



biogasmax

A DRIVING FORCE

Synthesis Report on Normative Regulatory Requirements



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APPENDIX content

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Summary

The present deliverable synthesizes the European regulatory and normative requirements for multi-fuel filling stations including biogas fuel in terms of safety, billing (HP meter approval) or environmental aspects.

1. BIOGASMAX PROJECT OBJECTIVES

The overall goal of the project is to support the European Community in reducing dependency on oil, reducing greenhouse gases and direct emissions through knowledge about more efficient production, distribution and use of biogas in the transport sector generated from a wide variety of feedstock available in urban areas and regions in Europe.

The specific objectives of the project are :

To prove the technical reliability, cost-effectiveness, environmental and societal benefits of biogas fuels ;

To perform large-scale demonstrations to optimise industrial processes, experiment and benchmark new and near-to-market techniques and expand biogas fleets ;

To identify and assess ways to remove existing technical, operational, organisational and institutional barriers, which can inhibit or prevent alternative motor fuels and energy efficient vehicles from entering the market in significant quantities ;

To widely spread knowledge about the demonstration experience and results to European cities and stakeholders in a transferable manner, with particular emphasis on New Member States, with training, decision tools and knowledge network support actions.

2. WORK PACKAGE 4 (WP4) OBJECTIVES

The BIOGASMAX project is made up of 8 work packages (WP), each one having its own objectives. The present document is the deliverable of the subtask 4.1.4, included in the Work Package 4 (WP4)

The objectives of the WP4 are :

Ensure good availability of biogas for transport use through building and extending of biogas filling station infrastructure ;

Enhance knowledge of optimised ways for non-grid distribution of biogas for transport use ;

Demonstrate optimised ways for grid injection of biogas in natural gas grids ;

Ensure good valorisation of results from grid-injection demonstrators.

This document is dedicated to the subtask 4.1, studying the concepts for fuelling station infrastructure. The main aim of this task is to demonstrate various distribution techniques, both dedicated to biogas and those where biogas is combined with natural gas fuelling.

The aim of the present deliverable is to synthesize the European regulatory and normative requirements for multi-fuel filling stations including biogas fuel in terms of safety, billing (HP meter approval) or environmental aspects. The subject of the road transportation of biogas will be handled too.



3. DEFINITIONS

ADR	Agreement concerning the International Carriage of Dangerous Goods by Road
Battery vehicle	A vehicle consisting of elements, united to each other by collectors and permanently attached on the transport unit. As element count gas bottles, big bottles, pressure barrels, gas bottle packages and tanks with a volume exceeding 450 liters.
BGV	Biogas for Vehicles
ICPE	French abbreviation for « Installation Classée pour la Protection de l'Environnement », which means « Classified Installation for Environment Protection »
MEG containers	Transportation device consisting of elements, which are joined together by collectors and assembled in a container frame. Element are referred to as gas bottles, big bottles, pressure barrels, gas bottle packages and tanks.
NGV	Natural Gas for Vehicles
OIML	International Organization of Legal Metrology



4. EUROPEAN REQUIREMENTS

The purpose of this part is to list the European texts to be considered by each Member State with no specific regulation concerning one of the following subjects :

- Environment and safety,
- Billing,
- Road transportation.

4.1. Environment and safety : European standard pr EN 13638

This document is attached in Appendix 1.

4.1.a. References

- Number :** pr EN 13638
Title : NGV filling stations
Date : 25 September 2006
Prepared by : CEN TC 326
Secretariat : Deutsches Institut für Normung (DIN)

4.1.b. Status

As indicated by the “pr” prefix, the pr EN 13638 European standard is still a “project” version. This document is currently submitted to the formal vote.

Once accepted, this document will have to be implemented at national level, either by publication of an identical text or by endorsement, and conflicting national standards will have to be withdrawn in the following countries :

Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Spain, Slovak Republic, Slovenia, Sweden, Switzerland and United Kingdom.

As a matter of fact, this text is already used as a guideline by many European stations manufacturers. For example, in France, the regulation about NGV and Biogas distribution (see 5.2) has already integrated the pr EN 13638 by picking up the main principles set out in this text.

4.1.c. Scope

Although the title of the pr EN 13638 is “NGV filling stations”, and “applies to filling stations supplied with normally distributed Natural Gas as defined in EN ISO 14532”, **“it will be appropriate for other fuel gases, including those generated from landfill sites.** However, the different constituent characteristics shall be recognised, in particular their possible consequent effect upon materials and operations and their impact on the vehicles to be operated”.

