

Job Safety Guidelines



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1.0 Introduction

These safety guidelines are produced to inform all employees of DXC Geological Limited of potential hazards that may be encountered while performing their duties as Wellsite and Operations Geologists. It is the duty of all DXC Geological personnel to perform their work in a safe manner.

2.0 Emergency Response Procedures

The DXC Geological **Secretary** will be the person responsible for co-coordinating information between DXC Geological and the main Emergency Response Centre. The DXC Geological Secretary will normally be **Clare Clark**. If she is not available, another responsible person will be delegated this position.

Contact Numbers:

Telephone: 01642 599532
Mobile: 07958 529542
Email: ClareClark@DXCGeological.co.uk

In the event of **Clare Clark** being unavailable, the contact details of the designated responsible person will be forwarded to all personnel by email.

2.1 Duty Response Guidelines

All media enquiries and media responses will be dealt with solely by the Client to ensure confidentiality and accuracy of reporting.

The duty response person will have a list with contact details of all personnel and their next of kin and the contact details of the Clients Representatives.

2.11 Near Miss

The duty person should ask the DXC Geologist concerned to submit a written report of the incident. The report should include the time, date, location, persons / equipment involved and a full description of events. The near miss will be discussed with the Client Representative. Depending on the risk involved, a response review may be implemented to identify whether any equipment or procedural modification is required.

2.12 Accident

Co-ordinate all information through the Client Emergency Response Team Leader. Ensure all information is accurate and cross checked/verified with the Client Emergency Response Team Leader before action such as contacting next of kin. Do not pass on any non-confirmed information.

2.13 Information from the rig-site:

Note time / persons reporting / names and details of casualty(ies) / contact number / current conditions / weather / proposed plan of action on the site.

Confirm this information with the Client Emergency Response Team Leader and pass on your own name, contact number and location.

2.14 Information from Relatives / Next of Kin:

Note time / Persons enquiring/ contact number and location. State you will call back as soon as you have accurate and verified information. Check next of kin details with your records. Pass on this information to the Client Emergency Response Team Leader.

A full report must be made of the accident / incident. Follow up actions may include:

- Debriefing of geologists to gather all information
- Potential alert / circular to all personnel regarding the event
- Possible revision of procedures
- Comprehensive report to the Client with identified actions / follow up

2.15 Medical or Emergency Evacuation

The following data may be required:

- Full name and location of the Client Contact.
- All appropriate contacts (telephone / mobile phone/ Fax / email).
- Full name (s) of person(s) to be evacuated.
- Type and gravity of accident/illness (only confirmed information).
- Blood Group & allergies of casualty (ies) - (from medical records).
- Location of person(s) to be evacuated.
- Contact details for next of kin.
- Evacuation plan / route / destination.
- Use of commercial flights for evacuation or special flight details?
- Nearest airport or landing facility
- Details of accompanying personnel (doctors/nurses).
- Any anticipated problems with visa / exit permits etc?
- Any special transport at receiving location?
- Casualty condition from local diagnosis (only confirmed information).
- Any other relevant points / difficulties / problems?

All information must be confirmed and accurate - not assumed.

2.16 Definitions

- Accident:** any unplanned or unforeseen event that resulted in injury to personnel and / or damage to equipment.
- Incident:** any unplanned or unforeseen event that could have caused injury to personnel and or / damage to equipment.
- LTI:** a Lost Time Incident is an accident at work that results in an employee / sub contractor being off work for more than one day.
- Near Miss:** is an accident that almost resulted in injury or loss and / or damage to equipment.
- Emergency:** is an abnormal condition resulting in injury to personnel and/or damage to equipment that requires action to stabilize, prevent deterioration and/or recurrence.
- Medivac:** is the evacuation of injured personnel from a rig site to better medical facilities.

3.0 HSE Rules

Introduction

This section defines the standards and rules, which relate to all employees while at work. All employees are responsible for observing these rules and behaving in a safe, healthy and environmentally responsible manner while at work.

All employees must take reasonable care for their own health and safety and that of others affected by their work and the protection of the environment. All employees are also responsible for bringing to the attention of a responsible person any instruction that they believe endangers themselves, others or the environment. Failure to comply with the following rules will render employees liable to action involving the established disciplinary procedure. Barrel recognizes that it is not possible to prepare in written form every safety rule that may be encountered. Circumstances may vary depending upon the nature and location of work. However, employees are expected to act in a responsible manner and adhere to verbal instructions given by Clients representatives.



Health & Safety Rules

These rules are important. Please read them carefully to ensure that they are clearly understood.

3.1 Working Practices

- An employee must not operate any machine, plant or equipment unless that employee has been trained and authorized to do so (cutting of core for example).
- An employee must not make any repairs or carry out maintenance work of any description unless authorized to do so.
- An employee must use all substances, chemicals, liquids, etc. in accordance with all written and verbal instructions. Put any unused chemical back into the original container or properly label any secondary containers.
- An employee must return all substances, chemicals, liquids, etc. to their designated safe storage area when not in use.

3.2 Notices and Written Instructions

- Employees must comply with all hazards/warning signs and notices displayed on the premises/installation.
- Employees must read and observe any notices and instructions displayed in the work area.

3.3 Working Conditions/Environment

- Employees must make proper use of all safety equipment and facilities provided to control working conditions/environment.
- Employees must keep work areas clear and in a clean and tidy condition.
- Employees must dispose of all rubbish and waste materials within the working area using the facilities provided.
- Employees must clean up any spills as soon as is possible, in a safe and environmentally responsible manner.
- Employees must not pollute watercourses, sewers or drains with chemicals, oils or other hazardous substances.
- Employees must report potential threats and/or real damages to the environment.

3.4 Protective Clothing and Equipment

- Employees must use all items of protective clothing/equipment provided, as instructed.
- Employees must not misuse or willfully damage any item of protective clothing/equipment provided.

- Employees must store and maintain protective clothing/equipment in accordance with instructions.
- Employees must follow all site-specific personal protective equipment requirements and rules, whether on a third party or customer location/site.

3.5 Fire Precautions

- Employees must comply with all emergency procedures pertinent to their work activity.
- Employees must ensure that any fire escape route, fire equipment or fire doors are kept free from obstruction.
- Employees must report any use of fire fighting equipment to their supervisor.

3.6 Accidents

- Employees must seek medical treatment for injuries they sustain, no matter how slight and ensure that appropriate records are kept. Upon returning from treatment all employees must report the incident to their supervisor.
- Employees must report all accidents and near misses to the employee's supervisor as soon as it is practicable. Certain locations may specify a time frame, and this must be complied with.
- Employees must notify their supervisor of any incident in which damage is caused to Company or customers' property.
- All motor vehicle accidents, which occur when driving a company vehicle, or when driving a personal vehicle on company business, must be reported.

3.7 Health

- An employee must report to their supervisor any medical condition that could affect the safety of themselves or others.
- An employee is expected to co-operate in the implementation of the medical and occupational health provision.

3.8 Rules Covering Gross Misconduct

Employees will be liable to disciplinary proceedings up to and including dismissal if they are found to have acted in any of the following ways:

- A serious or willful breach of the Safety Rules.
- Unauthorized removal or interference with any guard or protective device.
- Unauthorized operation of any item of machinery, plant or equipment.
- Unauthorized removal of any item of first aid equipment.
- Willful damage to, misuse of or interference with any item provided in the interests of health, safety, environmental protection or welfare at work.
- Unauthorized removal or defacing of any label, sign or warning device.
- Misuse of chemicals, flammable or hazardous substances or toxic materials.
- Smoking in any designated 'No Smoking' area.
- Smoking while handling flammable substances.
- Horseplay or practical jokes, which could cause accidents.
- Making false statements or in any way deliberately interfering with evidence following an accident or dangerous occurrence.
- Failure to wear Personal Protective Equipment provided when required or prescribed.

This list is not intended to be complete.

3.9 Disciplinary Action

The Company will deal firmly with workers who intentionally break HSE rules. Depending on the circumstances, progressive corrective action for Company employees may include disciplinary action up to and including dismissal. Infractions of customer's safety rules will be handled in the same manner as infractions to Company safety rules.

Unless the disciplinary action is stated in policies or standards elsewhere, a progressive disciplinary action for general safety rules violations will include verbal reprimands, written reprimands, probation and dismissal.

A progressive disciplinary action may include the following actions:

- For **Minor** safety infractions - verbal reprimand.
Repeated minor safety infractions - verbal and written reprimand.
- For **Medium** safety infractions - verbal and written reprimand.
Repeated medium safety infractions - written reprimand.
- For **Major** safety infractions - written reprimand or possible dismissal.
Continued disregard of safety rules - dismissal.

4.0 Alcohol, Drugs and Contraband Policy

This policy defines the Company's position regarding alcohol, drugs and contraband in the workplace, to prevent the problems caused by alcohol, drugs and contraband in the workplace, thereby providing our employees with a safe workplace environment.



4.1 Prohibited Activities

The use, possession, transportation or sale of narcotics, illegal drugs, or drug paraphernalia by any employee while on duty, while on Company premises or in any Company vehicle, or while on any job site of a customer, is prohibited. The only exception shall be for properly used prescription medication prescribed by a licensed physician for use solely by the person the medication is prescribed to.

The use, possession, transportation, or sales of alcohol or intoxicating beverages, while on Company premises or in any Company vehicle, or on any job site of a customer, is prohibited unless specifically authorized by Management.

The use, possession, transportation, or sale of contraband, including firearms, ammunition, explosives, and prohibited weapons while on company premises, in any company vehicle, or on any job site of a customer, is strictly prohibited unless specifically authorized by Management. Prohibited weapons are defined by local, state or country regulations.

4.2 Disciplinary Action

Any employee determined by the Company to have engaged in any of the prohibited activities set forth in this policy, without an explanation satisfactory to the Company, will be subject to disciplinary action up to and including immediate termination from employment.

5.0 Offshore Safety Training Requirements

5.1 Safety Training for Geologists working more than 15 days per year offshore.

Mandatory

Approved Offshore Combined Basic Survival/Firefighting training and Refresher training at least every four years. For personnel working more than 15 days per year - see next section.

Valid Offshore Medical Certificate (from a medical establishment that conducts medicals to OGUK requirements). Validity: Up to age 40 - 3 years; Age 40 - 50 - 2 years; Over age 50 - 1 year.

5.2 Safety Training for Geologists working less than 15 days per year offshore.

Mandatory

Approved One Day Combined Offshore Basic Survival Course, which includes elements of firefighting and helicopter safety, as well as elements of theoretical and practical underwater helicopter escape training.

All the safety procedures detailed in the above document relating to Personal Safety and Wellsite Geological work safety are applicable to the Geologist working less than 15 days per year. They should therefore be trained and maintain knowledge of all the above procedures.

5.3 Safety Training for Visitors (One Day Trips)

All visitors to offshore installations are required to familiarize themselves with safety and evacuation procedures as soon as possible on arrival at the installation and attend all safety drills.

Outside the accommodation area, visitors should be accompanied at all times by a person who is familiar with the installation.

The Wellsite Geologist must maintain a basic working knowledge of general actions to take prior to, during and after evacuation or abandonment from an offshore installation, the use of life saving equipment, survival techniques, the common causes and nature of fires, the operation of portable fire-fighting appliances, self rescue techniques with and without breathing apparatus and the need for personal protection equipment.

This information is taught in the Offshore Survival Course but it is important that the knowledge is maintained throughout the geologists' offshore career.

6.0 Travelling To and From Places of Work

- Check you have comprehensive instructions on how to get to the worksite and the names of all contacts before travelling. Make sure that you have all documents and certification to comply with both client and local legislative requirements (Passport, Visas, Medical certificates, Offshore Survival certificates etc.)
- Check with the Client the day before you are due to travel to re-confirm bookings and crew change details. Remain available and contactable, as last minute plan changes are not uncommon.
- Always take your own Personal Protective Equipment (PPE) with you to the site and take it with you when you leave. Do not assume you will return to the same location.
- Bear in mind that there are maximum baggage weights in use in some areas (North Sea). Bag weights are limited to 17kgs per bag. Excess baggage may cause problems on helicopters, so do not over pack.

6.1 Requirements for Going to a Rig Site

It is important that each wellsite employee:

- Is in good health.
- Reports any physical defects and any drugs or medicines prescribed by a doctor prior to going offshore.
- Report to their Supervisor if they become unwell at anytime.
- Maintain high personal hygiene standards at all times, safeguarding good health of themselves and others.
- Is in possession of current medical, fire fighting and survival certificates, where required.

It is important that each well-site employee is **NOT**:

- Under the influence of alcohol or un-prescribed drugs.
- Suffering from a communicable disease.
- Have any condition that will impair their judgment or ability to carry out their duties safely.

It is also important that each wellsite employee is aware of the certain items that are **forbidden at work**, during their period offshore (on Rig). These are as follows:

- Alcohol.
- Drugs (except prescribed medicines).
- Firearms, Sporting/Hunting Knives, Weapons.

