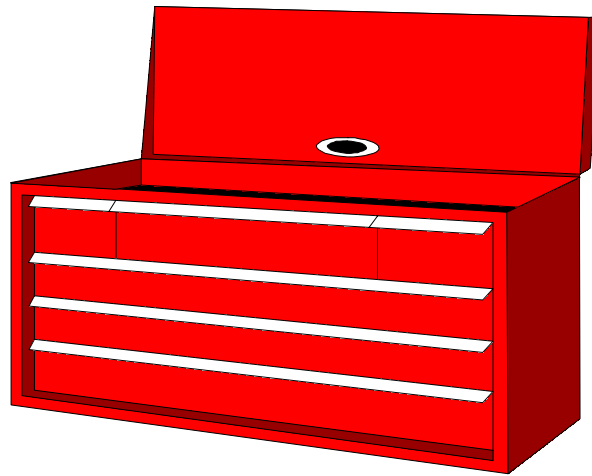


# INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

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Common Industry Jobs (CIJs)

## Drop Sorter Tool Kit



**IMIRP** program coordinated by:

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Council of  
Forest  
Industries



Industrial  
Wood & Allied  
Workers of  
Canada



Advanced  
Ergonomics  
Inc.

In cooperation with the Workers' Compensation Board of British Columbia

# **DROP SORTER TOOL KIT**

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Drop Sorter  
Tool Kit

## Overview

# Drop Sorter

### Job Summary

The Drop Sorter is responsible for sorting the lumber that arrives at their workstation based on quality, thickness, width, length, species and distributing it to the appropriate workstations in the mill. The Drop Sorter will drop out obvious waste, such as edgings, slabs, marked lumber (export chain), and materials with obvious defects, to re-manufacturing stations such as trimmer, resaw, and edger, with emphasis on size recovery. The Drop Sorter may also be required to clear cross-ups occurring at the workstation, monitor infeed and outfeed chains, and clean up the work area. Refer to the Physical Demands Analysis for more details.

### Physical Demands

The physical demands of the Drop Sorter may include:

- a) Walking to clear cross-ups
- b) Sitting while operating the drop sort
- c) Standing while operating the drop sort
- d) Climbing to clear cross-ups
- e) Balancing to operate foot pedals
- f) Repetitive motions of the hands, arms, shoulders, neck and eyes
- g) Awkward postures of the hands, shoulders, neck and back
- h) Forceful gripping
- i) Pulling boards off the chain
- j) Pulling boards to clear cross-ups
- k) Lifting boards off the chain and lowering them into the waste conveyor

### Mental Demands

The Drop Sorter has to determine where each piece of lumber has to go based on the lumber thickness, width, length, species, obvious defects, and marked lumber. To do this the operator must view the lumber, decide where to send the lumber, and then act accordingly. This requires sustained alertness, constant visual inspection and continuous decision making.

## **Major Variations**

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

- 1) To sort lumber the Drop Sorter may operate:
  - a) A drop gate
  - b) A power roller
  - c) A conveyor
  
- 2) When clearing jams, hand tools used may include:
  - a) Pike pole
  - b) Picaroon
  - c) Peevee

## **Minor Variations**

Depending on the mill, the following minor workstation variations may be found:

- 1) The pace that the operator works depends upon the mill. The average work pace is 3 to 45 pieces/minute. This pace is dependant on:
  - a) The performance or pace of the proceeding process
  - b) Machine's pace
  - c) Dwell area
  
- 2) Control types used may include:
  - a) Foot pedals
  - b) Push/pull buttons
  - c) Rotary selector switches
  
- 3) When operating machinery, displays used may include:
  - a) Mirrors
  - b) Video monitors

# Physical Demands Analysis

## Drop Sorter

### PDA General Instructions: Drop Sorter

This Physical Demands Analysis (PDA) identifies the physical demands of the Drop Sorter job as assessed by IMIRP ergonomists. The information reported was collected from a sample Drop Sorters 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 Drop Sorter 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.

### 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.*

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# Physical Demands Analysis

## Drop Sorter

### Task List

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



### **Inspect and sort lumber**

A Drop Sort Operator must inspect and sort lumber to appropriate areas using a drop gate. The operator may stand or sit to do this task.

*Does this task occur at you mill?*

Yes

No



A Drop Sort Operator must inspect and sort lumber to appropriate areas using a power roller. The operator may stand or sit to do this task.

*Does this task occur at you mill?*

Yes

No



A Drop Sort Operator must inspect and sort lumber to appropriate areas using a conveyor belt. The operator may stand or sit to do this task.

*Does this task occur at you mill?*

Yes

No



### **Clear cross - ups**

A Drop Sort Operator may have to clear cross-ups and jam-ups that occur at the workstation.

*Does this task occur at you mill?*

Yes

No



### **Monitor infed and outfeed**

A Drop Sort Operator may have to use monitors to view infed and outfeed transfer deck and waste conveyors.

*Does this task occur at your mill?*

Yes

No



### **Clean up work area**

A Drop Sort Operator may have to clean up around the work area.

*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 Drop Sorter.

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

Note the corresponding values for the percentage of the shift spent performing the task (Percent of Shift) as found during the ergonomic investigation. The Comments section may be used to elaborate on the task description (e.g., 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%	
<i>Inspect and sort lumber</i>				✓	<ul style="list-style-type: none"> <li>• <i>Frequency of 6 to 30 times per minute</i></li> </ul>
<i>Clear cross-ups</i>	✓				<ul style="list-style-type: none"> <li>• <i>Frequency of 2 times per shift</i></li> </ul>
<i>Monitor infeed and outfeed</i>	✓				<ul style="list-style-type: none"> <li>• <i>Frequency of 5 times per minute</i></li> </ul>
<i>Clean up work area</i>	✓				
<i>Other:</i>					

## Organisational Factors

The table below contains a list of organisational factors for a Drop Sorter. For each of the items input the necessary information to reflect the situation at your mill.

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'.

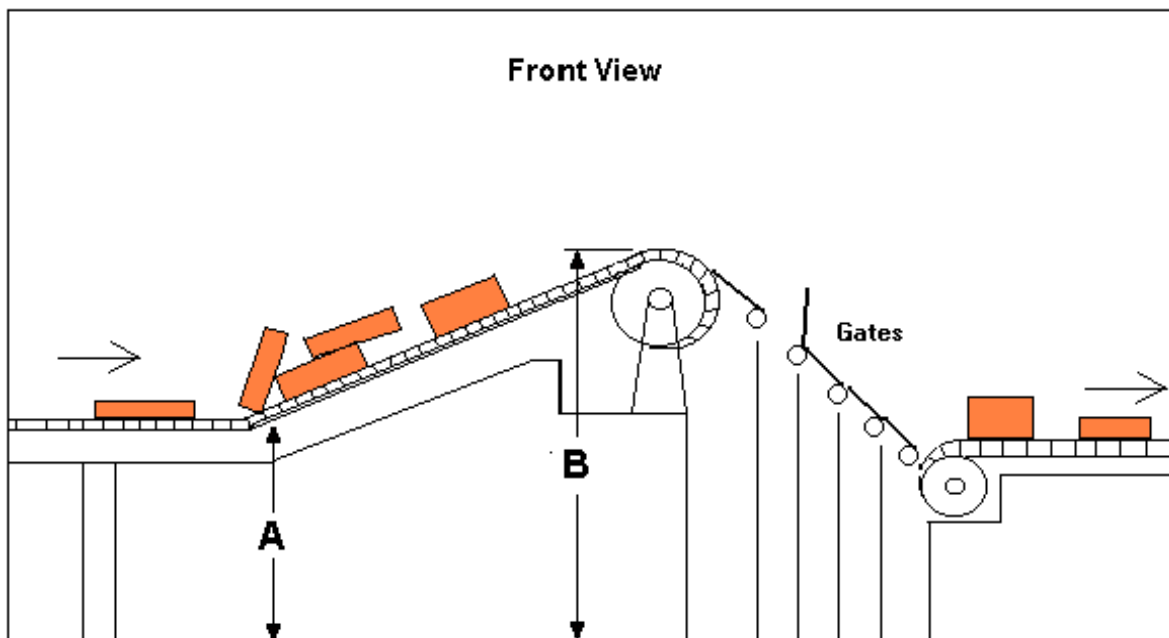
<b>Length of shift</b>	<input type="checkbox"/> 8 to 10 hours <input type="checkbox"/>
<b>Formal breaks</b>	<input type="checkbox"/> 50 to 55 minutes ( two 10 to 15 minute breaks, one 30 minute lunch) <input type="checkbox"/>
<b>Informal breaks</b>	<input type="checkbox"/> 5 to 10 minutes <input type="checkbox"/>
<b>Work pace</b>	<input type="checkbox"/> 3 to 45 pieces per minute <input type="checkbox"/>
<b>Work pace control</b>	<input type="checkbox"/> Pace depends on performance or pace of the previous process <input type="checkbox"/> Machine paced <input type="checkbox"/> Dwell area.
<b>Job rotation</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <i>(Check one)</i>	If <b>Yes</b> : 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 Chain	cm
B) Height of conveyor, drop gate or power roller.	cm



*Figure 1: Workstation (right side view)*



## Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Drop Sorter.

