

Government of Assam

GUWAHATI WATER SUPPLY PROJECT (GWSP)

JICA ODA LOAN PROJECT (ID-P201)

**HEALTH AND SAFETY
MANUAL**

January 2019

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1 Going onto Site

Introduction

This Manual is to be read in conjunction with the Contract and is essentially written to prepare all site personnel to work safely on sites of water works, sewerage works and general building sites, which aims to inform all concerned of the hazards and how to avoid accidents. This is not a document for the specialized training of personnel in first aid and emergency treatment of injuries.

This Health and Safety Manual only provides guidance in understanding the diversity of potential hazards, the simple set of associated precautions to be taken and to instill a sense of responsibility to each individual working within the construction environment.

Each contract package shall have a specific Risk Assessment protocol for identifying in advance all potential hazards and the related mitigation steps to be taken by whom, whether the contractor, the supervising engineer or associated construction workers, depending on the nature of the work.

This Health and Safety Manual is therefore to be closely adhered to in ensuring the overall safety of the construction sites under the Guwahati Water Supply Project (GWSP)

It should be noted that statistics show a person is more at risk of an accident during the first two weeks on site than at any other time. Acting on the advice contained in this Manual will help to effectively reduce risks.

Under the provisions of the Contract it is mandatory that a Health and Safety Policy is implemented and shall include, but not be necessarily limited to, the following policy items:

- How to set up and maintain a safe and healthy working environment;
- What health and safety responsibilities exist, who is responsible and how to contact them;
- The safe systems of working, who is responsible, and how to contact them; and
- The arrangements for review and update, etc.

It is of fundamental importance to understand your own responsibilities and carry them out. Make sure that you are informed, competent, capable and prepared for site, which is a potentially dangerous environment.

In accordance with the contract, the conditions require the contractor to have on site a designated officer qualified to promote and maintain safe working practices.

It is mandatory for the contractors to purchase this Health and Safety document.

Considerations before Proceeding on Site

- Be familiar with all health and safety rules, regulations and site policy as included herein
- Read thoroughly this health and safety policy of the Health and safety manual and understand all related practices and procedures.
- Assess with management if you require any further training before going onto a particular site, which may have additional risks and require detailed mitigation procedures.

Procedures for Joining New Sites

- Report to the site management and review your experience and knowledge.
- Be given induction training, and be informed of site safety rules, regulations, instructions, notices, procedures and the name of the person responsible for site safety.
- Be informed of the requirements for personal protective equipment and clothing and be issued with this as and when appropriate.
- Be told of your personal responsibilities for health and safety.
- Have explained to you the procedures for authorizing the use of plant, machinery and powered tools, etc.
- Be instructed how to report accidents, near misses and defective plant and equipment.
- Be shown first aid facilities.
- Be shown round the site and informed of the hazards and the preventative and protective measures to be taken to control them.

You should inform your site management of any illness or disability which could affect your actions such as colour blindness, epilepsy, diabetes or vertigo.

You should not come to work under the influence of alcohol or drugs or take these whilst at work.

If you see a situation that, in your opinion, involves a risk of death or injury, you have duty and a right to take immediate action.

- Tell the person in danger to stop. Explain why and warn other operatives of the danger. Don't put yourself at risk.
- Immediately contact the person in charge of the activity, and your immediate manager, and inform them of your actions.
- Later inform appropriate senior site personnel.
- If you are uncertain about the degree of risk involved, consult your immediate manager before taking any further action.

If you ignore a danger you are condoning it and could share responsibility for any accident. Remember, things that look unsafe usually are!!

2 The Management of Health & Safety

Risk Assessment and Control

Fundamental to managing health and safety is an appreciation of those hazards that are present at the work place. This is obtained by undertaking a risk assessment.

To control risks the following five steps must be taken:

- Identify the hazards.
- Assess the risks from the hazards and the consequences if something goes wrong.
- Apply measures to eliminate or avoid the risks.
- If the risks cannot be eliminated or avoided then control them as far as is reasonably practicable.
- Review the assessment regularly and take further action if necessary.

In practical terms when on site this will mean:

- Planning ahead and considering how the work will be done.
- Walking around the whole site and looking at what might cause harm.
- Deciding who might be harmed and how.
- Evaluating the risks and deciding on action.
- Considering if hazards can be removed or if not eliminated then controlled.
- Taking action which aims, where practicable, to protect the whole workforce rather than selected individuals.

Inform those involved about the hazards and the precautions and review the situation regularly, taking further action where and when appropriate.

Do not overlook the need to consider children, members of the public and visitors when planning site security.

Safe Systems of work

Every site is unique and requires specific rules for safe systems of working. These should be contained in written method statements, which should cover all hazardous operations.

A method statement will typically include information on:

- What the hazards and their controls are.
- The person in charge of operations.
- Safe means of access to all work areas.
- Specific details of any equipment that is required such as lifting gear, protective clothing and breathing apparatus.
- Details of storage of materials and methods of dealing with hazardous substances.

- How the work is to be carried out, covering items such as isolation of plant, over-pumping, hygiene arrangements, programme liaison with operational staff, takeover and hand-back if appropriate.
- Communication procedures.
- Emergency procedures.
- The equipment to be used.
- Residual risk.

An appreciation of the extent of risk due to fatalities within the construction sector is given in the adjoining Table, which gives the frequency and typical types of fatalities along with the overall percentages of their occurrence.

Typical % Occurrence of Fatal Injuries within the Construction Sector.

	Number of Fatalities	Percentage of Total
FALLS FROM A HEIGHT		
Ladders (all types)	6	
Scaffolding (all types)	9	
Fragile roofs	9	
Roof edges or holes in roofs	10	
Structural steelwork	2	
Work platform (above ground)	2	
Parts of floors/surfaces not listed above	5	
Total	45	54%
TRAPPED BY SOMETHING COLLAPSING OR OVERTURNING		
Building/structures (or parts of)	1	
Earth, rocks e.g. trench collapse	4	
Plant including lifting machinery	2	
Vehicles falling from supports/overturning	3	
Total	10	13%
STRUCK BY A MOVING VEHICLE		
Dumper	1	
Excavator	3	
Goods vehicle	3	
Trailer	1	
Other	1	
Total	9	11%
STRUCK BY FLYING/FALLING OBJECTS		
Material being lifted	3	
From a table, shelf, stack or rack	1	
From a building or structure	1	
From a vehicle	2	
Other	1	
Total	8	10%
CONTACT WITH ELECTRICITY OR AN ELECTRICAL DISCHARGE		
Domestic type equipment	1	
Overhead lines	1	
Other network maintenance	1	
Industrial plant	1	
Total	4	5%
CONTACT WITH MACHINERY OR MATERIAL BEING MACHINED		
Mobile crane	1	
Revolving shaft	2	
Total	3	4%
DROWNING/ASPHYXIA		
Water	1	
Other	1	
Total	2	2%
HANDLING, LIFTING AND CARRYING		
Lifting or moving other weights, objects	1	
Total	1	1%

3 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is equipment which is intended to be worn or held by a person and which protects against risks to health or safety. It may also afford some protection against the weather.

PPE is required to be supplied and used wherever there are risks to health and safety that cannot be adequately controlled in other ways.

In adequately reducing the risk of injury, the use of PPE is mandatory in accordance with the provisions of the Contract.

Typical PPE Listing

- Protective clothing.
- Eye, ear and head protection.
- Foot, hand, leg and arm protection.
- Respiratory protection.
- Reflective clothing.
- Gas detectors and breathing apparatus.
- Lights, belts and harnesses.

Suitability of PPE

When assessing the suitability of PPE consider whether:

- It is appropriate for the risks involved and the conditions at the workplace.
- It prevents or adequately controls the risks involved without creating risks itself, or increasing the overall level of risk
- It can be adjusted to fit the wearer correctly.
- The wearer's state of health has been considered.
- The needs of the job and the demands it places on the wearer have been assessed.
- Items of PPE being worn together are compatible.
- Training is required.

Utility of PPE

The user should be aware of why PPE is provided, when it is to be used, repaired or replaced and its limitations.

- The correct maintenance schedule should be followed and replacement PPE always readily available.
- PPE needs to be properly stored and any defects reported and corrected.
- The use of PPE is not optional when required by an approved method statement.

It is important that users wear PPE all the time they are exposed to risk.

Never allow exemptions for jobs that take “just a few minutes”.

4 Diseases and Health

Water Supply Systems

All construction work in the vicinity of water supply systems must be conducted so that it does not contaminate the supply or endanger public health.

Hazards: Contamination of the water supply with substances or micro-organisms.

Possible consequences

- Endangering public health.
- Toxic materials in supply
- Spread of disease.

Prior to working

- Prepare a risk assessment.
- Plan the work.
- Identify services.
- Set up a contingency plan for emergencies.

During work

- Where practicable, maintain water pressure to prevent infiltration.
- Keep groundwater below pipes during repair.
- Prevent the contamination of groundwater and rivers.
- Provide toilets and proper wastewater drainage.
- Store chemicals safely.
- Keep the site secure.

Long-term policy measures

- Clean and disinfect before commissioning.
- Undertake regular maintenance.
- Prevent illegal connections.
- Control delivery of chemicals to sites.
- All tanks/plant/delivery points to be labeled and secure.
- Monitor water quality and health of workers.
- Restrict staff in vulnerable or sensitive areas.

Sewerage Systems

All work in contact with a sewerage system must be done in a way that minimizes the risk of infection to the workers and the public.

Hazards

- Exposure to sewage.
- Exposure to toxic or explosive gases.
- Micro-organisms entering through the eyes, nose, and mouth, through cuts or scratches, or by inhalation as a dust, aerosol or mist.