All equipment and tools must be safe and in good working condition.

Other items that may not be permitted on rigs unless by prior arrangement with the operating company, include:

- Cameras, Radios, Tape Recorders, etc.
- Explosive Materials.
- Pressurized Gas.
- Radioactive, Corrosive, Poisonous or Toxic Substances.

Work clothing should be suitable, safe, and of a type supplied or approved by the Company. This clothing should include:

- Safety footwear (To EN345, ANSI Z41.1-1991 or equivalent).
- Well fitting coveralls (Flame retardant - To EN470-1 & EN531 or equivalent).
- Hard Hat (To EN397, ANSI Z89.1- 1986 or equivalent).
- Safety Glasses (To EN166, ANSI Z87.1-1989 or equivalent).

6.2 Driving

DXC Geological recognizes that driving is both necessary for business and also represents a hazardous activity and accordingly DXC Geological will take the appropriate action to reduce the identifiable risks as far as reasonably practicable.

Employees are reminded that driving on the roads is a hazardous activity, the following precautions shall be taken to minimize the risks involved:

- When hiring a vehicle you should only use a recognized car hire firm.
- It is recommended that full insurance, including personal accident cover, is taken when hiring a vehicle.
- Vehicles are to be driven only by the employee to whom the vehicle has been assigned or an employee who has been authorized to operate a particular company vehicle.
- Plan work to minimize driving requirements.
- Ensure that the vehicle is maintained in accordance with the manufacturer's instructions, including climatic or seasonal precautions.
- Take sensible breaks and seek to avoid tiredness when driving.
- Use all available safety equipment; wear seat belts, whenever these are fitted.
- All road accidents and near misses will be reported and investigated, all corrective actions will be widely communicated.
- It is strictly forbidden to drive a vehicle while under the influence of alcohol or drugs.
- Observe all local speed limits
- Drive below the posted speed limits when approaching a potential hazard such as road works, broken down vehicles or areas of poor visibility (allow for the unexpected).
- Keep car doors locked when travelling in urban areas.
- Keep all valuables (especially laptop computers and mobile phones, etc) out of sight or taken out of the vehicle, if possible when travelling and when parked.
- Always approach the vehicle with the keys to hand, check in the rear seat area before opening the vehicle, be aware of people around. Lock the vehicle when inside.
- Try to avoid eye contact with, gesturing at or confronting other drivers, do not drive aggressively or in any other way provoke other road users.
- Never pick up hitchhikers.
- Inattention to the road is the most common cause of road accidents. **Mobile telephones must not be used while driving a vehicle. Stop the vehicle in a safe location before using a mobile telephone.** Do not attempt to read a map, documents or take notes while driving.
- Fatigue is a major cause of road accidents, ensure when driving you take regular breaks, if it is unsafe to stop, open windows and turn up the radio (if available) until you have an opportunity to stop in a safe location.
- If you believe you are being followed, drive to a police station or a crowded place, if possible.
- If anyone stops to confront you, do not stop if at all possible, and keep the doors and windows locked. Summon help as soon as it is safe to do so.

6.3 Driving in Adverse Conditions

- Consult weather reports before setting out on your journey. If you consider the conditions to be too poor to drive in you must contact the Barrel office and the Client representative to inform them of your intention not to travel.
- In cold weather conditions ensure that you have warm clothing and spare food available in case you become stranded.
- Do not deviate from the planned route. Never drive along seismic lines, pipelines or cross-country. Shortcuts often compromise safety.
- Never overtake through a dust cloud if you cannot see what is coming in the opposite direction.
- Always drive to suit the road conditions and within your own limitations, e.g. sandy patches, loose gravel, water and snow covered roads.
- Beware of vehicles approaching from the opposite direction over sand dunes. Always reduce speed and keep well to the left side of the road when approaching sand dunes.
- In case of breakdown or accident, do not leave the vehicle. Seek shelter from the sun and restrict body movement. Remember that dehydration kills faster than hunger. A search will begin soon after you are reported overdue.

6.4 Helicopter Safety

A pre-flight helicopter safety video must be watched prior to each helicopter flight. Personnel must be aware of the location and use of survival equipment on helicopters as well as emergency escape procedures. You must attend any pre-flight or pre-transportation safety briefing given.

Boarding

- Walk to and from helicopter, never run. Approach in full view of the pilot from the side of the helicopter, as directed by the handling staff.
- Keep clear of the tail rotor.
- Ensure that loose items are held securely. Do not chase after items blown across the helideck/pad.
- Beware of high winds or unusual conditions, which can cause the main rotary blades to dip considerably.
- Hold piping, poles or other long items horizontally so that they do not strike the rotor.
- Take care not to damage the helicopter floats, particularly when transferring baggage.
- Obtain permission from the pilot or cabin attendant before placing baggage or cargo in the luggage compartment.

Inside The Helicopter

- The pilot is in complete charge of the helicopter and its passengers.
- Do not smoke unless permitted.
- Wear a lifejacket as instructed, and do not remove it until the helicopter has landed. Replace the lifejacket to its correct stowage.
- Take a seat as directed by the pilot or cabin attendant. Fasten the seat belt securely and do not remove it until the signal to disembark has been given.
- Where necessary, wear ear-defenders.
- Heed any pre-flight safety briefing and follow the pilot's instructions during the flight.
- Never throw anything from the helicopter as it could cause damage to the rotors.
- Do not move your position during the flight, as this may affect the safe handling of the helicopter.

After Landing

- Follow the directions of the pilot or cabin attendant.
- Release the safety belt.
- Remove the lifejacket and return it to correct stowage.
- Keep a firm grip on any portable light items.
- Do not disembark until directed.
- Be prepared for strong, gusting winds.
- Adopt a crouched position.
- Walk to the side of the helicopter and follow directions from pilot, cabin attendant or heli-guard.
- Do not chase items blown across the helideck/pad.

Emergency Landing

If an emergency landing becomes necessary, remain in your seat with the seat belt fastened. Strictly follow the pilots instructions.

6.5 Travelling by Boat

Boat transfers are not generally approved of nowadays. If you work at a location where boat transfers of personnel are still used you should follow the guidelines below:

- Transfer by Personnel Basket.
- Follow the instructions of the Person in charge of the transfer.
- Always wear a life jacket.
- Baggage should not be transferred in the same basket as personnel. If it is, it should be safely located in the centre of the basket.

- Maintain good hand holds and foot holds on the basket. Do not let go to wave to someone!
- If you feel unsafe or unsure of a basket transfer you should raise your concerns with the Client Representative.
- Once onboard the boat you should follow the instructions of the boat crew.

7.0 Working at the Rig Site

An induction course will be given when arriving on a mobile rig or platform for the first time, which will explain the safety procedures of that particular installation.



7.1 Site Familiarization

On arrival at the Rig/Platform:

- Familiarize yourself with the layout of the rig/platform.
- At the first opportunity, put on your hard hat and safety boots and proceed to your lifeboat or emergency muster station.
- Study and remember your escape routes and the location of safety equipment.
- You must attend any safety induction talk given by the rig or, platform operator.
- Always follow the instructions of rig/platform Supervisor.
-

7.2 Personal Conduct To Increase Safety

Rig-site tidiness - is important to safety, especially during an emergency:

- Do not block gangways or doorways, or leave litter lying around. Any breakages or spilled liquids must be cleaned immediately.
- Do not misuse any safety or lifesaving equipment. The availability of this equipment in good condition can save lives.
- Report details of defective equipment immediately.
- Do not throw anything overboard. Carefully follow all rules designed to prevent pollution.
- Do not take part in horseplay, “practical joking”, etc., as this often leads to accidents.

7.3 Personal Protective Equipment (PPE)

Wearing the following protective gear is a requirement whenever you are outside the accommodation:

7.4 Clothing

- Loose clothing can get caught in moving machinery, e.g. rotating shafts, etc.
- Clothing should be correctly fastened with cuffs either fastened or sleeves rolled up.
- The weather will dictate the type/weight of clothing worn.
- If clothing becomes saturated with oil or other chemicals, remove at once and wash affected parts of the body. Chemicals may irritate the skin and could be hazardous during a fire.
- Rings, chains and other items of jewelry should be removed while working.

7.5 Footwear

- Wear approved safety boots or shoes and ensure these are kept in good condition.
- If footwear becomes slippery with grease or mud, clean them. Many accidents are caused by slipping.

7.6 Safety Hard Hats

- An approved safety hat should always be worn outside the living quarters.
- Chin straps and ear defenders are optional and can be helpful additions to your headgear. Chin straps should be worn in windy conditions and if entering lifeboats with your safety hat on.

7.7 Hearing Protection

- Ear plugs or ear defenders are strongly recommended for use at the rigsite. Some installations have now made it mandatory to wear hearing protection while working or moving outdoors. Follow the Clients and the installations instructions.

7.8 Gloves

- Impact protection gloves should be worn at all times when outside of the living quarters. Handrails may be wet or dirty so gloves will help to keep your hands safe.
- Other suitable protective gloves should be worn when handling:
 - Wire ropes and slings.
 - Chemicals/corrosive materials.
 - Hot items.
 - Sharp materials.

7.9 Eye Protection

- Must be worn at all times when outside of the rig accommodation area.
- Must be worn when there is a danger of flying particles or when handling chemicals/corrosive liquids.
- Is mandatory when using fixed or portable grinding equipment.
- Eye protection with dark lenses should be worn near burning, cutting or arc welding.
- Personnel who normally wear glasses must ensure these are fitted with safety lenses.
- Contact lenses should not be worn when working at the rig site. Use spectacles instead. Do not wear contact lenses when handling chemicals.

7.10 Safety Harnesses

- Approved safety harnesses should be worn when working in high places or when unable to stand firmly on the floor.
- The Geologist should not need to work in high places or in places where harnesses are needed.

7.11 Smoking

- Smoking is permitted only in the safe designated areas.

7.12 Safe Working & Safe Practices

- Work safely at all times. If you notice any unsafe practices or conditions, bring them to the attention of the person concerned, or to your supervisor.
- Plan each job before it is performed.
- When unsure of the safe procedure for performing any job, ask your immediate supervisor. Do not risk your safety as well as the safety of others by performing work without full understanding of the job and the appropriate safe procedure.
- Abide by any "Permit to Work" systems operated on-site.
- Actively participate in rig-site safety systems in operation, such as STOP or SOAR systems.

7.13 Safe Access

- Keep a clear space in which to work and ensure that a means of escape is always available.
- Ensure that damaged or missing deck grating and handrails are reported immediately and repaired.
- Secure ladders and position on a firm, level base.
- Take care when working at heights to avoid the possibility of materials, tools, or equipment falling onto persons below.

7.14 Materials Handling

When lifting or handling equipment always be sure to:

- Protect your hands.
- Lift with your legs bent.
- Get a good grip.
- Get help for heavy loads.
- Do not walk or stand under suspended loads.
- Do not stand in the line of sight (between the crane operator/banksman and objects being lifted).

- Never step over or stand on a rope or cable under strain.
- Be careful not to cause unnecessary shock to delicate pieces of equipment.
- Supervise the handling of equipment assigned to you.

7.15 Housekeeping

- Good housekeeping is essential on a platform or wellsite due to the restricted area and types of materials and equipment used.

7.16 Cleaning Up

- Clean up all spills (especially oil) immediately.
- Dispose of oily rags and other oil soaked materials properly. These can be a fire hazard.
- Clean up after completing any task.

7.17 Storage Guidelines

- Store paint and other flammable substances separately.
- Substances like acids, which react if combined, must not be stored together.
- Stored oils must never come into contact with hot surfaces.
- Oxidizing agents must be stored separately.
- Keep all tools and equipment not in immediate use in their proper storage area.
- Don't store anything but designated materials in fire fighting, emergency, or medical equipment areas.
- Maintain clear access to all safety equipment, lifeboats, jackets etc.
- Store all substances in marked (labeled) and appropriately designated containers.

7.18 Welding

- DXC Geological personnel must not perform welding or burning operations. Welding and burning operations are high fire risks. Extreme care is necessary even for those not welding. You may have to come close to areas where welding or burning work is taking place. Do not linger around such operations.
- Avoid inhaling the fumes from welding, as they can be toxic.
- Observe the work area for fire or smoldering materials.
- Remember that welding pieces remain hot for extended periods of time.
- Protect your eyes when welding is being done around you.

7.19 Emergencies

If an emergency occurs on the installation, it will be indicated by either audible or visual alarms backed up by updated status announcements as required. Some alarms that may be raised include:

- Fire.
- Serious Gas or Oil Leak.
- Serious Incident (equipment failure likely to endanger the rig).
- Man overboard.
- Bad weather.
- Hydrogen Sulfide release.
- When any alarm is sounded:
 - Stop work, ensuring it is left in a secure condition.
 - No Smoking.
 - No exposed electrical components.
 - Stay off the phone or public address system.
 - Vacate affected area.
 - Listen to instructions.
 - Act as required by instructions received

If you are the observer at the scene of an emergency, your prompt action can minimize danger to life and to the platform/rig. In any case, try to make mental notes of the situation as you found it to determine the cause and to prevent a recurrence of the same problem.

