

HyApproval

WP2 – Handbook Compilation

Deliverable 2.2

- PUBLIC -

APPENDIX III

Emergency Response Plan

Hydrogen Refuelling Station

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HyApproval WP4

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MODEL TEMPLATE
(Amend as applicable for a gaseous &/or liquid
hydrogen refuelling station)

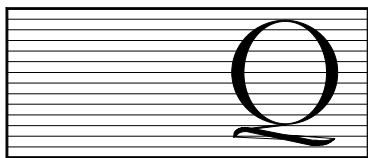
**EMERGENCY RESPONSE PROCEDURES
PLAN**
Hydrogen Refuelling Station

Street Address of Hydrogen Refuelling Station:

Phone Number:

Fax Number:

Email address:



DOCUMENT CONTROL PAGE (DCP)

DOCUMENT TITLE: Emergency Response Plan: Hydrogen Refuelling Stations

DOCUMENT NO.: DOCUMENT CONTROLLER:

ISSUE DATE	AMENDED DCP / SECTION No. / PAGE NO.	DETAILS OF CHANGE	DCR No.	APPROVED BY	MAILING IND.
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01.00 CONTENTS PAGE

Fehler! Es wurden keine Einträge für das Inhaltsverzeichnis gefunden. **02.03 SCOPE**

This Manual has been compiled to ensure an efficient and consistent approach to any emergency. It covers H2 emergencies within the refuelling station boundaries, response to neighbours emergencies, and unintended H2 releases.

02.04 HAZARDOUS MATERIALS ON SITE

The following H2 materials are stored on site (refer to Appendix 11.01 for drawings and site plans):

Product	Location of plant	Maximum quantity stored (kgs or m3)	HAZCHEM code
CGH2			
LH2			
<i>Others?</i>			

02.05 MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets for can be accessed from the *Company (Name) Web site* or service centre, from computer disk or from hard copies located at the service station, refuelling installation, retail operations office,

Examples (Air Products) attached:

CGH2 LH2



at Doc at Doc

Always handle materials according to the MSDS, labels, and instructions.

DO NOT use your nose, fingers or mouth or a naked flame to investigate an unintended H2 release.

Refer to section 03.00, for telephone numbers to contact for assistance in an emergency.

02.06 ALARM INITIATION (if applicable)

The alarm system at this refuelling station is a *two tone (wailing) siren (bell)*. It is activated by pressing the red button at alarm points located

The alarm will continue to sound until cancelled (for 5 minutes, until the all clear is sounded,) The all clear signal is

Sounding the alarm will automatically call the fire brigade, isolate the power to the H2 refuelling stationbut power will still operate security lighting, the office,

On hearing the alarm all refuelling station personnel with assigned roles will proceed to their duty points. Unassigned staff, general public and contractors will be directed by the refuelling station staff to move clear of the H2 facilities.....

The emergency alarm is tested every *weekday* at

02.07 MEDIA

During a H2 emergency you may be contacted by the media. Preparation for giving a press release is just as important as dealing with the emergency itself. The following is a guide for talking to the media:

- Appoint one spokesperson (See Public Affairs contact in Section 3)
- The spokesperson must be involved with all briefings even if it has to be by phone.
- Set up a media centre with adequate facilities and advise them how often media releases will be provided.
- Use short sentences outlining what has happened.
- Confine the comments to facts, include details of time and place.
- Make clear whether the incident is over or continuing.
- If an important question cannot be answered, tell the journalist that the information will be provided when it is known.
- Journalists have deadlines, so be prompt with information
- **DO NOT** speculate on cause.
- **DO NOT** refer to causes at all.
- **DO NOT** blame anyone or anything.
- **DO NOT** estimate cost of damage or loss.
- **DO NOT** speculate about liability or who will pay.

2.08 ROLES OF PERSONNEL

Depending on the size of the incident and staff availability, certain roles are required to be taken by Shell staff. Where numbers are limited the main role is one of liaison with the emergency service provider. Some of these roles may not be required or multiple roles may be handled by one person.

Prompts for the main roles are described below. Laminated pocket sized action cards can be produced to assist as memory aids

On-site responsible person

- **Receive & Assess Alarm** (source, appropriate alarm & response)
- **Assess situation** (who, how, what, personal safety, PPE & equip, record/log pertinent information, contact Emergency Services - hazard & risk assessment)

- **Personnel considerations** (rescue, evacuate, assembly, unaccounted, expertise required)
- **Notifications** (Emergency Services, Managers, Authorities)
- **Strategy & Tactics**
 - ◆ **Control** (ESD shutdown, isolate area, first-aid treatment)
 - ◆ **Contain** (protect, utility services isolation, observe/monitor)
 - ◆ **Communicate** (emergency services, site manager, area manager)
 - ◆ **Review & Assess** (until emergency services & site manager arrives)
- **Administration** (H2 supply management, H2 product available)
- **Resume Operations** (recommission plan/process, communicate, monitor)

Public Relations spokesperson

- Gather information & verify status
- Liaise with media/Government/authorities/other important people

First Aid

- Assess (own safety, others safety, type of injury)
- Treat (escalate, call ambulance)
- Record (type of injury, times)
- Report

HSE Advisor

- Assess (plans, current activities, risks & hazards)
- Monitor (continually monitor activities)
- Advise
- Record

03.0 NAMES AND TELEPHONE NUMBERS
 Hydrogen Refuelling Station
 Address:

EMERGENCY SERVICES	<u>Normal Hours</u>	<u>After Hours</u>	<u>Name</u>
Fire Brigade			
Police			
Ambulance			
Hospital			
SHELL CONTACTS (as applicable)			
Retail Operations Contact			
Commercial Operations Contact			
HSE Contact			
Public Affairs Contact			

Engineering/maintenance contact

NEIGHBOURS

AUTHORITY CONTACTS

Regulatory authority

Electricity Supply

Gas Supply

04.00 UNINTENDED RELEASES – H2 EMERGENCY PROCEDURES

04.01 GENERAL

This section covers small or large unintended H2 releases, inside or outside the refuelling station.

All unintended H2 releases, are to be reported to your supervisor by telephone with a confirmation facsimile immediately, so that the release can be reported to the appropriate Senior Company Manager within twenty four hours.

The basic procedure to be followed in the handling and control of an unintended H2 release are:

- **Immediate action** is the most important factor in fire control. The first few seconds count, as ignition can quickly occur unless prompt and efficient action is taken.
- The following instructions are contained on a notice supplied with your installation, and should be **known to yourself and staff** in the event of a H2 emergency.

