Burgess-Limerick & Associates
Ergonomics and Research Consultants
ABN 84976421949

Procedure for Managing Injury Risks Associated with Manual Tasks

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1. Purpose

Injury risks associated with manual tasks include risks of both sudden injuries, and injuries caused by an accumulation of tissue damage over a period of time. This procedure describes how to manage these injury risks.

2. Scope

Manual tasks include "work that involves the use of force for lifting, lowering, pushing, pulling, carrying, moving, holding or restraining any person, animal or item. Manual tasks at work include tasks that have repetitive actions, sustained postures and may involve concurrent exposure to vibration."[1] This procedure applies to all manual tasks.

3. Managing manual tasks risks

Not all manual tasks are hazardous. Managing manual tasks risks requires first identifying potentially hazardous manual tasks.

When potentially hazardous manual tasks have been identified, the degree and source of risk associated with the tasks must be assessed. This assessment must consider the direct risk factors of exertion, postures, and movements required to perform the task, and the duration of exposure; as well as other environmental characteristics.

If the manual tasks cannot practicably be eliminated, then design controls must be implemented to reduce the risk as far as reasonably practicable. Administrative controls may also be required to manage the residual risks.

[1] National Code of Practice for the Prevention of Musculoskeletal Disorders From Performing Manual Tasks at Work. Australian Safety and Compensation Council, 2007.

Keeping records of the potentially hazardous tasks identified, risk assessments, proposed controls, actions taken, and resulting residual risks, is required.

Successful management of manual tasks risk requires participation at all stages of the process by the people who perform the tasks. Training in manual task risk assessment and control is required to ensure this participation is successful.

3.1 Identify potentially hazardous manual tasks.

Identification of potentially hazardous manual tasks requires (i) consultation with employees; (ii) observation of manual tasks; and (iii) reviewing workplace records. A task should be considered as potentially hazardous if any of the following apply:

- An injury has been recorded which 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 2 hours per shift
- If the task involves repetitive movements of any body part and is performed for more that 30 minutes without a break, or for more than 2 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 4 hours per shift
- If exposure to whole body vibration (vehicles) or peripheral vibration (power tools) exceeds 2 hr per shift

- Any employee reports discomfort associated with the manual task
- Employees have improvised controls for the task
- Workers doing this task have a higher turnover, or rate of sick leave, than elsewhere in the organisation

Manual task hazard identification is a continuous process, and employees should be encouraged to report discomfort associated with manual tasks using the form such as that provided in Appendix A.

The potential for hazardous manual tasks shall also be considered whenever there is a proposed change in equipment or work processes.

3.2 Assess Risks

Where a potentially hazardous manual tasks is identified, and the task cannot immediately be eliminated, the risk associated with the manual task shall be assessed using the form provided in Appendix B.

The risk assessment shall involve participation of persons who perform the task. The risk assessment shall be facilitated by a person with appropriate training.

3.3 Eliminate or Control Risks

Where the risk score assessed indicates a moderate or high risk, action shall be taken to eliminate the task, or introduce design controls which reduce the risk. Guidance regarding manual tasks risk controls is provided in Appendix C.

The determination of design controls shall involve participation of persons who perform the task. The process of determining appropriate control measures shall be facilitated by a person with appropriate training.

3.3 Monitor and Review

Managing manual tasks risk is an iterative "continuous improvement" process. A risk assessment should be undertaken following implementation of any control measures to assess whether the controls are working as anticipated, and whether new risks have been introduced.

3.4 Record Keeping

Records shall be kept of potentially hazardous tasks identified, risk assessments undertaken, control measures suggested, control measures implemented, and the subsequent reassessment undertaken following the implementation of control measures. Ideally, these records should be kept in an easily accessible format to facilitate sharing across the organisation.

3.5 Training

Participation of persons who perform manual tasks is required at all stages of the risk management process. Training in manual task hazard identification, risk assessment, and control is required for all persons performing manual tasks. Appendix D provides guidance regarding the content of such training. The training should incorporate section specific video footage to illustrate manual task risk factors and control measures. Training is also required for persons responsible for facilitating manual tasks risk assessments and the development and implementation of control measures.

Appendix A - Example Manual Task Hazard Identification Form

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:

Appendix B - 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)

Appendix C - Guidance regarding manual task risk control

Elimination

Having determined that hazardous manual tasks are performed in a workplace, the first step is to determine whether any, or all, of the manual tasks can be eliminated. If this is possible, this will be the most effective way of reducing injuries. Some manual tasks can be eliminated by examining the flow of materials and reducing double handling. Others may be able to be eliminated by changing to bulk handling systems. Outsourcing hazardous manual tasks may also be appropriate way of eliminating hazards if the organization undertaking the task has specialized equipment which reduces the risk to acceptable levels. Some tasks, such as cleaning up waste, are non-productive and may be able to be eliminated or reduced by examining the source of the waste.

