Workplace Guidelines for the Prevention of Musculoskeletal Injuries

A Joint Initiative

B.C. Government and
Service Employees' Union

Public Service Employee
Relations Commission

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1. Introduction

This booklet is a joint venture of the Public Service Employee Relations Commission, the Government of British Columbia, and the BC Government and Service Employees' Union. The objective of this booklet is to provide a general guide for Joint Occupational Health and Safety Committee (JOHSC) members, supervisors and workers on how to reduce musculoskeletal injuries (MSI) in the workplace.

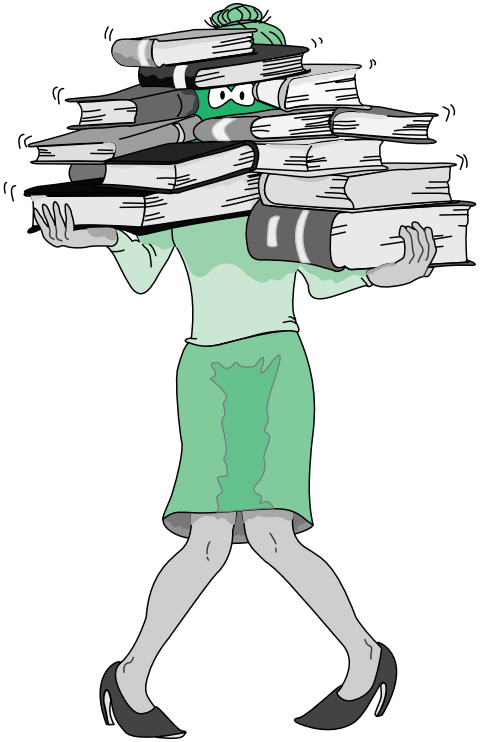
The booklet provides basic information about MSI prevention and risk factors, and makes available the information a worker should use to actively participate in the prevention of workplace musculoskeletal injuries. Although MSI can happen outside of the workplace, the focus of this guide is the work environment.

The areas covered include:

- What are:
  - MSI's?
  - Risks of MSI?
  - MSI signs and symptoms?
  - Causes of MSI's?
  - Risk factors

- ✯ Safe work practices and measures to prevent MSI's.
- ✯ Checklist for JOH&S committee workplace inspection teams.
- ✯ Examples of ergonomic risk assessments.

*Note: For specific information on prevention of MSI in the office environment, refer to the joint booklet *"Prevention of Strain Injuries in the Office Environment"*.



What is Ergonomics?

The term ergonomics is derived from two Greek words: "ergon" meaning work and "nomos" meaning natural laws. As applied today, ergonomics means adapting the task, tools and equipment to fit the person and his or her environment. The science of ergonomics applies to a variety of environments including the workplace and home. Even so, ergonomics is more commonly considered with respect to the work environment and working individuals.

The goal of an ergonomic program, within the context of this document, is to prevent musculoskeletal injury from occurring, as explained further on in this guide.

Musculoskeletal Injury (MSI)

Many of the ways work is done - such as lifting, reaching, or repeating the same movements - may strain the body. Wear and tear on muscles, tissues, ligaments and joints can injure the neck, shoulders, arms, wrists, legs and back. These injuries are called musculoskeletal injuries or MSI.

The Workers' Compensation Board (WCB) of British Columbia defines MSI as:

"an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including a sprain, strain and inflammation, that may be caused or aggravated by work".

This definition includes terms commonly used to refer to MSI's: repetitive strain injury; musculoskeletal disorder; cumulative trauma disorder; musculoskeletal strain injuries and repetitive motion injury.

MSI is a potential problem for all workers who perform repetitive, unaccustomed or physically demanding tasks.

Causes of Musculoskeletal Injury (MSI)

The demands (if they are high enough) placed on the body from daily activities can cause musculoskeletal injury. Musculoskeletal injury occurs when there is a mismatch between the physical capacity of workers and the demands of the job. Common factors associated with MSI include; repetitive motions of sufficient intensity and duration that it does not allow the affected muscles to recover; performing an activity in an awkward or unnatural posture; maintaining the same position/posture for prolonged periods; failing to take frequent short recovery breaks (when performing demanding tasks) and force.

Signs and symptoms of a Musculoskeletal Injury

Recognizing the early signs and symptoms of MSI is critical so that corrective measures can be implemented to avoid further damage and rehabilitative treatment can be provided if necessary. The risk of work-related injuries can be reduced by education and by well designed job tasks that minimise physical demands.

Signs and symptoms of an injury can appear suddenly or gradually.

A sign can be observed, such as:

- redness
- swelling
- loss of range of movement- difficulty moving a particular body part
- loss of strength

A symptom can be felt but cannot be observed, such as:

- pain (may include eyestrain and headaches)
- tenderness
- numbness
- tingling
- a burning feeling
- cold sensation

Pain is the most common symptom of MSI. It can range from mild irritation to extreme discomfort. Pain is not always confined to the site of injury but can be transmitted to other parts of the body. For example, discomfort can start in the neck and shoulder, and then spread to other parts of the body such as the back and arms. Early intervention and treatment of the injury helps to ensure isolation of the pain to the injured area, which allows for easier diagnosis of the injury and prevention of further discomfort.

Stages of Musculoskeletal Injuries

Musculoskeletal injury may progress in stages: early, intermediate and late.

Early Stage: The body aches and feels tired at work but symptoms disappear during time away from work. Early warning signs, for example sore shoulders and neck pain, often occur after the work activity stops (e.g. when driving home after a day of work). The effects may also be noticed the next morning such as aches and stiffness in the limbs or hands. The injury does not interfere with the ability to work and should heal completely if appropriate precautions are taken. At this stage there are often no visible signs of a problem.

Intermediate Stage: The injured area aches and feels weak near the start of work and continues until well after work has ended. Work becomes more difficult to do. However, the injury will still heal completely if dealt with properly. Visible signs may be present.

Late Stage: The injured area aches and feels weak, even at rest. Sleep disturbance is a common complaint. Even non-demanding tasks are very difficult. The injury may not heal completely but effects can be eased if dealt with properly. Visible signs may be present.

Not everyone goes through these stages in the same way. It may be difficult to say exactly when one stage ends and the next begins. The first sign of pain is a signal the muscles and tendons should rest and recover and that medical attention may be required. If there is no recovery an injury can become longstanding and sometimes irreversible. The earlier workers recognize signs and symptoms, the quicker the employer will be able to respond.

Health effects can be serious

Typically, when a problem is diagnosed and treated early, it can usually be resolved quickly with minimal discomfort to the worker. If signs and symptoms are ignored they can develop into more serious conditions that may affect the worker's ability to do their job, such as:

- Tendonitis or tenosynovitis (swelling of a tendon, a band of tissue that attaches muscle to bone).
- Carpal tunnel syndrome (pressure on a nerve in the wrist, resulting in numbness, tingling, pain, or weakness in the hand, wrist, or forearm).
- Muscle strain to the neck, back, shoulders or legs.

If workers are experiencing signs or symptoms of an MSI they should:

- Inform their supervisor,
- Report to first aid (ensure First Aid rendered/received is recorded in the First Aid treatment book), and
- Where necessary, consult their doctor.

2. Risk Factors that contribute to MSI's

Factors that contribute to the risk of musculoskeletal injuries are commonly referred to as "risk factors".

Risk factors place physical demands on the body, which medical and scientific research indicates may cause or contribute to musculoskeletal injuries. A risk factor may individually or by a combination of risk factors, create the potential for an MSI.

There are both work-related and non-work related risk factors that can contribute to musculoskeletal injuries. The focus of this guide is on work-related risk factors.

Work-related risk factors can be divided into two categories, primary risk factors and secondary risk factors, as explained in the following pages.

The primary risk factors for MSI are related to:

- The physical demands of a task, including:
  - Force
  - Work Posture
  - Repetition,
  - Contact stress
  - Duration and Magnitude

Secondary risk factors can cause primary risk factors or make them worse. They include:

- Environmental conditions of the workplace, including:
  - cold temperature
  - vibration
  - illumination
- Characteristics of the organisation of work:
  - work recovery cycles
  - task variability
  - work rate
- Aspects of the layout and condition of the workplace or work station, including:
  - working reaches
  - working heights
  - seating, and,
  - floor surfaces
- Characteristics of objects handled, including:
  - size and shape
  - load condition and weight distribution, and
  - container, tool and equipment handles

Note 1: "Aspects of the layout and condition of the workplace or work station" and the "Characteristics of objects handled" are described throughout the Manual Material Handling Section of this guide.

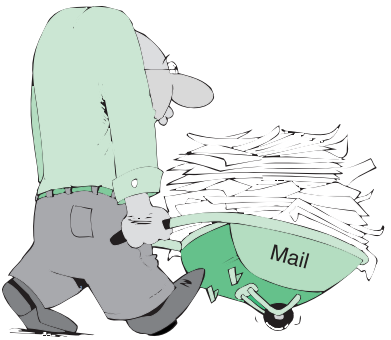
Note 2: The mere presence of MSI risk factors may not in itself result in injury. It depends on, for example, how great the force is and how long the worker is exposed to the risk. It can also depend on individual characteristics that vary from worker to worker (such as height, gender, and the body's ability to deal with the risk factors).

