

PREVENTING MUSCULOSKELETAL DISORDERS

LEARNING OUTCOME

Using the principles of ergonomics, apply risk management strategies to the 2 key injury mechanisms for musculoskeletal disorders (MSD): hazardous manual tasks, and slips trips and falls at level (STFAL).

ASSESSMENT CRITERIA

- Identify the relevant Queensland Work Health and Safety legislation specifically the hazardous manual tasks regulation and code of practice
- Apply risk management strategies for hazardous manual tasks including:
 - Identification of the risk factors and sources of risk
 - Use of appropriate methods and tools to assess the risks, and
 - Application of the hierarchy of control to develop controls.
- Identify the relevant Queensland Work Health and Safety legislation relating to STFAL in the current Regulations and code of practice.
- Understand how STFAL occur
- Understand and identify common occupational STFAL hazards and influencing factors
- Understand how to manage occupational STFAL risks

ATTACHMENTS

- Slips, Trips and Falls at Level (STFAL)
 - STFAL Supplementary Guidance
- [Slips, Trips and Falls Prevention Guide](#)
- Selecting and Setup of Equipment for Computer Work
- Manual Tasks Risk Register
- [Preventing Sprains and Strains in Construction](#)
- [Hazardous Manual Tasks Code of Practice 2011](#)

PREVENTING MUSCULOSKELETAL DISORDERS INCLUDING SLIPS, TRIPS AND FALLS AT LEVEL

WHAT IS ERGONOMICS

Defining ergonomics

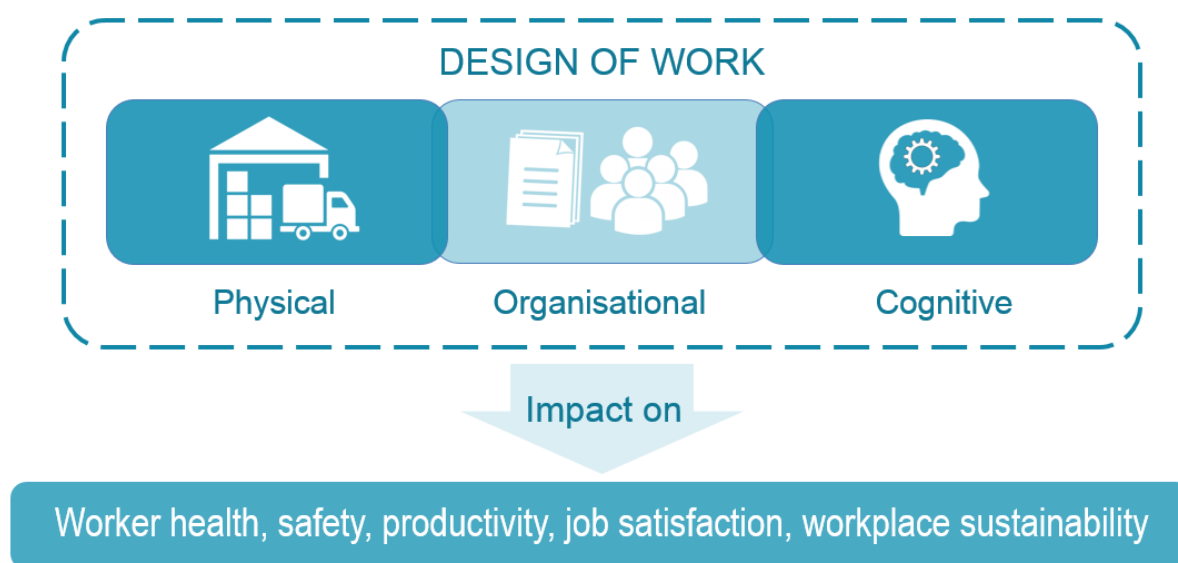
Ergonomics is the scientific study of human work and the interaction between workers, tools and the environment. The term ergonomics is derived from the Greek words “ergos” meaning work and “nomos” meaning natural law. Ergonomics is an applied science with knowledge drawn from psychology, biology, medicine and engineering.

Ergonomics in practice, is the application of scientific information concerning people to the set up, use and design of equipment, objects, systems and environments. In simple terms ergonomics “matches the job to the worker” and the “product to the user” by applying knowledge of how work and product use affects people.

The field of ergonomics can be divided into three main areas:

- **Physical ergonomics** - human anatomical, and some of the anthropometric (size, shape and composition of the human body), physiological and bio mechanical characteristics as they relate to physical activity.
- **Cognitive ergonomics** - mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system. (Relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress and training as these may relate to human-system and Human-Computer Interaction design.)
- **Organizational ergonomics** - optimisation of socio technical systems (complex interaction between humans, machines and the environmental aspects of the work system), including their organizational structures, policies, and processes. (Relevant topics include communication, crew resource management, work design, design of working times, teamwork, participatory design, community ergonomics, cooperative work, new work programs, virtual organizations, telework, and quality management.

Ergonomics



ERGONOMICS IN THE WORKPLACE

Poor ergonomics within workplaces can have wide ranging impacts on the health, safety and wellbeing of workers as well as their productivity. It is not just seen with tasks involving lifting or manual handling but is relevant to a broad range of tasks, tools, equipment, processes and work practices as well as environmental factors.

The match between the worker, the task and tools and the environment is critical in the design of a machine guard, the height of a work bench, the design of a hand tool, the location of a lever, the temperature of a workplace while completing physical work, the design of computer software or the weight of a load to name a few examples.

Human fatigue, operator error, plant and tool design as well as work design can be a major cause and/or contributor to accidents or incidents. Such factors need to be considered to minimize the risk of injury including musculoskeletal disorders.

The application of ergonomics principles in the workplace focuses on the design of good work including the systems of work and the work environment. This extends to the design and function of workstations, controls, displays, safety devices, tools, and lighting to fit the workers needs and to ensure their health, safety and wellbeing. It may also include the restructuring or changing of workplace conditions to reduce the stressors or risks associated with hazardous manual tasks or slips, trips and falls.

The application of ergonomics principles in the workplace facilitates the improvement and optimisation of workplace systems particularly:

- productivity and performance
- quality
- health and safety
- employee wellbeing and satisfaction

By designing the working system and the working environment to suit the worker, the risks associated with the task can be reduced. In addition, matching work and equipment design to human capabilities often leads to increased productivity. A system which has been designed for ease of use and worker comfort may produce fewer errors and result in improved efficiency.

