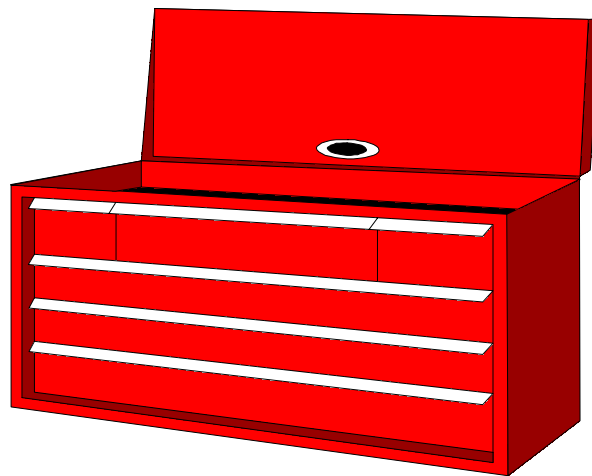


INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

Common Industry Jobs (CIJs)

Saw Filer Tool Kit



IMIRP program coordinated by:



Council of
Forest
Industries



Industrial
Wood & Allied
Workers of
Canada



Advanced
Ergonomics
Inc.

In cooperation with the Workers' Compensation Board of British Columbia

SAW FILER TOOL KIT

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Overview

Saw Filer (Round)

Job Summary

The Saw Filer is required to maintain circular saws by tensioning (straightening) and leveling them back to their functional capacity. The Saw Filer levels the saws and removes ridges or dents by hammering with a cross-face hammer. Bends in the saws must be straightened/tensioned on a machine, which is set up by the Saw Filer. The Saw Filer is also in charge of manually re-tipping the saws. An automatic grinding machine is used to sharpen the saws. The Saw Filer also has to change the guides and maintain them by pouring new babbits. The Saw Filer may also have to manually change the saws at the machinery. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Saw Filer may include:

- a) Repetitive motions of the neck, shoulders, arms, and wrists
- b) Awkward postures of the neck, shoulders, wrists, and back
- c) Continuous standing/sitting
- d) Lifting/lowering saws & guides
- e) Pushing/pulling saws around the filing room
- f) Carrying saws

Mental Demands

The Saw Filer is required to make decisions on how to return the saws to the best possible condition. This is a highly visual task that requires the worker to find large and small flaws in the saws and correct them accordingly. A long training period is required for this job.

Major Variations

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

- 1) Machinery used to maintain the circular saws may include:
 - a) Grinders
 - b) Tippers
 - c) Levellers/Tensioners
 - d) Babbit pots

- 2) Loading circular saws onto the machinery may be done:
 - a) Manually - worker loads the machine unaided
 - b) Using lifting aids – worker uses a lifting aid such as a hoist to lift the circular saw onto the machinery
 - c) Aided by a co-worker - worker seeks aid to lift the saw

- 3) Grinding, tipping, and leveling/tensioning the saw may be done:
 - a) Manually
 - b) Semi-automatically
 - c) Automatically

- 4) Worker postures while filing the saws may include:
 - a) Standing
 - b) Sitting
 - c) Sit/standing

- 5) The operator may have to:
 - a) Tension saws
 - b) Level saws
 - c) Re-tip saws
 - d) Pour babbit
 - e) Change/maintain guides
 - f) Change saws

Minor Variations

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

- 1) The pace that the operator works depends upon the mill. The average work pace is 20 saws/shift. This pace is:
 - a) Self-paced
 - b) Dependent on time pressure deadlines

- 2) Grip types used to handle saws and tools may include:
 - a) Power/cylindrical
 - b) Pinch
 - c) Hook

Physical Demands Analysis Saw Filer (Round)

PDA General Instructions: Saw Filer (Round)

This Physical Demands Analysis (PDA) identifies the physical demands of the Saw Filer job as assessed by IMIRP ergonomists. The information reported was collected from a sample of Saw Filers 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 Saw Filer 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 Saw Filer (Round)

Task List

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



Level and tension a saw

A Saw Filer levels and tensions a round saw by straightening it on an anvil with a hammer.

Does this task occur at your mill?

Yes No



Sharpen a saw

A Saw Filer sharpens a saw by using grinders that require manual operation.

Does this task occur at your mill?

Yes No



A Saw Filer sharpens a saw by using a machine that grinds the saw automatically.

Does this task occur at your mill?

Yes No



Re-tip a saw

A Saw Filer re-tips a saw with a brazing torch at a brazing station.

Does this task occur at your mill?

Yes No

A Saw Filer places a saw into a machine that automatically re-tips the saw.

Does this task occur at your mill?

Yes No



Pour babbitt

A Saw Filer pours babbitt for maintaining the guides for the saws.

Does this task occur at your mill?

Yes No



Maintain guides

A Saw Filer maintains guides.

Does this task occur at your mill?

Yes No



Change saws

A Saw Filer changes saws during scheduled breaks and during down time.

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 Saw Filer.

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>Level and tension a saw</i>			✓		<ul style="list-style-type: none"> • Cycle time = Approximately 15 minutes per saw
<i>Sharpen a saw</i>		✓			<ul style="list-style-type: none"> • Approximately 5 minutes is required to set up a machine to sharpen a saw automatically • Time to manually sharpen a saw will vary depending on worker technique and experience, and level of repair of the saw
<i>Re-tip a saw</i>		✓			<ul style="list-style-type: none"> • Approximately 5 minutes is required to set up a machine to re-tip a saw automatically • Time to manually re-tip a saw will vary depending on worker technique and experience, and level of repair of the saw
<i>Pour babbit</i>	✓				<ul style="list-style-type: none"> • Cycle time = Approximately 15 minutes per shift
<i>Maintain guides</i>		✓			<ul style="list-style-type: none"> • Cycle time = Approximately 15 minutes
<i>Change saws</i>		✓			<ul style="list-style-type: none"> • Cycle time = Approximately 15 minutes
<i>Other</i>					

Organisational Factors

The table below contains a list of organisational factors for a Saw Filer. 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'.

