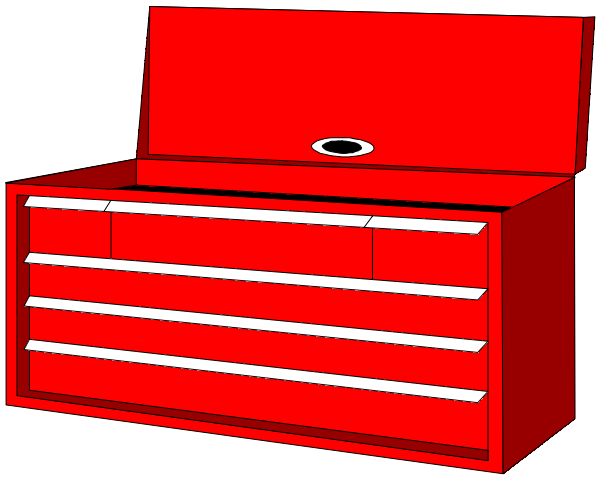
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Saw Fitter 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 FITTER TOOL KIT
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Overview

Saw Fitter (Bandsaw)

Job Summary

A Saw Fitter is responsible for the maintenance of bandsaws. A Saw Fitter swages, shapes, gauges and inspects bandsaws, sharpens bandsaw teeth with an auto grinder, and dresses the grinding stone. Other tasks Saw Fitters perform include transporting and changing saws. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Saw Fitter may include:

a) Awkward postures of the neck, elbow, wrist, and low back
b) Static postures of the neck, shoulder, and low back
c) Repeated forceful movements of the shoulder and elbow
d) Contact stress of the hand
e) Continual standing for a long duration
f) Lifting and lowering bandsaws and tools

Mental Demands

A Saw Fitter is required to remain alert at all times when working with heavy machinery. A Saw Fitter has to be able to make decisions on the quality of the sharpened teeth of the bandsaw, and to correct any defects on the saws.

Major Variations

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

1) Swaging and shaping of bandsaws can be:
   a) Performed manually, with a swager and shaper
   b) Performed automatically, with an auto swager and shaper

2) A Saw Fitter may use a swager that is:
   a) Manual, with two levers to be pulled by the operator
   b) Pneumatic, with one lever and one repeated manual gripping component
   c) Pneumatic, with one lever which combines the gripping movement with the lever pull

Minor Variations

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

1) A Saw Fitter may lift a swager:
   a) Manually
   b) Assisted with a tool balancer

2) When inspecting bandsaw teeth, a Saw Fitter may:
   a) Bend to see underside directly
   b) Use a mirror to see under each tooth

Physical Demands Analysis
Saw Fitter (Bandsaw)

PDA General Instructions: Saw Fitter

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

PDA Table of Contents

Physical Demands Analysis
Saw Fitter (Bandsaw)

Task List

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

Transport bandsaws

A Saw Fitter transports a bandsaw, by lifting, lowering, carrying, rolling, and/or using a hoist, from storage or from the mill to the workstation.

Does this task occur at your mill?

☐ Yes ☐ No

Set up bandsaw on grinding workstation

A Saw Fitter will set up a bandsaw on the grinding workstation, and set up the grinding stone to the proper placement.

Does this task occur at your mill?

☐ Yes ☐ No

Dress grinding stone

A Saw Fitter will dress (sharpen) a grinding stone with a star dresser or wheel dresser.

Does this task occur at your mill?

☐ Yes ☐ No

Oil bandsaw teeth

A Saw Fitter oils bandsaw teeth.

Does this task occur at your mill?

☐ Yes ☐ No

Swage bandsaw teeth

A Saw Fitter swages bandsaw teeth.

Does this task occur at your mill?

☐ Yes ☐ No

Shape bandsaw teeth

A Saw Fitter shapes bandsaw teeth.

Does this task occur at your mill?

☐ Yes ☐ No

Gauge and inspect bandsaw teeth

A Saw Fitter gauges and inspects bandsaw teeth for defects.

Does this task occur at your mill?

☐ Yes ☐ No

Change bandsaw and guides

A Saw Fitter changes a bandsaw(s) and guides when required. This task requires removing and replacing bandsaw and guides into machinery.

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 Fitter. These tasks may vary between mills. To ensure accuracy, consult with a Saw Fitter at your mill regarding the percent of shift, task duration, and frequencies. Percent of shift is not completed due to large variations among mills.

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

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Transport bandsaws					• *A bandsaw can be moved by lifting, lowering, rolling, carrying, or a hoist* • *Can be performed with one or two operators* • *Physical demands increase with one operator* • *Approximately 2 to 6 bandsaws per day*
	Set up bandsaw on grinding workstation					• *Duration approximately 1 to 3 minutes*
	Dress grinding stone					• *Duration approximately 30 to 60 seconds for each saw* • *Dressing is performed manually with a star dresser or wheel dresser* • *Some have dressing stones attached to arm on grinder, which decreases the amount of force required to perform task*
	Oil bandsaw teeth					• *Performed for each saw* • *Approximately 2 to 6 bandsaws per shift*

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Swage bandsaw teeth					• *Approximate duration 5 to 8 minutes per saw* • *25 to 40 movements per minute* • *Number of teeth vary according to saw size (e.g., estimate small saw, 180 teeth)* • *Approximately 2 to 6 bandsaws per day* • *Involves standing in an awkward posture with highly repetitive movements of the upper limb*
	Shape bandsaw teeth					• *Duration approximately 5 to 8 minutes per saw* • *25 to 40 movements per minute* • *Number of teeth vary according to saw size (e.g., estimate small saw, 180 teeth)* • *2 to 6 bandsaws per day* • *Involves standing in an awkward posture with highly repetitive forceful movements of the upper limb*
	Gauge and inspect bandsaw teeth					• *Pinch grip required to hold onto small 0.5 kg (approximately) gauge* • *Visual inspection required to identify defects in the teeth* • *Static postures of the low back when inspecting and reaching*
	Change bandsaws and guides					• *Number of times performed will vary depending on the size of the bandsaw and the mill* • *Bandsaws are changed approximately every 2 hours during breaks and lunch* • *Duration of saw change is approximately 7 to 10 minutes* • *Emergency saw changes can occur at any time, this increases the frequency and duration of demands associated with saw changes*
	Other:					

