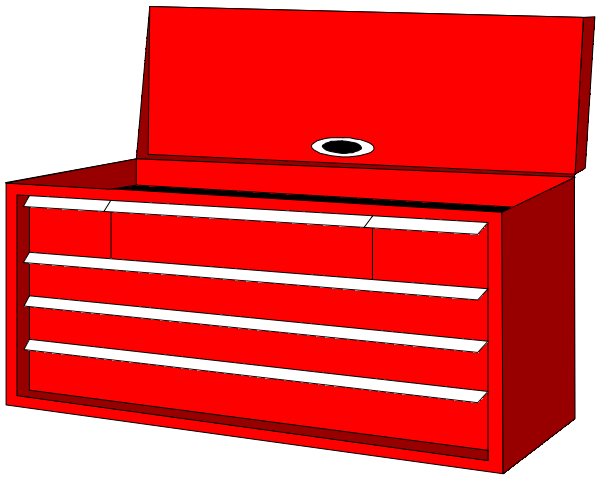
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Forklift 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

FORKLIFT TOOL KIT
Table of Contents

Overview

Forklift Operator

Job Summary

The Forklift Operator is responsible for the transportation of loads of lumber to and from various workstations, and for piling and separating products. The operator uses multiple controls to perform these tasks. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Forklift Operator may include:

a) Repetitive motions of the neck, shoulders, arms, and wrists
b) Awkward postures of the neck, shoulders, wrists, and back
c) Continual sitting
d) Climbing onto and off of the forklift
e) Lifting and lowering of dunnage
f) Carrying dunnage/carrier blocks
g) Walking

Mental Demands

The Forklift Operator must continuously concentrate on what is happening in the lumberyard while simultaneously operating the forklift. The operator must have the co-ordination and training to be able to operate the forklift safely and efficiently under these conditions.

Major Variations

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

1) The Forklift Operator may operate the forklift to:
   a) Load or unload truck or rail cars
   b) Load lumber into and out of kilns
   c) Load infeed chains to the mill
   d) Unload outfeed chains from the mill
   e) Move loads of lumber around the mill yard

2) The operator may also:
   a) Move dunnage
   b) Move carrier blocks

Minor Variations

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

1) The pace that the operator works depends upon the mill. The work pace range found is 100-350 loads/shift. This pace may be:
   a) Dependent upon the dwell area
   b) Group-paced
   c) Self-paced

2) The types of controls in the forklift may include:
   a) Levers
   b) Foot pedals
   c) Steering wheel knobs

Physical Demands Analysis
Forklift Operator

PDA General Instructions: Forklift Operator

This Physical Demands Analysis (PDA) identifies the physical demands of the Forklift Operator as assessed by IMIRP ergonomists. The information reported was collected from a sample of Forklift Operators in the BC Sawmill Industry. Where possible, state-of-the-art equipment and techniques were used in data collection and analysis to increase accuracy. However, some information is based on third party comments that are often subjective and not subject to verification.

Subsequent changes to the work process may reduce the validity of any pre-existing physical demands analysis. The IMIRP Society accepts no responsibility for the use or misuse of the Physical Demands Analysis, or for the accuracy of the PDA as it applies to any specific workplace.

To make the PDA specific to your workplace, determine which of the tasks identified are present in your mill. For each section, check off the items (e.g., tasks, tools, etc.) listed that reflect the Forklift Operator job at your mill.

Rehabilitation professionals are encouraged to verify and update critical information through the client and through workplace sources to ensure that the content (e.g., tasks, weights of objects handled, etc.) accurately reflects the job.

This PDA was generated from information collected in 1997.

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 Supervisor 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.

PDA Table of Contents

Physical Demands Analysis
Forklift Operator

Task List

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

Load forklift

A Forklift Operator judges how wide the forks should be in order to load a forklift. Fork movement is activated by controls within the cab.

Does this task occur at your mill?

☐ Yes ☐ No

Drive forklift

Once lumber is loaded, a Forklift Operator drives the forklift to its destination.

Does this task occur at your mill?

☐ Yes ☐ No

Unload forklift

A Forklift Operator unloads a forklift using controls to raise and lower the loads.

Does this task occur at your mill?

☐ Yes ☐ No

Manually handle items

A Forklift Operator moves dunnage.

Does this task occur at your mill?

☐ Yes ☐ No

A Forklift Operator moves carrier blocks.

Does this task occur at your mill?

☐ Yes ☐ No

Company Profile

Company Name: _____ Division: _____

Number of Employees: _____ Turnover in last 12 months: +/- _____ or ____ %

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

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

Work Organisation

Task Description

The table below contains a list of tasks performed on an everyday basis by a Forklift Operator.

Indicate each of the tasks performed at your mill by placing a check mark (✓) in the far left column.

Note the corresponding values for the percentage of the shift spent performing the task (Percentage of Shift) as found during the ergonomic investigation. The Comments section may be used to elaborate on the task description (i.e., variations between mills, frequencies, cycle times, etc.)

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Load forklift		✓			• *Cycle time = Approximately 1 to 2 minutes*
	Drive forklift			✓		• *Cycle time = Approximately 2 to 5 minutes*
	Unload forklift		✓			• *Cycle time = Approximately 1 to 2 minutes*
	Manually handle items		✓			• *Cycle time = Approximately 5 to 10 minutes*
	Other:					

Organisational Factors

The table below contains a list of organisational factors for a Forklift Operator. For each of the items, place a check beside the statements (i.e., 30 minute lunch) that reflect the situation at your mill. Additional check boxes have been provided for you to enter your mill-specific information if it is not stated.

For the last item, if the job has scheduled job rotation (i.e., rotate from one job to another during a shift) check 'Yes' and then write in the jobs the worker rotates to and how often these rotations occur. If you do not have job rotation for this job, check 'No'.

Length of shift	☐ *8 hours* ☐
Formal breaks	☐ *Two 10 minute breaks* ☐ *30 minute lunch* ☐
Informal breaks	☐ *5 to 30 minutes, depending on flow of wood* ☐
Work pace	☐ *100 to 350 loads per shift* ☐
Work pace control	☐ *Self paced or group paced* ☐ *Dwell area* ☐
Job rotation ☐ Yes *(Check one)* ☐ No	If **Yes:** Rotation with what job(s):_____ _____ How often: (e.g., every 2 hours)_____

Workstation Characteristics

Dimensions & Layout

Indicate the specified dimensions of the workstation to the nearest centimetre. Please refer to Figure 1 for the measurement locations.

Workstation Dimensions	
(A) Height of stairs into the forklift	cm
(B) Chair height	cm

