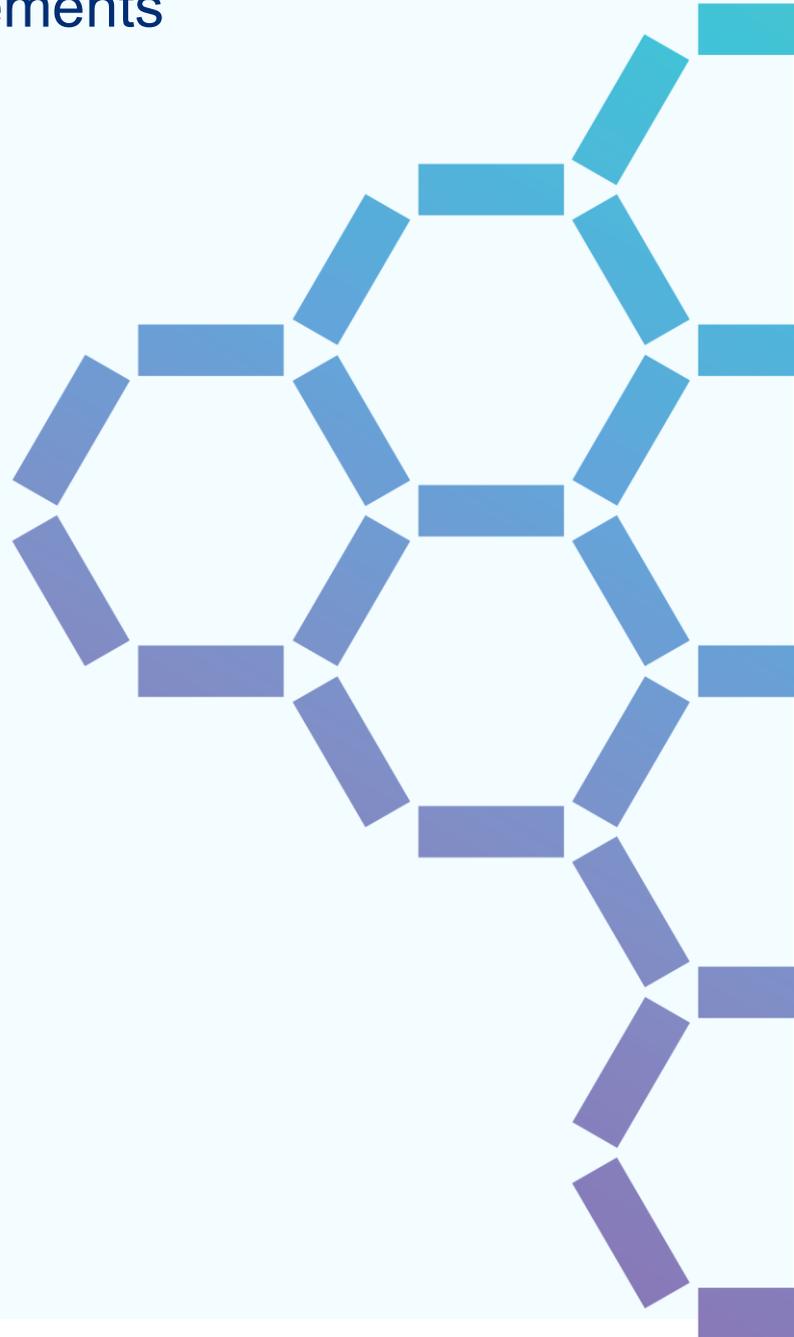


Hydrofluoric Acid Guidance – Section A Training Requirements



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Introduction

The Hydrofluoric Acid Sector Network of the Chemical Industries Association (CIA) has developed this Guidance. It is intended to identify the training requirements for employees and contractors associated with a facility handling hydrogen fluoride (HF). The Guidance is based upon many years of practical operational experience amongst members of the CIA HF Network, covering the whole range of anhydrous, aqueous, concentrated and dilute forms of HF.

