

Preventing Musculoskeletal Injury (MSI)



About WorkSafeBC

At WorkSafeBC, we're dedicated to promoting safe and healthy workplaces across B.C. We partner with workers and employers to save lives and prevent injury, disease, and disability. When work-related injuries or diseases occur, we provide compensation and support injured workers in their recovery, rehabilitation, and safe return to work. We also provide no-fault insurance and work diligently to sustain our workers' compensation system for today and future generations. We're honoured to serve the workers and employers in our province.

Prevention Information Line and contact information

We provide information and assistance with health and safety issues in the workplace.

Call the information line 24 hours a day, 7 days a week to report unsafe working conditions, a serious incident, or a major chemical release. Your call can be made anonymously. We can provide assistance in almost any language.

If you have questions about workplace health and safety or the Occupational Health and Safety Regulation, call during our office hours (Monday to Friday, 8:05 a.m. to 4:30 p.m.) to speak to a WorkSafeBC officer.

If you're in the Lower Mainland, call 604.276.3100, or toll-free at 1.888.621.7233 (621.SAFE) in Canada.

Health and safety resources

You can find our health and safety resources at worksafebc.com/forms-resources. Printed copies are available for some resources and can be ordered from worksafebcstore.com.

Preventing Musculoskeletal Injury (MSI)

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ISSN 1499-237X

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Introduction

Why focus on musculoskeletal injury (MSI) prevention?

Having an MSI prevention strategy in place for your workplace can help reduce injuries, improve productivity, and create a safer work environment.

Musculoskeletal injury (MSI) is a common workplace injury in British Columbia. MSIs account for about one-third of all workplace injury claims and can happen in any industry. MSIs are often associated with long recovery times that increase the injury's impact and cost. An MSI prevention strategy should be part of your overall occupational health and safety program.

Requirements versus best practices

As an employer or joint health and safety committee member, you can do a lot to prevent MSIs in your workplace. This book explains your responsibilities and the MSI requirements that are described in the Occupational Health and Safety Regulation. It also includes best practices for making your workplace safer for workers who are at risk of MSI.

When you see the word *must* in this book, the information being presented is a requirement that's specified in the Regulation. When you see the word *should*, it refers to a recommended action that's not required by the Regulation but will improve workplace safety.

Although this book is mainly for employers and joint committees, workers may also find the information useful.

What are MSIs?

MSIs are injuries to soft tissues, including muscles, tendons, ligaments, joints, nerves, and blood vessels. They're often referred to as strains and sprains.

MSIs result from exposure to MSI risk factors in the workplace — things like force, repetition, awkward posture, local contact stress, and vibration.

Signs and symptoms

MSIs can result in one or more signs or symptoms. Signs and symptoms of MSI may appear suddenly — for example, from a single incident — or they may appear gradually over a period of months or years. Workers may notice them during the activity that is causing or aggravating the condition, or afterward.

MSI signs	MSI symptoms
Signs are things that can be observed, such as the following: <ul style="list-style-type: none">• Swelling• Redness• Difficulty moving a body part	Symptoms are things that can be felt but not observed, such as the following: <ul style="list-style-type: none">• Pain• Numbness• Tingling

Reporting signs or symptoms

Employers should have a process for reporting MSIs so that workers experiencing signs or symptoms can tell their supervisor or employer and can report the MSI to a first aid attendant, if there is one. MSIs can be treated and followed up on more effectively when they are identified and reported early.

Potential health effects

MSIs can affect a person's ability to perform tasks at work and at home. Early signs or symptoms of MSI that are not dealt with can lead to conditions with long-term effects, such as the following:

- Muscle strains
- Tendinitis (swelling of a tendon, which is 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)
- Hand-arm vibration syndrome, also called vibration white finger or dead finger (a form of Raynaud's syndrome)

How to get started

MSI prevention doesn't have to be difficult or complicated. Start by getting familiar with the four steps to managing MSI risk. Then tackle the most obvious risks in your workplace and build your prevention strategy from there.

Management commitment and worker consultation are key elements of a successful MSI prevention strategy.

Management commitment — As an employer, you need management support before you take steps to prevent MSI. Without a solid commitment from them, an occupational health and safety program that includes an MSI prevention strategy is unlikely to be effective. The most effective MSI prevention strategies are developed with input from workers, supervisors, and joint committees.

Worker consultation — It's essential to consult with and educate workers throughout the process of developing an MSI prevention strategy. You can learn a lot by asking workers how they perform their work, what kinds of risks they may already know about, and if they have any ideas on how to control the risks. For more information on consultation, see "Consulting with workers and joint committees," pages 11–12.

To get started, you'll need a basic understanding of the risk management process.

The risk management process

There are four steps to managing the risks of MSI:

1. Understand the risks.
2. Implement measures to control the risks.
3. Communicate your MSI prevention strategy to workers, supervisors, and joint committees.
4. Monitor your prevention efforts. Evaluate the effectiveness of your control measures and update as necessary.



It's helpful to visualize the steps as a circle because risk management is a continuous process. Getting to the monitoring and updating step doesn't mean you're finished. New risks can arise and existing risks can change, so review your MSI prevention strategy regularly and make adjustments as necessary.

