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Working Party on Gas

Ad Hoc Group of Experts on the Supply and Use of Gas

Fourth session, 23 January 2003

**TECHNOLOGICAL STANDARDS AND NORMS REQUIRED  
FOR DESIGN AND OPERATION OF NGV  
FILLING STATIONS**

(Draft questionnaire, prepared by the delegation of Portugal)

Note by the secretariat: This document is prepared in accordance with the decision of the fourth session of the Ad Hoc Group of Experts (ENERGY/WP.3/GE.5/2003/2, para 9), held in Geneva in January 2003.

You are kindly requested **to review** the draft questionnaire and send your **comments** to the General Rapporteur, **Mrs. Maria Teresa SAO PEDRO**, Head of Fuel Department, General Directorate for Energy, Av.5 Outubro, 87, 1069-039 Lisboa, Portugal, Fax: +351 21 793 9540 and e-mail [combustiveis@dge.pt](mailto:combustiveis@dge.pt), with a copy to the secretariat, **by 1 November 2003**.

**1 – GENERAL DESCRIPTION**

1.1 How many NGV filling stations exist in your country?

1.2 How many NGV stations are:

- Fast fill
- Slow-fill
- Public
- Private

1.3 Do you use vessels or cylinder batteries in your NGV filling stations?

1.4 Do you install the storage facility in the open air?

1.5 Do you use an enclosure to house the storage facility?

	Yes	No	Observations
1.6 If you use a compressor on the local gas supply network does there exist a non-return system fitted immediately downstream of the meter?			
1.7 Does the non-return system have to be acceptable to the gas transportation company?			
1.8 Does a low pressure switch exist and does it have to be located so as to sense if the inlet gas pressure in the compressor falls below an acceptable level?			
1.9 On failure of the inlet gas pressure does the compressor shut down and not re-start automatically			

**2 – PRINCIPLES OF DESIGN AND INSTALLATION OF NGV FILLING STATIONS**

	Yes	No	Observations
2.1 All equipment, components, pipework and fittings shall be of a type and manufacture suitable for their intended use and supported by appropriate certification			
2.2 The equipment of the filling station is located preferably <ul style="list-style-type: none"> <li>• In open areas</li> <li>• In dedicated buildings</li> </ul>			
2.3 When the components are located in open areas they are protected against corrosion taking into account environmental conditions			
2.4 The refuelling station components are adequately protected against collision of vehicles			
2.5 The natural gas refuelling stations have adequate facilities to prevent unauthorized access to various parts of the installation, especially those parts that may only be accessed by competent persons. <ul style="list-style-type: none"> <li>• Placing a fence</li> <li>• Installing in a secure area</li> <li>• Installing in a container</li> </ul>			
<b>3 - GAS COMPOSITION</b>			
	Yes	No	Observations
3.1 Natural gas used by NGV is odorised to a level similar to that found in the local distribution system			

3.2 Gas supplied to the dispenser has a particulate matter level which will not cause malfunctions of the dispensing equipment or vehicle fuel system			
3.3 Particle filters are used to remove all particulate matter greater than 20 microns?			
<b>4 - SAFETY DEVICES</b>			
	Yes	No	Observations
4.1 The natural gas filling stations are equipped with safety devices			
4.2 The natural gas filling stations are equipped with an independently operating safety device, which will work in such a way as to prevent exceeding the maximum allowable delivery pressure.			
4.3 The natural gas filling stations have auxiliary safety devices that include at least: <ul style="list-style-type: none"> <li>• An emergency gas isolation valve</li> <li>• An emergency stop button</li> </ul>			
4.4 What is the maximum delivery pressure of the natural gas at the refuelling stations without temperature compensation?			
<b>5 - HAZARDOUS AREAS</b>			
	Yes	No	Observations
5.1 Is your hazardous area classification in accordance with: <ul style="list-style-type: none"> <li>• European standards</li> <li>• National standards</li> </ul>			