This Guidance reflects the 'best current practice' (at the time of publication) and is recommended for use in conjunction with the supplier(s) of HF to form the basis of a discussion aimed at setting an appropriate level of training for given roles, duties or activities. It is intended as a recommendation and not as a mandate to which manufacturers and users of HF must adhere. As the title of the Guidance suggests, it is focused on training for those associated with HF only.

Note: The Guidance is not to be used as a substitute for any applicable legal duties and regulation. Whilst all reasonable efforts have been made to ensure the accuracy of the contents at the time of publication, readers must themselves refer to current legislation to ensure their compliance with legal duties.

Additional information and Guidance relevant to training in specific aspects of working with HF or equipment in HF service is indicated as appropriate in the text in Section 4 below.

Acronyms

HF	Hydrogen Fluoride, Hydrofluoric Acid
AHF	Anhydrous Hydrogen Fluoride
COMAH	Control of Major Accident Hazards Regulations.
HSE	Health & Safety Executive
ISO Tank	A bulk liquid tank container designed to ISO standards to be safely stacked and handled in intermodal freight transport
"Line of Fire"	A life-saving rule to keep yourself and others out of the line of fire
PPE	Personal Protective Equipment
PTW	Permit To Work

A1 General Overview

All HF handling facilities should have written policies and procedures covering the appropriate training and refresher requirements for each task or role. All employees and contractors involved with HF handling facilities should understand the risks associated with handling HF and should be provided with the training required to complete their task or role safely. Specific training should as a minimum include hazard awareness; risk assessment; the correct way to fit, wear and decontaminate PPE; and First Aid and emergency procedures.

This Guidance aims to describe typical training requirements for an HF handling facility and an appropriate level of refresher re-training. All recommendations in this Guidance refer to additional training above and beyond the general health and safety training which is legally required and would normally be expected for any workplace.

Competence Management

Training for any facility handling HF should also be considered in the context of the overall Competency Management arrangements for the site. The Health & Safety Executive (on behalf of the COMAH Competent Authority) has published a Guidance document that sets out the requirements of managing competence at sites subject to the Control of Major Accident Hazards Regulations (COMAH). The guide sets out the expectations of the regulators, and is available via the following links:

[Safety related systems: Managing competence for safety- related systems](#) (Part one – Key Guidance) (PDF)

[Safety related systems: Managing competence for safety- related systems](#) (Part two – Supplementary material) (PDF)

A guide to Competence Management has also been developed by the Chemical Industries Association (CIA) and is freely available to CIA member companies – please contact the CIA Responsible Care team for details if you require a copy.

Auditing

Periodic auditing to verify the adequacy of the training or to identify gaps should take two forms:

1. Auditing of the training and competence management system to ensure that HF-related roles (generally operating and engineering employees) and associated training requirements are identified; that initial training and subsequent refresher training programmes are in place; and that a record is available to show it has taken place.
2. Auditing of personnel engaged in HF-related work must also be planned in, to confirm that the learning from the training package has been retained, any skills related to the task are being properly applied, and that the application of standards and adherence to procedures is shown as an embedded behaviour.

A2 Training Requirements

Training requirements (which include validation and cycles of refresher training) should be identified for all personnel involved with the manufacture, storage, transport and use of HF. The recommended requirements for different job roles (see Table 1 Training Matrix) must be set out, with records maintained in a suitable training management system, and with consideration given to local information accessibility so that each individual's training status can be verified.

In this Guidance the overall training programme has been structured into modules of training, with increasing levels of detail, each of which is intended to build upon basic training already given and should be used to re-emphasize key points. The appropriate modules can be combined into a single induction or training system.

Each facility manufacturing or using HF should produce bespoke suitable training material appropriate to the scope and complexity of the processes to meet these requirements. Some of the required training is generic, e.g. basic HF awareness or initial First Aid. However, much of the training needs to be specific to the site/plant/processes – as such, training may vary from company to company, and from site to site within a single company, as there will be significant differences in process conditions, operating procedures and maintenance procedures.

