ASTUTIS

NEBOSH International General Certificate in Occupational Health and safety

Element 3

Managing Risk - understanding people and processes

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3.0 Learning outcomes and assessment criteria

The learner will be able to:

- **Positively influence** health and safety culture and behaviour to improve performance in their organisation

    3.1 **Describe** the concept of health and safety culture and how it influences performance

    3.2 **Summarise** how health and safety culture at work can be improved

    3.3 **Summarise** the human factors which positively or negatively influence behaviour at work in a way that can affect health and safety

- **Do** a general risk assessment in their own workplace – profiling and prioritising risks, inspecting the workplace, recognising a range of common hazards, evaluating risks (taking account of current controls), recommending further control measures, planning actions

    3.4 **Explain** the principles of the risk assessment process

    3.4 **Produce** a risk assessment of a workplace which considers a wide range of identified hazards and meets best practice standards ('*suitable and sufficient*')

- **Recognise** workplace changes that have significant health and safety impacts and effective ways to minimise those impacts

    3.5 **Discuss** typical workplace changes that have significant health and safety impacts and ways to minimise those impacts

- **Develop** basic safe systems of work (including taking account of typical emergencies) and knowing when to use permit-to-work systems for special risks

    3.6 **Describe** what to consider when developing and implementing a safe system of work for general activities

    3.7 **Explain** the role, function and operation of a permit-to-work system

    3.8 **Discuss** typical emergency procedures (including training and testing) and how to decide what level of first aid is needed in the workplace

3.1 Health and safety culture

Organisational culture has been defined as:

'a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid, and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems.'

Culture will inevitably form in any group, through spontaneous interactions between the members, leading to patterns and norms of behaviour.

In an organisation the personal vision, goals, beliefs, values and assumptions of the leader should be imposed within the group, and reinforced as members are recruited and promoted on the basis of consistent thoughts and values.

When a new employee is *'learning the ropes'*, *'the ropes'* represent the organisational culture, or *'the way we do things around here'*.

Safety culture

The Confederation of British Industry (CBI) describes the culture of an organisation as:

'The mix of shared values, attitudes and patterns of behaviour that give the organisation its particular character' or 'the way we do things round here'.

They suggest that the *safety culture* of an organisation could be described as:

'The ideas and beliefs that all members of the organisation share about risk, accidents and ill health'.

The HSE defines safety culture as:

'The safety culture of an organisation is the produce of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the Commitment to, and the style and proficiency of, an organisation's health and safety management.

Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures.'

Every group of people develops a *'culture'*. In an organisation with a good safety culture everyone puts health and safety high on the list and adopts the same positive attitudes to health and safety. This influences the ways in which individuals in the group handle new events and decisions.

Some key aspects of an effective culture include:

Management commitment

Management commitment should be demonstrated by the proportion of resources (time, money and people) and support allocated to health and safety management, and by the relative status of health and safety against other business priorities such as production, cost etc. The active involvement of senior management in the health and safety system is very important.

Visible management

Managers should lead by example when it comes to health and safety. Good managers appear regularly on the *'shop floor'*, talk about health and safety and visibly demonstrate their commitment by their actions – wearing PPE, following safety rules, where appropriate putting health and safety concerns over commercial considerations.

Good communications

Open two way communications are essential. Questions about health and safety should be part of everyday work conversations. Management should listen actively to what they are being told by employees, and be seen to take what they hear seriously.

Active employee participation

Ownership of health and safety has to be built at all levels and the knowledge that employees have of their own work is a valuable resource. Employees should be actively involved in safety workshops, risk assessments, plant design etc.

Effective health and safety training

Training is discussed in more detail in **Element 3, section 2**. Training has an important role to play in improving employees understanding of not just site specific hazards and controls but the principles of sensible risk management.

Safety climate

'Safety climate' is the term often used to describe the tangible outputs or indicators of an organisation's health and safety culture as perceived by individuals or work groups at a point in time.

Measuring health and safety culture (or climate)

Workers perception of an organisations safety culture can be evaluated by the use of survey tools such as questionnaires and interviews that may focus specifically on workers perception of safety culture or on broader issues such as worker satisfaction or engagement.

Given that culture relates to shared values, beliefs and behaviours it is reasonable to expect that organisations with a more positive safety culture will manage health and safety more effectively and cause less harm to their workers and others.

Tangible indicators of health and safety culture

Tangible indicators of health and safety culture therefore relate to health and safety performance (see **Element 4**, **section 1** on active and reactive monitoring). Indicators of a more positive safety culture might therefore include:

- good levels of compliance with health and safety rules and procedures (as seen in workplace inspections/job observations)
- low levels of staff turnover, as staff are content
- few (if any) complaints about health and safety issues/working conditions
- reduction in accident rates
- reduced absenteeism.
- is the workplace happy healthy and here? (are employees engaged and happy in their work? are they happy to be at work?)

Managing an improvement of health and safety culture and behaviour should be tackled in the same way as any change management process, as illustrated in Figure 3.1.

Good two-way communication

Workforce support

Successful change

Well managed and planned actions

Management commitment

Clearly defined objectives

Figure 3.1: Change management process

Problem areas should be identified through proactive and reactive monitoring activities (See **Element 4, section 1**). The monitoring information can then be used to define SMART objectives and action plans (see **Element 2, section 2**). Management commitment and workforce support, co-ordinated through effective communication is essential if the defined objectives are to be achieved.

5 Cs

Another approach to identifying the essential factors that will help to create a working environment and safety culture where safer behaviour is the norm is to consider the 5Cs:

Commitment	Management commitment / leadership is essential.
Control	The infrastructure for control is provided by the safety management system: Policy, organising, planning and implementing, monitoring and review. Clear responsibilities and objectives are used to control the efforts of the workforce to achieve organisational goals.
Cooperation	If the workforce co-operates, *i.e.* contributes because the workers know it is the right thing to do the culture will evolve positively and objectives will be easier to achieve. *Consultation* is a key process for obtaining workforce co-operation.
Communication	Effective two way communication goes hand in hand with consultation, cooperation and control. Workers need to be clear on their responsibilities and objectives and understand and buy into what management is trying to achieve. Workers input on the operational practicalities of any change are vital.
Competence	An incompetent workforce is unlikely to achieve much. Demonstrable competence in terms of operational activity and risk management is another imperative.

Table 3.1: 5Cs

Note: the *'4 Cs'* were discussed in the **Element 2, section 1** overview of HSG65 in the context of organising for health and safety generally. The same variables are relevant here in getting organised to positively impact upon health and safety behaviours. The extra C here is for commitment (from the top).

Securing management commitment

Attempts to secure management commitment typically rely on moral, financial and legal arguments as discussed in **Element 1, section 2 and 3**.

Management commitment can be graded on the scale presented in Table 3.2.

Apathetic	Has no opinion or interest
Non-compliant	Does not see the point and will not do what is expected
Reluctant	Does not really see the point but will grudgingly do what is expected to keep job
Compliant	Sees the benefits and will do what is expected, but is not enthusiastic
Involved	Believes in the benefits, is reasonably enthusiastic and will do what can be done within the existing system
Committed	Believes in the benefits, is enthusiastic and will actively modify the rules or systems to achieve the goal

Table 3.2: Levels of management commitment

To be effective, management commitment must be visible and tangible. It can be demonstrated through a range of activities including:

- setting realistic, achievable targets for health and safety
- ensuring that health and safety performance is a key performance measure for senior managers
- making consistent business decisions to show the relative importance of health and safety against other business objectives such as production and quality
- being actively involved in proactive monitoring through safety tours etc.
- encouraging open and honest learning from experience and a *'fair blame'* culture
- visibly demonstrating expected standards of behaviour *e.g.* wear PPE where required
- providing adequate resources (time, equipment and competent staff)
- providing a good working environment and welfare facilities
- providing and supporting means of consultation and communication with the workforce.

Leadership

As well as showing commitment, management need to demonstrate clear leadership in health and safety The key requirements for a leader are to:

- set a clear and credible vision of the future state the organisation is trying to achieve

- establish the style and tone of communication, the social architecture and culture

- create an atmosphere of two way trust between leaders, managers and the workforce

- visibly demonstrate commitment, persistence, willingness to take risks/accept losses, consistency, self-knowledge and above all learning.

Consultation and information

The passing of information to employees is a one way process. Employees are the passive recipients of information

Consultation is a two way process. Employees are active participants in the process and have an opportunity to express their opinions. Consultation should occur prior to any decision being made.

Information

The employer should provide employees with relevant health and safety information to enable them to help protect themselves, their colleagues, and others who might be affected by the work.'

The information to be supplied should include:

- information about hazards at the workplace and methods of avoiding them
- information made available by manufacturers and suppliers of materials used at work.

It might also include:

- statutory information, *e.g.* copies of regulations or Approved Codes of Practice
- official HSE publications, *e.g.* guidance notes or technical data notes
- industry standards.

Information provided should be suitable given the level of training, knowledge and experience of the employee, and taking account of any language difficulties or disabilities. Information can be provided in any suitable format as long as it can be understood by everyone.

Consultation

The legal requirements for consultation specify a minimum requirement. Building upon this legal foundation to create a genuine partnership between employers and employees creates a culture of collaboration where concerns, ideas and solutions are shared and acted upon, and where the whole workforce is engaged in the management of health and safety.

Research has shown that stronger employee involvement leads to:

- better control of common workplace risks

- lower accident rates
- a more positive health and safety climate where employees feel encouraged to raise concerns.

What should the workforce be consulted about?

The workforce should be consulted about anything in the workplace that could substantially affect their health and safety. The specifics will vary from workplace to workplace.

In general the workforce must be consulted about:

- any change which substantially affects health and safety, *e.g.* new or different procedures, new equipment, or new shift patterns
- the arrangements for appointing competent person(s) to help meet health and safety obligations *e.g.* health and safety advisor
- information on the likely risks in the workplace and the precautions to be taken
- the planning of health and safety training
- the health and safety consequences of new technology.

Employees may be consulted with directly as individuals, or through elected representatives.

In a small business consulting directly with individuals is often effective in giving everyone a chance to have a say in health and safety matters.

Where the size or spread of the workforce may make it unrealistic to consult everyone individually arrangements can be made for employees to elect representatives of their choice.

If there are too many employees to consult with directly an efficient solution can be via consultation with elected representatives in a structured forum such as a health and safety committee or works council.

Employee Representatives

Employee representatives involved in consultation on health and safety matters should be trained

The training should include:

- The role of the safety representative;
- Communication skills for: safety committee meetings; with colleagues with differing views; with employers to raise issues; and with health and safety inspectors;

- Health and safety legislation;
- How to identify and minimise hazards and dangerous occurrences;
- Health and safety issues of new technology;
- How to carry out a workplace inspection and accident investigation (recommended).

Safety committees

It is also good practice to set up a health and safety committee as a forum for representatives of the employer and employees to come together with the aim of improving health and safety performance in the workplace.

The following needs to be agreed:

- the principles of how it will function best so it is clear for all employees and members of the committee
- who the members will be
- what the committee will do
- how it will make decisions and deal with disagreements
- what resources will be needed by committee members?

Function and objectives of safety committees

Safety committees have the legal function of keeping under review the measures taken to ensure the health and safety at work of the employees.

Agreed objectives and terms of reference should be drawn up to establish a working framework for the safety committee.

A key objective should be the promotion of co-operation between employers and employees in developing and carrying out measures to ensure effective management of health and safety at work.

Specific activities might include:

1. the study of accident and notifiable disease statistics and trends
2. examination of safety audit reports
3. consideration of reports and factual information provided by enforcing authority inspectors

4. consideration of reports submitted by safety representatives
5. assistance in the development of works safety rules and safe systems of work
6. monitoring the effectiveness of the safety content of employee training
7. monitoring the adequacy of safety and health communication and promotion in the workplace
8. the provision of a link with the appropriate enforcing authority.

Membership of safety committees

The membership and structure of safety committees should be settled in consultation between management and the safety representatives.

The committee should be reasonably compact but still able to adequately represent the interests of management and of all the employees. The number of management representatives should not exceed the number of employees' representatives.

Management representation should be aimed at ensuring:

- an appropriate level of knowledge and expertise (by including the likes of work engineers, personnel managers and supervisors as well as senior managers)
- adequate authority to act on recommendations.

Company specialists, such as safety officer/adviser, occupational health doctor or nurse, or occupational hygienist should be ex-officio members and others such as project engineers, chemists, or training officers should be co-opted as necessary.

The conduct of safety committees

The frequency of meetings will depend on the size of the business, level of inherent risk, and the stage of development of safety management systems.

Sufficient time should be allowed during each meeting to ensure full discussion of all business.

Meeting dates should be planned well in advance. The schedule of planned meetings should be published on company notice boards and each committee member should be sent a personal copy.

The agenda and accompanying papers should be sent to committee members at least one week before the meeting.

Meetings should not be cancelled or postponed except in very exceptional circumstances.

Agreed minutes of each meeting should be kept and, as soon as possible after the meeting, a copy of the minutes should be:

- sent to each member of the committee
- sent to the most senior executive responsible for health and safety
- displayed on company notice boards or otherwise made available to employees.

Effective and ineffective safety committees

Table 3.3 lists some of the attributes of an effective safety committee and compares with an ineffective committee.

Effective	Ineffective
clear terms of reference	no (or vague) terms of reference
a manageable number of members	too many or too few members
a good balance between management and employees	biased towards management or employees
appropriate knowledge and expertise	lack of knowledge and expertise
regular frequent meetings	infrequent ad hoc meetings
a senior management champion	lack of management commitment
a strong chair-person	poor chair person
a level of formality and organisation, *i.e.* properly communicated agenda and minutes	poorly organised, no agenda or minutes
focussed on key issues	distracted by trivia
opportunity for all to contribute	dominated by certain individuals
able to make decisions or influence decision making process.	no influence on decision making process.

Table 3.3: Effective and ineffective safety committees

Effective communication

The art of effective communication is getting the right message (in the right format), to the right audience at the right time.

The communication process can be thought of as a cycle, involving the message sender and the message receiver (Figure 3.2). At each stage there are potential barriers to effective communication.
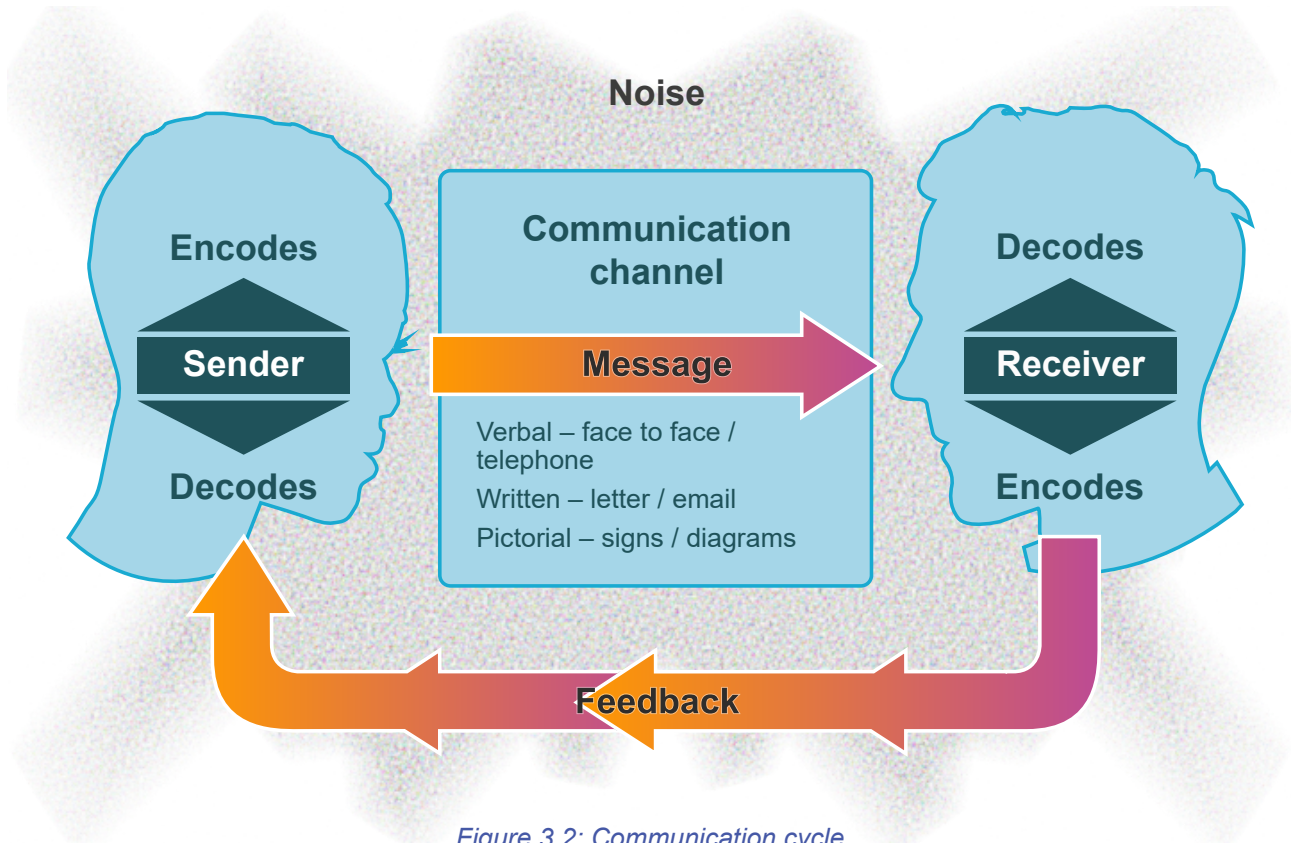
Figure 3.2: Communication cycle

The *message sender* may not understand the subject matter well enough to be able to properly encode the message. The language may be inappropriate (too much jargon) or the pitch may be too complicated or too simplistic for the audience.

The communication channel may be:

- unsuitable, *e.g.* trying to explain a complex process through written description only when a pictorial approach would be simpler
- compromised, *e.g.* technical failures of telephone systems or email servers, or background noise interrupting face to face conversation.

The *message receiver* may not be able to properly decode the message because of: unfamiliarity with the subject matter or technical jargon, disability or illness, impairment

through drugs or alcohol or the wearing of personal protective equipment.

The *feedback* is subject to the same challenges as the original message with regard to communication channels.