7.20 Fire Fighting

Many fires can be extinguished in seconds by the immediate and effective use of the correct fire fighting equipment. A fire can however, get out of control and quickly cut off the means of escape. It will also produce carbon dioxide, an invisible odorless gas, which will not support life. If any fire fighting situation, therefore, where a person cannot control the fire himself in the first few seconds, he is instructed to place his own safety and the safety of other people first before any considerations of equipment or material value.

7.21 Ignition Sources

Likely sources of ignition are as follows:

- Direct heat, e.g. cigarettes, welding.
- Mechanical sparks, e.g. metal tools.
- Electrical equipment.
- Static electricity.
- Chemical reactions.

7.22 Prevention

Most fires could be prevented by attention to the following:

- Proper storage of flammable materials and oxidizing materials.
- Strict observance of non-smoking areas.
- Good housekeeping, especially in disposal of cigarette ends, matches, oily rags, etc.
- The correct use of electrical equipment.
- Extreme care when welding or burning.

7.23 Fire or Explosion

If you see a fire or suspect a fire or explosion is likely:

- Sound alarm (if there is no alarm system, call the rig superintendent and give details quickly).
- Assist in the evacuation of the area.
- Use available fire fighting equipment immediately until help arrives.
- Have details ready of exact location, cause and extent of fire, knowledge of any person's injured, and own name and status to give Supervisors.

7.24 Hydrocarbon Gas or Oil Leak

Leakages sometimes give off concentrations of gas that are dangerous as well as toxic. Hydrocarbon gases (and other gases) may accumulate and remain in enclosed spaces. When the presence of gas is suspected, the area should be restricted to trained personnel, under supervision, wearing breathing apparatus. If you observe or suspect that gas or oil is leaking or present:

- Leave the area as quickly as possible - holding your breath.
- Initiate a general alarm or call to Superiors.
- Warn personnel in area.
- Switch off portable electrical tools, etc.
- Do nothing, which could cause a spark or source of ignition.
- Inform company representative by nearest rig phone or quickest means, providing details of leak, size, likely source, etc.
- The risk of fire is increased considerably when gas is present and therefore any tool or materials capable of producing a spark must not be used.

7.25 H₂S Emergency

Some crude and gas contains hydrogen sulphide (H₂S). This is an extremely toxic gas whose escape must be treated very seriously. H₂S gas should be detected automatically and alarms should be activated. However, the company representative should be notified at first indication that gas is present, i.e. a "rotten egg" smell. The properties of H₂S are:

- Extremely toxic - can be deadly.
- Heavier than air - tends to settle in low-lying areas.
- Colorless and water-soluble.
- Capable of forming an explosive mixture with air - keep sources of ignition away.

The susceptibility to H₂S poisoning depends both upon its concentration and its cumulative affect. If a person has been exposed to H₂S take immediate action as follows:

- Hold your breath (do not inhale the gas).
- Get out of the area and summon help.
- Attach a safety line to the victim if possible (or necessary when the victim is out of direct line of sight).
- Use buddy system to remove the victim to fresh air.
- If unconscious or difficulty with breathing, apply artificial resuscitation, using a resuscitator if available.
- If victim is not breathing, massage nose and throat to overcome the effects of paralysis caused by H₂S.
- Use resuscitation as required. (This is safe even though victim has been exposed to H₂S).
- If no heart beat, apply heart massage.
- Keep victim warm and at rest and avoid chilling.
- Treat as for shock until professional treatment is available.

7.26 Failure of Equipment Affecting Safety

If any equipment fails which may have an effect on either personnel or the installation, immediately notify the area supervisor. Examples of equipment failures affecting safety are:

- Lifesaving equipment.
- Communications equipment.
- Emergency / Standby equipment e.g. electrical.
- Monitoring Devices.
- Drilling Equipment.
- Production Equipment.

7.27 Man Overboard

The extreme dangers of man overboard in some locations are clear to all. Due to the height of the installation, the sea temperature, currents, and possible weather conditions, going overboard is not desirable. Action to be taken in the event of Man Overboard:

- Alert other personnel.
- Throw a life buoy in order to assist the man overboard as well as mark his position.
- Keep a watch on the person in the water, i.e. location in water, identification of status - injured or hurt.
- Help others retrieve the man overboard.

7.28 Serious Injury

If you are present when someone is seriously injured:

- Make the area safe.
- Switch off electricity if involved.
- Protect yourself.
- Get help.
- Give details.

- Apply first aid.
- Never assume victim is dead.
- Try to revive.
- Leave area "as is" other than making it safe.
- Do not move the victim unless there is a risk of further danger. Wait for the medic.

7.29 Evacuation of a Platform / Rig

An offshore rig/platform can only be evacuated in one of two ways: by boat or helicopter, land rigs can be evacuated on foot or in a vehicle. While the need for evacuation is unlikely, it can become necessary in certain circumstances, i.e. fire, weather, etc. Abandonment of the rig/platform can only be at the instruction of the Supervisor in charge of the rig/platform. The Station Bill gives information on the location of muster and emergency stations on offshore installations. When abandoning the rig/platform by helicopter, all personnel will be gathered in a safe waiting area and assigned particular flights. When such flights are organized, no personnel property or equipment is allowed.

The alarm to evacuate the rig/platform will be given by the rig/platform Supervisor in the same manner as other emergency drills (which will be part of the regular safety training on the rig/platform). At this point all work will cease and personnel will proceed immediately to their emergency muster stations where assigned personnel will give further instructions. Make sure you and those around you:

- Take nothing other than warm clothing, survival suits and lifejackets (if that is the installations procedure).
- Get there as quickly as possible.

7.30 Preventing Falls and the Correct Way to Fall

Good housekeeping at the worksite can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of any obstacles which can cause slips and trips. These areas should never be obstructed by objects of any kind.

Adequate lighting to ensure good visibility is also important in the prevention of slips, trips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on a spill or trip over a misplaced object.

Carrying an oversized object can also obstruct one's vision and result in a slip, trip or fall. This can be a particularly serious problem on stairs.



Before the Fall

While you can't prevent all slips, trips and falls there's plenty you can do to improve your footing.

- **Be here now.** Practice mindfulness. Focus on the present and be aware of your surroundings, instead of being lost in your thoughts.
- **Fix your blind spots.** If you can't see it, you can't avoid tripping over it. Have your eyesight and eyeglasses checked regularly.

The Correct Ways to Fall

For Forward Falls:

- Hit the ground with entire palm and forearm. This reduces the likelihood of a wrist fracture.
- Turn your head to the side. This reduces the risk of hitting your nose or mouth on the ground.
- Try to land on your palms and forearms in a push-up position without letting the rest of your body touch the ground.
- Breathe out.
- Avoid locking your joints.

For Side Falls:

- Hit the ground with entire palm and forearm on the side you fall on. If left side use left arm etc.
- Grab your hip with opposite arm. If falling to the left use your right arm to grab your hip.
- Tuck your chin to your chest to avoid your head hitting the ground.
- Squat.
- Try to roll your neck back.
- Avoid landing directly on your hip.

For Backwards Falls:

- Bend at the knees and squat.
- Tuck your chin in to avoid hitting your head.
- Hit the ground with your forearms first.
- Round your back.

Naturally, the goal is not to slip, trip or fall; however, the possibility of a fall still exists. There are correct ways to fall, however, the recommended procedures are:

- Tuck your chin in, turn your head, and throw an arm up. It is better to land on your arm than your head.
- While falling, twist or roll your body to the side. It is better to land on your buttocks and side than on your back.
- Keep your wrists, elbows and knees bent. Do not try to break the fall with your hands or elbows.

When falling, the objective is to have as many square inches of your body contact the surface as possible, thus, spreading out the impact of the fall.

8.0 Manual Handling

8.1 General

Statistics show that manual handling is one of the most common causes of absence through injury at the workplace. More than one third of lost time accidents are caused in this way. These injuries may often have long-term effects.

You may not think that your job as a Geologist involves manual handling. However, you must consider that you may need to lift sample boxes, core boxes, boxes of logs and data, computers and printers, boxes of paper and of course your rig bags.

This procedure is intended to help reduce the risk of manual handling injuries and to provide guidance on the measures that should be taken to ensure safe lifting and carrying in the workplace.

Simple common-sense measures can be taken to reduce these risks. The three most important steps are to:

- Follow the system of work, using handling aids properly and effectively.
- Never take personal risks by over-reaching, twisting, stretching, stooping or overexerting during any handling task.
- Report any problems in the working activity or equipment as soon as these arise and ask for assistance as necessary.

Tasks - Bending and stooping considerably increases the risk of back injury. Items should, ideally, be lifted from no lower than knee height to no higher than shoulder height. Outside this range lifting capacity is reduced, therefore, the risk of injury is increased. Where items are required to be lifted above shoulder height a stand or suitable means of access should be used. Items, which are to be pushed or pulled, should be as close to waist height as possible, pushing is preferred especially where the back can be rested against a secure fixed object for leverage.

Carrying distances should be minimized, especially if the task is repeated regularly. In general repetitive tasks and tasks which require twisting of the body should be avoided wherever possible. Tasks, which include both lifting and carrying, should allow sufficient time for recovery; rest breaks, to avoid fatigue.

Loads - The load should be carried as close as possible to the trunk of the body to reduce strain and should not be so large as to obscure vision. Unstable loads should be handled particularly carefully. This type of load can cause overbalancing. A secure handhold should be available and gloves should be worn if there is any risk of sharp edges or splinters.

Employees - Consideration should be given to age, body weight and physical fitness with regard given to personal limitations. Employees should not be expected to handle loads that are beyond their individual capabilities. Assistance should be found whenever necessary. Persons with genuine health reasons for avoiding lifting should be taken into consideration and should not be expected to undertake hazardous lifting tasks.

Individuals undertaking lifting will be given suitable instruction, training and information to perform lifting /carrying tasks with the minimum of risk.

Working Environment - There must be enough space to allow the task to be completed safely and any carrying route must be free from obstruction. Lighting, heating and weather conditions must be taken into account. Floors and other working surfaces must be in a safe condition and adequate ventilation is required, especially in areas where there is no natural ventilation. The work area should be clear of any obstructions that may cause the employee to trip or fall while carrying the load.

Other Factors - The use of PPE may be required while conducting manual handling activities, if the use of such equipment restricts vision or safe and easy movement. This should be reported to a responsible person. Constant interruptions from other workers must be avoided as this can interrupt the concentration of an individual.



8.2 Safe System of Work

Poor lifting and carrying techniques can result in discomfort and increase the risk of injury. In extreme cases, these injuries can have permanent effects. Adopting the following precautions can reduce these risks:

- Ensure that safe working practices for the activity are complied with.
- Make full and proper use of lifting and carrying aids and access equipment.
- Store heavy items between shoulder and hip height; where possible store only small or light items above shoulder or below knee height.
- Use the legs and knees to bend and lift, avoid stooping or bending the back.
- Avoid tasks that involve stretching or twisting.
- Ensure that regular rest breaks are taken to prevent the onset of fatigue and to where manual handling activities are repetitive.
- Ensure the load has no sharp, hot or cold edges, which could cause injury.
- Ensure that walkways are free from obstructions.
- Make full and proper use of PPE.
- Report any problems or concerns associated with manual handling to a responsible person without delay.

8.3 General Guidance for Manual Handling Operations

If possible, manual-handling operations should be avoided. If this is not possible the following recommendations are given for guidance:

- In general, unfamiliar loads should be treated with caution. For example it should not be assumed that an apparently empty drum or other closed container is in fact empty. The load may first be tested by attempting to raise one end. Force should be applied gradually until the strain is felt, in which case the task should be either reconsidered or it becomes apparent that the task is within the handler's capability.
- Stop and think. Plan the lift, where is the load going to be placed. Use appropriate handling aids if possible; do you need help with the load or can the load be moved using the forklift or sack truck. Remove obstructions such as discarded wrapping material. For a long lift such as floor to shoulder height consider lifting the load mid-way onto a table or bench in order to change grip.
- Feet apart, giving you a balanced and stable base for lifting with the leading leg as far forward as it is comfortable. Adopt a good posture, bend the knees so that the hands when grasping the load are as level with the waist as possible, do not kneel or over flex the knees. Keep the back straight (tucking in your chin helps). Lean forward a little over the load if necessary to get a good grip. Keep shoulders level and facing in the same direction as the hips.
- Get a firm grip and try to keep the arms within the boundary formed by the legs. The optimum position and nature of the grip depends on individual circumstances and individual preferences but it must be secure. A hook grip is less tiring than keeping the fingers straight. If it is necessary to change the grip as the lift proceeds do this as smoothly as possible.
- Do not jerk. Carry out the lifting movement smoothly keeping control of the load.
- Move the feet. Do not twist the trunk when turning to the side.
- Keep close to the load. Keep the load close to the trunk for as long as possible, keep the heaviest side of the load closest to the trunk. If a close approach to the load is not possible, try sliding the load towards you before attempting to lift it.
- Put the load down and then adjust. If precise positioning of the load is necessary, put it down first, then slide it into the desired position.
- Carrying distances should be minimized especially where the task is to be repeated regularly.
- Tasks, which involve both lifting and carrying, should allow sufficient time for recovery and rest breaks to avoid fatigue. Consideration should be given to age, body weight and physical fitness with regard to individual limitations. Assistance should be found whenever necessary.
- Items, which are to be pushed or pulled, should be as close to waist height as possible, pushing is preferred especially where the back can be rested against a secure fixed object for leverage.
- There must be enough space to allow the task to be completed safely and the carrying route must be free from obstruction. Lighting, heating and weather conditions must be taken into account. Floors and other working surfaces must be in a safe condition and free from contamination.

