Government of Western Australia
Department of Mines and Petroleum
Resources Safety

# Prevention of musculoskeletal disorders from performing manual tasks in mining workplaces

## Presenter's guide

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## Contents

**Acknowledgements**

This training package is based on the WorkSafe Western Australia publication *Preventing manual handling injuries in the workplace training package.*

The WorkSafe training package can be downloaded from the WorkSafe section of the Department of Commerce website at www.commerce.wa.gov.au/worksafe

# Introduction

Resources Safety's workshop on preventing musculoskeletal disorders arising from performing manual tasks in mining workplaces will assist employers in meeting the training requirements outlined under the general duty of care provisions of the *Mines Safety and Inspection Act 1994*. This presenter's guide outlines the aims of the workshop and provides background information on the topics covered.

The workshop is focused on those requirements enabling workers to participate in the risk management process, as outlined in the Australian Safety and Compensation Council's 2007 *National Standard for Manual Tasks*. The Powerpoint presentation and group activities can be tailored to suit a workplace induction program or training for managers.

The workshop aims to provide participants with the knowledge and skills to effectively participate in the risk management procedure of hazard identification, risk assessment, risk control and control evaluation applied to managing risks arising from hazardous manual tasks.

After training, participants should be able, as part of a manual tasks risk management team, to recognise hazardous manual tasks, the risk factors in these tasks and, using the consultative approach, decide the best way to minimise the risk. They will be able to:

- provide the definition of a manual task, a hazardous manual task and a musculoskeletal disorder;
- explain the legislative requirement to manage the risk resulting from hazardous manual tasks;
- understand the basics of anatomy and biomechanical principles;
- explain how performing manual tasks can lead to injury;
- participate effectively in the process used to identify, assess and control the risk posed by manual tasks including:
  - recognising what sort of manual tasks have the potential to give rise to injury, that is identifying hazardous manual tasks;
  - assessing the risk of injury, including identifying the source (underlying cause) of the risk and evaluating the severity of the risk; and
  - developing control measures that alter the source of the risk identified in the risk assessment process, to eliminate or reduce the risk.

In order to determine if the learning outcomes have been met, the ability of participants to effectively participate in the manual task risk management process of identification, assessment and control should be assessed in the workplace.

# Terminology

## Manual task

*Manual task* is a label given to any activities that require a person to use their physical body (musculoskeletal system) to perform work. This includes work that involves the use of force for lifting, lowering, pushing, pulling, carrying, moving, holding or restraining anything. It also includes work with repetitive actions, sustained postures and concurrent exposure to vibration.

## Hazardous manual task

Almost every activity involves some form of a “manual task”. To distinguish between those that are potentially a problem and those that are not, the term *hazardous manual task* is used. *Hazardous manual task* refers to any manual task with characteristics that increases the risk of injury, such as those listed below.

- **Repetitive or sustained application of force** – Repetitive application of force means using force repeatedly over a period of time to move or support an object. Sustained means maintaining the same position or making the same movement continuously for a period of time. For example, repetitively pressing a pedal or button to operate plant involves repetitive application of force; holding the trigger of a power tool involves the sustained application of force.
- **Repetitive or sustained awkward postures** – An awkward posture is one in which any part of the body is in an uncomfortable or bent and twisted position. For example bending down to ground level to lift multiple sample bags involves repetitive bending, repetitive awkward postures; crouching or squatting to service plant involves sustained awkward postures.
- **Repetitive or sustained movements** – Repetitive or sustained movement means using the same parts of the body to repeat similar movements over a period of time or to maintain movement. An example is using a socket and ratchet or spanner to unscrew long bolts.
- **Application of high force** – Application of high force occurs in any task that people in the working population would find difficult because of the effort it requires, such as lifting or carrying heavy items such as large steel plates. Tasks where force is applied at speed generate high force. Rapid or sudden speed changes such as jerky or unexpected movements, or unexpected impact recoil from a power tool, while handling an item or load are particularly hazardous because the body must suddenly adapt to the changing force.
- **Exposure to sustained vibration** – Tasks where vibration is transferred from tools or machinery to parts of the operator’s body can be hazardous, particularly when force is being applied. Examples of tasks involving exposure to sustained vibration include using pneumatic, electric and percussive hand tools such as sanders, grinders, drills, and riveters and operating mobile plant such as earth-moving equipment.
- **Involve handling of person or animal** – Handling of live people or animals is hazardous not only because they can be heavy but because they may move unexpectedly. For example, an injured person being carried in an emergency response situation may move between a conscious and unconscious state unexpectedly, which can significantly change the amount of support required.
- **Involve handling of unstable or unbalanced loads that are difficult to grasp or hold** – Loads that are unstable or unbalanced can move or change shape suddenly, or may be uneven and heavier on one side. Loads that are difficult to grasp or hold include those with no handles or specific handholds, or that are very large, slippery, floppy, sharp, hot, cold, toxic or unpleasant or likely to spill. These characteristics can apply sudden, unexpected forces on handlers. For example, core sample trays with no handles are difficult to grasp.

## Musculoskeletal disorders

Hazardous manual tasks can lead to a variety of injuries and conditions collectively referred to as *musculoskeletal disorders*, including:

- sprains and strains of muscles, ligaments and tendons;

- back injuries, including damage to the muscles, tendons, ligaments, spinal discs, nerves, joints and bones;
- joint injuries or degeneration, including injuries to the shoulder, elbow, wrist, hip, knee, ankle, hands and feet;
- bone injuries;
- nerve injuries;
- muscular and vascular disorders as a result of hand-arm vibration; and
- soft tissue hernias.

Hazardous manual tasks are the main cause of work-related musculoskeletal disorders in Western Australian mining workplaces.

# Injuries from performing manual tasks and their cost

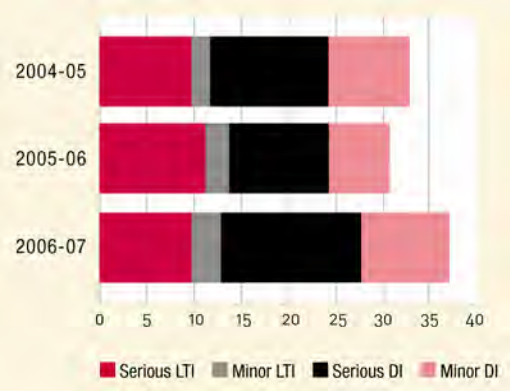
## How injuries occur

Injuries to the musculoskeletal system occur when the forces on the structures, such as muscles, tendons, ligaments and bones, are greater than the structure can tolerate.

Acute injuries, causing sudden damage to the musculoskeletal system, occur as a consequence of a single exposure to high force. For example, lifting an item that is heavier than expected and requires an unexpected exertion of force can result in an acute musculoskeletal disorder. Commonly, however, such injuries are a result of cumulative "wear and tear" on the musculoskeletal system, caused by repeated or prolonged exposure to lower levels of force. Even low levels of force can cause small amounts of damage to structures. This damage is normally repaired before injury occurs but if the rate of damage is greater than the rate of repair then injury occurs.

## Extent and cost of manual task injuries in the Western Australian mining industry

Hazardous manual tasks are recognised as a major occupational safety and health (OSH) risk for the mining industry. Injuries from performing hazardous manual tasks accounted for about one-third of all injuries in Western Australian mining workplaces over the three-year period from July 2004 to June 2007, as shown in the graph below.




**Lost time injury (LTI)** – work injury that results in an absence from work of at least one full day or shift any time after the day or shift on which the injury occurred

**Disabling injury (DI)** – work injury (not LTI) that results in injured person being unable to fully perform his or her ordinary occupation (regular job) any time after the day or shift on which the injury occurred, regardless of whether or not the person is rostered to work, and where either alternative or light duties are performed

**Serious LTI** – LTI that results in injured person being disabled (unable to perform his or her ordinary occupation) for a period of two weeks or more and absent from work for at least one day

**Serious DI** – injury that does not result in any lost time but injured person is disabled for a period of two weeks or more

**Minor LTI** – LTI that results in injured person being disabled for a period of less than two weeks and absent from work for at least one day

**Minor DI** – injury that does not result in any lost time but injured person is disabled for a period of less than two weeks

**Days off** – total calendar days, whether rostered or not, absent from work or on alternative duties, restricted duties or restricted hours due to work

The graph has also been categorised into serious and minor injuries. Not only are musculoskeletal disorders from performing manual tasks a leading cause of injury, about two-thirds are serious, resulting in injured employees being unable to perform their ordinary duties (i.e. either off work or on alternative or light duties) for 14 or more days.

The direct and indirect costs associated with these injuries are considerable. Between July 2004 and June 2006, compensation for musculoskeletal disorders from performing manual tasks in the WA mining industry resulted in 643 lost time claims and 1,064 no lost time claims. This represents 38.5 per cent of all lost time compensation claims and 30 per cent of all no lost time compensation claims. “No lost time compensation” relates to payments for treatments, including medical costs, occupational therapy or physiotherapy.

The total cost of lost time claims from these injuries in this two-year period was $23.9million (37% of total lost time claims cost) and for no lost time claims was $1.8million (30% of total no lost time claims cost). According to WorkCover WA, 96,763 days were lost in the two-year period as a result of musculoskeletal disorders from performing manual tasks, representing 45 per cent of the total days lost from mining workplace injuries.

In addition to the direct cost of compensation claims, these injuries incur costs such as lost productivity, staff replacement and training costs, loss of expertise and administrative overheads. The cost to the injured worker includes pain and stress, loss of income and possible long term disability.