The scope includes general criteria concerning multifuel filling stations.

4.1.d. Contents

The following paragraph will present briefly the different sections of the pr EN 13638.

4.1.d.i. Normative references

The Chapter 2 lists all the European and international standards incorporated in the pr EN 13638. This section is associated to Annex K, which is about the non European and non international standards cited in the document.



4.1.d.ii. General provisions

The chapter 5 describes the components likely to be on a gas filling station, including :

- Gas compressor,
- Gas storage,
- Mother daughter station,
- Dispenser,
- Control systems,
- Gas dryer,
- Gas cooling system.

4.1.d.iii. General principles of design and installation

The chapter 6 specifies the general principles and the standards to be applied for the following subjects :

- General construction,
- Gas composition,
- Safety devices,
- Delivery pressure to the vehicles,
- Venting.

4.1.d.iv. Location and layout of equipment

In the chapter 7, requirements about the location of installations are listed. Informations about hazardous area classification and safety distances are also included.

4.1.d.v. Specifications

Chapters 8 to 16 list all the safety requirements needed for each component of the filling station.

Procedures relating to safety, like the emergency shut down or the bleeding procedure, are also described.



4.2. Billing (HP Meter approval) : OIML Recommendation

This document is attached in Appendix 2.

4.2.a. References

Number : Fourth Committee Draft of International Recommendation

Title : Compressed gaseous fuel measuring systems for vehicles

Date : February 2005

Prepared by : OIML Subcommittee TC8 Sc7

4.2.b. Status

This document is an International Recommendation, compiling all the recommendations concerning compressed gaseous fuel measuring systems. These are international recommendations, and therefore European ones.

The application of this recommendation is not effective in all the European states. It is applicable in France.

4.2.c. Scope

This International Recommendation (IR) specifies the metrological and technical requirements applicable to compressed gaseous fuel systems for vehicles. It also provides requirements for the approval of constituent elements of the measuring systems (meter, etc).

In general, the measuring systems that are covered by this recommendation are intended for the refuelling of roadside motor vehicles, small boats, and aircraft with compressed natural gas. **Applications with other compressed gaseous fuels are covered.**

According to the state of the art, this IR is made for measuring systems providing mass indications. If further evolution of technologies allows indications in other units of measurements, this IR will have to be revised.

4.2.d. Contents

The following paragraph presents briefly the different sections of the OIML recommendations.

4.2.d.i. **General requirements**

Chapter 2 describes briefly a measuring system, including :

The ancillary and additional devices requirements,

The field of operations,

The indications provided by a measuring system, and the fact that unit price and price to be paid shall be related to the mass of gas,

The suitability of additional devices.

4.2.d.ii. **Metrological requirements for measuring systems and meters**

Chapter 3 deals with the maximum permissible errors, and the conditions for applying maximum permissible errors.

4.2.d.iii. **Requirements for meters and ancillary devices of a measuring system**

Chapter 4 is a detailed list of all the requirements to be met for some constituents of a measuring system, whether or not they are subject to a separate pattern approval.



These components are :

- Meter,
- Indicating device,
- Zero setting device,
- Price indicating device,
- Printing device,
- Memory device,
- Pre-setting device,
- Calculator.

4.2.d.iv. Technical requirements for electronic devices

This fifth chapter deals with the general requirements concerning the electronic devices, in order to minimize the errors and to comply with the maximum permissible errors defined in chapter 3.

It also describes the emergency power supply device and the checking facilities roles.

4.2.d.v. Technical requirements for measuring systems with self-service arrangements

This chapter lists all the requirements specific to the self service of fuel, in attended or unattended service mode.

4.2.d.vi. Markings and sealing

The “Markings” section describes all the indications to be displayed, legibly and indelibly, on each component granted with pattern approval.

The “Sealing” section deals with the protection by seals of all parts of the measuring system which cannot be materially protected in any other way against operations liable to affect the measurement accuracy, and with electronic sealing devices too.

4.2.d.vii. Metrological control

This last section is about the metrological control of the measuring system, and is made up of 3 parts :

- Pattern approval : about the tests to be made on each part of the measuring system
- Initial verification: describes the procedure for controlling the measuring system before the first use.
- Subsequent verification: explains when the measuring system is about to be verified again.