- The use of PPE may be required while conducting manual handling activities. If the use of such equipment restricts vision or safe and easy movement this should be reported to your line supervisor. Full and proper use of PPE is essential, the MSDS or Chemical Information Tag must be studied to determine the PPE requirements for individual products.
- Do not carry heavy or bulky objects on stairs. One hand must always be available to steady yourself.

9.0 Ergonomic Risks

Inadequate adaptation of man to work systems is an ergonomic factor often responsible for a decrease in work performance and physical reactions such as fatigue, lumbago and cramp etc. The following may be considered as contributory factors:

9.1 Inadequate Lighting

Inadequate or insufficient lighting can cause eye fatigue, reduced work performance, and accidents such as falls. To prevent such effects it is essential to ensure that lighting (both natural and/or artificial) is adequate. Maintenance and housekeeping are also crucial factors if the lighting provided is to remain effective (cleaning, replacing fittings, covers and fluorescent tubes etc.)

9.2 Inadequate Ventilation

Inadequate ventilation in the work place can cause discomfort and decreased work performance as well as affect health. This may be because the ventilation system requires maintenance or servicing as it can not dissipate generated heat or replenish the air fast enough to disperse fumes, smoke and bad odours (respiratory discomfort). The balance for pressurized units with LEV (Local Exhaust Ventilation - fume extraction system) must be adjusted to maintain a healthy working environment. Natural ventilation is the best option for workshops and offices (in temperate regions) and should be optimized whenever possible.

9.3 Incorrect Posture or Muscular Strain

Poor posture and body movement at work creates additional physical effort and may in the long term lead to lumbago, cramp, spasms etc. To reduce individual risk:

- Never lift heavy weights or bulky objects that exceed your capability (get help)
- Use the required tools or mechanical, electrical or pneumatic equipment to lift heavy objects.
- Avoid using your body to hold or stop something.
- Take the allotted rest throughout the day.
- Follow safe procedures for lifting objects. The basic rule is lift with the legs, by bending the knees and keeping your back naturally straight.
- Carry or pass materials or objects rather than throwing them. It is not advisable to catch flying objects or pull or push objects that require too much effort (over exertion)
- When seated, use a backrest; adopt a position that allows you to keep your back straight and do not remain in the same position for long periods of time.

9.4 Work Environment

Inadequate colour, too much glare and visual reflection where there is excessive brightness, darkness or where there are objects partially obscured are factors that may cause eye fatigue and distort information. Take the trouble to evaluate your own workplace and check you have clear visibility without eyestrain (simple re-arrangement of furniture or change of aspect may significantly improve your work environment).

9.5 Inadequate Facilities or Equipment

Inadequate handling of tools and inappropriate work places can cause fatigue, aches etc. The following aspects for controlling these risks must be taken into consideration.

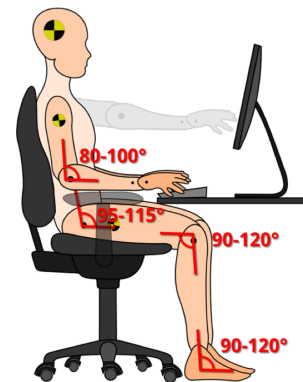
- Equipment should be conveniently to hand and positioned to avoid repetitive and excess movement. During handling, try not to bend your wrists - this will reduce effort. If it becomes necessary to press a button or pull a lever repetitively, it is preferable to use the thumb rather than middle fingers.
- It is essential that the work area is large enough for unrestricted body movement and enables ease of use of machinery. If seated for an activity adjust the chair to suit your own physique, place your feet flat on the floor or use a footrest to minimize lower leg pressure.

10.0 Working with Computers and Display Screen Equipment

Many of us have to spend a lot of time working on a computer or gazing at visual display units. Remember that it is essential to take short breaks doing other activities in order to prevent eye or body fatigue.

10.1 General Fatigue

Repetitious tasks will cause fatigue if you do not take regular breaks or at least changes of work type. Extreme concentration worsens the problem of sitting in the same position for long periods. Take a 15minute break or change of activity every hour. Exercise and stretch your muscles at frequent intervals. Whenever possible a break should involve stretching and fresh air.



10.2 Hand Strain

Adjust your seat to ensure your forearms rest on the desk (supported). Use a keypad rest (if available and comfortable). Exercise your hands by opening and stretching your fingers and then by clenching your fists. Take regular breaks and vary your tasks.

10.3 Back Ache

Ensure you are using the correct type of supportive seat and that it is adjusted to the correct height for you. Alternate your tasks to ensure you do not sit for prolonged periods - you should get up and move around at least once an hour - stick to this variation plan. Ensure your back is properly supported and sit without slouching in the chair.

10.4 Leg Ache

Place your feet on the footrest or floor. Do not rest on your toes - this causes strain on the back of the legs.

10.5 Eye Strain

Changing or varying your work type is equally important to prevent eyestrain. Exercising your eyes is as important as exercising your muscles.

10.6 Change of equipment – affecting the ideal setup

It is important to ensure changes to your workstation are taken into account and adjustments made for optimum comfort and minimum stress. This may include moving the monitor, raising the seat to best eye level or adjusting the distances. Monitor your DSE/VDU changes during the first day of use to ensure it suits you personally.

11.0 Biological Risks

Biological risks are associated with infectious agents (bacteria, viruses, fungi, parasites etc.) which often damage our health and well-being. They frequently result in allergies, infections, poisoning, dermatitis etc. These infectious agents may enter the body through direct contact or via one of the following:



11.1 Water

Drinking contaminated water can occur primarily through lack of hygiene or inadequate transportation. Water quality control is affected through bacteriological tests. Never drink water directly from streams or wells without being sure of their purity. Water containers must be kept clean and stored in places to prevent them from being contaminated. The general rule is don't drink tap water - use bottled and sealed water only. Occasionally rigs have problems with the water used for washing etc and some people may experience dry skin from this. If you experience this then you should inform the medic at the installation. Rig water and air conditioners should be regularly checked for contamination by Legionella bacteria. If there is a problem with this you should be informed of the necessary precautions by the OIM.

11.2 Animals

Pests may be wide ranging and include mice, rats, dogs, cats, snakes, flies and mosquitoes etc. They must be kept away from worksite and accommodation areas to prevent direct contact, (bites or stings etc.) or direct contact (urine contamination etc.). It is essential to keep work places clean and tidy through regular housekeeping and particularly germ-free with disinfectant to deter infectious agents. If you identify pests with a potential risk to health, notify the appropriate specialists for treatment and removal (fumigation, extermination etc.)

11.3 Decomposable and waste materials

Direct contact or inhaling fumes from waste poses a health risk. It is therefore recommended that the following precautions be taken:

- Waste materials must be placed in a sealed plastic bag or a canister with a lid on.
- In areas where foodstuffs or materials susceptible to decomposition are being handled, protective equipment must be used.
- Dispose of materials as necessary for recycling.

11.4 Cuts and abrasions

Conditions such as abrasions and wounds increase significantly the possibility of infection as resistance / barriers are minimal. They must therefore always be attended to immediately. Similarly, infectious and contagious diseases (hepatitis etc) must be treated and contained as soon as practically possible. Always report cuts, wounds and infections to the medic at the rig site.

12.0 Hygiene

Good hygiene is important.

- Do not eat or drink without having washed your hands first
- Avoid biting your fingernails
- Maintain a clean and tidy appearance. Make sure you shower every day - you have to work in close proximity to other people!
- Keep clothing and work gear clean - the rig laundry is free.
- Do not eat, drink, cook or refrigerate foods in places not intended for such purposes within a work area. Many mud logging units are equipped with a kettle and tea/coffee making facilities. Ensure that these facilities are located away from sources of contamination from chemicals and away from the sink area where they may be splashed by oils and detergents. Try to use disposable cups and spoons and wrapped sugar. Some of the spoons I have seen in logging units could be mistaken for hazardous waste!
- In laboratories there is always a possibility of infection. Follow procedures to perform your work. Always label your samples. Use a pump-fitted pipette rather than sucking a sample with your mouth. Never place food in refrigerators used for laboratory substances or samples.



13.0 Noise

Noise from operating machines and facilities can damage hearing. It does not necessarily need to cause discomfort or distraction to cause harm. You could be gradually losing your hearing ability without being aware of it. In other words, loss of hearing can not only be caused by intense noise but also by extended exposure to apparently harmless noise (e.g. having a personal stereo too loud).

In order to control noise level exposure, you must:



- Wear personal hearing protection (ear muffs/plug sand other noise insulating devices) whenever you are in an area defined as requiring hearing protection or, working in an area of excess noise (over 90 dBa)
- Post signs to advise others if you are generating noise levels over 85 dBa.
- Use personal hearing protection when travelling by helicopter.
- Have your hearing ability checked regularly.

14.0 Radiation

Under normal circumstances Barrel Geologists should not come directly into contact with sources of radiation. However, sources of radiation are found at most rig sites (wireline logging and LWD tools, pip tags, radioactive scale). You should be aware of such sources of radiation and keep your distance from them.



Ionizing Radiation

Radioactive sources and particularly the poor handling of them, are dangerous to living things. Exposure is not always easily detected (you could be receiving a radiation dose without being aware of it). Knowledge of sources of radiation and correct handling will prevent exposure and avoid any adverse effects. The following section identifies the common sources of radiation to ensure all personnel can identify and avoid the inherent risks.

There are two types of radioactive sources:

14.1. Non-ionising radiation

Extended exposure to these can cause skin heat, burns and eye cataracts. They are also sources of ignition. The following are the most common sources of this kind of radiation:

- Infrared: Hot bodies such as furnaces, engines, pipes or flames.
- Ultraviolet: Welding arcs, Neon and hydrogen fluorescent lamps, Suns rays.
- Microwave: Microwave ovens.

Always observe the following precautions:

- Protect your eyes from radiation (goggles, mask or visor with filtering screen) when working in an area when gas welding or electric arc welding is being carried out. Be aware of where welding operations are taking place and try to avoid it.
- Do not test the temperature of any surface with your bare hands.

14.2. Ionising Radiation

This type of radiation can cause major injuries. Possible adverse effects include dermatitis, burns, eye cataracts and cancer. This type of radiation is emitted specifically by X-rays and Gamma rays.

- X-Rays: Medical and industrial x-ray equipment.
- Gamma Rays: Industrial x-rays. Sources for nuclear logging tools.

Listen to announcements that will be made when radioactive sources are being moved or used. Obey the instructions. Obey all signs and barriers regarding radioactive material.

15.0 Psychological and Social Risks

Factors such as individual habits and social activities can cause conditions of discomfort, fatigue, diminished work performance or lack of motivation. Such factors are hazardous to health.

15.1 Unhealthy or Addictive Habits

- Working while under the influence of alcohol.
- Sleeping during working hours.
- Practical jokes or betting while at work.
- Smoking in non-smoking areas.
- Failing to use personal protective equipment.
- Not following safe procedures.

15.2 Negative Attitude

Work must always be carried out according to safe procedures. This includes following instructions, remaining attentive, using common sense and exercising caution. Participate in the safety systems such as STOP, 5x5, JSA etc. Having the right (positive) attitude is a major factor in successfully accomplishing a safe job.

15.3 Lack of Training or Understanding the Task at Hand

Before starting a job you must understand fully your responsibilities and the correct procedure for safely completing the task. If in doubt about any aspect; ask the client representative you are reporting to or another experienced Barrel person.

15.4 Ineffective Communication and / or Supervision

These factors can lead to mistakes or create hazardous conditions during the execution of tasks. Therefore:

- As part of a team you must be an effective communicator; able to relay information, ask to clarify questions and input any relevant personal experience. Input of experience from the team is vital for improving work quality. This is particularly important for new to the location personnel - never assume familiarity with equipment or procedures. If in doubt always ask.
- The supervisor must ensure safety regulations and procedures are complied with by the whole team.

