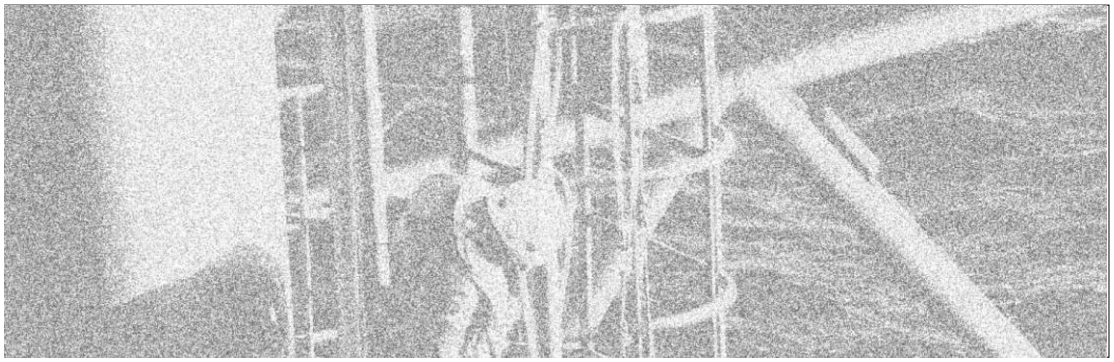
STC-KNRM

OFFSHORE-SAFETY



Document control sheet;

Control information	
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Document review	Timeframe for document review – 12 months (if necessary)

Approved by		
manager	Name;	R.Moleman

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2	2-11-07	Issue norwegian suit+EBS	GR	EM	EM
3	27-05-08	Issue stcw BT handout	GR/AK	EM	EM
4	12-4-11	update	GR/AK		
5	27-05-11	Update safety plans	GR/AK	GR/AK	EM
6	3-12-12	Update book	GR/AK	GR/AK	
7	22-10-15	Update book	GR/AK	GR/AK	GR/AK/RM

This document will be controlled by the manager.
This document will be approved by the manager when;

- New documentation is issued
- Significant changes are made in the content of the handbook.

All revisions will be approved by the manager.

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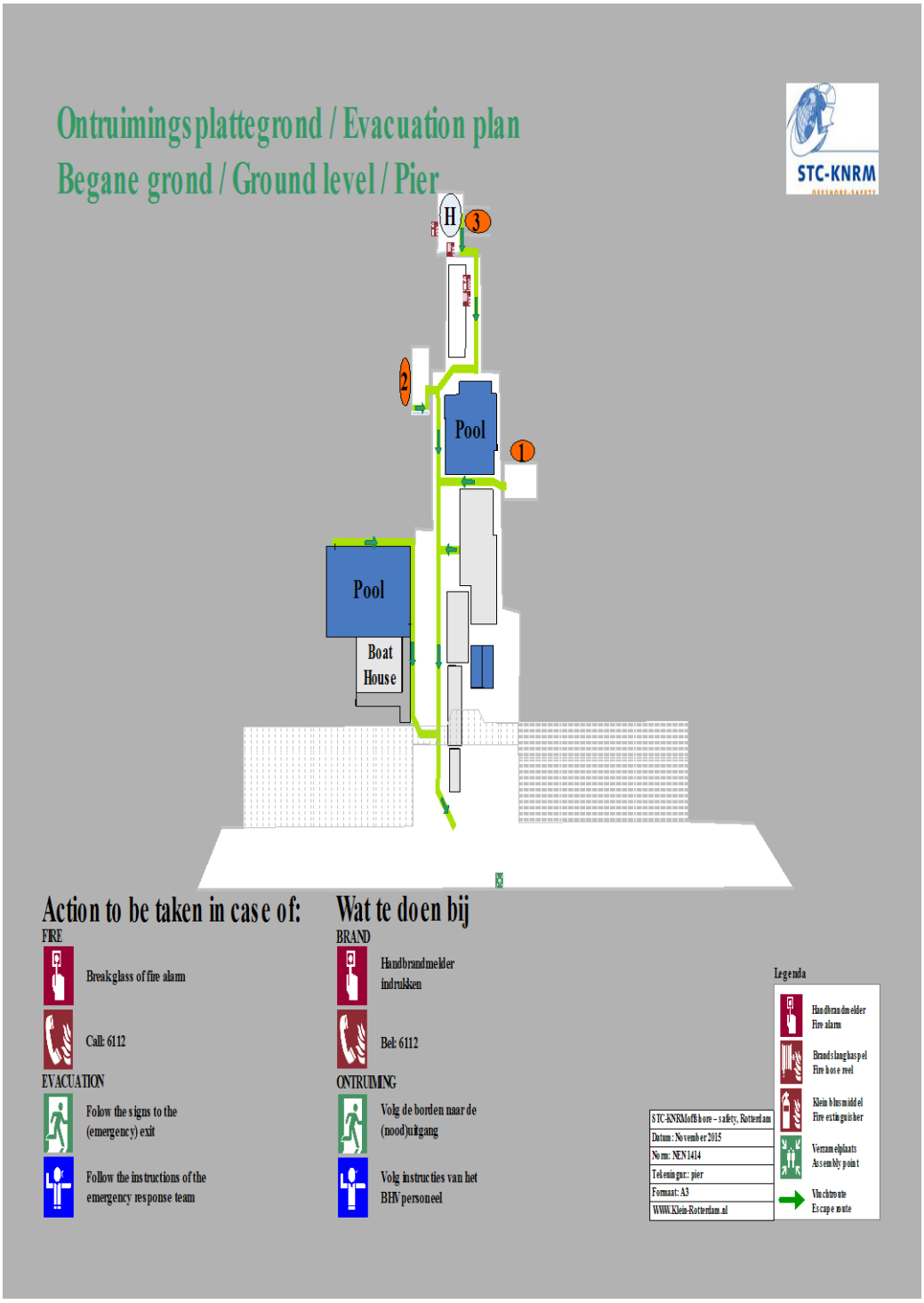
FIRE ALARM & LAYOUT OF ESCAPE ROUTES



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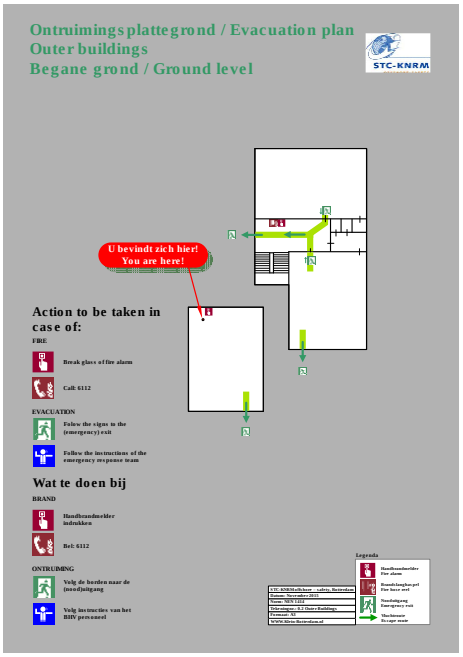
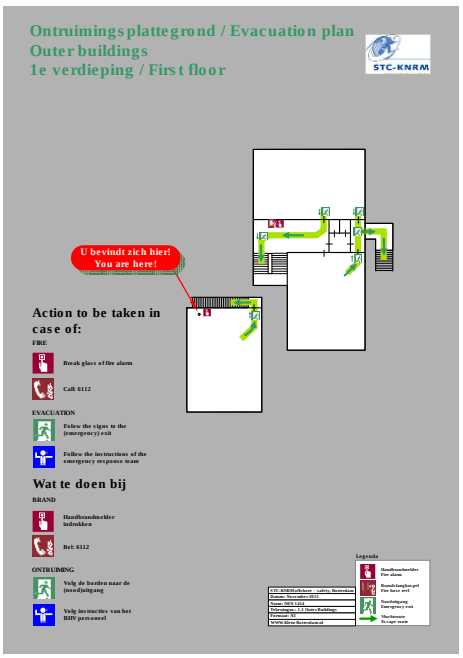
FIRE ALARM & LAYOUT OF ESCAPE ROUTES OUTBUILDINGS (GROUND-FLOOR)



FIRE ALARM & LAYOUT OF ESCAPE ROUTES OUTBUILDINGS (FIRST-FLOOR)



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FIRE ALARM & LAYOUT OF ESCAPE ROUTES BUILDING EAST (GROUND-FLOOR)

Ontruimingsplattegrond / Evacuation plan
Begane grond / Ground level

STC-KNRM

Action to be taken in case of:

FIRE

Break glass of fire alarm

Call: 6112

EVACUATION

Folow the signs to the (emergency) exit

Follow the instructions of the emergency response team

Wat te doen bij

BRAND

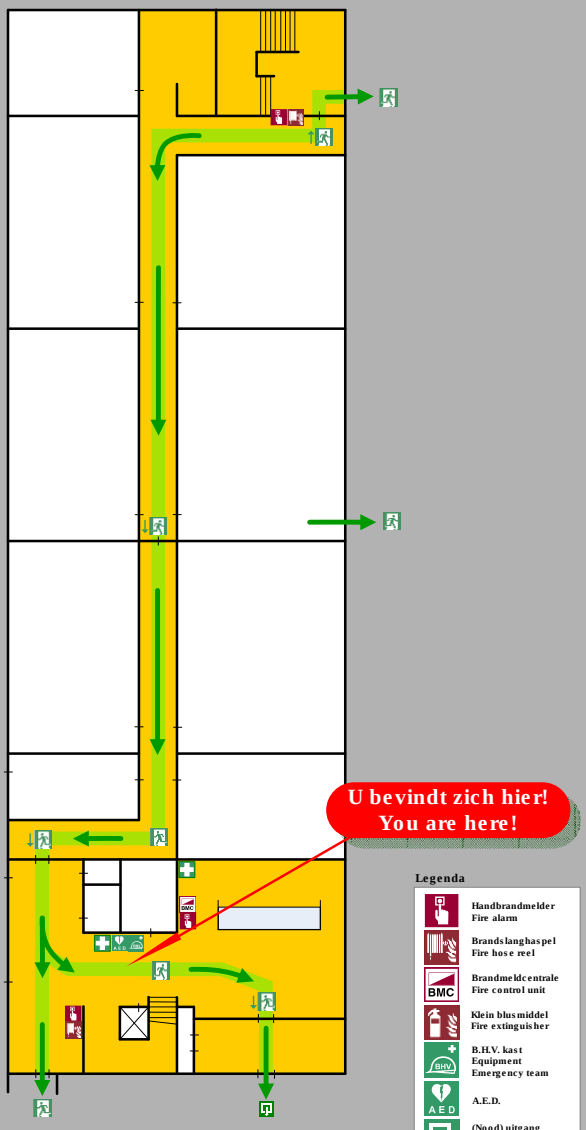
Handbrandmelder indrukken

Bel: 6112

ONTRUIMING

Volg de borden naar de (nood)uitgang

Volg instructies van het BHV personeel

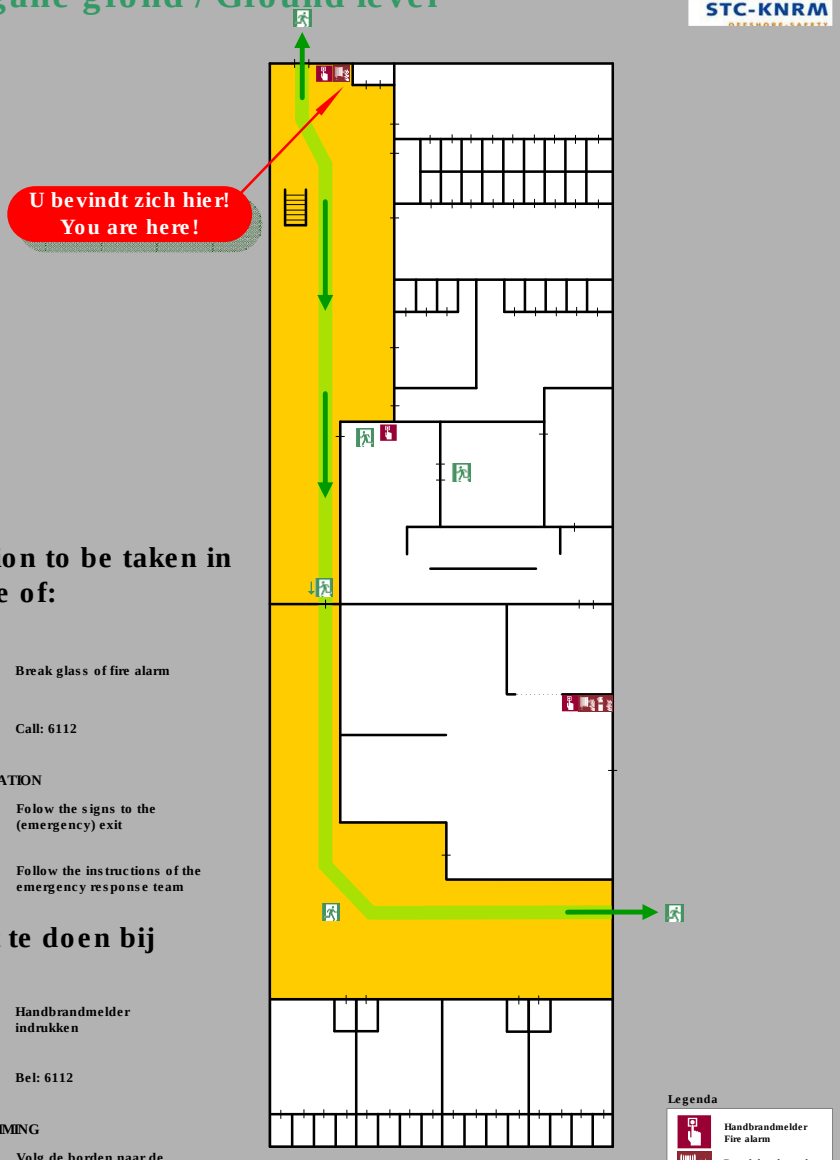


STC-KNRM
OFFSHORE-SAFETY

FIRE ALARM & LAYOUT OF ESCAPE ROUTES BUILDING WEST (GROUND-FLOOR)

Ontruimingsplattegrond / Evacuation plan
Begane grond / Ground level

STC-KNRM



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Follow the instructions of the emergency response team

Wat te doen bij

BRAND

Handbrandmelder indrukken

Bel: 6112

ONTRUIMING

Volg de borden naar de (nood)uitgang

Volg instructies van het BHV personeel

Legenda

- Handbrandmelder / Fire alarm
- Brandslanghaspel / Fire hose reel
- Nooduitgang / Emergency exit
- Vluchtroute / Escape route

STC-KNRM offshore – safety, Rotterdam
Datum: November 2015
Norm: NEN 1414
Tekeningnr.: 0.1 West
Formaat: A3
WWW.Klein-Rotterdam.nl

STC-KNRM OFFSHORE-SAFETY

FIRE ALARM & LAYOUT OF ESCAPE ROUTES BUILDING WEST (FIRST-FLOOR)

Ontruimingsplattegrond / Evacuation plan
1e verdieping / First floor

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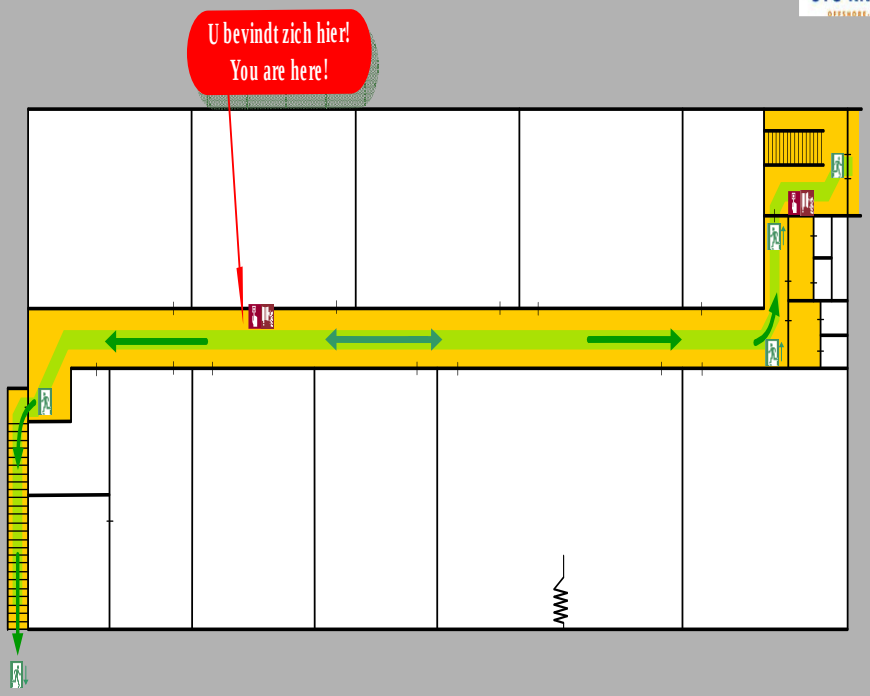

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Volg de borden naar de (nood)uitgang

Volg instructies van het BHV personeel

Action to be taken in case of:

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Break glass of fire alarm

Call: 6112

EVACUATION

Folow the signs to the (emergency) exit

Follow the instructions of the emergency response team

Legenda

Handbrandmelder
Fire alarm

Brandslanghaspel
Fire hose reel

Nooduitgang
Emergency exit

Vluchtroute
Escape route

STC-KNRM offshore – safety, Rotterdam
Datum: November 2015
Norm: NEN 1414
Tekeningnr.: 1.2 West
Formaat: A3
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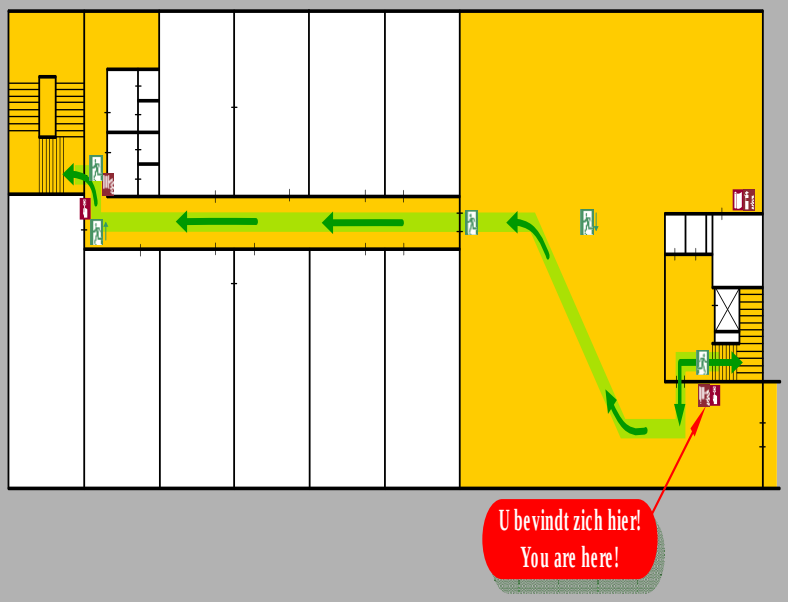
FIRE ALARM & LAYOUT OF ESCAPE ROUTES BUILDING EAST (FIRST-FLOOR)

Ontruimingsplattegrond / Evacuation plan
1e verdieping / First floor



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Folow the signs to the (emergency) exit

Follow the instructions of the emergency response team

Wat te doen bij

BRAND

Handbrandmelder indrukken

Bel: 6112

ONTRUIMING

Volg de borden naar de (nood)uitgang

Volg instructies van het BHV personeel

Legenda

- Handbrandmelder / Fire alarm
- Brandslanghaspel / Fire hose reel
- Blusdeken / Fire blanket
- Klein blusmiddel / Fire extinguisher
- Nooduitgang / Emergency exit
- Vluchtroute / Escape route

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Datum: November 2015
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SELF TEST – CAN YOU ANSWER THESE QUESTIONS?

SEA SURVIVAL

1. What are the basic principles of survival?
……

2. What action should be taken on hearing the evacuation alarm?
……

3. What are the immediate threats to life on entering cold water?
……

4. On entering cold water and having no liferaft/lifeboat to swim to, what position must you adopt?
……

5. What are the advantages of a survival circle?
……

6. What are the vital actions on boarding a liferaft?
……

7. What are the two main types of liferaft currently in use?
……

HELICOPTER ESCAPE

1. Name just three parts of an aircraft that you need to stay clear of.
……

2. What illuminated signs must you obey on entering the craft?
……

3. What are the four main checks prior to ditching on water?
……

4. If a helicopter was to ditch, what two things must you locate?
……

5. Name two methods of winching during rescue.
……

6. What should never be done with a Hi-line during rescue?
……

T.E.M.P.S.C. (LIFEBOAT)

1. Name two types of lifeboats.

……

2. Name three properties of a lifeboat.

……

3. Name three of the many checks made prior to launching a lifeboat.

……

LOCATION AIDS

1. Name three visual location aids.

……

2. Name two audible location aids.

……

3. What is an E.P.I.R.B. and what does E.P.I.R.B. stand for?

……

SURVIVAL SUITS & LIFEJACKETS

1. What is the purpose of a survival suit?

……

2. Name two types of survival suit.

……

3. Will a survival suit turn you over if unconscious in the water?

……

4. Name two main types of lifejacket.

……

FIRE FIGHTING

1. What three things must be present for a fire to occur?

……

2. Name another type of protection apart from a B.A. set.

……

FIRST AID

1. What are the aims of first aid?
……

2. What are the priorities of 'First Aid' to the casualty?
……

3. What is the initial treatment for someone who is suffering severe bleeding?
……

4. What is the treatment for an unconscious casualty?
……

RESCUE

1. When being rescued by a winch man/diver from a helicopter, state the main danger from him just before he approaches you.
……

2. Describe the ideal lifting position for a hypothermic survivor when being winched by a helicopter.
……

3. Apart from helicopters name two other methods of rescue.
……

LEGISLATION

1. Who supervises the petroleum industry?
……

2. Is an employee required to take part in organized safety and environmental work of the enterprise?
……

3. What are the maximum working hours per day?
……

OFFSHORE SAFETY INDUCTION

BASIC OFFSHORE SAFETY INDUCTION

The aim of the induction is to:

- Give new entrants to the offshore and gas industry a basic insight of activities and the need to develop a safety culture
- Inform students of the hazards and potential dangers that can be encountered and the safety management systems in place to mitigate those hazards
- Point out the general rules of helicopter transportation and basic knowledge of the permit to work scheme
- Create an awareness of further in-house training with regards to a more detailed induction relevant to the unit they are working on.
- Explain the role of essential personnel

Here are a number of examples of types of platform/vessels found offshore:

Multi Purpose vessel
This is a semi-submersible type of installation which can be used as accommodation for a large workforce. It has a platform with a helideck, hospital facilities and also fire fighting and diver rescue teams. It can be used as an 'on-scene' command facility, as the M.S.V. Tharos was used during the Piper Alpha disaster.

