

PREVENTING MUSCULOSKELETAL INJURY (MSI)

A guide for employers
and joint committees



WORK SAFE BC

WORKING TO MAKE A DIFFERENCE
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About WorkSafeBC

WorkSafeBC (the Workers' Compensation Board) is an independent provincial statutory agency governed by a Board of Directors. It is funded by insurance premiums paid by registered employers and by investment returns. In administering the *Workers Compensation Act*, WorkSafeBC remains separate and distinct from government; however, it is accountable to the public through government in its role of protecting and maintaining the overall well-being of the workers' compensation system.

WorkSafeBC was born out of a compromise between B.C.'s workers and employers in 1917 where workers gave up the right to sue their employers or fellow workers for injuries on the job in return for a no-fault insurance program fully paid for by employers. WorkSafeBC is committed to a safe and healthy workplace, and to providing return-to-work rehabilitation and legislated compensation benefits to workers injured as a result of their employment.



WorkSafeBC Prevention Information Line



The WorkSafeBC Prevention Information Line can answer your questions about workplace health and safety, worker and employer responsibilities, and reporting a workplace accident or incident. The Prevention Information Line accepts anonymous calls.

Phone 604 276-3100 in the Lower Mainland, or call 1 888 621-7233 (621-SAFE) toll-free in British Columbia.

To report after-hours and weekend accidents and emergencies, call 604 273-7711 in the Lower Mainland, or call 1 866 922-4357 (WCB-HELP) toll-free in British Columbia.



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WorkSafeBC Publications

Many publications are available on the WorkSafeBC web site. The Occupational Health and Safety Regulation and associated policies and guidelines, as well as excerpts and summaries of the *Workers Compensation Act*, are also available on the web site: WorkSafeBC.com.

Some publications are also available for purchase in print:

Phone: 604 232-9704
Toll-free phone: 1 866 319-9704
Fax: 604 232-9703
Toll-free fax: 1 888 232-9714
Online ordering: WorkSafeBC.com and click on Publications;
follow the links for ordering

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Introduction

Some of the tasks we perform at work—such as lifting, reaching, and repeating the same movements—can strain our bodies. In some situations, these tasks can result in an injury to the muscles, tendons, ligaments, nerves, blood vessels, and joints of the neck, shoulders, arms, wrists, legs, and back. This type of injury is called a musculoskeletal injury, or MSI.

MSI is a common type of workplace injury in all industries in British Columbia. MSI claims associated with overexertion and repetitive motion account for about one-third of claims accepted by WorkSafeBC. In some industries, this proportion is much higher.

The Occupational Health and Safety Regulation lists specific requirements to help employers prevent MSI. Based on the Regulation, this educational booklet provides guidance to help employers, joint health and safety committees, and worker health and safety representatives implement an effective strategy to prevent MSI in the workplace. It includes information that will help you to:

- Identify factors that place workers at risk for MSI
- Understand the steps in preventing MSI
- Understand how control measures can reduce the risk of MSI
- Investigate injuries and signs or symptoms of MSI

What is MSI?

The Occupational Health and Safety Regulation defines musculoskeletal injury (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.

Risk factors

The factors that contribute to the development of MSI are called risk factors. A risk factor is something that may cause or contribute to an injury. Two or more risk factors can be present at one time, increasing the risk of injury.

The Occupational Health and Safety Regulation requires employers to consider a number of factors when identifying and assessing the risk of MSI. The physical risk factors for MSI are the demands of a task, including force, repetition, work posture, and local contact stress.

For a description of these risk factors, along with illustrations and examples, see the WorkSafeBC publication *Understanding the Risks of Musculoskeletal Injury (MSI): An Educational Guide for Workers on Sprains, Strains, and Other MSIs*. The publication also looks at factors that influence the physical demands, such as the layout of the workplace and the organization of work tasks. In addition, this booklet provides information on the signs and symptoms of MSI and the potential health effects of these injuries. The booklet is available in print or online (see page 12).

The mere presence of MSI risk factors may not in itself result in an injury. It depends on the extent of exposure—for example, how great the force is and how long the worker is exposed to the risk. The extent of exposure is further discussed in risk assessment (page 6) and risk control (page 8).

Developing an MSI 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). In addition, activities outside the workplace can result in exposure to the risk factors for MSI.