Length of shift	<input type="checkbox"/> <i>8 hours</i> <input type="checkbox"/>
Formal breaks	<input type="checkbox"/> <i>Two 10 minute breaks</i> <input type="checkbox"/> <i>30 minute lunch</i> <input type="checkbox"/>
Informal breaks	<input type="checkbox"/> <i>Taken as needed</i> <input type="checkbox"/>
Work pace	<input type="checkbox"/> <i>20 saws per shift (dependent on level of repair required)</i> <input type="checkbox"/>
Work pace control	<input type="checkbox"/> <i>Self-paced (time pressure deadline)</i> <input type="checkbox"/>
Job rotation <input type="checkbox"/> Yes <i>(Check one)</i> <input type="checkbox"/> No	If Yes: Rotation with what job(s): _____ _____ How often: (e.g., every 2 hours) _____

Workstation Characteristics

Dimensions & Layout

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

Workstation Dimensions	
(A) Anvil/Bench height	cm
(B) Grinder height	cm

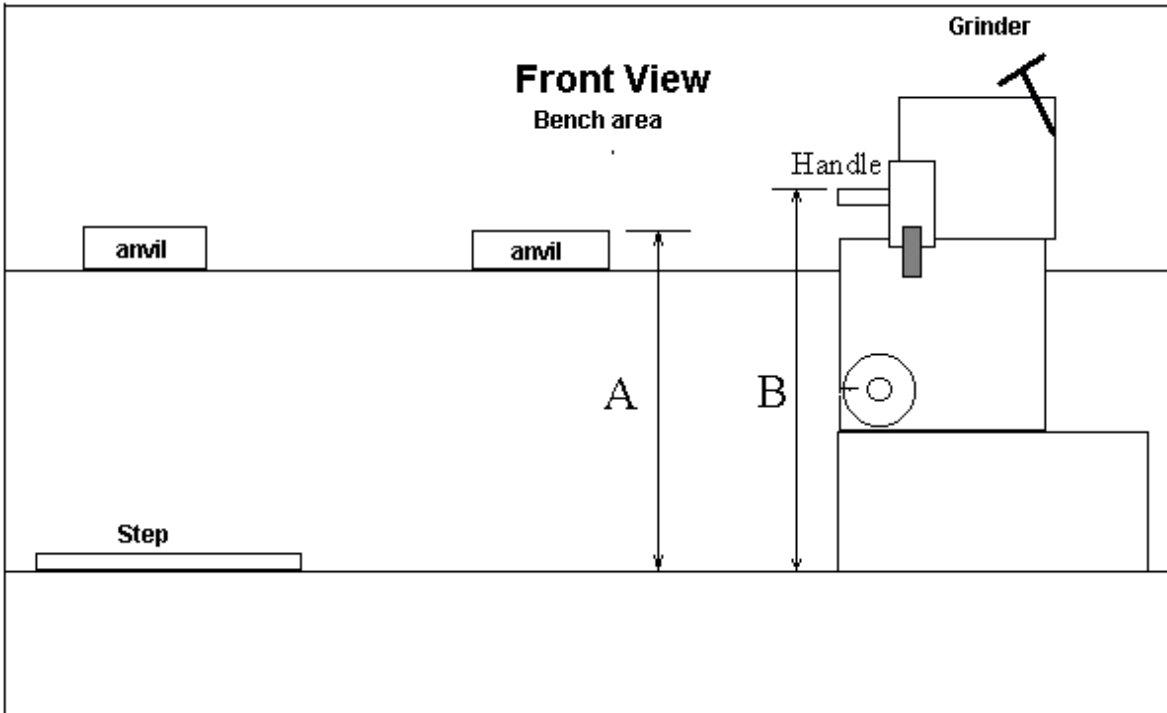


Figure 1: Saw Filer Workstation (Front View)

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Saw Filer.

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	Function	Frequency	Comments
<i>Foot pedals</i>	<input type="checkbox"/> <i>Stop/start machines</i>	<i>Approximately 3 times per hour</i>	<ul style="list-style-type: none"> • <i>Dependent on number of saws to be repaired and which machines may be used</i>
<i>Push/pull buttons</i>	<input type="checkbox"/> <i>Stop/start machines</i>	<i>Approximately 3 to 6 times per hour</i>	
<i>Lever</i>	<input type="checkbox"/> <i>Position machines</i> <input type="checkbox"/> <i>Used on press roller to stretch saws for levelling and tensioning saws</i> <input type="checkbox"/> <i>Adjust grinder to sharpen saws</i> <input type="checkbox"/> <i>Adjust tipper to attach new tips to saw</i>	<i>Approximately 3 to 6 times per hour</i>	
<i>Wheel</i>	<input type="checkbox"/> <i>Adjust (tighten) machines</i>	<i>Approximately 3 times per hour</i>	
<i>Crank</i>	<input type="checkbox"/> <i>Adjust (tighten) machines</i>	<i>Approximately 1 to 2 times per shift</i>	

Physical Demands

Whole Body Physical Demands

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

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

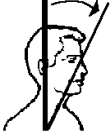

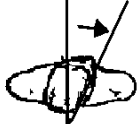
Physical Demands	Tasks	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Walking	<ul style="list-style-type: none"> Change saws Saw filing room tasks 		✓			<ul style="list-style-type: none"> Walking to areas of the mill where saw changes are required Between different workstations within filing room
Sitting	<ul style="list-style-type: none"> Re-tip saws 		✓			<ul style="list-style-type: none"> Some manually re-tipping may result in longer periods of sitting
Standing	<ul style="list-style-type: none"> Saw filing room tasks 			✓		<ul style="list-style-type: none"> Many of the saw repair tasks within the saw filing room require the worker to stand
Climbing (stairs)	<ul style="list-style-type: none"> Change saws 	✓				<ul style="list-style-type: none"> To get to specific areas of the mill for saw changes
Climbing (other)	<ul style="list-style-type: none"> Change saws 	✓				<ul style="list-style-type: none"> Over and around machinery to change saws
Balancing	<ul style="list-style-type: none"> Change saws 	✓				<ul style="list-style-type: none"> Depends on the location of the saw being changed and the machinery layout
Kneeling/ Crouching	<ul style="list-style-type: none"> Change saws 	✓				<ul style="list-style-type: none"> Depends on the location of the saw being changed and the machinery layout
Other:						


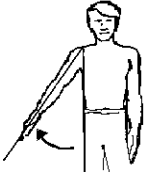
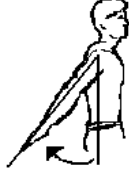
Body Postures

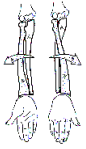




The table below outlines the body postures held or repeated throughout the shift by a Saw Filer.


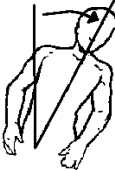
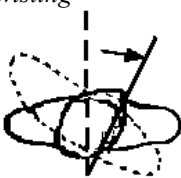

For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

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%	
<i>Neck</i>						
Flexion 	<ul style="list-style-type: none"> Level and tension a saw Sharpen saw Re-tip saw 			✓		<ul style="list-style-type: none"> Dependent on the number of deviations in a saw, and whether tasks must be done manually
Extension 						Not Applicable
Twisting 	<ul style="list-style-type: none"> Level and tension a saw 			✓		<ul style="list-style-type: none"> Dependent on the number of deviations in a saw

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Shoulder						
<i>Flexion</i> 	<ul style="list-style-type: none"> Sharpen saw Re-tip saw Change saws 		✓			<ul style="list-style-type: none"> To grind and re-tip saws, a saw is placed into a machine or onto a workbench
<i>Abduction</i> 	<ul style="list-style-type: none"> Level and tension a saw 			✓		<ul style="list-style-type: none"> Duration is dependent on the state of repair of the saw
<i>Extension</i> 						Not Applicable