**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 that describes variations between mills.

Type of Control		Function	Frequency	Comments
<input type="checkbox"/>	<i>Foot pedal</i>	<input type="checkbox"/> <i>Stop and start transfer chains</i> <input type="checkbox"/> <i>Open drop gate</i>	<i>2 to 27 times per minute</i>	
<input type="checkbox"/>	<i>Push/pull button</i>	<input type="checkbox"/> <i>Stop and start transfer chains,</i> <input type="checkbox"/> <i>Stop and start unscramblers</i> <input type="checkbox"/> <i>Stop and start conveyors</i> <input type="checkbox"/> <i>Stop and start powerrollers</i>	<i>3 to 180 times per hour</i>	
<input type="checkbox"/>	<i>Rotary selector switch</i>	<input type="checkbox"/> <i>Operation sequence</i> <input type="checkbox"/>	<i>1 to 2 times per hour</i>	
<input type="checkbox"/>	<i>Other:</i>			

## Physical Demands

### Whole Body Physical Demands

Identify each of the physical demands required by a Drop Sorter, 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.

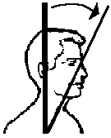

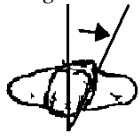
Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Walking	<ul style="list-style-type: none"> <li>To clear cross-ups</li> </ul>		✓			<ul style="list-style-type: none"> <li>Frequency of 1 to 6 times per hour</li> <li>Duration of 2 seconds to 2 minutes</li> </ul>
Sitting	<ul style="list-style-type: none"> <li>To inspect and sort the lumber</li> </ul>				✓	<ul style="list-style-type: none"> <li>A Drop Sort Operator may move frequently within a one meter area to adjust the lumber</li> </ul>
Standing	<ul style="list-style-type: none"> <li>To inspect and sort the lumber</li> </ul>				✓	
Climbing (stairs)						Not Applicable
Climbing (other)	<ul style="list-style-type: none"> <li>On to transfer decks to clear cross-ups</li> </ul>	✓				<ul style="list-style-type: none"> <li>Frequency of 0.5 to 30 times per hour</li> </ul>
Balancing	<ul style="list-style-type: none"> <li>To operate foot pedals</li> </ul>			✓		<ul style="list-style-type: none"> <li>A Drop Sort Operator will operate two foot pedals simultaneously causing them to balance on their heels</li> </ul>
Kneeling/ Crouching						Not Applicable
Other:						


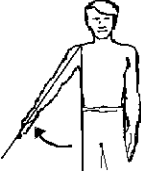

## Body Postures

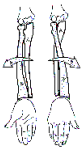






The table below outlines the body postures held or repeated throughout the shift by a Drop Sorter.

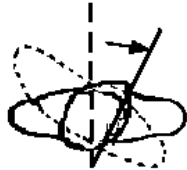

For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

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%	
<b>Neck</b>						
Flexion 						Not Applicable
Extension 						Not Applicable
Twisting 	<ul style="list-style-type: none"> <li>Twists to view monitors and lumber flow</li> </ul>			✓		<ul style="list-style-type: none"> <li>Frequency of 1 to 12 times per minute</li> <li>Duration of 1 to 2 seconds</li> </ul>

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<b>Shoulder</b>						
Flexion 	<ul style="list-style-type: none"> <li>Reaches out to the side to sort, direct and uncross lumber</li> </ul>			✓		<ul style="list-style-type: none"> <li>Frequency of 2 to 10 times per minute</li> <li>Duration of 1 to 5</li> </ul>
Abduction 	<ul style="list-style-type: none"> <li>Reaches out in front to sort and inspect lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Frequency of 3 times per minute</li> </ul>
Extension 	<ul style="list-style-type: none"> <li>Extends the arm back when pulling lumber off of the chain</li> <li>Extends the arm when reaching for the control panel</li> </ul>		✓			<ul style="list-style-type: none"> <li>Frequency of 4 times per hour</li> <li>Duration of 5 to 10 seconds</li> </ul>

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<b>Forearm</b>						
Rotation 	<ul style="list-style-type: none"> <li>Rotates the forearm when turning lumber</li> </ul>	✓				<ul style="list-style-type: none"> <li>Frequency of 3 to 20 times per minute</li> <li>Duration of 1 to 2 seconds</li> </ul>
<b>Wrist</b>						
Flexion 	<ul style="list-style-type: none"> <li>Bends the wrist when handling the lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Depending on how much the operator touches the lumber, the frequency will vary</li> </ul>
Extension 	<ul style="list-style-type: none"> <li>Bends the wrist when handling the lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Depending on how much the operator touches the lumber, the frequency will vary</li> </ul>
Ulnar Deviation 	<ul style="list-style-type: none"> <li>Extends the wrist when handling and turning the lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Depending on how much the operator touches the lumber, the frequency will vary</li> </ul>
Radial Deviation 	<ul style="list-style-type: none"> <li>Flexes the wrist when handling and turning the lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Depending on how much the operator touches the lumber, the frequency will vary</li> </ul>
<b>Back</b>						
Flexion 	<ul style="list-style-type: none"> <li>Bends forward to handle the lumber</li> <li>Bends forward to use a pike pole</li> <li>Bends forward to uncross or un-jam lumber</li> </ul>	✓				<ul style="list-style-type: none"> <li>Frequency of 2 to 5 times per minute</li> <li>Duration of 1 to 2 seconds</li> </ul>
Lateral Flexion 	<ul style="list-style-type: none"> <li>Leans to the side when handling lumber</li> <li>Leans to the side when uncrossing or un-jamming lumber</li> </ul>		✓			<ul style="list-style-type: none"> <li>Frequency of 1 to 12 times per minute</li> <li>Duration of 1 to 3 seconds at once</li> </ul>







Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<b>Back</b>						
	<i>Twisting</i> 					<i>Not Applicable</i>
	<i>Extension</i> 					<i>Not Applicable</i>
<b>Other:</b>						

## Hand Grips

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

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

The Comments section may contain information relating to duration, frequencies, 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%	
<i>Power</i> 	<ul style="list-style-type: none"> <li>Grasping peavy to uncross or un-jam lumber</li> </ul>	✓				<ul style="list-style-type: none"> <li>Peavies are gripped with one hand</li> <li>Frequency 4 times per shift</li> <li>Duration of 1 to 10 minutes</li> </ul>
<i>Power</i> 	<ul style="list-style-type: none"> <li>Grasping pike pole to uncross or un-jam lumber</li> </ul>	✓				<ul style="list-style-type: none"> <li>Pike poles are gripped with both hands</li> <li>Frequency of 2 times per shift</li> <li>Duration of 1 to 10 minutes</li> </ul>
<i>Power</i> 	<ul style="list-style-type: none"> <li>Grasping picaroon to uncross or un-jam lumber</li> <li>Grasping picaroon to pull lumber toward the worker</li> </ul>		✓			<ul style="list-style-type: none"> <li>Picaroons are gripped with one hand</li> <li>Frequency 4 times per shift</li> <li>Duration of 1 to 10 minutes</li> </ul>
<i>Pinch</i> 	<ul style="list-style-type: none"> <li>Pinching the lumber to turn them</li> </ul>		✓			<ul style="list-style-type: none"> <li>Some operators use a pinch grip to turn lumber</li> <li>Frequency of 3 to 6 times per minute</li> <li>Duration of 1 to 2 seconds</li> </ul>
<i>Hook</i> 	<ul style="list-style-type: none"> <li>Carrying lumber to waste conveyer</li> </ul>	✓				Not Applicable
<i>Precision</i> 	<ul style="list-style-type: none"> <li>Using a rotary selector switch to operate the machinery</li> </ul>	✓				<ul style="list-style-type: none"> <li>Frequency 8 to 10 times per shift</li> <li>Duration of 5 to 10 seconds</li> </ul>
<i>Other:</i>						

## Manual Material Handling

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

**Indicate which tasks are performed by placing a check mark (✓) in the far left column. Fill in the weight (or force) required to move the objects (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	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Pulling and pushing lumber to uncross or un-jam lumber.</i>			✓			<ul style="list-style-type: none"> <li>The weight may vary depending upon the type of lumber. See the Weight of wood equation in Appendix A.</li> </ul>
<i>Pulling on a pike pole with lumber attached.</i>		✓				<ul style="list-style-type: none"> <li>The weight may vary depending upon the type of lumber. See the Weight of wood equation in Appendix A.</li> <li>Add the weight of the pike pole to this</li> </ul>
<i>Lifting lumber to sort out cross-ups.</i>			✓			<ul style="list-style-type: none"> <li>The weight may vary depending upon the type of lumber. See the Weight of wood equation in Appendix A.</li> </ul>
<i>Carrying lumber to waste conveyor</i>		✓				<ul style="list-style-type: none"> <li>The weight may vary depending upon the type of lumber. See the Weight of wood equation in Appendix A.</li> </ul>
<i>Other:</i>						

## Hand Tools

Indicate the hand tools used by a Drop Sorter at your mill by placing a check mark (✓) in the far left column. Determine the weight of the hand tool and enter it in the 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%	
<i>Pike Pole</i>	<input type="checkbox"/> <i>Uncross and un-jam lumber.</i>	2.5	✓				<ul style="list-style-type: none"> <li>• <i>Frequency of 2 to 6 times per hour</i></li> <li>• <i>Duration of 1 to 10 minutes</i></li> </ul>
<i>Picaroon</i>	<input type="checkbox"/> <i>Uncross and un-jam lumber.</i> <input type="checkbox"/> <i>Used to pull lumber toward the worker.</i>	1.3		✓			<ul style="list-style-type: none"> <li>• <i>Frequency of .5 to 12 times per hour</i></li> <li>• <i>Duration of 1 to 5 minutes</i></li> </ul>
<i>Peavy</i>	<input type="checkbox"/> <i>Uncross and un-jam lumber.</i>	5.0	✓				<ul style="list-style-type: none"> <li>• <i>Duration of 30 seconds to 1 minute</i></li> </ul>
<i>Other:</i>							

## Environmental Conditions

### Work Environment

The table below contains a list of environmental conditions that may be of concern at the Drop Sorter 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, indicate the appropriate value for the noise and lighting levels at your mill for the Drop Sorter. For the lighting level, include the location of the measurements within the workstation.

