UNIT - 7 Occupational Health Risks

Learning Outcomes
By the end of this unit the learner will be able to:

Unit 7

Occupational Health Risks

Occupationalhealthrisks

Safety risks in construction have been recognised for some time. Occupational health risks have only recently started to be addressed. The main health risks in construction are:

- musculoskeletal disorders: back and other muscle and joint injuries (see *Moving, lifting and handling loads*);
- hand-arm vibration syndrome: pain and numbness in the fingers and hands caused by the use of vibrating tools (see paragraphs 463-474);
- dermatitis: redness and inflammation of the skin related to exposure to hazardous substances such as cements and solvents (see paragraphs 419-424);
- noise-induced hearing loss: deafness or ringing in the ears caused by exposure to high levels of noise;
- asbestos-related diseases (see paragraphs 432-448).

Hazardous substances and processes

Any hazardous substances that are going to be used, or processes which may produce hazardous materials, should be identified. The risks from work that might affect site workers or members of the public should then be assessed. Designers should eliminate hazardous materials from their designs. Where this is not possible, they should specify the least hazardous products which perform satisfactorily.

Contractors often have detailed knowledge of alternative, less hazardous materials. Designers and contractors can often help each other in identifying hazardous materials and processes and suggesting less hazardous alternatives.

If workers use or are exposed to hazardous substances as a result of their work, the Control of Substances Hazardous to Health Regulations 2002[16] (COSHH) make it a legal duty to assess the health risks involved and to prevent exposure or else adequately control it. There are separate regulations for asbestos and lead – the Control of Asbestos at Work Regulations 2002[17] and the Control of Lead at Work Regulations 2002.[18]

Identification

People may be exposed to hazardous substances either because they handle or use them directly (eg cement and solvents), or because the work itself results in the creation of a hazardous substance (eg scabbling concrete generates silica dust). Identify and assess both kinds of hazard.

If hazardous substances are going to be used, manufacturers and suppliers of such substances have a legal duty to provide information. Read the label on the container and/or the safety data sheet. Approach the manufacturer or supplier directly for more information if necessary.

Some hazardous substances may be on site before any work starts, eg sewer gases or ground contaminants. Assess these risks in the same way as for other hazardous substances. Information to help identify these risks may be available from the client, the design team or the principal contractor and should be contained in the pre-construction-stage health and safety plan.

Assessment

Look at the way people are exposed to the hazardous substance in the particular job that they are about to do. Decide whether it is likely to harm anyone's health. Harm could be caused by:

- **Breathing in fumes, vapours, dust:** does the manufacturer's information say that there is a risk from inhaling the substance? Are large amounts of the substance being used? Is the work being done in a way that results in heavy air contamination, eg spray application? Is the work to be done in an area that is poorly ventilated, eg a basement? Does the work generate a hazard, eg hot cutting metal covered with lead causes lead fumes to be given off?
- **Direct contact with skin:** does the manufacturer's information say there is a risk from direct contact? How severe is it, eg are strong acids or alkalis being used? Does the method of work make skin contact likely, eg from splashes when pouring from one container to another, or from the method of application?
- **Swallowing or eating contaminated material:** some materials can contaminate the skin and hands. The contamination can then be passed to a person's mouth when they eat or smoke. This is a particular problem when handling lead and sanding lead-based paint. Make sure people do not smoke or eat without washing first.

Once a full assessment has been completed and where the same work is being done in the same way under similar circumstances at a number of sites, the risk assessment does not have to be repeated before every job but you should check it to make sure there are no real differences. You should continuously look out for new safer ways of working and new products, which could be safer substitutes.

If, however, there are many processes that result in different hazardous substances being used in a wide range of circumstances, a fresh assessment may be needed for each job or set of similar jobs. This will make sure the assessment is relevant to the job being done and the circumstances in which it is being carried out.

Remember to assess both immediate risks, eg being overcome by fumes in a confined space, and longer-term health risks. Materials like cement can cause dermatitis. Sensitising agents like isocyanates can make people using them have sudden reactions, even though they may have used the substance many times before.

Prevention

If harm from the substance is possible, the first step to take is to try and avoid it completely by not using it at all. This will mean either:

- doing the job in a different way, eg instead of using acids or caustic soda to unblock a drain, use drain rods; or
- using a substitute substance, eg instead of using spirit-based paints, use water-based ones, which are generally less hazardous. However, always check one hazard is not simply being replaced by another.