The compensation and other costs of musculoskeletal disorders from performing manual tasks are a major contributor to total injury costs in the WA mining industry. Clearly, reducing the extent and severity of such injuries would be of considerable cost benefit to all stakeholders.

**Legislation**

Resources Safety administers the *Mines Safety and Inspection Act 1994* and Mines Safety and Inspection Regulations 1995. The Act sets out broad duties with respect to OSH, and is supported by the Regulations, codes of practice and guidelines. The legislation aims to promote and improve the safety and health of all people working or visiting Western Australian mining operations, including exploration sites.

Under the Act, all duty holders must protect workers from hazards, as far as is practicable. Duty holders include employers, employees, contractors and their employees, labour hire agents and workers, and designers, manufacturers, importers and suppliers of plant.

If a manual task in a workplace is hazardous all duty holders must ensure they fulfil their obligations to reduce the risk of injury to workers completing the task. The risk management process of hazard identification, risk assessment, risk control, and control monitoring and review provides a structured approach to achieve this. It is a requirement for employers, employees, their safety and health representatives and safety officers to consult throughout the process. If possible, the hazardous manual task should be eliminated. Where the hazardous manual task cannot be eliminated, the risk arising from the hazards associated with the task must be reduced.

The Australian Safety and Compensation Council’s 2007 *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work* provides practical guidance that will help with compliance for the general duty of care requirements. The provisions of the Code are not mandatory, a duty holder may choose to comply some other way provided the alternative method used also fulfils the legislative requirements. Guidance material on manual task risk and the management of the risk specific to the mining industry has been developed to complement the information in the Code. The provisions of the guidance material are not mandatory.

See the “Further information” document in this training package for a list of guidance material.

## Anatomy and biomechanics

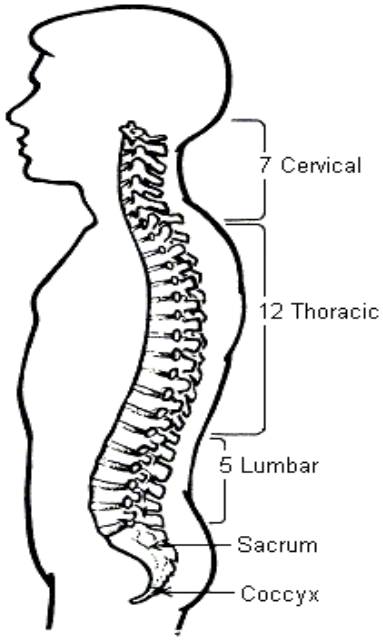
A knowledge of anatomy and biomechanical principles provides the basis for a better understanding of what happens to the body when performing a manual task. This information is included here to provide presenters with some background about what happens to the body when performing a manual task. For example:

- Why does the risk of injury increase as the load is held further away from the front of the body?
- Why does twisting increase the risk of injury?

To answer these questions, it is important to consider:

- anatomy of the spine;
- terminology of body positions;
- posture;
- types of muscle work; and
- some basic biomechanical principles.

### Anatomy of the spine




The spine is made up of 33 small bones or vertebrae. They can be divided into three areas – the top seven comprise the cervical or neck region; the next 12 the thoracic vertebrae; then the five lumbar vertebrae. The remaining vertebrae are fused to form the sacrum, with the coccyx at the end.

Looking from the front or the back, the vertebrae are stacked one on top of the other in a straight line. However, from the side, they form three spinal curves – the curve bends forwards in the neck, backwards in the thoracic area, and then forwards again in the lumbar area. Good posture involves maintaining these curves. Each vertebra is separated from the next by a disc made of cartilage, which allows for movement of the spine and acts as a shock absorber.

Tough ligaments support the spine by preventing any unwanted movement. They are overlain by deep postural muscles, which are small muscles running between a few vertebrae. Their job is to hold up the body against the influence of gravity. There are also larger back muscles over these that control the movement of the trunk and upper limbs. Other important muscles in the function of the spine are the abdominal muscles. These three pairs of muscles form a broad band of muscle around the front of the trunk.

### Terminology for body positions

The terminology used for body positions is demonstrated using examples from WorkSafe WA's training package for:

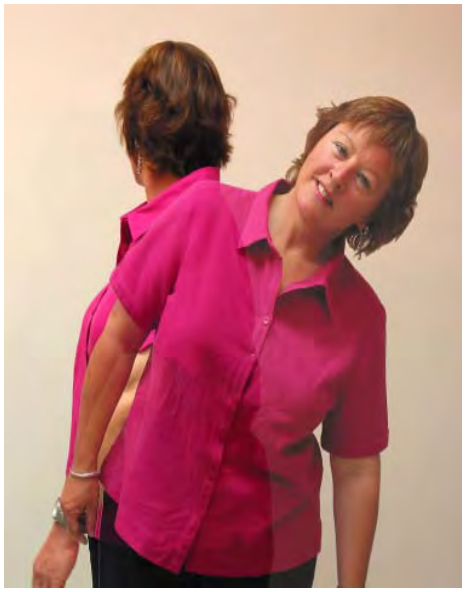
- the spine or trunk; and
- the hand and forearm.

## *Positions of the spine or trunk*

**Extension – bending backwards**

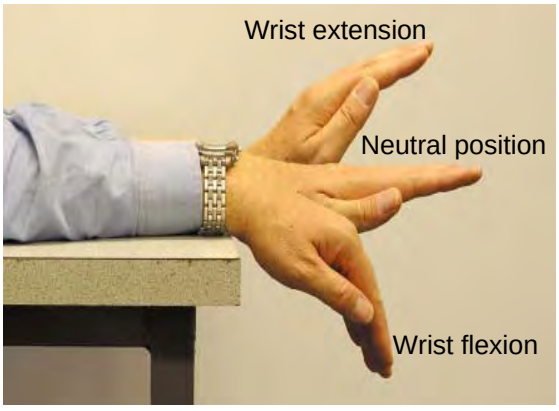
**Flexion – bending forwards**

**Rotation, twisting the spine**

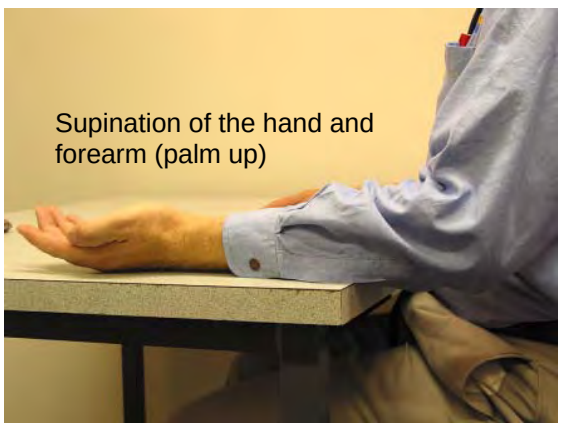


**Side flexion, bending sideways**

## *Hand and forearm positions*



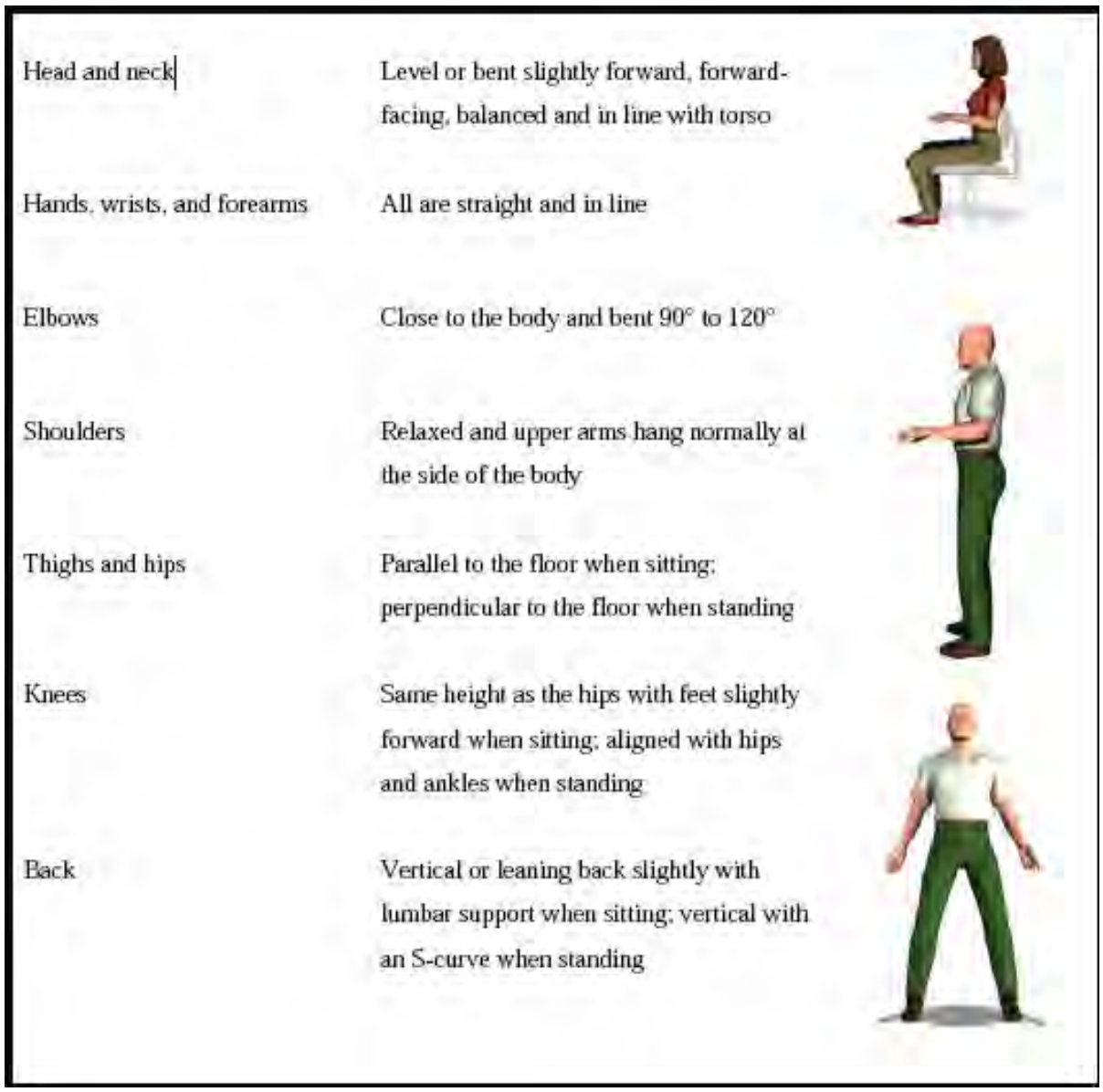




## Posture

Muscles are generally weaker when they are shortened or lengthened. When joints are at the extremes of their normal range of movement, the muscles are weaker. The optimal design of work therefore aims to provide tasks that can be performed while maintaining neutral postures.

