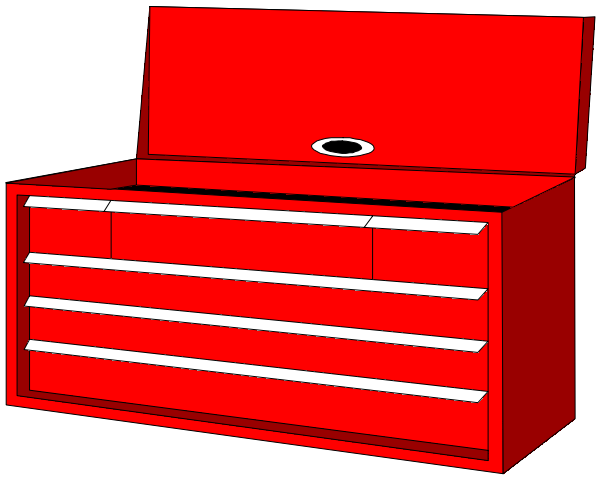
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Bobcat Operator Tool Kit



IMIRP program coordinated by:

Council of Forest Industries

Industrial Wood & Allied Workers of Canada

Advanced Ergonomics Inc.

In cooperation with the Workers' Compensation Board of British Columbia

BOBCAT OPERATOR TOOL KIT
Table of Contents

Overview

Bobcat Operator

Job Summary

A Bobcat Operator is responsible for moving material around the yard. A Bobcat Operator will move all types of debris (e.g., chips, sawdust, sand, snow). The operator uses both hand and foot controls to perform these tasks. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Bobcat Operator may include:

a) Forceful exertions of the shoulder
b) Repetitive motions of the neck, shoulder, and knee
c) Awkward postures of the neck, shoulder, hand/fingers, and knee
d) Static postures of the wrist and low back
e) Continuous sitting
f) Continuous pushing and pulling on controls
g) Climbing onto and out of the bobcat

Mental Demands

A Bobcat Operator must continuously concentrate on what is happening in the yard while simultaneously operating the Bobcat.

Major Variations

With different mills, the following major variations may be found:

1) The operator may remove large debris:
   a) Manually
   b) Using a split bucket on the Bobcat

2) The Bobcat Operator may also:
   a) Maintain the Bobcat

Minor Variations

With different mills, the following minor variations may be found:

1) A Bobcat may be operated:
   a) All day
   b) Part of the day

2) The driving surface may consist of:
   a) Uneven terrain
   b) Level terrain
   c) A combination of uneven and level terrains

Physical Demands Analysis
Bobcat Operator

PDA General Instructions: Bobcat Operator

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Bobcat Operator. This PDA can be used to gather information about an individual's job and to assist in developing a rehabilitation and return-to-work plan. It is not intended for use in claims adjudication.

Where applicable, common industry job data (e.g., hand tools, tasks) have been included in the tables of this document. The information reported was collected from a sample of Bobcat Operator(s) in the BC Sawmill Industry. However, the PDA requires completion by the healthcare professional, with input from the injured worker to highlight tasks that aggravate the injury or prevent the worker from returning to their job. The worker's supervisor may be contacted for further information or verification of tasks.

A PDA should be filled out for each individual worker following an injury. Subsequent changes in the work process may reduce the accuracy of any pre-existing physical demands assessments. The IMIRP Society accepts no responsibility for the use or misuse of this Physical Demands Analysis, or for the accuracy of the PDA as it applies to any specific workplace.

Disclaimer

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PDA Table of Contents

Physical Demands Analysis
Bobcat Operator

Task List

For each of the tasks listed below, please indicate whether it occurs at your mill.

Operate Bobcat

A Bobcat Operator will remove debris (e.g., chips, sawdust) in the yard. In the wintertime, the Bobcat may be used to move snow. Some Bobcats have split buckets to help remove large debris, like logs.

Does this task occur at your mill?

☐ Yes ☐ No

Sub-tasks include:

1) Operate hand controls to steer

2) Operate foot pedals to raise, lower, and tilt the bucket

3) Observe in front of and around the Bobcat

Maintenance duties

Duties may include fuelling, washing, and greasing the Bobcat, changing motor oil, and various mechanical tasks.

Does this task occur at your mill?

☐ Yes ☐ No

Job Profile

Date: _____

Company Name: _____ Division: _____

Employee Name: _____ Supervisor: _____

Phone: _____ Fax: _____

Is a Return-to-Work (RTW) strategy in place? ☐ Yes ☐ No

If yes, check all that apply: ☐ Modified Job ☐ Modified Worksite ☐ Graduated RTW

Describe:

_____

_____

_____

Length of shift _____ hours

Formal breaks
- ☐ Two 10 minute breaks
- ☐ One 30 minute lunch break
- ☐ Other: _____

Informal breaks
- ☐ Yes, length of break varies
- ☐ Yes, _____ minutes/shift

Work pace control
- ☐ Self-paced
- ☐ Time pressure (e.g., completing a task during the 30 minute lunch break)
- ☐ Other: _____

Job rotation

☐ Yes ☐ No

Describe:

_____

_____

_____

_____

Work Organisation

Task Description

The table below contains a list of tasks performed by a Bobcat Operator. Use the left column to check off tasks that are present. Estimate the *Percent of Shift* each task is performed and place a check mark in the appropriate column. The *Comments* section may be used to include information related to duration, frequency, and cycle times. Additional tasks can also be included under *Other*.

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Operate Bobcat *Sub-tasks may include:* • *Operate hand controls* • *Operate foot pedals* • *Observe in front of and around truck*					• *Amount of operation varies depending on the task*
	Maintenance duties					• *Amount of maintenance which the operator is responsible for varies greatly between sawmills*
	Other:					
	Other:					
	Other:					

Workstation Characteristics

Dimensions & Layout

Sketch workstation(s) and indicate relevant measurements, such as working heights and reaches.

Flooring, Displays and Seating

The table below lists several components of a workstation. For *Flooring* and *Displays* there are several options provided. Please indicate all of the options that apply to the workstation. For the *Seating* section, describe and identify the features of the seat, if applicable. The *Comments* section may be used to include additional information, especially any workstation characteristics of concern.

Workstation Characteristics	**Comments**
Flooring *(Check all that apply)* ☐ Cement ☐ Wood ☐ Rubber matting ☐ Metal ☐ Other _____	
Displays *(Check all that apply)* ☐ Lights on console ☐ Mirrors ☐ Video monitors ☐ Computer monitors ☐ Scrolling display ☐ Signal lights ☐ Other: _____	
Seating *(Check all that apply)* ☐ Armrests ☐ Backrest ☐ Swivel seat ☐ Slide track ☐ Lumbar support ☐ Foot rest ☐ Casters #_____ *Indicate if adjustable:* ☐ Height ☐ Armrests ☐ Backrest ☐ Forward tilt	Height of seat: _____ cm Depth of seat: _____ cm Width of seat: _____ cm Covering type: _____

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Bobcat Operator. Use the left column to check off controls that are present at the work site. Highlight controls that may aggravate the injury, or which the worker finds difficult to use. The *Comments* section may be used to include any additional information. Additional controls can be included under *Other*.

	Type of Control	Function	Comments
	Hand controls (Levers)	• *Movement of Bobcat*	• *Used constantly when operating Bobcat*
	Foot pedal	• *Raise and lower bucket* • *Tilt bucket* • *Brake (Parking)*	• *Right foot controls bucket tilt* • *Left foot controls the raising and lowering of the bucket* • *Foot pedals are constantly used when operating Bobcat*
	Finger push button	• *Kill switch*	• *Rarely used*
	Other:		

Physical Demands

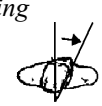
Whole Body Physical Demands

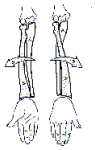
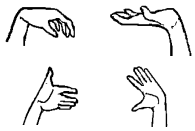
Identify each of the physical demands required by a Bobcat Operator and list the corresponding tasks in the second column. Check off (✔) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, and cycle times.

Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Example: Siting	• *Operate Bobcat*				✔	• *Amount of time varies between sawmills*
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

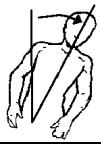
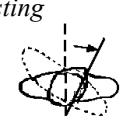
The table below outlines the body postures that may be adopted throughout the shift by a Bobcat Operator, related to tasks. Check off (✔) the estimated *Percent of Shift,* and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Example: Neck Twisting	• *Looking behind when driving Bobcat backwards*		✔			• *Operators may have more neck twisting with increased backward driving*
Neck						
Flexion 						
Extension 						
Twisting 						
Shoulder						
Flexion 						
Abduction/adduction 						
Extensio 						

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm						
Rotation 						
Wrist						
Wrist Movements 						
Hand/Fingers						
**Handling*						
**Fingering*						
**Gripping*						

Legend for Hand/Fingers

Handling	*grasping, turning, holding, etc.*			
Fingering	*picking, pinching, etc.*			
Gripping	*Power* 	*Pinch* 	*Hook* 	*Precision* 

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back						
Flexion 						
Lateral Flexion 						
Twisting 						
Extension 						

Manual Material Handling

The table below contains a list of general manual material handling activities performed by a Bobcat Operator. Indicate tasks that require one or more of these activities, and fill in the weight of the objects, or the force required, for each action. Check off (✔) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled. If necessary, please refer to Appendix A to calculate the weight of the wood being handled.

