



SOUTHWEST GAS CORPORATION
ENGINEERING STAFF

MATERIAL SPECIFICATION

Prepared By: M.R. Haught

Approved By: J.F. Wunderlin *JFW*

Section No.:	MS P-5
Page No.:	1 of 7
Issue Date:	08/15/96
Superseded Date:	Original

COMPRESSED NATURAL GAS (CNG) EQUIPMENT

Natural Gas Vehicle and Fuel Dispenser Hose Assemblies

1. SCOPE

This material specification applies to compressed natural gas (CNG) hoses which are used for Natural Gas Vehicle (NGV) dispensing stations to connect the dispenser to the refueling nozzle (dispenser hoses), or as part of a vehicle on-board fuel system.

This specification also applies to dispenser hoses for use with appliances such as those covered by the American Gas Association, "Requirements for Natural Gas Vehicle Fueling Appliances," Document No. 2-90. The hoses have nominal internal diameters of 1/4, 3/8, 1/2, 5/8, 3/4 and 1 inch (6.35, 9.525, 12.7, 15.875, 19.05, 25.4 mm), respectively. If a value for a measurement, as given in these requirements, is followed by an equivalent value in other units, the first stated value is to be regarded as the specification.

2. APPLICABLE DOCUMENTS

- 2.1 American Gas Association (AGA), "Requirements for Natural Gas Vehicle Fueling Appliances," Document No. 2-90.
- 2.2 International Approval Services/American Gas Association (IAS/AGA), "U.S. Requirements for Hoses for Natural Gas Vehicles and Fuel Dispensers," Document No. 1-93, April 14, 1994 edition, Sections 2.5, 2.15 and 2.19.
- 2.3 Society of Automotive Engineers (SAE) Handbook, Volume 2, Part 19.

3. TERMINOLOGY

3.1 General

- 3.1.1 "Southwest Gas," "Southwest" or "SWG" wherever used in this specification and other related documents will refer exclusively to Southwest Gas Corporation.
- 3.1.2 The terms "approved," "as approved," "satisfactory," "as directed," "or equal" or other similar terms wherever used in this specification and other related documents will mean "as determined by Southwest Gas," unless specifically stated otherwise.
- 3.1.3 "Product Information Package" or "PIP" wherever used in this specification and other related documents will mean the required information that a manufacturer must submit to SWG to determine if the product is suitable for use by SWG, unless specifically stated otherwise.



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4. MATERIALS AND MANUFACTURE

- 4.1 The construction of hose parts not specifically covered by this requirement shall be in accordance with reasonable concepts of safety and durability.
- 4.2 All specifications relative to construction set forth herein may be satisfied by the construction actually prescribed or provide documentation of equivalent performance.
- 4.3 The inner tube surface and outer cover shall be smooth, of uniform thickness and free from imperfections. The intent of this requirement is not to exclude the use of a corrugated or perforated cover.
- 4.4 The outer cover shall be constructed to prevent fluids from penetrating into the inner plies, braids or tube, unless these materials are resistant to the affects of water, motor oil, brake fluid and other common automotive fluids.
- 4.5 Reinforcement shall be provided and shall be evenly and firmly applied over the tube.
- 4.6 The hose outer cover shall be constructed of non-electrically-conductive material.
- 4.7 Fittings shall be faced or otherwise finished externally to provide a hexagonal or octagonal wrench grip. The dimensions across the flats for the type of fitting shall not be less than those specified in the SAE Handbook, Volume 2, Part 19.
- 4.8 Fittings shall be made of corrosion-resistant metal or of steel provided with a corrosion-resistant plating. (See IAS/AGA Document No. 1-93, Section 2.15.)
- 4.9 The manufacturer shall supply evidence acceptable to SWG that all materials have been evaluated and found suitable for their intended usage.
- 4.10 All CNG hose assemblies shall be manufactured to IAS/AGA Document No. 1-93.

5. PERFORMANCE REQUIREMENTS

- 5.1 A hose for high pressure service shall be constructed in such a manner that permeation or leakage from the inner tube does not expand or damage the outer cover or inner plies. The manufacturer shall provide to SWG the method of compliance with this provision.
- 5.2 Hoses shall be suitable for use at a temperature range of -40°F to 180°F (-39.9°C to 82.2°C). Hoses for use in the vehicle engine compartments shall be suitable for use at a temperature range of -40°F to 250°F (-39.9°C to 121.1°C).



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5. PERFORMANCE REQUIREMENTS (Continued)

- 5.3 Dispenser hose assemblies shall be constructed as to provide an electrically-conductive and bonding path between the couplings at each end of the hose in order to dissipate static electricity in accordance with IAS/AGA Document No. 1-93, Section 2.5.
- 5.4 Materials used in the interior construction of the hose shall be suitable for use with natural gas. The inner tube shall also be resistant to natural gas compressor lubricating oils. Satisfactory documentation of these properties shall be furnished to SWG prior to the purchase of the hose assembly.
- 5.6 The manufacturer shall supply documentation to SWG that the materials used in the construction of the hose outer cover are resistant to water, motor oil, grease, brake fluid, salt and other common automotive fluids.
- 5.7 All CNG hose assemblies shall perform to guidelines referenced in IAS/AGA Document No. 1-93.
- 5.8 All hose assemblies to be used for CNG stations and vehicle conversions shall conform to the requirements outlined in International Approval Services/American Gas Association, "U.S. Requirements for Hoses for Natural Gas Vehicles and Fuel Dispensers", Document No. 1-93, April 14, 1994 edition.