15.5 Bullying Attitudes

Rig sites are unfortunately places where there still exist some outdated, bigoted, sexist and racist attitudes. If you feel you are being intimidated or undermined in your work then you don't just have to take it. However, be careful that you are perhaps not being oversensitive on some issues.

If you feel you are being treated unfairly you should mention it to the person concerned, but try to avoid turning it into an argument. If you feel uncomfortable about this then discuss it with another person at the rig site, with the Client representative in town and with the Barrel Management. Keep a record of incidences and try to have this corroborated by witnesses.

This of course works both ways. You should always treat your co-workers with respect and not abuse your position of authority.

16.0 Safety Procedures Specific To Wellsite Geological Work

The Wellsite Geologist must at all times promote safe working practices, whether it be inside or outside the accommodation, in the mudlogging unit or on the drill floor.

16.1 Sample Catching

There may be instances where you have to catch and process drill cuttings samples. You will also be working closely with sample catchers and you should ensure that they are working safely.

Job Safety Analysis	
Sample Catching at the shakers or separator unit at the wellsite.	
Hazard	Control
Manual handling, lifting and carrying (repetition, restricted or awkward access to sampling points).	On a new worksite carry out an assessment of the shakers and other sampling areas. Prepare a plan with steps required (may involve permit to work for modifications required to allow ease of access, safety barrier, handrail, splash / spray protection, lighting, washing down and emergency facilities. On a re-start worksite carry out an assessment to ensure that the existing facilities are the best available, particularly if there has been a change to the layout or equipment. Ensure that all steps of the plan are fully discussed with the crew, client, rig operators and all other involved personnel. Ensure preparations, including hot work, lighting barriers, permits to work are completed before sampling operations start. Ensure your route between the sampling point and preparation point is not restricted, poorly lit or includes trip hazards.
Rushing due to fast drilling / sampling interval.	Do not run. Adjust the sampling interval according to the Rate of Penetration.
Personal injury due to slips and trips around shaker area.	Keep one hand free for steadying yourself. Use handrails provided. Avoid over reaching or over extending. Always walk, never run. Stay alert - do not become complacent. Keep the area around the shakers uncluttered. Keep the sampling equipment (spoons, sieves, buckets, washing fluids) tidily in a safe place. Ensure that your boot tread is in good condition.
Dermatitis and other skin diseases.	Avoid skin contact. Ensure coverall sleeves are rolled down. Use barrier cream on hands and lower arms. Use good quality gloves. Use recommended hand cleaner and skin cream. Obtain medical treatment for any rashes. Ensure clothing is regularly washed after each shift. Take extra care with oil base muds.
Hearing damage.	Wear ear defenders or ear plugs when around the shaker area.
Eye injury.	Ensure safety glasses are worn at all times and cleaned regularly. Ensure eyewash bottle and first aid kit are in good condition and correctly located.

16.2 Sample Analysis

Take care when using chemicals for sample analysis. See the COSHH guide to these chemicals. Analysis of the samples should take place in a well lit, well ventilated place. Ensure that the work area is not cluttered and untidy. Make sure that the microscope is correctly adjusted and the eyepieces are cleaned regularly.

If Micro-Palaeo analysis is being carried out in the same area you should make yourself aware of the chemicals and processes being used. Take care around the Micro-palaeontologists chemicals and hot plates.

16.3 Core Catching Safety Procedures

General

Core catching is one of the most important duties of the Wellsite Geologist and he/she should provide direction to the Driller, who is in control of rig floor operations, and service company personnel when the core barrel comes to surface. The Wellsite Geologist is responsible for the recovery, packaging and dispatch of cored material. Considerable time and effort has already gone in to drilling the well, so a few extra minutes spent paying particular regard to safety procedures whilst core catching is time and money well spent.

Sometimes core catchers from a contracting company will be provided. However, this will not always be the case. In such circumstances core catching **must not** be undertaken by inexperienced personnel. Only after observing the operation several times should any attempt be made, and initially only under close supervision of experienced personnel.

Remember, catching the core should be in an efficient manner but never hurried.

Pre-coring Preparation

Good preparation is the key to safe core catching. It avoids unnecessarily hurried actions leading to procedures being overlooked.

- Hold a pre-job 'tool-box' meeting to review procedures and safety activities with all parties concerned in the coring operation.
- All aspects of the coring programme should be discussed in full with the Drilling Supervisor and Operations Geologist.
- Ensure that all materials required are available.
- Ensure all core boxes/trays/sample bottles are properly numbered and marked up in good time.
- Before the core barrel arrives at surface, ensure that everyone involved with catching the core is fully aware of his/her role.

While-coring Procedures

- Record any significant drilling events as the core is being cut that may lead to problems when recovering the core, e.g. high ROP may indicate fractured or unconsolidated material.
- In the event of H₂S being recorded during core cutting, adhere to the rig safety procedures.
- Monitor gas levels while circulating and anticipate the presence of hydrocarbons at surface when the core is being recovered.

All personnel involved must wear standard safety gear especially eye protection and gloves. The top of the core barrel should be checked with a portable gas and H₂S detector before it is recovered.

Conventional Barrel

- All unnecessary personnel to leave the drill floor.
- Liaise with the driller. Make sure he understands your commands to lower or raise the core barrel.
- Recover the core from the barrel with extreme care. Do not hurry. If a problem arises, stop the job and solve the problem.
- Never put your hands under the core barrel. Always use a geological hammer to drag the pieces away.
- Never look up inside the core barrel.

-
- If the core gets stuck high up in the barrel it may be necessary to hit the barrel with a sledge hammer to dislodge it. Keep well away from the person using the hammer, especially if they are up in a riding belt. If you hear the core falling down inside the barrel, look away before it hits the deck as it may send up rock chips or mud that could hit you.

Inner Sleeve Barrel

- The sleeve is made from fibre-glass, aluminium or, in rare cases, rubber, and is usually laid out on the cat-walk or pipe deck for analysis.
- All unnecessary personnel to leave the immediate area.
- It is recommended that the core should be kept in 30ft lengths for dispatch.
- The sleeve may be cut in to 3ft sections. Do not undertake this task. The Wellsite Geologist is responsible for the supervision of this task. It is undertaken by the core analysis or coring contractor. Exercise extreme caution - any gas trapped within the core has the potential to ignite.
- Further core preservation may take place including resin injection and chilling. Supervise and assist with caution.

Job Safety Analysis	
Retrieval of cut cores from a barrel or sleeve. Cleaning and packaging of core.	
Hazard	Control
Injury due to manual handling of sections of slabbed / full bore rock from the barrel. (cleaning, boxing, waxing and carrying operations are still carried out in some areas - mostly now encased or lined barrel sent from the worksite intact).	The operation should be planned with the Geologist/ Core hands/ Mud Loggers/ Rig crew before the operations commence. Ensure responsibilities are defined / all personnel are competent / supervised throughout the operation. Clean up throughout the operation. Ensure only involved personnel are present and positioned in a safe place (away from moving equipment, overhead hazards and pressure lines etc).
Slips, trips and falls - with core boxes.	Transfer the full core boxes to a pallet using the correct manual handling techniques. Two personnel are required for each box. Ensure your work / transfer area is clear of obstacles before the start of operations.
Dermatitis due to skin contamination from spilled substances and drilling mud from core recovery.	Plan the cleaning, preparation operation and always wear the appropriate PPE. Keep non-essential personnel away from the work area when cleaning down.
Boxed core maneuvering - dropped from crane or on stairs.	Boxed core must be secured on a pallet for transfer from the work site and moved by mechanical means. Never stand or work under a suspended load.
Slips due to substances on the floor from spillage or general foot traffic.	Regular floor cleaning involving all crew. Immediate spillage clean up.
Trips due to materials, tools or equipment left in the wrong place.	Correct storage procedures supported by regular inspection.
Cuts, bruising or puncture wounds from core or core box / sleeve handling.	Check the condition of core handling materials (catcher, transfer basket, boxes etc). Check and remove shards, projecting nails etc before the operation begins. Ensure suitable tools are available and correctly positioned (not trip hazards or potential junk in the hole). Plan the physical movements required with alternation of personnel for long core recovery. Wear the correct PPE. Work as a team for safe operations.
Burns and scalds from wax.	Wear full PPE. Ensure the wax bath is correctly positioned on a stable surface. Ensure the location of the douse shower and other emergency equipment is known, unrestricted and is working.
Trapped fingers, hands.	Never place hands beneath the core barrel or handling equipment. Never restrict the view of the driller or tugger operator.
Precautions if cutting core with a core saw.	The core saw must only be operated by the core hand. Never operate a core saw - you are not insured. Make sure the core barrel is clearly marked where it is supposed to be cut. Get assistance to lift and move the core barrel onto the saw. Wear the correct PPE - especially boots, coveralls, hard hat, eye and ear protection. Take care when lifting the cut pieces they may be heavy and have sharp burrs or shards of metal.

16.4 Formation Fluid Recovery Safety Procedures

Wireline testing is an important part of data acquisition and extreme care must be taken when retrieving samples. Under no circumstances should sample recovery be undertaken by inexperienced personnel. The Wellsite Geologist is responsible for supervising the recovery of formation fluids. The Wireline Logging Engineer, in the presence of the Wellsite Geologist carries out the actual recovery.

MDT/RFT Sample Recovery

- Hold a pre-job 'tool-box' meeting, reviewing procedures, responsibilities and safety measures.
- Ensure all materials required are available
- Before the RFT/FMT tool arrives at surface, ensure that everyone involved with sample recovery is aware of his/her role and action to be taken if H₂S is present. Rig safety procedures to be adhered to. All unnecessary personnel to leave the area (usually the rig floor but may be some other well-ventilated area).
- As soon as gas is released the Wireline Logging Engineer should immediately check for H₂S. If present the chamber should be re-sealed and the Drilling Supervisor informed.
- All personnel to stay clear of the sample pressure discharge vent during sample extraction.
- Supervise sample recovery and assist with caution.
- Ensure the PVT tank is clearly labeled as pressurized and hazardous and that all paper work clearly marked as to its nature.

16.5 Borehole Safety

Borehole downhole safety is the responsibility of the Drilling Supervisor; rig safety is the responsibility of the OIM/Toolpusher.

However, geological contributions and involvement in the safety aspect of the borehole include the following:

- Shallow gas and H₂S hazards.
- Over-pressured formations.
- High-pressure reservoirs.
- Drilling and coring problems.
- Wireline pressure testing and sampling.
- Wireline and MWD logging.

Expected drilling hazards are documented in the Well Geological and Drilling Programmes. Additionally, Geologists should be:

- Aware of and understand the technicalities of drilling a well.
- Able to positively contribute to its operational safety.
- Able to advise on potential downhole geological hazards.

16.6 Safety Checklist

This safety checklist has been designed to promote awareness and understanding of your roles and responsibilities for both general and specific activities in an offshore environment. It is hoped that this will demonstrate the effectiveness of safe wellsite geological operations.

The Wellsite Geologist should be fully aware and have complete understanding of the following:

General

- Rig alarms and emergency signals and the action to be taken prior to and during evacuation or abandonment of the rig.
- The location and use of life saving and fire fighting equipment.
- General rig layout and basic understanding of rig equipment.

-
- Drill Floor layout and basic understanding of equipment.
 - Location of smoking and non-smoking areas.
 - Location of potentially hazardous areas.
 - Responsibility of the individual for his/her own safety, as well as the safety of others.
 - Need for attendance of rig safety meetings.
 - Role of the safety representative.
 - The need for personal safety equipment.
 - Knowledge of the general structure for safety on the rig including the role of the Drilling Supervisor and Offshore Installation Manager.
 - The rig communications system, including emergency paging.
 - The purpose and function of a work permit system.
 - Importance of, and reasons for, pressurized areas.

Mud Logging Unit

- The function and purpose of the mud logging unit.
- Recognition of potential well problems.
- Ensure equipment is functioning to an acceptable standard.
- Ensure that the mud logging contractors work is carried out satisfactorily and complies with all safety standards.
- Usage of potentially dangerous chemicals such as Hydrochloric Acid, Trichloroethane, etc.
- The need for care when Oil Based Mud is used.

Wireline Logging

- The function and purpose of the wireline logging unit.
- Formation sampling recovery safety procedures.
- The reasons for radio silence when running sidewall core guns.
- The use of radioactive materials, and adhering to the Rig and Service Company's safety procedures when these materials are being used.

17.0 Control of Substances Hazardous to Health (COSHH) Assessment

DXC Geological safety objective is to minimize the risks associated with substances used in our industry.

A risk is defined as "the likelihood of the dangerous properties of a substance (chemical or gas) causing harm to people or the environment".

Very limited quantities of hazardous substances are handled directly by Barrel personnel. Barrel personnel may also come into contact with a range of potentially harmful substances used by third parties. In our roles as supervisors at the workplace it is important that you recognize the risks associated with harmful substances and that you minimize the risks involved in their use by yourself and by others working with you.

