# Element IC1:

## General Workplace Issues

# Contents

# Safe Working Environment

The ILO Convention on Occupational Safety and Health (C155) defines the term 'workplace' as all places where workers need to be or to go by reason of their work, and which are under the direct or indirect control of the employer. Additionally, employers are required to ensure that those workplaces are safe and without risks to health.

Some key issues relating to the working environment are access and egress, pedestrians and slips, trips and falls.

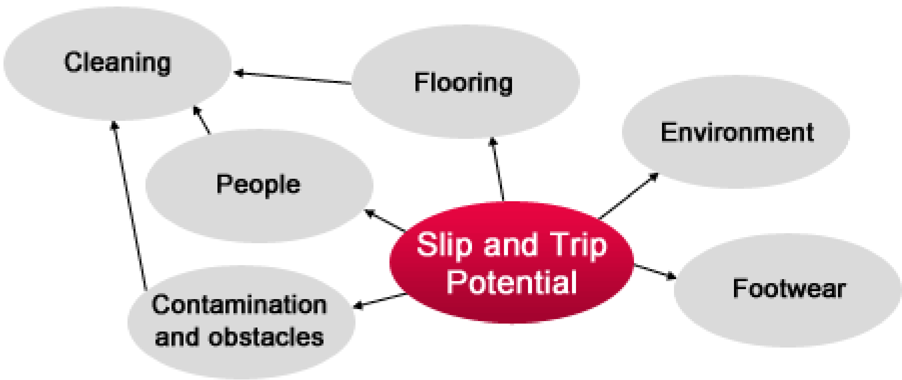
## Measures to Reduce Slip and Trip Accidents

Slipping accidents cause many thousands of occupational injuries every year with broken bones, pain and suffering, as well as financial loss for society. The perception by the public, the workforce and by many who are responsible for designing floors for use both inside and outside is that these accidents are inevitable. The reality is that sensible precautions can and do eliminate the majority of these accidents, and, if the problem is explained, and sensible floor choices, made then the risks to those who ultimately use the floor can be managed more effectively. The right choice of flooring should be considered at the beginning of the design process, taking a balanced view of cost, durability, aesthetics and safety, with particular attention to those areas that get wet. Getting it right by design is a giant step forwards in reducing slip injuries!

### Slip and Trip Potential

The diagram below shows a slip and trip potential model. It highlights the main factors that can play a part in contributing to a slip or trip accident. One or more may play a part in any situation or accident.

**Figure 1: Slip and Trip Potential**



## Flooring

The floor in a workplace should be suitable for the type of work activity that will take place on it. Where a floor can't be kept dry, people should be able to walk on the floor without fear of a slip or trip, despite any contamination that may be on it. To achieve this:

- The floor should have sufficient roughness;
- The floor should be cleaned correctly to ensure that it does not become slippery or keeps its slip resistance properties (if a nonslip floor);
- The floor should be fitted correctly to ensure that:
    - there are no trip hazards; and
    - to ensure that non slip coatings are correctly applied;
- The floor should be maintained in good order to ensure that there are no trip hazards e.g. holes, uneven surfaces, curled up carpet edges, etc.;
- Ramps, raised platforms and other changes of level should be avoided; if they can't they must be highlighted;

Stairs should have:

- High visibility, non slip, square edges;
- A suitable handrail;
- Steps of equal height; and
- Steps of equal width.

## Environment

Environmental issues can either increase or reduce the likelihood of slips and trips, so it is important to take them into consideration. In this context 'Environment' means:

- Lighting (natural or otherwise);
- Loud or unfamiliar noises;
- The weather;
- Humidity; and
- Condensation etc.

The environment can affect slips and trips in the following ways:

- Too much light on a shiny floor can cause glare and stop people from seeing hazards on the floor and stairs;
- Too little light will also prevent people from seeing hazards on the floor and stairs;
- Unfamiliar and loud noises may be distracting;
- If rainwater gets onto a smooth surface inside or outside of a building, it may create a slip hazard. Good entrance design (e.g. canopies) can help;
- Cold weather can cause frost and ice to form, which may create slippery surfaces. (Link to gritting); and
- Condensation may make a smooth floor slippery.

# *Footwear*

Footwear plays an important part in reducing slips and trips.

Where footwear is not specified by an employer and therefore cannot be controlled e.g. pedestrians using a shopping centre thoroughfare, it is vitally important to ensure that smooth floors are kept clean and dry.

For work situations where there is some control over footwear, but where floors are mainly clean and dry, a “sensible” footwear policy can help reduce risks. To prevent slips and trips sensible means: - flat, with a sensible heel, with the sole and heel made in a softer material that provides some grip.

In work situations where floors can’t be kept dry or clean e.g. food preparation, the right footwear will be especially important, so a slip resistant shoe may be required. If an employer introduces a slip resistant shoe policy, the footwear should be appropriate for  the  task.

Choosing the most suitable slip-resistant footwear for a particular environment / work activity can be difficult. Descriptions of slip-resistance given in suppliers’ brochures range from ‘improving the grip performance’ to ‘excellent multi-directional slip-resistance’, but often do not describe the work environments for which the footwear is , or is not, suitable.

## Key Points on Soles and Walking Surfaces

The sole tread pattern and sole compound are both important for slip resistance. Generally a softer sole and close-packed tread pattern work well with fluid contaminants and indoor environments. A more open pattern works better outdoors or with solid contaminants. The only sure way to tell is to trial footwear in the work environment.

Tread patterns should not become clogged with any waste or debris on the floor – soles should be cleaned regularly. If soles do clog up, then an alternative design of sole should be considered e.g. with a wider space between the cleats and a deeper tread pattern.

Slip resistance properties can change with wear; e.g. some soles can deteriorate with wear, especially when the cleats become worn down.

Therefore a system is needed for checking and replacing footwear before it becomes worn and dangerous.

The correct choice of footwear on wet or contaminated profiled steel or aluminium surfaces, e.g. chequer plate, is important. With some footwear the surface profiles do not provide the improvement in slip resistance that might be expected.

'Oil-resistant' does not mean 'slip-resistant' – the former is just a statement that the soles will not be damaged by oil.

## Testing for Slip Resistance

The supplier should be asked for evidence to show whether the footwear has actually been tested for slip resistance – older models might not have been. Where footwear has been tested, coefficient of friction (CoF) test values must be available. CoF data can be requested from the supplier. Some suppliers now publish it in their catalogues. The higher the CoF, the better the slip resistance.

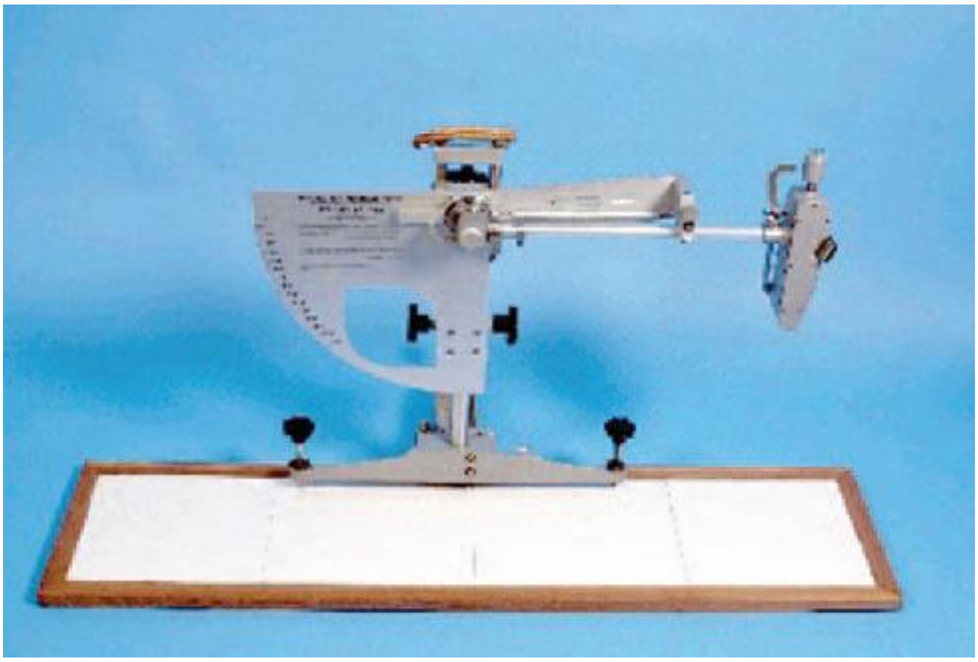
The methodology is based on using two instruments:

- A pendulum coefficient of friction (CoF) test (HSE's preferred method of slipperiness assessment, see Figure 2); and
- A surface microroughness meter (see Figure 3).