<b>Factor</b>	
<b>Vibration</b>  <input type="checkbox"/> Yes  <i>(Check one)</i>  <input type="checkbox"/> No	<input type="checkbox"/> Whole body <input type="checkbox"/> Seat <input type="checkbox"/> Floor  <input type="checkbox"/> Hand transmitted <input type="checkbox"/> Tool <input type="checkbox"/> Other: _____

<b>Noise level</b>	<i>Range found: 89.1 to 99.9 dB</i>  <i>Mill specific:</i>
<b>Lighting level</b>	<i>Range found: 133 lux to 3.45 klux ( in front of the worker)</i>  <i>Mill specific:</i>
<b>Other:</b>	

## **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.

<b>Work Environment</b>	
<input type="checkbox"/>	Outside uncovered
<input type="checkbox"/>	Outside covered
<input type="checkbox"/>	Inside enclosed
<input type="checkbox"/>	Inside exposed
<input type="checkbox"/>	Heater present
<input type="checkbox"/>	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.

<b>Region</b>	<b>Avg. Max July/Aug</b>	<b>Avg. Min Dec/Jan</b>	<b>Extreme Max.</b>	<b>Extreme Min.</b>
<input type="checkbox"/> Vancouver Island	22.5 °C	-0.6 °C	36.1 °C	-18.8 °C
<input type="checkbox"/> Southwestern BC	22.9 °C	0.4 °C	35.6 °C	-18.3 °C
<input type="checkbox"/> Cariboo Chilcotin Coast	22.2 °C	-11.6 °C	36.4 °C	-42.5 °C
<input type="checkbox"/> High Country	26.3 °C	-9.9 °C	39.6 °C	-39.7 °C
<input type="checkbox"/> Okanagan Similkameen	26.5 °C	-8.4 °C	36.0 °C	-36.3 °C
<input type="checkbox"/> Kootenay Country	26.2 °C	-6.7 °C	38.5 °C	-32.0 °C
<input type="checkbox"/> British Columbia Rockies	24.7 °C	-12.3 °C	37.5 °C	-42.2 °C
<input type="checkbox"/> North by Northwest	19.5 °C	-11.7 °C	32.9 °C	-38.1 °C
<input type="checkbox"/> 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 Drop Sorter 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.*

$$[(\text{Dimensions of wood}) \times 12] / 144 = \text{Multiple}$$

**For example:** For a 5 by 5 piece of wood  $[(5 \times 5) \times 12] / 144 = 2.08$

### 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

$$2.95 \text{ (wet lb./ board foot)} \times 0.67 \text{ (size of wood multiple for 2" x 4")} \times 16 \text{ (length of board in feet)} = 32 \text{ lbs.}$$

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.

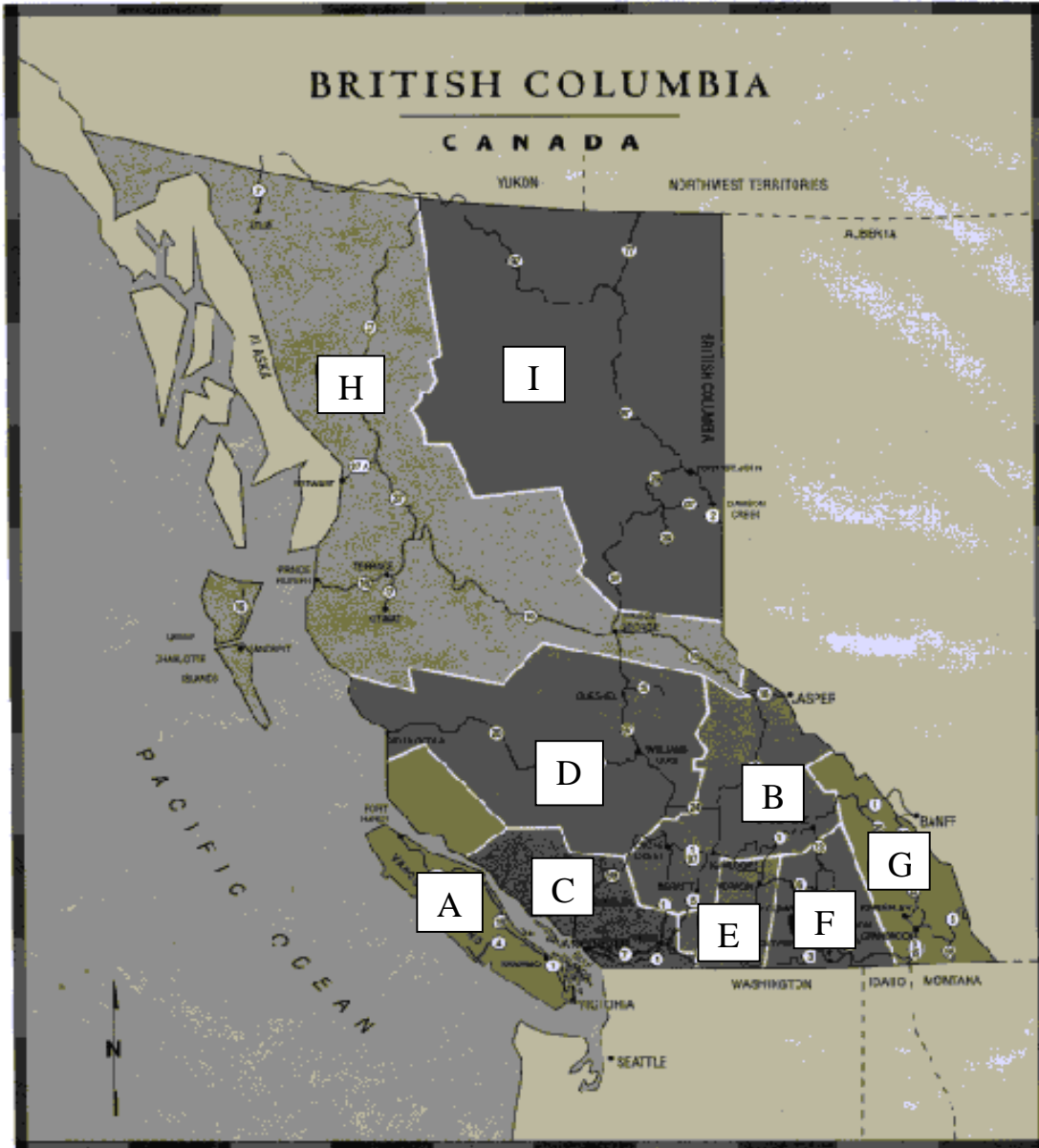
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

*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) <i>From Section 1</i>	x	Multiple (size of wood) <i>From Section 2</i>	x	Length of Wood <i>From Section 3</i>	=	Weight of the Board in pounds	Divide by 2.2 to calculate value in kilograms
<b>Heaviest Species Handled</b>	x		x		=		
<b>Most Common Species Handled</b>	x		x		=		
<b>Lightest Species Handled</b>	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



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

# Risk Factor Identification Checklist

## Drop Sorter

### Purpose

The Risk Factor Identification Checklist for a Drop Sorter 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 – Drop Sorter

Management Representative \_\_\_\_\_

Risk Identification completed:

Worker Representative \_\_\_\_\_

Before implementation of solutions

Date \_\_\_\_\_

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.