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm						
Rotation 						Not Applicable
Wrist						
Flexion 						Not Applicable
Extension 						Not Applicable
Ulnar Deviation 	<ul style="list-style-type: none"> Level and tension a saw 		✓			<ul style="list-style-type: none"> While hammering Dependent on worker technique
Radial Deviation 						Not Applicable





Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back						
Flexion 	<ul style="list-style-type: none"> Level and tension a saw 		✓			<ul style="list-style-type: none"> Degree and amount of flexion is dependent on the height of the workstation, machine layout, and worker dimensions
Lateral Flexion 	<ul style="list-style-type: none"> Level and tension a saw 		✓			<ul style="list-style-type: none"> Amount of lateral flexion depends on size of saw
Twisting 						Not Applicable
Extension 						Not Applicable
Other:						

Hand Grips

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

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

The Comments section may contain information relating to duration, frequencies, 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"> Level and tension a saw 		✓			<ul style="list-style-type: none"> Preferred hand is used Item held for approximately 10 to 60 seconds Levers are held on different types of machinery
<i>Pinch</i> 			✓			<ul style="list-style-type: none"> Both hands are used to hold the saws
<i>Hook</i> 						
<i>Precision</i> 	<ul style="list-style-type: none"> Re-tip saw 	✓				<ul style="list-style-type: none"> Preferred hand is used Individual work technique determines how the brazing torch is held
<i>Modified Pinch-Hook</i>	<ul style="list-style-type: none"> Change saws Level and tension a saw Maintain guides 		✓			<ul style="list-style-type: none"> Either hand is used Item held for approximately 30 to 60 seconds Usually involved in carrying saws, guides, and saw collars Grip has the opposing thumb position of a pinch grip but the bent fingers of the hook grip Grip is modified due to the size of the object being manipulated grip
<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 Saw Filer.

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 (kg)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Pushing large round saws around the saw filing room</i>	<i>91 (estimate)</i>	✓				<ul style="list-style-type: none"> • <i>Both hands are used</i> • <i>Often pushed over a wooden floor</i>
<i>Lifting round saws on and off machines and work benches</i>	<i>9 (estimate)</i>		✓			<ul style="list-style-type: none"> • <i>Both hands are used</i> • <i>Modified pinch-hook grip is used</i>
<i>Lifting guides in and out of machines</i>	<i><16(estimate)</i>		✓			<ul style="list-style-type: none"> • <i>Both hands are used</i> • <i>Modified pinch-hook grip is used</i>
<i>Carrying round saws</i>	<i>9 (estimate)</i>		✓			<ul style="list-style-type: none"> • <i>Both hands are used</i> • <i>Modified pinch-hook grip is used</i>
<i>Carrying guides</i>	<i><16 (estimate)</i>		✓			<ul style="list-style-type: none"> • <i>Either hand is used</i> • <i>Modified pinch-hook grip is used</i>
<i>Carrying saw collars</i>			✓			<ul style="list-style-type: none"> • <i>Either hand is used</i> • <i>Hook grip is used</i>
<i>Other:</i>						

Hand Tools

Indicate the hand tools used by a Saw Filer 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>Hammer</i>	<ul style="list-style-type: none"> Level and tension a saw 	1.8		✓			
<i>Level</i>	<ul style="list-style-type: none"> Level and tension a saw 			✓			
<i>Gauge</i>	<ul style="list-style-type: none"> Level and tension a saw 		✓				
<i>Grinder (Manual)</i>	<ul style="list-style-type: none"> Sharpen a saw 	2.3		✓			
<i>Brazing torch</i>	<ul style="list-style-type: none"> Re-tip a saw 			✓			
<i>Impact Wrench</i>		3		✓			<ul style="list-style-type: none"> Use dependent on scheduled repair times Needed to disassemble saws
<i>Wheel wire brush</i>	<ul style="list-style-type: none"> Sharpen a saw 	3.2	✓				<ul style="list-style-type: none"> Preparation of saws
<i>Buffer</i>	<ul style="list-style-type: none"> Sharpen a saw 		✓				
<i>Other:</i>							

Environmental Conditions

Work Environment

The table below contains a list of environmental conditions that may be of concern at the Saw Filer 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 Saw Filer. For the lighting level, include the location of the measurements within the workstation.

Factor	
Vibration <input type="checkbox"/> Yes <div style="text-align: center;"><i>(Check one)</i></div> <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: _____

Noise level	<i>86 to 97 dB</i>
Lighting level	<i>177 to 1450 lux Filing room</i>
Other:	

Location of Workstation

The table below contains a list of the type of work environments a workstation may be located in. For the workstation, indicate which of the following types of work environments apply. For example, the workstation may be inside the main building but exposed to the outside via a doorway that is always open and has both a fan and a heater. In this situation all three, 'Inside exposed', 'Fan' and 'Heater', would be checked for this workstation.

Work Environment	
<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.

Region	Avg. Max July/Aug	Avg. Min Dec/Jan	Extreme Max.	Extreme Min.
<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 Saw Filer 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	
8 foot		14 foot	
10 foot		16 foot	
		18 foot	
		20 foot	
		22 foot	
		24 foot	
		Other:	
		Other:	