Many workplaces are doing things to improve the fit between the worker and the job without realising that they are applying ergonomic principles. For example, the PCBU who purchases tools that are lighter and easier to use or the worker who rearranges the layout of parts so that they can be assembled more efficiently.

The principles of ergonomics also underpin Good Work Design. Good Work design optimises work health and safety, human performance, job satisfaction and business success. Safe work Australia's publication [Principles of Good Work Design](#) provides a framework to achieve effective injury prevention including musculoskeletal disorders.

ECONOMICS OF ERGONOMICS

The economics of ergonomics is often a topic of discussion. Implementation of ergonomic design controls is often perceived as cost prohibitive. This is far from the truth. "*Good ergonomics practice is good business*" and ergonomic interventions often result in significant productivity gains.

Evidence on the cost benefits of ergonomic interventions is quite strong. Case studies are available on the [WHSQ website](#) that illustrate the cost benefits achieved by Queensland businesses after implementation of hazardous manual tasks controls.

The potential costs of musculoskeletal injuries to workplaces can be enormous and the impact of these costs on business profitability is significant. Uninsured costs (those that are not covered by workers' compensation insurance) include lost time, extra wages and overtime payments, sick pay, production delays following the incident, loss of skills and experience, recruitment and training, loss of contracts, fines and damage to products, tools, equipment and materials.

For example, consider a case. A worker at a manufacturing workplace sustained a work related musculoskeletal disorder involving his neck while handling heavy panes of glass. The total uninsured costs in this case are \$48,084.00. These out of pocket expense are borne by the business. In the event of this case progressing to a common law claim, total insured costs exceeded \$175,000.00.

There is also the potential for businesses to influence their premium by preventing injuries and reducing workers compensation costs. The premium rate varies depending on the industry performance and individual workplace performance. High workers' compensation and medical costs as a result of poor OHS can reduce a company's ability to compete.

WHSOs may consider preparing a business case for management as part of the control approval process.

To assist, there are injury and cost benefit calculators available, including on the WHSQ website:

- [WHSQ injury cost calculator](#)
- [WHSQ Return on investment calculator](#)

MUSCULOSKELETAL DISORDERS

Musculoskeletal disorders (MSDs) are those injuries that we often refer to as sprains and strains. The term musculoskeletal disorder describes a range of injuries and diseases related to the musculoskeletal system. This includes inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, intervertebral discs, peripheral nerves, and supporting blood vessels.

The WHS Regulation 2011 (Schedule 19 Dictionary) defines the term musculoskeletal disorder as "an injury to, or disease of, the musculoskeletal system, whether occurring suddenly or over time but does not include an injury caused by crushing, entrapment or cutting resulting principally from the mechanical operation of plant".

Musculoskeletal injuries can result in permanent injuries that can have a significant impact on a person's working ability and quality of life, as well as impacting on the productivity and economic performance of the company.

Musculoskeletal disorders (MSD) or sprains and strains are a major issue across most industries. MSDs currently represent approximately 61 per cent of all serious workers' compensation claims in Queensland. The majority of these claims are caused by performing hazardous manual tasks.

How do musculoskeletal disorders occur?

Sprains and strains occur when the forces on body tissue (e.g. muscle, tendon, ligament, bone) are greater than the tissue can withstand.

The injury process typically happens in one of the following ways:

- Gradual wear and tear or cumulative exposure to risk factors (more common).
- Sudden damage caused by a single one-off exposure to a high force (quite rare).
- Combination of both of the above.

Other causes of MSDs are slips, trips and falls; and hitting and being hit by objects. Strong links have also been identified between MSDs and psychosocial factors, such as work-related stress, and chronic disease risk factors, such as obesity and smoking.

There is information on the WHSQ web site about [work-related stress](#) and [health and wellbeing](#).

COMMON TYPES OF MUSCULOSKELETAL DISORDERS

Musculoskeletal disorders include a wide variety of conditions such as:

- Sprains and strains of muscles
- Low back disorders
- Tendon disorders
- Nerve and neurovascular disorders

Some examples of common musculoskeletal disorders arising out of work include:

Disc injuries

Disc injuries commonly known as slipped or ruptured discs and prolapsed intervertebral discs. These disc injuries can be caused in particular by exposure to force, awkward postures and vibration.

Shoulder injuries

Rotator cuff, and tendonitis (inflammation and weakening of the tendons) of the shoulders. These are particularly linked to work in awkward postures – working overhead, and repetitive movement with or without force.

Carpal Tunnel Syndrome

Carpal Tunnel Syndrome (CTS) is a common and well known of the nerve conditions. Compression and entrapment of the median nerve occurs when it passes through the wrist into the hand (through the carpal tunnel). Any swelling of the tendon sheaths in the carpal tunnel will cause compression and potential long-term damage to the median nerve. It is particularly linked to repetitive work in wrist awkward postures for long durations.

Musculoskeletal disorders can range from minor pain responses with minimal cost to the individual, workplace or society through to injuries or disease with permanent disability and significant cost to the workplace and society.

Neurovascular Disorders

Occasionally both the nervous and the circulatory system are affected. Conditions include:

- Thoracic Outlet Syndrome (compression of nerves between neck and shoulder).
- Vibration Syndrome or Raynaud's.

KEY PIECES OF LEGISLATION

The key pieces of legislation in Queensland that are directly relevant to prevention of MSDs and in particular hazardous manual tasks are listed below. Students should refer to the listed sections of the legislation and note the content. Please see the WHSQ publication [An overview of the Hazardous Manual Tasks Regulation and Code of Practice 2011](#) for a brief summary of the PCBU requirements.

- **Work Health and Safety Act 2011.** Refer to the following sections of the WHS Act:
 - Section 18 Reasonably practicable
 - Section 19 Primary duty of care
 - Section 27 Duty of officers
 - Section 47 Duty to consult workers
- **Work Health and Safety Regulation 2011**
 - Part 3.1 Managing risks to health and safety.
 - Part 3.2 General workplace management.
 - Part 4.2 Hazardous Manual Tasks
 - Dictionary – Schedule 19, includes the definitions for *musculoskeletal disorder* and *hazardous manual task*.
- **Hazardous Manual Tasks Code of Practice 2011**(HMT COP 2011)
- **Manual Tasks Involving the Handling of People Code of Practice 2001**

HAZARDOUS MANUAL TASKS CODE OF PRACTICE 2011

The *Hazardous Manual Tasks Code of Practice 2011* (HMT COP 2011) provides guidance, methods and tools to assist duty holders to manage hazardous manual tasks.