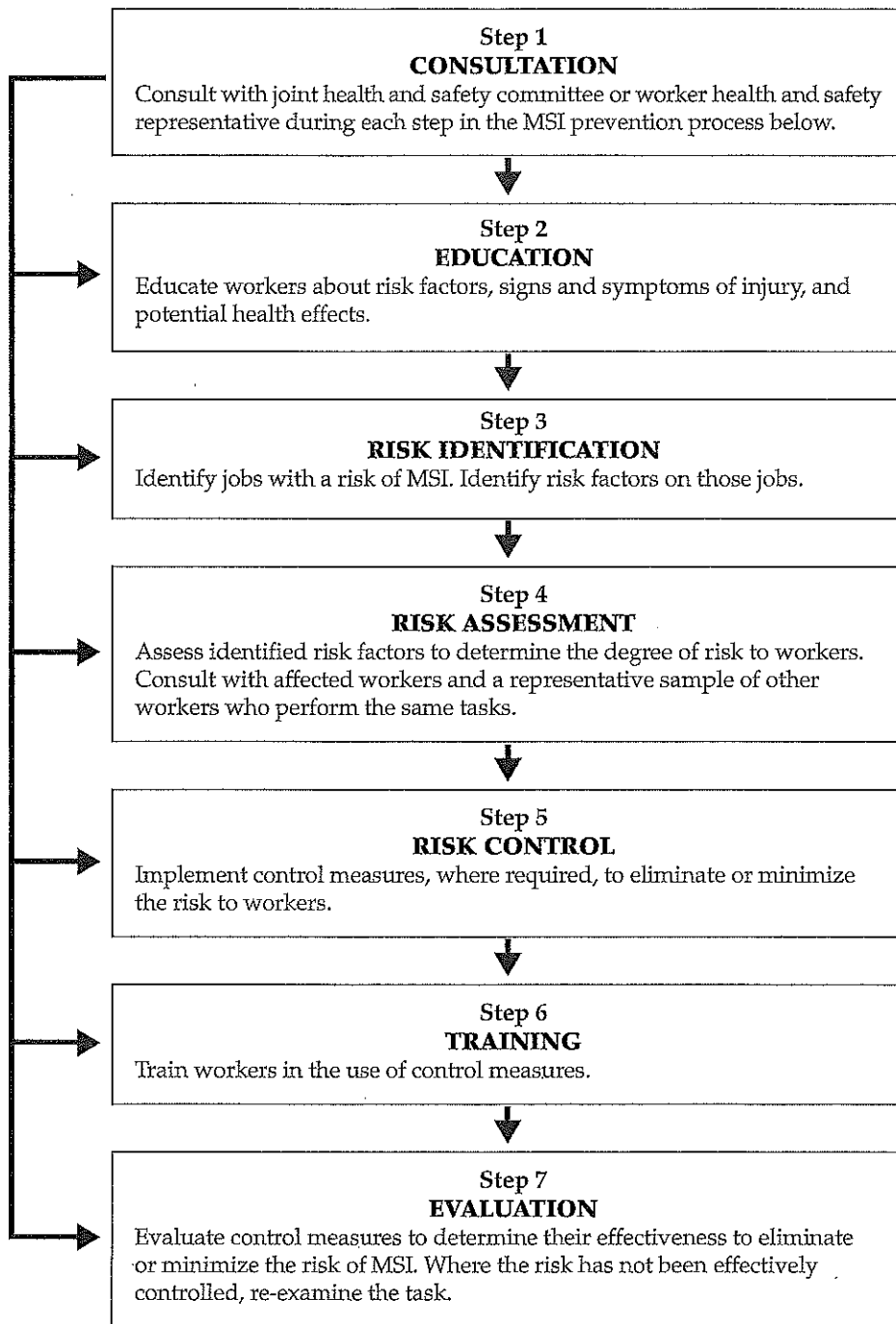
Preventing MSI in the workplace

Employers need to make sure that preventing MSI is a key part of their company's occupational health and safety program. The ergonomics requirements listed in the Occupational Health and Safety Regulation are intended to eliminate or minimize the risk of MSI to workers.

This booklet describes the process for preventing these injuries in the workplace. This is not necessarily a linear process from beginning to end. More than one step can take place at one time.

2 Preventing Musculoskeletal Injury (MSI)

Steps in the MSI prevention process



Step 1: Consultation

Employers must consult with the joint committee or the worker health and safety representative at every step of the MSI prevention process. “To consult with” means to seek information or advice from the joint committee or worker health and safety representative.

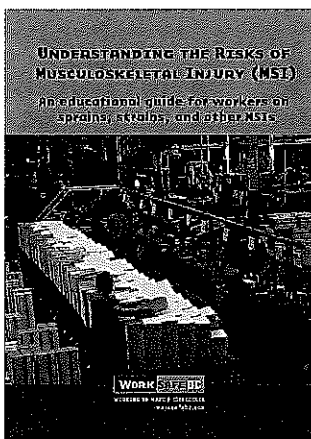
When doing a risk assessment (step 4), employers must also consult with a sample of workers who carry out the tasks being assessed and with workers who have experienced signs or symptoms of MSI. Workers can also be consulted at other steps since they may know the job best.

Step 2: Education

Employers must ensure that workers are educated about:

- Risk identification related to their work (factors that may put workers at risk for MSI)
- The signs and symptoms of injury
- The potential health effects of MSI

The WorkSafeBC publication *Understanding the Risks of Musculoskeletal Injury (MSI): An Educational Guide for Workers on Sprains, Strains, and Other MSIs* can help with this education.



*This publication is available on the WorkSafeBC web site (WorkSafeBC.com).
To order print copies, see page ii.*

Step 3: Risk identification

Employers are required to identify factors in the workplace that may expose workers to a risk of MSI. This doesn't mean that you have to identify risk factors for *every* job at your workplace, just for jobs in which there is reasonable expectation of a risk of MSI. Risk identification should be conducted by people who understand both the work process and the risk factors and who have some education and training in the principles of risk assessment.

