



NEBOSH National General Certificate

UNIT NGC2

CONTROLLING WORKPLACE HAZARDS

ELEMENT 3: MUSCULOSKELETAL HAZARDS AND RISK CONTROL

SAMPLE MATERIAL

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Work-Related Upper Limb Disorders



Key Information

- Musculoskeletal disorders such as back pain and work-related upper limb disorder (WRULD) can result from repetitive tasks such as display screen equipment (DSE) use, checkout operation and bricklaying.
- Many factors influence ergonomic risk, such as repetition, force, posture, twisting, rest breaks, equipment design and adjustability, and workplace lighting.
- DSE use can cause WRULD, back pain and eye strain.
- Precautions for safe use of DSE include: ergonomic assessment of the workstation; provision of basic equipment; short, frequent breaks; eye tests; and the provision of information and training.

Musculoskeletal Disorders

If the workplace has been poorly designed, tasks are being carried out badly, the environment is poor or tools and equipment are poorly selected and used, then various ill-health effects will occur. The specific ill-health will depend on the work and the individuals concerned, but typical forms of ill-health associated with poor work design are:

- **Back injuries and back pain** – associated with repetitive handling or poor posture and movement whilst standing or sitting for long periods of time. Injuries such as back muscle strain, ligament strain and disc injury are common and a significant cause of workplace absence.
- **Work-related upper limb disorder (WRULD)** – a collection of conditions that affect the arms and hands. Examples include carpal tunnel syndrome (inflammation of a nerve in the wrist that causes tingling sensations, pins and needles, numbness in the fingers and arm pain) and tenosynovitis (inflammation of the tendon in the forearm that makes finger movement difficult and painful).
Early symptoms of WRULDs often include tingling sensations, numbness and discomfort but then progress to more severe pain and immobility. These conditions are sometimes referred to as repetitive strain injuries (RSIs).
- **Other chronic soft-tissue injuries** – associated with sitting, standing or kneeling for long periods of time at work. For example, painful knee joints as a result of having to kneel down to work under floorboards.

Collectively all these conditions can be referred to as **musculoskeletal disorders (MSDs)**.

High risk activities

The following repetitive activities all involve significant risk of musculoskeletal disorders:

- Display screen equipment (DSE) use.
- Factory assembly of small components.
- Bricklaying.
- Supermarket checkout operation.

Adapting the Workplace

The risk of musculoskeletal disorders can be reduced by adapting the workplace to suit the individual needs of workers. This is often referred to as applying an “ergonomic” approach.



Jargon Buster

Ergonomics

The study of the relationship between the worker, the work that they are doing, and the environment in which they are doing it.

Ergonomics is concerned with the interaction between people and:

- The tools, equipment or machinery that they are using (e.g. the ease of use of control panels).
- The workplace environment (e.g. suitability of lighting).
- Organisational factors (e.g. shift patterns, hours of work).



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The aim of ergonomics is to minimise ill-health effects and optimise efficiency by adapting the workplace to suit the individual. This means taking into account both a person's physical attributes (such as height, shape, muscle strength, etc.) and their mental attributes (processing speed, decision-making ability, etc.). For example, ergonomic principles can be applied to a manual handling operation to reduce the risk of injury.

MSD Risk Factors

Various factors influence the risk of musculoskeletal disorders from work activities. These relate to the task the worker is doing, the equipment they are using, and the environment they are working in. These factors can be applied to any repetitive work activity, whether it is factory assembly line work or bricklaying on a construction site.



An uncomfortable static posture leads to musculoskeletal disorders such as neck pain and knee pain



Topic Focus

Ergonomic factors that influence risk

- **Repetition** – the need for repetitive movements when carrying out the task (e.g. typing for several hours).
- **Force** – the physical force required to perform the task and the strain this puts on the body (e.g. closing steel catches on a machine).
- **Posture** – any requirement to adopt an awkward posture (e.g. stooping over into a bin to pick up components).
- **Twisting** – any twisting action required by the task (e.g. twisting the wrist when using a screwdriver).
- **Rest** – the potential for the worker to rest and recover from any fatigue (e.g. a worker on a production line cannot stop the line; they have to keep working even when fatigued).
- **Equipment design** – the shape of the equipment and how this affects ease of use (e.g. a large, shaped handle on a scraper makes it easier to hold and use).
- **Equipment adjustability** – the scope there is for the user to adjust the equipment to suit their personal preferences (e.g. the height of the seat for a computer user).
- **Lighting** – the availability of natural and artificial light and the effect on the worker's ability to see the work clearly.
- **Other environmental parameters** – in particular temperature, humidity and ventilation will directly affect the worker's ability to perform the task and their comfort.