4. Weight of Wood Equation*

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

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

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

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

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

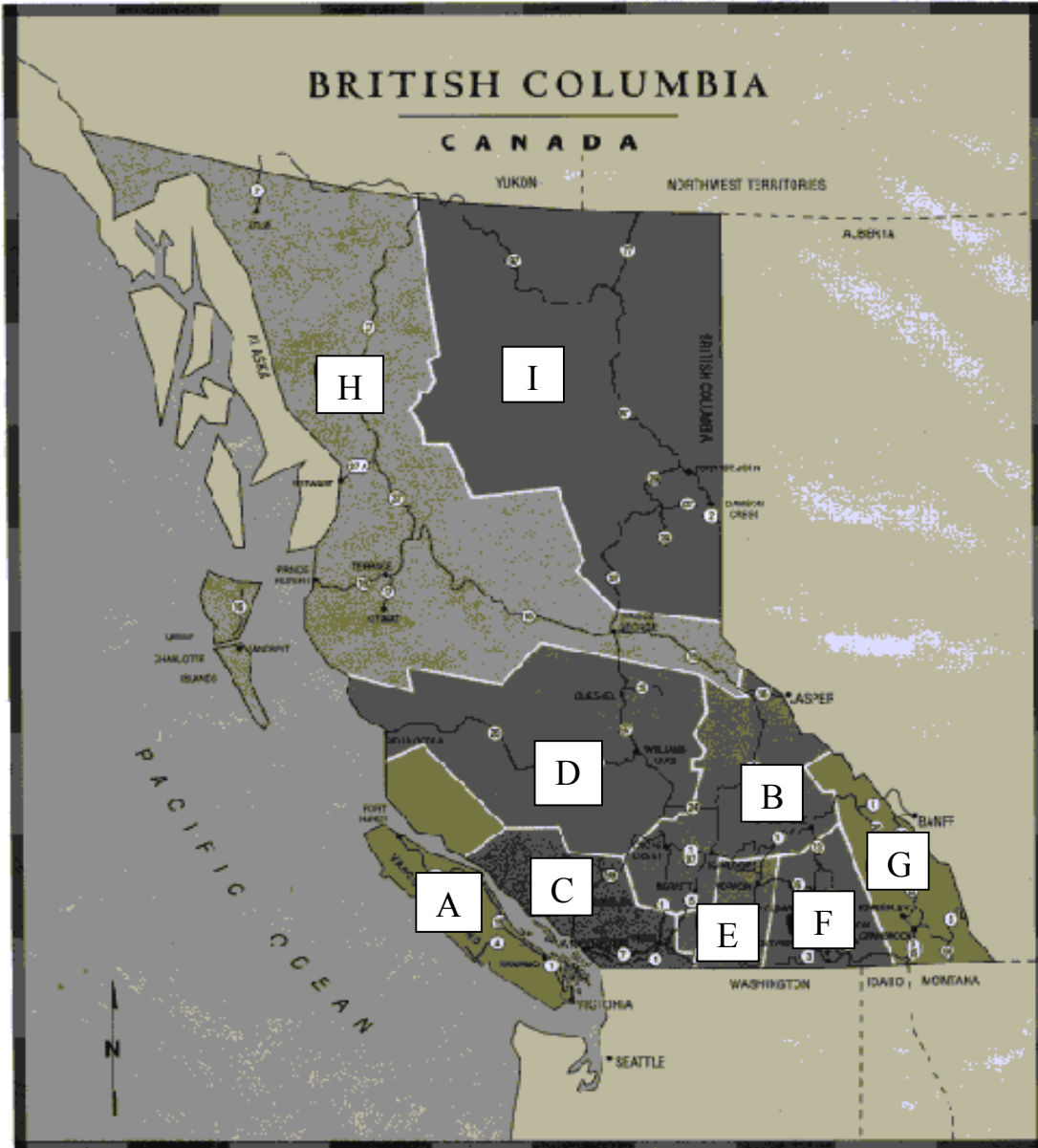
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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

Type of Wood Handled (lb./ board foot) <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
Heaviest Species Handled	x		x		=		
Most Common Species Handled	x		x		=		
Lightest Species Handled	x		x		=		

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

Appendix B – Regional Map



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

Risk Factor Identification Checklist

Saw Filer

Purpose

The Risk Factor Identification Checklist for a Saw Filer 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 – Saw Filer

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.

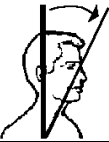
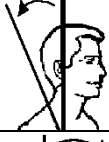
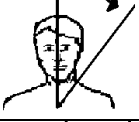
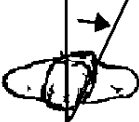
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

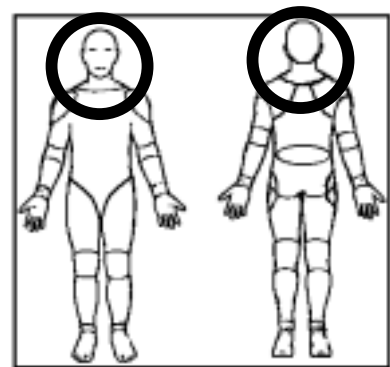
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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., hammering)			S	
			O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., levelling saws)			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., levelling saws)			S	
			O	
Awkward Posture				
Flexion			S	
			O	
Extension			S	
			O	
Lateral Bending			S	
			O	
Rotation			S	
			O	



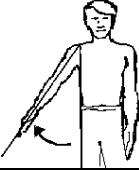
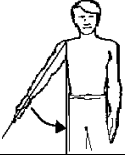
Please indicate whether the following direct risk factors were identified at the NECK.		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the Injury Statistics 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 Discomfort Survey 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



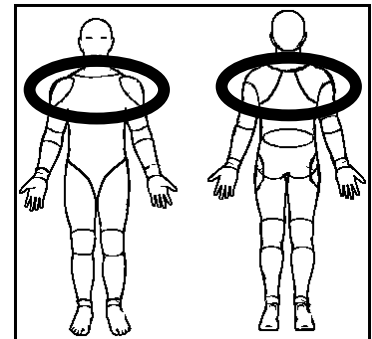
Body parts within the circled area will be classified as NECK issues.

SHOULDER

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




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

Please indicate whether the following direct risk factors were identified at the SHOULDER .		
Direct Risk Factors	Force	<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 Injury Statistics 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 Discomfort Survey 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



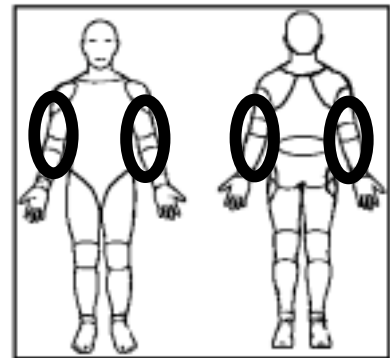
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

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




Static Posture		N	Y	Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture? (e.g., brazing)			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., hammer)			S O	
Contact Stress				
Ask the worker: Do any objects, tools or parts of the workstation put pressure on any parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., metal edges of consoles or workstation digging into elbow)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., grinder)			S O	





Please indicate whether the following direct risk factors were identified at the ELBOW .	
Direct Risk Factors	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 Injury Statistics 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 Discomfort Survey 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	



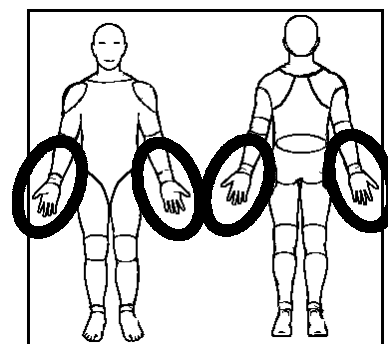
Body parts within the circled area will be classified as ELBOW issues.

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., hammer) 			S O
Are objects handled in a pinch grip? (e.g., saws) 			S O
Are objects handled in a hook grip? (e.g., carrying saws) 			S O
Ask the worker: Do you wear gloves while performing your job? If the answer is No , check the No box and go to next section.		*	S O
*If the answer to the above question is Yes , ask the worker: Are the gloves too large/small?			S O
Does the thickness of the gloves cause problems with gripping?			S O
Repetition			
Are identical or similar motions performed over and over again? (e.g., hammering)			S O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., levelling saws)			S O

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





Please indicate whether the following direct risk factors were identified at the WRIST/HAND .		
Direct Risk Factors	Force	<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 Injury Statistics 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 Discomfort Survey 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



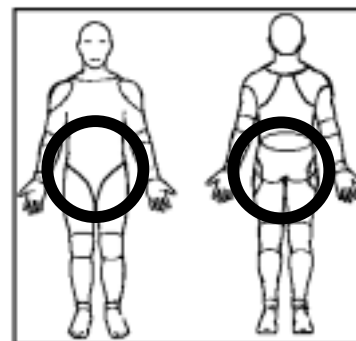
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