Possible consequences

- Illness, e.g., gastroenteritis,
- Leptospirosis (Weil's disease),
- Hepatitis, occupational asthma,
- Infections, polio, typhoid, tetanus.
- Poisoning.
- Injury or death by explosion.

Ensure that Safety procedures are followed.

Prior to working

- Undertake a risk assessment.
- Divert flows and clean sewers, where appropriate.
- Provide workers with full health and safety rules, regulations and guidance.

During work

- Minimize the need to enter the sewers.
- Use personal protective equipment.
- Where possible, clean contaminated plant and equipment before starting work.
- As appropriate, maximize the use of closed-circuit TV for inspections. Use washing facilities and do not eat, drink, smoke, or touch the face until after washing.
- Use first aid facilities immediately to deal with any injuries, however small. The In accordance with the provisions of the Contract, first aid services must be available

at all sites having workers strength of more than 40, a person qualified in first aid with access to appropriate first aid equipment shall be available at all times.

- Ensure clean and contaminated clothes and equipment are stored separately.

Long-term policy measures

- Provide training and supervision.
- Provide health monitoring.

Strict attention to personal hygiene is required.

Vibration

Vibration from using hand-held power tools can affect the fingers, hands and arms. Long-term use can cause permanent damage. Use low vibration tools where possible and minimize vibration from worn parts by good maintenance. Risk of injury during operation can be reduced by hands being kept warm to maintain a good flow of blood into the fingers.

Noise

Hazards: Excessive noise.

Possible consequences

- Permanent damage to hearing may arise in cases for prolonged exposure.
- Hearing will be less sensitive.
- Permanent ringing in the ears, i.e. tinnitus.
- Breakdown of safe and effective communications.

Noisy areas and activities must be identified. Everyone must understand the risk of injury, and know how to use suitable hearing protection where necessary.

- If difficulty is experienced in hearing normal conversation at about 1 m then it is possible that the noise levels are too high. Request that an assessment is carried out.
- Where assessments show noise is in excess of 85 decibels hearing protection must be provided and employees advised to wear it.
- Where exposed to noise in excess of 90 decibels hearing protection must be provided and must be worn.
- Comply with any notice requiring the use of hearing protection. Do not ignore warning signs.
- If in any doubt about noise levels, wear hearing protection. If no warning notice is apparent, inform management.

Investigate the possibility of reducing the noise at source.

5 Vehicles and Plant

The nature of construction is such that the situations are continuously changing. Operation of vehicles and plant on site can be very dangerous and must be properly managed.

Hazards: Moving and working items of plant and machinery.

Possible consequences

- Being struck, crushed, or run over by vehicles and plant.
- Falling from vehicles and plant.
- Being struck by objects falling from vehicles and plant.

Minimize risk

- Undertake a risk assessment.
- Check what measures are needed for safe working and implement them.

Arrange a safe site layout and plan properly

- Segregate vehicles and people.
- Plan routes, maintain them and keep them clear.
- Minimize vehicle movements and set speed limits.
- Keep working areas tidy and fenced off.
- Establish a signaling system where necessary.
- Arrange warning signs.
- Tip and store materials only in designated areas.
- Set aside an area for parking.

Vehicles and plant must be safe

- Use only suitable plant and withdraw defective plant.
- Maintain and test plant. Keep records.
- Use plant within its capabilities. Do not overload.
- Use appropriate signs and flashing lights.
- Keep manuals available.
- Prohibit makeshift repairs.
- Store plant safely and immobilize when not in use.

Safe working practices are essential

- Make everyone aware of any hazards.
- Use banks-men for direction of maneuvers as and when necessary. Minimize reversing.
- Be careful especially near to services.
- Carry personnel only in vehicles which are provided with seats for the purpose.
- Use stop logs to prevent falls into excavations.
- Ensure personnel are kept clear of un-propped vehicle bodies when tipping.
- Make sure loads are secure.

- Keep site and public roads clean.
- Guard against improvised use of vehicles and plant.

Specific points of note for some plant include the following:

Mobile cranes	Maintain space to turn or swing round. Make safe provisions for overhead cables. Crane must be in a stable position and an appointed person must monitor all lifts and drops. Outriggers must be fully extended to sound ground. Rigging and de-rigging only by competent persons. Requires safe load indicator. Clear signals must be given. All wire ropes, slings, lifting hooks and tackle must be checked at an agreed interval for their safe load carrying capacity.
Fork-lift trucks	Load stability is crucial. Extra care on slopes and when reversing.
Compressors and Breakers	Site to minimize noise and exhaust gases nuisance. Use hearing protection. Use silenced equipment. Take precautions against vibration.
Dumpers	Care when tipping. No one to be on dumper when loading with loose material. All dumpers while transporting soil, cement, etc shall be covered to prevent dust pollution.
Excavators	Keep clear of slewing body.
Excavators Used as cranes	Only use approved lifting attachments.
Compaction Equipment	Keep feet well clear. Use protective footwear and hearing protection. Take precautions against vibration.
Changing tyres and wheels	Do not rely on jacks; also chock for support. Take care when inflating tyres and use cages when appropriate. Keep to correct and recommended pressures.

The site roads shall be watered regularly to avoid dust pollution, which shall be checked at regular intervals for all petrol, diesel driven equipment.

6 Temporary Works

Temporary works are sometimes necessary in order to complete the permanent works. They might include pilling excavation, dewatering, pumping, formwork, scaffolding, roads, bridges, buildings, site services, etc.

Hazards: Unsuitable or insufficient arrangements which lead to partial or complete failures.

Possible consequences: Injury or death.

Temporary works must be planned and properly designed

Checked and approved calculations, sketches and drawings, must be drawn up in conjunction with an approved method statement detailing how the work is to be carried out. All Method statements are to include details of protective and preventive measures, residual risks, physical controls, how the work is to be managed and the name of the person in charge.

Once established, the method of working should not be changed without approval and reference to the calculations and drawings. All paperwork should be issued to those implementing the temporary works at site so that they are aware of the assumptions made in the design. The method statement must be checked and signed, and incorporated into the construction phase health and safety plan.

Some aspects for consideration are:

Environmental Health	Reasonable steps should be taken to minimize problems associated with noise, smell, smoke, dust, vibration, etc. The local Environmental Health Officer should be consulted if in doubt.
Access	This should be safe for pedestrians and vehicles. Temporary access roads, footpath diversions and traffic management measures may be required.
Hoardings and barriers	The public should be safely separated from the works and the site made secure.
Construction Power	All provisions given in accordance with safety norms
Site lighting	This should be adequate. Emergency lighting may be appropriate.
Services	The routes and connection points for site services should be identified.
Flow diversions	Flow interruptions or diversions should be planned and the effects of these considered. Risk of flooding or contamination of water supplies should be assessed. Standby pumping facilities may be required.
Excavations	These should be safely supported. Spoil should be stored and disposed of safely. Roads should be kept clean.
Formwork	Formwork should be robust. Arrangements for erection and dismantling should be planned.
Chutes and Conveyors	These should be sited safely with proper guards.
Scaffolding	These shall be properly designed, method statements prepared for erection and dismantling

7 Services

Electricity, gas, water, sewerage and telecommunication services are frequently present but a range of other less common services are also to be found.

Hazards

- Electricity.
- Explosive and toxic gases.
- Water or sewage.

Possible consequences

- Burns and electrocution.
- Explosive and fire.
- Arcing electrical current
- Bursting or collapse of pipelines.
- Flooding and insanitary conditions.
- Injury disease and death.
- Break in emergency communications.

Accidents involving damage to services are common as much water industry construction is below ground.

Colour coding of services may be introduced.

The utilities should have an agreed colour coding scheme for new buried services up to 75 mm in diameter. Older services obviously will not conform.

Suggested coding:

Colour	Service
Black	Electricity
Red	Electricity – some 11 KV cables
Blue	Water
Grey/White	Telecommunications
Green	Cable TV

Where there is any doubt about the type of exposed service it should be treated as an electricity cable or gas pipe until proven otherwise.

Before starting to excavate:

- Consult and liaise with services companies – confirm if service is in use or not, review need to isolate, understand the material and the form of construction.
- Obtain services plans of the area.
- Undertake a risk assessment and consider the need for a permit to work system.
- Use cable and pipe locating tools. Detector types include hum detectors, radio frequency detectors, transmitter receiver instruments.
- Hand dig as many trial holes as necessary and recheck with detectors as work proceeds.
- Mark the services positions on the ground and inspect for signs of unexpected services.

When excavating:

- Adequately support and protect services.
- Always assume services are present.
- Services embedded in concrete should be made safe before being broken out.
- Watch for services as work proceeds. Assume all services are live unless proven otherwise.
- Backfill around services in an approved way.
- Do not use power tools or excavators closer than limits recommended. Keep clear when digging.

**Remember metallic service pipes may
be live due to faulty earthing of building
services.**

If an electricity cable is broken:

- Do not touch it. Keep everyone clear.
- Do not try to disentangle the excavator bucket.
- Jump from the excavator. **DO NOT** climb down as the current could pass through you to earth.

Overhead power lines

Electricity can flash over from overhead powerlines. These are not insulated. When working under or near powerlines is unavoidable, consult the local electricity authority. Do not allow anything to touch them. Take particular care with metal leveling staffs, ladders, scaffold poles and all metal equipment. Safe working requires a separation zone.

If mobile cranes or excavators are used the minimum horizontal distance from the ground level barrier to the path of the overhead lines should be 6m plus the length of the jib or boom.

If there is a gas leak or pipe break:

- Evacuate the area. Keep everyone clear.
- Enforce no smoking and no naked lights.

Telecommunication services

These can be expensive to repair but there is normally no direct risk of personal injury.

In all cases report services damage IMMEDIATELY to assist emergency services as required.

8 Electricity

Electric shock can injure and kill. The severity of the shock depends on the level of current and the duration of contact.