A2.1 Site Induction

While it is not within the scope of this Guidance to set out the content of a general Site Induction (which should be site-specific for each business), it is expected that each site will have one for the various employee, visitor or contractor personnel likely to be on site. As part of each company's site induction, reference to hazardous chemicals present will provide a good opportunity for raising basic awareness of the presence of HF among other site hazards.

A2.2 Plant Induction Module

Purpose

The Plant Induction Module is intended to build upon the site induction awareness by detailing the requirements of the HF user plant. Each plant handling HF will have specific requirements, safety procedures and alarms – the correct response to which should be fully understood by all personnel working on or visiting the plant. This training will be plant specific though there may be areas common to more than one plant within a site boundary.

Content

This module should include the following HF specific information:

- Access requirement/controls
- General introduction to the plant (geography, location of HF containing equipment, etc.)
- How to raise an alarm (including reference to Evacuation routes, wind direction indicators and assembly points / toxic refuge etc.)
- Location of emergency equipment and immediate action to take in the event of an incident (safety showers, First Aid etc.)
- PPE requirements, i.e. the specified levels of PPE on plant and the acceptable activities.

Audience

The Plant Induction Module should be undertaken by all employees, contractors and internal or external visitors who will be working on 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.

A2.3 HF Induction Module

Purpose

Consistent with the increasing level of detailed training in the modular approach, the HF Induction Module is intended to raise awareness of the specific hazards associated with handling HF.

Content

The HF Induction Module should build upon the basic information contained in the Site & Plant Induction Modules and give detailed information about the hazards associated with HF and its use together with any mitigation arrangements such as PPE, safety showers, calcium gluconate gel supply etc. The training should cover the following topics:

- A description of the hazards associated with HF
- An overview of PPE/RPE levels for tasks
- The correct response to involvement in an HF incident/ emergency and how to raise the alarm
- A description of the symptoms associated with HF exposure, including the possibility of delayed onset in some circumstances
- A description of initial First Aid measures (See also Guidance Section I for First Aid treatment)
- The location of First Aid equipment on site
- The location of safety, health and environmental information and procedures
- Decontamination procedures (including labelling samples or contaminated equipment)
- The most effective way to decontaminate tools, equipment and PPE (See also Guidance Section H – Decontamination)

Audience

The HF Induction Module should be undertaken by all employees and contractors who may potentially come into contact with HF as part of their work and job role. In some circumstances depending upon exposure risk this may include other contractors such as hauliers.

A2.4 Personal Protective Equipment Module

Purpose

This module should describe the levels of PPE to be used for low, medium and high-risk HF activities, including pre-use inspection and post-task decontamination methods. *For additional information see CIA HF Network Guidance – Section B – Personal Protective Equipment*

Within this training module, consideration should also be given to any potential health implications for the wearer and appropriate standards to be applied, e.g. individuals must be made aware of the effects and symptoms of heat stress that can be brought on when wearing certain levels of PPE, which can be accelerated by increased ambient temperatures or levels of exertion.

Content

- A description of the hazards associated with HF (e.g. exposure and contact with liquid/vapour)
- A review of some past incident examples, and learning relevant to PPE use
- A description of the PPE required and any limitations there may be
- A description of the pre-use checks before work, and subsequent decontamination of PPE
- A practical demonstration showing how to put the PPE on correctly (this may be achieved through a 'buddy' type process during initial usage)

Notes: Consideration must also be given to manufacturers' recommendations associated with PPE. PPE supplied by external contractors or visitors should not be used within the plant boundaries unless it has been proven to be suitable for use with HF and agreed with Site personnel responsible.

Audience

This training is intended for any individual who is involved in HF plant operations or maintenance. It may in some circumstances relate to hauliers who interact with the area.