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
Repetition			
Are identical or similar motions performed over and over again?			S
			O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., levelling saws)			S
			O
Static Posture			
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending forward to level saws)			S
			O
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., standing stationary)			S
			O
Contact Stress			
Ask the worker: Do any objects, tools or parts of the workstation put pressure on any parts of your hip/thigh? (e.g., workstations that dig 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	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., through the floor)			S O	

Please indicate whether the following direct risk factors were identified at the LOW BACK or HIP/THIGH .		
Direct Risk Factors	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 Injury Statistics 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 Discomfort Survey 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

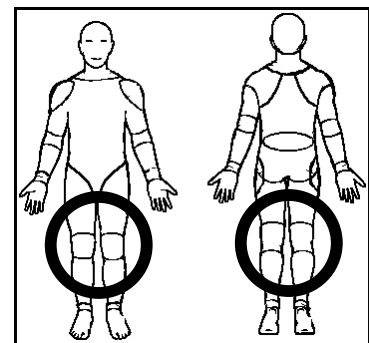


Body parts within the circled area will be classified as **LOW BACK** issues.

KNEE


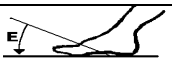
Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., climbing steps)			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture?			S O	
Are workers required to sit or stand in a stationary position for 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 any objects or parts of the workstation put pressure on your knee(s)? (e.g., kneeling on hard surfaces)			S O	
Awkward Posture				
Extreme Flexion			S O	

Please indicate whether the following direct risk factors were identified at the KNEE .		
Direct Risk Factors	Repetition	<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 Injury Statistics 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 Discomfort Survey 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

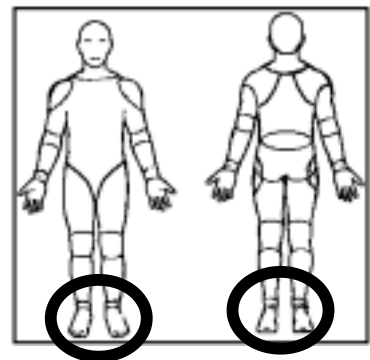


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., walking on uneven surfaces)			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., through the floor)			S O	

Please indicate whether the following direct risk factors were identified at the ANKLE/FOOT .		
Direct Risk Factors	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 Injury Statistics 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 Discomfort Survey 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? (e.g., large saws)			S O
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			S O
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., hand tools)			S O
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is No , check the No box and go to the next section.			S O
If the answer to the above question is Yes , ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O

ENVIRONMENTAL CONDITIONS

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

ENVIRONMENTAL CONDITIONS [CONTINUED]

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

WORK ORGANISATION

	N	Y	Comments:
Is the work externally-paced or controlled by a machine or the process? (e.g., saw changes during lunch break)		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**



Saw Filer (Round)

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

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

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

Work Manual

Saw Filer (Round)

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.

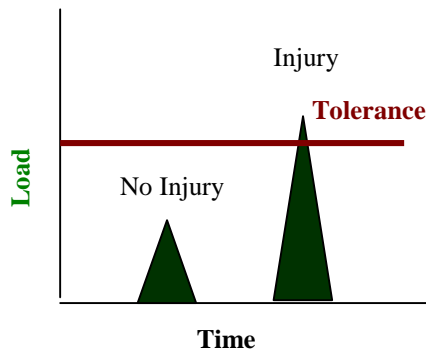
Neither AEI nor the IMIRP Society accepts any responsibility for the use or misuse of these documents.

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Injury Education

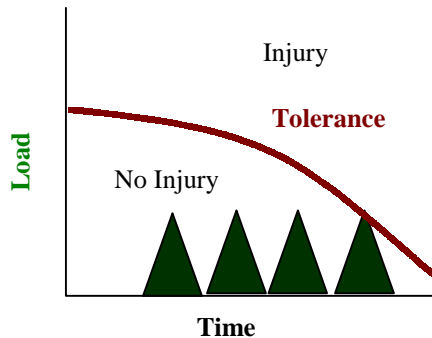
*Injuries occur when ...
Loads exceed tissue tolerances*



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.

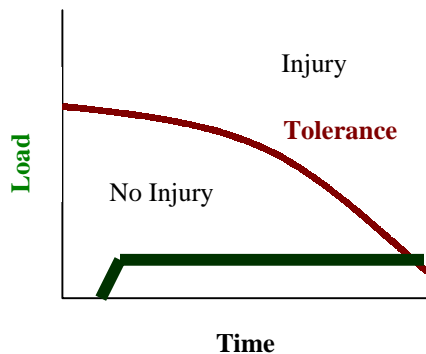
Example – a worker going over on their ankle and spraining it.



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 Saw Filer 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 Saw Filer. 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
Static Postures



A Saw Filer must hold the head in a twisted posture in order to see and maintain the saws..

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 forward or side bent position. The more the neck bends, the greater the load on the muscles and tendons.

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height of the workstation forces the saw filer to hold the head with the neck bent while inspecting the saws.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

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

NECK/SHOULDER

Direct Risk Factors: Force Awkward Postures Static Postures



A Saw Filer frequently holds their arms away from the body in order to perform both heavy and precision saw maintenance tasks.

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

Force

- Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons.

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- The positioning and design of some task workstations, such as re-tipping, may leave the arm unsupported for an extended duration.

Working Heights

- The control heights of some grinders and other machinery may put the shoulder into awkward postures.

Characteristics of Objects Handled

Size and Shape

- Tasks that involve using a pistol grip tool on a horizontal work surface, such as removing babbitt plates from guides, can place the shoulder in awkward postures.

CONSEQUENCES

- When the arms are held away from the body, muscles and soft tissues of the neck and shoulder may fatigue. Fatigue leads to an accumulation of waste products and/or a decrease in the ability to tolerate additional stress.
- Signs and symptoms include pain, tenderness, muscle spasm in the neck and shoulder area, and headaches.

SUGGESTED SOLUTIONS

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

ELBOW/WRIST

Direct Risk Factors: Force Repetition Awkward Postures
--



A Saw Filer must grip hand tools in order to maintain saws.

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.

Repetition

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

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.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Workstation heights can affect wrist postures, especially when hand tools are used.

Characteristics of Objects Being Handled

Size and Shape

- Tasks that involve using a pistol grip tool on a horizontal work surface, such as attaching babbitt plates to guides, place the wrists in awkward postures.

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

WRIST

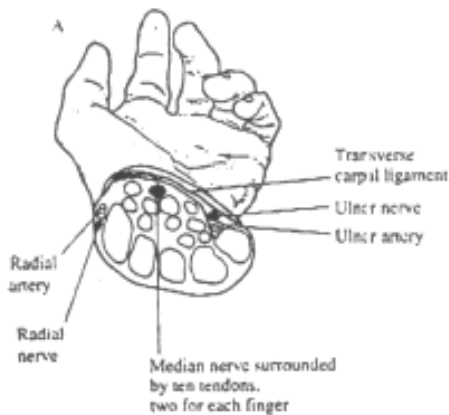
Direct Risk Factors:
Force
Repetition
Awkward Postures



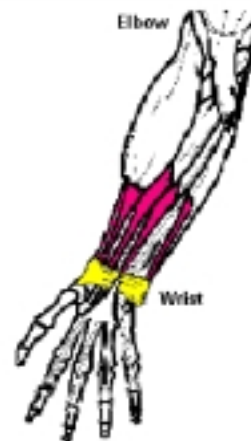
A Saw Filer must grip hand tools with the wrists bent in order to maintain saws.