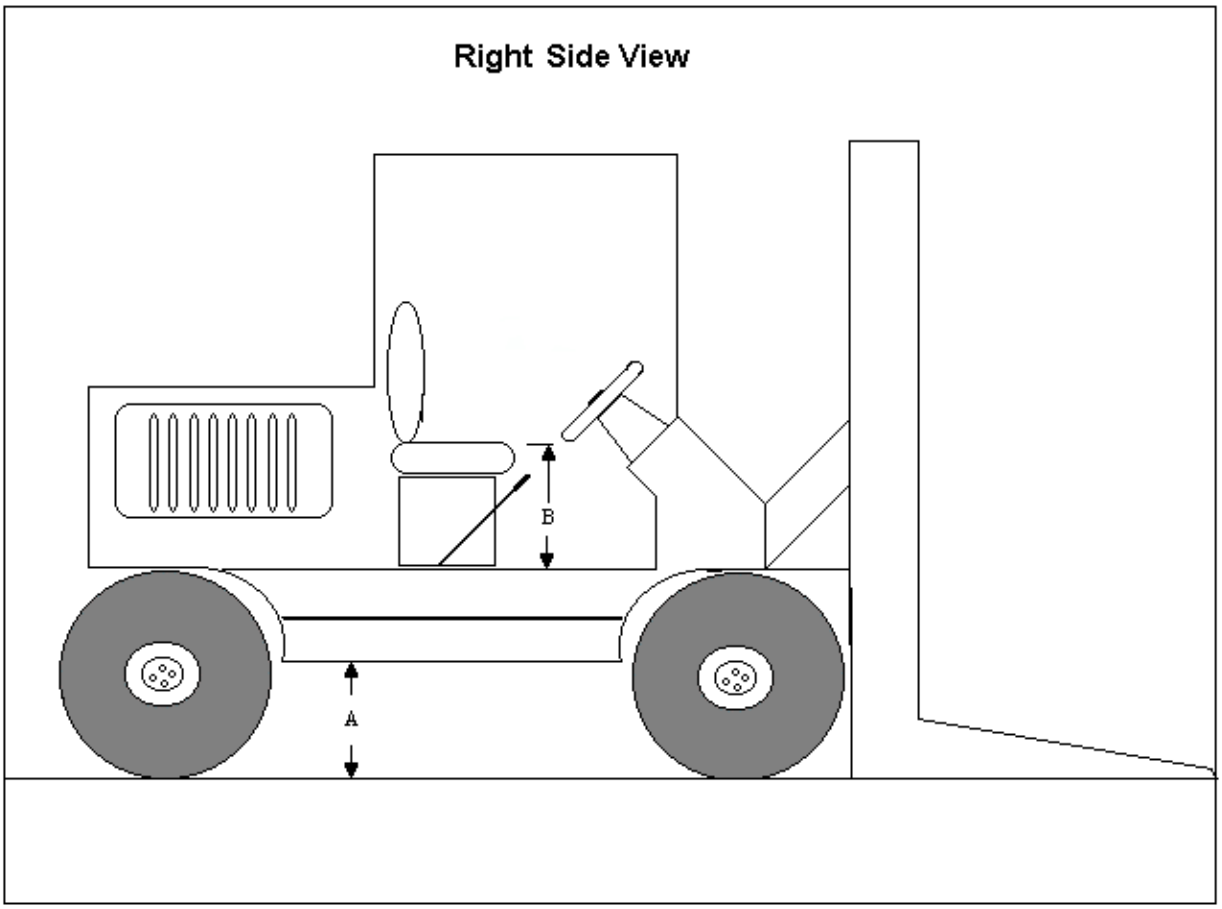


Figure 1: Forklift

Flooring, Displays and Seating

The table below lists components of the workstation. For **Flooring** and **Displays** there are several options provided. Please indicate all of the options, which apply to the workstation at your mill.

For the **Seating** section, first indicate whether seating is present at the workstation and then continue by elaborating on the features of the seating.

Workstation Characteristics	
Flooring	*Check all that apply* ☐ Cement ☐ Wood ☐ Rubber Matting ☐ Metal ☐ Other (e.g., tile, carpet) _____
Displays	*Check all that apply* ☐ Lights on Console ☐ Mirrors ☐ Video Monitors ☐ Computer Monitors ☐ None ☐ Scrolling Display ☐ Signal Lights ☐ Other _____
Seating: ☐ Yes *(Check one)* ☐ No	☐ Sit/stand ☐ Office ☐ Industrial ☐ In-house Design Height of seat: _____cm Depth of seat: _____cm Width of seat: _____cm
	Check all that apply ☐ Armrests ☐ Backrest ☐ Swivel Seat ☐ Slide track ☐ Castors #_____ Covering type: _____ Seat adjustable? ☐ Yes ☐ No If yes, adjustable: ☐ Height ☐ Armrests ☐ Backrest ☐ Forward tilt

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Forklift Operator.

Indicate the controls which are present at your mill by placing a check mark (✓) in the far left column. Indicate their corresponding functions by checking off the applicable box(es).

The Comments section may contain information, which describes variations between mills.

	Type of Control	Function	Frequency	Comments
	Lever	☐ *Fork controls (up, down, left, right, clamps)*	*Approximately 6 times per minute*	• *Frequency dependent on the number of loads handled*
		☐ *Gear shift – forwards (1st, 2nd, 3rd), reverse*		• *Frequency is dependent on the need of use, road conditions, workload, driving speed, etc.*
	Foot pedal	☐ *Clutch, accelerator, brake*		• *Frequency is dependent on the need of use, road conditions, workload, driving speed, etc.*
	Steering wheel/knob	☐ *Steers the forklift*		• *Frequency is dependent on the need of use, road conditions, workload, driving speed, etc.*
	Other:			

Physical Demands

Whole Body Physical Demands

Identify each of the physical demands required by a Forklift Operator, by placing a check mark (✓) in the far left column.

The Comments section may contain information relating to duration, frequencies and other variations in the physical demands.

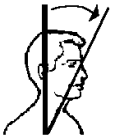
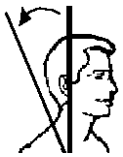
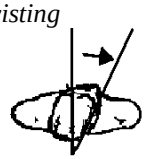
Physical Demands		Tasks	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Walking	• *Load forklift* • *Manually handle items*		✓			• *Walking includes standing and movement within 3 metres* • *Operators may leave cab to check the condition of the load before loading onto forklift*
	Sitting	• *Load forklift* • *Drive forklift* • *Unload forklift*				✓	• *Amount of sitting is dependent on operator preference, workload, and the amount of visual checking and manual handling performed*
	Standing						• *See Walking*
	Climbing	• *Load forklift* • *Drive forklift*		✓			• *Climbing into or out of the cab of the forklift or on and off of the forklift itself* • *Amount of climbing is dependent on operator preference, workload, and the amount of visual checking and manual handling performed*
	Balancing						*Not Applicable*
	Kneeling/ Crouching						*Not Applicable*
	Other:						

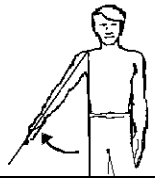
Body Postures

The table below outlines the body postures held or repeated throughout the shift by a Forklift Operator.

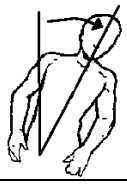
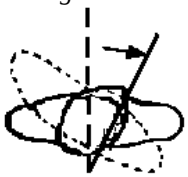
For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

The Comments section may contain information relating to duration, frequencies and other variations in posture.

	Body Posture	Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck							
	Flexion 	• *Load forklift* • *Drive forklift* • *Unload forklift*		✓	✓		• *Looking down at loads as they are loaded and at the ground while driving* • *Frequency and duration are dependent on the number of loads, placement of seating relative to load, viewing angles, worker technique, etc.*
	Extension 	• *Load forklift* • *Drive forklift* • *Unload forklift* • *Manually handle items*		✓			• *Dimensions of the mill yard will affect both frequency and duration* • *Operator looks up at the load on forklift either while driving or during loading and unloading*
	Twisting 	• *Load forklift* • *Drive forklift*			✓		• *Looking from side to side to view loads before loading onto forklift* • *Driving backwards once a load is on the forklift* • *Dimensions of the mill yard will affect both frequency and duration*

Body Posture		Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Shoulder							
	Flexion 	• *Load forklift* • *Drive forklift* • *Unload forklift*			✓	✓	• *Reaching forward to reach controls while driving or loading/unloading* • *Frequency and duration dependent on cab design, worker dimensions, number of loads handled, size of yard* • *Controls include steering wheel, gear shift, and load/unload levers*
	Abduction 						*Not Applicable*
	Extension 						*Not Applicable*

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 						*Not Applicable*
Wrist							
	Flexion 			✓			• *Degree of flexion, frequency, and duration dependent upon cab design and worker dimensions*
	Extension 			✓			• *Degree of extension, frequency, and duration dependent on cab design and worker dimensions*
	Ulnar Deviation 						*Not Applicable*
	Radial Deviation 						*Not Applicable*

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 	• *Load forklift* • *Unload forklift*		✓			• *Leaning forward to view loads when unloading and loading* • *Frequency and duration dependent on the characteristics of the load*
Lateral Flexion 						*Not Applicable*
Twisting 	• *Load forklift* • *Drive forklift*		✓			• *Twisting from side to side to view loads, and while driving backward* • *Frequency and duration dependent on distance operator must travel with load*
Extension 						*Not Applicable*
Other:						

Hand Grips

The table below contains a list of the common types of hand grips (i.e., how objects are held) used by a Forklift Operator.