Part 1:

Managing MSI risks

Part 1 at a glance

In Part 1, you will learn:

- What risk factors are and how to identify, assess, and control them
- About the hierarchy of controls
- How employers can communicate their MSI prevention strategy to workers
- How to monitor and update your prevention strategy so it remains effective


Understanding MSI risk factors

The first step of the risk management process is to understand the risks. This includes identifying and assessing MSI risk factors that may be present in the workplace.

A *risk factor* is something that may cause or contribute to the development of an MSI.

Section 4.49 of the Regulation lists factors that employers must consider during the risk identification and assessment process. These include primary risk factors that relate to the physical demands of a task or job and contributing risk factors that may also be present and can increase the overall risk.

Two or more risk factors can be present at one time, increasing the risk of injury (see “Multiple risk factors — Example,” page 25).

 For more information on risk factors, see “Part 2: Types of MSI risk factors,” pages 15–24.

Identifying risk factors

Employers are required to identify factors in their workplace that may expose workers to MSI risks.

Identify higher-risk jobs

Start by identifying jobs with a higher risk of MSI, and then identify the risk factors for each job. When identifying risks, consult with your joint health and safety committee or worker health and safety representative. You should also talk to your workers, who often know their jobs best and may have insights on how to prevent MSI.

You can identify jobs with higher risks by reviewing documentation such as first aid records, your MSI claims history, and past incident investigations. Other sources of information may include trends in your industry and MSI statistics for other, similar operations, if available.

You should prioritize jobs where a worker has:

- Already had a work-related MSI claim
- Reported an MSI to first aid
- Reported signs or symptoms of an MSI
- Reported an MSI risk factor

Identify risks before an incident happens

To eliminate or minimize risk factors for MSI, identify jobs and tasks with an increased risk, and address those issues. Be proactive before injuries occur — for example, interview workers, conduct a survey, and observe workers on the job. Before a new job or work process is introduced to workers, identify its potential risks.

Encourage workers and supervisors to report potential risk factors. For example, a supervisor might identify a risk factor during a routine workplace inspection.

How workers can help identify risk factors

Workers should report work-related injuries and signs or symptoms of MSI to a supervisor or their employer without delay.

When a worker reports an injury requiring medical attention or an unsafe condition that could lead to injury, their employer must investigate. That investigation will help identify risk factors that contributed to the incident or caused the symptom. Once you know about risk factors, you can implement controls to eliminate or minimize the risks.

What incidents must be investigated?

As required by the *Workers Compensation Act*, employers must immediately investigate any MSI that:

- Resulted in an injury to a worker and required medical treatment
- Involved a minor worker injury that didn't require medical treatment but had the potential for causing a serious worker injury
- Did not lead to a worker injury but had the potential for causing a serious worker injury

Workers can help identify risk factors in their own tasks by considering each task's physical demands and contributing risk factors (see pages 17–24).

If workers have suggestions for eliminating or reducing risk factors, they should tell their supervisor or employer.

For questions or concerns about MSI, workers can talk to members of the joint committee or the worker health and safety representative.

Assessing risks

Once risk factors have been identified, the employer must ensure that the risk to workers is assessed. The risk is the chance (high, moderate, or low) that somebody could be harmed by a hazard. When several risk factors are present, the risk of MSI increases (see “Multiple risk factors — Example” page 25). Employers must prioritize higher-risk jobs.

Consult with workers who actually do the tasks being assessed or who have experienced signs or symptoms of MSI. Talk to a representative sample of workers who do the work being assessed. Include workers from different shifts and workers who represent a range of characteristics such as gender, age, and height.

How can I assess risks?

When considering an identified MSI risk factor, start by considering three variables: duration, magnitude, and frequency.

Duration

The longer a worker is exposed to risk factors, the greater the risk of injury. When examining duration, ask these questions:

- How long is the worker exerting force (e.g., to lift or grip an object)?
- How long does the worker perform a repeated task?
- How long does the worker hold an awkward body posture?
- How long is one part of the body in contact with a hard or sharp object (i.e., local contact stress)?

Magnitude

When considering magnitude, ask these questions:

- How much force is the worker using?
- How severe is the awkward posture?
- How hard is the edge digging into the skin?

Frequency

When considering frequency, ask how often the worker is exposed to the risk factor during a workday or work shift.

Risk assessment tools

When you identify risk factors, you'll need to assess them. See the WorkSafeBC [Musculoskeletal Injury \(MSI\) Risk Assessment Worksheet](#) and accompanying [Guide to Musculoskeletal Injury \(MSI\) Risk Assessment](#) for information about assessing risks in your workplace.

You don't have to use the WorkSafeBC tool. You can use other methods to identify and assess risk factors, but you must consider all the risk factors listed in [section 4.49](#) of the Regulation.