Note 3: For specific information on office ergonomics such as seating and working at a computer workstation, refer to the publication *"Prevention Guidelines for Strain Injuries in the Office Environment"*

2A. PRIMARY RISK FACTORS

Force

The force that a worker exerts on an object is a primary risk factor. Muscles and tendons can be overloaded when a strong (high) force is applied against the object (load). A risk can also occur when a weaker (low) force is applied repeatedly (repetition) or continuously over a long period of time (duration). Exerting high or low muscle force can interfere with circulation, lead to muscle fatigue and tissue damage.



These conditions can result from:

- Gripping, pinching, holding
- Lifting, lowering
- Pushing, pulling, carrying
- Stopping a moving object or resisting the kickback from tools

Factors that affect the amount of force applied include:

- Size of the load
- Weight of the load
- Position of the load
- How often the load is handled
- How long of time the load is handled

Factors affecting grip force include:

- Grip Type - a pinch grip requires 5x the force of a power grip
- Wrist Posture - grip force decreases dramatically in flexion
- Grip Size - handle size will influence grip force
- Cold - results in increased force application
- Gloves – improperly fitted gloves hinder the ability to have or maintain a good grip
- Vibration - vibrating tools cause an increase in the gripping force used to hold them

The effects of these forces can be made worse by:

- Slippery or odd shaped objects that are difficult to hold.
- Lack of handles or unsuitable handles on tools, or objects that are too small or too large.
- Awkward body positions, such as bending down or reaching forward or overhead.
- Vibrating tools or equipment.
- Poorly fitted or inappropriate gloves.

Pinch grip *Power grip*

The muscles tire more easily when the worker uses a pinch grip (left) rather than a power grip (right)

Work Posture

Posture refers to the position the worker assumes to do a task. The goal is to maintain a neutral (natural) body posture through out the job task. Neutral posture reduces the strain on working muscles and joints and keeps blood circulating, which enhances the body's ability to remove toxins. Any posture that requires the body to move out of the neutral posture range is considered to be awkward posture.

Awkward postures force the muscles to work harder and stress the ligaments, such as when any part of the body bends or twists away from a comfortable position. A posture held for a long time is called a static posture.

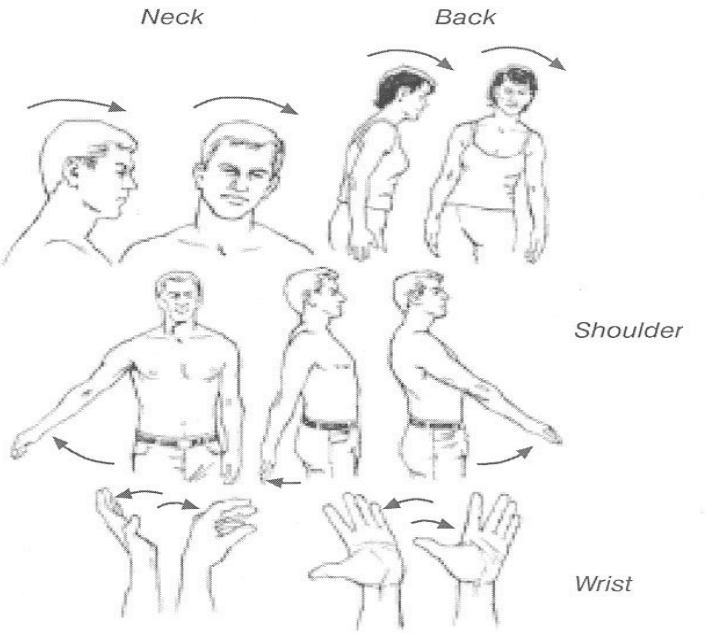
Awkward posture can result from:

- Looking up to work overhead
- Reaching at or above shoulder height
- Stooping or bending at floor level
- Transferring items across in front of the body
- Positioning of the body to the location or shape of tools and equipment
- Using a tool (such as turning the forearm when using a screwdriver)
- A poor visual environment (such as bending forward to view small components)
- "Flaring" the elbows out to the side.
- Lack of clearance or confined areas that

prevents the worker from maintaining a neutral position.

The effects of posture can be made worse by:

- Applying force in an awkward position (such as strong grip with a bent wrist, or lifting while stooped over).
- Maintaining an awkward position for a prolonged period, or repeatedly moving into an awkward posture.



These drawings show a comfortable range of movement, where the body is in a good working posture. Frequent and/or long periods of movement beyond these ranges places the worker at risk of an MSI.

Repetition

Repetition is the rate of recurrence with which a task or set of motions is performed. Using the same body part repeatedly to perform a task puts a worker at increased risk of MSI, as it does not allow for the rest or recovery of the affected muscles.

The effects of repetition can be made worse by:

- The task or motion is repeated at a high rate over long durations.
- There is not enough of a rest period to allow the stressed muscle or body part to recover.
- Repetition is combined with other risk factors such as high forces and/or awkward posture.
- When muscles and/or the body part is unaccustomed to task.

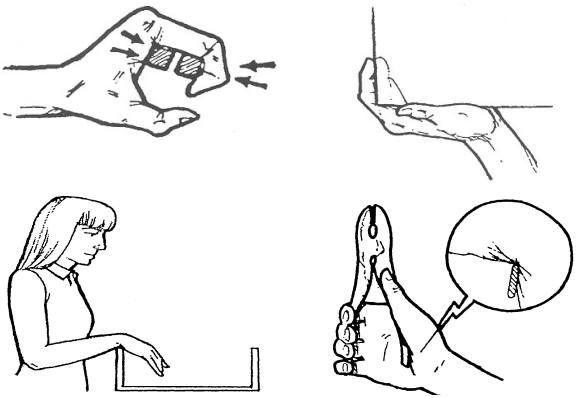
Contact Stress

Contact stress occurs when a hard or sharp object comes in contact with a small area of the body. The tissues and nerves beneath the skin can be injured from the pressure. Local contact stress can result from:

- Ridges on tool handles digging into fingers.
- Edges or work surfaces digging into forearms or wrists.
- Striking objects with the hand, foot, or knee.

The effects of local contact stress can be made worse if:

- The hard object contacts an area with minimal protective tissue, such as the wrist, palm, or fingers
- Pressure is applied repeatedly or held for a long time.



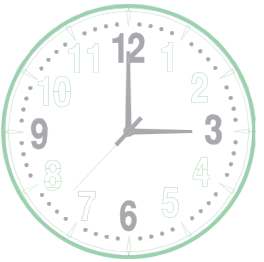
Examples of local contact stress. Local contact stress occurs when hard or sharp edges of tools or objects dig into the skin.

Duration and Magnitude

The amount of risk depends on the duration (how long) the worker is exposed to the risk factor. Duration should be considered along with the four primary risk factors, rather than separate from them.

The person looking at risk factors should consider questions about duration for each factor:

- How long is the worker using force (for example, to lift or grip an object)?
- How long does the worker perform a repeated task?
- How long is one part of the body exposed to local contact stress?



Although exposed to a risk factor, if there is sufficient time between the exposure there may not be a risk of injury to the worker. For more information refer to section on “Work recovery cycles and task variability”.

Magnitude, or ‘how much’, should also be considered for each risk factor:

- How much force is the worker using?
- How fast is the worker doing the repeated movements?
- How severe is the awkward posture?
- How hard is the edge digging into the skin, causing local contact stress?

2B. SECONDARY RISK FACTORS

Environmental Conditions

Cold Temperatures

People who work outdoors – on construction sites, doing avalanche surveys, or work on loading docks – face additional risk of injury aggravated by cold. Cold temperatures produce a reduction in the hands ability to feel (tissue sensitivity), function (dexterity) and grip strength. It also makes muscles and joints stiffer, and increases reaction time. As a consequence, workers must use greater force to grip and hold hand tools, which increases the risk of an MSI.

The effects of cold temperatures can be made worse by:

- Not dressing appropriately for the environment and activity e.g. for physically active work, wear layers of clothing that can be removed as the worker warms up. For less active work, more layers may be needed.
- Not keeping the head covered to retain body heat and not keeping the feet warm and dry.
- Lifting or forceful exertion when chilled; stiff joints and muscles increase the risk of injury.

Vibration

Vibration affects tendons, muscles, joints and nerves. Vibration to a specific body part can decrease sensitivity and result in unnecessary increases in muscle contraction, which may lead to injury or fatigue of that part. Localized vibration from machines and hand tools can damage the nerves and blood vessels of the hands and arms. Whole-body vibration, experienced by people who operate heavy equipment such as truck and bus drivers, increases the risk of lower back pain and damage to the spinal discs. The body's response depends on the duration, frequency and extent of the vibration.