If one or a combination of the above factors is inherent in the work, then ergonomic risk exists.

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Control Measures

Countless activities involve significant ergonomic risk. For example, bricklaying on a construction site involves several of the risk factors noted above: the work is repetitive; awkward posture and twisting is necessary; rest periods may be infrequent; and the work area may be extremely cold and windy or hot, humid and airless.

In general terms the control of ergonomic risk can be achieved by introducing changes to:

- the task and the way that it is done,
- the tools, equipment and machinery, and
- the workplace environment,

so as to suit the individuals carrying out the work.

In some cases, it may be appropriate to put restrictions on the individuals doing the work (i.e. restricting those people who have a known WRULD to light duties to avoid further injury). The first step in achieving controls is to undertake a risk assessment.

The following two examples (use of display screen equipment and work on a factory assembly line) illustrate the ill-health effects that can occur due to ergonomic risks and the possible control measures that may be implemented.

Display Screen Equipment: Risks

Use of display screen equipment (DSE) or computers and keyboards is a common workplace activity that has several associated ill-health issues:

- **WRULDs** – associated with repetitive use of the keyboard and mouse for long periods of time.
- **Eye strain** – temporary eye fatigue associated with prolonged use of the screen.
- **Back pain** – and other MSDs associated with sitting in a fixed position, perhaps with poor posture, for long periods of time.
- **Fatigue and stress** – associated with the type of work being done, e.g. call centre staff may be subjected to verbal abuse during telephone calls.

These health effects can occur when using desktop computers but are becoming increasingly common in association with the use of laptops when they are used for long-duration work.



The portability of laptops allows them to be used in a casual manner that is inappropriate for long-duration use

Display Screen Equipment: Control Measures

Control measures appropriate for DSE use:

- Carry out a workstation assessment of the user's workstation to ensure that the equipment and environment meet minimum standards and that the workstation can be adjusted to suit the user.
- Provide basic DSE workstation equipment that meets minimum standards in terms of good ergonomic design.
- Plan the user's work routine so that they can take short, frequent breaks from screen and keyboard use.
- Provide DSE users with a free eye test and, if required, spectacles for screen use.
- Provide information and training to users on the potential health risks of DSE use and the preventive measures, in particular ergonomic use of the workstation.

These measures are incorporated into the **Health and Safety (Display Screen Equipment) Regulations 1992**.

Some of the minimum standards for workstation equipment and the good practices with regards to posture and workstation use are illustrated in the following figure.



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Good ergonomics at a DSE workstation

The numbered issues are as follows:

1. Adjustable height and angle to seat back.
2. Good lumbar support.
3. Adjustable height seat to bring the hands to a comfortable position on the keyboard. Seat also has a stable 5-star base.
4. Correct seat height adjustment and keeping the feet supported prevents excess pressure on underside of thighs and backs of knees.
5. Footrest for user cannot get their feet on the floor.
6. Space for postural change, no obstacles under desk; this allows the user to fidget and change position as they work.
7. Forearms approximately horizontal when hands are on keyboard.
8. Minimal extension, flexion or deviation of wrists; wrists should be straight and flat when on the keyboard indicating proper seat height adjustment.
9. Screen height and tilt should be adjustable so as to allow comfortable head position.
10. Space in front of keyboard to support hands/wrists during pauses in keying; a wrist-rest can provide further support if required.

Additional points:

- The desk should be laid out to minimise the need for twisting or overreaching (e.g. when reaching for a

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telephone).

- A document holder may be required.
- If frequent telephone use is necessary when using the keyboard then a headset may be required.
- Workplace lighting should be provided so as to avoid reflections on the screen and glare.