Implementing risk controls

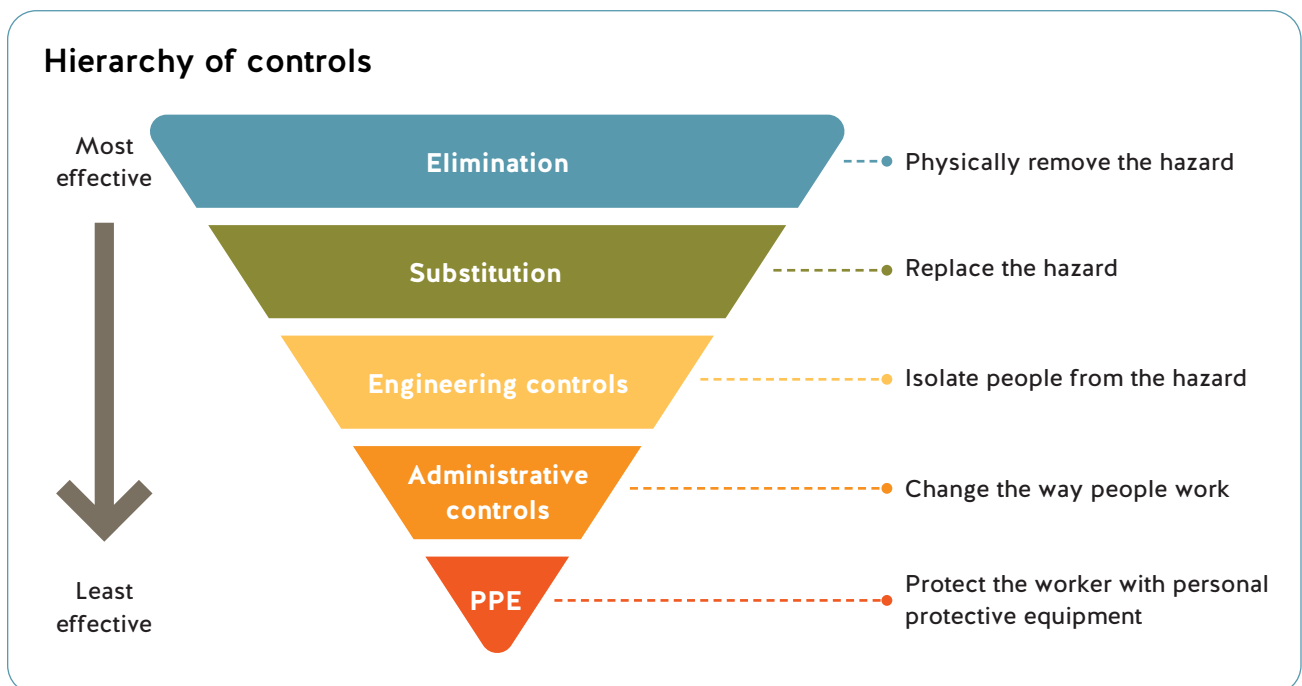
Once you've identified risk factors and assessed the risk levels for them, the next step is to come up with effective risk controls that are prioritized according to the hierarchy of controls.

Employers must ensure that risk controls are implemented as soon as possible. If there will be a delay in implementing permanent controls, you must implement interim controls without delay.

Hierarchy of risk controls

Always follow the hierarchy of controls and implement controls in the following order: First, consider ways to eliminate the risk. If that isn't possible, then try to use substitution. Then, move on to possible engineering controls and administrative controls. Personal protective equipment (PPE) should be the last type of control you consider because it's the least effective.

The image below shows risk controls listed in order of effectiveness, but you should always consider all types of controls. They often work best in combination — for example, providing ergonomic handles on containers (engineering control) and ordering loads in smaller containers (administrative control).



Elimination: Can the task be eliminated?

Example: Eliminate the need for manual handling by piping necessary liquids into a facility rather than carrying them in barrels.

Substitution: Can the task be redesigned or done differently?

Example: Work with distributors to reduce the weight of materials or packages being delivered.

Engineering controls: Can tools, devices, or equipment be used to isolate people from the risk?

Example: Use lifting devices to reduce the amount of manual handling required.

Administrative controls: Can procedures reduce the risk by changing the way the work is performed?

Example: Use job rotation to reduce the amount of time workers are exposed to risk factors.

PPE: Can appropriate and well-fitting PPE protect workers from MSI?

Example: Use vibration-damping gloves.

Controlling risk factors before they become injuries

MSIs are reduced when the interactions between workers and their workplace are optimized. Consider the following:

- Think about MSI prevention at the design and purchasing stages, and when you are setting up processes and workflow. Select equipment with advantages such as a better fit, improved efficiency, lighter weight, or lower vibration.
- Incorporate MSI prevention into elements of your overall occupational health and safety program. Examples of these elements are workplace inspections, safety meetings, and incident investigations.
- Work with maintenance staff to ensure equipment is properly maintained. Engineering and maintenance departments and service providers can often provide innovative solutions that improve worker performance and safety.

Whether your workplace is at the design stage or it has well-established controls in place, participation is the key to success in preventing MSI. This means getting commitment from all levels of management, ensuring participation from key departments, and involving workers throughout the risk management process.

Communicating the MSI prevention strategy

Communicating your strategy to workers, joint committees, and supervisors — and educating workers about MSI — can help to ensure success.

An MSI prevention strategy won't be effective if no one knows about it. Employers should consider the following:

- Document and communicate your MSI prevention strategy to workers, supervisors, and joint committees.
- Provide managers, supervisors, and workers with orientation and training on how to identify risk factors and how to control risks.
- Increase worker awareness and employer support for early reporting of signs and symptoms of MSI.

