GUIDELINES FOR PERSONAL PROTECTIVE EQUIPMENT

RESISTANT AGAINST HYDROGEN FLUORIDE (AHF) AND HYDROFLUORIC ACID (HF)

Eurofluor (European Technical Committee for Fluorine)

www.eurofluor.org

Version: 2018.10.09

CONTENT

INTRODUCTION

- This Recommendation is based on the various measures taken by member companies of Eurofluor.
- It in no way is intended as a substitute for the various national or international regulations, which should be respected in an integral manner.
- It results from the understanding and many years experience of the 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 experts in the field.

INTRODUCTION

- 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.

- Eurofluor does not, and indeed cannot, make any representation or give any warranty of guarantee in connection with material published in Eurofluor publications and expressly disclaims any legal liability or responsibility for damage or loss resulting from the use, or misuse, of information contained in this document.

- It is for each reader to decide to apply this recommendation (in full or partly), or not.

INTRODUCTION

GENERAL

- The following information provides the basic principles regarding different levels of Personal Protective Equipment (PPE) to be worn for particular types of activity associated with handling AHF/HF.

  - EMERGENCY RESPONSE - LEVEL
  - HIGH RISK - LEVEL
  - MEDIUM RISK - LEVEL
  - Minimum Standard of Protecion – LEVEL (this is not AHF/HF specific as it is the minimum level of PPE any person entering a chemical plant has to wear)

- Although some sites have extra levels of PPE within their procedures than those identified, or for certain activities adopt a higher standard than others, the following suggests the minimum standard of equipment that should be worn versus the risk category defined in the risk assessment for each task handling AHF/HF.

DO's and DON'Ts when working with HF

	Always treat HF with the Greatest Respect.	Don't eat, drink or smoke when wearing work clothes or PPE.	
	Always assume chemical contamination exists even after decontamination, therefore wear appropriate PPE.	Don't store or re-use contaminated PPE without completely decontaminating it first.	
	Carefully inspect and test Personal Protective Equipment (PPE) before wearing it.	Don't delay with HF First-Aid. Don't forget to protect yourself and those administering aid or assistance.	
	Remove immediately, with caution and without hesitation any work clothes contaminated with HF.	Don't store work clothes with personal clothes.	
	Neutralise any spillage of HF immediately.	Don't carry out any maintenance or work on a HF system against a single isolation valve.	
	Always follow up HF First-Aid Treatment and go to the Medical Department, even if any pain has receded.	Don't touch any liquid in the workplace. Don't assume it's harmless.	
	Apply HF First-Aid Treatment with any suspected HF contamination. "Better to be Safe, than Sorry"	Don't share Personal Protective Equipment (PPE).	

CTEF – Comité Technique Européen du Fluor

CTEF (Comité Technique Européen du Fluor) represents the major producers and users of hydrogen fluoride (HF) and fluoride chemicals in Europe. CTEF aims to assure safe production, storage, transportation and use of hydrofluoric acid.

For more information, visit our website: www.eurofluor.org

Responsible Care
OUR COMMITMENT TO SUSTAINABILITY

GENERAL INFORMATION ABOUT ANHYDROUS HF

Concen-tration %	CLP CLASSIFICATION CLP – Classification, Labelling and Packaging	ADR / RID CLASSIFICATION ADR - European Agreement on International Carriage of Dangerous Goods RID – Regulations Concerning the International Carriage of Dangerous Goods
AHF HF > 85%	ACUTE TOXICITY (oral, dermal and inhalation) Cat. 1 and 2 SKIN CORROSION Cat 1A  Hazard statements (H Statement) H300: Fatal if swallowed H310: Fatal in contact with skin H330: Fatal if inhaled H314: Causes severe skin burns and eye damage	HYDROGEN FLUORIDE, ANHYDROUS CLASS 8 PG I CT1 : CORROSIVE SUBSTANCE, TOXIC, LIQUID 886 1052  HYDROFLUORIC ACID with more than 85% of hydrogen fluoride CLASS 8 PG I CT1 : CORROSIVE SUBSTANCE, TOXIC, LIQUID 886 1790 