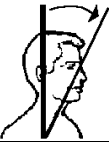

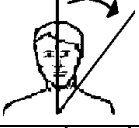
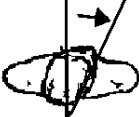
**Static Postures:** Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

**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.

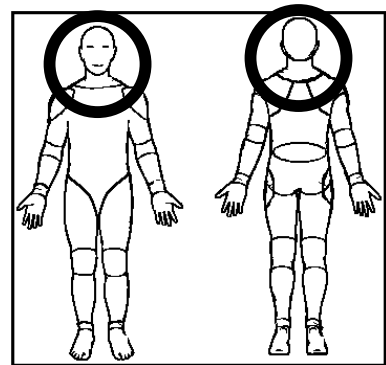
**Awkward Postures:** Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

**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 down and up)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., monitoring flow of lumber)			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., looking down at lumber)			S O	
Awkward Posture				
Flexion			S O	
Extension			S O	
Lateral Bending			S O	
Rotation			S O	



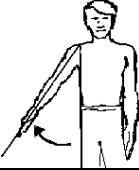
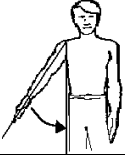
Please indicate whether the following direct risk factors were identified at the NECK.		
<b>Direct Risk Factors</b>	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes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



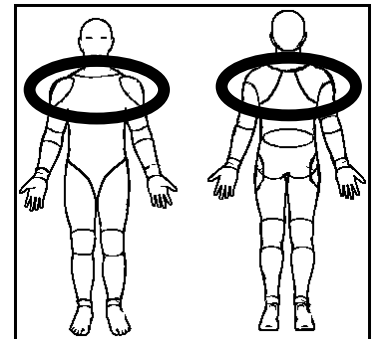
*Body parts within the circled area will be classified as NECK issues.*

## SHOULDER

<b>Force</b>	<b>N</b>	<b>Y</b>	<b>Comments:</b>
Is forceful physical handling performed? Such as: Lifting		S O	
Lowering		S O	
Pushing		S O	
Pulling		S O	
Carrying		S O	
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., turning lumber)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., monitoring lumber)		S O	
<b>Static Posture</b>			
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., picaroon)		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 <b>SHOULDER</b> .		
<b>Direct Risk Factors</b>	Force	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the <b>Injury Statistics</b> investigation, were there injury reports for the Shoulder or Neck or Upper Back? (see Worksheet 1 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> No
In the <b>Discomfort Survey</b> investigation, were there reports of discomfort for the Shoulder or Neck or Upper Back? (see Worksheet 2 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> No



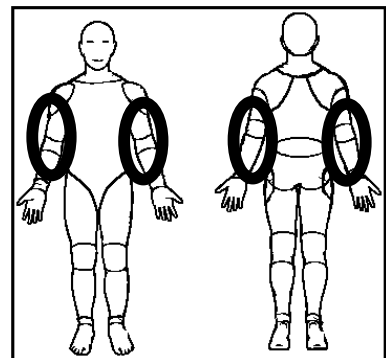
*Body parts within the circled area will be classified as SHOULDER issues.*

## ELBOW

Force	N	Y	Comments:
Is forceful physical handling performed? Such as:			S
Lifting			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., pike pole) 			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 <b>No</b> , check the <b>No</b> box and go to next section.		*	S
			O
*If the answer to the above question is <b>Yes</b> , ask the worker: Are the gloves too large/small?			S
			O
Does the thickness of the gloves cause problems with gripping?			S
			O
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., turning lumber)			S
			O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., turning lumber)			S
			O




<b>Static Posture</b>		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., pike pole)			S O	
<b>Contact Stress</b>				
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., hand tools that dig into the palm of the hand)			S O	
<b>Vibration</b>				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	





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



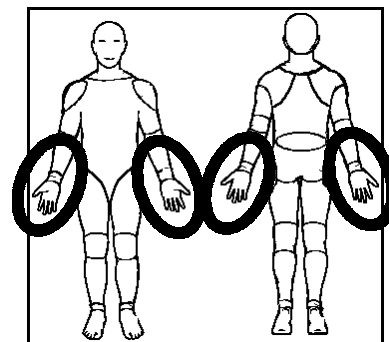
*Body parts within the circled area will be classified as ELBOW issues.*

## 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., pike pole) 		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 <b>No</b> , check the <b>No</b> box and go to next section.		*	S
			O
*If the answer to the above question is <b>Yes</b> , ask the worker: Are the gloves too large/small?			S
			O
Does the thickness of the gloves cause problems with gripping?			S
			O
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., turning lumber)			S
			O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., turning lumber)			S
			O

<b>Static Posture</b>		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., pike pole)			S O	
<b>Contact Stress</b>				
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., hand tools that dig into the palm of the hand)			S O	
Ask the worker: Do you use your hand like a hammer for striking?			S O	
<b>Awkward Posture</b>				
Flexion			S O	
Extension			S O	
Ulnar Deviation			S O	
Radial Deviation			S O	
<b>Vibration</b>				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	





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



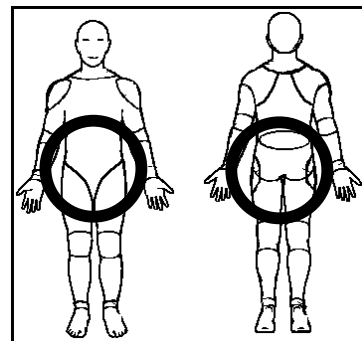
*Body parts within the circled area will be classified as WRIST issues.*

## LOW BACK OR HIP/THIGH

<b>Force</b>	N	Y	Comments:
Is forceful physical handling performed? Such as:			S
Lifting			O
Lowering			S
			O
Pushing			S
			O
Pulling			S
			O
Carrying			S
			O
<b>Repetition</b>			
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., turning lumber)			S
			O
<b>Static Posture</b>			
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending forward to handle lumber)			S
			O
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S
			O
<b>Contact Stress</b>			
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hip/thigh? (e.g., workstation that digs into the hip or thigh)			S
			O


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

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

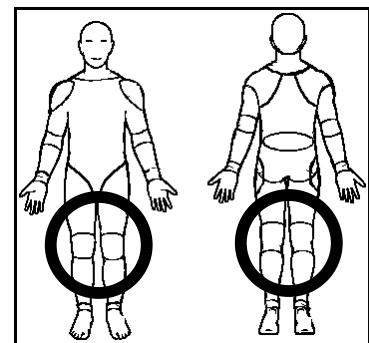


*Body parts within the circled area will be classified as LOW BACK issues.*

## KNEE



Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture?			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 <b>any</b> objects or parts of the workstation put pressure on your knee(s)?			S O	
Awkward Posture				
Extreme Flexion			S O	

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

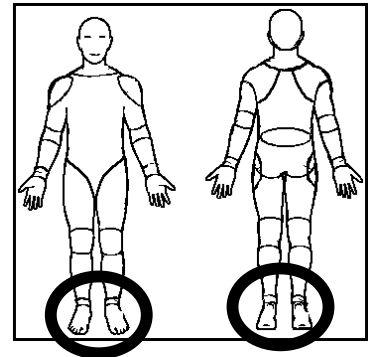


*Body parts within the circled area will be classified as KNEE issues.*

## 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., standing or sitting on vibrating surface)			S O	

Please indicate whether the following direct risk factors were identified at the ANKLE/FOOT.		
<b>Direct Risk Factors</b>	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Vibration	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the <b>Injury Statistics</b> investigation, were there injury reports for the Ankle or Foot? (see Worksheet 1 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> No
In the <b>Discomfort Survey</b> investigation, were there reports of discomfort for the Ankle or Foot? (see Worksheet 2 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> 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 <b>No</b> , check the <b>No</b> box and go to the next section.			S O
If the answer to the above question is <b>Yes</b> , ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O

## ENVIRONMENTAL CONDITIONS

<b>Temperature</b>			
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
<b>Lighting</b>			
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?		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**



# **Drop Sorter**

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

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## Work Manual

# Drop Sorter

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### **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.*

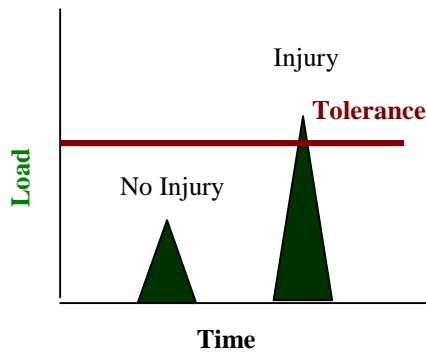
*Neither AEI nor the IMIRP Society accepts any responsibility for the use or misuse of these documents.*

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# Injury Education

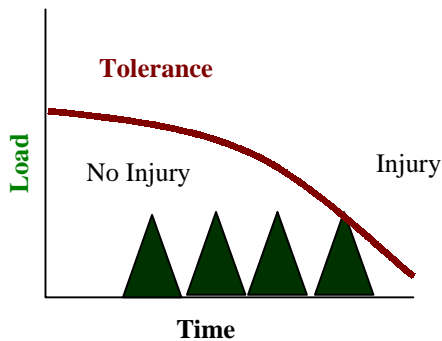
*Injuries occur when ...  
Loads exceed tissue tolerances*



## ***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.

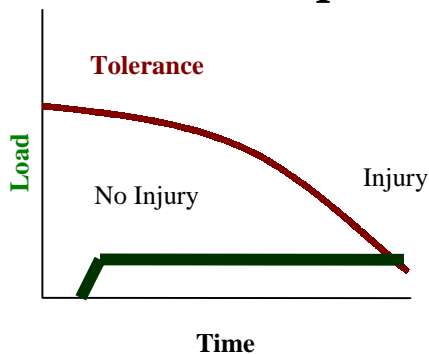
*Example – a worker going over on their ankle and spraining it.*



## ***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 Drop Sort 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 Drop Sorter. 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:**  
Awkward Postures  
Repetition



**A Drop Sorter must look to the side in order to observe mirrors, monitors, lumber quality, and lumber flow.**

### BACKGROUND INFORMATION

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

### DIRECT RISK FACTORS

#### *Awkward 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 side bent position. The more the neck is bent, the greater the load on the muscles and tendons.