4.3. Road Transportation : European Directive 94/55/EC

This document is not included in an appendix because of its size. The document is downloadable at the following internet address in html format : <http://europa.eu/scadplus/leg/en/lvb/l24051.htm>.

4.3.a. References

Title : Council Directive on the approximation of the laws of the Member States with regard to the transport of dangerous goods by road

Date : 21 November 1994

Number : 94/55/EC [Official Journal L 319, 12.12.1994]

Amended by the following acts:

Directive 2000/61/EC of the European Parliament and of the Council of 10 October 2000 [Official Journal L 279, 01.11.2000] ;

Commission Directive 2003/28/EC of 7 April 2003 [Official Journal L 90, 08.04.2003].

4.3.b. Status

4.3.b.i. About the ADR

The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was done at Geneva on 30th September 1957 under the auspices of the United Nations Economic Commission for Europe, and it entered into force on 29th January 1968. The Agreement itself was amended by the Protocol amending article 14 (3) done at New York on 21st August 1975, which entered into force on 19th April 1985.

The Agreement itself is short and simple. The key article is the second one, which says that, apart from some excessively dangerous goods, other dangerous goods may be carried internationally in road vehicles subject to compliance with:

the conditions laid down in Annex A for the goods in question, in particular as regards their packaging and labelling; and

the conditions laid down in Annex B, in particular as regards the construction, equipment and operation of the vehicle carrying the goods in question.

Annexes A and B have been regularly amended and updated since the entry into force of ADR. These annexes were entirely revised and restructured between 1992 and 2000, and a first version of the restructured annexes entered into force on 1st July 2001. It was published as document ECE/TRANS/140, Vol.I and II. New amendments entered into force on 1st January 2003, and consequently, a second consolidated "restructured" version was published as document ECE/TRANS/160, Vol.I and II ("ADR 2003"). Corrections and one Amendment to ADR 2003 were circulated as ECE/TRANS/160/Corr.1-3.

A set of new Amendments entered into force on 1st January 2005, and consequently, a third consolidated "restructured" version was published as document ECE/TRANS/175, Vol.I and II ("ADR 2005").

The ADR text is downloadable at the following address :

http://www.unece.org/trans/danger/publi/adr/adr_e.html

4.3.b.ii. Directive 94/55/EC

The ADR is designed to rule international carriage of dangerous goods, which means the transportation of dangerous goods between at least two countries.

This Directive is a "frame directive" intended for harmonizing the rules for transport of dangerous goods within the European Union. It is designed to extend the rules defined by the ADR to the national traffic.



This Directive is introduced in national laws of each Member State.

4.3.c. Scope

The Directive applies to the transport of dangerous goods by road in the Community.

It does not apply to the transport of dangerous goods by vehicles belonging to the armed forces or under the control of the armed forces.

Dangerous goods to be transported are listed and classified in the directive

4.3.d. Contents

Regarding the scope of the 94/55/EC directive and the part the BIOGASMAX project is concerned with, there is no need to describe all the content of the directive.

The important parts of the document are the Annexes, which repeat the two annexes of the ADR.

Annex A deals with the provisions concerning dangerous substances.

Annex B deals with the vehicles and the driver.

Nota :

Considering that the road transportation rules may vary, even a little, from one Member State to another, and considering that for the BIOGASMAX project, the demonstration including road transportation takes place in Sweden, we choose to give a detailed description of the Swedish instructions for road transportation of biogas (see 5.1.a), instead of insisting on the frame directive.

Nevertheless, the information contained in this chapter give the opportunity to other Member States to get information about the road transportation of biogas.



5. NATIONAL SPECIFIC REQUIREMENTS

In this part are to be found references to specific national requirements, concerning especially countries with demonstration activities in BIOGASMAX project (Sweden, France and Italy), and other European countries in which NGV and biogas have been in use for a long time (Germany, Switzerland).

European requirements (see chapter 4) are applicable when no other specific national text is mentioned.

5.1. SWEDEN

5.1.a. Instructions for transportation of compressed gases intended for vehicle use

As explained in paragraph 4.3.d, the description of this document will be more detailed than the other ones in this part, because we took Sweden as an example for the road transportation.

This document is attached in Appendix 3.