The following diagram shows neutral postures for different body parts.




*Source: NIOSH IC 9509: Ergonomics Processes Implementation Guide and Tools for the Mining Industry*

Good back posture involves maintaining the three spinal curves (described under “Anatomy of the spine”). In this position, the spine is under least stress and the muscles are at their strongest. Extra tension is placed on all the structures of the spine as posture deviates from this least stressed position. In particular, twisted or bent postures mean increased stress and increased risk of injury.

Maintaining a neutral wrist posture is also important for workers undertaking repetitive hand and arm movements.

Many of the risk control recommendations, such as storing heavier and frequently used items at about waist level, help ensure the worker is able to maintain a good posture while doing the manual task.

## Types of muscle work

Muscles work in two ways – dynamically and statically.

Dynamic muscle action involves muscle contraction and movement of a body part. The action of lifting sample bags and placing them on the back of a vehicle is an example of this. The shoulder muscles contract and raise the arms.

Static muscle work involves muscle contraction, but there is no movement of a body part. An example is a mechanic bending over to work on an engine of a mining vehicle. The flexed posture of the spine is held there by the back muscles working statically.

The body reacts differently to the two types of muscle work.

In dynamic muscle work, the blood pumped to the muscle flows through the muscle flushing out the lactic acid and carbon dioxide (waste products of muscle work). Thus the chemical balance of the muscle is maintained, and it can work for lengthy periods without discomfort.

In static muscle work, the sustained muscle contraction acts like a tourniquet on the blood vessels. This results in a loss of blood flow to the working muscle and a build-up of the waste products in the muscle itself. The chemical imbalance is detected by the brain as discomfort, fatigue or heaviness. This occurs even after very short periods of static muscle work. Many risk factors (see below) are listed because they are examples of static muscle work. An example is static muscle work for the shoulders and arms in carrying loads over long distances.

Many tasks involve both static and dynamic muscle work. For example, for a mechanic working on a mining vehicle engine, there is static work for the back muscles and dynamic work for the wrist and forearm muscles when tools are used.

The optimal design of work results in tasks that involve slow to moderately paced movements and varied patterns of movement.

## Principles of biomechanics

For our bodies to move, the muscles have to pull on the bones of our arms, legs and back. The bones are therefore like levers. To understand the mechanism, we need to look at some basic principles of levers. A weight at a short distance from the fulcrum requires less effort to move than the same weight at a longer distance from the fulcrum.

When lifting a load, the closer it is to the person's body the less stress there is on the body, and therefore the lower the risk of injury.

If the load is further away, there is greater stress on the person handling the load. The distance between the person and load results from a variety of factors, such as the layout of the work area, a cluttered floor making access difficult, or the large dimensions of the item held.

Force exerted – up to 50 kg

Box weight – 5 kg

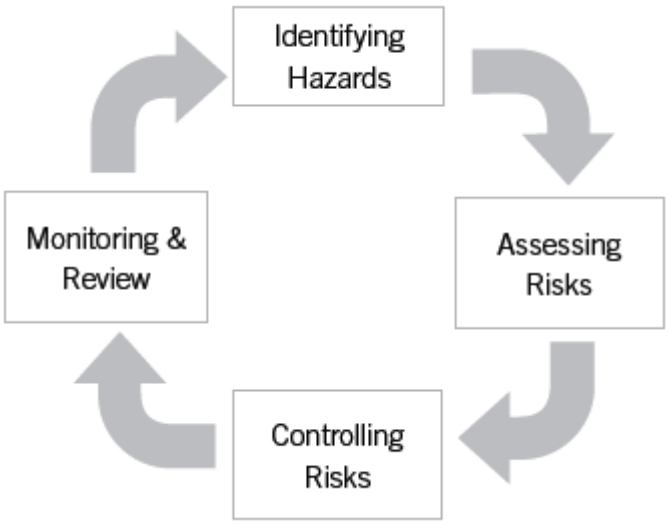
The spine can sometimes be used as a lever, although it was not designed to be used like a crane. The spine becomes a very long lever arm, with a load being handled at the end. The muscles of the back have to support not only the weight of the load being handled, but also the weight of the trunk as it is bent over. The force exerted by the spinal muscles can be up to ten times greater than the weight of the load handled.

## Manual task risk management process

Using this background information, we now return to look in detail at the manual tasks risk management process. The risk management process provides a structured approach to reduce the risk of musculoskeletal disorders from performing manual tasks at work.

1. **Identify hazards** – identify hazardous manual tasks by screening manual tasks to recognise those that have the potential to cause injury (i.e. musculoskeletal disorders).
2. **Assess risks** – assess risks of injury that arise from the hazardous manual tasks, identify the source/s (underlying root cause/s) of the risk and evaluate the severity of the risk.
3. **Control risks** – implement measures to eliminate the risk or, where elimination is not possible, reduce the risk by altering its source or underlying root cause.
4. **Monitor and review** – assess the effectiveness of the risk control measures that have been implemented.

The risk management process is one of continuous improvement as shown schematically below.




*Source: National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work*

Consultation between employers and workers, including any safety and health representatives, is essential at each stage for the process to be successful. Current best practice is a participative ergonomics approach, which involves workers undertaking the risk management process, assisted by an ergonomist or OSH personnel with skills in ergonomics.

Resources Safety's online training package details how to undertake these steps, and gives practical examples of what workplaces can do to reduce the risk of injury to employees performing manual tasks.

While the workshop provides training for organisations to do this process "in house", in some instances outside ergonomics consultants may need to be called in. They should be made aware of the consultative nature of the process, as specified in the Act, and should be allowed to talk to employees, supervisors and safety and health representatives.

It is important to keep written records of the process. The forms included with this package or other recommended forms can be used for this purpose.

### Identifying hazards

Hazard identification is a way to analyse manual tasks and determine which ones could cause or contribute to the development of musculoskeletal disorders. Information is gathered, reviewed and analysed to identify those tasks that may be hazardous, and includes:

- examining available sources of information such as injury records, and incident and hazard reports;
- consulting with workers involved in the work process; and
- observing work processes.

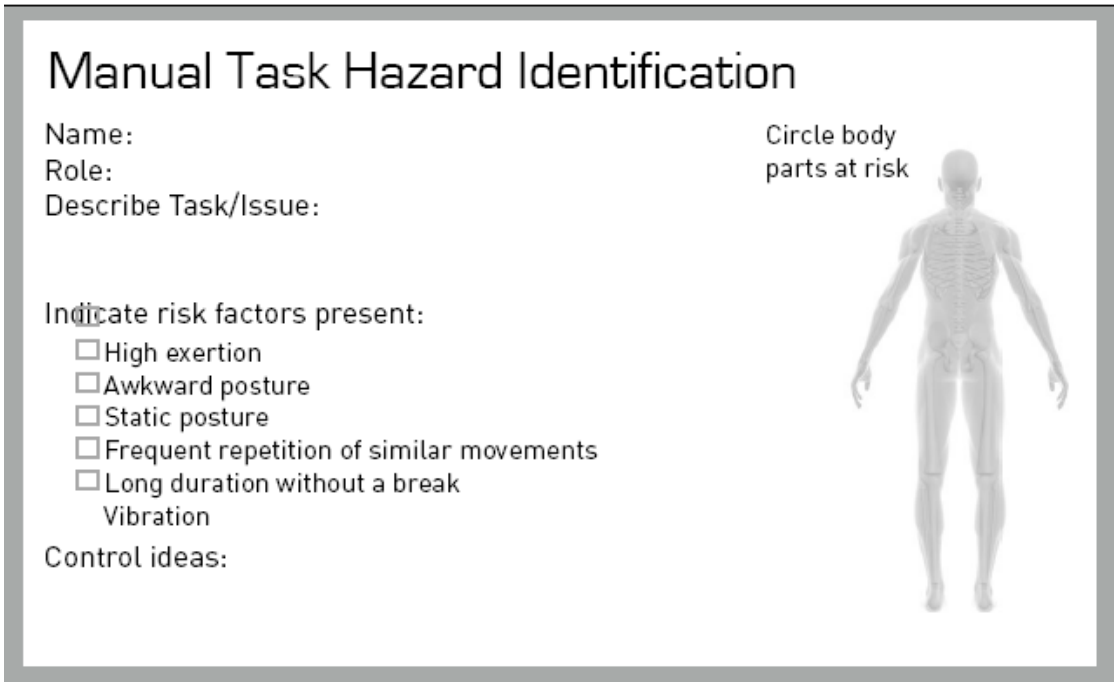
Tasks that are likely to be hazardous manual tasks include those where an injury, pain, discomfort or difficulties have been reported. All employees have a statutory obligation to report hazards, and effective reporting procedures are essential. Early reporting of concerns or discomfort associated with completing a task may prevent serious injury. The hazard identification and discomfort survey form/s used at the participants' workplace should be included in the presentation. Examples are provided on the following page.