#### *Repetition*

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

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Heights**

- The height of mirrors and monitors can lead to awkward neck postures, in combination with repeated twisting. This results in an increased risk of neck injury.

#### **Additional Workstation Design Options**

- Loading on the neck muscles is increased because the orientation of the worker, with respect to the infeed and outfeed, and the location of mirrors and monitors, requires the operator to repeatedly twist the neck to monitor the work area.

## 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 90 & 91.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

## NECK/SHOULDER

**Direct Risk Factors:**  
Awkward Postures  
Repetition



**A Drop Sorter frequently works with the arms away from the body in order to operate 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

#### *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.

#### *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.

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Reaches**

- The Drop Sorter may use a console to control machinery at the workstation. The reach distance to these controls can require extreme arm postures, especially if the console is behind the operator. These postures can increase the risk of tissue injury.

#### **Working Heights**

- The height of control panels can also lead to awkward shoulder postures, increasing the risk of injury.

## CONSEQUENCES

- When working with the arms 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 90 & 91.
- For exercises that can help to prevent *neck* and *shoulder* injuries, see the *Neck* and *Shoulder sections of the Body Manual*.

## SHOULDER

### Direct Risk Factors:

Force  
Awkward Postures  
Repetition



**A Drop Sorter must manipulate lumber in order to turn boards and sort pieces.**



**A Drop Sorter also pulls lumber in order to remove waste pieces from the chain.**

## BACKGROUND INFORMATION

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

## DIRECT RISK FACTORS

### *Force*

- The rotator cuff stabilises the shoulder joint when objects are pushed and pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff.
- If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.

## ***Awkward Postures***

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

## ***Repetition***

- When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

## **INDIRECT RISK FACTORS**

### ***Workstation Design***

#### **Working Reaches**

- Extended reaching for lumber pieces on the chain, or pulling lumber behind the body, can force Drop Sorters to adopt awkward postures.

#### **Working Heights**

- Controls or chains that are too high for a Drop Sorter can lead to the use of awkward shoulder postures to complete job tasks.

### ***Characteristics of Objects Being Handled***

#### **Size and Shape**

- Handling larger pieces of lumber places more force on the tissues of the shoulder.

## **CONSEQUENCES**

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

## **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled “Shoulder” in the Summary of Solutions on pages 90 & 91.
- For exercises that can help to prevent *shoulder* injuries, see the ***Shoulder section of the Body Manual***.

## ELBOW/WRIST

### Direct Risk Factors:

Force  
Awkward Postures  
Repetition



**A Drop Sorter must grip lumber in order to turn and sort pieces.**

### BACKGROUND INFORMATION

- Muscles used for gripping are found in the forearm. The tendons of these muscles cross over the elbow and the wrist joints before connecting to bones. The elbow area may be affected by tension generated in the forearm muscles.

### DIRECT RISK FACTORS

#### *Force*

- Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. The harder that an object must be gripped, the greater the load on the tendon/bone connection.

#### *Awkward Postures*

- The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection.
- The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip. Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.

### ***Repetition***

- Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury.

## **INDIRECT RISK FACTORS**

### ***Characteristics of Objects Being Handled***

#### **Size and Shape**

- The Drop Sorter often has to handle the lumber flowing through the workstation. The size and shape of the lumber may affect how the operator handles the lumber. The larger the lumber pieces, the greater the force that is needed to manipulate the lumber piece.

#### **Container, Tool, and Equipment Handles**

- Pike poles and picaroons with slippery handles require more grip force to control, leading to increased tension and fatigue in the forearm muscles.

## **CONSEQUENCES**

- Repeated forceful gripping may lead to fatigue at the tendon/bone connection near the elbow.
- Signs and symptoms include pain in the elbow area and decreased grip strength.

## **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the Elbow/Wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 90 & 91.
- For exercises that can help to prevent *elbow* injuries, see the *Elbow section of the Body Manual*.

# LOW BACK

**Direct Risk Factors:**  
Force  
Awkward Postures  
Repetition

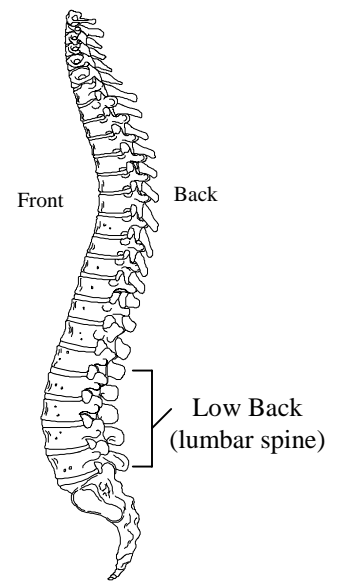


**A Drop Sorter must bend forward and to the side in order to sort lumber, reach pieces, and clear jam-ups.**

## 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.

*Neutral Spine*



## DIRECT RISK FACTORS

### *Force*

- Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back.

### *Awkward Postures*

- Back muscles must support the weight of the upper body when leaning forward or to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.

## ***Repetition***

- Repeated forward bending, side bending, or lifting can gradually fatigue the structures of the low back. If the repetitive stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury.

## **INDIRECT RISK FACTORS**

### ***Workstation Design***

#### **Working Reaches**

- Extreme forward or side reaching can put a Drop Sorter's back into an awkward posture. Workstations with obstructions (e.g., foot pedals, control console) between the operator and the chains can lead to this extreme reaching.

#### **Working Heights**

- Straightening lumber on chains that are too low can force a Drop Sorter to use awkward back postures.

### ***Characteristics of Objects Being Handled***

#### **Size and Shape**

- The force required in the back to handle lumber increases with the size of the lumber. These increased forces can result in tissue fatigue and injury.

#### **Container, Tool, and Equipment Handles**

- Using pike poles or picaroons that are too short to easily reach lumber pieces can lead to awkward postures of the back.

## **CONSEQUENCES**

- Repeatedly bending forward or to the side may lead to damage in the disc walls.
- Signs and symptoms may 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 90 & 91.
- For exercises that can help to prevent **back** injuries, see the ***Back section of the Body Manual***.

# LOW BACK

**Direct Risk Factors:**  
Awkward & Static Postures  
Vibration

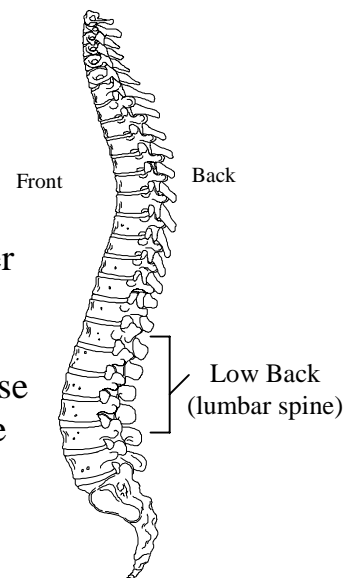


**A Drop Sorter continually sits on a vibrating surface.**

*Neutral Spine*

## 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.



## 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*

#### **Seating**

- The design of the seating will have a large impact on the level and degree of vibration felt by the Drop Sorter.

### *Environmental Conditions*

#### **Vibration**

- Vibration occurs because the workstation is in direct contact with the machines, transfer chains, and conveyors around the workstation. In combination with the seated posture, this transmitted vibration puts the operator at a greater risk for injury.

### *Work Organisation*

#### **Task Variability**

- The Drop Sorter is required to perform the same motions over the duration of the shift. There is very little task variability in a Drop Sorter's job.

## 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 90 & 91.
- For exercises that can help to prevent *back* injuries, see the *Back section of the Body Manual*.

## ANKLE

**Direct Risk Factors:**  
Awkward Postures  
Repetition



**A Drop Sorter frequently activates foot pedals in order to operate drop gates, transfer chains, power rollers, and**

### 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**

- The height of foot pedals, and the distance they need to be depressed, can increase the awkward nature of ankle postures.

## **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 90 & 91.

# FOOT

**Direct Risk Factors:**  
Awkward Postures  
Static Postures



**A Drop Sorter must continually press down on foot pedals in order to activate transfer chains.**

## 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 when the height of the foot pedals requires a Drop Sorter 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 90 & 91.
- For exercises that can help to prevent *foot* injuries, see the *Foot section of the Body Manual*.

# FOOT

**Direct Risk Factors:**  
Static Postures  
Vibration



**Some Drop Sorters continually stand on a hard, vibrating surface in order to sort lumber.**

## 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 is responsible for producing the arch in our feet.

## DIRECT RISK FACTORS

### *Static Postures*

- While standing, the weight of the body loads the plantar fascia. If the duration of standing is excessive, and recovery is not adequate, the fascia may deform to the point of injury.

### *Vibration (whole body)*

- Vibrating floors can increase the loading on the foot. Factors like vibration level and vibration frequency increase the amount of loading on the foot, and could lead to irritation. The longer the Drop Sorter is exposed to vibration, the greater the risk of injury.