5.1.a.i. References

Title : Instructions for transportation of compressed gases intended for vehicle use

Date : 23 December 2004

Author : Svenska Gasföreningen (The Swedish Gas Association)

5.1.a.ii. Scope

These instructions contain a compiled summary of the regulations concerning road transports of gases intended for vehicle use. The instructions are constructed in the same way as the transport regulation framework, which means a chain of actions starting with identification of the dangerous substances and thereafter finding applicable demands for packaging, marking, labelling, documentation and handling the transportation of the identified substance. Since the instructions are limited to national transports on roads, references to relevant parts, chapters or sections in ADR-S, the Swedish version of the European Agreement ADR, have been introduced. To the instructions, examples of the demands, applicable for three different operational cases, have been attached.

These instructions are limited to handling only regulations for transportation of the following compressed gases, with the transportation terms

Hydrogen,

Compressed gas, fire hazardous N.O.S (Nitrous Oxide Systems)

Methane, compressed,

Natural gas, compressed, and

Hydrogen and Methane gas mixtures, compressed

which are known as the most common gases used for vehicle driving today.

5.1.a.iii. Contents

1. Introduction

The introduction gives a list of all the regulations (international, European and national) which are compiled in these instructions. Definitions are also given, and the different responsibilities (sender, transporter, etc) are explained.



2. Classification and identification

The classification and identification are defined by the ADR-S, the Swedish version of the European Agreement ADR (see 4.3.b.i).

According to the ADR, the gases are referred to as “Class 2”. The biogas, particularly, is a Class 2 IF gas (“I” for compressed gas and “F” for fire hazardous).

3. Packaging regulations

This chapter defines the packaging in which the compressed gases for vehicle use shall be transported, in terms of:

- Control and approval,
- Material in tanks or containers,
- Operational and security equipment.

Two types of packaging are identified :

- Gas containers,
- Tanks, battery vehicles and MEG containers.

4. Requirements of vehicles and drivers

This section details all the requirements concerning :

The vehicle,

The driver’s education, including a special tank course needed for :

- Vehicles with fixed or demountable tanks over 1000 liters,
- Battery vehicles with a total volume over 1000 liters,
- Tank containers or MEG containers with individual volume over 3000 liters.

The vehicle equipment.

5. Marking and labelling

This chapter describes the marking and labelling to be displayed :

On the packages,

On the tanks and truck.

6. Transportation document

This part lists all the document needed for the transportation of compressed gases :

Declaration of goods,

Written instructions (card of transportation),

Driver certification,

Certificate of vehicles,

Agreements or permissions (in certain cases)

7. Transportation regulations



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This chapter lists all the requirements in terms of education of personnel and loading and unloading. It also details the reliefs and exceptions from the regulations.



5.1.b. Swedish Code for NGV and BGV Filling Stations

This document is attached in Appendix 4.

5.1.b.i. References

Number : TSA 06
Title : Swedish Code for NGV and BGV Filling Stations
Date : 1 June 2006
Author : Svenska Gasföreningen (The Swedish Gas Association)

5.1.b.ii. Scope

This code of practice provides examples of the design, manufacture, construction, operation and maintenance of NGV (Natural Gas Vehicle) and BGV (Biogas Vehicle) filling stations. The code of practice is designed to provide a safe facility in accordance with Swedish public authority requirements.

If the facility is built, inspected, and operated in accordance with TSA 06, the risk assessment required for filling stations pursuant to the Flammable and Explosive Goods Act may already be considered completed. Therefore, an additional risk assessment is not required.

5.1.b.iii. Status

This document is valid and applicable in Sweden.

5.1.b.iv. Contents

The structure of the document is similar to the pr EN 13638. All the detailed requirements for each component of a filling station are to be found in the TSA 06.

Nota :

This document defines the maximum permissible errors of the flow meters. This values prevail over the OIML recommendation (see 4.2)



5.2. FRANCE

5.2.a. Section 1413 of the ICPE Nomenclature

This document is attached in Appendix 5 (French version).

5.2.a.i. References

Number : 1413

Title : Installations de distribution de gaz naturel ou de biogaz

Date : 18th September 2006

5.2.a.ii. Status

The Section 1413 was introduced in the ICPE nomenclature by the decree dated the 31st May 2006, and was made applicable by the decree dated 18th September 2006.

5.2.a.iii. Scope

The section 1413 deals with NGV and BGV filling stations.

According to the ICPE Nomenclature, administrative obligations necessary for the running of the station depends on the maximum flow exiting from the compression unit and the total mass of gas in the station :

Flow higher than 2000 m³/h or total mass of gas in the station higher than 10000 kg requires an “Authorization” procedure,

Flow between 80 and 2000 m³/h or total mass of gas in the station higher than 1000 kg requires a “Declaration” procedure.