GENERAL INFORMATION ON AQUEOUS HYDROFLUORIC ACID (HF)

<table>
<tr><th>Concen-tration
%</th><th>CLP CLASSIFICATION
CLP – Classification, Labelling and Packaging</th><th>ADR / RID CLASSIFICATION
ADR - European Agreement on International Carriage of Dangerous Goods
RID – Regulations Concerning the International Carriage of Dangerous Goods</th></tr>
<tr><td rowspan="2">HF > 60%
HF < 85%</td><td rowspan="2">ACUTE TOXICITY (oral, dermal and inhalation)
Cat 1 and 2

SKIN CORROSION
Cat 1A

Hazard statements (H Statement)

H300: Fatal if swallowed
H310: Fatal in contact with skin
H330: Fatal if inhaled
H314: Causes severe skin burns and eye damage</td><td>HYDROFLUORIC ACID
with more than 60% but not more than 85% hydrogen fluoride
CLASS 8 PG I
CT1 : CORROSIVE SUBSTANCE, TOXIC, LIQUID

  </td></tr>
<tr><td>HYDROFLUORIC ACID
with not more than 60% of hydrogen fluoride
CLASS 8 PG II
CT1 : CORROSIVE SUBSTANCE, TOXIC, LIQUID

  </td></tr>
<tr><td>HF ≤ 60%</td><td></td><td></td></tr>
</table>

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

GENERAL

- Each operating site should have written policy and procedures covering the needs and use of personal protective equipment (PPE) by all employees, contractors and visitors, describing the needs, the use and the requirements of individuals with regard to PPE.

- The policy, which should be reviewed periodically, should comply with all local, national and international legislation where appropriate and, as a minimum, should include the following areas:

  - RISK ASSESSMENT
  - TRAINING
  - MATERIAL FOR PPE
  - PROTECTIVE EQUIPMENT CARE

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Risk and hazard assessment

- **Each site handling AHF/HF should have a procedure that demands a risk assessment be completed prior to initiating each new task or job.**
- The risk assessment may be in the form of an established Local Area Instruction or similar formal written procedure for routine work.
- For non-routine or one-off tasks then it is advised that a risk assessment is completed, including a representative of the working party involved in the task.
- All areas and associated hazards of the facility should be considered when evaluating and defining the suitability and use of personal protective equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Risk and hazard assessment

- The health aspects associated with the wearing of personal protective equipment should not be under-estimated and should form part of the risk assessment
- Clear identification of the task to be done and the individuals involved, including:
  - Clear identification of the equipment required.
  - A review of the competence and understanding of the individuals involved.
  - An evaluation of the risks associated with each step of the task.
  - Clear identification of the possibility of exposure to all hazards.
  - Elimination or mitigation of as many hazards as possible.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Risk assessment

- A review of the appropriate level of personal protective equipment required for each step of the task and at what point the personal protective equipment should be worn.
- Clear identification of any health implications associated with the task, the individuals involved in the task and the personal protective equipment to be used.
- Clear identification of the expected duration of the task and any hygiene implications.
- Clear identification of the decontamination procedures required.
- Clear identification of any back up emergency plan, if necessary.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Training

- All employees and contractors involved with facilities handling AHF/HF should have regular appropriate training, to include

  - hazard awareness,
  - risk assessment,
  - the correct way to fit,
  - wear and
  - decontaminate personal protective equipment as well as
  - first aid and
  - emergency procedures as a minimum.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Training

- In all cases personal protective equipment should only be worn by those trained in its use, application and decontamination.
- All individuals working on or visiting facilities handling AHF/HF should be trained in the use and limitations of the personal protective equipment available within the facility.
- Training must include to dress and undress with the specific PPE.
- The training requirements for operators, maintenance, contractors, management and visitors should be clearly identified and must be strictly followed.
- Periodic re-training should also be provided.
- In all cases training and re-training should be recorded and these records maintained for a suitable period.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Material for PPE

- Many materials have been tried and tested following recognised procedures for resistance to AHF/HF. Many materials have also been shown to be acceptable through years of experience.