Activity	Task Description	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Pushing							
Pulling							
Lifting							
Lowering							
Carrying							

Hand Tools

Indicate the hand tools used by a Bobcat Operator by placing a check mark (✔) in the far left column. Determine the weight of the hand tool and enter it in the appropriate column. Check off (✔) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled.

	Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Other:							

Environmental Conditions

Work Environment

The table below contains a list of environmental conditions that may be of concern. If any of these factors aggravate the injury, describe in the *Comments* section.

Factor	Comments
Vibration *(Indicate source)* ☐ Seat ☐ Floor ☐ Tool ☐ Other: _____	
Noise level	
Lighting level	
Other:	

Location of Workstation

The table below contains a list of potential work environments. Indicate with a check mark (✔) in the left column which of the work environments apply to the specific workstation. For example, the workstation may be inside a building with both a local fan and heater, exposed to the outside by a doorway that is always open. In this situation, 'Inside exposed', 'Heater present', and 'Fan present' would all be checked.

	Work Environment
	Outside uncovered
	Outside covered
	Inside enclosed
	Inside exposed
	Heater present
	Fan present

Temperature

The table below contains a list of the geographical regions of British Columbia. Indicate the appropriate region with a check mark (✔) in the left column. Refer to the regional map in Appendix A of the PDA.

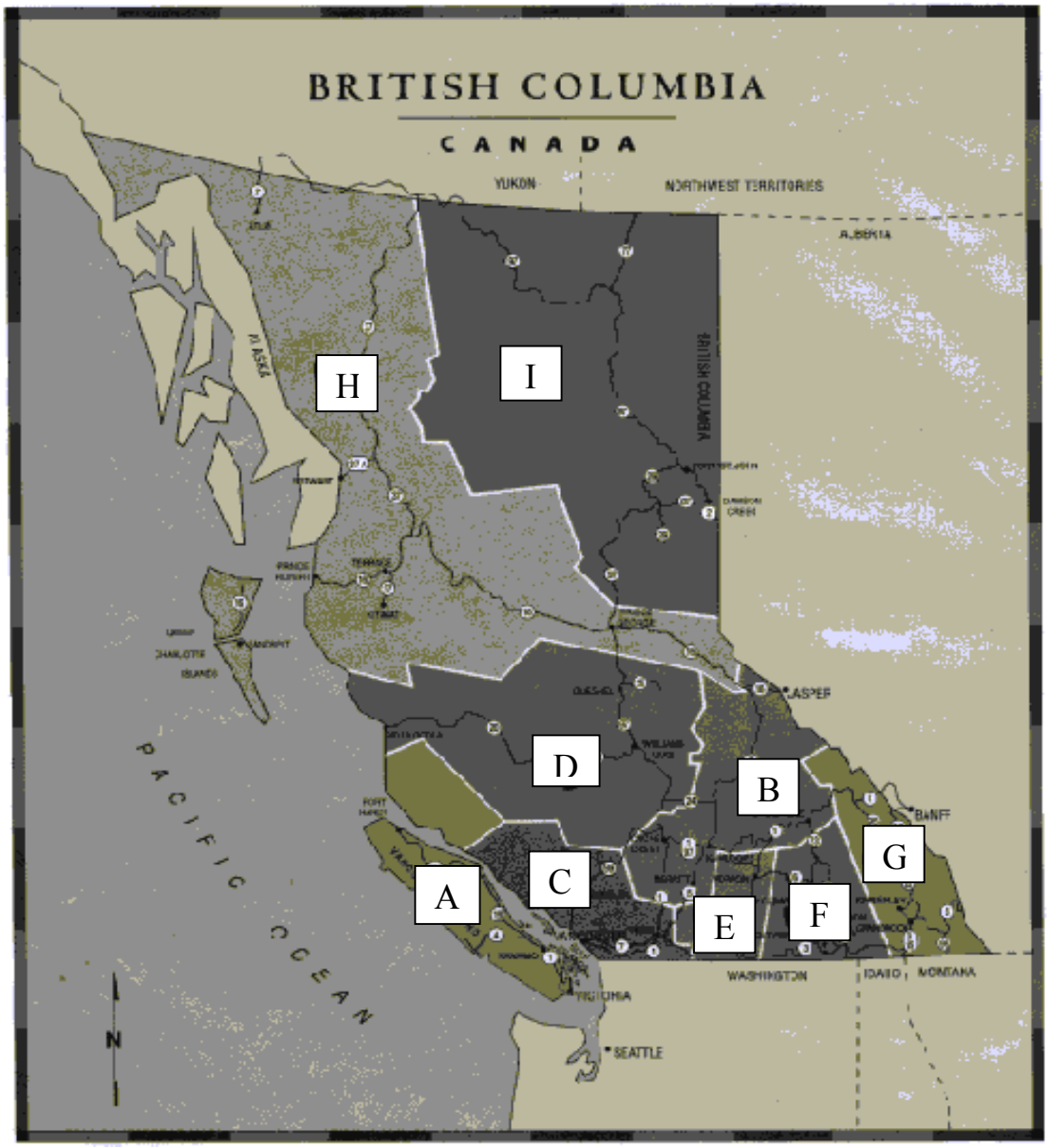
	Region	Avg. Max July/Aug	Avg. Min Dec/Jan	Extreme Max.	Extreme Min.
	Vancouver Island	22.5 °C	-0.6 °C	36.1 °C	-18.8 °C
	Southwestern BC	22.9 °C	0.4 °C	35.6 °C	-18.3 °C
	Cariboo Chilcotin Coast	22.2 °C	-11.6 °C	36.4 °C	-42.5 °C
	High Country	26.3 °C	-9.9 °C	39.6 °C	-39.7 °C
	Okanagan Similkameen	26.5 °C	-8.4 °C	36.0 °C	-36.3 °C
	Kootenay Country	26.2 °C	-6.7 °C	38.5 °C	-32.0 °C
	British Columbia Rockies	24.7 °C	-12.3 °C	37.5 °C	-42.2 °C
	North by Northwest	19.5 °C	-11.7 °C	32.9 °C	-38.1 °C
	Peace River Alaska Highway	20.0 °C	-20.2 °C	34.6 °C	-47.7 °C

Personal Protective Equipment

The table below contains a list of the personal protective equipment (PPE). For the Bobcat Operator job at your mill, indicate with a check mark (✔) which of the PPE items are required.

	Gloves Type:		Hard Hat		Leather Apron
	Glove Liners		Steel-toed Boots		Dust Mask
	Eye Protection		Hearing Protection		Seat Belt
	Face Shield/Helmet		Life Jacket		Harness
	Knee Pads		Other:		Other:

Appendix A – Regional Map



A - Vancouver Island	**F** - Kootenay Country
B - High Country	**G** - British Columbia Rockies
C - Southwestern BC	**H** - North by Northwest
D - Cariboo Chilcotin Coast	**I** - Peace River Alaska Highway
E - Okanagan Similkameen	

Risk Factor Identification Checklist
Bobcat Operator

Purpose

The Risk Factor Identification Checklist for a Bobcat Operator is used to **identify** potential ergonomic risk factors. Keep in mind that the purpose of this checklist is only to **identify** potential ergonomic risk factors, **not** to assess them.

The checklist can be used as part of your ergonomic intervention process, when workers express concerns about their work environment, during regular workplace inspections and observations, or when conducting an accident or injury investigation. Ideally, management and worker representatives who have completed the IMIRP Occupational Health & Safety Committee and Supervisor Ergonomic Training Session should complete this checklist. Try to view different workers in the same occupation when completing the checklist. Some specific examples are given to help answer the questions.

Instructions

General

Except for the first two questions, all remaining questions will require an answer with an implied frequency. For appropriate questions indicate with a check mark whether the answer to the question is 'No' or 'Yes'. This way you will have a record indicating that all risk factors have been considered in the identification process.

If you indicate 'No', please continue to the next question. If the question refers to a situation which does not exist (e.g., there is no seating available), please indicate 'No' in the appropriate box and continue to the next question.

If your answer is 'Yes', please check the appropriate box and then circle the frequency ('S' for 'Sometimes' or 'O' for 'Often'). If you answer 'Yes – Sometimes', then this risk factor **may be** a potential area of concern. If you answer 'Yes – Often' then there is an increased likelihood that this risk factor **is** an issue. Each mill will be responsible for defining what 'Sometimes' and 'Often' will mean to them. It is important that all people who complete the checklist are consistent in how they determine if a risk factor occurs 'Sometimes' or 'Often'. Use the 'Comments' section to indicate specific tasks, or to make other notes about the direct risk factors.

Since ergonomic risk factors frequently occur in combinations, you may find similar questions in different sections. Answering all questions will ensure that the situations that involve combinations of ergonomic risk factors are identified. It is very important to recognise all risk factors that occur in the work area.

Please note that for some of the questions it will be beneficial to ask the worker for their input. Please take the opportunity to include the operator in the risk factor identification process as much as possible. Videotaping the job of interest and reviewing the checklist in a quiet area with the worker may allow for more discussion.