Unfortunately some of these good ergonomic principles cannot be applied to use of a laptop computer. If laptops are going to be used in the workplace then:

- Allow short-duration use but not long-duration use.
- When laptops are going to be used for long durations apply the same management approach of workstation assessment, frequent breaks, eye test, information and training.
- Provide a docking station and/or separate screen, keyboard and mouse as required to allow the user to convert the laptop to a more adjustable configuration.

Factory Assembly Line: Risks

Assembling small components on a factory production line will have many of the same health effects as DSE use:

- **WRULDs** – associated with repetitive handling of parts for long periods of time.
- **Eye strain** – temporary eye fatigue associated with having to focus on small parts.
- **Back pain** – and other MSDs associated with sitting or standing in a fixed position for long periods of time, perhaps in association with overreaching, twisting and stooping to reach parts.
- **Fatigue and stress** – associated with infrequent rest breaks and a demanding work-rate.

Factory Assembly Line: Control Measures

The control measures appropriate for the factory assembly line are very similar to those applied in the case of DSE use:

- Carry out an ergonomic assessment of the workstation to ensure that it is appropriate and can be adjusted to suit the worker's needs.
- Plan the worker's work routine so that they can take recovery breaks.
- Provide information and training to workers on the potential MSD health risks and the preventive measures, in particular ergonomic use of the workstation.

Specific controls might include:

- Automate the process to eliminate the MSD risk entirely.

- Re-layout the workstation to allow comfortable posture and to minimise overreaching, stooping, twisting, etc.
- Provide seating if not already available.
- Provide comfortable shoes and floor mats to relieve foot pressure if sitting is not possible.
- Allow short, frequent breaks from the production line or introduce job rotation to prevent long duration on one task.
- Ensure lighting is appropriate for the task (brightness or lux levels should be relatively high for fine detail work).
- Introduce ergonomically-designed hand tools.

More...

<http://www.hse.gov.uk/msd/index.htm>

Revision Questions

1. Sum up the aims of ergonomics in a simple phrase.
2. What are the categories of health risks arising from poor task and workstation design?
3. State the risk factors involved in the physical requirements of the task.
4. Summarise the key requirements relating to the following parts of a DSE workstation:
 - (i) Work surface/desk.
 - (ii) Keyboard.
 - (iii) Chair.
 - (iv) Space.

(Suggested Answers are at the end of Unit NGC2.)



Manual Handling Hazards and Controls



Key Information

- Manual handling is a common cause of musculoskeletal injury such as injury to the back, tendons, ligaments, muscles and work related upper limb disorder (WRULD).
- Manual handling can be assessed by looking at four main factors: the task; the load; the environment; and individual capabilities.
- The risk associated with manual handling can be controlled by automating or mechanising the handling; using handling aids; modifying the task, load or environment and by ensuring individual capabilities are matched to the activity.
- Safe lifting technique involves following simple precautions before the lift, during the lift, and when setting down.

Common Types of Injury

Manual handling is an activity that takes place in most workplaces. Often manual handling is a routine part of day-to-day work activity: workers on a construction site frequently move building materials by hand; factory workers routinely pack boxes by hand; farm labourers spend hours at a time bent double in the fields picking crops. In some workplaces manual handling occurs infrequently; office workers do not often have to lift or carry loads on a daily basis, but they will do so occasionally. Manual handling can involve very repetitive movements of relatively small loads (e.g. handling small components on a production line); in other instances it can involve one off movements of very large and heavy items (e.g. handling structural steels into position in an inaccessible location).

spinal cord. This type of injury is perhaps the most serious of all manual handling injuries since recovery is often slow, incomplete and in some instances the victim will have to undergo surgery to repair the defect or may end up permanently disabled.

Tendon and ligament injuries – (tendons and ligaments are the connective tissues that join muscle to bone and bone to bone respectively). When tendons and ligaments are overloaded they tear causing extremely painful injuries which can take a long time to heal. In some instances recovery is incomplete and an operation may be required.