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Seating**

- The absence of appropriate seating at a workstation can force a Drop Sorter to use a standing work posture all shift, increasing the loads on the feet.

#### **Floor Surfaces**

- Floors that are too hard can increase the vibration transmission to the feet. Uneven flooring can also cause discomfort in the feet with static standing.

### *Environmental Conditions*

#### **Vibration**

- Vibration occurs because the workstation is in direct contact with the machines, transfer chains, and conveyors around the workstation. In combination with the standing posture, this transmitted vibration puts the operator at a greater risk for injury.

## CONSEQUENCES

- Continual standing 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 problems progress the pain may become chronic.

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled “Ankle/Foot” in the Summary of Solutions on pages 90 & 91.
- For exercises that can help to prevent *foot* injuries, see the *Foot section of the Body Manual*.

## Summary of Body Parts at Risk

### NECK

- A Drop Sorter must look to the side in order to observe mirrors, monitors, lumber quality, and lumber flow.



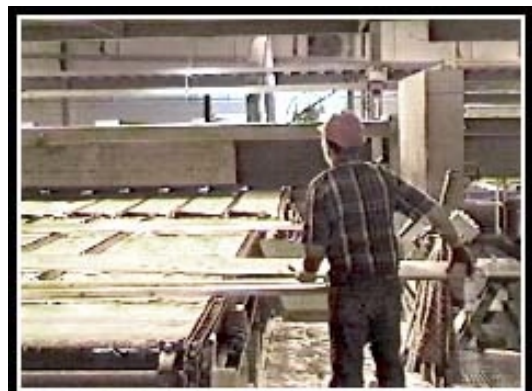
### NECK/SHOULDER

- A Drop Sorter frequently works with the arms away from the body in order to operate controls.



### SHOULDER

- A Drop Sorter must manipulate lumber in order to turn boards and sort pieces.
- A Drop Sorter also pulls lumber in order to remove waste pieces from the chain.



## ELBOW/WRIST

- A Drop Sorter must grip lumber in order to turn and sort pieces.



## LOW BACK

- A Drop Sorter must bend forward and to the side in order to sort lumber, reach pieces, and clear jam-ups.



- A Drop Sorter continually sits on a vibrating surface.



## ANKLE

- A Drop Sorter frequently activates foot pedals on order to operate drop gates, transfer chains, power rollers, and conveyors.



## FOOT

- A Drop Sorter must continually press down on foot pedals in order to activate transfer chains.
- Some Drop Sorters continually stand on a hard, vibrating surface in order to sort lumber.



# 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
<b>Duration**</b>	Duration	✓	✓	✓	✓			✓			✓	✓
<b>Workstation Design</b>	Working Reaches		✓	✓				✓				
	Working Heights	✓	✓	✓				✓			✓	✓
	Seating							✓				✓
	Floor Surfaces											✓
<b>Characteristics of Objects Being Handled</b>	Size and Shape			✓	✓							
	Load Condition and Weight Distribution											
	Container, Tool and Equipment Handles				✓			✓				
<b>Environmental Conditions</b>	Heat Exposure	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Cold Exposure	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Lighting	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Noise	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Vibration*	♦	♦	♦	♦	♦	♦	✓	♦	♦	♦	✓
<b>Work Organisation</b>	Work-Recovery Cycles	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Task Variability	♦	♦	♦	♦	♦	♦	✓	♦	♦	♦	♦
	Work Rate	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

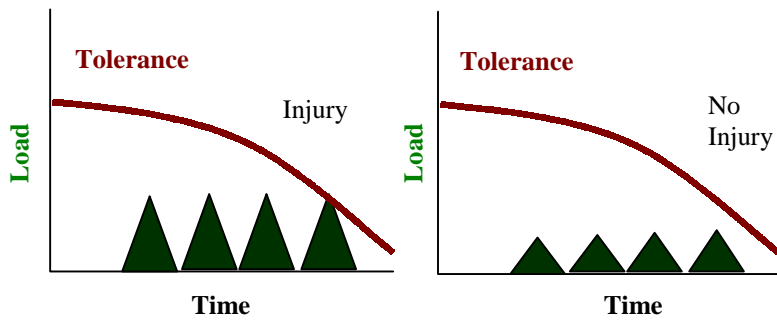
\* Vibration is categorised under both direct and indirect risk factors. Vibration can directly increase the likelihood of injury to the back and wrist as well as indirectly (environmental conditions) promote injuries in other parts of the body.

\*\* Extended exposure to any 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 90 & 91 for specific problem/ solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

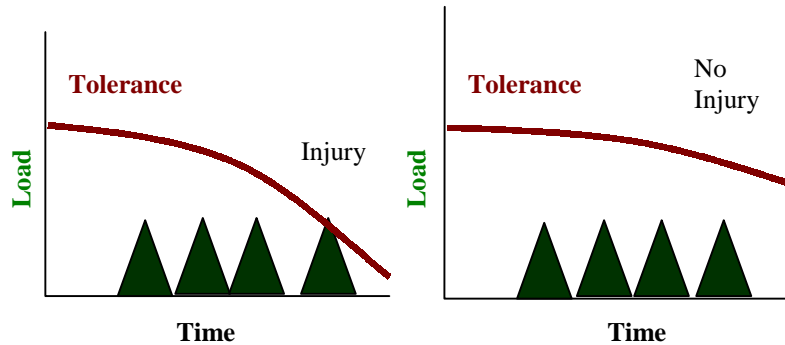
# Injury Prevention

*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 Drop Sort 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**

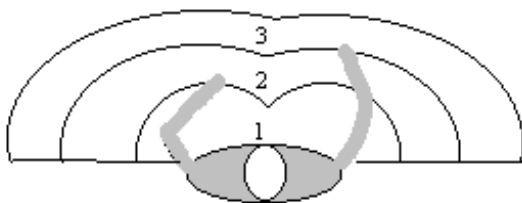
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

**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.



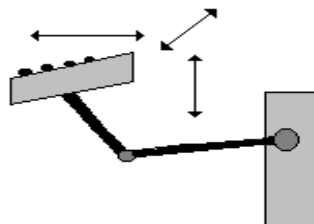
1 = Controls/items most frequently used  
2 = Controls/items less frequently used  
3 = Controls/items least frequently used

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.

### *Movable console*

E

Drop Sorters often have to reach behind themselves to activate controls on the control panel. This movement places the shoulder in an awkward posture and puts the operator at risk for injury. By relocating the console adjacent to the conveyor on a movable arm, the control panel could be placed where the operator would like it, removing the backward reach and allowing the console to be at a convenient angle. The console could be readily pushed aside when access to the transfer deck was needed.



## 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 Drop Sorter, 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.

### *Adjustable floor height*

E
---

 A workstation that is adjustable in height would be preferable. This can be done one of two ways:

- 1) Platforms can be built for individual workers if the height of the chain is above hip height. These platforms will bring the workers up to the height of the chain, reducing the stress on the shoulder. The edges of the platform should be clearly marked, to prevent tripping.
- 2) A pneumatic floor that the operator can adjust to a height that is optimal for him/her, as shown in the figures below, can also minimise awkward postures. The difference in height should be highly visible to the worker, as this may be a potential tripping hazard if the height difference is not well marked.



*Figure 1: platform lowered*



*Figure 2: platform raised*

### ***Monitor height***

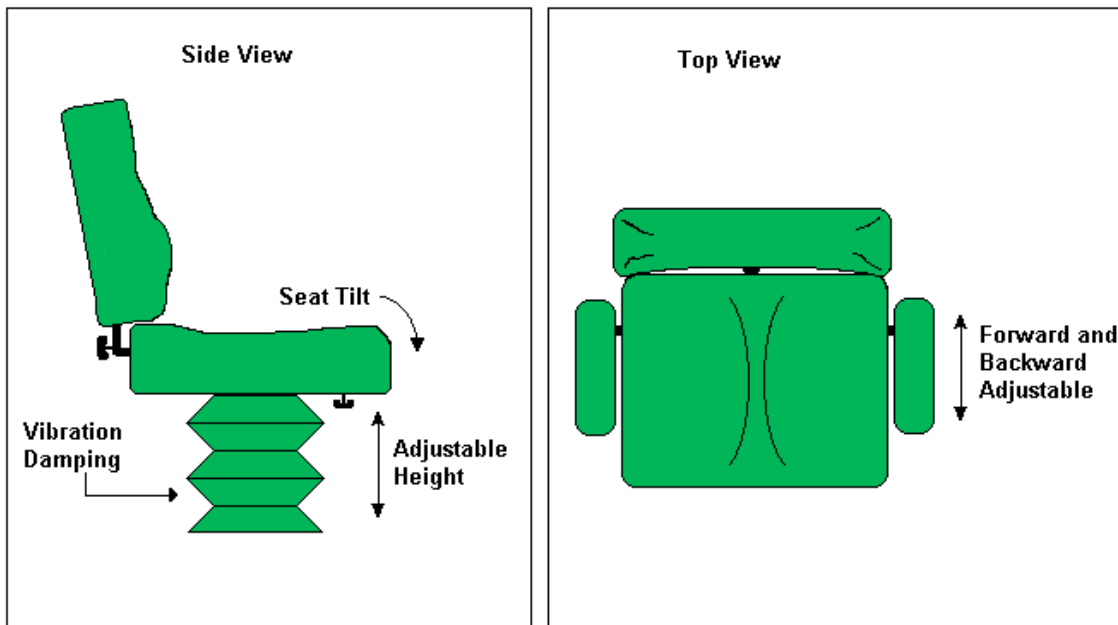
E

Drop Sorters often have to view monitors to ensure the constant flow of lumber through the drop sort workstation and to other workstations. If the monitors are placed improperly, awkward and repetitive postures of the neck could result. Monitor heights are preferably between eye level and up to  $20^{\circ}$  below this horizontal. Monitors should also be less than  $15^{\circ}$  to the left or right of centre for an operator who is facing forward. Ensure that monitors are kept clean and glare free.