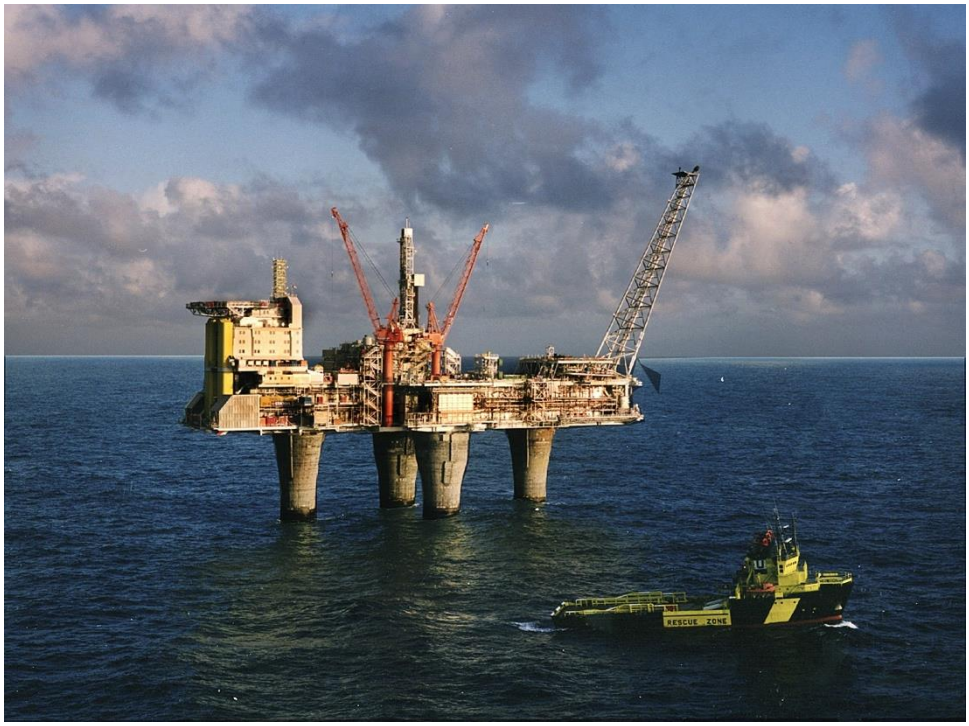
Standby vessel

All installations in the designated British sector of the North Sea must have a standby vessel, 24 hours a day, within the vicinity. They must be able to pick up the full compliment of their designated platform. They will be equipped with Fast Rescue Craft (F.R.C.) and personnel fully trained in their use.

Drill Ship
Computers may be used to hold the drill ship in position (Dynamic Position System), but in shallower water anchors may be used instead.

Semi-submersible platform
This is a mobile drilling platform which can be moved under its own propulsion or towed by a vessel and is held in place with several anchors.

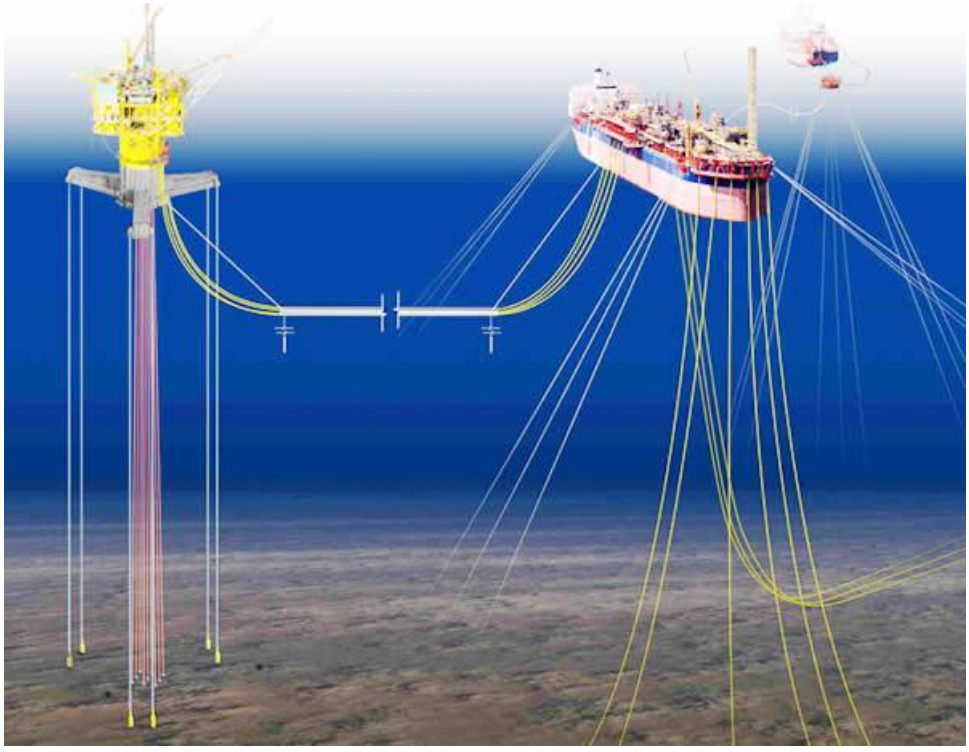
Concrete platform
This type of platform is kept in place by its own weight and has the advantage of built in storage space in its base.



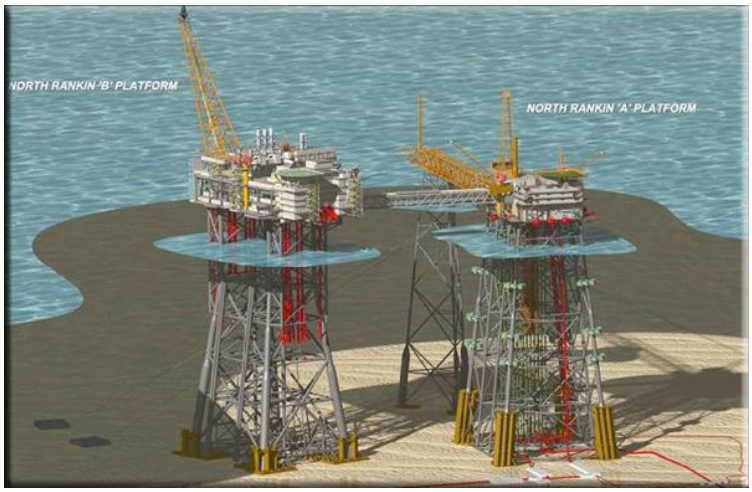
Inside the leg of the Troll platform

Jack-up platform
Jack-ups can nowadays work in water depths of up to 175 metres (because of modern technology this may increase over the years) with legs positioned on the sea bed, the platforms have their own propulsion systems, but can be towed to their locations.

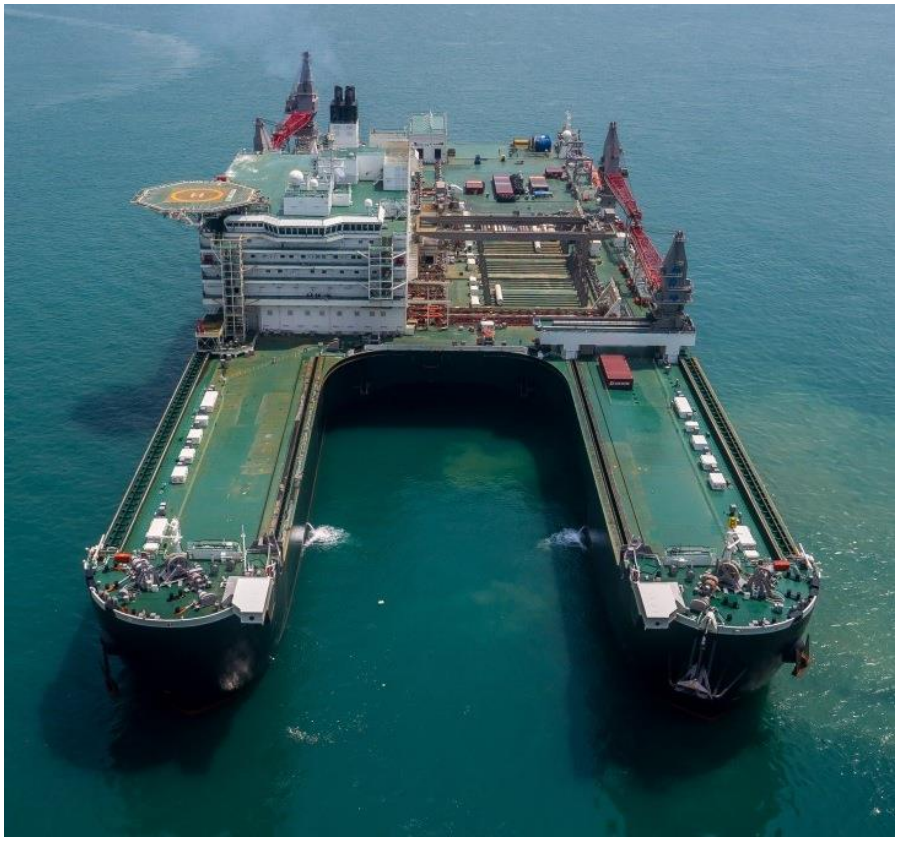
Tension leg platform
This is for deep-water use. It is a semi-submersible structure and is attached to the seabed by large anchorage points; these are attached to the platform with cables.



Steel jacket platform
This is a fixed installation and is used in shallower water with jacket supports piled into the seabed.



Decommission ship Pioneering Spirit



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OFFSHORE-SAFETY

UK LEGISLATION

Current safety legislation stems from Lord Cullen's report on the Piper Alpha disaster and the apparent lack of a safety culture within the offshore industry in the UK section of the North Sea.

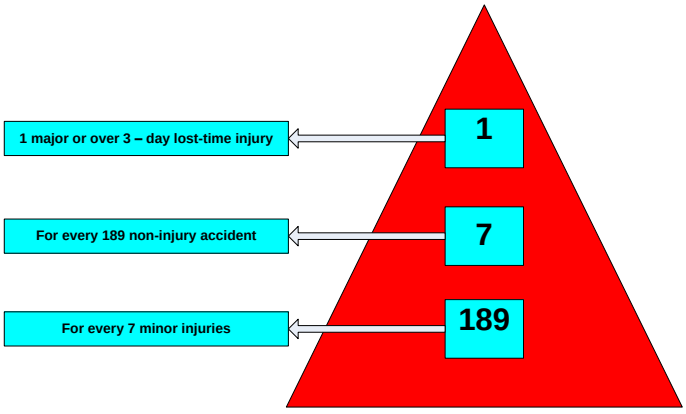
Lord Cullent's report came out on April 1st, 1991 and condemned the safety culture or lack of it within our industry.

The report advised that our industries' health and safety culture should come under the Health and Safety executives' umbrella.

The industry approached the HSE and the offshore safety division was formed. They set our industry strategic tasks aimed at the safety of all personnel working within our sector and looking after the environment that we work in and a goal setting approach was taken on board by all.

Working in partnership, our industry and the OSD/HSE launched the step change in safety initiative at Offshore Europe in September 1997. This was for us to reduce all accident and injury rates by 50% within 5 years. Although very close, the target was not reached so the initiative was extended for a further 2 years, taking us through to 2004. This has now been adopted as an ongoing concern within the industry for a continual 50% reduction per year until we reach 0% accidents/incidents.

HSE figures state that for every major or lost time injury there are 7 minor injuries and 189 non injury accidents within the UK sector.



- During your course you will be shown all pertinent legislation within the industry and their functions.
- You will be shown things you may encounter whilst living and working in an offshore environment.
- You will be made aware of the hazards you may encounter whilst living and working offshore.
- You will be shown the framework for organization and safety responsibilities offshore.

UK Legislation:
The Offshore Installation Manager (O.I.M.)
- The legally appointed representative of the oil company and responsible for the safety of the installation and the safety and welfare of all persons aboard.

UK Legislation:
The Health and Safety at Work Act 1974
This legislation covers all industries in the UK from shop floor to offshore and was adapted to the industry in 1991.

General duties
General duties of employers to employees:
It shall be the duty of every employer to ensure, so far as is reasonably practicable, the Health, Safety & Welfare at work, of all his employees.
It shall be the duty of every employee, while at work:
To take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at work

Prevention of fire and explosion and emergency response regs. 1995
- These Regulations specify goals for preventive and protective measures to manage fire and explosion hazards and to secure effective emergency response.

The offshore installations (safety representatives and safety committees) regs. 1989
The workforce shall be entitled to nominate and elect safety representatives
- To investigate hazards and complaints
- To carry out inspections
- To make representation to management
- Represent you to and from HSE (OSD)
- Attend Safety Committee meetings
- Consultation about H&S
- Reports through OIM to OSD on imminent hazards

R.I.D.D.O.R. 95
- Reporting of injuries, diseases and dangerous occurrences regulations 1995
- All accidents or incidents should be reported to the OIM through your supervisor immediately

Permit to work
- There is a legal requirement to have a Permit to Work system in place in all UK offshore installations to control and mitigate existing hazards to personnel and the installation.

Management of Health and Safety at work regs. 1999
- Assessment of Health and Safety risks
- Effective planning, organization, control, monitoring and review of preventive and protective measures
- Health surveillance
- Competent persons to assist in compliance
- Provide information to employees of risks and protective and emergency measures
- Health and Safety training of new employees

Offshore safety case reg. 1992
Operators and owners of fixed and mobile installations to submit to the HSE a safety case covering:

- The design of the installation
- The operation of the installation
- Combined operations between installations
- The abandonment of the installation

These cover amongst other things:

- A fire, explosion or release of a dangerous substance involving death or serious injury
- Major damage to an installation or plant
- Aircraft crash on deck
- Any event involving death/serious injury to five or more persons
- Diving operations

DUTCH LEGISLATION

State supervision of Mines

All activities in connection with the exploitation and production of minerals are supervised by State Supervision of Mines, a division of the Ministry of Economic Affairs.

Minerals in the Netherlands
The remaining reserves of natural gas on 1 January 2004 were about 1,600 billion cubic metres. The gas production in 2003 was about 68 billion cubic metres. The oil production in 2003 was about 47,000 barrels a day. The Minister of Economic Affairs encourages the exploitation and development of new reserves as part of the "small fields policy" aimed at the conservation of the Groningen gas field, the largest gas field of Western Europe, as a strategic reserve. The mining industry in the Netherlands includes salt production of about 6,000 kton per year.

Mission
State Supervision of Mines ensures that the exploration and production of minerals in the Netherlands and the Netherlands part of the continental shelf is carried out in a responsible and socially acceptable manner.

Vision
State Supervision of Mines strives to be a learning organisation based on professionalism, transparency and independence, offering an important contribution in controlling risks to health and safety (internal and external), the environment, subsidence and induced tremors, and to the optimal exploitation of oil and gas fields.

Organisation
The Inspectorate is headed by an Inspector General who is accountable to the Minister of Economic Affairs. The Inspectorate comprises the Management Team, a Management Office, a Knowledge Centre, an Operations Department, an Engineering Department and a Geo-Engineering Department. The Inspectorate has an establishment of 44 employees.

Legal Framework
On 1 January 2003, the (new) Mining Act and the accompanying Mining Decree and Mining Regulations came into force. The new Act replaces over two centuries of legislation on the production of mineral resources.
State Supervision of Mines is responsible for the supervision of the Mining Legislation and also ensures that the mining industry complies with the Working Conditions, Working Times, Environmental, Food & Drugs, Water Supply and Nuclear Energy Legislation.
State Supervision of Mines has been authorised by means of special Assignment Decrees to supervise and uphold these laws and publishes its findings in an annual report to the Ministers of Economic Affairs, Social Affairs and Environmental Affairs, and through these for both chambers of parliament.

Tasks
The task of State Supervision of Mines is to supervise the execution of seismic surveys, the exploration for and the production of minerals and geothermal resources, and of the underground storage of substances (article 127 of the Mining Law). State Supervision of Mines has two core tasks:

- Supervision and Enforcement of all mining activities focusing on safety, health, environment and optimal use of mineral resources;
- Advising the Minister of Economic Affairs and other governmental bodies.

Law Enforcement
When dealing with offences of legislation with regard to the working conditions, working times, environment, food & drugs, water supply and nuclear energy, the enforcement policy and procedure is followed as applied by e.g. the Labour Inspectorate and/or the VROM Inspectorate. With regard to the Mining Legislation the Inspectorate uses a three-phase approach in ensuring compliance. This approach comprises voluntary compliance through providing information, the stimulation of development of industry guidelines and implementing systems of management control, conducting inspections of industry guidelines and implementing systems of enforcement policy by executing administrative and/or penal powers. Depending on the type of offence appropriate steps are taken.

Advising Government Bodies
State Supervision of Mines has a number of legal advisory tasks performed for the Minister of Economic Affairs, and a number of other government bodies which are named in various laws and regulations.

Working Arrangements
State Supervision of Mines has developed specific working arrangements for its inspection regime. These arrangements are based on a systems approach as recommended by Lord Cullen in his report 'Public inquiry into the Piper Alpha disaster'. The working arrangements of State Supervision of Mines are now more focused than previously towards the way in which a mining company manages safety, health and environmental issues in its business processes. These supervisory arrangements are based on three guiding principles, namely:

Proactive
In ensuring that due account of safety, health and environmental considerations have been incorporated into the business processes associated with all new and proposed developments, activities and operations, prior to consents, permissions or permits being granted. Similarly, that these developments, activities and operations are properly planned, designed, controlled, managed, executed and verified.

Preventive
In requiring that all companies involved in mining, including oil and gas activities and operations have a documented system of management control, addressing all activities and operations associated with those business processes covering:
- the seismic surveying;
- the drilling process;
- the design and construction of installations and locations;
- the production and maintenance process;
- the abandonment, removal and disposal of installations and locations;
- the after care

Similarly, that companies develop and submit to State Supervision of Mines, a safety and health document, identifying, evaluating and assessing the risks to safety and health, associated with the various activities and operations performed during the lifecycle of the installation or location, thereby demonstrating the measures taken or proposed, to eliminate or reduce such risks. In addition to these documents, Mining Companies are also required to develop and submit their documented environmental plan, addressing the strategy that they have adopted, to effectively implement and realise the

environmental improvements required of the industry by "The National Environmental Policy Plans" and the environmental covenant with industry. These documents provide the basis for an integrated approach to preventive supervision by State Supervision of Mines, utilising audits to verify that safety, health and environmental aspirations, commitments and statements of companies, are adequately and effectively implemented.

Reactive
In responding to and investigating incidents, accidents and dangerous occurrences on mining installations, facilities, locations and units, so that lessons from such events are learnt from all.

International Contacts
State Supervision of Mines is involved in the internationalisation of supervision and is active in a number of different harmonisation and enforcement networks. The Inspectorate is convinced that supervision should be harmonised in order to create a level playing field between countries. These Networks are:

- The North Sea Authorities Forum (NSOAF). Through this forum the Inspectorates from the UK, Norway, Denmark, Germany, Sweden, Ireland, Faroe Islands and the Netherlands work on harmonisation matters, exchange lessons learned and best practises. In addition they carry out multi-national audits on mobile drilling installations.
- The International Regulators Forum (IRF). Through this forum the Inspectorates from the UK, Norway, USA, New Foundland, Nova Scotia, Brazil, Australia, New Zealand and the Netherlands work on harmonisation matters, exchange lessons learned and best practises. An HSE conference is planned to share knowledge for offshore regulators around the world.
- Offshore Industry Committee (OIC)/ OSPAR Commission. Through the OIC, established on the basis of the convention for the protection of the marine environment of the North East Atlantic (OSPAR convention) harmonised measures are taken to protect the marine environment from discharges and emissions from the oil and gas activities. The committee also monitors the implementation of these measures. Contracting parties to this convention are the European Union, UK, Norway, Denmark, Ireland, France, Spain, Portugal, Belgium, Germany, Finland, Iceland, Sweden and the Netherlands.
- The European Pipeline Regulatory Authorities. Annual meeting to discuss supervisory related issues regarding cross border pipelines.
- Diving Medical Advisory Committee (DMAC). To discuss legislative matters, exchange lessons learned and best practis

As from 1 January 2003 the new mining legislation (Mijnbouwwetgeving) consisting of the Mining Act, the Mining Decree and the Mining Regulation entered into force. As a result the old mining legislation as well as all directives, further and special rules etc. based on this legislation and issued by State Supervision of Mines mainly lost their relevance on 1 January 2003.

As per 1 January 2003 the E&P industry is no longer exempt from the Health & Safety legislation (Arbowetgeving). This legislation is now applicable to mining activities on the

Dutch territory and the Dutch continental shelf. All health and safety related issues have been removed from the mining legislation and are being dealt with by the Arbolegislation.

Safety and Health

Safe and healthy working conditions are an important part of preventing illness and occupational disability. Creating and maintaining healthy working conditions is the joint responsibility of employers and employees, whereby they can make use of expert advice from private organisations, such as occupational health and safety services (arbodiensten).
The government has established the legal framework within which employers and employees are expected to fulfil their responsibilities. The Dutch Working Conditions Act (Arbowet) contains a code of conduct for safety & health policy and the Working Hours Act (Arbeids- en rusttijdenwet) forms a statutory framework for working hours. The Labour Inspectorate ensures compliance with the legislation. A number of financial measures have been implemented to reward good conduct and to penalise bad practices. Besides that, the Ministry encourages executives and workers to cooperate and take an active role e.g. by drawing up occupational Safety & Health Covenants. The Ministry also encourages all parties involved to actively increase expertise.

Working Conditions Act
Under the Dutch Working Conditions Act of 1998, employers are required to pursue a working conditions policy in order to prevent absenteeism due to illness, occupational disability and occupational illnesses. Employers and employees are jointly responsible for the systematic improvement of working conditions. The Working Conditions Act mainly contains general provisions regarding, for example, the guiding principles for occupational safety and health policy, the risk inventory and assessment system, support from expert services and cooperation between employers and employees. The law also provides for monitoring and enforcement by the Labour Inspectorate, and for a sanction system. The Working Conditions Decree and the Working Conditions Order implement the provisions of the Working Conditions Act. Many of the provisions in the 1998 Act, the Decree and the Order were developed in accordance with the relevant mandatory EU regulations. Some of the main components of the Working Conditions Act concern:

- cooperation and employee representation
- improving working conditions as a cyclical process
- risk inventory and assessment
- the occupational safety and health service
- employee safety information and instructions
- in-house emergency and first-aid assistance

Cooperation and employee representation
Good working conditions are only achieved when employers and employees work together. Employers are responsible for policy but they are required to consult and cooperate with their employees. For example, an employer must obtain the Works Council's approval for all arrangements related to health, safety and sick leave.

Improving working conditions as a cyclical process
According to the 1998 Working Conditions Act, the improvement of working conditions is an ongoing systematic process and should be a permanent element of a company's operations.

Risk inventory and assessment
The starting point of working conditions policy is to prevent risk. For that reason, all companies and volunteer organisations are required to identify and evaluate the risks in

their organisations in order to bring to light any problem areas that may exist. Employers must hire a certified occupational safety and health service to assist them in the risk inventory and assessment process.