Hazards: Electricity.

Possible consequences

- Electric shock.
- Fire and explosion.
- Injury and death.

A safe system of working is essential. A permit to work may be required. Electrical work should be conducted by a qualified electrician.

Portable Tools and Appliances

- All portable tools and appliances should be cordless or operate at not more than 110 volts and with a centre tapped earth.
- The use of isolating transformers will increase protection.
- The voltage rating of Hand lamps should be kept at a minimum, according to required usage.
- Take care not to drop power tools into water. Consider using cordless tools.
- Keep cables short and off the ground.
- Unplug tools when not in use.

Temporary Electric Lighting and Power

Where flammable gases, vapours or potentially explosive dust may be present, then the area should have been previously cordoned off and appropriate warning signs given. Specialist advice will be required. Intrinsically safe equipment is necessary.

Light switches should be suitably located and emergency lighting provided where power failure would result in danger due to darkness. Power and lighting cables should be kept off the ground as much as possible and fixed above head height.

Routine Precautions

Temporary systems must be correctly installed and tested. Arrange for regular inspection and testing. Inspect and test leads, sockets, plugs, equipment, etc.

Check for bare wires and damage to leads. Mark equipment to show date of last test and when the next test is due.

9 Working in Roads

Hazards: Moving vehicles, hazards to road users, pedestrians, employees and operatives.

Possible consequences

- Road traffic accidents.
- Injury and death.

Work associated with the inspection, construction and maintenance of water, Waste water and storm water drains services in roads, will require the following considerations:

- Give the prescribed period of notice for nature of work / location.
- As appropriate coordinate with the Roads and Highway Authority.
- Execute the works safely.
- Provide qualified supervisors and operatives.
- Complete in a reasonable period of time.
- Complete reinstatement to the required standards, and not inferior to the existing standard.

When Planning Roadworks:

- Plan for the safe movement of vehicles and personnel, and provide for the disabled.
- Decide which carriageways can be kept open and if temporary traffic lights or stop/go boards are needed.
- Consider if road closures are needed.
- Maintain minimum allowable lane and footpath widths.
- Consult with the police, local authorities and public transport companies. Issue appropriate notifications.
- Arrange signs, cones, barriers, lamps, information boards and lighting. Maintain and keep these clean.
- Speed controls should be considered, in consultation with the police.
- Maintain clean road surface clear construction sector's etc.\

Safe working procedures must be in place before work starts.

- Define the working area and working space required.
- Provide a safety zone to separate the workers, plant and materials from the traffic.
- Ensure personnel use high visibility clothing and that all warning beacons on site vehicles are functioning.

Monitor reinstatement and ensure that road surfaces are clean. Check that all required actions have been completed before leaving site.

10 Manual Handling

Hazards: The manual movement of loads and repetitive, forced or awkward body movement can cause injuries.

Possible consequences

- Typically, many injuries are due to handling, lifting and carrying.
- Strains and sprains to muscles and joints, including repetitive strain injury.
- Torn ligaments and tendons.
- Disc troubles and hernias.
- Cuts and abrasions
- Crushed limbs, hands and feet.

CONTROLS: The risk of injury can be significantly reduced by good planning by using correct handling techniques and by taking ample precautions.

The risk of injury from manual handling activities which cannot be avoided should be reduced, where practicable.

Undertake a risk assessment by initial consideration of the job:

- Ensure staff members are trained for the task.
- Check the size and weight of the item and the distance it is to be moved. It may be possible to make the loads smaller, lighter or easier to hold.
- Check that the route is clear and safe; avoid sloping or slippery surfaces.
- Where necessary, have more than one person available or use mechanical assistance.
- When handling loads wear suitable safety footwear and gloves when necessary.

Adopt appropriate and correct procedures for lifting and lowering loads:

- Stand close to the load with feet 0.5m apart.
- Place one foot in front of the other and bend your knees, keeping a straight back.
- Keep your chin in and get a firm grip.
- Use the whole of your fingers.
- Keep the load close to your body.
- Grip the load diagonally where possible.
- Lift by straightening your legs.
- To put down reverse the procedure.

When carrying:

- Keep the load close to the body.
- To change grip rest the load on a ledge.

**Always use mechanical aids for lifting heavy and awkward loads.
Get help when necessary.**

11 Ladders and Scaffolding

It should be noted that typically the majority of accidents on site involve falls.

Ladders

Hazards

- Working at height and or depths.
- Not properly secured.
- Set on uneven or unstable base.
- Contact with overhead cables.

Possible consequences

- Falls.
- Slippage or collapse.
- Dropped tools and equipment.
- Electrocution.

Ladders should be:

- Properly stored and inspected regularly and suited to the use to which they are put.
- In sound condition, clean, and not painted.
- Handled and placed by a sufficient number of people.
- Set on a firm and level surface at an optimum angle of 1 in 4, and properly erected and secured near to the top, or, if this is not possible, at the bottom.
- Set the right way up and where appropriate also secured midway.
- Projecting to approximately 1m above landing place and with sufficient overlap on extension sections.
- Placed to avoid overreaching when in use.
- Where necessary held by a person at the foot.
- Spacing of rungs shall be uniform
- The maximum length shall not exceed 10m, at every 10m height, or depth, a resting platform shall be provided.

When lowering an extending ladder into a tank or trench, take care that sections do not separate and injure workers below.

Do not use metal ladders under live power cables.

Fixing of ladder access to scaffolding:

- Ladder extends to approximately 1m above platform.
- Ladder to be securely lashed to scaffold.
- All boards to be supported in at least three places.
- Fix scaffold on firm level base.
- Guardrails to be provided.
- Fix Toe-board at base of guardrails.
- Platforms to be three to five boards wide.
- All boards to be suitably secure.

Step ladders should be:

- Set stable on a level firm surface.
- Fully open and set 90 degrees to the work.
- With user's knees below the top step.

Scaffolding

Hazards

- Poor access.
- Working at height.
- Poor standards of erection including missing parts, such as guardrails.
- Use of incorrect parts.
- Poor maintenance.
- Overloading and unauthorized alteration.
- Weather and contact with overhead cables.
- Poor foundation conditions.

Possible consequences

- Falls.
- Overturning and collapse.
- Dropped tools and materials.
- Electrocution.

Tower scaffolds should:

- Be erected to manufacturer's instructions and not overloaded.
- Rest on a firm level base with outriggers in place and castors locked before use.
- Have the height-to-base ratio not more than recommended by the scaffold manufacturer.
- Be tied and anchored in windy weather, when unattended or sheeted.
- Not be moved with people, materials or equipment on the scaffold.

Fixed scaffolds should:

- Be designed, erected, altered or dismantled by competent and experienced personnel.
- Be suitable for intended use and anticipated loading.

- Be on a firm level base with base plates and soleplates as necessary.
- Have each scaffold board supported in at least three places and at appropriate levels.
- Have the scaffold boards securely in place.
- Be adequately tied to the building or structure.
- Have guardrails and toe-boards to all working platforms, access ways, stairways and landings and where a fall of more than 2 m is possible.
- Any gaps between the toe board and guard rail must be effectively filled in.

No fixed or mobile scaffold should be used unless it has been inspected by a competent person:

- Before use.
- Within the previous seven days.
- After exposure to adverse weather conditions, which may have affected its strength or stability?
- After any substantial modification or alterations.

All inspection details are to be recorded on an inspection report, which should be kept on site and readily available.

Consider also alternative means of access such as hydraulic work platforms, which can lead to greater efficiency for certain types of work and give a higher standard of safety.

Where lifting appliances are used on scaffold, additional strengthening shall be given to the part of scaffold where lifting appliances are to be supported

Scaffolds shall not be used for storage of material other than that required for immediate use.

12 Excavations

All types of excavation occur throughout water supply and sewerage pipeline installations and associated ancillary works. Note that excavations, however shallow, may require support.

Hazards: Holes in the ground of all shapes, sizes and depth.

Possible consequences

- People falling into excavations.
- Collapse of excavations.
- Suffocation and drowning.
- Injury and death.
- Damage to property.

The risk of collapse must always be assessed and appropriate precautions taken. The ground may be weak, laminated, previously disturbed, or may consist of fill material, which can be contaminated.

Considerations before Commencing Work:

- Consider services and nearby structures. Is there risk of damage and in particular subsidence?
- Get data on ground conditions, including the groundwater table level. Has the ground been disturbed before? Is this likely to make it unstable?
- Plan the method of work and establish an adequate support system.
- Provide edge protection – barriers, fences, etc.
- Keep unauthorized people away from excavations
- Ladders or alternative methods of access must always be provided.
- Assess the risk of flooding and the presence of gasses or fumes.
- Arrange adequate lighting.
- Plan emergency escape routes.

Instability of Excavations Caused by Water

It is very important to note that water can cause instability through:

- There being a high water table.
- Changes in ground water regime.
- Soil becoming dryer or wetter.
- Potential erosion by rain or drainage of water.

Ensuring Safety of Excavations

Excavations must be made safe by battering the sides to a safe angle of repose or by installing adequate supports to the sides where necessary. Side supports, where installed,

must be placed in advance or as the excavation proceeds and not lag behind leaving the sides unsupported.

Support Methods

A range of proprietary trench boxes and hydraulic waling are available, which allow trench supports to be put in place with minimum requirement for people to enter the excavation.

Typically, excavations are supported by trench sheets and props. The trench supports extend above the edge of the excavation to act as toe boards and guardrails are provided to prevent falls into the excavation. Safe access is provided by a tied ladder. Exposed services are supported.