5.2.a.iv. Contents

The Section 1413 is quite similar to the pr EN 13638 (see 4.1) and adopts the requirements defined in the pr EN 13638.



5.3. ITALY

5.3.a. Decreto 28 giugno 2002

This document is attached in Appendix 6 (italian version).

5.3.a.i. References

Number : GU N. 161 del 11 Luglio 2002

Title : Rettifica dell'allegato al decreto 24 maggio 2002, recante norme di prevenzione incendi per la progettazione, costruzione ed esercizio degli impianti di distribuzione stradale di gas naturale per autotrazione.

Date : 28th June 2002

5.3.a.ii. Status

Italy uses International and European standards to build the NGV and BGV filling stations. All these standards are listed in the pr EN 13638 (see 4.1). Nevertheless Italy uses a national decree concerning the fire safety on NGV filling stations : the Decreto 28 giugno 2002.

This decree is a modification of the decreto 24 maggio 2002 “Norme di prevenzione incendi per la progettazione, costruzione ed esercizio degli impianti di distribuzione stradale di gas naturale per autotrazione”. Only the annex was modified.

5.3.a.iii. Scope

This decree deals with NGV filling stations building, fire prevention and running.

5.3.a.iv. Contents

At first, the main components of the installation are described, then the installation layout and characteristics, the fire prevention (security distances) and finally the running conditions.



5.4. GERMANY

Germany have run NGV filling stations for a long time, and have had therefore national regulation. Furthermore, the first biogas station was started in June 2006.

5.4.a. DVGW G 651 / VdTÜV 510

The English version can be ordered at the following Internet address : <http://www.beuth.de/>.

5.4.a.i. References

Number : DVGW G 651 / VdTÜV 510

Title : Guideline for design, construction, testing, commissioning and operation of natural gas refuelling stations

Date : July 1999

5.4.a.ii. Scope

This directive concerns exclusively NGV filling stations, but as the other regulations we listed above, we can reasonably think that biogas filling stations shall respect the same regulations. Moreover, this directive lists all the German regulations applicable for the design, construction, testing, commissioning and operation of natural gas refuelling stations.

5.4.a.iii. Contents

The DVGW G 651 / VdTÜV 510 is quite similar to the pr EN 13638 (see 4.1).



5.5. SWITZERLAND

Like Germany, Switzerland runs NGV and Biogas filling stations for a long time and has a national regulation too.

5.5.a. *G9F*

This document is attached in Appendix 7 (french version).

5.5.a.i. References

Number : G9f

Title : Directives pour la construction, l'entretien et l'exploitation de grandes stations de ravitaillement de gaz naturel comprimé (GNC)

Date : 1st July 1995

5.5.a.ii. Scope

This guideline aims at granting the safety of NGV filling stations. It is applicable for the design, the construction, the running and the maintenance of the NGV filling stations.

Like the German text, the G9f doesn't mention biogas, but we assume that biogas filling stations shall respect the same rules in terms of safety.

5.5.a.iii. Contents

Like the German text or the pr EN 13638, this one lists all the requirements component by component.



6. COMPARISON OF EUROPEAN AND NATIONAL SPECIFIC REQUIREMENTS

In this part, national specific requirements from Sweden, France, Italy and Switzerland concerning the design, manufacturing, construction, operation and maintenance of NGV and BGV filling stations are compared with the European standard pr EN 13638.

The main requirements of the European Directive prEN 13638 are listed in the first column of the tables below. In the other ones are listed the main differences or additional requirements of nation-specific guidelines.

Analysis of these different tables shows that each country rules safety distances and equipment normative requirements. These norms agree with the European directive, but sometimes are more restrictive. For instance, security distances between equipments are different: minimum distance between the compressor and the limits of property is 10 m in France and 20 m in Italy.

Concerning the equipments, the regulations are very similar to the European directive. The main differences relate to the storage and the dispenser : categories and thickness of materials or internal safety distances (for example, distance between the bottles and the roof of storage).

Specific requirements concern the electrical equipments that must be in accordance with national regulation : in France with the “French decree n°88-1056 11/14/1988”, in Switzerland with the ESA (Swiss electrician association) and in Sweden with norm ELSÄK-FS 2004:1.

It is also interesting to underline that the climate can also affect the security rules as in Sweden with restrictions in case of low temperature.