A2.5 Initial First Aid Module

Purpose

The Initial First Aid Module is intended to describe the first response actions which should be taken in the event of a potential exposure to HF. The training should emphasise the need for prompt and correct action to be taken to minimise the impact of the exposure. *For additional information see CIA HF Network Guidance – Section I – Medical First Aid*

Content

- A description of the hazards associated with HF and how to recognize a potential exposure
- A review of past incidents and learning as examples
- The importance of fast and effective First Aid specific to HF exposure
- The importance of self-protection to prevent additional casualties
- The importance of getting help and how this is achieved – particularly if more than one casualty is present
- 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, ingestion, eye contact and inhalation
- The importance of reporting any exposure or suspected exposure, either whilst at work or home and reporting any use of calcium gluconate gel
- The importance of seeking attention from a medical professional as soon as possible, and the site procedures in place to move from First Aid level to transferring a casualty to hospital
- The importance of giving full and accurate information to medical professionals upon their arrival, e.g. the use of the Treatment Record recommended in the Guidance Section, and full description of the circumstances of the incident

Note: If in doubt it should be assumed that exposure has taken place and treatment should be given.

Audience

This training is intended for any individual who is involved in HF plant operations or laboratory work or maintenance activities including site-based emergency responders. It may in some circumstances relate to hauliers who interact with the HF areas.

A2.6 Medical Treatment Module

Purpose

While it is not in the scope of this Guidance to cover Medical Treatment by medical professionals in detail, consideration should be given to sharing the information and references given in [CIA HF Network Guidance – Section I – Medical First Aid](#) with local hospital facilities and responders for awareness-raising. This is to emphasise the need for the correct medical care to be given to both serious and minor exposures to minimise the longer-term effects. In some cases, companies have collaborated with local medical facilities, paramedics, emergency responders etc. to offer awareness training sessions in the specific properties of HF and to highlight the recommendations for medical treatment options. HF exposure cases are thankfully quite rare, which means that it is often the case that doctors, and first responders may have limited or no experience of dealing with HF burn casualties. CIA's HF Network can advise on previous initiatives of this sort that have led to useful training and awareness events.

Audience

This training is intended for those with a higher level of medical training, e.g. medical professionals, company doctors, specialist nurses, and hospital accident & emergency staff.

A2.7 Tanker Procedures Module

Purpose

Where sites receive or consign HF by road tanker or ISO tank (tank container), the Tanker Procedures Module is intended to describe, in detail, the steps needed to connect and disconnect a tanker to safely load or unload HF. It should also cover the design features associated with the various tankers within the fleet such as valve design, relief systems, etc. [For additional information see CIA HF Network Guidance – Section C – Loading Unloading.](#)

Detailed procedures describing the tasks and activities required to operate the plant area safely shall be available. The tanker loading or unloading teams must be fully trained in all these procedures. For new operators moving into this area a structured training plan should be developed, with the aim of ensuring that new staff become fully familiar with all the necessary safety processes and procedures.

Tanker procedure training involves both theoretical and practical training with validation for each part. Individuals have to prove their understanding of the theory before being allowed to connect or disconnect a tanker under supervision. Once the individual has shown an appropriate level of competence the supervisor will sign off the practical validation and only then will the individual be considered fully competent.

Many companies appoint a 'mentor' for an operator moving into a loading/unloading area for the first time. The mentor's role is to help, guide and support the new starter through the training program by sharing knowledge and experiences. In this way new operators gain a high level of training and knowledge, whilst the plant management team gains confidence in the new operator.

Content

- A description of the hazards associated with HF
- A description of the tank design features (valves, reliefs, etc.) both inside and out
- A description of the PPE required at each stage of the procedure and its limitations
- A description of the emergency procedures
- A detailed explanation and understanding of the procedure for loading a tanker
- A detailed explanation and understanding of the procedure for unloading a tanker
- A detailed description of the procedure for preparing a tanker for maintenance
- A detailed description of the procedure to change a valve or a relief valve on a tanker
- A detailed description of the procedure for re-commissioning a tanker following maintenance.

Audience

This training is intended for the supervisors, operators and maintenance personnel responsible for the loading/unloading of HF tankers.