The effects of vibration can be made worse by:

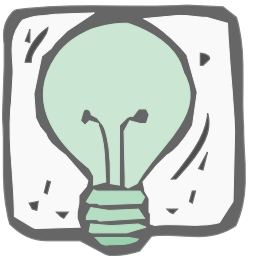
- Machines and power tools that are not maintained. Well-maintained equipment minimizes vibration.
- Not limiting exposure to vibration by failing to implement work practices and administrative controls such as task rotation and rest breaks.
- Not wearing appropriate personal protection equipment where required e.g. vibration-dampening gloves.
- Simultaneous exposure to cold temperatures.

Illumination

Appropriate lighting and elimination of glare in the work area allows for adequate depth perception and contrast by the worker(s) when handling material such as when lifting and carrying objects. Improper lighting can be a contributing factor to a musculoskeletal injury. For example, poor lighting could cause the worker to misjudge weight and object shape resulting in inappropriate or poor lifting techniques.

The effects of illumination can be made worse by:

- Lighting is not maintained e.g. replacing burned out bulbs.
- Lighting in the work area was not designed for the type of work tasks being performed.



Characteristics of the organization of work

Work recovery cycles and task variability:

The objective of planned work recovery cycles and task variability is to avoid the onset of fatigue of specific muscles or body parts, which can put workers at an increased risk of injury.

Work recovery cycles and task variably can include rotating jobs, performing tasks with different physical or mental demands, or a rest break. The need for recovery cycles and task variability depends on:

- the nature of the task,
- worker characteristics, and
- environmental conditions.

Fatigue increases the risk of injury. Risk of injury depends largely on the ratio of work period to work recovery cycles/task variably, that is, the recovery time compared to exertion.

Risk control for work recovery cycles and task variably:

The demands of physical handling should be well below the normal exhaustion level for the worker. When developing work recoverycycles and task variability for a specified task consider work rate, load weights and whether tasks involve vigorous or minor exertions.

To vary physical demands, consider alternating physical task with non-physical tasks, or long cycle tasks with shorter ones, or to a task where the demands on specific muscle and body parts are sufficiently different. Ideally, workers should be given the flexibly to vary the type of tasks they perform.

Review the adequacy of work recovery cycles and task variability whenever there are changes in any of these factors:

- The requirements of a task
- Environmental conditions
- The work process
- Physical capacity of workers

Work rate:

Individual workers vary in the rates at which they perform the same task. Some individuals need longer periods to recover from physical work to prevent injury.

The more critical or physically demanding the task, the more desirable it is to let the worker set the pace, where possible. Just as important, where possible, is to avoid sudden increase in workload.

Planning the work rate will also involve consideration of work recovery cycles/task variability and staffing schedules.

Other Considerations

Risk Factors can overlap:

More than one risk factor can be present in a task. The more risk factors in the task, the greater the risk of injury. For example:

A worker bends forward from the waist to lift a box from the floor. The bending is an awkward posture (work posture) linked to the location of the box (out of proper lifting/bending* range?) on the floor (layout of the workplace). The box is wrapped with twine, which the worker grabs to lift the box (contact stress). If the worker repeatedly lifts boxes from the floor (repetition), or does similar lifting tasks all day (long duration, organization of work tasks), the risk of MSI is further increased.

Note: "Aspects of the layout and condition of the workplace or work station" and the "Characteristics of objects handled" are described throughout the Manual Material Handling Section of this guide.

*Refer to section on "Lifting" for information on proper lifting/bending techniques.

3. Eliminating or Minimizing Risk Factors

After identifying and assessing risk factors, the next step is to determine which control measures should be implemented, and which ones eliminate or minimize the risk of MSI. Ask the following questions when considering control measures:

- ✓ Can exposure to the risk factor be eliminated?
- ✓ How can the intensity/magnitude of the job duty be reduced?
- ✓ Can frequency of the job function be reduced?
- ✓ Can duration be reduced?

Control measures for eliminating or minimizing risk factors:

- ✯ Engineering Controls
- ✯ Administrative Controls
- ✯ Personal Protective Equipment (PPE) Controls

Engineering controls

The purpose of engineering controls is to design (or change by redesign) physical aspects of the workplace or tools to reduce or eliminate employee exposure to ergonomic risk factors. Engineering controls are preferred over other control methods. They are relatively permanent and benefit anyone performing the job – not just the individual who experienced an MSI.

Some examples are: adjusting work heights, minimising reach distances, changing the layout of workstations, using adjustable or angled tools or equipment and the use of carts and other conveyors.

Administrative Controls

Administrative control functions include determining appropriate policy, procedures, education and training activities that affect the individual worker and the work environment. These actions are intended to reduce the workers' exposure to MSI risks. This can be accomplished by reducing the duration of exposure and/or slowing the onset of fatigue and discomfort. For example, by ensuring that repetitive or demanding tasks incorporate opportunities for rest or recovery breaks (e.g. allow brief pauses to relax muscles; change work tasks; change postures or techniques).

To be effective, administration controls require:

- support by management,
- education and training,
- employee awareness of risk factors, and
- monitoring to ensure effectiveness of program and compliance of WCB requirements.

Personal Protective Equipment

Personal protective equipment may only be used as a substitute for reducing MSI risk factors where engineering and administrative controls are not practicable. For example, workers may wear vibration-dampening gloves while using a chain saw or wear knee pads while working on their knees to install flooring.

4. MANUAL MATERIAL HANDLING

Manual handling (i.e. lifting, carrying, pushing and pulling) of heavy, bulky, and/or irregularly shaped objects during work tasks) can lead to possible musculoskeletal injures. Under these circumstances a worker is more susceptible to injury as these type of tasks often require using awkward body postures, which can place considerable physical demands on the body, especially the back. The following information lists potential causes of MSI where such tasks are performed, as well as, examples of ways to prevent injuries (control measures) while performing these tasks.

Manual material handling examples:

- manually loading and unloading material from vehicles, boxes or pallets
- manually moving materials in warehouses, offices or outdoor work locations
- stocking shelves, etc.

This section on material handling is divided into the following categories

- Lifting
- Carrying
- Extended reaching
- Working heights
- Pushing/pulling

Lifting

Lifting of heavy, bulky, and/or irregularly shaped items can increase the risk of MSI's. Lifting too heavy a load puts unnecessary strain on the body, particularly the back. Proper lifting techniques play an important role in ensuring no injuries occur while performing these tasks (e.g. hold object close to the body and lift with the legs not the back). It is important that lifting be performed between the shoulder and knuckles height.

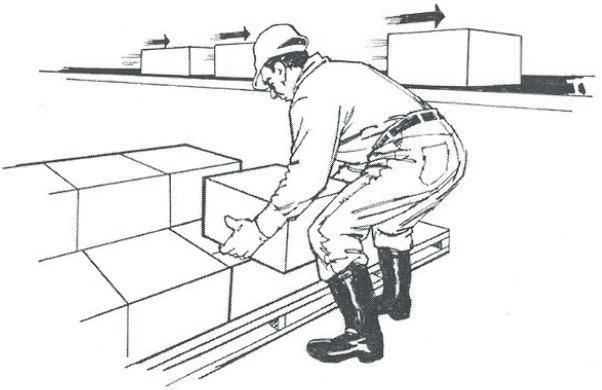
Knuckle height is when the arms are straight down in front of the worker, the height above the floor where the knuckles of the hands are located is the lowest height a worker should be lifting from or bending down to. Lifting and handling materials above shoulder level or below knuckle level (particularly while bending or twisting) adds unnecessary stress to the spine and back muscles.

In some cases lifting may have to be performed from the floor level. Where a mechanical lift is unavailable and the material does not allow for the proper use of body mechanics, workers must be trained in proper lifting procedures (e.g. seek assistance from a co-worker).

Control Measures:

- Restrict lifting to between knuckle and shoulder height.
- Minimize frequency of lift.
- Where possible separate the material into more manageable loads.

- Don't put a load(s) on the floor if it needs to be manually lifted again later.
- When moving an item, test its weight before lifting.
- Don't overestimate your ability to handle heavy items.
- Get as close as possible to loads and get a firm grip before lifting.
- Position yourself so that you are facing your load.
- Avoid reaching, twisting and bending.
- Be sure of your footing before performing the lift.
- Where feasible, provide lifting aids (lift tables, mechanical or powered assists, hoists, etc.) to move heavy or bulky loads.
- Ask for assistance if in doubt.
- Establish safe lifting work procedures and ensure workers are trained in them.



It is important that lifting is performed between the shoulder and knuckles height. The work platform in this example should be adjustable to allow for the proper working height at all times.

Carrying

Depending on the distance an object is carried, it's weight and size, there may be unnecessary strain placed on the body for long duration's, which can attribute to an increase of MSI. It is important to be aware that the weight that can be safely carried by hand is less than the amount that can be safely lifted. This is due to the fact that carrying involves holding the object for a longer period in combination of having to physically move it. The longer the holding time (i.e.distance of travel while carrying object) the less weight that can be carried; the limiting factor is fatigue of the grip and shoulder muscles.