Duty holders must either:

- follow the advice outlined in the HMT COP 2011, or
- adopt another way that identifies and manages exposure to the risks related to hazardous manual tasks to an equivalent or higher standard of safety than the standard required in the HMT COP 2011.

An overview of the HMT COP and the key sections is provided below.

Structure of the HMT COP 2011

The HMT COP 2011 outlines the following risk management process:

- identify hazardous manual tasks,
- assess the risks of musculoskeletal disorders,
- implement suitable risk control measures to eliminate or minimise those risks,
- review the effectiveness of controls.

The HMT COP 2011 appendices A-F contain practical worksheets. These worksheets can assist with the risk management process, serve as a record of what was done and be used when consulting with workers about hazardous manual tasks.

The worksheets found in the appendices include:

- Appendix A: one page flow chart of the risk management process for manual tasks.
- Appendix B: one page hazardous manual tasks identification checklist.
- Appendix C: discomfort survey which can be helpful in identifying which manual tasks are hazardous.
- Appendix D: risk assessment worksheet
- Appendix E: provides good design control ideas
- Appendix F: references for risk assessment methods

Key features of the HMT COP 2011

Useful sections of the HMT COP 2011 together with the page number they are located on in the code are listed below:

- Definitions and examples of musculoskeletal disorders, page 5.
- Risk factors for hazardous manual task explained with visual examples, pages 5 and 9-12.
- How to conduct a risk assessment for manual tasks, page 13.
- Identifying risk factors:
 - section 3.3, pages 14-17 provides a series of questions and guidance that when followed will assist to identify which risk factors or characteristics are present. This section also has good examples of risk factors.
 - Appendix D - risk assessment worksheet can also be used and provides somewhere to document the assessment.
- Sources of risk: section 3.4, page 17 provides guidance on common sources of risk. Sources of risk are areas that the PCBU modifies or changes in order to reduce the risk of MSD. These include:
 - work area design and layout
 - the nature, size, weight or number of things handled in performing the manual task
 - systems of work
 - the environment in which the manual task is performed
- Control options and implementation, pages 21 – 34.
- Information, training and instruction, section 4.9. This section requires that the PCBU provide training and instruction when needed to further reduce the risk. However, it also stipulates that training in lifting techniques must not be used as the sole or primary means to control the risk of MSDs. Section 4.10 (page 33) provides specific guidance on what training should include and when it should be delivered.
- Guidance on work environment (temperature, floors and surfaces, lighting) page 30.

Other relevant codes of practice and standards

The following codes of practice are also relevant to prevention of MSDs and ergonomics:

- Managing the Work Environment and Facilities Code of Practice 2011
- Children and Young Workers Code of Practice 2006

- [How to Manage Work Health and Safety Risks Code of Practice 2011](#)
- [Managing Risks of Plant in the Workplace Code of Practice 2013](#)
- [Work Health and Safety Consultation, Co-operation and Co-ordination 2011](#)

A list of relevant Australian Standards and further references can be found in the reference list.

HAZARDOUS MANUAL TASKS

Definition of a hazardous manual task

The HMT COP 2011 and WHS Regulations define a hazardous manual task as:

“a task that requires a person to lift, lower, push, pull, carry or otherwise move, hold or restrain any person, animal or thing involving one or more of the following:

- Repetitive or sustained force
- High or sudden force
- Repetitive movement
- Sustained or awkward posture
- Exposure to vibration”

These risk factors listed in the dot points above directly impact on the body and can result in musculoskeletal disorders. They are known as the hazardous manual task risk factors.

The term manual task covers almost anything that a person can physically do. However, it is only the *hazardous* manual tasks that we are concerned with.

Hazardous manual tasks cover a wide range of activities, for example:

- operating mobile plant
- putting stock on shelves
- changing a truck tyre
- mopping a floor
- lifting a wheelchair out of a car.

How do we know if a manual task is hazardous?

To determine if a manual task is hazardous and requires further assessment look for the existence of one or more of the risk factors. The risk factors are explained in the following sections. Refer section 2.2 (pages 9 – 12) of the HMT COP for further details and examples.

If one or more of these risk factors exists, then the task is a potential hazardous manual task and requires further assessment. .

HAZARDOUS MANUAL TASK RISK FACTORS

Force

The HMT COP 2011 breaks force down into four types:

- repetitive force
- sustained force
- high force
- sudden force.

Force is the amount of muscular exertion or effort required to perform a movement or task. Muscles fatigue with increased muscular exertion and the time needed to recover increases. If recovery time is limited, soft tissue injury is more likely to occur. All soft tissue structures have a load limit before failure and damage can occur. If the exertion forces are high enough, body tissues may be damaged immediately.

Forceful muscular exertions overload muscles, tendons, joints and intervertebral discs and are associated with most MSDs.

Forces can be applied internally e.g.: to hold or stabilize an object, for example:

- Forces exerted by muscles, such as when lifting items.
- Carrying loads.
- Holding one position for a period of time.
- Using a forceful grip.

Forces can also be generated externally and then applied to the body. For example:

- The weight of the load being carried or caught.
- Hammering
- The impact of landing on the ground when jumping down out of mobile plant.

Large muscle groups such as those in the leg can withstand larger forces than the small tissues of the hand, which may be injured by relatively low forces. The weights handled and the distance away from the body that weights are handled, can generate large forces on the joints and soft tissue structures of the body, particularly the spine.

For more information about force refer to pages 9, 10 and 16 of the HMT COP 2011.

Repetitive movement

Repetitive movement involves using the same parts of the body to repeat similar movements over a period of time. This means the same muscles are being used continuously.

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

As a general guideline, 'repetitive' means that a movement or force is performed more than twice a minute (Section 3.3 page 14 HMT COP 2011)

Repetitive movement can result in:

- An increase in 'wear and tear' of body tissues because of limited opportunity for them to recover during repetitive work.
- A greater potential for muscle fatigue, which may be followed by an inflammatory response and tissue damage.

If the task involves repeated performance of the same movements and especially if the cycle time is short, then the same tissues are being loaded with little opportunity for recovery. Such tasks are likely to pose a high risk of cumulative injury if combined with moderate to high forces or speeds, awkward postures and/or long durations (excerpt from The Core Body of Knowledge for Generalist OHS Professionals, Biomechanical Hazards, 2012).

Further information on movement can be found on page 10 of the HMT COP 2011.