MSI education

If workers could be exposed to a risk of MSI, employers must provide them with MSI education that includes the following:

- Signs and symptoms of MSI
- Potential health effects of MSI
- How to identify risk factors that could lead to MSI

Consulting with workers and joint committees

Involving workers and joint committee members in conversations about reducing the risk of MSI increases engagement and helps build a stronger safety culture.

First, talk to workers and supervisors to understand how they perform their work tasks and what their challenges may be. Continue these conversations and let them guide you when developing solutions. Worker participation is key to the success of any MSI prevention strategy. Involving your workers in risk management may provide insights about ways to prevent MSI.

[Section 4.53](#) of the Regulation requires employers to consult with their joint committee (or worker health and safety representative, if applicable) during the risk management process. Ask for feedback about managing risks, including MSI risk factors.

Here are some ideas for consulting with workers and joint committees:

- Encourage workers to report anything that could lead to an MSI. Encourage them to work with their supervisors and managers to identify and assess MSI risks.
- Encourage workers to share ideas about how to control risks and how to make their jobs easier.
- Consult with workers who perform each job. Collaborative conversations and sharing information with workers help to build engagement and trust.
- Establish a team to focus on MSI prevention and to support consultation and prevention activities.
- During joint committee meetings, review and act on recommendations for reducing MSI risk factors.
- Revisit conversations and consult with workers and joint committees regularly. Their input can add value throughout the development of an MSI prevention strategy.

Monitoring and updating the prevention strategy

Managing MSI risks in the workplace is an ongoing process. Continuously monitor the effectiveness of your control measures and improve any measures that are not working as intended.

Consider the following ideas for monitoring and updating your MSI prevention strategy:

- Conduct regular workplace safety inspections to identify new or changed risk factors. Aside from regular monthly inspections, your monitoring activities might include daily checks, supervisory walk-throughs, and regular, ongoing maintenance inspections.
- Confirm that workers are using controls properly and following procedures.
- Ensure that joint health and safety committees meet monthly to discuss health and safety issues.
- Review the effectiveness of your MSI prevention strategy at least annually and whenever you introduce new equipment, materials, or work processes.
- Create a list that summarizes your workplace risks and the controls in place. If a risk has not been effectively controlled, re-evaluate the task and reconsider which controls may be needed.
- Conduct incident investigations to identify risks or improvements needed to more effectively manage known risks.

Part 2:

Types of MSI risk factors

Part 2 at a glance

In Part 2, you will learn about two types of risk factors: physical demand risk factors and contributing risk factors. This part also includes examples of risk control options for risk factors.

What are MSI risk factors?

A risk factor is something that may cause or contribute to the development of an MSI.

[Section 4.49](#) of the Regulation lists the factors that employers must consider during the risk identification and assessment process.

They are divided into five categories. The first category is physical demands (see pages 17–21). These are the primary risk factors.

The other four categories are often referred to as contributing risk factors (see pages 22–24). That's because they often act in combination with or are the cause of the physical demands risk factors. Contributing risk factors may increase the level of risk.

Physical demands (primary) risk factors

The primary risk factors for MSI are the physical demands of work activities, including:

- Force
- Repetition
- Work posture
- Local contact stress

Force

Force is the effort a worker exerts to perform a task. The greater the magnitude or intensity of the force, the greater the risk of an MSI. Muscles and tendons can be overloaded if force is applied frequently or for a long time.

There are many activities that require force, including the following:

- Lifting or lowering
- Pushing, pulling, or carrying
- Gripping or pinching

Lifting or lowering

When you lift or lower an object, force is exerted. Several factors, including the weight of the load and the locations where the load is lifted to and from, affect how you generate force.



The workplace should be designed so loads can be lifted from waist level, reducing the risk of injury.

Case study: Layering controls

Workers at a cabinet company must handle heavy stone countertops that are awkward to manoeuvre.

The employer assessed the risks of moving the countertops and considered possible controls. The eventual solution involved layering the engineering and administrative controls.

Engineering: The employer provided a stone lifter that automatically locked when carrying a load. This minimized manual handling. The employer discovered it was safer than lifters that required workers to squeeze into a tight space to release a latch.

Administrative: The team planned installations before workers arrived at the jobsite.

The employer reported that the money saved by greater efficiency and safer, happier employees far exceeded the cost of leasing or purchasing lifting equipment.

Pushing, pulling, or carrying

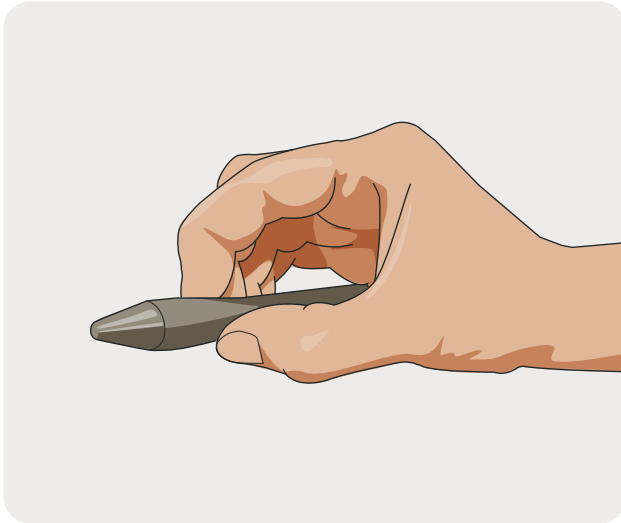
Several factors can affect the force needed to push, pull, or carry an object — for example, the weight of the load, the floor surface, and the type of equipment used.