The grade of the floor is also a factor – carrying uphill or downhill increases the strain on the body, especially on stairways.

Control Measures:

Eliminate the need to carry by:

- ✯ Using a cart, dolly, or pallet jack.
- ✯ Using a conveyor.
- ✯ Rearranging the work place.
- ✯ Providing slides or tables between workstations.

If elimination of carrying is not feasible:

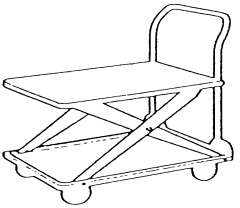
Reduce the weight by:

- ✯ Reducing the size of the object.
- ✯ Using lighter material for the object.
- ✯ Reducing the capacity of the container.
- ✯ Reducing the weight of the container itself.
- ✯ If unable to reduce the weight, ask for assistance to move the object.

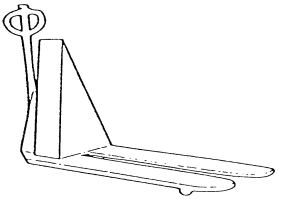
Reduce the distance material is carried by:

- ✯ Moving the operation closer to the previous or following operation.
- ✯ Using conveyors or rollers.
- ✯ Changing the layout of the workplace.

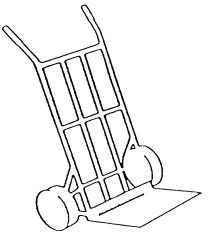
Note: If carrying can not be eliminated, provide proper handles on object to ensure a good grip and proper positioning of object when carried by worker(s).



Cart



Pallet jack



Dolly

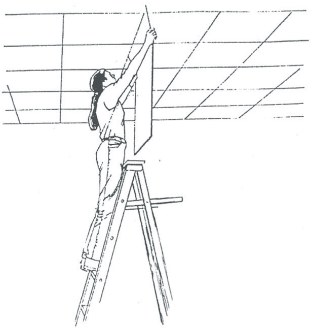
Examples of tools for alternative methods.

Extended Reaching

Extended reaching occurs when workers are required to reach to heights or distances outside of the range from knuckle to shoulder height, and more than about 18 inches from the front of the body. This can require bending, twisting, stretching, and holding the arms up high or other awkward postures. In such postures, the weight of objects (and even of the body itself) creates greater stress on muscles and tissues due to the "lever effect". Extended reaching can cause musculoskeletal injuries to the neck and shoulders.

Control Measures:

- Adjust work stations, fixtures, parts, tools, etc. to put the most-used items within easy reach.
- Keep workplaces clear of obstructions which increase reaching.
- Use platforms, step stools or other such aids to reach locations above shoulder height.
- Support or counter balance tools that are used above chest level.
- Limit or avoid reaching to full arms length for or with loads, or exerting force with the arm extended.
- Provide turntables, to allow easy access from all sides.



Extended reaching can cause musculoskeletal injuries to the neck and shoulders.

Working Heights

Poor working heights in combination with any of the following can increase the risk of MSI:

- duration of work,
- repetition,
- high forces,
- weight,
- static loading, and
- cold.

If the work area is raised too high, the shoulders and arms must frequently be lifted up to compensate, which may lead to cramping and fatigue in the neck and shoulders.

If work heights are too low, the back and neck must be bent forward which can lead to neck and back pain or discomfort.

Ideally the height of work surfaces or the height of the worker's position should be adjustable to allow the employee to work from an appropriate **neutral position** at all times.

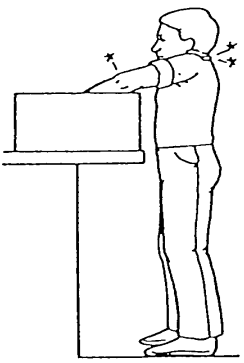
Control Measures:

Work at an appropriate height by using:

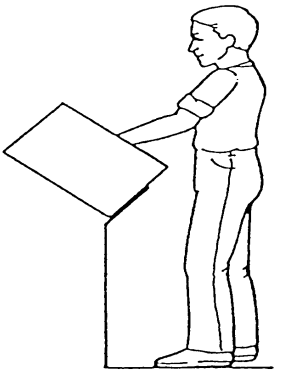
- ✯ False bottom bins and lift tables to change the product height and reduce the need to bend or stoop.
- ✯ Adjustable working platforms, stools, and ladders to allow for neutral positions of the limbs, neck and torso.
- ✯ Tilt tables (e.g. drafting tables) to bring work closer.
- ✯ Extended handles on tools.

Reduce the demand on the body by:

- ✯ Limiting the period of time required to perform an operation that is overhead, to the side, or down low. This can be accomplished by changing tasks frequently (e.g. paper work that may be normally completed at the end of the shift could be done in intervals through out the day to allow the body to recover).



Poor



Improved

The right work angle keeps the shoulder in a more comfortable position.

Pushing/Pulling

The greater the force required to push or pull an object, the greater the risk of developing an MSI. In general, pushing a load is preferable to pulling a load. While pulling a load, arm and shoulder extension and abduction (working behind the mid-line of the body) and twisting may create an MSI risk factor.

Posture is a key factor in limiting how much force can be exerted in pushing and pulling. With extended reaches, or other awkward postures, less force can be exerted. On the other hand, by leaning into a push or away from a pull, the operator can apply more force. For example, pushing a heavy hand truck down a long corridor is usually possible because the large muscles of the legs and trunk can be used. Moving the same hand truck in a tight space where upright posture must be maintained is more difficult because the smaller arm muscles must be used to maneuver it.

Push or pull force is affected by:

- Body weight.
- Height of the work (height of handles).
- Distance of force application from body, or amount of trunk flexion/extension.
- The amount of friction between the worker's shoes and the floor.
- How long the force must be applied.
- The distance the object must be moved.
- The availability of a brace or structure for the worker to push against.

- The texture of the floor surface e.g. carpet, smooth, slippery.
- Debris on surface areas.

Control Measures:

Eliminate the need to push or pull by using:

- Conveyor system.
- Fork lift.
- Slide, chute, etc.
- Powered carts instead of hand carts.

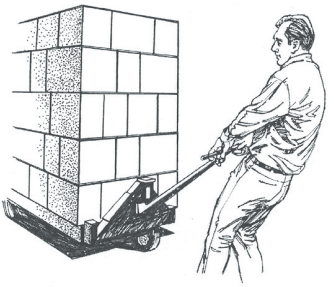
Reduce the force by:

- Reducing the weight or size of the load.
- Using wheels and casters.
- Improving the size, composition, tread, maintenance and swivel properties of wheels on carts.
- Using ramps.
- Regular maintenance of equipment and floor surfaces e.g. lubrication of equipment; keep floor surfaces clean and clear of debris.
- Redesigning the work area to minimize how far items need to be moved.
- Installing automatic doors.
- Making friction work for the worker– minimize the friction on the object (i.e. don't push on carpets) and maximize traction for the worker by wearing appropriate shoes.

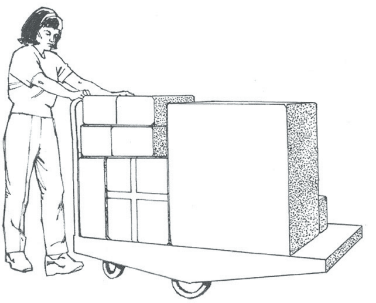
- Providing well-designed handles in appropriate locations.

Force is needed for pushing or pulling an object.

Pulling uses force to move a load.



Pushing may be less of a risk than pulling because it uses stronger back muscles.



5. WORKPLACE MUSCULOSKELTAL INJURY (MSI) CHECK LIST

Using the following checklist to assist in the risk identification process of a work area or task will assist in pinpointing potential musculoskeletal injury related hazards within the work environment.

The checklist does not take the place of a workplace 'Risk Assessment' as defined in WCB OHS Regulation, ergonomic requirements. It will, however, assist in identifying risk factors in the workplace.

A checked 'box' only indicates a potential risk to employee(s). Additional information must be gathered that should include the following:

- an employee interview, and
- an in depth assessment of the
  - ✓ force
  - ✓ repetition
  - ✓ duration
  - ✓ work posture, and
  - ✓ local contact stresses.

To assist with developing this information, examples of risk assessments are in the appendices to this document.

Workplace Ergonomic Checklist

Date: _____ *Location:* _____

Name of employee whose workstation/task is being inspected: _____
Please print

Assessor: _____ *Signature :* _____
Please print

Assessor: _____ *Signature :* _____
Please print

Use this checklist to assist in identifying factors that may expose workers to a risk of musculoskeletal injury. Observe the work tasks being performed by the worker and where identified, check the appropriate box. A checked 'box' indicates a potential risk to worker. Where identified that there is a potential risk to worker, the supervisor and/or manager will ensure a "Risk Assessment" is conducted.

