



Comité Technique Européen du Fluor (CTEF)

Working Group on Storage, Transport and Safety (STS)

Group 07

**RECOMMENDATION ON TRAINING
FOR HANDLING OF ANHYDROUS HYDROGEN FLUORIDE
AND HYDROFLUORIC ACID SOLUTIONS**

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PREFACE

Anhydrous hydrogen fluoride/ hydrofluoric acid (AHF/HF) is essential in the chemical industry and there is a need for HF to be produced, transported, stored and used.

The AHF/HF industry has a very good safety record; nevertheless, the European AHF/HF producers, acting within EUROFLUOR (previously CTEF) have drawn up this document to promote continuous improvement in the standards of safety associated with AHF/HF handling.

This Recommendation is based on the various measures taken by member companies of EUROFLUOR.

Each company, based on its individual decision-making process, may decide to apply the present recommendation partly or in full.

It is in no way intended to be a substitute for various national or international regulations, which must be respected in an integral manner.

It results from the understanding and many years of experience of AHF/HF producers in their respective countries at the date of issue of this particular document.

Established in good faith, this recommendation should not be used as a standard or a comprehensive specification, but rather as a guide, which should, in each particular case, be adapted and utilised in consultation with an AHF/HF manufacturer, supplier or user, or other expert in the field.

It has been assumed in the preparation of this publication that the user will ensure that the contents are relevant to the application selected and are correctly applied by appropriately qualified and experienced people for whose guidance it has been prepared.

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The contents of this recommendation are based on the most authoritative information available at the time of writing and on good engineering practice, but it is essential to take account of appropriate subsequent technical developments or legislative changes. It is the intent of EUROFLUOR that this guideline be periodically reviewed and updated to reflect developments in industry practices and evolution of technology. Users of this guideline are urged to use the most recent edition of it, and to consult with an AHF/HF manufacturer before implementing it in detail.

This edition of the document has been drawn up by the Working Group on "Storage, Transport and Safety" to whom all suggestions concerning possible revision should be addressed via the offices of EUROFLUOR. It must not be reproduced in whole or in part without the authorisation of EUROFLUOR or member companies.

AHF is an acronym for anhydrous hydrogen fluoride.

HF is an acronym for hydrofluoric acid solutions of any concentration below 100%.

GENERAL REMARK

This guideline has been developed by the Storage, Transport and Safety Group of the Comité Technique Européen du Fluor (EUROFLUOR). It is intended to offer recommendations on the safety management for handling of anhydrous hydrogen fluoride (AHF) or hydrofluoric acid solutions (HF) at ambient temperatures (from -20°C to +50°C), unless stated otherwise.

All materials of construction, which are mentioned in this document should be double-checked and there should be a search for more information on materials, in our “Recommendation on materials of construction for Anhydrous Hydrogen Fluoride and Hydrofluoric Acid solutions” available from EUROFLUOR publication webpage www.eurofluor.org.

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TRAINING RECOMMENDATION FOR AHF/HF HANDLING

1 GENERAL OVERVIEW

All AHF/HF handling facilities should have written policies and procedures covering the appropriate safety training requirements for each task or role. All employees and contractors involved with AHF/HF handling facilities should understand the risks associated with handling AHF/HF and should be provided with the training required to complete their task or role safely. Specific training should include hazard awareness, risk assessment, the correct way to fit, wear and decontaminate personal protective equipment (PPE) as well as first aid and emergency procedures as a minimum. These training requirements should be strictly enforced and implemented.

Note: In order to ensure that the appropriate standards are achieved and maintained a policy detailing the re-training of personnel should be implemented.

AHF/HF is a very toxic and corrosive chemical which, when exposure occurs, can lead to severe health risks and can be fatal, if the correct treatment is not quickly and efficiently applied. However, it should be noted that, despite the hazards associated with handling AHF/HF, the European industry has a good safety record and has shown that AHF/HF can be safely handled, that the associated risks can be accurately identified. The largest proportion of injuries is due to a failure in the Risk Assessment process, missing training or to a lack of or incorrect use of the appropriate personal protective equipment. It is recommended that users of this guideline also use the information contained in the Chemical Safety Data Sheet for AHF/HF and the EUROFLUOR guideline for PPE (See www.eurofluor.org).