Control

If the substance has to be used because there is no alternative, or because use of the least hazardous alternative still leads to significant risk, the next step is to try and control exposure. Some of the ways this could be done include:

- transferring liquids with a pump or siphon (not one primed by mouth) rather than by hand. Keep containers closed except when transferring;
- rather than spraying solvent-based materials, use a roller with a splash guard or apply by brush;
- using as little of the hazardous substances as possible – don't take more to the workplace than isneeded;
- using cutting and grinding tools and blasting equipment fitted with exhaust ventilation or water suppression to control dust;
- ensuring good ventilation in the working area by opening doors, windows and skylights. Mechanical ventilation equipment might be needed in some cases.

Personal protective equipment

If, **and only if**, exposure cannot be adequately controlled by any combination of the measures already mentioned, you will need to provide personal protective equipment (PPE).

Any PPE must be selected with care. Choose good quality equipment which is CE-marked. Let the user of the equipment help choose it – they will be more willing to wear it. Explain to the user why the equipment has to be worn and the hazard(s) the equipment protects against.

Respiratory protection

Respirators can protect against dusts, vapours and gases. There are many types of respiratory protective equipment (RPE), including:

- disposable face mask respirators;
- half-mask dust respirators;
- high-efficiency dust respirators;
- positive-pressure powered respirators;
- ventilator visor or helmet respirators;
- compressed air line breathing apparatus;
- self-contained breathing apparatus.

Make sure the respirator is the correct type for the job; dust masks may not protect against vapours or vice versa. If the respirator has replaceable cartridges, make sure the correct type is fitted, that they have not become exhausted or clogged and are still in date (many filters have a limited shelf life). Have replacement filters available.

A competent person should select RPE that is both suitable for the user and the job, as this choice will depend upon a number of factors, including:

- the nature of the hazards and materials;
- the measured level of the contaminant;
- the period ofexposure;
- if working outdoors, the prevailing weather conditions;
- suitability for each user, such as field of vision, provision for communication and the ease of movement in cramped working places, eg confined spaces.

It is essential that respirators fit well around the face. Make sure the user knows how to wear the equipment and check for a good face seal. Respirators do not seal well against a beard, so when the user has a beard, alternative protection is needed, such as air-fed visors, which do not rely on a good face seal.

Users need to know how the respirator should be fitted and operated and what maintenance checks they should carry out. Supervise the user to make sure they are using the respirator properly and regularly checking it for damage.

Make sure the respirator does not become a source of contamination by keeping it clean. Store it in a clean box or cupboard – don't leave it lying around in the work area.

Skin protection

Dermatitis is an inflammatory skin condition caused by certain irritants contained in many industrial materials. There are two general types:

- irritant dermatitis: usually caused by the skin coming into contact with an irritant substance. Anyone can be affected and the strength of the irritant together with the duration of exposure will affect the seriousness of the complaint;
- sensitising dermatitis: where a person develops an allergic reaction to a substance. The reaction may follow weeks, months or even years of use without any ill effects but once it has occurred, any future exposure to the substance will produce an adverse reaction.

Reaction of the skin to an irritant varies from one individual to another. The reaction may be only a mild redness but this can develop into swelling, blisters and septic ulcers that are both unsightly and painful (see Figure 46). In addition to dermatitis, some substances can cause other skin problems, such as oil acne from bitumen-based products and skin ulcers from corrosive substances.

Figure A person suffering from dermatitis

In the course of their work, construction workers may come into contact with many skin irritants. The most common types include:

- cement, lime and plaster;
- paint;
- tar, pitch and bitumen;
- solvents, thinners and de-greasers;
- certain epoxy, acrylic and formaldehyde resins;
- mineral oils and grease.

Where protective clothing is provided (such as overalls and gloves), it must be of the right type to protect the wearer against the particular hazard they are going to encounter. All manufacturers offer advice on the most suitable gloves for specific types of hazard. When using gloves to help prevent dermatitis, users must avoid getting contaminants inside the gloves when putting them on and taking them off.

It is also essential to provide washing facilities, with a supply of hot and cold (or warm) running water, soap and a means of drying the hands, to help prevent dermatitis.

Advice on general PPE is contained in paragraphs 530-546, and advice on measures to protect against noise and vibration can be found in the sections specific to those topics.

Personal hygiene

Substances can also be a hazard to health when they are transferred from workers' hands onto food, cigarettes etc and so taken into the body. This can be avoided by good personal hygiene, eg by:

- washing hands and face before eating, drinking and smoking and before, as well as after, using the toilet;
- eating, drinking and smoking only away from the work area.

In cases where clothing may become contaminated, people should change out of this clothing before eating and drinking.

