

# Worksheet B: MSI Risk Factor Assessment

Musculoskeletal injury (MSI) is an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels, or related soft tissues that may be caused or aggravated by work. Examples of MSIs include sprains, strains, and inflammation.

Section 4.48 of the Occupational Health and Safety Regulation requires employers to assess those factors that expose workers to a risk of MSI. This worksheet can be used to determine if the risk factors identified in the companion publication, [Worksheet A: MSI Risk Factor Identification](#), pose a moderate or high risk.

## Instructions

1. **Document** the job title or task, the date, and the name of the person completing the worksheet. Risk factor assessment should be performed by someone who understands the work process, the MSI risk factors, and the principles of risk assessment.
2. **Complete** the Risk Factor Summary Table using the results from *Worksheet A: Risk Factor Identification*. These risk factors are considered to pose at least a moderate risk of MSI.
3. **Complete** Worksheet B only on those risk factors identified from Worksheet A.
4. **Observe and consult** with a representative sample of workers. A representative sample would include workers showing signs and symptoms of MSI, as well as workers of different ages, heights, weights, genders, shift schedules, and work locations.
5. In the tables that follow, **read** across the page under each risk factor and determine if all of the criteria in each row are present in each work activity. Explanatory notes regarding duration and exposure pattern under “Instructions” in Worksheet A also apply to Worksheet B.
6. If all criteria are present, **check** the box  to indicate that a high risk of MSI exists. Make any appropriate notes to clarify specific details.
7. **Complete** the “High Risk” column of the Risk Factor Summary Table.

## Interpretation of results

Section 4.50(1) of the Occupational Health and Safety Regulation requires employers to eliminate, or if that is not practicable, minimize the risk of MSI to workers. *Practicable* is defined in the Regulation as “that which is reasonably capable of being done.”

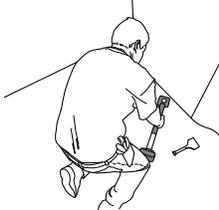
Worksheets A and B can be used to prioritize tasks for risk control based on their risk levels. Employers should eliminate or minimize higher-risk tasks first.

Job title or task: \_\_\_\_\_ Date: \_\_\_\_\_

Completed by: \_\_\_\_\_

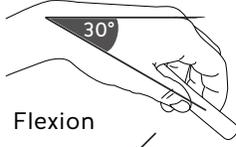
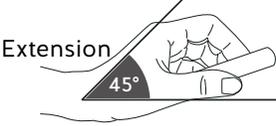
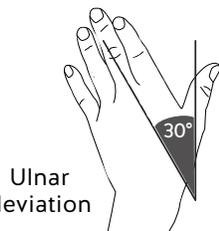
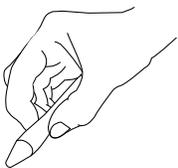
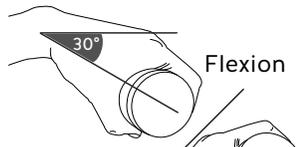
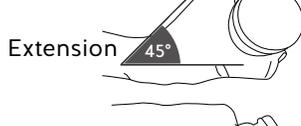
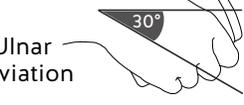
### Risk factor summary table

Risk factor	Moderate risk Risk factors identified from Worksheet A	High risk Risk factors indicated on Worksheet B
Contact stress		
Repetition		
Grip force		
Lift/lower force		
Awkward posture		
Vibration		

Contact stress risk assessment (to determine if high risk)				Check the box <input checked="" type="checkbox"/> to indicate high risk of MSI
Body part	Work task that poses MSI risk	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 risk assessment (to determine if high risk)				Check the box <input checked="" type="checkbox"/> to indicate high risk of MSI
Body part	Work task that poses MSI risk	Combined with	Duration	
Neck Shoulders Elbows Wrists Hands	Using the same motion with little or no variation every few seconds (excluding typing)	No other risk factors	More than 6 hours total per day	Neck Shoulders Elbows Wrists Fingers
Wrists	Using the same motion with little or no variation every few seconds (excluding typing)	Wrists bent in $\geq 30^\circ$ flexion, $\geq 45^\circ$ extension, or $\geq 30^\circ$ ulnar deviation AND High forceful exertion of hand(s)	More than 2 hours total per day	
Hands	Intensive typing Typing with the hands or fingers in a rapid, steady motion with few opportunities for temporary work pauses	Awkward wrist posture $\geq 30^\circ$ flexion, $\geq 45^\circ$ extension, or $\geq 30^\circ$ ulnar deviation	More than 4 hours total per day	
		No other risk factors	More than 7 hours total per day	