During excavation always work from within the protected area of the trench or outside from above and:

- Examine the excavation daily, the trench support system and in particular the working face, as work proceeds. Check it is secure.
- Check that the supports are adequate and have been installed as planned. Watch for movement. This can indicate the need for additional support.
- Consider if soil conditions are as expected and are not changing or deteriorating.
- Keep soil heaps, rocks, stones and other materials sufficiently clear of the edge.
- Review if the methods of support and excavation are as planned.
- Check for gas and fumes. Keep plant exhaust pipes away from excavations.
- Check that the pumping arrangements are sufficient and are not removing fine soil material. Provide standby pumps.
- Make sure all operatives have suitable equipment, protective clothing and hard hats.
- Provide solid barriers as edge protection.
- Arrange sufficient warning signs and lights.
- Ensure that safe access and means of escape are provided around the work and into the excavation.
- No person should work in an excavation unless the supports have been inspected and the inspection recorded on an excavation inspection report.

Do not enter any unsafe excavation. Insist that any workers at risk are withdrawn and the excavation made safe.

Excavation in rock: Drillers shall wear protective hand gloves, gumboots and hard hats. Special arrangements need to be made for storage, transportation and handling of explosives, where used. Only authorized blasting foreman shall handle the explosives and the detonators, no smoking or open flames be allowed in the explosive area

The foreman shall inspect the blasted rock, scale down the loose rock, check the gas level and declare the area safe for working, Blast size and pattern shall be designed by the foreman and vibration monitoring be done.

13 High Pressure Cleaning Equipment

Tanks and pipelines are frequently cleaned by using jets of water under pressure. These powerful cleaning methods also have the capability to cut through solid materials such as concrete.

Hazards

- High pressure and high velocity jets of water.
- Abrasive particles.
- Exposure to hazardous substances.
- Kickback from jetting equipment.
- Noise.

Possible consequences: Injury and death.

Safety of other people

- Keep working areas clear of people.
- Display warning and no entry signs.
- Install shields and barriers.
- If practical, do the work in a separate area set aside.

Arrange for personal protection

- Use waterproof protective clothing and equipment.
- Protect against the direct impact of a jet of water.
- Install shields and barriers.
- Use eye protection.
- Use suitable respiratory protection if required.

For safe working:

- A trained team of at least two or three members with a nominated team leader may be necessary.
- The operator should direct work while jetting.
- Only start a pump if the jet of waters is aimed at the work.
- Use targets and side shields to guard against grit or solids washed out by water jets.
- Only use stable secure working platforms and when appropriate use additional supports and restraints to prevent the operator being forced backwards by the reaction of the jet.
- Keep electrical cables clear of water and spray.
- Collect and safely dispose of all waste material.
- Take additional precautions when using abrasives.
- Have an emergency shut-down procedure in place.

Equipment

- Check, clean, maintain, and test equipment.
- Check nozzles are clear.
- Guard against kinks, and parting couplings in hoses.
- Relieve the pressure in hoses when turning the pump off.
- The pumps shall have by-pass arrangement, return line to regulate the pressure while working

Avoid jetting in:

- Confined spaces. Consider remote operation.
- Potentially flammable atmospheres. These require intrinsically safe equipment and methods of work.

Injuries:

Report all jetting injuries. Sometimes apparently insignificant wounds hide more serious injury.

14 Working Alone

Working alone is common and should be planned carefully. Make sure you are familiar with procedures and follow them. When you are working alone your responsibilities to safe working remain unchanged.

Hazards

- Changing weather conditions.
- Assault.
- Attack by animals.
- Injury and illness.

Possible consequences

- Getting lost or trapped.
- Falls and drowning.
- Hypothermia or heat exhaustion.
- Delay in obtaining medical or other help.
- No direct access to help in case of an accident.

You must be suitably trained for the job assisted, understand the risks, and know how to deal with them.

As appropriate and as required, include formal reporting procedures and management supervision arrangements. Always have contingency plan(s) in anticipation of possible complications or if thing go wrong.

You should:

- Undertake a risk assessment. Plan ahead.
- Decide if more than one person is required.
- Find out details of location and check weather forecasts.
- Leave details of your movements, vehicle type, registration and time expected back.
- Take a personal alarm if necessary.
- Tell people in the vicinity that you are there.
- Report in by phone or radio at prearranged times.
- Report in when leaving the site.

In changing circumstances:**If****Take appropriate action**

The weather deteriorates earlier rather than later.

Consider abandoning the task.

You become Unwell

Report to base. Rest if necessary. Return to base.

You should not work alone:

- In any potentially dangerous circumstances.
- With potentially dangerous equipment.
- Unless you are medically fit for the job.
- In some confined spaces (Particularly existing Solid and liquid waste related locations)
- In, on, over, or near water.
- In derelict buildings and on roofs.

Rule: Working alone on live electrical equipment should be prohibited.

15 Working on, Over or Near Water

Water presents a hazard whether it is deep or shallow. If it is fast flowing, or tidal, or both, the hazards are greater.

Hazards

- Water both still and flowing.
- Changing flow rates and water levels.
- Hydraulic structures, e.g. intakes, outfalls and weirs.
- Underwater obstructions.
- Tides and currents.
- Changes in the weather.
- Polluted water and sewage.
- Other water users.
- Fixed structures, boats and rafts.
- Steep banks. Loose or wet ground.

Possible consequences

- Drowning.
- Injury
- Ill health

**Undertake a risk assessment. Consider the particular circumstances of the site
Establish safe working / arrangements to suit the conditions. For it will be quite
different when working in river conditions to working over a tank in a treatment works.
Depending upon the particular circumstances some or all of the following will apply**

General Precautions

- Obtain local knowledge of the conditions including depths, flows, tides and currents.
- Install safe working areas, platforms and safe access.
- Erect barriers, guard rails, toe boards, and warning signs where there is a risk of people or plant falling into water.
- Provide, and train employees in the use of high visibility life jackets or buoyancy aids. Provide a whistle and, for night work, a light.
- Install safety nets, floating grab ropes, lifebuoys and throwing lines.
- Illuminate the water surface when working at night.
- Carry out a head count at regular intervals.
- Only use safe methods to recover any tools dropped into the water.
- Establish alarm and communication systems.
- Ensure that sufficient people trained and practiced in rescue techniques are present.

Use of Boats

- People who work in boats must be trained and competent.
- Ensure uniform loading and correct handling of craft by a competent boatman.
- Check moorings of craft at regular intervals and adjust to suit changing water levels particularly in tidal conditions.

Emergency and Rescue Arrangements

- Pre-plan emergency procedures and means of rescue.
- Provide first aid points, with resuscitation equipment, and a sufficient number of people trained in its use.
- Assess the need for a fully equipped and manned rescue boat, to be constantly on hand while work is in progress.
- The rescue boat will usually be power driven, manned by a competent boatman, who is also a trained first-aider.
- For some canals and other still waters a rowing boat may be adequate.

16 Confined Space

It is very important to understand that a confined space is any place where the atmosphere is, or can potentially become hazardous to life.

The risks of anyone entering a confined space include being:

- Overcome due to gas, fumes, vapour, or the lack of oxygen.
- Buried under free-flowing solids (e.g. soil).
- Drowned.
- Injured due to fire or explosion.
- Overcome due to high temperature.

This section covers the aspects to be considered when working in general areas where there may be hazards (typically tanks, sumps, reservoirs, etc.).

The precautions that are necessary when working inside pipelines and chambers (typically sewers and manholes, etc.) are described in the following Section.

Hazards

- Toxic gases, e.g. chlorine, hydrogen sulphide.
- Explosive and flammable gases, and liquids: typically methane, propane, petroleum.
- High or low oxygen levels.
- Carbon monoxide and carbon dioxide.
- Flooding.
- Darkness.
- Slippery, sloping and uneven surfaces.

Possible consequences

- Poisoning (being gassed).
- Fire and explosion.
- Asphyxiation.
- Drowning and falling.
- Burns, other injuries and death.

Confined spaces are not necessarily small or completely enclosed and can include:

- Treatment units, tanks, service reservoirs.
- Chemical handling and storage areas.
- Pumping stations, sumps, overflows, boreholes.
- Unventilated rooms, cellars and basements.
- Sewers and manholes, pipelines and chambers.

CHECKLIST**Do not enter a confined space unless:**

- It is unavoidable in order to do the work. A risk assessment has been done and all foreseeable hazards have been considered.
- Where relevant, the weather forecast is known.
- You are in a trained team of an appropriate size.
- You are physically fit for the job.
- You are working to a written method statement.
- All necessary atmosphere tests (monitoring of gases) have been done and the results recorded.
- Adequate ventilation requirements are provided.
- Continuous monitoring of the atmosphere is done.
- You have adequate protective clothing, breathing apparatus if necessary, and intrinsically safe equipment.
- Sufficient trained and equipped personnel are on hand outside and everyone knows the rescue arrangements and the emergency procedures
- The Area is declared safe for working and permit to work is issued by the safety officer.

Extreme care must be taken in the event of accidents in a confined space.

Being injured in a confined space can make rescue very difficult and even aggravate or could sustained additional injuries.

17 Sewers, Pipelines and Chambers

This Section should be read in conjunction with the previous Section for confined spaces in general. The following relates to work in sewers, pipelines and chambers.

Note: For different circumstances different procedures will apply.

Preparation for Work

When preparing for work:

- Establish a safe system of working. A written method statement is required which should also detail the arrangements for rescue in the event of an emergency. This should include the actions to be taken by your site management and those of the rescue services, normally the Fire and Ambulance Services.
- A system to work, inclusive of provision of Work Permit, is often used, which must be based on comprehensive up-to-date information.
- Establish, size, depth and condition of the pipeline and the distance between manholes, means of access and egress, etc.
- If possible check depth and velocity of flow and record all gas test results. Assess the risk of flooding or rising water levels. If there is risk of high run-off from the catchment area which would cause high flows obtain a detailed local weather forecast.
- Ensure that all personnel know and understand the surface conditions for the full length of the works before going underground.
- Identify all harmful discharges from commercial and industrial premises.
- Arrange for the pipeline where practicable to be cleaned, isolated and well ventilated prior to commencement.