- When selecting personal protective equipment the material of choice should be proven to be resistant to AHF/HF.

- It is recommended that handlers of AHF/HF select only reputable personal protective equipment suppliers who can give documentary evidence of resistance to AHF/HF.

- It should be requested to have the up to date data on breakthrough times for the various products, the test procedure followed and the recommended maximum working time from the supplier.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Material for PPE

- Certain tasks, for example scaffolding in areas of high risk, may require a heavy duty glove which is not only chemically resistant but will also resist mechanical damage.

- It is recommended to check the fabric in the facilities to verify if the material is suitable for AHF and diluted HF.

- The condition and integrity of the PPE should be checked before each time of use.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Material for PPE

- *Note:*
  - *Respect the recommendation for use of the PPE*
  - *All materials have some permeability to AHF/HF, particularly liquid AHF/HF, and direct contact should be avoided.*
  - *Also, once HF has penetrated the outer protective layer it cannot be removed by the decontamination process, therefore a suitable operational lifespan should be determined where appropriate.*
  - *Personal protective equipment known to have been exposed to liquid AHF/HF should be DECONTAMINATED as soon as possible or DISPOSED correctly if necessary.*

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Health consideration

- It may be appropriate to define a maximum work time for some equipment to avoid potential health implications (follow your local rules).
- Heating and cooling systems for personnel required to wear personal protective equipment in extreme conditions are available and should be considered where necessary.
- Make sure, that the health condition of the personal is sufficient for wearing PPE

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Protective Equipment care

- Control
  - Verify they are still in due date of use.
- Store & Dispose
  - In good conditions avoiding any contamination.
  - In a specific place clean and well maintained.
  - Dispose safely to avoid any contamination and further contact with people.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Protective Equipment care

- Initial decontamination should take place immediately on leaving the area, for example, by use of a shower.
- All personal protective equipment used on plant should be assumed to be contaminated with AHF/HF and treated with appropriate care.
- Care should also be exercised during the removal of all personal protective equipment.
- In particular, where others provide assistance, the risk assessment should have identified suitable personal protective equipment for the assistant.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Protective Equipment care

- Secondary systems to ensure complete decontamination by neutralisation should be available for use by the operating teams.
- Where protective equipment is not issued to individuals as equipment for their personal use care must be taken to ensure that hygiene issues are adequately addressed.
- All cleaned personal protective equipment should be tested for integrity prior to re-use within the AHF/HF handling facility.
- This testing may be completed in a number of ways and will depend upon the personal protective equipment, for example, gloves should be tested before each trip onto the plant by inflating with air and/or submerging in a water bath, suits should be visually inspected using a light source to determine minor defects, etc.