Summary Tables

At the end of each body part section, summarise your findings in the table provided. If any of the direct risk factor sections contain a 'Yes', indicate 'Yes' in the appropriate section of the summary table. Answer the questions referring to injury statistics and discomfort survey findings. If there are only 'No' answers in a direct risk factor section, indicate 'No' in the summary table for that section. Use the summary information to determine how you will use the Work Manual.

Risk Factor Identification Checklist – Bobcat Operator

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions
☐ After implementation of solutions

Job History		No	Yes	Comments
1	Are there records of musculoskeletal injuries or accidents to indicate a risk of musculoskeletal injury? (refer to Worksheet 1 in Implementation Guide)			
2	Are there worker comments to indicate a risk of musculoskeletal injuries? (refer to Worksheet 2 in Implementation Guide)			

Definitions

Force: Force is the amount of physical effort required by the person to do a task and/or maintain control of tools and equipment. The effort depends on the type of grip, object weight and dimensions, body posture, type of activity, surface of the object, temperature, vibration, duration of the task, and number of repetitions.

Repetition: Repetition is defined as similar or the same motions performed repeatedly. The severity of risk depends on the frequency of repetition, speed of the movement or action, the number of muscle groups involved, and the required force. Repetition is influenced by machine or line pacing, incentive programs, piecework, and deadlines.

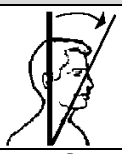
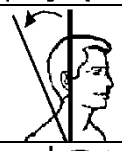
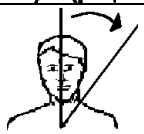
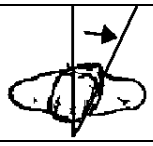
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

Contact Stress: Contact stress is the contact of the body with a hard surface or edge. Contact stress can also result when using a part of the body as a hammer or striking instrument.

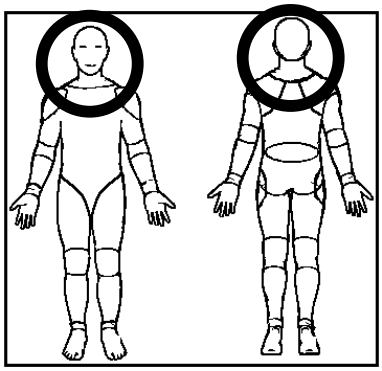
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

Vibration: Vibration is oscillation of a tool or surface. Vibration can be transmitted through the arm or through the whole body.

NECK

Repetition		N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., looking over the shoulder frequently)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?				S O	
Static Posture					
Ask the worker: Do tasks require your neck or shoulders to be maintained in a fixed or static posture? (e.g., holding arms away from the body to operate controls)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

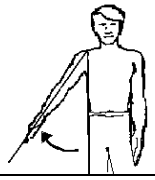
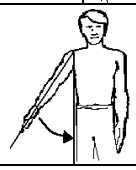
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Neck or Head/Eye or Upper Back? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



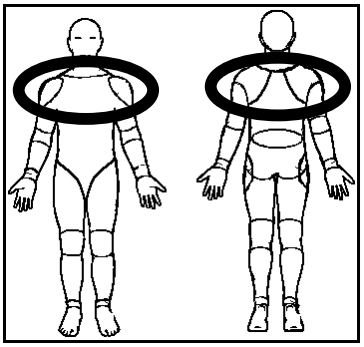
Body parts within the circled area will be classified as NECK issues.

SHOULDER

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., operating controls)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating Bobcat)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., holding arms away from the body when operating controls)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., holding controls)			S O	

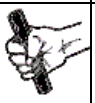
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Abduction				S O	
Adduction				S O	

Please indicate whether the following direct risk factors were identified at the **SHOULDER**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Shoulder or Neck or Upper Back? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Shoulder or Neck or Upper Back? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



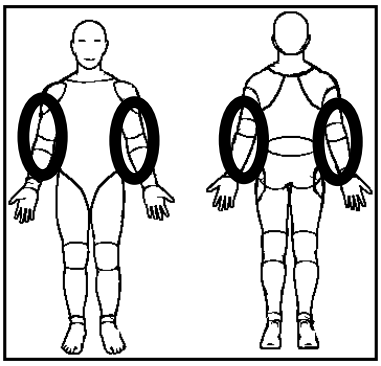
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., controls) 			S O	
Are objects handled in a pinch grip? 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., operating controls)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating Bobcat)			S O	

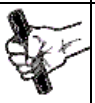
Static Posture	N	Y		Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture? (e.g., holding controls)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding controls)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., controls)			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., arms resting on the restraint bar)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	

Please indicate whether the following direct risk factors were identified at the **ELBOW**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Elbow or Forearm? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Elbow or Forearm? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



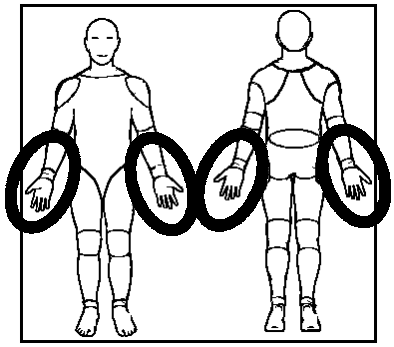
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., controls) 			S O	
Are objects handled in a pinch grip? 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., operating controls)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating Bobcat)			S O	

Static Posture		N	Y		Comments:
Ask the worker: Do tasks require any part of your arm or hand to be maintained in a fixed or static posture? (e.g., holding controls)				S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding controls)				S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., holding controls)				S O	
Contact Stress					
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., pressure from controls on hands)				S O	
Ask the worker: Do you use your hand like a hammer for striking?				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Ulnar Deviation				S O	
Radial Deviation				S O	
Vibration					
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?				S O	

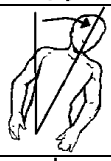
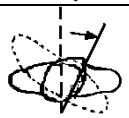
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Wrist or Hand/Finger or Forearm? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Wrist or Hand/Finger or Forearm? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



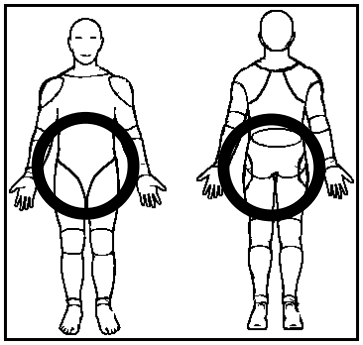
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again?			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating Bobcat)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., sitting for long periods)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh? (e.g., seat digging into the back of the thigh)			S O	

Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., sitting on vibrating seat)				S O	

Please indicate whether the following direct risk factors were identified at the **LOW BACK or HIP/THIGH**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Low Back or Hip/Thigh? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Low Back or Hip/Thigh? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No

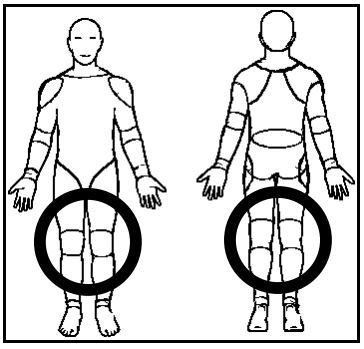


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture? (e.g., operating foot pedals with bent knees)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Do workers kneel (with one or both knees)?			S O	
Contact Stress				
Ask the worker: Do **any** objects or parts of the workstation put pressure on your knee(s)?			S O	
Awkward Posture				
Extreme Flexion 			S O	

Please indicate whether the following direct risk factors were identified at the **KNEE**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Knee or Hip/Thigh? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Knee or Hip/Thigh? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No

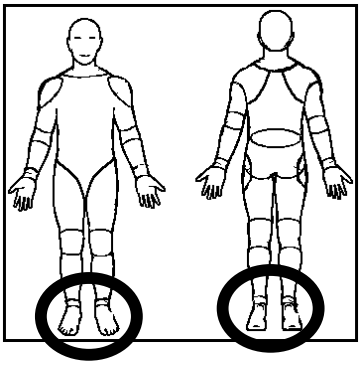


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., activating foot pedals)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift? (e.g., holding foot pedal down)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift?			S O	

Please indicate whether the following direct risk factors were identified at the **ANKLE/FOOT**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Ankle or Foot? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Ankle or Foot? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



Body parts within the circled area will be classified as ANKLE/FOOT issues.