6.1. Equipment specifications

The safety requirements needed for each component of the filling station are listed in table below.

6.1.a. Gas compressor

prEN 13638	Switzerland : G9f	France : 1413	Sweden	Italy
<ul style="list-style-type: none"> - The compressor shall be in compliance with the essential requirements of European directive 98/37/EEC on machinery and EN 1012-1. - Each stage of compression should be equipped with a safety device to prevent over pressurising - The final stage shall have a full capacity relief valve which may vent to atmosphere or may vent to a recovery vessel, which itself shall have a relief valve. - A compressor shall be CE-marked by the manufacturer according to the EC directives applicable for the compressor 	<ul style="list-style-type: none"> - A non-return system shall be fitted the nearest possible of the station. The system should consist of a non-return device and a pressure operated slam-shut. 	<p>Similar to prEN13638</p>	<ul style="list-style-type: none"> - Compressors must fulfil the requirements contained in the Machinery Directive, SS-EN 1012-1, and the ATEX directive, and they must bear the CE mark in accordance with both directives. 	<p>Similar to prEN13638</p>



6.1.b. Storage facility

prEN 13638	Switzerland : G9f	France : 1413	Sweden	Italy
<ul style="list-style-type: none"> - Storage pressure vessel shall comply with EN 13445-1 and EN 13445-2 - At least one suitable non temperature dependent safety device shall be fitted to protect the storage from over-pressurisation with a discharge rate that is adequate to ensure a controlled depressurisation of the system - An automatic emergency isolation valve shall be fitted on the outlet from any storage facility. - A pressure gauge shall be fitted to each storage unit. 	<ul style="list-style-type: none"> - A security device must protect the storage facility against increasing pressure. A manometer shall be fitted on each storage facility, which can be operated independently. - The storage facility shall be isolated with an appropriated device. 	<p>Similar to prEN13638</p>	<ul style="list-style-type: none"> - Gas storage located inside a building must be separated from other parts of the building by walls that fulfil, as a minimum, fire resistance classification EI 60 	<ul style="list-style-type: none"> - The storage facility, which slows down the compressor pulse shall be under 300 Nm³. - The gas storage shall be in a building whose reinforced concrete wall thickness is above 15 cm (20 cm in case of other device near the building). The roof shall be at the minimum at 1 m above the storage. If there is an opening in a wall, there shall be a protective wall in front the door of 15 cm at the minimum to avoid the spreading in case of explosion. - The storage capacity of one device shall be under 3 000 Nm³. - If the gas is stored in bottles, The building shall be with 15cm walls at the minimum (20 cm in case of other device near the building) and the distance between the bottles and the roof should be above 1 m, and the distance between the bottles and the walls shall also be above 1 m. - If the storage capacity is above, 50 Nm³, there shall be a safety valve after the storage.



6.1.c. Dispenser

prEN 13638	Switzerland : G9f	France : 1413	Sweden	Italy
<p>- Equipment required :</p> <ul style="list-style-type: none"> . break away system with a disconnection force lower than 500 N for dispensers for personal vehicles and 850 N for high flow dispensers for commercial vehicles in any direction . automatic shut off valves : it may be required by local regulation to install a minimum of two automatic in series, European harmonization of this issue still pending. - The nozzle shall comply with the requirements of ISO 14469 and shall match the receptacle of any vehicle complying with ISO 15501-1:2000 and ISO 15501-2:2000. 	<ul style="list-style-type: none"> - Between the dispenser and the compressor, an automatic device to stop the gas shall be installed. - The steel thickness of the protection cover shall be 1,0 mm for the steel and 0,5 mm for the stainless steel. The pane of glass whose surface is more than 0,12 m² or lightened from inside shall have a thickness above 4,5 mm. The pane of glass whose surface is 0,12 m² maximum shall have a minimal thickness of 4 mm. 	<ul style="list-style-type: none"> - Filing hose length : 5 m maximum (8 m for heavy trucks or buses) - Break away : minimum pressure break : 500 N (850 N for heavy trucks or buses) 	<ul style="list-style-type: none"> - The filler hose must be equipped with a break-away valve. The break-away valve must stop the flow of gas at a tensile stress of less than 500 N for dispensers at public filling stations and 850 N for facilities that use the larger nozzle for buses and other heavy vehicles. - The filler nozzle must meet the requirements in ISO 14469-1 and have a gas return connection. - The supply temperature of the gas must be between -40 °C and +60 °C. - Filling stations must have a temperature compensated filling system complying with SÄIFS 1998:5. - Filling stations must be designed for a nominal filling pressure of 200 bar at 15°C, although with a maximum of 230 bar. - Pressure in excess of 230 bar must undergo a special review by the Swedish Rescue Services Agency for each filling station. - The maximum filling pressure to vehicles is 260 bar. Since there are vehicles in today's vehicle parks that cannot handle 260 bar, this pressure is reduced to 230 bar. This pressure may be raised to 260 bar when these vehicles are phased out. Therefore, filling stations should already be designed with 260 bar as the maximum filling pressure. 	<p>Similar to prEN13638</p>