### Pendulum

The pendulum CoF test is also known as the portable skid resistance tester, the British pendulum, and the TRRL pendulum (see Figure 2).

**Figure 2: The Pendulum CoF Test**



This instrument, although often used in its current form to assess the skid resistance of roads, was originally designed to simulate the action of a slipping foot. The method is based on a swinging, imitation heel (using a standardised rubber soling sample), which sweeps over a set area of flooring in a controlled manner. The slipperiness of the flooring has a direct and measurable effect on the pendulum test value (PTV) given (previously known as the Resistance Value).

Research has confirmed the pendulum to be a reliable and accurate test, leading to its adoption as the standard HSE test method for the assessment of floor slipperiness in dry and contaminated conditions. However, to use it reliably needs a suitably trained and competent person to operate it and to interpret the results.

### Interpretation of Pendulum Results

Pendulum results should be interpreted using the information reproduced in Table 1 (from UKSRG, 2005).

**Table 1: Slip Potential Classification (based on pendulum test values PTV)**

| PTV | |
|---|---|
| High slip potential | 0–24 |
| Moderate slip potential | 25–35 |
| Low slip potential | 36 + |

### Surface Microroughness

An indication of slipperiness in water contaminated conditions may be simply obtained by measuring the surface roughness of flooring materials. Roughness measurements may also be used to monitor changes in floor surface characteristics, such as wear. Research has shown that measurement of the Rz parameter allows slipperiness to be predicted for a range of common materials. Rz is a measure of total surface roughness, calculated as the mean of several peak-to-valley measurements.

**Figure 3: Surface Microroughness Meter**

**Interpretation of Surface Roughness**

When surface microroughness data is used to supplement pendulum test data, the roughness results should be interpreted using the information reproduced in Table 2.

**Table 2: Slip Potential Classification, based on Rz microroughness values (applicable for waterwet pedestrian areas)**

| Rz Surface Roughness | |
|---|---|
| Below 10 µm | High slip potential |
| 10–20 µm | Moderate slip potential |
| 20 + µm | Low slip potential |

## Contamination

In many cases contamination can reduce the coefficient of friction on an acceptable floor to a level where it does constitute a slip hazard. Preventing contamination can reduce or even eliminate the slip risk.

Contamination can be classed as anything that ends up on a floor e.g. rainwater, oil, grease, cardboard, product wrapping, dust etc. It can be a by-product of a work process or be due to adverse weather conditions.

Where prevention of contamination is not an option, alternative controls should be sought, e.g.:

- Drip trays for leaks;
- Lids on cups and containers; or
- Appropriate sized mats at building entrances to dry feet.

Where contamination is expected on a floor, an effective cleaning response is required. Where the floor is designed to cope with contamination and still be non-slip then the more viscous (the thicker) the contamination the rougher a floor will need to be in order for slips not to happen.

## Obstacles

A common cause of all trip accidents are caused by poor housekeeping. Consequently good housekeeping should eliminate a large number of accidents, e.g. by:

- Ensuring there is a suitable walkway through the workplace;
- Keeping walkways clear, no trailing wires, no obstructions;
- Assessing employees' workstations to ensure the floors are tidy, and there is adequate storage space; and
- Ensuring all rooms are kept tidy, with goods suitably stored, and a sufficient number of bins.

## Cleaning

The process of cleaning can create slip and trip hazards, especially for those entering the area being cleaned, such as the cleaners, e.g. smooth floors left damp by a mop are likely to be extremely slippery and trailing wires from a vacuum or buffing machine can present a trip hazard.

An effective cleaning regime requires a good management system to identify problem areas, decide what to do, act on decisions made and check that the steps have been effective. Good communications are needed at all levels e.g. between equipment and chemical suppliers to ensure suitability of product for the likely type of contaminant and floor surface.

Effective training and supervision is required to ensure cleaning is undertaken to the correct standard. Cleaners should to be informed of their duties and why the cleaning needs to be undertaken in a particular way or at a particular time. Lack of understanding of the system of work may lead to inappropriate shortcuts being taken.

The use of an incorrect cleaning substance can destroy the frictional design criteria for flooring. There are specific non-slip polishes available for flooring which have to be carefully selected to ensure compatibility with the floor surface finish.

Contamination is implicated in many slip accidents. Regular and effective cleaning to remove contamination can reduce the risk of slipping accidents. People can slip on floors that have been left wet after cleaning. Pedestrian access to smooth wet floors should be prevented by using barriers, locking doors, or cleaning in sections. Signs and cones only warn of a hazard, they do not prevent people from entering the area. If the spill is not visible they may be ignored.

A typical control measure is to carry out cleaning outside normal working hours to minimise the number of people who may be at risk from wet floors or trip hazards associated with cleaning equipment.

To summarise, there are many steps that can be taken to reduce risks associated with slip and trip hazards, see examples in Table 3.

**Table 3: Slip/Trip Hazards and Controls**

| Hazard | Suggested Action |
|---|---|
| Spillage of wet and dry substances | Clean spills up immediately, if a liquid is greasy, make sure a suitable cleaning agent is used. After cleaning the floor can be wet for some time; dry it where possible. Use appropriate barriers to tell people the floor is still wet and arrange alternative bypass routes. If cleaning is done once a day, it may be possible to do it last thing at night, so it is dry for the start of the next shift. |
| Trailing cables | Position equipment to avoid cables crossing pedestrian routes, use cable covers to securely fix to surfaces, restrict access to prevent contact. Consider use of cordless tools. Remember that contractors will also need to be managed. |
| Miscellaneous rubbish, e.g. plastic bags | Keep areas clear, remove rubbish and do not allow it to build up. |
| Rugs/mats | Ensure mats are securely fixed and do not have curling edges. |
| Poor lighting | Improve lighting levels and placement of light fittings to ensure more even lighting of all floor areas. |
| Slippery surfaces | Assess the cause and treat accordingly, for example always keep them dry if wet causes the problem. In certain circumstances the surface may have to be chemically treated and appropriate cleaning methods used. |
| Change from wet to dry floor surface | Provide suitable footwear, warn of risks by using signs, and locate doormats where these changes are likely. |
| Changes of level | Try to avoid. If cannot be avoided, improve lighting, add highly visible tread nosings (i.e. white/yellow/reflective edge to step) |
| Slopes | Improve visibility, provide hand rails, use floor markings. |
| Smoke/steam obscuring view | Eliminate or control by redirecting it away from risk areas; improve ventilation and warn of it. |
| Unsuitable footwear | Ensure workers choose suitable footwear, particularly with the correct type of sole. If the type of work requires special protective footwear. |

## *People or Human Factors*

How people act and behave in their work environments can affect the potential for slips and trips.

A positive attitude toward health and safety, a ‘See it, sort it!’ mentality can reduce the risk of slip and trip accidents e.g. dealing with a spillage, instead of waiting for someone else to deal with it.

What footwear is worn can also make a difference e.g. wearing smooth soled shoes or high heels at work will make slipping and tripping more likely.

Factors that prevent people from seeing or thinking about where they are going, can also increase the risk of an accident e.g. rushing about, carrying large objects, becoming distracted whilst walking e.g. using a mobile phone

Physical attributes - If individuals have a physical problem that stop them from seeing, hearing, or walking in a regular manner it can increase the likelihood of an accident e.g. Vision, balance, age, disability that affects their manner of walking or moving on foot.