For each of the hand grips used at your mill, indicate which types of grips are used, by placing a check mark (✓) in the far left column.

The Comments section may contain information relating to duration, frequencies, preferred hand used, etc.

	Type	Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Power 	• *Drive forklift*				✓	• *Use of steering wheel while driving* • *Use of controls of the forklift while loading and unloading* • *Either hand used depending on the side of the controls and operator preference*
	Pinch 						• *See Modified pinch-hook grip*
	Hook 						• *See Modified pinch-hook grip*
	Precision 						*Not Applicable*
	Modified pinch-hook grip	• *Manually handle items*	✓				• *Moving dunnage or carrier blocks* • *Grip has the opposing thumb position of a pinch grip but the bent fingers of the hook grip* • *Grip is modified due to the size of the object being manipulated* • *Both hands are used*

Manual Material Handling

The table below contains a list of manual material handling tasks (i.e., pushing, pulling, lifting, lowering, and carrying) performed by a Forklift Operator.

Indicate which tasks are performed by placing a check mark (✓) in the far left column. Fill in the weight of the objects handled (may have to estimate).

The Comments section may contain information relating to duration, frequencies and details regarding characteristics of the object handled.

	Task Description	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Lifting and/or lowering carrier blocks or dunnage	*4.5*	✓				• *Modified pinch-hook grip is used* • *Both hands are used*
	Carrying carrier blocks or dunnage	*4.5*	✓				• *Modified pinch-hook grip is used* • *Both hands are used*
	Other:						

Hand Tools

Indicate the hand tools used by a Forklift Operator at your mill, by placing a check mark (✓) in the far left column. Determine the weight of the hand tool and place in appropriate column.

The Comments section may contain information relating to duration and frequencies of use.

	Type of Tool	Task(s)	Weight of Tool (kg)	Percent of Shift				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Picaroon	• *Load forklift* • *Unload forklift*	*1.3*	✓				• *Frequency and duration dependent on the condition of the loads*
	Other:							

Environmental Conditions

Work Environment

The table below contains a list of environmental conditions that may be of concern at the Forklift Operator job.

Vibration occurs when the body is in contact with a vibrating object or surface such as a tool, a seat or the floor. If vibration occurs at this job, check 'Yes' and then mark whether the vibration is whole body and/or hand transmitted and the path through the body by which the vibration is transmitted. If vibration does not occur at this job, check 'No'.

If possible, please indicate the appropriate value for the noise and lighting levels at your mill for the Forklift Operator. For the lighting level, please include the location of the measurements within the workstation.

Factor	
Vibration ☐ Yes *(Check one)* ☐ No	☐ Whole body ☐ Seat ☐ Floor
	☐ Hand transmitted ☐ Tool ☐ Other: _____

Noise level	*87 to 94 dB*
Lighting level	*166 lux to 17.5 klux In cab* *Lighting levels vary depending on seasonal and weather changes*
Other	

Location of Workstation

The table below contains a list of the type of work environments a workstation may be located in.

For the workstation, indicate which of the following types of work environments apply with a check mark (✓) in the left column.

For example, the workstation may be inside the main building but exposed to the outside via a doorway that is always open and has both a fan and a heater. In this situation all three, 'Inside exposed', 'Fan' and 'Heater', would be checked for this workstation.

	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.

For your mill, indicate the appropriate region with a check mark (✓) in the left column.

Refer to the regional map in Appendix B 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 Forklift Operator job at your mill, indicate which of the PPE items are required with a check mark (✓).

	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 – Weight of Wood Equation

1. Type of Wood Handled

The table below contains a list of the types of wood processed in British Columbia. The weight per board foot wet and dry is given for each species. This information will be used in the table in *Section 4* to calculate the weight of the wood handled. Please indicate all of the types of wood processed at your mill.

	Wood Handled	Wet lb./ Board Foot	Dry lb./ Board Foot		Wood Handled	Wet lb./ Board Foot	Dry lb./ Board Foot
	Douglas Fir	3.60	2.83		Larch	3.48	N/A
	Hemlock	3.42	2.49		Spruce/Pine/Fir*	2.95	2.18
	Red Cedar	2.42	2.00		Alpine Fir	2.67	2.00
	Yellow Cedar	3.01	2.49		Lodge Pole Pine	3.26	2.41
	Sitka Spruce	2.76	2.23		White Spruce	2.93	2.15

*The Spruce/Pine/Fir values are an average of White Spruce, Lodge Pole Pine, and Alpine Fir.

2. Size of Wood*

The table below contains a list of different sizes or dimensions of wood. The percentage next to the size of the wood is the multiple used to compare the size of the board to a board foot (1" by 12" by 12"). This multiple will be used in the table in *Section 4* to calculate the weight of wood handled. Please indicate all of the applicable sizes of wood handled at the workstation. Add any other sizes to the bottom of the table if your particular size of wood is not listed.

	1" Sizes	Multiple		2" Sizes	Multiple		4" Sizes	Multiple		6" Sizes	Multiple		8" Sizes	Multiple
	1 by 4	0.33		2 by 4	0.67		4 by 4	1.33		6 by 6	3.00		8 by 8	5.33
	1 by 6	0.50		2 by 6	1.00		4 by 6	2.00		6 by 8	4.00		8 by 10	6.67
	1 by 8	0.67		2 by 8	1.33		4 by 8	2.67		6 by 10	5.00		8 by 12	8.00
	1 by 10	0.83		2 by 10	1.67		4 by 10	3.33		6 by 12	6.00			
	1 by 12	1.00		2 by 12	2.00		4 by 12	4.00						

* Conservative estimates of actual wood dimensions

If the size of the board is different from those in this table, use this equation to find out the multiple value.

[(Dimensions of wood) x 12] / 144 = Multiple

For example: For a 5 by 5 piece of wood [(5x5) x 12]/144 = 2.08

3. Length of Wood

The table below contains a list of the common lengths of wood. Please indicate which of these lengths are being handled at this particular workstation. Add additional lengths to the table if necessary. This information will be used in the table in *Section 4*.

Length of Wood							
	6 foot		12 foot		18 foot		22 foot
	8 foot		14 foot		20 foot		24 foot
	10 foot		16 foot		Other:		Other:

4. Weight of Wood Equation*

The table below is used to calculate the weight of the boards being handled. The weight is calculated by multiplying the species weight/board foot (*Section 1 value*) by the size of wood multiple (*Section 2 value*) and by the length of wood (*Section 3 value*).

Example: For a run of wet Spruce/Pine/Fir, 2" x 4", 16 feet long

2.95 *(wet lb./ board foot)* x **0.67** *(size of wood multiple for 2" x 4")* x **16** *(length of board in feet)* = **32 lbs**.

For the heaviest species handled, enter the lb./board foot value, the multiple for the largest size of this wood, and the largest length of this wood. Multiply these values together to determine the weight of the board in pounds.

For the most common species handled, enter the lb./board foot value, the multiple for the most common size of wood, and the most common length of this wood. Multiply these values together to determine the weight of the board in pounds.