Force Required

When the worker grasps or handles objects:

- *Is a bent wrist used?* ☐
- *Are poorly fitting gloves used?* ☐
- *Is there vibration?* ☐
- *Is a pinch grip used?* ☐
- *Is the task performed in cold temperatures?* ☐
- *Is the surface of the object slippery?* ☐

When the worker lifts, lowers, or carries objects:

- *Is the object animate (people, animals)?* ☐
- *Is an awkward posture required (e.g. stooped, long reach)?* ☐
- *Is the travel distance long?* ☐
- *Is the load large or an odd shape?* ☐
- *Is the load heavy or unbalanced?* ☐

If the worker pushes and/or pulls objects:

Is the handle height above shoulder or below waist? ☐

Is the travel distance long? ☐

Does the load slide easily? ☐

Is the load unstable? ☐

Is there an uneven, sloping, or slippery surface? ☐

Is poorly maintained or designed equipment used? ☐

Is it in restricted space? ☐

Are awkward postures used or awkward loads handled? ☐

Is there frequent pushing or pulling? ☐

Comments:

Duration

Does the worker hold one position for long periods of time? ☐

If yes, how long? _____

Does the worker maintain pressure/force on an object? ☐

Comments:

Repetition

Are any motions repeated by the same body part with little variation? ☐

If yes, how often? ..... ____

Comments:

_____

_____

_____

Work Postures

If the trunk of the body is in an awkward postures, is it:

Twisting? ..... ☐

Reaching excessively? ..... ☐

Bending? ..... ☐

If the shoulders are in awkward postures, are they:

Reaching excessively? ..... ☐

At an awkward work height? ..... ☐

Reaching across or behind body? ..... ☐

Does the worker bend or twist the neck?

In an unnatural position, as part of work task ..... ☐

Does the worker bend the wrist?

Upward, downward or to either side more than 10 degrees, as part of work task? ..... ☐

Does the worker twist the forearm?

As part of work task? ..... ☐

Does the worker sit:

With poor posture? ☐

For long periods? ☐

With contact stress? ☐

With no back support? ☐

Does the worker stand:

On a non-resilient floor (very hard surface, e.g. concrete) ☐

For long periods of time? ☐

Without a foot rest? ☐

Comments:

Local Contact Stress

Does the object press against the skin and leave a white or red mark? ☐

Does the worker use the hand or other parts of the body to impact? (e.g. hand or knee as hammer) ☐

Comments:

Environmental

Does the worker sit or stand on a vibrating surface? ☐

Are parts of the worker's body cold while performing tasks? ☐

Is lighting adequate?

Is there glare? ☐

Is it too bright? ☐

Is it too dark? ☐

Comments:

Organisation

Are physically demanding tasks performed without adequate opportunities for recovery or rest? ☐

Are repetitions/monotonous tasks performed without adequate task variability? ☐

If yes, describe the repetitive task

Is the worker unable to keep up with the pace of the work tasks? ☐

Comments:

General comments and observations

_____

_____

_____

When completed, provide copies of this checklist to the following:

1. Employee (whose work process you evaluated)
2. Employee's manager and supervisor
3. JHS Committee

Appendix 1

Article 22.18 Thirteenth Master Agreement between the BC Government and the BCGEU

18.18 Strain Injury Prevention

(a) The parties agree that there is a shared interest in minimizing and/or eliminating musculoskeletal strain injuries or illnesses which are work related.

(b) Local Occupational Health and Safety Committees (or Union and Employer designated safety representative) shall, in the performance of regular worksite inspections, identify the following risk factors which may contribute to risk:

(1) the work methods and practices

(2) the layout and condition of the workplace and workstation

(3) the characteristics of objects or equipment handled

(4) the environmental conditions

(5) the physical demand of work

in a manner consistent with generic guidelines developed by the Provincial Joint Occupational Health and Safety Committee.

(c) Where new equipment will be introduced to the workplace, or during the design and planning stages of new or renovated workplaces or workstations, the Employer shall seek the appropriate advice with respect to the risk factors noted in (b). Such advice will be sought from resources which will, where appropriate, include a joint occupational health and safety committee or designated safety representatives.

Appendix 2

Workers' Compensation Board Ergonomics (MSI) Requirements

The purpose of section 4.46 to 4.53 is to eliminate or, if that is not practicable, minimize the risk of musculoskeletal injury to workers.

Definition **4.46** In section 4.47 to 4.53 (the Ergonomics (MSI) Requirements)

'musculoskeletal injury" or "MSI" means an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including a sprain, strain and inflammation, that may be caused or aggravated by work.

Risk identification **4.47** The employer must identify factors in the workplace that may expose workers to a risk of musculoskeletal injury (MSI).

Risk Assessment **4.48** When factors that may expose workers to a risk of MSI have been identified, the employer must ensure that the risk to workers is assessed.

Risk Factors

4.49 The following factors must be considered, where applicable, in the identification and assessment of the risk of MSI:

(a) the physical demands of work activities, including
  (i) force required,
  (ii) repetition,
  (iii) duration,
  (iv) work postures, and
  (v) local contact stresses;

(b) aspects of the layout and condition of the workplace or workstation, including
  (i) working reaches,
  (ii) working heights,
  (iii) seating, and
  (iv) floor surfaces;

(c) the characteristics of objects handled, including
  (i) size and shape,
  (ii) load condition and weight distribution, and
  (iii) container, tool and equipment handles;

(d) the environmental conditions, including cold temperature;

(e) the following characteristics of the organization of work:
  (i) work-recovery cycles;
  (ii) task variability;
  (iii) work rate.

Note: In work situations where a risk of MSI exists, typically only some factors from the list will be applicable. The WCB provides the chart *Applicability of Risk Factors* to assist.

Risk Control

4.50 (1) The employer must eliminate or, if that is not practicable, minimize the risk of MSI to workers.

(2) Personal protective equipment may only be used as a substitute for engineering or administrative controls if it is used in circumstances in which those controls are not practicable.

(3) The employer must, without delay, implement interim control measures when the introduction of permanent control measures will be delayed.

Education and Training

4.51 (1) The employer must ensure that a worker who may be exposed to a risk of MSI is educated in risk identification related to the work, including the recognition of early signs and symptoms of MSIs and their potential health effects.

(2) The employer must ensure that a worker to be assigned to work which requires specific measures to control the risk of MSI is trained in the use of those measures, including, where applicable, work procedures, mechanical aids and personal protective equipment.

Note: The WCB provides the pamphlet *The Basics of MSI Risk Identification* to assist with the application of section 4.51(1). Materials addressing other matters such as risk assessment and control are also available.

Evaluation

4.52 (1) The employer must monitor the effectiveness of the measures taken to comply with the Ergonomics (MSI) Requirements and ensure they are reviewed at least annually.

(2) When the monitoring required by subsection (1) identifies deficiencies, they must be corrected without undue delay.

Consultation

4.53 (1) The employer must consult with the joint committee, or the worker health and safety representative, as applicable, with respect to the following when they are required by the Ergonomics (MSI) Requirements:

(a) risk identification, assessment and control;

(b) the content and provision of worker education and training;

(c) the evaluation of the compliance measures taken.

(2) The employer must, when performing a risk assessment, consult with

(a) workers with signs or symptoms of MSI, and

(b) a representative sample of the workers who are required to carry out the work being assessed.

Appendix 3

Sample of Ergonomic Risk Assessment Developed by Ministry of Forests

How to Use the Ergonomics Investigation Report

Step 1 – Complete Form A – Investigation Focus

Step 2 – Complete Form B – Injury Information and Contributing Factors

Step 3 – Observe the work.

Step 4 – Identify what awkward postures each major body part is performing. Use Form C – Primary Risk Factors to capture this information.

Step 5 – Use Form C to identify how frequently you observed those awkward postures being performed.

Step 6 – Use Form C to identify any other Primary Risk Factors you observed for each major body part in addition to the awkward postures.

Step 7 – Use Form C to identify the magnitude (low, medium or high) of the primary risk factors observed.

Step 8 – Use Form D – Secondary Risk Factors to identify for each major body part what secondary risk factors are present that cause the primary risk factors to occur or make them worse. Several categories of secondary risk factors are listed at the bottom of the page for your consideration. Typically only some of them will apply.

Step 9 – Use Form E – Risk Control Plan to list recommendations or control measures to eliminate or if that is not possible minimise the secondary risk factors which are causing the primary risk factors to occur.

Step 10 – Supervisor or spending authority to use Form E to identify the persons responsible for completing each recommendation and the date to be completed.

Step 11 – In consultation with the supervisor, worker and safety committee representative, decide on a reasonable follow-up date to evaluate the effectiveness of the control measures. Record this date on Form E.

Step 12 – Have the appropriate persons sign and date Form E if they are in agreement with the Risk Control Plan.

Step 13 – Distribute completed Ergonomics Investigation Report up to Form E to the distribution list identified on Form E.

Step 14 – Supervisor to monitor the completion of the control measures and identify the date completed and initial them as completed on Form E.

Step 15 – Use Form F – Evaluation to conduct a follow-up visit and document the effectiveness of the control measures implemented.