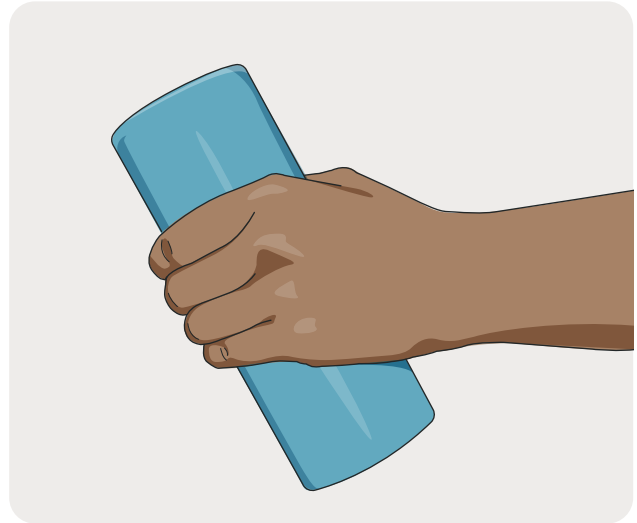
It's better to push a load rather than to pull it. Pushing can take less effort, improve sightlines, and reduce the risk of twisting.

Gripping or pinching

A pinch grip mostly uses small muscles in the hand. A power grip is stronger because it uses the whole hand and muscles in the forearm. When possible, use tools and equipment that are designed for a power grip rather than for a pinch grip.



Muscles tire more easily when using a pinch grip.



A power grip allows the entire hand to grip the object.

Repetition

Repetition involves performing a task that uses the same muscles over and over with little time for rest or recovery. With repetitive tasks, there's a higher risk of injury when other risk factors, such as awkward posture or force, are present.



Make repetitive tasks such as cutting safer by taking regular breaks that allow the muscles to rest and recover.

Case study: An inexpensive solution

A garden nursery worker moves products from one conveyor line to another.

The worker developed wrist discomfort from repeatedly moving the products and reported it to the supervisor. As a result, the manager collaborated with workers to design a foot pedal that eliminated the need to pull a product by hand. The pedal was an inexpensive solution that prevented wrist injuries.

Work posture

Work posture refers to the position of the body when performing tasks. Awkward postures occur when a joint bends or twists outside of its neutral range of motion. This can stress tendons, muscles, and other soft tissues, decreasing their strength and efficiency. A *static posture* refers to holding the body in a single position long enough to feel aches or pains.



Examples of awkward postures: reaching overhead, bending down to a low level, and bending the neck.

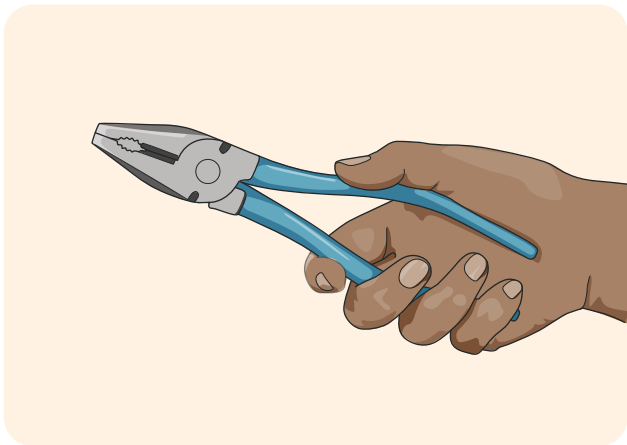
Local contact stress

Local contact stress occurs when a hard or sharp object comes into contact with a body part. Pressure placed on the nerves and tissues beneath the skin can increase the risk of injury. Local contact stress often involves the knees, shoulders, elbows, wrists, fingers, or hands. It can occur when:

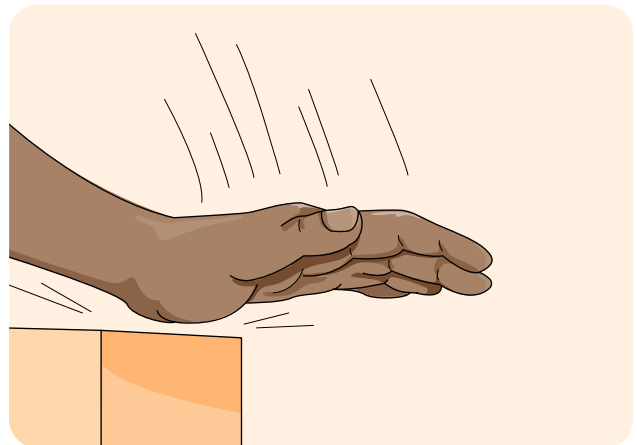
- Using tool handles with ridges or hard edges that dig into the hand
- Kneeling on hard surfaces
- Using a work surface with sharp edges that dig into the forearm or wrist
- Using a body part, such as a palm or knee, as a hammer

There is an increased risk of local contact stress when:

- The hard object contacts an area that doesn't have much protective tissue, such as the wrist
- Pressure is applied repeatedly or held for a long time



Avoid using tools with hard or sharp edges that can dig into the skin.