Make sure those at risk know the hazards. Provide good washing facilities and somewhere clean to eat meals. Good clean welfare facilities can play an important part in protecting the health of everyone involved in the work.

Make sure as few people as possible are exposed to hazardous substances by excluding people not directly involved in the work from the contaminated area.

Further details of COSHH requirements, including the text of the Regulations themselves, are given in the COSHH *Approved Code of Practice and guidance*.[19]

Health surveillance

Sometimes workers' health can be protected by checking for early signs of illness. Such surveillance is a legal duty in a restricted range of cases for work involving some health risks such as asbestos. Surveillance may be appropriate in other cases, eg for workers regularly engaged in blast-cleaning surfaces containing silica, or where workers are exposed to high levels of noise or hand-arm vibration, especially for long periods.

Where appropriate, arrangements should be made for workers to have regular examinations by an occupational health professional to detect early signs of skin complaints, such as dermatitis. In addition, workers should be encouraged to carry out 'self-checks' and report skin irritations to their supervisor at an early stage.

Asbestos

Asbestos-related diseases kill more people than any other single work-related cause. All types of asbestos can be dangerous if disturbed. The danger arises when asbestos fibres become airborne. They form a very fine dust which is often invisible. Breathing asbestos dust can cause serious damage to the lungs and cause cancer. There is no known cure for asbestos-related disease.

The more asbestos dust inhaled, the greater the risk to health. Until recently it was thought that those dying from asbestos-related diseases were regularly exposed to large amounts of asbestos. It is now thought that repeated low exposures or occasional high exposures to asbestos can lead to asbestos-induced cancers, although the exact scale of risk at lower levels of exposure is unknown. Therefore precautions should always be taken to prevent exposure, or where this is not practicable, to keep it to a minimum. Workers such as plumbers, electricians and heating engineers may not consider that they work with asbestos, but they might regularly drill, cut and handle materials containing asbestos and need to be protected.

The free HSE leaflet *A short guide to managing asbestos in premises*[20] contains essential guidance for those who own, occupy, manage or have responsibilities for non-domestic premises that may contain asbestos.

Asbestos is a very durable fibre. It was widely used in materials where resistance to heat or chemical attack was important and to give strength to cement products such as insulation boards, corrugated roof sheets and cement guttering and pipe work. Sprayed asbestos coatings have also been used to reduce noise.

In May 2004, regulation 4 of the Control of Asbestos at Work Regulations 2002[17] came into force. Since then, anyone responsible for maintenance and repair of a commercial or industrial property has an explicit duty to identify asbestos in the premises and manage the risk. In summary, this means they must:

- check whether there is any asbestos present;
- check on its condition;
- assume the material contains asbestos unless there is strong evidence to the contrary;
- assess the risks from any asbestos-containing material;
- take action to manage the risk so that no one will unknowingly disturb asbestos; and
- provide information about the material to anyone likely to disturb it.

Building and maintenance contractors should no longer be unsure about when they will come across asbestos in commercial buildings as, under the duty to manage asbestos in non-domestic premises, the building owner/occupier is required to provide information about the presence of asbestos on their premises. Often the presence of asbestos will not be obvious and it is not always easy to identify asbestos from its appearance. Unless the building owner can produce clear records to show that the area where work is to be done is free from asbestos, it is sensible to assume that any buildings constructed or refurbished before the 1990s are likely to contain asbestos-based materials. Figure 47 shows some of the typical locations for the most common asbestos-containing materials.