Step 16 – Use Form F to determine if an additional follow-up evaluation is required and identify the date if necessary.

Step 17 – Have the appropriate persons sign and date Form F if they agree with the evaluation.

Step 18 – Distribute Form F only, to all those listed on the distribution list so it can be amended to their copy of the Ergonomics Investigation Report distributed to them earlier.

Ergonomics Investigation Report

for the Investigation and Prevention of Musculoskeletal Injuries (MSI)

Form A - Investigation Focus

File No. _____

Worker Information

Worker Name: _____
Telephone: _____
Job Title: _____
Job Classification: _____
Work Site Name: _____

Employment Status:

☐ Permanent, Full Time ☐ Part Time
☐ Temporary ☐ Seasonal ☐ Casual

Hours of Work? _____
How long in this Job? _____

WCB Ergonomics Requirements require that a representative sample of workers be consulted. If more than one worker performs task, please provide names of other worker(s) consulted:

Investigating Team

Supervisor: _____ Tel: _____
Ergonomics Leader: _____ Tel: _____
Safety Committee Rep: _____ Tel: _____

Task Information

Task Observed: _____
Date Observed: _____
Task Duration (% of shift): ☐ up to 25% ☐ 26% to50% ☐ 51% to 100%

Task Description: (identify the activities performed to accomplish task)

Credit - The Ministry of Forests would like to thank the Healthcare Benefit Trust for granting us permission to use their pictures in our Ergonomics Investigation Report.

Form B - Injury Information and Contributing Factors

Injury Information

1. Has worker received education in risk identification, including recognition of early signs and symptoms of MSIs and their potential health effects?
☐ Yes, ☐ No (supervisor to arrange education)

2. Is the worker currently experiencing MSI or signs and symptoms at work?
☐ Yes, date first noticed? _____ ☐ No

If yes to #2, please answer questions 3 - 8.

3. If yes, please describe injury and body part(s) affected.

4. Has worker reported MSI or signs and symptoms to the first aid attendant?
☐ Yes ☐ No (ask worker to report)

5. Is the worker currently seeking treatment from a healthcare professional (ie. family doctor, specialist, physiotherapist, chiropractor, massage therapist, etc.) for MSI or signs and symptoms?
☐ Yes ☐ No

If yes, on average, how frequently?
☐ Once a week ☐ Once every two weeks ☐ Once a month
Other _____

Contributing Factors

6. List any **significant** changes made to the workstation design, work process or the way the work is done, in the past 6 months? ☐ Not Applicable

7. Is the worker aware of any **work related activities** that may be causing or contributing to an MSI or signs and symptoms.
☐ Yes ☐ No ☐ Not Sure
If yes, please identify them here.

8. Is the worker aware of any **non-work related activities** that may be causing or contributing to an MSI or signs and symptoms.
☐ Yes ☐ No ☐ Not Sure
If yes, please identify them here.

Form C - Primary Risk Factors

GUIDES

Rarely - awkward posture observed a few times
Occasionally - awkward posture observed several times
Often - awkward posture observed many many times

Highly Repetitive - movement repeated every 30 seconds and occurs over and over again using the same muscle groups with little variation.
Static Posture - muscles contracted > 30 sec. with no movement or long enough to cause noticeable fatigue.
High Force - visibly noticeable muscular exertion while performing task.
Contact Stress - body part in contact with hard and/or sharp object.

NECK

Awkward Postures (Low/Med/High)

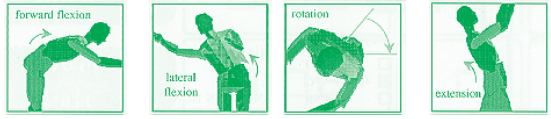
Frequency	Rarely	☐	☐	☐	☐
	Occasionally	☐	☐	☐	☐
	Often	☐	☐	☐	☐

Primary Risk Factor — **Magnitude** (Low/Med/High)

- ☐ Highly Repetitive
- ☐ Static Posture
- ☐ High Force
- ☐ Contact Stress

BACK

Awkward Postures (Low/Med/High)



Frequency	Rarely	☐	☐	☐	☐
	Occasionally	☐	☐	☐	☐
	Often	☐	☐	☐	☐

Primary Risk Factor — **Magnitude** (Low/Med/High)

- ☐ Highly Repetitive
- ☐ Static Posture
- ☐ High Force
- ☐ Contact Stress

LOWER BODY

Awkward Postures (Low/Med/High)

Frequency	Rarely	☐	☐	☐	☐
	Occasionally	☐	☐	☐	☐
	Often	☐	☐	☐	☐

Primary Risk Factor — **Magnitude** (Low/Med/High)

- ☐ Highly Repetitive
- ☐ Static Posture
- ☐ High Force
- ☐ Contact Stress

Form C - Primary Risk Factors

GUIDES

Rarely - awkward posture observed a few times
Occasionally - awkward posture observed several times
Often - awkward posture observed many many times

Highly Repetitive - movement repeated every 30 seconds and occurs over and over again using the same muscle groups with little variation.
Static Posture - muscles contracted > 30 sec. with no movement or long enough to cause noticeable fatigue.
High Force - visibly noticeable muscular exertion while performing task.
Contact Stress - body part in contact with hard and/or sharp object.

UPPER ARMS

Awkward Postures (Low/Med/High)

Frequency

Rarely ☐ ☐ ☐ ☐
Occasionally ☐ ☐ ☐ ☐
Often ☐ ☐ ☐ ☐

Primary Risk Factor	Magnitude (Low/Med/High)
☐ Highly Repetitive	
☐ Static Posture	
☐ High Force	
☐ Contact Stress	

LOWER ARMS

Awkward Postures (Low/Med/High)

Frequency

Rarely ☐ ☐ ☐
Occasionally ☐ ☐ ☐
Often ☐ ☐ ☐

Primary Risk Factor	Magnitude (Low/Med/High)
☐ Highly Repetitive	
☐ Static Posture	
☐ High Force	
☐ Contact Stress	

HANDS

Awkward Postures (Low/Med/High)

Frequency

Rarely ☐ ☐ ☐ ☐
Occasionally ☐ ☐ ☐ ☐
Often ☐ ☐ ☐ ☐

Primary Risk Factor	Magnitude (Low/Med/High)
☐ Highly Repetitive	
☐ Static Posture	
☐ High Force	
☐ Contact Stress	

Form D - Secondary Risk Factors

Secondary Risk Factors which cause or make the Primary Risk Factors worse:
(see Secondary Risk Factors identified below)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Secondary Risk Factors: **(typically only some of these will be applicable)**

Aspects of the layout and condition of the workplace or workstation, including:
- ❒ working reaches
- ❒ working heights
- ❒ seating
- ❒ floor surfaces

The characteristics of objects handled, including:
- ❒ size and shape
- ❒ load condition and weight distribution
- ❒ container, equipment and tool handle

The environmental condition, including:
- ❒ cold temperature
- ❒ vibration
- ❒ illumination

The following characteristics of the organization of work:
- ❒ work-recovery cycles
- ❒ task variability
- ❒ work rate

Form E - Risk Control Plan

Control Measures	Person Responsible	Person Responsible	Person Responsible	Initial

Follow-up Evaluation Date?

_____

_____ Supervisor's Signature _____ Print Name _____ Date

_____ Worker's Signature _____ Print Name _____ Date

_____ Safety Committee Rep's Signature *(if applicable)* _____ Print Name _____ Date

_____ Ergonomics Leader's Signature *(if applicable)* _____ Print Name _____ Date

Distribution:

- ☐ Ergonomics Leader
- ☐ Supervisor/Manager
- ☐ Worker
- ☐ Safety Committee *(for consultation)*
- ☐ Regional Safety Officer *(if applicable)*

Form F - Evaluation

Evaluation Date: _____

1. Have all risk control measures been implemented? ☐ Yes ☐ No
If No, please describe the delay in implementation.

2. Does worker feel it takes less effort to do the same job/tasks as a result of control measures implemented?
☐ Yes ☐ No ☐ Not Sure

3. If the worker was experiencing MSI or signs and symptoms, since the implementation of control measures have they:
☐ Decreased ☐ Stopped ☐ Increased ☐ Not Applicable

4. If the worker was seeing a medical professional (family doctor, specialist, physiotherapist, chiropractor, massage therapist, etc.) for treatment of MSI or signs and symptoms of MSI, has the frequency of those visits:
☐ Decreased ☐ Stopped ☐ Increased ☐ Not Applicable

Please Explain:

Additional Evaluation Date Required?
☐ Yes ☐ No

If Yes, Date?