## Grip force risk assessment (to determine if high risk)

Grip force risk assessment (to determine if high risk)					Check the box <input checked="" type="checkbox"/>
Body part	Work task that poses MSI risk	Combined with	Duration	Visual aid	to indicate high risk of MSI
Arms Wrists Hands	<b>Pinch gripping</b> unsupported objects weighing 1 kg (2 lb.) or more per hand OR Pinch gripping with a force of 2 kg (4 lb.) or more per hand (comparable to pinch gripping half a stack of photocopy paper)	Highly repetitive motion	> 3 hours total per day		
		Wrists bent in $\geq 30^\circ$ flexion, $\geq 45^\circ$ extension, or $\geq 30^\circ$ ulnar deviation	More than 3 hours total per day	 Flexion  Extension  Ulnar deviation	
		No other risk factors	More than 4 hours total per day		
Arms Wrists Hands	<b>Power gripping</b> unsupported objects weighing 5 kg (10 lb.) or more per hand OR Power gripping with a force of 5 kg (10 lb.) 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 $\geq 30^\circ$ flexion, $\geq 45^\circ$ extension, or $\geq 30^\circ$ ulnar deviation	More than 3 hours total per day	 Flexion  Extension  Ulnar deviation	
		No other risk factors	More than 4 hours total per day		

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

## Lift/lower risk assessment (to determine if high risk)

This section can be used to assess forceful exertion due to lifting and lowering. WorkSafeBC's online [Lift/Lower Calculator](#) can also be used to assess lifting and lowering forces.

If a job involves a number of lifts with different weights and/or different postures, use steps 1–6 to assess the **heaviest object lifted** and the **most awkward part of the lift**. In Step 3, use the Frequency + Duration Adjustment for all of the lifting done in a typical workday.

### Step 1

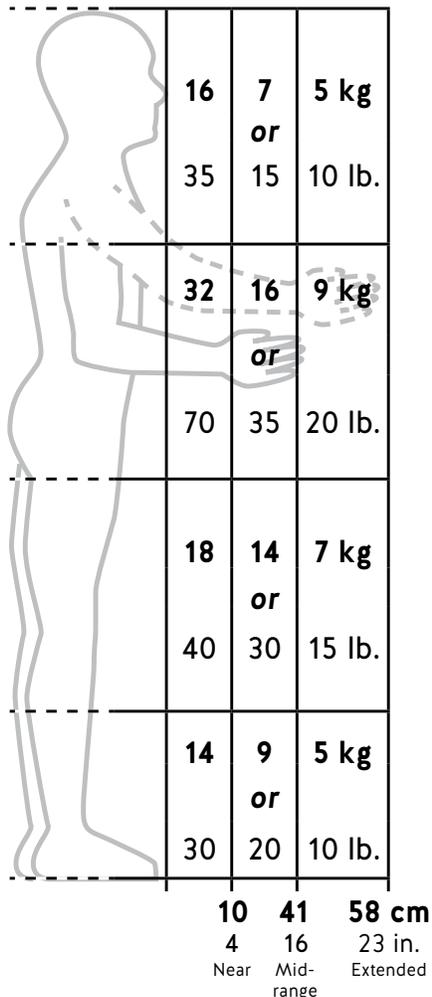
**Determine the actual weight of the object that the worker lifts.**

Actual Weight = \_\_\_\_\_

### Step 2

**Determine the Unadjusted Weight Limit.**

Determine the most extreme hand position during the lift/lower task. Mark that spot on the diagram below. The number in that box is the **Unadjusted Weight Limit**.



Unadjusted Weight Limit = \_\_\_\_\_

### Step 3

**Frequency + Duration Adjustment.** Find out how many times the worker lifts per minute and the total number of hours per day spent lifting. Use this information to look up the **Frequency + Duration Adjustment** in the following table.

