

## 6. Principles of control

A risk assessment is of no value if the results are not acted upon, with the ultimate objective being to reduce risk.

The first question to ask must always be 'can the hazard be removed?' If the answer is no, there is a hierarchy of control measures to consider. With this hierarchy it is important always start at the top, as these are the most effective controls. The options are:

- Trying a less risky option (changing process, materials, quantities);
- Installing physical barriers that prevent access to the hazards;
- Implementing procedural controls and rules to keep people away from the hazard.

Other options are available to reduce risks further, once the above controls have been implemented. They include use of Personal Protective Equipment (PPE), providing information to people who may be harmed and making arrangements to deal with emergencies (e.g. safety showers, first aid, fire fighting). These are not considered as effective controls because they do not prevent people being exposed to hazards, but they still have a role in reducing the likelihood of harm if primary control of a hazard is lost.

### 6.1 Safe systems of work

Although below hazard elimination and physical barriers in the hierarchy of risk control, the way tasks are performed is an important part of managing risks. Often there will be many different ways of doing the same activity, but some will be safer than others. This is why it is important to define safe systems of work.

A safe system of work is a method of working that is designed to eliminate, if possible, or otherwise reduce risks to health and safety. It should consider:

- The physical lay-out of the job;
- The sequence in which the work is to be carried out;
- The provision of warnings, instructions, procedures and notices;
- Competence requirements;
- Tools, equipment and other resource requirements;
- The role and importance of supervision.

Safe systems of work should consider the need to change methods during an activity (i.e. in response to related and unrelated events) and constraints of work (i.e. when the activity should stop). A clear definition of what success will look like will help everyone understand what is required.

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## 6.1.1 Procedures

A true definition of the word procedure is a method of performing a task. However, in a work setting, especially where health and safety is concerned, reference to procedures is usually related to a method that is written down and available on paper or possibly on a computer screen.

Unfortunately reading and following procedures is not something people usually like doing. This is especially the case for experienced people who may have performed a task many times before. Although there are some things that can be done to enforce the use of procedures, the reality is that this can be a long and fruitless battle. Instead it is important to think carefully about the role of procedures in risk management. Where they are considered necessary, making sure they are fit for purpose makes it more likely they will be used. In particular procedures need to:

- Be easy to find when needed;
- Presented clearly and concisely;
- Legible and easy to read;
- Use diagrams, pictures, flowcharts and checklists where appropriate;
- Be accurate and up to date;
- Used during training;
- Form the basis or benchmark for competence assessment.

It is most critical that procedures describe practical and realistic methods for performing tasks that are also safe. There are too many 'safe' procedures that can not be followed or are too longer winded to get the job done. Involving end users in the development of procedures is a very good way of making sure procedures are useful and used.

There is a balance to strike with the number of procedures provided. Having too many will make it more difficult to find the one needed and tends to discredit the whole system, which may be perceived as being overly bureaucratic. Therefore, procedures should only be provided where there is a risk and where the procedure is able to make a positive contribution.

There are many cultural factors that affect whether procedures are used (or not). A positive culture means that everyone understands that using procedures for critical tasks is normal and expected. This avoids a macho culture where procedures are only considered necessary for trainees and other people who do not know what they are doing.

*Reference – 'HSE Human Factors Briefing Note No. 4 – Procedures' available free at <http://www.hse.gov.uk/humanfactors/comah/04procedures.pdf>*

## 6.1.2 Emergency procedures

It is vital that organisations make arrangements to deal with foreseeable emergencies and that everyone knows what to do if an emergency occurs.

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Procedures are an important part of these arrangements. The types of event that should be covered include fire, explosion, toxic release, someone being injured, bomb threat and security incidents.

Emergency procedures should explain how to:

- Raise the alarm if someone discovers an emergency situation;
- Initiate emergency response;
- Evacuate part or all of the premises;
- Carry out roll call and identify missing persons;
- Call emergency services;
- Deal with casualties;
- Declare the all clear.

Emergency procedures need to be particularly clear and concise; and readily available. People should be trained in them so they immediately know what to do. However, managing an emergency is a demanding and stressful activity and hence prone to error. Anyone with a significant role should refer to procedures during emergencies, no matter how well trained they are.

People with disabilities require special attention when developing emergency procedures. A 'Personal Emergency Escape Plan' (PEEP) may be required for an individual if they may not hear and/or see a warning or may be unable to evacuate promptly without assistance.