Figure Typical locations for the most common asbestos-containing materials

Roof an dexterior walls

Boiler, vessels and pipe work

11 Rope seal on boiler access hatch and between cast iron boiler sections

Ceilings

Interior walls/panels

Flooring materials

suspended floor

Air handling systems

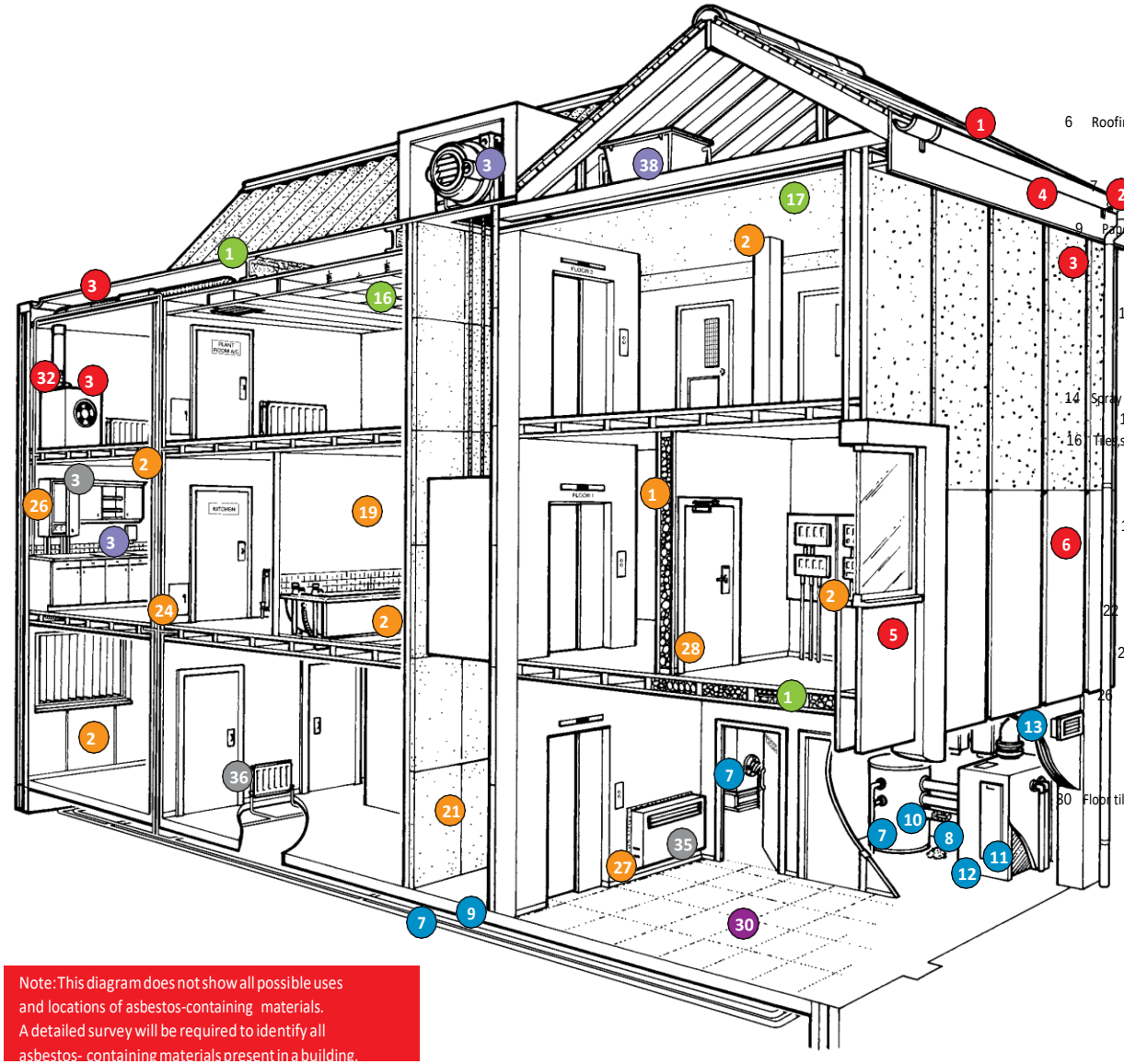
32 Gaskets
33 Anti-vibrationgaiter

Domestic appliances

34 Gaskets,ropesealsandpanelsindomesticboilers
35 'Caposil' insulating blocks, panels, paper, stringetcindomesticheater
36 String seals onradiators

Other

37 Fire blanket
38 Water tank
39 Brake/clutch lining



Note: This diagram does not show all possible uses and locations of asbestos-containing materials. A detailed survey will be required to identify all asbestos- containing materials present in a building.

1 Roof sheets, slates and tiles
2 Guttering and drainpipe
3 Wall cladding
4 Soffit boards
5 Panel beneath window
6 Roofing felt and coating to metal wall cladding
7 ging on boiler, pipework, calorifier etc.
8 Damaged lagging and associated debris
9 Paper lining under non-asbestos pipe lagging
10 Gasket in pipe and vessel joints
12 Paper lining inside steel boiler casing
13 Boiler flue
14 Spray coating to ceiling, walls, beams/columns
15 Loose asbestos in ceiling/floor cavity
16 Tiles, slats, canopies and fire breaks above ceilings
17 Textured coatings and paints
18 Loose asbestos inside partition walls
19 Partition walls
20 Panel beneath window
21 Panel lining to lift shaft
22 Panelling to vertical and horizontal beams
23 Panel behind electrical equipment
24 Panel on access hatch to service riser
25 Panel lining service riser and floor
26 Heater cupboard around domestic boiler
27 Panel behind/under heater
28 Panel on, or inside, fire door
29 Bath panel
30 Floor tiles, linoleum and paper backing, lining to
31 Lagging

Do not carry out any work that is likely to expose employees to asbestos unless an adequate assessment of exposure has been made. This means that the building or area of the building where work is to be done should be checked to identify the location, type and condition of any asbestos that could be disturbed during the work.