Organisational Factors

The table below contains a list of organisational factors for a Saw Fitter. 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	☐ *8 hours* ☐ *8.5 hours* ☐
Formal breaks	☐ *One half hour lunch, two 10 minute breaks* ☐ *One half hour lunch, two 15 minute breaks* ☐
Informal breaks	☐ *Yes – amount of time varies depending on amount of work available* ☐
Work pace	☐ *Not Applicable* ☐
Work pace control	☐ *Self-paced* ☐
Job rotation ☐ Yes *(Check one)* ☐ No	If **Yes:** Rotation with what job(s):_____ _____ How often: (e.g., every 2 hours)_____

Workstation Characteristics

Dimensions & Layout

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

Workstation Dimensions	
(A) Height of bandsaw teeth	cm
(B) Height of grinding stone adjuster	cm

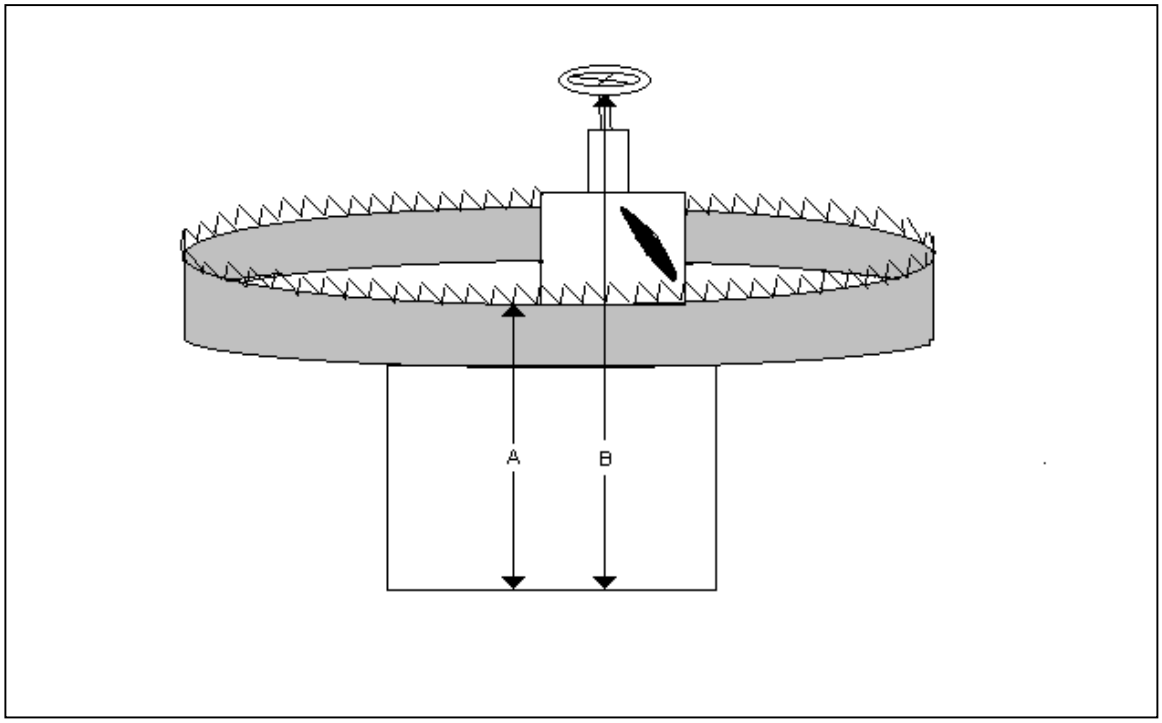


Figure 1: saw set-up

Flooring, Display, and Seating

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

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

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

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Saw Fitter. These controls may vary between types of grinding workstation. To ensure accuracy, consult with a Saw Fitter at your mill. If controls are different at your mill, check off *other* box(es) and fill in the information in the space provided.

Indicate the controls which are present at your mill by placing a check mark (✓) in the far left column.

The Comments section may contain information that describes variations between mills.

	Type of Control	Function	Frequency	Comments
	Hand wheel	• *Adjusts the height of the grinding stone*	• *Approximately 2 to 6 times per shift* • *Duration approximately 10 to 30 seconds*	• *Frequency and duration will vary depending on the number of bandsaws sharpened per shift*
	Push Buttons	• *Start/stop controls on grinding workstation*	• *Frequency approximately 4 to 12 times per shift* • *Duration approximately 1 to 2 seconds*	• *Frequency and duration will vary depending on the number of bandsaws sharpened per shift*
	Lever	• *To operate swager and shaper*	• *Frequency approximately 25 to 40 times per minute* • *Duration approximately 5 to 7 minutes per saw*	• *Frequency and duration will vary depending on the size of bandsaw and the number of bandsaws per shift*
	Other:			

Physical Demands

Whole Body Physical Demands

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

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

Physical Demands	Tasks or Activity	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Walking	• *Transport bandsaws*			✓		• *Walking distances will vary with mill size* • *Walking can be forward or backward when pulling*
	• *Change bandsaw and guides*		✓			• *Walking distances will vary with mill size* • *Ground may be uneven due to mill conditions* • *2 to 4 saw changes per shift*
Sitting						*Not Applicable*
Standing	• *Set up bandsaws on grinding workstation*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*
	• *Dress grinding stone*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*
	• *Oil bandsaw teeth*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*
	• *Swage bandsaw teeth*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*

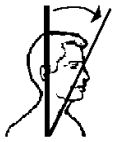
Physical Demands	Tasks or Activity	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Standing	• *Shape bandsaw teeth*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*
	• *Gauge and inspect bandsaw teeth*			✓		• *2 to 6 bandsaws sharpened per shift* • *Duration and frequency will vary among mills*
Climbing (stairs)	• *Change bandsaw and guides*	✓				• *Amount of climbing will vary among mills* • *2 to 4 bandsaw changes per shift*
Climbing (other)						*Not Applicable*
Balancing						*Not Applicable*
Kneeling/ Crouching	• *Changing bandsaws*	✓				• *Amount of kneeling/crouching will vary among mills*
Other:						

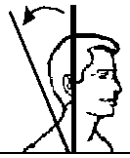
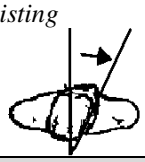
Body Postures

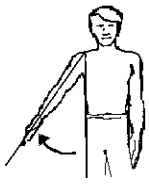
The table below outlines the body postures held or repeated throughout the shift by a Saw Fitter.