This guideline attempts to describe typical training requirements for an AHF/HF handling facility and the appropriate level of retraining. All training discussed in this document refers to additional training above and beyond that which would normally be expected for each employee. The guideline also assumes that training in standard procedures for a chemical plant, e.g. Permit to Work, has been identified and given as appropriate.

Before reading this recommendation, please consider that:

- Site: meaning the entire location incl. the plants and other facilities such as administration buildings, labs, etc.
- Plant: meaning the specific production facility/-ies, with related risks.

2 TRAINING RECOMMENDATIONS

Training recommendations for all personnel involved with the manufacture, storage, transport and use of AHF/HF have been summarised in Table 1.

The training program has been structured as modules of training with increased levels of details. Each facility manufacturing or using AHF/HF should produce suitable packages to meet these requirements. Some of the required training is generic, e.g. AHF/HF Awareness or First Aid, but much of the training is specific to the plant and, as such, may vary from site to

site within a single company, e.g. Operating Procedures, Maintenance procedures.

Consideration must also be given to re-training. The requirements and frequencies for retraining will vary with the activities and experience of personnel but the importance of positive reinforcement of good practice by retraining should not be under-estimated.

For each module of training provided the understanding of the individual should be validated and recorded. In some packages practical training as well as classroom training is appropriate, and this should also be tested. In this way the trainer can ensure that the messages have been received and understood and any misunderstandings can be identified and clarified.

All training or re-training given, together with the identity of the trainer should be formally recorded and these records should be readily available for checking and auditing.

Please note, **visitors must be either accompanied on site at all times by an experienced site person, or have a proven understanding (training and test) of the risks associated with the different site areas they are allowed in.** As soon as the visitor enters the plant, the condition of being accompanied by an experienced site/plant person is mandatory. Under this circumstance, the host will be responsible for the visitor's behaviour and will ensure that the plant procedures and systems are followed.

3 TRAINING MODULES

3.1 Site Induction Module

3.1.1 Purpose

The Site Induction Module is intended to raise the awareness of the potential risks associated with the site for all individuals working on or visiting the site (excluded the plant).

3.1.2 Audience

The Site Induction Module should be given to all employees and contractors who will be working on or visiting the site. Additionally, consideration should be given to making any close neighbours aware of these systems and procedures, in particular the testing, use and meaning of any emergency alarm systems and the appropriate actions required.

Individuals having completed the site training module should then be given a pass or badge which clearly shows that the training has been successfully completed.

3.1.3 Content

The Site Induction Module should include the basic requirements of an individual who wishes to enter the site boundary (entire site) and should, as a minimum, cover the following topics:

- General Introduction to site
- Site policies, rules and regulations
- On-site Vehicle policy
- Parking requirements

- Signing in and out policy
- Fire & Emergency Procedures (including, where possible examples of alarms, etc.)
- Wind direction indicators
- Evacuation routes and assembly points
- Personal protective equipment requirements
- The importance of reporting incidents and unsafe situations
- Definition on plant areas and related rules
 - Instructions on entering plant areas
 - Identification of any specific equipment (e.g. cameras, phones etc.) requirements (e.g. intrinsically safe, etc.)
 - Hygiene Issues
 - Permit to Work Arrangements (additional training may be required)

3.2 Plant Induction Module

3.2.1 Purpose

The Plant Induction Module is intended to build upon the Site Induction module by detailing the requirements of the plant. Each plant handling AHF/HF will have specific requirements and alarms. The correct response to those requirements and alarms should be fully understood by all personnel working in or visiting the plant.