Observing a manual task helps in identifying whether the task has any of the characteristics of a hazardous manual task, such as:

- repetitive or sustained application of force;
- repetitive or sustained awkward postures;
- repetitive or sustained movements;
- application of high force;
- exposure to sustained vibration;
- involve handling of person or animal; or
- involve handling of unstable or unbalanced loads that are difficult to grasp or hold.

According to *NIOSH Information Circular 9509, Ergonomics Processes: Implementation Guide and Tools for the Mining Industry* and Burgess-Limerick (2008) *Procedure for Managing Injury Risks Associated with Manual Tasks*, a task should be considered as potentially hazardous if any of the following apply:

- an injury (i.e. musculoskeletal disorder) has been recorded that was associated with performance of the task;
- any employee is physically incapable of performing the task, or the task can only be done for a short time before stopping;
- the mass of any object, person, or animal being handled exceeds 16 kg;
- if the force exerted on any object, person, or animal exceeds 200 N;
- if the postures adopted to perform the task involve substantial deviations from neutral;
- if the task involves static postures held for longer than 30 seconds and the task is performed for more that 30 minutes without a break, or for more than two hours per shift;
- if the task involves repetitive movements of any body part and is performed for more than 30 minutes without a break, or for more than two hours per shift;
- if the task is performed for longer than 60 min at a time without a break;
- if the task is performed for longer than four hours per shift;
- if exposure to whole body vibration (vehicles) or peripheral vibration (power tools) exceeds two hours per shift;
- any employee reports discomfort associated with the manual task;
- employees have improvised controls for the task; or
- workers doing this task have a higher turnover, or rate of sick leave, than elsewhere in the organisation.



# Manual Task Hazard Identification

Name:
Role:
Describe Task/Issue:

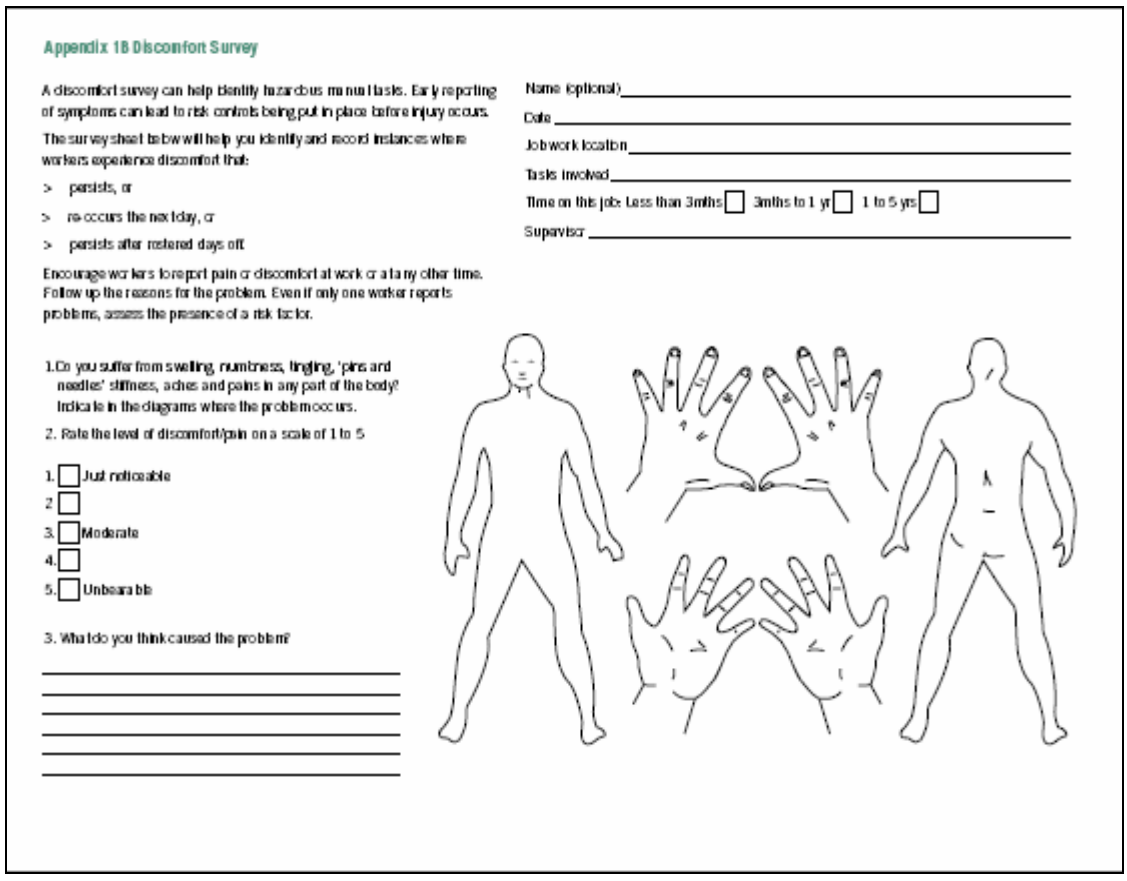
Circle body parts at risk

Indicate risk factors present:

- ☐ High exertion
- ☐ Awkward posture
- ☐ Static posture
- ☐ Frequent repetition of similar movements
- ☐ Long duration without a break
- Vibration

Control ideas:

*Source: Appendix A of Burgess-Limerick, R. (2008) Procedure for Managing Injury Risks Associated with Manual Tasks* http://www.burgess-limerick.com/download/manualtasksprocedure.pdf



## Appendix 1B Discomfort Survey

A discomfort survey can help identify hazardous manual tasks. Early reporting of symptoms can lead to risk controls being put in place before injury occurs.

The survey sheet below will help you identify and record instances where workers experience discomfort that:

- > persists, or
- > re-occurs the next day, or
- > persists after rostered days off

Encourage workers to report pain or discomfort at work or at any other time. Follow up the reasons for the problem. Even if only one worker reports problems, assess the presence of a risk factor.

Name (optional) _____

Date _____

Job/work location _____

Tasks involved _____

Time on this job: Less than 3mths ☐ 3mths to 1 yr ☐ 1 to 5 yrs ☐

Supervisor _____

1. Do you suffer from swelling, numbness, tingling, 'pins and needles' stiffness, aches and pains in any part of the body? Indicate in the diagrams where the problem occurs.
2. Rate the level of discomfort/pain on a scale of 1 to 5

1. ☐ Just noticeable
2. ☐
3. ☐ Moderate
4. ☐
5. ☐ Unbearable

3. What do you think caused the problem?

_____
_____
_____
_____
_____
_____

*Source: Appendix 1B of ASCC (2007) National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work* http://www.safeworkaustralia.gov.au/NR/rdonlyres/65298783-6262-4D0D-A41D-13296040703D/0/ASCC_ManualTasks_COP.pdf

When practicable, the identified hazardous manual task should be eliminated. If more than one hazardous manual task is identified, it is important to prioritise the tasks to ensure that those hazardous manual tasks likely to pose a higher level of risk are assessed first.

## Assessing risk

The risk assessment process determines:

- whether a hazardous manual task poses a risk of injury (i.e. musculoskeletal disorder);
- identifies the source/s (i.e. underlying cause/s) of the risk; and
- rates the severity of the risk.

In other words, risk assessment is about understanding the problem. To assess the likelihood of an identified hazardous manual task increasing the risk of musculoskeletal disorders, the risk factors known to lead or contribute to such injuries are investigated and, where applicable, measured.

- Direct risk factors – risk factors that are known to lead to musculoskeletal disorders are:
  - the postures and movements of the worker, including those that are repetitive, sustained or awkward;
  - the forces (exertion) involved in the task, including high force, jerky or unexpected forces and speed and force; and
  - the frequency, repetition and duration of the task.
- Contributing risk factors – risk factors that are known to contribute to the risk of musculoskeletal disorders are:
  - work environment;
  - systems of work, work organisation and work practices; and
  - exposure to vibration.

The risk of injury significantly increases where direct and contributing risk factors are present and interact within a task – the more risk factors in a task, the greater the risk of developing a musculoskeletal disorder.

### *Direct risk factors*

#### (i) Postures and movements

If a task involves repetitive or sustained postures or movements and/or awkward postures, the risk of injury increases.

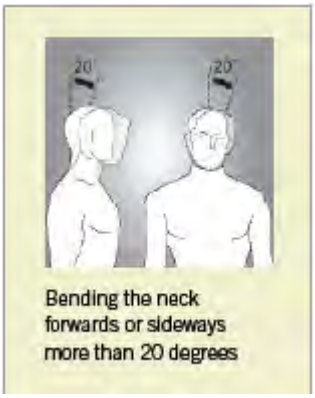
*Repetitive posture* means assuming the same position repeatedly. *Repetitive movement* means repetitively performing a movement. As a general guide, repetitive means a movement or action is performed more than twice a minute. If tasks involve repetitively completing the same pattern of movement then the same structures (ligaments, muscles etc) are being loaded in the same way without the opportunity to recover;

*Sustained posture* means maintaining the same position continuously for a prolonged period of time. *Sustained movement* means using the same parts of the body over a period of time to maintain movement. As a general guide, sustained means a movement or posture is continued or held for more than 30 seconds at a time. If tasks involve little or no movement then the flow of blood through muscles is restricted, increasing the risk of discomfort or injury;

*Awkward postures* are those positions where the whole body or parts of the body parts are not in their normal or neutral position. When a joint moves further away from its normal (neutral) position, more muscular effort is needed to achieve the same force. If any part of the body is in an uncomfortable or bent and twisted position then it is in an awkward posture. If tasks involve adopting postures that are at the extreme ranges of normal movement, the structures around the joint are stretched or compressed and the risk of injury increases.