6. DIMENSIONS AND TOLERANCES

- 6.1 The nominal hose diameter shall refer to the finished internal diameter (for example: a tolerance of $\pm .05$ -inch (1.28 mm) is for a 1-inch size). A tapered plug having a taper of 3/8-inch per foot (9.525 mm/m) marked to indicate variation of 1/64-inch (0.4 mm) in diameter or other equivalent means may be used for measuring inside diameter.
- 6.2 All dimensions and tolerances of CNG hose assemblies shall conform to guidelines referenced in IAS/AGA Document No. 1-93.
- 6.3 The length of the hose assembly shall not exceed 15 feet (4.56 meters).



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7. INSPECTION

- 7.1 Successful review of the Product Information Package (PIP), as well as any future reference by SWG to the seller's part number or internal code number in any future contract or purchase, will mean only that no conflict with the specification was found, and will not relieve the seller from meeting all the requirements of this specification.
- 7.2 SWG retains the option to inspect the manufacture and testing of NGV hoses sold to SWG.
- 7.3 SWG will make appropriate inspections and tests of any and all materials, products or systems supplied to this specification. SWG will have the right, at their option, to reject any material which fails to conform to this specification. Any such rejection may take place at the manufacturer's facility, the vendor's warehouse or any subsequent delivery location, before or after SWG assumes possession. Notice of the rejection will be made promptly to the supplier by SWG's Corporate Purchasing Department. The defective product will be replaced or returned for credit at the manufacturer's expense.
- 7.4 Any changes in the manufacturing of previously approved hose assemblies covered under this document for sale to SWG must be approved by SWG's Engineering Staff. Failure to obtain SWG's approval may be cause for rejection and disqualification as an approved supplier.

8. CERTIFICATION

The manufacturer's or supplier's certification will be furnished to SWG. This certification will state that samples representing each lot have been manufactured, tested and inspected in accordance with this specification and that all requirements have been met.

9. MATERIAL SAFETY DATA SHEETS

In accordance with law, the seller will supply Material Safety Data Sheets for all applicable items supplied under this specification to the following:

- 1) The Receiving Location
- 2) Engineering Staff
- 3) Southwest Gas Corporation
Staff Safety
Mail Station LVA-581
P.O. Box 98510
Las Vegas, NV 89193-8510



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10. PRODUCT MARKING

10.1 Each hose assembly shall bear a permanent marking on either a non-removable ring, a portion of a non-removable fitting not subject to tool usage or the hose cover itself, on which shall appear the following:

- Manufacture's name, trademark or symbol.
- Maximum operating pressure.
- Nominal I.D. of the hose.
- "NGV" to indicate that the hose is for natural gas vehicle applications.
- A distinctive designation to specifically identify the product.
- A number, not less than 3/32-inch (2.381 mm) in height, identifying the last two numbers of the calendar year in which the hose was manufactured.
- A letter(s) not less than 3/32-inch (2.38 mm) in height, identifying either the month or batch of manufacture. The batch size shall be determined by the manufacture.
- A marking to identify these requirements as follows: "IAS/AGA 1-93."

10.2 Each hose assembly shall have all of the above information visible.

10.3 All markings shall be resistant to the elements they may be subjected to and shall demonstrate suitable legibility as outlined in IAS/AGA Document No. 1-93, Section 2.19.

10.4 All CNG hose assemblies shall conform to the hose instruction guidelines referenced in IAS/AGA Document No. 1-93.

11. PACKAGING

11.1 Instructions covering proper installation and usage shall be attached to each hose assembly.

11.2 The instructions need not be permanent in nature, but shall be durable and attached in a manner that they may be expected to reach the person who will install the hose assembly. A self-adhering label wrapped around the hose is considered acceptable.



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11. PACKAGING (Continued)

11.3 The instructions shall include, as a minimum, the following information:

- The hose must not be kinked, twisted or torqued.
- The hose is for use with natural gas only.
- The maximum operating pressure which is marked on the hose must not be exceeded.
- Contact with foreign objects or substances must be avoided.
- The manufacture's specified minimum bend radius for the hose.
- The specific application for the hose (eg., fuel dispenser hose, vehicle fuel system hose, etc.).
- If the hose is for a vehicle fuel system, state whether or not the hose is intended for use in engine compartments.
- The final assembly must be tested for leaks.

11.4 The information contained in paragraph 11.3 shall also be provided on a separate "User's Instruction Sheet" with instructions for SWG to retain for future reference. This instruction sheet shall also contain the flow coefficient of each end fitting and per foot of hose (or other method of determining the flow coefficient for different diameters and lengths.).

11.5 All CNG hose assemblies shall conform to the hose instruction guidelines referenced in IAS/AGA Document No. 1-93.

12. STOCK CLASSIFICATION DESCRIPTION

HOSE ASSEMBLY, SLOW FILL, RATED WORKING PSI _____, (SWG MS P-5).

HOSE ASSEMBLY, FAST FILL, RATED WORKING PSI _____, (SWG MS P-5).

HOSE ASSEMBLY, HOT CHANGE BOTTLE, WORKING PSI _____, (SWG MS P-5).