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Protective Equipment care

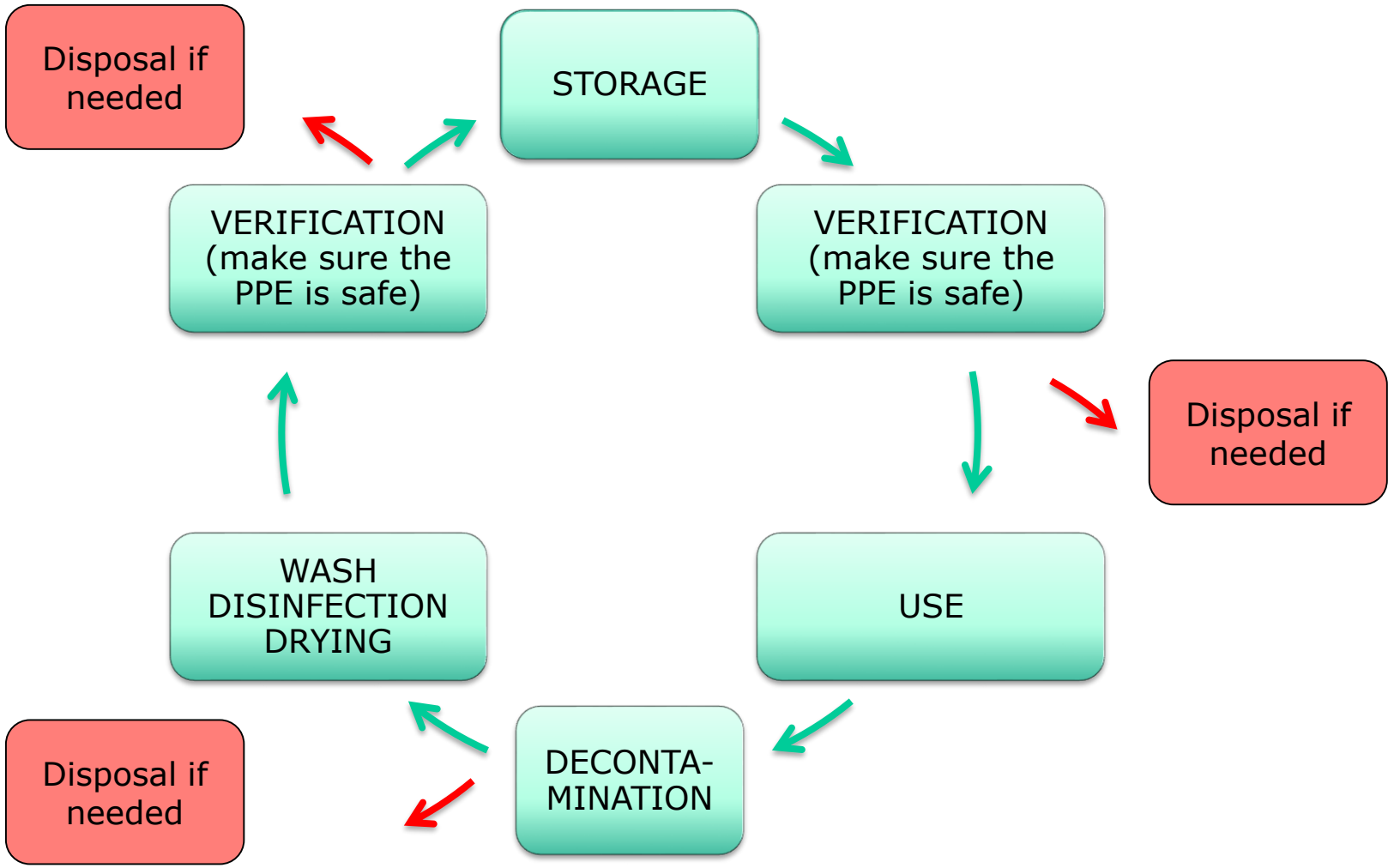
- Personal protective equipment should be stored and routinely maintained by trained personnel in accordance with the manufacturer's recommendations.

- In all cases defective or untested equipment must not be used within the facility.

- If PPE is contaminated or damaged a special risk assessment should be conducted:
  - Either dispose the PPE (safest option) or
  - Repair, only if it can be assured, that
    - All repairs to personal protective equipment should only be carried out by trained and authorized suppliers or individuals
    - The supplier or provides a guarantee for the thorough and 100% correctness of this repair
    - A repaired PPE must be examined by authorized plant personal prior to re-use

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Protective Equipment care



PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

Minimum requirements for PPE

- ALL personal protective equipment is required to carry the 'CE' marking as a sign that the product complies with the essential requirements of Regulation 2016/425 .
- Personal protective equipment must be tested using the standard test protocol against the relevant hazard(s) and manufactured under an approved Quality Assurance system (e.g. ISO 9002).
- Enough escape masks should be available in the plant.
- It must be ensured, that the personnel in the control room has the right PPE or technical equipment to shut down the production if needed in the case of emergency.

APPLICABLE REGULATIONS

- As of 21 April 2018, the new **EU regulation on PPE** (**Regulation 2016/425**) has become applicable and binding in all Member States
- PPE must comply with that regulation *(please, check the EU rules)*
- In synthesis, <u>in the EU PPE may only be sold and used if</u>:
  - Where properly maintained and used for its intended purpose, it complies with the EU regulation 2016/425, especially the **essential health and safety requirements**;
  - It does not endanger the health or safety of people, domestic animals or property.