Occupational safety and health service
Occupational safety and health services are private companies that provide employers with expert assistance in improving working conditions in the company. Employers are legally required to engage these agencies for certain tasks, such as risk assessment.

Employee safety information
To prevent and limit risks, employers are required to properly inform and instruct their employees, particularly young workers. The information mainly deals with high-risk activities and the related safety measures the employer has taken.

In-house emergency and first-aid assistance
The purpose of in-house emergency and first aid assistance is to minimise the immediate harmful effects of accidents and fire. Every company is required to ensure that one or more employees have sufficient expertise in the areas of first aid, basic fire fighting and evacuation.

Working Hours Act
The aim of policy on working hours and leisure time is to promote the workers' health, safety and well-being. In that respect, the goals of the Working Hours Act correspond to those of the Working Conditions Act. The law is also intended to enable people to more effectively combine work and other tasks, such as care and education.
Through the Working Hours Act (WHA) the government offers a legal framework for work and leisure time for adult and under-aged employees. The law applies to everyone who performs work 'under authority', with the exception of managers and senior staff members. The law sets minimum standards for the length of compulsory rest periods and breaks, and maximum standards for, among other things, working hours and the number of night shifts an employee may be required to work.
The implementation of international regulations, and particularly EU directives, is an important part of the legislative process in the Netherlands. For some sectors of industry, e.g. mining, specific rules are laid down in the Working Hours Directive and the Working Hours (Transport) Directive.
The Cabinet has set itself the objective of reducing bureaucracy and curbing the tendency to over-organise, in order to give citizens and institutions more room to solve their own problems. Simplifying the rules is an essential element of this objective. Besides that, simplifying the Working Hours Act may strengthen the Netherlands' position on the international labour market.
The Cabinet feels the law should offer more latitude for employers and employees to make collective and/or individual agreements about work hours and rest periods. The Cabinet wants to reduce legislation to provisions and regulations necessary to ensure the protection, safety, health and well-being of an employee.

The new Health and Safety Act came into effect on 1 January 2007.

Why introduce a new Health and Safety Act?
- Employers and employees feel that the Health and Safety Act is excessive and far too detailed. The Cabinet therefore wants to abolish superfluous rules and regulations and give companies more room to customise. Because employees and employers are being given the opportunity to interpret health and safety policy in their own way, the support base for the health and safety policy will increase. This in turn will improve safety and health on the shop floor.

- The Cabinet wants to reduce the administrative burden for companies.
- The switch to less detailed regulations and more customisation is consistent with the policy of prevention, absence through illness and reintegration pursued by the Ministry for Social Affairs and Employment. It means that employers and employees will together bear more responsibility for safety, health and reintegration into the workforce.

What will change?

- Greater opportunities for employers and employees
  Employers and employees will have greater opportunities to themselves define how they satisfy health and safety requirements in their own sector. The government will define target regulations specifying the level of protection that companies must provide for their employees to enable them to work in a safe and healthy way. These target regulations will be described as specifically as possible.

  Example:
  The regulation that requires 'measures to be taken if there is a danger of falling down 2.5 metres or more'. It is specified that the employer must take measures against this, but it is the task of the employees and employers together to determine how they will interpret these target regulations. This interpretation will be recorded in a 'Health & Safety catalogue'. The employer will consult with the Works Council (OR) or the personnel representative body (PVT) about matters that affect the company's working conditions policy. In this way, they can jointly decide on the best interpretation of that policy for that specific company.

- Fewer laws and regulations
  As few Dutch regulations as possible will be added to the European Union regulations. Additional regulations will continue to apply only if they are really necessary.

What is a Health & Safety catalogue and how is it tested?

- The Health & Safety Inspectorate checks whether companies are complying with the statutory regulations. As soon as a tested Health & Safety catalogue has been drawn up, it is used as a frame of reference for the inspection. A Health & Safety catalogue describes the various ways employers can comply with the target regulations drawn up by the government.

For example, a Health & Safety catalogue can contain measures that have contributed in the past to a safe and healthy working climate, norms resulting from (scientific) research, best practices (practical solutions that have proven their worth), NEN norms, sector guidelines, agreements, handbooks or current health and safety policy regulations.

The responsibility for compiling and publishing the Health & Safety catalogues is borne by the employers and employees (or associations of employers and employees, for example, in a particular sector or industry). Health & Safety catalogues are tested marginally. This means that it is checked whether the catalogue was realized properly and whether the catalogue is adequate. To summarize, the following subjects are tested:

- Does the catalogue include a description of the field of activity (sector / group of companies) for which it is intended?
- Do the people who compiled the catalogue represent the employers and employees in this field of activity?
- Is the catalogue available and familiar to (all) employers and employees?
- If employers and employees follow the stipulations in the catalogue, will they be complying with the target regulations? This point is tested by means of a quick scan: is the catalogue understandable, logical and not in conflict with the law?

Catalogues that pass this test - after they have been incorporated into a policy regulation - become a frame of reference for the enforcement activities of the Health & Safety Inspectorate.

Labour Inspectorate

The Labour Inspectorate monitors compliance with occupational safety and health legislation and regulations. It investigates violations of worker safety, takes action and provides politically relevant information.

Abuses are understood to be:
1. serious infringements of laws and regulations, resulting in unacceptable risks to the safety and health of people;
2. systematic infringement of laws and regulations, such that the public's sense of justice and the rule of law are violated;
3. systematic infringement of worker safety laws, resulting in unfair competition between market parties or financial disadvantage to the government, for example through the use of machinery that does not meet safety standards or by employing illegal workers.

The Labour Inspectorate was reorganised in 2003. Since then its organisational structure has provided for national sector-specific directorates that enforce occupational safety and health regulations. In addition, there are two thematic directorates: Labour Market Fraud, which combats illegal employment, and Major Hazard Control, which manages major risks.

The Labour Inspectorate actively carries out dozens of inspection projects at any one time. In order to determine which sectors and subjects should be given priority, the Inspectorate uses a risk model that incorporates data on risks (chance x effect), the number of people exposed and compliance levels. In addition to the direct risks, the causes of sickness absenteeism and occupational disability are also important points of attention in the inspection process.

The Labour Inspectorate also performs reactive inspections and investigations in response to serious industrial accidents and worker complaints.

NORWEGIAN LEGISLATION

OBJECTIVES FOR SAFETY, PREVENTATIVE AND PROTECTIVE MEASURES

Laws and regulations:
- To name at least two central laws that regulates petroleum activities
- To explain the concept of emergency preparedness
- To explain the main contents of a set of alarm instructions
- To name at least two of the emergency preparedness teams on board a platform and their assigned functions

The work environment act:
- To explain the objectives of the Act
- To name at least three factors that affect the work environment
- To explain the tasks of accompany personnel safety representative
- To explain the responsibilities of the employer under the Act
- To explain the responsibilities of the employee under the Act

Inspection authorities:
- To state who co-ordinates inspections of the petroleum industry
- To explain the importance of reporting all accidents and near-accidents
- To explain the responsibilities and duties of a company with respect to internal control

Protective measures:
- To explain the principle of permit to work
- To name at least three types of potential injury due to exposure to organic solvents
- To explain the purpose of a data sheet
- To describe the minimum personnel protective equipment to be located outside a platform's living quarters
- To name at least two other examples of personal protective equipment and what these are intended to protect against
- To explain how a lack of organization and cleanliness can affect safety on board
- To name at least three types of activities that require permit to work

Protective cycle:
- To explain the importance of a well-organised safety set-up
- To use protective equipment correctly in various working situations
- To identify dangerous actions and propose the correct measures
- To select the appropriate protective measures on the basis of data sheets and markings
- To lift objects using appropriate lifting techniques

Practical exercises:
- To select and implement relevant regulations
- To analyse and interpret accident data

LAW AND REGULATIONS

The regulations that apply to petroleum activities on the continental shelf consist of laws, regulations and guidelines, which apply to everyone involved in such activities.

Central laws
The Petroleum Act, Work Environment Act and Pollution Act are particularly important laws that apply to activities on the continental shelf.

The Petroleum Act deals with exploration, exploratory drilling, exploitation, recovery and pipeline transportation on the continental shelf and it applies to everyone who is engaged in these activities. Activities must be carried out in a responsible manner and the necessary attention must be paid to the safety of personnel and the environment.

The licensee/operator carries a special responsibility. All parties engaged in petroleum activities on the continental shelf are responsible for ensuring that their own activities are performed in accordance with the regulations, but the licensee/operator has a particular responsibility to ensure that this is done. He is also obliged to ensure that anyone working for him carries out his task in accordance with the relevant regulations.

A licensee is a company which has licence(s) to engage in exploration, exploratory drilling, recovery, exploitation and/or pipeline transport on the continental shelf.

Recovery includes production, treatment and storage of petroleum, as well as the construction, installation and operation of facilities for such activities.

An operator is a company that has a responsibility for the day-to-day management of activities once a production licence has been granted.

A production licence grants exclusive rights to explore for petroleum and to conduct exploratory drilling and petroleum recovery within a defined area. The licensee/operator owns the petroleum produced.

The objective of the Work Environment Act is to ensure that the work environment does not cause employee's physical or psychological injury and that all individuals enjoy a meaningful work situation.

Certain sections of the Act do not apply to petroleum activities. For example, special rules apply to working hours on the continental shelf.

The Pollution Act is intended to ensure that everyone enjoys responsible environmental quality, so that pollutants and waste neither harm nature, affect well being nor damage health.

Overriding regulations
The safety regulations, internal control and work environment regulations have been adopted to Royal Decree and are regarded as taking precedence over other regulations.

The Objective of the Safety Regulations is to establish and maintain an acceptable level of safety and to further develop this level by means of an internal control system.

The Internal Control Regulations require the licence to implement systematic measures within his organization that will ensure that he, himself, can be certain that his own activities and those carried out by others on his behalf, are in accordance with the regulations.

The Work Environment Regulations state how and where the Work Environment Act applies to petroleum activities on the continental shelf. In certain areas the regulations include special rules in addition to the Act, e.g. the rules regarding work hours and rest periods.

SYSTEMS REGULATIONS

The emergency preparedness regulations and the risk-analysis regulations are often called system regulations because they deal with systematic procedures and analysis, which are intended to promote a responsible level of safety.

The Risk-analysis Regulations require companies to establish, maintain and develop contingency planning routines in order to maintain a fully responsible level of safety at all times.

The operator must carry out a contingency planning analysis in order to be able to dimension his contingency planning system on the basis of his own requirements.

Contingency planning consists of all technical, operational and organization measures that can prevent a potentially dangerous situation from developing into a disaster. If an accident does occur, the measures shall prevent or diminish the damage caused.

Contingency planning should be integrated into all aspects of the activities of a company. A separate action plan must describe the contingency planning measures that will be implemented if a dangerous situation or accident occurs.

The risk-analysis regulations require risk analysis to be drawn up and utilized. In this context, 'risk' is the likelihood of, and consequences of, an accident occurring.

Risk analysis are used to identify accidents that might happen (the risk is estimated) in order to reduce the risk of preventing possible accidents.

Of the preventative measures that reduce risk, those that reduce the likelihood of accidents happening should be given higher priority than those that reduce the consequences of accidents.

The regulations require operators to set safety goals; with the aid of separate criteria he must therefore identify an acceptable level (norms) required for the regulation.

In other words, the results of the risk analysis are part of the basis for decision-making needed by the operator to ensure that his level of safety meets the requirements of the regulations, his own safety aims and his own criteria for an acceptable level of risk.

Technical regulations
We have a total of 11 sets of technical regulations that deal with the following areas: drilling and well activities (and geological data acquisition), manned underwater operations, nature data, pipeline systems, load-bearing structures, process and support systems, lifting systems, electrical systems, explosion and fire protection, safety and communication systems and marking of equipment.

THE WORK ENVIRONMENT ACT

The Work Environment Act applies to petroleum industry activities on both a permanently fixed and mobile installation. It also applies to manned underwater operations. The objective of the Work Environment Act is to ensure the safety of employees in the work situation and to enable companies themselves to meet the challenges presented by the work environment. Efforts to improve the work environment should be a continual process of co-operation between all parts involved.

The reason for this is the active efforts on the part of the company and its employees to improve the work environment will produce far better results than would have been achieved by the authorities alone. The involvement of the employees is needed in order to obtain the best possible understanding of the problems and ways of solving them.

The Norwegian Petroleum Directorate (NPD) has prepared a report on points of contract between continental shelf legislation and the safety and work environment regulations. The report is updated annually. It provides an overview of the relationship between safety and work environment legislation within the range of authority of the NPD and the regulations within the range of other authorities, such as the relationship between the Petroleum Act and Pollution Act.

The duty of the **Personnel Safety Representative** is to look after the interests of the employees in work environment matters. Specifically, the safety representative should ensure that:

- Machinery, technical installations, chemical and work processes do not expose employees to danger.
- Protective installations and personal protective equipment are in position, in a satisfactory condition and are adequate in number.
- Employees receive such training, instruction and practice as are required.
- The work to be done is organized in a way that promotes safety.
- Accident at work is reported.
- Reports are submitted to the employer on any conditions that could lead to accidents or risks to health. The employer is obliged to reply to the safety representative. If no response to the report is received within a reasonable period of time, the safety representative has a duty of warning the NPD or the work environment committee.
- He, himself, is included in the process of planning and implementing work environment measures. The employer must orient the safety representative about work-related illnesses, accidents, reports on work hygiene and measurements, etc.
- He is familiar with relevant work environment protection regulations, instructions and requirements issued by the employer and public sector bodies.
- He is enabled to participate in inspections carried out by the NPD.

INTERNAL CONTROL

Requirements for systematic measures:
All persons with responsibilities in the petroleum industry are required to ensure that the regulations are observed. They must therefore implement systematic measurements to meet this obligation and this is usually done with the aid of organizational control systems (in this context, standard documented methods).

The particular responsibilities of the licensee mean that he has a duty to have such control systems within his own organization. He is obliged to maintain internal control of this in order to be able to monitor and ensure that his own activities and work carried out by others on his behalf, meet the requirements of the regulations.

The internal control principle is the basis of safety and work environment management and it is thus a feature of the regulations and of the way which they are implemented.

Relationship between different types of accidents and fires:
Industrial experience has shown that there is usually a fairly constant relationship between the number of fatal accidents and numbers of major and minor accidents. For

every fatal accident in industry, there are on average 30 serious accidents and 300 less serious accidents.

In the course of the past few years, a number of countries have performed studies that have dealt, not only with accidents, but also with the circumstances that could lead to accidents.

Through analyses of accidents, near-accidents, fires and the beginnings of fires in industry will provide us with a means of making preventative work environment measures more effective. In conjunction with risk analyses, analyses of this sort will help in contingency planning in different types and sizes of company.

Monitoring the Petroleum Industry
The permit regulations should be regarded in the context of safety monitoring in the petroleum industry. A company that has been awarded a permit to engage in petroleum activities receives its permit on condition that its activities are carried out in accordance with safety regulations and internal control regulations.

The Norwegian Petroleum Directorate (NPD)
The Norwegian Petroleum Directorate ensures that Norwegian petroleum resources are managed in a good and safe manner.

Facts about the Petroleum Safety Authority Norway (PSA)

The Petroleum Safety Authority Norway was established 1 January 2004 as an independent regulatory body under the Ministry of Labour and Government Administration. The authority is situated in Stavanger, in the same office building as the NPD, and will have a staff of about 155.

Main objective
The Petroleum Safety Authority Norway shall stipulate premises and follow up to ensure that the players in the petroleum activities maintain high standards of health, environment, safety and emergency preparedness, and thereby also contribute to creating the greatest possible values for society.

The new Petroleum Safety Authority Norway (PSA) was established 1 January 2004 as a consequence of the Storting process surrounding the Storting White Paper No.17 (2002-2003) on State supervision bodies.

The PSA have the regulatory responsibility for safety, emergency preparedness and the working environment in the petroleum activities. This responsibility was transferred from the Norwegian Petroleum Directorate (NPD) 1 January 2004.

With the establishment of the PSA, regulations relating to health, safety and environment (HSE) in the petroleum activities continues with the PSA as the responsible authority.

In addition, the PSA's sphere of responsibility is expanded to include supervision of safety, emergency preparedness and the working environment at the petroleum facilities and connected pipeline systems at Kårstø, Kollsnes, Stura, Tjeldbergodden, Mongstad, Melkøya and Slagentangen, as well as potential future integrated petroleum facilities.

The responsibility for issuing regulations and carrying out supervision of the land facilities has been transferred from the Directorate for Civil Protection and Emergency Planning and the Norwegian Labour Inspection Authority 1 January 2004.

New, temporary regulations relating to HSE for certain petroleum facilities on land and connected pipeline systems has been entered into force 1 January 2004.

The PSA will carry out information and advisory activities vis-à-vis the players in the petroleum industry, cooperate with other HSE authorities both nationally and internationally, and contribute to sharing and promoting knowledge concerning HSE in the society at large.

By means of its own supervision and cooperation with other authorities with independent regulatory responsibility in the HSE field, the PSA shall ensure that the supervision of the petroleum activities are carried out in a comprehensive manner

The Petroleum Safety Authority Norway has been delegated authority pursuant to:

- Act of 29 November 1996 No. 72 relating to petroleum activities
- Act of 4 February 1977 No. 4 relating to worker protection and working environment, etc.
- Act of 24 May 1929 No. 4 relating to supervision of electrical facilities and electrical equipment
- Act of 14 June 2002 No. 20 relating to protection against fire, explosion and accidents involving hazardous substances and to the rescue responsibilities of the fire department
- Act of 9 March 1973 No. 14 relating to prevention of harmful effects of tobacco

Act of 17 July 1925 No. 11 relating to Svalbard

Safety and the work environment
The safety and work environment sector itself is the responsibility of the Minister of Local Government and Labour, but the PSA has been delegated authority to monitor the offshore petroleum industry in this sector.

Both before and after a permit has been issued, the authorities will investigate whether the licensee/operator has the internal control system that will ensure that his activities are in accordance with the regulations and whether the system functions as intended.

In the process of monitoring, the PSA collaborates with other national bodies and/or private institutions (Norwegian Telecom, the Norwegian Maritime Directorate, the Civil Aviation Administration, etc.), but the PSA has been delegated authority to monitor safety and the work environment offshore. For this reason, the PSA also carries out a certain number of co-ordinating tasks via other national bodies that enjoy independent monitoring authority.

System audits
When the PSA monitors petroleum activities, it nearly always uses system audits, i.e. it studies one or more activities of a licensee/operator in order to determine whether his internal control system is operating satisfactorily. The PSA does not usually inspect the work of activities themselves, but it may well carry out random tests in the course of an

audit, if necessary to determine whether an operation or activity is being performed in accordance with the specifications or procedures that have been submitted to the PSA.

The Most Important Factor
The most important factor guaranteeing a high level of safety and a good work environment is probably that all participants in petroleum activities observe the regulations. The licensees' internal control systems must function efficiently and appropriately. One of the responsibilities of the Petroleum Safety Authority is precisely to ensure that this happens.

Type of Helmet	Features
A	Protects wearers from falling objects.
B	Has stiffened sides, which thus protect the head from compression injuries to a certain extent. Often used in forestry, mining, quarries, the building and construction industry and shipyards and in loading and discharging cargoes.
AV	Same features as A & B, V refers to heat.
BV	These helmets are heat-resistant to a certain extent and are used in industries that expose the wearer to radiated heat, such as steelworks and foundries

Important when you use a helmet:
- Check it before use; its shock lining must be whole. If one of the straps breaks, the helmet loses its shock-dampening effect. If this happens, the shock lining or the whole helmet must be replaced.
- Do not use a helmet that has been exposed to stress resulting in cracks or other types of damage. Obtain a new helmet immediately.
- Helmets must not have been painted nor have stickers applied to them except with agreement as the strength of the helmet can be reduced.
- Check the durability of the helmet material in your work environment with the manufacturer.
- Fasten the chin strap in such a way that the helmet will not fall off as a result of sudden movement, etc.

HAIR PROTECTION

Wear a hat, hairnet or headscarf if you are operating machinery with rotating components. This will prevent your hair from being trapped in the machine. Cover your hair if you are working with dangerous or polluting substances.

PROTECTIVE EQUIPMENT IN GENERAL (feet & legs)

This type of equipment is intended to protect the feet or legs from physical or chemical injury. It should also protect the wearer from fire and from injury caused by heat, cold or humidity. Anti-slip footwear also exists.

Materials
This should be a good quality and meet the relevant requirements. It must not be easily flammable. Footwear for protection from physical injury, e.g. from failing objects, must be

equipped with toecaps of steel or of another material that provide an equal degree of protection.

The toecaps should be large enough to protect all toes. Protective footwear may be made of leather, rubber or plastic. Soles of leather, rubber, plastic or wood.

WRIST PROTECTORS AND LEGGINGS

These protect the wrist or ankles and part of the legs. They protect the wearer against welding sparks, liquid metal, corrosive substances etc. These items must be easy to put on and take off.

KNEE PROTECTORS

These are intended to protect the wearer's knees form physical injury when work has to be done in a kneeling position.

HAND / ARM PROTECTORS
Description of Glove Material

Article	Material	Application	Durability
Protective gloves	Cotton twill	General Workshop use & packing work	Wear resistance; relatively good. Chemicals, oils & acids; poor.
Protective gloves with PVC coating	Cotton with PVC coating	Work involving chemicals or solvents	Wear resistance; less good. Acids & alcohol; good. Oils & fats; relatively good.
Protective gloves with PVC coating	Crude rubber and cotton	Work involving risk of cutting oneself	Wear resistance; good. relatively good. Chemicals, oils & acids; poor.
Rubber protective gloves	Synthetic and natural rubber	Work involving certain acids & chemicals	Wear resistance; good. Acids; good. Oils; less good.
Protective gloves with Neoprene coating	Cotton with Neoprene coating	Work involving oils, acids or chemicals	Wear resistance; relatively good. Chemicals, oils, acids & humidity; poor.
Goatskin protective gloves	Goatskin, sometimes with cloth on back of hand	Argon welding & installation	Wear resistance; relatively good. Chemicals, oils & acids; poor.
Fire protection gloves of textile fibre	Textile fibre	Fire glove for welding	Wear resistance; good. Heat up to 2,200°C.
Fire protection gloves	Cotton acetate	Fire glove for welding	Wear resistance; relatively good. Heat; withstands heat of gas flame for about 8 seconds.

HEARING PROTECTION

Why hearing protection?

Exposure to noise for a long period of time can damage our ears and result in loss of hearing. This reduces our ability to understand situations and our ability to work is compromised. Studies have shown that a person who is exposed to high noise levels may experience changes in the circulation of the blood and cardiac (heart) function. For this reason, we should take the use of ear protectors seriously.