6.1.d. Electrical equipment and wiring

prEN 13638	Switzerland : G9f	France : 1413	Sweden	Italy
<p>- Where the equipment is placed in a hazardous area it shall comply with EN 50014, EN 50020 and one of the appropriate types of protection specified in EN 60079-10.</p> <p>- The essential requirements of European directive 94/9/EC shall be taken into account</p>	<p>- The electrical equipment on the compression station shall comply with the ASE (Swiss electrician association) prescription.</p>	<p>- Electrical equipment shall comply with the French decree n°88-1056 14/11/1988</p> <p>- In ATEX area, electrical equipment shall comply with the French decree n°96-1010 19/11/1996</p>	<p>- The compressor's electrical installation must fulfil the requirements for high voltage power regulations, ELSÄK-FS 2004:1, the requirements for electrical materials, ELSÄK-FS 2000:1, and the regulations regarding electrical equipment for potentially explosive environments, ELSÄK-FS 1995:6.</p>	<p>Similar to prEN13638</p>



6.2. Safety layouts

6.2.a. Fire protection

prEN 13638	Switzerland: G9f	France : 1413	Sweden	Italy
If a fire wall is constructed, thus reducing the minimum safety distances, it shall be of at least 1 hour fire-resistant construction, impermeable and of solid masonry or concrete. The wall shall be at least as high as the highest component and have a minimum height of 2 m		With a 2h fire wall, 2.5 m high, 5 m far from the dispenser: - distance from the principal opening of a public building is at the minimum 12 m. - Distance from limit of property is equal to the length of the filling hose increased by 2 m		Between the gas storage and the opening of room, there must be a firewall of 15 cm large. For the bottle storage option, there must be an extinguisher of 120 L/min, 2 bar and 30 min. For storage of 3 000 Nm ³ or above, there must be a rain-extinguisher of 5 L/min, per m ² , 1 bar and 30 min.

Synthesis

Each country rules the layout equipments and the security distances. The norms agree with the European directive, but for instance the security distance between equipments are different : the minimum distance between the compressor and the limits of property is 10 m in France and 20 m in Italy.

It is interesting to remember that CNG stations are well developed in Italy contrary to France. Through the comparison of Italian security distances and the French one, it appears that the French one are not really more restrictive than Italian one.

It is also important to underline that the climate can affect the security rules.