3.2.2 Audience

The Plant Induction Module should be given to all employees and contractors who will be working on the plant, and to people visiting the plant. For larger sites this will mean that employees or contractors working on more than one plant will require more than one plant induction module.

Individuals having completed the site training module should then be given a pass or badge which clearly shows that the plant-specific training has been successfully completed.

3.2.3 Content

The Plant Induction Module should build upon the basic information contained in the Site Induction module and should identify the requirements for an individual who wishes to enter inside the plant boundary and should, as a minimum, cover the following topics:

- General Introduction to plant (geography, areas of special concern, specific chemicals and risks, etc.)
- Plant rules and regulations
- Signing on and off policy
- How to raise an alarm
- Fire & Emergency Procedures (including, where possible examples of alarms, etc.)
- Wind direction indicators
- Evacuation routes and assembly points
- Personal protective equipment requirements (i.e. the levels of personal protective equipment on plant and the acceptable activities)

- Identification of any specific equipment (e.g. cameras, phones, etc.) requirements (e.g. intrinsically safe, etc.)
- Hygiene Arrangements
- Permit to Work Issue Points (if applicable)
- The importance of reporting any incidents and unsafe situations
- The location of safety equipment (e.g. First aid kit; safety showers, etc.)

3.3 AHF/HF Induction Module

3.3.1 Purpose

The AHF/HF Induction Module is intended to raise the awareness of the specific hazards associated with handling AHF/HF.

3.3.2 Audience

The AHF/HF Induction Module should be given to all employees (Operations, Laboratory, Logistics, Engineering / Maintenance (Internal or External), Emergency Response (Internal or External), Occupational Health (Internal or External)), who could potentially be exposed to AHF/HF either directly or indirectly. For contractors (including contract hauliers, drivers, etc.), a task-specific selection of topics should be given.

It must be ensured, that only personnel, who passed the AHF/HF training and re-training is allowed to enter areas, where a potential exposure with AHF/HF could happen. The proof of the implemented training should be kept per individual in the responsible department for at least two years.

3.3.3 Content

The AHF/HF Induction Module should build upon the basic information contained in the Plant Induction module and give detailed information about the hazards associated with AHF/HF and its use together with any mitigation systems. The training should cover the following topics:

- A description of the hazards associated with AHF/HF
- A description of the first aid measures
- A description of the delayed onset of symptoms associated with AHF/HF
- A description of the site personal protective equipment and its suitability, limitations, etc.
- The location of Safety, Health & Environmental information (e.g. Safety data sheet)
- The location of first aid equipment on site
- The correct response to involvement in an AHF/HF incident
- Decontamination procedures
- How to raise further help if required
- How / where to get further advice
- The importance of ceasing work and reporting back to the control room if in doubt
- The importance of cleaning up when work is complete

- The most effective way to decontaminate tools, equipment and personal protective equipment
- The role of the individual in a plant emergency
- Assembly points
- The importance of labelling samples or contaminated equipment
- The importance of reporting all incidents, near misses and unsafe situations so that learning can prevent a recurrence

3.4 PPE Module

3.4.1 Purpose

The PPE Module is intended to describe the requirement for personal protective equipment. When, where and how it should be used and maintained. The module should identify the correct personal protective equipment.

3.4.2 Audience

This training is intended for any individual who works in an area where AHF/HF is handled (incl. operations, storage, transportations, etc.).

It must be ensured, that only personnel, who passed the PPE training, is allowed to enter areas, where a potential exposure with AHF/HF could happen and how to use and maintain the appropriate PPE. The proof of the implemented training should be kept per individual in the responsible department for at least two years.

3.4.3 Content

- A description of the hazards associated with AHF/HF
- A review of past incidents and learning
- A description of the personal protective equipment required
- A description of the decontamination systems
- A description of the first aid procedures
- A practical demonstration showing how to put the personal protective equipment on and off (i.e. donning and doffing)
- A practical demonstration of the decontamination procedures
- A practical demonstration of the use of Calcium Gluconate gel
- A description where Calcium Gluconate gel is stored
- A discussion on potential pitfalls identified
- Validation of the understanding of each part of the procedure
- The importance of reporting any exposure without any delay
- The importance of reporting the use of gel and requesting a replacement

Note: PPE supplied by external contractors or visitors should not be used within the plant boundaries unless it has been shown to be suitable for use with AHF/HF.