Merits and limitations of methods of communication

Verbal communication

May be direct (face to face), or indirect. Indirect verbal communication may involve sight of the message receiver (*e.g.* video conferencing) or may not (*e.g.* telephone call).

A great deal of direct communication is through non-verbal cues or body language, this is lost with a telephone call.

The merits of verbal communication are that it is immediate and provides an immediate opportunity for feedback and clarification. The limitations are that there is no tangible information for future reference, or evidence.

Written communication

Historically the major limitation of written communication (traditional letters and internal memos) was the delay between stages of the process. Email has largely addressed this issue but has its own limitations *e.g.* circulating to too wide an audience so that ownership of the action is lost, and getting an appropriate, business formal tone to the message.

Written communication allows for complex messages to be conveyed and recorded, providing the reader with an opportunity to reflect on and revisit the message before determining the next course of action. With modern software applications it is easy to include complex diagrams and photographs within written reports.

Literacy levels can be a major barrier to written communication.

Graphic communication

'A picture paints a thousand words'

The major limitation of pictorial communication is that without an explanation a picture is open to interpretation. The merits are: that well designed safety signs, conforming to international standards eliminate difficulties with language and literacy and convey a consistent message to an international workforce.

As well as considering the most suitable medium for the type of message consideration should be given to the preferences of the audience.

When following driving directions some drivers like to follow a map, others prefer written step by step instructions, and others listen to verbal instructions from a portable route planner.

With modern technology using combinations of media for any given message is easier than ever.

Use and effectiveness of health and safety media

In marketing terminology, communication that is aimed at influencing the attitude of a community toward some cause or position is termed propaganda and the media that is used to *'sell'* the concept is termed collateral.

There are many tools and techniques available to help sell the importance of health and safety management within the workplace, including:

- health and safety notice boards
- employee handbooks
- toolbox talks
- videos
- posters.

Health and safety notice boards

A well-managed health and safety notice board can be an effective means of sharing information with the workforce.

Typically the notice board would present the required statutory information, such as:

- health and safety law poster
- employers liability insurance certificate
- first-aid arrangements
- emergency arrangements – what to do in case of fire etc.
- the latest news, and specific local information, guidance and warnings.

To be effective the information will need to be current and relevant, the content must be managed and the notice board kept in good order, and staff must be made aware that it is intended to be useful means of keeping them informed.

Toolbox talks

A *'toolbox talk'* is a short presentation to the workforce on a single aspect of health and safety. The term originates in the use of the toolbox as a stage for the foreman to brief his team on the health and safety topic of the day.

The talk should be relatively brief (10/15 minutes), should focus on a relevant health and safety issue (*e.g.* improving housekeeping, safe use of ladders, wearing of PPE etc.) and should have clearly defined SMART objectives so that progress against the intended impact can be monitored.

The person who delivers the talk should:

- be a good speaker
- be committed to what they say
- know enough about the topic to be able to answer any questions that may be asked
- be able to practically demonstrate skills where necessary.

If the topic is relevant and the speaker is committed, toolbox talks can be an effective means of improving workers knowledge and encouraging worker participation in health and safety initiatives.

Employee handbooks

An employee (staff) handbook or manual is typically given to employees during their induction. The handbook contains information about company policies and procedures and may also form part of the terms and conditions of employment.

The employee handbook can be an important source of information about health and safety, *e.g.* the policy statement, the employer and employee responsibilities, hazard information, site rules and what to do if an accident or ill-health occurs.

To be successful, handbooks should be written especially for employees, in plain English, avoiding jargon and using images and colours to attract the reader's attention.

The handbook should be used to support and reinforce induction and other training sessions – it should not be the only source of health and safety information.

Posters

Safety posters in the workplace can be a useful tool to promote safety and provide employees with a visible reminder of job hazards.

Posters are no substitute for proper training and procedures but can be useful in reinforcing existing information.

Posters can be serious and shocking or may try to attract attention through humour and cartoons. They should be displayed in the immediate vicinity of the issue they are intended to draw attention to, and should be changed regularly to remain current and topical.

With modern technology, posters can be personalised to an individual workplace by incorporating company logos and banding and can be created in a totally bespoke way.

Training DVDs

Training films can be useful in providing a consistent message to workers in a multisite business without the expense of running formal training courses at multiple locations.

DVDs can be played individually through PCs or used for group sessions through a large screen TV or projector.

Training videos are very often used for new staff inductions but can also be effective in other areas such as the introduction of new technology or new policies and procedures.

As a visual medium training films can effectively convey the instructor's visual cues – gestures, posture and facial expressions that aid communication and comprehension.

It is important to ensure that training films are relevant to the organisation and the specific audience *e.g.* a film of hospital patient handling may have little relevance on a manual handling course for engineering apprentices.

With modern technology filming in the workplace is more affordable and is becoming increasingly popular.

The importance of using a variety of communication methods

No individual means of communication is going to be universally acceptable. Different people have different preferences. It is therefore essential that a range of methods and media (routes to market) are deployed to ensure that the messages are received and understood by as many of the target audience as possible in a timely manner.

Different methods can also help to maintain interest in ongoing issues and reinforce messages that have been previously communicated.

Issues to consider include:

- language barriers – workers are not necessarily going to have English as a first language
- literacy – notice boards and written instructions will not be helpful to those with reading difficulties
- accessibility – workers that are not based at head office may miss out
- disabled workers may have particular problems with different methods
- the need for feedback to demonstrate understanding indicates that consultative approaches are better than the provision of information
- some types of information are better imparted in particular ways, *e.g.* use of a map for directions
- overfamiliarity with a particular means of communication can mean that it no longer grabs peoples interest or attention
- legal requirements – some information has to be imparted in particular ways, *e.g.* the prominent display of the *'Health and safety law – What you should know'* poster.

Training

Training is a planned and systematic effort to modify or develop knowledge, skills and attitude through learning experiences to achieve effective performance in an activity or range of activities.

As shown in Figure 3.5 training is one of many interrelated influences on an individual's behaviour, and from Figure 3.4 that the individual cannot be considered in isolation – the influence of the job as designed, and the organisational culture also impact upon behaviour.

Safety training may look to influence an individual's attitude by improving knowledge of the hazards and the consequences of risky behaviour. However the behaviour will only change if the person desires that change, and if the work climate is supportive of the change.

Induction training

Training upon recruitment provides an early opportunity to provide new starters with health and safety information and to make an impression regarding expected standards of behaviour.

The aims of health and safety induction training are to provide new starters with the information necessary to keep themselves safe as they familiarise themselves with the site, its activities and their roles and responsibilities.

Induction training should be arranged in several sessions over time. Bombarding a new starter with all they need to know about health and safety in a day is unlikely to be productive. Much of the required learning may be able to be covered through discovery learning in the workplace.

First day

First day induction training is likely to be provided in a classroom environment, and would normally cover:

● health and safety policy statement

● site health and safety rules

● hazards that may be encountered during the first few days, and the corresponding precautions

● authorisations and limitations regarding movement around site and specific tasks and activities

● emergency procedures including fire evacuation and first aid

- reporting procedures for accidents, near misses and dangerous occurrences
- health surveillance procedures (if relevant).

The training given on day one should be simple and brief. It is often given off-the job, *i.e.* in a classroom.

First week

During the first week the following information should be covered, probably using a combination of workplace learning and supplementary classroom sessions:

- health and safety policy –
    - organisation and arrangements for health and safety
    - line management responsibilities for health and safety
    - key individuals such as the health and safety manager, safety representative, first-aider, fire marshal etc.
- consultation arrangements and the role of safety representatives
- specific hazards and risks relevant to the job and area of work
- workplace precautions and risk control systems required
- procedures for obtaining PPE etc.

First 3 – 6 months

The remaining needs of the employee should be regularly reviewed and addressed during the early months of their career. The employee should remain under an appropriate level of supervision that is proportionate to their gradually increasing competence.

Additional training

Additional training will be required whenever workplace changes introduce new risks or increase existing risks *e.g.* the introduction of new or significantly changed processes, equipment or procedures.

Other drivers for health and safety training include:

- lessons learnt as a consequence of investigating accidents or analysing accident trends
- the introduction of new legislation or guidance
- the introduction of new technology
- risk assessments identifying new hazards or inadequately controlled hazards
- management systems deficiencies identified through audit.

Job changes

People who are transferred or promoted into a new job will invariably face new hazards and responsibilities. Wrong assumptions may be made about their competence and they may be reluctant to make their limitations public.

Refresher training

Competences will erode over time if unpractised – this is one of the main reasons for regular refresher training for first-aiders, providing an opportunity to reinforce and refresh skills in a safe environment.

Regular refresher training can also provide an opportunity for an exchange of views between older, experience staff and younger staff which can help with motivation and norming of attitudes.

Behavioural change programmes

Behavioural modification programmes, which address safety, typically involve some form of workplace observation of unsafe acts or conditions. The observers are often specially trained colleagues but may be managers or safety professionals.

Follow-up procedures are required for the reporting and recording of the unsafe behaviours and for actions to address the issues. The follow-up action can be targeted at the individual, team or organisation, depending on the features of the specific programme.

The process can be summarised withy the acronym *'Do it'* as shown in Figure 3.3.

Define behaviours to target

Observe to collect baseline data

Intervene to influence target behaviour(s)

Test to measure impact of intervention
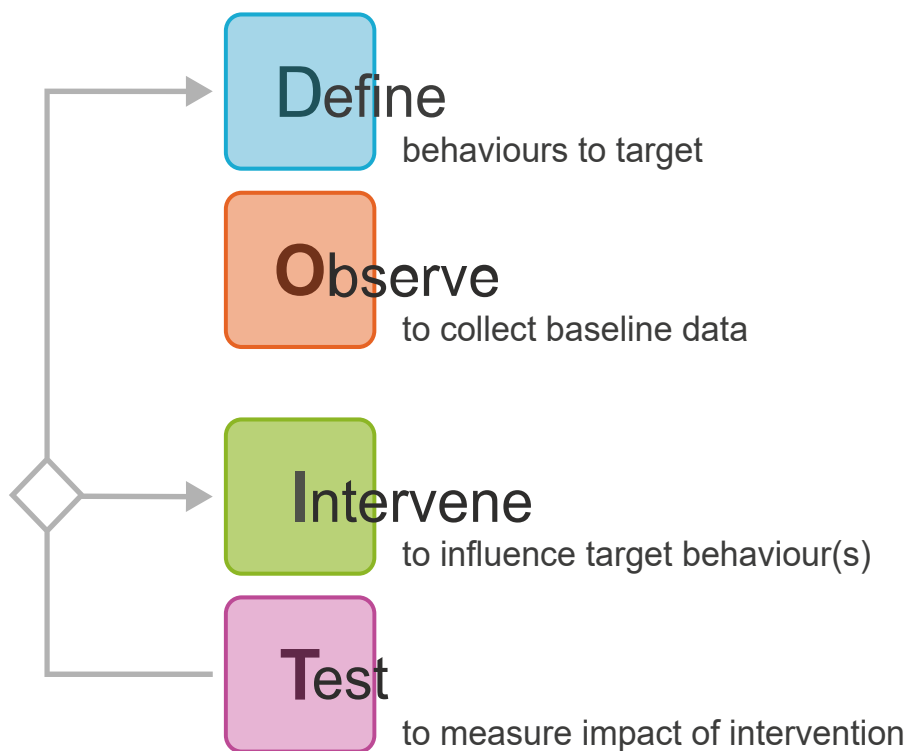
Figure 3.3: 'Do it' behavioural safety model

Behavioural change programmes are not an alternative to effective engineering controls and sound safety management policies, systems and procedures, and should only be considered when these essential foundations are established and effective.

Behavioural change programmes are not a quick fix. It takes time for benefits to show through as measurable changes in behaviour.

It is often thought that behaviour change begins with a change in attitude. In reality the casual link between attitude and behaviour is weak and the reverse causal link between behaviour and attitude is much stronger.

If a person's behaviour changes and becomes incompatible with the corresponding attitude a state of discomfort, known as *'cognitive dissonance'* occurs. To resolve the discomfort the attitude changes to be consistent with the newly-adopted behaviour.

How do behaviour change programmes work?

Behaviour modification programmes are typically underpinned by the following well established principles:

- behaviour can be measured – if it is carefully defined and observable
- behaviour is a function of its consequences and can be changed by providing appropriate reinforcement and feedback – praising good behaviour is more effective than punishing bad behaviour
- the antecedents of behaviour (training, attitude, motivation etc.) provide an insight into why people behave as they do
- goal-setting ads to the positive effects of reinforcement and feedback – by involving people in setting challenging and achievable targets for behaviour change.

The term human factors refers to:

'Environmental, organisational and job factors and human and individual characteristics which influence behaviour at work in a way which can affect health and safety.'

A simple way to view human factors is to think about three aspects: the *individual*, *the job*, and the organisation, and how they impact on people's health and safety–related behaviour.

As per Figure 3.4 the individual and the job come together to create a risk interface. The job takes place within the context of the organisational culture – this is often the greatest influence on workplace behaviour.

The organisation

Culture, leadership, resources, work patterns, communications......

The individual

Competence, skills, personality, attitudes, risk perception...

The job

Task, workload, environment, displays and controls, procedures...
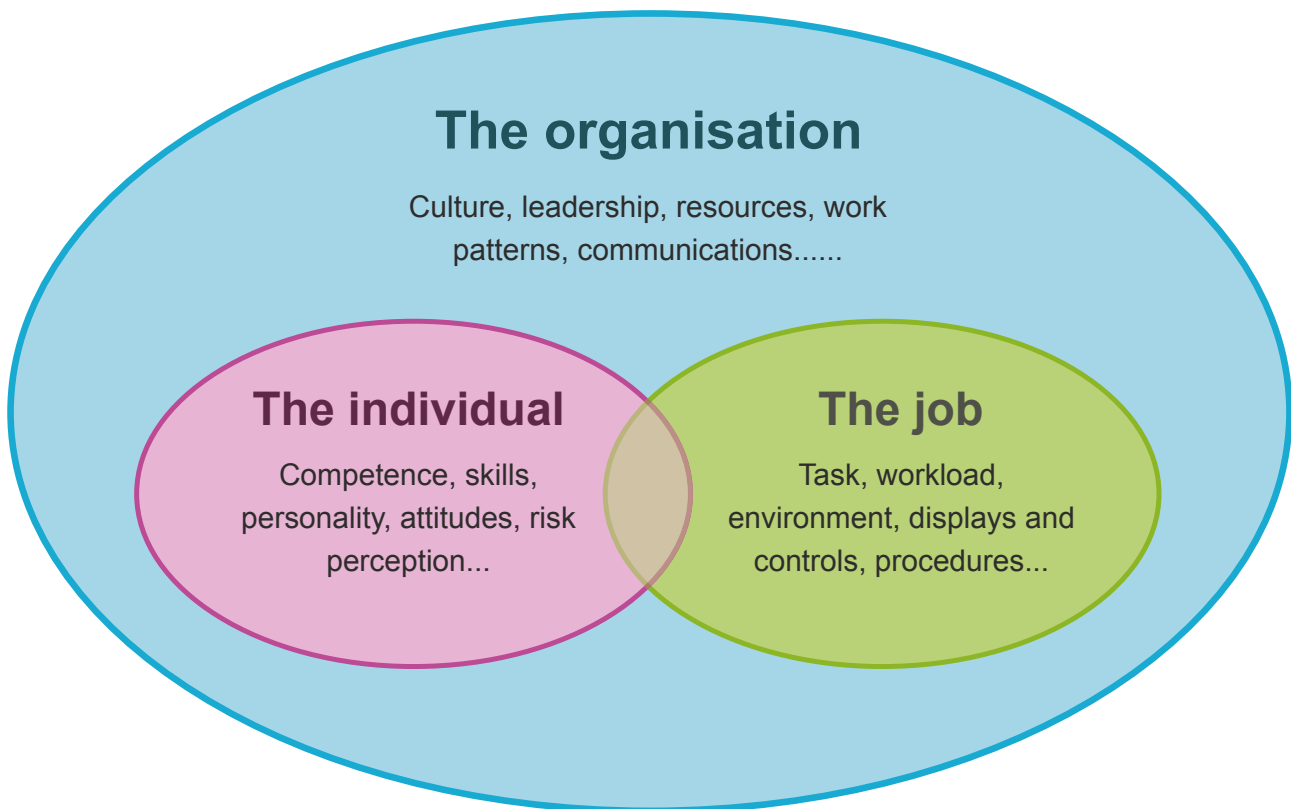
Figure 3.4: Human factors model

The organisation

Organisational factors have the greatest influence on individual and group behaviour, yet they are often overlooked during the design of work and during investigation of accidents and incidents.

Organisations need to establish a positive health and safety culture that promotes employee involvement and commitment at all levels, and emphasises that deviation from established health and safety standards is not acceptable.

As can be seen from Figure 3.4 the range of organisational influences includes safety culture, leadership, resources, work patterns and communications. Safety culture and leadership were discussed in **sections 3.1** and **3.2**. Resources, work patterns and communications are discussed below.

Resources

As discussed in **section 3.2** on leadership it is the responsibility of senior management to ensure that health and safety is adequately resourced. The allocation of sufficient time, money and staff for health and safety shows strong evidence of management commitment.

Work patterns

Different work patterns can impact on health and safety performance in different ways:

- workers on short hour contracts typically have higher injury rates than those on full-time contracts
- shift workers are more likely to suffer psychological and physical ill-health than day workers
- fatigue associated with long shifts and night shifts in particular make it more likely that mistakes will be made
- continuous exposure to specific hazards (vibration, noise, repetitive tasks etc.) without sufficient breaks makes damage more likely.

Communications

Effective communication between and within levels of the organisation and is associated with good safety performance. Communication is discussed in more detail in **section 3.4.**

Tasks

Tasks should be designed in accordance with ergonomic principles to take into account limitations and strengths in human performance. Matching the job to the person will ensure that they are not overloaded and are able to make an effective contribution to the business results. Overly complex tasks that are beyond an individual's capability create the potential for human error.

Matches/mismatches may be physical or mental:

- **physical match** includes the design of the whole workplace and working environment
- **mental match** involves the individual's information and decision-making requirements, as well as their perception of the tasks and risks.

Good mental and physical match is achieved through ergonomic design.

Ergonomics is about ensuring a good *'match'* between people and the things they use. People vary enormously in many ways including height and weight, physical strength, and the ability to handle information.