Noise:	This is defined as unwanted sound
Sound:	This consists of a series of pressure variations, oscillations that are transmitted through gases, the air, water, concrete etc.
Noise level:	Noise level depends on the amplitude of these oscillations. It refers to as a sound level and is measured in decibels – dB.
Frequency:	This refers to the number of oscillations per unit time and is measured in cycles per second (c/s) or in Hertz (Hz). The frequency determines what we experience as pitch.

Complex sounds

Noise often consists of a number of frequencies, usually as many as the ear can experience. In order to describe such noise, we utilize a curve that shows the sound pressure level for all the frequencies that make up the sound. Noise is often defined in terms of sound pressure level alone. The results of the level obtained, if the different sound pressure levels (with varying frequency) are added, is known as the result level. The total level is always somewhat higher than the highest sound pressure level component of the noise.

Adding sound pressure levels.

Sound (m in dB) from two sources of noise cannot be added as we usually understand this operation. Two machines, each of which generates 80 dB, produces a total of 83 dB, while four machines at 80 dB each, produces a total sound pressure level of 86 dB. The increase of 3 dB when the sound is doubled in intensity is applicable no matter what the sound pressure level is.

Distance law

In open air, the noise falls by 6 dB every time we double the distance from the source. For example, 90 dB at a distance of one metre becomes 84 dB at two metres and 78 at four metres. Excerpt from guidelines issued by the Directorate of Labour Inspection.

EYE PROTECTION

Protective goggles

Protective goggles may or may not be fitted with side protectors or with eye screens.

Masks

Masks are intended to protect the wearer's face and eyes, as well as his head and neck. They may be used as facemasks or welding masks which can either be hand-held or mounted on a helmet.

Eye protectors
Eye protectors are divided into three groups:
A. Protective goggles B. Masks C. Hoods

General
Eye protectors protect the wearer against chemical or physical injury or from dangerous radiation. Safety glass must be used in goggles and it must be without faults, which might reduce protection and safety. If plastic is used instead of glass, protection standards must be satisfactory quality. Where necessary, the materials used must protect the wearer against heat.

Eye-sprays
If an employee gets splashes, steam or foreign matter in his eyes, they must be flushed immediately with large quantities of water; the patient must then be taken to a doctor (ophthalmologist). During transport, continue to flush the eyes using an eye spray bottle.

SAFETY BELT WITH A ROPE

If work is taking place where there is a risk of falling, appropriate safety equipment must be available. The employer has an obligation to provide such equipment and the employee must use it.

'Safety belt' refers to the belt itself, with rope or strop, special shock absorbers and other details. The belt should be made of material capable of withstanding sunlight, heat, cold, humidity and micro-organisms (fungus etc.). The material must also resist any acids, oil or chemical to which the belt may be used in use. It should be made of rot proof linen, synthetic fibre, leather or equivalent material. It should be non-shrink. The belt must be adjustable and lockable when in use.

Lifting belt
A lifting belt should be capable of raising or lowering a worker, for example through a narrow opening without injuring him. Such belts should be designed as harnesses and be fastened to a rope.

Fall arrester (Capture belt)
This is designed to prevent a worker from falling, or if he does fall, to catch him in such a way to avoid injury as much as possible.

RESPIRATORY PROTECTION

Breathing in injurious dust and gases can lead to poisoning or to permanent damage to the lungs, kidneys, liver or nervous system.

If it is technically impossible to remove hazardous materials from the atmosphere, suitable respiratory protection must be worn. You must know the composition of the hazardous substances in order to know what type of protection to use. The employer is obliged to maintain a register of substances used in the workplace. Your safety representative can find out for you, which pollutants are in use at your place of work.

TYPES OF BREATHING PROTECTION

- Protector with dust and/or gas filter
- Protector with fresh or pressurized air supply

Remember that dust or gas-filter masks can only be used when there is sufficient oxygen in the air. When working in closed rooms without proper ventilation, e.g. containers, tanks, or wells, you must use breathing protectors with an external supply of air, such as a portable tank.

Dust filters / gas filters
Gas filters are divided into classes according to the amount of gas or humidity they can absorb. They are given code letters and colours, which show the gases they can be used with, e.g.AI, K2, etc.

In conjunction with a perfectly fitted whole-face mask, class 3 filters can be used in concentrations of up to 1 volume per cent (10,000ppm).

Useful life
It is difficult to suggest how long a gas filter can be used. If the gas is an irritant and can be smelt in low concentrations, the filter can be used until the wearer begins to notice the gas. If the gas is non-odorous, breathing apparatus must be used.

Please note!
Dust filters are **NOT** gas filters !
Gas filters are **NOT** dust filters !

If dust and gas occur simultaneously, you must wear a combination gas and dust filter. For example, for coal dust and ammonia use dust filter P2, gas filter K green (K2-P2).

CHEMICAL HAZARDS TO HEALTH

A complete review of chemical substances is difficult to address, as there are approximately 2000 new products or so developed throughout the world. More than 70,000 products containing 10,000 substances are distributed in Norway.

Many of these chemical substances are used in Norwegian work places, including offshore installations. To a large degree chemicals are used in our private homes for different purposes. It is vital that the person(s) using chemical substances know the hazards of the actual substances and the slowly developing chronic health damages.

In order to prevent damages caused by the chemical substances and products, a checking system has been worked out by the Norwegian authorities.

The system includes:
- Regulations concerning labelling, sales, etc. of chemical substances and products that may involve a hazard to health. Stipulated 26th November, 1982.
- Regulations concerning the list of substances, hazards and safety. Stipulated 19th January, 1983.
- Regulations concerning labelling of products containing soluble (YK – labelling). Stipulated 9th December, 1982.
- Regulations concerning labelling explosives. 7th December, 1982.
- Product information sheets.

All chemical substances and products being sold in Norway shall have a data sheet. If the goods are produced in Norway, it is the producer's responsibility to procure such information. If the goods are produced abroad, it is the responsibility of the importer to make the product information sheet available.

The used language should be Norwegian or English. A product information sheet should give information concerning:

- Trade name of the product
- Producer / importer
- Chemical composition
- Appearance – odour etc.
- Occupational, hygienic and toxicological information
- Hazards to health
- First aid
- Information to personnel health
- Safety measures
- Reactivity – corrosion and special precautions
- Physical information
- Transport classification
- User labelling
- Sources of information
- Own information – (to be filled in by user) approval

EXPOSURE TO CHEMICAL SUBSTANCES

Damage to health may arise through:

- Inhaling of vapour or exhaust gas
- Skin contact
- Swallowing of the substances

When acute poisoning occurs, symptoms may appear such as intoxication, nausea, anxiety and feeling of tiredness and drowsiness long after the end of a working day. In worst case, consciousness may be lost and a life-threatening condition may occur.

Chronic poisoning will, as a rule, gradually appear over a long period of time and may appear as unnatural tiredness, weakened ability to concentrate, poor memory, continuous headache, change of behaviour or allergy which may be lasting.

Several substances are classified as carcinogenic.

Soluble

Soluble is liquid substances used to dissolve solid substances. They may be inorganic substances such as acid and lye or organic.

Soluble is used to dilute sticky and thick substances, to dilute fat or substances to fat and for cleaning.

Many chemical classes are represented as:

Alcohol, ester, ethers, acetate and benzene derivatives are among the most common. White spirit, thinners, xylene, ethanol and trichloroethylene are some examples of familiar and much used solubles.

The products are often a mixture of various single substances with various technical and medical effects.

A common fact about solubles is that they are very transient. The soluble evaporates at ordinary room temperature. Some evaporate very fast and others more slowly e.g. white spirit. For the last category it may, when the ventilation is bad, be a question of only minutes before the concentration may be hazardous to health. Intake in the body appears mainly by inhalation of vapour, but many solubles may penetrate into the skin and lead to poisoning.

Daily dose destroys health
About 200,000 Norwegian workers are daily exposed to soluble. About 100 new cases of lasting brain damage are registered in Norway every year because of soluble. The central nervous system is also exposed to injury.

Damage caused by soluble
Chronic effects of poisoning may be the result of a single dose, but the most common damage is caused by long-lasting exposure of smaller doses which separately do not give poisoning symptoms.

Certain substances (e.g. heavy metal compounds, aromatic amine and aromatic nitro compounds) are accumulated in the organism, thus increasing the effect of the substance after a long period of exposure.

Caustic and irritating properties
A substance can, in direct contact, affect skin, mucous membrane or eyes and give local injuries. Local influences may be characterised by caustics or irritation depending on the degree of influence.

Damage caused by soluble may appear as:
- Damage to the central nervous system, which is the most damage that may appear. In the beginning the most characteristic symptoms are headache, dizziness, nausea and tiredness.
- Generally increasing tiredness, both physical and psychological strain, irritability and lowered mood develop gradually and are characteristic of more serious injuries.
- Together with loss of memory (especially short-term memory) and concentration difficulties this may be a symptom of the injured being incurable.
- During the first years, the symptoms are clearly connected to the working situation, with improvement during weekends and holidays. If the exposure stops at this stage, the worker will have a great chance of getting rid of his/her symptoms.
- The mechanism behind the damage is to a great degree unknown, but since the soluble often attach to fat like structures, the injury may be caused by disorder of the membrane functions.
- Soluble may have a damaging effect on foetuses. Pregnant women should therefore avoid exposure to soluble as much as possible.
- Some soluble have a carcinogenic effect. That has been clearly proved for benzene and possibly for some other substances such as trichloroethylene and styrene. Most soluble are not carcinogenic.
- Contact between soluble and skin is damaging when the skin is deflated and dry and therefore more susceptible to other types of injury. Contact eczema is common in exposed groups of people, especially on the hands.
- Further exposure to brain toxic substances should be avoided, the patient should be careful with use of alcohol.

PREVENTATIVE MEASURES

What can be done to reduce the danger of health in connection with use of soluble? A key word is substitution that is exchange a dangerous substance with a less hazardous substance, wherever possible. If possible, an assessment should be made so the working process can be closed, in order to reduce evaporation and dust production.

Next on the list comes better ventilation. Here, a spot extract close to the source may be better than general ventilation.

Lastly, but maybe the most important, is:
Use of personal protective equipment (PPE) in those cases where permanent measures are not satisfying. When working with chemicals, rubber gloves stretching up to the elbows should be used.

Protection of the body, with everything from wearing a raincoat, splash suit to chemical protection suit, should be used according to nature of the substance.

To protect the respiration, a filter mask should be used. It is important to know what limitations the filter has and what protection qualities it provides. The filter will be saturated after some period of use and the Fresh-air mask is an alternative, but it is necessary to make sure that the air used in the mask is clean enough. Exposed workers may be supervised according to various methods, but common to these methods is that they give a clear answer, only when the damage is done and can not be cured. It is therefore vital that the preventative actions are directed towards the working environment. The measures taken to prevent injuries caused by soluble must be tailor-made to fit the individual's working place.

TIDINESS AND CLEANLINESS

On board installations and vessels, technical equipment is concentrated within a limited area. Tidiness and cleanliness are therefore essential for the sake of safety.

Without a stable and responsible work force, this is virtually impossible to achieve. Since minor infractions of the rules are involved (wiping up oil-spills, removing forgotten tools or materials, etc.) it is easy to simply close our eyes because such things are not our business. A multitude of requirements of regulations can never replace a feeling of personal responsibility in the workplace.

FIRE FIGHTING

Introduction

Fire, reaction involving fuel and oxygen that produces heat and light. Early humans used fire to warm themselves, cook food, and frighten away predators. Sitting around a fire may have helped unite and strengthen family groups and speed the evolution of early society. Fire enabled our human ancestors to travel out of warm, equatorial regions and, eventually, spread throughout the world. But fire also posed great risks and challenges to early people, including the threat of burns, the challenge of controlling fire, the greater challenge of starting a fire, and the threat of wildfires.

How Combustion Occurs

Several important factors need to be present for combustion to occur. The first requirements are fuel and oxygen. Fuel for a fire may range from trees in a forest to furniture in a home to gasoline in an automobile. The oxygen in the reaction usually comes from the surrounding air. The next requirement for combustion is an initiating energy source, or source of ignition. Ignition sources may be in the form of a spark, a flame, or even a very hot object. The ignition source must provide enough energy to start the chemical reaction. Finally, a chemical chain reaction (reaction that continuously fuels itself) must occur between the fuel and oxygen for combustion to take place.

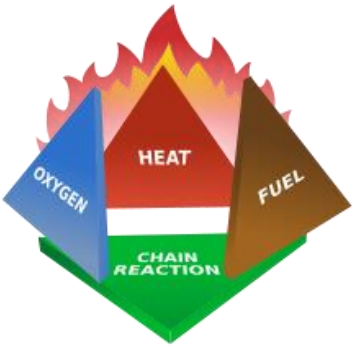
The fire triangle.

The **fire triangle** or **combustion triangle** is a simple model, from the science of fire fighting, for understanding the ingredients necessary for most fires. It has largely been replaced in the industry by the **fire tetrahedron**, which provides a more complete model, also described below.

The “triangle” illustrates the rule that in order to ignite and burn, a fire requires three elements — heat, fuel, and oxygen. The fire is prevented or extinguished by “removing” any one of them. A fire naturally occurs when the elements are combined in the right mixture (e.g., more heat needed for igniting some fuels, unless there is concentrated oxygen).

When a fire runs out of ***fuel*** it will stop. Fuel can be removed naturally, as where the fire has consumed all the burnable fuel, or manually, by mechanically or chemically removing the fuel from the fire. Fuel separation is an important factor in wild land fire suppression, and is the basis for most major tactics. Other fuels may also be chemically altered to prevent them from burning at ordinary temperatures, perhaps as part of a fire-prevention measure.
Without sufficient ***heat***, a fire cannot begin, and it cannot continue. Heat can be removed by dousing some types of fire with water; the water turns to steam, taking the heat with it. Note that water will actually increase or spread some other types of fires (such as combustible metal fires, see comments be-low). Separating burning fuels from each other can also be an effective way to reduce the heat. In forest fires, burning logs are separated and placed into safe areas where there is no other fuel. Scraping embers from a burning structure also removes the heat source. Turning off the electricity in an electrical fire removes the heat source, although other fuels may have caught fire and continue burning until the fire fighter addresses them and their fire triangles too.
Oxygen may be removed from a fire by smothering it with an aqueous foam, or some inert gas (e.g., carbon dioxide, Halon), dry chemicals, or enclosing it where the fire will quickly use up all of the available oxygen. A candle snuffer uses this principle. Oxygen for the fire may also be instantaneously consumed, if only for a moment, by more ‘sophisticated’ means such as using explosives to ‘snuff’ an oil well gas fire. Once the gas fire is out, it is not hot enough to start again, but workers must be extremely careful not to create sparks.

Fire tetrahedron



STC-KNRM
OFFSHORE-SAFETY

The fire triangle is a useful teaching tool, but fails to identify the fourth essential element of fire: the sustaining chemical reaction. This has led to development of the **fire tetrahedron**: a triangular pyramid having four sides (including the bottom). In most fires, it does not matter which element gets removed; the fire fails to ignite, or it goes out. However, there are certain chemical fires where knowing only the “fire triangle” is not good enough.

Combustion is the chemical reaction that feeds a fire more heat and allows it to continue. With most types of fires, the old fire triangle model works well enough, but when the fire involves burning **metals** (known as a class-D fire in the American system of fire classifications, involving metals like lithium, magnesium, etc.), it becomes useful to consider the chemistry of combustion. Putting water on such a fire could result in the fire getting hotter (or even exploding) because such metals can react with water in an exothermic reaction to produce flammable hydrogen gas. Therefore, other specialized chemicals must typically be used to break the chain reaction of metallic combustion and stop the fire.

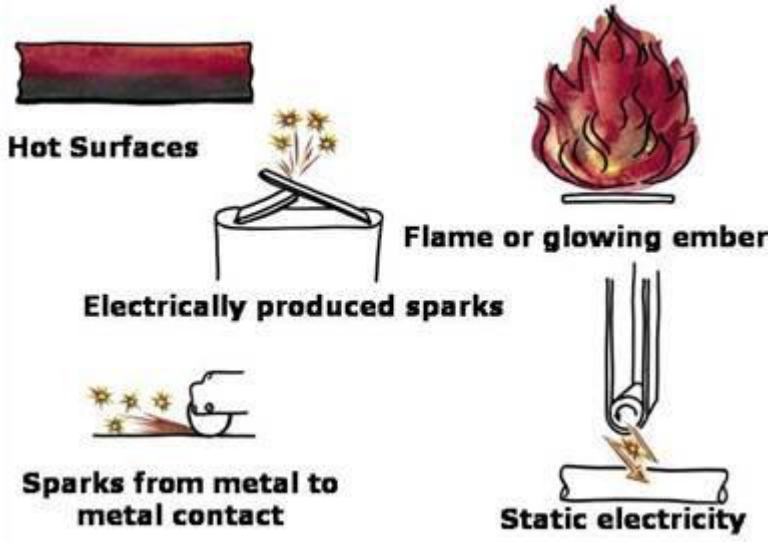
Fuel and Oxygen

Most combustible fuels begin as solids, such as wood, wax, and plastic. Many fuels that people burn for energy, including gasoline and methane (natural gas), begin as either a liquid or a gas. Any fuel must be in a gaseous state (so that it can react with oxygen) before a fire can occur. Heat from the fire’s ignition source, and later from the fire itself, decomposes solid and liquid fuels, releasing flammable gases called volatiles. Some solids, such as the wax in a candle, melt into a liquid first. The liquid then evaporates, giving off volatiles that may then burn. Other solids, such as wood and cotton, decompose and evaporate directly. In a wood fire, gases given off by the decomposing wood enter the flame, combine with oxygen from the surrounding air, and ignite. The heat from the flame decomposes more wood, thus adding more flammable gases to the flame and creating a self-supporting process.

Most common fuels consist of compounds containing the elements carbon and hydrogen. Fuels often also contain oxygen, nitrogen, chlorine, and sulphur. Cellulose is the principle combustible compound in wood, paper, and cotton. It contains carbon, hydrogen, and oxygen. Plastics that burn, such as polyvinylchloride (PVC), polystyrene, polymethyl methacrylate (PMMA), nylon, and polyurethane, are composed mostly of carbon and hydrogen. Liquid fuels include oil and gasoline, while gaseous fuels include methane, propane, and hydrogen. All of these fuels (except pure hydrogen) contain both carbon and hydrogen.

Ignition Source

A fire can start when a fuel becomes so hot that it releases sufficient flammable gases for combustion to occur. At this temperature, called the fuel’s piloted ignition temperature, a spark or flame will start the combustion reaction. One source of piloted ignition is an open flame, such as that from a match or lighter. Sparks, such as those generated by electricity, may also ignite a fire. Engineers and scientists usually use the term piloted ignition to refer to solid fuels. Liquid fuels have, instead, a flash point temperature. At a liquid’s flash point, an ignition source will cause a flame to flash across the surface of the liquid.



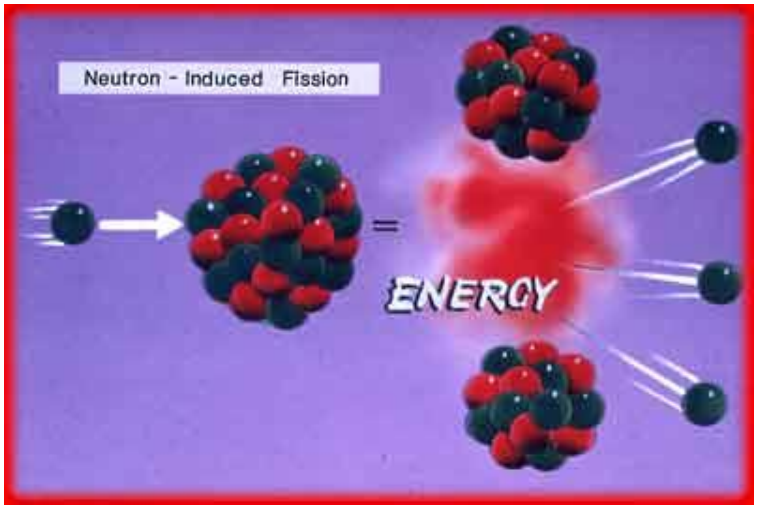
The unpiloted ignition temperature of a fuel, also called its spontaneous ignition temperature, is the temperature the fuel must reach to ignite on its own. It is higher than the piloted ignition temperature, because a flame or spark is not present to provide the extra heat needed to kick-start the chemical reaction. Heat within the fuel provides this energy. Some fuels do not have a spontaneous ignition temperature because they break down into other substances before they can ignite on their own. Flammable gases have just one ignition temperature. They will ignite at this temperature if they are present in the right concentration for combustion to take place.

Ignition depends not only on a fuel's ignition temperature but also on the way the fuel absorbs heat. This absorption determines how heat will affect the fuel's temperature. A fuel's capacity to absorb heat depends on the type of fuel involved and its arrangement. Thick logs, for example, can absorb a large amount of heat before they reach their ignition temperature. Small twigs, however, need just a small amount of heat to reach the same ignition temperature. Fuels also need to absorb heat at or above a certain rate for ignition to occur. (The absorption rate can be expressed as units of heat absorbed per unit of time.) At the minimum absorption rate, the fuel will eventually reach its ignition temperature. A piece of wood will never ignite if the ignition source produces heat at a rate slower than the minimum rate required for ignition.

Chain Reaction

The final requirement for a fire is a chemical chain reaction. The heat of the ignition source starts the reaction, and heat from the fire's flame continues the reaction. The flame needs to heat the fuel and make it release enough flammable gases to continuously support the chemical reaction. A common example of combustion is the burning of wood. When an ignition source heats wood to a sufficient temperature, about 260°C (500°F), the cellulose in the wood decomposes, producing volatile gases and char. The average composition of the gases can be represented by the compound CH2O, where C stands for carbon, H stands for hydrogen, and O stands for oxygen. Under ideal conditions, CH2O reacts with oxygen in the air and produces carbon dioxide (CO2) and water vapour (H2O). In the real world conditions are not ideal, so fires often produce other products as well, such as carbon monoxide (CO) and soot. The following equations show the two main stages involved in burning wood. The italicized letters represent

numbers that depend on the conditions of the fire, such as how quickly the fire burns and the specific composition of the wood.



Burning Rate

Different kinds of fires burn at different rates. One fire may slowly smoulder, while another may quickly use up its fuel. The rate at which a fire burns depends on the composition of the fuel, the surface area of the fuel, and the amount of oxygen that is available.
Most plastics burn at twice the rate of cellulose fuels, such as wood and leaves, because of the different chemical reactions involved. The burning rate of the same fuel, however, can also vary depending on how much of the fuel's surface is exposed to the air. As the exposed surface of a fuel increases in comparison to its volume, the burning rate of the fuel increases as well. When the fuel's gases have more surface area from which to escape, they can come into contact with more air. The increased exposure to air increases the amount of oxygen available for combustion. For example, people often use small twigs and pieces of wood called kindling to start a campfire. Kindling has a large amount of surface area compared to its volume. Its relatively large surface area to volume ratio also means that kindling heats and ignites more easily than thicker pieces of wood. Once ignited, kindling burns very quickly.

