STS 81/34

Comité Technique Européen du Fluor

Working Group Storage, Transport and Safety

Safe Handling of AHF Cylinders and Bottles

Third Edition

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PREFACE

The production of Hydrofluoric Acid has expanded rapidly in recent years and larger and larger quantities are stored, used and transported. The industry has a good accident record, and any incidents which have occurred have in general led to consequences of relatively little importance. Nevertheless, the European HF producers, acting within the CTEF, and wishing to improve the general standards of safety, have drawn up this recommended code.

The recommendations proposed in this code are based on the various measures taken by the member companies of the CTEF. They constitute a base line above which one is free to choose. They in no way are intended as a substitute for the various national or international regulations, which should be respected in an integral manner. They result from the understanding and experience of the HF producers in their respective countries at the date of edition of this particular document. Established in good faith, they should not be used as a comprehensive working document, but as a guide which should, in each particular case, be adapted and utilised in consultation with a HF producer. Any potential user, therefore, should address their enquiries to a HF manufacturer before any detailed implementation of the guidelines laid down in this paper. This text may be modified in the future to take into account the evolution of the technology and general technical progress.

This edition of the document has been drawn up by a Working Group "STORAGE, TRANSPORT and SAFETY", to whom all suggestions concerning possible modifications should be addressed through the offices of the CTEF. It should not be reproduced in whole or in part without the authorisation of the CTEF.

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S U M M A R Y

1. General

Anhydrous HF is normally supplied in bottles and cylinders of several capacities up to 1 000 litres.

For larger quantities, road ad rail tank cars are used as well as containers (See recommendation STS 75/5 et 78/8).

The following recommendation has been written to prevent accidents in the handling and in the operations of emptying bottles and cylinders.

2. Handling

AHF bottles and cylinders must be stored and handled in protected and restricted areas, having an easy access, good ventilation and sufficiently dry and cold.

Any transportation and movement of bottles and cylinders must be made in a safe way, without any risk of falling.

AHF bottles and cylinders must be clearly marked and labelled following RID and national regulations and shall not be mixed with packages containing other materials when stored, in order to avoid any confusion.

These bottles and cylinders shall not be used for materials other than AHF.

Bottles shall be stored in a vertical position in order to have the valve in the gas phase. Bottles and cylinders shall be stored in a place with no risk of temperature increase and particularly protected from risk of fire and flammable materials. Full and empty packages shall be stored in different places in order to avoid any confusion.

3. Emptying in the gas phase

The content of the package should be checked in order to detect any overfilling which could be dangerous.

Bottles or cylinders shall be placed in a fixed position.

At ambient temperature, the inlet pressure of the package is close to atmospheric pressure. Therefore a slight increase of temperature of the bottle or cylinder is required in order to effect discharge.

But :

As the package is designed for a maximum allowable temperature MAT ranging from 45° to 50°C, it is very important to limit the temperature of the bottle or cylinder to 10°(C) below MAT. Such a temperature is sufficient to permit a reliable discharge of the product.

Therefore :

The heating device shall preferably be a warm air circulation into a shroud and the wall temperature of the bottle or cylinder shall also be limited to MAT.

Direct heating by electricity, steam coils or direct radiation shall be prohibited, in order to avoid any risk of overheating of the content of the bottle or the steel walls.

4. Discharge line

The valve of the bottle or cylinder shall not be used as a control valve. Suitable pipe (stainless steel, monel, copper, nickel, inconel) shall be used for the discharge line with a needle valve for regulating the flow. Plastic pipes are not recommended because of their low mechanical strength and sometimes low chemical resistance.

5. Emptying in the liquid phase

The figure n° 1 show a typical flow sheet for emptying a cylinder in the liquid phase to a storage vessel or an evaporator.

Dry air or nitrogen is used to increase the pressure inside the cylinder. The pressure of this air or nitrogen must be carefully controlled below 6 bars gauge (for a 10 bars test pressure).

The line must be designed to prevent back flow in the air / or nitrogen supply.

6. Protection against back flow

the discharge line shall not be connected to a pressurised vessel and / or a liquid phase which will present a risk of back flow, without suitable trap or vacuum break.

7. Flow measurement

It should be noted that the molecular weight of AHF gas is strongly dependant on temperature and pressure. Therefore the flow measurement in gas phase should be done above 70°C if atmospheric pressure.

In no case should the container be heated to that temperature.

Therefore, it should be recommended to use a weighing device instead of a gas flow measurement.

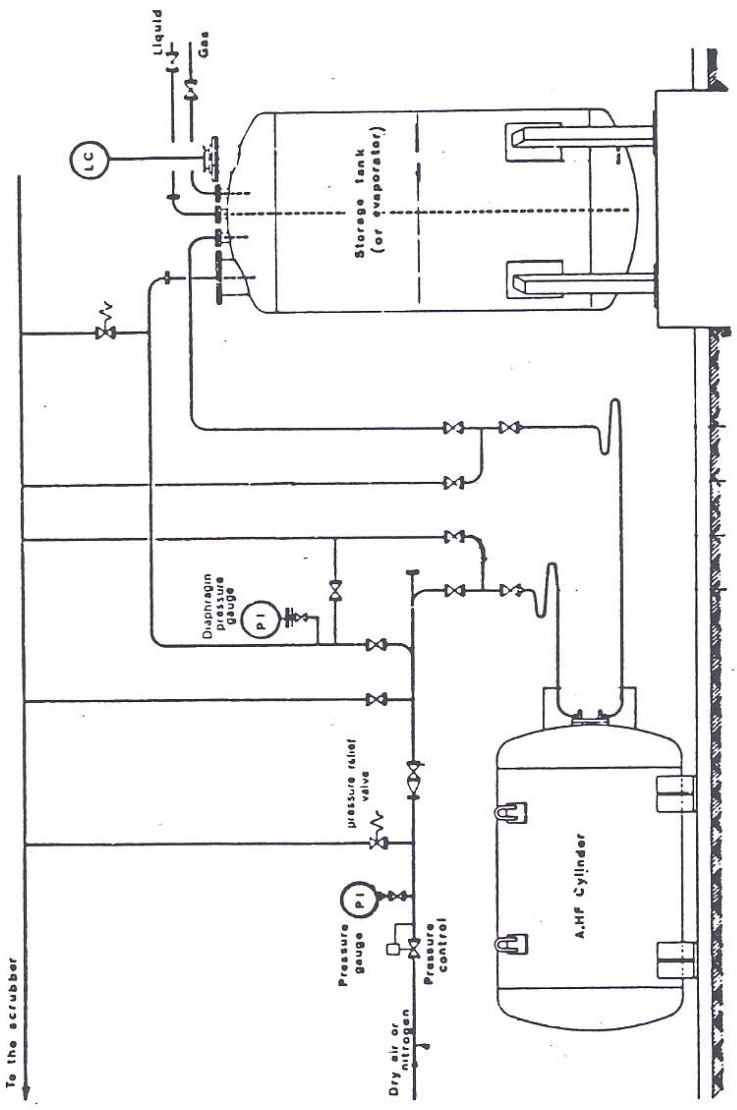
8. Absorption of HF effluents

See recommendation STS 78/22

9. Limitation of storage time

Long storage time of anhydrous HF in steel bottles and cylinders will cause hydrogen formation and overpressure. Therefore, the storage time must be limited to two years as a maximum and less if the bottle or cylinder has been heated.

Appendix 1 – Flow sheet for emptying a cylinder in the liquid phase



CTEF - Appendix to STS 81/34