5.2 Is the electrical equipment of the natural gas filling stations specified as suitable to be located inside hazardous areas?			
<b>6 - ISOLATION DISTANCES</b>			
	Yes	No	Observations
6.1 Do you consider isolation distances for: <ul style="list-style-type: none"> <li>• Compressor (including ancillary equipment)</li> <li>• Storage facility (including ancillary equipment)</li> <li>• Dispenser unit</li> <li>• High voltage cables</li> </ul>			
<b>7 - GAS COMPRESSOR (INCLUDING ANCILLARIES)</b>			
	Yes	No	Observations
7.1 Each compressor has to be designed for safe operation and be capable of continuous full load duty			
7.2 Each compressor has to be provided with adequate means of support or mounting to minimize the transmission of mechanical vibration to the structure.			
7.3 Each compressor has to be provided with a suitable device which prevents the system from unacceptable pressure vibration			
7.4 A compressor intended for outdoor installation has to be adequately protected against weather conditions			
7.5 Components and integral parts and user controls are easily accessible			

7.6 A gas released from a separator shall be recovered			
7.7 A safe and controlled system has to be used to facilitate liquid removal from the point of condensate collection			
7.8 Each stage of compression has to be fitted with a suitable relief valve			
7.9 A suitable non-return device has to be fitted to the compressor discharge line to prevent loss of downstream pressure when the compressor is unloading and when the separator is draining			
7.10 The compressor system has to be provided with a time meter			
<p>7.11 The compressor system has to be fitted with devices which will ensure safe operation of the compressor under the following conditions:</p> <ul style="list-style-type: none"> <li>• Low gas inlet pressure</li> <li>• High gas inlet pressure</li> <li>• High gas outlet pressure</li> <li>• High outlet temperature at the final stage</li> <li>• Low lubricant pressure/level</li> <li>• High hydraulic oil temperature</li> <li>• Low hydraulic oil level</li> <li>• High temperature of cooling fluid</li> </ul>			
7.12 Resetting of the control system has to be undertaken manually			
7.13 Indicators have to be provided to show that electrical supply is “on” and that the motor is running			

7.14 The compressor shuts down safely in the event of loss of energy supply			
7.15 Each compressor unit is marked clearly and permanently with all relevant information, on a data plate			
7.16 Each compressor is provided with comprehensive installation instructions, servicing and user instructions			
<b>8 – STORAGE FACILITY ( INCLUDING ANCILLARIES )</b>			
	Yes	No	Observations
8.1 Each vessel complies with an applicable standard			
8.2 Means have to be provided to prevent each pressurised vessel from being isolated from its pressure relief device			
8.3 A pressure gauge has to be fitted to each storage unit			
8.4 An emergency isolation valve has to be fitted on the outlet from each storage facility			
8.5 At least one suitable non temperature dependent safety device has to be fitted to each manifold group of vessels to protect the storage from higher pressures than the design pressure			
8.6 There is at least one suitable device that releases the pressure at a temperature of approximately 110° C			

8.7 Each pressure relief must be designed so that: <ul style="list-style-type: none"> <li>• If it is adjustable, it can be locked in the set position in order to prevent unauthorised adjustment</li> <li>• It is marked with the set pressure and, where appropriate, the direction flow</li> </ul>			
<b>9 – VEHICLE FILLING DISPENSER</b>			
	Yes	No	Observations
9.1 The dispenser unit has to be protected against collisions of vehicles			
9.2 The dispenser unit must have the following safety devices: <ul style="list-style-type: none"> <li>• Breakaway system</li> <li>• Automatic shut-off valve (s)</li> <li>• Excess flow control device</li> </ul>			
9.3 Emergency button must be located close to the dispenser			
9.4 When connected to the vehicle, the vehicle and dispensing equipment have to be equipotential and grounded			
9.5 When the electronic part is effectively separated from the gas processing compartment it is possible to classify the area as non hazardous			
9.6 The filling hose has to be: <ul style="list-style-type: none"> <li>• Flexible and resistant to corrosion and mechanical damage</li> <li>• Supported adequately to prevent kinking and abrasion</li> <li>• Suitable for transportation of natural gas under normal operating conditions</li> <li>• Safely stowed when not in use</li> <li>• Periodically inspected</li> </ul>			

9.7 The filling hose must have and have a burst pressure of at least 4 times the PMO			
9.8 The hose must be clearly marked distinctly along its length to indicate the year of production, internal use, the producer and identification			
9.9 The service life of the hose shall be no more than ten years			
9.10 The hose connections have to stand a force in linear direction greater than the breakaway force			
9.11 The filling nozzle has to be equipped with a device which only allows the flow of gas if there is an adequate connection between the nozzle and the receptacle of the vehicle			
9.12 The nozzle must comply with related standards			
9.13 The small volume of gas released when the nozzle is removed is collected by a captive vent systems			
<b>10 – STATION PIPE WORK AND ANCILLARY DEVICES</b>			
	Yes	No	Obs
10.1 Pipework and fillings must be designed, fixed firmly and secured to prevent disconnection in use			
10.2 The material of supply pipework has to be in accordance with: <ul style="list-style-type: none"> <li>• European regulations</li> <li>• National regulations</li> </ul>			