The risk of injury is increased for tasks requiring any of the following to be done repetitively or for a sustained time (illustrations from *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work*):

- bending the neck forwards or sideways more than 20 degrees;
- twisting the neck more than 20 degrees;
- visible backward bending of the neck;



Bending the neck forwards or sideways more than 20 degrees


Twisting the neck more than 20 degrees

- visible backward bending of the back;
- twisting the back more than 20 degrees;
- bending the back forwards or sideways more than 20 degrees;


Visible backward bending of the back


Twisting the back more than 20 degrees

Bending the back forwards or sideways more than 20 degrees

- working with one or both hands above shoulder height;
- reaching forwards or sideways more than 30 cm from the body;


Working with one or both hands above shoulder height



Reaching forwards or sideways more than 30 cm from the body

- reaching behind the body;
- twisting behind the body;

Reaching behind the body

Twisting behind the body

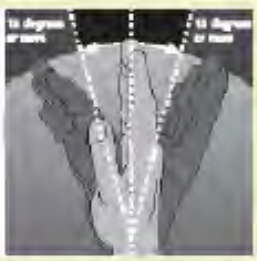
- squatting, kneeling, crawling, lying, semi-lying or jumping;
- standing with most of the body's weight on one leg;

Squatting, kneeling, crawling, lying, semi-lying or jumping

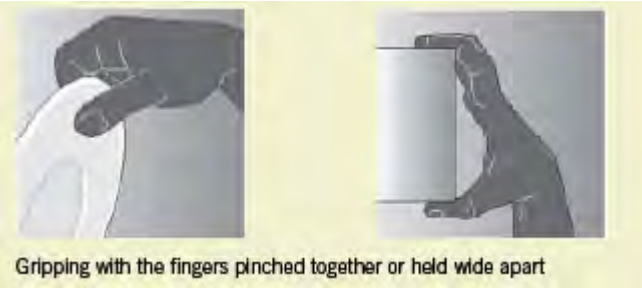
- twisting, turning, grabbing, picking or wringing actions of the fingers, hands or arms;
- working or gripping with the fingers close together or wide apart;
- very fast movements;
- bending of the wrist;

Bent wrists in actions where the fingers and hands are applying forces and fingers are fairly straight (eg. typing)

Where the fingers are bent or applying higher forces (eg. gripping)

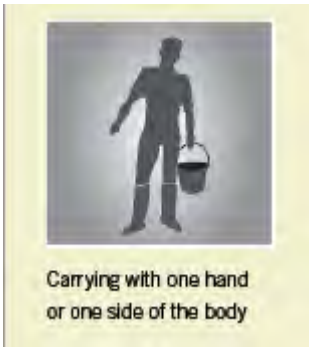


Where the wrist is bent to the side



Gripping with the fingers pinched together or held wide apart

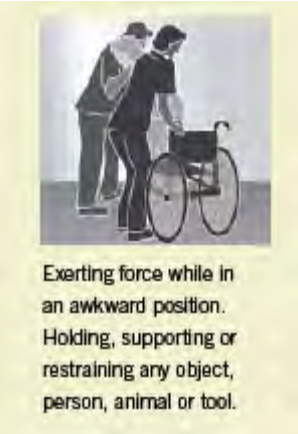
- lifting, lowering or carrying;
- carrying with one hand or on the side of the body;
- exerting force with one hand or on the side of the body;
- pushing, pulling or dragging;



Carrying with one hand or one side of the body

Pushing, pulling or dragging

- exerting force while in an awkward posture; and
- holding, supporting or restraining anything.



Exerting force while in an awkward position. Holding, supporting or restraining any object, person, animal or tool.

### (ii) Force or exertion

A manual task that involves high force is one that people in the working population would find difficult because of the effort it requires. Forceful muscular exertions place high stress on the muscles, tendons, joints, ligaments and vertebral discs. High force also fatigues muscles and increases the time needed to recover.

If there are high forces involved in the task, even if they are not repetitive or sustained, there can be a risk of injury. This means that any manual task involving force may be assessed as a risk, even if it is

only done occasionally or for short periods. The longer and more often force is applied and the higher the force, the greater the risk.

The risk in tasks involving high force is related to the following.

- **Intensity of the force needed** – Some tasks requiring force involve the whole body – for example, lifting, lowering and carrying heavy weights, or pushing a heavy load. Other tasks involve only some parts of the body, such as the hands and arms. A small amount of force could be considered high force when the small muscles of the hands are used to perform the manual task.
- **Speed involved** – Fast movements (particularly if repeated; e.g. swinging a sledge hammer) can injure muscles, tendons and ligaments. The rapid or sudden speed changes caused by sudden or unexpected movements are high risk.
- **Whether the force is jerky or sudden** – Forces suddenly applied or stopped can overload the structures of the musculoskeletal system such as muscles, tendons, joints, ligaments and vertebral discs. This can occur when throwing or catching loads, or when the load or item being worked on moves unexpectedly (e.g. when pulling on a hose that suddenly comes free).

**(iii) Duration and frequency of the task**

Tasks that continue over a long period, or are repeated over the work day, increase the worker's exposure to hazards. If a task is performed continuously for prolonged periods without any breaks, there is no opportunity for the structures of the musculoskeletal system to recover.

The risk of injury is influenced by:

- how long the task is carried out – duration; and
- how often the task is done – frequency.

If a task is done for a total of two hours over a shift or continually for more than 60 minutes at a time, this will increase the risk of injury, particularly cumulative injury risks.

## *Contributing risk factors*

**(i) Work environment**

Aspects of the work environment that can contribute to the risk of injury when performing manual tasks include:

- thermal environment;
- workplace lighting;
- floor surfaces; and
- housekeeping.

*Thermal environment*

Aspects of the thermal environment that can increase the risk of musculoskeletal disorders include cold, heat, humidity and wind. Higher temperature and humidity increase the total physical load on the body, which leads to more rapid fatigue. Perspiration on the hands may reduce gripping ability. Cold, windy conditions, particularly at the beginning of work, may prevent muscles being properly warmed up. Windy conditions may also increase the forces required to handle loads with a large surface area, such as sheeting.

*Workplace lighting*

The risk of injury increases with lower levels of light or higher levels of glare. Low levels of light or the contrast between areas of bright light and deep shadows can increase the risk of tripping. Poor lighting can reduce concentration on the task.

*Floor surfaces*

Slippery, uneven or varying level floor surfaces increase the risk of injury. Steps or steep slopes add to the difficulty of movement when handling loads, particularly if the load obscures a person's view. Carrying a load up or down a ladder will be difficult due to the need to have a proper hold on the ladder.

*Housekeeping*

Poor housekeeping can increase the risk of injury. For example, obstructed access ways increases the risk of tripping when carrying a load.

**(ii) Systems of work, work organisation, work practices**

Aspects of work organisation, work practices and systems of work can trigger physiological changes. Physiological responses in the body, such as changes in muscle tension, can increase the risk of musculoskeletal disorders.

Aspects of work systems, organisation and practices that can increase the risk of injury include:

- pace of work and time constraints (e.g. high workloads and tight deadlines, lack of rest breaks);
- ability workers have to influence workload or work methods (e.g. little leeway to influence pace of work and task design); and
- level of resources and guidance available (e.g. unsuitable or insufficient equipment, staffing levels that do not allow sufficient rest and recovery time or for assistance when needed).

**(iii) Exposure to sustained vibration**

The longer a worker undertaking manual tasks is exposed to vibration, the greater the risk of a musculoskeletal disorder. Workers may be exposed to two types of vibration:

- **Whole-body vibration** – occurs when a worker is in contact with a vibrating surface such as a seat or the floor in heavy vehicles or machinery, plant or equipment such as earth moving equipment.
- **Hand–arm vibration** – occurs when vibrations are transferred to the hands and/or arms either from a tool (e.g. nut runners, impact wrenches, grinders) or from steering wheels or controls in heavy machinery.

## *Determining the source of the risk*

Determining the source (underlying root cause) for the presence of the above risk factors will assist in selecting and implementing the most effective risk control measure. For example, considering what causes a worker to adopt an awkward posture will identify what needs to be altered to improve the worker's posture.

Some sources of risk are listed below.

- Work area design and layout (e.g. high shelves or obstructed access can result in awkward postures).
- Nature of load being handled (e.g. loads that are large, bulky, and hard to grip, may result in high forces and/or awkward postures).
- Nature of the items, including hand tools, plant and equipment (e.g. the weight, balance, handle design or orientation, shock loading or impact forces and "match to the task" of hand tools may result in forceful exertions or grip and/or sustained and awkward postures).
- Working environment (e.g. slippery or uneven floor surfaces, steps, ramps and contaminants of floors and obstructions related to poor housekeeping, can contribute to sudden unexpected movements and increase the risk of slips, trips and falls).
- Systems of work, work organisation, work practices (e.g. methods of work and tasks designed for the "average" worker may result in sustained awkward postures and movements or high forces).