Products of Combustion

The products that a fire releases, and the rate at which it releases them, depend on the fuel and on the fire's burning rate. Some fuels will produce more heat than others as they burn, and some will produce different kinds of gases. A fire that burns slowly may produce different products than one that burns quickly. The burning rate also affects the rate at which a fire releases products.

Light and Heat

Once a material ignites, a flame forms. The flame consists of volatile gases moving upward, and it is the region in which the combustion reaction occurs. The gases in the flame move upward because they are hotter and therefore lighter than the surrounding air. The colours in the flame come from unburned carbon particles that glow and travel upward as the flame heats them.

The flame continues to burn as the volatile gases streaming from the fuel combine with oxygen from the surrounding air. Different parts of the flame have different temperatures. Most common fuels are compounds called hydrocarbons, and they produce about the same flame temperature, roughly 1200°C (2200°F). The maximum theoretical flame temperature for most hydrocarbons is about 1300°C (2400°F).

Different fuels produce varying amounts of heat. The rate at which a fire generates heat is equal to the burning rate of the fuel (measured in grams per second, or g/s) multiplied by the amount of heat produced by the combustion reaction. This second factor is called the effective heat of combustion, and scientists measure it in units of kilojoules per gram (kJ/g). When a gram of wood burns, for example, it produces 8 kJ of heat energy. Wood's effective heat of combustion is therefore 8 kJ/g. Polyurethane's effective heat of combustion is about 18 kJ/g. Polyurethane's burning rate is also about twice that of wood under similar conditions. Multiplying the burning rates for these two substances by their effective heats of combustion, one finds that polyurethane fires produce heat at about 4.5 times the rate of wood fires under similar conditions.

Gases

Fires can produce a number of different gases, including some that are harmless and some that are toxic. Carbon dioxide (CO2) and water vapour (H2O) are two relatively harmless gases produced by fires. Toxic gases from fires include carbon monoxide (CO), hydrogen cyanide (HCN), sulphur dioxide (SO2), and hydrogen chloride (HCl).

The specific gases and the amount of gas a fire produces depend on the type of fuel involved and the environment surrounding the fire. Different fuels will react differently in the combustion reaction, producing gases and amounts of gas specific to that type of fuel. For example, in well-ventilated conditions, polyurethane foam produces ten times more carbon monoxide for each gram burned than does wood. Fires that burn in an oxygen-rich environment will also produce less carbon monoxide than fires that burn where little oxygen is present. A well ventilated fire has plenty of oxygen, so nearly all of the fuel's volatile gases can take part in the combustion reaction, combining with oxygen in the air to produce carbon dioxide and water vapour. These fires produce less carbon monoxide because there is less carbon and oxygen left over from the initial combustion reaction to form carbon monoxide.

Fires that occur in an environment lacking sufficient oxygen will burn incompletely and smoulder. These fires produce increasing amounts of carbon monoxide. For example, in an enclosed room, a fire will use up oxygen from the air as it progresses, decreasing the amount of oxygen in the room over time. Without sufficient oxygen, the volatile gases from the fire cannot fully take part in the combustion reaction. Some of the gases instead react to form carbon monoxide, which requires less oxygen than does combustion. Eventually, the amount of oxygen decreases below the level necessary for continued combustion, causing the fire to self-extinguish. Depending on the type of fuel, most fires self-extinguish at an oxygen concentration between 12 and 14 percent (by volume). By contrast, normal atmospheric air has an oxygen concentration of 21 percent.

Soot

As fires produce light, heat, and gases, they also produce soot, consisting of mostly carbon particles. Smoke may be defined either as just the soot particles given off by a fire, or as both the soot and the gaseous products of combustion.

The amount of soot produced by a fire depends on the type of fuel, the fuel's burning rate, and environmental conditions. Most plastic fuels produce more soot than wood and other cellulose fuels. Plastics also usually burn more quickly than wood. Under similar conditions, for example, a slab of polyurethane will burn almost twice as fast as a slab of wood. The composition of plastic and plastic's more rapid burning rate cause it to produce about 2.7 times as much soot as does wood. Fires also tend to produce more soot when they smoulder and less soot when they burn freely in a well ventilated area, with plenty of oxygen available.

DESTRUCTIVE FORCE OF FIRE

Destructive fires can occur wherever fuel and oxygen are available, including in office buildings, homes, vehicles, forests and offshore installations.

Fires in the Workplace

Dangerous work conditions and arson can lead to fires in the workplace. Industries that produce chemicals often deal with extremely flammable materials, while metalworking industries deal with materials at very high temperatures. Companies prevent fires by training employees in the handling of dangerous materials and by hiring specialists, called fire protection engineers, to design safe workspaces. Sprinkler systems can limit property damage, and the establishment of clear exit routes for employees can limit injury caused by fire. In the United States, the leading cause of fires in office buildings is arson. Office buildings often include security systems, such as locked doors and camera surveillance of entrances and exits, to prevent potentially dangerous people from entering the building.

CHEMISTRY IN FIRE FIGHTING

Extinguishing a fire involves removing one of the requirements for combustion. Fire fighters may physically remove the fuel from the fire by taking a burning item outside a structure. They can remove heat by cooling the fire with water or remove oxygen by smothering the fire with chemicals or a fire blanket. Interrupting the chemical chain reaction is more difficult but is typically done by applying special chemicals, such as halogenated compounds, to the fire. These halogenated compounds are being used less often as they cause damage to the atmosphere's ozone layer.

There are three requirements for starting and maintaining a fire:
- Fuel - wood, paper, oil, textiles, flammable gases etc.
- An oxidant - usually oxygen from the air, but may be a chemical in contact with the fuel
- Heat - the temperature must be greater than the ignition temperature of the fuel

There are three approaches to putting out a fire:
- Starvation - cutting off the fuel supply
- Smothering - separating the fuel from the oxidant
- Cooling - lower the temperature, usually with water

There are five main types of fire extinguishers: water, foam, carbon dioxide, BCF (or Halon 1211) and dry powder. The choice of extinguisher depends on the type of fuel, and whether there is danger from live electrical equipment.

CASSIFICATION OF FIRE

Fires are classified by the nature of the fuel and whether electrical equipment is involved.

Class A: Involving solids, usually organic. Wood,paper, textiles, hay, grain, plastics, sugar ,coal leather, etc. come under this class.

Class B: Involving flammable liquids or liquefiable solids. Petrol, oils, fats, kerosene, turpentine, wax, varnish, paint, alcohols, acetone, organic solvents, etc. come under this class.

Class C: Involving flammable gases. CNG (methane), propane, butane (LPG), Hydrogen, carbon monoxide come under this class.

Class D: Involving combustible metals. Sodium, magnesium, lithium, aluminium come under this class.

Class E: Electrical fires. Fires complicated by the presence of electricity so water should not be used.

The nature of the fuel and electrical hazards dictate the method of fighting the fire. Table 1 summarises the different kinds of extinguishers. The rating of different kinds of extinguishers (what types of fires they should be used on) have come from extensive testing on real situations, taking into account possible undesirable side effects.

Table 1 - Methods of fire extinction

Class	Extinguisher	Method	Remarks
A	Water Foam ABC dry powder	Cooling & Smothering	Lower temperature Blanket cuts off air from fuel
B	Dry powder foam, CO2, BCF	Smothering	Blanket cuts off air Possible re-ignition
C	Dry powder CO2, BCF Water fog	Smothering & Cooling	Blanket cuts off air Possible re-ignition Special equipment
D	Special dry powders or sand	Smothering	Water would produce H2 and an explosion
electricity	Dry powder CO2, BCF	Smothering	Blanket cuts off air Possible re-ignition

CHEMISTRY OF EXTINGUISHERS

Water

The function of water is simply to cool the burning fuel. Water is cheap, and can be directed on to the seat of a fire by a high pressure. Buildings are provided with sprinklers which operate automatically if the temperature rises above a certain value. Risers are vertical pipes in buildings to which a high pressure water supply may be attached at ground level. Many buildings have fire hose reels connected to the water supply ready for an emergency.

The cooling action of water is mainly due to its heat of vaporisation.

Water should only be used on class A fires, solid fuel. Most organic liquids have a lower density than water and will float on top and keep burning. Spattering of drops of burning liquid can also occur. Where electrical equipment is involved water can cause shorting resulting in sparks which could ignite material, and in material becoming electrically live. Reactive metals like sodium react vigorously with water at ambient temperature to produce combustible hydrogen, and less reactive metals such as aluminium also react in highly exothermic reactions at higher temperatures.

The simplest water fire extinguisher is a hose connected to a high pressure water supply. Fire hoses must be able to deliver 14 litres per minute and the pressures required for this are 225 kPa for 13 mm hose and 150 kPa for 19 mm hose.

Water type portable extinguishers used to be activated by turning them upside down, this causing sulphuric acid to mix with sodium bicarbonate releasing carbon dioxide to provide the necessary pressure. These are now banned. Modern extinguishers are simply pressurised with enough nitrogen gas to drive out the water or have a cartridge containing a very volatile liquid, usually carbon dioxide. To activate the extinguisher the cartridge is opened in some way and the evaporating liquid provides the necessary pressure to drive out the water.

Foams

A foam is a stable mass of air filled bubbles and has a lower density than oil, gasoline or water. Surfactants which give water surface properties suitable for foam formation are dissolved in water, and when pressure is released on a mixture of the solution and air a foam is formed.

Foams work by:

- blanketing the fuel surface smothering the fire
- separating the surface of the fuel from the flames
- cooling the fuel and adjacent surroundings
- suppressing the release of flammable vapours that can mix with air

A variety of surfactants, based on fluorocarbons, hydrocarbons, hydrolysed protein and solvents are used, the particular formulation varying with the class of fire. They are used on both class A and class B fires.

Carbon dioxide
Carbon dioxide has a triple point (the pressure and temperature where gas, liquid and solid forms co-exist) of 5.11 atm. and -57oC compared that of water of 6 x10-3 atm and 0° C. Thus while ice melts to liquid water at 0°C at 1 atm. pressure and then has to be heated to 100°C for it to boil, solid carbon dioxide (dry ice) sublimes, that is goes directly from solid to gas at atmospheric pressure, and this occurs at -78°C. However if carbon dioxide gas at 25°C is compressed to a pressure above 67 atm. it liquefies. This makes carbon dioxide an ideal material for fire fighting as it can be kept in liquid form in pressurised cylinders, and when the valve is opened rapid evaporation occurs giving a cloud of very cold carbon dioxide gas, the rapid expansion causing rapid cooling, due to the Joule-Thomson effect. Further as carbon dioxide is denser than air it can form a blanket over burning material. It is the smothering effect and not the cooling effect which is most important. And of course CO2 cannot be further oxidised.

CO2 extinguishers should not be used on class A fires as the blast can disperse fine burning solid particles or drops of liquid and thus spread the fire. Further they have insufficient cooling effect on burning solids.

BCF (Halon 1211)
BCF or Halon 1211is CF2ClBr, the numbers being the number of carbon, fluorine, chlorine and bromine atoms respectively per molecule. Of course Halon 1211 does not undergo combustion itself. Its boiling point is -4°C and thus it is easily liquefied by pressure at room temperature and it has a vapour pressure of 2.3 atm. at 20°C Its vapour density is 16.5 g L-1 compared with 1.1 g L-1 of CO2. Thus it has excellent properties for smothering a fire, and comes out from its container with much less pressure than CO2 and is not so likely to disperse a fire. Smothering is not the only way in which they work. They act as scavengers of free radicals in the flame, terminating the propagating chain reactions. (In a sense they are antioxidants). It can be suitable for all classes of fire.

BCF are scheduled to be removed in light of the Montreal protocol on the ozone layer. However dispensations will probably be given for aeronautical, marine and shipping use until viable alternatives are found.

Dry powders
In addition to sand there are are two main dry powders used in fire fighting. These are regular dry chemical for classes B or C fire, the major constituent being sodium bicarbonate (NaHCO3), and multi purpose dry chemical for A,B and C class fires, the major constituent being mono-ammonium phosphate (NH4H2PO4). The latter has now almost completely (99%) replaced the former.

The powders are driven out of their containers by either pressurised nitrogen or with a CO2 cartridge as for water extinguishers.

Sodium bicarbonate works by absorbing heat from the fire and giving products which would help smother it.

Small home and vehicle fire extinguishers are dry powder. The smallest CO2 extinguisher contains 2 kg of CO2, and because the cylinders have to withstand much higher pressures than dry powder they are bulky and expensive. 1 kg of powder is as efficient as 4 kg of CO2.

FIRE DETECTION AND PREVENTATION

Early detection of fire

Early detection of fires allows them to be fought before they gain in intensity and spread from their place of origin. Sprinklers which are automatically activated by heat can put out a fire in its early stages.

Fire detectors which raise an alarm can work on three principles heat, light or smoke detection.

With heat there are several types. They can be activated by the melting of a metal component, by movement of a bimetallic strip, of by change in electrical conductance of a material above a certain temperature. With light either infra-red or ultra-violet light is detected; they "see" the flame and activate an alarm.

Smoke detectors are of two types, ionisation chamber and optical. The former contain a very small radioactive source, usually Americium-241, a 5.5 MeV α-particle emitter. When smoke enters a chamber the emitted radiation from the source ionises the particles increasing the conductance of the gas and allowing a current to flow between electrodes, this current activating the alarm. In optical detectors smoke particles interrupt a continuous light beam by absorption or scattering of light.

Materials

Fire can be prevented by using non-combustible materials where possible. In silicate materials elements other than oxygen are already in their highest oxidation states. Thus they do not burn and of course are widely used in construction - concrete, tiles and glass.

Internal walls are often constructed of gypsum plaster board. With a fire in one room the plaster board absorbs heat, every kilogram of plaster releasing 200 g of water. $CaSO4.2H2O \rightarrow CaSO4$. This water acts as a heat barrier, ensuring that the temperature behind the plaster board does not rise appreciably above the boiling point of water and thus preventing the fire from crossing over the board.

Fire-Fighting Strategy

Fire fighting strategy involves the following basic procedures: arriving at the scene of the fire as rapidly as possible; assessing the nature of the fire by determining its intensity and extent, the type and abundance of fuel, the danger of entering the fire area, and the most effective techniques for extinguishing the fire; locating and rescuing endangered persons; containing the fire by protecting adjacent areas; ventilating the fire area to allow for the escape of heat and toxic gases; and, finally, extinguishing the fire.

How to Use a Fire Extinguisher

Millions of people every day rely on fire extinguishers to put out minor fires which start in the home. Fire extinguishers contain a powder which is known to instantly put out a fire and prevent it from spreading any further. In 2004, fire extinguishers saved over 25 lives in the United States and prevented over 1,500 injuries. Fire departments all over the world encourage home owners to have at least one fire extinguisher in the home at all times. That said, studies show that approximately 80% of homeowners do have at least one in their home, but the question is do they know how to use it?

Sure it's great to know there's a fire extinguisher close by if you ever need one, but what most people don't understand is if you don't know how to use these devices, they are practically useless. Everyone should know how to use a fire extinguisher and if you are one of the many who don't, the follow steps will provide you with everything you need to know.

The easiest way to learn how to use a fire extinguisher is to memorize the acronym P.A.S.S. and memorize the meaning of each letter. The following list will provide you with the meanings of each letter:

P - The first letter to remember is "P". This indicates to the user to pull the pin. Pulling the pin is the first step in the process and is crucial to the successful execution of fire extinguishers.

A - The "A" stands for Aim. This tells the user to aim the fire extinguisher nozzle towards the base of the flames.

S - The first "S" stands for Squeeze. This advises the user to squeeze the trigger while maintaining the extinguisher in an upright position.

S - The last "S" stands for Sweep. The user will then sweep the extinguisher from side to side making sure to cover the area of the fire completely.

Remembering the word **PASS** can save the life of you or someone you love.

Having a fire extinguisher in your home is a great idea however the location of your extinguisher is a determining factor in whether or not it will be useful. You will want to

keep your fire extinguisher in areas which are most likely to produce fires such as kitchens, near fireplaces, garages or areas with a number of candles (perhaps a bedroom).

Do not keep your fire extinguisher near your stove. Stoves are a prime target for fires and should a fire break out near your stove, you will want to be able to access your extinguisher. You may also want to keep your extinguisher near an exit so you can leave it the fire becomes too large.

SURVIVAL FIRST AID

WHAT IS FIRST AID

'First Aid' is the immediate assistance or treatment given to someone injured or suddenly taken ill before the arrival of a medic/doctor or other appropriately qualified person. The person offering his help to a casualty must act calmly and with confidence and above all must be willing to offer assistance whenever the need arises.

The Aims of First Aid:
- Preserve life
- To limit the effects of the condition
- Promote recovery

Assess the situation
- Observe what has happened quickly and calmly
- Look for dangers to yourself and the casualty
- Never put yourself at risk
- Protect the casualty from danger
- Be aware of your limitations

Assess all Casualties and give Emergency First Aid:
- Assess each casualty to determine treatment priorities and treat those with life threatening conditions first.

RESUSCITATION

For life to continue, the body requires an adequate supply of oxygen to enter the lungs and be transferred to all cells in the body through the bloodstream. In particular, if the brain, the organ that controls all bodily functions, does not have a constant supply of oxygen it will begin to fail after three or four minutes. Without oxygen, the casualty will lose consciousness, the heartbeat and breathing will cease and death will result.

THE A.B.C. OF LIFE

Three elements are involved in getting oxygen to the brain. The air passage or 'Airway' must be open so that oxygen can enter the body; breathing must take place so that the oxygen can enter the bloodstream via the lungs; and the blood must travel around the body (the circulation), taking the oxygen to all the tissues and organs, including the brain.

RESUSCITATION TECHNIQUES

The priority in treating any casualty is to establish and maintain effective circulation. This section tells you what you can do to assist a casualty whose breathing has stopped. The sequence of techniques used to sustain life in the absence of spontaneous breathing is known as Cardio Pulmonary Resuscitation (CPR).

First aid priorities
Keep the brain supplied with oxygen by following the A.B.C. of resuscitation, open the 'Airway' and maintain Breathing and Circulation. Obtain professional medical help urgently.

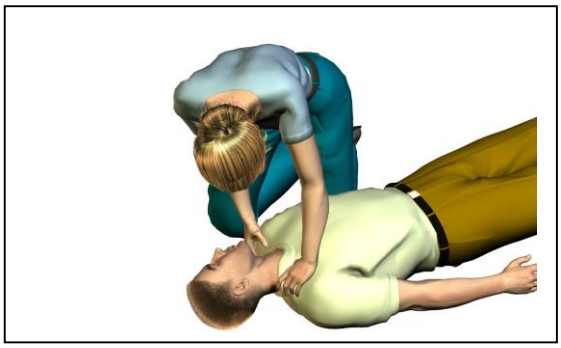
RESUSCITATION IN AN ADULT

Check for your own safety
- Electric cables
- Smell of gas

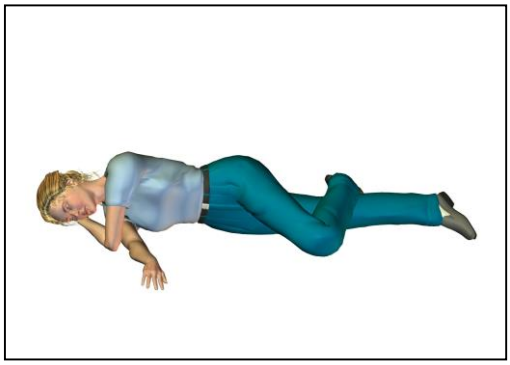
Check for responsiveness
- Push the shoulders gently down, and ask " are you alright ? "
- Call for help

Clear Airway
- Head tilt/Chin lift (to clear tongue)

Check breathing
- Look, listen for ten seconds



Scenario 1
- Breathing present, turn into Recovery Position



Scenario 2
- No breathing
- Get help before commencing CPR
- Fetch AED

In general
- Ratio for 30 CPR compressions and 2 ventilations
- If there is other help available designate someone to go for help, fetch an AED and tell them to return.

WOUNDS AND BLEEDING

Any abnormal break in the skin or on the body surface is known as a wound. Open wounds allow blood and other fluids to be lost from the body and germs to enter. If the bleeding is purely internal, the wound is closed. This is recognized by bruising (damage to the blood vessels) and swelling along with other signs. Wounds can be quite daunting, so controlled; quick action is needed to reduce blood/fluid loss and shock.

TYPES OF BLEEDING

Arterial Bleeding:

This type of bleeding is mostly noticed by the richly oxygenated blood, which is bright red. It is also under pressure from the heart, so it tends to spurt out in time with the heartbeat. A severed main artery may jet blood several feet high and also rapidly reduces the volume of circulating blood.

Venous Bleeding:

The venous blood, having less oxygen, is very dark in colour and tends to flow as opposed to spurt. Blood from a severed major vein may gush profusely.

Capillary Bleeding:

This type of bleeding/oozing occurs at the site of all wounds. Capillary bleeding may at first be brisk, but blood loss is usually slight.

PRIORITIES

External Bleeding:

- Control blood loss by applying direct pressure (10 min) to the wound and elevating the injured part
- Apply defused pressure over the wound with a dressing (two if necessary) to protect from infection and promote natural clotting. If bleeding comes through both dressings then add more dressings and apply pressure (after 10 min the bleeding should stop)
- Minimise the risk of shock
- Apply dressings to protect from infection and promote natural clotting
- Pay attention to hygiene with regards to cross infection

Internal Bleeding

- Treat for shock
- Monitor breathing and pulse rate
- Take samples of any specimens passed
- DO NOT give anything to eat, drink or smoke

SHOCK

There are obvious varying degrees of shock, but virtually anything can bring somebody to suffer from it, whether it is from; fluid loss, gassing, choking, or even seeing somebody in distress. What actually causes shock is a lack of oxygen to the brain and other vital organs.

- Rapid/weak pulse
- Pale grey/blue skin
- Cold and clammy
- Rapid/shallow breathing
- Weakness
- Nausea and possible vomiting

- Treat the cause
- Lay the casualty down and elevate legs
- Reassure & keep warm
- Monitor breathing/pulse
- Loosen tight clothing
- DO NOT give anything to eat or drink and no cigarettes

BURNS

There are many types of burn, i.e. chemical, electrical, scalds, etc.

Initial treatment
- Remove the source
- Cool for at least 10 minutes (with chemicals 30 minutes) with copious amounts of tepid running water (preferably), or any other liquid available such as milk, orange juice, etc.
- Protect from infection by covering the affected area
- Treat for shock

Do not
- Apply fluffy bandages
- Ointment or fats of any kind
- Give the casualty anything to eat or drink

FRACTURES

There are a number of different types of fractures, compound fracture (open fracture). This is where the bone has come through the skin and your priorities must then change to controlling the bleeding and then immobilizing the fracture. There is also a complicated fracture where the bone has broken and also severed a vein or artery. However, all we are concerned with is the initial treatment given to any particular type of fracture.