Design controls

If, after the possibilities have been examined, it is determined that some hazardous manual tasks cannot practicably be eliminated, and the risks associated with these tasks have been assessed, the next step is to devise design controls which will reduce the injury risks. This step also is most effectively undertaken in consultation with the people who perform the work. Apart from the fact that these people are the ones who know most about the tasks, the probability of success of the design changes is enhanced if the people concerned have a sense of ownership of the changes. It is also important to ensure that all people affected by proposed design changes are consulted. For example, maintenance as well as operational staff may need to be involved. Before implementing the design controls it is also important to consider whether new hazards will be introduced as a consequence. The following framework is a useful way of thinking about possible design controls.

Work Areas - Work height, space, reach distances, work flow, adjustability

The design of work areas has a large impact on manual tasks injury risks. For example, limited space, limited clearances, and restricted access to work are common causes of awkward postures. Work should be located at an appropriate height and close to the body. Providing adjustability of workstations may be an option to accommodate workers of different sizes. Workplaces should be designed to increase postural variability during work.

Loads - Size, shape, weight, stability, location, height

The nature of loads which are delivered to a workplace, handled within a workplace, or produced by a workplace, are a common source of hazardous manual tasks. Increasing the size and mass of loads and implementing mechanised bulk handling systems is an effective design control. Reducing the size and weight of loads is another option, but requires training and ongoing supervision, otherwise multiple loads will be handled simultaneously to increase speed. Ensuring loads are easily gripped is important. Hot or cold loads should be insulated to allow them to be comfortably held close to the body. Where loads are manually handled, they should be stored at waist height rather than on the floor or above shoulder height.

Tools- Size, weight, handles, grips, trigger, vibration

Poorly designed hand tools are a common source of awkward postures, high exertion, (particularly of small muscles of the hand and arm), and peripheral vibration. Hand tools should be designed such that joint postures remain close to neutral during use, and should be a light as possible. Heavy tools may be counter-balanced to reduce exertion. While power tools reduce exertion, the vibration associated with power tools introduces a new risk, and tools should be chosen to minimise the amplitude of the vibration as far as possible.

Mechanical aids - Hoists, overhead cranes, vacuum lifters, trolleys, conveyers, turntables, monorails, adjustable height pallets, forklifts, pallet movers,

A large range of mechanical aids are available to reduce manual tasks risks, and these can be effective controls. However, care is required to ensure than the use of the aid does not slow down the performance of work. If it does, the probability that the control will be effective is reduced because administrative controls and ongoing supervision will be required to ensure compliance. The design of the mechanical aids require careful consideration. For example, trolley wheels should be as large as possible to reduce rolling friction and vertical handles should be provided which allow the trolley to be gripped at different heights by different sized people. Introducing mechanical equipment such as forklifts also introduces new risks, which require control. Where mechanical aids are introduced to control manual tasks risks it is important to ensure that they are maintained in working order, and available when, and where, required.

Administrative Controls

Depending on the design controls which are implemented it may also be necessary to consider additional administrative controls. Administrative controls rely on human behaviour and supervision, and on their own, are not an effective way of controlling manual task injury risk. Administrative controls must always be used in combination with appropriate design controls. Administrative controls include:

Maintenance

Maintenance of tools, equipment, and mechanical aids is crucial, but requires a maintenance schedule to be developed and supervision to ensure that it occurs. Maintenance includes good housekeeping.

Workload

Injury risk associated with manual tasks may be reduced by reducing shift duration or the pace of work. It may be possible to change the distribution of work across the

work day, or week, to avoid high peak workloads. Ensuring appropriate staff levels are maintained is important. Provision of adequate rest breaks can reduce injury risks.

Job rotation and task variety

It may be possible to reduce injury risks by rotating staff between different tasks to increase task variety. This requires that the tasks are sufficiently different to ensure that different body parts are loaded in different ways. Alternately, multiple tasks might be combined to increase task variety.

Team lifting

Team lifting may be effective in reducing injury risk where the load is bulky but relatively light. If team lifting is employed as a control, training and supervision is required to ensure the task is only done when appropriate staff are available to perform the task.

Personal Protective Equipment

Some forms of PPE may be effective in reducing manual task injury risk. Knee pads, protective aprons, and gloves are examples.

Training

Training is an important administrative control regardless of which design controls are employed, in that training in the appropriate way of performing work and using equipment must always be provided. Implementing an effective manual task risk management program also requires that staff are able to identify hazardous manual tasks, and are aware of the aspects of manual tasks which increase injury risks. This might legitimately extend to principles such as “keep the load close” and “avoid twisting”. However, the evidence is clear that training in “correct” load handling techniques is not effective in reducing injuries associated with manual tasks.