## *Rating the severity of the risk*

The risk assessment also evaluates the severity of the risk arising from the identified hazardous manual tasks for prioritisation within existing OSH risk management systems. An example of a general risk matrix is shown on the next page.

| CONSEQUENCE | LIKELIHOOD | | | |
|---|---|---|---|---|
| | Very Likely | Likely | Unlikely | Highly Unlikely |
| Fatality | HIGH | HIGH | HIGH | MEDIUM |
| Major injuries | HIGH | HIGH | MEDIUM | MEDIUM |
| Minor injuries | HIGH | MEDIUM | MEDIUM | LOW |
| Negligible injuries | MEDIUM | MEDIUM | LOW | LOW |

*Source: www.safetyline.wa.gov.au/institute/level1/course6/lecture93*

### *Risk assessment tools*

It is recommended that the risk assessment form/s used at the participants' workplace be included in the presentation. An example is provided on the following page.

## Risk control

Risk control is the process of eliminating or minimising the risk of injury (i.e. musculoskeletal disorders) arising from a hazardous manual task.

Where the risk of a hazardous manual task is assessed as moderate or high, risk control measures must be implemented to eliminate or reduce the risk. The measures must:

- follow the hierarchy of control;
- address the source/s or underlying root cause/s of the risk identified in the risk assessment; and
- be derived and developed in consultation with workers who do the task.

Ideally, manual tasks performed in the workplace should include:

- dynamic and varied movement of the body regions;
- moderate levels of force;
- comfortable and varied postures;
- no exposure to whole body or hand–arm vibration; and
- rest breaks taken at appropriate intervals to allow adequate recovery.

### *Hierarchy of control*

The best control measure is to eliminate the hazard by eliminating the hazardous manual task. Eliminating hazardous manual tasks is best achieved during the design of workplaces, equipment, tools, plant and systems of work. Implementing systems to promote good design is imperative. Incorporating ergonomics specifications into purchasing procedures will ensure tools and equipment are fit for purpose.

Often, however, elimination is not possible or practicable. If it is determined that the hazardous manual task cannot be eliminated then design (engineering) controls need to be devised to reduce injury risks. The design controls need to change the source (underlying root cause) of the risk identified in the risk assessment. Administrative controls must only be used as a last resort or to supplement other controls.

Employees undertaking manual tasks need to receive task specific training to ensure that they have the knowledge and skills to employ safe work practices when completing manual tasks. Task specific training is a *supplementary* control and should not be implemented as the single control measure to reduce the risk of a hazardous manual task causing injury.

**Manual task risk assessment**

Step 1. Describe the task characteristics (Exertion, Exposure, Posture & Movement) for the following body regions independently: back; arms; shoulders; legs. Transfer the corresponding scores to the Risk Scores table.
Step 2. Describe the environmental characteristics. Performing the task in excessive heat or cold or in stressful conditions increases the score for all regions by 1. Moderate or high whole body vibration increases the risk score for the back by 1 or 2. Moderate or High hand/arm vibration increases the risk score for the arms by 1 or 2.

Step 3. Assess acute injury risk - a maximum exertion score (8) for any body region indicates a high risk of acute injury, regardless of other task characteristics. An acute injury risk is also indicated if the sum of exertion and posture for any body region is 6 or greater.

Step 4. Assess cumulative injury risk - The sum of task scores and environmental scores provides an indication of the injury risk for each body region. Scores less than 8 are considered low risk. Scores between 8 and 15 are considered moderate risk. Risk scores greater than 15 for any body region indicate a high risk of injury.

Risk Scores

| | Exertion | Exposure | Posture | Movement | Environment | Injury Risk (sum) |
|---|---|---|---|---|---|---|
| Back | | | | | | |
| Hand/ Arms | | | | | | |
| Shoulders | | | | | | |
| Legs | | | | | | |

Task Characteristics

| Score | Exertion | Exposure | Posture | Movement |
|---|---|---|---|---|
| +1 | Low force and speed | Task performed infrequently for short periods | Comfortable postures within a normal range about neutral | Dynamic and varied movement patterns |
| +2 | Moderate force or speed, but well within capability | Task performed regularly, but with many breaks or changes of task | Uncomfortable postures, but not approaching an extreme range of motion | Little or no movement, or repeated similar movements |
| +4 | High force or speed, but not close to maximum | Task performed frequently, without many breaks or changes of task | Postures approaching or at an extreme range of motion | Repeated identical movement patterns |
| +8 | Force or speed close to maximum | Task performed continuously for the majority of the shift | | |

Environmental Characteristics

**Temperature & Stress**
☐ moderate heat (+1) or extreme heat (+2)
☐ stress, ☐ lack of control, or ☐ time pressure (+1)

**Whole body vibration**
☐ moderate (+1 to back)
☐ high (+2)

**Hand/Arm vibration**
☐ moderate (+1 to arms)
☐ high (+2)

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*Source: Manual Task Risk Assessment (ManTRA) from Appendix B in Burgess-Limerick, R. (2008) Procedure for Managing Injury Risks Associated with Manual Tasks http://www.burgess-limerick.com/download/manualtasksprocedure.pdf*

There is compelling evidence that safe-lifting type training alone is ineffective in reducing injuries from performing manual tasks. It is more effective to look at the task and ask “Do we need to do it?” and “How can we do it better?”

## *Address the source/s of the risk*

Risk control measures need to change the source of the risk identified in the risk assessment by altering:

- the design and layout of the workplace;
- the nature of the load (including using mechanical aids or assistive devices);
- the nature of the items used/handled during manual tasks (including hand tools);
- the working environment; or
- work organisation and work practices, including systems of work.

**Alter the design and layout of the work area**

The design and layout of the work area directly impact on the risks associated with a manual task. For example, restricted access to work can cause workers to adopt awkward postures, increasing the risk of injury. Aspects of the work area design and layout that can be a source of risk include the work height, work space, reach distances, location of items and lack of adjustability. Where practicable:

- place items so workers can undertake tasks in a neutral posture;
- place items to avoid double handling or moving loads manually over long distances;
- lay out displays and controls to encourage comfortable head and neck postures and comfortable hand or arm reach;
- provide seating that is adjustable so the user can adopt a comfortable, well-supported seated posture;
- design workstations to be adjustable, or when this is not possible design the workstation to suit the widest range of workers; and
- ensure the working height suits the tasks.

***Example 1 – altering the layout of controls***

This example is adapted from *NIOSH IC: 9491 Ergonomics and Mining: Charting a Path to a Safer Workplace*.

To operate the water truck pump switch, workers were required to reach forward while rotating their arms (left photograph). This action was sometimes performed every few seconds. The switch was moved to a shift pedestal (right photograph), reducing the reach and allowing the operators arm to be in a neutral position when operating the switch.

***Example 2 – improving access to the work area***

This example is adapted from *ACARP Project C11058: Reducing Musculoskeletal Risk in Open Cut Coal Mining*.

When hosing down the wash-plant areas, there was very limited access to the area (left photograph). This resulted in the worker undertaking forceful exertions with the arms in awkward postures when holding and directing the hose. A walkway was built and installed to allow access for hosing (right photograph). This eliminated the awkward postures.

***Example 3 – raising the work height and changing the layout***

This example is adapted from *NIOSHTIC-2 No. 2003465: Ergonomics Interventions at Badger Mining Corporation*.

To verify bags were accurately filled, a sampling of bags was lifted from the conveyor and weighed on a scale located on the floor away from the conveyor (left photograph). This resulted in the worker being exposed to forceful exertions and awkward postures. To reduce exposure to these risk factors, the scale was placed on an elevated cart so it could be moved closer to the conveyor (right photograph), eliminating carrying, and the lift could be performed between knee and shoulder height.

**Alter the load handled, including use of mechanical aids and devices**

The nature of the load handled in a manual task directly impacts on the risks associated with that task. Aspects of loads such as the size, shape and design can be a source of risk. Whenever practicable:

- modify the size and shape of the load so as facilitate handling – in some cases this could be increasing load size so it can be mechanically handled, while in others the size or weight could be decreased to reduce exertion of force and awkward postures;
- improve the grip on the load – have handles if possible;
- minimise the risk of sudden movement of the load;

- label loads appropriately; or
- use mechanical aids.

***Examples – mechanical aids or assistive devices adapted to mining workplaces***

These examples are adapted from *NIOSH IC 9507: Reducing Low Back Pain and Disability in Mining*.

The mining industry has many unique environments. Using traditional mechanical aids or assistive devices can be difficult but there are a number of examples where they can be used easily and effectively, as shown below.

**Hoists – lift heavy items**

**Mobile manipulators – lift and move heavy items**

**Forklift and pallet – easy transfer of loads**

**Lift stands – facilitate load transfer**

**Attaching a simple handle – improves postures when handling**

**Alter the item being used**

Poorly selected or incorrect use of items used to perform or assist with performing manual tasks can increase the risk of injury. Items used in manual tasks should suit the task and work environment, and be well maintained, adjustable and used correctly.

Hand tools should be selected if they:

- can be held in a neutral wrist or handshake position;
- allow the hand to retain a comfortable grip span;
- can be used by the worker in one hand;
- are well balanced (i.e. the heaviest part of the tool should be behind the wrist);
- are suitable for use with either hand;
- provide a good grip surface; and
- prevent a worker from adopting a pinch grip with high force or for prolonged periods

*Source: National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work*

The level of muscular effort when using hand tools can be minimised by:

- using power tools where possible;
- suspending heavy tools when they are used repetitively in the same place;
- counterbalancing heavy tools that are used repetitively and need to be kept away from the body;
- using trigger locks when grip has to be sustained more than 30 seconds;
- holding the work piece in place with either jigs or fixtures;
- selecting tools that produce the least amount of vibration;
- reducing impact shocks; and
- limiting torque or “kick back” reactions

***Example 1 – suspending heavy tool***

This example is adapted from *NIOSH IC: 9491 Ergonomics and Mining: Charting a Path to a Safer Workplace*.