3.5 Equipment Decontamination Procedures Module

3.5.1 Purpose

The Decontamination Procedures Module is intended to describe, in detail, the principles to be followed when decontaminating or preparing equipment for maintenance and when maintaining equipment. The module should cover the specific issues associated with break-ins where it is identified that full decontamination cannot be guaranteed.

Special attention should be given during the training to ensure that where equipment is being moved either on site or off-site the wider issues of the transportation are included.

3.5.2 Audience

This training is intended for the supervisors, operators and maintenance personnel responsible for preparing or working on AHF/HF plant equipment.

It must be ensured, that only personnel, who passed the decontamination training, is allowed to enter areas, where a potential exposure with AHF/HF could happen and how to use the appropriate PPE. The proof of the implemented training should be kept per individual in the responsible department for at least two years.

3.5.3 Content

- A description of the hazards associated with AHF/HF
- A description of the equipment to be decontaminated (with diagrams if possible)
- A description of any equipment needed to perform the decontamination (hoses, water lines, etc.)
- A description of the personal protective equipment required at each stage of the procedure
- A description of the potential issues which may arise, their likelihood and how these would be dealt with if they arise
- A description of the first aid procedures
- A description of the isolation standards necessary (locks, lock-tag-try, spades/spectacle blinds, etc.)
- An overview of the Permit to Work system
- A table-top example preparing a system for decontamination
- A practical example where the individual prepares a system for maintenance under supervision
- The importance of reporting all incidents, near misses and unsafe situations so that learning can prevent a recurrence

3.6 First Aid Module

3.6.1 Purpose

The First Aid Module is intended to describe the actions which should be taken in the event of a potential exposure to AHF/HF. The training should emphasise the need for prompt and correct action to be taken in order to minimise the impact of the exposure.

For additional information see *EUROFLUOR Guidelines in Case of Exposure with Hydrogen Fluoride (AHF) and Hydrofluoric Acid (HF)*.

3.6.2 Audience

This training is intended for any individual who works in an area where AHF/HF is handled (incl. operations, storage, transportations, etc.).

Support personnel, e.g. Emergency response teams, also require this module.

It must be ensured, that only personnel, who passed the First Aid training, is allowed to enter areas, where a potential exposure with AHF/HF could happen and how to use the appropriate PPE. The proof of the implemented training should be kept per individual in the responsible department for at least two years.

3.6.3 Content

- A description of the hazards associated with AHF/HF
- A review of past incidents and learning
- The importance of fast and effective first aid
- The importance of self-protection to prevent additional casualties
- The importance of getting help & how this is achieved – particularly if more than one casualty is present
- A description of the personal protective equipment required when treating a casualty
- A description of the need to remove all contaminated clothing
- A description of how to decontaminate a casualty
- A description of the correct first aid procedures for each potential exposure, i.e. Skin contact, Eye contact, Ingestion and Inhalation
- A practical demonstration of the use of Calcium Gluconate gel
- A description where Calcium Gluconate gel is stored
- Validation of the understanding of each part of the procedure
- The importance of reporting any exposure, without any delay
- The importance of reporting the use of gel and requesting a replacement
- The importance of passing on casualties who are injured to medical professionals as soon as possible
- The importance of giving full and accurate information to medical professionals upon their arrival e.g. Safety data sheet if available, history, treatment given, etc. (use EUROFLUOR questionnaire for anamnesis – “Form to accompany the patient to the hospital”).

Note: This training should only be given by medical professionals or those with extensive knowledge of AHF/HF first aid procedures.