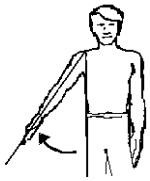
For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

Check marks (✓) in the Percent of Task columns correspond to percentages found during the ergonomic investigation. The Comments section may contain information relating to duration, frequencies, and other variations in posture.

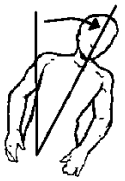
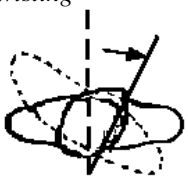
Body Posture	Task(s)	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck						
Flexion 	• *Transport Bandsaw*	✓				• *Looking down to view route for transporting saw*
	• *Set up bandsaws on grinding workstation*			✓		• *Looking down to see position of grinding stone* • *Looking down to see if bandsaw is secure*
	• *Dress grinding stone*				✓	• *Looking down into grinding stone* • *Height of the bandsaw and operator will vary amount of neck flexion*
	• *Oil bandsaw teeth*				✓	• *Looking down at bandsaw teeth* • *Height of the bandsaw and operator will vary amount of neck flexion*
	• *Swage bandsaw teeth*				✓	• *Looking down at swager* • *Height of the bandsaw and operator will vary amount of neck flexion*
	• *Shape bandsaw teeth*				✓	• *Looking down at shaper* • *Height of the bandsaw and operator will vary amount of neck flexion*
	• *Gauge and inspect bandsaw teeth*				✓	• *Looking down at bandsaw* • *Height of the bandsaw and operator will vary amount of neck flexion*
	• *Change bandsaw and guides*			✓		• *Looking down into bandsaw equipment and machinery*

Body Posture		Task(s)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck							
	Extension 	• *Change bandsaw and guides*	✓				• *Looking up to see bandsaw being lowered by hoist from ceiling*
	Twisting 	• *Transport bandsaws*		✓			• *Looking to the side to view route for transporting saw*
Shoulder							
	Flexion 	• *Transport bandsaws*			✓		• *Reaching forward to move saw by rolling or pulling* • *Reaching forward to operate hoist controls* • *Reaching forward to manipulate bandsaw onto and off of hoist* • *Duration approximately 2 to 10 seconds* • *Reaching movement can be repeated several times during transporting process*
		• *Setting up bandsaw on grinding workstation*		✓			• *Reaching for bandsaw below the waist to lift onto grinding workstation* • *Reaching overhead (> 90^{o}) to turn hand wheel to adjust level of grinding stone* • *Turning hand wheel requires force*
		• *Dress grinding stone*			✓		• *Reaching forward in a pushing movement* • *Duration 1 to 5 seconds*
		• *Oil bandsaw teeth*		✓			• *Reaching forward to pour oil onto teeth*

Body Posture	Task(s)	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Shoulder						
Flexion 	• *Swage bandsaw teeth*			✓		• *Repeated shoulder flexion one side, other side is held in a static posture* • *2 to 6 bandsaws per shift* • *Some swagers require both arms to be repeatedly flexed* • *Reaching distance will vary depending on the height of the person, generally taller workers reach less than shorter workers*
	• *Gauge and inspect bandsaw teeth*			✓		• *Reaching forward to inspect and reach teeth in front* • *Degree of flexion will vary depending on worker technique and size*
	• *Change bandsaw and guides*					• *Reaching forward to manipulate bandsaw on rollers* • *Reaching forward to lift and carry guide from hoist* • *The degree of shoulder flexion will vary depending on worker technique and size*
Shoulder						
Abduction 	• *Dress grinding stone*		✓			• *Task performed on each bandsaw sharpened* • *2 to 6 bandsaws per shift* • *Pressing dressing tool into grinding stone requires shoulder abduction* • *Degree of shoulder abduction will depend on worker technique and size*

Body Posture	Task(s)	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Shoulder						
Abduction 	• *Shape bandsaw teeth*			✓		• *Task performed on each bandsaw sharpened* • *2 to 6 bandsaws per shift* • *Repeated shoulder abduction with forceful adduction and pronation movement* • *Direction of lever varies between different types of shapers*
Extension 	• *Swage bandsaw teeth*			✓		• *Pulling lever back* • *Task performed on each bandsaw sharpened* • *2 to 6 bandsaws per shift* • *Degree of shoulder extension will vary depending on operator height*
Forearm						
Rotation 	• *Shape bandsaw teeth*				✓	• *Forearm is repeatedly pronated with force* • *Frequency 25 to 40 times per minute* • *Duration 5 to 7 minutes per bandsaw* • *2 to 6 bandsaws per shift*
Wrist						
Flexion 	• *Set up bandsaws on grinding workstation*	✓				• *Wrist is bent when reaching for hand wheel*
Extension 	• *Set up bandsaws on grinding workstation*	✓				• *Wrist is bent when positioning bandsaw on grinding workstation*
	• *Swage bandsaw teeth*			✓		• *Wrist is bent back when holding onto swaging handle*

Body Posture	Task(s)	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Wrist						
Ulnar Deviation 	• *Dress grinding stone*			✓		• *Wrist is bent when holding onto dressing tool and pushing it into grinding stone* • *Degree of deviation and duration will vary among different workers and different dressing tools*
	• *Swage bandsaw teeth*					• *Wrist is bent when repeatedly pulling on swaging lever*
Radial Deviation 	• *Swage bandsaw teeth*		✓			• *Wrist is bent with force when pulling on swaging lever* • *Degree of force and angle will vary depending on worker technique and size*
Back						
Flexion 	• *Transport bandsaws*		✓			• *Lifting and lowering bandsaw*
	• *Set up bandsaws on grinding workstation*		✓			• *Back is bent forward to look at position of stone* • *Back is bent forward to secure bandsaw locks on grinding machine*
	• *Dress grinding stone*			✓		• *Back is bent forward to reach into the grinding stone* • *Degree of back flexion will vary depending on worker technique and size*
	• *Swage bandsaw teeth*			✓		• *Back is held in a bent posture to swage teeth* • *Duration 5 to 7 minutes per bandsaw* • *2 to 6 bandsaws per shift* • *Degree of back flexion will vary depending on worker technique and size*