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y		Comments:
Are there problems handling a load due to its size or shape? (e.g., large debris)			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object? (e.g., hoists)			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., controls)			S O	
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is **No**, check the **No** box and go to the next section.			S O	
If the answer to the above question is **Yes**, ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O	

ENVIRONMENTAL CONDITIONS

Temperature				
Ask the worker: Are your hands or arms exposed to cold from exhaust air, cold liquids or solids?			S O	
Ask the worker: Are you exposed directly to temperature extremes that may cause you to use more force or cause you to fatigue quicker than normal? (e.g., hot or cold, either by equipment or natural environment)			S O	
Lighting				
Ask the worker: Do you assume awkward postures to overcome problems associated with glare, inadequate lighting, or poor visibility? (e.g., working at night)			S O	

ENVIRONMENTAL CONDITIONS [CONTINUED]

Noise	N	Y		Comments:
Have there been complaints on the level of noise in the work area?			S O	
Ask the worker: Are there any distracting or annoying noises at the workstation?			S O	

WORK ORGANISATION

	N	Y		Comments:
Is the work externally-paced or controlled by a machine or the process?			S O	
Do peak workloads or sudden increases in pace occur with the tasks?			S O	
Ask the worker: Are there indications of excessive fatigue or pain, or symptoms of adverse health effects due to extended work days or overtime?			S O	
Ask the worker: Are there indications of excessive fatigue or adverse health effects due to shiftwork?			S O	
Ask the worker: Are rest periods or task variety insufficient to prevent the build-up of fatigue or the risk of adverse health effects?			S O	
Ask the worker: Are tasks in a job rotation program similar to one another, and therefore not providing a variation in movements?			S O	

Work Manual

Industrial
Musculoskeletal
Injury
Reduction
Program

Bobcat Operator

This Work Manual contains information about the body parts found to be at risk of musculoskeletal injury (MSI) for the Bobcat Operator (Injury Education), and how to reduce the risk of MSIs using various control measures (Injury Prevention). Each Work Manual is intended to help Occupational Health and Safety Committee members establish effective solutions to reduce MSIs, and as a resource for workers to understand the MSI risks that they may encounter on the job.

The Body Manual, referenced throughout the Work Manual, is a separate document that contains information on how to prevent common MSIs through exercise. Please note exercises described in the Body Manual should only be used after consulting a healthcare practitioner.

The General Risk Factor Solutions Manual, referenced throughout the Work Manual, is a separate document that contains general, preventative information on Environmental Conditions and Work Organisation issues.

Work Manual

Bobcat Operator

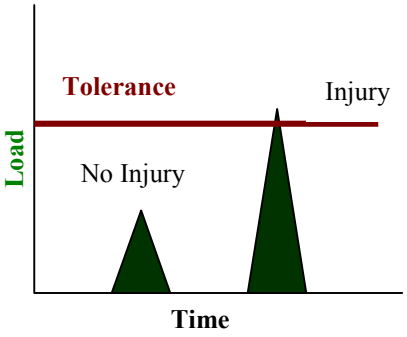
Disclaimer

The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness and/or lead to hazardous situations. Individuals or committees wishing to make Physical Demands Analyses (PDAs) site-specific, or wishing to implement options from the Work Manuals, are advised to first complete the two-day OHSC and Supervisors Ergonomics Training Session. Modifications to a PDA must be within the scope of competence of those individuals making the changes and must be reported to any rehabilitation professional using the PDA. Neither AEI nor the IMIRP Society accepts any responsibility for the use or misuse of these documents.

WM Table of Contents

Injury Education

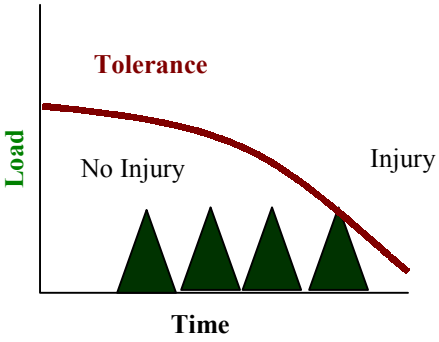
Injuries occur when ...
Loads exceed tissue tolerances



Excessive Force

This type of injury occurs from a single event, where the loads or forces are so great they exceed tissue tolerances and cause an immediate injury. This type of injury is more common with trips and falls.

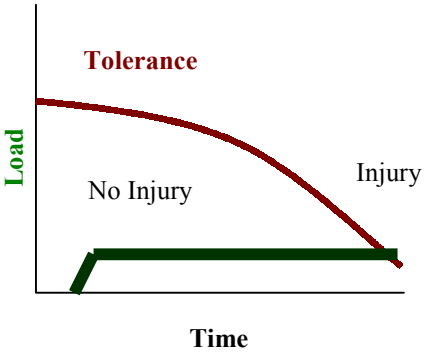
Example – a worker going over on their ankle and spraining it.



Excessive Repetition

This type of injury occurs from repeated loading weakening tissue to the point of failure. It progresses slowly to the point where a subfailure load can cause an injury. This type of injury is more common with repetitive tasks.

Example – a worker pulling lumber off a chain developing a herniated disc.



Excessive Duration

This type of injury occurs from constant loading weakening tissue to the point of failure. This type of injury is more common with tasks that require workers to adopt static or awkward postures for extended periods.

Example – a Grader developing neck tension.

Body Parts at Risk

The previous page on injury education explains how injuries can occur. The Injury Education section of this Work Manual expands on these principles, relating them to the specific body parts at risk of being injured.

After all of the appropriate information is collected during the investigation of the Bobcat Operator job (i.e., injury statistics, discomfort surveys, results from the Identification Checklist), the next steps are to:

1. Match the body parts of concern from your investigation to those described in this section of the Work Manual.

2. Note the direct risk factors associated with each body part of concern.

3. Read the information on the page and try to understand why a body part, in combination with each of the direct risk factors, is of concern.

4. Discover which indirect risk factors are associated with a particular body part problem and the headings under which they are found in the Injury Prevention section of the Work Manual.

5. Note the consequences of the direct risk factor relative to a body part.

6. Note where the potential solutions can be found within the Injury Prevention section of the Work Manual. In addition, for many of the body parts, a reference may be provided to refer to specific sections of the Body Manual.

At the end of the Body Parts at Risk Section, there is a summary page of all the body parts of concern for the Bobcat Operator. In addition, a reference table, with a summary of the direct and indirect risk factors by body part, is provided.

In the last section on Injury Prevention, the Work Manual discusses specific solution options for each of the body parts at risk.

Major Risk Identification

IMIRP ergonomists have assessed the Bobcat Operator position and found that the neck, shoulder, and low back are the body parts of major concern while performing the duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

Neck: Major risks include repetitive, awkward, and static postures of the neck (extension) while watching the bucket or forks, especially overhead, and while twisting the neck to back up the vehicle.

The following solutions are targeted at reducing the risk of injury to the neck:

1. Good driving posture (page 68)
2. Windshield wipers (page 79)
3. Hourly stretch breaks (page 80)
4. Alternate looking over shoulders (page 82)
5. Flood lighting (page 85)

Shoulder: Major risks include repetitive, awkward, and static postures of the shoulder while operating controls at the outer range of the reach envelope. The amount of force required to manipulate the controls can also contribute to the risk of discomfort or injury.

The following solutions are targeted at reducing the risk of injury to the shoulder:

1. Control distance (page 68)
2. Range of motion in controls (page 69)
3. Hourly stretch breaks (page 80)
4. Split bucket (page 83)
5. Task variability (page 86)

Low Back: Major risks include constantly sitting in the cab of the Bobcat while manipulating controls to move objects.

The following solutions are targeted at reducing the risk of injury to the low back:

1. Adjustable seating (page 73)
2. Brace upper body (page 75)
3. Yard, equipment, and tire maintenance (page 76)
4. Hourly stretch breaks (page 80)
5. Task variability (page 86)

For additional stretching and strengthening exercises that would benefit a Bobcat Operator, refer to the Neck, Shoulder, and Low Back sections of the Body Manual.

NECK

Direct Risk Factors:
Awkward Posture
Repetition

A Bobcat Operator must repeatedly turn their head to the side when driving.

BACKGROUND INFORMATION

- A number of smaller muscles around the neck produce the forces necessary to support and move the head. These muscles remain relatively relaxed when the head is balanced over the spine (neutral posture). The neutral posture occurs when the head is upright, and the ears and shoulders are aligned.

DIRECT RISK FACTORS

Awkward Posture

- Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons.

Repetition

- When the head is repeatedly turned to the side, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the neck muscles is increased when working in a confined area that requires more driving backward.

CONSEQUENCES

- When the neck is repeatedly twisted, muscles and soft tissues of the neck may fatigue. Fatigue leads to an accumulation of waste products and/or a decrease in the ability to tolerate additional stress.
- Signs and symptoms include pain, tenderness, muscle spasm in the neck area, and headaches.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 87 to 89.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Force
Awkward Posture
Repetition

A Bobcat Operator manipulates levers in order to manoeuvre the Bobcat.

BACKGROUND INFORMATION

- The shoulder joint is designed for mobility. The joint is held together by muscles and soft tissues. The larger muscle groups around the shoulder are responsible for producing movement (e.g., deltoids). The deeper muscles stabilise the shoulder joint as well as produce movement. These deeper muscles and their tendons are referred to as the rotator cuff.

DIRECT RISK FACTORS

Force

- The rotator cuff stabilises the shoulder joint when objects are manipulated. The larger the force required, the greater the load on the rotator cuff.

Awkward Posture

- The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.

Repetition

- If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Loading on the shoulder joint is increased when the controls for the Bobcat require excessive reaching.