Ergonomics uses information about human abilities, attributes and limitations to ensure that work, work equipment and workplaces allow for such variations. *e.g.* in a car built for *'average'* sized drivers larger people might need to crouch, while smaller people may be unable to reach the pedals. An ergonomically designed car will accommodate the central 90% of a normally distributed population, *i.e.* 5% of the population will be too tall and 5% too short to be accommodated in an affordable design.

Ergonomic design seeks to produce equipment that most people can operate comfortably, conveniently and safely, and to design tasks to reduce human error, accidents and ill health.

Ergonomic problems, typically uncovered during accident investigations include operators being:

- unable to see important displays
- unable to reach controls
- unable to work in a comfortable position
- overloaded with too much information at one time
- not paying attention because there is too little to do.

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Displays and controls

The layout of controls and displays can influence the safety of a system. Typical problems include:

- switches which can be inadvertently knocked on or off
- control panel layouts which are difficult to understand
- displays which force the user to bend or stretch to read them properly
- critical displays which are not in the operator's normal field of view
- poorly identified controls which the operator could select by mistake
- emergency stop buttons which are difficult to reach.

Work equipment

Work equipment should be *'fit for purpose'*. It should be suitable for the worker, the task to be undertaken, and the work environment *i.e.* ergonomically sound. Work equipment that is suitable when provided must thereafter be maintained in safe working order.

Workload

Tasks with a high workload requiring a high level of alertness or attention are not sustainable for prolonged periods. Neither is a low workload with monotonous or repetitive tasks that can cause a worker to lose attention. Work rates that are imposed by a process without consideration of the physical and mental capabilities of the worker are also likely to result in human failure.

Environment

Work environment stressors such as extremes of heat, humidity, noise or vibration, poor lighting, and restricted workspace can all have a negative impact on human reliability.

Procedures

Written procedures, such as standard operating procedures and emergency procedures are vital in maintaining consistency and in ensuring that everyone has the same basic level of information. They are a key element of a safety management system and an important training tool. However, poor procedures can be a reason for people not following recommended actions and committing violations.

Procedures and instructions should be clear, concise, relevant, practical, available, up-to-date and accepted by users. Inaccurate and confusing instructions and procedures should be avoided.

Good procedures should be:

- accurate and complete
- clear and concise with an appropriate level of detail
- current and up to date
- supported by training
- in a suitable format
- accessible.

They should also:

- identify any hazards
- state necessary precautions for hazards
- use familiar language and consistent terminology
- reflect how tasks are actually carried out
- promote ownership by users.

The individual

Every human being is unique and is the sum of a complex range of physical and psychological characteristics and attributes, and socio-cultural influences, some of which are shown in Table 3.4.

Physical attributes and characteristics	Psychological characteristics	Socio-cultural factors
• Gender • Age • Physical abilities • Physique • Health state	• Personality traits • Motivation • Attitudes • Perceptions • Mental abilities	• Family background • Religion • Socio economic status • Education • Peer pressure and work culture

Table 3.4 Individual differences

People bring to their personal characteristics and attributes to their work. Individual characteristics influence behaviour in complex and significant ways and may be strengths or weaknesses depending on the circumstances.

Some negative personal characteristics may be addressed by ergonomic design. Some characteristics such as skills and attitudes may be changed or enhanced by training and development, and others such as personality are fixed and cannot be changed.
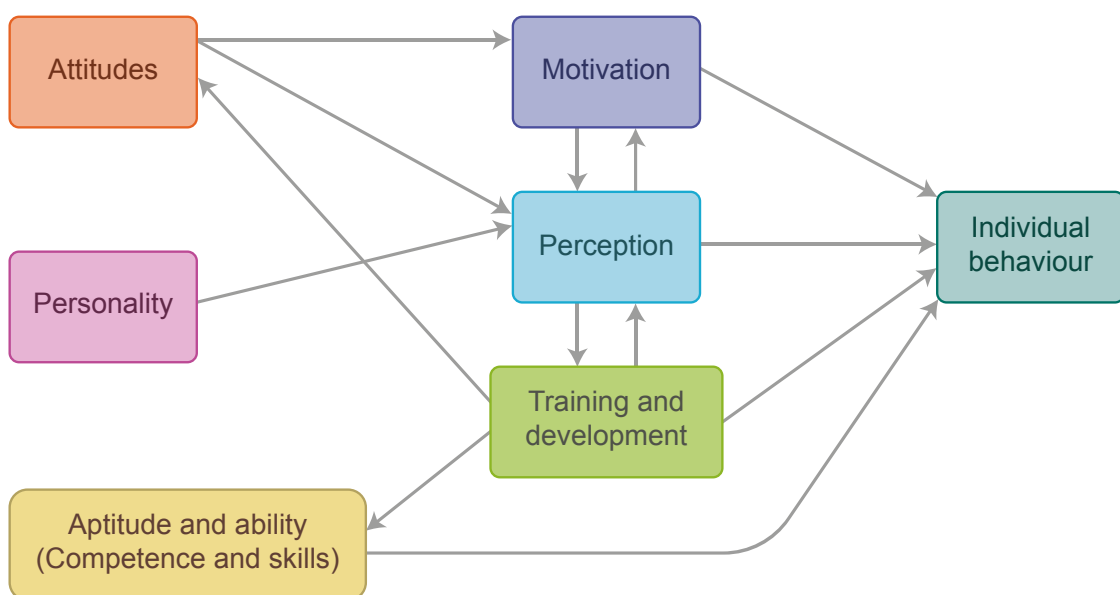

Figure 3.5: Factors influencing individual behaviour

Figure 3.5 models the relationships between some of the key variables and individual behaviour.

Attitude

An attitude represents an individual's degree of like or dislike (positive or negative view) of an object, where the object may be a person, place, thing, or event.

An attitude involves thoughts, feelings and predispositions to act towards an object. (*i.e.* involves the head, the heart and the hands!).

Attitudes can be modified as a consequence of feedback on behaviour and are also influenced by the prevailing attitude of a peer group.

Personality

Personality is made up of a person's unique characteristic pattern of thoughts, feelings and behaviours. Personality arises from within the individual and remains fairly consistent throughout life.

Personality has certain fundamental characteristics, including:

Consistency: People act in the same ways or similar ways in a variety of situations.

Psychological and physiological: Personality is a psychological construct, but is influenced by biological processes and needs.

Impact upon behaviours: Personality does not just influence behaviour, it causes people to act in certain ways.

Multiple expressions: Personality is expressed in thoughts, feelings, close relationships and other social interactions.

There are many models of the aspects of human personality. Costa and McRae's five factor model (also known as the Big 5 or OCEAN) identified five main aspects of personality as shown in Table 3.5.

Factor	High scorer	Low scorer
Openness (Active seeking of experience for its own sake, tolerating and exploring the unfamiliar)	Curious, broad interests, creative, original, imaginative, untraditional	Conventional, down-to-earth, narrow interests, not artistic, non-analytical
Conscientiousness (Degree of organisation, persistence, and motivation in goal-directed behaviour)	Organised, reliable, hardworking, self-disciplined, punctual, scrupulous, neat, ambitious, persevering	Aimless, unreliable, lazy, careless, lax, negligent, weak-willed, hedonistic
Extroversion (Amount and intensity of social interaction, activity level, need for stimulation, capacity for joy)	Sociable, active, talkative, person- oriented, optimistic, fun-loving, affectionate	Reserved, sober, not exuberant, aloof, task-oriented, retiring, quiet
Agreeableness (Quality of interpersonal orientation)	Soft-hearted, good-natured, trusting, helpful, forgiving, gullible, straightforward	Cynical, rude, suspicious, uncooperative, vengeful, ruthless, irritable, manipulative
Neuroticism (Adjustment v emotional instability)	Worrying, nervous, emotional, insecure, inadequate, hypochondriac	Calm, relaxed, unemotional, hardy, secure, self-satisfied

Table 3.5: Costa and McRae Big 5 personality factors

Research applying the Big 5 as determinants of work performance found that *conscientiousness* is a good predictor of performance, and *extroversion* correlates closely with social interaction and training proficiency.

Abilities and aptitude/skill and competence

Ability is the capacity to perform a particular physical or mental function.

Aptitude is the inherent propensity for acquiring or developing ability.

Skill refers to a person's ability to perform an activity effectively. Skills are typically learned or acquired by training.

Competence is the demonstrated ability to perform to a required standard. The Management of Health and Safety at Work Regulations define competence as *'the ability to perform to a required standard'*, and states that:

> *'A person shall be regarded as competent …………….. where he has sufficient training and experience or knowledge and other qualities to enable him properly to assist in undertaking the measures referred to….''*

Training and development

Training is:

> *'organised efforts to assist learning through instruction and practise'*

Training tends to be practical, dealing with concrete concepts and *'hands on'* skills. It may be job specific, seeking to improve performance in a current role, or developmental – which involves longer term planning to get the best out of an individual through following career stages.

Training is discussed fully in **Element 3, section 2**.

Motivation

Motivation is the reason to act or the driving force which gives purpose and direction to behaviour.

Motivation can impact upon behaviour in three ways:

- it gives purpose to and activates the behaviour
- directs the behaviour towards a particular goal
- sustains the behaviour and level of effort (perseverance) until the goal is achieved.

Motivational factors can be modelled in numerous ways. Table 3.6 categorises them as needs and rewards.

Intrinsic (Needs)	• Internal to the individual • Psychological rewards • Fulfilment of personal needs
Extrinsic (Rewards or Expectation of reward)	• External to the individual • Within the gift of the organisation • Tangible rewards – salary, benefits, promotion

Table 3.6: Intrinsic and extrinsic motivational factors

People are generally well motivated at work if:

● they understand the importance of the objectives they are tasked to achieve

● the objectives are realistic and achievable

● satisfactory achievement of the objective results in personal fulfilment and/or a tangible reward.
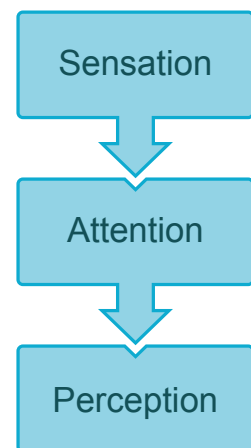
Perception

Perception is the process by which sensation is organised and interpreted to make sense of the world.

People take in information through the senses (*i.e.* touch, sight, smell, hearing and taste, and other senses regarding positioning and balance).

To prevent sensory overload the brain is selective. Not all sensory information attracts attention. Finally the information is processed and made sense of.

The process can be affected at each stage:

- The senses may be ineffective due to illness (could not smell something because of a cold), disability (could not hear the alarm because of deafness), or PPE (vision restricted by safety goggles or hearing impeded by ear defenders). Some hazards such as microbiological agents or radiation are not detectable by human senses.
- A person's attention may not be attracted because of focus elsewhere, or may be distracted by something else. Hazards can be masked by environmental factors such as lighting levels or background noise.
- The processing of the information may be flawed because of a lack of knowledge, experience or training, previous experience including overfamiliarity, or the influence of drugs or alcohol.

In addition to the possible health and safety effects arising from basic perception of workplace information it is important to consider the issue of risk perception.

Risk perception

HSE research has identified eight distinct factors that will influence an individual's perception of risk:

1. **Perceived control**

    When people feel in control of a risk they don't feel stressed by it. This has been shown to be a key factor in the acceptability of risk.

2. **Psychological time and risk**

    Warnings about the link between smoking and lung cancer have been ineffective in stopping people smoking, because the time lag between smoking and the onset of lung cancer can be up to 40 years.

If workers in a chemical plant were instructed to evacuate the workplace because of a leak of a toxic substance that posed the same level of risk but with imminent effects they would not hesitate.

3. Familiarity

Research has shown that there is truth in the old adage *'familiarity breeds contempt'*. People tend to underestimate familiar risks and overestimate unfamiliar risks.

4. Perceptions of vulnerability

People with the perception of low vulnerability or invulnerability (to the consequences of smoking, drink driving, sexual activity etc.) are not likely to modify their behaviour.

Some people have an *'unrealistic optimism'*, and assume that the harmful consequences will happen to someone else. This makes them more willing to take risks in all areas of their lives, including the workplace. Young men, in particular, may be prone to feeling invulnerable.

5. Framing effects

The way risk based data is presented (or framed) has been shown to introduce significant biases. Changing the description of a risk from positive to negative (*i.e.* talk about costs rather than benefits or losses rather than gains) will have a measurable effect on observed behaviour.

6. Numerical representations of risk

Many people experience difficulty in understanding and interpreting statistical probabilities, thus the need to introduce additional qualitative characteristics to enable the conceptualisation of risk.

7. Perception of hazardous substances

Workplace studies have shown workers to perceive the risk associated with water based pesticides to be lower than solvent based, because water is natural and inert, and must therefore be lower risk than solvent. This is irrational as it does not consider the risk of the pesticide itself.

8. Risky situation or risky individual?

Individual differences and situational factors can interact and prompt risk taking behaviours.

Researchers that emphasise the significance of the individual variables have identified links between maturity, personality types and risk taking behaviour.

One theory suggests that individuals are equipped with *'risk thermostats'*, and that safety interventions do not affect the setting of the thermostat. Regardless of workplace controls the individual will behave in a way that maintains the level of risk with which they were originally content.

Human factors and accident causation

Typical examples of job, individual and organisational factors as immediate causes or, or contributory factors to, accidents are given in Table 3.7.

Job factors	Individual factors	Organisational factors
• illogical design of equipment and instruments • constant disturbances and interruptions • missing or unclear instructions • poorly maintained equipment • high workload • noisy and unpleasant working conditions.	• low skill and competence levels • tired staff • bored or disheartened staff • individual medical problems.	• poor work planning, leading to high work pressure • lack of safety systems and barriers • inadequate responses to previous incidents • management based on one-way communications • deficient co-ordination and responsibilities • poor management of health and safety • poor health and safety culture.

Table 3.7: Examples of human factors as immediate causes and contributing factors for accidents

Human failure

Human failures may be intentional or unintentional. Intentional failures, or deliberate deviation from a rule or procedure, are known as *violations*. Unintentional failures are known as *human errors*.

Failures may also be categorised as active or latent, where:

- active failures have an immediate consequence and are usually made by front-line people such as drivers, control room staff or machine operators

- latent failures are distant in time and space from the consequences. They are typically failures in health and safety management systems (design, implementation or monitoring) and are often attributed to designers, decision makers and managers.
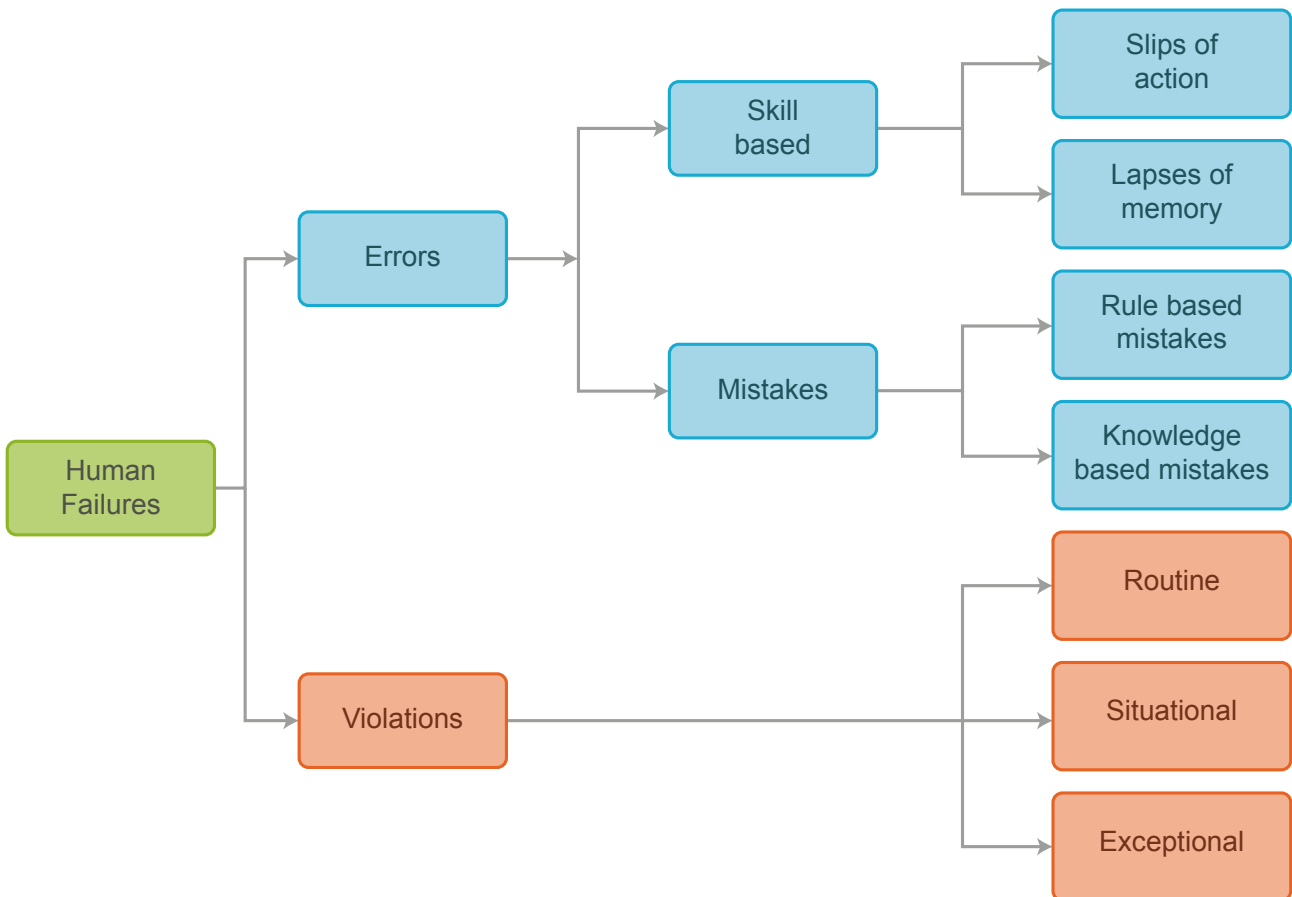
Figure 3.6: Human failure (from HSG48)

Violations

Violations are any deliberate deviations from the rules.

Most violations are motivated by a desire to get the job done, very few are wilful acts of sabotage or vandalism.

Violations are divided into three categories: routine, situational and exceptional.