### 6.1.3 Permit-to-work systems

Permit to work systems are fairly common, especially in hazardous industries. They are formal written systems used to manage risks by controlling certain types of work. They perform a number of key functions including:

- Ensuring work does not start until necessary preparations have been completed;
- Communicating information about hazards and controls to the work party;
- Defining what can and cannot be done whilst performing the task;
- Making sure people normally in charge of the plant, equipment and/or area know what work is being carried out;
- Providing a means by which the interaction between different pieces of work can be evaluated to identify any potential conflicts;
- Recording the locations that people are working in case there is an emergency;
- Providing a formal handback when work is suspended or completed, so that there is no ambiguity about who is in control of the plant, equipment or area at any time.

Permit-to-work systems are normally considered most appropriate for non-production work, especially maintenance and construction at operational site. This covers a vast array of work, and in some cases different types of permit are used.

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The types of work typically covered by a permit to work system include hot work, confined space entry, electrical work, use of radioactive material or explosives, excavations, pressure testing and opening up systems where there is the potential to release hazardous substances (because it cannot be proved that they are isolated and/or hazard free).

### 6.2 Personal Protective Equipment (PPE)

PPE is equipment that is intended to be worn or used to protect people against one or more health and safety risks. It includes safety helmets, gloves, eye protection, high-visibility clothing, safety footwear, safety harnesses, hearing and respiratory protection equipment, and clothing protecting against extremes of weather.

PPE is at the bottom of the hierarchy of risk control measures. This is because it only reduces the likelihood of harm rather than preventing exposure to a hazard. It is not 100% reliable and so all other risk control measures must be considered first to reduce exposure to hazards. PPE can then be considered to provide additional protection, or protect against accidental exposure.

#### 6.2.1 Selecting PPE

The correct type of PPE needs to be selected according to the hazard, task and characteristics of the person. The following issues need to be considered.

##### Eyes

- Hazards: chemical or metal splash, dust, projectiles, gas and vapour, radiation.
- Options: safety spectacles, goggles, face shields, visors.
- Consider: likelihood of exposure and consequences of contact with eyes and face. Force of impact. People wearing 'normal' glasses. Affect on vision and steaming up.

##### Head

- Hazards: impact from falling or flying objects, risk of bumping head on low structure, hair entanglement.
- Options: a range of helmets and bump caps.
- Consider: restriction of movement and vision, securing PPE so it does not fall off.

##### Breathing

- Hazards: dust, vapour, gas, oxygen-deficient atmospheres.
- Options: disposable filtering face piece or respirator, half- or full-face respirators, air-fed helmets, breathing apparatus.
- Consider: size of particles, concentration vs. time filter will remain effective, people with beards, potential for air breathed to bypass the filter (e.g. sucked in around the edge).

##### Protecting the body

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- Hazards: temperature extremes, adverse weather, chemical or metal splash, spray from pressure leaks or spray guns, impact or penetration, contaminated dust, excessive wear or entanglement of own clothing.
- Options: conventional or disposable overalls, boiler suits, specialist protective clothing (e.g. chain-mail aprons), high-visibility clothing, chemical suits (may include hood and can be pressurised).
- Consider: restriction of movement, flammability of material, cleaning vs. disposal, preventing ingress at cuffs.

### Hands and arms

- Hazards: abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, skin infection, disease or contamination.
- Options: gloves, gauntlets, mittens, wristcuffs, armllets.
- Consider: need for arm protection, restriction of movement, resistance to abrasion and cuts, resistance to substances, cleaning vs. disposal.

### Feet and legs

- Hazards: wet, electrostatic build-up, slipping, cuts and punctures (including walking on sharp objects), falling objects, metal and chemical splash, abrasion.
- Options: safety boots and shoes with protective toe caps and penetration-resistant mid-sole, gaiters, leggings, spats.
- Consider: need for ankle support, slip resistance, waterproof, static acting as ignition source.

### Hearing

- Hazards: noise.
- Options: ear defenders, ear plugs.
- Consider: noise levels, duration to be worn, impact on communication, contamination of ear plugs.

## 6.2.2 PPE Legislation

Personal Protective Equipment at Work Regulations 1992 (as amended) apply to all PPE, except hearing protection and respiratory protective equipment, which are covered by other legislation. They require:

- Proper assessment before use (i.e. necessary to consider other controls before specifying PPE);
- PPE must be provided free of charge;
- Must be maintained and stored properly;
- People must be given instructions on how to use it safely;
- Employees must use it correctly and report any defects.