Avoid using parts of your body as a hammer. Use an appropriate tool instead.

Contributing risk factors

Contributing risk factors can increase the level of risk by acting in combination with or increasing the physical demands of work activities. There are four possible contributing risk factors:

- Aspects of workplace layout
- Characteristics of objects handled
- Environmental conditions
- Organization of work

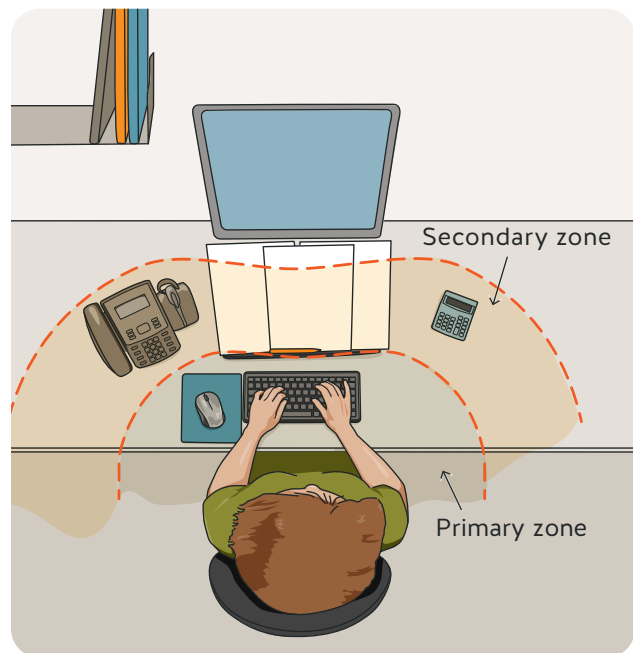
Aspects of workplace layout

Working reaches — Work that requires reaching too far forward, across, or behind the body can put workers in an awkward posture that increases the force necessary.

Working heights — Work surfaces that are too high or low for the work being done can put workers in an awkward posture that increases the force necessary.

Seating — Sustained positions, such as sitting or standing, for long periods of time may increase the risk of MSI. Performance of work while seated is affected by the type of chair used and by the way workers interact with workstations.

Floor surfaces — Physical characteristics of a floor, including its grade, surface texture, material, unevenness, and slip resistance, can affect MSI risks. These factors may increase muscle fatigue when standing or force exertion when pushing or pulling.



Set up work areas and workstations so that frequently used tools or other items are closer to the worker, in the primary work zone. Less frequently used items can be in the secondary zone.

Characteristics of objects handled

- **Size and shape** — The object being handled influences the physical demands on the body. For example, a large bulky object may require greater force, require an awkward posture, or create gripping difficulties.
- **Load condition and weight distribution** — When loads are slippery, sharp, fragile, hot, cold, rigid, or liquid, workers often have difficulty grabbing them. This often requires increased force when gripping and puts workers in an awkward posture. For example, workers may have to use awkward or static postures to handle fragile loads, but a rigid load will allow for a good grip and smooth, predictable movements.
- **Container, tool, and equipment handles** — Consider handle design features such as size, shape, texture, and location. A tool or handle that allows workers to grasp with a power grip and a neutral wrist posture makes work easier and reduces risks. Poorly designed handles or items with no handles can be more difficult to grasp and can increase the force required.



Handling large, irregular-size objects can require increased force, put workers in awkward body postures, and limit visibility. Use an engineering control such as a mechanical lifting device.

Environmental conditions

- **Cold temperatures** — Cold temperatures or drafts can affect muscle flexibility and efficiency, leading to an increase in the force required.
- **Illumination** — Poor lighting or glare can lead to eye strain and to physical discomfort from awkward postures.
- **Vibration** — Hand-arm vibration can occur when gripping vibrating tools or equipment. Whole-body vibration can result from standing or sitting on vibrating equipment or surfaces. Cold temperatures can increase the effects of vibration.



Hand-arm vibration can occur when gripping vibrating tools. When purchasing tools, consider the level of vibration stated by the manufacturer.

Organization of work

- **Work-recovery cycles** — Using the same muscles repetitively or for long periods of time without enough rest can lead to fatigue and can increase the risk of injury. Scheduling regular breaks helps workers recover and return to a resting state.
- **Task variability** — Changing the work tasks and body parts used during a shift allows for variability in work posture and muscle use. Varying work tasks can reduce repetition and allow tissues to rest and recover.
- **Work rate** — The speed at which tasks are done is the rate of work. Quick, non-stop movements and pressure to meet a specific work rate can increase the risk of MSI.

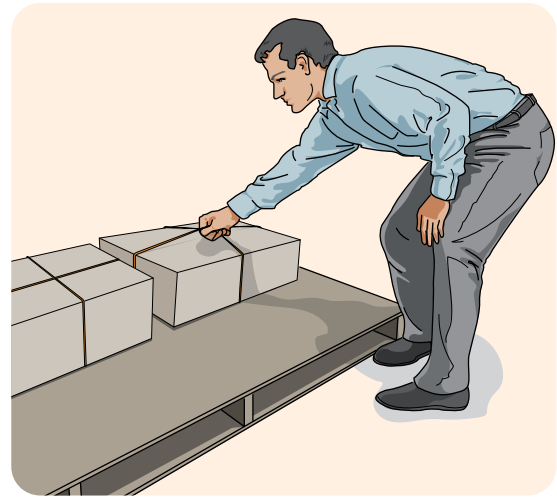
Multiple risk factors — Example

Tasks may have more than one risk factor. The more risk factors associated with a task, the greater the risk of injury.