Wherever possible, the following action **MUST** always be taken:

(Typical HSE notices to be clearly displayed at refuelling point and at hydrogen station plant)

H2 EMERGENCY PROCEDURES

Hydrogen Gas or Liquid Leak:

1. Activate Emergency Shutdown (ESD) control
2. Close all manual isolation valves
3. Keep bystanders away
4. No smoking. No naked lights
5. No engines to be started
6. Phone fire brigade (Phone Number:)
7. Phone maintenance contractor (Phone number: ...)
8. Isolate electricity

Fire:

1. Activate ESD control
2. Phone Fire Brigade (Phone number: ...)
3. Phone maintenance contractor (Phone number: ...)
4. Keep bystanders away
5. Isolate electricity
6. Follow fire-fighting instructions

05.00 PERSONAL INJURY, ACCIDENT, INCIDENT

05.01 PERSONAL INJURY

If a minor injury occurs First Aid is to be rendered. For any injury more serious than minor, assess the injury and if necessary take the injured to a doctor or call an ambulance.

05.02 ACCIDENTS AND INCIDENTS

All accidents and incidents **MUST** be reported to the relevant Manager.

To assist in the investigation/prevention **IMMEDIATELY** record the **FACTS** of the accident/incident on the Incident Report Form.

Investigation is to be carried out to assess the implications of the accident/incident to enable steps to be put in place to prevent any recurrence.

Note: All accidents and Incidents **MUST** be reported by use of the relevant form within **forty eight hours** of occurrence.

ALL lost time or fatal accidents **MUST** be reported **IMMEDIATELY** direct to the **MANAGER**. For contact names and telephone numbers refer to section **03.00**.

06.00 EQUIPMENT MALFUNCTION

In the event of equipment failure or malfunction the following procedure **MUST** be adhered to. Contact is to be made with your relevant Focal Point, Facilities Management Contractor (FMC) or in his absence the Maintenance or Service Provider or his nominee. They will issue the necessary work orders or permits.

Note:- Only endorsed contractors are permitted to work within the H2 refuelling station. Under **NO** circumstances is any **HOT WORK** to be carried out in the refuelling station without personal and written confirmation from your Focal Point, or in his absence the Maintenance Service Provider or his nominee.

07.00 SECURITY

In the event of any breach of the H2 refuelling station security and there is evidence of malicious intent, the Police must be advised immediately and care taken not to disturb any evidence. Following clearance from the Police, repairs may be undertaken.

Where there is property damage and no evidence of malicious intent, eg storm or flood damage to security fence foundations, repairs must be initiated immediately by contacting your Focal Point or Maintenance Service Provider.

Where the security or remote monitoring phone link system (if fitted) fails, repairs must be made immediately by contacting your Focal Point or Maintenance Service Provider.

Note: Advice of the breach of security is to be made to your relevant Focal Point with a confirmation facsimile as soon as possible.

Refer to section 03.00, for contact names and telephone numbers.

08.00 ROBBERY

Any operation that handles cash is at risk of armed hold-ups.

During a robbery:

What you should do

- 1 Remain calm and in control.
- 2 Comply totally with the robber's instructions—do as you are told.
- 3 Tell the robber or explain:
 - ➔ Any unusual movements you may have to make
 - ➔ If there are other staff members working who could surprise him/her
- 4 Keep all movement short and smooth like a normal sales transaction and give only what is asked for.
- 5 Stand side on towards the robber.
- 6 Observe physical details such as:
 - ➔ Height in relation to the height gauge in the store
 - ➔ Marks or scars
 - ➔ Weight
 - ➔ Age
 - ➔ Speech, distinctive mannerisms
 - ➔ Distinguishing characteristics such as unusual rings or clothing
 - ➔ Items of clothing or shoes, which are not easily discarded
 - ➔ Physical features, eg. hair and eyebrow colour
- 7 Watch what the robber touches.
- 8 Note which way the robber goes on leaving the store. If he/she gets into a car, note the description, registration number and time of robbery.

Activate the duress alarm if it can be done without being observed and when it is **safe to do so**.

DON'T

- 1 Don't use weapons.
- 2 Don't follow the robbers.

Why you should do it

The average armed hold-up only takes about 30 seconds.

Some robberies are committed under the influence of drugs, therefore, the robber may be highly unstable.

Offenders are often very nervous and this helps to stop them over-reacting.

Avoid giving the robber any surprises.

The longer it takes, the more nervous the robber gets.

This pose is less threatening to the robber.

These mental notes may help police apprehend the robber later.

Robbers often wear their favourite shoes, even when disguised.

Staring, also, may cause over-reaction.

So the police can check for fingerprints.

This early information is invaluable to the police.

The best way to keep anyone from being hurt is to avoid being a hero!

Weapons only breed violence.

They may shoot at pursuers and police may not know which person is the pursuer and which is the robber.

After a robbery:**What you should do**

- 1 Activate the alarm, if you haven't already done so.
- 2 Close and lock the doors until the police arrive.
- 3 Call the police emergency number. The police will probably ask for the following information:
 - ➔ time of the robbery
 - ➔ what direction the robber/s travelled on leaving
 - ➔ whether a vehicle was used and, if so, its description
 - ➔ how many suspects/robbers were involved and whether or not they were armed
 - ➔ description of suspects
- 4 Ask witnesses to wait until the police arrive. Get witnesses' names, addresses and phone numbers if they cannot wait for the police.
- 5 Keep customers and other employees away from the robbery area.
- 6 Save any notes used by the robber but don't touch them.
- 7 In case of delay with police arriving on site, start filling out the Offender Description Form

Write down your information:

 - ➔ Bandit ID
 - ➔ Weapon ID
 - ➔ Vehicle ID
 - ➔ Robbery Layout
- 8 Phone the Dealer and 24-hour Trauma Counselling Service.
- 9 If appropriate, count the cash and attempt reconciliation after the police arrive.

Why you should do it

The faster the police respond, the better the chance of the robber being caught.

If the robbers meet the police while escaping, they may try to come back.

This initial information is vital since there is a chance that police responding to your call may spot the robber on the way to your site.

All eye witnesses' accounts are vital to the police.

This protects the site for the investigation by police.

Fingerprints can be detected on paper as well.

Information should be recorded while it is fresh in your memory.

Armed hold-ups are traumatic events for everyone.

To see how much has been taken.

09.00 BOMB OR SABOTAGE THREAT

IF YOU DISCOVER A BOMB OR SUSPICIOUS OBJECT

Don't touch it, clear the area

Notify the Police and give details

Notify your Supervisor

Prevent other personnel from going into the area

IF A BOMB THREAT IS RECEIVED BY PHONE

- a) **DO NOT HANG UP - KEEP THE LINE OPEN.** This may assist in tracing the call.
- b) Record details of the threat as per the following page
- c) Ask for the message to be repeated.
- d) Tell the caller that there are people in the building and they will be injured if the bomb goes off.
- f) If possible get some one else's attention while you are talking to the caller and get them to contact the police.
- g) Evacuate staff and visitors as soon as possible in an orderly and safe manner to a protected area, consideration should be made to the following, closing of tank valves and the evacuation of all vehicles.
- h) If necessary notify your neighbours, refer section **03.00** for contact names and telephone numbers.
- i) Prepare for any emergency situation that may develop, such as **FIRE, INJURY, EXPLOSION**, but await the arrival of the police.