How many lifts per minute?	For how many hours per day?		
	1 h or less	1 h to 2 h	2 h or more
1 lift every 2–5 min.	1.00	1.00	0.85
1 lift every min.	0.95	0.95	0.70
2–3 lifts every min.	0.90	0.85	0.60
4–5 lifts every min.	0.85	0.70	0.50
6–7 lifts every min.	0.60	0.50	0.35
8–9 lifts every min.	0.40	0.30	0.15
10+ lifts every min.	0.20	0.10	0.05

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

Frequency + Duration Adjustment: \_\_\_\_\_

### Step 4

**Determine the Twisting Adjustment.** If the worker twists more than 45 degrees while lifting, the Twisting Adjustment is 0.85. Otherwise, use 1.0.

Twisting Adjustment: = \_\_\_\_\_

### Step 5

**Calculate the Weight Limit.** Multiply the Unadjusted Weight Limit (Step 2) by the Frequency + Duration Adjustment (Step 3) and the Twisting Adjustment (Step 4) to get the Weight Limit.

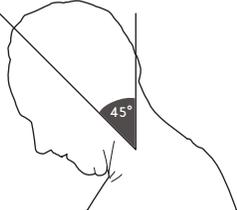
$$\frac{\text{Step 2}}{\text{Step 2}} \times \frac{\text{Step 3}}{\text{Step 3}} \times \frac{\text{Step 4}}{\text{Step 4}} = \frac{\text{Weight Limit}}{\text{Weight Limit}}$$

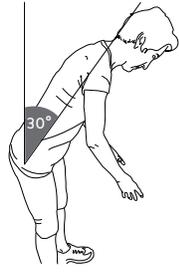
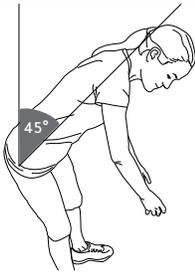
Actual Weight = \_\_\_\_\_ Weight Limit: = \_\_\_\_\_

### Step 6

**Analysis.** Compare the Actual Weight (Step 1) to the calculated Weight Limit. If the Actual Weight (Step 1) is greater than the Weight Limit (Step 5), risk control is required under section 4.50 of the Occupational Health and Safety Regulation.

## Awkward posture risk assessment (to determine if high risk)

Body part	Work task that poses MSI risk	Duration	Visual aid	Check the box <input checked="" type="checkbox"/> to indicate high risk of MSI
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 45° (without support or the ability to vary posture)	More than 4 hours total per day		

Awkward posture risk assessment (to determine if high risk)				Check the box <input checked="" type="checkbox"/> to indicate high risk of MSI
Body part	Work task that poses MSI risk	Duration	Visual aid	
Back	Working with the back bent forward more than 30° (without support or the ability to vary posture)	More than 4 hours total per day		
	Working with the back bent forward more than 45° (without support or the ability to vary posture)	More than 2 hours total per day		

## Vibration risk assessment

Use this section to determine if worker exposure to hand-arm vibration (HAV) exceeds regulatory limits. Exposure beyond these limits poses a high risk of HAV disorders.

### Step 1

Find the vibration value for the tool through one of the following methods:

- Get it from the manufacturer.
- Look it up on a vibration database (for example, [www.vibration.db.umu.se/Default.aspx?lang=en](http://www.vibration.db.umu.se/Default.aspx?lang=en)).
- Measure the vibration yourself. Follow ISO Standard 5349-1:2001 and ISO Standard 5349-2:2001.

### Step 2

Determine how many hours per day the worker uses the tool (i.e., the amount of time that the tool is actually vibrating in the worker's hands). This is the total exposure time (see the left-hand column in the table opposite).

### Step 3

The right-hand column of the table shows the vibration value that will protect nearly all workers for a given daily exposure time.

Total daily exposure time	Maximum vibration value considered safe for nearly all workers
4 to less than 8 hours	4 m/s <sup>2</sup>
2 to less than 4 hours	6 m/s <sup>2</sup>
1 to less than 2 hours	8 m/s <sup>2</sup>
Less than 1 hour	12 m/s <sup>2</sup>

**Note:** This table is adapted from [Occupational Health and Safety Guideline G7.11-1](#), and the values shown refer to the 2015 ACGIH limits. For a full explanation, please refer to the ACGIH TLVs and BEIs.