For example, a task where a worker has to repeatedly lift boxes from a pallet to a storage shelf could involve multiple risk factors. How many risk factors are shown in the image?

Physical demand risk factors shown in the image include the following:

- **Force** — Lifting heavy boxes with one hand
- **Awkward posture** — Bending forward at the waist and reaching forward with the arm and shoulder
- **Local contact stress** — Gripping narrow plastic strapping
- **Repetition** — Doing the same lifting task all day (i.e., repeatedly lifting boxes using the same muscles)



Contributing risk factors shown in the image include the following:

- **Aspects of workplace layout** — The location of the skid on the floor requires reaching below knee height and using extended reaches to grab boxes.
- **Characteristics of objects handled** — There are no handles on the boxes, and the resulting poor grip increases the force needed.
- **Organization of work** — There may be limited recovery time and no task variability between lifts.

Common risk control options

When considering risk control options such as the ones described in the following table, always follow the hierarchy of controls. First, use elimination or substitution to deal with the risk. If that isn't possible, consider engineering controls, administrative controls, and personal protective equipment (PPE), in that order. For more information, see "Hierarchy of risk controls," pages 9–10.

Risk factor	Risk control options
<p>Force: Lifting or lowering</p>	<p>Eliminate the need to manually lift or lower objects by changing your work designs or processes. If that's not practical, use engineering controls such as hoists, pallet jacks, carts, or conveyors. Additional control options that can minimize risks include the following:</p> <ul style="list-style-type: none"> • Minimize load sizes (e.g., work with suppliers to order loads in smaller containers). • Minimize the distance between loads and workers (e.g., use turntables and keep obstructions away from the front of loads). • Minimize the vertical distance over which loads are lifted or lowered (e.g., optimize heights to encourage lifting and lowering between knee and elbow heights). • Avoid tasks above shoulder height (e.g., limit shelf heights and improve storage practices). • Avoid stooped or twisted postures (e.g., situate workstations to minimize twisting). • Improve the grip on loads (e.g., provide handles or handholds to improve grip where feasible). • Minimize carrying distances (e.g., optimize workflow). • Change the design of tasks (e.g., from a lifting task to a pushing or pulling task). • Schedule alternate work duties and allow micro-pauses so muscles can recover from applying force for prolonged periods.
<p>Force: Pushing, pulling, or carrying</p>	<p>Eliminate the need to manually push, pull, or carry objects by changing your work designs or processes. If that's not practical, use engineering controls such as conveyors, hoists, and gravity-fed systems. Additional control options that can minimize risks include the following:</p> <p>Design of work areas</p> <ul style="list-style-type: none"> • Minimize the distance over which workers need to push, pull, or carry loads. • Avoid putting loads in areas where workers must use awkward postures to initiate and maintain movement of a load. • Make sure visibility isn't restricted when workers are pushing loads. • Plan pathways that limit exposing workers to uneven, sloped, or damaged surfaces or to high-friction areas. For example, plan pathways to avoid potholes and cracks, and do not install thick, plush, or shag carpet in pathways. <p>Design of equipment</p> <ul style="list-style-type: none"> • Provide the appropriate equipment for tasks and for the environment where it will be used. For example, consider the size, material, weight, durability, manoeuvrability, and handling of equipment for workers. • Establish regular preventive maintenance programs for equipment. • For pushing or pulling, use equipment with handles that workers can grasp between their waist and elbow heights. For example, vertical or adjustable handles can accommodate workers of different heights.

Risk factor	Risk control options
<p>Force: Pushing, pulling, or carrying (cont'd)</p>	<ul style="list-style-type: none"> • For pushing or pulling, ensure that the size, number, and type of wheels or casters used are appropriate for each floor surface and load. • For carrying, use handles that are easy and comfortable to grasp and that allow the equipment's centre of gravity to be close to the body. <p>Other considerations</p> <ul style="list-style-type: none"> • Train workers to push rather than pull and to push or pull rather than carry. • Provide a way to secure loads on equipment, such as belts or clamps. • Make sure workers avoid using awkward postures to initiate and maintain movement of loads. • Keep floors clean and free of debris or clutter. • Make sure floors are not slippery.
<p>Force: Gripping or pinching</p>	<p>Change your work design or processes to eliminate the need to manually grasp or handle objects. If that's not practical, use engineering controls (such as power tools or handles with texture) to improve grip. Additional control options that can minimize risks include the following:</p> <ul style="list-style-type: none"> • Select tools and equipment that promote a power grip and neutral posture of hands, wrists, and arms. For example, use boxes with cut-outs or handles so workers can use a power grip. • Consider manufacturer vibration values and anti-vibration design characteristics when purchasing tools and equipment. • Reduce the total time workers spend manually gripping objects. For example, rotate job tasks. • Ensure that gloves, when necessary, fit well to enable better gripping while handling objects. When vibration-dampening gloves are necessary, make sure they are ISO approved.
<p>Repetition</p>	<p>Change your work design or processes to eliminate highly repetitive tasks. If that's not practical, use engineering controls such as mechanization (e.g., power tools) or automation to reduce repetition. Additional control options that can minimize risks include the following:</p> <ul style="list-style-type: none"> • Design jobs with a work pace that matches what workers can manage safely. If the pace is too fast, workers may not maintain good technique and their muscles may fatigue. • Design jobs with task variability that allows workers to use different muscles and postures. For example, rotate the tasks or jobs that workers do. • Avoid unnecessary repetition. For example, reduce the need to scan a grocery item or to turn lumber for grading multiple times. • Schedule rest breaks and encourage micro-pauses.