A2.8 Decontamination Module

Purpose

The decontamination module is intended to describe, in detail, what to do and in what sequence when decontaminating or preparing equipment for maintenance. [For additional information see CIA HF Network Guidance – Section H – Decontamination](#)

This training module should cover the site / area Work Control system for plant and equipment in HF service. This is often a proforma document or series of documents recording isolation, decontamination, execution and re-commissioning phases of a hazardous maintenance activity. The decontamination procedure may be a part of such an overarching document, or a separate procedure designed for a specific system. Examples of these should be provided within the package and a description included of how to correctly fill in the documentation.

The package of information should emphasise the attention to detail that needs to be applied due to the critical nature of decontamination where error can lead to a major release. The link between work control / decontamination and the Permit to Work (PTW) process must also be explained, particularly as the PTW will capture the PPE requirements for any trade persons supporting the decontamination process.

Reference to PTW should also be made to capture PPE or other controls associated with the movement of partially decontaminated equipment off plant for final cleaning. Attention should also be given during the training to reference the issues regarding equipment being moved either on- or off-site, and possible formal documentation required to accompany such equipment.

Content

- An overview of the Work Control/ PTW system (including isolation standards e.g. locks, spades, etc.)
- A review of past incidents and learning associated with decontamination
- A description of the equipment to be decontaminated (with diagrams if possible)
- A description of any equipment needed for the decontamination (hoses, water lines, etc.)
- A description of the PPE required at each stage of the procedure and its limitations
- A description of the issues which may potentially arise, their likelihood and how these would be dealt with should they happen
- A paper example covering the preparation of a system for decontamination
- A practical example where the individual prepares a system for maintenance under supervision.

Audience

This training is intended for the supervisors, operators and maintenance personnel responsible for preparing or working on HF plant and equipment that has been or is intended to be in HF service.

A2.9 Maintenance Module

Purpose

The maintenance procedures training module is intended to describe, in detail, the principles to be followed when maintaining equipment in use on HF systems. It is presumed for this Training Guidance that basic pipe and gasket alignment standards, and lifesaving “line of fire” principles during break-in, will already be established as part of the fundamental tradesperson training.

The module should cover materials of construction to be used in the maintenance of both mechanical and electrical / instrument equipment, along with gasket types and reference to any torque settings that need to be applied to flanges or screwed couplings. The training should also highlight known failure modes associated with the equipment and how to identify them during strip down or during visual equipment inspections (identifying for example wear & tear on parts, damaged flange faces, staining which potentially indicates leakage etc.)

The training package should also explain the potential for error when ordering materials, whether by the trade person or by the supplier providing equipment with incorrectly specified component parts. The information package should therefore include diagrammatic examples showing component equipment parts of valves, pumps, gauges etc. with the trainer emphasizing the need to check part specification when ordering and rebuilding damaged equipment.

The package should also include a list of items on plant that have critical joints identified. A formal procedure should be in place for the inspection and fitting of such joints when being replaced. Any such procedure should be shown and explained to the trainee. This would only be an initial training step for such a task – a supervised inspection/ fitting to determine competence would be required before completion of training and appointment.

Content

- A description of the equipment to be maintained (with diagrams if possible)
- A review of past incidents and learning associated with maintenance
- A description of Safety Critical Tasks and required documentation for control/management
- Local engineering standards for HF areas including management of change considerations
- Location of material specification information
- A description of the potential engineering issues and degradation or failure modes which may arise, their likelihood, and how these would be dealt with should they arise.

Audience

This training is intended for supervisors and maintenance personnel responsible for working on HF plant and equipment.

A2.10 Sampling Procedures Module

Purpose

The sampling procedures module is intended to describe, in detail, the steps to be followed when taking samples from systems containing HF. **For additional information see CIA HF Network Guidance – Section E – Sampling**

Content

- A description of the sample equipment to be used (with diagrams if possible)
- A description of the PPE required at each stage of the procedure and its limitations
- A copy of the procedure to be shown and worked through, with emphasis upon the sequence to be followed and why
- A description of the potential issues which may arise, their likelihood and how these would be dealt with should they arise
- A description of the arrangements for safe transportation to the laboratory, if this is not located on the plant

Audience

This training is intended for the supervisors, operators and laboratory personnel responsible for taking samples on an HF plant.