Some of the most common materials containing asbestos are:

- boiler and pipe-work coatings and laggings;
- sprayed coatings providing fire or acoustic insulation;
- insulation board;
- cement-based sheets and formed products, such as facias, soffits, gutters and downpipes etc;
- ceiling (and some floor) tiles;
- gaskets and paper products used for thermal and electrical insulation;
- some textured surface coatings.

Figure a Asbestos-insulated water pipes showing evidence of maintenance work damage, with detached preformed sections and calico wrapping

Figure b Poorly tamped sprayed chrysotile fireproofing on a structural steel beam holding up a concrete floor, showing some overspray onto the concrete and damage by electrical work

Figure c Painted asbestos insulating board facing to a fire door with some damage around the door furniture

Figure 48d Asbestos cement downpipe, hopper and profile sheet

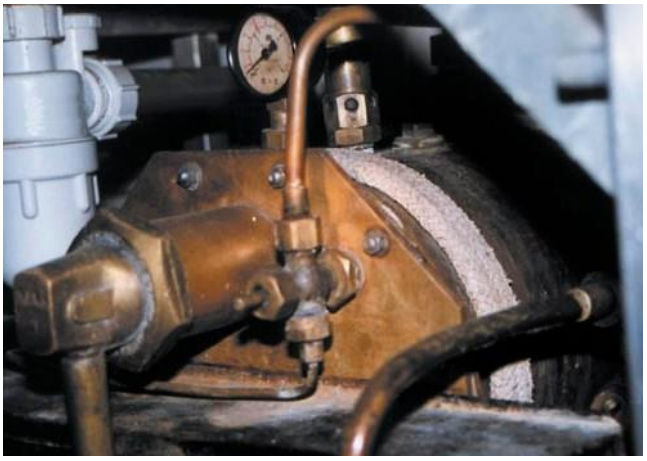


Figure 48f Asbestos rope seal in a domestic gas boiler

Figure e Asbestos-containing vinylfloor tiles

Figure g Painted asbestos-containing textured coating on a ceiling

Further information can be found in *Working with asbestos in buildings*,[21] which contains essential guidance for workers in the maintenance or building refurbishment trades.

In general, the softer the material, the more easily it is damaged and the more likely it is to release fibres when disturbed or worked on. The greater the fibre release, the greater the risk to health it will generate and the higher the standard of precautions required when working with that material. Many of the softer materials, eg boiler lagging, will be protected by a hard outer coating. If the protective outer coating could be inadvertently damaged during the work, take precautions either to protect it or to ensure that if it is damaged, the subsequent release of asbestos will not create a risk. Work in which asbestos insulation, asbestos coating or asbestos insulating board is removed, repaired or disturbed will normally have to be carried out by a specialist contractor licensed under the Asbestos (Licensing) Regulations 1983, as amended.

If asbestos (or what is suspected to be asbestos) that was not identified during the initial assessment is discovered, stop work. Evacuate the area and protect the asbestos from further damage until it has been decided how work can proceedin safety. If there is doubt about the presence of asbestos, seek the advice of a specialist analyst.

All work with asbestos and the precautions needed are covered by the Control of Asbestos at Work Regulations 2002[17] and the supporting *Approved Code of Practice and guidance*.[23] The Regulations place a duty on an employer to prevent the exposure of employees to asbestos, or to reduce exposure to the lowest reasonably practicable level. So, if possible, a work method which avoids any disturbance of asbestos-containing materials should be chosen. If this is not possible, before carrying out any work that is liable to expose employees (or others) to asbestos, make an assessment of the likely exposure.

It is important to make this assessment even when exposure to asbestos is infrequent and only happens by chance, eg during building refurbishment or repair work such as gas fitting, plumbing or electrical work. The assessment will help in deciding what precautions need to be taken to protect people who may be affected by the work.

Apart from a few limited exemptions, the Asbestos (Licensing) Regulations 1983[22, 24] prohibit contractors working on asbestos insulation, asbestos coating or asbestos insulating board unless they have a licence issued by HSE. This isspecialist work usually requiring the erection of enclosures around the work, filtered and powered ventilation for the enclosure, high-efficiency powered respirators and separate changing and showering facilities.