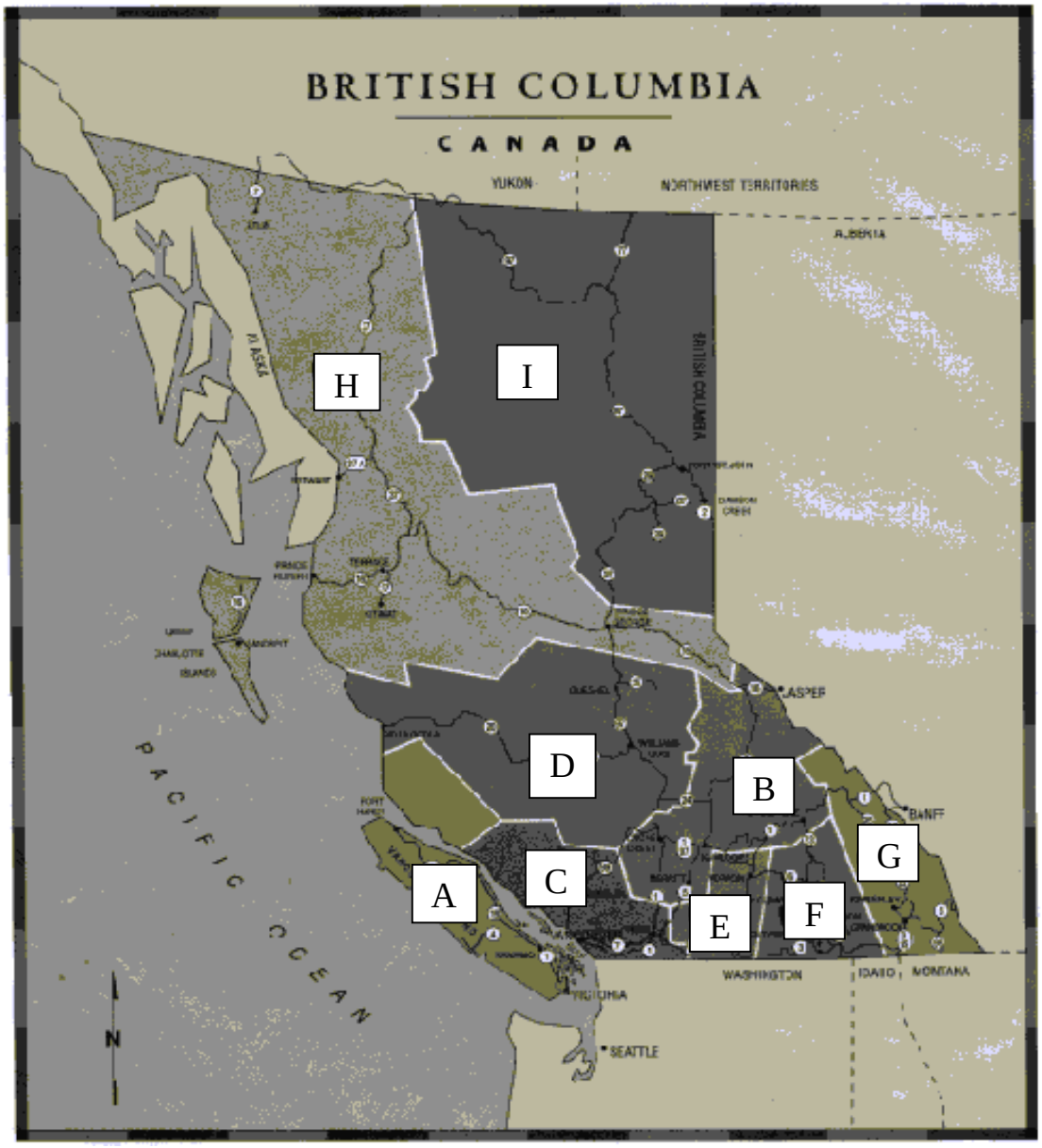
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

If required, divide the pound value by 2.2 to obtain the weight of the board in kilograms.

Type of Wood Handled (lb./ board foot) *From Section 1*		**x**	**Multiple (size of wood)** *From Section 2*	**x**	**Length of Wood** *From Section 3*	**=**	**Weight of the Board in pounds**	**Divide by 2.2 to calculate value in kilograms**
Heaviest Species Handled		x		x		=		
Most Common Species Handled		x		x		=		
Lightest Species Handled		x		x		=		

* Weight may vary from the above calculation depending on the cell moisture content of the wood, actual wood dimensions, and wood density.

Appendix B – 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
Forklift Operator

Purpose

The Risk Factor Identification Checklist for a Forklift 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 – Forklift 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.

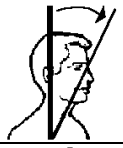
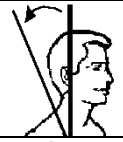
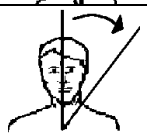
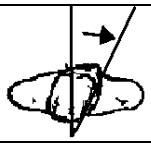
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

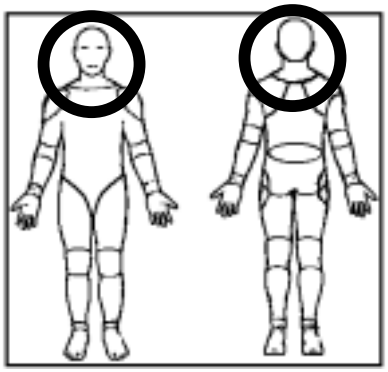
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 shoulder when backing up)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating forklift)				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., operating controls)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

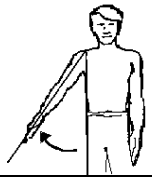
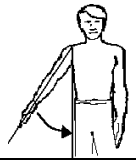
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



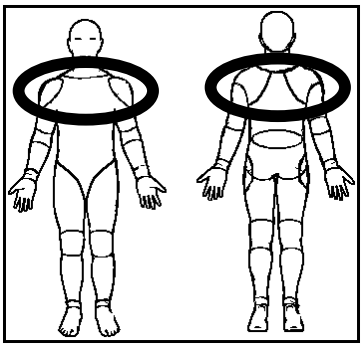
Body parts within the circled area will be classified as NECK issues.

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., driving forklift)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., operating controls)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., steering wheel)			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



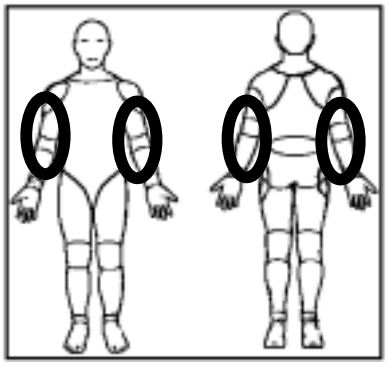
Body parts within the circled area will be classified as SHOULDER issues.

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., steering wheel) 			S O	
Are objects handled in a pinch grip? (e.g., lumber) 			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., driving forklift)			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?			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., steering wheel)			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., resting wrist on steering wheel)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., chain saw)			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



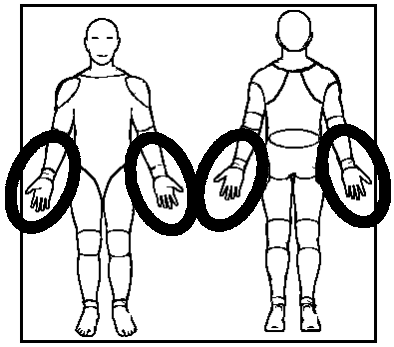
Body parts within the circled area will be classified as ELBOW issues.

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., steering wheel) 			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., driving forklift)			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?				S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand?				S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., steering wheel)				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., resting wrist on steering wheel)				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? (e.g., chain saw)				S O	

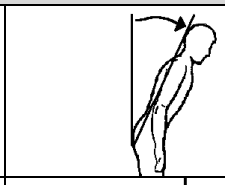
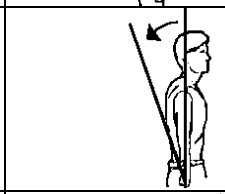
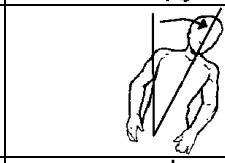
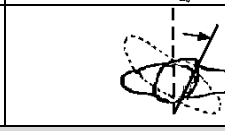
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there 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



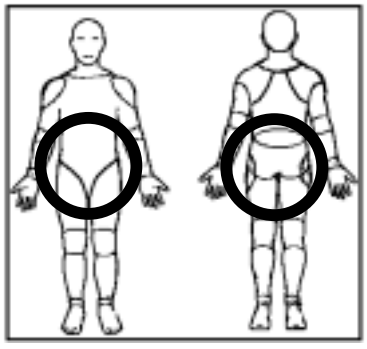
Body parts within the circled area will be classified as WRIST issues.