APPLICABLE REGULATIONS

- PPE must bear the CE marking and be sold together with the technical documentations and the EU declaration of conformity

- PPE shall be classified according to the following **risk categories** (i.e. risk against which PPE is intended to protect users):
  - **Category I** — minimal risks;
  - **Category II** — risks not included in categories I or III;
  - **Category III** — very serious risks such as death or irreversible damage to health.
    - For use in tasks where contact with AHF/HF may occur only Category III Design PPE is acceptable.
    - **(All the AHF/HF levels of protection have to comply with EU Reg. 2016/425 risk category III).**

LEVELS OF PROTECTION

- There are four levels of protection:

EMERGENCY RESPONSE – Level

HIGH RISK – Level
(equipment for increased risks by invasive interactions)

MEDIUM RISK – Level
(routine operational equipment without invasive interactions)

MINIMUM STANDARD PROTECTION – Level
(this level corresponds to the generic protection that a person must wear once entering a chemical plant, regardless of the production)

SUITABLE EQUIPMENT OF PROTECTION

EMERGENCY RESPONSE LEVEL

EMERGENCY RESPONSE – Level

- *EMERGENCY RESPONSE* Level is used for emergency response or where the risk assessment has identified a high degree of probability that the task could result in a significant exposure.
- *EMERGENCY RESPONSE* Level should use equipment designed to prevent ingress of HF and is designed to be gas tight and should give full protection from potential AHF/HF exposures.
- The health impact of using this level of personal protective equipment should not be under-estimated. The wearing of fully encapsulated suits and breathing apparatus (BA) whilst working, particularly in hot climates, can lead to additional health risks for the employees involved. The additional risks associated should be identified and assessed in the risk assessment.
- Periodic specific training is required to ensure correct donning and doffing (fitting and safe undressing).
- Strict management of the PPE is required.

SUITABLE EQUIPMENT OF PROTECTION

EMERGENCY RESPONSE LEVEL

EMERGENCY RESPONSE – Level – Examples

- Existing loss of containment
- Situations where AHF/HF vapor and/or liquid are very likely to be released
- e.g.
  - Isolating failed pump seals and valve packing and
  - Working in close proximity to leaks.

SUITABLE EQUIPMENT OF PROTECTION

EMERGENCY RESPONSE LEVEL

EMERGENCY RESPONSE – Level

- Fully encompassing gas tight suit including integrated boots with steel toe
- Suitable gloves either built in or completely sealed at the wrists
- SCBA set (Self Contained Breathing Apparatus)
- Standard hard hat or bump cap worn inside the suit

- *Note: all materials must have proven resistance to AHF/HF*
- *Note: it is mandatory to have at least two people at the place of action with the same level of PPE*

SUITABLE EQUIPMENT OF PROTECTION

HIGH RISK LEVEL

HIGH RISK – Level

- *HIGH RISK -* Level personal protective equipment is used for routine operational tasks involving opening of process equipment (invasive) or for non-routine interactions which have been identified as requiring a higher level of protection.

- *HIGH RISK -* Level equipment is designed to prevent the ingress of AHF/HF and should give full protection from potential AHF/HF exposures (eg. splash).

- *HIGH RISK -* Level personal protective equipment is to be used for operations where the risk of contact with process fluid (liquid and/or gas) is not excluded.

- This PPE level is not suitable for an emergency !