# Safety Signs

In determining where to use safety signs, employers need to take into account the results of the risk assessment. This assessment deals with hazard identification, the risks associated with those hazards, and the control measures to be taken. When the control measures identified in the assessment have been taken there may be a ‘residual’ risk such that employees need to be warned, and informed of any further measures necessary.

Safety signs are not a substitute for other means of controlling risks to employees; safety signs are to warn of any remaining significant risk or to instruct employees of the measures they must take in relation to these risks. For example, in some workplaces:

- Risk of flammable materials catching fire may exist. In addition to the other necessary precautions, provision of the ‘no smoking’ prohibition sign may be needed.

Employees should be provided with comprehensible and relevant information, instruction and training on safety signs and signals.

There may be local rules that require signs eg. certain fire safety signs may be specified.

Safety signs need to contain a pictogram to convey the message instead of relying solely on text.

# Types of Signs

A sign provides information or instructions by a combination of shape, colour and a symbol or pictogram which is rendered visible by lighting of sufficient intensity. In practice, many signs may be accompanied by supplementary text (e.g. “Fire exit” alongside the symbol of a moving person).

Signs can be used for different reasons, including:

- To prohibit behaviour likely to increase or cause danger;
- To give warning of a hazard or danger;
- To prescribe a specific behaviour; or
- To give information on emergency exits, first-aid or rescue facilities.

Where used in a workplace, signs must be sufficiently large and clear so they can be easily seen and understood.

Signs also need to be durable, securely fastened and properly maintained – including being kept clean – to ensure they remain visible.

Examples of safety signs are given in Figures 4 and 5.

**Figure 4: Examples of Safety Signs (UK)**


Emergency Exit Sign


Warning Sign

Prohibition Sign

Mandatory Sign

**Figure 5: Examples of Safety Signs (US)**


Danger Sign


Caution Sign


Safety Instruction Sign

# Signs to Mark Obstacles and Dangerous Locations

Places where there is a risk of colliding with obstacles, of falling or of objects falling should be marked with alternating yellow and black, or red and white stripes. The yellow and black or red and white stripes must be at an angle of approximately 45 degrees and of more or less equal size. This is normally achieved by the use of suitable tapes.

# Signs on Containers and Pipes

Containers, tanks and vessels used in the workplace to contain dangerous substances, and the visible pipes in the workplace containing or transporting dangerous substances, will in general need to have signs or labels fixed to them unless the risk is adequately controlled or not significant. Small stores of dangerous substances need to be similarly marked.

Signs or labels will be most useful at points where employees are likely to be exposed to the contents of the pipework, for example sampling or filling points, drain valves, and flanged joints which are likely to need periodic breaking. Where there are long pipe runs on which points of potential exposure are infrequent, labels or signs may also be displayed at intermediate points.

# Illuminated Signs

An illuminated sign - is a sign made of transparent or translucent materials which is illuminated from the inside or the rear to give the appearance of a luminous surface. Many emergency exit signs are illuminated.

The sign has to be bright enough to be seen, without causing glare. Care is needed to ensure that a number of illuminated signs are not used together if this could give rise to confusion.

An illuminated sign can either be on continuously or operate intermittently (i.e. flash on and off), use the flashing sign to indicate a higher level of danger or a more urgent need for intervention or action.

The duration and frequency of flashes for an intermittent illuminated sign need to be such as to ensure the message is properly understood, and avoid any confusion with other illuminated signs, including continuous illuminated signs.

If a flashing sign is used instead of, or together with, an acoustic signal, it is important to synchronise the two. This means that the duration and frequency of flashes need to be in line with both the pulse length and interval for an acoustic signal. The choice of equipment and the way it operates will, of course, need to take account of other risks. For example, with fast flicker rates epilepsy could be triggered in some people.

Where flashing signs are used to warn of imminent danger, it is particularly important to ensure that measures are in place to either detect failure of the sign quickly or to prevent its failure (e.g. by fitting duplicate bulbs, etc.).

# Confined Spaces

The ILO Encyclopaedia of Occupational Health and Safety (Chapter 58) gives the meaning of the term 'confined space' as:

*"an environment in which a broad range of hazardous conditions can occur. These conditions include personal confinement, as well as structural, process, mechanical, bulk or liquid material, atmospheric, physical, chemical, biological, safety and ergonomic hazards. Many of the conditions produced by these hazards are not unique to confined spaces but are exacerbated by involvement of the boundary surfaces of the confined space".*

In UK legislation, a confined space is defined as:

*"any place, including any chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar place which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk".*

A specified risk means one or more of the following:

- Serious injury due to a fire or explosion;
- Loss of consciousness due to increased body temperature;
- Loss of consciousness or asphyxiation due to gas, fume, vapour or the lack of oxygen;
- Drowning due to an increase in the level of liquid; or
- Asphyxiation in a free flowing solid or the inability to reach a respirable environment due to entrapment by a free flowing solid.

In the US, the term "permit-required confined space" (permit space) is used to describe a confined space that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential to engulf an entrant;
- Has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or
- Contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress.

Some confined spaces are fairly easy to identify and some may become a confined space only occasionally, perhaps due to the type of work to be undertaken, such as a room during paint spraying.

Every entry into a confined space is potentially hazardous. Accidents in confined spaces are a major source of deaths at work. Two examples are given below.

At Carsington Reservoir in the UK, four men, all aged between 20 and 30 and physically fit, died in an open-topped inspection shaft. Naturally evolved carbon dioxide had displaced the oxygen. No tests were made before entry. The first man down collapsed and the three other men climbed down to their deaths in futile attempts to effect a rescue.

In North Carolina, US in 2004, a 36-year-old Hispanic labourer (the victim) died after he entered a sawdust storage silo to unclog a sweep auger advance mechanism and became engulfed in sawdust. Several minutes after the victim entered the silo, a Hispanic coworker working nearby heard a noise from the silo which prompted him to call out to the victim. When he heard no response, he and several Hispanic co-workers began looking for the victim. After approximately 20 minutes of digging through the collapsed sawdust, they found him. Co-workers ran to several locations trying to report the incident and get help. They notified a company senior official who then called 911. Emergency Medical Services (EMS) responded within approximately 30-35 minutes of the presumed time of engulfment and attempted resuscitation. They transported the victim by ambulance to a local hospital where he was pronounced dead by the emergency room physician.

While most victims of confined space accidents are workers, as might be expected, victims also include engineering and technical people, supervisors and managers, and emergency response personnel. Safety and industrial hygiene personnel also have been involved in these accidents.

# The Dangers Associated with Confined Spaces

## Toxic Gas, Fume or Vapour

Toxic gases, fumes or vapours may be present in a confined space for a variety of reasons:

- Fume may remain from previous processing or as a result of previous storage, or arise from sludge or other deposits disturbed, for example during cleaning;
- Hydrocarbon vapour may also be present under scale even after cleaning;
- Fume may also enter the space from adjoining plant that has not been effectively isolated;
- Gas and fume can build up in sewers, manholes, contaminated ground or leak from behind vessel linings, rubber, lead, brick, etc.
- Fume and vapour can also be produced by work inside the confined space, for example, welding, flame cutting, lead lining, brush and spray painting, or moulding using glass reinforced plastics, use of adhesives or solvents, or from the products of combustion;
- Fume and vapour can also occur inside a compartment or space by hot work taking place on the exterior surfaces or enter the space from equipment in use outside the space, such as exhaust fume from mobile plant, especially on construction sites;
- Plant failure can also cause problems, for example, by the build-up of ammonia if refrigeration plant fails or the potential for accumulation of carbon dioxide in pub cellars following leaks from compressed gas cylinders.

# Oxygen Deficiency

Normal air that we breathe contains about 21% oxygen. A fall to 17% brings on the start of ill effects including loss of co-ordination, concentration and abnormal fatigue. A fall to 10% brings on breathing difficulties, unconsciousness and death.