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., driving forklift)			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., leading forward off backrest while driving)			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., edge of the seat)			S O	

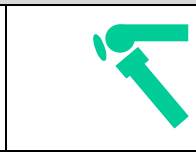
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., sitting on vibrating surface)				S O	

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

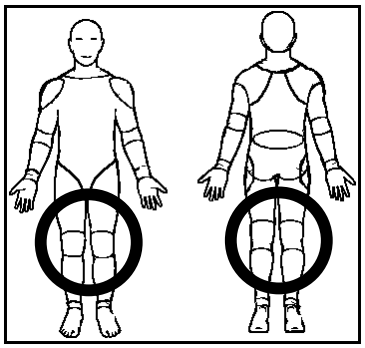


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., climbing into and out of cab)			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture? (e.g., seating in cramped cab)			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)? (e.g., kneeling on hard surface)			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

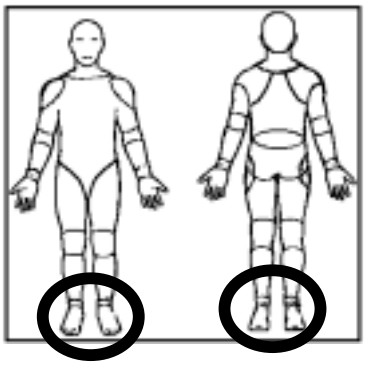


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., operating foot pedals)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift?			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? (e.g., sitting on vibrating surface)			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?			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?			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., hand tools)			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?			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? (e.g., loading trucks)			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

Forklift Operator

This Work Manual contains information about the body parts found to be at risk of musculoskeletal injury (MSI) for the Forklift 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

Forklift Operator

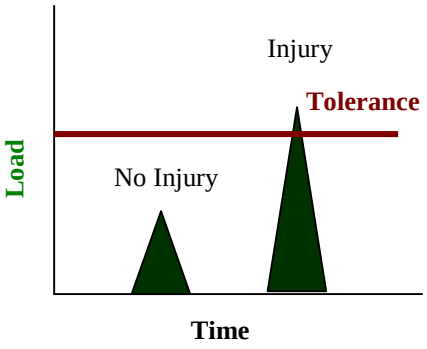
Disclaimer

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

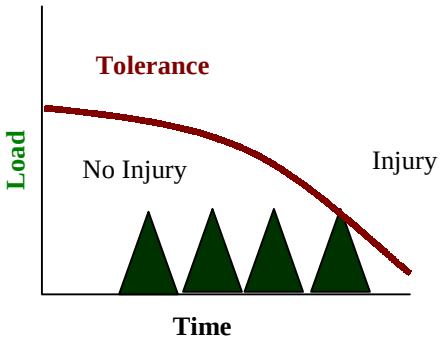
Injuries occur when …
Loads exceed tissue tolerances



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.

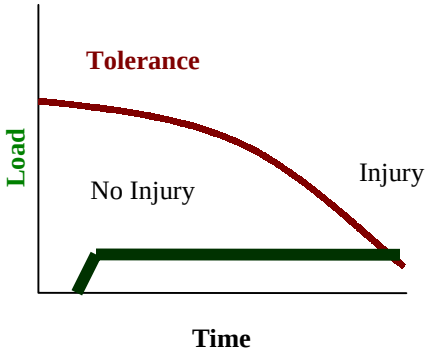
Example – a worker going over on their ankle and spraining it.



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 Forklift 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 Forklift 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.

NECK

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

Repetitive neck twisting occurs when a Forklift Operator has to drive backwards. The neck is often held in an awkward position for sustained periods.

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

Repetition

- When the head is repeatedly turned to the side or bent forward/backward, 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.

Awkward Postures

- 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.
- Neck muscles must support the weight of the head while in a twisted position. The more the neck bends, the greater the load on the muscles and tendons.

Static Postures

- When the neck is held still in a twisted position, the muscles of the neck must remain tense to support the weight of the head. With no time allowed for recovery, the constant state of tension in the neck muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Seating

- Seating which does not swivel will lead to awkward neck postures. For safety, seating which does swivel must lock in place when not being moved.

Viewing Angles

- All Forklift Operator cab views should be as unobstructed as possible. Windows should be kept clean to avoid glare. Defrosting fans should be operational to prevent fogged or icy windows, which can lead to awkward neck postures.
- Mirrors can help minimise awkward neck postures during backing up. Mirrors need to be adjustable to suit multiple drivers, but the mirrors should be tightly fastened in place to prevent vibration.

CONSEQUENCES

- When the head is held in a twisted posture, 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 82 & 83.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

A Forklift Operator frequently holds their arms away from the body in order to use controls.

BACKGROUND INFORMATION

- The neck and shoulder regions work together to produce certain movements, or to hold certain postures. The larger muscles of the neck and upper back (e.g., trapezius) move the shoulders, and the larger muscles of the shoulders (e.g., deltoids) move the arms.

DIRECT RISK FACTORS

Repetition

- When the arms are repeatedly lifted, the muscles of the neck and shoulder are subjected to repeated stress with little or no time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

Awkward Postures

- Neck and shoulder muscles must support the weight of the arms when they are away from the body. The farther away the arms are from the body, the greater the load on the muscles and tendons.

Static Postures

- When the arms are repeatedly held away from the body, the muscles of the neck and shoulder must remain tense to support the weight. If the duration of constant tension is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Awkward shoulder postures can result from extreme reaches for forklift controls.

Working Heights

- Controls may also be positioned at heights that cause awkward and static shoulder postures.

CONSEQUENCES

- When the arms are held away from the body, muscles and soft tissues of the neck and shoulder 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 and shoulder area, and headaches.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 82 & 83.
- For exercises that can help to prevent ***neck*** and ***shoulder*** injuries, see the ***Neck*** and ***Shoulder sections of the Body Manual.***

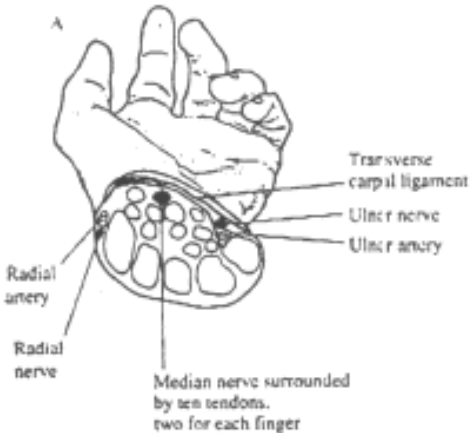
WRIST

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

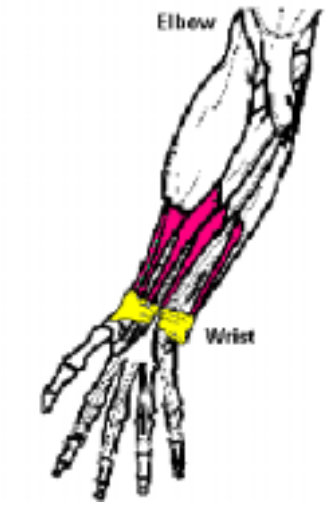
A Forklift Operator must use equipment control levers with the wrists bent.

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

Repetition

- Repeated bending of the wrist causes stress to the tendon sheaths. If the repetitive stress is excessive, and recovery is not adequate, the tendon sheaths may fatigue to the point of injury.

Awkward Postures

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

Static Postures

- 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.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Poor handle design and placement can lead to awkward wrist postures.