TELEPHONE BOMB THREAT

Wording of the threat (try to record exact words):

_____ Time _____ Date _____
 _____ Name _____
 _____ Position _____
 _____ Phone Number _____

Keep the caller talking (try to obtain as much information as possible). Questions to ask:

1 When is bomb going to explode?

2 Where is it right now?

3 What does it look like?

4 What kind of bomb is it?

5 What will cause it to explode?

6 Who placed the bomb?

7 Why?

8 Where are you?

9 What is your name?

Estimated age of caller _____

Sex of caller _____ Intoxicated _____

Tel. No. at which call was received _____

CALLERS VOICE

Tick applicable boxes:

- | | |
|-----------------------------------|--|
| <input type="checkbox"/> Calm | <input type="checkbox"/> Nasal |
| <input type="checkbox"/> Angry | <input type="checkbox"/> Stuttering |
| <input type="checkbox"/> Excited | <input type="checkbox"/> Lisp |
| <input type="checkbox"/> Slow | <input type="checkbox"/> Raspy |
| <input type="checkbox"/> Rapid | <input type="checkbox"/> Deep |
| <input type="checkbox"/> Soft | <input type="checkbox"/> Ragged |
| <input type="checkbox"/> Loud | <input type="checkbox"/> Clearing throat |
| <input type="checkbox"/> Laughing | <input type="checkbox"/> Deep breathing |
| <input type="checkbox"/> Crying | <input type="checkbox"/> Cracking voice |
| <input type="checkbox"/> Normal | <input type="checkbox"/> Accent |
| <input type="checkbox"/> Distinct | <input type="checkbox"/> Disguised |
| <input type="checkbox"/> Slurred | <input type="checkbox"/> Familiar |

Is voice familiar, who did it sound like?

BACKGROUND SOUNDS

- | | |
|---|--|
| <input type="checkbox"/> Street noises | <input type="checkbox"/> Factory machinery |
| <input type="checkbox"/> Crockery | <input type="checkbox"/> Animal noises |
| <input type="checkbox"/> Voices | <input type="checkbox"/> Clear |
| <input type="checkbox"/> PA System | <input type="checkbox"/> Static |
| <input type="checkbox"/> Music | <input type="checkbox"/> Local |
| <input type="checkbox"/> House noises | <input type="checkbox"/> Long distance |
| <input type="checkbox"/> Motor | <input type="checkbox"/> Booth |
| <input type="checkbox"/> Office machinery | <input type="checkbox"/> Other |
| <input type="checkbox"/> Children | |

THREAT LANGUAGE

- | | |
|---|--|
| <input type="checkbox"/> Well spoken (educated) | <input type="checkbox"/> Incoherent |
| <input type="checkbox"/> Foul | <input type="checkbox"/> Taped |
| <input type="checkbox"/> Irrational | <input type="checkbox"/> Message ready by threat maker |

Remarks:

Don't hang up your telephone, even though the caller may have done so. Immediately report the call (using another phone) to the Police on and to your Supervisor. Ignore everything else until you have completed this information.

10.00 IMPACT ON OR FROM NEIGHBOURS

An emergency at a hydrogen refuelling site will have an impact on neighbours. Conversely, our neighbours may have an emergency that impacts on the H2 refuelling site.

Individual sites need to consider:

- the types of neighbours and possible hazards
- the effect of a H2 emergency on the neighbours
- the benefits of establishing mutual aid agreements

11.00	APPENDICES
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11.01 Hydrogen Refuelling Station Site Plan: Drawing No:

11.02 Emergency Notices (to be affixed in appropriate locations):

EMERGENCY AND ALARM PLAN			
Remember: In an emergency – Keep calm!			
What has happened?			
<input type="checkbox"/> Leakage	<input type="checkbox"/> Fire	<input type="checkbox"/> Explosion	<input type="checkbox"/> Other
1.1 Give the following information –			
<input type="checkbox"/> WHERE	did it happen?	Place!	
<input type="checkbox"/> WHEN	did it happen?	Time!	
<input type="checkbox"/> WHAT	has happened?	Incident!	
<input type="checkbox"/> HOW MANY	injured?	Number!	
<input type="checkbox"/> HOW SEVERE	is the injury?	Nature of the injury!	
<input type="checkbox"/> WHO	is reporting the fault?	Name!	
EMERGENCY PHONE NUMBERS:			
FIRE BRIGADE	.....	
POLICE	.....	
CASUALTY DOCTOR	.....	.....
CASUALTY HOSPITAL	.....	
SPECIAL BURNS CLINIC	.....	
In the event of irregularities, immediately inform the Hydrogen Station Manager Or deputy			
	Emergency Phone No.	Private Phone No.	
Hydrogen Station Manager	.....	.....
1st Deputy	.....	.....
2nd Deputy	.....	.....
Company Management	.....		.....
Safety & Technical Expert	.....	.....
Maintenance Provider	.....		.....
Neighbouring Companies	.....	.....
Regulatory Authority	.....		.....
Assembly Point in an Emergency:		As at:	

Danger Protection Plan (*Damage Minimization Plan*) for a Hydrogen Refuelling Station

Action to be taken when vessels are affected by fire

- Press EMERGENCY SHUTDOWN Button!
- Immediately take the steps set out in the Alarm Plan.
- Arrange for the problem area to be cordoned off and evacuated.
- Cool exposed vessel surfaces uniformly with water, to prevent increase in pressure.
- Observe outlet tubes of the safety valves from a safe distance (danger of the formation of shooting flames).

Instructions for Persons not directly involved

- Immediately leave the danger zone.

Action to be taken in the event of burns and frostbite

- Douse burning clothing with water or by rolling the injured person.
- Remove any clothing in the vicinity of burns.
Do not pull if the clothing sticks to the skin.
- Immediately place limbs under running cold water.

Action to be taken in the event of leakages without ignition

- Shut down the station, if necessary press EMERGENCY SHUTDOWN button!
- Immediately take the steps set out in the Alarm Plan.
- Immediately cut off all ignition sources
- Arrange for the problem area to be cordoned off and evacuated.
- Wear protective gloves. Avoid skin contact with liquid phase. A white mist is indicative of the liquid phase.
- Ensure that the leak is expertly sealed off after having released the pressure.