Routine violations occur when breaking the rule or procedure has become a normal way of working within the work group. This can be due to:

- the desire to cut corners to save time and energy
- the perception that the rules are too restrictive
- the belief that the rules no longer apply
- lack of enforcement of the rule
- new workers starting a job where routine violations are the norm and not realising that this is not the correct way of working.

Situational violations occur when a rule is broken due to pressures from the job such as being under time pressure, insufficient staff for the workload, the right equipment not being available or even extreme weather conditions.

Exceptional violations rarely happen and only then when something has gone wrong. When solving a problem during an emergency it may be necessary to break a rule, regardless of the risk, because it is believed that the benefits outweigh the risks.

Table 3.8 suggests ways of reducing the likelihood of violations.

Routine	Situational	Exceptional
• increase levels of supervision and monitoring • remove any unnecessary rules • ensure rules are relevant and practical • explain the reasons behind the rules • design tasks to minimise the likelihood of corner cutting • involve the workforce in drawing up rules to increase acceptance.	• improving the working environment • providing appropriate supervision • improving job design and planning • establishing a positive health and safety culture.	• provide more training for abnormal and emergency situations • consider violations during risk assessments • try to reduce the time pressure on staff to act quickly in novel situations.

Table 3.8: Reducing the likelihood of violations

Errors

Errors fall into three categories: slips, lapses and mistakes.

Slips and lapses occur in very familiar tasks which can be carried out without much need for conscious attention. These tasks are called *'skill-based'* and are very vulnerable to errors if attention is diverted, even momentarily.

Slips are failures in carrying out the actions of a task. They are described as *'actions-not-as planned'*, *e.g.* picking up the wrong component from a mixed box, operating the wrong switch, transposing digits when copying out numbers or doing steps in a procedure in the wrong order.

Typical slips might include:

● performing an action too soon in a procedure or leaving it too late

● omitting a step or series of steps from a task

● performing the action in the wrong direction (*e.g.* turning a control knob to the right rather than the left, or moving a switch up rather than down)

- doing the right thing but on the wrong object (*e.g.* switching the wrong switch)
- carrying out the wrong check but on the right item (*e.g.* checking a dial but for the wrong value).

Lapses cause actions to remain undone or workers to lose their place in a task. They can be reduced by minimising distractions and interruptions to tasks and by providing effective reminders especially for tasks which take some time to complete or involve periods of waiting.

Mistakes are a more complex type of human error where the wrong thing is done in the belief that it is right. Mistakes may be rule-based or knowledge-based.

Rule-based mistakes occur when behaviour is based on remembered rules or familiar procedures. There is a strong tendency to use familiar rules or solutions even when they are not the most convenient or efficient.

Knowledge based mistakes occur when it is necessary to solve problems from first principles. Misdiagnoses and miscalculations are natural consequences of learning by trial and error.

Steps to reduce human errors include:

- addressing the conditions and reducing the stressors which increase the frequency of errors
- designing plant and equipment to prevent slips and lapses occurring or to increase the chance of detecting and correcting them
- ensuring that arrangements for training are effective
- designing jobs to avoid the need for tasks which involve very complex decisions, diagnoses or calculations, *e.g.* by writing procedures for rare events, ensuring proper supervision of inexperienced staff, and provision for independent checking
- checking that procedures and instructions are clear, concise, available, up to date and accepted by users
- considering human error when undertaking risk assessments
- considering human error during incident investigations
- monitoring control measures for effectiveness.

3.4 Assessing risk

Definitions

A risk assessment is:

'Simply a careful examination of what, in the workplace, could cause harm to people, so that a decision can be made as to whether the precautions taken are satisfactory or whether more should be done to prevent harm'.

The key terms of hazard, harm and risk have been defined as follows:

Hazard: anything that may cause harm, such as chemicals, electricity, working from ladders, or an open drawer.

Harm: includes ill-health and injury, damage to property, plant, products or the environment, and production losses or increased liabilities.

Risk: The chance, high or low that somebody could be harmed by a hazard, together with an indication of how serious the harm could be.

Risk Profiling: The process of ensuring that the right risks have been identified and prioritised for action and informs decisions about what risk controls measures are needed.

The assessment and management of risk is a natural part of day to day activities. A simple example of crossing the road can be used to illustrate the key concepts.

Figure 3.7: The high street

In this example the *hazard* is the moving vehicles, the *harm* is the injury arising from being struck by a vehicle, and the *risk* is determined by considering the factors that may influence the chance of being struck by a vehicle and the seriousness of the injury.

The factors that might influence the chance of being struck by a vehicle include:

- the availability of a safe crossing point *e.g.* pedestrian crossing
- the speed (30, 60, or 70 mph) and volume of traffic (*e.g.* dual/single carriage way)
- the fitness of the person crossing the road (*e.g.* mobility, vision, hearing)
- whether or not the person is rushing or paying attention etc.
- the fitness of driver (vision, reaction times etc.)
- the weather conditions (*e.g.* rain or fog)
- other environmental factors (parked cars, no safe crossing point)
- the condition of the vehicle (no MOT, worn tyres etc.).

The factors that might influence the seriousness of the injury include:

- the size of the vehicle, *e.g.* getting struck by a bus or lorry rather than a car
- the speed of traffic (30, 60, or 70 mph)
- the age and fitness of the injured party
- the effectiveness of the emergency response.

Some of this information, together with information on available control measures may be used to determine how safe it is to cross.

Risk Profiling

Effective leaders and line managers should know the risks their organisations face, ranking them in order of importance and taking action to control them.

The range of risks goes beyond health and safety risks to include quality, environmental and asset damage, but issues in one area could impact in another. For example, unsafe forklift truck driving may have a service or quality dimension as a result of damage to goods.

A risk profile examines the nature and levels of threats faced by an organisation. It examines the likelihood of adverse effects occurring, the level of disruption and costs associated with each type of risk and the effectiveness of the control measures in place.

Although perhaps not using these precise terms, an organisation will most likely have built a risk profile that covers:

- the nature and level of the risks faced by the organisation
- the likelihood of adverse effects occurring and the level of disruption
- costs associated with each type of risk
- effectiveness of the controls in place to manage those risks

Key Actions

- Identify who takes ownership of health and safety risks
  - This might be the owner, or chief executive – in larger organisations it may be a risk committee or a senior board champion for health and safety

- Think about the consequences of the worst possible occurrence for the organisation
  - How confident is senior management that plans are in place to control the effects?

- Ensure that risk assessments are carried out by a competent person
  - This is someone who has the necessary skills, knowledge and experience to manage health and safety effectively

- Maintain an overview of the risk-profiling process
  - Make sure senior management are aware of the major risks within the organisation

- Check that minor risks have not been given too much priority and that major risks have not been overlooked
  - Identify who will be responsible for implementing risk controls and over what timescale

- Remember to assess the effects of changing technology

  - Think about issues related to changes in asset ownership. This may increase the risk profile if design information and knowledge haven't been passed on

  - Have the effects of ageing plant and equipment been examined?

Suitable and sufficient

A suitable and sufficient risk assessment should do the following:

- identify the risks arising from or in connection with work
- be proportionate to the risk
- consider all those who might be affected whether they are workers or others such as members of the public
- demonstrate that reasonable steps have been taken to identify hazards, *e.g.* by researching relevant legislation, guidance, supplier manuals, manufacturers' instructions or advice from competent sources
- use relevant examples of good practice from within their industry
- be appropriate to the nature of the work and should identify the period of time for which it is likely to remain valid.

A risk assessment should also:

- ensure the significant risks and hazards are addressed
- ensure all aspects of the work activity are reviewed, including routine and non-routine activities
- cover all parts of the work activity, including those that are not under the immediate supervision of the employer, *e.g.* employees working off site as contractors
- take account of the non-routine operations, *e.g.* maintenance or cleaning
- be systematic in identifying hazards and looking at risks *e.g.* by:
  - grouping hazards
  - dividing sites geographically
  - analysing specific operations

- take account of the way in which work is organised, and the effects this can have on health
- take account of risks to the public.

Sensible risk management

Sensible health and safety risk management is about saving lives, and preventing injuries and illness, not about stopping business from working. In particular sensible risk management should:

- ensure that workers and the public are properly protected

- provide an overall benefit to society by balancing benefits and risks, with a focus on reducing real risks, *i.e.* those which arise most often and those with serious consequences

- enable innovation and learning, and not stifle them

- ensure that those who create risks manage them responsibly and understand that failure to manage real risks responsibly will lead to robust action

- enable individuals to understand that as well as the right to protection, they also have to exercise responsibility.

Who should risk assess?

The responsibilities to ensure that risk assessments are made rests upon the employer who is required to appoint one or more competent persons, to assist in conducting the risk assessments.

Competence is not achieved by obtaining a particular qualification, but results from a combination of adequate knowledge and skills, experience and certain personal qualities such as good judgement.

To be competent for straightforward risk assessments, risk assessors require:

- experience and training in hazard identification and carrying out risk assessments

- knowledge of the processes or activities to be assessed

- technical knowledge of the plant or equipment

- good communication and report writing skills

- ability to interpret legislation and guidance

- the right attitude for the task.

Additionally, risk assessors also need:

- an understanding of current best practice in the area of work
- an awareness of the limitations of one's own experience and knowledge
- the willingness and ability to supplement existing experience and knowledge, when necessary by obtaining external help and advice.

Risk assessments should be practical and well rounded. They should take account of the views of employees, safety representatives, managers and technical experts if necessary.

More complicated assessments may require more specific applied knowledge and skills which can only be delivered by appropriately qualified specialists.

Sources of health and safety information

There are many sources of useful information to aid planning for the management of health and safety.

Broadly, information may be obtained from sources within the organisation *e.g.* absence records, accident investigation reports etc. and from sources external to the organisation, such as suppliers, enforcing authorities or trade associations.

Internal sources of information

Information readily available within the organisation may include:

1. the personal knowledge and experience of managers and employees

2. accident, ill health and incident data

3. records of previous proactive and reactive monitoring, *i.e.* accident investigations and workplace inspections

4. historical records of audits and management reviews

5. other existing records such as training records, maintenance records, safety committee minutes and records of statutory inspections and examinations.

External sources of information

- National legislation and supporting guidance (*e.g.* in the UK Acts of Parliament, Regulations, Approved Codes of Practise and Guidance);

- International/Supra-national/National standards *e.g.* BS EN ISO 12100:2010 "*Safety of machinery – General principles for design – Risk assessment and risk reduction*" is a British, European and International standard;

- Manufacturers/Suppliers information such as material safety data sheets for hazardous substances and safe operating instructions for plant and equipment;

- The ILO. The ILO website (www.ilo.org) provides free access to ILO conventions, recommendations and Codes of Practice on a broad range of health and safety issues; and the International Occupational Safety and Health Information Centre (CIS) is the knowledge management arm of SafeWork. It provides online access to a range of resources including International Chemical Safety Cards (ICSC); and The ILO Encyclopaedia on Occupational Health and Safety;

- Professional Bodies for health and safety practitioners such as IOSH, the IIRSM or ASSE;

- Related professional bodies such as the Institute of Chemical Engineers, The Institute of Engineering and Technology; British Occupational Hygiene Society etc.;

- Trade/industry bodies such as the Chemical Industries Association;

- National/state enforcement agencies or government departments, *e.g.*
  - UK – Health and Safety Executive (HSE);
  - USA – Occupational Safety and Health Administration (OSHA);
  - Western Australia – Work Safe;
  - Canada – The Canadian Centre for Occupational Health and Safety (CCOHS);

- Commercial databases of health and safety information, *e.g.* Technical Indexes, Barbour or Croner;

- Specialist text books;

- Magazines and journals.

The risk assessment process

The risk assessment process can be clearly explained using the following five step approach:

Step 1: Identify the hazards

Hazards may arise from *acts* such as manual handling, *situations* such as working at height or in a confined space, *sources of energy* such as a radiation source, or the moving parts of a machine.

Hazards may also be categorised as:

- **Mechanical:** *e.g.* moving parts of machinery or moving vehicles.
- **Physical:** *e.g.* noise or vibration energy, radiation, or electricity.
- **Biological:** *e.g.* legionella bacteria or blood borne viruses.
- **Chemical:** *e.g.* corrosive or toxic cleaning chemicals.
- **Ergonomic:** *e.g.* poor posture or repetitive work at a computer workstation.
- **Psychosocial:** *e.g.* pressure of work or shift-work.

Non-routine operations such as maintenance, cleaning and changes in production cycles should be considered as should long-term-health hazards from noise or exposure to substances that are hazardous to health.

The approaches to hazard identification will vary from workplace to workplace depending on the complexity of the business and the hazards present.

Whatever the context it is important that a consistent approach is determined to ensure that significant hazards are proactively identified.

The following tools and approaches can be useful in most workplaces:

- **Workplace inspections:** look around to identify any obvious concerns.
- **Workforce involvement:** ask the employees, or their representatives for their opinion. The people directly involved in tasks and processes will be very aware of any serious concerns.
- **Information and advice (see previous section)**
- **Historical records** of accidents, injuries and work-related ill-health

Step 2: Decide who might be harmed and how

Once the significant hazards have been identified consideration must be given to the people that may be affected and how they may be affected. This will help to identify the best way of managing the risk.

This will involve identifying groups of people (*e.g. 'people working in the storeroom'* or *'passers-by'*), and in each case identifying exactly how they might be harmed, (*i.e.* what type of injury or ill health might occur). For example, *'shelf stackers may suffer back injury from repeated lifting of boxes'*.

Some groups of workers are covered by specific legal requirements for risk assessment, *e.g.* new and young workers, new or expectant mothers and people with disabilities who may be at particular risk (these will be discussed later).

Other groups of workers who may not be in the workplace all the time may require additional consideration *e.g.* cleaners, visitors, contractors, maintenance workers etc.

In a shared workplace the possibility of work activities affecting the health and safety of employees of a neighbouring employer must also be considered.

Members of the public must also be considered if they could be hurt by work activities.

Step 3: Evaluate the risks and decide on precautions

Having identified the hazards and who might be harmed it is necessary to determine whether or not they are effectively controlled.

Legally, there is a requirement to do all that is *'reasonably practicable'* to protect people from harm.

The first part of the process is to evaluate the risk by considering both the likelihood of harm occurring, and the seriousness of the harm should it occur with current controls in place. This enables risks to be compared and priorities to be established.

3(a) – Evaluate the risks

There is no magic formula for evaluating risk, however the simple computation explained below provides a *'rough and ready'* means of determining relative risks.

If risk is the *likelihood* (or chance) that somebody could be harmed by a hazard, together with an indication of the *seriousness* of the harm.

"When deciding the likelihood of harm, factors including the frequency and duration of the task, the competency of the worker, the repetitive nature (or not) of the task and any history of incidents would all need to be considered."

Similarly the type of harm and any acute (immediate) or more chronic (longer term, sometimes after repeated exposure) effect would also need to be included when considering the level of seriousness or consequence."

The *likelihood* of harm may be rated:

(3) **High**   Where it is certain or near certain that harm will occur.

(2) **Medium** Where harm will often occur.

(1) **Low**   Where harm will seldom occur.

The *seriousness* of the consequences may likewise be rated:

(3) **Major**   Death or major injury or illness causing long term disability

(2) **Serious** Injuries or illness causing short-term disability.

(1) **Slight**   All other injuries or illness.

An overall risk ranking may be determined by multiplying one by the other as in table 3.9.

Seriousness

Likelihood	Major (3)	Serious (2)	Slight (1)
High (3)	9	6	3
Medium (2)	6	4	2
Low (1)	3	2	1

Table 3.9: Simple risk ranking matrix

The resultant risk rating can be used to determine priorities for future action as per Table 3.10.

6 or 9	High risk	May require considerable resources, *e.g.* special equipment, training, high levels of supervision, and consideration of the most effective methods of eliminating or controlling hazards.
3 or 4	Significant risk	Will require an appropriate level of resources to control the risk.
1 or 2	Low risk	Reasonable actions should still be taken to try to further reduce these risks, if possible.

Table 3.10: Simple risk ratings

3(b) – Decide on precautions

The second part of this process is to review controls already in place against recognised standards of good practice. This benchmarking exercise will determine if there is more that needs to be done.

In determining the adequacy of existing controls the first question to ask is can the hazard be ***Eliminated?***

If not, what can be done to control the risks so that harm is unlikely?

Can the risk be ***Reduced*** (*e.g.* by switching to using a less hazardous chemical)?

Can the hazard be ***Isolated*** (*e.g.* by guarding)?

Can additional engineering or management ***Controls*** be introduced to reduce exposure to the hazard?

Can ***Safe Systems of Work (SSW)***, method statements, or Permits-to-Work (PTW) help to ensure that safe procedures and rules are followed to help minimise the risk?

Finally, issue ***Personal Protective Equipment (PPE)*** (*e.g.* clothing, footwear, goggles etc.).

Priorities should be based upon such considerations as the level of the initial risk, the numbers of people affected, legal requirements, the level of residual risk after implementing controls, the cost of control, the amount of reliance on human behaviour, the consequences if the control measure fails and ongoing maintenance requirements.

Improving health and safety need not be expensive, *e.g.* placing a mirror on a dangerous blind corner to help prevent vehicle accidents is a low-cost precaution considering the risks, particularly when compared to the cost of the accident it may prevent.

'Hierarchies of control' are considered in more detail in **Section 3.6**.

Step 4: Record the findings and implement them

Putting the results of the risk assessment into practice will make a difference in improving the health and safety of employees and others affected by the work.

The results of the risk assessment should be documented and shared with staff.

If there are fewer than five employees legally the risk assessment does not need to be documented. The record is useful however in:

● demonstrating the process undertaken

● in sharing information with employees

● in facilitating review processes when things change.

Legally the risk assessment must be suitable and sufficient. This means that it should show that:

● a proper check has been made

● all those who might be affected have been considered

● all the significant hazards have been addressed, considering the number of people who could be involved

● the precautions are reasonable, and the remaining risk is low

● staff or their representatives were involved in the process.

If after completing the risk assessment there are a lot of improvements that need to be made an action plan should be developed to prioritise them so that they can be dealt with on a *'worst first'* basis.

Priorities are generally determined by the risk ratings (the outcomes of the risk evaluation as discussed earlier) *i.e.* those that are considered *'high risk'* on the basis of the likelihood and severity of harm occurring should be considered as highest priority. Other factors to be considered might include:

● whether the risk arises from a breach of legislation

● enforcement action

- reasonable practicability, *i.e.* the cost of a solution that is proportionate to the risk

- supply chain pressure, *i.e.* it is a requirement for doing business with a customer

- exposure of vulnerable people, *e.g.* children, young people or disabled

- affecting the public

- other effects on business reputation.