3.7 Medical treatment Module

3.7.1 Purpose

The Medical Treatment Module describes the actions which should be taken in the event of an exposure to AHF/HF. The training should emphasise the need for the correct medical care

to be given to serious and minor exposures in order to minimise the long-term effects. Medical treatment may be provided by an on-site facility or by a local hospital or doctor.

For additional information see *EUROFLUOR Guidelines in Case of Exposure with Hydrogen Fluoride (AHF) and Hydrofluoric Acid (HF)*.

3.7.2 Audience

This training is intended for those with a higher level of medical training e.g. medical professionals, company doctors, specialist nurses etc.

For the sake of awareness this module may be shared also with operators.

3.7.3 Content

- A description of the hazards associated with AHF/HF
- A review of past incidents and learning
- The importance of fast and effective treatment
- A description of the effects of AHF/HF on the human body
- A description of the correct symptomatic treatment required
- The importance of self-protection to prevent additional casualties
- A description of the personal protective equipment required when treating a casualty
- A description of the need to remove all contaminated clothing
- A description of how to decontaminate a casualty
- A description of the first aid procedures which will have been followed by the initial response
- A practical demonstration of the use of Calcium Gluconate gel
- A description where Calcium Gluconate gel is stored
- A check that gel is available at the medical facility and in due time of use
- The importance of reporting all incidents and the treatments given so that learning can prevent a recurrence

Note: This training should only be given by medical professionals or those with extensive knowledge of AHF/HF first aid and treatment procedures.

4 TABLE 1: TRAINING GUIDELINES MATRIX

	Operations	Laboratory	Logistics	Engineering/ Maintenance <small>(Internal or External)</small>	Emergency Response <small>(Internal or External)</small>	Other employees in close proximity to the plant within the site	Medical staff <small>(Internal or External)</small>	Visitors
Site Induction	*	*	*	*	*	*	*	+
Plant Induction	*	*	*	*	*	+	*	+
AHF/HF Induction	*	*	*	*	*	+	*	+
PPE	*	*	*	*	*	+	*	+
Equipment Decontamination	*	*	*	*	*	N/A	+	N/A
First Aid	*	*	*	*	*	+	*	N/A
Medical treatment	+ (Awareness only)	+ (Awareness only)	+ (Awareness only)	+ (Awareness only)	* (Awareness only)	N/A	*	N/A

* Obligational Training

+ Optional additional Training

N/A - Training not Applicable

5 TABLE 2: OVERVIEW TRAINING MODULES

TRAINING - MODULES		
Site Induction - Module	Plant Induction - Module	AHF/HF Induction - Module
<ul style="list-style-type: none"> • General Introduction to site • Site policies, rules and regulations • On-site Vehicle policy • Parking requirements • Signing in and out policy • Fire & Emergency Procedures (including, where possible examples of alarms, etc.) • Wind direction indicators • Evacuation routes and assembly points • Personal protective equipment requirements • The importance of reporting incidents and unsafe situations • Definition on plant areas and related rules <ul style="list-style-type: none"> • Instructions on entering plant areas • Identification of any specific equipment (e.g. cameras, phones etc.) requirements (e.g. intrinsically safe, etc.) • Hygiene Issues • Permit to Work Arrangements (additional training may be required) 	<ul style="list-style-type: none"> • General Introduction to plant (geography, areas of special concern, specific chemicals and risks, etc.) • Plant rules and regulations • Signing on and off policy • How to raise an alarm • Fire & Emergency Procedures (including, where possible examples of alarms, etc.) • Wind direction indicators • Evacuation routes and assembly points • Personal protective equipment requirements (i.e. the levels of personal protective equipment on plant and the acceptable activities) • Identification of any specific equipment (e.g. cameras, phones, etc.) requirements (e.g. intrinsically safe, etc.) • Hygiene Arrangements • Permit to Work Issue Points (if applicable) • The importance of reporting any incidents and unsafe situations • The location of safety equipment (e.g. First aid kit; safety showers, etc.) 	<ul style="list-style-type: none"> • A description of the hazards associated with AHF/HF • A description of the first aid measures • A description of the delayed onset of symptoms associated with AHF/HF • A description of the site personal protective equipment and its suitability, limitations, etc. • The location of Safety, Health & Environmental information (e.g. Safety data sheet) • The location of first aid equipment on site • The correct response to involvement in an AHF/HF incident • Decontamination procedures • How to raise further help if required • How / where to get further advice • The importance of ceasing work and reporting back to the control room if in doubt • The importance of cleaning up when work is complete • The most effective way to decontaminate tools, equipment and personal protective equipment • The role of the individual in a plant emergency • Assembly points • The importance of labelling samples or contaminated equipment • The importance of reporting all incidents, near misses and unsafe situations so that learning can prevent a recurrence