Since it is not practical to identify MSI risk factors associated with all jobs at one time, a reasonable approach is to prepare a list of jobs in order of decreasing risk and establish a plan in order of priority. To determine which jobs are at a higher risk for MSI and should be given priority, you might examine first aid records and claims history for MSI and other relevant information.

The jobs of workers who have already had an MSI or have signs or symptoms of MSI could have a higher risk of MSI. Therefore, priority for risk identification should be given to jobs in the following situations:

- A worker has already had a work-related MSI claim
- A worker has been injured and reports to first aid with an MSI
- A worker has reported signs or symptoms of MSI

Risk identification should also take place *before* any problems or injuries are reported so that risk factors can be eliminated or minimized and injuries potentially prevented. To set priorities for preventive risk identification, you might, for example, interview workers, take a survey, or observe workers on the job. In addition, early risk identification can help prevent injuries in the following situations:

- A worker or supervisor observes high exposures to risk factors in a job—for example, during workplace inspections and observations of current work methods.
- A new job is introduced or a process changes.

After identifying particular jobs that pose a higher risk of MSI to workers, the employer needs to identify the MSI factors that contribute to the risk for each of those jobs. There are several tools (such as checklists and worksheets) available. Tools to help identify jobs or tasks incorporating exposures that pose a risk of MSI can be obtained from a WorkSafeBC officer (see list of local WorkSafeBC offices on the inside

back cover). These tools help identify risk factors that require further investigation to assess the risk to workers. Some of these tools take duration and magnitude into account along with the risk factors to help you establish priorities.

Other methods can be used to identify risk factors as long as they include the risk factors listed in the Occupational Health and Safety Regulation. The WorkSafeBC web site has links to various resources (see page 12).

You can also contact your local WorkSafeBC office and talk to an officer to get further guidance on risk identification for your workplace.

If the risk identification step reveals an obvious and effective risk control that will eliminate or minimize the risk to workers, you do not need to conduct a separate risk assessment (step 4) before implementing controls (step 5). For example, if a receptionist twists her neck to view the computer monitor (which has been placed to one side), the employer may decide to alter the counter so there is room for the monitor to be placed directly in front of the worker. This control measure can be implemented without first assessing how long the worker is in that posture or how severe it is.

Step 4: Risk assessment

Employers must assess the degree of risk (high, moderate, or low) to the workers in those jobs or tasks where exposure to risk factors has been identified. **Risk assessment will help you decide which risk factors pose a risk of injury to workers and are therefore important to control.**

For example, you may have identified an awkward stooping posture when a worker reaches to perform a task. During the risk assessment, you may find out that the worker does this task only occasionally or for a very short period of time during the day. There may be exposures to other factors (such as high force and repetition) associated with other tasks the worker performs for longer durations. In this example, force and repetition pose a greater risk and need control measures more urgently.

During risk assessment, the employer must consult with workers who have signs or symptoms of MSI and with a representative sample of workers who perform the tasks being assessed. The sample should include workers who represent a range of characteristics such as gender,

age, and height. Some situations, however, may not require a specific risk assessment. As stated in step 3, if the risk control is obvious and effective, risk identification can lead directly to risk control. In such situations, you should consult with workers at the risk identification stage.

Risk assessment should be performed by people who understand the work process, the MSI risk factors, and the principles of risk assessment and control. The basic principles of risk assessment involve looking at the *extent of exposure* to assess how great the risk is. Extent of exposure includes magnitude (how much), duration (how long), and frequency (how often, how fast).

To take extent of exposure into account, consider questions such as the following:

- What is the magnitude of the exposure? For example, how much force is needed or how severe is the awkward posture?
- How long (total time) is the worker exposed to the risk? For example, is the worker exposed to the risk for a full shift or for two hours?
- How frequently is the worker exposed to the risk? For example, is the task repeated many times each shift or does it occur only occasionally?

A risk assessment should also consider the following:

- What is the combined effect of all the identified risk factors? For example, lifting heavy objects from the floor to a height above the shoulders several times a minute poses a greater risk than lifting the same objects between the knee and waist level infrequently.
- What body part is most likely to be affected? For example, when a person is working overhead, the shoulders and neck may be affected.

If risk identification revealed exposure to risk factors that should be assessed, it may be more efficient to conduct risk assessment immediately following identification. In this way, the person doing the identification can use information already gathered, ask questions, and observe workers to assess whether the exposure is significant enough or frequent enough to require risk controls.

Risk assessment tools are available from a WorkSafeBC officer. These will help you assess the degree of risk (high, moderate, or low), determine where controls are needed, and establish priorities for implementing controls to prevent MSI.

Step 5: Risk control

If risk controls are needed, the next step is to look at options. The employer must eliminate the risk of MSI, or, if that is not practicable, must minimize the risk. You should implement the risk controls selected without undue delay. If there will be a delay in implementing permanent controls, interim controls must be implemented without delay.