Appendix D - Guidance regarding training for manual task risk assessment and control

Assessing manual tasks risks

The aim of the risk assessment is to assist the risk control process by providing information about the sources of the risk and the severity of the risk. The assessment of manual tasks risks is complicated by the number of aspects of the task which contribute to determining the injury risk, and by the interactions between these different risk factors. The risk assessment process is also complicated by the number of different parts of the body which can be injured, and by the variety of possible ways in which injury can occur.

Injuries occur when the forces on a body tissue (eg., muscle, tendon, ligament, bone) are greater than the tissue can withstand. Injuries can occur suddenly as a consequence of a single exposure to a high force. Injuries can also arise gradually, as a consequence of repeated or long duration exposure to lower levels of force. Even low levels of force can cause small amounts of damage to body tissues. This damage is normally repaired before injury occurs. However, if the rate of damage is greater than the rate at which repair can occur, then an injury may result. Injuries can also result from a combination of these mechanisms, for example, a tissue which has been weakened by cumulative damage may be vulnerable to sudden injury by lower forces. Manual task risk assessment needs to consider these possible mechanisms.

Injuries associated with manual tasks can occur to a range of different parts of the body, and the injury risks associated with a task will vary for different body regions. Consequently, the degree of exposure to different risk factors must be assessed independently for different body regions.

As well as the forces involved, the risk of injury to a body part is also dependent on the movements and postures involved, the duration of the exposure, and whether there is exposure to vibration. The risk assessment must address each of these risk factors and the interactions between them.

The first step in assessing the risk of injury associated with a particular hazardous manual task is to determine the body regions of interest. This may be self-evident, in that the task has been identified as causing injuries or discomfort to a particular body part or parts. Alternately, the risk assessment should consider the risk of injury to each of the following regions independently: lower limbs, back, neck/shoulder, elbow/wrist/hand.

The ultimate aim of manual task risk management is to ensure that all tasks performed in workplaces require dynamic and varied movements of all body regions with low to moderate levels of force, comfortable and varied postures, no exposure to whole body or peripheral vibration, and that breaks are taken at appropriate intervals to allow adequate recovery. Injury risk is elevated by deviations from this optimal situation, and injuries are most likely to occur when significant exposure to multiple risk factors occurs.

Direct Risk Factors

Exertion. An important factor in determining the likelihood of injury to a specific body part is how much force is involved. Historically, the mass of objects being handled has been the focus, however the force involved in a task depends on a number of other factors as well. For example, in lifting and lowering tasks, the force required by the back muscles depends as much on the distance of the load from the body as it does on the mass of the load. Similarly, if the task involves pushing or pulling a load the force involved will depend on the frictional properties of the load and the surface as well as the mass of the load. Other manual tasks may not involve the manipulation of any load, however high forces can still be required.

If the force exerted by a body part is close to the maximum the person is capable of then the risk of sudden injury is high, and urgent action is indicated. Even if the forces involved are not close to maximum, the task may pose a high risk of injury if the body part is also exposed to other risk factors. High speed movements (eg., hammering, throwing) are an indication of elevated risk, mostly because high speed implies high acceleration, which in turn implies high force, especially if the speed is achieved in a short time. Such "jerky" movements are a sure indication of high exertion at the body parts involved. This also includes rapid changes in the direction of movement. The

strength of muscles is in part dependent on the speed at which they shorten, and high speed movements consequently reduce the strength of the muscles producing the movement. Another high force situation occurs when impact force are applied by the hand to strike and object or surface, in this case there is a high force applied to the hand by the object or surface being struck.

The magnitude of the force relative to the capabilities of the body part is what is important in assessing injury risks. For example, the small muscles of the hand and forearm may be injured by relatively small forces, especially if the task also involves extremes of the range of movement at a joint. This also implies that the capability of the individual performing the work must be taken into consideration when assessing the injury risk. This is also true of the assessment of posture, in that people of different sizes may well adopt very different postures to perform the same task.

Movement and Repetition. The optimal design of work provides tasks which involve slow to moderately paced movements and varied patterns of movement. Little or no movement at a body part elevates the risk of discomfort and injury because the flow of blood through muscles to provide energy and remove waste depends on movement. Tasks which involve static postures quickly lead to discomfort, especially if combined with exposure to other risk factors.

If the task involves repetitively performing identical patterns of movement, and especially if the cycle time of the repeated movement is short, then the same tissues are being loaded in the same way with little opportunity for recovery. Such repetitive 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.