Awkward or Sustained Postures

Postures can be awkward or sustained, or both. Postures that are both awkward and sustained are particularly hazardous.

Awkward postures

The term awkward postures refers to any posture where the body parts are away from their comfortable, neutral position (e.g. a bent back, a bent wrist or arms raised above the head). Awkward postures result in stretching or shortening of the connective and nervous tissues. As a result, the functional capacity of muscles can be reduced and the tissues are at greater risk of injury. Awkward postures are not always harmful—it is only when they are repeated frequently or performed for a long time.

Sustained postures

Sustained postures refer to postures where part of or the whole body is kept in the same position for a long period of time (e.g. standing in one position with no movement). Sustained postures quickly fatigue muscles because blood flow is more restricted due to the lack of muscle movement. This can lead to blood pooling and a lack of blood supply to some areas of the body and increase the risk of injury.

Prolonged sitting and standing also present an increased risk of injury. Continuous static standing creates fatigue in muscles and a significant increase in disc pressure. Static standing can lead to lower back discomfort and swelling of the legs, because of blood pooling in the lower legs.

Prolonged sitting

Sitting for prolonged periods, especially in awkward posture can cause pain and affect your health. Static sitting can lead to (a) poor nutrition of discs (b) decrease in the circulation and (c) pooling of blood in the lower legs. Sedentary workers in seated postures may suffer back pain due to increases in muscle activity and spinal disc pressure. The figure below illustrates the increased disc pressure when seated and with inclined trunk.

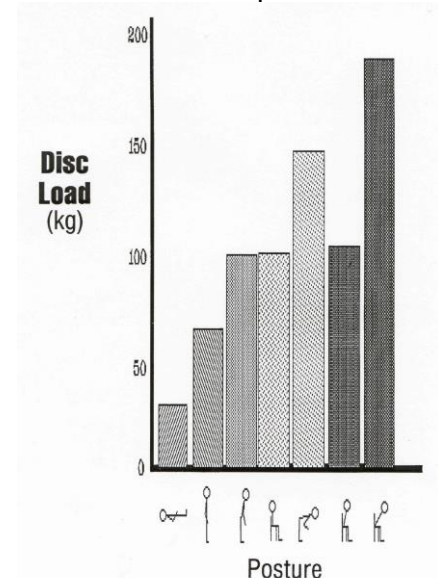


Figure showing loading of lumbar disc in various spinal postures (DETIR 1990)

Refer to pages 14-16 of the HMT COP 2011 (Section 3.3, Question 1) for further examples of postures and movements that pose a risk if they are repetitive or sustained.

Vibration

Long duration or frequent exposure to vibration will significantly increase the risk of permanent musculoskeletal injury.

When the body or limbs are exposed to vibration, the force of this movement is absorbed by the body's skin and the musculoskeletal system. Intermittent exposure to vibration may allow sufficient time for the soft tissues to recover between periods of exposure.

There are two forms of vibration exposure depending on the contact points between the body and the source of vibration.

Whole body vibration occurs when vibration is transmitted to the body through a vibrating surface such as a vehicle seat or floor in vehicles and machinery. Prolonged exposure increases the risk of low back pain, degeneration of the lumbar vertebrae and disc herniation.

Hand arm vibration occurs when workers hold or operate vibrating tools, air operated tools, steering wheels or other controls in heavy machinery, or any other vibrating work piece. Vibration to the hand/arm can result in disrupted blood and oxygen circulation in the hand and forearm and damaged nerves and tendons, and vibration related injuries. (link to WBV and HAV fact sheets)

Duration

The HMT COP 2011 provides the following definition of duration: "The duration of the task is how long the task is carried out over a whole shift or continually at any time during a shift. As a general guideline, long duration means the task is done for more than a total of 2 hours over a whole shift or continuously for more than 30 minutes at a time" (Question 2, page 16, HMT COP 2011).

In the WHS Regulation 60 (2) (b), duration is included as a matter that the PCBU must have regard to that may contribute to a MSD.

If a task is performed continuously without a break for a long time, the tissues involved do not have the opportunity for recovery and cumulative injury risk increases. This is especially likely if the task involves a combination of moderate force or repetitive movement and awkward postures. The appropriate task duration also depends on environmental factors.

RISK MANAGEMENT FOR HAZARDOUS MANUAL TASKS

A PCBU must manage risks to health and safety relating to musculoskeletal disorders that are associated with a hazardous manual task (section 60, Work Health and Safety Regulation 2011).

To manage risk under the WHS Regulation 2011, a duty holder must:

- identify hazards that could give rise to the risk
- eliminate the risk so far as is reasonably practicable
- if not reasonably practicable to eliminate the risk, minimise the risk by implementing control measures in accordance with the hierarchy of control
- maintain the control measure so that it remains effective