First consider engineering or administrative controls that *eliminate* the risk to workers. If this is not practicable, introduce controls that *minimize* the risk. Personal protective equipment can be used only if engineering or administrative controls are not practicable.




- **Engineering controls** are the arrangement, design, or alteration of the physical work environment, equipment, or materials. For example, a mechanical lifting device is an engineering control that health care workers can use to reduce the risk of MSI when moving patients.
- **Administrative controls** include the use and scheduling of resources and staffing to improve how the work is organized and performed. For example, limiting the hours a cashier spends at an express checkout is an administrative control that can reduce the amount of repetitive motion.
- **Personal protective equipment and clothing** may be used as a control if other controls are not practicable, or in addition to other controls. For example, workers may wear vibration-dampening gloves while using a chainsaw or wear knee pads while working on their knees to install flooring.

Some control measures will eliminate the exposure to the risk factor. Where that is not possible, the control measures should result in the extent of exposure being reduced in at least one of the following ways.

Reduced *magnitude* of exposure

Controls that reduce the magnitude of exposure involve, for example, reducing the force required or making the work posture more comfortable:

- Use better-designed tools to reduce the effort. For example, use a lighter tool or a suspended tool to reduce the force needed to grip the tool (engineering control).
- Redesign the workstation to avoid excessive reaching or bending. For example, change the height of the work surface to reduce the reaching distance and an awkward shoulder posture (engineering control).

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- Modify the work practice. For example, use two people to lift a heavy object instead of one person (administrative control).



Reduced *duration* of exposure

Reduced duration of exposure to the risk over the work shift involves reducing the total time the worker is exposed to the risk:

- Use some mechanization to reduce the time spent during the day doing physical tasks. For example, use a mechanical stacker for some products during the shift (engineering control).
- Rotate jobs to reduce the time spent doing manual handling. For example, rotate workers between manual stacking and forklift driving (administrative control).

Reduced *frequency* of exposure

Reduced frequency of exposure to the risk involves reducing the number of times the task is done in a period of time:




- 
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- Use partial mechanization to reduce repetition. For example, use power tools for parts of the job and use hand tools only where the power tools are not practical (engineering control).
 - Combine other tasks with the job to reduce repetition. For example, let a worker doing intense keyboarding tasks also handle non-keyboarding tasks such as customer service (administrative control).

Improved *pattern* of exposure

The pattern of exposure can be improved if the time the worker is exposed to the risk is divided into smaller blocks of time over the work shift. This control can be used where it is not practical to reduce the total duration of time on the task:

- Organize the work so that highly physically demanding tasks are interspersed with less physically demanding tasks. For example, rotate workers so that each worker does the physically demanding task in two blocks of two hours instead of one block of four hours (administrative control).

The table on pages 13–18, Common Risk Control Options, lists examples of some controls to consider for the risk factors identified in the Regulation.




In addition to working through the MSI prevention process, the employer must investigate certain situations involving MSI to determine contributory causes. An investigation must lead to risk controls that eliminate or minimize the risk to the injured worker and prevent a recurrence of similar incidents. MSI investigations are further discussed on page 11.


Step 6: Training

The employer must ensure that workers are trained to use the risk control measures. For example, if you provide a worker with a mechanical lifting device, the worker must be trained to use the device properly. In addition, where safe work procedures have been implemented to reduce the risk of MSI, workers must be trained and supervised in those procedures. Workers must follow the safe work procedures they have been trained to use and must use any engineering controls and required personal protective equipment and clothing.

Step 7: Evaluation



Finally, the employer must evaluate the control measures to determine how effective they are in eliminating or minimizing the risk of MSI. Some ways to evaluate the controls are:



- Interviewing workers
- Looking for decreases in the number and severity of signs and symptoms of MSI
- Observing a reduction in the number of risk factors or in the severity of risk factors
- Using a checklist or other tool to compare the exposure to risk factors before and after controls are implemented

If the risk has not been effectively controlled or if new risks have been created, re-examine the task and reconsider which controls may be needed. Additionally, the employer needs to evaluate the overall MSI prevention program at least once a year to make sure it continues to meet the objective of eliminating or minimizing the risks to workers.



Investigating an MSI

The employer is required to conduct an investigation into the following situations associated with MSI:

- Where a worker has a work-related MSI requiring medical treatment
- Where an incident had the potential to result in a serious MSI

Unsafe or harmful conditions must also be reported and investigated. For example, if a worker reports persistent signs or symptoms of MSI (such as swelling or tingling), there may be an unsafe work situation that could lead to a serious MSI. The unsafe condition must be investigated.

The focus of these MSI investigations is to:


- Identify risk factors that likely contributed to the MSI or to the unsafe condition that may result in MSI
- Implement controls to prevent the recurrence of similar injuries or to correct the unsafe condition

To assist with the investigation process, a chart is provided on pages 19–23. This chart is useful in correlating which risk factors might have contributed to the injury of the specific body part. The chart can help you focus on the risk factors that may need immediate attention. You will then need to assess each applicable risk factor and eliminate or minimize its impact on the worker.