Environmental Conditions

Cold Temperatures

- Exposure to cold temperatures, in combination with the above risk factors, can increase the likelihood of wrist injury.

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 Wrist, please see the column labelled “Wrist” in the Summary of Solutions on pages 82 & 83.

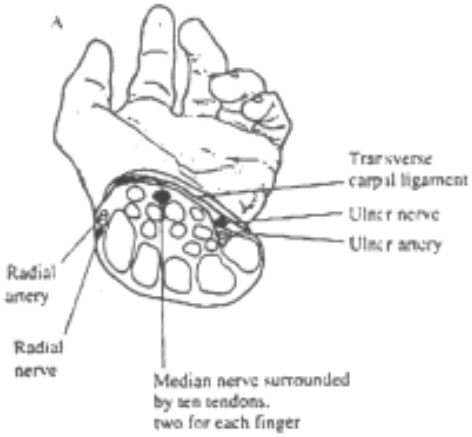
WRIST/HAND

Direct Risk Factors:
Contact Stress
Vibration

A Forklift Operator may be exposed to contact stress and hand/arm vibration when using equipment controls.

BACKGROUND INFORMATION

- The carpal tunnel is located at the base of the palm; it contains the tendons of the muscles that bend the hand and wrist inwards, and an important nerve (median nerve).



The Carpal Tunnel

DIRECT RISK FACTORS

Contact Stress

- Contact between hard or sharp surfaces and the base of the palm places stress on the tendons and nerves in the carpal tunnel.
- Continual contact with hard or sharp surfaces may damage the nerve and/or gradually weaken the tendons, and cause injury.

Vibration

- Exposure to vibration, through the use of power tools or 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.
- Continual exposure to hand/arm vibration may gradually damage neurovascular tissue (nerves and blood vessels) in the hand, and may contribute to problems in the wrist.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Poor handle designs can lead to increased vibrations. All controls should be regularly maintained, including re-gripping and re-tensioning, to minimise risks to the operator.

Environmental Conditions

Cold Temperatures

- Exposure to cold temperatures, in combination with the above risk factors, can increase the likelihood of wrist injury.

CONSEQUENCES

- Continual exposure to hand/arm vibration and contact stress may lead to neurovascular damage.
- Signs and symptoms include pain, whitening of the fingers, and a loss of feeling and strength in the hand.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Wrist/Hand, please see the column labelled “Wrist/Hand” in the Summary of Solutions on pages 82 & 83.

LOW BACK

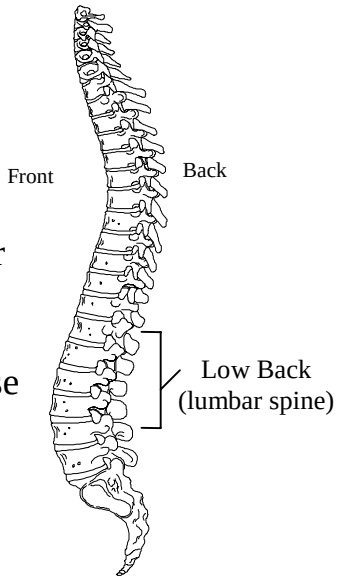
Direct Risk Factors:
Awkward Postures
Static Postures
Vibration

A Forklift Operator continually sits on a vibrating seat.

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 & Static Postures

- 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

Working Reaches

- Excessive working reaches can lead to awkward postures and forceful back movements.

Seating

- Poorly designed or maintained seats can also contribute to low back injuries. Seats should be adjustable, with good back support and a comfortable seat pan.
- Seats with vibration damping (e.g., springs, and pneumatic shock absorbers) can also help to minimise injury risks in the low back.

Work Organisation

Task Variability

- Prolonged sitting without any intermittent standing can lead to low back discomfort or injury. The disc structures of the back need occasional relief from the compression that occurs during sitting.

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 82 & 83.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

KNEE

Direct Risk Factors:
Awkward Postures
Static Postures

A Forklift Operator maintains bent knees in order to operate foot pedals.

BACKGROUND INFORMATION

- At the knee joint, the knee cap (patella) is held in place over the thigh bone (femur) by connective tissue. When the leg is straight, there is little or no contact between these two bones. However, as the knee bends, the knee cap can come into contact with the thigh bone.

DIRECT RISK FACTORS

Awkward Postures

- Bending the knee increases the contact stress between the knee cap and the thigh bone. Contact stress increases significantly when the knee is bent over 90 degrees.

Static Postures

- Static knee bending may gradually irritate the knee. Irritation of the knee may lead to muscle wasting, which in turn leads to poor tracking of the knee cap on the thigh bone and increased contact stress between these bones.
- Muscles and tissues in the knee can also become fatigued during this constant bending.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Forklift operators are forced to assume awkward postures to reach pedals that are too close to or too far from their seat.

Working Heights

- Pedals that are too high or low for a worker can also lead to awkward postures.

CONSEQUENCES

- Repeated knee bending could cause inflammation under the kneecap, which may cause pain and may change the mechanics of kneecap tracking. Changes in knee cap 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 82 & 83.
- For exercises that could help to prevent ***knee*** injuries, see the ***Knee section of the Body Manual.***

ANKLE

Direct Risk Factors:
Awkward Postures
Repetition

A Forklift Operator frequently activates foot pedals while operating the forklift.

BACKGROUND INFORMATION

- The muscle responsible for pulling the foot upwards is found in the front of the shin. Its tendon runs beneath thick bands at the ankle before attaching to the foot bones.

DIRECT RISK FACTORS

Awkward Postures

- Lifting the foot to activate a foot pedal puts the ankle into an awkward posture, which increases the loading in the muscle on the front of the shin. The further away from the neutral posture the ankle is, the greater the loading to this muscle. If the shoes worn are rigid or heavy, the loading is also increased.

Repetition

- Repetitive use of foot pedals may gradually cause small tears in the muscle on the front of the shin. If the repetitive stress is excessive, and recovery is not adequate, the small tears in the muscle on the front of the shin may progress to a more significant problem.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Pedals at inappropriate heights can increase the risk of awkward ankle postures for operators.

CONSEQUENCES

- Repeated use of foot pedals can cause damage to the tissues in the shin.
- Signs and symptoms include inflammation, and pain with walking.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Ankle, please see the column labelled “Ankle” in the Summary of Solutions on pages 82 & 83.

FOOT

Direct Risk Factors:
Awkward Postures
Static Postures

A Forklift Operator must continually press down on foot pedals in order to operate the equipment.

BACKGROUND INFORMATION

- There are a number of small muscles in the base of the foot, as well as a tough band that attaches to the heel bone and runs down towards the toes. This band is called the plantar fascia, and it contributes to the arch in our feet.

DIRECT RISK FACTORS

Awkward Postures

- Pressing down on a foot pedal while the ankle is bent leads to increased loading on the plantar fascia.

Static Postures

- Continual standing on foot pedals can cause tissue in the foot to deform and breakdown over time. If the tissue deformation is excessive and recovery not adequate, an injury may occur.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the plantar fascia is increased because the height of the foot pedals requires a Forklift Operator to repeatedly activate foot pedals with the ankle bent.

CONSEQUENCES

- Continual use of foot pedals may cause damage to the plantar fascia.
- Signs and symptoms include pain and stiffness at the base of the heel, initially in the morning. As the problem progresses the pain may become chronic.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled "Foot" in the Summary of Solutions on pages 82 & 83.
- For exercises that can help to prevent ***foot*** injuries, see the ***Foot section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- Repetitive neck twisting occurs when a Forklift Operator has to drive backwards. The neck is often held in an awkward position for sustained periods.

NECK/SHOULDER

- A Forklift Operator frequently holds their arms away from the body in order to use controls.

WRIST

- A Forklift Operator must use equipment control levers with the wrists bent.

WRIST/HAND

- A Forklift Operator may be exposed to contact stress and hand/arm vibration when using equipment controls.