Body Posture		Task(s)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back							
	Flexion 	• *Gauge and inspect bandsaw teeth*			✓		• *Back is bent to reach forward and inspect bandsaw teeth* • *Duration 5 to 7 minutes per bandsaw* • *2 to 6 bandsaws per shift*
		• *Change bandsaw and guides*		✓			• *Back is bent when reaching into bandsaw machine to change guides* • *Total duration for bandsaw change is approximately 10 minutes*
	Lateral Flexion 	• *Set up bandsaws on grinding workstation*		✓			• *Back may bend to the side when looking at grinding stone position*
		• *Dress grinding stone*		✓			• *Back can be bent to the side when dressing the grinding stone* • *Degree of side flexion will vary depending on worker technique and size*
		• *Gauge and inspect bandsaw teeth*			✓		• *Back is bent to the side when a worker leans to get over top of the bandsaw*
	Twisting 	• *Change bandsaw and guides*		✓			• *Worker may be required to twist when in smaller spaces* • *Degree of twisting will vary depending on confined area*
	Extension 	• *Change bandsaw and guides*	✓				• *Back is bent when a worker has to look up to see a bandsaw being lowered through the ceiling* • *Degree of back extension will vary depending on worker technique*
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 Fitter.

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

Check marks (✓) in the Percent of Task columns correspond to percentages found during the ergonomic investigation. The Comments section may contain information relating to duration, frequencies, hand used, etc.

	Type	Task(s)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Power 	• *Transport bandsaws*	✓				• *Power grip used when operating hoist controls* • *Duration and frequency will vary depending on the number of saws transported*
		• *Set up bandsaws on grinding workstation*		✓			• *Power grip used when turning hand wheel for grinding stone*
		• *Dress grinding stone*			✓		• *Power grip used for holding dressing tools*
		• *Swage bandsaw teeth*			✓		• *Power grip used to hold onto lever handle*
		• *Shape bandsaw teeth*			✓		• *Power grip used to hold onto lever handle*
		• *Changing saws & guides bandsaw teeth*	✓				• *Power grip used when using tools (wrench) to change guides*
	Pinch 	• *Set up bandsaws on grinding workstation*		✓			• *Pinch grip used to make adjustments on grinding machine*
		• *Swage bandsaw teeth*	✓				• *Pinch grip used to insert air supply for pneumatic swagers* • *Mills may only have a manual swager*
		• *Gauge and inspect bandsaw teeth*			✓		• *Pinch grip used when holding onto gauge (0.5 kg)* • *Pinch grip used when marking with crayon*
		• *Change bandsaw and guides*		✓			• *Pinch grip used to unscrew bolts for guides* • *Varies depending on layout of machinery and worker technique*

Type	Task(s)	Percent of TASK				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Hook 	• *Set up bandsaws on grinding workstation*	✔				• *Hook grip used when lifting or lowering bandsaw onto grinding machine*
Precision 						*Not Applicable*
Other:						

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 Fitter.

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).

Check marks (✓) in the Percent of Task columns correspond to percentages found during the ergonomic investigation. The Comments section may contain information relating to duration, frequencies, and details regarding characteristics of the object handled.

	Task Description	Weight (kg)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Transport bandsaws • *Pulling bandsaw on cart* • *Rolling bandsaw across floor*	*Weight of the bandsaw will vary depending on the size*		✓			• *Amount of stress applied to body will vary depending on technique used*
	Setting up bandsaw on grinding workstation • *Lifting and lowering bandsaw onto grinding workstation*	*Weight of the bandsaw will vary depending on the size*	✓				• *Lifting and lowering can be performed individually or in pairs* • *4 to 12 times per shift*
	Swage bandsaw teeth • *Lifting and lowering swaging tool*	*11 to 14 (pneumatic)* *4 (manual)*	✓				• *Mills vary in the type of tool used (pneumatic versus manual)* • *Lift is sometimes made away from the body in full shoulder flexion* • *Tool is lifted and lowered for each bandsaw sharpened* • *2 to 4 bandsaws per shift* • *Pneumatic swager can be hung from a tool balancer to counteract the weight*

	Task Description	Weight (kg)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Swage bandsaw teeth • *Repeatedly pulling on swager lever*	*Not Available*				✓	• *Amount of pulling will vary depending on type of swager (pneumatic versus manual)* • *Manual requires both arms to pull on levers* • *25 to 40 pulling movements per minute* • *5 to 7 minutes per bandsaw* • *2 to 6 bandsaws per shift*
	Shape bandsaw teeth • *Lifting and lowering shaping tool*	*4.7 to 4.8*	✓				• *Lift is sometimes made away from the body in full shoulder flexion* • *Tool is lifted and lowered for each bandsaw sharpened* • *2 to 4 bandsaws per shift*
	Shape bandsaw teeth • *Repeatedly pulling shaper lever across the body (forearm pronation)*	*Not Available*				✓	• *Amount of pronation will vary depending on the size of the worker* • *Taller workers will pronate primarily, while shorter workers will pronate with adduction* • *Height of the bandsaw will also determine the amount of physical demand required to perform task* • *25 to 40 pulling movements per minute* • *5 to 7 minutes per bandsaw* • *2 to 6 bandsaws per shift*

	Task Description	Weight (kg)	Percent of TASK				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Changing Saws & Guides Bandsaw Teeth • *Lifting and lowering guides from hoist into bandsaw equipment*	*Guide weights vary depending on size*	✓				• *Awkward body postures may result when performing saw changes in confined areas* • *Saw changes occur approximately 2 to 4 times per shift* • *Frequency of saw changes will vary among mills* • *Amount of handling increases with the number of bandsaw changes*
	Other:						

Hand Tools

Indicate the hand tools used by a Saw Fitter 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.

Check marks (✓) in the Percent of Task columns correspond to percentages found during the ergonomic investigation. The Comments section may contain information relating to duration and frequency of use.

	Type of Tool	Task(s)	Weight (kg)	Percent of TASK				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pneumatic Swager	• *Swage bandsaw teeth*	*11.5 to 14.0*				✓	
	Manual Swager	• *Swage bandsaw teeth*	*4.0*				✓	
	Shaper	• *Shape bandsaw teeth*	*4.7 to 4.8*				✓	
	Gauge	• *Gauge and inspect bandsaw teeth*	*0.5*				✓	
	Grinding stone		*0.9 to 1.3*				✓	
	Other:							

Environmental Conditions

Work Environment

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

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

Noise level (dB)	*Range found: 87.6 to 90.0* *Mill Specific:*
Lighting level (lux)	*Range found: 50 to 1000* *Mill Specific:*
Temperature (^{0}C)	*See Regional Temperatures on the next page*

Location of Workstation

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

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

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

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

Temperature

The table below contains a list of the geographical regions of British Columbia.