A2.11 Emergency Procedures Module

Purpose

The emergency procedures module is intended to describe, in general, the required actions in an on-site or off-site emergency. The level of training provided will depend upon the role and responsibilities of the individual. The emergency module will include both theoretical and practical training. **For additional information see CIA HF Network Guidance – Section F – Emergency Procedures**

Emergencies involving HF are an infrequent occurrence, but when they do occur, they require a highly trained team to respond. A supplier of HF must also consider the potential off-site implications of transporting HF and response teams which will require training.

By the nature of emergencies, it is impossible to predetermine every possible scenario, although through the COMAH Safety Report process COMAH sites will have identified a range of scenarios (including worst case) for a major accident hazard; established responses should already be in place. The COMAH Regulations also require that regular Emergency Exercise Simulations and 'Desktop' Exercises should be carried out involving those persons expected to respond in a real incident to maintain their competency, working collaboratively with Local Authority emergency planners and the emergency services.

In addition to the CIA HF Guidance document Section F referenced above, the European HF organization Eurofluor also publishes Guidance on a number of topic areas – which can be accessed via the Eurofluor website at this link:

<https://www.eurofluor.org/publications-and-recommendations/>

The following Eurofluor documents relevant to emergency response may be of use:

Eurofluor-GD08-180410: Intervention handbook for traffic incidents with anhydrous hydrogen fluoride (AHF) and hydrofluoric acid solutions (HF)

Eurofluor-GD06-20190521: Recommendation on emergency response (on site) for handling of anhydrous hydrogen fluoride (AHF) and hydrofluoric acid solutions (HF)

Content

- A description of the likely HF related emergency scenarios both on and off-site
- A review of past incidents and learning associated with HF emergencies
- A description of the remote or control room response actions for each of the identified scenarios
- A description of the equipment required (water hoses/ deluge systems, clamps/patches, gas monitoring etc.) for each of the identified scenarios including where it is kept and how it is maintained
- A description and practical exercise in the PPE required for emergency response, and its limitations
- An understanding of HF First Aid procedures and the process for transferring casualties into medical care
- Any mutual aid scheme or emergency contacts arrangements in place
- A description of information available (e.g. safety data sheets, plant diagrams, drainage maps, etc.) and how to access this data
- A description of the communication processes on- and off-site.

Audience

This training is intended for the response teams and management personnel who would be expected to manage any emergency involving HF.

A2.12 HF Handling in Laboratories Module

Purpose

The HF Handling in Laboratories module is intended to describe, in general, the requirements for using HF safely in a laboratory environment. This could be for example a quality control laboratory or a research and development environment. **For additional information see CIA HF Network Guidance – Section J – Laboratories**

Due to the nature of the work carried out in laboratories, relatively small amounts of HF are likely to be present at any one time. However, the nature of the specialist activities involved can have a high-risk factor associated with them and the potential for serious incident should not be overlooked nor be underestimated.

Content

- A description of, and practical exercise in, the PPE required and its limitations
- A detailed description of each analytical technique to be followed and its associated risks
- The location of emergency equipment
- Detailed descriptions of any waste disposal requirements
- Detailed risk assessment required prior to initiating a new experiment involving HF