BACKGROUND INFORMATION

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



The Carpal Tunnel



DIRECT RISK FACTORS

Force

- Gripping an object requires activation of the forearm muscles, which generates tension in the tendons and tendon sheaths running through the wrist. The harder an object is gripped, the greater the tension in the tendons. As tension increases, the pressure within the carpal tunnel may also increase.

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Workstation heights can affect wrist postures, especially when hand tools are used.

Characteristics of Objects Being Handled

Size and Shape

- Tasks that involve using a pistol grip tool on a horizontal work surface, such as attaching babbitt plates to guides, place the wrists in awkward postures.

Environmental Conditions

Cold Temperatures

- Cold working temperatures, in combination with the previously identified risk factors, can increase the risk of wrist injury.

CONSEQUENCES

- Repeatedly gripping objects with the wrist bent may lead to irritation and damage in the tendon sheaths.
- Signs and symptoms include pain, tenderness, and inflammation in the wrist area.

SUGGESTED SOLUTIONS

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

WRIST/HAND

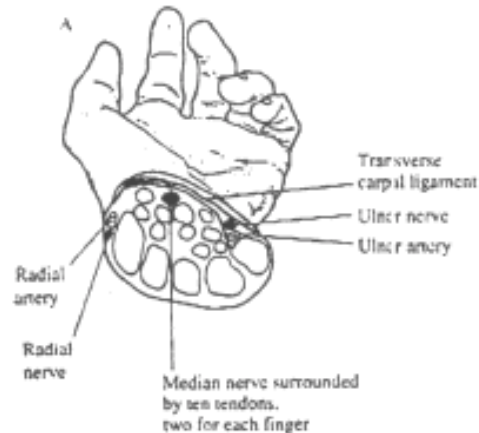
Direct Risk Factors:
Contact Stress
Vibration



A Saw Filer may be exposed to contact stress and hand/arm vibration when operating hand tools.

BACKGROUND INFORMATION

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



The Carpal Tunnel

DIRECT RISK FACTORS

Contact Stress

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

Vibration

- Exposure to vibration, through the use of power tools or through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and vibration frequency influence the amount of mechanical stress.
- Continual exposure to hand/arm vibration may gradually damage neurovascular tissue (nerves and blood vessels) in the hand, and may contribute to problems in the wrist.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Hand tools with un-insulated handles transmit more vibration to the user. This problem is most significant with power tools, which have higher vibration frequencies.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

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

LOW BACK

Direct Risk Factors:
Awkward Postures
Static Postures

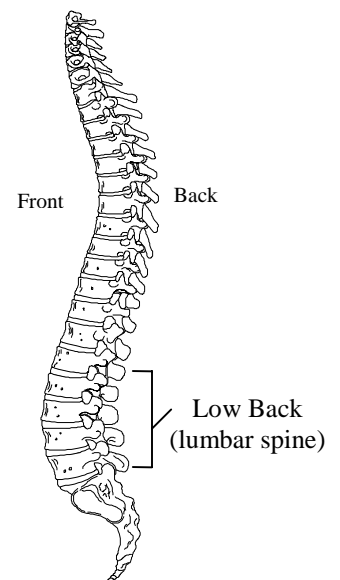


A Saw Filer must bend forward and to the side in order to inspect and maintain saws.

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.



DIRECT RISK FACTORS

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Inappropriate working heights can increase the use of awkward back postures, and the risk of back injury.

Seating

- Handling loads in a seated position can lead to awkward back postures and physical injury.

Floor Surfaces

- Floors that are too hard, too soft, or uneven can increase the risk of low back discomfort.

CONSEQUENCES

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

Summary of Body Parts at Risk

NECK

- A Saw Filer must hold the head in a twisted posture in order to see and maintain the saws.



NECK/SHOULDER

- A Saw Filer frequently holds their arms away from the body in order to perform both heavy and precision saw maintenance tasks.



ELBOW/WRIST

- A Saw Filer must grip hand tools in order to maintain saws.



WRIST

- A Saw Filer must grip hand tools with the wrists bent in order to maintain saws.

WRIST/HAND

- A Saw Filer may be exposed to contact stress and hand/arm vibration when operating hand tools.



LOW BACK

- A Saw Filer must bend forward and to the side in order to inspect and maintain saws.



Risk Factors by Body Part

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

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

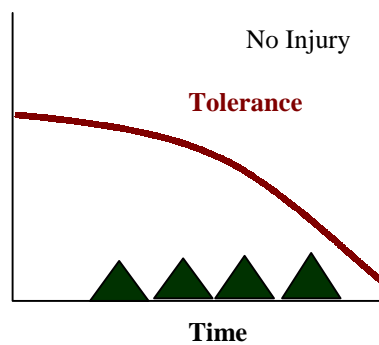
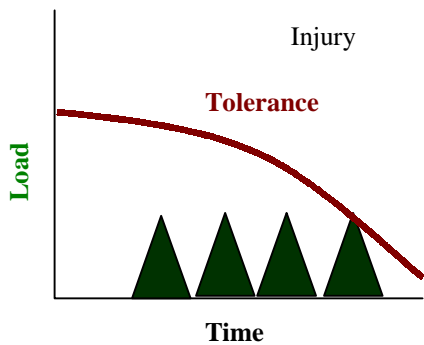
* Vibration is categorised under both direct and indirect risk factors. Vibration can directly increase the likelihood of injury to the back and wrist as well as indirectly (environmental conditions) promote injuries in other parts of the body.

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

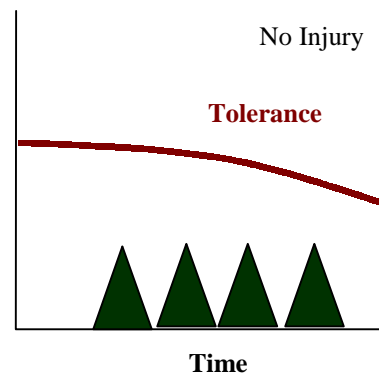
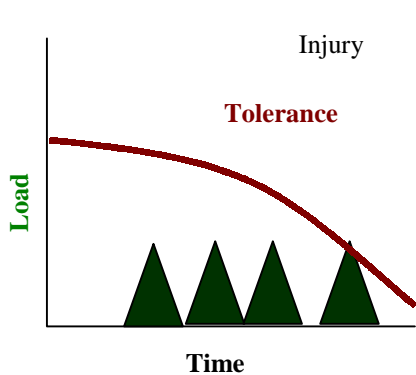
Injury Prevention

*Injuries are prevented by ...
Decreasing loads and increasing tissue tolerances*



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

Example – using a torque multiplier wrench to loosen bolts.