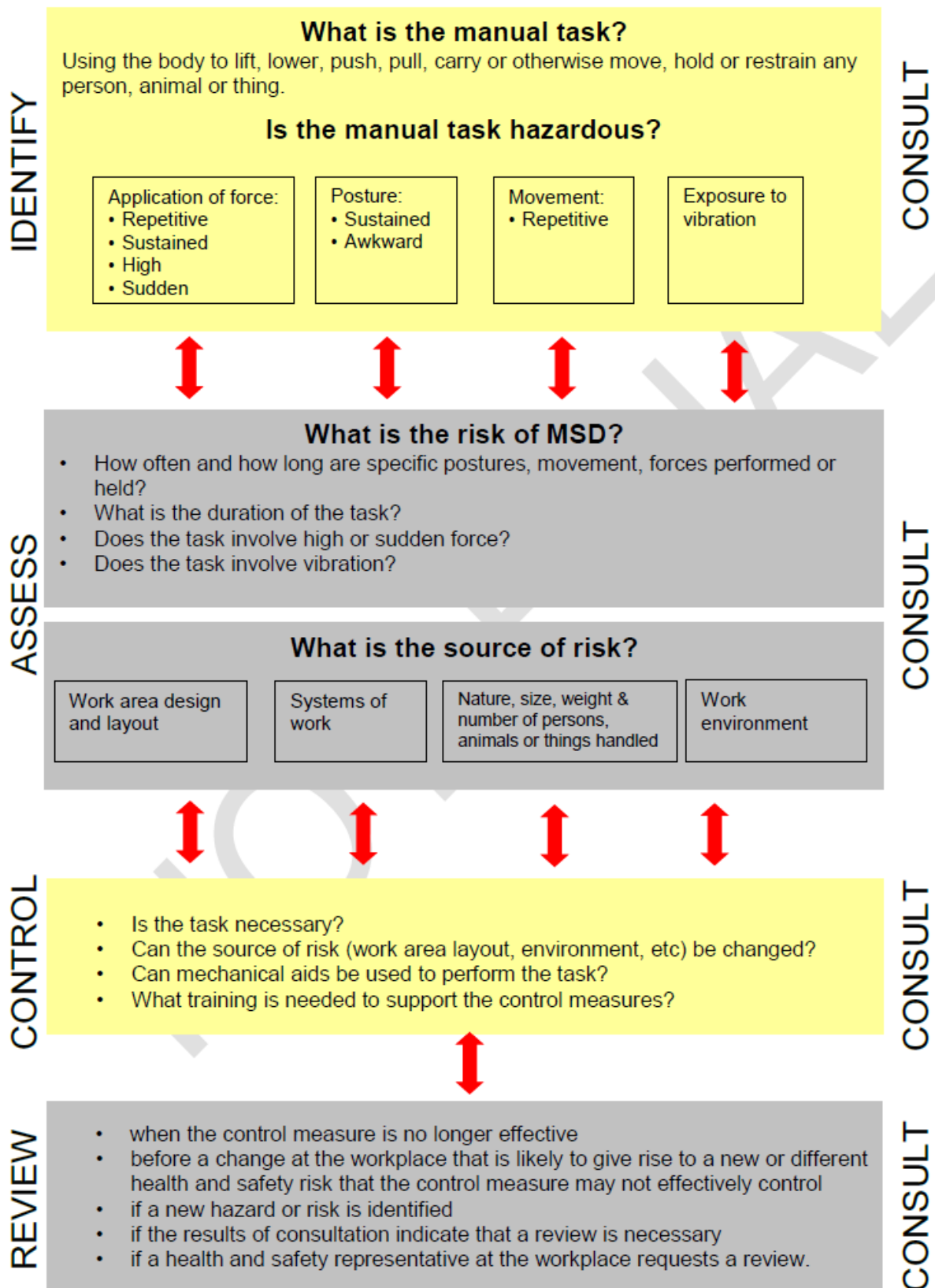
- review risk control measures (sections 34-38, Work Health and Safety Regulation 2011).

The risk management process for hazardous manual tasks as per the HMT COP 2011 is:

- Identify hazardous manual tasks
- Assess the hazardous manual tasks - examine each risk factor, and consider:
 - What is the risk of MSD?
 - What is the source of risk?
- Control the risk
- Monitor and review

Appendix A - HMT COP 2011

Appendix A of the HMT COP 2011 shown over the page outlines this risk management process. The above steps 1-4 are listed down the left hand side of appendix A. Note that at each step, consultation is included as part of the process.



HOW TO IDENTIFY POTENTIALLY HAZARDOUS MANUAL TASKS

PCBUs, WHSOs and others can use the worksheet in the HMT COP 2011, *Appendix B – hazardous manual task identification worksheet*. Key points include:

- Consult with workers – listen to reports of particular tasks being very difficult or tiring.
- Review available information – injury or incident reports, industry data
- Look for trends
- Observe manual tasks – look for the presence of hazardous manual tasks risk factors – high or sudden force, awkward or sustained postures, repetitive movement, vibration

Once hazardous manual tasks have been identified, the next part of risk assessment is to assess if there is a risk of MSD.

WHEN SHOULD A RISK ASSESSMENT BE DONE?

The PCBU should carry out a risk assessment for any hazardous manual task unless the risk is well-known and PCBU knows how to control it. A risk assessment can help determine:

- Which postures, movement and forces in the task pose a risk
- Where during the tasks they pose a risk
- Why they are occurring
- What needs to be fixed.

Assessing the risk of MSD

The following questions 1 – 5 will help you determine if the task has a risk of MSD. They can be found in Chapter 3 of the HMT COP 2011. Appendix D of the HMT COP 2011 also provides a risk assessment worksheet that can assist with this process. This process is also covered in the WHSQ [hazardous manual tasks risk management worksheet](#) also in appendix.

- Q1. Does the task involve any of the following:
 - repetitive movement
 - sustained or awkward postures
 - repetitive or sustained forces?

(repetitive means movement or force performed for more than twice a minute and ‘sustained’ means a posture or force is held for more than 30 seconds at a time).

- Q2. Does the task involve long duration?

(long duration means the task is done for more than a total of 2 hours over shift or continuously for more than 30 minutes at a time)

- Q3. Does the task involve high or sudden force?

(forceful muscle exertions, fast movements, jerky or sudden)

- Q4. Does the task involve vibration?

- Q5 Is there a risk? There is an MSD risk if the PCBU has answered yes to Q1 and Q2, or Q3 or Q4.

If there is a risk, identify the source of risk and implement controls.

SOURCES OF RISK

The following are common sources of risk that cause the HMT risk factors. It is important to identify the sources of any risks that are present in the task, as these will be the things that may be able to be changed to eliminate or reduce the risk of MSD. For example, poor postures and movements may be due to the layout of the workplace, high forces may be due to the loads being handled, and the frequency and duration of the task may be due to the work organization, limited staff numbers or increased work pace to meet tight deadlines.

The sources of risk are:

- The 'work area design and layout', which includes the furniture, fittings and equipment used by the workers to perform the task. The positioning and relationship of the different elements in a work area are important because of the effect on working postures.
- The 'nature, size weight or number of persons, animals or things involved', is about the loads required to be handled and the muscular effort needed to handle them.
- 'Tool design' which includes the design of the tool being used. Poor design may cause vibration, forceful exertions, awkward and static postures. Plant can also be a source of risk.
 - for example if operator controls are difficult to reach or require high force to operate. Cognitive ergonomics issues regarding control layout and operation are also relevant.
- 'Systems of work' includes issues such as the length of the shift, how often the task is performed, the number of workers assigned to the task and the pace of work.
- The 'workplace environment' is potentially a source of risk in the work being performed. For example:
 - Cold environments can lower body and hand temperature and make handling and gripping more difficult.
 - Hot environments can also make handling and gripping items more difficult.
 - Humidity can cause discomfort and fatigue, and wind can increase the force required to handle items.
 - Floor surfaces should be considered (e.g. friction in pushing trolleys on carpet).

Determine for each risk factor:

- Where in the task each risk factor is occurring.
- Why each of these actions is occurring (source of risk).