Action to be taken in the event of leakages with ignition

- Press EMERGENCY SHUTDOWN button!
- Immediately take the steps set out in the Alarm Plan.
- Arrange for the danger area to be cordoned off and evacuated.
- Fight resultant fires using fire extinguishers or water sprays.
(Do not direct water onto electrical equipment)

→ Cover burnt parts of the body with burn dressings or clean lint. Use a blanket to prevent a drop in body temperature.	
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Hydrogen Emergency Procedures

Hydrogen Gas Leak

1. Activate ESD control
2. Close all manual isolation valves
3. Keep bystanders away
4. No smoking. No naked lights
5. No engines to be started
6. Phone fire brigade (Phone Number: ...)
7. Phone maintenance contractor (Phone number: ...)
8. Isolate electricity

Fire

1. Activate ESD control
2. Phone Fire Brigade (Phone number: ...)
3. Phone maintenance contractor (Phone number: ...)
4. Keep bystanders away
5. Isolate electricity
6. Follow fire-fighting instructions

ESD = Emergency Shutdown

11.03 Basic Rules for Safety & Good Housekeeping (Site staff & contractors)

The purpose of this Model Procedure is to provide a general guide to safe practice in the operation of H2 refuelling stations.

It is not the intention of the guide to provide rigid rules, rather recommendations, which can be developed to suit the actual H2 refuelling installation and the organisational structure of the operational staff.

YOUR installation has a LICENCE or PERMIT to operate. If your LICENCE or PERMIT IS WITHDRAWN, then you CANNOT OPERATE.

So DO NOT:

- Alter pipework or equipment
- Alter the installation layout in any way

DO:

- Apply the requirements of the Licence or Permit
- Carry out regular inspections to ensure your installation is functioning correctly

UNDER NO CIRCUMSTANCES SHOULD UNAUTHORISED STAFF CARRY OUT ANY WORK WHATSOEVER ON THE INSTALLATION EQUIPMENT.

REFER ALL MATTERS TO YOUR SHELL REPRESENTATIVE, SITE SUPERVISOR OR AUTHORISED FACILITIES MAINTENANCE CONTRACTOR.

1.2 SAFETY

- 1 Rapidly get basic knowledge of the properties and potential hazards of the materials and products you are dealing with.
- 2 Never use or be influenced by alcohol or other drugs at work
- 3 *Remember to rest and avoid use of drugs and alcohol also during your free time.*
- 4 Company Safety Procedures : refer to... (insert name of procedures / Manuals, database, etc... as appropriate).
- 5 Smoking is forbidden except in areas that are dedicated for smoking.
- 6 Do not waste paper, water, energy and other utilities and minimise the gas losses.
- 7 Wear personal protective equipment (safety shoes, overalls, gloves, safety glasses (or goggles), hearing protectors and hard hat) where it is required.
- 8 **Get skilled in handling safety equipment such as fire extinguishers, emergency showers and eye wash devices.**
- 9 Report deficiencies faulty equipment and unsafe conditions immediately.

- 10 Leave electrical work or repair to a qualified electrician. Do not open electrical cabinets.
- 11 Work tidily - maintain a high standard of housekeeping.
- 12 Do not start a job unless you have been trained to do it and know the correct procedure.
- 13 Report all injuries to the supervisor immediately and get first aid for even a minor cut or burn to reduce the risk of infection.
- 14 Worn or damaged tools should never be used. Take them to your supervisor who will have them repaired or will scrap them.
- 15 Learn how to stop machines quickly in the event of an emergency.
- 16 Learn what actions will be required of you in the event of an emergency.
- 17 Identify (your) emergency exits and where the fire fighting equipment is located.
Identify (your) first aid trained persons.
- 18 Report immediately accidents or “near misses” (ie incidents which could have resulted in injury or equipment damage) to your supervisor.
- 19 Do not enter high voltage switch rooms unless authorised.
- 20 Use the checklist or operating procedure provided when starting up or shutting down machines or plant.
- 21 If an electrically driven machine trips, refer to your supervisor before attempting to restart.
- 22 Do not put yourself in front of the discharge port of a relief valve. It might open while you are there.
- 23 Close or open valves gradually. Rapid operation of a valve can lead to local compression and temperature rise. Also when changing cylinders, pressure reducer pressure setting valve must be released. Valves must not be forced open or closed using extension devices to increase torque.
- 24 Do not attempt any unauthorised modifications to plant or equipment. Any changes must be approved by the appropriate level of management.
- 25 Guards, safety valves and other protective devices are provided for your protection. They should not be removed or tampered with.
- 26 All fire and safety equipment must be kept clear of obstructions. It should not be removed or used except in case of actual emergency or authorised practice (drills).
- 27 Always use an approved cleaning compound to clean your hands or other parts of your body. Solvents should not be used as they can cause skin disease.
- 28 Do not use compressed air for blowing dust off clothing.
- 29 Clothing must be free from oil or grease when working. Clothes must be made of cotton, wool or special flame resistant fibbers.
- 30 We are all responsible for each other’s safety. If you see another person not complying with safety rules - eg not wearing personal protective equipment - point it out to him/her.

You are not supposed to know everything:

IF IN DOUBT, ASK!

Do not take chances

1.3 GOOD HOUSEKEEPING

31 *A cluttered workplace leads to accidents.*

32 Aisles, passageways, doorways, emergency exits and access to safety equipment must

be kept clear of obstructions.

33 Floors must be kept clear of oil, grease and any spillage of chemicals.

34 Waste material must be placed in the correct disposal place.

35 Tools and equipment must be taken back to in their correct storage point after use and

not left lying around.

36 Maintenance spares and lubricant containers should be kept in approved stores.

37 Oily rags must be placed in special closed containers.

38 Areas where liquid hydrogen is handled must be kept particularly clean and free from oil

and grease.

39 A job is finished only when everything is clean and in order.

1.4 SUBCONTRACTORS

Subcontractors working at the premises of your Company must respect the Health, Safety and Environment Protection rules and requirements. Report any deviation to your supervisor that you may identify.

11.04 Hydrogen – General Safety

- 1 Hydrogen is referred to as H₂. It is a colourless, odourless and tasteless gas. It is non-toxic but does not support life and acts as an asphyxiant. It is the lightest element/gas known.
- 2 Hydrogen is highly flammable and most mixtures of hydrogen and air will burn or even explode. It ignites more easily than any other common gas and a high pressure leak can even ignite spontaneously. It burns with a hot and almost invisible flame. Hydrogen fires are difficult to extinguish. If you do extinguish a hydrogen flame and do not stop the flow of hydrogen, the escaping gas can be re-ignited, sometimes explosively...
 - 2.1. When approaching a hydrogen leak, hold some readily combustible material such as a rolled up newspaper or a straw broom in front of you.
 - 2.2. To extinguish a hydrogen fire, shut off the source of supply, provided that this can be done safely. If the hydrogen supply cannot be shut off keep nearby equipment cool by drenching with water until the flame has extinguished itself.
 - 2.3. Never release or vent hydrogen into buildings or confined spaces.
 - 2.4. Ensure that buildings in which hydrogen is stored or handled have adequate ventilation at high and low levels to prevent the build-up of an explosive