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

Example – using maintenance exercises to strengthen tissues.

Suggested Solutions

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

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

The focus of the Injury Prevention section is on solutions developed following the ergonomic investigation of the Saw Filer (Round) 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 |
|-----|

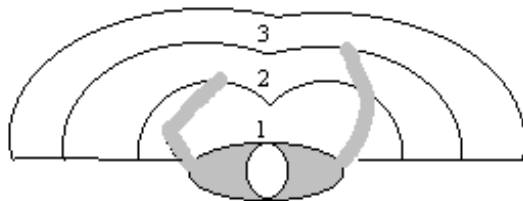
PERSONAL PROTECTIVE EQUIPMENT
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

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 Saw Filer, identify the body part of most concern. If the main concern is the:

Neck - minimise forward bending of neck by increasing the working height.

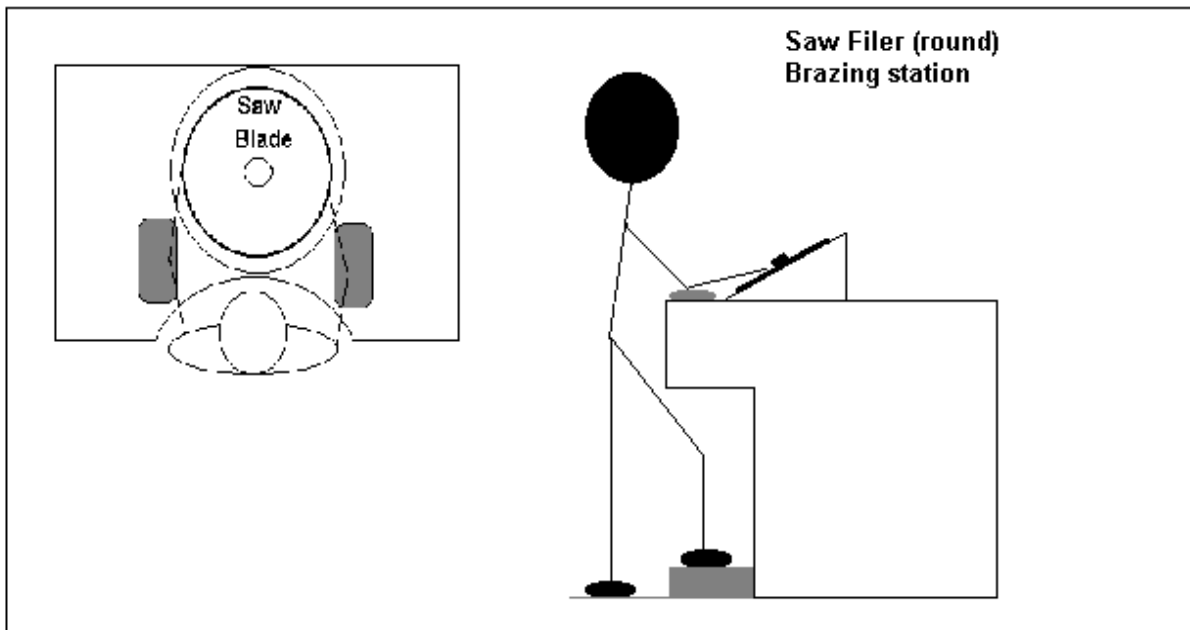
Shoulders - minimise elevation of the by lowering the working height.

Low Back - minimise forward bending of back by increasing the working height.

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

Brazing bench

E	The ideal brazing station is above elbow height and has padded arm rests to support the arms.
WP	

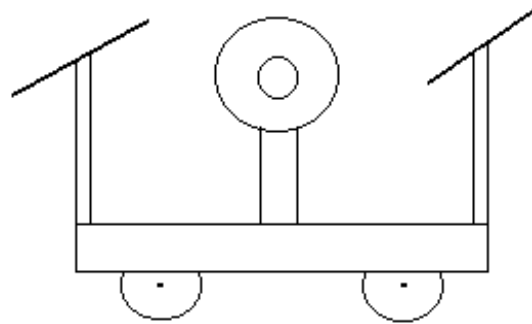


Transport cart

E

Saw Filers must transport round saws from the saw filing room to the appropriate machinery. A transport cart could be designed or purchased with large wheels, pushing handles between waist and shoulder height, and structured to position saws at waist height (to decrease bending when lifting).

**Cart for transporting
round saws**



Bend neck to either side

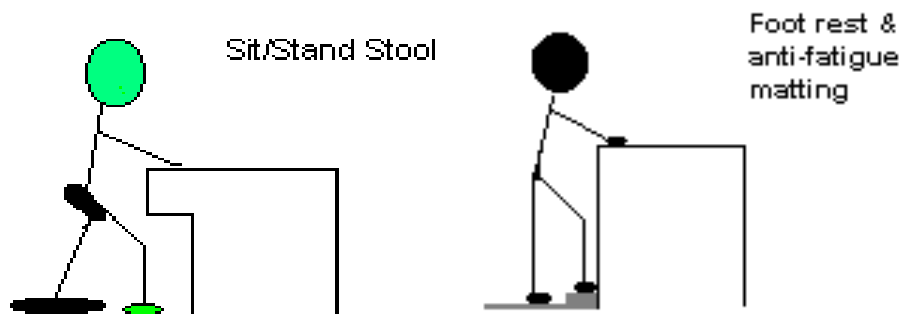
WP

Bend the neck to either side when viewing saws to even out stress on both sides of the neck.

SEATING

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

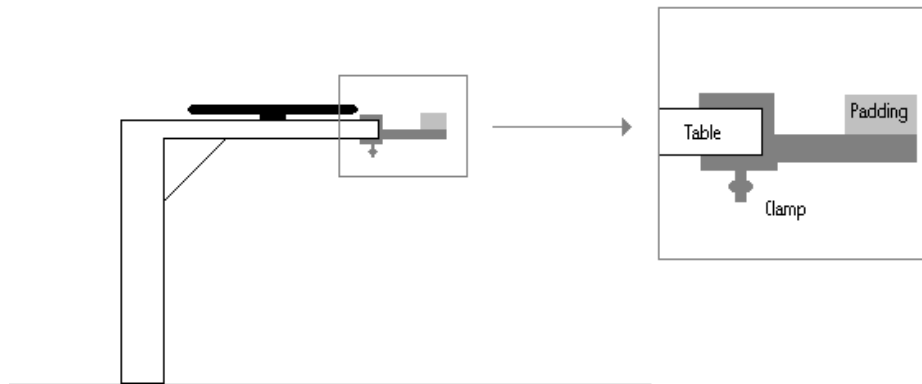
E In order to minimise fatigue in the lower extremities, anti-fatigue matting can be installed. The use of anti-fatigue matting in the work area will help to increase comfort and reduce muscle fatigue. The cushioned surface encourages continuous micro-movements of the feet, which minimises blood pooling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

ADDITIONAL WORKSTATION DESIGN OPTIONS

Portable and adjustable arm supports

E WP

 Portable and adjustable arm supports can be attached to a work surface to support the arms during precision tasks (e.g., brazing). The supports can be moved from one workstation to another with ease.