The most common hazardous substances that we may come into contact with are those used within a mud logging unit for drill cuttings and core sample analysis. These usually include but are not limited to the following:

- 10% and 20% Hydrochloric Acid.
- Propan - 2-Ol cutting agent
- Trichloroethane 1.1.1. (being phased out) Phenolphthalein.
- Alizarin Red.
- Potassium Ferricyanide.
- Barium Chloride.
- Methylene Blue.

Other chemicals that we may come in close proximity to include:

- Bactericide
- Calcium Carbonate.
- Calcium Carbide.
- Ammonia.
- Silica Gel.
- Various gases - C1 to C5 and H2S.
- Various cleaning fluids including rig wash Base oil.
- Drilling Mud and its associated chemicals.
- Hydraulic Fluid.
- WD 40 - lubricant type sprays.
- Pipe Dope.

The above lists are not exhaustive. There may be other substances that we may encounter while on a drilling location or in a laboratory. Some COSHH (Control of Substances Hazardous to Health) sheets are included here but it is the responsibility of Barrel Personnel to find out what substances are stored and in use at the workplace. The necessary COSHH and MSDS (Material substance data sheets) will be available at the workplace and it is your responsibility to ask to see them and to be instructed by the responsible person at the work site in the precautions that you must take.




Conditions of use of substances, including personal protective equipment, are under the control of the user. It is therefore the users responsibility to satisfy himself / herself as to the suitability and completeness of such information and equipment for his/her own particular use.

If you are in any doubt about the correct use of any substance, it is your duty to ask the Onsite Safety Supervisor or Barrel Management and ensure you are competent to safely carry out the task. This is for your own safety and the safety of all other personnel on the worksite.

Follow the instructions below when working with or supervising the use of chemicals at the wellsite:

- Familiarize yourself with the information contained in the COSHH sheets and the MSDS sheets. If working in a mud logging unit, ensure that the MSDS sheets are located on the wall, preferably near to the substance storage cupboard. Ensure there is an MSDS sheet for every substance used in the unit.
- Ensure that all personnel follow the correct method for mixing acids i.e. add acid to water, **not** water to acid.
- Ensure that chemicals are stored in the correct allocated cupboard and not by the sink or near electrical equipment.
- Make sure that all substances are stored and transported in suitable containers, which are, secure and clearly labeled.
- Observe safe handling of calcium carbide. Make up carbide bombs in a safe area and keep the carbide away from water. Ensure that carbide is not stored near liquids. Always check to see if a carbide lag check is really necessary. The use and effectiveness of carbide for lag checks may be limited by mud fluid types, downhole equipment (MWD etc) and hole inclination. An alternative substance such as rice or paint may be used.
- Clean up all substance spills immediately. Use correct procedures and PPE.
- Familiarize yourself with the location of emergency safety showers and eye wash stations.
- Comply with all safe handling procedures as outlined on the COSHH and MSDS sheets.




Substance Safety Data Sheet

1. Generic name / Trade (other name): Hydrochloric Acid Solutions.	
2. Appearance and Odour: Clear colourless slightly pungent odour.	
3. Composition: Commercial 37% conc. Generally 10% and 20% dilution for wellsite operations.	UN No. 1789 (soln) CAS No. 7647-01-0 EEC No. 231-595-7
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m³: 1100	Vapour Density (air=1): 1.1
Boiling Point °C: n/a	Vapour Pressure (mbar): 100-500
Melting Point °C: n/a	Solubility (kg/m³): miscible all sol.
Auto-ignition Temp °C: n/a	Particle Size (micron): :
Flammability Limits (%v/v): n/a	pH : below 1
5. Important Characteristics: Incompatibilities: Alkalis, metals, oxidants, sulphides. E.L.OES.TWA 8 hours STEL 15 mins 5 ppm	
6. Safety Hazards: Fire: Non combustible, toxic fumes. Stability: Stable.	
7. Precautions: Fire: Control Ventilation. Stability: None.	
8. Fire Extinguishing Agents: Associated fire use water, alcohol resistant foam, powder, carbon dioxide.	
9. Fire Fighting Precautions: Personal protective equipment (PPE). Breathing apparatus (BA).	
10. Health Hazards: Inhalation: sore throat, systemic effects. Skin: burning redness. Eyes: pain, redness, watering, blurred vision. Ingestion: corrosive, irritant.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Drench with water, remove contam. clothing.* Eyes: Irrigate with water for 10 mins.* Ingestion: Drink plenty of water.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: When diluting: Full PPE including safety glasses/goggles/face shield, rubber or plastic gloves, plastic apron/sleeves. When using diluted acid: Apply carefully, avoid spills.	Spillage: Full PPE. Treat spill with Soda Ash and dilute with plenty of water.
13. Environment Hazards: Marine pollutant above 25 mg/l.	14. Precautions: Do not allow to enter drinking water supplies, waste or soil.
15. Spillage Mitigation (see also 12.): Flush spillage with copious water – dilution to 1000x.	
16. Disposal Options (disposal to legislative requirements): Preferred – neutralize with Alkali (Soda Ash); flush with plenty of water.	
17. Storage: Store at room temperature (15 to 25°C) away from oxidants and strong bases (plastic unbreakable container).	18. C.H.I.P. Label: Irritant–Xi-(10) Risk: R36/37/38 Safety: S26 Contact with eyes – rinse immediately with plenty of water. Seek medical advice.
19. Supplementary Information: May evolve toxic fumes in fire. No evidence of Carcinogenic properties/mutagenic or teratogenic effects.	   <p style="text-align: center;">DANGER TO ENVIRONMENT CORROSIVE HARMFUL IRRITANT</p>

Personal contact assessment:

Used in small quantities to identify calcareous rocks and minerals. May give off CO₂ when reacting with calcium carbonate. May give off H₂S when reacting with pyrite.

Substance Safety Data Sheet

1. Generic name / Trade (other name): Sulphuric Acid (Oil of Vitriol).	
2. Appearance and Odour: Clear colourless oily liquid, odourless.	
3. Composition: 98% single compound. Remainder water.	UN No. 1830 CAS No. 7664-93-9 EEC No. 231-639-5
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m ³ : 1.8	Vapour Density (air=1): n/a
Boiling Point °C: 330	Vapour Pressure : 1mmHg: 146°C.
Melting Point °C: 10	Solubility (kg/m³): miscible all sol.
Auto-ignition Temp °C: n/a	Particle Size (micron): n/a
Flammability Limits (%v/v): n/a	pH : below 1
5. Important Characteristics: Incompatibilities: water, metals, reducing agents, alkalis. Occupational exposure limit: OES mg/m ³ 1 – (long term 8 hour TWA).	
6. Safety Hazards: Fire: Non combustible, toxic fumes. Stability: Stable.	
7. Precautions: Fire: Do not expose to heat (toxic fumes). Stability: Avoid contamination.	
8. Fire Extinguishing Agents: N/A –avoid use of water. Also may evolve toxic fumes in fire.	
9. Fire Fighting Precautions: Personal protective equipment (PPE). Breathing apparatus (BA). Keep container cool.	
10. Health Hazards: Inhalation: irritant, sore throat, cough, systemic effects. Skin: burning, redness, sever burns. Eyes: pain, redness, permanent damage likely. Ingestion: burns, abdominal pain, vomiting.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Drench with water, remove contam. clothing.* Eyes: Irrigate with abundant water.* Ingestion: Drink water. Do not induce vomiting* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Nitrile/PVC gloves, goggles or face shield, rubber apron/sleeves. Use in well ventilated area.	Spillage: Nitrile/PVC gloves, goggles or face shield, rubber apron/sleeves. Respirator/self contained breathing apparatus (BA).
13. Environment Hazards: Harmful due to pH shift (toxic to aquatic organisms).	14. Precautions: Minimize contamination of soil/water.
15. Spillage Mitigation (see also 12.): Absorb, prevent spreading by adding sand/earth barriers. Dilute any trace with abundant water – dilution to 1000x.	
16. Disposal Options (disposal to legislative requirements): Preferred – neutralize with Alkali (Soda Ash) then flush to drains with abundant of water.	
17. Storage: Store at room temperature (15 to 25°C). Separate from all substances. Keep in a dry place.	18. C.H.I.P. Label: Corrosive-C Risk: R35 Causes severe burns. Safety: S1/2 Keep locked up and out of reach of children. S26 Contact with eyes – rinse immediately with plenty of water. Seek medical advice. S30 NEVER ADD WATER TO THIS PRODUCT. S45 In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
19. Supplementary Information: Never add water to this material. Causes severe burns.	   <p style="text-align: center;">DANGER TO ENVIRONMENT CORROSIVE HARMFUL IRRITANT</p>

Personal contact assessment:



Rarely to never used. May be required by a client for sample analysis of Claystone / Shale.

Minute quantities (a few drops of 5/N) of sulphuric acid solution are used during titration to determine the cation exchange capacity (C.E.C.) in Shale factor identification. The test would probably be performed by the logging crew but must be supervised by the Wellsite Geologist from an accuracy and safety point of view.

If specially requested, it is supplied in restricted quantities, within a glass bottle in an unbreakable container (UN packaging). It should be stored in a separate chemical cupboard with L.E.V. as additional fume prevention precautions within the unit and kept away from other substances.

When used in standard logging unit the continuous replenishment of the atmosphere within the logging unit (with the fresh air from external ducting) ensures that airborne internal contamination is minimized. The entire atmosphere of a pressurized laboratory unit is replaced in several minutes.

Substance Safety Data Sheet

1. Generic name / Trade (other name): Trichloroethane 1.1.1 (Chlorothene, Genklene).	
2. Appearance and Odour: Clear colourless liquid with sweetish odour.	
3. Composition: Halogenated Solvent Inhibitor 3 to 8% m/m (Does not mix with water).	UN No. 2831 CAS No. 71-55-6 EEC No. 200-756-3
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m ³ : 1.34	Vapour Density (air=1): 4.54
Boiling Point °C: 64.1	Vapour Pressure (kPa): 14 at 20°C.
Melting Point °C: -30.4	Solubility (kg/m³): immiscible
Auto-ignition Temp °C: n/a	Particle Size (micron): n/a
Flammability Limits (%v/v): n/a	pH: n/a
5. Important Characteristics: Incompatibilities: strong alkaline materials, powder metals and aluminium. Occupational exposure limit: MEL 3mg/m ³	
6. Safety Hazards: Fire: Non combustible. Stability: Stable.	
7. Precautions: Fire: May evolve toxic fumes. Stability: None.	
8. Fire Extinguishing Agents: Associated fires use water spray, foam, powder, carbon dioxide.	
9. Fire Fighting Precautions: Personal protective equipment (PPE). Breathing apparatus (BA). Store at room temperature (15 to 20°C).	
10. Health Hazards: Inhalation: harmful (irritant effect). Skin: strong irritant / degreaser effect. Eyes: strong irritant effect. Ingestion: harmful in quantity.	11. First Aid: Inhalation: Remove to fresh air. Rest, keep warm* Skin: Drench with water, remove contam. clothing.* Eyes: Irrigate eyes with water for 10 mins.* Ingestion: Wash mouth, drink plenty of water.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Butyl rubber or Neoprene gloves, safety glasses with side protection or goggles. Attacks natural rubber. Use in a well ventilated area.	Spillage: Butyl rubber or Neoprene gloves, safety glasses with side protection or goggles. Attacks natural rubber. Wear Butyl rubber boots, PVC suit and full face respirator/organic vapour canister.
13. Environment Hazards: Marine and/or freshwater pollutant. Ozone depleting substance.	14. Precautions: Prevent contamination of soil and water. Recycle whenever possible.
15. Spillage Mitigation (see also 12.): Special waste (Chemical disposal company).	
16. Disposal Options (disposal to legislative requirements): Special waste requiring local legislative conditions to be observed.	
17. Storage: Store at room temperature (15 to 25°C). Ventilation along the floor.	18. C.H.I.P. Label: Harmful-Xn, Toxic-T Risk: R20 Harmful by inhalation. R59 Dangerous for the ozone layer. Safety: S2 Keep out of reach of children. S24/25 Avoid contact with skin/eyes. S59 Refer to manufacturer for information on recycling/recovery. S61 Avoid release to the environment. Refer to special instructions/safety datasheet.
19. Supplementary Information: n/a	 

Personal contact assessment:

Regularly used in small quantities during cuttings sample analysis as solvent for oil show detection with a fluoroscope. Its use is restricted to target or reservoir sections at certain periods during the drilling phase. It is generally being phased out.

This substance has been under examination for several years as it is a known ozone depletion solvent. As a direct result of the Montreal Protocol and subsequent legislative agreements, it is no longer used as an industrial cleaner or degreaser but is still manufactured and available in small quantities for laboratory analysis.

The quantities stored at any time on the wellsite should be carefully monitored and maintained at a minimum.