Oxygen deficiency may result from, for example:

- Purging of the confined space with an inert gas to remove flammable or toxic gas, fume, vapour or aerosols;
- Naturally occurring biological processes consuming oxygen, which can occur in sewers, storage tanks, storm water drains, wells, etc;
- Gases can be produced as a result of fermentation in sealed silos where crops have been or are being stored; in fermentation vessels in brewing; or in cargo holds caused by the carriage of timber or timber products, steel turnings or swarf, vegetable products, grain, coal, etc.;
- Leaving a vessel completely closed for some time (particularly one constructed of steel) as the process of rust formation on the inside surface consumes oxygen. Newly fabricated or shot blasted carbon steel vessels are especially vulnerable to rusting, particularly those with a large surface area, for example, heat exchangers, separators, filters, etc.;
- The risk of increased levels of carbon dioxide from limestone chippings associated with drainage operations when they get wet;
- Burning operations and work such as welding and grinding which consume oxygen;
- Displacement of air during pipe freezing, for example, with liquid nitrogen; or
- A gradual depletion of oxygen as workers breathe in confined spaces and where provision of replacement air is inadequate.

# The Ingress or Presence of Liquids

Liquids can flow into the confined space eg. excavation or tunnel, and lead to drowning and other serious injury depending on the nature of the liquids such as their corrosivity or toxicity.

# Free Flowing Solids

Free flowing solids can submerge a person, preventing breathing. Materials which create this hazard include grain, sugar, flour, sand, coal dust and other substances in granular or powder form in silos.

# Presence of Excessive Heat

This can lead to a dangerous rise in core body temperature and can be made worse as a result of personal protective equipment being worn. In extreme cases heat stroke and unconsciousness can result. A slower heat build-up in the body can cause heat stress, and if action is not taken to cool the body there is also a risk of heat stroke and unconsciousness. This may be a particular problem in closed tanks, or where work is carried out inside process plant eg industrial ovens or driers.

# Fire and Explosion

The presence of flammable substances and oxygen enrichment in a confined space creates a serious hazard to workers inside the space.  There is also a risk of explosion from the ignition of airborne flammable contaminants. In addition, a fire or explosion can be caused by leaks from adjoining plant or processes and the use of unsuitable equipment.

# Working in Confined Spaces – Assessment of Risk

When assessing the risks associated with a confined space and possible control measures to manage those risks, the first consideration should always be whether entry into the confined space is necessary at all. It is sometimes possible to do the necessary work using an alternative method eg. using a fibre-optic camera to inspect the inside of a tank.

If entry is required, then a thorough risk assessment will be required which will need to take the following factors into account:

- The atmosphere within the confined space;
- Testing / monitoring of the atmosphere;
- Ventilation;
- Gas purging procedures;
- Level of supervision;
- Level of competence for confined spaces working;
- Communications between workers and those outside of the confined space;
- Removal of residues;
- Isolation from gases, liquids and other flowing materials;
- Isolation from mechanical and electrical equipment;
- Selection and use of suitable equipment eg. intrinsically safe electrical equipment in a flammable atmosphere;
- Personal protective equipment (PPE) and respiratory protective equipment (RPE);
- Portable gas cylinders and internal combustion engines;
- Gas supplied by pipes and hoses;
- Access and egress;
- Fire prevention;
- Level of lighting;
- Possible ignition sources, e.g. static electricity and smoking; and
- Required working time in the confined space.

Additionally procedures for dealing with emergencies and rescue need to be considered.

# Development of a Safe System of Work

The priority when carrying out a confined space risk assessment is to identify the measures needed so that entry into the confined space can be avoided. If it is not reasonably practicable to prevent work in a confined space the employer (or the self-employed) must assess the risks connected with persons entering or working in the space and also to others who could be affected by the work. The assessor(s) must understand the risks involved, be experienced and familiar with the relevant processes, plant and equipment and be competent to devise a safe system of working.

The precautions required to create a safe system of work will depend on the nature of the confined space and the hazards identified during the risk assessment.

# Use of a Permit-To-Work Procedure

A permit-to-work system is a formal written system and is usually required where there is a reasonably foreseeable risk of serious injury in entering or working in the confined space. The permit-to-work procedure is an extension of the safe system, not a replacement for it.

The use of a permit-to-work does not, by itself, make the job safe. It supports the safe system, providing a ready means of recording findings and the authorisations required to proceed with entry. It contains information, e.g. time limits on entry, results of gas testing, and other information that may be required during an emergency and which, when the job is completed, can also provide historical information on original entry conditions.

A permit-to-work system is appropriate, for example:

- To ensure people working in the confined space are aware of the hazards involved and the identity, nature and extent of the work to be carried out;

- To ensure there is a formal check undertaken, confirming elements of a safe system are in place. This must take place before people are allowed to enter or work in a confined space;

- Where there is a need to coordinate or exclude, using controlled and formal procedures, other people and their activities where they could affect work or conditions in the confined space;

- If the work requires the authorisation of more than one person, or there is a time limit on entry;

- If communications with the outside are other than by direct speech, or if particular respiratory protective equipment or particular PPE is required.

Although there is no set format for a permit system, it is often appropriate to include certain information relevant to all confined space working. In all cases, it is essential that a system be developed which ensures that:

- The people working in the confined space are aware of the hazards involved and the identity, nature and extent of the work to be carried out;
- There is a formal and methodological system of checks undertaken by competent people before the confined space is entered and which confirms that a safe system of work is in place; and
- Other people and their activities are not affected by the work or conditions in the confined space.

Isolation requirements, that is the need to isolate the confined space to prevent dangers arising from outside, should also be included in the permit system. Permits are particularly appropriate if essential supplies and emergency services, such as sprinkler systems, communications, etc., are to be disconnected. The most effective isolation technique is to disconnect the confined space completely by removing a section of pipe or duct and fitting blanks. Other methods include the use of barriers, water seals and suitable, reliable lock-off valves.

**Figure 6: Confined Space Entry Permit Checklist (OSHA)**

## Confined Space Entry Permit

Date and Time Issued: ____________________ Date and Time Expires: ____________________

Job site/Space I.D.: ____________________ Job Supervisor: ____________________

Equipment to be worked on: ____________________ Work to be performed: ____________________

Stand-by personnel: ________________________________________

**1. Atmospheric Checks:**

Time __________

Oxygen ________ %

Explosive ______ % L.F.L.

Toxic __________ PPM

**2. Tester's signature:** ____________________

**3. Source isolation (No Entry):**

| | N/A | Yes | No |
|---|---|---|---|
| Pumps or lines blinded, | ( ) | ( ) | ( ) |
| Disconnected, or blocked | ( ) | ( ) | ( ) |

**4. Ventilation Modification:**

| | N/A | Yes | No |
|---|---|---|---|
| Mechanical | ( ) | ( ) | ( ) |
| Natural Ventilation only | ( ) | ( ) | ( ) |

**5. Atmospheric check after Isolation and Ventilation:**

Oxygen ___________ % > 19.5 %

Explosive __________ % L.F.L < 10 %

Toxic _____________ PPM < 10 PPM $H_2S$

Time ________________________________

Tester's signature ____________________

**6. Communication procedures:** ____________________

________________________________________

________________________________________

**7. Rescue procedures:** ____________________

________________________________________

**8. Entry, standby, and back-up persons:**

| | Yes | No |
|---|---|---|
| Successfully completed required training? | ( ) | ( ) |
| Is it current? | ( ) | ( ) |

**9. Equipment:**

| | N/A | Yes | No |
|---|---|---|---|
| Direct reading gas monitor - tested | ( ) | ( ) | ( ) |
| Safety harnesses and lifelines for entry and standby persons | ( ) | ( ) | ( ) |
| Hoisting equipment | ( ) | ( ) | ( ) |
| Powered communications | ( ) | ( ) | ( ) |
| SCBA's for entry and standby persons | ( ) | ( ) | ( ) |
| Protective Clothing | ( ) | ( ) | ( ) |
| All electric equipment listed Class I, Division I, Group D and Non-sparking tools | ( ) | ( ) | ( ) |

**10. Periodic atmospheric tests:**

Oxygen ______ % Time _____

Oxygen ______ % Time _____

Oxygen ______ % Time _____

Explosive _____ % Time _____

Explosive _____ % Time _____

Explosive _____ % Time _____

Toxic ________ % Time _____

Toxic ________ % Time _____

Toxic ________ % Time _____

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: (Supervisor) ________________________________________

Approved By: (Unit Supervisor) ________________________________________

Reviewed By (Cs Operations Personnel) :

____________________ ____________________

(printed name) (signature)

This permit to be kept at job site. Return job site copy to Safety Office following job completion.