10.3 The number of joints in the pipeline is kept to a minimum			
10.4 Pipework has to be located in a position where it cannot be damaged by moving vehicles			
10.5 Pipework has to be provided with suitable protection			
10.6 Above ground pipework is constructed of: - Stainless steel - Material with appropriate equivalent standard			
10.7 Where overhead pipework crosses any vehicle accessway it has to be positioned and protected to avoid damage from high vehicles			
10.8 Pipework is inspected visually on a regular basis according to: • Local regulations • European regulations			
10.9 Buried pipework inside the filling station is avoided to the greatest possible extent			
10.10 Buried pipework is inspected and tested in accordance with: • Local regulations • European regulations			
<b>11 - SHUTDOWN PROCEDURE</b>			
	Yes	No	Observations
11.1 An emergency shut down procedure has to be arranged to shut down the NGV filling station safely and isolate the gas mains			

<p>11.2 Are the following emergency shut down procedures used?</p> <ul style="list-style-type: none"> <li>• the refuelling station has to become powerless except for mechanical ventilation</li> <li>• the supply of natural gas to the vehicle has to stop at the beginning of the hose</li> <li>• the transport of natural gas between the compressor, storage facility and dispenser unit and also between storage sections has to be stopped</li> <li>• If more than one dispensing unit is connected to the storage section, the delivery has to be stopped with one central valve</li> <li>• the shut-down sequence has to cut the power supply to the compressor station ensuring a safe shut-down of the station</li> <li>• the shut-down sequence includes delayed closing of the isolation valve on the compressor station inlet</li> </ul>			
<p>11.3 Are shut-down devices located suitably throughout the filling station?</p>			
<p>11.4 Is one of the emergency switches freely accessible at a safe distance from the critical components?</p>			
<b>12 - ELECTRICAL EQUIPMENT AND WIRING</b>			
	Yes	No	Obs
<p>12.1 The equipment placed in a hazardous zone has to comply with</p> <ul style="list-style-type: none"> <li>• EN 50014</li> <li>• EN 50020</li> <li>• EN 60079</li> <li>• national regulations</li> </ul>			
<p>12.2 All conductive surfaces have to be adequately grounded to a common earth</p>			

12.3 Measures for protection against lighting have to be considered to limit the overloading of cables and electrical equipment			
<b>13 – OPERATING NOTICES AND INSTRUCTIONS</b>			
13.1 Signs have to be erected adjacent to the area which is classified as a hazardous zone indicating that smoking and naked lights are prohibited			
13.2 Filling instructions have to be displayed clearly at dispensing units adjacent to each filling hose			
13.3 Filling instructions have to include the relevant safety precautions, especially non-smoking, turn off engine			
13.4 Details of typical filling procedures instructions exist for: <ul style="list-style-type: none"> <li>• Fast-fill refuelling stations</li> <li>• Slow-fill refuelling stations</li> </ul>			
13.5 In your filling stations there are emergency plans with instructions on measures to be carried out in case of fire or serious leakage?			

## ANNEX

### (DEFINITIONS)

For the purpose of these procedures we apply the following definitions:

**Burst pressure** ( $P_b$ ) – the maximum pressure the component will withstand when new;

**Compression unit** – unit that compresses the natural gas consisting of one or more compressors, including all piping and equipment;

**Dispenser** – the combined component through which the natural gas is supplied to the vehicle starting at the end of the piping of the compressor, and/or storage;

**Enclosure** – a designed structure, not a building which may be a housing, a container, etc, which encloses a component of the station;

**Filling station** – location at which gas is dispensed into a vehicle storage facility;

**Hazardous area** - an area in which an explosive gas atmosphere is present, or may be expected to be present in quantities such as to require special precautions for the construction, installation and use of apparatus;

**Maximum allowed operating pressure** ( $P_{mo}$ ) – the maximum allowed pressure within the system under operating conditions but always lower than or equal to the design pressure.