The answers to these questions will provide the information on how to fix the source of the risk and effectively control the risk of MSD.

For further information on source of risk, refer to the HMT COP 2011 Section 3.4 pages 17-20. For plant and human factors issues please refer to the *Managing risks of plant in the workplace Code of Practice 2013*

DETERMINING CONTROLS

Now you know which risk factors are present, where they are present and why they are present (sources of the risk), you are in a position to know what must be controlled and work out how to do it.

The hierarchy of control should be applied when controlling hazardous manual tasks risks as per Part 3.1 of the WHS Regulation. The most effective controls involve eliminating the hazardous manual task and the associated risk. If this is not reasonably practicable, then PCBU's must minimize the risks so far as reasonably practical by either substituting or isolating

the hazard, or implementing engineering controls.

The WHS legislation requires the duty holder to work through the control hierarchy to determine the control that most effectively eliminates or minimises the risk in the circumstances. Sometimes this may involve using a single control measure, or using a combination of two or more different controls.

Control measures should be aimed at eliminating or minimising the frequency, magnitude and duration of movements, forces and postures by changing the source of risk: the work area, tool, load, environment, method of handling and/or the way work is organised.

Chapter 4 of the HMT COP 2011 provides guidance on determining and implementing appropriate controls in relation to hazardous manual tasks. The following table is taken from the HMT COP 2011 and provides examples of suitable control measures.

Hierarchy of control		Examples of control measures
Level 1	Elimination	- Automate the manual task (such as using remote controls) - Deliver goods directly to the point of use to eliminate multiple handling
Level 2	Substitution	- Replace heavy items with those that are lighter, smaller and/or easier to handle - Replace hand tools with power tools to reduce the level of force required to do the task
	Isolation	Isolate vibrating machinery from the user, for example by providing fully independent seating on mobile plant
	Engineering	- Use mechanical lifting aids - Provide workstations that are height adjustable
Level 3	Administrative	- Rotate workers between different tasks - Arrange workflows to avoid peak physical and mental demands towards the end of a shift
	Personal protective equipment	- Heat resistant gloves for handling hot items - Shock absorbent shoes for work on hard concrete floors

Table 6.1 hierarchy of controls with examples from HMT COP 2011

Specific information about various control options is provided on pages 22 – 32 of the HMT COP 2011 under the categories of:

- Purchasing
- Design/Layout
- Change the nature, size, weight, number of items
- Using mechanical aids
- Handling people and animals
- Changing the system of work
- Changing the work environment
- Using administrative measures

A summary of the information is provided here, but for further detail please refer to the HMT COP 2011.

DESIGN PRINCIPLES AND EXAMPLES OF CONTROL OPTIONS

The following principles contribute to good design in the workplace. A well-designed work area will assist in eliminating or reducing the risk factors associated with a hazardous manual task, such as the degree of reaching, twisting or bending.

Work area layout and design

Consider the placement of task components to minimize reach and improved access:

- Distances for frequent reach no greater than 30cm in front of body (seated) and 50cm (standing).
- Distances for infrequent reach should be no greater than 50cm
- When determining placement of components consider with regards to use of the item; importance, frequency and sequence of use.

Workstation design

Provide adjustable workstations, ideal work heights allow for:

- Good visibility to the task.
- A functional, forward facing, upright neutral posture.
- Ideal arm movements.

The above elements are critical in design workstations for example manufacturing, control room and computer workstations.

Detailed information on setting up for computer work is found in the attachment.

ANTHROPOMETRY

Individuals vary in their body measurements (size, shape and weight of the human body as a whole and of individual parts). Calculation based on the range of these measurements and of the extremes is essential when designing furniture and work-stations.

Whenever an aspect of the human body is measured across a population, the results in graph form usually show the typical bell-shaped curve of a normal distribution. The figure below shows the normal distribution of the heights of adult males. Most are clustered around the mean or average, the 50th percentile at 173cm. Five percent of adult males are shorter than 162cm. This height of 162cm is thus the 5th percentile (5%ile) height. At the other extreme we have the tall adult males where only five percent of adult males are taller than 185cm. Of course, ninety-five percent are shorter than this height so this height is called the 95th percentile (95%ile) height.

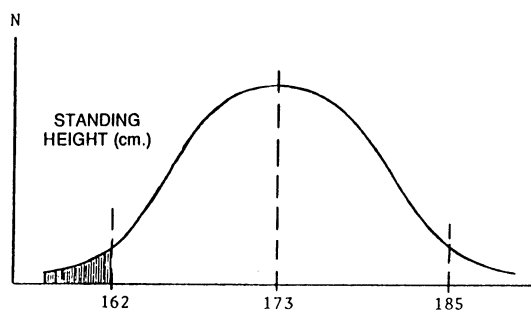


Figure showing normal distribution curve for heights of adult males.

Anthropometric data can be used in 4 different ways:

- a) to design for extremes e.g. so taller people can fit through doorways
- b) to design for the average e.g. for a fixed height bench to suit as many people as possible
- c) to design for adjustability e.g. office chairs to suit 90% of people
- d) to design for the individual e.g. for custom designed workstations

Based on anthropometric data the following guidelines illustrate recommended reach distances and working heights.

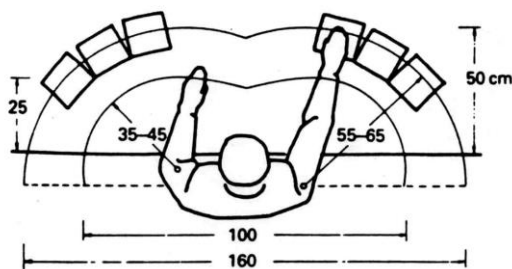


Figure Arc of Horizontal Grasp and Reach with Work Surface Layout (Kroemer & Grandjean 1997)

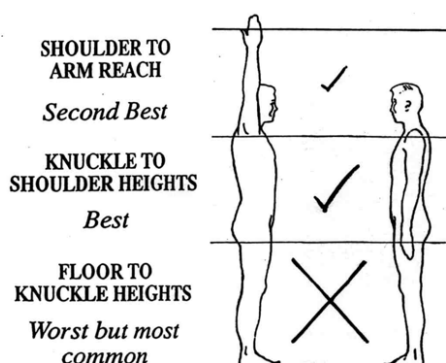
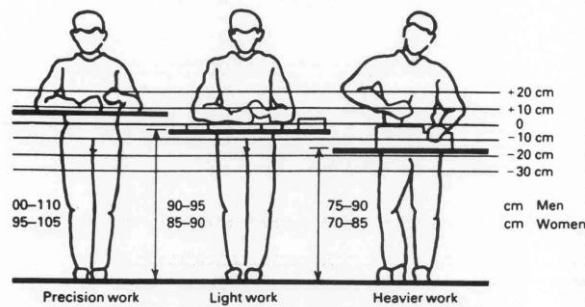


Figure showing optimal reach zone



Recommended Working Heights of Benches for Standing Work (Kroemer & Grandjean 1997)

DESIGN OF TOOLS AND EQUIPMENT

Poorly designed tools are linked to increased risk of MSD. The tool design contributes to the risk factors of forces (required to hold and manipulate tool) and working postures.