*Reference – ‘A short guide to the Personal Protective Equipment at Work Regulations 1992’ free available at <http://www.hse.gov.uk/pubns/indg174.pdf>*

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### 6.3 Safety signs

There is a convention for the colours of safety signs. It is

RED - Prohibition, danger or alarm;

YELLOW or AMBER – Warnings;

BLUE – Mandatory instructions;

GREEN – Emergency information, escape etc.

Whilst signs are important, their effect is limited, and after someone has seen the same sign a few times they are unlikely to notice it. Also, too many signs can be confusing and dilute the message. Therefore, whilst a useful addition, signs are not good risk control measures.

*Reference – ‘Signpost to the Health and Safety (Safety Signs and Signals) Regulations 1996’ free available at <http://www.hse.gov.uk/pubns/indg184.htm>*

### 6.4 Making sure people implement risk controls

#### 6.4.1 Competence

Having competent people is a key element of any safe system of work. Competency is the ability to perform an activity safely and to a specified standard by having the necessary skills, knowledge, understanding and attitude. This can apply to individuals and groups of people.

#### 6.4.2 Training

Training is one factor in someone becoming competent. However, training on its own does not make someone competent as that usually requires experience, other forms of education and having the right attitude.

Training comes in many different forms including people attending training courses and learning ‘on the job.’ Unfortunately a lot of training is ineffective because the objectives (i.e. what is needed to do the job safely) are not clearly defined and because the retention of training is not tested afterwards. Therefore, it is important that competency requirements are fully understood, training needs are evaluated (i.e. identifying which of the competency requirements an individual does not have), selecting the correct method of training and assessing competence after training.

#### 6.4.3 Induction training

People new to a job or work location are particularly vulnerable to having accidents because they may not know what hazards are present or the systems in place to control risks. Induction training can be a useful way of getting key messages over and making sure people start out with the right knowledge and attitude.

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Induction training should cover the following:

- Health and safety policy;
- The main hazards present;
- Risks and control measures;
- Safety rules;
- Use of PPE;
- Supervision arrangements;
- Emergency procedures;
- First aid arrangements;
- Welfare facilities;
- Reporting incidents.

A tour of relevant parts of the premises, pointing out hazards, safe routes, emergency call points and muster locations can be particularly useful.

*Reference – ‘Leading learning and skills – guidance for employers’ available free at <http://www.hse.gov.uk/campaigns/euroweek2006/pdfs/lscemployers.pdf>*

### 6.4.4 Visitors

Visitors to premises are usually intending to stay for a short time, and so it is not normally practical to give them full induction training. However, they can still be at risk and this needs to be controlled.

The first thing to consider is safe access to the premises when they first arrive. It should be clear where visitors are supposed to go, how they can get there safely and what they do when they arrive. If reception facilities cannot be arranged at the entrance, a safe route should be marked out with signs at the entrance informing visitors that they must stay on this route.

Once they have arrived it is usually safest to have the visitor accompanied by someone who knows the risks, rules and procedures (e.g. employee or fully inducted contractor). In a low hazard environment (e.g. office) this may not be necessary. In this case some simple instructions should be issued about where they can and cannot go, what they can and cannot do, how to contact someone if they need to and what to do if the emergency alarms sound.

### 6.4.5 Supervision

Supervision does not seem to be a very 'trendy' subject at the moment, with far more interest being shown in self-managed teams and the like. However, supervision is an important management function when it comes to managing safety, and not matter what way teams are organised it needs to be carried out.

Supervision has a key role in:

- Ensuring people know and stick to safety rules;

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- Ensuring people are competent to do their job and know their limitation;
- Ensuring teams have an appropriate competence mix (including when normal members are absent);
- Providing leadership in emergencies;
- Ensuring incidents are reported and investigated;
- Facilitating communication within and outside the team, including between team members and management.

Supervision is not an easy job, and many people are not suited to it. A good supervisor will know his/her team very well, including their capabilities and limits. He/she will allow them a certain degree of free reign, but know when intervention is required.

### 6.5 Human error

Studies suggest that up to 80% of accident causes involve some form of human failure. These failures involve people:

- Meaning to do the right thing but making a slip or lapse of attention and ending up getting it wrong;
- Thinking they are doing the right thing, doing it perfectly but it turns out they made the wrong decision or selection at the start;
- Choosing to do the wrong thing in violation of a rule or procedure.