Essential points to remember when working with small quantities of hard asbestos-containing materials:

- There is no requirement for a licence to work on asbestos-cement sheet, or with asbestos-cement products like ducts and pipe work, but the work must be done in compliance with the Control of Asbestos at Work Regulations 2002.[17] Make sure the material comes within the definition of asbestos cementbefore starting work by having a density measurement taken. An assessment of exposure is always required. Avoid exposure to airborne dust and provide necessary protective equipment, including respirators. **Only use respirators to control exposure after all other steps to reduce exposure have been taken.** Further information can be found in the publication *Working with asbestos cement*.
- Apart from a few exemptions, work with asbestos coating, asbestos insulation, or asbestos insulating board requires a licence. Before starting work, check whether a licensed contractor should be doing it.
- Where exposure is to low levels of fibre, eg when removing small numbers of good condition ceiling tiles or drilling a few holes as part of plumbing or electrical work, disposable respirators may give adequate protection. For more extensive work involving breaking boarding or handling damaged materials, more precautions will be necessary, such as full-face respirators, disposable overalls and ventilated enclosures, as required when working with lagging.
- Don't break asbestos board or sheeting; try to remove it as an undamaged piece. Where sheet has to be worked on, wet it first. Handle the material carefully – don't drop materials onto the floor or ground. Pick up loose pieces immediately. If working outdoors (eg taking down roof sheets) make sure vehicles don't run over sheets at ground level – this results in high dust levels.
- Use hand tools – drilling and cutting sheet with power tools produces a lot of dust. Use the working methods and precautions described in the asbestos guidance referred to in this section. Avoid blasting, sanding and grinding the material.
- If asbestos materials are removed, they must be disposed of safely. Board and sheet materials should usually be wrapped and sealed in polythene sheet and marked to indicate the presence of asbestos. Only specified tips accept asbestos-containing waste; check with the appropriate waste authority who will be able to provide information on the relevant hazardous waste legislation.

The Asbestos (Prohibitions) (Amendment) Regulations 1999[26] prohibit the import, supply and use of all typesof asbestos and products containing them, apart from a few exemptions allowing the continued use of chrysotile (white) asbestos in very specialised circumstances.

Further guidance is available in *Introduction to asbestos essentials*[27] and *Asbestos essentials task manual*,[28] which contains task guidance sheets for short-duration work with asbestos-containing materials, aimed at the building maintenance and allied trades.

Noise

Regular exposure to high noise levels causes deafness or tinnitus (a permanent sensation of noise and ringing in the ears) – the longer the exposure and the higher the noise level, the greater the degree of hearing loss. It may only be when damage caused by exposure to noise over the years combines with normal hearing lossdue to ageing that people realise how deaf they have become. This hearing loss is incurable anddistressing.

Employers have duties to control this risk under the Control of Noise at Work Regulations 2005,[29] which sets out levels at which action must be taken. The exposure of anyone to noise from work activities should be assessed and controlled. Where risks to hearing have been controlled to the lowest level practicable, hearing protection should be provided if risks remain.

Noise on construction sites usually comes from machinery used for demolition, excavation or piling and from compressors and concrete mixers etc. Other operations, such as hammering, riveting and the use of cartridge-operated fixing tools, may also be the source of excessive noise. Check which work will involve noisy equipment. Assess how much the noise from this work is going to affect people working at the site.

The manufacturers and suppliers of equipment have a legal duty to provide information on the noise their equipment produces. This information should give a good idea if there is likely to be a noise problem. Go back to the manufacturer or supplier if the information is not clear. Where possible, choose low-noise tools and equipment.

Poor maintenance of tools can lead to increased noise levels. You need to make sure that equipment is properly maintained and that any noise reduction measures, such as pneumatic silencers, are kept in place.

Assessment

Look at how equipment will actually be used on site. Can the person using the equipment talk to someone 2 m away without having to shout to be understood?

If they have to shout, the noise from the equipment is probably loud enough to damage their hearing, so action will have to be taken.

Get the noise levels assessed by someone with the skill and experience to measure noise and who can identify what needs to be done. In the meantime, offer workers ear defenders (earmuffs or earplugs) to wear.

Tell all workers exposed above the action levels that there is a risk to their hearing, what is being done about it and what they are expected to do to minimise the risk.

Prevention

Can the job be done in another way that does not involve using noisy equipment? If not, can a quieter item of equipment be used? When buying or hiring equipment, choose the quietest model. Try and carry out the noisy job well away from where other people are working. Move workers who are not involved out of the noisy area. Erect signs to keep people out of the noisy area.