_____

_____ Supervisor's Signature	_____ Print Name	_____ Date
_____ Worker's Signature	_____ Print Name	_____ Date
_____ Safety Committee Rep's Signature *(if applicable)*	_____ Print Name	_____ Date
_____ Ergonomics Leader's Signature *(if applicable)*	_____ Print Name	_____ Date

Distribution:

- ☐ Ergonomics Leader
- ☐ Supervisor/Manager
- ☐ Worker
- ☐ Safety Committee *(for consultation)*
- ☐ Regional Safety Office *(if applicable)*

Appendix 4

Sample of Ergonomic Risk Factor Identification recommended by the Workers' Compensation Board

WORKSHEET "A"
MSI Risk Factor Identification

- PHYSICAL DEMANDS OF WORK -

Section 4.47 of the Ergonomic (MSI) Requirements requires an employer to identify factors in the workplace that may expose workers to a risk of MSI. This document can assist in identifying factors that pose a risk of MSI. If a risk is identified, a "moderate" or "high" risk of MSI exists and merits assessment and control. Exposures not identified by this document would be considered "low risk" and may not merit assessment and control. For a complete guide, refer to the WCB documents, *"MSI Prevention in the Workplace: A Guide for Employers & Joint Committees"* and *"Understanding the Risks of MSI: An Educational Guide for Workers on Sprains, Strains, and other MSIs."*

Instructions

1. Document the job title or task, date and name of person(s) completing the worksheet.
2. Observe a representative sample of workers performing regular work activities.
3. Read the minimum criteria listed under each risk factor.
   - ✯ If magnitude is significantly greater than criteria referenced (e.g. pinch grips objects

significantly greater than 1 kg), the duration component must be reduced.

- Duration (for example, 2 hours total per day) refers to the total time per day the worker is exposed to the risk factors, not the duration of the work activity that includes the risk factor. However, when duration is associated with repetition (using the same motion every few seconds or frequency (for example, more than once per minute), it refers to duration per day of repetitious task.
- If exposure to risk factor (e.g. 2 hours total per day) is continuous, the risk to workers will be significantly greater that intermittent exposure distributed over a shift.

4. **Check** the box for that risk factor if any criteria listed are present. ☑
5. **Write** notes for any identified risk factor to clarify the task or duty where it occurs.
   - Risk factors marked in the box pose at least moderate risk to workers and require further assessment and control.
6. Go to "Worksheet B – Risk Factor Assessment" if any risk factors are identified. Fill out the "Risk Factors Summary – Moderate Risk" to summarize the risk factors identified in Worksheet A.

Note: Some aspects of contact stress (e.g. hand tools digging into skin) and force (e.g. pushing/pulling/carrying loads) are not included. Also, some risk factors (e.g. cold temperature, characteristics of objects handled) are not addressed. Persons using these worksheets need to address them separately and minimize the risk to workers.

WORKSHEET "A"
MSI Risk Factor Identification

Job Title or Task: ..... **Date:** .....
(mm/dd/yr)

Completed By: .....

CONTACT STRESS	IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX → ☐	*Perform Contact Stress Assessment*
1	• Worker uses the one of the following as a hammer more than 10 times per hour and for more than 2 hours total per day • Hand (heel/base of palm), or • Knee • (An extremely severe contact stress usually results in a traumatic injury such as bruising and therefore is not considered an MSI risk factor.)	Notes

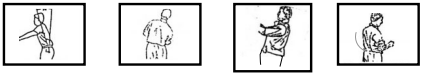
REPETITION	IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX → ☐	*Perform Repetition Assessment*
1	• Worker repeats the same motion with the neck, shoulders, elbows, wrists, or hands every few seconds with little or no variation for more than 2 hours total per day (excluding keying activities)	Notes
2	• Worker performs intensive keying more than 4 hours total per day	

** Note: Total time is determined by measuring the cumulative duration of a task, and considering whether the risk factor in question is a significant part of that task.

Force	**For the purposes of MSI risk identification, force can be classified as grip force, or lift/lower force**	
GRIP FORCE	**IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX** → ☐	***Perform Grip Force Assessment***
Pinch Grip**	• Pinch gripping an unsupported object(s) weighing 1 kg (2 lbs.) or more per hand for more than 2 hours total per day OR • Pinch gripping with a force of 2 kg (4 lbs.) or more per hand for more than 2 hours total per day Pinch Grip 	Notes
Power Grip**	• Power gripping an unsupported object(s) weighing 5 kg (10 lbs.) or more per hand for more than 2 hours total per day OR • Power gripping with a force of 5 kg (10 lbs.) or more for more than 2 hours total per day Power Grip 	

LIFT/LOWER FORCE	**IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX** → ☐	***Perform Lift/Lower Assessment***
1	• Lifting objects weighing more than 75 lbs. once per day	Notes
2	• Lifting objects weighing more than 25 kg (55 lbs.) more than 10 times per hour, more than 2 hours total per day	
3	• Lifting objects weighing > 5 kg (10 lbs.) if done more than twice per minute, more than 2 hours total per day	
4	• Lifting objects weighing more than 11 kg (25 lbs.) more than 25 times per day and - Above the shoulders, or - Below the knees, or - At arms length from the body	

**Note: A pinch grip occurs when the force application is primarily between the fingers and thumb. A power grip occurs when the force is primarily between the fingers and the palm.

AWKWARD POSTURE:	**IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX →** ☐	***Perform Repetition Assessment***
Neck	Worker performs <u>any</u> minimum joint deviations: • Working with the neck bent more than 30° in any direction for more than 2 hours total per day  Side Backward Forward (circle the appropriate movements)	Notes
Shoulder Back	• Working with the hand(s) above the head more than 2 hours total per day • Working with the elbow(s) above the shoulder more than 2 hours total per day • Working with the back bent more than 30° in any direction for more than 2 hours total per day  Forward Side Backward Twisted (circle the appropriate movements)	
Knees	• Worker squats/ kneels more than 2 hours total per day  (circle the appropriate movements)	

VIBRATION	**IF ANY OF THE FOLLOWING CRITERIA ARE PRESENT, MARK THE ASSESSMENT BOX →** ☐	***Perform Vibration Assessment***
1	• Use high vibration tools (impact wrenches, carpet strippers, chain saws, jack hammers, scalers, riveting hammers) for more than 30 minutes total per day	Notes
2	• Use moderate vibration hand tools (grinders, sanders, jig saws) that typically have moderate vibration levels more than 2 hours total per day	

Appendix 5

Sample of Ergonomic Risk Assessment recommended by the Workers' Compensation Board

WORKSHEET "B"
MSI Risk Factor Assessment

- to determine high risk from risk identification: physical demands of work -

Job Title or Task: ..... **Date:** .....
(mm/dd/yr)

Completed By: .....

Section 4.48 of the Ergonomic (MSI) Requirements requires an employer to assess those factors that expose workers to a risk of MSI. This document can be used to determine if the risk(s) identified in the document titled "Worksheet A - MSI Risk Factor Identification" pose a "high" or "moderate" risk.

Instructions

1. Document the job title or task, date and name of person(s) completing the worksheet. Risk assessment should be performed by someone who understands the work process, the MSI risk factors, and the principles of risk assessment and control.

2. Complete the "Risk Factor Summary-Moderate Risk" from "Worksheet A – Risk

Factor Identification." These risk factors are considered to pose at least a "moderate" risk of MSI.

3. Perform "Risk Factor Assessment" **only** on those factors identified from "Worksheet A."

4. Observe **and** consult with a representative sample of workers and those workers with signs & symptoms of MSI.

5. Reading across the page under each risk factor, determine if all of the conditions in that row are present in the work activities.

6. If all conditions are present, place a mark in the box to indicate that a "high" risk of MSI exists. 

7. Make any appropriate notes to clarify specific details.

8. Complete the "High Risk" column of the Risk Factor Summary Table.

Interpretation of Results

The risk factors in the "high risk" column require that controls must be implemented without undue delay. Controls should eliminate, or if that is not practicable, minimize the risk of MSI to workers. If the risk remains "moderate," controls may be merited to minimize the risk of MSI. For assistance in developing controls, refer to the WCB document, "*Common Risk Control Options*."

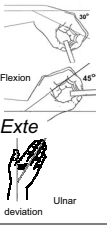
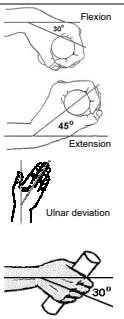
Risk Factor Summary Table

RISK FACTOR	"Moderate Risk" Risk Factors Identified from Worksheet "A"	"High Risk" Risk factors Indicated from Assessment Worksheet "B"
CONTACT STRESS	❑	❑
REPETITION	❑	❑
GRIP FORCE	❑	❑
LIFT/LOWER FORCE	❑	❑
AWKWARD POSTURE	❑	❑
VIBRATION	❑	❑

CONTACT STRESS:				Mark ✓ here to indicate a High Risk of MSI
Body Part	**PHYSICAL RISK FACTOR**	**DURATION**	Visual Aid	
Hands	**Using the hand (heel/base of palm) as a hammer more than once per minute**	More than 2 hours total per day**		❑
Knees	**Using the knee as a hammer more than once per minute**	More than 2 hours total per day		❑

REPETITION:				Mark ✓ here to indicate a High Risk of MSI
BODY PART	**PHYSICAL RISK FACTOR**	**COMBINED WITH**	**DURATION**	
NECK SHOULDERS ELBOWS WRISTS HANDS	Using the same motion with little or no variation every few seconds (exclude keying activities)	No other risk factors	More than 6 hours total per day	❑ Neck ❑ Shoulders ❑ Elbows ❑ Wrists ❑ Fingers
WRISTS HANDS	Using the same motion with little or no variation every few seconds (exclude keying activities)	Wrists bent in; ≥ 30° flexion, or ≥ 45° extension, or ≥ 30° ulnar deviation, or AND High, forceful hand(s) exertions	More than 2 hours total per day	❑
	Intensive keying *Keying with the hands or fingers in a rapid, steady motion with few opportunities for temporary work pauses.*	Awkward wrist posture, ≥ 30° flexion, or ≥ 45° extension, or ≥ 30° ulnar deviation	More than 4 hours total per day	❑
		No other risk factors	More than 7 hours total per day	❑

** Note: Total time is determined by measuring the cumulative duration of a task, and considering whether the risk factor in question is a significant part of that task.