In the MSI Investigation Chart, each risk factor gives examples of movements or activities. Some of the examples involve more than one risk factor (such as exerting force with a bent wrist). The right side of the chart shows the following four areas of the body:

- Neck, shoulders, upper back
- Lower back
- Elbows, forearms, hands
- Hips, knees, feet

First, choose the area of the body you are focusing on. Then look at the corresponding risk factors on the left side of the chart. For example, if you are investigating tasks performed by a worker who is experiencing lower back pain, you should look under the lower back heading. Where there is a circle, investigate the corresponding risk factors and look at the examples of movements and activities. The investigation should result in control measures that eliminate or minimize exposures to these factors.



To use this chart, the person identifying risk factors needs to observe workers, one task at a time. Only some factors from the chart will apply to each task.

Getting assistance

The WorkSafeBC web site (WorkSafeBC.com) has a Safety at Work centre with ergonomics as a topic. Visit the site for more information on MSI and for links to other ergonomics sites.

The following WorkSafeBC publications include information about MSI topics. These publications are all available on the WorkSafeBC web site. Some are available in print (see page ii for ordering information).

- *Back Talk: An Owner's Manual for Backs*
- *Constructive Ideas: Innovative Ideas to Reduce Soft Tissue Injuries in the Construction Industry*
- *Ergonomic Commentary 1: Back Belts*
- *Ergonomic Commentary 2: Wrist Braces*
- *Ergonomic Commentary 3: PC Mouse*
- *How to Make Your Computer Workstation Fit You*
- *MSI Prevention Bulletins*
- *Preventing Tree Planting Injuries*
- *Understanding the Risks of Musculoskeletal Injury (MSI): An Educational Guide for Workers on Sprains, Strains, and Other MSIs*

The WorkSafe™ Education Network offers a course on preventing and investigating MSI; it is offered in various school districts and community colleges. For information on this course, call the campus in your area or call WorkSafeBC at 604 276-3100 in the Lower Mainland or toll-free in B.C. at 1 888 621-SAFE (7233).

If you have questions about health and safety requirements, you can call the WorkSafeBC Prevention Information Line at 604 276-3100 in the Lower Mainland or toll-free in B.C. at 1 888 621-SAFE (7233).

A WorkSafeBC officer can give further guidance on how to prevent MSI at your workplace and can provide some tools such as checklists for risk identification and assessment. See the list of local WorkSafeBC offices on the inside back cover.

Common risk control options

This table does not include all possible options for risk control. It is a starting point for the selection of appropriate risk controls. Priority should be given to controls that do not rely primarily on changes in worker behaviour to reduce the risk of MSI. First try to eliminate the risk, but if that is not practicable, minimize the risk. Engineering or administrative controls must be used before personal protective equipment where practicable.

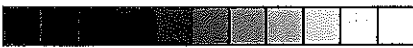
Risk factor	Common risk control options
Force: Lift, lower, or carry	<p>Eliminate the need to manually lift, lower, or carry objects by using engineering controls such as hoists, pallet jacks, carts, and conveyors. If that is not practicable, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> • Minimize the distance of the load from the worker (e.g., use turntables; move the worker closer to the object; don't place obstructions close to the object). • Minimize the vertical distance over which the load is lifted or lowered (e.g., use pallet jacks; limit shelf height). • Avoid tasks below knuckle height (e.g., use scissor lifts, pallet jacks). • Avoid tasks above shoulder height (e.g., limit shelf heights; improve storage practice; raise the worker). • Avoid stooped or twisted positions (e.g., provide unrestricted work space; arrange the workstation to minimize twisting when the worker picks up or puts down a load). • Minimize the size of the load (e.g., order loads in smaller containers; have worker take two trips rather than one). • Minimize carrying distance (e.g., have a well-designed work flow). • Avoid handling heavy or unbalanced objects while sitting down (e.g., stand so that stronger muscles are used to perform physically demanding tasks; avoid handling more than 4.5 kilograms/10 pounds while sitting down). • Improve the grip on the load (e.g., provide good handles on containers; add clamps or other devices to improve grip). • Change the design of the task (e.g., from a lifting task to a lowering task; from a lifting, lowering, or carrying task to a pushing or pulling task). • Use pause periods or job enhancement to permit muscles to recover from applying force for prolonged periods.

Risk factor	Common risk control options
<p>Force: Push or pull</p>	<p>Eliminate the need to manually push or pull objects by using engineering controls such as conveyors, hoists, and gravity-fed systems. If that is not practicable, consider options such as the following to minimize risks:</p> <ul style="list-style-type: none"> • Use carts that are well designed and appropriate to the task: <ul style="list-style-type: none"> – Handle can be grasped between waist and shoulder height (e.g., vertical handles that can accommodate workers of different heights). – Load can be secured on the cart if necessary (e.g., belts or clamps provided). – The size, number, and type of wheels are appropriate for the floor surface and weight carried. – Moving parts are maintained (preventive maintenance). – The worker has good visibility when pushing the cart. • Use carts in an unrestricted area: <ul style="list-style-type: none"> – The worker is able to push and is not forced to pull the cart. – The worker can assume a comfortable position to initiate and maintain movement of the load. – The worker is not forced to assume awkward postures because of restricted work space or poor visibility. • Use carts in areas with proper flooring or surface: <ul style="list-style-type: none"> – The floor is clean (e.g., no debris or clutter on floor). – The floor does not slope and is not slippery. – There is no thick, plush, or shag carpet. – The surface is level (e.g., minimize surface height changes in areas such as the entrance to elevators; fill potholes and cracks in surface). • Reduce the load (e.g., make two trips). • Reduce the total time spent pushing or pulling, or break the total time into smaller blocks of time doing that task.