Treatment
- Control any bleeding present
- Steady and support the injured part, if at all possible
- Provide more permanent support with padding or bandaging (use an uninjured part of the body as a splint)
- Treat the casualty for shock
- DO NOT give anything to eat, drink or smoke
- Obtain medical assistance

EFFECTS OF EXTREME TEMPERATURE

For the body to function properly its temperature must be kept at about 37°C (98.6°F). Therefore, extremes of both hot and cold can damage the skin, other tissues and vital organs. The brain is one of the vital organs most easily impaired by extreme temperatures, closely followed by the heart. In severe cases, death may result.

The body regulates its temperature by balancing heat production against heat lost to the environment. Heat loss is affected by environmental temperature, wind and contact with cold or hot surfaces. Heat loss is much greater in water than it is in air.

Temperature regulation is achieved using a number of mechanisms:
- **Metabolic heat production** – heat produced by shivering and physical activity
- **Sweating** – heat loss as a result of evaporation of moisture from the skin
- **Shutting down blood flow to the skin conserves heat** – while increasing blood flow to the skin loses heat
- **Insulation** – clothing and body fat insulate the body, reducing heat loss

While some of the above functions are involuntary, others are dependent upon behaviour such as level of physical activity, intake of food, clothing worn and body posture.

THERMAL STRESS AND ITS EFFECTS

Definition : A significant decrease in body core temperature to a value of 35°C (95°F) or below
Cause : The rate at which heat is lost from the body is greater than the rate at which heat is produced by the body

DIAGNOSIS OF HYPOTHERMIA

The diagnosis of hypothermia can only be made accurately when a measurement of the body core temperature has been made. Ideally, this should be made immediately and is always done in any situation where hypothermia is expected or likely.

The most reliable technique for the assessment of body temperature is the measurement of rectal temperature. Although this may be socially unacceptable, it is the method which is likely to be encountered.

However, in an emergency evacuation situation, especially in lifeboats or life rafts, it would not be used. Therefore, careful monitoring of each individual should be carried out, with particular attention being paid to the development of the signs and symptoms of shock and hypothermia.

Signs and symptoms of hypothermia
A very quick visual assessment of the casualty often reveals a lot of information concerning the casualties' condition. Remember, like shock, hypothermia can progress very quickly, so do not delay the assessment of the casualty.

Is the casualty:
- Cold to touch?
- Looking cold/blueness of extremities?
- Shivering?
- Confused or disorientated?
- Unable to perform simple mental arithmetic?
- Showing signs of abnormal behaviour such as aggression or introversion (a prior knowledge of the casualty is useful in this situation)?
- Suffering from memory loss (either of events, which have just happened, or of a common knowledge)?
- Having problems with slurred speech?

SHORT-TERM IMMERSION

This phase refers to periods from 3 minutes to 30 or more minutes, following immersion when the effects of cold shock have declined, but hypothermia has not yet developed.

During this period the individual will feel very cold and the body temperature will be decreasing, resulting in heavy shivering, particularly in those not protected by an immersion suit.

Swimming is difficult in cold water and even excellent swimmers may only manage 50 to 100 metres before collapsing. The hands and feet quickly become numb, making self-help increasingly difficult. Drowning remains the major risk during this period, particularly in rough seas and in those not protected by a lifejacket and spray shield.

Once clear, it is important to keep movements to a minimum, to conserve energy and reduce further heat loss. During this first half hour immersion, individuals should, where possible, attempt to attract attention and then make their way towards, or be assisted into, any nearby life raft , survival or fast rescue craft. However, if none are close to hand, it is important to carry out the following procedures in order to aid survival.

Adopt the Heat Escape Lessening Posture (HELP) with one leg crossed over the other, arms tucked close into the body and hands under the lifejacket. If you have a spray shield make sure that it is deployed as soon as possible, in order to protect your breathing. If you have no protection, then you may have to cup your hands over your nose and mouth to protect your airways from waves and spray breaking over your face. Should you be in a group, link arms and form a “huddle”. Conserve your energy, keep movement to a minimum, stay together for warmth and to help rescuers find you.

METHODS OF REWARMING A VICTIM OF HYPOTHERMIA

1. **Rapid rewarming**
Immersion of the body trunk in warm water (41-42°C / 105-107°F) is a classic method of rewarming a hypothermic casualty and is the fastest method of restoring body heat.

This is because heat is applied to the shell or trunk of the body rather than to the body core. It is of value as it rewarms the heart, decreases blood thickness (viscosity), raises the threshold for ventricular fibrillation, improves the heart’s work capacity and restores hydrostatic pressure. It can, however, cause collapse of the casualty and therefore should be carried out ideally by experienced medical personnel.

Improperly warming the body will drive cold blood from the extremities to the heart, which can lead to heart failure

The immersion technique may also be used by less experienced rescuers to treat a casualty who is shivering heavily, but who is still conscious. Take care not to over warm; the casualty may feel faint when getting out of the warm water. Following rewarming it is advisable to keep the casualty at rest for 24 hours, during which time, if possible, a doctor should examine the casualty.

2. Rewarming by insulation (warm blankets /sleeping bag)
Again, this is a very old technique which, in some situations, will be the only method available, e.g. in a lifeboat / liferaft. This technique is essentially a passive one in so far as allowing the casualty to rewarm him/herself by his own heat production. Thus, the vital part of this method is to ensure that the casualty loses no more heat.

This may be achieved in a number of ways. Firstly, it may be necessary to remove any wet clothes and replace them with dry coverings (if none are available then as much water as possible should be wrung out and replace with dry clothing). The casualty should be covered in extra clothing and / or blankets, if possible, remembering to keep the head and extremities covered and protected as well, because a considerable amount of heat can be lost if they are left unprotected.

At all times the casualty must be handled as carefully as possible, keeping movement to a minimum. If possible, place the casualty in a horizontal position with feet slightly raised. Remember to keep checking the vital signs; airway, breathing and circulation.

Help remove wet clothing, etc. In extreme cases, it may also be necessary to use the "Buddy" system to provide heat transfer.(Prevent heat loss in rescuer) This is simply a case if one or maybe more rescuers getting as close to the casualty as possible (with the least amount of disturbance to the casualty) in order to prevent heat loss. The value of this technique is that it gives a slower increase in blood flow to the limbs and the skin (slower peripheral vasodilatation). It avoids surface heating and a lesser workload on the heart with slower changes in blood pressure.

THE EFFECTS OF OVERHEATING

During strenuous exercise and/or in a hot environment, heat is released and distributed throughout the body, causing the body temperature to rise.

The body then reacts immediately:
- Skin capillaries dilate so that more blood moves nearer to the skin's surface, increasing heat loss and causing the person to look flushed and hot
- Sweat glands producing more sweat, evaporation of which helps cool the body
- The breathing rate increases so that more heat is lost from the lungs (via water vapour)

There are 3 conditions produced by overheating:
- Heat cramp
- Heat exhaustion
- Heat stroke

HEAT CRAMP
Usually occur after exercise when the body is cooling down again, under the shower for example. Heat cramps are not dangerous, but may be extremely painful.

HEAT EXHAUSTION

Heat exhaustion is a body temperature of 38°C - 39°C, usually caused by working in hot and humid environments, resulting in a loss of water and salt from the body through excessive sweating. It is aggravated by vomiting and diaries.

Signs and symptoms:
- Headache, dizziness and confusion
- Loss of appetite and nausea
- Sweating with pale, clammy skin
- Cramps in the arms, legs or the abdominal wall
- Rapid, weakening pulse and breathing

Treatment:
- Move the casualty to a cooler environment if possible
- Place in a half sitting position supporting the head and shoulders
- Replace lost fluid and salt (ORS)
- Remove excessive clothing and cool if necessary
- If unconscious, place into the recovery position
- Seek medical aid

HEAT-STROKE

Heat stroke is a body temperature above 39°C, usually caused by failure of the thermostat in the brain to regulate the body's temperature.

Signs and symptoms:
- Headache, dizziness and discomfort
- Restlessness and confusion
- Hot, flushed and dry skin
- A rapid deterioration in the level of response
- A full bounding pulse

Treatment
- Move the casualty to a cooler environment if possible
- Remove excessive clothing
- Lower the casualty's body temperature by wrapping the casualty in a sheet and sprinkling the sheet with water. Continue until body temperature returns to 38°C
- If unconscious, place into the recovery position
- Seek medical aid

IMMERSION SUITS

GENERAL

Immersion suits are one-piece protective garments designed to provide the wearer with protection in cold water, where individuals are at risk from losing excessive quantities of heat.

There are many requirements laid down by operators and government bodies to ensure high standards of suit performance. These include the type of material used to construct the suit, performance of the suit ergonomically, as well as thermally, and clear instruction in English on its donning and general use.

The make and type of survival suit depends upon the environment within which it is used and the operator in question, but in all cases the individual must be aware of the operational use of whatever garment he is provided. Furthermore, if the garment does not remain with his personal possessions he must ensure that he is aware of where it is stored, particularly in the event of an emergency when rapid deployment may be necessary.

These suits may take several forms depending on their usage. Broadly speaking they may be divided into two groups:

- Helicopter immersion suits
- Abandonment suits

DONNING PROCEDURE

Many types of survival suits are available for use and the donning procedure will vary from suit to suit. Some have neck seals, gloves, built-in boots, etc. and it is VITAL that the wearer familiarizes himself with the different garments. It can be appreciated that this is especially important when donning is necessary. Regardless of suit type, however, several checks must be made prior to donning.

Make sure:
- The suit is in good working order
- The size of the suit is appropriate
- Any seals present are intact
- All zips operate freely, from top to bottom
- All survival aids are present (whistle, light, gloves, etc.)
- There is no damage to the suit that would reduce its effectiveness (rips, tears, etc.)

Any problem noticed should be reported to the relevant department for attention to facilitate a high level of suit maintenance.

Helicopter (Immersion) transportation suit

Work / boat driver suit

Survival suit (one size fit all)

EMERGENCY USE

Once the wearer has donned the suit correctly he should be ready for water entry, either from a helicopter or an installation. Under the circumstances it is important to give the suit the best possible chance of providing the wearer with protection against cold water.

The body zip must be fully deployed to reduce the possibility of water entry, as even small amounts of water within the suit significantly reduce the insulation provided, with a resultant increase in body heat loss. If a hood or gloves are provided these must be used from the outset as the head and hands are two areas of the body with high levels of heat loss.

Although these suits are designed for use in water it must be remembered that individuals must attempt to remain as DRY as possible at all times. Once in water it is important to remain as still as practicable to reduce the possibility of further water ingress unless swimming towards or boarding a survival craft.

MARINE & AVIATION LIFEJACKETS

GENERAL
Many different types of lifejackets are at present used on oil/gas installations, shipping and aircraft in the North Sea and elsewhere. Whatever the type, however, rigorous requirements for lifejackets and attachments are laid down by the Merchant Shipping (Life Saving Appliances) Regulations, Safety Of Life At Sea (SOLAS) and the Civil Aviation Authority, to ensure adequate construction and performance of these garments.

Among the requirements are that they must be easily donned, comfortable to wear, hold the mouth and nose of an unconscious person clear of the water and be able to right them from a face down position in not more than 5 seconds. When used correctly, they should also allow the wearer to jump from a height of at least 4.5m into water without injury, or damage to the lifejacket.

The many types of lifejackets can fall under one of two headings:
- Marine lifejackets
- Aviation lifejackets

MARINE LIFEJACKETS

- Inherently buoyant lifejackets
- Partially inherently buoyant lifejackets
- Automatic gas-inflated inflatable lifejackets

Inherent buoyant lifejackets
These are the simplest types of lifejacket. They are bulky garments constructed of Kapok or synthetic material to provide the buoyancy and are covered in a durable material, such as pre-shrunk cotton of a highly visible colour (international orange).

The donning of all lifejackets varies with the type, but they are so constructed to be capable of being worn inside out, or clearly capable of being worn only one way and, as far as possible, cannot be donned incorrectly.

Partially inherent buoyant lifejackets
This type of lifejacket is less commonly used in the maritime environment. They do contain synthetic buoyant material within the garment, but have the additional facility of being able to be ‘topped up’, using an oral inflation tube to provide extra buoyancy if required.

Automatic gas inflatable lifejackets
These lifejackets are often worn when working in a hazardous environment and include a variety of mechanisms to ensure that they will automatically inflate on contact with water.

In addition to complying with the above requirement, these lifejackets must not have less than two separate inflatable chambers. In the event of the loss of buoyancy in any one chamber, the remaining one is capable of complying with the requirements previously mentioned.

These lifejackets have three mechanisms for inflation:
- Automatic inflation on immersion
- Single manual motion, e.g. pull one toggle to inflate both chambers
- Oral inflation

The type of marine lifejacket available to the wearer will depend upon the user/operator's policy. It is the responsibility of the user to know which lifejacket is available to him and how to use it effectively.

AVIATION LIFEJACKETS

Similar to the gas inflated lifejackets, aviation lifejackets rely on an inflation system to provide the buoyancy. These jackets, when worn, are dilated in the form of a waistcoat. In this condition they are less bulky and are suitable for helicopter travel.

Each lifejacket is fitted with a light source, operational for a period of 12 hours when activated. A whistle may also be attached. The lifejacket is made up of single compartments and is inflated by a sharp tug on the inflation toggle, which causes the release of CO2, which inflates the jacket. It can be 'topped up' using the oral inflation tube provided.

On the more sophisticated jacket types, a search and rescue beacon may be found which, when switched on, sends out a continuous distress signal on a suitable radio frequency.

Important additions to lifejacket attachments (marine and aviation) are the spray visors, which in many cases have been attached. This device provides protection to the airway from wave slap and accidental inhalation of water, which is especially likely during initial immersion in cold water, where rapid rises in breathing rates may be experienced. These visors are deployed soon after initial water entry. Rolling the visor over the wearer's face, the bottom end being attached to the base of the lifejacket by a Velcro-type tape, does this. These lifejackets should NOT be inflated inside the aircraft.

Donning the lifejacket

Specific donning instructions are posted in all areas where lifejackets are stowed. It is the individuals' responsibility to ensure that they are fully conversant with instructions for use.

Use of a lifejacket

Once the lifejacket has been properly donned, it is ready for use. If it is necessary to enter the water while wearing a lifejacket, the 'step off' routine must be observed.

The sequence of events is as follows:

- Remove false teeth, spectacles and sharp objects
- Get as low/close to the water as possible
- Block off mouth and nose with one hand, allowing the free hand to be placed over the top of the lifejacket with a secure grip. This helps to brace the jacket in readiness for impact with the water
- Look down and check that all is clear below
- Stand up straight, look directly ahead and step off. The feet should then be brought together.

Water entry from a height should, if possible, be avoided. If the individual is in a 'no alternative' situation, at whatever height and is forced to step off, then of course the individual will have to do so.(jumping from a height more than 4,5 m whilst wearing a lifejacket could cause injury)

If no alternative is possible and a water entry above 4,5 m is the only solution the lifejacket should be taken not worn. Only when the individual has fully surfaced and is floating on his back should the arms be taken away, and the spray hood, if present, be deployed. The individual should move away from the danger area by lying on his back, using the arms as paddles and keeping the legs still. He should adopt the HELP position (feet and knees together, brought up towards the chest area and hands placed underneath the lifejacket).

If there are a number of survivors in the water, they should form a 'survival circle' or 'huddle' in an effort to stay warmer, remain together and to be seen more easily by rescuers.









STC-KNRM
OFFSHORE-SAFETY

TYPES OF INFLATABLE LIFERAFT

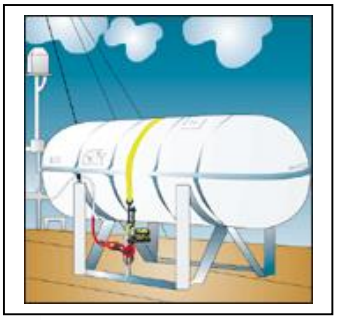
LIFERAFT

For use in the marine, offshore and aviation environment there are various methods of launching inflatable liferafts.

CONVENTIONALLY LAUNCHED LIFERAFT

This liferaft is stowed in a canister/valise and attached to the deck in a convenient location for launching. Within this category there are several types of raft, but generally they are constructed with two superimposed buoyancy tubes. Each buoyancy tube is capable of supporting the full complement of the raft, should one fail. The arch of the raft automatically inflates, raising the flame-orange canopy, which provides immediate relief from the environmental conditions.

The floor is double-skinned and is inflated manually, providing insulation from the cold sea and improving stability. Webbed or inflatable boarding ramps are provided at both entrances, together with a lifeline located on the outside perimeter of the raft. The compliment of the liferaft varies and is indicated on the liferaft and canister.



Operation of a liferaft
Prior to launching, several checks have to be made on the equipment. Points to check should include:

- Length of the painter line (it is important to ensure there is enough line to avoid inflation of the raft before reaching sea level)
- Compliment of the raft (the number of personnel the raft can accommodate)
- Ensure the painter is secured to a strong point
- Check there are no obstructions below the deck. The liferaft should then be released from its stowage, picked up and thrown over the side. It should not be rolled over as it is possible that this will disturb the package of the raft, thus increasing the chances of the raft inflating upside down. The painter should then be pulled in until the raft inflates to the full extent.

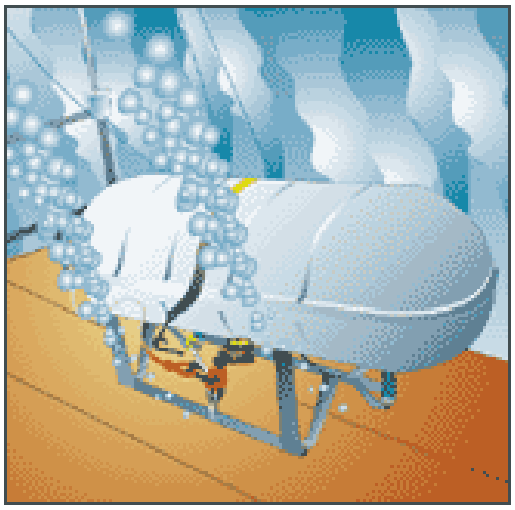
When possible, the liferaft should be boarded dry..

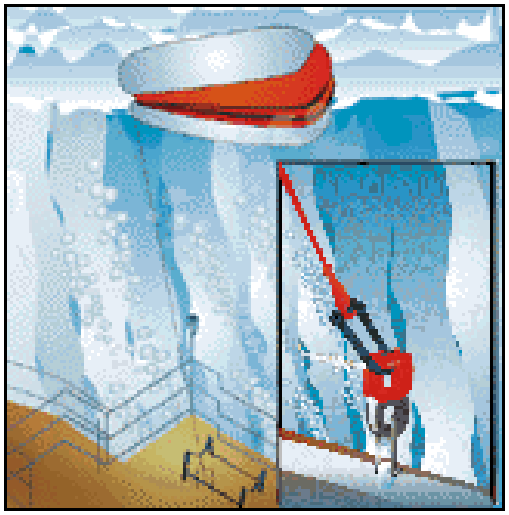
Water-borne survivors arriving at the raft should help each other to board; those remaining in the water should hold onto the lifelines around the outside of the raft whilst waiting to board.

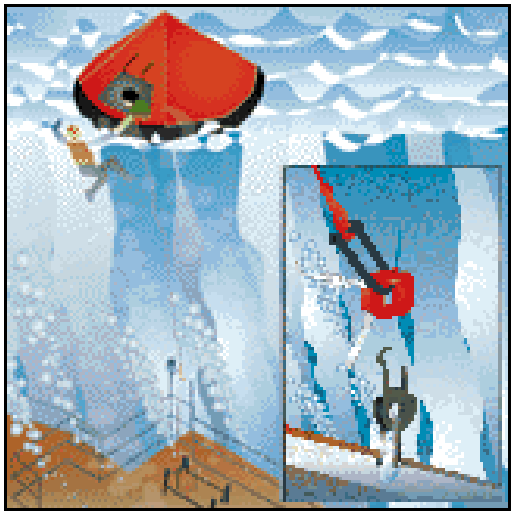
HYDROSTATIC RELEASE LIFERAFT

The glass fibre canister containing the rafts are usually fitted with a hydrostatic release mechanism bolted to the deck, while the other end is attached to a pelican hook and painter line. This device ensures the release of the liferaft from its stowage position, should manual release be impossible, as in the event of the liferaft becoming submerged or dragged down by a sinking installation/vessel.

At a predetermined depth it is automatically released, thus freeing the pelican hook and allowing the canister to float towards the surface. Under these circumstances the painter line is attached to a secure point via a ‘weak link’. As the installation/vessel sinks, the ‘weak link’ is of sufficient strength to withdraw the painter line from the liferaft canister, so operating the inflation system. Ultimately the ‘weak link’ parts, leaving the raft floating untethered.







Hydrostatic release unit

colours represent activation depths: Blue 6 Mtr
Green 4 Mtr
Yellow 1,5-4 Mtr

DAVIT LAUNCHED LIFERAFT

This type of liferaft is also stored in a canister/valise and located beside a single davit arm, from which it is launched. The design of this raft is the same as the conventionally launched types, with modifications, to enable it to be lowered to the water from the deck with its full complement. The liferaft is inflated at a height prior to being boarded.

Checks made prior to launching a liferaft:

- Painter secured to a strong point
- Length of painter is sufficient
- Check the number the raft can accommodate
- Release liferaft from stowage; make sure there are no obstructions below and throw the raft over the side

Helicopter Liferaft

This type of life raft can be stored in a bag, Sponsons or inside a helicopter.

This is a reversible liferaft with no distinction between top and bottom and so can never be deployed upside down.

Righting an upturned liferaft
In the event of a liferaft inflating upside down, a person in the water must right it. The individual must swim on his back, using arms only, arrive at the liferaft on the same side as the gas bottle before reaching up and taking a hold of the righting strop.

Facing the liferaft they then pull and kick themselves onto the raft over the gas bottle. Once on the raft, stood up, individuals place their feet on either side of the gas bottle, holding onto the righting strop, lean back over the edge allowing their weight to bring the raft to the vertical position. (use the wind direction to assist turning)

Once the raft has reached the vertical position and is coming over the individual, the individual needs to keep hold of the righting strop and pull themselves on their back to the opposite side. This leaves the individual in a good position to board the raft if necessary.

Self righting life raft

VITAL ACTIONS ON BOARDING LIFERAFT
Cut! Stream! Close! Maintain!

Cut the painter
When all survivors are on board the liferaft, if necessary the painter should be cut using the safety knife provided. The raft should then be paddled clear to a safe area, away from danger. A constant lookout for other survivors in the water is important at this stage of the incident.

Stream the sea anchor (drogue)
This is located at one of the entrances and is attached to a strong point on the outside of the raft. There is a spare anchor stowed in the survival pack. The sea anchor serves several useful purposes:

- Maintaining the entrances at right angles to the weather.
- Helps stabilise the raft in the water.
- Slows down the rate of drift.

Close down the entrances
In most cases this is done using a system of straps or simple elastic to provide protection from the weather. Instructions to close down are found written on the side of the canopy or in the survival bag.