CONSEQUENCES

- When using the arms to manipulate controls, the rotator cuff may fatigue. Fatigue leads to an accumulation of waste products and/or a decrease in the ability to tolerate additional stress.
- Stressing a fatigued shoulder may lead to degeneration or injury in the rotator cuff muscles of the shoulder joint.
- Signs and symptoms include pain, tenderness, and decreased range of motion and strength in the shoulder joint.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled "Shoulder" in the Summary of Solutions on pages 87 to 89.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

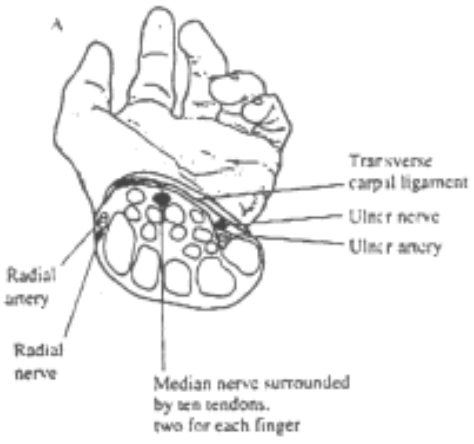
WRIST

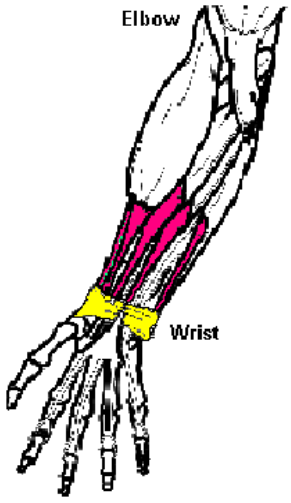
Direct Risk Factors:
Awkward Posture
Static Posture
Vibration

A Bobcat Operator continuously grips controls when manoeuvring the Bobcat.

BACKGROUND INFORMATION

- Most of the muscles involved in gripping and manoeuvring the hands are found in the forearms. These muscles attach at the elbow and their tendons (surrounded by a protective sheath) run down the forearm into the hand. At the wrist, the tendons and a nerve run under a thick band (see pictures below), which forms the roof of the carpal tunnel.





The Carpal Tunnel

DIRECT RISK FACTORS

Awkward Posture

- As the wrist is bent, the tendon sheaths rub against the walls of the carpal tunnel. The further the wrist is bent, the more friction experienced in the tendon sheaths.

Static Posture

- When the wrist is held in a bent position, the tendon sheaths are under constant stress. If the duration of constant stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

Vibration

- Exposure to vibration, through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and frequency influence the amount of mechanical stress.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool and Equipment Handles

- Loading on the hands and fingers is increased when the grips are too small and have non-pliable material with sharp edges.
- Wrist postures may become more awkward when controls have too much play.

Environmental Conditions

Cold Exposure

- Loading on the wrists may increase if the operator is exposed to cold temperatures. Decreased sensitivity in cold hands may result in over- gripping.

CONSEQUENCES

- Holding the wrist in a bent position may lead to irritation and damage in the tendon sheaths.
- Signs and symptoms include pain, tenderness, and inflammation in the wrist area.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Hand/Finger, please see the column labelled “Hand/Finger” in the Summary of Solutions on pages 87 to 89.

LOW BACK

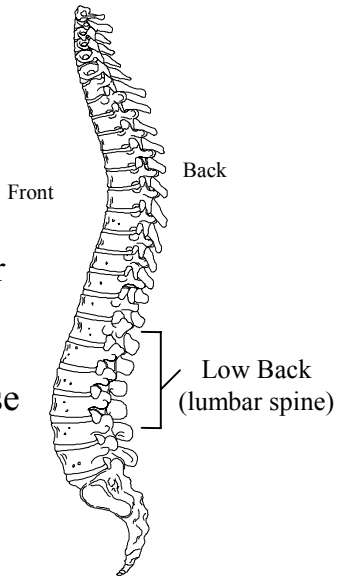
Direct Risk Factors:
Awkward Posture
Static Posture
Vibration

A Bobcat Operator may sit for prolonged periods on a vibrating surface.

BACKGROUND INFORMATION

- The spine is made up of 33 bones called vertebrae. Each of these vertebrae is specially designed to protect the spinal cord and provide support for the back. Between each of the vertebrae are discs. Discs have tough elastic walls that are filled with a watery gel-like substance. These discs are like jelly donuts; when they are pressed down on one side, the other side bulges and puts increased pressure on the wall of the disc. To maintain an even distribution of pressure across the discs, the spine has to be kept in the neutral posture. Sitting will cause the pelvis to rotate out of a neutral posture, as the lumbar spine will flatten.

Neutral Spine



DIRECT RISK FACTORS

Awkward and Static Posture

- Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury.

Vibration

- Whole body vibration is usually transmitted through the seat into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs.

INDIRECT RISK FACTORS

Workstation Design

Seating

- Loading on the back is increased when seating is poor or is not properly adjusted and maintained.

Work Organisation

Task Variability

- Exposure to vibration is increased when task variability is low. Workplaces that require operation of Bobcats for an entire shift increase the exposure to low back loading and vibration.

CONSEQUENCES

- Continually sitting on a vibrating surface may lead to deformation in the disc walls and accelerated degeneration of the tissues.
- Signs and symptoms include muscle spasm and sharp or radiating pain in the back and/or lower extremities.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 87 to 89.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

KNEE

Direct Risk Factors:
Awkward Posture
Static Posture
Repetition

A Bobcat Operator must constantly activate foot pedals with the knees bent.

BACKGROUND INFORMATION

- Muscles in the front of the thigh that attach near the knee (quadriceps) contract when activating foot pedals. At the knee joint, the kneecap (patella) is held in place over the thighbone (femur) by these muscles which are attached to connective tissue. When the leg is straight, there is little or no contact between these two bones. However, as the knee bends, the muscles will contract more, and contact stress will increase between the kneecap and the thigh bone.

DIRECT RISK FACTORS

Awkward and Static Posture

- Bending the knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees.

Repetition

- Repeated activation of foot pedals may gradually irritate the knee.

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the knee is increased when the cab is too small for the operator, leading to increased bending of the knee.

CONSEQUENCES

- Repeated or continuous activation of foot pedals could cause inflammation under the kneecap, which may cause pain and may change the mechanics of kneecap tracking. Changes in kneecap tracking may lead to premature wear of the knee cap and/or the thigh bone.
- Signs and symptoms include muscle wasting around the inner knee, creaking in the knee, and chronic pain if left unchecked.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Knee, please see the column labelled “Knee” in the Summary of Solutions on pages 87 to 89.
- For exercises that could help to prevent ***knee*** injuries, see the ***Knee section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Bobcat Operator must repeatedly turn their head to the side when driving.

SHOULDER

- A Bobcat Operator manipulates levers in order to manoeuvre the Bobcat.

WRIST

- A Bobcat Operator continuously grips controls when manoeuvring the Bobcat.

LOW BACK

- A Bobcat Operator may sit for prolonged periods on a vibrating surface.

KNEE

- A Bobcat Operator must constantly activate foot pedals with the knees bent.

Risk Factors by Body Part

Direct Risk Factors	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Finger	Low Back	Hip	Knee	Ankle/ Foot	Foot
Force			✓								
Repetition	✓		✓						✓		
Awkward Posture	✓		✓		✓		✓		✓		
Static Posture					✓		✓		✓		
Contact Stress											
Vibration – Whole body*							✓				
Vibration – Hand Transmitted*					✓						

Indirect Risk Factors		Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Finger	Low Back	Hip	Knee	Ankle/ Foot	Foot
Duration*	Duration	✓		✓		✓		✓		✓		
Workstation Design	Working Reaches			✓								
	Working Heights											
	Seating							✓				
	Floor Surfaces											
Characteristics of Objects Being Handled	Size and Shape											
	Load Condition and Weight Distribution											
	Container, Tool and Equipment Handles					✓						
Environmental Conditions	Heat Exposure	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Cold Exposure	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Lighting	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Noise	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Vibration**	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Work Organisation	Work-Recovery Cycles	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Task Variability	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Work Rate	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

** Extended exposure to <u>any</u> risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual*
*** Vibration is categorised under both direct and indirect risk factors. Vibration can directly increase the likelihood of injury to the back and wrist as well as indirectly (environmental conditions) promote injuries in other parts of the body.*

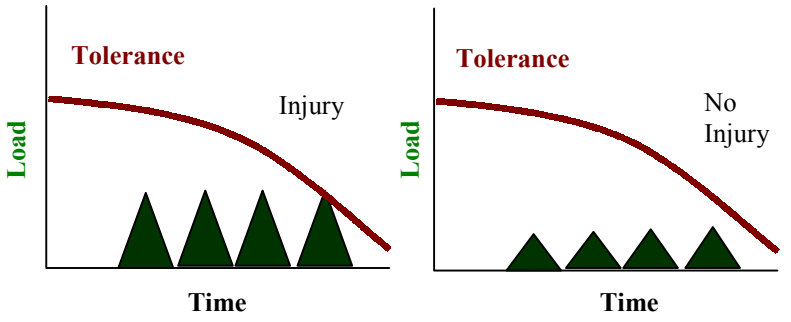
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = Indicates that the risk factor assessed is commonly found in sawmills, and may need to be addressed at your mill. See the appropriate section of the General Risk Factor Solutions Manual for more information.