A good action plan might include:

- a few *'quick wins'* – cheap or easy improvements that can be done quickly, perhaps as temporary solutions until more reliable controls are in place

- long-term solutions to those risks with the worst potential consequences, especially personal injury or ill-health

- arrangements for training employees on the main risks that remain and the corresponding controls

- arrangements for monitoring to ensure that the control measures stay in place

- clear responsibilities for leading on individual actions

- target dates for completion.

Step 5: Review the risk assessment and update if necessary

Few workplaces stay the same. Sooner or later, equipment, substances and procedures are updated, often with the introduction of new hazards.

Risk assessments should therefore, be reviewed on an ongoing basis.

If a significant change occurs, ideally the risk assessment should be reviewed as part of the change management process, and revised if necessary.

In addition a formal review should be undertaken every year or so to ensure progress against the action plan and to show that standards are being maintained or are continually improving.

The review should consider:

- any changes to equipment, substances or procedures

- any problems reported by the workforce

- any lessons learnt from accidents or near misses.

Specific cases for risk assessment

Legislation may also require that specific risk assessments are carried out where employees are exposed to certain categories of hazards. This could include fire, display screen equipment (DSE), Manual Handling, Hazardous Substances and Noise. This is to enable proper, systematic consideration of all relevant issues that contribute to these risks.

The risks and controls associated with these are discussed in more detail in **Elements 5–11**.

Legislation requires special consideration be given to risk assessments of work involving the following groups:

1. new and expectant mothers
2. young persons
3. disabled persons
4. lone workers.

1. New and expectant mothers

As part of the general requirement to assess health and safety risks that employees may be exposed to at work consideration should be given to specific risks to female employees of child bearing age, and new or expectant mothers and their new-born.

The risks do not need to be assessed separately, however as soon as the expectant mother informs the employer, in writing, that she is pregnant the general risk assessment should be revisited and reviewed.

A medical certificate or maternity statement is useful for conveying medical advice that may need to be considered in a risk assessment.

There is a range of workplace hazards that could affect the health and safety of a new or expectant mother or her child. Appropriate action should be taken to identify, and remove or reduce the risks associated with these hazards.

Physical hazards

- Awkward spaces and workstations
- Noise and vibration
- Radiation (covered by specific legislation)

Chemical hazards

- Handling of chemicals that may be harmful to reproduction, or to a developing foetus

Biological agents

- Infections

Working conditions

- Inadequate facilities (including rest rooms)
- Excessive working hours (night work etc.)
- Overly stressful work
- High or low temperatures
- Lone-working
- Work at height
- Travelling
- Exposure to violence

If pregnancy related medical conditions such as high blood pressure are a concern the following options should be considered in order:

- **Action 1:** temporarily adjust working hours or working conditions or both
- **Action 2:** offer suitable alternative work at the same rate of pay if available
- **Action 3:** suspend on full pay for as long as is necessary to protect the health of the mother and child.

Note: Suspension may be the only option in work where there is a serious risk of harm to mother and child – *e.g.* working with lead, or underground mining.

General Risk Assessment

The risks to the health and safety of all employees, including females of child-bearing age and new and expectant mothers must be assessed.

Upon receiving **written notification** that an employee is pregnant, has given birth in the last six months or is breastfeeding:

- revisit general risk assessment
- consider medical advice from medical certificate or maternity statement.

Has a risk been identified?

No → No immediate risk has been identified. Monitor and review regularly as circumstances may change.

Yes ↓

Can the risk be removed?

Yes → Remove risk.

No ↓

Action 1
Can working hours and/or conditions of work be adjusted?

Yes → Adjust conditions/hours.

No ↓

Action 2
Can suitable alternative work be offered?

Yes → Give suitable alternative work on same terms and conditions.

No ↓

Action 3
Suspend on paid leave for as long as necessary to protect the health and safety of mother and/or child.
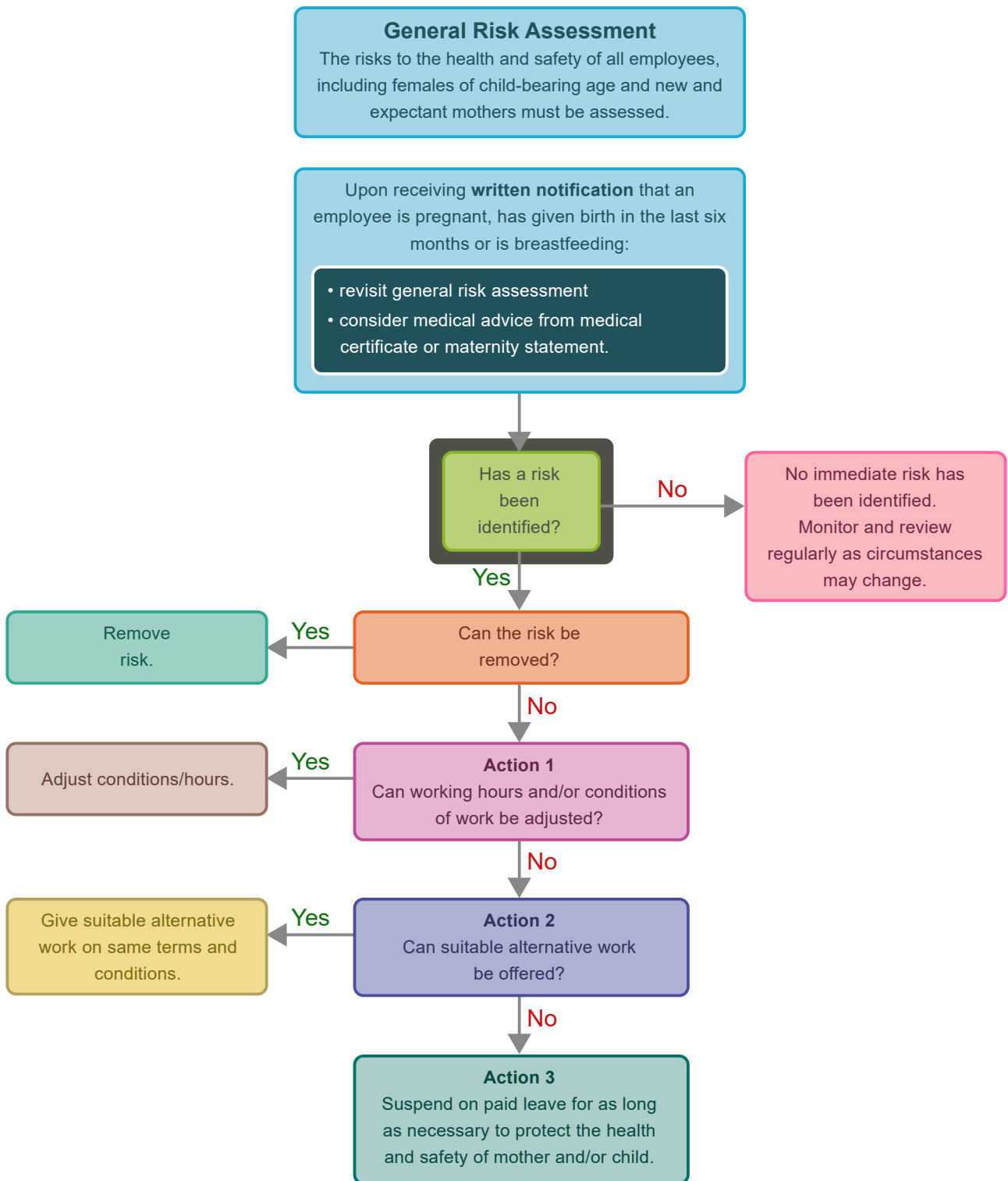
Figure 3.8: Process for expectant mother risk assessment and control

2. Young Persons

A specific risk assessment should be undertaken for young persons before they start work. The young person must be informed of the findings before they start work or work experience.

If the young person is a child their parent or guardian must be informed of the risk assessment findings before they start a work placement:

- A *young person* is anyone under 18 years old
- A *child* is anyone who has not yet reached the official minimum school leaving age (MSLA) which is just before or just after their 16th birthday.

The risk assessment should take into account both the psychological and physiological characteristics of young persons.

Psychological Factors

The assessment should take into account the following factors:

- inexperience and immaturity
- lack of awareness of existing or potential risks
- need for additional supervision, training and information.

Physiological factors

Particular considerations include:

- availability of PPE which will fit young persons
- stature, strength and reach of young persons and the ability to operate controls (of vehicles and power tools)
- body dimensions of young person's relative to safe distances used to prevent access to machinery danger zones.

In addition there are some work activities where young persons may require greater protection because of ongoing physiological development.

Hazard	Harm
Work where pace is determined by machinery	Muscle strength not fully developed
Work in high pressure atmospheres	Bones not fully developed and may be at greater risk of long-term harm
Ionising radiation	Slightly greater risk of developing cancer and hereditary effects
Whole body vibration (WBV)	Greater risk of spinal damage as bones not fully matured and muscle strength not fully developed

Table 3.11: Specific work activities posing a risk to young persons

No young person should be employed for work which:

- is beyond their physical or psychological capacity
- involves harmful exposure to toxic or carcinogenic agents or those which can cause heritable genetic damage or harm to the unborn child or which in any other way chronically affect human health
- involves harmful exposure to radiation
- involves the risk of accidents which it may reasonably be assumed cannot be recognised or avoided by young person's owing to their insufficient attention to safety or lack of experience or training
- poses a risk to health from extreme cold or heat, noise, or vibration.

3. Disabled workers

A person is considered to be disabled if they have a physical or mental impairment that has a substantial and long-term adverse effect on their ability to carry out normal day-to-day activities.

'Normal day-to-day' means things that people do on a regular or daily basis, such as reading, writing, using the telephone, having a conversation and travelling by public transport etc.

Long-term usually means the impairment should have lasted or be expected to last at least a year.

Substantial means not minor or trivial.

The Equality Act 2010 requires that employers treat disabled employees and job-seekers fairly to avoid disability discrimination, victimisation, or harassment.

Discrimination may occur when a disabled person is treated less favourably than an able bodied person, and the only difference is the disability. Discrimination may also occur when reasonable adjustments have not been made to accommodate the needs of the disabled person.

Reasonable adjustments will need to be considered as part of the risk assessment process.

A risk assessment is only required if the person's disability changes the way they work. A risk assessment is not required just because a person is disabled.

If a persons' impaired mobility, vision or hearing impacted upon their own safety or the safety of others, this should be addressed through risk management processes.

It is vital that the risk assessment does not make assumptions about the disabled person and what jobs they can or cannot do as this can lead to discrimination.

The process should be participative, involving the disabled person, with a view to making reasonable adjustments to enable work to be done.

4. Lone workers

Lone workers are those who work by themselves without close or direct supervision, they usually fit into one of the following four categories:

1. people in fixed establishments where only one person works on the premises, *e.g.* in petrol stations or home-workers
2. people working separately from others, *e.g.* in factories, warehouses, or research establishments
3. people working outside normal hours, *e.g.* cleaners, security, special production, maintenance or repair staff
4. mobile workers working away from their fixed base, *e.g.* plant installation or maintenance contractors, agricultural and forestry workers, and service workers such as rent collectors, postal staff, social workers, estate agents, and others visiting domestic and commercial premises.

Establishing safe working for lone workers is no different from organising the safety of other employees. The key question is whether or not the requirements can be met by people working alone.

Issues requiring attention include:

1. Can the risks of the job be adequately controlled by one person?

Lone workers should not be at more risk than other employees. This may require extra risk-control measures for normal work and foreseeable emergencies.

2. Does the workplace present a special risk to the lone worker?

- Are the means of access and egress safe for a lone person?
- Can work equipment be safely operated by one person?
- Can work equipment and materials be safely handled by one person (male/female)?

3. Is there a risk of violence?

4. Is the person medically fit and suitable to work alone?

5. What training is required to ensure competency in safety matters?

- Limits should be set regarding what can and cannot be done alone.
- Employees should be competent to deal with new and unusual circumstances. Training is particularly important where there is limited supervision to control, guide and help in situations of uncertainty.
- Consideration should be given to individual factors such as their experience and level of training, their personality and attitude (are they confident and outgoing or shy/insecure), state of health (as in (4) above).

6. How will the person be supervised?

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. Employees new to a job, undergoing training, doing a job which presents special risks, or dealing with new situations may need to be accompanied at first.

7. How will lone workers be monitored?

Approaches include:

- periodic supervisor visits
- regular telephone or radio contact
- automatic warning devices which operate if check in signals are not received
- manually activated emergency alarms
- automatic alarms in the case of inactivity (*e.g.* man down alarms)
- checks that a lone worker has safely returned to their base or home.

Lone workers should have access to adequate first-aid facilities and mobile workers should carry a first-aid kit suitable for treating minor injuries. Occasionally risk assessment may indicate that lone workers need training in first aid.

3.5 Principles to consider when controlling risk

Risk assessment should be viewed as a means to an end rather than an end in itself. The reason risks are assessed is to ensure that they are effectively controlled.

Risk assessment and risk control are parts of the larger process of risk management. An effective risk management system should assess the risks that arise in the workplace, put in place sensible health and safety measures to control them and then make sure that they work in practice.

As discussed, health and safety control measures are designed at three levels:

- workplace precautions
- risk control systems (RCSs)
- management controls.

Principles of prevention

The principles of prevention as specified in the European Union's Framework Directive for Occupational Safety and health are:

Avoid risks

If possible avoid a risk altogether, *e.g.* Do the work in a different way, taking care not to introduce new hazards.

Evaluate risks which cannot be avoided

Evaluate risks that cannot be avoided by carrying out a risk assessment.

Combat risks at source

Risks should be tackled at source, rather than taking measures to deal with the consequences. Prevention is better than core or prevention is better than protection is better than mitigation.

If steps are slippery, treating or replacing them is better than displaying a warning sign.

Adapt work to the individual

Affected individuals should be consulted when designing workplaces, selecting work and personal protective equipment, and drawing up working and safety procedures. Monotonous work should be avoided where possible individuals should be given control over work they are responsible for.

Adapt to technical progress

Technological and technical advances often afford opportunities for improving working methods and making them safer.

Develop a coherent overall prevention policy

Develop and implement a coherent policy to progressively reduce those risks that cannot be prevented or avoided altogether, taking account of the way work is organised, the working conditions, the environment and any relevant social factors.

Give collective measures priority over individual protective measures

Give priority to measures which protect the whole workplace and everyone who works there, and so give the greatest benefit (*i.e.* give collective protective measures priority over individual measures).

Give appropriate instructions

Ensure that workers understand what they need to do to help keep themselves and their colleagues safe.

Hierarchies of control

There are many practical tools available to help ensure that appropriate risk controls are in place.

Focussing on the purpose of the intervention, *prevention* is better than *protection* is better than *mitigation*.

With regard to the nature of the intervention, *engineering* controls are generally regarded as more reliable than *procedural* controls which in turn are better than *behavioural* controls.

Hierarchy of control simply means the order by which options for reducing and controlling risk should be considered, so far as is reasonably practicable, usually with eliminating/avoiding/designing out risk as the most preferred option and often with personal protective equipment (PPE) as a last resort.

Any individual control measure is likely to have weaknesses. A combination of controls will be more reliable than any individual control.

The hierarchy from ISO 45001

ISO45001 requires consideration to be given to reducing risks according to the following hierarchy, when determining controls, or considering changes to existing controls:

1. eliminate the hazard
2. substitute with less hazardous processes, operations, materials or equipment
3. use engineering controls and reorganisation of work
4. use administrative controls, including training
5. use adequate personal protective equipment.

Examples of controls under this hierarchy include:

- **Elimination** – Modify a design to eliminate the hazard, *e.g.* introduce mechanical lifting devices to eliminate the manual handling hazard
- **Substitution** – Substitute a less hazardous material or reduce the system energy (*e.g.* lower the force, amperage, pressure, temperature, etc.)
- **Engineering controls** – Install ventilation systems, machine guarding, interlocks, sound enclosures, etc.
- **Administrative controls including training** – Safety signs, hazardous area marking,

photo luminescent signs, markings for pedestrian walkways, warning sirens/lights, alarms, safety procedures, equipment inspections, access controls, safe systems of working, tagging and work permits, etc.

- **Personal protective equipment (PPE)** – Safety glasses, hearing protection, face shields, safety harnesses and lanyards, respirators and gloves.

ERIC SP

ERIC SP is a simple six stage hierarchy descending from safe place strategies (engineering controls/prevention strategies) which seek to make the workplace safe for all, down to safe person strategies (procedural controls/protection strategies) which look to protect individuals or smaller groups of workers.

(Remember ERIC SP – Eric Saves People!)

- **Eliminate** the hazard
- **Reduce** the hazard
- **Isolate** people from the hazard
- **Control** exposure to the hazard
- -
- **Safe System of Work**
- **Personal Protective Equipment (PPE).**

Safe Place

Safe Person

Eliminate

This may involve eliminating a task altogether. *'Health and safety'* should not, however be used as an excuse to not undertake a task.

Buying in components rather than manufacturing on site may eliminate the hazard locally, but transfers it elsewhere.

Eliminating a specific hazard by design may be straightforward *e.g.* provision of adequate floor power sockets would eliminate trailing cable hazards or it may involve introducing different hazards *e.g.* mechanical hazards rather than manual handling hazards or hydraulic power rather than electrical.

The implication of exchanging one hazard for another requires careful consideration.

The risks posed by a particular hazard should also be considered in the context of its benefits *e.g.* an electric lawn mower compared to a manual mower.

Reduce

Hazards may be reduced by substitution *e.g.* swapping a corrosive cleaning chemical for one that is irritant or a highly flammable solvent for one that is flammable or by specification *e.g.* UK construction site rules requiring the use of 110 V electrical equipment rather than 230 V.

With this type of control strategy two things require consideration:

1. Is the lower hazard alternative as effective at doing the job?
2. Do the workforce appreciate that a lower hazard alternative is safer but not safe?

Isolate

Isolation strategies may be designed to keep the hazard away from people or to keep people away from the hazard, *e.g.* an acoustic enclosure around a noisy machine will contain the noise energy and keep it away from the workers whereas an acoustic haven provides a safe place for people away from noise sources.