- atmosphere, especially in the ceiling. Keep all ventilation openings clear and do not block them for any reason.
- 2.5. Do not smoke or bring matches and lighters into an area where hydrogen is manufactured, stored or used.
 - 2.6. Do not bring to any hydrogen installation any unauthorised electrical equipment such as torches, radios or power tools. Use only approved lighting apparatus.
 - 2.7. Do not carry out any hot work such as cutting, grinding, welding or soldering on a hydrogen installation. When hot work is necessary obtain a Work Permit.
 - 2.8. Do not tamper with or damage grounding (or earthing) systems ; they are provided to prevent the accumulation of static electric charges that could act as a source of ignition.
 - 2.9. Before opening plant and equipment on a hydrogen installation for maintenance or any other purpose obtains a Work Permit. This Permit will require all pipes and vessels to be purged with nitrogen before work commences.
 - 2.10. Before admitting hydrogen into a system, purge it with nitrogen to ensure that a flammable mixture cannot be developed. For liquid hydrogen system, Helium purge is required after or before nitrogen purge.
 - 2.11 Never vent hydrogen from a high pressure source such as a cylinder in order to remove contaminants. Always use an external source of nitrogen or air for this purpose.
 - 2.12. It is recommended to either permanently or periodically monitor hydrogen systems (pressure vessels and piping) using explosive atmosphere detectors in order to identify leaks as early as possible and take necessary corrective actions.
- 3 Liquid hydrogen storage specific hazards and prevention measures.
- 3.1. Liquid hydrogen storage tanks are registered pressure vessels, you must know what the indications engraved in the identification plate mean. Tank pressure monitoring and control is critical, operating instructions must be known and respected, uncontrolled deviations must be reported immediately.
 - 3.2. Pressure relief devices protect storage tanks against overpressure hazards, you *must know their set points*.
 - 3.3. Operation of liquid hydrogen storage tanks requires specific instructions and training. Storage tank and surroundings must be in perfect condition and cleanliness.
 - 3.4. Immediately report any abnormal condition to your supervisor or Facilities Maintenance Contractor.

11.05 Emergency Procedures – Liquid Hydrogen

1.5 A General

- 1 Hydrogen can burn with an almost invisible flame, and often can only be detected visually by heat waves. If entering an area where a suspect fire may exist, always approach the area with caution. It is good practice to hold a readily-combustible item (such as a broom or large square of paper) in front of you when approaching a suspected hydrogen fire.
- 2 Keep all spectators and other personnel who are not directly involved in handling the emergency at least 50 metres (150 feet) away.
- 3 The most effective method to extinguish a hydrogen fire is to shut off the flow of hydrogen and allow the flame to self-extinguish.
- 4 NEVER SPRAY WATER ON THE VENT SYSTEMS OR SAFETY RELIEF VALVES.

1.6 B Tank Venting

- 1 The primary inner vessel relief devices, manual vents, and piping vents are piped to a vent stack that terminates 7 or 8 metres (25 feet) above grade to a safe location. The vent system is designed to permit the safe venting of hydrogen vapours or to allow for the safe combustion of the hydrogen should ignition occur. In the event the venting hydrogen ignites, the fire will be at the top of the stack and should not create an exposure to personnel or equipment.
- 2 Some vessels are equipped with a secondary vent that is located at the rear of the vessel. This vent system terminates 4 metres (12 feet) or 0.6 metres (2 feet) above the top of the vessel, whichever is greater. Any venting from this vent is directed vertically upward and, as in the case of the primary vent, is designed to safely discharge any hydrogen.
- 3 In the event of a vent stack fire, the following action may be taken:

CAUTION

IN THE EVENT OF A VENT STACK FIRE, DO NOT PERMIT FIREMEN TO SPRAY WATER ON OR IN ANY VENT STACK OR ON THE SAFETY RELIEF VALVING.

- a. Allow the fire to burn, and notify your Supervisor and Facilities Maintenance Contractor immediately.
- b. The most effective method to extinguish a hydrogen vent stack fire is to shut off then flow of hydrogen, thus eliminating the fuel. This may involve reducing the tank pressure by manually venting the vessel and permitting the venting device to reset. Vent valves shall only be operated by trained and authorised personnel (typically LH2 supplier or Facilities Maintenance Contractor).
- c. LH2 tanks are equipped with a dual safety valve/rupture disc protective system. One safety valve and one rupture disc are 'on stream' to protect the inner vessel while the other disc and safety valve is on standby. The safety valve/rupture disc selector valve is designed so that one set of protective devices is 'on stream' at all times. In the event of a blown rupture disc, the flow of hydrogen may be stopped by operating the safety valve/rupture disc selector valve. The safety valve/rupture disc selector valve shall only be operated by trained and authorised personnel. Improper operation of the selector valve may result in the failure of the standby rupture disc and subsequent uncontrollable venting of the entire contents of the tank.

1.7 C Outer Vessel Relief Plate

- 1 The outer vessel is protected with a relief plate that is designed to relieve any pressure build-up within the annular space. A loss of vacuum in the annulus will result in venting of hydrogen through the vent stack described above in Section B. Notify your LH2 supplier or Facilities Maintenance Contractor immediately.
- 2 An inner vessel leak or annular space piping failure will result in hydrogen venting through the outer vessel relief plate located on the top portion of the head or on top of the vessel and possibly through the vent stack. The vessel will continue to vent hydrogen until it is empty. In the event the hydrogen ignites, allow it to burn until all of the product is vented. Notify your LH2 supplier or Facilities Maintenance Contractor immediately.

CAUTION

DO NOT PERMIT FIREMEN TO SPRAY WATER INTO THE ANNULAR SPACE IN AN ATTEMPT TO EXTINGUISH THE FIRE.

1.8 D Leaks and Spills

- 1 The principal hazard from a leak or spill is ignition and subsequent fire. To lessen the chances of a leak, the vessel piping is all welded or brazed except in cases where mechanical joints (flanges) are required for installation.
- 2 The liquid product piping on LH2 tanks is equipped with an isolation valve actuated through a remote emergency shut off valve. The remote emergency valve (typically located 8 metres [25 feet] or more from the hydrogen system) vents the air supply to the isolation valve actuator causing it to close.

In the event of a hydrogen product leak or spill, operate the remote emergency shut-off valve to close the isolation valve on the liquid product line.

In addition, the air supply to the isolation valve is equipped with a fusible link that will melt when exposed to fire and causes the isolation valve to close automatically.

- 3 Piping leaks are generally limited to small valve packing and flange leaks, which quickly dissipate, and do not typically result in fires. Trained and authorised maintenance personnel wearing protective equipment can repair these leaks.
- 4 In the event of a spill, do not enter areas where flammable atmosphere may exist. The extremely cold hydrogen vapours usually provide a built-in warning by condensing moisture in the air and creating a fog.