✓ = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 87 to 89 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

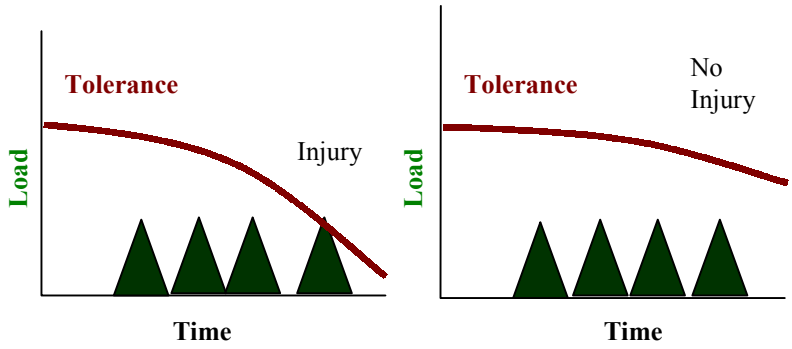
Injury Prevention

Injuries are prevented by …
Decreasing loads and increasing tissue tolerances



Injuries may be avoided by decreasing the size of the loads on the tissue.

Example – using a torque multiplier wrench to loosen bolts.



Injuries may be avoided by increasing tissue tolerances, and allowing the body to endure more loading.

Example – using maintenance exercises to strengthen tissues.

Suggested Solutions

The previous page explains how injuries may be prevented by decreasing the load on a tissue or by increasing the tissue tolerances. The Injury Prevention section of the Work Manual provides possible solutions that can be implemented to decrease the size of the loads on the tissues.

Each of the solutions described in the Work Manual has a risk control icon. The Risk Control Key provides guidelines on how to distinguish between different types of risk controls. Generally, engineering, administrative, and work practice controls are considered more effective than the use of personal protective equipment to decrease the risk of musculoskeletal injuries.

The focus of the Injury Prevention section is on solutions developed following the ergonomic investigation of the Bobcat Operator job. The solutions are presented under the headings of Workstation Design, Characteristics of Objects Being Handled, Environmental Conditions, and Work Organisation.

The Summary of Solutions table provides a quick reference guide to solutions for specific body part problems.

Please note that the information provided in the Body Manual addresses the issue of injury prevention in terms of increasing tissue tolerances through exercise. This information is not provided in the Work Manual.

Risk Control Key

Risk control measures (solutions) are commonly grouped into four categories:

E

ENGINEERING CONTROLS

These include physical changes to workstations, equipment, materials, production facilities, or any other relevant aspect of the work environment, that reduce or prevent exposure to risk factors.

A

ADMINISTRATIVE CONTROLS

These include any change in procedure that significantly limits daily exposure to risk factors, by control or manipulation of the work schedule or manner in which work is performed. Administrative controls include, but are not limited to, job rotation, rest breaks, alternative tasks, job enlargement, redesign of work methods, and adjustment of work pace or output. Some models of risk control include work practice controls within this category.

WP

WORK PRACTICE CONTROLS

These include techniques used to perform the tasks of a job, such as reaching, gripping, using tools and equipment, or discarding objects, etc. Education and training are an integral part of work practice controls.

PPE

PERSONAL PROTECTIVE EQUIPMENT

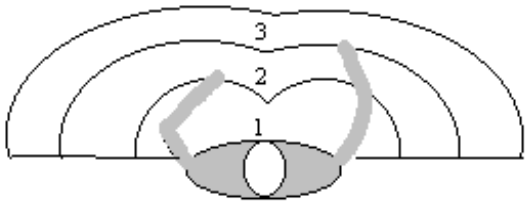
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

On the following pages, the icons next to the solution options indicate the type of risk control.

Workstation Design

WORKING REACHES

A working reach that is too far for the worker will require stressful shoulder, elbow, wrist, and back postures. Reaching to the side, behind, or too far in front of the body can put stress on the smaller muscles. Ideally, working reaches should be within a normal reach envelope, as laid out below, with the controls and materials that are handled most often closest to the body. It is also ideal to have controls that perform similar or combined functions grouped together to decrease awkward postures that may otherwise occur.



1 = Controls/items most frequently used
2 = Controls/items less frequently used
3 = Controls/items least frequently used

Generally, the most frequently used items should be placed within a forearm's reach, with less frequently used items placed within a comfortable arm's reach, and infrequently used items placed within a fully extended arm's reach. For more specific recommendations on working reaches, please consult anthropometric tables or an ergonomist.

Control distance

E
WP

In order to reduce loading on the neck and shoulder, keep controls close to the body by moving the seat forward on slide tracks and/or extending controls into safe reach envelopes. This adjustability is important to accommodate operators of different sizes. The following pictures illustrate how the adjustable seat mechanism can allow an operator to move closer to any controls.

Extended reach to steering wheel.

Steering wheel within safer reach envelope.

Good driving posture

WP

In order to reduce loading on the neck and back, encourage workers to adopt good driving postures. Place back against the backrest, and avoid a static head forward posture where the head and eyes are continually pointed down at ground level work. The following pictures illustrate how to establish a good driving posture.

Slouching while driving.

Good driving posture.

Range of motion in controls

E

In order to reduce loading on the shoulder, limit the amount of travel in the levers to manoeuvre the Bobcat.

Larger control movements increase stress on the shoulder joint. Excessive movement or play may increase the risk of injury.

Research mobile equipment with operators

A

Operators can effectively identify potential challenges with awkward and static postures through an equipment trial period prior to purchasing. Most equipment dealers support such a trial period. Investigating mobile equipment with Bobcat Operators will minimise the need to retrofit equipment.

WORKING HEIGHTS

A working height that is too high for the worker will require stressful shoulder and arm postures, while a height that is too low will require stressful bending of the neck and trunk. The height of a work surface should allow room to change position and move the legs and feet (WCB Draft Ergonomic Regulations, 1994).

The ideal workstation is height adjustable, allowing a large percentage of the population to adjust the work surface height to suit their dimensions

To determine the appropriate work height specific for the Bobcat Operator, identify the body part of most concern. If the main concern is the:

Neck - minimise forward bending of the neck by increasing working height.
Shoulders - minimise elevation of the arms by lowering working height.
Low Back - minimise forward bending of the back by increasing working height.

For more specific guidelines on matching the working heights with the tasks performed please consult anthropometric tables or an ergonomist.

Arm supports

E In order to reduce awkward and static postures of the neck/shoulder and wrist when operating controls, consider the height of the controls and arm supports. An operator's elbows and forearms should sit comfortably on the arm supports with the shoulders relaxed and the wrists free for using controls. Arm supports that are well-padded are preferred. The support provided by these arm supports reduces muscle tension and fatigue in the neck and shoulder.

WP Bobcat Operators should be encouraged to use the arm supports to relax the muscles in the neck/shoulder region when there is a break in the workload. Placing the elbows and forearms on the arm supports while taking these microbreaks will allow working muscles to recover and repair.

Stepping down

WP

To significantly reduce loading on the back, avoid jumping down from equipment. After prolonged exposure to vibration in a static posture, the spine is more susceptible to an acute injury resulting from the impact of jumping down.

Ensure that you have secure foot and hand placement as you lower yourself off the machinery. Safe locations for hand and foot placement should be well-marked.

Climbing into cab

E
WP

Handholds should be low enough so that operators do not have to jerk themselves upward, which can place large loads on the shoulders when they are in a flexed position.

SEATING

Bobcat Operators are required to sit when operating the equipment. Sitting for long periods of time increases the load on the spine, which stresses the ligaments and discs of the low back. The load is increased when the operator does not maintain a neutral spine (see Injury Education for the Low Back on page 57).

Lumbar support

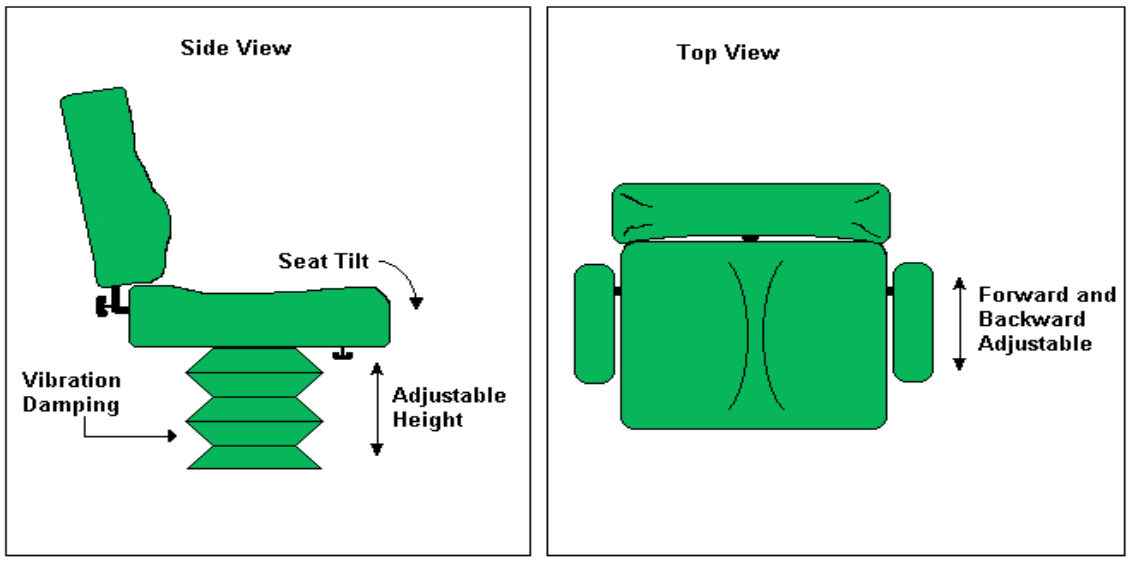
E

To improve the posture of the low back, install seats with good lumbar support. Seats that wrap around the low back and encourage proper posture, helping to maintain the curve of the lower back, have good lumbar support. Padded lumbar cushions can also be added to existing seats.