TRAINING - MODULES

PPE - Module	Equipment Decontamination Procedures - Module
<ul style="list-style-type: none"> • A description of the hazards associated with AHF/HF • A review of past incidents and learning • A description of the personal protective equipment required • A description of the decontamination systems • A description of the first aid procedures • A practical demonstration showing how to put the personal protective equipment on and off (i.e. donning and doffing) • A practical demonstration of the decontamination procedures • A practical demonstration of the use of Calcium Gluconate gel • A description where Calcium Gluconate gel is stored • A discussion on potential pitfalls identified • Validation of the understanding of each part of the procedure • The importance of reporting any exposure without any delay • The importance of reporting the use of gel and requesting a replacement 	<ul style="list-style-type: none"> • A description of the hazards associated with AHF/HF • A description of the equipment to be decontaminated (with diagrams if possible) • A description of any equipment needed to perform the decontamination (hoses, water lines, etc.) • A description of the personal protective equipment required at each stage of the procedure • A description of the potential issues which may arise, their likelihood and how these would be dealt with if they arise • A description of the first aid procedures • A description of the isolation standards necessary (locks, lock-tag-try, spades/spectacle blinds, etc.) • An overview of the Permit to Work system • A table-top example preparing a system for decontamination • A practical example where the individual prepares a system for maintenance under supervision • The importance of reporting all incidents, near misses and unsafe situations so that learning can prevent a recurrence

TRAINING - MODULES

First Aid - Module

- A description of the hazards associated with AHF/HF
- A review of past incidents and learning
- The importance of fast and effective first aid
- The importance of self-protection to prevent additional casualties
- The importance of getting help & how this is achieved – particularly if more than one casualty is present
- A description of the personal protective equipment required when treating a casualty
- A description of the need to remove all contaminated clothing
- A description of how to decontaminate a casualty
- A description of the correct first aid procedures for each potential exposure, i.e. Skin contact, Eye contact, Ingestion and Inhalation
- A practical demonstration of the use of Calcium Gluconate gel
- A description where Calcium Gluconate gel is stored
- Validation of the understanding of each part of the procedure
- The importance of reporting any exposure, without any delay
- The importance of reporting the use of gel and requesting a replacement
- The importance of passing on casualties who are injured to medical professionals as soon as possible
- The importance of giving full and accurate information to medical professionals upon their arrival e.g. Safety data sheet if available, history, treatment given, etc. (use EUROFLUOR questionnaire for anamnesis – “Form to accompany the patient to the hospital”).

Medical Treatment - Module

- A description of the hazards associated with AHF/HF
- A review of past incidents and learning
- The importance of fast and effective treatment
- A description of the effects of AHF/HF on the human body
- A description of the correct symptomatic treatment required
- The importance of self-protection to prevent additional casualties
- A description of the personal protective equipment required when treating a casualty
- A description of the need to remove all contaminated clothing
- A description of how to decontaminate a casualty
- A description of the first aid procedures which will have been followed by the initial response
- A practical demonstration of the use of Calcium Gluconate gel
- A description where Calcium Gluconate gel is stored
- A check that gel is available at the medical facility and in due time of use
- The importance of reporting all incidents and the treatments given so that learning can prevent a recurrence