A minimum chamber opening size required is 460mm x 410mm, or 460mm in diameter, but a minimum opening of 600mm x 600mm is recommended for practical purposes.

Gas monitors indicate a dangerous atmosphere, do not enter the pipeline in unsafe condition. If you are in the pipeline already, put on your breathing apparatus and get out.

Note: Breathing apparatus falls into two main types:

- Escape sets which are used for escape when an atmosphere has become dangerous, and
- Working sets which are used for working in dangerous atmospheres.

Check List before Leaving for Site

Check all personal equipment and clothing which might include:

- Atmosphere testing equipment and proper breathing apparatus.
- Harness and rope.
- Man lifting winch.
- Warning and road signs.
- Safe portable lighting.
- Spare cylinders.
- First Aid Kit.
- Mobile telephone or radio.
- Safety chains and ropes.

Safe Procedures on Arrival at Site

On arrival at site and prior to entering:

- Establish communications links and locate nearest telephone, or use a mobile or radio.
- Advise management of team and job details.
- Erect barriers and hazard warning signs.
- Open covers for ventilation, and store them securely while working to prevent unauthorized replacement.
- Remove all matches, lighters, etc.
- Test the atmosphere and check for unusual smells.
- Arrange forced air ventilation where appropriate.
- Put on personal protective clothing and equipment, including a gas monitor. Wear (**and be ready to use**) suitable breathing apparatus in any circumstances where there is a risk that the atmosphere has become dangerous.
- Deploy “top” man or men and assemble and check man lifting winch.
- Obtain a Work Permit before entering the confined space.

Typical Protective Clothing and Equipment

A typical list of protective clothing and equipment for working in sewers, pipelines and chambers, would be as follows:

- Sweat band
- Protective clothing (non static)
- Rubber gloves
- Hand lamp if required
- Fog horn or alternative safe communication system.
- Safety helmet incorporating intrinsically safe cap lamp
- Splash guard of goggles
- Gas monitor / detector
- Full body safety harness
- Rubber thigh or knee boots
- Appropriate duration/ type escape set
- Toe protectors
- Anti- spark studs

- Steel mid-soles and heels.

Procedures at Work Front

In order to maintain a safe working environment at the site front, it is required that strict adherence is taken in imposing and following a set of procedures, as follows:

- Enter one at a time, and where appropriate descend wearing a vertical lift harness attached to a winch line.
- Test the atmosphere continuously. Always wear your gas monitor in your "breathing zone", i.e. on your chest. (Oxygen, H₂S, Methane, CO, NO₂)
- Check that ladders and step irons are safe as you go down and use safety harnesses where appropriate.
- Put safety chains or ropes in position.
- Where appropriate install running lines.
- Keep in touch with one another and the top man and constantly watch for circumstances that may affect safe working (rainfall for example).
- Do not use naked lights. Prohibit smoking.
- Take care not to disturb any sludge as this can release gases.

Reasons for Immediate Evacuation

Evacuation should take place immediately, if:

- The gas monitors indicate that the atmosphere is dangerous.
- Any member of the team feels unwell.
- Depth or velocity of flow increases.
- The top man calls the sewer gang to leave the sewer.
- The communication system fails.
- There are any unusual smells.

Procedures for Leaving the Work Front

As with commencement of the work, in order to maintain a safe working environment at the site front, it is required that strict adherence is taken in imposing and following a set of procedures for leaving the work, as follows:

- Leave singly checking everyone is present.
- Close the covers and remove the warning signs.
- Attend to personal hygiene. Check and clean all equipment.
- Complete and return the permit to work.

In the Event of an Emergency

In an emergency, the following actions should be taken in a calm and orderly fashion:

- Put on your breathing apparatus if gas monitors indicate that the atmosphere is unsafe.
- Evacuate immediately.
- Do not re-enter without appropriate safety equipment.
- Notify management immediately.
- Prevent unauthorized entry.

In the event of an accident and if the casualty appears to have respiratory failure, prop the casualty up out of any water or sewage flows and evacuate the area immediately.

Rescues require trained and properly equipped personnel many attempted rescues by untrained or ill-equipped people have sadly resulted in multiple fatalities.

In Case of Rescues

Rescues from pipelines and chambers can be complex depending on the nature of the rescue and the prevailing conditions. When rescue assistance is used to recover an injured man, the top man should give details of the sewer layout, position of injured man and any other relevant information.

18 Pipeline Construction & Repair in Trench

This section deals with the construction and repair of pipelines. Related matters such as excavation, laying, testing and commissioning are dealt with in other sections.

Pipe size, material, location and depth are the main factors which influence the significance of the hazards listed below.

Hazards

- Pipe stacks - especially if close to the trench.
- Other services.
- Lifting and lowering operations.
- Working at depth, and trench side collapse.
- Dangerous atmospheres.
- Operation of equipment in the trench.
- Noise and dust (including asbestos dust).
- Water and sewage.
- Changing working area as pipe laying progresses.
- Groundwater.

Possible consequences

- Crush and impact injuries, death.
- Burns and electrocution.
- Fire and or explosion.
- Falling materials.
- Damage to hearing.
- Flooding and drowning.
- Pollution of water supplies and water courses.

**Undertake a risk assessment and develop a safe method of working.
Consider how hazards will change as the pipeline progresses, and the
working location changes.**

Pipeline Materials Delivered To Site

For the pipeline materials delivered to site you must follow the following procedures:

- Arrange for safe delivery and off-loading of all pipeline materials.
- Ensure safe, stable and secure storage of pipeline materials and at a safe distance from the edge of trench (typically 1.5 x the depth).
- Prevent the accidental or malicious rolling of pipes.

**Collapsing pipe stacks can result in deaths.
Store materials safely and securely.
Erect barriers and warning signs to keep the public away**

General Precautions

As general precautions you should adhere to the following:

- Where possible arrange for the section to be isolated and, in the case of a sewer, provide adequate flow diversion arrangements, or over-pumping facilities.
- Identify services that you will be working near or under, which may be live or under pressure.
- Maintain adequate trench support at all times.
- Arrange adequate working space for men and plant, both on the surface, and in the trench and ensure safe access and egress.

Arrangement for Stacking Pipes

A typical stack of pipes will require the following arrangement:

- Minimize the height of the stack.
- 'Chock" or 'stake the ends.
- Place on a firm level surface and include bearers where necessary.
- Where appropriate, leave in manufacturer's packing.
- Regularly inspect and assess if the arrangements are safe.
- Fence off where appropriate.

Precautions when Repairing Pipelines

When laying or repairing pipes you should adhere to the following precautions:

- Establish clear communications and lines of sight between the surface and the trench. Use a banks-man where appropriate.
- Do not exceed the safe working load of lifting plant. Lift pipes with double slings, or when using a single choker sling or flat band slings ensure the pipe is correctly balanced and will not slip out (see below).
- Avoid awkward lifting movements and trapped fingers.
- Follow the pipe manufacturer's recommendations when cutting and jointing pipes, and where practicable, use "purpose made" cutting and jointing equipment in place of disc-cutters.
- Welding or brazing of pipe joints may cause toxic fumes. Arrange adequate ventilation facilities and appropriate respiratory protective equipment.

**Keep clear of pipes as they are being slung into
position.
Heavy pipes can crush and kill.**

Working with Asbestos Cement Pipes

When working with asbestos cement pipes, the following procedures should be considered:

- Work in accordance with procedures. Check if a respirator is required.
- Wherever possible cut pipes with hand tools such as a hacksaw. Keep the work damp.
- Do not cut pipes dry. Do not use grinding or abrasive power disc-cutting tools.
- If necessary use a purpose-made, power-driven cutter, with a water feed, and wear a respirator.

19 Trenchless Construction & Rehabilitation Works

Trenchless construction and rehabilitation methods have been developed in response to pressure to avoid the surface disruption caused by trenches in congested areas.

NOTE
Trenchless construction creates a confined space.

Trenchless construction includes:

Man entry tunneling, with or without compressed air, and micro-tunneling, headings, pipe jacking, auger boring, pipe-ramming, impact-moling, and directional drilling.

Trenchless rehabilitation and repair works include:

Slip-lining, where a plastic pipe is inserted into an existing pipe with or without grouting, resin impregnated “sock type linings”, spirally wound plastic linings, and sprayed-on cement mortar or epoxy resin linings.

Hazards

- Difficult and contaminated ground conditions.
- Dangerous atmospheres, e.g. methane, hydrogen sulphide, lack of oxygen, CO.
- Ground-water and sewage flows. Flooded excavations.
- Live underground services.
- Restricted access and limited clearances.
- Chemicals and dust.
- Noise.
- Plant and vehicles.
- Materials.

Possible consequences

- Collapse.
- Asphyxiation.
- Fire and explosion.
- Gassing.
- Drowning.
- Damage to hearing and breakdown in communications.
- Crush injuries from plant. Injury and death.
- Health effects from hazardous substances.

Evaluate the risks and plan ahead. Have a clear method statement and well-defined rescue procedures. Check for contaminated ground

Surface Arrangement to be Set in Place

Arrangements at the surface, which will need to be set in place well in advance of commencing with any work, shall include the following:

- Select working shaft positions carefully and plan for safe vehicle, pedestrian and plant movement.
- Erect warning signs. Divert roads and footpaths.
- Establish a safe boundary and good lighting and arrange good visibility around the site.
- Organize safe lifting facilities.
- Watch for overhead cables.
- Arrange for the safe delivery and removal of materials and stack pipes, segments, and other materials safely.
- Detect all known services prior to excavation.
- Supervise shafts and use banks-men. Erect guardrails.
- Prevent spillage of chemicals, powders and liquids and control noise, dust and bright lights.
- Keep roads clean.