Risk factor	Risk control options
<p>Work posture</p>	<p>Eliminate awkward postures. You can do this through changes to work design or processes that allow workers to work in neutral postures. If that's not practical, use engineering controls such as adjusting work heights, minimizing reaching distances, or changing the orientation of work. Additional control options that can minimize risks include the following:</p> <ul style="list-style-type: none"> • Design and organize workstations so that frequently used items are within easy forward reach (e.g., install arms on conveyor belts to move product closer to the worker, use turntables to access and place product). • Use adjustable workstations to optimize working heights (e.g., above elbow height for precision work, below elbow height for mechanical or assembly lines, at waist height for heavy work). • Move objects so they are at the front of the worker's body to prevent reaching to the side or twisting. • Use tools that are designed to prevent awkward postures (e.g., power tools or mechanical turners, tools with angled handles or longer tools to reduce reaching). • Allow for periodic changes to posture and movement to prevent static postures (e.g., use sit-stand desks, provide footrests or low stepstools). • Raise work off the floor to prevent stooping, squatting, and kneeling (e.g., lift tables, scissor lifts).
<p>Local contact stress</p>	<p>Eliminate or minimize exposure to local contact stress by selecting appropriate tools and equipment or redesigning the workstation:</p> <ul style="list-style-type: none"> • Change or modify equipment (e.g., use a long-handled screwdriver to prevent the end of the handle from digging into the palm of the hand). • Change or modify the workstation to prevent sharp edges from digging into the skin (e.g., round off or pad sharp or metal edges). • Avoid using a body part (e.g., hand or knee) as a hammer. • Use PPE (e.g., knee pads when kneeling on hard surfaces, padded gloves when lifting heavy objects by narrow strapping).
<p>Environmental conditions</p>	<p>Consider environmental conditions, such as vibration, lighting, and hot or cold temperatures. How might these interact with the other risk factors listed above to increase the risk of MSI? Here are some examples of controls for environmental conditions:</p> <ul style="list-style-type: none"> • Select equipment with vibration-damping features, or isolate the source of the vibration. • Minimize the magnitude of exposure to vibration (e.g., maintain equipment regularly). • Reduce the duration of exposure to vibration (e.g., use job rotation). • Control lighting to minimize awkward postures that can result from compensating for glare, too much light, or not enough light. • Find ways to regulate temperature within the work environment. For heat, consider controls such as shading, overhead fans, or air-conditioning units. For cold, consider controls such as space heaters for when bay doors are open or exterior doors that close automatically.

Risk factor	Risk control options
<p>Organization of work</p>	<p>Determine how factors such as work rate, work recovery cycles, and task variability affect the risk of MSI. For example, the following controls can impact work organization:</p> <ul style="list-style-type: none"> • Plan and schedule tasks so that workers don't use the same muscles repetitively for long periods of time. For example, schedule job rotations or use job enlargement to reduce repetition of tasks. • Provide recovery breaks for repetitive or demanding tasks. For example, plan work to allow for micro-pauses or design workstations to allow for alternating work postures. • Make sure the pace of work allows workers to maintain neutral work postures and safe repetition rates. You can consult workers for input on the pace of their work. • Consider how overtime and incentivized work (piecework) might increase MSI risks for workers. • Consider how management plays an essential role in scheduling, providing resources, training workers, and communicating and setting expectations for workloads.

For more information

OHS Regulation and guidelines

For MSI requirements, see the Occupational Health and Safety Regulation and related guidelines on [worksafebc.com](https://www.worksafebc.com).

The following sections of the Regulation relate to MSI risk assessment:

- 4.46 to 4.53, Ergonomics (MSI) Requirements
- 4.64 to 4.69, Illumination
- 7.10 to 7.16, Vibration Exposure

See the following corresponding guidelines for additional support:

- G4.46 to G4.53, Ergonomics (MSI) Requirements
- G4.65 to G4.69, Illumination
- G7.11-1 to G7.16, Vibration Exposure

Webpages

The following webpages on [worksafebc.com](https://www.worksafebc.com) provide more information on reducing the risk of MSI:

- Ergonomics
- Lifting & handling
- Sprains & strains

Other resources

The following WorkSafeBC publications and video contain information about MSI. You can find these and other health and safety resources on [worksafebc.com](https://www.worksafebc.com):

- *Guide to Musculoskeletal Injury (MSI) Risk Assessment*
- *Musculoskeletal Injury (MSI) Risk Assessment Worksheet*
- *How to Make Your Computer Workstation Fit You*
- *Back Talk: An Owner's Manual for Backs*
- *Lifting in the Workplace* (video)