Control

Try and reduce the noise at source, eg fit mufflers to breakers, drills etc. Keep the covers closed on compressors. Most modern compressors are designed to run with all covers closed, even in hot weather. Make sure the silencers on mobile plant are in good condition. Maintain equipment regularly to prevent noise from loose bearings and leaky compressed-air hoses and joints.

Noise levels can be reduced by making sure the exhausts of compressors, generators and other plant are directed away from work areas. Screens faced with sound-absorbent materials can be placed around plant.

If it is not possible to eliminate the noise source or reduce the noise, provide workers with ear defenders (muffs or plugs). Providing hearing protection is **not** a substitute for noise elimination and control at source.

Carefully select ear defenders, keep them in good condition and train workers in their use. Ensure that they fit well and are kept in good condition. Make sure that where defenders are needed they are actually used. Check that the hearing protection does not interfere with other safety equipment, eg if ear defenders are difficult to wear with a hard hat, get defenders that fit onto the hat.

For further information read *Noise in construction*.[30]

Vibration

Many jobs in construction involve the use of hand-held power tools. The vibration from such equipment can cause hand-arm vibration syndrome (HAVS). This condition affects the fingers, hands and arms and, in the long term, causes permanent damage. Eventually parts of the fingers go white and numb and there is a loss of touch. This condition is often called ‘vibration white finger’.

Vibration damage to the fingers, hands or body is very much dose-related. The greater the exposure to vibration, the more likely there is to be damage. Other factors that can influence the degree of severity of hand-arm vibration syndrome include:

- the grip, push and other forces used to guide and apply the vibrating equipment. The tighter the grip, the more vibration energy is transferred to the hands;
- the exposure pattern, length and frequency of work and subsequent rest periods;
- the hardness of the material being worked upon; and
- factors that can affect blood circulation, such as workplace temperature, smoking and individual susceptibility.

While all vibration can be damaging, it is perhaps logical to assume that the faster a machine vibrates, the more dangerous it is, whereas in fact it is lower- speed vibrations (those between about 2 and 64 vibrations per second) that cause the most damage. Some of the tools used in construction that are likely to result in high levels of exposure to vibration are:

- road and concrete breaking drills;
- concrete vibro thickeners and concrete pokers;
- plate vibrators;
- chisels (air or electric);
- compressor guns;
- pneumatic and percussive drills;
- angle grinders;
- sanders and other similar 'rotary' tools;
- abrasive wheels;
- cutting-off wheels and discs;
- power hammers and chisels.

The Control of Vibration at Work Regulations 2005[31] give employers responsibilities to control the risk of vibration. They set out specific requirements relating to assessment, control and action levels.

If anyone uses hand-held power tools, they should identify, assess and prevent or control the risk from vibration.

The manufacturer or supplier's information should indicate if there is a vibration problem. Go back to the manufacturer or supplier if the information is not clear. Where possible, choose low-vibration tools.

Assessment

The information from the manufacturer or supplier, the amount of time the tools are used and discussions with the people using the tools should reveal the tools most likely to present a risk.

Make sure workers using vibrating tools know about the risks and what they need to do to minimise them. Further information for workers is provided by HSE's guidance *Hand-arm vibration: Advice for employees*.[32]

Prevention

Can the job be done in another way that does not involve using hand-held power tools (eg by using a hydraulic breaker to break a concrete beam rather than spending long periods using hand-held breakers or using a chemical method for pile capping or surface preparation)?

Control

Maintain equipment so that it is properly balanced, has no loose or worn out parts and blades/cutters are sharp etc. Use the power tool and attachment which will do the job properly in the shortest time.

It is good practice for workers to keep their hands warm to get a good flow of blood into the fingers by:

- wearing gloves;
- having hot food or drinks;
- massaging the fingers;
- not smoking (as this can cause narrowing of the blood vessels).

For further information on vibration, see HSE's guidance *Hand-arm vibration. The Control of Vibration at Work Regulations 2005. Guidance on Regulations*[33] and *Control the risks from hand-arm vibration. Advice for employers on the Control of Vibration at Work Regulations 2005.*[34]

Electricity

Electrical equipment is used on virtually every site. Everyone is familiar with it, but unlike most other hazards, which can be seen, felt or heard, there is no advance warning of danger from electricity, and **electricity can kill**.

Electrical systems and equipment must be properly selected, installed, used and maintained. Hazards arise through faulty installations, lack of maintenance and abuse of equipment. Accidents happen because people are working on or close to equipment which is either:

- assumed to be dead, but is in fact live; or
- known to be live, but workers have not received adequate training or adequate precautions have not been taken.