Risk factor	Common risk control options
Force: Grip	<p>Eliminate the need to manually grasp or handle objects by using engineering controls such as clamps or automated tools. If that is not practicable, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none">• Maintain a straight wrist (neutral position) through:<ul style="list-style-type: none">– Improved design of handles (e.g., bent instead of straight handles)– Improved design of workstation (e.g., parts containers that are tilted instead of flat; use of in-line tools)– Improved work practice (e.g., conscious effort to keep wrist straight)• Use power grip to grasp objects through:<ul style="list-style-type: none">– Improved design of objects or handles on tools (e.g., using boxes with cut-outs to permit power grip; adding handles to objects)– Improved layout of workstation (e.g., objects positioned to permit easy access to handles)– Improved work practice (e.g., conscious effort to avoid pinch grip)• Avoid strong or hard grasping of vibrating tools through:<ul style="list-style-type: none">– Improved design of tools (e.g., tools with built-in vibration-dampening sleeve)– Improved work practice (conscious effort not to grasp too hard)– Use of personal protective equipment (e.g., well-fitting vibration-dampening gloves to reduce grip force)• Avoid handling objects with cold surface temperature through:<ul style="list-style-type: none">– Improved work practice (e.g., at the end of the day, store the next day's supplies inside instead of keeping them outside where they will be cold by morning)– Improved work procedure (e.g., avoid skin contact by using tools or utensils for grasping; use warm water periodically to warm hands)– Use of suitable gloves• Improve grip while handling slippery objects by using friction-enhanced, well-fitting gloves or gloves with fingers removed.• Reduce the total time spent manually gripping objects, or break the total time into smaller blocks of time doing that task.





Risk factor	Common risk control options
Repetition	<p>Eliminate highly repetitious tasks by using engineering controls such as mechanization (e.g., power tools) or automation. If that is not practicable, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> • Combine or eliminate some parts of work to reduce the pace of repetition. • Incorporate flexibility over pace (e.g., allow the worker to take rest breaks and micro-pauses or to control the speed of the conveyor). • Use good work techniques (e.g., avoid unnecessary repetitions as with multiple scanning of grocery items or multiple turning of lumber for grading). • Reduce the duration of exposure to repetition (e.g., offer job rotation or job enhancement).
Work posture	<p>Eliminate awkward postures by using engineering controls such as adjusting work heights, minimizing reaching distances, changing orientation of work, changing layout of workstation, using adjustable or angled tools and equipment, and using turntables, conveyors, tilted surfaces, or spring-loaded surfaces. The objective is to enable the worker to work in a comfortable posture. Every posture requires periodic changes and movement or it becomes static. If elimination of awkward postures is not possible, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> • Minimize awkward postures of the trunk: <ul style="list-style-type: none"> – Minimize forward bending by increasing the work height or moving objects closer (e.g., use turntables; improve layout of workspace). – Minimize side bending by reducing the reach distance or moving objects to the front of the worker (e.g., improve layout of work space; move closer to the objects). – Minimize twisting by reducing reach distance or moving objects to the front of the worker (e.g., improve layout of work space; move closer to the objects).





Risk factor	Common risk control options
<p>Work posture (continued)</p>	<ul style="list-style-type: none"> • Minimize awkward postures of the shoulder: <ul style="list-style-type: none"> – Minimize reaching forward by reducing the reach distance or lowering the work height. – Minimize reaching sideways by reducing the reach distance, lowering the work height, or moving objects to the front of the body. – Minimize reaching behind by moving objects to the front of the worker. – Minimize reaching across the body by moving closer to the objects or transferring objects from one hand to another. • Minimize awkward postures of the wrist by selecting the required tools with appropriate handles (e.g., angled handles). • Minimize forearm rotation by using power tools or mechanical turners. • Minimize squatting and kneeling by raising the work. • Minimize static postures: <ul style="list-style-type: none"> – Provide footrests to allow the worker to transfer weight from one foot to another. – Provide opportunities for the worker to move about periodically. • Minimize awkward postures while sitting by providing an appropriate chair that is adjusted to give good back support, maintain a comfortable posture, and minimize contact stress. • Provide tilted sit-stand stool to take weight off the worker's feet and legs while allowing mobility.
<p>Local contact stress</p>	<p>Eliminate or minimize exposure to local contact stress:</p> <ul style="list-style-type: none"> • Change or modify equipment (e.g., use a long-handled screwdriver to prevent the butt from digging into the palm). • Change or modify work area to prevent sharp edges from digging into the skin (e.g., pad sharp or metal edges). • Use personal protective equipment (e.g., use knee pads while kneeling; use padded gloves when lifting heavy objects by narrow plastic strapping). • Improve or change work practice: <ul style="list-style-type: none"> – Avoid resting or leaning against sharp edges. – Avoid using a body part (e.g., hand or knee) as a hammer.