CAUTION

DO NOT DEPEND ON A VISIBLE CLOUD AS A WARNING

This fog normally extends over a larger area than the flammable cloud; however, you should not assume that the lack of a cloud means a flammable atmosphere does not exist.

- 5 In the event of a LH2 spill, the following action should be taken:
 - a Keep all spectators and other personnel who are not directly involved in handling the emergency at least 50 metres (150 feet) away from the perimeter of the spill and upwind if at all possible.
 - b Do not allow non-emergency vehicles in the area of the spill. If possible, eliminate all sources of ignition such as electrical devices, open flames, etc. in the area of the spill and, especially downwind.
 - c IF A FIRE STARTS, THE BEST WAY TO HANDLE IT IS TO LET IT BURN UNDER CONTROL UNTIL THE HYDROGEN FLOW CAN BE STOPPED. IT IS IMPORTANT TO REMEMBER THAT IF THE FIRE IS EXTINGUISHED WITHOUT STOPPING THE GAS FLOW, AN EXPLOSIVE MIXTURE MAY FORM, RESULTING IN A MORE SERIOUS HAZARD THAN THE FIRE ITSELF. IN GENERAL, THE APPROACH SHOULD BE TO PREVENT ADJACENTEQUIPMENT FROM BECOMING INVOLVED IN THE FIRE AND ALLOW THE HYDROGEN TO BURN UNTIL FLOW IS STOPPED OR IT IS COMPLETELY CONSUMED.

- d THE LIQUID PRODUCT PIPING ON LIQUID HYDROGEN TANKS IS EQUIPPED WITH AN ISOLATION VALVE ACTUATED THROUGH A REMOTE EMERGENCY SHUTT-OFF VALVE. THE REMOTE EMERGENCY SHUTT-OFF VALVE (TYPICALLY LOCATED 8 METRES [25 FEET] OR MORE FROM THE HYDROGEN SYSTEM) VENTS THE AIR SUPPLY TO THE ISOLATION VALVE ACTUATOR CAUSING IT TO CLOSE.

IN THE EVENT OF A HYDROGEN PRODUCT LEAK OR SPILL, OPERATE THE REMOTE EMERGENCY SHUTT-OFF VALVE TO CLOSE THE ISOLATION VALVE ON THE LIQUID PRODUCT LINE.

IN ADDITION, THE AIR SUPPLY TO THE ISOLATION VALVE IS EQUIPPED WITH A FUSIBLE LINK THAT WILL MELT WHEN EXPOSED TO FIRE AND CAUSE THE ISOLATION VALVE TO CLOSE AUTOMATICALLY.

1.9 E Fire Fighting

- 1 In most instances, hydrogen fires should be allowed to burn until the gas flow is stopped or the hydrogen is consumed.
- 2 Water can be used to cool and protect adjacent combustible equipment or materials.
- 3 Water may be applied to the vessel shell in some cases to keep the vessel cool if the fire is impinging directly on the vessel. Water **MUST NEVER** be applied to the vent stack, control valves, relief devices or the outer vessel relief plate. Due to the low temperatures involved with liquid hydrogen, any water introduced into the vent system may freeze, plugging the vent system, rendering it useless, thus increasing the possibility of a vessel rupture.

1.10 F Evacuation

- 1 Any release through the specially designed safety circuits should not result in a condition requiring evacuation. The liquid hydrogen system is designed to safely handle an upset condition and to vent hydrogen through one of the relief circuits mentioned previously.
- 2 In the event of a hydrogen spill, keep all spectators at least 50 metres (150 feet) away. Refer to the procedures outlined in Section D above. The piping is constructed with the minimum mechanical joints, thus reducing the possibility of leaks or spills. Piping leaks are generally limited to small packing leaks or flange leaks, and do not require evacuation.
- 3 In the event of any fire, notify the fire services and your supervisor immediately. A fire that is coming from one of the vent systems described above, DOES NOT REQUIRE evacuation. Evacuation is recommended in a situation where there is a continuous fire burning under an aboveground tank or if a fire is directly impinging on the shell itself. An evacuation distance of 300 metres (1000 feet) is recommended for personnel not directly involved in handling the emergency.

11.06 General Safety – Liquid Hydrogen Spills and Vapour Clouds

- 1 *Always follow the correct transfer procedure (including transfer equipment, correct coupling, hoses, etc).*
- 2 Boiling and splashing always occur when charging a warm container. Wear proper protective equipment (goggles or face shield, gloves).
 - 2.1 Stand clear of boiling and splashing liquid and its issuing gas.
 - 2.2 Never release cryogenic liquids in confined areas.
 - 2.3 Always handle cryogenic liquids in well-ventilated areas to prevent hazardous concentrations of gases.
- 3 Liquid hydrogen is so cold that they can freeze skin and other human tissues immediately, thus inflicting serious injuries. Breathing the very cold gases that arise from vaporising cryogenic liquids can cause serious damage to the lungs.
 - 3.1 Never allow any unprotected part of your body to touch uninsulated pipes or vessels containing cryogenic liquids. Wear protective clothing (goggles, gloves and safety shoes).
- 4 When liquid hydrogen is released into the atmosphere, its extremely low temperature condenses the atmospheric water vapour and this forms a dense fog. A liquid hydrogen spill is often identified by the presence of a low-lying cloud of fog creeping over the ground.
 These clouds can be dangerous, as you do not know their temperature or composition. Visibility inside the cloud is very low and you could fall, perhaps into a stream of cryogenic liquid.
 - 4.1 DO NOT ENTER A VAPOUR CLOUD.
 - 4.2 When you see a cryogenic spill or a large vapour cloud notify your supervisor immediately.
 - 4.3 If possible shut off the source of liquid, by use of a remotely controlled valve if one is fitted. Do not expose yourself to a cryogenic liquid hazard.
- 5 If the spillage was near to a vehicle the cold liquid could freeze the tyres to the ground and make them so hard and brittle that the tyres could explode.
 - 5.1 If liquid has reached the tyres do not attempt to move the vehicle. Also do not start engine in case of a spill.
- 6 Low or high oxygen contents will generally exist inside and in the immediately vicinity of the vapour clouds. However, wind and weather conditions could spread hazardous conditions beyond the vapour cloud. Watch the windsock frequently.
 - 6.1 Keep clear of the vapours and be prepared to move if the wind changes. Portable oxygen analysers can be used to evaluate oxygen enrichment or deficiency hazards.
 - 6.2 If roads, railway lines, rivers or canals bordering the site are threatened by the liquid or the vapour cloud, then your supervisor may instruct you to notify the authorities to stop or divert traffic. No traffic must be allowed to enter the cloud.
(An emergency call list should be available).
 - 6.3 Shut off petrol or diesel engines on any equipment that may be remaining in the area.
- 7 Carbon steel becomes brittle when in contact with cryogenic liquids, so steel plates can crack and structural steel beams can fail and piping can burst.
 - 7.1 If necessary and on the advice of your supervisor, divert the liquid away from vulnerable plant equipment towards a safe area by using stainless steel or aluminium sheet or clean sand dikes.