It is important to understand that human failures are not random events and that they have causes. This means they can be predicted and their likelihood reduced. HSE guidance document HSG48<sup>3</sup> shows that the causes fall into three main categories:

- Job factors - illogical design of equipment, disturbances and interruptions, poor instructions, poorly maintained equipment, high workload and unpleasant working conditions;
- Individual factors - low skill and competence levels, tired staff, bored or disheartened staff or individual medical problems;
- Organisational and management factors - 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, poor health and safety culture.

Understanding the root causes of human failures and general performance problems is essential if effective solutions are to be developed.

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<sup>3</sup> HSG48 Reducing error and influencing behaviour. Published by Health and Safety Executive 1989

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### 6.5.1 Types of human error

There are many different types of error, but most fall into the following categories:

- Omitting an action;
- Doing the wrong action;
- Doing the right action on the wrong object;
- Doing the action too soon or too late;
- Doing the action too quickly or too slowly.

This list can be used during risk assessments to consider the potential consequences of different types of error.

### 6.5.2 Communications errors

Error is a natural part of human communication. It occurs when someone understands a message differently to the way sender of the message intends. Communication errors are particularly common when one person is much more knowledgeable than another (i.e. experienced person talking to a trainee).

One-to-one face-to-face communication is usually most reliable because people have an opportunity to discuss the message so that both parties can be sure it has been understood properly. Of course that requires the people to choose to discuss. Other forms of communication including remotely (i.e. by telephone or radio) and written usually cause more errors.

### 6.5.3 Risk perception

One reason why people fail to pay sufficient attention to what they are doing or choose to either not read a procedure or to knowingly violate it is because their perception of the risk is less than reality (i.e. they think they are safer than they really are). Equally there are many high profile cases where people perceive the risk of something to be higher than it probably is (e.g. nuclear power, travelling by train in the days after an accident).

The reality is that people are pretty poor at evaluating risks. Lack of knowledge clearly has an influence, but there are greater powers at work. Complacency is one of these, and is a natural reaction when people become familiar with a hazard so that they can almost forget it exists. Also, people seem to make an automatic evaluation of risks vs. benefits, and will instinctively accept a risk where they feel the benefit is worthwhile. Road travel is a good example. People are happy to continue this activity even though an average of 10 people die per day on UK roads, but would not accept anything like this risk from any work setting.

The challenge for health and safety is to get people having a realistic perception of risks. We want them to understand that there are reasons for controls, but we do not want them to become overly risk averse as this can stifle the business and stops people actually engaging with the risk management process. Getting this level of understanding is not easy, and will require continuous attention. As with many things, communication is the key and will involve finding ways of informing people about risks in a way they will understand.

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### 6.5.4 Motivation

As well as a realistic perception of risk, people need to be motivated to work safely. In general terms people at work are motivated by:

- Skill variety – not having to do the same thing all day every day;
- Task significance – feeling their job is making a difference;
- Task identity – understanding how their contribution fits in to the bigger picture;
- Autonomy – having some control over how they do their task;
- Task feedback – getting information that they are doing their job well.

These can present a challenge to health and safety. In particular, the desire for variety and autonomy can lead to people deviating from laid down procedures. Also, if people do not perceive the risks to be high, some of the activities they do for safety can seem to have little significance.

Avoiding too much unnecessary prescription in the way things are done can assist in motivating people. It has the added benefit that people understand that when methods are being prescribed that there is a safety reason. It helps if the safest way of doing a job is the easiest and most efficient as people are more likely to choose these methods over others. Putting it simply, people like to take short-cuts, and so it is best to make the short-cut the safest method available rather than trying to stop them taking it.

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## A note about the text

This is an excerpt from Health and Safety 2008 written by Andy Brazier, which covers all the key elements of health and safety as it stands as a discipline at the end of 2007. The book provides a quick reference, focussing on hazards in the workplace and practical controls of risk. The aim has been to present the health and safety processes so that, if these are understood, appropriate solutions to a very large range of health and safety issues can be developed. It provides links to freely available HSE guidance throughout.

The book has been arranged, to a large extent, around the syllabus of the NEBOSH National General Certificate (NGC). This is because the syllabus appears to provide a very comprehensive overview of all the key issues of health and safety. Also, by doing this it is hoped that the book will be a useful aid to people studying for the certificate, acting as a supplement to training material from course providers or to assist in self-study.

The draft text of the whole book is available at <http://healthandsafetycertificate.blogspot.com/>

If you would like a copy of the book or more information go to Andy's website at <http://www.andybrazier.co.uk/Health&safety/book.htm>