Maintain the sea worthiness of the liferaft
It is important to maintain the liferaft as soon as everyone is on board. There are several priorities to be attended to:

- Bale out the seawater.
- Inflate the floor/canopy.
- Check for leaks.
- Administer first aid, if necessary.
- Post lookouts.
- Issue seasick tablets.
- Check emergency rations and equipment.
- Have pyrotechnics ready (read instructions prior to using them).

KEEP UP MORALE !!!!

HELICOPTER TRANSPORTATION & METHODS OF ESCAPES

HELICOPTER TRANSPORTATION SAFETY

There are many types of helicopters being operated in the offshore industry and elsewhere. These notes are designed to give general procedures, which can be utilized in any aircraft. Before flight the operators give more detailed information by either a briefing or video presentation, backed up by information sheets for each specific craft.

Before flight
- Arrive in good time, in good mental and physical condition.
- Collect survival suit (check size, method of wearing).
- Collect lifejacket (check correct method of wearing and how to inflate) and EBS.
- Note type of helicopter to be used for flight.

Boarding
- Never walk under the rotors at the front. Do not approach the tail.
- Zip up suit.
- Beware of high winds or unusual conditions, which can cause the main rotor blades to dip considerably anywhere around the aircraft.
- Take great care not to damage the helicopter floats.

During flight
- Observe 'No Smoking' and fasten seatbelt signs
- Obey pilot at all times.
- Sit in the seat that you are instructed to by the pilot or cabin crew.
- Do not remove seatbelt until instructed.
- Wear ear protection.
- Report unusual occurrences to the helicopter crew.

EMERGENCY LANDING

Final preparation
In the event of an emergency, passengers must carry out emergency actions:
- Tighten seatbelt, check lifejacket is tight enough.
- Check emergency exit.
- Remove glasses, stow away loose objects, etc.
- Put hood up and secure suit.
- Take up impact position.

If crash is imminent and the time is too short to carry out the full emergency procedures, then the most vital of the actions are to 'tighten the seatbelt and to take up the impact position'.

After impact
The helicopter crew will normally instruct passengers on the action to be taken, if for whatever reason the pilot or cabin crew are not able to do this (due to injury), then you may have to take action yourself.

The main consideration given after impact will be whether the aircraft has landed on firm ground or 'ditched' in to water.

On land
The main hazards are fire/smoke. Therefore, the procedure is to evacuate the helicopter as quickly and as safely as possible through the normal exit. If necessary, other emergency exits can be opened to assist the evacuation.

Passenger action can be summarised as follows:
- Check rotors before leaving.
- Leave helicopter via normal exits (where possible)
- Take up a position uphill / upwind of the aircraft.
- Signal to others to join up with you.
- Take survival aids, if safe to do so.
- Treat the injured.

HELICOPTER UNDERWATER ESCAPE PROCEDURES

Introduction
Whilst at STC-KNRM Training, you will be briefed and participate in drills in the Helicopter Underwater Escape Trainer (HUET) to familiarize yourself on procedures used when escaping from a ditched helicopter.
The escape from a helicopter varies depending on the attitude of the aircraft once it has ditched. It can be in an upright floating position (due to the aircraft's floatation equipment), partially sunk or capsized. The HUET is able to simulate all these eventualities, giving delegates the opportunity to experience the conditions and learn correct exit procedures.

Training exercises
Six main exercises have been designed, to simulate the most likely characteristics of cabin motion, in the event of a controlled ditching on water by a helicopter. An instructor remains inside the Trainer throughout the exercise and supervises the delegates.

Once inside the Trainer, they are briefed by the instructor on exercises they will undertake. The HUET is then winched clear of the water, whereupon the delegates carry out the five checks prior to the ditching sequence.

The checks made are:
- Check the seatbelt is secured.
- Check and if necessary prepare exit.
- Secure loose items.
- Don survival suit hood.
- Brace for impact.

These five checks prepare the delegate for ditching and for the eventual escape from the helicopter in a state of readiness. On landing on the water, the delegates locate their harness buckle with one hand, the other hand locating their nearest exit point. They then leave the simulator in a predetermined fashion, depending on the exercise undertaken.

1. Surface Evacuation
This is the simplest exercise and simulates the controlled landing on water of a ditched helicopter, where the aircraft remains upright and in a stable condition, allowing an orderly evacuation. On landing deploy EBS, the HUET remains on the surface and trainees leave the simulator under supervision of the instructor, boarding a heliraft.

2. Partial Submersion
This exercise simulates a controlled landing on the water in which the HUET remains in an upright position, but continues to sink, slowly flooding the cabin area. Deploy EBS and operate. Continue breathing underwater, look towards the exit, and count for 7 seconds. On reaching 7, the trainees release their harnesses and pull themselves out of the Trainer through the appropriate exit.

3. Rapid Capsize
This exercise simulates a descent onto the water at short notice, with a failure of flotation equipment resulting in the rapid capsize. Once the HUET makes contact with the water deploy EBS and operate, the air brake is released enabling it to immediately capsize. This reduces the time trainees have to locate their harnesses and exits. As before, once all movement has ceased the trainees make their escape through predetermined exits. Once the trainees are well clear of their exits, they then inflate their lifejackets.

SAFETY

At all time during these drills, there are instructors with the trainees where they can assist them if needs be when escaping from the HUET. During all of the drills, an air space is left at the top of the trainer for safety purposes.

Finally, to assist in identification, trainees are asked that swimmers wear blue helmets and non-swimmers wear red helmets.

EMERGENCY BREATHING SYSTEMS

Air Pocket Plus
Air Pocket is a unique Emergency Breathing System (EBS), which represents a major step forward in helicopter transport safety. It has been developed as part of the integrated Survival System, that is, personal survival equipment which is compatible and complementary, designed and engineered to maximize the survival prospects of the immersion victim by comprehensively and effectively addressing all of the hazardous physiological responses which he or she will experience. Air Pocket is so unique that it has been covered by worldwide patents.

Prior to the six years of research work which underpinned the development of the integrated survival system, the physiological responses to immersion in cold water were studied in depth by Dr Mike Tipton of the Robens Institute of Health and Safety, working at the institute of Naval Medicine, “Cold Shock” was identified as the primary physiological hazard which has to be addressed in a cold water immersion emergency.

The initial respiratory responses include reflex gasping and uncontrollable hyperventilation. In addition heart rate goes up, blood vessels constrict and blood

pressure rises, leading to increased risk of stroke or heart attack. Apart from the danger of aspirating water, the victim's breath-hold time is significantly reduced. It has been shown that the insulating effect of normal clothing, even when supplemented by a survival suit intended to provide protection from hypothermia, will only enable a mean breath-hold time of about 17 seconds to be achieved during submersion in cold water (5-10°C). This is approximately half the time estimated to be required from an individual to make a controlled, successful escape from a helicopter which has crashed into the sea and become submerged.

It was concluded that a EBS which was safe and simple to use would be an essential component of an integrated survival system, since unless the transit passenger could survive "cold shock" and egress from the helicopter, other physiological responses such as hypothermia did not become a factor in his or her survival.

The development of Air Pocket took three years and was sponsored by Shell and Esso UK Exploration and Production Ltd. It went through 7 phases of development and testing before being declared safe for general use.

Lap jacket (Lifejacket Air Pocket plus)
Air pocket plus system combined with Aviation lifejacket. This lifejacket contains an integral air pocket re-breather which automatically activates upon immersion.

The lifejacket has a nominal capacity of 275 Newton which offers excellent buoyancy and self-righting capability and is manually operated.

It has proved its performance in exacting independent tests and trials and is now in service with many operators. The LAP jacket can also be combined with Shark's Variable Insulation System (VIS) and the Shark 93204 survival suit and also Multifab's 459 and 500 survival suits.

Life jacket air pocket plus (LJAPP)

CA-EBS

The Civil Aviation Authority 'CAP 1145' review of helicopter safety following the 2013 Sumburgh helicopter crash made a series of recommendations, some relating to post-crash survivability.
Among them was a requirement for use of Category 'A' (compressed air) Emergency Breathing Systems (EBS) by passengers and aircrew.
Work has been underway to amend the OPITO training standards for BOSIET/HUET/FOET to include Category A EBS into the Helicopter Underwater Emergency Training (HUET) module of the standards.

SEA AIR transportation suit E352-D offshore transportation suit

This helicopter transportation suit has an integrated EBS system. The sea air transportation suit has a waterproof FR (flame retardant) outer fabric and a heat reflective

mid layer. The suit has an integrated lung for additional buoyancy and an emergency re-breathing system.

SEA AIR transportation suit

E352-D offshore transportation suit

SEA AIR PLB system as used in Norwegian sector

Spray hood SEA AIR

T.E.M.P.S.C. (LIFEBOATS)

TOTALLY ENCLOSED MOTOR PROPELLED SURVIVAL CRAFT (TEMPSC)

If evacuation of an offshore installation is to be waterborne, it is likely to be by totally enclosed lifeboat. There are various types in use on offshore installations. In this handbook, and while attending courses at STC-KNRM, the main types are discussed.

These are the British Watercraft, Norwegian Harding and the Freefall systems. It is possible that other types will be encountered. Once in the water however, the operational procedures of all these craft are very similar. The main difference will be in the launch systems. These can be of three types, double wire, single wire or freefall, the latter being a system found mainly in the Norwegian sector of the North Sea.

Under International Convention and National Government Law, these craft have to meet certain requirements and stringent testing is done to ensure that this is the case. Some of the main criteria, which these craft have to fulfilled, are listed below.

All totally enclosed survival craft must be constructed with rigid hull and watertight enclosure, which completely encloses the craft and will protect the occupants from heat and cold. The material used must ensure that the craft can withstand lateral impact and a drop from a height of at least 3 metres, as well as providing strength, the material should be fire retardant. The craft, with life-support systems operating, will protect the occupants in a fire (or otherwise contaminated atmosphere) for a minimum of 10 minutes. The lifeboat water spray system, sprays seawater externally over the lifeboat, protecting the fabric of the craft.

All lifeboats must also have an inherent buoyancy or be fitted with buoyant material, such that the craft will remain afloat when fully laden, flooded and open to the sea. If there is no damage, and the hatches are closed with all personnel secured in their seats, then the craft should be totally self-righting. The types of lifeboat mentioned above are, in addition, fitted with a self-contained air support system. This system must be capable of supporting the needs of the occupants and engine for a period of at least 10 minutes, during which the air pressure inside the boat must never fall below the outside atmospheric pressure.

The propulsion system in these craft must be a compression ignition engine, which will deliver sufficient power to propel the craft forward at a speed of 6 knots when laden in calm water.

Watercraft
There are many different models in use, varying in size and in the number of persons carried and they are commonly used offshore in the UK sector. Arrangements on individual installations may differ slightly; therefore it is extremely important to be fully aware of the procedures adopted for any particular boat you are designated offshore.

Harding
The Harding Company produces a variety of craft. The Harding boats are all basically similar in operational procedures. However, difference can occur and it is essential that you should be fully aware of all procedures used in your designated lifeboat offshore.

Freefall lifeboats
Today, several types of freefall lifeboats are in use on cargo ships, tankers, semi-submersibles, drilling platforms and fixed installations.
Freefall is an easily operated system, which allows the launch to be postponed to the last possible moment. Launching without engine power, the immediate forward speed gained

by the freefall launch results in the lifeboat being a greater distance from the installation than a conventional TEMPSC, thus prevents risk of the lifeboat from making contact with the shipside or rig. It also allows realistic training to be carried out during drills offshore by use of the simulated launch mechanism. The coxswain and the passengers can practice procedures required to abandon by freefall without leaving the platform.

FINAL ABANDONMENTS – ALL CRAFT

- Ensure that hatches and access doors, etc are closed
- Initiate launch (brief personnel)
- Start air support systems by ordering the opening of the appropriate valve
- Ensure water spray system is used when appropriate
- Lower lifeboat by operating brake release
- Once lifeboat is waterborne, coxswain must:
    - Operate release gear to disengage boat from falls
    - Engage forward gear and full throttle
    - Steer boat on predetermined course to clear platform
    - Once clear of installation, steer to reach the safe rescue area and then maintain boat's head to sea

Freefall TEMPSC
The coxswain will carry out similar checks to those in conventional TEMPSC, prior to loading personnel. In addition, they will ensure that the cradle is in the locked position ready to launch and that any lifting hooks and lines are clear of the craft.

It is essential to ensure that all the persons aboard are correctly seated and strapped into position prior to the launch.

Having been given clearance to launch, the coxswain carries out the required actions and the TEMPSC leaves the cradle and descends to the sea. The momentum gained by the drop propels the TEMPSC away from the installation. Once surfaced, the TEMPSC is sailed to a safe area in the same manner as a conventionally launched craft.

Notes:
It is vital for everyone's safety that all aboard must remain seated and securely strapped in. No-one should move from his or her position, unless the coxswain gives prior permission.

Once the safe area has been reached, any injured may be attended to and communications established with the rescue services. These personnel have the necessary experience and training to advise in the best methods of subsequent rescue, which will be dependent on prevailing circumstances. Circumstances may also dictate that the coxswain should consider deviating from the above plan.

These may include:
- Other TEMPSC unable to manoeuvre and drifting into danger (tow)
- Liferaft adrift (tow)
- Personnel in water (recovery)

Handling TEMPSC in rough seas
The safety and comfort of all persons aboard the TEMPSC are of paramount importance to the coxswain. In rough seas, due consideration should be given to positioning a TEMPSC in relation to the weather.

Loss of power
In the event of TEMPSC being disabled, action must be taken quickly to prevent the situation becoming more dangerous than it need be. Almost immediately the craft will begin to take up a position where it will present its largest face to the weather. This means that the craft will be broadside on, with the risk of capsize in large seas. It is possible to prevent the craft from adopting this position and bring the craft end to sea again, by streaming the sea anchor. The sea anchor will orientate the craft so that it points head into the weather. This will stabilise the craft and reduce its drift rate, keeping it closer to the main search area.

These three things are achieved by the sea anchor causing a drag on the bow of the craft, which therefore drifts downwind more slowly than the stern, until an attitude is achieved in which the craft points up-weather.

Transfer from TEMPSC
Rescue from the TEMPSC will be co-ordinated by the on-scene commander whether it concerns direct transfer to helicopter, fast rescue craft or standby/rescue ship.

Weather conditions will determine whether a transfer should be attempted. If doubt exists due to rough seas or other dangerous situations, it is advisable to remain in the survival craft where there is a greater degree of safety than to risk a dangerous transfer, where lives would be put at risk.

In the event of a transfer, it is important that the occupants avoid panic and exit the craft in an orderly manner. Remain seated and strapped in until ready to leave the craft or you are required to assist in the disembarkation of injured persons. Any injured crew member should be transferred first. Do not attempt to leave the craft until secured in a helicopter strop or a lifeline has been attached. When leaving the TEMPSC, if possible, do so at the top of a swell, especially if transferring to another boat.

GENERAL SUMMARY

Any person detailed as a coxswain of a lifeboat has a serious responsibility. In the event of an emergency occurring, which requires a lifeboat to be launched, those within such a craft will depend upon the coxswain for their safety. Any failure on his part to carry out his duties efficiently could have serious consequences. It is, therefore, in any potential coxswain's interest to ensure that they are well prepared for a situation.

Knowledge of boat systems, confidence in his own handling ability, planning ahead to account for factors such as weather, injuries, equipment failure etc., are assets, the lack of which will only be fully appreciated by a coxswain when faced with a real emergency situation.

These same points are also valid for any person working in the offshore environment. In the event of a real emergency, abandonment will be controlled with far less chance of panic than might otherwise be the case, if during drills the procedures mentioned in this handbook are followed.

OTHER METHODS OF EVACUATION / ABANDONMENT

SELSTAIR

A new entry/egress staircase system for oil platforms and other installations offshore has been developed by Norwegian company Selantic.

The system is used in exiting/entering offshore installations at or from sea level. Selantic has spent nearly four years developing this product and has designed a prototype for testing purposes. The offshore users of the Selantic evacuation chutes have often asked for the chute to be also equipped with easy access facilities. Selantic chose to develop a completely new product, finding innovative solutions to some problems and making use of familiar technology from the evacuation chute on others.

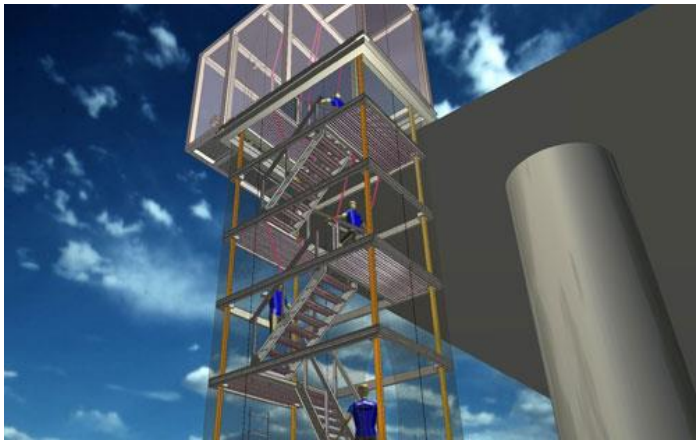
Selstair is a foldable (retractable) staircase, which is stored onboard the installation when not in use. The upper interface section may be either a swing davit, a fixed frame or vertical launch/hoist or derrick crane working as a drawbridge gangway, the latter, a more costly solution, for special purposes.

The staircase itself is a spiral, foldable ladder with aluminium pontoon, for use only on the sea, or special catamaran – shaped pontoon for multi-purpose uses; onto ice in an arctic climate; directly onto ship or onto the open sea.

It has practically no height limitation, but it is expected to be used most frequently for heights from 10 to 50 metres. Even with many people inside walking the stairs, it is surprisingly stable. There is also room to carry a stretcher, hand tools or boxes, and it can carry a very high working load in most practical applications, only limited by the foundation structure.

Selstair may be used as a safe, cost saving entry/egress system instead of costly helicopter transport. It can be used on nearby platforms or installations as easy access for maintenance purposes, or it may be the main entry system on unmanned installations. Selstair will provide access also in dense fog when bad visibility prevents the use of helicopters.

It can also be used for evacuation, either as an additional evacuation means on manned platforms and installations, or as a single, combined evacuation and entry means on unmanned installations.



MARINE EVACUATION SYSTEM (MES)

These systems for rapid deployment and subsequent evacuation of ships carrying large numbers of personnel have been introduced by most leading manufacturers to meet the increase safety demands of legislation.

SELANTIC CHUTE (Skyscape)

Selantic safety has, since 1983, developed and delivered evacuation systems for the offshore industry. The systems are based on the patented Selantic Chute and they are designed to have maximum capacity and reliability.

When deployed, the chute is kept rigid and stable by constant tension wires, and underneath it is a boarding platform, which inflates automatically when it reaches sea level. The chute itself is made from Kevlar and Nomex aramid fibres for optimal strength and fire resistance characteristics. On its circumference and at intervals of one metre, stainless steel rings are sewn into the chute.

Inside the chute, speed retarding slides and load-bearing Kevlar ropes are connected to the rings. Outside the chute the constant tension wires run through wire guides welded to the ring. Between the rings there are openings in the chute wall and the evacuee can enter/exit at any level. The open net construction reduces wind resistance, smoke collection and any feeling of claustrophobia or panic. The shape and size of the chute also makes it possible to evacuate injured or unconscious personnel.

Capacity:
Normally the Selantic chute has a capacity for evacuating 15 persons per minute. This capacity is partly dependent on wave heights, but is not expected to be lower than 5 persons per minute.

As opposed to other evacuation systems, the Selantic Chute offers continuous access to muster points at sea level, which can easily be identified by rescue vessels.

Reliability:

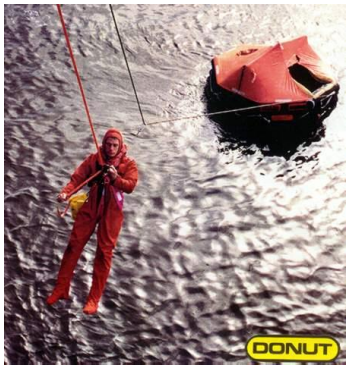
The reliability of evacuation systems delivered by Selantic Safety has been proven during numerous full-scale tests. One such test was carried out on Statpipe in the North Sea, in wind speeds up to 60 knots and significant wave heights of up to 4.5 metres. The test lasted 17 hours and the platform manger concluded that the system could be used as an effective means of evacuation.

In addition to full-scale tests and independent risk analysis, the probability of evacuating 100 persons successfully from installation, using the Selantic Chute of liferafts, was calculated to be as high as 89% in a force 6 weather state.

DO-NUT

The Problem:
An individual can not use TEMPSC, liferaft, etc. because he is trapped or because these systems are unavailable.

The Solution:
The individual obtains a Do-Nut from containers strategically located on the installation, and takes the Do-Nut to the optimum escape position available. Once the unit is donned and attached to any suitable strong point, the individual lowers himself to a safer level on the installation, or to a point above the sea. He remains in this position – visible, dry and clear of wave action – until contact is made with rescue craft, when he releases himself from the system. The system does not tangle or spin during descent and upon release, but instead recoils out of the way of evacuees and rescue craft.



STC-KNRM
OFFSHORE-SAFETY

LOCATIONS AIDS

There are many different types of location aids in use in the maritime environment. All, however, are designed to alert others of the survivors' predicament and assist in the location of survivors.

There are two categories into which all location aids can be grouped:
- Visual Location Aids – requiring the rescuer to see the signal
- Audio Location Aids – requiring the rescuer to hear the signal

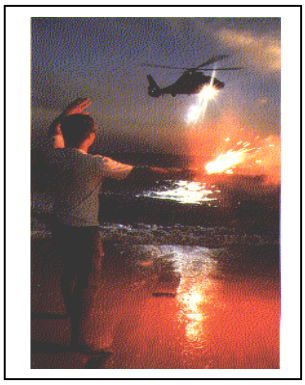
VISUAL LOCATION AIDS

Pyrotechnics
These are the most effective visual location aids, but are also the most dangerous and must be handled with care, as ignorance of correct procedures can lead to serious injury.

Parachute Rocket
For situations requiring a signal to be seen over a longer distance, the parachute rocket should be used. This will launch a flare to a height of over 300 metres from which it will descent suspended under a parachute, burning for approximately 40 seconds.

The advantage of height is that it increases the distance over which the signal can be seen. However, a certain amount of accuracy is sacrificed as the flare drifts with the wind. A parachute rocket should never be used when aircraft are within the immediate vicinity as they can pose a serious threat to their safety. They will, however, allow any vessel in the search area to take a compass bearing on which to head, bringing that vessel closer to the survival craft, which can then use other means of attracting attention.

Hand-Held Flare
This type of signal can be used, day or night, to indicate position of rescue craft within reasonable proximity to the survivors, i.e. around 3 miles. The flare burns with a very bright red light, which will last for approximately 60 seconds. Not only will light be produced but also smoke. Therefore, when using such a device, hold to leeward and 'do not' look at the flame as it can be painful to the eyes and lead to temporary loss of vision.