LOW BACK

- A Forklift Operator continually sits on a vibrating seat.

KNEE

- A Forklift Operator maintains bent knees in order to operate foot pedals.

ANKLE

- A Forklift Operator frequently activates foot pedals while operating the forklift.

FOOT

- A Forklift Operator must continually press down on foot pedals in order to operate the equipment.

Risk Factors by Body Part

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

Indirect Risk Factors		Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	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	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

***** *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.*

****** *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.*

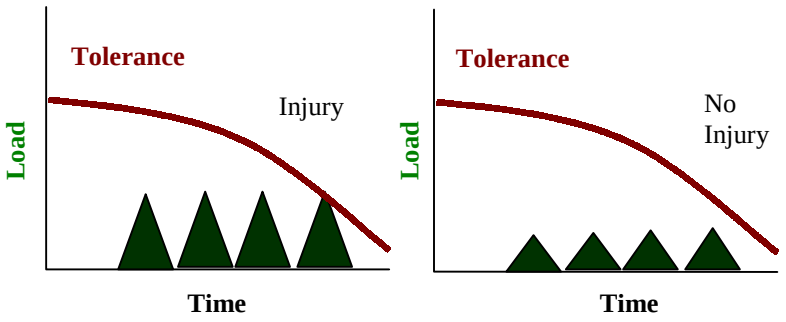
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 82 & 83 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

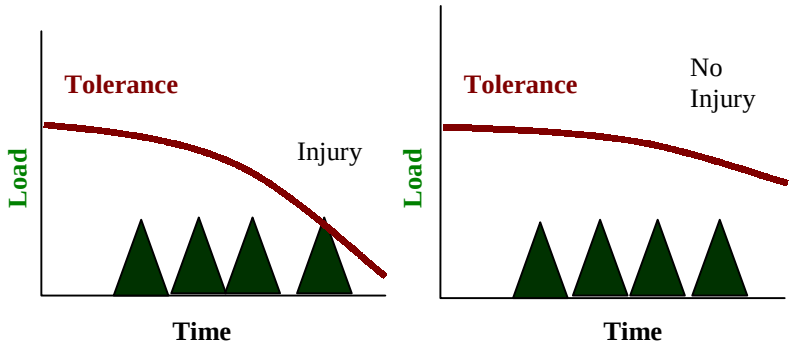
Injury Prevention

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 Forklift 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

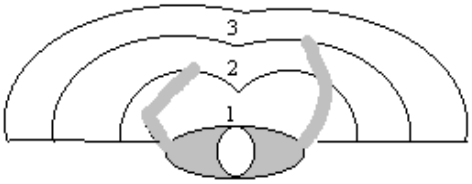
PERSONAL PROTECTIVE EQUIPMENT
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

Front/back adjustable seat

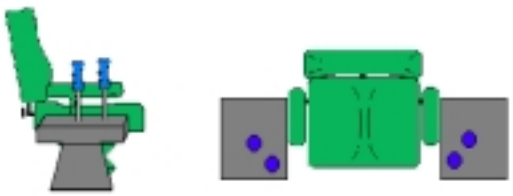
E

Work reaches to foot and hand controls can be individualised for operators by providing a seat that is forward/backward adjustable. This adjustability will allow operators to locate controls within a comfortable reach envelope.

Controls beside operator

E

Locate the forklift controls and other hand controls to the side of the operator, to prevent repetitive forward reaching and awkward shoulder and back postures. The addition of armrests will aid in supporting the shoulders while using the controls.



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 height specific for the Forklift 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.

Foot pedals closer to floor

E Move the foot pedals closer to the floor. This will reduce the amount of time the foot is unsupported, therefore reducing the risk of injury to the knee.

Foot pedals easier to activate

E Reduce the force required to engage foot pedals. This will reduce fatigue in the leg muscles.

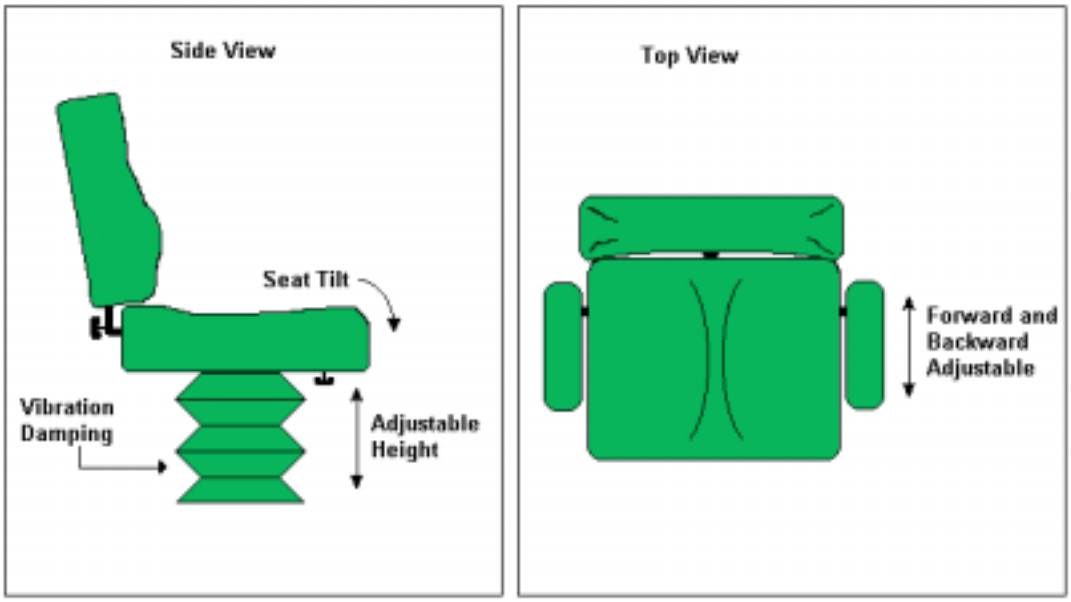
SEATING

Many Forklift 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 11).

Adjustable seating

E

In order to minimise awkward and static postures of the low back, seating should have several adjustable features (see list below) to accommodate various operators, and allow for continual postural adjustments.



- ★ 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

Lumbar support

WP

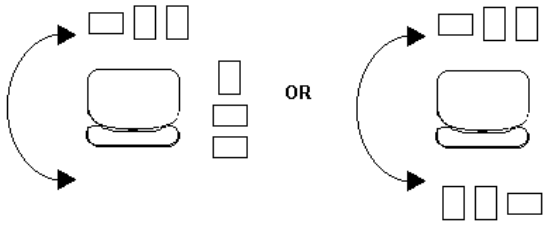
In order to reduce awkward postures in the low back, the lumbar support in the chair should be adjusted to maintain the curve in the low back while sitting.

Standing breaks

WP In order to reduce awkward and static postures in the low back, encourage Forklift Operators 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.

Swivel seat

E Have the seat swivel to the right and stop and lock in. A seconds set of foot controls will be needed for this seat position. Swivelling the seat allows an operator to back up the forklift with a minimal amount of neck twisting.



Turn body

WP Slide around in the seat when driving backwards to reduce the amount of neck and low back twisting which occurs.

Alternate sides

WP Vary which way you twist when driving backwards (left and right) to reduce repetitive movements to one side only.

Step down from forklift

WP Avoid jumping down when exiting the truck - step down. This will reduce jarring of the spinal tissues.

FLOOR SURFACES

Anti-fatigue matting

E Anti-fatigue matting can be installed around foot pedals to reduce fatigue in the ankles and feet. The cushioned surface encourages continuous micro-movements of the feet, which minimises blood pooling in the feet and legs and the associated discomfort.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Air tires

E — Use air tires, instead of solid tires, to reduce vibration felt by operator.

Maintain yard

A — Keep the yard well maintained to reduce the vibration and jarring felt by the worker when riding over a rough yard.