The following characteristics are commonly associated with high risk hand tools:

- Weight of hand tools. (particularly tools exceeding 1.5kg)
- Wide grip span. (risk will vary depending on worker's hand spans).
- Triggers don't lock.

Features of well designed tools include:

- natural tool handle
- bilateral use
- powered tool where possible (note introduction of hand arm vibration)
- special purpose "right tool for the job"
- minimize weight or suspend to counter balance
- reduced torque.

Change the nature of loads or the way loads are handled

When it comes to handling loads, the characteristics of the load are important. Consider the size, shape, grip and stability of the load as these are directly related to the level of risk. These characteristics impact on the force and working postures required to handle loads.

The risk associated with load handling increases with increases in the following dimensions:

- Loads too wide.
- Loads too long.
- Loads obstructs vision.

Eliminating or reducing the risk associated with load handling through improved work design which can involve:

- Eliminate load handling by redesign and/or mechanisation.
- Reduce risk by use of mechanical aids and devices.
- Changing work area layouts and handling methods. Review the workplace layout and workflow with the aim to reduce double handling and the need to move items long distances.
- As a last option only, implement team handling.

Controls related to nature of load involve changing the nature of the load (such as reducing the size, weight or shape), or improving grip (providing handles).

With any mechanical aids implemented ensure the following also takes place:

- Equipment is trialled and proved to be appropriate.
- Adequate number of equipment are provided.
- Preventative maintenance program is implemented for all equipment.
- Workers are trained how and when to use equipment.

SYSTEM OF WORK

System of work controls address workload and pace of work, designing for the working population and provision of adequate support and resources. Where possible, work should be organised to minimise multiple handling and improve the flow of work. Task design should take account of the range of human dimensions and capabilities such as height, reach and weight. Some principles to consider here include:

- Planning for current and future work
- Control work load
- Suitable work pace
- Adjustability of pace/load
- Task variation
- Provide sufficient equipment in good working order
- Maintenance schedule of equipment
- Minimise externally imposed risks by negotiating with supply chain partners
- Adequate staffing levels
- Consult with workers to identify, assess, control and monitor
- Reporting of hazards and incidents etc

ADMINISTRATIVE CONTROLS

Administrative controls do not address the risk factors or source of the risk – they only attempt to reduce risk by reducing exposure to those risk factors.

Training and supervision supports the implementation of higher level design controls.

The HMT COP 2011 allows that, if a risk of MSDs remains after implementing higher-level control measures then the risk must be minimized by providing information, training and instruction. Section 4.10, of the HMT COP 2011 provides guidance on how training should be used.

Effective and appropriate training includes:

- HMT Risk assessment
- Methods of work:
 - Training in safe work methods or operating procedures
 - How and when to use equipment
 - Organizational requirements

Supervision may be necessary to ensure controls are being used.

Why lifting technique training is not effective

Lifting technique training is not effective and the risk factors causing the problem are not changed. Even if workers attempt to apply lifting techniques, they may still be exposed to a serious injury risk. When faced with a hazardous manual task that involves lifting, some initial questions should be considered:

- Why do the workers have to lift?
- Can that part of the job be eliminated?
- Can the task be done another way?

Evidence strongly suggests that there is no 'safe' way to lift.

Further information can also be found on the WHSQ website: [Lifting technique training: Is it effective?](#)

Job Rotation

Job rotation *may* reduce the level of risk, particularly for tasks where duration is the primary problem. However, if the risk of injury is due to risk factors such as forces or postures then rotation is only reducing the exposure to these risk factors, not addressing the source of the risk. Rotation will also be exposing more workers to the hazardous task.

The key to using job rotation as a control is to rotate workers between tasks that are sufficiently different. This will ensure that different muscle groups are used in different ways so they have a chance to recover.

Team handling

Team handling brings its own risks and requires coordination. It should only be used as an interim control measure. The preferred control measures include redesign of manual tasks to allow the use of mechanical equipment or eliminate the need to lift. Refer to the information on team handling in the HMT COP 2011 section 4.9,

Work environment

The environment in which work is performed, can significantly impact on the risk of injury.

- Floor surfaces. Clean, smooth well maintained floors minimise force required for pushing and pulling, jamming wheels of equipment in cracks and holes
- Lighting. Avoids the need to bend over for visibility of work items.
- Cold conditions, heat, humidity. Cold temperatures increase the risk of MSD.
- Windy conditions. Can make handling items more difficult, increasing the force exerted and awkward postures to control the task eg carrying large sheets of plasterboard in strong winds.

TOOLS AND RESOURCES

A variety of tools and resources are available to assist employers manage the risks of hazardous manual tasks. The HMT COP 2011 has a comprehensive reference list and includes the 3 listed below:

WHSQ manual tasks risk management worksheet

The [manual tasks risk management worksheet](#) is a simplified version of the hazardous manual tasks risk management process. WHSOs or PCBU's may use this worksheet as an alternative to completing Appendix D in the HMT COP 2011.

The worksheet is also available on the WHSQ website under hazardous manual tasks.

ManTRA

The Manual Tasks Risk Assessment tool (ManTRA) is a risk profile audit tool developed for the WHSQ inspectorate. ManTRA is optional and provides a measure of risk for specific body regions and the worker as a whole.

The ManTRA tool is available online as part of the Work Health and Safety eTools at [worksafe.qld.gov.au/etools](https://www.worksafe.qld.gov.au/etools)

Further information and the original paper based ManTRA tool is available on the [WHSQ website](https://www.worksafe.qld.gov.au/etools)

PERforM

The PERforM program is a simple manual task risk management program. It is based on a participative ergonomics approach, which is the internationally recommended approach for reducing musculoskeletal disorders. PERforM is an acronym for “Participative Ergonomics for Manual tasks”.