Other examples of isolation strategies would include:

- machinery guarding to stop people reaching the dangerous parts
- guard rails to prevent people falling off a scaffold
- security fencing to keep children away from construction sites.

Control

Engineering controls may be used to reduce exposure to a hazard, *e.g.* local exhaust ventilation (LEV) to control dust or fume near its source, minimising airborne concentrations reaching the workers breathing zone.

Organisational or procedural controls may be used to reduce overall exposure to a hazard. This may be particularly useful where there is a dose response relationship (*i.e.* the greater the exposure the greater the likelihood and/or severity of harm). Examples might include systems for managing trigger times on vibrating equipment, or job rotation to reduce the frequency and duration of exposure to repetitive tasks.

Safe Systems of Work (SSW)

SSW defines safe methods of undertaking a particular activity. This includes method statements, safe operating procedures and where necessary Permits-to-Work (PTW).

SSW and PTW are explained more fully later in **sections 3.7** and **3.8** respectively.

Personal Protective Equipment (PPE)

PPE is very much the last line of defence. PPE does nothing to prevent the accident from happening and does nothing until the accident happens in which case it provides a protective barrier to reduce the harmful consequences.

Examples include:

- a construction safety helmet reducing the effects of impact should an object fall from height and land on a person's head
- a respirator filtering harmful chemicals out of the air before they can be breathed in.

The effectiveness of PPE is dependent upon the wearer using it properly. Should it fail, it fails to danger and the wearer is exposed to harm.

PPE is explained more fully later in **section 3.9**.

Required levels of control

Employers are required to do all that is *'reasonably practicable'* to protect the health and safety of their employees and others at work.

Determining whether or not a control measure is *'reasonably practicable'* requires a balancing of the costs of dealing with the risk (money, time, effort) against the risk of injury (likelihood x severity).
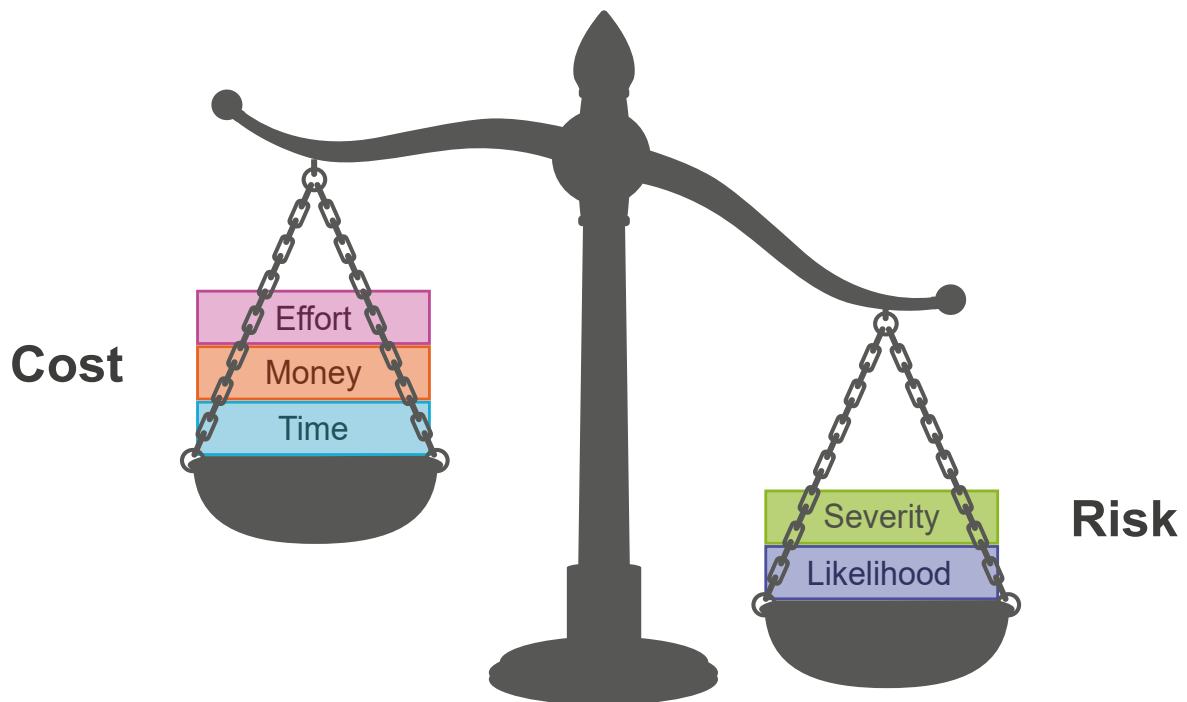

Figure 3.9: Reasonably practicable

The greater the risk the greater the efforts expected to control the risk. If there is gross disproportion between the two, *i.e.* significant resources are required for minimal risk improvement then it may be argued that the control is not reasonably practicable.

The objective is to manage risks to a tolerable level which is one that people are willing to live with because it delivers certain benefits, and because there is confidence that the risk is being properly controlled.

Three important things are known about probabilities (the likelihood / chance / odds aspect of risk):

● There is no such thing as *'zero risk'*. Whatever a person is doing there is always a risk of injury or death. There is a 1 in 600 chance that a forty year old man will not live to be forty one.

- However unlikely it is that something could happen it could still happen. There is a 1 in 14 000 000 chance of winning the lottery jackpot in the UK, but most weeks someone wins it.

- Each individual's risk (or odds or chance) will vary from the average because of the many variables such as age, gender, location, etc.

3.6 Safe Systems of Work for general work activities

Safe system of work definition

A safe system of work (SSW) is defined as:

'A formal procedure which results from a systematic examination of a task in order to identify all the hazards. It defines safe methods to ensure that hazards are eliminated or risks minimised.'

A SSW is required when hazards cannot be eliminated and a degree of risk remains after technical control measures are introduced.

Process

The process for developing a SSW is outlined below.

Assessing the task/identifying the hazards

There are various ways of systematically analysing a task:

A *job safety analysis (JSA)* may be used to break the task down into its component steps and identify hazards at each stage. Once the hazards have been identified the processes of risk assessment, control and management are worked through as discussed previously.

Hazards may also be systematically identified by considering issues around materials, equipment, environment or people (MEEP). The materials, equipment and environment prompt consideration of unsafe conditions, the people relates to unsafe acts. The *MEEP analysis* may be used in conjunction with or independent to a JSA.

Another approach considers:

- **what** plant, equipment or materials are being used
- **who** is responsible for what during the task
- **where** the work is to be undertaken – identifying local hazards
- **how** the task is done.

In the UK the Health and Safety Executive (HSE) consider the 4Ps to ensure that all areas of work activity and risk creation are addressed:

Premises: including the place of work, entrances and exits, the general working environment, welfare facilities, and all plant and facilities which are part of the fixed structure, such as permanent electrical installations

Plant and substances: including the arrangements for their handling, transport, storage and use

Procedures: including the design of jobs and work procedures and all aspects of the way the work is done

People: including the placement of employees, their competence for the job and any health surveillance needed.

A simple SSW may be defined verbally, as a written procedure or become a formal Permit-to-Work (PTW) (discussed later), depending on the level of risk and the needs of the organisation.

In all cases the SSW should:

- consider the preparations and authorisations necessary before beginning work
- ensure the job sequence is logically and clearly planned
- specify safe methods for undertaking specific activities
- specify safe means of access and egress if relevant
- consider the end of activity tasks such as dismantling and disposal.

Implementing the system

The co-operation of the workforce is essential to the success of the SSW. Employees should be consulted and involved in the development of the SSW.

The content of the SSW and management's commitment to it must be clearly communicated to all employees.

Training should be given in the SSW which should include details of the hazards and risks involved with the task, the methods of work required, the equipment to be used together with any pre-use inspections, PPE required, what action to take if problems arise and any actions to be taken when task is complete.

Managers and supervisors will also require training to enable the effective implementation and ongoing monitoring of the SSW.

Monitoring the system

Once implemented the SSW will require periodic monitoring to ensure:

- the system is workable and employees are comfortable following it

- the procedures as specified are being followed and are effective

- any changes to the workplace or work practises that would necessitate a review and reiteration of the SSW are identified early.

3.7 Permit to Work Systems

A SSW is adequate for most work activities, but some require extra care. A *'permit-to-work'* (PTW) is a more formal, auditable system that is appropriate for control of higher risk activities.

Activities suitable for control by PTW

Examples of high-risk jobs where a written PTW procedure will be appropriate are shown in Table 3.12.

Activity requiring PTW	PTW is intended to:
Confined space entry	Ensure hazards have been identified and the atmosphere is regularly monitored whilst work is in progress
Hot work	Ensure control of ignition sources
Work on live electrical equipment or high voltage electrical work	Ensure the necessary isolation is provided
Working at height	Ensure a fall arrest strategy is in place
Specialist maintenance work	Specify control measures where normal standards of work and precautions are not possible

Table 3.12: Activities requiring PTW

A PTW is not simply permission to carry out a dangerous job. It is an essential part of a system which determines how that job can be carried out safely, and helps communicate this to those doing the job.

The permit-to-work is a documented procedure that:

- authorises certain people to carry out specific high risk work within a specified time frame
- identifies the precautions required to complete the work safely, based on a risk assessment
- describes what work will be done and how it will be done in a *'method statement'*.

The permit-to-work requires declarations from the people authorising the work and carrying out the work. Where necessary it requires a declaration from those involved in shift handover procedures or extensions to the work.

Finally, before equipment or machinery is put back into service, it will require a declaration from the permit originator that it is ready for normal use.

The PTW should:

- ensure proper authorisation of designated high risk work
- clearly identify the location and nature of work to be done
- clearly define any limits on the work to be done – including time limits
- clearly identify the hazards associated with the work and the necessary precautions including safe isolation of power or other energy sources
- be prominently displayed at or near the point of work with copies kept by the issuer and at a suitable permit co-ordination room
- ensure that the manager responsible for the area in which the work is to take place is aware
- ensure that any person responsible for particular plant or installations to be worked on is made aware
- provide a record of continuous control to show that appropriate precautions have been taken and checked
- ensure that when plant that has been worked on is handed back it is safe and ready to return to use.

Before introducing a PTW system it is imperative that all affected workers and responsible signatories receive training and instruction in the issue, use and closure of permits.

Once the system is implemented it must be monitored and audited to ensure that it works as intended.

Key stages of a PTW system

- *Issue* by a competent issuing authority setting the parameters of the permit and confirming that precautions are in place.

- *Acceptance* by a competent worker (performing authority) confirming understanding of the work to be done, hazards involved and corresponding precautions.

- *Handback* of the PTW, by the performing authority, confirming that the work has been completed to plan.

- *Cancellation* of the PTW by the issuing authority confirming the work has been tested and the work area returned to normal use.

- Additional procedures are required for *extension* of agreed time limits if necessary and for managing *shift handovers*.

The permit-to-work form

The permit-to-work form should be designed to help communication between everyone involved, and should take into account individual site conditions and requirements, and the particular requirements of the tasks to be controlled such as confined space entry or hot work. Different permit forms may be required for different tasks.

The essential elements of a permit-to-work form are shown in Figure 3.9. If the permit form does not cover these areas it is unlikely to be able to achieve its purpose.

1. Permit title:	2. Permit reference number: Reference to other relevant permits or isolation certificates:

3. Job location:

4. Plant identification:

5. Description of work to be done and its limitations:

6. Hazard identification – including residual hazards and hazards associated with the work.

7. Precautions necessary and actions in the event of an emergency – people, who carried cut precautions, *e.g.* isolating authority, should sign that precautions have been taken.

8. Protective equipment (including PPE):

9. **Issue** – signature (issuing authority) confirming that isolations have been made and precautions taken, except where these can only be taken during the work. Date and time duration of permit. In the case of high hazard work a further signature from the permit authoriser will be needed.

10. **Acceptance** – signature confirming understanding of work to be done, hazards involved and precautions required.

 Also confirming permit information has been explained to all permit users.

11. **Extension/shift handover procedures** – signatures confirming checks made that plant remains safe to be worked upon, and new performing authorities and permit users made fully aware of hazards/precautions. New expiry time given.

12. **Hand-back** – signed by performing authority certifying work completed. Signed by issuing authority certifying work completed and plant ready for testing and re-commissioning.

13. **Cancellation** – certifying work tested and plant satisfactorily re-commissioned.

Figure 3.9: Permit-to-Work

3.8 Personal protective equipment

Personal Protective Equipment (PPE) can be defined as:

'...all equipment designed to be worn or held by a person
at work to protect him against one or more risks, and any
addition or accessory designed to meet this objective.'

Risk means any risk to the health or safety of a person and includes wet or extreme temperature, caused by adverse weather or otherwise.

The definition of PPE does not include:

- ordinary working clothes and uniforms not specifically designed to protect the health and safety of the wearer
- equipment used during the playing of competitive sports
- self-defence or deterrent equipment
- portable devices for detecting and signalling risks and nuisances.

Where more specific legislation such as the Control of Substances Hazardous to Health (CoSHH), or the Control of Asbestos Regulations (CAR) applies it takes precedence over the general requirements of the PPE Regulations.

Provision of suitable PPE

The employer has a duty to provide suitable PPE to employees who may be exposed to a risk to their health and safety while at work, except where the risk has been adequately controlled by other means which are equally or more effective.

To be suitable PPE must satisfy the following four criteria:

- appropriate for the risk(s), and the conditions where exposure may occur
- take into account the ergonomic needs and health of the wearer
- fit the wearer correctly
- be effective in preventing or controlling the risk involved without increasing the overall risk (as far as is reasonably practicable).

i.e. the assessment of suitability should consider the job, the person and the environment.

Any PPE provided should be CE marked to demonstrate compliance with relevant European standards.

PPE is a last resort

PPE is the last resort of control measures for the following reasons:

- it does nothing to prevent the harmful event
- it only protects the wearer, not other persons in the vicinity
- it relies on the wearer to wear it correctly
- it may impede movement, visibility or communication
- it may only be effective for a limited time, *e.g.* until a respiratory filter or chemical gloves become saturated
- it may only be effective in specific circumstances *e.g.* a respiratory filter is only effective against specific contaminants
- ihe effectiveness of PPE is difficult to assess but maximum levels of protection are unlikely to be achieved
- it exposes the wearer to danger should it fail
- it requires effective systems for regular inspection and maintenance.

Justifying use of PPE

PPE is a common form of control measure, particularly for hazardous substances. Use of PPE may be justified in the following situations:

- for short-term activity where no other form of control is reasonably practicable
- as a supplement to other control measures, particularly where a carcinogenic substance or material with an Occupational Exposure Limit is in use
- as a temporary measure for a recently identified risk, while other controls are being established, or during temporary failure of a control
- during certain maintenance procedures, *e.g.* cleaning out of an LEV system, which by definition will not be in use.

Maintenance and replacement of PPE

Any PPE provided has to be maintained in an efficient state, in efficient working order and in good repair.

An effective maintenance system includes the following:

- **Examination** - Checking for faults, damage, wear and tear, dirt etc. All PPE should be examined, by a competent person, to ensure it is in good working order before issue.
- **Testing** - To ensure PPE is operating as intended. Records of tests and examinations should be kept.
- **Cleaning** – Cleaning and disinfection are particularly important for shared equipment to control health risks to the next wearer.
- **Repair** – Repairs should only be carried out by someone with the required skills and technical knowledge. Simple repairs may be undertaken by the wearer.
- **Replacement** – If PPE exceeds its 'shelf-life', or is so badly damaged that it cannot be used safely or repaired systems are required to ensure safe disposal and timely replacement.

Appropriate accommodation for PPE

Appropriate accommodation should be provided for storing PPE when it is not being used, to protect against:

1. damage from chemicals, sunlight, high humidity, heat and accidental knocks
2. contamination from dirt and harmful substances
3. the possibility of losing the PPE.

Information, instruction and training

Adequate and appropriate information, instruction and training should be provided to enable the employee to know:

1. the risk(s) which the PPE will avoid or limit
2. the purpose for which and the manner in which PPE is to be used
3. any action to be taken by the employee to ensure that the PPE remains in an efficient state, in efficient working order and in good repair.

Use of PPE

Employees are required to use any PPE provided in accordance both with any training, information and instruction received regarding the use of the PPE.

Employers are required to take reasonable steps to ensure that PPE provided to employees is properly used.

Arrangements are required for appropriate levels of supervision and monitoring.

Reporting loss or defect

Employees are obliged to promptly report to the employer any loss of or obvious defect in their PPE.

Compatibility of personal protective equipment

If more than one item of PPE is being worn, the different items of PPE must be compatible with each other.

All items, when used together, should adequately control the risks which they are provided to protect against, *e.g.* certain types of half-mask respirator and goggles worn together can prevent one or both items fitting correctly.

Assessment of PPE

When selecting PPE for a specific task the employer should ensure the correct PPE is used for the particular circumstances of use and risks likely to be present.

The main types of PPE

As PPE is generally worn it is typically referred to by the body part it is worn on and is designed to protect. Whichever part of the body the PPE is designed to protect it must be properly specified to protect against specific hazards.

Head protection

There are different types of safety helmet designed to protect against specific type of hazards:

- **crash helmets** protect the wearer from a fall impact
- **industrial (or construction) safety helmets** protect against impacts from falling objects
- **bump caps** protect from impacts against overhead obstructions *e.g.* low headroom
- **caps and hair nets** may also be worn to cover hair and protect from risks of drawing in to machinery.

Safety helmets are prone to weakening as a result of exposure to sunlight or high temperatures and humidity. Procedures for storage and inspection should address this concern.

Eye protection

Hazards that affect the eyes may be grouped as mechanical, chemical and biological, and radiation.

Examples of types and sources of hazards are shown in Table 3.13.

Classification	Hazard (examples)	Source (examples)
Mechanical	Flying metal particles	Metal machinery, weld chipping, riveting, wire cutting, grinding
	Molten metal splash	Metal pouring, metal skimming, die casting, metal flame cutting, soldering
	High pressure water	Water jet blasting
Chemical and Biological	Chemical splashes	Battery filling, electrolytic plating, degreasing, paint stripping
	Fine dusts and powders	Cement mixing, wall sanding, lime spreading, powder coating
	Fumes, vapours and gases	Varnishing, adhesive bonding, exhaust gas analysis, welding/soldering, fumigation
	Biological agents/viruses	Veterinary work, dental surgery, first aid, medical research, waste management
Radiation	IR	Furnace work, metal pouring/smelting, metal casting, gas welding/brazing, flame cutting
	Visible glare	High temperature furnaces, high intensity artificial light, strong sunlight
	Ultra-violet	Electric arc welding, high energy discharge lamps, short circuit electric arcs, strong sunlight
	Laser	Laser measurement equipment, laser cutting, stray beams

Table 3.13: Eye hazards with workplace examples

Styles of eye protector

Styles of eye protection include:

- **Safety spectacles:** provide general eye protection against impacts, protection is improved with side shields. *Eyeshields* may be worn over normal spectacles and provide a greater level of protection than standard spectacles.