When used in a standard logging unit the continuous replenishment of the atmosphere within the logging unit (with the fresh air from external ducting) ensures that airborne internal contamination is minimized. The entire atmosphere of a pressurized laboratory unit is replaced in several minutes.




Substance Safety Data Sheet																										
1. Generic name / Trade (other name): Alizarin Red S (Alizarin Sodium Sulphonate).																										
2. Appearance and Odour: Solid orange red crystals. No odour (C ₁₄ H ₇ NaO ₇ S).																										
3. Composition: C ₁₄ H ₇ NaO ₇ S	UN No. CAS No. 130-22-3 EEC No.																									
4. Physical Properties (at 20°C, 1013 mbar):																										
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Density</td> <td style="width: 15%;">kg/m³:</td> <td style="width: 15%;">2400</td> <td style="width: 30%;">Vapour Density (air=1):</td> <td style="width: 10%;">n/a</td> </tr> <tr> <td>Boiling Point</td> <td>°C:</td> <td>430</td> <td>Vapour Pressure (kPa):</td> <td>n/a</td> </tr> <tr> <td>Melting Point</td> <td>°C:</td> <td>289</td> <td>Solubility (kg/m³):</td> <td>immiscible</td> </tr> <tr> <td>Auto-ignition Temp</td> <td>°C:</td> <td>n/a</td> <td>Molecular Weight :</td> <td>342.26</td> </tr> <tr> <td>Flammability Limits (%v/v/):</td> <td></td> <td>n/a</td> <td>pH :</td> <td>n/a</td> </tr> </table>	Density	kg/m³:	2400	Vapour Density (air=1):	n/a	Boiling Point	°C:	430	Vapour Pressure (kPa):	n/a	Melting Point	°C:	289	Solubility (kg/m³):	immiscible	Auto-ignition Temp	°C:	n/a	Molecular Weight :	342.26	Flammability Limits (%v/v/):		n/a	pH :	n/a	
Density	kg/m³:	2400	Vapour Density (air=1):	n/a																						
Boiling Point	°C:	430	Vapour Pressure (kPa):	n/a																						
Melting Point	°C:	289	Solubility (kg/m³):	immiscible																						
Auto-ignition Temp	°C:	n/a	Molecular Weight :	342.26																						
Flammability Limits (%v/v/):		n/a	pH :	n/a																						
5. Important Characteristics: Incompatibilities: oxidizing materials. Occupational exposure limit: no limit.																										
6. Safety Hazards: Fire: Combustible. Stability: Stable.																										
7. Precautions: Fire: None. Stability: None.																										
8. Fire Extinguishing Agents: Use fire extinguishing media suitable for materials involved.																										
9. Fire Fighting Precautions: May give off toxic fumes from associated material.																										
10. Health Hazards: Inhalation: low toxicity. Skin: mild irritant. Eyes: mild irritant. Ingestion: mild allergen.	11. First Aid: Inhalation: Clear air passages. Skin: Wash with soap and water. Eyes: Irrigate with cold water.* Ingestion: Drink water. Do not induce vomiting.* * N.B. Obtain medical attention.																									
12. Personal Protection: Normal Use: Goggles. In the event of inhalation risk, a mask/dust respirator should be used.	Spillage: No special requirements.																									
13. Environment Hazards: Mildly toxic to marine life.	14. Precautions: Avoid gross contamination of soil and water.																									
15. Spillage Mitigation (see also 12.): Scoop up for landfill disposal. Flush with water – dilution to 1000x.																										
16. Disposal Options (disposal to legislative requirements): Preferred: disposal to landfill. Disposal must be within the requirements of Operative Legislation.																										
17. Storage: Store at room temperature (15 to 25°C). Cold and dry environment.	18. C.H.I.P. Label: n/a Risk: No significant hazard. Safety: No significant hazard.																									
19. Supplementary Information: Slight fire hazard when exposed to heat.	<div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="text-align: center;">DANGER TO ENVIRONMENT</div> <div style="text-align: center;">HARMFUL IRRITANT</div> <div style="text-align: center;">FLAMMABLE SOLID</div> </div>																									

Personal contact assessment:

Used as a substance indicator from a dropper bottle during rock cuttings analysis e.g. a quick method of calcite identification. Alizarin Red S solution (dye) will rapidly stain calcite deep red - other minerals remain unstained.

Maintained in very small quantities within the substance storage cupboard in unbreakable plastic bottles. Usage is dependent on formation type and required analysis.

Substance Safety Data Sheet

1. Generic name / Trade (other name): Potassium Ferricyanide (Hexacyanoferrate 111), Red Prussiate.	
2. Appearance and Odour: Solid dark red. No odour.	
3. Composition: Inorganic Salt. C ₆ FeK ₃ N ₆	UN No. n/a (Classified as non hazardous) CAS No. 13746-66-2 EEC No. 237-323-3
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m³: 1.89	Vapour Density (air=1): n/a
Boiling Point °C: n/a	Vapour Pressure (kPa): n/a
Melting Point °C: n/a	Solubility (kg/m³): soluble in water
Auto-ignition Temp °C: not avail.	Molecular Weight : n/a
Flammability Limits (%v/v): n/a	pH : n/a
5. Important Characteristics: Incompatibilities: avoid acids, oxidizing agents, fluorine, ammonia, CrO ₃ , nitrides, nitrites, hydrogen halides. Occupational exposure limit: LD 50 - 2970mg/kg.	
6. Safety Hazards: Fire: Reaction with acids yields toxic gas. Stability: Stable.	
7. Precautions: Fire: Store at 15 - 25°C Stability: Keep closed, away from sunlight.	
8. Fire Extinguishing Agents: Use fire extinguishing media suitable for materials involved.	
9. Fire Fighting Precautions: Personal protective clothing including respiratory and eye protection. Water fog or spray to cool containers.	
10. Health Hazards: Inhalation: harmful at ambient temperature. Skin: harmful. Eyes: irritant. Ingestion: harmful, gastrointestinal symptoms.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Wash with soap and water.* Eyes: Irrigate with cold water for 10 mins.* Ingestion: Drink water. Do not induce vomiting.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Normal PPE, safety glasses with side shields, chemically impervious gloves.	Spillage: Plastic apron, ventilation, extraction hood for large volume spillage.
13. Environment Hazards: Classified as special waste.	14. Precautions: Prevent contamination of soil and water.
15. Spillage Mitigation (see also 12.): Land: mop up and collect for specialist disposal. Wash site with detergent and water. Water: dilute as much as possible if skimming collection is impossible.	
16. Disposal Options (disposal to legislative requirements): Disposal must be in conformance with National and Local regulations.	
17. Storage: Store at room temperature (15 to 25°C). Cold and dry environment. Keep well closed and protected from direct sunlight and moisture.	18. C.H.I.P. Label: n/a Risk: R20 Harmful by inhalation. R21 Harmful in contact with skin. R22 Harmful if swallowed. R32 Contact with acids liberates very toxic gas. Safety: S36 Wear suitable protective clothing.
19. Supplementary Information: Handle with care.	   <p style="text-align: center;">DANGER TO ENVIRONMENT HARMFUL IRRITANT VERY TOXIC</p>

Personal contact assessment:

Sometimes used to perform carbonate stain tests. Was used with 998cc of distilled water plus 2ml of concentrated HCL and 1 gram of Alizarin Red S. It is no longer recommended for use.

Substance Safety Data Sheet




1. Generic name / Trade (other name): Calcium Carbonate (Calcite, Chalk, Marble).	
2. Appearance and Odour: White powder or colourless crystalline solid.	
3. Composition: CaCO ₃	UN No. n/a CAS No. 471-34-1 / 1317-65-3 EEC No. n/a
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m ³ : n/a	Vapour Density (air=1): n/a
Boiling Point °C: n/a	Vapour Pressure (kPa): n/a
Melting Point °C: n/a	Solubility (kg/m³): insoluble in water
Auto-ignition Temp °C: not avail.	Molecular Weight : n/a
Flammability Limits (%v/v): n/a	pH : n/a
5. Important Characteristics: Incompatibilities: reacts violently with acids giving off CO ₂ . Occupational exposure limit: OES 10mg/m ³ - STEL 15 mins (total inhalable dust)	
6. Safety Hazards: Fire: Can ignite and burn fiercely in contact with fluorine. Stability: Stable.	
7. Precautions: Fire: None. Stability: None.	
8. Fire Extinguishing Agents: All (unlimited).	
9. Fire Fighting Precautions: Personal protective clothing including respiratory and eye protection. Water coolant.	
10. Health Hazards: Inhalation: cough – moderate irritant. Skin: redness. Eyes: pain, redness, watering. Ingestion: unlikely to cause a problem.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Wash with soap and water.* Eyes: Irrigate with cold water for 10 mins.* Ingestion: Drink water.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Rubber or plastic gloves, goggles or face shield, dust respirator.	Spillage: Plastic apron, ventilation, extraction hood for large volume spillage.
13. Environment Hazards: n/a	14. Precautions: Prevent contamination of soil and water.
15. Spillage Mitigation (see also 12.): Sweep up, contain large volumes with sand/earth and place in disposal containers.	
16. Disposal Options (disposal to legislative requirements): Preferred: Dispose of at land fill.	
17. Storage: No special requirement.	18. C.H.I.P. Label: n/a Risk: No significant hazard. Safety: No significant hazard.
19. Supplementary Information: n/a	 HARMFUL IRRITANT

Personal contact assessment:

Naturally occurring as limestone, chalk, marble and mineral calcite. Used by Mud Loggers to calibrate calcimeters. Used by Mud Engineers for quantitative chlorides testing of mud filtrate. Often kept on the rig in bulk form as Lost Circulation Material (LCM) in powder or crystal state (Irritant dust hazardous to health).

Has a low toxicity rating, no handling problems are likely to be encountered, providing normal safe hygiene practices are applied.

Substance Safety Data Sheet

1. Generic name / Trade (other name): Barium Chloride.	
2. Appearance and Odour: Colourless and odourless, flat crystals.	
3. Composition: Inorganic Salt BaCl ₂	UN No. 1564 CAS No. 10361-27-9 EEC No. 231-149-1
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m³: 3856	Vapour Density (air=1): n/a
Boiling Point °C: 1560	Vapour Pressure (kPa): n/a
Melting Point °C: 900	Solubility (kg/m³): soluble in water
Auto-ignition Temp °C: not avail.	Molecular Weight : n/a
Flammability Limits (%v/v): n/a	pH : 5 - 8
5. Important Characteristics: Incompatibilities: BrF ₃ , 2 Furfan Per carboxylic Acid Occupational exposure limit: TWA 0.5 mg /m ³ (Ba)	
6. Safety Hazards: Fire: Non Flammable. Stability: Stable.	
7. Precautions: Fire: Possible toxic fumes. Stability: None.	
8. Fire Extinguishing Agents: All (unlimited).	
9. Fire Fighting Precautions: Personal protective clothing including respiratory and eye protection.	
10. Health Hazards: Inhalation: cough – shortness of breath. Skin: redness. Eyes: pain, redness, watering. Ingestion: vomiting, abdominal pain.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Wash with soap and water.* Eyes: Irrigate with cold water for 10 mins.* Ingestion: Drink water.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Wear skin protection and filter mask and gloves.	Spillage: Wear skin protection and filter mask and gloves, ventilation, extraction hood for large volume spillage.
13. Environment Hazards: High air pollution and aquatic contamination factor.	14. Precautions: Prevent contamination of soil, water and atmosphere.
15. Spillage Mitigation (see also 12.): Collect in disposal containers.	
16. Disposal Options (disposal to legislative requirements): Preferred: Retrieve spillage and incinerate.	
17. Storage: Dry, well ventilated environment. Avoid halogens and halogen compounds.	18. C.H.I.P. Label: Harmful-Xn Risk: R20 Harmful by inhalation. R22 Harmful if swallowed. Safety: S28 After contact with skin, wash immediately and thoroughly with water. In sever cases obtain medical attention.
19. Supplementary Information: High toxicity and moderate irritant.	   <p style="text-align: center;">DANGER TO ENVIRONMENT HARMFUL IRRITANT VERY TOXIC</p>




Personal contact assessment:

Used under laboratory conditions in solution to differentiate between Gypsum and Anhydrite in drilled cuttings samples.

Personal contact assessment:

Used under laboratory conditions to determine cement contamination in drilled cuttings samples or drilling mud. Used in small volumes (3 - 5mls). The major hazard associated with this substance is the solution composition, which includes Isopropanol.