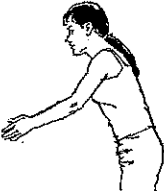

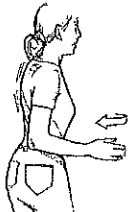

Risk factor	Common risk control options
Environment	<p>Eliminate or minimize exposure to whole-body vibration:</p> <ul style="list-style-type: none"> • Avoid sitting or standing for prolonged periods on a vibrating surface if practicable (e.g., catwalks on vibrating machinery). • Isolate the source of vibration from the rest of the work space to prevent transmission of vibration to the sitting or standing area (e.g., isolation of truck cabs from diesel engine vibration). • Keep equipment well maintained to reduce vibration. • Reduce total exposure to vibration by breaking up driving tasks or incorporating job rotation. • Keep road surfaces well maintained where possible. <p>Keep the body warm at a comfortable temperature:</p> <ul style="list-style-type: none"> • Use local source heating. • Wear warm clothing. • Take rest breaks in warm areas. <p>Ensure that lighting is proper for the task being performed and glare is avoided so that the worker does not assume awkward postures to compensate for glare, brightness, or inadequate lighting.</p>
Work organization	<p>Ensure that repetitive or demanding tasks incorporate opportunities for rest or recovery (e.g., allow brief pauses to relax muscles; change work tasks; change postures or techniques).</p> <p>Incorporate task variability so that the worker does not have to perform similar repetitious tasks throughout the full shift. Provide the worker with the opportunity to vary work tasks by rotating jobs or increasing the scope of the job.</p> <p>Ensure that work demands and work pace are appropriate.</p>

MSI investigation chart

This chart can be used to correlate risk factors with specific body parts when investigating an injury or signs and symptoms of MSI. For each risk factor, use or adapt the examples of activities or movements that could place a worker at risk.

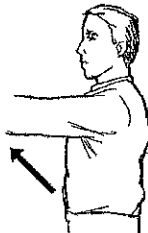
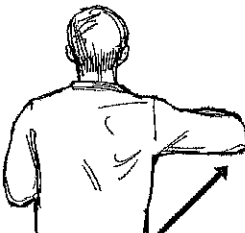





Risk factor	Neck, shoulders, upper back	Elbows, forearms, hands	Lower back	Hips, knees, feet
	The risk factor applies to the body part marked with a ●			
<p>FORCE: Lift, lower, or carry</p> <p>Worker lifts, lowers, or carries objects:</p> <ul style="list-style-type: none"> • That are alive (people, animals) • That are large or odd-shaped • That are heavy or unbalanced or that have a shifting centre of gravity • That are difficult to grasp or hold onto • Using awkward postures (e.g., stooped, long reach) • Over long distances • From a sitting position • Frequently or repeatedly 	●	●	●	●
<p>FORCE: Push or pull</p> <p>Worker pushes and/or pulls objects:</p> <ul style="list-style-type: none"> • That are unstable • With a handle height above the shoulder or below the waist • Over long distances • By sliding the load • Over uneven, sloping, or slippery surfaces • Within restricted space • Using poorly maintained or designed equipment • Using awkward postures • Using visible effort 	●	●	●	●



Risk factor	Neck, shoulders, upper back	Elbows, forearms, hands	Lower back	Hips, knees, feet
<p>FORCE: Grip</p> <p>Worker uses grip force to grasp or handle objects:</p> <ul style="list-style-type: none"> • With a bent wrist • With a wide grip span • With a firm grip • Wearing poorly fitting gloves • That vibrate • That have a cold surface temperature • That have a slippery surface • Using a pinch grip 	●	●		
<p>REPETITION</p> <p>Worker repeats similar motions with the same body part.</p>	●	●	●	●
<p>WORK POSTURE</p> <p>The trunk of the body is in an awkward posture.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p><i>Bending trunk forward</i></p> </div> <div style="text-align: center;">  <p><i>Bending trunk to side</i></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 20px;"> <div style="text-align: center;">  <p><i>Twisting trunk</i></p> </div> <div style="text-align: center;">  <p><i>Bending trunk backward</i></p> </div> </div>			●	

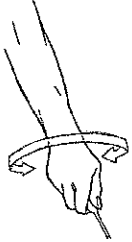





Risk factor	Neck, shoulders, upper back	Elbows, forearms, hands	Lower back	Hips, knees, feet
WORK POSTURE (continued)	The risk factor applies to the body part marked with a ●			
Either shoulder is in an awkward posture: <ul style="list-style-type: none"> • When worker uses excessive reach, such as in front or to the side • When worker reaches above the shoulder • When worker reaches across or behind the body 	●			
 <p><i>Moving shoulder forward</i></p>	 <p><i>Moving shoulder out</i></p>			
Worker bends or twists the neck.	●			
 <p><i>Bending neck to side</i></p>	 <p><i>Bending neck backward</i></p>			
Worker bends the wrist.		●		
   <p><i>Bending wrist forward Bending wrist backward Bending wrist to outside</i></p>				