- 7.2 Water sprayed from a fire hose will help to vaporise the liquid and protect vulnerable steelwork by coating it with ice. However, judgement must be made on the weather and wind conditions. It may not be desirable to speed up vaporisation as the resulting larger vapour clouds could endanger staff and third parties.
- 7.3 If so advised by your supervisor, shut down any air conditioning or ventilating systems that may draw vapours or gases from the spill into buildings.
- 7.4 Call the Fire Department in the case of a large LH2 spill. Have them stand by until the spillage is dispersed. Do not allow vehicles to enter the vapour cloud.
- 7.5 Keep all visitors to the site advised as to the hazards of the spill and arrange for their evacuation from the area unless they are company staff that are qualified to assist with the emergency.
- 7.6 If liquid hydrogen reaches a black top (bitumen or asphalt) area do not allow any movement of machines or people until it is fully unfrozen.

11.07 General Safety – Pressure (Hydrogen containment systems)

- 1 When handling gases it is most important to understand what is meant by pressure; how it is generated and what safeguards are necessary to contain it in order to prevent injury to personnel or damage to equipment.

Pressure can be generated in many ways, the most common being:

- by mechanical means, such as a pump or compressor,
- by heating vessels or piping, either deliberately or accidentally eg. cylinders in fires,
- by the vaporization of cryogenic liquids in confined spaces eg. in a pipeline between two closed valves,

The unit of measurement most commonly used is the “bar” ; the name is derived from the fact that it is approximately equal to barometric pressure.

Pressure is indicated on gauges or other measuring devices that may be marked in different units such as bars, “atmospheres”, “pounds per square inch” (psi), “kilopascal” (kPa).

- 1 bar approximately equals 1 atmosphere (atm),
- or 100 kPa,
- or 14.7 psi.

If a pipeline or vessel contains any gas or liquid under pressure it constitutes a potential hazard and must be protected against overpressure.

Pressure gauges are used to know whether a system is pressurized or not.

Pressure vessels have the maximum allowable working pressure, service and test pressures marked on the nameplate.

- 1.1. Assume that all pipes and vessels contain gas or liquid under pressure unless you can positively prove otherwise.
- 1.2. If the pointer of a pressure gauge is stationary or reads zero.
 - tap the gauge with your finger to make sure that the pointer is free and is not stuck. Do not do that when pressure gauge is fitted with electrical switches!
 - if there is a valve between the system and the gauge, make sure that it is open.
- 1.3. Report leaks from systems under pressure immediately.

- 1.4. Always relieve the pressure in a vessel or system before commencing repairs. Never repair a leak while the system is under pressure. If in doubt, check with your supervisor.
- 1.5. Never disconnect a pipe or flexible hose when it contains pressure ; it will straighten or "whip" and could cause severe injury.
- 1.6. Before breaking into a pipe or vessel relieve the pressure in it (do this slowly through a vent valve taking care that flow is directed to a safe place and cannot affect other people or equipment) and make sure it is isolated. (Work Permit requested).
- 1.7. Cryogenic liquids must never be trapped between two valves or closed ends.

Check that there is a relief valve to protect any part of the system where this could occur and always operate valves in the correct sequence.

- 1.8. Pressure systems have to be tested periodically. This must always be done by trained personnel. Personal Protection Equipment must be worn during this operation and, when appropriate, operators must be protected (shielded) from the pipe or vessel being tested.
- 1.9. You might hear about "absolute" or gauge pressure.
Absolute pressure = gauge pressure + atmospheric pressure.
Most of instruments exhibit gauge pressure.

11.08 General Safety – Electricity

- 1 Electricity is hazardous. You cannot see it. Only full respect of stringent rules by qualified personnel will prevent accidents.
 - 1.1. Only qualified personnel is allowed to open electrical cabinets and work on electrical circuits.
 - 1.2. Always de-energize, isolate and lockout the electrical circuits before making repairs or adjustments - See Work Permit
 - 1.3. Never switch electricity "on" and "off" with wet hands or when standing on a wet floor.
 - 1.4. Always allow easy access to electrical equipment, switches and plugs, do not store combustible materials in their vicinity.
 - 1.5. Keep electrical equipment dry and clean.
 - 1.6. Do not use adaptors. They may overload the circuit and cause a short-circuit and fire.
 - 1.7. Troubleshooting or repair of energized electrical equipment requires specific procedures and permits.

- 2 Electricity can be hazardous if it is not handled properly. Poor maintenance or poor executed repairs may result in fires or electric shock.
 - 2.1. Do not attempt to carry out electrical repairs unless you have been properly trained and are authorised to do so. If in doubt - do not attempt to use or repair the equipment but call an electrician.
 - 2.2. If at any time an electrical plug, connector or cable is found to be hot or exhibits evidence of burns, report it immediately to your supervisor.
 - 2.3. In the event of a fire on electrical equipment, switch off the power and then use a CO₂ or dry powder extinguisher. Do not use water or foam.
 - 2.4. If a fuse blows, have it replaced by a similar one (ask the electrician). Do not use a fuse of higher rating as this may not protect the equipment. If the replacement fuse blows within a short time then have the equipment checked by an electrician.
 - 2.5. Never replace a fuse by some makeshift such as a piece of wire, a nail, silver paper, etc... This is highly dangerous.

- 2.6. Same comments when a differential protection trips or is out of service.
- 3 An electric shock, no matter how slight, is a warning that something is wrong.
 - 3.1. If you receive a shock - switch off the power, label the equipment so that no one else will try to use it and report the matter to your supervisor.
 - 3.2. If someone is suffering from electric shock and is still in contact with the electrical supply do not touch the person with your bare hands. If possible switch off the electricity and apply artificial respiration if the person has stopped breathing. Call for assistance.
 - 3.3. If you cannot de-energize the circuit/equipment, try to push the person away using a long wooden pole or equivalent mean of non-conductive material before attempting first aid. Call for assistance.
- 4 Many items of electrical equipment - eg. switches, some motors, produce sparks when in use or when switched off and on and so can be a source of ignition for flammable atmospheres.
 - 4.1. Do not introduce unauthorised electrical equipment eg. torches, radios, portable power tools, into potentially flammable atmospheres such as acetylene plants or flammable gas cylinder filling areas (hydrogen and hydrogen mixtures...).

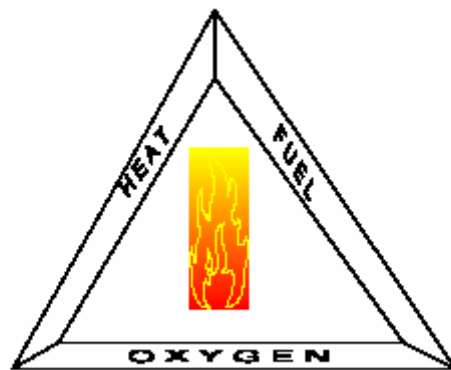
11.09 Fire

- 1 Every employee must be trained in the emergency response procedures and actions necessary to prevent the spreading of fires.