- **Safety goggles:** may be cup type (with separate eye coverings) or box type (with a

single covering). Provide a higher level of protection than spectacles but may be less comfortable and prone to misting unless ventilation is designed in.

- **Face shields:** protects the whole face from impact or chemical splashes but offers little protection against dust and fume. May be worn over spectacles and may be integrated with a safety helmet. A welding shield is a specialist face shield affording protection from welding arcs.

Figure 3.10: Safety spectacles, safety goggles and face shields

Body protection – torso and legs

Jackets, trousers and aprons can be specified to protect against a range of hazards. Work clothing can protect against hot, cold or wet conditions (including the weather), or chemical splashes.

Chain mail aprons may be worn by butchers during *'boning out'* operations to protect the abdomen and thighs from stabbing injuries.

Chainsaw workers wear protective jackets and leggings that afford some degree of protection against a chainsaw blade.

Asbestos workers wear hooded overalls with an elasticated fit at hood, cuffs and ankles to protect the worker and their normal clothing from exposure to asbestos fibres.

Hand – arm protection

Gloves and gauntlets can be specified in a range of materials to protect against different hazards, including: general handling (cuts and abrasions), hot and cold handling, cuts or punctures (*e.g.* syringes), wet work and chemicals.

Table 3.14 shows recommended glove materials for different chemical hazards.

Chemical group	Glove material					
	Natural rubber	Nitrile rubber	Neo-prene	PVC	Butyl	Viton
Weak acids/ alkalis	✓	✓	✓	✓		
Oils		✓				
Chlorinated hydrocarbons						✓
Aromatic solvents						✓
Aliphatic solvents		✓				
Strong acids					✓	
Strong alkalis			✓			
PCBs						✓

Table 3.14: Glove materials for chemical hazards

Protective gloves will, at some stage, fail to protect the wearer from exposure to chemical agents, because of degradation of the glove material due to chemical contact, penetration through seams, imperfections and pinholes or permeation on a molecular level.

Gloves never afford anywhere near stated levels of protection in practical use.

Latex gloves and powdered gloves (corn-starch) pose a risk of allergic dermatitis.

Foot Protection

Foot protection should be specified upon consideration of the parts of the foot to be protected, *e.g.* sole, toes, metatarsals, ankle, and the hazards to be protected against.

Toe protection affords protection against impact and compression. Soles may be slip resistant, chemical resistant, electrically insulating or anti-static and provided with penetration resistant inserts.

The upper and the whole shoe may be designed to be: insulated against extremes of heat and cold, water proof, resistant to hot contact, chemically resistant or penetration resistant.

Respiratory Protective Equipment (RPE)

There are two broad categories of RPE – respirators and breathing apparatus (BA). Respirators work by filtering contaminants out of the air so that the wearer breathes clean air. BA works by delivering a supply of breathable air from a uncontaminated source.

The key factors in selecting appropriate RPE are:

● the level of oxygen present in the air to be breathed

● the presence of toxic chemicals that may pose an imminent risk to life.

Only BA should be specified where the level of oxygen in the air is less than 20% or if there is an imminent risk to life.
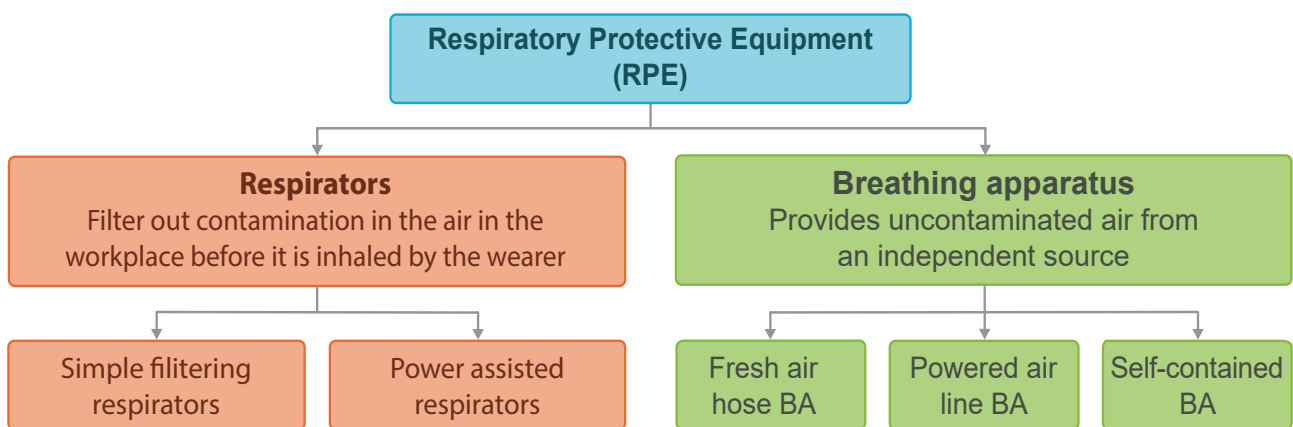
```
                  Respiratory Protective Equipment
                              (RPE)

        Respirators                          Breathing apparatus
  Filter out contamination in the air in the     Provides uncontaminated air from
  workplace before it is inhaled by the wearer        an independent source

  Simple filitering    Power assisted      Fresh air     Powered air    Self-contained
    respirators         respirators        hose BA        line BA            BA
```

Figure 3.11: Main categories of RPE

Respirators   **BA**

Figure 3.12: Types of respirator and BA

Respirators

Simple filtering respirators range from simple disposable paper dust masks providing a low level of ori-nasal (nose and mouth) protection against larger particulates (dust) to cartridge type respirators which may be half mask (ori-nasal) or full face mask and may use one or two exchangeable filter cartridges that must be carefully specified for known contaminants.

Power assisted respirators use hoods, helmets, visors or blouses with a battery powered filter unit. They achieve a high level of protection as in addition to the filtration unit the positive airflow to the breathing zone prevents the ingress of contaminated air. The cooling effect of the airflow can also improve worker comfort.

Breathing Apparatus (BA)

Breathing apparatus (BA) relies upon a supply of fresh air, either:

- from an *air hose* whose outlet is in an uncontaminated atmosphere and relies on the operator's lung power to draw in the fresh air
- from an *airline* using a compressor to provide a powered supply of filtered breathable air
- *self-contained breathing apparatus*, which may be open or closed circuit.

Open circuit systems supply air to the wearer from a cylinder either worn on a back pack or from a remote location.

Closed circuit systems remove excess carbon dioxide from exhaled air which is then re breathed by the wearer. This type of apparatus is generally only used for emergency self-rescue purposes.

3.9 Safety signs and signals

Employers should provide, and maintain, a safety sign where there is a significant risk to health and safety that has not been avoided or controlled as required under other legislation, provided it can help reduce the risk.

Safety signs are not a substitute for engineering controls and safe systems of work, they should be used to warn of any remaining significant risk or to instruct employees of the measures they must take in relation to these risks.

Safety signs need to contain a pictogram to convey the message instead of relying solely on text, the standard signs are presented in Table 3.15.

Prohibition (red) Prohibits behaviour likely to increase or cause danger (*e.g.* no access for unauthorised persons or no smoking).	
Warning (yellow) Giving warning of a hazard or danger, *e.g.* danger: electricity.	
Mandatory (blue) Must be done, prescribing specific behaviour, (*e.g.* eye protection must be worn).	
Safe Condition (green) Information on emergency exits, first-aid, or rescue equipment and activities.	
Fire-fighting equipment (red) Information on the identification or location of fire-fighting equipment.	

Table 3.15: EU Standard signs

As well as the traditional signboards, the regulations also apply to other types of safety sign and signals including signs to mark obstacles, dangerous locations and traffic routes, illuminated signs, acoustic signals, spoken communication, and hand signals.

Signs to mark obstacles, dangerous locations and traffic routes

Markings consisting of an equally sized yellow and black (or red and white) stripe at an angle of 45 degrees may be used for marking obstacles and dangerous locations.

Traffic route markings take the form of continuous lines, preferably yellow or white, taking into account the colour of the ground.

Illuminated signs

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 (*e.g.* emergency exit signs).

An illuminated sign has to be bright enough to be seen, without causing glare.

A flashing sign may be used to indicate a higher level of danger or a more urgent need for intervention or action.

Acoustic signal

A sound signal which is transmitted without the use of a human or artificial voice (*e.g.* fire alarm).
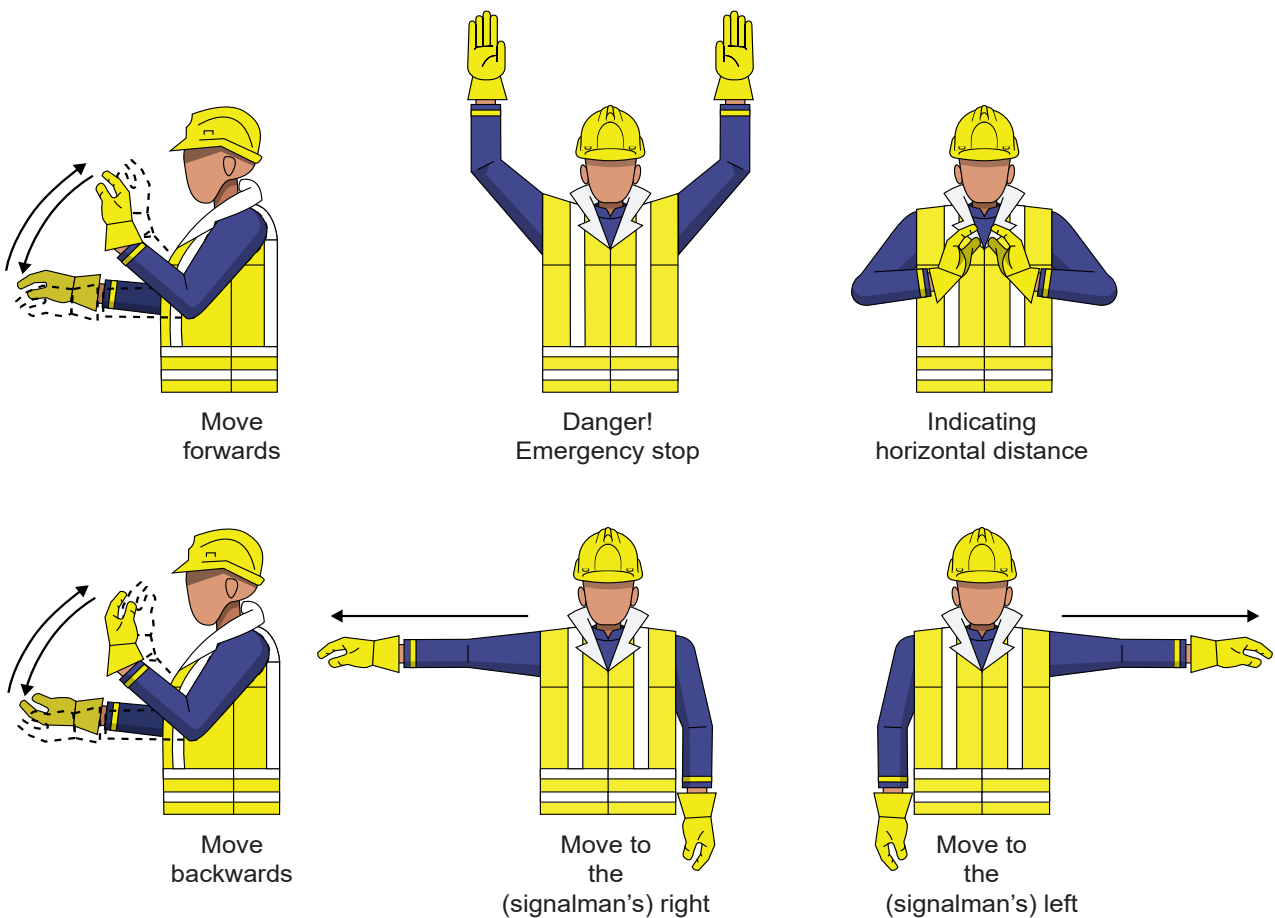
Acoustic signals need to be loud enough to be heard (usually 10 dB(A) above ambient at any given frequency).

If the signal can operate at alternating frequencies (like a two tone siren) it may be operated in that mode to indicate a higher level of danger or a more urgent need for intervention or action.

Spoken communication

A predetermined spoken message communicated by a human or artificial voice. Spoken messages need to be clear, concise, and understood by the listener.

Hand signals

Move forwards

Danger! Emergency stop

Indicating horizontal distance

Move backwards

Move to the (signalman's) right

Move to the (signalman's) left

Hand signals can be used to direct hazardous operations such as crane or vehicle manoeuvres. The signals should be precise, simple, easy to make, and to understand. Hand signals should be consistent with the code of signals shown in Schedule 1 of the Regulations, or a relevant British Standard.

Information, instruction and training

In addition to providing and maintaining suitable safety signs and signals the employer has to ensure that all employees receive comprehensible and relevant information, training and instruction regarding:

- the meaning of safety signs
- the measures to be taken in connection with safety signs.

3.10 Management of Change

Many aspects of organisational change can affect health and safety management, notably changes to: roles and responsibilities, organisational structure, construction works, process, equipment, working practices or other changes that may affect the control of hazards.

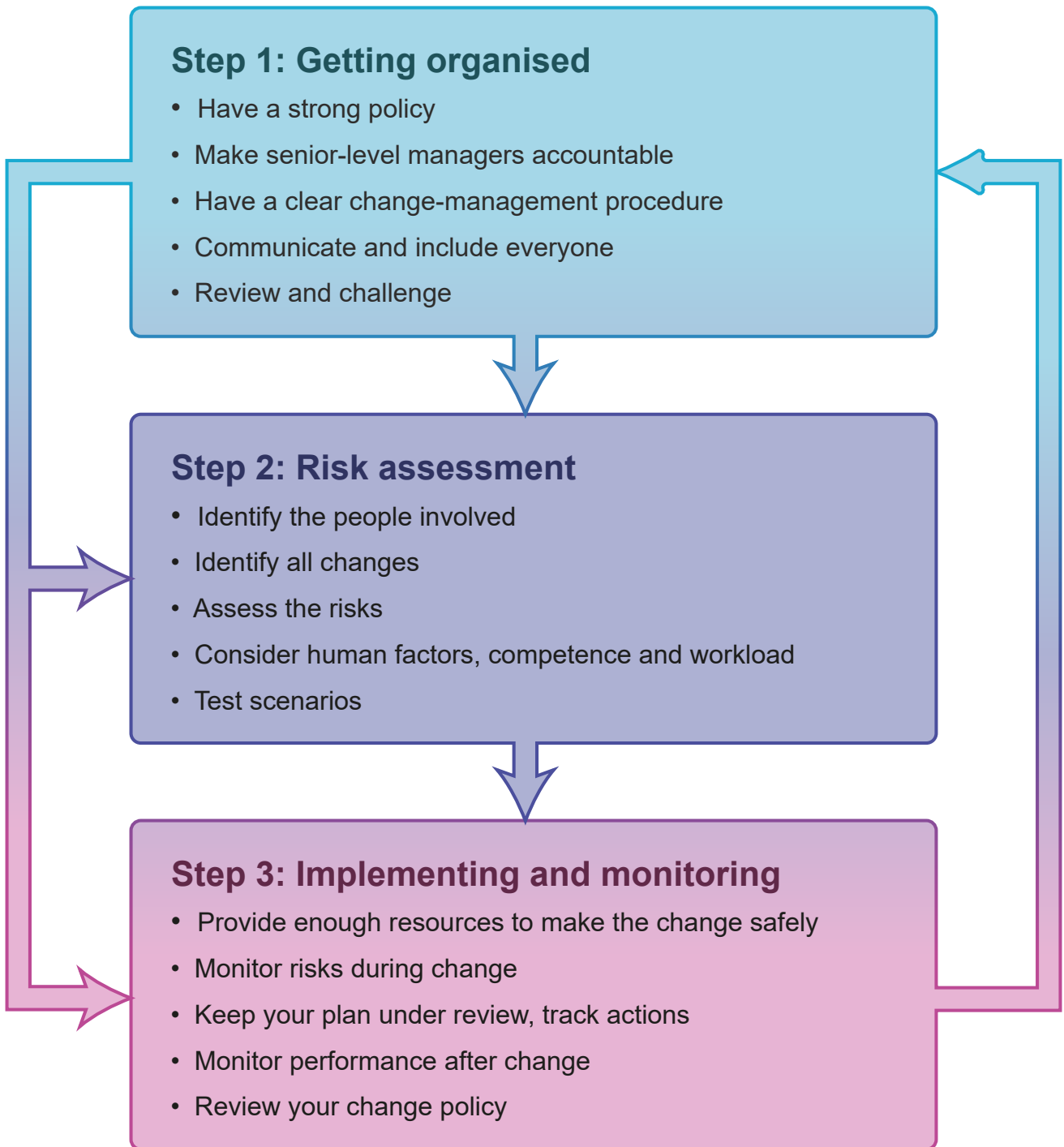Organisational changes can have negative impacts on the management of health and safety as a consequence of:

- a smaller, overworked workforce
- less expertise due to multi-skilled flexible working and an increased reliance on contractors
- flatter management structures, less supervision and possibly confused reporting structures
- more automated plant
- different working practices and processes

HSE guidance on organisational change sets out a three-step framework for managing change:

Step 1 – Getting organised for change
Step 2 – Assessing risks
Step 3 – Implementing and monitoring the change

Step 1: Getting organised

- Have a strong policy
- Make senior-level managers accountable
- Have a clear change-management procedure
- Communicate and include everyone
- Review and challenge

Step 2: Risk assessment

- Identify the people involved
- Identify all changes
- Assess the risks
- Consider human factors, competence and workload
- Test scenarios

Step 3: Implementing and monitoring

- Provide enough resources to make the change safely
- Monitor risks during change
- Keep your plan under review, track actions
- Monitor performance after change
- Review your change policy

Step 1: Getting organised

Policy

A strong and clear policy is required to:

- set out principles, commitments and accountabilities in relation to impact on health, safety and the environment
- commit to proportionate consideration of all organisational changes, large and small as even those not obviously connected to safety need to be considered.