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

Refer to the regional map in Appendix B of the PDA.

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

Personal Protective Equipment

The table below contains a list of the personal protective equipment (PPE).

For the Saw Fitter job at your mill, indicate which of the PPE items are required with a check mark (✓).

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

Appendix A – Weight of Wood Equation

1. Type of Wood Handled

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

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

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

2. Size of Wood*

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

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

* Conservative estimates of actual wood dimensions

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

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

3. Length of Wood

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

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

4. Weight of Wood Equation*

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

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

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

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

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

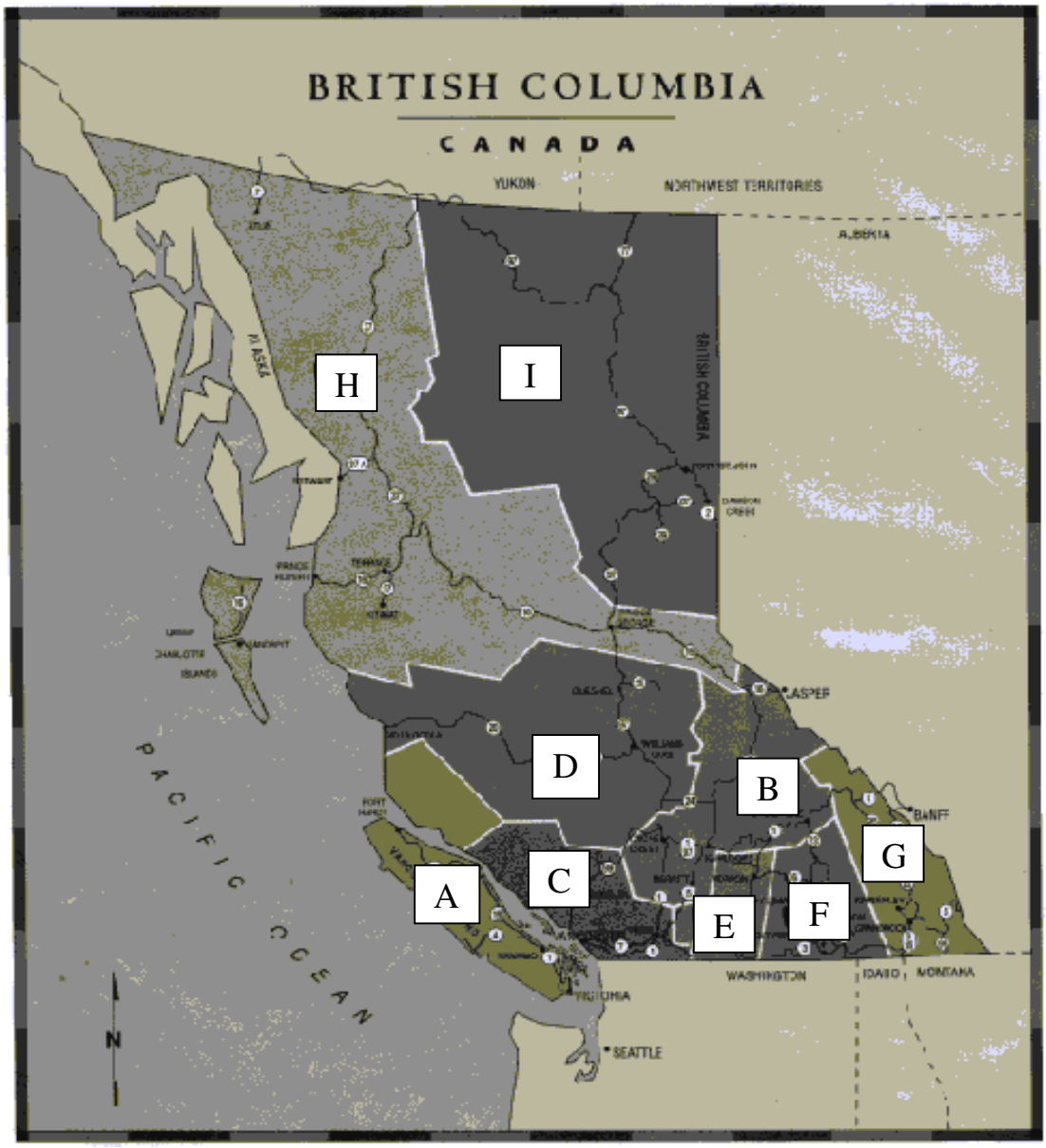
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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

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

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

Appendix B – Regional Map



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

Risk Factor Identification Checklist
Saw Fitter

Purpose

The Risk Factor Identification Checklist for a Saw Fitter 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 Fitter

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions

☐ After implementation of solutions

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

Definitions

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

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

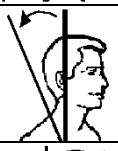
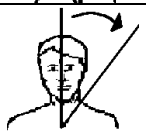
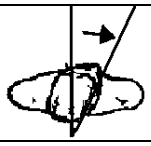
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

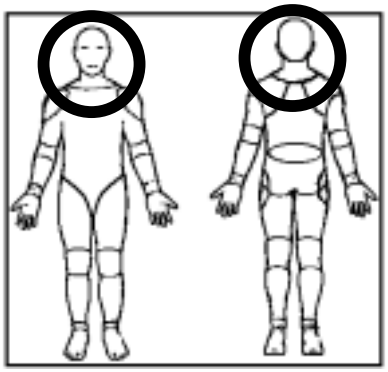
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., swaging)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			S O	
Static Posture				
Ask the worker: Do tasks require your neck or shoulders to be maintained in a fixed or static posture? (e.g., bending head forward to swage a saw)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Lateral Bending 			S O	
Rotation 			S O	

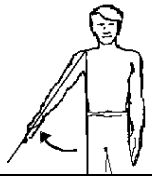
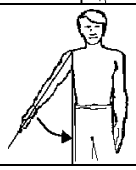
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



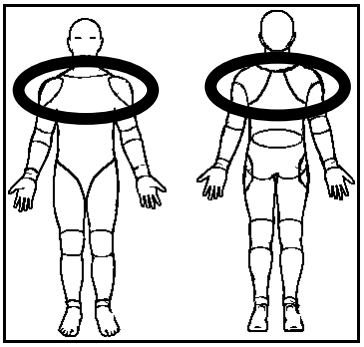
Body parts within the circled area will be classified as NECK issues.