Mirrors for backing up

E — Add a mirror to existing forklifts to reduce neck twisting when driving backwards. Parabolic mirrors, in combination with flat mirrors, can expand the field of view (Mobile Equipment Section - Workers' Compensation Board, 1995).

Characteristics of Objects Being Handled

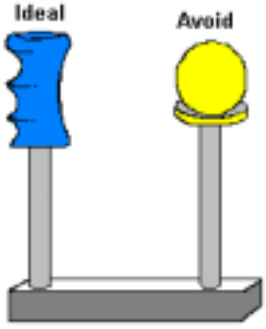
CONTAINER, TOOL AND EQUIPMENT HANDLES

Space between controls

E — Controls should be spaced at least 8 cm – 10 cm apart to allow room for the hands.

Control grips

E — Controls need to have a cylindrical grip shape for the hand to allow the forearm to remain in a neutral position. This lessens the stress over the forearm and wrist, and can prevent hand and wrist discomfort or injury. Grips should be made of a material that allows for good contact and is not slippery (e.g., vinyl).



Isolate controls

E

Damp vibration in the forklift controls by isolating the levers from the machine. This will reduce exposure to hand-transmitted vibration.

Environmental Conditions

Please refer to the General Risk Factor Solutions Manual for solutions regarding environmental risk factors.

Work Organisation

Please refer to the General Risk Factor Solutions Manual for solutions regarding 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	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Front/back adjustable seat	**76**		**A S**					**A S**		**A S**		
Controls beside operator	**76**		**A S**					**A S**				
Foot pedals closer to floor	**77**									**F A**	**F A**	
Foot pedals easier to activate	**77**									**F A**		
Adjustable seating	**78**	**A S**	**A S**			**A S**		**A S**				
Lumbar support	**78**							**A**				
Standing breaks	**79**							**A S V**				
Swivel seat	**79**	**R A S**						**R A S**				
Turn body	**79**	**R A S**						**R A S**				
Alternate sides	**79**	**R A S**						**R A S**				
Step down from forklift	**79**	**F**						**F**		**F**		

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Postures*

S = *Static Postures* **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	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Anti-fatigue matting	**79**										**S**	**S**
Air tires	**80**	**V**						**V**				
Maintain yard	**80**	**V**						**V**				
Mirrors for backing up	**80**	**R A S**						**R A S**				
Space between controls	**80**					**A**						
Control grips	**80**					**A**	**C V**					
Isolate controls	**81**						**C V**					
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 Postures*

S = *Static Postures* **C** = *Contact Stress* **V =** *Vibration*

◆ = *See General Risk Factor Solutions Manual*

Forklift Operator MSI Safety Guide

OBJECTIVE: To identify ergonomic risks involved in operating forklifts and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Forklift Operator.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck Repeatedly twisting the neck to view the work area.	**Repetition** **Awkward Posture**	• When the head is repeatedly bending and/or twisting, the small muscles of the neck are subjected to repeated stress with little time for recovery. This can cause fatigue. • Neck muscles must support the weight of the head in a bent position. The more the head bends the greater the load on muscles and tendons.	• If twisting cannot be avoided, try to turn the head in both directions. • When twisting the head, keep the chin tucked in and the ears in alignment with the shoulders. • For exercises that can help prevent ***neck*** injuries, ***see the neck section of the Body Manual***.
	Shoulder Repeatedly reaching the arms forward to reach the controls.	**Repetition** **Awkward Postures** **Static Postures**	• When the arms are repeatedly moving away from the body, the rotator cuff muscles supporting the shoulder joint are exposed to repeated stress. This can lead to fatigue and small tears in the soft tissues and muscles surrounding the shoulder. • When the arms are away from the body, the shoulder muscles must support the weight of the arms. The farther the arm is from the body, the larger the force on the shoulder muscles. • When the arms are held still away from the body, the muscles of the shoulder must remain tense in order to support the weight of the arms. This constant state of tension can cause fatigue.	• Try to use armrests to help support the weight of the arms. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • For exercises that can help prevent ***shoulder*** injuries, ***see the shoulder section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist Holding the wrist in a bent position while operating controls.	**Awkward Postures** **Static Postures**	• Bending of the wrist can narrow the space in the carpal tunnel and increase the possibility of the tendons passing through the wrist pressing up against bones, nerves, blood vessels, and other structures. The result is a disadvantaged position where the risk of injury is increased, especially in combination with other risk factors. • Continuous gripping requires the small muscles of the hand and forearm to remain tense to maintain a grip on the object being held. This constant state of tension in the hand and forearm muscles, with no time allowed for recovery, can cause fatigue.	• Whenever possible, try using both hands to distribute the workload evenly between the two wrists. • Hold levers with the palm of the hand facing the body, not the floor. • Avoid sudden forceful movements of the hands. Use smooth motions and keep the wrists straight. • For exercises that can help prevent ***wrist*** injuries, ***see the wrist section of the Body Manual***.
	Exposure to hand-transmitted vibration through controls.	**Contact Stress** **Vibration**	• Contact stress occurs when a part of the body contacts a hard or sharp surface. The concentration of force in certain sensitive areas of the palm, under which lie nerves and blood vessels, can place undue stress on the hand. This can restrict blood flow and inflame the tissue, leading to discomfort and an increased risk of injury. • Exposure to hand transmitted vibration, through vibrating controls, can place a unique form of mechanical stress on the tissues of the hand. The mechanical stress of vibration may lead to damage of the nerves, tendons, and veins that run into the hand.	• Protect the base of the hand; try to keep pressure away from this area of the body. • Grip controls lightly so that pressure in the hand is reduced. • Operate vibrating controls with the wrists in a neutral (straight) posture. • Minimise grip and push force used to operate the controls. • For exercises that can help prevent ***elbow*** and ***wrist*** injuries and help to strengthen the forearm, ***see the Body Manuals for the Elbow and Wrist***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back Heavy lifting, or jumping down from the cab after prolonged sitting.	**Force**	• After a period of prolonged sitting the back can be left in a weakened state (muscles and ligaments are stretched). Attempting to lift objects or jumping out of the cab after prolonged sitting may introduce enough stress to cause injury in the low back.	• After getting out of the cab, stand for a few minutes before heavy lifting. • Step down from the cab instead of jumping down. • For exercises that can help prevent ***back*** injuries, ***see the back section of the Body Manual***.
	Twisting of the low back while driving backwards.	**Awkward Postures** **Static Postures**	• When the back is twisting to one side the low back and abdominal muscles on that side of the body become tense and can cause unnatural loading in the structures of the spine. • When holding the back in a twisted position the structures of the lower spine are subjected to a constant strain, and may become weakened or irritated.	• Slide around in the seat when driving backwards to reduce the amount of neck and low back twisting which occurs. • Vary which way you twist when driving backwards (left and right) to distribute the stress to both sides. • For exercises that can help prevent ***back*** injuries, ***see the back section of the Body Manual***.
	Prolonged sitting.	**Static Postures** **Vibration**	• When sitting, the muscles and ligaments that support the spine are stretched and can become weakened. This can lead to the back being more vulnerable to injury. • Whole body vibration can be transmitted to the low back through the seat of the forklift. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine, which can weaken the tissues of the spine, and lead to accelerated degeneration of the low back.	• When sitting, keep the back in a natural position (ears, shoulders, and hips aligned). • Make slight posture variations/chair adjustments throughout the shift. • Try standing during formal breaks rather than sitting. • Get out of the forklift at least once every hour to stand.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Ankle/Foot Repeated use of foot pedals.	**Repetition**	• The repetitive ankle flexion and extension that occurs when pressing foot pedals requires the muscles of the foot and lower leg to repeatedly contract, with little time for recovery. This can lead to fatigue, and can cause small tears to develop in the muscles and tendons of the foot and lower leg.	• Stretch the ankles before and during work to make sure the muscles and ligaments are loose. • For exercises that can help prevent ***ankle/foot*** injuries, ***see the ankle and foot sections of the Body Manual***.