- **Muscle injuries** – overloaded muscle tissue can tear. This is painful and likely to lead to short-term impairment.
- **Hernias** – when the sheet muscle that surrounds the gut is overloaded it can distort and tear. This usually happens in the lower abdomen and can be a painful injury that will not repair naturally. In many instances an operation is required.
- **Work Related Upper Limb Disorders (WRULDs)** – chronic soft-tissue injuries to the arms, wrists and hands as a result of repetitive movements (also referred to as Repetitive Strain Injuries (RSI)).

This is a generic term for many different medical conditions such as carpal tunnel syndrome and tennis elbow. WRULDs usually involve inflammation and discomfort through overuse of muscles, tendons or ligaments and frequently there is irritation to the nerves that causes additional pain. WRULDs usually start as minor discomfort that gradually worsens to severe pain and immobility. They can result in corrective surgery, and even disability if left untreated.

- **Cuts, burns and broken bones** – physical injury may result if the load is hot, sharp or dropped on the feet.



Jargon Buster

Manual handling

The lifting, carrying, pushing and pulling of a load by bodily force.

All these manual handling activities generate the possibility of injuries, most of which are musculoskeletal injuries. Common types of manual handling injury include:

- **Back injury** – the spine is made up of individual bones (vertebrae) separated by tough pads (intervertebral discs). Wear and tear can occur to the pads so that they become distorted (slipped discs). This causes extreme pain and discomfort and is often accompanied by nerve pain because the distorted disc traps nerves where they enter the

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Worker with back injury

- Does the task involve twisting (turning the shoulders while the feet stay still)?
- Can rest breaks be taken as the worker requires them?
- Does the task involve lifting the load through a vertical distance?
- Does the task involve reaching above shoulder height?
- Does the task involve the worker holding the load away from their trunk (torso)?

Each of these risk factors increases the risk associated with the task. For example, picking up a load at waist height, carrying it a short distance and putting it down at waist height is a simple task that does not complicate the risk associated with the handling. But picking up the same load from floor height (risk factor 1) from the bottom of a box that requires the worker to stoop down into the box (risk factor 2) then carrying the load arms' length (risk factor 3) for a distance of 15 metres (risk factor 4) and putting it down above head height (risk factor 5) increases the risk associated with the task very significantly.

Assessing Manual Handling Risks

The **Manual Handling Operations Regulations 1992** require that when a manual handling activity cannot be completely eliminated then it must be assessed. This risk assessment will be slightly different from the general risk assessment you are already familiar with because it focuses exclusively on the hazard of manual handling and ignores all other hazards.

Manual handling risk assessment focuses on four main factors:

- The task.
- The load.
- The environment.
- Individual capabilities.

The Task

The focus here is on the movements required of the worker as they handle the load.

The task can be assessed by asking questions such as:

- At what height is the load being picked up, carried or put down?
- Is the task very repetitive?
- Is a long carrying distance involved?
- Does the task involve stooping (worker has to keep their legs straight and bend their back) to move the load?



Holding a load away from your torso when lifting increases risk of injury

The Load

Here the focus is the load that is being handled.

Though the load is usually an inanimate object, in some workplaces it may be an animal or a person, e.g. in a hospital patients have to be moved from bed to gurney (a wheeled stretcher/trolley), from wheelchair to bath, etc.

The load can be assessed by asking questions such as:

- How heavy is the load?
- How large and bulky is the load?
- How stable is the load?
- Where is the centre of gravity (C of G) of the load?
- Is the load difficult to grip?
- Is the load hot, sharp or otherwise hazardous?



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For example, the risk associated with handling a concrete block of 12kg is lower than that associated with handling a bundle of flexible plastic pipes each 3 metres long that weighs the same.



Unsighted by load

The Environment

The focus here is the environment in which the handling takes place.

The environment can be assessed by asking questions such as:

- Are there restrictions on the space available?
- Is the floor surface slippery or uneven?
- Are there changes in floor level (steps, stairs, etc.)?
- What are the light levels like?
- What is the temperature and humidity?

For example, handling activities carried out outdoors on a poorly lit construction site in freezing conditions when there is ice on the ground will be a higher risk than similar activities carried out indoors in a warm, well lit area.