Safe access for people and their tools, equipment and material must be provided.

Going to Underground Work Face

The following activities are required to be put in place for proceeding with underground work:

- Regularly test for the presence of gases. Always before entry.
- Secure ladders and guards in shafts.(Minimum two access ladders to be provided).
- Install ladders in bays if space is available with intermediate platforms at appropriate intervals.
- Take particular care when raising or lowering men, materials and plant in shafts.
- Establish good communications with work underground.
- Guard against dropping objects down shafts.
- Arrange good lighting and ventilation in the under ground work place.

Once Below ground

- Avoid standing in pit bottoms.
- Regularly test for presence of gases.
- Install adequate drainage for dry working.
- Use “running boards” in man entry situations.

Look for changing conditions at the work face and guard against collapse. Also watch for movement at the surface.

It is important to:

- Operate machinery and spoil skips safely using competent, **authorized** personnel.
- Keep out of the way of moving plant.
- Guard against fires; they produce fumes and smoke which can hamper rescue. Control the use of burning and welding gear.
- Protect cables, pipes and hoses from mechanical damage. Regularly check electrical equipment.
- Guard against flooding. Check pumping equipment.

Restricted access during trenchless construction can make rescue difficult in emergencies

20 Pressure Mains

This Section deals with work on or near to water mains or sewage pumping mains under pressure, during normal operation or during testing and commissioning. Safety aspects during construction are dealt with in Section the following.

Hazards

- The high potential energy in a pipeline under pressure.
- Excessive pressures and pressure surges.
- Water and sewage.
- Inadequate disinfection.
- Foreign bodies.
- Trapped air.
- Poor ground conditions.
- Inadequate restraint and support to pipes.

Possible consequences

- Injury, drowning or death.
- Explosion.
- Bursts and leaks.
- Polluted water supplies.
- Failure of thrust blocks, anchorages and end caps.
- Trench collapse.
- Flooding and drowning.
- Pollution of water courses.
- Injury to the public and damage to property.

Work in Proximity of Pressure Mains

When working near to pressure mains, the following procedures should be adhered to:

- Exercise care when exposing them.
- Maintain support for the main and prevent movement. A small change in alignment can result in significant thrusts which if not restrained could lead to failure.
- Do not break out concrete thrust blocks, or remove original ground support from behind them.
- Take special care with flexible pipelines, partial removal of surround or bedding may cause eccentric loading, deformation and failure.

Before applying pressure or making any changes to operating conditions ensure that all external supports, particularly thrust blocks are adequately cured and in place and securely supported

Procedures for Rehabilitation Works

If working on an existing main which is under pressure or if involved in making tappings under pressure or making repairs you should:

- Undertake a risk assessment and establish a safe method of working.
- Treat as a specialist operation. Use only experienced personnel.
- Liaise with operational staff, particularly regarding changes in pressure and operating conditions.
- Note that the material, age and condition of the main will significantly influence safety.
- Install all necessary supports to accommodate any changes in thrust caused by the modifications.

Remember that the installation of an in-line tee will create a “new hydraulic thrust” which must be dealt with before commissioning a new branch.

Testing of Pressure Mains

Pressure testing with water is undertaken to check soundness of pipeline materials, anchorages and thrust blocks, and to check for leaks.

Air is 20,000 times more compressible than water and consequently can contain enormous potential energy. The explosive release of air, following a failure can have fatal consequences.

Air testing is not recommended for pressure mains and MUST NOT be carried out to test the soundness of materials or anchorages. In addition, NEVER use flammable gases for pipe testing.

Prior to Testing of Pressure Mains

The following activities need to be ensured, prior to the testing of pressure mains

- Signs and notices are in place to warn the work force and the public that testing is in progress.
- All materials used are manufactured to the correct pressure rating and have been correctly installed.
- All pipes have been correctly aligned, jointed and bedded, and all bolts tightened.
- All anchorages and thrust blocks have been completed.
- Where appropriate the pipeline is fenced off to prevent unauthorized tampering with valves.
- Each pipe length is sufficiently backfilled to resist uplift and lateral thrusts.

- A safe method of testing has been developed.
- Loads on stop ends have been evaluated and taken by anchorages against undisturbed ground.
- Pressure gauges have been marked with the maximum allowable pressure at the gauge location and are within calibration.

Fill the main slowly and bleed off air to prevent pockets of air forming, then raise the pressure slowly, and at frequent intervals check the pipeline, especially the thrust blocks for movement.

Ensure that the design test pressure is never exceeded, and that there is some form of emergency pressure relief valve in place to limit the maximum pressure that can be achieved.

Commissioning of Water Mains

After construction, repair or rehabilitation, potable water mains require cleaning and disinfecting to safeguard consumer's health.

Cleaning by air-scouring can give rise to violent discharges. Ensure that any discharge hydrant is well supported and barriers are in place to keep the public away from the discharge area.

Any water used for flushing/ cleaning shall be disposed off safely. Use sedimentation tanks to separate out and collect solids if necessary.

Follow the stipulated safety precautions for hazardous substances when using chlorine or sodium hypochlorite dosing systems for pipeline disinfection.

21 Covered Service Reservoirs

Covered Service reservoirs are tanks for the storage of potable water. They can vary considerably in size and age. Entry is often through small lockable covers. They are normally dark, wet and damp inside, even when empty.

Hazards

- Water (sometimes deep).
- External contamination (e.g. dirt and mud).
- Poor access and outlet facilities.
- Dangerous atmospheres.
- Darkness and poor visibility.
- Hidden sumps full of water.
- Unexpected reservoir filling.

Additional hazards when working inside

- Temporary electricity supplies in wet conditions, etc.
- Noxious fumes from chlorine gas arising from disinfection operations, or from solvents (or similar) from repair materials.
- Dust and noise.
- Working at height.

Possible consequences

- Pollution of water supply.
- Asphyxiation.
- Electrocution.
- Drowning.
- Falls, injury and death.

General Precautions

Service reservoirs are essentially confined spaces and have a number of very important considerations as follows:

- Generally treat as a confined space.
- Ensure all personnel are trained in confined spaces procedures.
- Study “as-built” drawings and identify entry and exit points, locations of sumps, pipe work, and any other hazards.
- Plan and programme the work with operational staff. Obtain permit to work or permit to enter from control room, or reservoir operator, as appropriate.
- Prevent accidental unauthorized filling. Close and lock all inlet valves and display “Do not operate” signs.
- Open all covers to maximize ventilation. Put guards around openings.
- Check the depth of water if the reservoir is not visibly empty.

Enter with care, checking the condition of ladders or step irons as you descend

- Remember all surfaces will be wet and most will be slippery; move with care.
- Arrange for the installation of adequate lighting and additional forced ventilation if necessary.
- Use gas monitoring devices during activities which give off fumes or during disinfection.
- Prohibit in sanitary practices.
- Put and maintain barriers round covers and sumps, etc. While cleaning using high pressure jetting additional precautions are necessary.

If full sterilization will not take place following your entry, minimize the risk of contamination to supply by ensuring the following:

- Sweeping clean and disinfecting the area around access covers before opening them.
- Set out a clean working area adjacent to the access point and use this for the sterilization of equipment and clothing.

Commissioning**First filling**

- Do not fill the reservoir before the overflow and outlet pipework has been completed, and arrangements for emergency draw-down are established.
- Confirm before filling that the design has catered for the proposed filling sequence and circumstances.
- Check if the reservoir has to be backfilled or if there is a minimum level of backfilling required for stability of the structure.
- Fill slowly and inspect regularly until filled. Look out for movement, leaks and structural problems.
- Ensure that all access points are closed or fenced off.

When testing reservoirs, make sure that a safe method for testing is set in place. In particular, devise safe access for level testing which avoids leaning over the side of a reservoir to take a reading.

Disinfecting Reservoirs

Special attention is to be given at the time of disinfection operations and is to include the following precautions:

- Undertake a risk assessment and establish a safe system of working which includes a permit to work.
- Note that disinfection with sodium hypochlorite solution gives off chlorine gas. Concentrations of gas must not exceed 0.5 ppm without personnel using breathing apparatus.
- Neutralize any discharges from disinfection work before releasing these into a watercourse.

Putting a reservoir into operation

- Check all work has been completed and that the reservoir is empty and all loose equipment removed.
- Close, lock all access covers and fill.

CHECKLIST FOR ENTRY INTO SERVICE RESERVOIR

- Watch for hidden sumps below the water.
- Take care on access ladders.
- Watch out for wet and slippery floors.
- Arrange good ventilation and lighting. Open covers.
- Make sure a safe exit is available.
- Don't contaminate sterilized areas.
- Guard against sudden inflows of water.
- Follow confined spaces procedures.
- Don't get trapped inside.

22 Isolation of Plant and Machinery

Construction of water supply works often involves the replacement, refurbishment, extension, maintenance or repair of part or all of existing operational systems.

When this happens, established operation and control routines often no longer apply.

The risk of injury is therefore potentially much greater in such circumstances.

Hazards

- Contact with live electrical equipment.
- Moving plant and equipment.
- Sudden start-up of plant and equipment.
- Suddenly changing circumstances.
- Fire, explosion and flooding.

Possible consequences

- Electric shock.
- Injury and death.
- Effects on system operation and performance.
- Damage to plant and property.

Before undertaking work that affects existing plant and machinery it is important that a risk assessment is carried out.

A safe system of working is essential and should be established before work starts. This should detail all the necessary precautions and controls, including:

- The arrangements for handing over the plant to do the work.
- Identification of the person in control of the work.
- Authorization of those who are to do the work.
- Details for isolation of the parts of the system affected by the work, barriers and signs.
- When the work is to be done.
- How the work is to be done, checked and monitored.
- The arrangements for testing and handing back the plant when the work has been done.