A range of [PERforM](https://www.worksafe.qld.gov.au/etools) resources are available on the [WHSQ website](https://www.worksafe.qld.gov.au/etools). An electronic version of the PERforM risk assessment tool is available at www.worksafe.qld.gov.au/etools.

PERforM provides a simple framework to help PCBU's engage with workers at all levels to identify, assess and control manual tasks risks within their workplace. The idea of PERforM is that the worker is the expert in performing their work tasks.

Workplaces can use whatever method or program they choose as long as they are controlling their manual tasks risks to the same level of protection (or better) as outlined in the HMT COP 2011.

WHSQ offers free industry workshops about how to implement the program as well as limited one to one coaching by inspectors and advisors.

The PERforM program has been used successfully in a wide range of industries and can be applied to most types of hazardous manual tasks. However, it is not recommended for people and animal handling tasks or computer workstation assessments.

MSD PREVENTION RESOURCE LIST

To view all resources visit [worksafe.qld.gov.au](https://www.worksafe.qld.gov.au).

Legislation	
Work Health and Safety Act and Regulation 2011 https://www.worksafe.qld.gov.au/laws-and-compliance/workplace-health-and-safety-laws/laws-and-legislation/work-health-and-safety-act-2011	Regulations Part 4.2 - hazardous manual tasks. Regulations Section 40 - Slips, trips and falls at level.
Risk management	
How to manage work health and safety risks Code of practice 2011 https://www.worksafe.qld.gov.au/injury-prevention-safety/managing-risks/managing-risk	Details the four step process for controlling exposure to work place health and safety risks.
Hazardous manual tasks	
Hazardous Manual Tasks Code of Practice 2011 https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/hazardous-manual-tasks-resources	Provides guidance about how to identify, assess and control hazardous manual tasks risks.
Manual Tasks Involving the Handling of People Code of practice 2001 https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/hazardous-manual-tasks-resources	Provides guidance about how to manage the risks related to people handling tasks.
Overview hazardous manual tasks regulation and code of practice 2011 https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/hazardous-manual-tasks-resources	Provides a summary of the relevant hazardous manual tasks legislation.
Hazardous manual tasks risk management worksheet https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/hazardous-manual-tasks-resources	A short version of the Hazardous Manual Tasks Code of Practice 2011 risk assessment.
Slips, trips and falls at level	
Managing the work environment and facilities Code of practice 2011 https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0003/58206/managing-work-environment-facilities-cop-2011.pdf	Note Section 2 - provides guidance about safe access & egress and movement around the workplace.
Guidance Material	
Hazardous manual tasks	
PERforM (Participative Ergonomics for Manual Tasks) https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/participative-ergonomics-for-manual-tasks-perform	Is a simple manual task risk management program that involves workers being actively involved in the risk management process. Free workshops and comprehensive resources are available to assist workplaces to run this program.
PERforM etool https://www.worksafe.qld.gov.au/etools/	These resources help to explain the program, how to get started and how to implement PERforM at your workplace, as well as sharing successful case studies across many industries. An electronic version of the PerforM tool is available under Work Health and Safety eTools.

Hazardous manual tasks continued... https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks	
Musculoskeletal issues (Frequently asked questions)	Clarifies a number of commonly asked questions surrounding musculoskeletal issues, such as “How much can I safely lift?” and “What is the best way to lift?”
Lifting techniques training	Answers the commonly debated question – How effective is lifting techniques training?
People handling	Provides information on safe people handling including ceiling hoists.
Ergonomic guide to computer based work	Provides guidance and practical advice on how to set up and check your computer workstation to reduce the risk of injury.
Safe use of laptops fact sheet	Outlines ways you can reduce the risk of injury when using your laptop.
Office workstations fact sheet	Provides advice on how to set up your computer workstation to suit your needs and the type of work you're doing.
Sedentary work fact sheets	Provides practical advice on how to move more and sit less at work.
Contact Centres	Provides information about health and safety in contact centers including hazardous manual tasks and psychosocial hazards.
Selecting chain tensioning devices - WHS considerations	Offers a number of design features for in-line chain tensioning devices to reduce musculoskeletal injuries.

Guidance material	
Slips, trips and falls	
Slips, trips and falls (WHSQ) https://www.worksafe.qld.gov.au/injury-prevention-safety/workplace-hazards/slips-trips-and-falls	Provides practical and comprehensive guidance to reduce the risk of injury from slips, trips and falls (STF) in the workplace.
Mapping tool http://www.hse.gov.uk/slips/mappingtool.pdf	Useful tool to map where STF incidents and hazards have been reported in your
Importance of cleaning http://www.hse.gov.uk/pubns/web/slips02.pdf	Outlines the value of good cleaning to reduce STF.
Preventing slips, trips and falls at work (Worksafe Victoria) https://www.worksafe.vic.gov.au/pages/forms-and-publications/forms-and-publications/preventing-slips-trips-and-falls-at-work	Another checklist to consider.
Interactive tools	
Work health and safety eTools https://worksafe.qld.gov.au/etools/	The eTools will assist businesses to develop effective risk controls and identify the financial benefits that follow.
	ManTRA
	PERforM
	Return on Investment Calculator.
Slips Assessment Tool (SAT) http://www.hse.gov.uk/slips/sat/index.htm	Useful electronic slip assessment tool that can be used with roughness tester.
STEP http://www.hse.gov.uk/SLIPS/step/launch_sector.htm	Slips and trips e-learning package for workers, management and cleaning contractors

Films https://www.worksafe.qld.gov.au/forms-and-resources/films	
Hazardous manual tasks	
PERforM used by Council of the City of Gold Coast	The Gold Coast Council implemented the Participative Ergonomics for Manual Tasks (PERforM) program into its business, and has
Capral Aluminium - Involving workers to develop solutions for hazardous manual tasks	Capral Aluminium have helped reduce their risks of manual handling injuries and take the steps to become the most automated and
Hazardous Manual Tasks Film	The film will walk you through a process to help you engage with your workers to identify hazardous manual tasks, assess the risks, identify controls and monitor their suitability to reduce injury, increase productivity and
No Sprains, Big Gains (PerforM)	This film is about providing a solution by using the newly developed PERforM tool, which is designed to assist employers, safety officers and workers with a practical resource.
Slips, trips and falls	
Changing focus - The Gavan McGuane story	A simple trip on a mat can leave a person with a serious, debilitating injury for the rest of their

Version	Date	Author
1	30/06/2018	WHSQ