SUITABLE EQUIPMENT OF PROTECTION

HIGH RISK LEVEL

HIGH RISK – Level - Examples

- Connection for loading / unloading AHF/HF
- Collecting samples of AHF/HF
- After clearing and purging e.g.:
  - Changing pressure gauges or other instruments in acid areas,
  - Line-breaking and blinding of any AHF/HF service equipment with potential remaining residues

SUITABLE EQUIPMENT OF PROTECTION

HIGH RISK LEVEL

HIGH RISK – Level

- Fully encompassing suit with gloves and boots sealed or tightened with the suit including hood with integrated visor or ventilated helmet
- Standard hard hat or bump cap worn inside the suit
- Air supply by air purifying respirator
- Boots or overboots with steel toe and shank under the trousers

- *Note: all materials must have proven resistance to AHF/HF*

SUITABLE EQUIPMENT OF PROTECTION

MEDIUM RISK LEVEL

MEDIUM RISK - Level

- *MEDIUM RISK -* Level personal protective equipment is used for routine operational tasks NOT involving opening of process equipment (non-invasive) or where the risk assessment requires this PPE level.

- It is designed to give a greater degree of protection against incidental and unlikely contact with process fluids for individuals working in the HF (no AHF) handling area in a safe system (no potential splash, no potential fumes) according to local hazard assessment.

- *MEDIUM RISK -* Level personal protective equipment should be used for operations which involve interaction with the process but which are not expected to cause a release of process fluids.

- This PPE level is not suitable for an emergency!

SUITABLE EQUIPMENT OF PROTECTION

MEDIUM RISK LEVEL

MEDIUM RISK – Level - Examples

- Laboratory tasks
- HF Sampling at closed and ventilated sampling areas,
- Work on equipment in acid area after HF has been removed and initial opening completed, rinsed equipment,
- Work on equipment that have been cleaned in such a way no HF should contaminate the operation

SUITABLE EQUIPMENT OF PROTECTION

MEDIUM RISK LEVEL

MEDIUM RISK – Level

- Jacket / apron with gloves overlapping the sleeves
- High waisted trousers overlapping boots with steel toe and shank or overboots
- Standard hard hat with nape and face visor (in down-position) and chemical goggles worn under the visor

- *Note: all materials must have proven resistance to HF*

MINIMUM STANDARD PROTECTION LEVEL

SUITABLE EQUIPMENT OF PROTECTION

MINIMUM STANDARD PROTECTION – Level

(generic protection that a person must wear once entering a chemical plant, regardless of the production)

- MINIMUM STANDARD PROTECTION - Level personal protective equipment is the minimum level of personal protective equipment and is not designed for use when there is a risk of potential exposure to AHF/HF.

- Standard equipment for no physical contact with AHF/HF anticipated and no physical action and no intervention on any process device or process apparatus whatever the type is planned.

MINIMUM STANDARD PROTECTION LEVEL

SUITABLE EQUIPMENT OF PROTECTION

MINIMUM STANDARD PROTECTION – Level - Examples

- Routine visual inspection of the facility and equipment, and
- Reading meters and gauges in the field,
- Work on equipment that has been opened, dissembled and fully neutralised so that no acid can be trapped inside

MINIMUM STANDARD PROTECTION LEVEL

SUITABLE EQUIPMENT OF PROTECTION

MINIMUM STANDARD PROTECTION – Level

- Jacket with long sleeves
- Long trousers
- Safety spectacles with side shields or chemical goggles
- Boots, overboots or safety shoes with steel toe
- Standard hard hat
- Gloves (task specific) may be required
- Escape air packs or suitable filtration systems should also be readily available to enable an escape in the unlikely event of a leak.

COMPARISON WITH OTHER ASSOCIATIONS

EUROFLUOR / CIA UK	HFIPI USA	API	OSHA / EPA
Emergency Response	A	D	A
High Risk	B	C	B
Medium Risk	C	B	C
Minimum Standard of Protection / Low Risk	D	A	D

CIA UK Chemical Industry Association United Kingdom
HFIPI North American Hydrogen Fluoride Industry Practices Institute
API American Petroleum Institute Safe Operation of Hydrofluoric Acid Alkylation Units
OSHA US Occupational Safety and Health Administration
EPA US Environmental Protection Agency

MORE INFORMATION PPE

For more information, please download:

Recommendations concerning the safe handling of Hydrogen Fluoride (AHF) and Hydrofluoric Acid (HF)

www.eurofluor.org

If you need any other information do not hesitate to contact to info@eurofluor.org