GRIP FORCE					Mark ✓ here to indicate a High Risk of MSI
BODY PART	**PHYSICAL RISK FACTOR**	**COMBINED WITH**	**DURATION**	**VISUAL AID**	
ARMS WRISTS HANDS	Pinch gripping** an unsupported object(s) • Weighing 1 kg (2 lbs) or more per hand, OR • Pinch gripping with a force of 2 kg (4 lbs) or more per hand (comparable to pinch gripping half a stack of photo-copy paper)	Highly repetitive motion	> 3 hours total per day		❑
		Wrists bent in ≥ 30° flexion, or ≥ 45° extension, or ≥ 30° ulnar deviation circle the appropriate movements	More than 3 hours total per day		❑
		No other risk factors	More than 4 hours total per day		❑
ARMS WRISTS HANDS	Power gripping** an unsupported object(s) • Weighing 5 kg (10 lbs) or more per hand OR • Power gripping with a force of 5 kg (10 lbs) or more per hand (comparable to clamping light duty automotive jumper cables onto a battery)	Highly repetitive motion	> 3 hours total per day		❑
		Wrists bent in ≥ 30° flexion, or ≥ 45° extension, or ≥ 30° ulnar deviation circle the appropriate movements	More than 3 hours total per day		❑
		No other risk factors	More than 4 hours total per day		❑

**Note: A pinch grip occurs when the force application is primarily between the fingers and thumb.
A power grip occurs when the force a primarily between the fingers and the palm.

LIFT/ LOWER FORCE RISK ASSESSMENT - TO DETERMINE HIGH RISK

This document can be used to assess forceful exertion due to lifting/ lowering force. Weight limits in this document represent "high" risk that require controls without undue delay.

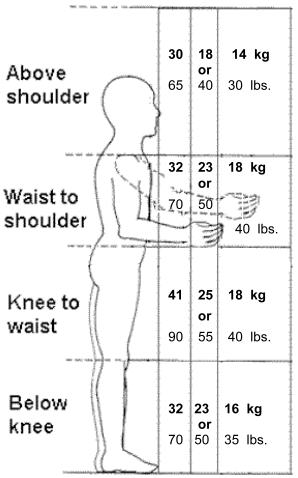
Mark one of the two boxes (❑) to indicate which assessment situation applies.

- ❑ **With one specific lift or when repeating the same lift, use Steps 1-5 below.** _____
- ❑ **When there is a number of lifts with different weights and/or different postures, use Steps 1-5 to:**
  1. Assess the two worst case lifts - the heaviest object lifted and the lift in the most awkward posture, AND
  2. The most commonly performed lift. In Step 3, use the frequency and duration for all of the lifting done in a typical workday.

Step 1 Find the actual weight of the object that the employee lifts.

Actual Weight = _____

Step 2 **Determine the Unadjusted Weight Limit.** Determine where the employee's hands are at the beginning of the lift/ lower. Mark that spot on the diagram below. The number in that box is the **Unadjusted Weight Limit.**



Unadjusted Weight Limit: _____

Step 3 **Find the Limit Reduction Modifier.** Find out how many times the employee lifts per minute and the total number of hours per day spent lifting. Use this information to look up the **Limit Reduction Modifier** in the table below.

How Many Lift per Minute?	*For How Many Hours per Day?*		
	1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2-5 min.	1.0	0.95	0.85
1 lift every minute	0.95	0.9	0.75
2-3 lifts every minute	0.9	0.85	0.65
4-5 lifts every minute	0.85	0.7	0.45
6-7 lifts every minute	0.75	0.5	0.25
8-9 lifts every minute	0.6	0.35	0.15
10+ lifts every minute	0.3	0.2	0.0

Note: For lifting performed less than once every five minutes, use 1.0

Step 4 **Limit Reduction Modifier:** _____

Calculate the Weight Limit. Start by copying the Unadjusted Weight Limit from Step 2.

Unadjusted Weight Limit (Step 2)**:** **=** _____

If the employee twists more than 45 degrees while lifting, reduce the Unadjusted Weight Limit by multiplying by 0.85. Otherwise, use the Unadjusted Weight Limit

Twisting Adjustment: **=** _____.____

Adjusted Weight Limit: **=** _____

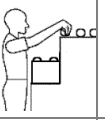
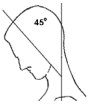
Multiply the Adjusted Weight Limit by the Limit Reduction Modifier from Step 3 to get the **Weight Limit.**

X

Limit Reduction Modifier (Step 3)**:** _____.___

Actual Weight = _____ **Weight Limit: =** ____

Step 5 **Is this a hazard?** Compare the Actual Weight lifted from Step 1 to the calculated Weight Limit in Step 4. If the **Actual Weight** (Step 1) **>** **the Weight Limit** (Step 4), then the lift is "high" risk and requires controls without undue delay to the degree technologically and economically feasible. If the Actual Weight is below the Weight Limit, the risk is "moderate" and requires consideration for control.

AWKWARD POSTURE				Mark ✓ here to indicate a High Risk of MSI
BODY PART	**PHYSICAL RISK FACTOR**	**DURATION**	**VISUAL AID**	
Knees	Squatting	More than 4 hours total per day		❑
	Kneeling	More than 4 hours total per day		❑
Shoulders	Working with the hand(s) above the head or the elbow(s) above the shoulder(s)	More than 4 hours total per day		❑
	Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute	More than 4 hours total per day		❑
Neck	Working with the neck bent more than 45º (without support or the ability to vary posture)	More than 4 hours total per day		❑
Back	Working with the back bent forward more than 30º (without support, or the ability to vary posture)	More than 4 hours total per day		❑
	Working with the back bent forward more than 45º (without support or the ability to vary posture)	More than 2 hours total per day		❑

VIBRATION RISK ASSESSMENT – TO DETERMINE HIGH RISK

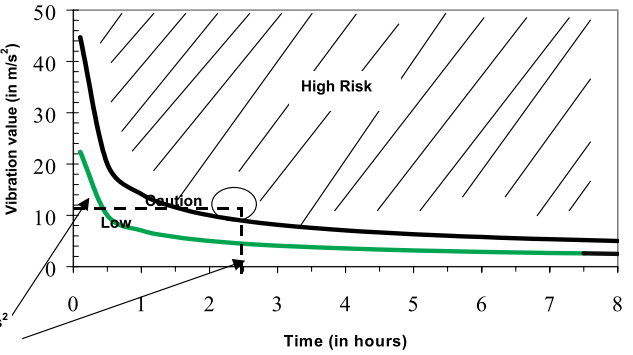
Use this document to determine if a "high" risk of MSI from hand-arm vibration exists.

Step 1 Find the vibration value for the tool. (Get it from the manufacturer, look it up at this web site: http://umetech.niwl.se/vibration/HAVHome.html, or you may measure the vibration yourself). The vibration value will be in units of meters per second squared (m/s^2). On the graph below find the point on the left side that is equal to the vibration value.

Step 2 Determine how many total hours per day the employee is using the tool and find that point on the bottom of the graph.

Step 3 Trace a line in from each of these two points until they cross.

Step 4 If that point lies in the crosshatched "High Risk" area above the upper curve, then the vibration exposure is "high risk" and requires controls without undue delay. The vibration must be reduced below the high risk level or to the degree technologically and economically feasible. If the point lies between the two curves in the "Caution" area, then the job is of "moderate risk" and may merit controls to minimize the risk of MSI. If it falls in the "Low" area below the bottom curve, then no further steps are required.



Example:
An impact wrench with a **vibration value of 12 m/s^2** is used for **2½ hours** total per day. The exposure level is in the High Risk area. The vibration must be reduced below the high risk level or to the degree technologically and economically feasible.

Note: The caution limit curve (bottom) is based on an 8-hour energy-equivalent frequency-weighted acceleration value of 2.5 m/s^2. The high risk limit curve (top) is based on an 8-hour energy-equivalent frequency- weighted acceleration value of 5 m/s^2.