In order to know how to prevent fires from starting, it is necessary to understand the basic process ; fire is a reaction resulting in the release of heat, light and smoke, which is started and maintained by the simultaneous presence of three factors :

 - a Fuel, ie. a combustible material,
 - b Oxygen (or oxidising agent), usually air which contains 21 % oxygen,
 - c An external source of ignition (heat, shock, flame,...). Once a fire has started it

generates its own energy / heat supply.



Fuels that may exist in our retail refuelling installations are :

- gases, such as hydrogen, natural gas, propane, butane, ...
- flammable liquids such as diesel oil, motor spirits, propane, (LPG), etc...

The main sources of ignition are:

- smoking,
- welding, flame cutting, grinding,

- friction,
- short circuits,
- heat and sparks,
- mechanical shocks,

Once fires have started, they spread by different means:

- conduction: structural steel frames / piping have a high heat conductivity,
- convection: hot gases and vapours rise up and transport heat and pieces of burning

materials...

- radiation : high temperature generates heat that travels across open spaces without any
lame or burning material (this is what you feel when you stand in front of a fire place).

2 *Specific hazards in our industry are represented by :*

Cylinders: if exposed to excessive heat, cylinders may explode; alternatively the material may be weakened so:

Keep all cylinders away from heat sources

Hydrogen fires: hydrogen burns with an invisible flame : precautions and procedures are detailed in Sections xxxx .

Report a hydrogen fire, or a suspected hydrogen fire to your supervisor immediately.

Electrical equipment: electrical equipment gets hot when it is overloaded or in case of short circuit.

Report any electrical equipment, such as motors, generators, cables, switchgear that is found to be hotter than normal.

Machinery: motion generates heat and all machinery is designed to operate between certain temperature limits.

Report any cases of machinery overheating to your supervisor.

Welding, cutting and grinding operations: sparks and molten metal can ignite combustible materials in the vicinity. Also torches generate high temperature flames.

Before starting work check that there are no combustible materials in the vicinity. Work in specified areas only or get a Work Permit.

Clothing: clothing, particularly soiled clothing, can ignite when exposed to heat or flame.

Keep all clothing that is not being worn in authorised lockers.

3 All employees will be trained in basic fire prevention, fire fighting and emergency procedures before commencing work.

- 3.1. Know which extinguishers can be used to fight particular types of fire and be able to recognise fire-fighting appliances by type, colour and use.
- 3.2. Easy access to fire-fighting equipment must be maintained.
- 3.3. Report any use of fire extinguisher so that it is replaced immediately.
- 3.4. Fire fighting equipment need be inspected periodically.

- 4 Emergencies:
- 4.1. If you hear the alarm, proceed to your meeting point via the normal escape route or, if not available, it's nearest alternative. All employees must know the escape route and meeting point. Learn what to do in case of an emergency.
- 4.2. If you discover a fire:
- sound fire alarm,
 - fight fires with appropriate extinguisher,
 - do not allow fire to spread so as to cut off escape route,
 - if fire cannot be extinguished, personal safety comes first : escape!
- 4.3. Fire and emergency instructions must be posted and maintained at various places in your plant or office. You must know these places and instructions.

1.11 FIRE EXTINGUISHERS

1.12 TYPE	GROUP 1 WATER	GROUP 2 CARBON DIOXIDE	GROUP 3 VAPORISING LIQUID	GROUP 4 DRY POWDER	GROUP 5 FOAM
1.13 COLOUR	According to national regulations / standards				
CLASS B FIRES 1.14 FLAMMABLE LIQUIDS	1.15 NO	YES	YES - EXCELLENT	YES - EXCELLENT	YES - SMOTHERS FIRE
CLASS C FIRES 1.16 FLAMMABLE GASES	YES - COOLS	1.17 NO	1.18 NO	1.19 NO	1.20 NO
FIRES INVOLVING ELECTRICITY	NO - HAZARDOUS	YES - EXCELLENT	YES - EXCELLENT	YES	1.21 NO

11.10 Work Permit

- 1 Some tasks can be hazardous unless special precautions are taken. A Work Permit procedure must exist so that for specific job activities a formal and documented approach is used to
- identify roles and responsibilities,
 - identify hazards and define specific work instructions that prevent identified hazards.
- 1.1. A Work Permit makes the person who is ultimately responsible for the work consider all possible hazards and remove them or mitigate them before allowing work to proceed.
- 1.2. A Work Permit informs the person carrying out the work of the specific procedures of precautions they must use in order to carry out the work safely.
- 1.3. Work Permit procedure is used when construction, maintenance or repair work is done on or in the vicinity of process equipment, particularly under following circumstances:
- when safety equipment or protective device have been temporarily rendered inoperative,
 - entering confined spaces eg. tanks, vessels, ducts or trenches.
 - grinding, burning, welding, soldering or similar types of work performed elsewhere than in dedicated workshops (Work Permit is sometimes named "Fire Permit" in this case).
 - electrical hot work or work near high voltage lines.
 - opening a process line or vessel, cutting or tapping lines or equipment.

- when oxygen enrichment or deficiency can happen.
- when electrical, mechanical or process equipment has to be isolated and locked-out.
- elevated work.
- excavation work.

If in doubt whether a Work Permit is required, check with your supervisor.

- 1.4. The issue and control of a Work Permit is the responsibility of the Plant Manager or his nominated delegate.

This responsibility continues through the entire operation and includes monitoring of the actions called for on the Permit and the subsequent signing off when the work has been completed.

When work is to be carried over into a second day or working period, it is the responsibility of the manager taking over to issue a new Permit before continuing the work. This requires implementation of the whole process as described below:

- 1.5. Make sure that the rules given below are followed during the whole period covered by the Work Permit.
 - 1.5.1. Before allowing work to proceed, the person responsible shall check that the requirements of the Permit have been carried out. Personnel need be instructed at the place where work will take place before they start to work.
 - 1.5.2. During the work the person responsible shall check that the required safety measures are being carried out.
 - 1.5.3. When work is being carried out in a confined space, the person responsible must ensure that all necessary back-up and support (equipment and personnel) as well as safety and emergency equipment are available, instructed and in working order. You must know your Company Confined Space Entry procedure and always comply with stipulated conditions.
 - 1.5.4. Nobody is allowed to remove or disturb any equipment or signs associated with a Work Permit situation, excepted when instructed to by the Work Permit signatory.
 - 1.5.5. When equipment lockout is necessary, Work Permit signer needs make sure that lockout plan is properly implemented and documented.