## SEATING

Many Drop Sorters are required to sit when operating controls and sorting pieces. 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 Drop Sorter does not maintain a neutral spine (see Injury Education for the Low Back on page 11).

- 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

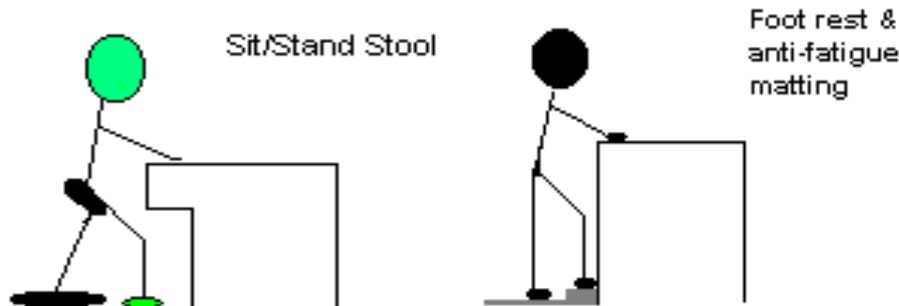
- WP In order to reduce awkward postures in the low back, the lumbar support in the chair should be adjusted to maintain the curve in the low back while sitting.

- WP In order to reduce awkward and static postures in the low back, encourage Drop Sorters 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.

### *Sit/stand stool*

E  
WP

In order to minimise fatigue the lower extremities, sit/stand stools can be provided. Sit/stand stools are preferred over regular stools, as the design makes it easier to alternate between sitting and standing, and allows the larger muscles of the lower extremities to be recruited when handling objects. If sit/stand stools are not possible, foot rests or foot rails can be provided to encourage frequent changes in posture.



## FLOOR SURFACES

### *Anti-fatigue matting*

E

In order to minimise fatigue in the lower extremities, anti-fatigue matting can be installed. The use of anti-fatigue matting in the work area will help to increase comfort and reduce muscle fatigue. The cushioned surface encourages continuous micro-movements of the feet, which minimises blood pooling in the feet and legs and the associated discomfort. Addition of anti-fatigue matting may also aid in damping vibration levels.

## Foot pedals

### Recessed foot pedals

E

In order to minimise awkward postures of the ankle, recess foot pedals into anti-fatigue matting to decrease the height of the foot pedal base. To recess foot pedals, and provide a more comfortable standing surface in the process, position anti-fatigue matting as close as possible to the foot pedal base. If the pedals are stationary, cut the matting to surround the front of the foot pedal. For moveable foot pedals, place the matting as close to the base of the foot pedal as possible. The height of the matting should not exceed the base of the foot pedal (see diagram below). It is important to ensure pedals are kept clean of debris and are well maintained.



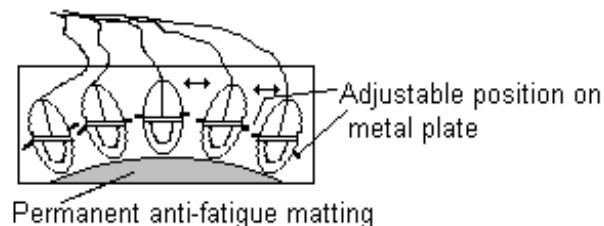
### Movable foot pedals

E

In order to reduce awkward postures of the lower extremities, allow operators to choose the most appropriate position for the pedals, based on their body dimensions and the workstation design.

Securing the foot pedals may be required or desirable. Three solutions include:

- 1) Providing moveable foot pedals on a metal plate. The foot pedals are positioned in slide tracks cut into the metal, which allow pedals to move into the desired positions. The pedals are then fastened into place. The operator is able to move the set of foot pedals to any desired position in the workstation.



- 2) Providing several positions on the floor where clips or nails may be used to secure foot pedals. If this option is considered, make sure each possible position is highly visible to all operators, to prevent tripping or injuries.

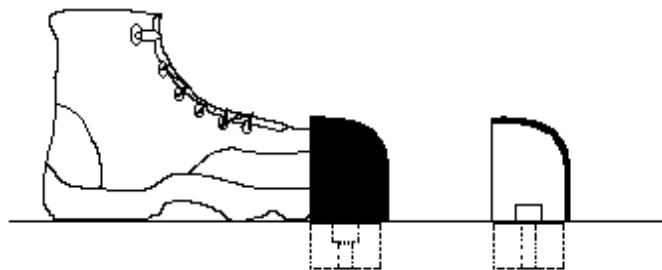
- 3) Providing a physical link (e.g., a metal bar) between two foot pedals with the same function. This solution is most appropriate where a worker may move to manipulate lumber but still needs to operate the foot pedals.



### Foot push buttons

E

In order to eliminate awkward ankle postures, foot buttons can be chosen over foot pedals in certain circumstances. In general, foot controls leave the upper body free to manipulate or handle items, while still maintaining control over the process or equipment. For processes or equipment that require a control to produce a discrete action (e.g., on/off, start/stop) or maintain a continuous process (e.g., movement of a chain), a foot push button may be appropriate. The desired operation (e.g., chain running) is easily activated by the weight of the operator on the push button. When the foot is removed, the switch is deactivated, causing the process to stop. For safety reasons, a foot push button needs to be protected from accidental activation. A guard, similar to those used on foot pedals, may be appropriate.



## ADDITIONAL WORKSTATION DESIGN OPTIONS

### *Pin stops*

E Drop Sorters often have to exert force while in awkward postures to clear cross ups and turn lumber. This increases the risk of injury to the low back, shoulder, elbow, and wrist. Adding pin stops to the workstation can aid in flipping the larger pieces of lumber, if the pins are located close to the workstation. By having one end of the board over the pin and activating the pin, the initial force needed to lift the lumber is decreased. This decreases the stress on the shoulders, elbows, and wrists. Pins placed further away from the workstation will allow the Drop Sorter to have more control over the level or flow of lumber coming in to his/her workstation at once. For example, the operator would be able to straighten lumber that is coming in at an angle. This would decrease the risk of injury at the shoulder and low back.

### *Drop gate*

E Add drop gates in place of power rollers or conveyors. When using the drop gate, unnecessary wood handling can be decreased because the worker no longer has to lift the lumber up, over, and into the waste conveyor. Power rollers aid in the movement of the lumber, but can cause unnecessary strain to the hands, arms, and shoulders if the worker doesn't let go of the lumber before the roller catches it.

### *Camel back chains*

E Using camel back chains on the transfer deck may cut down on the number of jam-ups that occur at the workstation, decreasing the risk of injury to the shoulder, elbow, wrist, and low back. Since the camel back chains are smooth on the top, they decrease the potential for large splinters on the wood getting caught in the chain and pulling the load out of alignment.

### *Convex mirror*

E The Drop Sorter has to monitor the lumber coming into and going out of the workstation. To do this, repetitive neck twisting is required, placing strain on the neck muscles and putting the worker at risk for an injury. To decrease this motion, install a convex mirror to give an overall view of the transfer deck. Only when a problem occurs does the operator have to turn their head to assess the corrective action necessary.

# Characteristics of Objects Being Handled

## SIZE AND SHAPE

### *Board turner*

- E Turning boards to inspect the lumber for defects places stress on the shoulders, elbows, and wrists of the Drop Sorter. Adding a board turner to use for turning larger or heavier pieces of lumber would decrease the load on the wrist, elbow, and shoulders.

### *Leverage*

- WP Leverage can be used to help get the lumber off of the main chain and into the conveyors. By pushing down on one end of the lumber, you can create a lever to aid in lifting the rest of the piece of lumber up on to the chain. Pulling the lumber out before pushing down would create a better leverage point. At least half the length of the board should be on the conveyor before lifting the rest of the board, to minimise loads. This can reduce risk of injury for the shoulder and low back, as it decreases the force needed to manipulate the lumber.

### *Alternating hands*

- WP Alternating hands to turn the lumber will decrease the load taken on by one hand individually. The one-handed technique should only be used when handling smaller lumber. By using both the right and left hands evenly to turn lumber, the risk of injury is reduced by sharing the load.

### *Two hands at once*

- WP Using both hands to flip larger pieces of lumber will significantly decrease the load on one hand when doing the same task.