SHOULDER

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

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

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



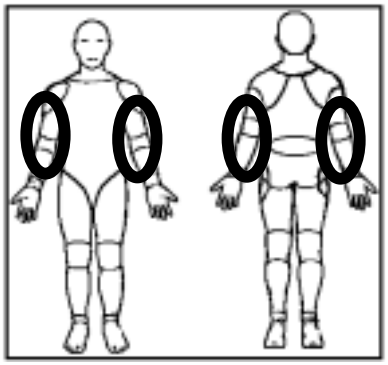
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., swager or shaper) 			S O	
Are objects handled in a pinch grip? (e.g., guage) 			S O	
Are objects handled in a hook grip? (e.g., carrying bandsaw) 			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., swaging)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			S O	

Static Posture	N	Y		Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture?			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			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?			S O	

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



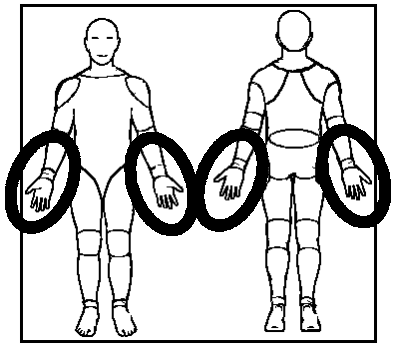
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip?  (e.g., swager or shaper)			S O	
Are objects handled in a pinch grip?  (e.g., gauge)			S O	
Are objects handled in a hook grip?  (e.g., carrying bandsaw)			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., swaging)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			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?				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	

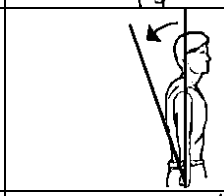
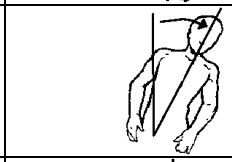
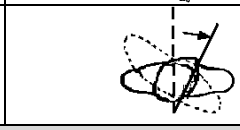
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



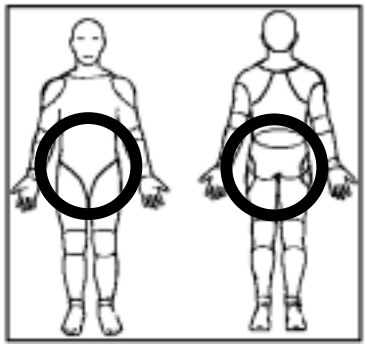
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., swaging)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending forward to swage a 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	

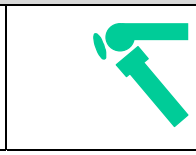
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., through the floor)				S O	

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

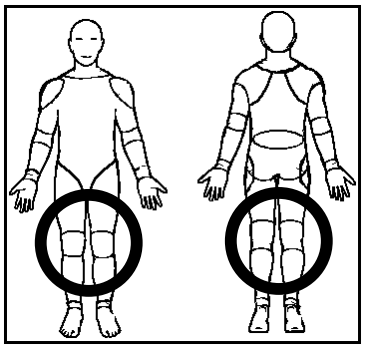


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., climbing 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 **<u>any</u>** 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	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Knee or Hip/Thigh? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Knee or Hip/Thigh? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No

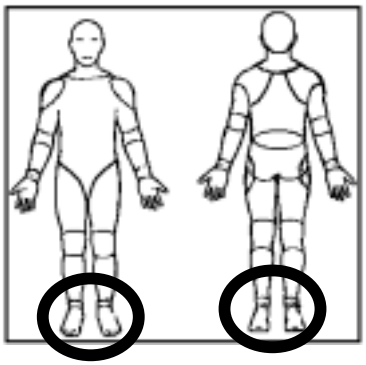


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., 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	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Ankle or Foot? (see Worksheet 1 in the Implementation Guide)		☐Yes ☐No
In the **Discomfort Survey** investigation, were there reports of discomfort for the Ankle or Foot? (see Worksheet 2 in the Implementation Guide)		☐Yes ☐No



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y		Comments:
Are there problems handling a load due to its size or shape? (e.g., large 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 Fitter (Bandsaw)

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

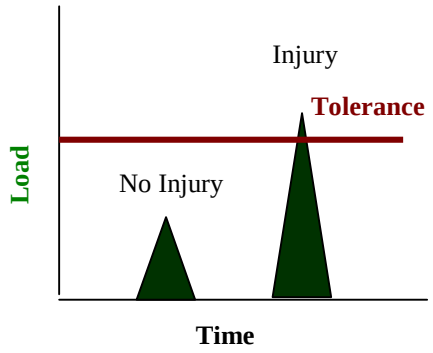
Disclaimer

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

WM Table of Contents

Injury Education

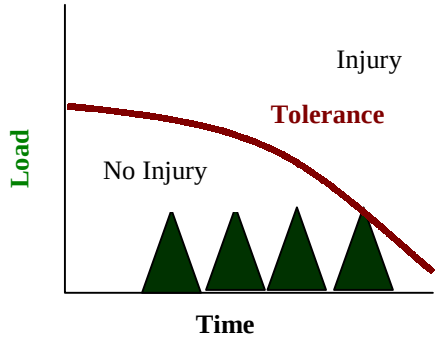
Injuries occur when …
Loads exceed tissue tolerances



Excessive Force

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

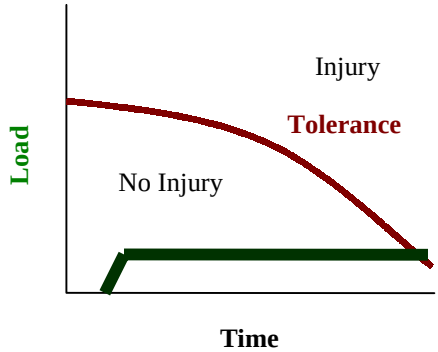
Example – a worker going over on their ankle and spraining it.



Excessive Repetition

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

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



Excessive Duration

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

Example – a Grader developing neck tension.

Body Parts at Risk

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

After all of the appropriate information is collected during the investigation of the Saw Fitter 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 Fitter. 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 Fitter may hold the head forward or to the side when dressing the grinding stone..