Copies: White Original (Safety Office) Yellow (Unit Supervisor) Hard (Job site)

# Procedures and Written Instructions

To be effective a safe system of work needs to be in writing, in the form of written instructions, setting out the work to be done and the precautions to be taken. Each procedure should contain all appropriate precautions to be taken and in the correct sequence.

In particular, procedures for confined space working should include instructions and guidance for:

- **First-aid** — the availability of appropriate first-aid equipment for emergencies until professional medical help arrives;
- **First-aiders** — the strategic positioning of trained personnel to deal with foreseeable injuries;
- **Limiting working time** — for example, when respiratory protective equipment is used, or when the work is to be carried out under extreme conditions of temperature and humidity;
- **Communications** — arrangements to enable efficient communication between those working inside the confined space and others to summon help in case of emergency;
- **Internal combustion engine driven equipment** — rules regarding the siting of such equipment, which should be well away from the working area, and downwind of any ventilator intakes;
- **Water surges** — especially the anticipation that sewers can be affected over long distances by water surges, for example following sudden heavy rainfall upstream of where the work is being carried out;
- **Toxic gas, fume or vapours** — procedures to ensure that work can be undertaken safely to include the availability of additional facilities and arrangements where residues may be trapped in sludge, scale or other deposits, brickwork, or behind loose linings, in liquid traps, joints in vessels, in pipe bends, or in other places where removal is difficult;
- **Testing / monitoring the atmosphere** — procedures for the regular testing for hazardous gas, fume or vapour or to check the concentration of oxygen before entry or re-entry into the confined space;
- **Gas purging** — the availability of suitable equipment to purge the gas or vapour from the confined space;
- **Ventilation requirements** — the provision of suitable ventilation equipment to replace oxygen levels in the space, and to dilute and remove gas, fume or vapour produced by the work; and
- **Lighting** — to ensure that the confined space is well lit. Lighting equipment, including emergency lighting, must be suitable for use in flammable or potentially explosive atmospheres. Generally all lighting to be used in confined spaces should be protected against knocks – for example, by a wire cage – and be waterproof. Where water is present in the space, suitable plug / socket connectors capable of withstanding wet or damp conditions should be used and protected. The position of lighting may also be important, for example to give ample clearance for work or rescue to be carried out unobstructed.

# Suitability of Individuals

The person carrying out the risk assessment for work in confined spaces will need to consider the suitability of individuals in view of the particular work to be done.

Examples of issues to be considered:

- Suitable build of individuals for exceptional constraints in the physical layout of the space (this may be necessary to protect both the individual and others who could be affected by the work to be done); and
- Medical fitness concerning claustrophobia or the wearing of breathing apparatus.

# Supervision and Training

It is likely that the risk assessment will identify a level of risk requiring the appointment of a competent person to supervise the work and ensure that the precautions are adhered to. Competence for safe working in confined spaces requires adequate training – in addition, experience in the particular work involved is essential. Training standards must be appropriate to the task, and to the individuals' roles and responsibilities as indicated during the risk assessment.

# Cleaning

There are a variety of methods of cleaning the inside of confined spaces to remove hazardous solids, liquids or gases:

- Cold water washing;
- Hot water washing;
- Steaming; and
- Solvents or neutralising agents.

Every cleaning method must be carefully assessed to determine the associated hazards and risks and appropriate control measures introduced.

# Purging and Ventilation

Where the presence of flammable or toxic vapours or gases has been identified, there may be a need to purge the gas or vapour from the confined space. This can be done with air or an inert gas where toxic contaminants are present, but with inert gas only where there are flammable contaminants.

Where an inert gas e.g. nitrogen has been used for purging it is normal practice to then use air to purge the nitrogen to then provide a breathable atmosphere which has to be confirmed through testing.

Ventilation may be carried out by removing covers, opening inspection doors, etc. and allowing ordinary air circulation, or by the introduction of compressed air via an air line. Higher rates of air exchange can be achieved by the use of air movers, induction fans or extractor fans.

# Atmosphere Testing and Monitoring

Before entry is made into a confined space, tests must be carried out to establish the levels of oxygen, toxic gas or flammable gas in the atmosphere. Suitably trained and qualified personnel may use simple, reliable instruments to measure oxygen and flammable gas levels.

A satisfactory oxygen content must not in itself be relied upon to indicate safety since flammable, explosive or toxic gas may exist alongside oxygen and need only be present in minute quantities to create a serious hazard. The tests should take account of what the space is known to have contained, including any inert gas used to purge a flammable atmosphere that may itself produce toxic hazards or the risk of asphyxiation.

Methane, hydrogen sulphide and carbon dioxide can all evolve naturally due to the decomposition of organic matter or, in some cases, by the effect of rainwater percolating through certain types of ground. The initial monitoring and testing must establish that the confined space is safe to enter. To ensure the safety of those that enter the space continual monitoring may be required, it may also be necessary to issue individual monitors to those that enter the confined space to give instant warning of low oxygen, or toxic or flammable gas hazards.

# Respiratory Protective Equipment

Where Respiratory Protective Equipment (RPE) is provided or used in connection with confined space entry or for emergency or rescue, it should be suitable for the purpose for which it is intended, that is, correctly selected and matched both to the job and the wearer.

Where the intention is to provide emergency breathing apparatus to ensure safe egress or escape, or for self-rescue in case of emergency, the type commonly called an 'escape breathing apparatus' or 'self-rescuer' (escape set) may be suitable. These types are intended to allow time for the user to exit the hazard area.

They are generally carried by the user or stationed inside the confined space, but are not used until needed.

In some circumstances entry without the continuous wearing of breathing apparatus may be possible. Several conditions must be satisfied to allow such work including:

- A risk assessment must be done and a safe system of work in place including all required controls, and continuous ventilation; and
- Any airborne contamination must be of a generally non-toxic nature, or present in very low concentrations well below the relevant workplace exposure limits.

# Access and Egress

A safe way in and out of the confined space should be provided and, wherever possible, allow quick, unobstructed and ready access. The means of escape must be suitable for use by the individual who enters the confined space so that they can quickly escape in an emergency. Suitable means to prevent access should also be in place when there is no need for anybody to work in the confined space.

To satisfy the safe system requirements it is necessary to plan the work thoroughly and to organise various facilities and arrangements. For a large confined space and multiple entries, a logging or tally system may be necessary in order to check everyone in and out and to control duration of entry. A safety sign that is clear and conspicuous to prohibit unauthorised entry alongside openings that allow for safe access should be displayed.

# Emergency Arrangements and Procedures

The arrangements for the rescue of persons in the event of an emergency must be suitable and sufficient and, where appropriate, include rescue and resuscitation equipment. The arrangements should be in place before any person enters or works in a confined space.

The arrangements should cover any situation requiring the recovery of a person from a confined space, for example incapacitation following a fall.

## *Openings for Rescue Purposes*

Experience has shown that the minimum size of an opening to allow access with full rescue facilities including self-contained breathing apparatus is 575 mm diameter. This size should normally be used for new plant, although the openings for some confined spaces may need to be larger depending on the circumstances, for example to take account of a fully equipped employee, or the nature of the opening.

## *Public Emergency Services*

In some circumstances, for example where there are prolonged operations in confined spaces and the risks justify it, there may be advantage in prior notification to the local emergency services before the work is undertaken. In all cases, however, arrangements must be in place for the rapid notification of the emergency services should an accident occur. On arrival, the emergency services should be given all known information about the conditions and risks of entering and / or leaving the confined space before a rescue is attempted.

## *Emergency and Rescue Training*

The arrangements for training site personnel for rescue and resuscitation should include consideration of:

- Rescue and resuscitation equipment;
- Raising the alarm and rescue;
- Safeguarding the rescuers;
- Fire safety;
- Control of plant; and
- First-aid.