Substance Safety Data Sheet

1. Generic name / Trade (other name): Bactericide.	
2. Appearance and Odour: Solid mass, yellowish, deliquescent and aromatic.	
3. Composition: Alkylbenzyltrimethylammonium Chloride Benzalkonium Chloride {BzAlkN + (CH ₃) ₂ Cl-}	UN No. 3261 CAS No. 63449-41-2 EEC No. 264-151-6
4. Physical Properties (at 20°C, 1013 mbar):	
Density kg/m ³ : n/a	Vapour Density (air=1): n/a
Boiling Point °C: 29-34	Vapour Pressure (kPa): n/a
Melting Point °C: n/a	Solubility (kg/m³): 4000g/l at 20°C
Auto-ignition Temp °C: n/a	Thermal decomp.: >150°C
Flammability Limits (%v/v): n/a	pH: 7 at 20°C
5. Important Characteristics: No information available.	
6. Safety Hazards: Fire: Hazardous vapours. Stability: No information available.	
7. Precautions: Fire: Combustible. Stability: Hygroscopic.	
8. Fire Extinguishing Agents: Water spray, dry powder, carbon dioxide.	
9. Fire Fighting Precautions: Personal protective clothing, respirator protection, chemical gloves, face shield. Possible hazardous vapours.	
10. Health Hazards: Inhalation: irritant. Skin: irritant on contact. Eyes: irritant, sensitiser, allergy. Ingestion: cardiovascular disorder.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Wash with abundant soap and water.* Eyes: Irrigate with cold water for 10 mins.* Ingestion: Drink water, induce vomiting.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: PPE plus goggles, rubber gloves, barrier cream.	Spillage: Plastic apron, SCBA for large volume spillage.
13. Environment Hazards: Local regulations apply.	14. Precautions: Do not allow to enter drinking/waste water system or soil.
15. Spillage Mitigation (see also 12.): Small spills: soak up with absorbent material.	
16. Disposal Options (disposal to legislative requirements): Local regulations apply.	
17. Storage: Store tightly closed and dry.	18. C.H.I.P. Label: Corrosive-C Risk: R21/22-34 Harmful in contact with skin and if swallowed. Causes burns. R22 Harmful if swallowed. Safety: S26-36/37/39-45 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
19. Supplementary Information: Handle with care according to manufacturers label.	  

Personal contact assessment:

Used to treat mud and formation samples prior to shipment from the wellsite to the laboratory. Generally supplied as a concentrated liquid which is added to the sample containers / cans to prevent bacterial growth. It protects yet does not alter or mask the chemical composition of the formation / fluid sample. Bactericide must be handled and dispensed with care. The manufacturers instructions should be checked before use and followed carefully. Ensure that spillage / splash procedures are in place prior to handling bactericide. Eye protection is mandatory whilst using bactericide.

Substance Safety Data Sheet

1. Generic name / Trade (other name): Calcium Carbide. (Calcium Acetylide).	
2. Appearance and Odour: Solid, dark grey, granules or powder.	
3. Composition: CaC ₂	UN No. 1402 CAS No. 75-20-7 EEC No. 200-848-3
4. Physical Properties (at 20°C, 1013 mbar):	
Density g/cm ³ : 2.2	Vapour Density (air=1): n/a
Boiling Point °C: n/a	Vapour Pressure (kPa): n/a
Melting Point °C: >1800°C	Solubility (kg/m³): n/a
Auto-ignition Temp °C: 390°C	Thermal decomp.: n/a
Flammability Limits (%v/v): n/a	pH: 12.48 at 20°C
5. Important Characteristics: Extremely reactive or incompatible with acids and moisture. Highly reactive with alkalis. Reactive with oxidizing agents. React violently with water to emit flammable but not toxic gasses (Acetylene).	
6. Safety Hazards: Fire: Flammable. Stability: Stable.	
7. Precautions: Fire: Produces combustible gas with water addition. Stability: Hygroscopic.	
8. Fire Extinguishing Agents: Dry chemical powder, foam. DO NOT USE WATER.	
9. Fire Fighting Precautions: Personal protective clothing, respirator protection, chemical gloves, face shield. Possible hazardous vapors.	
10. Health Hazards: Inhalation: respiratory irritant, coughing, nausea. Skin: irritant on contact. Eyes: irritant, risk of blindness. Ingestion: nausea and stomach pain, vomiting.	11. First Aid: Inhalation: Remove to fresh air.* Skin: Wash with abundant soap and water.* Eyes: Irrigate with abundant cold water.* Ingestion: Drink water, do not induce vomiting.* * N.B. Obtain medical attention.
12. Personal Protection: Normal Use: Safety glasses, plastic apron, dust respirator, gloves.	Spillage: Plastic apron, safety glasses, gloves, SCBA for large volume spillage.
13. Environment Hazards: Local regulations apply.	14. Precautions: Do not allow to enter drinking/waste water system or soil.
15. Spillage Mitigation (see also 12.): Cover with dry earth, sand, vermiculite or non-combustible material. Put in suitable waste disposal container.	
16. Disposal Options (disposal to legislative requirements): Local regulations apply. Specialist disposal company.	
17. Storage: Store tightly closed and dry in well ventilated area. Keep away from heat and sources of ignition.	18. C.H.I.P. Label: Highly Flammable-F Risk: R15 Contact with water liberates highly flammable gas. Safety: S2 Keep out of the reach of children. S8 Keep container dry. S43 In case of fire use only dry powder or sand - NEVER USE WATER.
19. Supplementary Information: Handle with care according to manufacturers label.	   

Personal Contact Assessment:

Used for checking lag time during drilling operations. Calcium carbide is a hydrophilic substance that reacts violently with any moisture to give off acetylene gas. It is therefore imperative that full PPE is worn, including safety glasses and gloves by anyone handling this substance. It must be stored away from other substances, any source of ignition or moisture in a designated isolation cupboard.

Other Substances:

"Tipp-Ex" Correction Fluid

Personal Contact Assessment:

Used to cover print errors on documents and reports (both office and offshore application). A type of liquid paper. Distributed in small bottles (20ml). Potentially hazardous - but low risk as it is provided in very small quantities. It is highly flammable and must be kept out of reach of children. Read the manufacturers instructions and follow them carefully. You may not be allowed to carry this substance in your personal luggage when travelling by helicopter.

18.0 Environmental Commitment

As a Wellsite Geologist in the worldwide oil and gas industry, there is a responsibility for conducting business in an environmentally responsible manner. Applicable environmental regulations and those procedures put in place by clients and the clients representatives must be adhered to.

18.1 Waste Management Techniques

There is an internationally agreed hierarchy of techniques for waste management and minimization, which is as follows, in descending order of preference:

- Reduce
- Reuse
- Recycle
- Recover
- Responsible disposal

These are known as the '5Rs' of waste management. A technique higher in the hierarchy is to be preferred as it removes waste earlier in the disposal process, reducing handling exposure, and further treatment requirements. A successful waste minimization program will use a mix of all five. When properly managed it provides a range of opportunities for the effective management of wastes. A key objective of the strategy is to provide an effective framework in which the range of options for managing waste, including avoiding its production, can be developed. The strategy is intended to encourage waste management to move through the hierarchy of options on the basis of the Best Practicable Environmental Option (BPEO) and Best Available Techniques (taking cost into account).

18.2 Waste Reduction

Waste reduction covers a wide range of techniques, all concerned with reducing the generation of waste at the source. The general categories of Good Practice in waste reduction techniques are:

- Rotation of product stocks to reduce inventory.
- Regular preventative maintenance to avoid plant leaks, overfilling, spillages, etc.
- Reduction in the volume of waste by compaction, shredding, drying, etc.
- Elimination of poor storage conditions, e.g. excess damp, temperature, sunlight, etc.
- Re-scheduling production to reduce cleaning operations.
- Establishing a Waste Reduction Action Plan (WRAP) for each location.

18.3 Waste Disposal

Where the generation of waste is unavoidable, safe licensed disposal is necessary. There are various methods available for disposal, and the best method should be chosen depending on the nature of the waste, the location and which authorized methods are available. The liability for disposal of waste is the responsibility of the waste generator. It is important for the generator company/organization to be aware of the final disposal methods and location for its waste and confirm that their obligations are covered. It is very important that BEFORE any of these methods are carried out that any required waste management authorizations and permits are obtained. It must also be clearly understood that Barrel will endeavor to promote re-cycling options with customers and where applicable will act as a waste broker, organizing the transportation of THEIR wastes for further treatment or disposal at authorized facilities, using suitable third parties. However, Barrel will not accept any additional waste disposal responsibilities and will not accept any additional producer liability for such wastes other than those liabilities already incurred as waste carriers or brokers.

18.4 Disposal Methods

There are various disposal routes for general and industrial waste as follows:

Landfill

Landfill is the disposal of waste to land. This is generally burying untreated waste in a suitable hole. Licensed landfill sites have the potential to cause a variety of pollution problems, including the release of leachate, production of methane and release of odor and must therefore be carefully designed and managed. Modern landfills are constructed of cells with an impermeable base, i.e. a combination of clay and rubber liners, for the collection of leachate, and gas collection systems such as clay capping, to prevent the loss of methane to the atmosphere. This type of management may need to continue for many years after the site has been closed.

Incineration

Incineration is the licensed, controlled burning of waste at high temperatures, which typically reduce the weight of the waste by 70% and the volume by 90%. Incineration has the potential to release a number of serious pollutants, such as hydrogen chloride, furans, dioxins, particulates and heavy metals, unless it is carefully controlled with adequate abatement plant fitted. Where such facilities are authorized, there is a very high level of clean-up required, as emission limits and licensing requirements are very strict. Many new incinerators use the combustion of waste to generate electrical power and are termed Waste to Energy or Energy from Waste plants. Incineration is particularly suitable for waste chemicals, oils, organic compounds, rubbers, plastics, clinical wastes and other wastes that are hazardous, resistant to biodegradation or which cannot be safely disposed of by authorized landfill.

18.5 Oilfield Generated Wastes**Disposal at Sea**

Historically, sea dumping of waste has been very difficult to control, and can give rise to significant pollution. This has led to many international agreements that severely restrict the use of this method. The sea dumping of drilling wastes, in particular drill cuttings is an authorized and approved method in many areas, although there are restrictions in some areas such as the North Sea and U.S. Gulf of Mexico.

Thermal Desorption

The thermal desorption treatment of drill cuttings is an established technology with treatment plants operational in the UK, Norway, the USA and South America. The design of units varies but the principal behind them is to volatilize hydrocarbons associated with cuttings to produce a low hydrocarbon content residue that can either be recycled, e.g. as a construction material, or land filled as a non-hazardous waste. The treatment is also well established for remediation of hydrocarbon contaminated soils, in particular with soils contaminated with volatile organic compounds (VOCs) and semi-volatile organic compounds.

Bioremediation

Bioremediation is a technology for treating organic contamination that uses micro-organisms; typically naturally occurring bacteria, to degrade organic contaminants into simpler compounds that may or may not be less toxic than the original contaminants. Degradation products can themselves be broken down further to more harmless constituents. If the end products are carbon dioxide and water, the organic contaminants have been completely broken down. However, it is not always necessary to carry out degradation to this level, as intermediate digestion products can be sufficiently benign so as not to cause an environmental problem.

Stabilization

One way of ensuring the safe disposal of waste is to convert it to a form where it is stable and insoluble. Although the waste will still contain contaminants, they are bound in an insoluble matrix that is stable, and so will provide an environmental barrier against further contamination. The type of waste will determine the applicability of stabilization and solidification as an appropriate treatment. This type of treatment is suitable for the immobilization of many metal compounds but the applicability to organic materials is limited.

Typical stabilization compounds are portland cement or cement kiln dust, lime, quicklime or limestone, fly ash, various mixtures of these cement base materials, and various organic binders such as asphalt. Most stabilization processes involve the application of concrete technology to produce a concrete-like material that can either be land filled or put to an alternative use. As well as immobilizing contaminants, stabilization and solidification processes have the advantage of producing a regular material with good structural integrity. The end product can be tailored to the final use, which is also beneficial to landfill planning; for example, materials can be encased in blocks to provide structural integrity to a landfill core, or can be made into a granular material for void filling. The applicability of the treatment will need to be determined by testing, the level and type of testing being determined by site specific criteria, and the nature of the immobilized contaminants. General leachability and ecotoxicology testing can be combined with weathering tests such as acid immersion to assess long term stability.

In many instances, standard concrete producing equipment can be customized to make an appropriate treatment plant, which makes stabilization and solidification an economical means of treatment for certain waste types. If cementitious processes are being used, it is also possible to adapt the same plan to treat various different types of waste through the use of different binding agents and cement products. Factors that must be considered in the design and selection of stabilization and solidification processes are design, implementation and performance requirements of the process and products.

Waste characteristics (physical and chemical), site-specific considerations and economics must also be included.

Paper

Ensure that paper used in the office which is blank on one side is used for printing draft documents, and also as note paper. Where possible, a plain paper fax should be used to prevent the need for photocopying thermal faxes. Incoming faxes should be copied only to the necessary people and the cover sheet on outgoing faxes should be used for writing the message. Where possible, a double-sided photocopier should be used to minimize the use of paper.

Packaging

Over packaging of outgoing parcels should be avoided and whenever possible packaging received should be reused.

Consumables

Where applicable, drinks cans should be recycled. Printer cartridges should also be recycled and recharged locally where this type of service is available.



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