A Saw Fitter may hold the head forward or to the side when swaging, shaping, gauging, and inspecting a bandsaw.

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 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 or side bent 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

- Loading on the neck muscles is increased when the head is held in a forward bent posture or a side bent posture when swaging, shaping, gauging, and inspecting bandsaw teeth, and when dressing the grinding stone. The lower the height of the bandsaw or grinding stone, the greater the amount of neck bending required, with more muscle activation needed to support the weight of the head.

Environmental conditions

Lighting

- Loading on the neck is increased when a Saw Fitter has to bend their neck forward to see more clearly. Insufficient lighting will increase the amount of neck bending required.
- Loading on the neck is increased when lighting is inappropriately placed, causing glare. Glare can cause awkward postures of the neck.

CONSEQUENCES

- When the head is held in a forward or side bent 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.
- Over time, postural changes will develop, weakening the supporting structures of the neck and upper back. This is reflected in a rounded back and a forward neck posture.
- Signs and symptoms include pain, tenderness, stiffness, 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 91 & 92.
- 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

A Saw Fitter lifts and lowers equipment and bandsaws.

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) elevate the shoulders, and the larger muscles of the shoulders (e.g., deltoids) raise 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.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the neck and shoulders increases when lifting equipment onto bandsaws or storage shelves that are too high. Loading significantly increases when lifting above shoulder height.

Working Reaches

- Loading on the neck and shoulders increases when lifting objects away from the body. The farther the object is from the body, the greater the muscle activation required to hold the object.

Characteristics of Objects Being Handled

Size and Shape

- The heavier the object being handled, the greater the load on the neck and shoulder to support the weight of the load.

CONSEQUENCES

- Forceful and repeated lifting and lowering can lead to neck and/or shoulder strain.
- Signs and symptoms include pain, tenderness, muscle spasm in the neck/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 91 & 92.
- To help prevent ***neck*** discomfort, see the upper trapezius stretch in the ***Neck section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Force
Awkward Postures
Repetition

A Saw Fitter may frequently push and/or pull on the swaging handle to swage a bandsaw.

A Saw Fitter may push with a dressing stone to sharpen the grinding stone.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the shoulder increases as the arm is raised higher. The higher the level of the bandsaw, the greater the amount of shoulder abduction required. Repetitive flexion and/or abduction of the shoulder further increases the load on the shoulder.

Characteristics of Objects Being Handled

Type of Equipment Used

- Operating manual equipment requires a Saw Fitter to physically generate force, which places increased loading on the shoulder. Repetitive use of manual equipment further increases the load on the shoulder. Powered equipment, such as pneumatic swagers, requires less operator force, minimising the loads on the shoulder tissues.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled “Shoulder” in the Summary of Solutions on pages 91 & 92.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Force
Awkward Postures
Static Postures

A Saw Fitter may work with the arms overhead in order to adjust grinding stone position.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

- The rotator cuff stabilises the shoulder joint when objects are manipulated. The larger the force required, the greater the load on the rotator cuff.
- If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.

Awkward Postures

- A rotator cuff tendon may rub up against bone (impingement) when the arms are lifted overhead. The friction between the tendon and the bone increases as the arm is lifted higher. In addition, the rotator cuff must stabilise the weight of the arms when working overhead, increasing the tension in the tendon. The combination of impingement and tension increases the stress on this tendon.

Static Postures

- The rotator cuff tendons can become stretched at their end range of motion when arms are held overhead. If the duration is excessive, and recovery is not adequate, the tendon may stretch and make the joint unstable.

INDIRECT RISK FACTORS

Workstation Design

Working Height

- Loading on the shoulder increases when arms are raised above shoulder height. Holding the arms above shoulder height and performing a task, which requires force, such as turning a stiff hand wheel, further increases the load on the shoulder.

CONSEQUENCES

- Holding the arms overhead for a prolonged duration may lead to stressing the rotator cuff tendons.
- Rotator cuff muscles may become weakened.
- Signs and symptoms include pain when lifting the arm to the side, above shoulder height.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled “Shoulder” in the Summary of Solutions on pages 91 & 92.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Awkward Postures
Repetition

A Saw Fitter may grip and pull the handle of the shaper across the body to shape bandsaw teeth.

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 or by excessive movements.

DIRECT RISK FACTORS

Force

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

Awkward Postures

- Loading on the ligaments and tendons of the elbow increases when the forearm is placed in postures near the end range of motion. Active pronation (forearm goes from palm up to palm down) and wrist flexion increases the loading on the elbow joint leading to fatigue.
- The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip.

Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.

Repetition

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Shape and Size

- Loading on the wrist can increase when the design of tool handles does not allow neutral postures of the wrist when operating the tool. When the wrist is bent out of the neutral posture and required to generate force, the tissues of the wrist and forearm are stressed, which can lead to injury. Repeatedly stressing the tissues can further increase the load on the wrist and forearm.

Container, Tool, and Equipment Handles

- Loading on the tissues of the wrist and forearm can increase with handles that have a poor gripping surface. The diameter of the handle can effect the amount of muscle activation required to grip. The harder it is to grip a handle or tool, the more muscle activation required, increasing muscle fatigue.
- Loading on the tissues of the wrist and forearm can increase when tools are poorly maintained, for example worn or broken handles. Poorly maintained tools may require an operator to physically generate more force. The increase in force can further increase the load on the tissues of the wrist and forearm.

CONSEQUENCES

- Repeated forceful gripping may lead to fatigue at the tendon/bone connection near the elbow.
- Signs and symptoms include gradual development of pain at end range of motion and tenderness over the elbow joint (inside).

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 91 & 92.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

HAND

Direct Risk Factors:
Contact Stress

A Saw Fitter may be exposed to contact stress when swaging and shaping a bandsaw.

BACKGROUND INFORMATION

- The hand is covered with two fat pads located in the palm at the base of the thumb and below the pinky finger. These fat pads are there to protect the underlying structures of tendons and nerves, which allow the fingers to move with ease.

DIRECT RISK FACTORS

Contact Stress

- Contact on the palm of the hand between the two fat pads can press upon a branch of the ulnar nerve, which is vulnerable to local pressure.
- Continual contact with hard or sharp surfaces may damage the nerve and cause injury.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Equipment handles with hard or sharp edges can increase the localised pressure between the two fat pads of the palm.
- Loading on the tissues of the hand can increase when the handle surface is difficult to grip due to slippery materials or grease. Over-gripping a handle will increase the localised pressure on the palm.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Hand, please see the column labelled “Hand” in the Summary of Solutions on pages 91 & 92.

