemical components.
- c. Abrasion: Rubbing against rough surfaces or cutting edges.

5.3 Wrong uses: Hose assembled sets are designed according to internal stress caused by the conducted fluid. Sets shall neither be pulled nor used for purposes implying stresses for which, both the hose and the terminals, have not been designed.

5.4 Specification and Standardizations: When purchasing hoses, they shall be identified and approved by means of a certificate issued by a Certification Organization, which shall guarantee that the product complies with the regulations in force.

5.5 Hose terminals: Hoses shall be provided assembled with their added terminals.

5.6 Hose cover protection: Hose cover shall be protected against abrasion, erosion, snags and cuts. They shall be installed in such a way so as to reduce rubbing against other hoses or any objects that may erode them (see Figure 1: External damage prevention).

Note: Under no circumstances shall hoses be coated, sheathed, wrapped up, protected by any external cover other than that their own, so as not to make their visual inspection difficult.

5.7 External physical variables: Hoses shall be installed and used in such a way so as to avoid:

- a. Axial loads (traction stresses).
- b. Cross section loads (cut stresses).
- c. Excessive bending: hoses shall have protecting systems (flexible supports).
- d. Excessive torsion: Torsion values registered in normal operation do not affect design conditions.
- e. Crushing.
- f. Cracks.
- g. Abrasion.
- h. Twisting (see Point 6.3).
- i. Excessive temperatures (see Point 5.1).

5.8 Slings and clamps: Slings and clamps shall be used to support long or heavy hoses in order to protect them from any other system mobile components. Clamps shall be used to avoid movements that may cause abrasion.

5.9 Minimum bending radius: Hoses being in use shall not adopt bend radius lower than those minimum specified by the manufacturer or importer and approved by the CO, at the risk of reducing their service life. Hose/terminal interface shall maintain a length straight stretch as minimum equal to an external radius. The most accentuated bends resulting from the non-compliance of this requirement may cause leaks, hose breaking or terminal loosening (see Figures 2A and 2B).

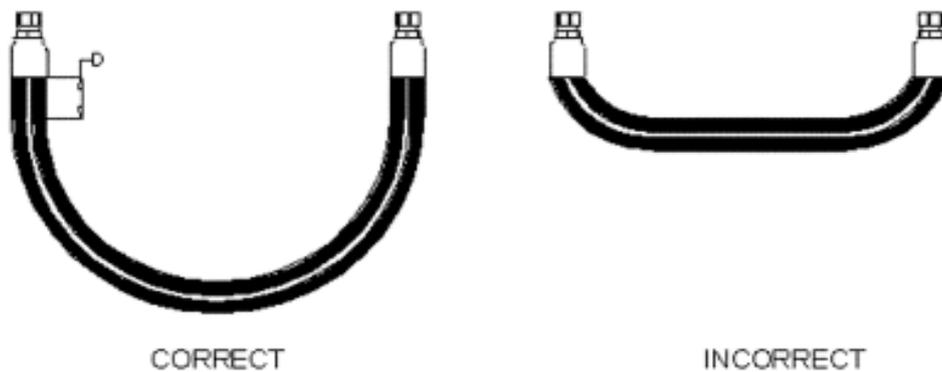


Figure 2A

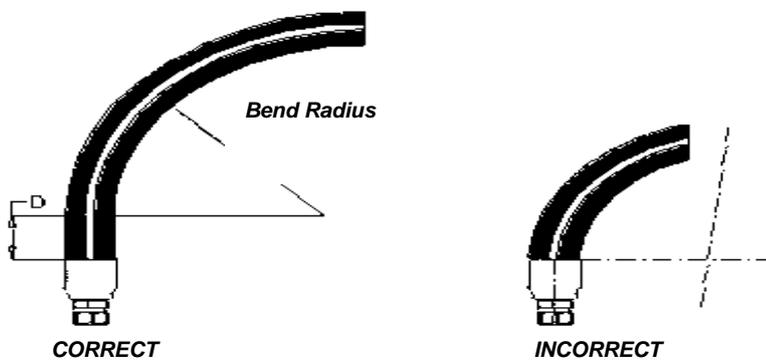


FIGURE 2B—MINIMUM BEND RADIUS

Figure 2B

Figure 2: Minimum bend radius

5.10 Elbows and adaptor: In certain cases, elbows and adaptors shall be used in order to reduce hose stress (see Figure 3).

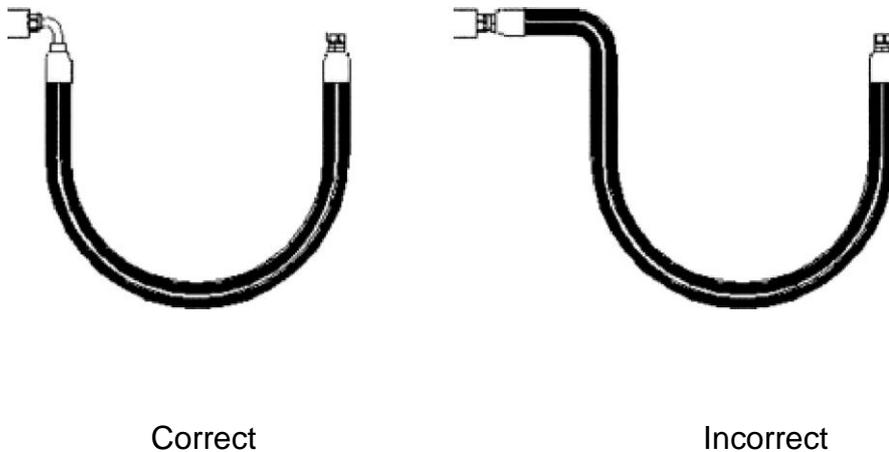


Figure 3

6. Hose installation and replacement

When installing hoses on new dispensers or replacing them on existent dispensers, the following shall be taken into account:

6.1 Pre-installation inspection: Before installing a hose, the following shall be foreseen:

- a. Hose length and its stretching.
- b. The correct positioning so as to avoid torsions, cracks and twists.
- c. The correct height in order to avoid rubbing against abrasive surfaces.

6.2 Hose handling during installation: During installation, hoses shall be carefully handled. Their mistreatment or excessive bending (less than the minimum bending radius) may reduce their service life. Excessive bending in the terminal and hose joint shall be avoided.

6.3 Hose turning angle and orientation: The pressure applied to a twisted hose may reduce its service life or loose its terminals. In order to avoid twisting, a marked generatrix (reference line) shall be used for guidance or it shall be marked (see Figure 4).

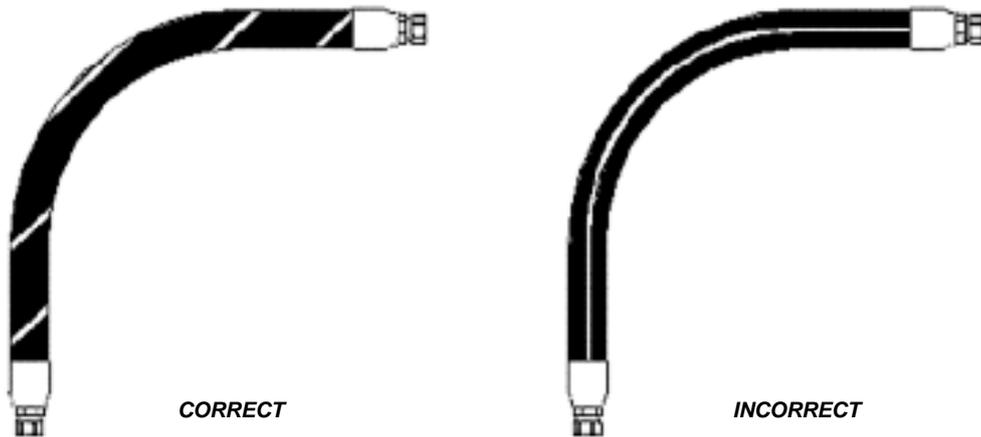


Figure 4

6.4 Safety and protective devices: The necessary restrictions and protective devices shall be installed. Those devices must not cause additional stresses or wearing points. See note 5.6.

6.5 Displacement: The recommended practices in Point 5 shall be revised so as to make the adequate corrections and obtain optimum results.

6.6 Assembly torque: The hose terminal end is normally threaded. In order to obtain a suitable sealing when making the connection (directly or by means of an adaptor or any other terminals), the specified different torque values shall be considered. A suitable tool shall be used to correctly adjust each connection so as to avoid terminal hexagon deformation.

6.7 Leak detection: If leaks are detected, during inspection or in any other circumstance, dispenser valve shall be immediately closed to depressurize the hose and avoid injuries. Thus, it must be replaced.

7. Maintenance, inspection and controls

Compliance with a hose and terminal inspection plan guarantees a safely high operation and reduces body injuries and property damages risks. Hose users shall design and implement a preventive maintenance program.

7.1 Inspection frequency: Inspection shall be permanently carried out by the hose operator and the Technical Representative. The frequency of inspections shall be estimated according to the records and the use characteristics of each hose. It shall be performed at least once a month.

7.2 Controls – Visual Inspection (hose and terminal): Hose and terminals shall be inspected for the following:

- a. Excessive axial loads (traction stresses).
- b. Excessive cross section loads (cut stresses).
- c. Excessive bending: The existence of protecting systems shall be verified.
- d. Excessive torsion: The way of hose installation shall be verified so as to prevent that a wrong installation generates a wrong torsion.
- e. Crushing: They are typically produced by an unforeseen hood closure or when a vehicle steps on hoses.
- f. Cracks.
- g. Abrasion: The non existence of rubbing (against the floor or sharp surfaces) defects, excoriations, cuts or loosening shall be verified on the external cover.
- h. Twist: The hose way of installation shall be verified, making sure that a wrong installation may generate twists.
- i. Excessive temperatures (see point 5.1): It shall be verified if hoses are harden, stiff, soften, blistered, brittle or carbonized.
- j. Hose or terminal leak.
- k. Damage, cracked, corroded or loosed hose terminals.
- l. Chemical deterioration.
- m. Other significant signs of deterioration.

If any of these conditions exist,

- ❖ evaluate if hose installation is the cause and if that is the case, the pertinent correction shall be made, or
- ❖ immediately replace it, if necessary.