Individual Capabilities

The focus here is on the worker carrying out the handling activity.

Individual capabilities can be assessed by asking questions such as:

- Does the activity require unusual ability? Some handling activities require unusual strength, stamina, size or technique.
- Does the activity present significant risk to vulnerable individuals such as pregnant women or people with pre-existing back injuries?

Minimising the Risks

Control of manual handling risk can be achieved by using a simple hierarchy of controls:

- Eliminate the manual handling.
- Assess the manual handling that cannot be eliminated.
- Use handling aids.
- Modify the task, load or environment.
- Ensure individual capabilities are matched to the activity.

Eliminate the manual handling – by automation or mechanisation of the handling activity. Conveyor belt systems, forklift trucks, electric pallet trucks, cranes, hoists and other types of mechanical moving or lifting equipment provide a way of moving loads without the need for workers to use bodily force.



Electric hoist moving load

Assess manual handling that cannot be eliminated – by looking at the four factors of: task, load, environment, and individual capabilities.

Use handling aids – consider the use of a piece of equipment that does not completely eliminate the manual handling but does make it much easier. For example, a sack truck does not eliminate the need to push the load, but it does eliminate the need to carry it.

There are many handling aids available such as: trolleys, barrel lifts, gin wheels, trucks, hoists and lifts that require some manual effort to lift or support the load, but give the worker mechanical advantage.

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A range of manual handling aids

Modify the task, load or environment – when the appropriate questions we listed earlier are answered, there are usually some simple solutions that present themselves.

Modifications may be possible to reduce the significant risk factors, such as:

- **The task:**
 - Control repetitive handling by introducing frequent rest breaks or job rotation to minimise the length of time that an individual worker has to perform the task.
 - Eliminate stooping and twisting by changing the layout of the workstation.
 - Use a table or lift to bring the load to waist height to eliminate picking up from floor level.
- **The load:**
 - Break down a heavy load into smaller parts.
 - Use several workers to handle large, bulky load rather than just one.
 - Stabilise an unstable load by securing it or putting it into a container.
 - Mark up a load with an off-centre C of G so that workers can see where the C of G is.
 - Attach handles to a load that is difficult to grasp.

- **The environment:**

- Rearrange the workspace to allow more space for the handling activity.
- Level an uneven floor.
- Supply additional lighting in a poorly lit location.

Ensure individual capabilities are matched to the activity – if the activity requires unusual ability then workers must have that ability. For example, if unusual strength and size are required then the worker must have those characteristics. If a particular technique is required then the worker must be trained so that they develop that technique.

If the activity presents significant risk to vulnerable individuals such as pregnant women or people with pre-existing back injuries then those people will have to be prohibited from carrying out the activity.



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Safe Lifting Technique

Employees should be trained in basic safe lifting technique. This technique minimises the risk of musculoskeletal disorders.

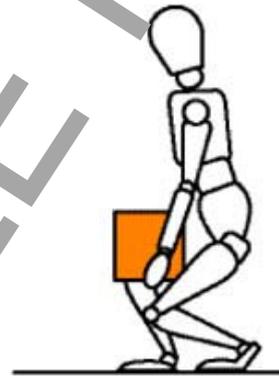
- **Before lifting**

- Check the weight, C of G and stability of the load.
- Plan the route of the carry.
- Establish a firm grip.



- **The lift**

- Bend the knees and use the leg muscles to lift.
- Keep the back upright.
- Keep the load close to the body.
- Avoid twisting, over-reaching, jerking.



- **Setting down**

- Use the same principles as when lifting.
- Maintain good balance.
- Set the load down and then adjust its position using body weight.





More...

<http://www.hse.gov.uk/msd/index.htm>

Revision Questions

5. What are the main injuries associated with manual handling?
6. What is a WRULD and how might it be brought about?
7. What are the characteristics of the load which may present a hazard?
8. Identify the main risk factors presented by the working environment in relation to manual handling.
9. What is the primary means of minimising the hazards of manual handling?
10. What sort of individual might be more prone to manual handling injury?

(Suggested Answers are at the end of Unit NGC2.)