Regular refresher training in the emergency procedures is essential and practice drills including emergency rescues will help to check that the size of openings and entry procedures are satisfactory.

The risk assessment may indicate that at least one person, dedicated to the rescue role, should be stationed outside the confined space to keep those inside in constant direct visual sight.

All members of rescue parties should be trained in the operation of appropriate fire extinguishers, which should be strategically located at the confined space. In some situations, a sprinkler system may be appropriate.

In all cases, in the event of a fire the local fire service should be called in case the fire cannot be contained or extinguished.

# Safety Equipment and Tools

## *Rescue Equipment*

When safety harness and lines are provided, it is essential that proper facilities to secure the free end of the line are available. In most cases the line should be secured outside the entry to the confined space. Lifting equipment may be necessary and the harness should be of suitable construction, and made of suitable material to recognised standards capable of withstanding both the strain likely to be imposed, and attack from chemicals.

## *Maintenance of Safety and Rescue Equipment*

All equipment provided or intended to be used for the purposes of securing the health and safety of people in connection with confined space entry or for emergency or rescue, should be maintained in an efficient state, in efficient working order and in good repair. This should include periodic examination and testing as necessary. Some types of equipment, for example breathing apparatus, should be inspected each time before use.

Atmospheric monitoring equipment – and special ventilating or other equipment provided or used in connection with confined space entry – needs to be properly maintained by competent persons. It should be examined thoroughly, and where necessary calibrated and checked at intervals in accordance with recommendations accompanying the equipment or, if these are not specified, at such intervals determined from the risk assessment.

# Fire Prevention Procedures

There are many fire precautions necessary for safe working in confined spaces; some of the more important of these are outlined below:

- Procedures to ensure that no flammable or combustible materials are stored in confined spaces that have not been specifically created or allocated for that purpose. In any event, the quantity of the material should be kept to a minimum and stored in suitable fire-resistant containers;

- Procedures to ensure the availability of appropriate fire-fighting equipment where the risk of fire has been identified. In some situations, a sprinkler system may be appropriate;

- Procedures to ensure the prohibition of all smoking within and around all confined spaces; and

- Procedures to ensure that the build-up of static in a confined space is minimised. It may be necessary to obtain specialist advice regarding insulating characteristics (for example, most plastics), steam or water jetting equipment and clothing containing cotton or wool, flowing liquids or solids, such as sand.

# Flammable Atmospheres in Confined Spaces

Flammable atmospheres can arise in confined spaces from a variety of sources, and these include the following:

- The confined space itself may usually contain a flammable substance eg. an underground petrol storage tank. Residual vapour may be present when work is carried out on the tank eg. during repair or decommissioning;
- Methane may build up in confined spaces such as sewers or drains from decaying organic matter;
- An oxygen enriched atmosphere may develop in a confined space if careful precautions are not followed during welding or similar processes; and
- Flammable substances may be introduced during the work being carried out in the confined space eg. using solvents for cleaning purposes.

## Control Measures

Control measures should aim to keep flammable atmospheres below Lower Explosive Limits (LEL). The LEL is the smallest concentration of a flammable fuel in air that is capable of being ignited and propagating an explosion under test conditions.

To achieve this, the following controls are appropriate:

- Purging and ventilation as discussed above. The atmosphere will need to be tested to measure the concentration of the flammable substance relative to its LEL;
- Any residues or sludges in the confined space that may give risk to flammable substances need to be removed prior to entry;
- Non-sparking tools and specially protected lighting are essential where flammable or potentially explosive atmospheres are likely; and
- Petrol fuelled equipment should be avoided. Special precautions should be taken if using gas cylinders or diesel engines, e.g. adequate ventilation to prevent a build up of harmful gases.

### *Equipment for Use in Explosive Atmospheres*

When selecting equipment for use in confined spaces where an explosive atmosphere may be present, country specific standards and legislation must be complied with. Requirements often relate to specific equipment and protective systems intended for use in potentially explosive atmospheres.

Any equipment provided for use in a confined space needs to be suitable for the purpose and should be selected on the basis of its intended use.

Where there is a risk of a flammable gas seeping into a confined space, which could be ignited by electrical sources (for example a portable hand lamp), specially protected electrical equipment must be used.

Earthing is essential to prevent static charge build-up, and mechanical equipment may need to be secured against free rotation, as people may tread or lean on it.

# Structural Safety of Workplaces

## Introduction

All work places are required to be maintained in a suitable and sufficient state. Those persons such as building owners, those responsible for building maintenance, surveyors, architects, local authority building control officers, estate agents, those with statutory responsibility for historic buildings, etc., must be able to carry out evaluations and inspections of certain traditional buildings and structures.

Over time the fabric of the buildings can deteriorate. This can be due to damage to the structure of the building, and also to structural failures.

## Causes of Damage to Building Structure

Building structure can be damaged in a variety of ways. These include:

- Adverse weather conditions, such as:
    - persistent ingress of rain water causing rot and other damage;
    - flooding;
    - high winds;
    - extreme temperature changes, which may affect certain structures; and
    - frost heave, a condition where the freezing of the ground and 'growth' of ice lenses in the soil causes the ground surface to heave;
- Overloading of structures, due to:
    - misuse; or
    - change of use of building leading to inadequate strength of structure for new use;

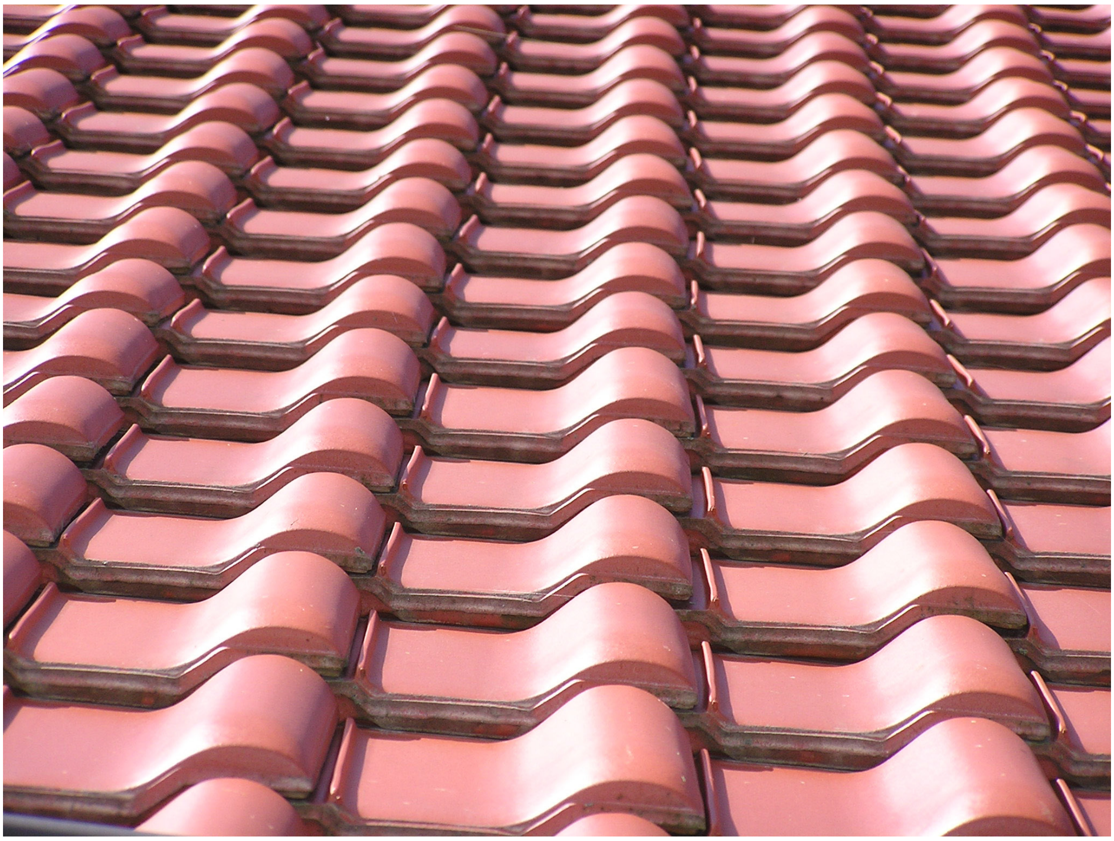
(list continues over page)

- Hot and corrosive atmospheres;
- Vibration, due to transport or quarry blasting activities;
- Alteration of structural members;
- Subsidence, due to:
    - settlement of foundations;
    - softening of the ground from roof drainage which may lead to unequal settlement cracking of walls;
    - erosion of soil due to rainwater run-off, which undermines shallow foundations leading to tilting of walls and piers;
    - removal of trees in shrinkable clays; and
    - damaged land drains, inspection chambers and soakaways;
- Deterioration of building materials, due to:
    - lack of maintenance due to poor design and difficult access for maintenance;
    - accidental impact damage due to moving plant;
    - damage due to wood boring insects in timber structures;
    - dry and wet rot (fungal infestations); and
    - tunnelling by vermin;
- Excavations that expose or undermine foundations; and
- Unauthorised modifications to buildings.