### *Unnecessary handling*

- WP Handling every piece of lumber can increase the chance of injury to the wrist, elbow, shoulder, and back of the operator. Try not to unnecessarily handle every piece of lumber going by, to reduce the risk of injury.

## LOAD CONDITION AND WEIGHT DISTRIBUTION

### *Pike pole use*

**WP** Pike poles should be lightweight and the right length for the job. The pike pole should be longer than the distance from the operator to the object to be retrieved. This extra distance will prevent the pike pole from striking the operator if the pike pole detaches from the object, and will also give the operator some extra grip length if the pike pole pulls away from the operator. Two hands should be used when handling the pike pole. Once the sharp end of the pike pole is stuck in the lumber, only pull on it twice before removing it from the wood. Repeat this process until the lumber is uncrossed or the jam is cleared.

## CONTAINER, TOOL AND EQUIPMENT HANDLES

### *Tool handles*

**E** In order to reduce the force required to grip hand tools, increase the friction between the tool handles and the operator's glove. Due to the smooth, slippery surface of metal or wooden tool handles (e.g., pike pole, picaroon) a Drop Sorter must use a higher grip force in order to maintain control of the tool. This can put the elbow, and possibly the wrist and hand, at risk of injury. Wrapping the tool handles with foam, rubber, medical/athletic tape, or modifying the surface using other friction increasing material (e.g., gritty paint if plastic substances are not allowed) would increase the friction between the handle and the Drop Sorter's glove, and thus decrease the grip forces required.

### *Gloves*

**PPE** In order to reduce grip forces required by the Drop Sorter, the operator should wear thin, close fitting gloves with a "sticky" palm surface to increase the friction between the gloves and the tool handles.

## **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.

		<b>Injury Prevention Potential</b>										
<b>SOLUTIONS</b>	<b>Page</b>	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/Hand	Low Back	Hip	Knee	Ankle	Foot
<b>Working Reaches</b>	<b>79</b>		<b>R</b> <b>A</b>	<b>R</b> <b>A</b>	<b>R</b> <b>A</b>			<b>A</b>				
<b>Movable console</b>	<b>79</b>		<b>A</b>	<b>A</b>	<b>A</b>							
<b>Working Heights</b>	<b>80</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>			<b>A</b>				
<b>Adjustable floor height</b>	<b>80</b>		<b>A</b>	<b>F</b> <b>R</b> <b>A</b>	<b>F</b> , <b>A</b>			<b>F</b> <b>R</b> <b>A</b>				
<b>Monitor height</b>	<b>81</b>	<b>A</b>										
<b>Seating</b>	<b>82</b>							<b>A</b> <b>S</b>			<b>A</b>	<b>S</b>
<b>Sit/stand stool</b>	<b>83</b>							<b>A</b> <b>S</b>			<b>A</b>	<b>S</b>
<b>Anti-fatigue matting</b>	<b>83</b>							<b>S</b> <b>V</b>				<b>S</b> <b>V</b>
<b>Foot pedals</b>	<b>84</b>										<b>A</b>	
<b>Pin stops</b>	<b>86</b>			<b>F</b> <b>R</b> <b>A</b>	<b>F</b> <b>R</b> <b>A</b>			<b>F</b> <b>R</b> <b>A</b>				
<b>Drop gate</b>	<b>86</b>			<b>F</b> <b>R</b> <b>A</b>	<b>F</b> <b>R</b> <b>A</b>			<b>F</b> <b>R</b> <b>A</b>				
<b>Camel back chains</b>	<b>86</b>			<b>F</b>	<b>F</b>							
<b>Convex mirror</b>	<b>86</b>	<b>R</b> <b>A</b>										
<b>Board turner</b>	<b>87</b>			<b>F</b> <b>R</b> <b>A</b>	<b>F</b> <b>R</b> <b>A</b>							

### Direct Risk Factors

**F** = Force

**S** = Static Postures

**R** = Repetition

**C** = Contact Stress

**A** = Awkward Postures

**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.

		<b>Injury Prevention Potential</b>										
<b>SOLUTIONS</b>	<b>Page</b>	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
<b>Leverage</b>	<b>87</b>		<b>F</b>	<b>F</b>				<b>F</b>				
<b>Alternating hands</b>	<b>87</b>				<b>F</b>							
<b>Two hands at once</b>	<b>87</b>		<b>F</b>	<b>F</b>	<b>F</b>							
<b>Unnecessary handling</b>	<b>87</b>		<b>F</b>	<b>F</b> <b>R</b>								
<b>Pike pole use</b>	<b>88</b>		<b>F</b> <b>A</b>	<b>F</b> <b>A</b>								
<b>Tool handles</b>	<b>88</b>				<b>F</b>							
<b>Gloves</b>	<b>88</b>				<b>F</b>							
<b>Heat Exposure</b>	♦	indirectly reduces risk of injury to the body										
<b>Cold Exposure</b>	♦	indirectly reduces risk of injury to the body										
<b>Lighting</b>	♦	indirectly reduces risk of injury to the body										
<b>Noise</b>	♦	indirectly reduces risk of injury to the body										
<b>Vibration</b>	♦	directly reduces risk of injury to the back and wrist										
<b>Rest breaks</b>	♦	indirectly reduces risk of injury to the body										
<b>Job Rotation</b>	♦	indirectly reduces risk of injury to the body										
<b>Task Rotation</b>	♦	indirectly reduces risk of injury to the body										
<b>Work Pace</b>	♦	indirectly reduces risk of injury to the body										
<b>Scheduling</b>	♦	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





CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Shoulder</b></p> <p>A Drop Sorter must manipulate lumber in order to turn boards and sort pieces.</p> <p>A Drop Sorter also pulls lumber in order to remove waste pieces from the chain.</p>	<p><b>Force</b></p> <p><b>Awkward Postures</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• The rotator cuff stabilises the shoulder joint when objects are pushed and pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff.</li> <li>• If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.</li> <li>• The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.</li> <li>• When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.</li> </ul>	<ul style="list-style-type: none"> <li>• Position yourself as close to the lumber as possible.</li> <li>• Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body.</li> <li>• Pike poles should be lightweight and the right length for the job. The pike pole should be longer than the reach from the operator to the object.</li> <li>• For exercises that can help prevent <i>shoulder</i> injuries, <i>see the shoulder section of the Body Manual</i>.</li> </ul>



CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Low Back</b></p> <p>A Drop Sorter must bend forward and to the side in order to sort lumber, reach pieces, and clear jam-ups.</p> <p>A Drop Sorter continually sits on a vibrating surface.</p>	<p><b>Force</b></p> <p><b>Awkward Postures</b></p> <p><b>Static Postures</b></p> <p><b>Repetition</b></p> <p><b>Vibration</b></p>	<ul style="list-style-type: none"> <li>• Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back.</li> <li>• Back muscles must support the weight of the upper body when leaning forward or to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.</li> <li>• 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.</li> <li>• Repeated forward bending, side bending, or lifting can gradually fatigue the structures of the low back. If the repetitive stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury.</li> <li>• 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, which 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.</li> </ul>	<ul style="list-style-type: none"> <li>• Try to keep the back in a neutral position (ears, shoulders, hips aligned).</li> <li>• When lifting, hold object close to the body and do not twist the torso.</li> <li>• Use leverage to help get the lumber off of the main chain and on to the re-trim chain or to move the lumber. By pushing down on one end of the lumber you can create a lever to aid in lifting the rest of the piece of lumber up onto the chain. Pulling the lumber out before pushing down would create a better leverage point. Once one side of the board is up on the top chain, the part of the board that is on the higher chain should be half the length of the board before lifting the rest of the board up onto the chain.</li> <li>• Pull off on both sides (left and right) of your body during the day to balance the stress on your back.</li> <li>• Move a board down the chain by flipping it side over side or by using the edge of the chain as a point of leverage.</li> <li>• For exercises that can help prevent <i>low back</i> injuries, <b>see the back section of the Body Manual.</b></li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Ankle/Foot</b></p> <p>A Drop Sorter frequently activates foot pedals in order to operate drop gates, transfer chains, power rollers, and conveyors.</p>	<p><b>Awkward Postures</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• Stretch the ankles before and during work to make sure the muscles and ligaments are loose.</li> <li>• Alternate using the toe of the foot and the heel of the foot to activate the foot pedals. This will use more muscles of the leg, increasing circulation in this area.</li> <li>• For exercises that can help prevent <i>ankle</i> and <i>foot</i> injuries, <i>see the ankle and foot sections of the Body Manual.</i></li> </ul>
	<p><b>Foot</b></p> <p>A Drop Sorter must continually press down on pedals in order to activate transfer chains.</p> <p>Some Drop Sorters continually stand on a hard, vibrating surface in order to sort lumber.</p>	<p><b>Awkward Postures</b></p> <p><b>Static Postures</b></p> <p><b>Vibration</b></p>	<ul style="list-style-type: none"> <li>• Pressing down on a foot pedal while the ankle is bent leads to increased loading on the plantar fascia.</li> <li>• 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.</li> <li>• Vibrating floors can increase the loading on the foot. The longer the Drop Sorter is exposed to vibration, the greater the risk of injury.</li> </ul>	