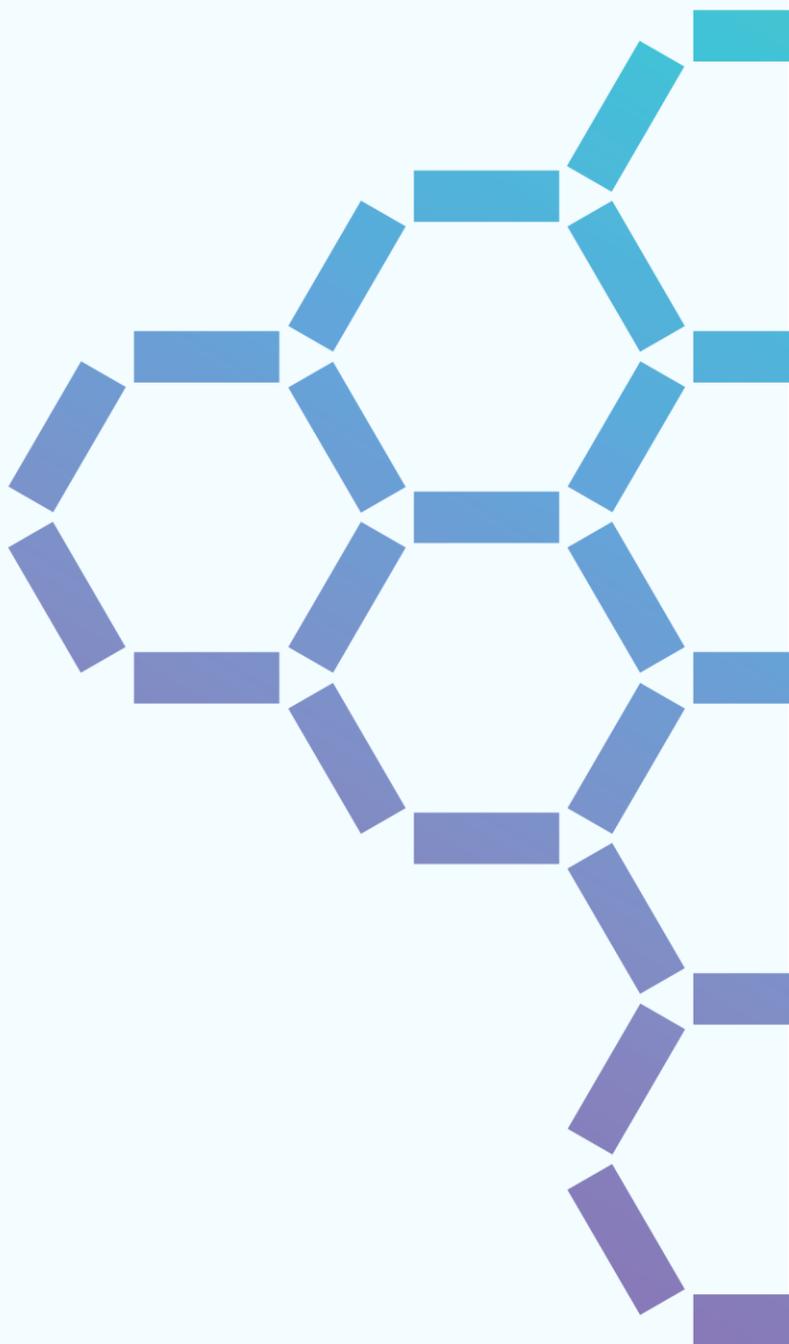
Audience

This training is intended for laboratory personnel, including supervisors, involved with handling HF.

Table 1. Example of Training Matrix

	Visitors	Plant Engineer	Plant Supervisor	Plant Operator	Tanker Operator	Plant/ Contract Maintenance	Laboratory Staff	Occupational Health	Emergency Response Team	Hauliers	Neighbours (On Site)	Customers
Site Induction												N/A
Plant Induction											N/A	N/A
HF induction												N/A
PPE											N/A	N/A
Initial First Aid												N/A
Medical Treatment	N/A	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A
Operating Procedures	N/A						N/A	N/A		N/A	N/A	N/A
Tanker Procedures	N/A						N/A	N/A	N/A		N/A	N/A
Decontamination Procedures	N/A									N/A	N/A	N/A
Maintenance Procedures	N/A						N/A	N/A	N/A	N/A	N/A	N/A
Sampling Procedures	N/A					N/A		N/A	N/A	N/A	N/A	
Emergency Procedures												
Laboratory Handling	N/A	N/A			N/A	N/A		N/A		N/A	N/A	N/A

Required Training
 Optional Training
 Overview Required as a minimum
 N/A – Training not applicable



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