# Structural Failure of Buildings

There are a number of key reasons why buildings may fail structurally after construction. These are:

- Poor design, including:
    - a failure to take account of the loads the structure will need to carry;
    - ignorance of the effects of repeated stresses on the structure; and
    - an improper choice of materials or misunderstanding of their properties;
- Substandard construction, such as:
    - failure to build in accordance with the drawings and specifications; and
    - the use of inferior or substandard materials;
- Dangerous modifications, such as:
    - cutting through roof beams or floor joists/trusses without consideration of the support these structures are providing; and
    - removal of internal load-bearing walls without providing replacement structural support.



# Inspection

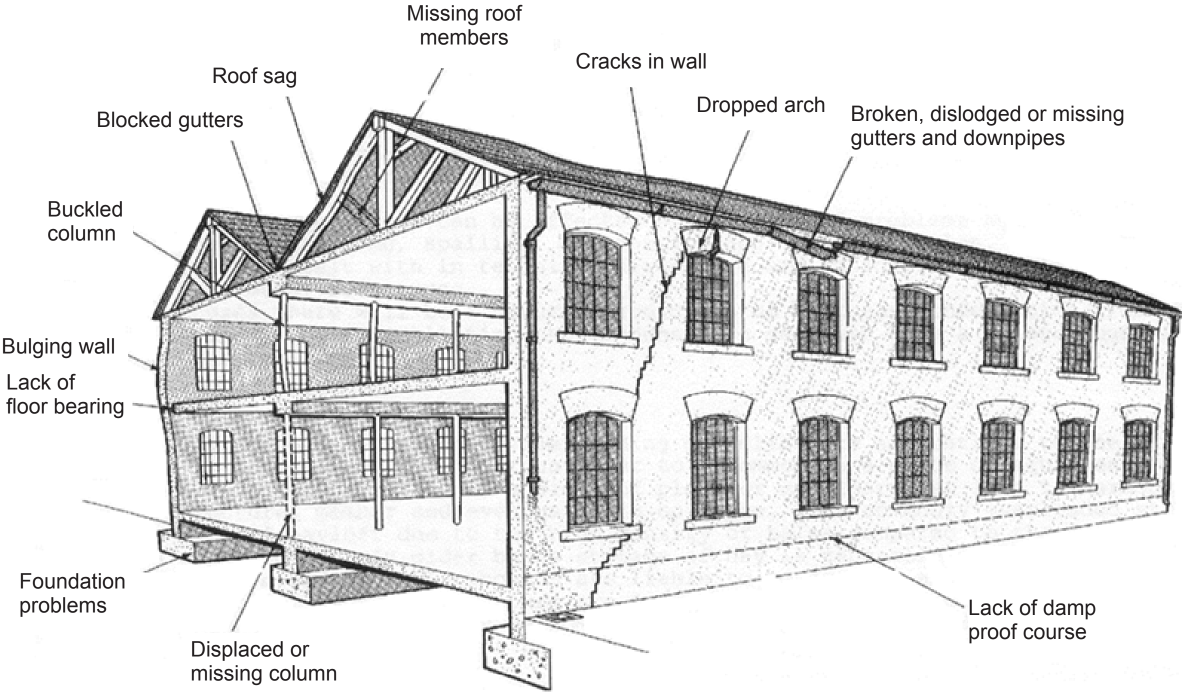
Prior to an internal inspection of a structure an external inspection from the perimeter should be carried out in order to check:

- Line of the roof ridge;
- Plumbness (vertical alignment) of walls and quoins- the external corners of the walls (especially at the eaves);
- State of weather, strong winds, etc. as it may affect unstable areas of the building during the inspection;
- Major cracks, particularly at corners;
- Missing masonry, roof timbers and roof coverings;
- Broken gutters and downpipes; and
- Timber lintels at doorways and other openings.

If the building assessment indicates that the building, while defective, is not in imminent danger of collapse then the internal inspection can take place with caution. The following areas may need inspection:

- Wall piers;
- Bearings to beams and joists;
- Tying of cross walls to main walls;
- Floors or part floors;
- Signs of vandalism and theft;
- Roof truss seatings;
- Roof tiles and timber integrity;
- Walls at roof level;
- Gables;
- Fire escapes;
- Imposed loads; and
- Health hazards.

**Figure 7: Structural Deterioration**




# Inspection Planning

Persons working on their own should not normally carry out surveys and or inspections of workplace structures. If however, work is carried out alone then a system of 'reporting in' should be adopted so that the alarm can be raised if a report is not received at the pre-arranged time(s).

If entry or inspections take place in confined spaces then the Confined Space Regulations should be complied with. A number of issues will need to be looked at during the planning stage and may include:

- Clothing: Depending on the conditions such as dirty or wet areas, dust masks, safety helmet and boots;
- Equipment: Flashlight, camera, binoculars, ladder or lightweight staging, moisture reading instrument and pocket knife;
- Previous reports: If available for previous inspections / surveys;
- Building history: How long it has been standing, what it has contained in the past, past works undertaken on the structure; and
- Specialist assistance: There may be a requirement to have structural engineers, chemists or occupational hygienists for sampling or checking on specific matters.

# Work at Height

## Introduction

Work at height may involve some or all of the following hazards:

- Fall of a person, e.g. from a work platform;
- Collapse of the work platform;
- Falls of objects or materials onto people below; and
- Contact with overhead services.

Falls from height remain the most common kind of accident causing fatal injuries. The majority of falls from height occur from:

- Ladders, primarily from moveable ladders;
- Scaffolding, primarily from general access scaffolds;
- Work area / machinery / platform;
- Vehicles;
- Roof edges;
- Fragile roofs;
- Stairs; and
- Raised walkways.

Falls from height can also occur from falls into unguarded holes in floors, e.g. hatchways, inspections holes and pits, and from falls into process tanks and machinery. The severity of the injury is increased when the fall is into the path of a moving vehicle or machinery or into a container or tank of hazardous substance, e.g. molten metal, granular or free flowing substance, corrosive or toxic substance.

The most common incidents involve over-reaching, over-balancing, equipment failure, misuse of equipment, unexpected movement (particularly where ladders are involved) and the failure of a fragile surface.

# Organisation and Planning

Employers, self-employed and those in control of the work should ensure that work at height is:

- Properly planned, including emergencies and rescue plans, and when selecting work equipment;
- Appropriately supervised; and
- Carried out in a manner which is so far as is reasonably practicable safe, ensuring that no adverse weather conditions are present to compromise the safety of persons working at height.

Employers should ensure that those carrying out the work, including those organising, planning or supervising it, are competent.

# General Precautions for Working at Height

The following hierarchy of control measures should be considered when planning activities that involve work at height:

- Avoiding work at height;
- Using an existing safe place of work;
- Providing work equipment to prevent falls;
- Mitigating the distance and consequences of a fall; and
- Additional control measures eg. Instruction and training.