The impact wrench is being supported while the mechanic is using it to change the cutting edges on a dozer blade. The support is attached with a strap to an overhead crane. Instead of workers holding the impact wrench, which results in sore hands, arms and shoulders, they only have to guide the wrench.

***Example 2 – using power tools where possible***

This example is adapted from *NIOSHTIC-2 No. 2003465: Ergonomics Interventions at Badger Mining Corporation*.

Cutting copper wire with a manual cable cutter (left photograph) is a highly repetitive task that involves forceful exertions. Using a cable cutter, which attaches to any power drill (right photograph), eliminates forceful exertions.

**Alter the work environment**

*Thermal environment*

Ensure workers in cold conditions:

- take regular rest breaks in a warm place;
- wear clothing that is fitted and not too bulky or restrictive;
- wear personal protective equipment and clothing selected for the task; and
- wear non-slip footwear and the floors are not slippery.

For workers in hot and humid conditions:

- reduce temperature and humidity during manual tasks where possible by
  - relocating work away from sources of heat
  - providing fans or air conditioning
  - using screens, awnings and clothing to shield workers from radiant heat sources such as the sun
  - enclosing hot processes and increasing ventilation
  - altering work schedules so that work is done at cooler times
  - providing a cool, well-ventilated area where workers can take rest breaks;
- minimise the risk of heat stress and heat exhaustion during manual tasks by
  - providing opportunities for workers who are not used to working in hot conditions to acclimatise
  - ensuring that workers work at a sensible pace
  - providing a supply of cool drinking water.

For workers in windy conditions, minimise the exposure by:

- planning the route of work through protected pathways;
- using vehicles to transport items in outdoor conditions; and
- coordinating tasks during low wind conditions.

*Floor surfaces and housekeeping*

Minimise the risk of injury by:

- selecting floor surfaces, steps and ramps suited to the manual tasks (e.g. fit low-friction floor coverings such as linoleum in areas where trolleys are used);

- maintaining floor surfaces, ramps and steps;
- removing contaminants on floors; and
- keeping work areas clean, tidy and free of clutter or obstacles.

*Lighting*

Lighting should be selected to suit the task being performed. Lighting characteristics to be considered include illumination levels, direction of lighting relative to the manual task, reflection, glare and colour.

To prevent awkward or sustained postures that may arise from low or excessive levels of lighting, glare or reflection:

- provide additional lighting, such as a lamp on a movable arm, where required;
- improve the layout of existing lights by lowering or raising them or changing their position in the work area;
- increase or decrease the number of lights;
- change the diffusers or reflectors on existing lights;
- change the lights to improve light levels or improve colour perception;
- change the orientation or position of the item to avoid shadows, glare or reflections;
- clean lights and light fittings regularly;
- use screens, visors, shields, hoods, curtains, blinds or external louvers to reduce reflections, shadows and glare; and
- control natural light sources (particularly bright sunshine) on work pieces, screens and work surfaces by orientation and placement at 90 degrees to the source, and providing screening and louvres.

*Vibration*

For workers who are exposed to whole body or hand–arm vibration minimise exposure by controlling:

- vibration at the source;
- the path of the vibration; and
- the vibration received by the worker.

Exposure to whole body vibration can be reduced by:

- modifying the process to eliminate the task or the risk;
- redesigning the task;
- designing machines or vehicles that reduce the vibration transmitted to the operator;
- improving road and surface conditions;
- implementing speed limits;
- implementing safe work procedures and standard operating procedures;
- implementing work breaks or job rotation to reduce exposure; and
- providing training on adjusting and operating equipment to reduce exposure.

Exposure to hand–arm vibration can be reduced by:

- substituting alternative methods or processes to eliminate the need to use vibrating hand-held tools;
- selecting tools to eliminate or minimise exposure to vibration;
- modifying existing tools to either dampen the vibration or prevent the vibration from moving into the handle of the tool;
- modifying the work methods to reduce exposure to vibration;

- altering work practices and the way work is organised to reduce exposure to vibration;
- maintaining equipment on a regular basis to minimise vibration;
- providing personal protective equipment, such as gloves and protective clothing, to keep workers warm and dry and encourage good circulation (gloves should not be relied upon to provide protection from vibration); and
- providing training, including advice on good work practices and tool maintenance, and information on the effects on vibration white finger of personal habits affecting circulation (e.g. smoking, drug use), and recognising and reporting symptoms of hand–arm vibration syndrome.

**Alter the way work is organised and work practices**

When risks cannot be eliminated or minimised through the controls listed above, the work organisation and work practices should be altered to minimise risks, such as:

- selecting the best work position to suit the task (e.g. a seated position is best for tasks that require workers to complete work that involves fine manipulation whereas a standing position is best for tasks that involve forceful movements; a range of tasks that involve a mixture of seated and standing activities, as well as some walking is recommended);
- modifying the handling task (e.g. pushing, pulling, sliding or rolling a load instead of lifting or carrying it);
- Promoting symmetrical handling or balanced loading (e.g. improving packaging and providing attachments to assist hand grip for off-centred loads);
- adjusting procedures for manual tasks in workplaces that constrain movement (e.g. ensuring, where practicable, that access ways are suitable both for the size and shape of the load);
- adjusting procedures for manual tasks performed in a seated position (e.g. reducing the load size, shape and weight where possible);
- improving the storage of loads (e.g. ensuring frequently used items are stored between knuckle and shoulder height;
- changing the location of loads (e.g. locating storage areas close to work areas to reduce the distance loads need to be carried);
- reducing the effort required by altering work methods (e.g. reducing the efforts of pushing or pulling tasks by positioning trolley wheels in the directions of travel);
- altering work organisation to allow workers sufficient time to recover from manual tasks (e.g. rotating workers to alternative duties that have different task demands, allowing specific body parts to rest and recover);
- altering the pace of work to accommodate the physical demands of the manual task (e.g. setting realistic work rates in consultation with the workers doing the tasks);
- altering the work flow (e.g. locating storage areas close to distribution areas);
- allowing for task variation (e.g. job rotation);
- altering workloads to reduce the likelihood of fatigue and injury (e.g. arranging staff levels so there are workers available to complete tasks within deadlines or at peak periods);
- providing adequate rest breaks to prevent fatigue;
- altering shifts and rosters;
- providing task specific training; and/or
- using team lifting as an interim control – team handling should only be used in emergency situations or as a temporary interim control measure, and only when the load can be shared evenly and handling in a symmetric, forward-facing posture can be ensured.

## *Implementing risk controls*

When implementing risk controls, it is generally best practice to:

- trial the solutions;
- review controls after a testing period;
- develop work procedures to ensure that the controls are understood and responsibilities are clear;
- communicate the reasons for the changes; and
- provide training to ensure workers can and do complete the tasks competently.

Risk control measures and the plan for their implementation, including assigning responsibilities and completion dates, should be documented.

It is recommended the risk control form/s used to document the risk control process at the participant's workplace is used in the presentation. An example of a manual task risk control recording form is shown below.


*Source: McPhee, B. (1993) Ergonomics for the Control of Sprains and Strains in Mining, page 28.*
*http://www.safeworkaustralia.gov.au/NR/rdonlyres/EBA2992C-F39D-4C3B-9E3A-51A2F053F1C2/0/ErgonomicsSprainsStrainsMining.pdf*

## Monitor and review

All implemented control measures must be reviewed and monitored, including:

- evaluating the effectiveness of the implemented control measure; and
- identifying if any new hazards have been introduced.

It is good practice to re-assess the task immediately after the control measures have been implemented, and to repeat the assessment at a suitable interval following implementation.

## Record keeping

Keeping records of the hazard identification, risk assessment and risk control processes will help you demonstrate that you have been actively working to ensure that risks of injury (i.e. musculoskeletal disorders) from performing manual tasks are being managed. Furthermore, documentation can facilitate information sharing across the organisation.

## Responsibility

At this stage in the workshop, some participants may be feeling a bit daunted by the process. They need to understand where they fit in.

**Who should be involved?**

Experience has shown management commitment and worker participation are fundamental to the successful management of manual tasks risks. Consultation between employees and employers is a requirement of the occupational safety and health legislation. Current best practice is a participative ergonomics approach. This involves workers, assisted by an ergonomist or OSH personnel with skills in ergonomics, undertaking the risk management process.

Everyone in a workplace should be actively involved in identifying hazardous manual tasks – it is inherent in the duty of care requirements. It is recommended that small teams of workers from the same occupational group are involved in the hazardous manual task risk assessment process, and in deriving and developing risk control measure. In other words, when carrying out the risk management process, the workers doing the task should be involved in the process.

Expert or specialist advice may be useful in undertaking difficult or complex risk assessments and developing risk control procedures. A person with an ergonomics background may be appropriate for helping to assess the risk, whereas a person with an engineering background may be more suitable for helping to control the risk. Where a safety and health committee exists, it should monitor the implementation of the risk management process.

# Practical exercises

## Practical exercise 1

This practical exercise aims to put the risk management process into perspective. Give the participants about 5 minutes to complete the worksheet below, then discuss the answers for their organisation. See the “Workshop resources” document in this training package for a copy of the exercise.