Control Procedures

Various control procedures can be used to manage such work, typically:

The permit to work: Special conditions may have to be attached if the plant cannot be isolated for operational reasons.

The plant transfer certificate: A document used to transfer responsibility for control of plant, equipment, site or part of a site to another party.

There are practical ways to reduce risk, including:

- Locking off the main isolator through which the electricity supply to the plant or equipment is fed.
- Locking in a fixed position (not necessarily open or closed) valves and penstocks which control flow.
- Fitting a warning “Do not operate” tag to an isolator valve or penstock.
- Fitting a lockable defect warning to prevent operation of defective equipment.

It is essential to ensure that all workers involved understand what is to be done, how and when.

23 Commissioning

This Section relates to putting electrical and mechanical plant and related civil works into service. It also can apply to returning modified or repaired plant to service.

Commissioning might involve, for example, putting a pump or a section of pipeline back into operation, or setting a treatment process to work. The commissioning period is a time of change. People suddenly find that things are different and not what they have come to expect. This is when accidents happen.

The use of a commissioning plan, with a clear allocation of responsibilities is needed.

Hazards

- New or changed circumstances.
- Personnel not familiar with new plant and equipment.
- Unexpected flows, bursts or flooding.
- Unexpected movement of machinery or plant.
- Dangerous atmospheres.
- Water and sewage.
- Fire and explosion.
- Sudden failure, tripping, or cut-out of plant.

Possible consequences

- Electrocutation.
- Drowning.
- Suffocation.
- Damage to plant and property.
- Injury and death.

Ask yourself: IS commissioning appropriate yet?

- Check that all work has been completed, including work by contractors.
- Check that all tests have been completed and relevant completion certificates issued.
- Make sure that emergency procedures and communication routes are established.

Typical tests might include:

- Electrical, hydraulic, pressure, and load tests.
- Performance and acceptance tests.

Make sure that everything is ready for commissioning before you start. Assess what might go wrong and arrange for the control of any hazards.

Think about the people involved

- Ensure that operation and maintenance manuals have been received, checked, approved and understood.
- Does everyone involved in the commissioning know the programme and what is involved?
- Do they know how the plant will be left on completion of commissioning, and how to report defects?

Make sure that all operations staff are fully informed and have received all the required training and documentation before the handover.

24 Repair & Maintenance of Treatment Plant

This section briefly considers the safe maintenance and operation of water and sewage treatment works. Procedures are to be put into place, which address these issues. Of particular relevance will be the Operation and Maintenance Manuals. You should refer to these with reference to this Site Health & Safety Manual and any related files (where available) before starting work.

Before you go around the works you need to know the hazards.

Bear in mind that not all works are manned. Report in to management and get a full briefing on the works.

Only go onto a site with permission.

The following table lists a typical range of locations and processes in a treatment works and shows some hazards that may be present.

Maintenance or repair of plant requires working with operations staff and often around operational equipment. Such work can affect the safety of these people, and the performance of the treatment process.

Regular preventive maintenance reduces component breakdown, system failure and possible accidents

- Follow maintenance schedules and procedures.
- Change parts subject to wear at appropriate and recommended intervals.
- Fit the correct replacement parts properly.

Although repairs often require prompt or even immediate action, they must still be carried out in a safe way.

Before starting work:

- Undertake a risk assessment.
- Plan the work with reference to the health and safety file and the operation and maintenance manuals for the plant.
- Establish a safe system of working.
- Where appropriate produce a written method statement. If necessary, establish a permit to work system.
- Inform all parties affected by the work of the methods to be used, the timing, and the precautions.
- Check that emergency procedures are known and are in place.

During work:

- Do not deviate from the approved method statements without re-planning and obtaining the necessary agreements and approvals.
- Ensure that an appropriate number of personnel are available.
- Keep the working area tidy, and dispose of waste promptly. Do not create new hazards.
- Follow appropriate safety procedures.

On completion:

Follow the agreed commissioning or operational procedure for returning plant to normal working.

HAZARDS	AREA OF WORKS								Refer to Section No.	
	Inlets, Grit Removal, Screens /Macerators	Filters	Aerators/Mixers	Tanks/Digesters	Chemical Dosing	Pumps – Pump Sumps	Pressure Vessels	Fuel Storage Methane Handling		Control Room/MCCs
Electricity	•		•		•	•		•	•	8
Remote/Automatic/Intermittent Operation of Plant	•	•	•	•	•	•	•			22
Confined Spaces		•		•		•	•	•		16
Sewage	•	•	•	•		•				5
Chemicals			•		•			•		25
High Pressure (water/air/gases)				•	•	•	•	•		13
Slips and Slippery Surface	•	•	•	•		•				-
Noise						•				4
POSSIBLE CONSEQUENCES										
Injury	•	•	•	•	•	•	•			
Electric Shock	•		•		•	•			•	
Disease	•	•	•	•	•	•				
Explosion				•		•	•	•		
Burns	•		•	•	•			•	•	
Asphyxiation				•	•	•	•	•		
Flooding		•		•		•				
Contamination of Public Water Supply				•	•	•				

25 Hazardous Substances

NOTE

A hazardous substance is one which is toxic, harmful, corrosive or irritant, whether in solid, liquid, gaseous or vapour form.

Hazards: The ability of the substance to cause harm, illness or damage to health through spillage system leakage, unsafe handling or incorrect storage.

Possible consequences

- Endangering public health.
- Injury and death.
- Fire and explosion
- Poisoning and/or asphyxiation.
- Chemical burns.

Prior to the use of a hazardous substance it is essential that the following are closely adhered to:

General Responsibility and Precautions

The overall responsibility of working with hazardous substances lies with the contracted handlers but this does not absolve all attached to the implementation programme to have individual responsibilities in knowing the site health & safety procedures:

- The risks to the staff and public are fully evaluated.
- All facilities are made available to ensure the safe handling, use and storage.
- Substances hazardous to health.

Special Storage Requirements

All hazardous substances are to be carefully stored in accordance with supplier's stipulations and provisions of the contract:

- Delivery points, tanks and pumps are clearly labeled and have individual secure and locked compartments.
- Bulk liquid storage and related pumps are surrounded by bunds with drainage to individual sumps.
- Pipework is exposed allowing easy inspection and where necessary is double-skinned, with the outer pipe draining to a sump.
- Correct materials are used for tank linings and pipework.
- Ensure incompatible substances are not stored adjacent to each other, i.e. oxidizing substances should be separated from flammable liquids or other flammable substances.

Handling of Hazardous Substances

It is essential that all associated with the handling of hazardous substances are trained in the safe handling and use of the substance and emergency procedure drills, with retraining being provided at a suitable frequency or as required.

- Suppliers' instructions and guidance information is made available and is fully understood and compiled with.
- Prevention of mixing of substances by spillage, damage to packing or by wetting during fire fighting.
- Deliveries of substances are programmed so that trained staff are available and incompatible substances are not delivered at the same location at the same time.
- Adequate emergency ventilation, detectors, alarms, drench showers, eye washes and other emergency equipment is provided at the correct locations.

Some hazardous substances in use in the water industry, their common forms and main hazardous properties are shown below:

Substance	Natural State	Supplied State	Corrosive	Poisonous ⁽¹⁾	Flammable/Explosive
Sulphuric acid (and other mineral acids)	L	L (96%)	●	●	
Sodium hydroxide (caustic soda)	L	L (47%)	● ⁽²⁾	●	
Calcium hydroxide (hydrated lime)	S	S(Powder)		●	
Potassium permanganate	S				
Aluminium sulphate	S	S or L	(1)		
Ferric aluminium sulphate	S	S or L			
Ferric chloride	S	L			
Polyelectrolytes	S or L	S or L			
Chlorine	G	L		(3)	
Sodium hypochlorite	S	L			
Sulphur dioxide	G	L		(3)	
Hexa fluorosilic acid	L	L			
Sodium Silicate	S	L			
Phosphoric acid	L	L			
Carbon dioxide	G	L		(4)	
Oxygen	G	L			(5)
Ozone	G	(6)			(5)
Ammonia	G	L		(3)	
Petroleum	L	L			
Solvents	L	L			
L - liquid form	(1)	If ingested in the form as supplied			
G - gaseous form	(2)	corrosive to skin			
S - solid form	(3)	asphyxiating gas			
(powders, etc.)	(4)	displaces oxygen in confined spaces – causes oxygen deficiency			
	(5)	promotes combustion			
	(6)	usually generated in situ			

Regular checks and procedures

- Implementation of frequent and regular inspection, testing and maintenance of control measures, supply equipment and safety facilities.
- Monitoring of the health and exposure of the workers to the substances in use.
- Warning notices are provided to restrict entry of untrained staff into areas of danger.
- Proper recording systems are in place.

Bulk Storage of Chlorine

Chlorine is used in the disinfection of water supplies. It is a toxic, powerful irritant and exposure, even in low concentrations, can be fatal. Where it is stored in bulk, additional precautions should be taken:

- Supplies should be stored in vessels approved by the suppliers.
- Safe systems of work should be established and followed.
- All personnel on site should be aware of the hazards.
- Emergency evacuation routines should be established.

When working with hazardous substances you should:

- Handle and use only the substances for which you have been trained.
- Have read and understood the manufacturers' instructions for use of the substances you are working with, and comply with them.
- Make proper use of all control measures including PPE.
- Know and use the correct protective clothing for specific substances.
- Keep dirty and used protective clothing separate to clean clothing and provide for cleaning as laid down in your companies' procedures.

In Case of Emergencies

Where emergencies such as leaks, spillages, fires or explosions could occur, an up-to-date on-site emergency plan must be made, in conjunction with the emergency services.