## Avoiding Work at Height

Wherever possible, alternative work methods should be considered that avoid the need to work at height altogether e.g.

- Erect guard rails on steelwork at ground level and then crane the steel and the guard rails into position; or
- Clean windows using extending poles.

# Using an Existing Safe Place of Work

Where work at height cannot be avoided, an existing safe place of work should be used where possible. These workplaces (and means of access or egress) should:

- Be stable and of sufficient strength and rigidity for purpose;
- Rest on stable and a suitably strong surfaces;
- Be of sufficient size to allow safe use for persons, plant and material;
- Have suitable means for preventing a fall;
- Have a surface which has no gap through which a person or material could fall and cause injury; and
- Be constructed, used and maintained to prevent the risks of slipping, tripping or any person being trapped between them and any adjacent structure.

For example, an existing flat roof with permanent edge protection may be used for work at height activities.

## *Fragile Surfaces*

**Figure 8: Fragile Roof**

Every employer should ensure that no person at work should pass or work on or near a fragile surface unless it is not reasonable to carry out the work elsewhere.

Where it is not reasonable to avoid work on or near a fragile surface then:

- Suitable protection, such as platforms, coverings, crawling boards, or guard-rails, must be provided; or
- Where this is not practicable, measures should be taken to minimise the distance and consequence of any fall, e.g. fall arrest systems, safety nets and air bags.

Prominent warning signs should be posted at any location where persons may pass near or work on a fragile surface.

# Work Equipment to Prevent Falls

Where there is no suitable existing safe place to work from, work equipment or other measures to prevent falls should be provided, such as access equipment fitted with guard rails. Independent scaffolds, tower scaffolds and mobile elevating work platforms (MEWPs) are examples. These are discussed in detail in Elements IC7 and IC9.

However there are some general considerations for work equipment to prevent falls. The employer should give collective measures priority over personal protection when selecting work equipment, and should select suitable equipment that is strong enough for the work and any loads placed on it, taking into account:

- The working conditions and the risks to the safety of persons at the place where the work equipment is to be used;
- In the case of work equipment for access and egress, the distance that has to be negotiated;
- The distance and consequences of a potential fall;
- The duration and frequency of use;
- The need for easy and timely evacuation and rescue in an emergency; and
- Any additional risks posed by the use, installation or removal of the work equipment, e.g. the erection and dismantling of scaffold on a busy street.

## *Inspection of Work Equipment*

Where the safety of work equipment depends on how it is installed or assembled, e.g. scaffolding, it should be inspected in place before it is used.

Where work equipment is exposed to conditions causing deterioration that could lead to a dangerous situation, such as high winds for example, it should be inspected at suitable intervals and each time exceptional circumstances occur that could jeopardise its safety.

There are specific requirements for the inspection of equipment used in construction sites, these are dealt with in Element IC9.

# Measures to Mitigate the Distance and Consequences of a Fall

Where the risk of falls cannot be prevented, work equipment or other measures to minimise the distance and consequences of a fall should one occur need to be provided, e.g. fall arrest systems, safety netting or air mats.

This equipment does not stop people falling, but minimises the potential injuries if they do.

If nets are used eg. for roof work, they need to be properly installed by competent riggers as close as possible below the roof involved to minimise the distance fallen.

If harnesses are used they must be securely attached to a sufficiently strong anchorage point, and checks to make sure that they are always worn. This requires user discipline and active management monitoring on a regular basis.

# Additional Control Measures

Additionally measures to reduce the risk of a fall should be used, e.g. information and training, use of competent persons, regular ladder inspections, demarcated areas to provide a warning, adequate lighting, good housekeeping measures, use of suitable footwear, checking weather conditions, etc.

Consideration must also be given to the safety of people working or passing beneath the work at height activity. In particular, measures should be in place to protect them from falling objects.

## *Falling Objects*

Employers should prevent the fall of objects or material, e.g. toe boards and sheeting on scaffolding. Where this is not reasonable, suitable steps should be taken to ensure that ensure persons are not struck by falling objects, e.g. barrier off danger area below and prevent unauthorised access. Chutes may be used to control the transport of materials and waste from a height to a safe location.

Materials and objects need to be stored and stacked in such a way that they are not likely to fall and cause injury.

Storage racking and shelving needs to be of adequate strength and stability for the loads to be placed on it. In general, racking and shelving is made from lightweight materials and is limited to the amount of wear and tear it can withstand. The skill of workplace transport operators has a great bearing on the amount of damage likely to be caused. The greater the damage to racking and shelving, the weaker it will be, until it may eventually collapse, even when supporting less than its normal working load.

To ensure that racking or shelving installations continues to be serviceable:

- They should be regularly inspected to identify damage and necessary action;
- Employees should be encouraged to report any damage, however minor, so that its effect on safety may be assessed; and
- Maximum load notices should be displayed and strictly adhered to.

Appropriate precautions in stacking and storing include:

- Safe stacking on sound pallets;
- Banding or wrapping to prevent individual articles falling;
- Setting limits for the height of stacks to maintain stability;
- Regular inspection of stacks to detect and remedy any unsafe stacks;
- Instruction and training of employees in stacking; and
- Special arrangements for objects which may be difficult to store.

# Lone Working

## Introduction

Lone working is where workers work by themselves without close or direct supervision; there is a wide range of situations where lone working occurs:

- Where only one person works on the premises, e.g. in small workshops, petrol stations, kiosks, and shops;
- People who work from home;
- People who work separately from others, e.g. in factories, warehouses, training establishments, leisure centres etc.;
- People who work outside normal hours, e.g. cleaners, security, special production, maintenance or repair staff, etc.
- People working on construction projects, plant installation, maintenance and cleaning work, electrical repairs, lift repairs, vehicle recovery, etc.;
- Agricultural and forestry workers; and
- Service workers, e.g. rent collectors, postal staff, social workers, home helps, district nurses, drivers, estate agents, sales representatives and similar professionals who visit customer and client premises.

## Risk Assessment and Lone Working

Lone working should be subject to a specific risk assessment. The following specific issues will need to be addressed in the risk assessment:

- Any special risks for the lone worker from the workplace eg. confined space, including safe access and egress;
- Any manual handling tasks that may require more than one person eg. installing temporary access equipment, such as portable ladders or trestles, or general handling of equipment and goods;
- Situations where more than one person is required to operate essential controls for the safe running of equipment or workplace transport;
- Situations that might pose a risk of violence eg. in remote areas, or where the task involves the handling of valuable or desirable goods;
- Situations that might pose additional risks to workers who are young, pregnant, disabled or those with medical problems when they work alone;
- The suitability and effectiveness of emergency procedures for lone workers, including the need for means to be able to summon help.

# Safe Working Arrangements for Lone Workers

Some of the issues which need special attention when planning safe working arrangements for lone workers are as follows:

- Procedures to check that lone workers have no medical conditions which make them unsuitable for working alone;
- Provision of training so the lone worker is aware of the particular risks they face and the appropriate control measures. This is particularly important where there is limited supervision to control, guide and help in situations of uncertainty, and training may be critical to avoid panic reactions in unusual situations;
- Setting limits to what can and cannot be done while working alone. They should ensure employees are competent to deal with circumstances which are new, unusual or beyond the scope of training, e.g. when to stop work and seek advice and how to handle aggression.
- Periodically visiting and observing people working alone;
- Means of regular contact between the lone worker and supervision using either a telephone or radio;
- Automatic warning devices that operate if specific signals are not received periodically from the lone worker;
- Other devices designed to raise the alarm in the event of an emergency and which are operated manually or automatically by the absence of activity;
- Checks that a lone worker has returned to their base or home on completion of a task;
- Emergency procedures should be established and employees trained in them; and
- Lone workers should have access to adequate first-aid facilities and mobile workers should carry a first-aid kit suitable for treating minor injuries.

The extent of supervision required depends on the risks involved and the ability of the lone worker to identify and handle health and safety issues.

There are some high-risk activities where at least one other person may need to be present. Examples include confined space working where a supervisor may need to be present, as well as someone dedicated to the rescue role, and electrical work at or near exposed live conductors where at least two people are sometimes required.

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