**Managing the risks associated with manual tasks – who’s responsible?**

Read each statement and decide who is responsible for carrying it out. Tick the appropriate box or boxes. There may be more than one entity (individual or team) responsible. Only include individuals, teams or committees that are in your workplace. For example, if your workplace does not have a safety and health committee, do not allocate responsibilities to the committee.

| | Employees | Supervisors | Managers | OSH Officer | Safety and health representatives | Safety and health committee | Manual tasks risk management team |
|---|---|---|---|---|---|---|---|
| **Reporting potential hazardous manual tasks** | | | | | | | |
| **Reporting injuries from performing manual tasks** | | | | | | | |
| **Reporting equipment issues and problems** | | | | | | | |
| **Keeping hazard and injury records** | | | | | | | |
| **Analysing hazard and injury records** | | | | | | | |
| **Screening tasks to identify hazardous manual tasks** | | | | | | | |
| **Assessing risks of hazardous manual tasks** | | | | | | | |
| **Developing and implementing risk controls measures** | | | | | | | |
| **Consulting with employees doing the task** | | | | | | | |
| **Ensuring appropriate control measures** | | | | | | | |
| **Attending task specific manual task training** | | | | | | | |
| **Following instructions on safe work practices** | | | | | | | |

## Practical exercise 2

### Case studies

In this session, the participants put into practice the process of addressing the risks arising from hazardous manual tasks. The exercise aims to make participants confident in using the risk management process to manage the risks arising from hazardous manual tasks.

See the “Workshop resources” document in this training package for copies of a case study guide and the three case study worksheets. You can use these and/or choose a scenario specific to the participants’ workplace.

A workplace-specific case study could be a task where either someone sustained a musculoskeletal disorder or it has been reported as hazardous.

One example may be sufficient for a general induction program.

For manual tasks risk management team training, it is recommended that at least three examples are worked through, including at least one from the workplace. It is a good idea to video record the identified hazardous manual task to show participants.

Work in small groups (2 to 4 people per group). When applicable, have groups comprising people with the same job or occupation. Each group needs to discuss the case study, and then complete the risk assessment section. You can provide risk assessment checklists utilised at your workplace as well as the case study guide and worksheets to complete this activity.

The risk assessment should be done as a group, consulting with other group members. The risk factors, sources of risk and severity of risk should be considered by the group. After this, each group needs to fill in the risk control section, outlining in a few words the best options to eliminate or reduce the manual task risks.

On completion, each group can report back on the major risk factors found in the risk assessment, and their control measures. This should be short, not allowing participants to get sidetracked. The purpose is to ensure that participants have understood the process, and can make reasonable judgements about the risks and appropriate control measures.

The completed case study worksheets are included here, with the main risk factors and some suggestions for control.

**CASE STUDY 1**

**Hazard identification**

A number of employees on your mine site have reported sore lower backs from loading and unloading their work utilities. There has recently been two serious lost time injuries (LTIs) associated with this task.

Most employees need to load and unload equipment and materials several times a day. The equipment and materials vary in size, shape and weight. Usually things are lifted to and from the back of the utility to and from the ground. The ground surface is often uneven. On many occasions, employees are working alone. The utilities have drop-down tray sides but these are rarely used and usually remain in the upright position. The heights of the utility tray and sides vary, but many are high enough so that workers are lifting or lowering near to or above shoulder height to clear the height of the tray sides.

**Risk assessment**

*Key risk factors*

- Awkward postures – reach to get to items stacked in the middle of the utility
- Awkward movements – lifting at or above shoulder height to lift items over the utility tray sides; and repetitive bending to lift items off the ground and to lower items onto the ground
- Application of high force – to lift, lower or move heavy or awkward items on and off the utility tray
- Working environment – uneven ground
- Work organisation – working alone

*Key source/s of risk*

- Weight, size and shape of some items loaded and unloaded
- Design and layout of the utility – height of the utility tray with sides up; accessing items stored in the middle of utility tray

*Severity of risk*

Based on the number of discomfort reports, the occurrence of two serious LTIs associated with this task, and the risk factors identified, the severity of the risk for this task is high (likelihood = likely; consequence = major, given serious LTIs).

**Risk control**

*Suggested measures*

- Identify ways to minimise the equipment and materials that need to be loaded and loaded on and off utilities. For example, if the same equipment is being loaded and unloaded to and from the same location on a daily basis, consider storing the equipment at the point of use, thus eliminating the need to load and unload the equipment every day.
- Modify utilities such that they have:
  - a mechanical lifting device fitted such as a vehicle mounted hoist; or
  - a hydraulic tailgate.
- Introduce a safe work procedure (SWP) including practices such as:
  - always lowering utility tray sides before loading and unloading equipment and materials;
  - loading heavy or awkward items on the side of the tray, and lighter easier-to-handle items in the middle of the tray;
  - completing heavy or awkward loading and unloading activities in two stages by moving items to or from the side of the tray and lifting items off or on the utility;
  - using team lifting (remember that team lifting should not be utilised as an ongoing control but is appropriate for one-off tasks and/or as an interim control); and
  - selecting the best pathway (e.g. even ground, free of obstructions) before starting loading or unloading activities.

## CASE STUDY 2

### Hazard identification

There has been a spike in musculoskeletal discomfort reports made to supervisors over the past three months. The reports are associated with the manual opening of isolation valves on the pipes at your process plant. During that time there has been one injury reported for a worker performing this task. Although it did not result in any lost time, the injured worker was on restricted duties for more than two weeks.

The location of the valves means workers have to bend and twist to access the opening mechanism. The force required to open the valve is often excessive and workers use a sledge hammer to loosen it. On occasions, it can take up to an hour to open a particularly difficult valve.

### Risk assessment

*Key risk factors*

- Awkward postures – bending and twisting to access the valves
- Application of high force – to open valve
- Speed of the force applied – swinging the sledge hammer
- Duration of task – can take up to an hour

*Key source/s of risk*

- Layout – difficult to access valve as a result of its location
- Design of valve – requires high force to open and close
- Duration of task – can take an hour to open particularly difficult valves

*Severity of risk*

There have been a number of discomfort reports and a no-LTI incident associated with this task, and there are a number of risk factors present, therefore the severity of the risk for this task is moderate (likelihood = likely; consequence = minor; although it may be argued that the consequence could be major, given the information states there were no lost time injuries it is reasonable to assume minor consequences).

### Risk control

*Suggested measures*

- Design all valves in the piping so they do not require manual opening and closing (i.e. mechanise the process)
- Improve access to the valves opening and closing mechanism (e.g. fit a valve extension)
- Develop a tool specific to the task of opening and closing valves
- Ensure all valves are maintained
- Introduce a safe work procedure (SWP) including practices such as:
  - using the most suitable tools available
  - taking regular rest breaks
  - seeking assistance if required

**CASE STUDY 3**

**Hazard identification**

It has become obvious there is a high turnover of excavator operators on your mine site. No incidents or injuries have been reported, but excavator operators take significantly more sick leave than is usual.

The excavator operators generally only get out of the excavator for morning, lunch and afternoon breaks, and therefore are sitting in the excavator for 2-3 hours without a break. The excavators transverse very rough ground. The operators often have to twist to see behind them. The operator's seat in all the excavators have been upgraded to fully adjustable suspension seats. On observation, it is obvious the seats in the excavators have not been adjusted to suit individual operators.

**Risk assessment**

*Key risk factors*

- sustained postures – sitting in excavator for 2-3 hours without a break
- awkward postures/movements – rotating neck to extreme ranges of movement to look behind
- exposure to whole body vibration – seating not adjusted therefore ineffective in reducing vibration exposure; rough access roads to work area
- duration of task – task completed for entire shift

*Key source/s of risk*

- work organisation – prolonged exposure to vibration and sustained sitting (more than 60 minutes without a break and more than 2 hour per shift)
- design of excavator – no mirrors or swivel seat, resulting in awkward postures
- workplace environment – rough roads adding to exposure to whole-body vibration
- lack of instruction and training – seating not adjusted correctly negating benefits

*Severity of risk*

Given the staff attrition, and the significant risk factors present, the risk for this task is moderate (likelihood = likely; consequence = minor, although it may be considered major, given the information states that there have been no injury reports it is reasonable to assume a minor consequence).

**Risk control**

*Suggested measures*

- Reorganise work such that operators take regular breaks from sustained sitting (e.g. job enlargement whereby the excavator operators are responsible for tasks such as refuelling, routine maintenance checks and completing associated paperwork)
- Minimise poor postures while operating excavator (e.g. fit the excavators with mirrors and/or ability to swivel seat and/or in-cab CCTV to eliminate need for operator to twist to see behind; and provide education on adjusting seating to suit individual so the operator is sitting in a comfortable supported seated posture)
- Maintain road surface as far as is practicable (e.g. regularly grade access ways to work area)
- Provide instruction, training and supervision to ensure operators adjust their seats to minimise exposure to vibration and to adopt a comfortable supported seated posture
- Ensure regular maintenance of excavator, including seating
- Implement a safe work procedure (SWP) including practices such as:
  - operators taking regular postural breaks (may include stretches and exercises)
  - adjusting seat before start up
  - reporting any issues or hazards

## Summary and conclusion

At the end of the workshop, summarise the main points of the risk management process of hazard identification, risk assessment, risk control and evaluation applied to manual tasks.

Reiterate that the aim is to reduce the overall risk of injuries, collectively referred to as musculoskeletal disorders, from performing manual tasks at work by effectively implementing the risk management process.

Time should be allocated for questions.