Senior management commitment should be clearly demonstrated by appointing a senior manager of appropriate influence to champion the change – ensuring the provision of an appropriate level of resource and attention, proportionate to:

- the complexity of the change
- the scale of the hazards concerned
- the degree to which the change may impact on the management of major hazards.

Change-management procedure

The change should be planned in a thorough, systematic, and realistic way ensuring that the following are made clear:

- the processes or activities that are to be carried out
- who is accountable and who is responsible for these activities
- who else is involved, and how
- what potential risk factors are to be considered
- who reviews the change process, when and how.

All stages of the process should be adequately recorded to ensure transparency, auditability, and accountability.

Communication and co-operation

All concerned should be involved from an early stage, and be kept involved throughout the process. This will help to:

- improve industrial relations and acceptance of the change
- utilise the unique knowledge of employees and contractors.

Review and challenge

Senior management should be provided with adequate information to review progress regularly. Plans should be changed if risk assessment shows a potential significant risk.

Step 2: Risk assessment

Risk assessment is required to ensure that following the change, the organisation will have sufficient resources, competence and motivation to ensure safety without making unrealistic demands on people.

The risk assessment should address:

- risks arising from the process of change (how the organisation gets there)
- risks and opportunities resulting from the outcome of change (where the organisation wants to get to).

Assessment procedures

The main risks are identified through:

- mapping of tasks, individuals and processes from the current position to the position after the change
- scenario assessments when the reorganisation impacts staff who may have a role in handling or responding to crises such as upsets and emergencies.

The assessment should consider the following factors:

- past experience and historical data
- risks from using contractors
- supervision and monitoring to ensure the quality and safety of work
- contingency plans to maintain low risks (and not increase risks) should the change not go to plan
- workload assessment to avoid the consequences of overloading (fatigue, shortcuts etc.)
- the potential for human failures.
- the effects on emergency procedures
- maintaining adequate welfare facilities
- changes to the provision of appointed persons *e.g.* first-aiders, competent advisors etc

Step 3: Implementing and monitoring

Implementation

Resources should be sufficient to ensure that exposure to risks is not significantly increased during the change and the plans should account for an increase in workload during the transition.

Monitoring and review

Risk assessments and plans for both the transition and progress should be regularly reviewed to determine progress against set objectives and key performance indicators.

Health and safety performance, during and after the change, should be subject to both proactive and reactive monitoring.

Where there is evidence of significant risk, decisions may need to be changed or reversed.

3.11 Emergency Procedures and Arrangements

Wherever there is potential for serious harm to people at work and affected by work, effective emergency procedures and arrangements are essential in helping to reduce the consequences and mitigate the effects of the situation.

The emergency plan should address both the immediate response to the emergency and the longer term considerations for securing the ongoing viability of the business.

The planning process should consider the:

1. **Identification and assessment of potential emergency situations**.

   Foreseeable emergencies on most sites might include:

   • Major personal injury;
   • Fire and explosion;
   • Terrorist activity;
   • Major plant failure;
   • Uncontrolled release of substances; or
   • Extreme weather events.

2. Prevention, control and mitigation – specification of appropriate controls can prevent/reduce the likelihood of an emergency situation arising; and protect people and business assets from the effects.

To be effective emergency plans must be regularly tested through drills and simulations. All employees will require training in the procedures, especially those with defined roles such as site incident controller, emergency response teams, fire marshals etc.

● have emergency procedures to be followed in the event of serious and imminent danger

● appoint a sufficient number of competent persons to implement evacuation procedures

● ensure that no employee has access to any danger area unless he has received adequate health and safety instruction

● make any necessary arrangements for contacting external emergency services.

It is important that as part of the risk assessment process, emergency situations are considered and appropriate procedures put in place and maintained. These procedures should also include instructions as to who and how the emergency services should be contacted together with what information should be passed on. This will ensure accurate information is given, reducing the possibility of confusion and any unnecessary delay.

If things go wrong, putting people and property at serious risk, it is vital that actions are taken swiftly to either deal with the situation and/or ensure personnel are evacuated efficiently and safely.

In emergencies people are more likely to respond reliably if they:

● are well trained and competent;

● take part in regular and realistic practice;

● have clearly agreed, recorded and rehearsed plans, actions and responsibilities.

Where the organisation shares the workplace with another employer, they should consider whether the emergency plans and procedures should be co-ordinated.

Points to include in emergency procedures

- Consider what might happen and how the alarm will be raised. Don't forget night and shift working, weekends and times when the premises are closed, *e.g.* holidays.

- Plan what to do, including how to call the emergency services. Help them by clearly marking the premises from the road. Consider drawing up a simple plan showing the location of hazardous items.

- If there is 25 tonnes or more of dangerous substances on site, notification must be made to the fire and rescue service and warning signs put up.

- Decide where to go to reach a place of safety or to get rescue equipment. Suitable forms of emergency lighting must be provided.

- Make sure there are enough emergency exits for everyone to escape quickly, and keep emergency doors and escape routes unobstructed and clearly marked.

- Nominate competent people to take control (a competent person is someone with the necessary skills, knowledge and experience to manage health and safety).

- Decide which other key people are needed, such as a nominated incident controller, someone who is able to provide technical and other site-specific information if necessary, or first-aiders.

- Plan essential actions such as emergency plant shutdown, isolation or making processes safe. Clearly identify important items like shut-off valves and electrical isolators etc.

- Train everyone in emergency procedures. Don't forget the needs of people with disabilities and vulnerable workers.

- Work should not resume after an emergency if a serious danger remains. If in any doubt ask for assistance from the emergency services.

Contact with the relevant emergency services, prior to any emergency occurring, may also be important. This will give them prior knowledge of the operations, procedures and materials/substances at the premises, thus helping to ensure a correct and prompt response in the event of an emergency.

First-aid in the workplace

'First-aid' means:

1. treatment for the purpose of preserving life and minimising the consequences of injury and illness until medical help is obtained

2. treatment of minor injuries which would not need treatment by a medical practitioner or nurse.

Employers are required to provide adequate and appropriate equipment, facilities and personnel to ensure their employees receive immediate attention if they are injured or taken ill at work. This will include sufficient arrangements to:

- give immediate assistance to casualties with both common (*i.e.* non work related) injuries or illnesses and those likely to arise from specific hazards at work
- summon an ambulance or other professional help.

Assessment of first aid needs

What is sufficient will depend on the circumstances. A formal assessment of first-aid needs is required to determine the appropriate level of provision. It should consider:

1. **The nature of the work and workplace hazards and risks**

   The general risk assessment is useful in assessing first-aid needs. Understanding the nature of an accident or injury if preventive or control measures fail can help in determining the necessary first-aid provision.

2. **The size of the organisation**

   A larger workforce generally has a greater the need for first-aid provision. The actual provision should be determined by the risk assessment and assessment of needs.

3. **The nature of the workforce**

   Consideration should be given to the needs of young workers, trainees, pregnant workers and employees with disabilities or particular health problems.

4. **The organisation's history of accidents**

   In large or multi-site organisations historical accident data may be useful in determining where first-aiders should be located, what area they should be responsible for and what first-aid equipment is necessary.

5. **The needs of travelling, remote and lone workers**

   The assessment should determine the need for the following:

   ● personal first-aid kit
   ● personal communicators, or mobile phone to call for assistance
   ● additional training.

6. **Work patterns**

   Sufficient provision should always be available when employees are at work. Separate arrangements may be required for each shift, and for *'out of hours'* working.

7. **The distribution of the workforce**

   On a site with more than one building, if the travel distance between buildings is unreasonable, separate first aid provision may be required in each building.

   Numbers and locations of first-aiders or appointed persons in a multi-storey building should give adequate provision to employees on each floor.

8. **The remoteness of the site from emergency medical services**

   Where a site is remote from emergency medical services, special transport arrangements may be required. The emergency services should be informed in writing of the location of remote sites and any particular circumstances, including specific hazards.

9. **Employees working on shared or multi-occupied sites**

   On a shared or multi-occupied site, employers can arrange for one employer to take responsibility for providing first-aid cover for all the workers.

10. **Annual leave and other absences of first-aiders and appointed persons**

    Adequate arrangements for covering both planned absences (*e.g.* annual leave) and unplanned absences (*e.g.* sickness) of first-aiders and appointed persons.

11. **First-aid provision for non-employees**

    There is no requirement for employers to provide first aid for anyone other than their own employees. However, it is strongly recommended that employers include non-employees in their assessment of first-aid needs and make provision for them.

First-aid personnel

Where the assessment identifies a need sufficient numbers of first-aiders should be provided, at appropriate locations, to enable prompt treatment whenever necessary.

Where a first-aider is deemed unnecessary an appointed person may be allocated responsibility to:

- take charge of the first-aid arrangements
- look after the equipment and facilities
- call the emergency services when required.

There are no hard and fast rules on exact numbers as all the relevant circumstances of the particular workplace need to be considered. However the following level of provision is suggested.
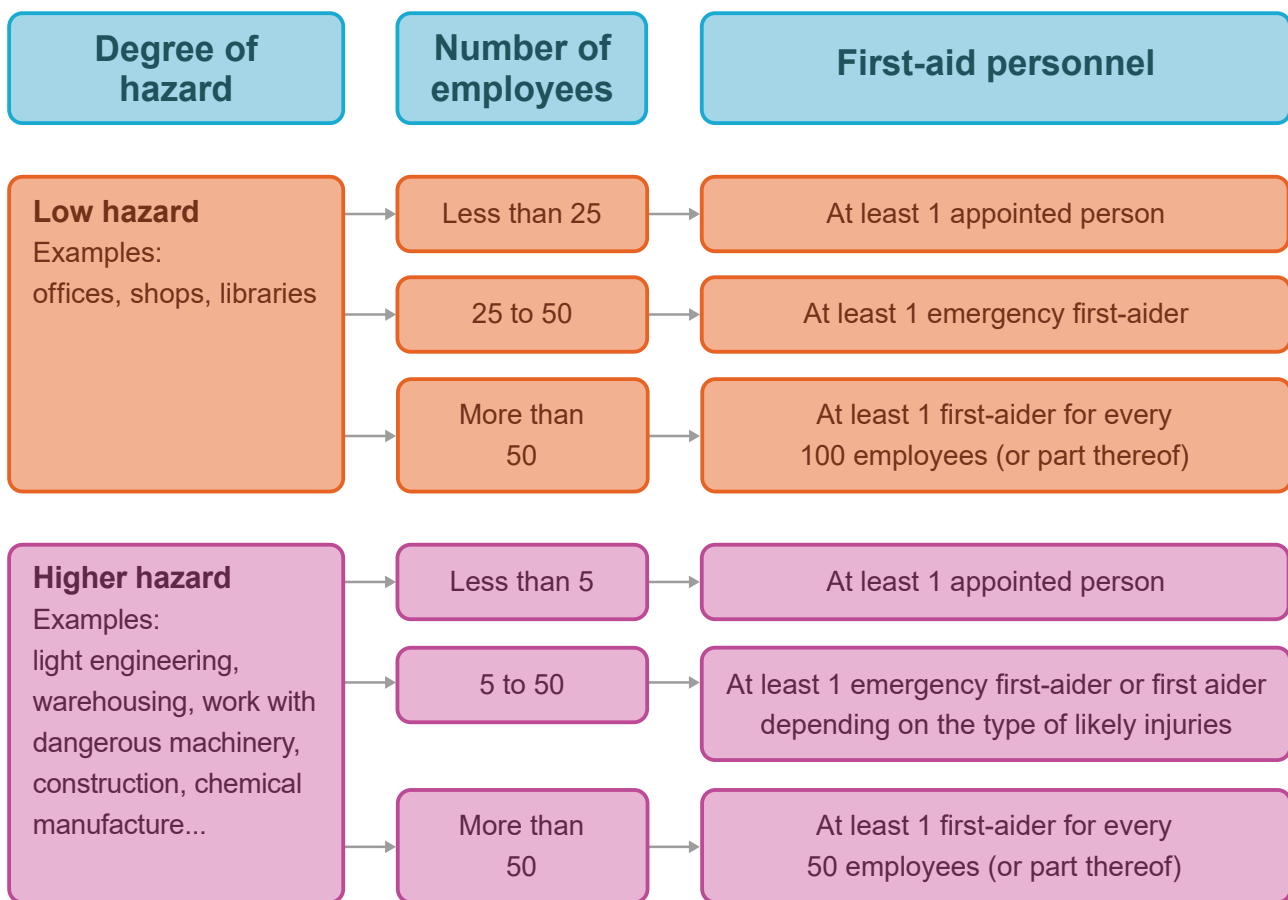
Degree of hazard	Number of employees	First-aid personnel
Low hazard Examples: offices, shops, libraries	Less than 25	At least 1 appointed person
	25 to 50	At least 1 emergency first-aider
	More than 50	At least 1 first-aider for every 100 employees (or part thereof)
Higher hazard Examples: light engineering, warehousing, work with dangerous machinery, construction, chemical manufacture...	Less than 5	At least 1 appointed person
	5 to 50	At least 1 emergency first-aider or first aider depending on the type of likely injuries
	More than 50	At least 1 first-aider for every 50 employees (or part thereof)

Figure 3.13: Suggested level of provision of first-aid personnel

Selecting a first-aider

The following factors should be considered when a candidate's suitability for the role of a first-aider:

1. reliability, disposition and communication skills
2. ability to absorb new knowledge and learn new skills
3. ability to cope with stressful and physically demanding emergency procedures
4. normal duties – can they be easily left to respond immediately to an emergency?

First-aider training

Before taking up first-aid duties, a first-aider should have undertaken training and obtained an approved qualification. A first aider must hold a valid certificate of competence in either:

a. First aid at work (FAW); or

b. Emergency first aid at work (EFAW).

FAW training

A qualified first-aider should be able to:

1. provide emergency first aid at work

2. administer first aid to a casualty with:
   - injuries to bones, muscles and joints, including suspected spinal injuries
   - chest injuries
   - burns and scalds
   - eye injuries
   - sudden poisoning
   - anaphylactic shock

3. recognise the presence of major illness and provide appropriate first aid.

EFAW training

A qualified emergency first-aider should be able to:

1. understand the role of the first-aider including reference to:
   - the importance of preventing cross-infection
   - the need for recording incidents and actions
   - use of available equipment

2. assess the situation and circumstances in order to act safely, promptly and effectively in an emergency

3. administer first aid to a casualty who is unconscious (including seizure)

4. administer cardiopulmonary resuscitation

5. administer first aid to a casualty who is choking

6. administer first aid to a casualty who is wounded and bleeding

7. administer first aid to a casualty who is suffering from shock

8. provide appropriate first aid for minor injuries.

Additional first-aid training

First-aiders may require additional training to deal with the consequences of special hazards such as hydrofluoric acid or working in confined spaces. Additional training would also be required to use a defibrillator.

Re-training and refresher training

FAW and EFAW certificates are valid for three years.

Retraining may take place up to three months before the expiry date in which case the new certificate takes effect from the date retraining is completed.

Retraining must be completed no more than 28 days beyond the expiry date in which case the new certificate will run from the expiry date of the previous certificate. If retraining is not completed within the 28-day period a full FAW course or EFAW course will need to be undertaken.

Although not mandatory it is recommended that first-aiders undertake annual refresher training within their three year certification period.

Refresher training helps to maintain basic skills and keep up to date with changes to first-aid procedures.

First-aid materials, equipment and facilities

First-aid containers

First-aid containers should be easily accessible and placed near to hand washing facilities. They should only be stocked with items useful for giving first aid and should protect them from dust and damp. All first-aid containers should be identified by a white cross on a green background.

The following is a suggested contents list for a low hazard workplace:

1. a leaflet giving general guidance on first aid
2. 20 individually wrapped sterile plasters (assorted sizes), appropriate to the type of work (hypoallergenic plasters can be provided, if necessary)
3. two sterile eye pads(d) four individually wrapped triangular bandages, preferably sterile
4. six safety pins
5. two large sterile individually wrapped unmedicated wound dressings
6. six medium-sized individually wrapped unmedicated wound dressings
7. a pair of disposable gloves.

Additional materials and equipment such as scissors, adhesive tape, disposable aprons, individually wrapped moist wipes, a container of sterile water (or saline) for eye irrigation, blankets and PPE may be required. These may be kept in the first-aid container if space allows, or otherwise stored safely in a first aid room or near the intended location for use.

First-aid room

A first-aid room is usually required on higher hazard sites and in larger premises at a distance from medical services.

The room(s) should be clearly signposted and identified by white lettering or symbols on a green background.

First-aid rooms should:

1. be large enough to hold an examination/medical couch, with enough space to work, a chair and any necessary additional equipment
2. have washable surfaces and adequate heating, ventilation, and lighting
3. be kept clean, tidy, accessible and available for use at all times when employees are at work
4. be positioned as near as possible to a point of access for transport to hospital
5. display a notice on the door advising of the names, locations, and if appropriate, telephone extensions of first-aiders and how to contact them.

Provision of the following equipment and facilities is also recommended:

6. a store for first-aid materials
7. a sink with hot and cold running water, soap and paper towels
8. drinking water with disposable cups
9. foot-operated refuse containers, lined with disposable yellow clinical waste
10. bags or a container suitable for the safe disposal of clinical waste
11. a telephone
12. the first aid record book.

Records of first-aid treatment

First-aiders and appointed persons should record incidents they attend in a suitable book.

Where there are a number of first-aiders working for a single employer, where practicable one central book should be used.

The information to be recorded should include:

1. date, time and place of the incident
2. name and job of the injured or ill person
3. details of the injury/illness and what first aid was given
4. what happened to the person immediately afterwards (for example went back to work, went home, went to hospital)
5. name and signature of the first-aider or person dealing with the incident.

The record book is not the same as the statutory accident book, although the two might be combined.

Information for employees

The employer has a general duty to inform employees of the arrangements that have been made for first aid.

This may be achieved in a number of ways including:

● consultation with employees or their safety representatives
● the inclusion of first-aid information during induction training
● displaying first-aid notices.

Information needs to be clear and easily understood. The needs of employees with reading or language difficulties should be addressed.

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