Adjustable seating

E
WP

In order to minimise awkward and static postures of the low back, seating should have several adjustable features to accommodate various operators, and allow for continual postural adjustments. The small size of a Bobcat makes it more difficult to include these seat features, but they should be included where possible.



- ★ Seating should have adjustable lumbar support
- ★ Seats should be adjustable forward/backward and up/down
- ★ Seats should have seat pans which tilt forward and backward
- ★ Seats should be air-ride, or have vibration damping cushions
- ★ Seats should be covered with a breathable, non-slip material

Vary body posture

WP

In order to reduce awkward and static postures in the low back encourage the Bobcat Operator to get up from the seated posture throughout the day. This alleviates the load on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting.

Seat maintenance

E
A
WP

Vehicle seats and supports are the only layer of protection between an operator and the whole-body vibration transmitted from mobile equipment. In many cases, the seat also provides the only suspension between the user and the vibration and impact from rough terrain. For these reasons, seats need to be properly maintained to help prevent injuries.

Seat maintenance should begin when a new piece of mobile equipment is being ordered. Many equipment manufacturers offer a selection of seats. Use the information on the previous page to select a seat that satisfies your ergonomic criteria. Where possible, have the intended operators try several different seat styles before deciding on a seat design. If the manufacturer does not offer seats of suitable quality, it might be necessary to order a custom seat. Remember: heavy equipment manufacturers do not specialise in ergonomic seat design. Good quality seats may require separate ordering and installation.

Any new seat should come with a clear set of instructions for adjustment and use. Photocopy a set of these instructions for each operator, and laminate another copy for prominent storage in the vehicle cab. Make sure all operators are familiar with the purpose and use of all seat features.

Regular seat maintenance

Regular vehicle seat maintenance should follow a schedule based on duration of use, similar to engine maintenance. At the prescribed time, all components of the seat should be inspected for wear, and damaged parts should be replaced. This inspection should include seat suspension, seat cushioning, seat covering, and arm supports. Seats should be replaced when they are too worn, or when they can no longer be repaired to safe working levels. Seats, like work boots, have a lifespan limited by their daily exposure to vibration, shock impact, and continuous load bearing.

Daily inspection of seat

Seat users should also be responsible for ongoing maintenance. A short daily inspection of the vehicle seat could identify wear or damage before it becomes a major problem. Keeping the seat and cab as clean as possible and regularly using all adjustments on the chair can also help to minimise uneven wear and prevent damage.

Adjust seat spring

WP In order to reduce vibration transmitted to the low back, operators should adjust seat spring to an appropriate level.

Many Bobcats have spring-damped seats. If the seats are too stiff more vibration may be transmitted from the seat to the back.

Seat belts

WP In order to improve the posture of the low back, encourage the Bobcat Operator to use a seat belt.

Safety regulations state that vehicle operators have to wear a seat belt. These seat belts can also be useful in helping to maintain lumbar curve by holding the low back against the seat and avoiding slouching.

Brace upper body

WP In order to reduce jarring on the spine, use the arms to brace the upper body against the restraint bar.

Some Bobcat Operators use their arms to brace their upper body to minimise jarring over rough terrain.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Yard maintenance

A

In order to reduce loading on the back from whole body vibration, maintain the yard and repair potholes.

Equipment maintenance

A

In order to reduce loading on the back from whole body vibration from jerky movements, maintain the machine properly and allow the machine to warm-up first.

Tire maintenance

E
A

In order to reduce loading on the back from whole body vibration:

- Ensure tires are properly inflated
- Look at the type of tread on the tires – knobby tires may increase vibration when driving on hard surfaces
- Install radial instead of ply tires for better control and less vibration

Tire pressure can effect vibration transmitted to the low back.

Control bobcat speed in yard

WP

In order to reduce loading on the back from whole body vibration caused by excessive bouncing, control the speed of the Bobcat when driving through the yard.

Force to activate foot pedals

E

To reduce loading on the knee, decrease the force required to activate foot pedals. It is important to ensure pedals are kept clean of debris and are well-maintained.

Foot pedals and floor areas should be free of obstruction.

Foot pedal maintenance

E
A

To reduce loading on the knee from activating foot pedals, remove debris under the pedals, and lubricate the rockers on the pedals to ensure they move freely.

To reduce the force required to maintain foot contact and activate foot pedals, maintain the rubber covering on the pedal.

Knee angle

WP To reduce the loading on the knee, move the seat back or increase the seat height. This change will straighten the leg and make it easier for the muscles above the knee to perform work.

Knee in flexed position while operating foot pedals.

Safer knee position for operating foot pedals.

The position of any vehicle seat needs to be a compromise of close reaches to minimise shoulder fatigue and adequate separation distance to minimise knee angle. Alternating between positions will more evenly distribute loading between the tissues.

Windshield wipers

E

To improve visibility and reduce awkward neck postures, install and maintain windshield wipers on both the front and back windows. This should be a clearly outlined job duty for either the Bobcat Operator or the Heavy Duty Mechanic.

Window cleaning

A

To improve visibility and reduce awkward neck postures, clean windows regularly. Hinged window caging can be opened to make cleaning more convenient.

Additional Work Practices

Hourly stretch breaks

WP In order to improve the body's tolerance for work, encourage Bobcat Operators to take stretch breaks every hour. Stretches should be done with the vehicle off and safely parked. Make sure that the ground is flat and dry for personal safety. Suggested stretches are listed below.

To help relax back muscles, stretch the low back by hanging off the equipment. Place feet at 45 degrees and bend the knees, keeping the low back straight. This will stretch one side of the back. Alternate sides.

To improve the posture of the low back when driving, stretch the back of the legs by putting one foot on the bucket. Keep the back straight and bend at the hips. Stretch each leg for 30 seconds after each hour of work.

To help relax neck muscles, stretch the neck for 30 seconds each side after every hour of driving. Reach for the ground or hold onto equipment and turn head slightly to the side. Stretch by lowering the head. Avoid overstretching.

To reduce loading on the neck from poor posture, perform the wall exercise 4 times for 15 seconds after every hour of driving. Re-align the spine by placing the feet out from the wall, and flattening the low back against the wall. Bend the elbows to 90 degrees, with the hands and wrists above shoulder height. Press the forearms back against the wall. Keep chin tucked in.

When time permits these stretches would complement the suggested hourly stretches.

Chin Tuck

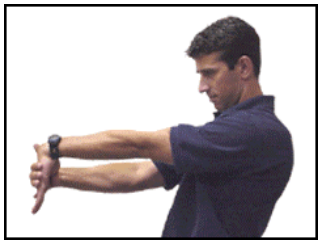
With your head upright, tuck chin in. You should feel a gentle stretch, in the back of the neck. Hold for 20 seconds and then relax. Repeat 3 times.

Shoulder Stretch

Gently pull elbow towards opposite shoulder, keeping both shoulders relaxed. You should feel a mild stretch in the back of the shoulder. Hold for 5 seconds. Repeat with the other arm.

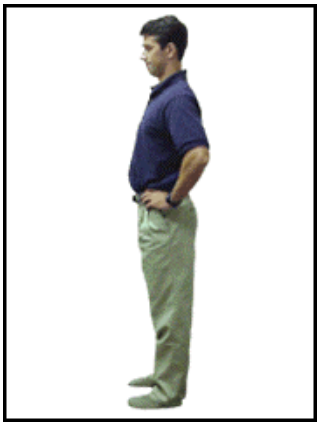
Wrist Flexor and Extensor Stretch

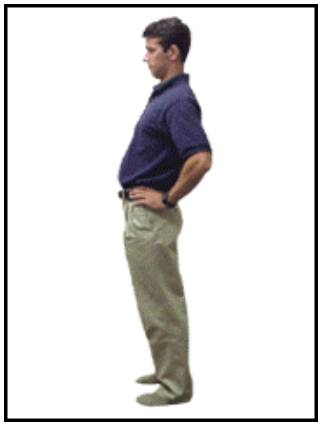
With your arm extended and fingers pointing up, gently pull hand towards your body until you feel a mild stretch in the forearm. (**Note**: do not stretch to the point where you feel pain or tingling). Hold for 15 – 30 seconds. Repeat with fingers pointing down. Repeat with the other arm.



Back Extension

Start by standing in an upright position (the back is in neutral posture). Lean backwards slightly, pushing the hips gently forward. Hold for 5 seconds. Repeat 3 times.





Alternate looking over shoulders

WP To avoid muscle imbalance in the neck and shoulders, try to alternate looking over each shoulder while driving backwards.