Characteristics of Objects Being Handled

SIZE AND SHAPE

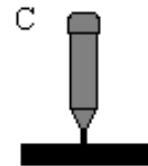
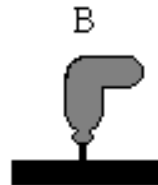
In-line tools

E
WP Pistol-style drills were designed to be used in the orientation indicated in the diagram below (A). When these drills are used on a horizontal surface (B), the wrist and shoulder can be put into awkward postures. The use of an in-line drill will help to keep the wrist and shoulder in more neutral positions (C).

Pistol-style drill with the intended orientation of use.

Pistol-style drill used in an orientation causing awkward wrist & shoulder postures.

An in-line style drill attempts to keep the wrist and shoulders in more neutral positions.



LOAD CONDITION AND WEIGHT DISTRIBUTION

Hoist for large objects

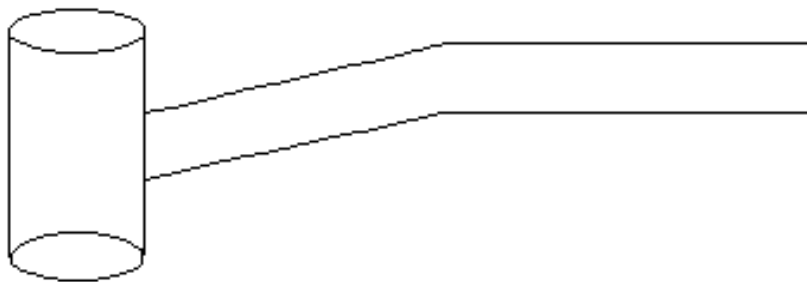
E
WP When moving large saws use a hoist.



CONTAINER, TOOL AND EQUIPMENT HANDLES

Bent handled hammer

E
WP The use of bent handled tools may help to reduce the awkward positions in the wrist. A bent handled hammer will attempt to keep the wrist in a neutral position while hammering, which will reduce the risk of wrist injury.



Improved tool handles

E
WP 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., hammers, torches) a Saw Filer 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 Saw Filer's glove, and thus decrease the grip forces required.

Gloves

PPE In order to reduce grip forces required by the Saw Filer, 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.

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Working Reaches	74		A S		A S			A S				
Working Heights	75	A S	A S		A S			A S				
Brazing bench	75	A S	A		A	A		A S				
Transport cart	76		F		F			F A				
Bend neck to either side	76	A S						A				
Sit/stand stool	77	A						A S S				
Anti-fatigue matting	77							S				
Portable and adjustable arm supports	78	A S	F A									

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.

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
In-line tools	79		A S		F A	A						
Hoist for large objects	79		F		F			F				
Bent handled hammer	80		A		A	A						
Improved tool handles	80		F		F A	F A	C V					
Gloves	80				F	F	C V					
Heat Exposure	♦	indirectly reduces risk of injury to the body										
Cold Exposure	♦	indirectly reduces risk of injury to the body										
Lighting	♦	indirectly reduces risk of injury to the body										
Noise	♦	indirectly reduces risk of injury to the body										
Vibration	♦	directly reduces risk of injury to the back and wrist										
Rest breaks	♦	indirectly reduces risk of injury to the body										
Job Rotation	♦	indirectly reduces risk of injury to the body										
Task Rotation	♦	indirectly reduces risk of injury to the body										
Work Pace	♦	indirectly reduces risk of injury to the body										
Scheduling	♦	indirectly reduces risk of injury to the body										

Direct Risk Factors

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♦ = See General Risk Factor Solutions Manual

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck/Shoulder</p> <p>A Saw Filer frequently holds their arms away from the body in order to perform both heavy and precision saw maintenance tasks.</p>	<p>Force</p> <p>Awkward Postures</p> <p>Static Postures</p>	<ul style="list-style-type: none"> • Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on muscles and tendons. • 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. • When the arms are repeatedly held away from the body, the muscles of the neck and shoulder must remain tense to support the weight. If the duration of constant tension is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. 	<ul style="list-style-type: none"> • Try to keep the arms supported while brazing saw tips or operating machinery. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • When reaching overhead, try to alternate arms. • When lifting, use both arms. • Get help when lifting heavy objects. • For exercises that can help prevent <i>neck</i> and <i>shoulder</i> injuries, <i>see the neck and shoulder sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Elbow/Wrist</p> <p>A Saw Filer must grip hand tools in order to maintain saws.</p>	<p>Force</p> <p>Repetition</p> <p>Awkward Postures</p>	<ul style="list-style-type: none"> • Gripping an object requires activation of the forearm muscles, generating tension at the tendon/bone connection of the elbow. • Repeated stress to the elbow without adequate rest could fatigue tissues to the point of injury. • Gripping with a bent wrist requires increased muscle tension. • Extremely wide or narrow grip spans also require more muscle tension. 	<ul style="list-style-type: none"> • Whenever possible, try using both hands to distribute the workload evenly. • Avoid sudden forceful movement of the hands. Use smooth motions and keep the wrists straight. • For exercises that can help prevent <i>elbow</i> injuries, <i>see the elbow section of the Body Manual.</i>
	<p>Wrist</p> <p>A Saw Filer must grip hand tools with the wrists bent in order to maintain saws.</p>	<p>Force</p> <p>Repetition</p> <p>Awkward Postures</p>	<ul style="list-style-type: none"> • Gripping an object requires activation of the forearm muscles, generating tension in the tendons and sheaths running through the wrist. • Repeated gripping and bending of the wrist causes stress to the tendon sheaths. • As the wrist is bent, the tendon sheaths will rub up against the walls of the carpal tunnel. The further the wrist is bent, the more friction experienced in the tendon sheaths. 	<ul style="list-style-type: none"> • Minimise grip and push force used to operate the tools/equipment. • For exercises that can help prevent <i>wrist</i> injuries, <i>see the wrist section of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Low Back</p> <p>A Saw Filer must bend forward and to the side in order to inspect and maintain saws.</p>	<p>Awkward Postures</p> <p>Static Postures</p>	<ul style="list-style-type: none"> • Back muscles must support the weight of the upper body when leaning forward and to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs. • Extended periods of forward or side bending can gradually fatigue the structures of the low back. If the stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury. 	<ul style="list-style-type: none"> • When leaning forward to work on saws, or when handling objects, try to keep the back in a neutral position (ears, shoulders, and hips aligned). • When changing saws in machines try to keep the back in a neutral position. • When stooping down, bend with the hips and knees, not with the back. • When lifting, hold objects close to the body. • For exercises that can help prevent <i>back</i> injuries, <i>see the back section of the Body Manual.</i>