It is essential that the electricity power supply requirements are established before any work takes place. Arrangements for the electricity supply should be completed with the local electricity supplier and the supply system installed.Guidance on requirements for low voltage (ie 400 and/or 230 volt ac systems) can be found in BS 7671.[35]

Electrical equipment used on building sites (particularly power tools and other portable equipment and their leads) faces harsh conditions and rough use. It is likely to be damaged and therefore become dangerous. Modern double-insulated tools are well protected, but their leads are still vulnerable to damage and should be regularly checked.

Where possible, eliminate risks. Cordless tools or tools which operate from a 110V supply system, which is centre-tapped to earth so that the maximum voltage to earth should not exceed 55V, will effectively eliminate the risk of death and greatly reduce injury in the event of an electrical accident. For other purposes such as lighting, particularly in confined and wet locations, still lower voltages can be used and are even safer.

If mains voltage has to be used, the risk of injury is high if equipment, tools, leads etc are damaged, or there is a fault. Residual current devices (RCDs or trip devices as they are sometimes called) with a rated tripping current not greater than 30 mA with no time delay will be needed to ensure that the current is promptly cut off if contact is made with any live part.

RCDs must be installed and treated with great care if they are to save life in an accident. They have to be kept free of moisture and dirt and protectedagainst vibration and mechanical damage. They need to be properly installed and enclosed, including sealing of all cable entries. They should be checked daily by operating the test button. If mains voltage is to be used, make sure that tools can only be connected to sockets protected by RCDs. By installing an RCD at the start of the work, immediate protection can be provided. Even so, RCDs cannot give the assurance of safety that cordless equipment or a reduced low-voltage (such as 110V) system provides.

Mains equipment is more appropriate to dry indoor sites where damage from heavy or sharp materials is unlikely. Where mains leads to sockets may be damaged, they should be:

- positioned where they are least likely to be damaged, eg run cables at ceiling height; or
- protected inside impact-resistant conduit.

Alternatively, special abrasion-resistant or armoured flexible leads can be used.

Electrical systems should be regularly checked and maintained. Everyone using electrical equipment should know what to look out for. A visual inspection can detect about 95% of faults or damage. Before any 230V hand tool, lead or RCD is used, check that:

- no bare wires are visible;
- the cable covering is not damaged and is free from cuts and abrasions (apart from light scuffing);
- the plug is in good condition, eg the casing is not cracked, the pins are not bent and the key way is not blocked with loose material;
- there are no taped or other non-standard joints in the cable;
- the outer covering (sheath) of the cable is gripped where it enters the plug or the equipment. The coloured insulation of the internal wires should not be visible;
- the equipment outer casing is not damaged and all screws are in place;
- there are no overheating or burn marks on the plug, cable or the equipment;
- RCDs are working effectively, by pressing the 'test' button every day.

Workers should be instructed to report any of these faults immediately and stop using the tool or cable as soon as any damage is seen. Managers should also arrange for a formal visual inspection of 230V portable equipment on a weekly basis.

Damaged equipment should be taken out of service as soon as the damage is noticed. **Do not carry out makeshift repairs.**

Some faults, such as the loss of earth continuity due to wires breaking or coming loose within the equipment, the breakdown of insulation and internal contamination (eg dust containing metal particles may cause shorting if it gets inside the tool), will not be spotted by visual inspections. To identify these problems, a programme of testing and inspection is necessary. This testing and inspection should be carried out by someone trained to do this. As well as testing as part of the planned maintenance programme, combined inspection and testing should also be carried out:

- if there is reason to suspect the equipment may be faulty, damaged or contaminated, but this cannot be confirmed by visual inspection; and
- after any repair, modification or similar work to the equipment, which could have affected its electrical safety.

Similar checks to those recommended for 230V hand tools are appropriate for other site electrical equipment. Suggestions for inspections and test frequencies are set out in Appendix 1.

With lighting systems, provide protection for cabling in the same way as for tools. Protect bulbs against breakage. If breakage does occur, the exposed filaments may present a hazard. Make sure there is a system for checking bulbs to maintain electrical safety and also to keep the site well lit.

Tools and equipment should be suitable for site conditions. DIY tools and domestic plugs and cables are not designed to stand up to everyday construction work. Also observe other restrictions on use imposed by manufacturers.

If work is to be done in areas where there is a risk of flammable vapours (such as in a petrochemical works), it will be necessary to select specially designed electrical equipment to prevent it acting as a source of ignition due to sparks and overheating. Precautions should be covered in the project health and safety plan and the operator of the premises should be able to provide advice. Specialist advice may also be needed.

Further information on controlling electrical risks can be found in *Electrical safety on construction sites*.