



HYDROGEN VENT SYSTEMS FOR CUSTOMER APPLICATIONS

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Amendments to 211/17

Section	Change
3.2	Definitions revised
4.3	Paragraphs deleted
5.3	New paragraphs added
8	Paragraphs deleted

NOTE Technical changes from the previous edition are marked on the left

1 Introduction

The purpose of this publication is to provide recommendations and a methodology for the safe design of venting systems for hydrogen installations and equipment located at a customer site.

The design of a hydrogen vent system aims at preventing Deflagration to Detonation Transition (DDT) and mitigating the hazards from fires, deflagration and DDT if it occurs. The following scenarios are reflected:

- deflagration due to the delayed ignition of the explosive hydrogen/air mixture coming out of the vent stack;
- thermal radiation generated by the jet fire (the flame coming out of the vent stack); and
- DDT inside the vent system due to the acceleration of the combustion of the air/hydrogen mixture that can be present inside the venting system (in the presence of an ignition source). This hazard is relevant if air can enter the venting system.

2 Scope

This publication covers the design, installation and maintenance of hydrogen vent systems used for equipment located at a customer site. This publication is not applicable to vent systems of hydrogen installations with capacity exceeding 5000 Nm³/hr of hydrogen.

It applies to Hydrogen Refuelling Stations with standard supplies of hydrogen (liquid, gas bulk, gas cylinders, on-site production of less than 5000 Nm³/hr of hydrogen).

Typical on-customer-site installations to which this document refers include equipment items such as:

- A fixed or transportable gaseous storage connected to a piping distribution network at low or high pressure through a gas pressure release system;
- A fixed or transportable liquid storage connected to a piping distribution network at low or high pressure through a pump / vaporizer;
- A gaseous compressor to increase hydrogen pressure up to 1000 bar;
- A high pressure hydrogen storage up to 1000 bar;
- One or more hydrogen dispensing systems to fuel hydrogen powered vehicles; and
- Stationary fuel cells systems.

Vent systems on vehicles themselves are excluded from the scope.

The vent system can be part of a gaseous or liquid hydrogen system. The scope is

- a) from the discharge of the device(s) controlling the release of hydrogen to the vent exit(s) to atmosphere. The piping up to inlet of the venting control device is also within scope as well as the silencer if any.
- b) up to the point where hydrogen concentration in the atmosphere is at the lower flammable limit.

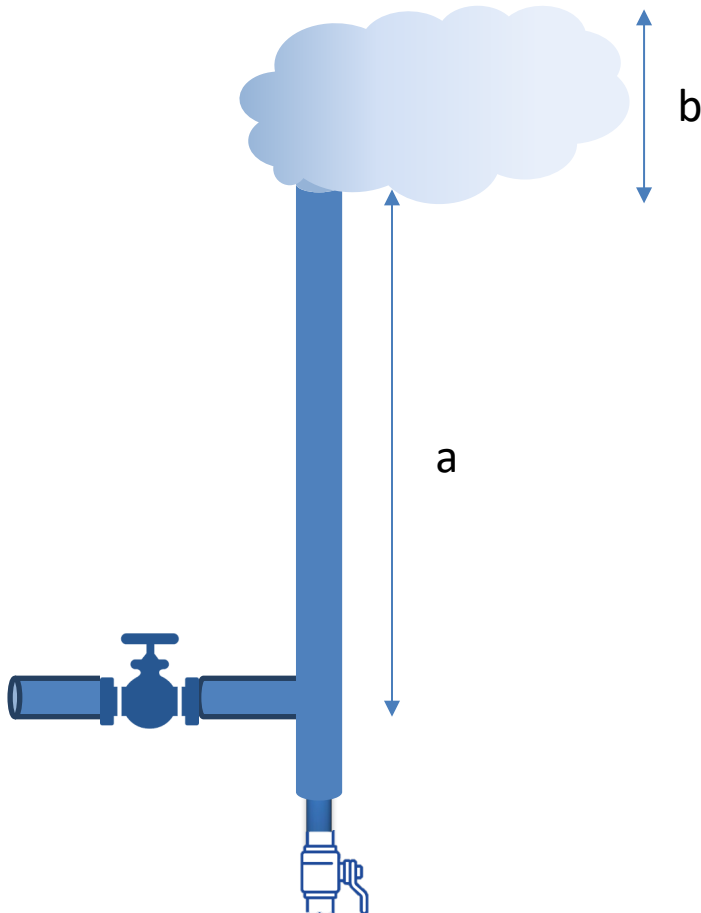


Figure 1: Scope of a vent system: a) vent system piping scope including stack b) flammable cloud

This publication does not cover:

- The design of the devices controlling the release of hydrogen;
- Flare systems; or
- Inerted vent systems.

3 Definitions

For the purpose of this publication, the following definitions apply:

3.1 Publications terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May and need not

Indicate that the procedure is optional.

3.1.4 Will

Is used only to indicate the future, not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

For the purpose of this publication, the following definitions apply:

3.2.1 Vent system

A vent system is the apparatus used for depressurizing or relieving gas from a system to a safe location. Vents can be used for normal discharge, abnormal discharge or emergency discharge as required. The vent stack is the part of the vent system routing the gas to the designed elevation with an outlet to direct the flow.

3.2.2 Pressure relief device (PRD)

A safety device used to control or limit the pressure in a system.

3.2.3 Deflagration in a flammable vapour cloud

Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.

3.2.4 Detonation in a flammable vapor cloud

Propagation of a combustion zone at a velocity that is greater than the speed of sound in the unreacted medium.

4 Sizing of a vent system

4.1 Definition

For gaseous hydrogen supply systems, the following are examples of releases:

- Manual venting;
- Purging;
- Venting of upstream compressor or cryogenic pump flow feeding the system; and
- In fuelling stations, malfunction of dispensing control valve causing filling line safety pressure valve to open.

For liquid hydrogen supply systems, the following are examples of releases:

- Manual venting;
- Purging;
- Normal boil-off from ambient heat input;
- Liquid flash and gas displacement during filling of the tank;
- Gas returned from cool down of lines, pumps and connected equipment; and