Body Posture. The postures adopted by a body region during a task influence the likelihood of injury in a number of ways. If joints are exposed to postures which involve extremes of the range of movement, the tissues around the joint are stretched and the risk of injury is increased. Ligaments, in particular, are stretched in extreme postures. If the exposure to extreme postures is prolonged the ligaments do not immediately return to their resting length afterwards. Tissue compression may also occur as a

consequence of extreme postures, for example, extreme postures at the wrist increase the pressure on the nerve which passes through the carpal tunnel.

The strength of muscles are also influenced by the posture of the joints over which they cross. Muscles are weaker if they are shortened, and this effect will be greatest when the joints approach the extreme of the range of movement. Consequently, one general principle of the design of work is to avoid postures which involve extremes of the range of movement at any joint.

Some non-extreme joint postures are also known to be associated with increased risk of discomfort and injury. These include trunk rotation, lateral trunk flexion, or trunk extension; neck extension, lateral flexion or rotation; and wrist extension or ulnar deviation.

Some other postures increase the risk of injury without involving extremes of the range of movement. These can be called awkward postures, and can be defined as any posture which causes discomfort. Such postures can occur without significant deviation of the joint from neutral, especially if the orientation of the body with respect to gravity is altered.

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

Vibration. Exposure to vibration in manual tasks takes two distinct types: peripheral vibration (typically associated with power tools) and whole body vibration (typically associated with vehicles). In both cases the vibration exposure impacts on injury risk both directly and indirectly.

Exposure of the upper limbs, and particularly the hands, to high frequency vibration associated with power tools is a direct cause of damage to nerves and blood vessels. Short terms effects are temporary loss of sensation and control, and blanching of the

fingers - hence "Vibration White Finger Syndrome". These effects become irreversible with long term exposure. Use of vibrating power tools is also an indirect cause of injury risk to the upper limbs because the vibration increases the force required by the upper limbs to perform the task. The degree of risk increases with higher amplitude vibration tools (eg., hammer drills or jack hammers).

Similarly, long term exposure to whole body vibration (typically from vehicles) is strongly associated with back injury. As well as a direct effect on the back, exposure to whole body vibration also has an indirect influence on injury risk by causing fatigue of the back muscles. Again, the risk is greater when the amplitude of vibration is high (eg., heavy vehicles and/or rough terrain).

Contributory factors

The issues presented below as contributory factors modify the degree of risk in two ways. Some of the contributory factors are characteristics of the work which commonly lead to increased exposure to the direct risk factors discussed above. Modification of these factors, if they are present, will be likely to directly reduce the injury risk. The remaining contributory risk factors are secondary risk factors which have an indirect influence on manual task injury risk.

Workplace or workstation layout

- working in confined spaces is very likely to result in the necessity to adopt awkward postures to perform tasks
- workstations with restricted visibility, typically result in awkward and static postures, especially of the neck
- workstations with inappropriate location of visual displays (usually too high) cause awkward postures, especially of the neck
- standing work leads to fatigue if undertaken for long durations
- kneeling work causes high force on the knees
- working below the height of the feet inevitably leads to extreme trunk postures

- working overhead requires awkward and static postures of the shoulders
- workstations which require reaching to handle objects create awkward postures
- work surfaces which are too high or too low lead to awkward postures
- locating objects to be handled below waist height increases injury risk
- locating objects to be handled above shoulder height increases injury risk
- carrying loads for long distances creates an injury risk
- inappropriate location of objects or tools can cause awkward postures to be adopted

Objects, equipment and tools

- any unpredictability increases the risk of injury, eg, handling of people or animals or uneven or changing mass distribution
- handling loads of high mass, even if they are not lifted, can require high force because of the inertia of the load
- handling large loads, even if they are not heavy, can require high forces because of the distance of the centre of the load from the body
- objects which are hot, cold or otherwise noxious, increases the risk because the load is held away from the body
- objects which do not have appropriate handles increases the injury risk
- poorly maintained tools can increase the force required
- using inappropriate tools can cause an injury risk
- handling loads with one hand increases injury risk
- triggers which require sustained force to operate increase injury risks
- gloves generally increase the force requirements of a task

Environmental conditions

- inappropriate lighting levels, or glare can cause awkward postures to be adopted
- exposure to hot environments increases fatigue, especially for heavy work
- exposure to cold increases the risk of some injuries, eg exposure to cold, in addition to other risk factors, is implicated in the development of carpal tunnel syndrome
- uneven or poorly maintained surfaces can increase injury risk by eg, increasing the force required to push trolleys, or increasing the amplitude of whole body vibration

Work organisation and systems of work

- high work rates
- lack of task variety
- uneven temporal distribution of work causing high peak loads
- understaffing
- high stress levels caused by eg., cognitive overload or underload, frequent deadlines, or inter-personal conflict
- lack of control over the pace of work, eg, because the work is machine paced
- pay schemes which encourage working faster or longer
- lack of opportunity for communication and personal contact