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6.2.b. Safety distances



	prEN 1363	Switzerland: G9f	France : 1413					Sweden					Italy																																																								
Hazardous areas and security distances	<p>A hazardous area classification analysis shall be undertaken for the location of electrical and other sources of ignition.</p> <p>The classification shall be in accordance with the European standard EN 60079-10.</p> <p>The hazardous area shall not exceed the boundary of the filling station unless a complementary risk analysis is carried out.</p>	<p>Hazardous areas are areas where explosive areas can happen.</p>						<p>Risk areas must be identified in accordance with SS-EN 60079-10, which is reproduced in SEK Manual 426, and must cover all of the flammable goods at the station in a single document.</p> <p>Distances between parts of the system :</p>					<p>There are 2 levels of security:</p> <p>Level 1: the roof and the walls are sealed.</p> <p>Level 2: the roof and the walls are not sealed.</p> <p>The safety distances depend on these levels.</p>																																																								
			Compressor, gas storage	Explosive area	Distance between	Dispenser	Compressor	Storage	Dispenser at 5m of a firewall of 2h and 2.5 m high	Compressor, Storage, combustible materials or other fire hazardous activity or building	Activities with high fire load density	Large vehicles parked for filing or simply parked	Private cars parked for filing or simply parked	<table border="1"> <thead> <tr> <th>Equipment s</th> <th colspan="2">Metering and pressure regulator room</th> <th colspan="2">Compressor room</th> <th colspan="2">Storage room</th> <th colspan="2">Bottle storage box</th> <th>Automatic Dispenser</th> </tr> </thead> <tbody> <tr> <td>Security level</td> <td>1</td><td>2</td><td>1</td><td>2</td><td>1</td><td>2</td><td>1</td><td>2</td><td>-</td> </tr> <tr> <td>Protection distance ⁽¹⁾ (m)</td> <td>2</td><td>2</td><td>5</td><td>10</td><td>5</td><td>-</td><td>5</td><td>10</td><td>10</td> </tr> <tr> <td>Inside security distance ⁽²⁾ (m)</td> <td>-</td><td>10</td><td>-</td><td>10</td><td>-</td><td>-</td><td>-</td><td>10</td><td>8</td> </tr> <tr> <td>Outside security distance ⁽³⁾ (m)</td> <td>10</td><td>10</td><td>20</td><td>20</td><td>20</td><td>-</td><td>20</td><td>20</td><td>20</td> </tr> </tbody> </table>						Equipment s	Metering and pressure regulator room		Compressor room		Storage room		Bottle storage box		Automatic Dispenser	Security level	1	2	1	2	1	2	1	2	-	Protection distance ⁽¹⁾ (m)	2	2	5	10	5	-	5	10	10	Inside security distance ⁽²⁾ (m)	-	10	-	10	-	-	-	10	8	Outside security distance ⁽³⁾ (m)	10	10	20	20	20	-	20	20	20
			Equipment s	Metering and pressure regulator room																Compressor room		Storage room		Bottle storage box		Automatic Dispenser																																											
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			Inside security distance ⁽²⁾ (m)	-																10	-	10	-	-	-	10	8																																										
			Outside security distance ⁽³⁾ (m)	10																10	20	20	20	-	20	20	20																																										
			1 m (outside station)	1 m																Opening of a public building	17 m	3 m	3 m	12 m	4000 < V	12 ⁽¹⁾	25 ⁽¹⁾	8 ⁽¹⁾	6 ⁽¹⁾																																								
			Dispenser	1 m																Opening of a station building	5 m	3 m	3 m	-	1000 < V < 4000	6 ⁽¹⁾	12 ⁽¹⁾	8 ⁽¹⁾	6 ⁽¹⁾																																								
			Fuel connector and nozzle	1 m																Emergency exit of the station buildings	17 m	-	-	-	60 < V < 1000	3 ⁽²⁾	12 ⁽²⁾	8 ⁽²⁾	6 ⁽²⁾																																								
Exhaust valve	3 m on the sides and above, 1 m under	Limit of property	5 m	10 m																10 m	Length of the filling hose increased by 2 m	Filing point for gas trailers	3 ⁽¹⁾	12 ⁽¹⁾	-	-																																											
		Nearest parking place	-	6 m	6 m	2 m with a fire proof cowling	Geometric volume of gas store, V including mobile gas stores	Compressor, Storage, combustible materials or other fire hazardous activity or building	Activities with high fire load density	Large vehicles parked for filing or simply parked	<p>⁽¹⁾ With fire separation of the lowest fire resistance classification, EI 60, the distance can be reduced by half. If fire separation of the lowest fire resistance class, REI 120, is used, fire separation is considered to be at a level adequate enough that no minimum distance requirements apply.</p> <p>⁽²⁾ With fire separation of the lowest fire resistance classification, EI 60, no minimum distance is required.</p> <p>⁽³⁾ Does not apply between two mobile gas stores.</p>																																																										
		Another fuel storage	-	-	3 m	-	4000 < V	12 ⁽¹⁾	25 ⁽¹⁾	8 ⁽¹⁾																																																											
		Dispenser	-	-	5 m	-	1000 < V < 4000	6 ⁽¹⁾	12 ⁽¹⁾	8 ⁽¹⁾																																																											
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							<p>If the fire separation is a classified as having a fire resistance greater than EI 60, the distances may be reduced if so determined by the Swedish Rescue Services Agency.</p>																																																														
							<p>⁽¹⁾Distance with other buildings</p> <p>⁽²⁾Distance with other equipments in the same room</p> <p>⁽³⁾Distance with the enclosure of the place.</p>																																																														
							<p>In the station buildings, the venting openings must represent at the minimum 10% of the building floor surface.</p>																																																														
							<p></p>																																																														