This must:

- Give details of how major accidents will be dealt with.
- Name the person responsible for site safety.
- Name those authorized to take emergency action under the plan.
- Include any manufacturers' instructions.

Everyone on site must be aware of the Site's Health and Safety Plan, and its location.

They must know the procedures to be carried out in the event of an emergency

26 Handling and Disposal of Wastes

Hazards

- Wastes from water and sewage treatment works including screenings and grit.
- Septic tank waste.
- Exposure to bacteria, viruses and fungi.

Possible consequences

- Danger to health.
- Contraction and spread of disease.

Measures for Protection of the Public

Direct responsibility is to be taken upon any person who imports, produces, keeps, treats or disposes of controlled waste or, as a broker, has control of such waste.

Sewage or sewage sludge are considered as industrial wastes and are hence subject to municipal control and regulations are set regarding disposal. The exceptions to this are when it is being processed and is an integral part of the operation of a treatment works or sludge is being deposited onto land for agricultural purposes.

Direct responsibility is also to be taken for any person involved in the handling of construction waste such as broken tarmac; excavated material etc.

Storage

- Wet sewage and waterworks sludge must be stored in adequate containers or lagoons with no public access.
- Water works sludge do not usually represent a health hazard.
- Dry sewage sludge must be stored in appropriate containers which do not allow dispersal by the wind.

Handling and disposal

- Direct contact with sludge and septic tank waste should be avoided wherever possible.
- When dealing with sludge appropriate PPE is required.
- Protective clothing must be cleaned regularly and clean and contaminated clothes stored separately.
- When sewage sludge or septic tank waste is loaded or discharged by tanker or spread on land, care must be taken to protect the public by minimizing dispersion as a mist.

Screenings and grit

- Screenings must be washed in a designated area, then bagged for disposal by incineration, or landfill, according to rules, regulations and set procedures.
- Grit must be cleaned and stored ready for disposal according to rules, regulations and set procedures.

Sludge and Septic Tank Waste Transporters

All transportation of sludge and septic tank wastes should be driven by a competent and qualified driver. The following requirements are considered mandatory:

- Must be roadworthy according to relevant regulations.
- Loading and unloading devices must be regularly checked and maintained.
- Driver must be provided with and must use the correct protective clothing, boots, eye shields, etc.
- Driver must be trained in the handling and transportation of sludge and have access to adequate washing facilities.
- Flushing of tankers must be carried out in a designated area and the effluent disposed into an approved and designated place, i.e., sewage works intake.

Precautions in the Handling of Asbestos Products

Asbestos associated products include insulation and fire protection, asbestos cement products such as pipes and building roofing and cladding sheets.

Hazards: Airborne asbestos fibers.

Possible consequences

- Lung cancer or cancer of the chest lining.
- Asbestosis or fibrosis (scarring) of the lungs.

Prior to work involving asbestos: Identify the type of asbestos and the form it is in.

Work with asbestos cement products can be undertaken by properly trained personnel provided the following precautions are adhered to:

- Assess the likely exposure and draw up a work plan. This should be in writing unless the work is small scale and exposures are low.
- Establish measures to minimize and monitor exposure.
- Provide PPE, washing, changing and decontamination facilities.
- Instruct workers in ways of working that keep dust to a minimum.

During work it is necessary for employees to:

- Keep the material wet.
- Keep the work area clean. Use specialized vacuum equipment if provided.
- Where possible, avoid breaking asbestos cement pipes or sheets.
- Use hand tools, instead of power tools wherever possible to minimize dust.
- Use protective clothing, and other PPE.
- Wear HSE approved "Respirator Zone" signs if stipulated control limits are liable to be exceeded.

Disposal of asbestos waste

- Asbestos waste is to be placed in sealed, clearly marked containers.
- Disposal must be only at a designated site.
- PPE must be either disposed of as asbestos waste, or thoroughly cleaned. It must not be removed from designated asbestos areas unless it is decontaminated.

For ensuring correct detailed records:

- Retain records of all work done on asbestos for at least five years.
- Record if an employee is exposed to asbestos above the specified levels and arrange regular health checks.

NOTE

Presently, there is no known cure for asbestos related diseases.

27 Accidents

NOTE
ACCIDENTS ARE AVOIDABLE

The risk of accidents happening can be minimized by:

- Good planning in conjunction with risk assessment.
- Training of employees.
- Provision of the correct equipment for the work.
- Correct operation of equipment and methods of working.

The responsibilities of your employer with regard to emergency precautions and procedures are to:

- Plan for the eventuality of accidents such as fires, explosions, gas and liquid chemical leakage, vehicles overturning, falls, structural failures.
- Appoint someone to be in charge in case of emergencies.
- Train employees in emergency procedures, arrange and regularly implement emergency drills.
- Ensure all emergency exits, accesses, escape routes and staff congregation points are known, well marked and kept clear.
- Make sure all emergency alarms, shut-off valves, power switches and isolators and fire fighting and other emergency equipment **are** correctly located and clearly labeled.
- Have in place procedures for accounting for staff and visitors in an emergency.
- Train enough first-aiders to provide cover at all times and provide fully equipped first aid boxes at appropriate locations.
- Display notices showing escape routes, names of first-aiders and locations of first aid boxes.

Employee's responsibilities in the event of an accident

- Make yourself familiar with all site emergency procedures and the role expected of you.
- Take emergency drills seriously, they may save your life or those of your colleagues.
- Make sure you know who is in charge and how they are to be contacted in the case of emergencies.
- Make sure you know who the trained first-aiders are in your team or organization.

- Ensure that you know the location of emergency exits, escape routes and congregation points or emergency stations.
- Operate emergency alarms, power switches or cut-off valves immediately an accident occurs.
- When raising the alarm and reporting the occurrence of an accident give clear and precise information on the locations, type of incident (fire, explosion, structure collapse), the number of people involved and seriousness of injuries sustained.
- Do not try to carry out rescues without the correct rescue equipment and appropriate protective equipment.

DO NOT BECOME ANOTHER CASUALTY

When to Report Accidents

If there is a work-related accident, and an employee, a self-employed person working on the premises, or a member of the public is killed, or seriously injured, you must be in a position to know the full extent of the health and safety plan and precautions setup on your site. The following are some reportable events:

Injuries

- Death
- Loss of limb.
- Joint dislocation.
- Unconsciousness.
- Loss of sight (inc. temporary).
- Major fracture.

Dangerous occurrences

- Failure of scaffolding, lifts, or lifting equipment.
- Explosion or fire.
- Unintentional contact with overhead power lines.
- Major electrical short circuit/overload.
- Failure of demolition to achieve its desired objective.
- Projection of any material(s) beyond a site boundary.
- Failure of breathing apparatus whilst in use/being tested.
- Release of any dangerous chemical/biological agents.
- Serious collisions involving plant.

Diseases

- Most poisonings.
- Serious skin diseases, e.g. occupational dermatitis.
- Lung diseases, e.g. asthma.

- Serious infections, e.g. Leptospirosis, hepatitis, tetanus.
- Any other serious disorder.

Keeping Records of Accidents

Any reportable injury, disease or dangerous occurrence must be reported to the person on the site who is responsible for investigating and reporting accidents.

Maintain a regularly available accident book. Any reportable injury, disease, or dangerous occurrences are to be recorded in this book. This will include a brief description of what happened and personal details of those involved.

28 First Aid

First-aiders and first aid boxes

- Appoint sufficient trained and qualified first-aiders to provide adequate cover according to the number of employees, the working hours, the shifts worked and the degree of risk in the workplace.
- Provide suitably equipped first aid boxes in appropriate locations.
- Display notices to show the names of the first-aiders and locations of first aid boxes. Make sure that you know these.
- First aid boxes must be clearly marked and easily accessible.

Emergency first aid

When an accident occurs you should immediately send for a first-aider and/or doctor or ambulance. They will, where appropriate, subsequently arrange for the casualty to be sent to hospital. In the meantime before they arrive you may be able to relieve the situation by carrying out simple emergency first aid, as described below, according to the type of accident.

Beware of doing more harm than good

Where possible you should wash your hands before giving emergency first aid. The casualty should be lying down or in a sitting position.

Breathing

- Check breathing.
- Apply rescue breathing if necessary.

Bleeding

- Stop bleeding by applying direct pressure on the wound.
- Apply a dressing.
- Reduce bleeding by raising an injured limb provided it is not broken.

Broken bones

- The casualty must not be moved unless they are exposed to further danger.
- Provide support for the injured parts of the body and secure them so that they cannot move.

Burns and scalds

- Do not burst blisters or try to remove clothing stuck to burns or scalds.
- Small burns or scalds can be placed under a flow of cool, clean water for a period prior to applying a sterilized dressing.

Chemical burns:

- Contaminated clothing should be removed provided it is not stuck to the skin.
- Flush the contaminated area with cool, clean water for ten to fifteen minutes or with an appropriate neutralizing agent, if available before applying a sterilized dressing.
- Take care not to contaminate yourself.

Eye problems

- If chemicals have entered the eye flush it out with clean, cool water for ten to fifteen minutes.
- To remove dust or loose particles, wash out the eye with cool, clean water.

Electric shock

Do not touch the casualty without switching off the current

- If it is not possible to switch off the current then use something made of a dry insulating material to free the casualty e.g. rubber or wood.
- If the casualty's breathing has stopped, start rescue breathing and continue if necessary until the casualty recovers or trained help arrives.

Gassing

- First protect yourself with suitable breathing apparatus.
- Move the casualty into fresh air.
- If breathing has stopped, start rescue breathing and continue until the casualty starts to breathe or trained help arrives.
- Send the casualty to hospital with a note of the gas involved.

If you have received no training you should consider taking a first aid course