Smoke Signals
The limitations on any pyrotechnic which uses smoke as a means of attracting attention are visibility and wind strength. There are two main types in use; one is a hand-held device, which will produce a cloud of orange smoke and burns for approximately 60 seconds; the other is dropped in the water after activation and floats upright producing smoke for 3 minutes.

Both types produce a non-toxic smoke, but for the comfort of persons in a survival craft, these should always be activated to the leeward side. Smoke signals are perhaps most effective when rescue is from air.

The smoke is more easily seen against the sea than the sky and its drift will give an indication as to wind speed and direction. This signal should only be used during daylight hours.

Day/Night Signals
This type of pyrotechnic can be found in helirafts or sometimes carried as a personal item. Both ends of the flare can be used as there is a division, which separates a flare in one end, from a smoke signal in the other. Care must be taken to ensure that the correct end is used at the appropriate time and the pyrotechnic stored for further use.

Mini-flare Pack
Usually found in heliraft emergency equipment, the pack consists of eight single star cartridges fired from a pen-sized projector. Each flare should reach a height of 250 feet and burn for 6 seconds. As for the parachute rocket, care should be taken when aircraft are in vicinity. On all pyrotechnics, operating instructions are marked clearly and should be followed implicitly. ‘Do not’ tamper with the firing mechanism until the signal is required, as accidental discharges inside a survival craft could prove to be extremely dangerous. If any pyrotechnic does not fire when operated, it must be ditched. Do not attempt to dismantle or tamper with the signal in any way.

Powered lights
These lights can be found on liferafts (one internal, one external), certain types of lifejackets and some survival suits. A battery powers the light, where the lifespan of the cells should be a minimum of 8 to 12 hours which will pinpoint the location of survivors in the immediate vicinity. Power can be saved during daylight hours in some cases by disconnecting the battery.

The effectiveness of these lights is very much dependant on weather conditions and the height of the light from the water surface. One that is being continually swamped will not be seen so well.

Waterproof Signal Torch
These are part of the equipment to be found in the survival craft emergency pack along with a spare set of batteries and bulb. This can be used to locate survivors in the water.

Heliograph Mirror
These devices are stowed in emergency packs along with operating instructions. This method of attracting attention requires a source of light (either sunlight or search light) which is then reflected back onto the rescue craft and is therefore very much dependant on the weather conditions. Due to their complexity in operation, use this device as a backup signal in conjunction with some other method of attracting attention.

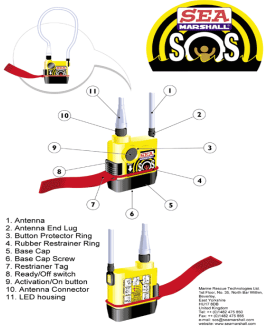
AUDIO LOCATION AIDS

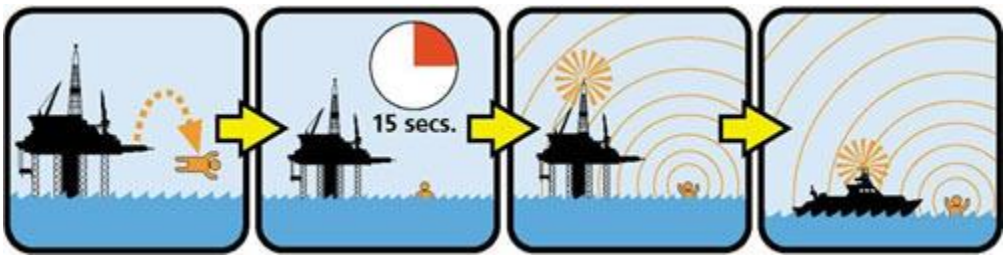
Whistle
These are provided in all emergency packs and are also attached to lifejackets. Used to attract attention over short distances, they are more effective than the human voice.

Radio Transmitting Devises
The most certain method of initiating a search is to transmit a radio signal. There are many types of transmitters on the market. These can be divided into four separate categories:

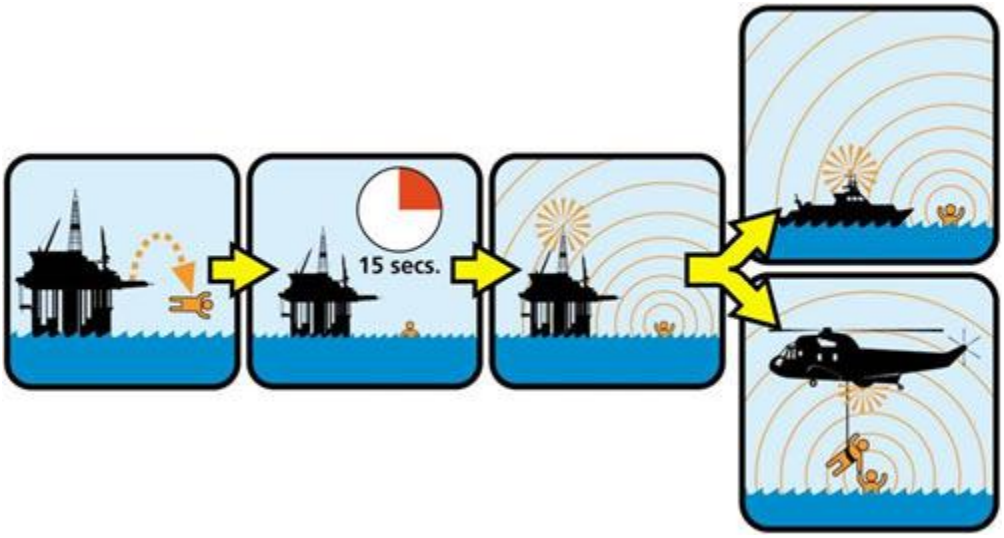
- Personal Locating Beacon (PLB)
- Emergency Position Indicating Radio Beacon (EPIRB) which are stowed in/near survival craft
- Search and Rescue Radar Transponders (SARTS)
- Emergency radios (TEMPSC)

All of these devices transmit on aeronautical or marine frequencies and should therefore be picked up within a very short time after being activated.



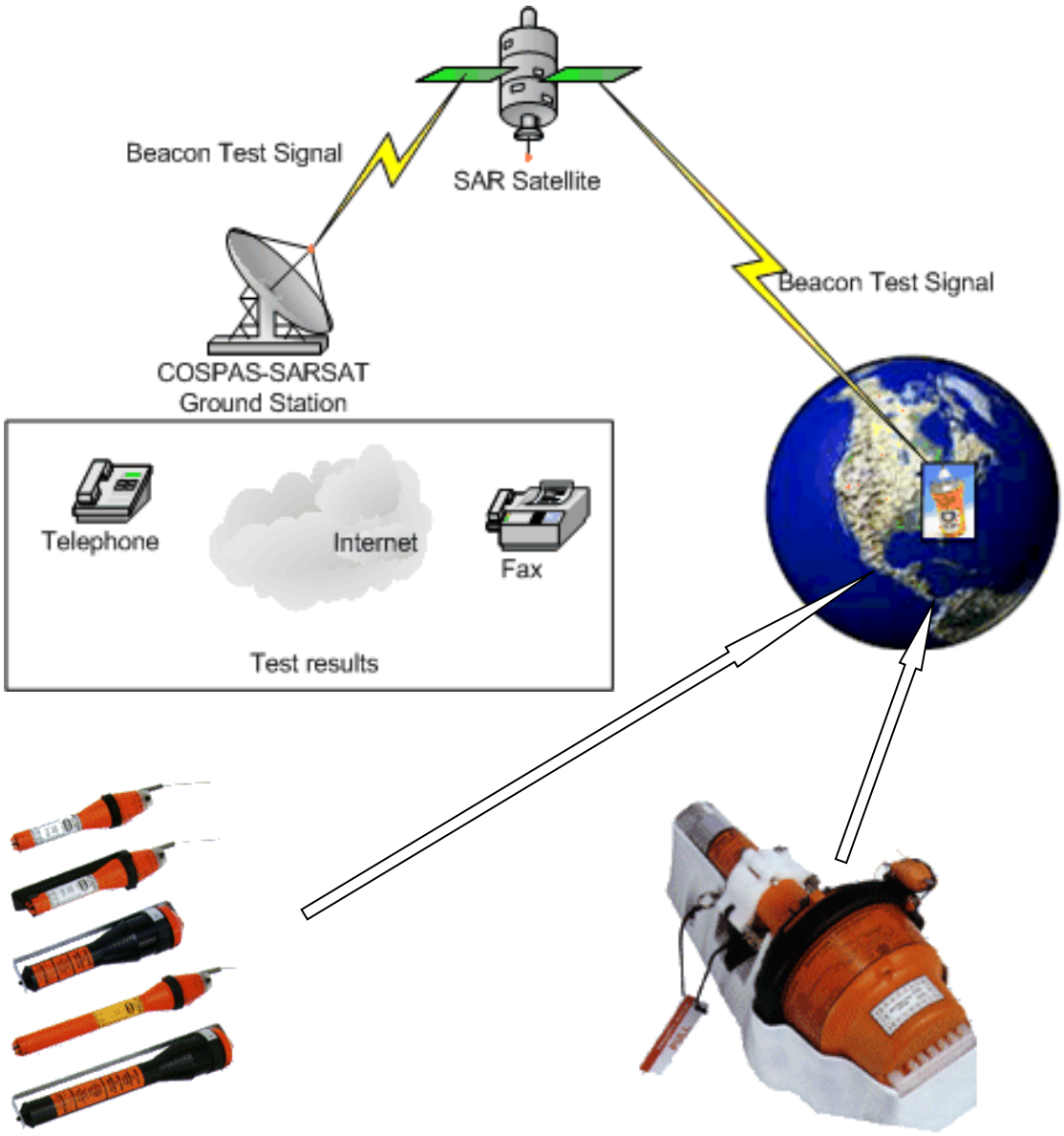


STC-KNRM OFFSHORE-SAFETY


15 secs.


SEA
MARSHALL
ALERTING UNIT (APPROXIMATE) RANGE DISTANCES
1 0.5 to 3 nautical miles from a ship to a man in the water depending on the height at which the Base Units antenna is located and the sea state.
2 7 to 15 nautical miles to a helicopter at 1,000ft.
3 35 or more nautical miles to a fixed wing aircraft over 10,000ft, increasing with altitude.

EPRIB


Beacon Test Signal
SAR Satellite
Beacon Test Signal
COSPAS-SARSAT
Ground Station
Telephone
Internet
Fax
Test results

SEARCH & RESCUE PROCEDURES

UNITED KINGDOM

The United Kingdom is required to provide maritime Search and Rescue (SAR) coverage around its coasts, under the Convention of the High Sea and Convention of Safety of Life at Sea. The statutory responsibility for initiating and co-ordinating SAR operations within the UK Search and Rescue Region lies with HM Coastguard. This includes the mobilisation, organization and tasking of adequate resources to respond to persons in distress at sea. However, it is recognised that the extent and complexity of the offshore oil and gas industry is such that many incidents in the vicinity of offshore installations can be successfully dealt with by the offshore operator using their own contracted facilities.

HM Coastguard's organizations are based upon a constantly manned communications watch system at 21 Maritime Rescue Co-ordination Centres, of which a number of these have specific responsibilities to the offshore industry.

There are both dedicated and additional facilities, dedicated being RNLI lifeboats, military and coastguard search and rescue craft. Additional facilities are those, which may be available from time to time, but are not to specific standard, i.e. vessels at sea, commercial helicopters, etc.

All facilities available for use in an emergency will be logged on a database, giving the Coastguard or operator up-to-date information on types of equipment, number of units available, where each unit is, contact details for the operator controlling each unit.

IN THE EVENT OF AN EMERGENCY

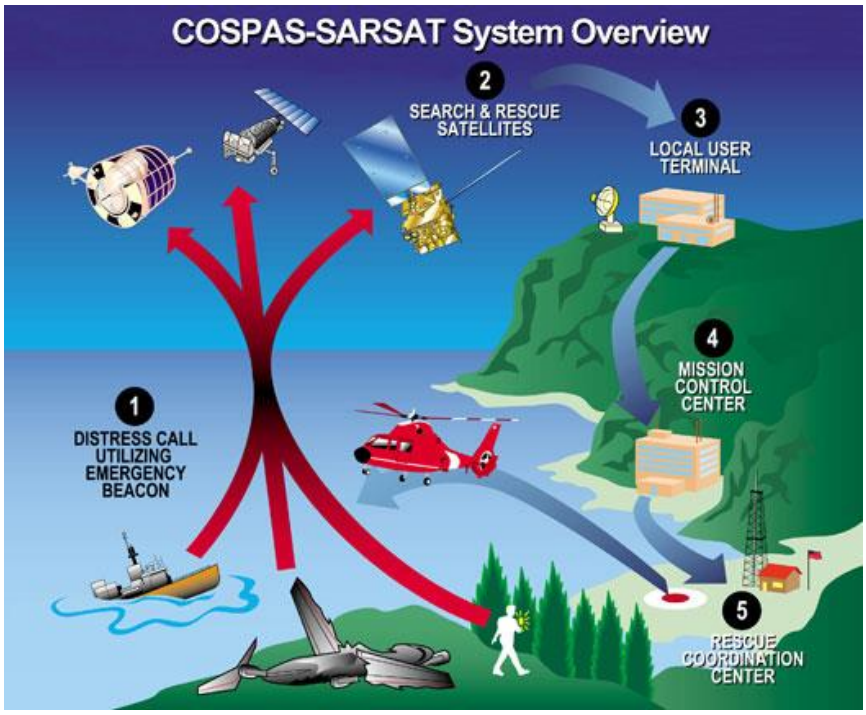
If a situation occurs where a search and rescue mission is to be initiated, the normal course of events would be to alert the Coastguard, who would have overall control of the incident.

However, in the oil industry, any mission where there is not an immediate threat to life may be handled by the operator, utilizing their own contracted facilities, the co-ordination being done by the industry's own personnel, monitored by the coastguard in case the incident develops to one where life is at risk, or there is a requirement to use declared rescue assets, when the coastguard will normally take back the co-ordination.

If the nature of the incident requires the assistance of the coastguard, they will assume total control until rescue has been effected or the search abandoned. HM Coastguard will normally delegate specific tasks to a unit close to the scene of the emergency able to implement the plan of action, controlling the assets made available and controlling communications between all participants.

This unit is called On Scene Commander (OSC). Depending on the situation this may be a nearby installation, safety or standby vessel, or suitably equipped aircraft. The OSC will modify any plans if local weather conditions or other factors change affecting flying conditions or the safety on any surface craft. He will also establish direct communications with the shore base co-ordination centre and report directly to the OSC and work through him unless told otherwise.

Depending on circumstances, a Co-ordinator Surface Search may be appointed to control the vessels taking part in the surface search, reporting to the OSC. An Air Asset Co-ordinator may also be appointed to liaise with receptor platforms, organize routing of helicopters and refuelling arrangements. In some instances they may also assist with air traffic control.



RESCUE FROM THE AIR

Single Lift
Its method involves the helicopter lowering a strop only. It is up to the person to be winched to put on the strop correctly.

Hi-line Transfer
A winch man will be lowered into the liferaft or survival craft and remain there while the persons to be rescued are winched aboard the helicopter. The winch man guides the strop by the use of a line to ensure fast and efficient recovery of a number of persons.

Double Lift
The winch man is lowered along with a strop. On reaching the person to be rescued, they will place the strop around the survivor and they accompany them back to the helicopter.

Hypothermic/Horizontal Lift
The winch man is lowered along with two strops, both of which are placed around the casualty. One strop is placed under the arms/chest, the other behind the knees. The winch man will accompany the casualty to the helicopter. This lift is used to relieve stress on the heart, which can be caused by winching vertically and is particularly used for wet, weak or cold casualties.

Single lift

RECEPTION OF EVACUEES AND SURVIVORS

If personnel are evacuated or picked up by a helicopter, they will be taken to a reception platform, if the location is close to land, onshore. Any installation, which is to be used as a reception point, will be chosen for its medical facilities, helicopter refuelling capabilities and accommodation levels. In any rescue by helicopter, certain safety points must be adhered to.

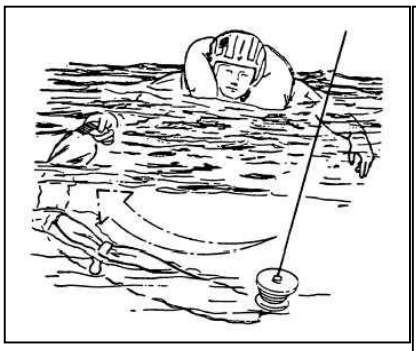
Anything lowered by helicopter may be charged with static electricity. It is important to allow this charge to run to earth before any attempt is made to touch whatever is being lowered, be it a strop or winch man. The static build-up can be quite significant and if the person to be rescued is in a weakened state due to injury or exposure, the electrical shock received may have adverse effects.

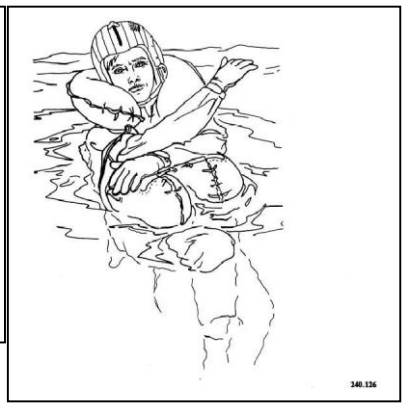
To prevent this, the winch operator will ensure that the strop or winch man is earthed prior to any contact being made.

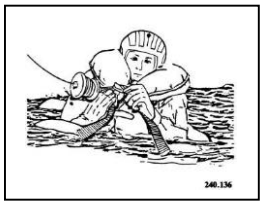
Ensure the lifting strop is worn correctly, that is clear of any part of the lifejacket and once round the body is taken as far as possible up under the arms. This is important, as the initial lift can be quite sudden and if the strop is around the small of the back, damage to the spine is possible.

During the ascent keep your arms by your side. If necessary, it is possible to ease the weight of the chest by grasping the strop. To ensure greater safety, have the strop secured as tightly as possible, and never raise the arms above head level.

At all times, do as the helicopter crew asks. They are highly trained and there is good reason for all the actions they ask you to perform.







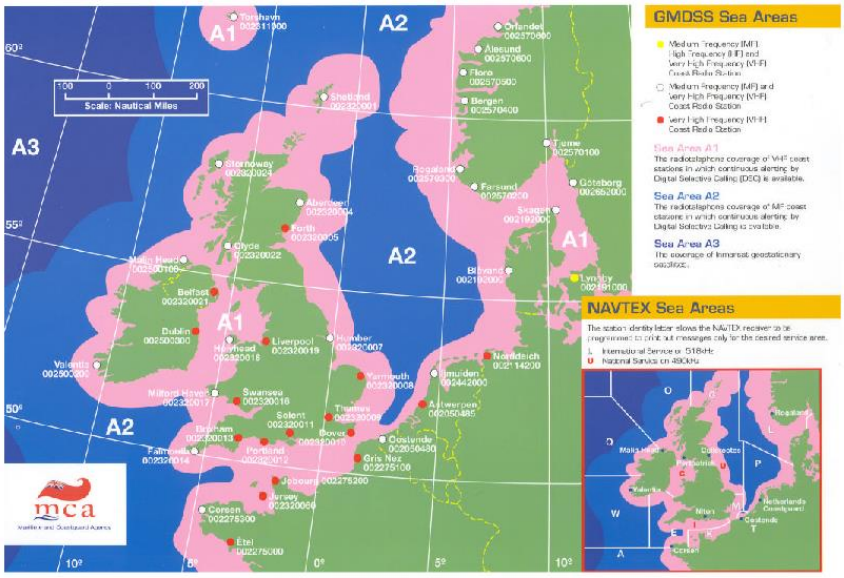
Let strop first touch water

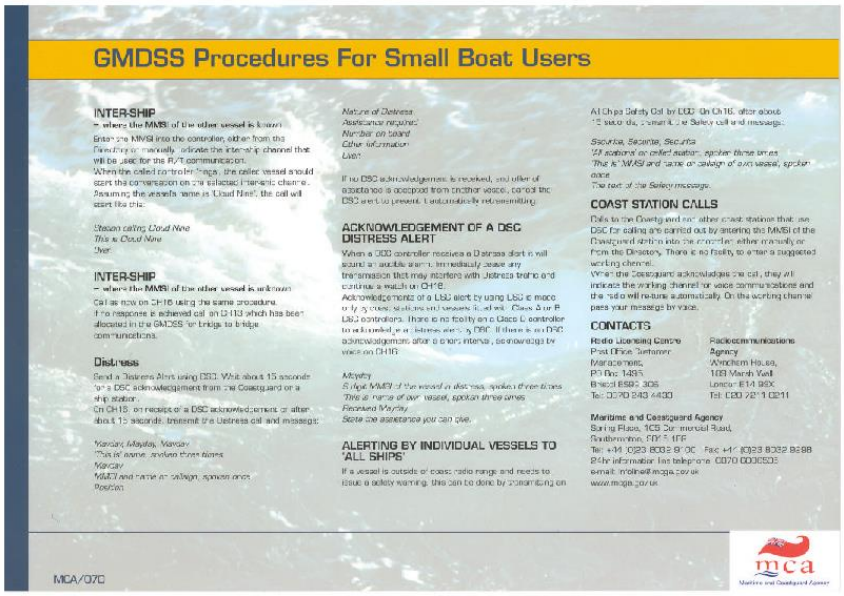
GLOBAL MARITIME DISTRESS & SAFETY SYSTEMS (GMDSS)

GMDSS uses 4 coverage areas: A1 – A2 – A3 and A4 to cover the sea areas of the world for distress watch keeping (See Page 108 for Map):

- Sea Area A1 is an area within VHF range of a coast station fitted with DSC (about 30-40 miles).
- Sea Area A2 is an area within MF range of a coast station fitted wit DSC (about 150 miles).
- Sea Area A3 is an area covered by the Inmarsat Satellite System (excluding A1 and A2 areas).
- Sea Area A4 is basically the polar regions which are not covered by the above.

In European coastal waters, area A1 and A2 are available. In the UK, A1 area coverage will be completed by 1999 and this service will be provided by HM Coastguard in addition to their A2 area distress watch. The A1 European Area has now been completed.





STC-KNRM OFFSHORE-SAFETY

Notes:

USEFUL INFORMATION

OFFSHORE TRAINING / INDUSTRIAL TRAINING / MARINE TRAINING

For a detailed list of training see:- www.STC-KNRM.nl
info@stc-knrm.nl
0031(0)104283860

Airports

Schiphol airport Amsterdam
General enquiries:
0031-(0)207940800
www.schiphol.nl

Rotterdam airport
General enquiries:
0031(0)104463444
info@rtha.com

Taxi firm:

Vlaardingen:
General enquiries:
VTC 0031(0)104354344
www.vtc-taxi.nl

Local Railway

General enquiries:
0031(0)307515155
www.ns.nl

Watertaxi

www.watertaxirotterdam.nl
0031(0)104030303

Aqualiner

www.aqualiner.nl
0800-0232545

Delta hotel

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0031(0)104345477