Characteristics of Objects Being Handled

SIZE AND SHAPE

Split bucket

E

In order to reduce time required to clean-up, install a split bucket. More effective clean-up methods can minimise the time spent sitting in the Bobcat. A split bucket may only be suitable for some tasks – study the typical use of the Bobcat at your mill before proceeding with this suggestion. Handling larger debris with a split bucket can also reduce loading on the back from manual material handling.

Some Bobcat Operators use a split bucket to handle larger debris.

Lever controls

E

In order to minimise contact stress on the hands controls should have cylindrical rather than ball shaped handles. This would allow for a more even distribution of contact with the lever. Grips should be made of a material that allows for good contact and is not slippery (e.g., bike handle foam coverings). Regardless of the shape of the lever control, the wrist should remain in a neutral position as often as possible.

Contoured lever grips are preferred to reduce contact stress and promote neutral wrist postures.

Hard lever handles can lead to contact stress.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Maintain neutral postures

WP

In order to reduce awkward postures of the wrist maintain a neutral posture (straight wrist) whenever possible while operating lever controls.

Padding for levers

E

In order to reduce stress to hands, place foam covers on control handles. These covers reduce contact stress and damp vibration transmitted to the hands.

Gloves

PPE

In order to reduce grip forces required by the Bobcat Operator, the operator should wear thin, close fitting gloves with a "sticky" palm surface to increase the friction between the gloves and control levers. For open-cab Bobcats, well-insulated work gloves may be required for winter work.

Environmental Conditions

Flood lighting

E

To improve visibility at night, install high-power floodlights on the front and back of the Bobcat to ensure adequate lighting. External floodlights on frequent work areas (e.g, log yard, gravel depot) can also improve visibility.

Winter clothing

PPE

In order to reduce loading on the wrists from overgripping, Bobcat Operators should be encouraged to wear proper winter clothing, including well-insulated gloves, when working in cold temperatures.

Reduce glare

PPE

To minimise awkward neck postures due to glare, operators may wear sunglasses, or windows can be treated to filter sunlight.

Work Organisation

Task variability

A WP

In order to reduce exposure to risk factors associated with Bobcat Operators, workers should vary tasks throughout their shift. Taking short breaks to get out of the cab and stand will help to re-align the spine.

Please refer to the General Risk Factor Solutions Manual for solutions regarding Environmental and Work Organisation risk factors.

Summary of Solutions

Refer to the table below to help determine which solution alternatives will aid in addressing risk factors in the particular body parts of concern.

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Finger	Low Back	Hip	Knee	Ankle	Foot
Control distance	**68**	**A**		**A**				**A**				
Good driving posture	**68**	**A**		**A**				**A**				
Range of motion in controls	**69**			**A**		**A**						
Research mobile equipment with operators	**69**	**A**		**A**		**A S**		**A S**		**A S**		
Arm supports	**70**			**A**								
Stepping down	**71**							**V**				
Climbing into cab	**71**			**F**								
Lumbar support	**72**							**A**				
Adjustable seating	**73**			**A**				**A S**				
Vary body posture	**73**			**R A**				**A S**				
Seat maintenance	**74**							**V**				
Adjust seat spring	**75**							**V**				
Seat belts	**75**							**A**				

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Posture*
S = *Static Posture* **C** = *Contact Stress* **V** = *Vibration*

Summary of Solutions

Refer to the table below to help determine which solution alternatives will aid in addressing risk factors in the particular body parts of concern.

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Fingers	Low Back	Hip	Knee	Ankle	Foot
Brace upper body	**75**							**A V**				
Yard maintenance	**76**							**V**				
Equipment maintenance	**76**							**V**				
Tire maintenance	**76**							**V**				
Control bobcat speed in yard	**76**							**V**				
Force to activate foot pedals	**77**									**A S**		
Foot pedal maintenance	**77**									**A S**		
Knee angle	**78**									**A S**		
Windshield wipers	**79**	**A**										
Window cleaning	**79**	**A**										
Hourly stretch breaks	**80**	**A R**		**A R**		**A S V**		**A S V**		**A S R**		
Alternate looking over shoulders	**82**	**A R**										
Split bucket	**83**			**F A**				**A**				

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Posture*
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Summary of Solutions

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		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Fingers	Low Back	Hip	Knee	Ankle	Foot
Lever controls	**83**					**A**						
Maintain neutral postures	**84**					**A**						
Padding for levers	**84**					**V**						
Gloves	**84**					**V**						
Flood lighting	**85**	**A R**						**A S**				
Winter clothing	**85**					**A**						
Reduce glare	**85**	**A**						**A S**				
Task variability	**86**	**A R**		**F A R**		**A S V**		**A S V**		**A S R**		
Heat Exposure	◆	indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Job Rotation	◆	indirectly reduces risk of injury to the body										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Posture*
S = *Static Posture* **C** = *Contact Stress* **V** = *Vibration*
◆ = *See General Risk Factor Solutions Manual*

BOBCAT OPERATOR MSI SAFETY GUIDE

OBJECTIVE:

To identify ergonomic risks involved in the Bobcat Operator position, and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Bobcat Operator.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Bobcat Operator must repeatedly turn their head to the side when driving.	**Awkward Posture** **Repetition**	• Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons. • When the head is repeatedly turned to the side, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury.	• Alternate looking over both shoulders when driving backwards. • Clean windows regularly. • Stretch neck to relax neck muscles after extended periods of driving. Reach for the ground or hold onto equipment and turn head slightly to the side. Lower the head to stretch. Avoid overstretching. • Re-align the spine by placing the feet out from the wall, and flattening the low back against the wall. Place the arms at 90 degrees and press the forearms back against the wall. Keep chin tucked in. Perform the wall exercise for 15 seconds four times after every hour of driving. • For more exercises that can help prevent ***Neck*** injuries, ***see the Neck section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder A Bobcat Operator manipulates levers in order to manoeuvre the Bobcat.	**Force** **Awkward Posture** **Repetition**	• The rotator cuff stabilises the shoulder joint when objects are manipulated. The larger the force required, the greater the load on the rotator cuff. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff. • If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.	• Avoid “resting" the hand on controls or gearshift. Use armrests - when properly adjusted they keep the shoulder in a more neutral position • Adjust the distances between the seat and driving controls. Position yourself to allow for neutral or near neutral postures of the shoulders. The shoulders should be relaxed and the elbows close to the body. • To stretch the shoulder, hang onto the machine and turn the body until a gentle stretch is experienced in the back part of the shoulder. • For more exercises that can help prevent ***Neck*** and ***Shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist A Bobcat Operator continuously grips controls when manoeuvring the Bobcat.	**Awkward Posture** **Static Posture** **Vibration**	• As the wrist is bent, the tendon sheaths will rub up against the walls of the carpal tunnel. The farther the wrist is bent, the more friction experienced in the tendon sheaths. • When the wrist is held in a bent position, the tendon sheaths are under constant stress. If the duration of constant stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • Exposure to vibration, through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and vibration frequency influence the amount of mechanical stress.	• Maintain neutral wrist postures when operating controls. • Release the hand from the controls whenever it is possible. • Sit back and use armrests when there is a break in the workflow. • Protect the base of the hand - try to keep minimise contact stress in this area. • Operators should be encouraged to wear proper winter clothing, including well-insulated gloves, to reduce over-gripping. • For exercises that can help prevent ***Wrist*** injuries, ***see the Wrist section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Bobcat Operator may sit for prolonged periods on a vibrating surface.	**Static Posture** **Vibration**	• Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury. • Whole body vibration is usually transmitted through the seat into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs.	• Remember to wear your seatbelt, both for safety and as a reminder to improve posture. • Use the arms to brace the upper body against the restraint bar. This will reduce jarring in the spine. • Control Bobcat speed to reduce bouncing, and exposure to whole body vibration. • In order to reduce loading on the back from whole body vibration, ensure tires are properly inflated and maintained. • Know how to adjust your seat, including the suspension. • Identify wear and damage of your seat before it becomes a major problem. • When getting out of the cab, climb down instead of jumping down. Jumping down from the cab, particularly after a long period of driving, can cause injury because the prolonged seated posture has already stressed the tissues of the low back.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back (continued)			• Get up from the seated posture throughout the day, and stretch when possible. This alleviates the load on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting. • To help relax back muscles, stretch the low back while hanging onto the equipment. Place feet at 45 degrees and bend the knees, keeping the low back straight. This will stretch one side of the back. Alternate sides. • To improve driving posture, stretch the back of the legs. Put one foot on a raised surface. Keep the back straight and bend at the hips. Stretch each leg for 30 seconds. • For more exercises that can help prevent ***Back*** injuries, ***see the Back section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Knee A Bobcat Operator must constantly activate foot pedals with the knees bent.	**Awkward Posture** **Static Posture** **Repetition**	• Bending the knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees. • Repeated activation of foot pedals may gradually irritate the knee	• To reduce loading on the knee, place the foot properly on the pedal. Pushing lower on the pedal increases the force required to activate the pedal. • To reduce the loading on the knee, move the seat back or increase seat height. This change will straighten the leg and make it easier for the muscles above the knee to work. • Remove debris from under foot pedals, and lubricate the rockers on pedals to ensure they move freely, reducing loading on the knee. • Avoid jumping down from the vehicle. • For exercises that can help prevent ***Knee*** injuries, ***see the Knee section of the Body Manual***.