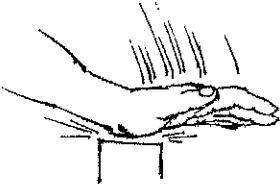
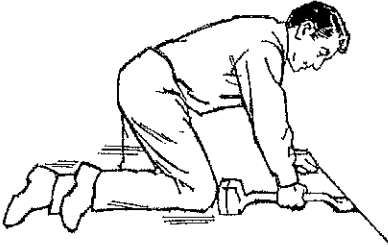




Risk factor	Neck, shoulders, upper back	Elbows, forearms, hands	Lower back	Hips, knees, feet
WORK POSTURE (continued)	The risk factor applies to the body part marked with a ●			
Worker twists the forearm.  <i>Forearm rotation</i>		●		
Worker squats or kneels.  <i>Squat position</i>				●
Worker sits: <ul style="list-style-type: none"> • Using a poor posture • For long periods • Resulting in local contact stress • With no back support • Using a poorly designed or poorly adjusted chair 			●	
Worker stands: <ul style="list-style-type: none"> • On a very hard surface (e.g., concrete) • For long periods of time • With no footrest • Using foot pedals continuously 			●	●





Risk factor	Neck, shoulders, upper back	Elbows, forearms, hands	Lower back	Hips, knees, feet
LOCAL CONTACT STRESS	The risk factor applies to the body part marked with a ●			
Worker contacts a hard or sharp object or surface: <ul style="list-style-type: none"> • With a tool or object digging into hand or arm • With a body part resting against a sharp edge • When kneeling • When the hand or body strikes an object, such as using a knee or hand as a hammer <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p data-bbox="472 1045 771 1073"><i>Using hand as a hammer</i></p> </div> <div style="text-align: center;">  <p data-bbox="938 1045 1230 1073"><i>Using knee as a hammer</i></p> </div> </div>	●	●		●
THE ENVIRONMENT				
Worker sits or stands on a vibrating surface.	●		●	●
Parts of the body are cold while performing tasks.	●	●	●	●
Lighting is inappropriate for the tasks being performed, such as: <ul style="list-style-type: none"> • Too much glare • Too bright • Too dark 	●			
ORGANIZATION OF WORK				
Worker uses the same muscles without opportunities for recovery or rest.	●	●	●	●
Worker is unable to keep up with the pace or demands of the work tasks.	●	●	●	●

WorkSafeBC Offices

Visit our web site at WorkSafeBC.com.

Abbotsford

2774 Irethewey Street V2T 3R1
Phone 604 276-3100
1 800 292-2219
Fax 604 556-2077

Burnaby

450 – 6450 Roberts Street V5G 4E1
Phone 604 276-3100
1 888 621-7233
Fax 604 232-5950

Coquitlam

104 – 3020 Lincoln Avenue V3B 6B4
Phone 604 276-3100
1 888 967-5377
Fax 604 232-1946

Courtenay

801 30th Street V9N 8G6
Phone 250 334-8765
1 800 663-7921
Fax 250 334-8757

Kamloops

321 Battle Street V2C 6P1
Phone 250 371-6003
1 800 663-3935
Fax 250 371-6031

Kelowna

110 – 2045 Enterprise Way V1Y 9T5
Phone 250 717-4313
1 888 922-4466
Fax 250 717-4380

Nanaimo

4980 Wills Road V9T 6C6
Phone 250 751-8040
1 800 663-7382
Fax 250 751-8046

Nelson

524 Kootenay Street V1L 6B4
Phone 250 352-2824
1 800 663-4962
Fax 250 352-1816

North Vancouver

400 – 224 Esplanade Ave. W. V7M 1A4
Phone 604 276-3100
1 888 875-6999
Fax 604 232-1558

Prince George

1066 Vancouver Street V2L 5M4
Phone 250 561-3700
1 800 663-6623
Fax 250 561-3710

Surrey

100 – 5500 152 Street V3S 5J9
Phone 604 276-3100
1 888 621-7233
Fax 604 232-7077

Terrace

4450 Lakelse Avenue V8G 1P2
Phone 250 615-6605
1 800 663-3871
Fax 250 615-6633

Victoria

4514 Chatterton Way V8X 5H2
Phone 250 881-3418
1 800 663-7593
Fax 250 881-3482

Head Office / Richmond

Prevention Information Line:

Phone 604 276-3100
1 888 621-7233 (621-SAFE)

Administration:

6951 Westminster Highway
Phone 604 273-2266

Mailing Address:

PO Box 5350 Stn Terminal
Vancouver BC V6B 5L5

After Hours

Health & Safety Emergency

604 273-7711
1 866 922-4357 (WCB-HELP)

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