LOW BACK

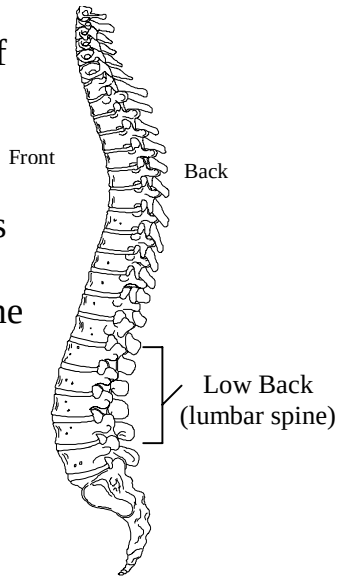
Direct Risk Factors:
Awkward Postures
Static Postures

A Saw Fitter bends down and/or to the side to swage, shape, gauge, and inspect bandsaws.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Awkward Postures

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

Static Postures

- Holding a forward or side bending posture can gradually fatigue the structures of the low back. If the duration of the static posture is excessive, and recovery is not adequate, the muscles of the lumbar spine will fatigue and lead to injury.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the low back is increased when the height of the bandsaw blade is too low and the operator is required to bend to reach.

Working Reaches

- Loading on the tissues of the low back increases when lifting and lowering objects away from the body. The further the distance from the body, the greater the load on the low back. Holding a load away from the body for periods of time will accelerate muscle fatigue, due to a decrease in circulation to the working muscles.

Characteristics of Objects Being Handled

Size and Shape

- The heavier the object being handled, the greater the load on the low back.

CONSEQUENCES

- Holding a forward bent or side bent posture may lead to muscle strain in the low back.
- Signs and symptoms may include muscle spasm, ache, and pain in the lower back region.

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 91 & 92.
- For exercises that could help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

FOOT

Direct Risk Factors:
Static Postures

A Saw Fitter stands on a hard surface throughout the day.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Floor Surfaces

- Loading is increased in the tissues of the foot when standing on a hard surface, such as concrete or metal.

CONSEQUENCES

- Continual standing may cause damage to the plantar fascia.
- Signs and symptoms include pain and stiffness at the base of the heel, initially in the morning. As problems progress the pain may become chronic.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled “Ankle/Foot” in the Summary of Solutions on pages 91 & 92.
- For exercises that can help to prevent ***foot*** injuries, see the ***Foot section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Saw Fitter may hold the head forward or to the side when swaging, shaping, gauging, and inspecting a bandsaw.

- A Saw Fitter may hold the head forward or to the side when dressing the grinding stone.

NECK/SHOULDER

- A Saw Fitter lifts and lowers equipment and bandsaws.

SHOULDER

- A Saw Fitter may frequently push and/or pull on the swaging handle to swage a bandsaw.

- A Saw Fitter may push with a dressing stone to sharpen the grinding stone.

- A Saw Fitter may work with the arms overhead in order to adjust grinding stone position.

ELBOW/WRIST

- A Saw Fitter may grip and pull the handle of the shaper across the body to shape bandsaw teeth.

HAND

- A Saw Fitter may be exposed to contact stress when swaging and shaping a bandsaw.

LOW BACK

- A Saw Fitter bends down and/or to the side to swage, shape, gauge, and inspect bandsaws.

FOOT

- A Saw Fitter stands on a hard surface throughout the day.

Risk Factors by Body Part

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

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

*** *Extended exposure to <u>any</u> risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual.*

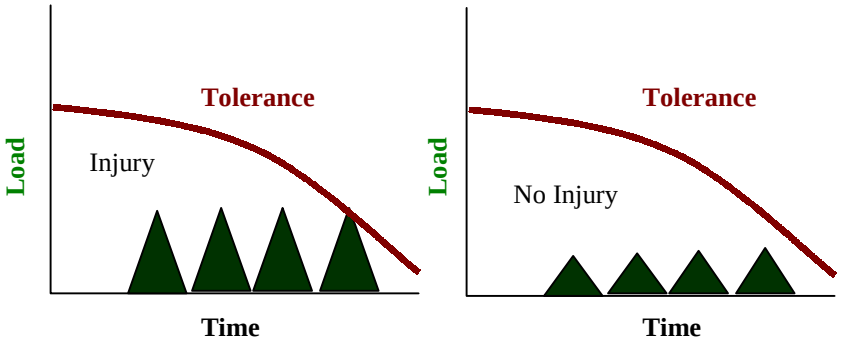
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

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

✓ = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Section on pages 91 & 92 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

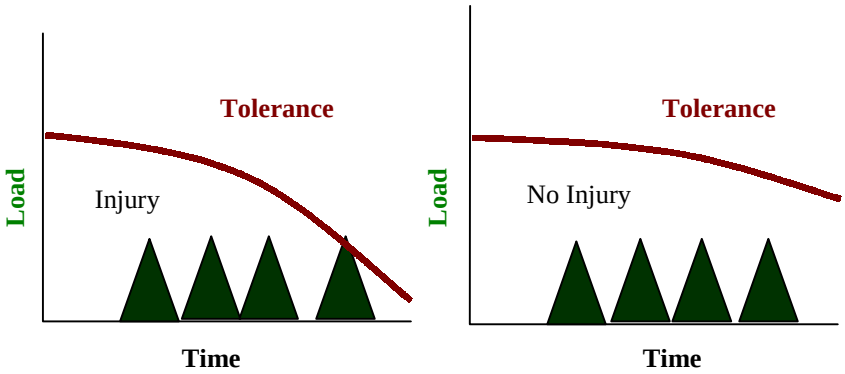
Injury Prevention

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 Fitter 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

Lifting and Lowering Objects

Reducing working reaches will reduce the load on the shoulders and low back. When objects are away from the body, the load on the joint tissues increases.

Joint Torque (effort) = Force x Distance

The farther an object is away from the body the higher the effort will be to lift or lower the object. The weight of the load also increases the amount of effort required to lift or lower a load.

Lifting load close to body requires a short distance from joint centre point to load centre of object, therefore less effort is required.

Lowering load away from the body increases the effort in the shoulders and low back.

Lifting postures

WP

To minimise loading on the shoulders and low back, keep objects close to the body by storing them in locations where a worker can get close to the object. Keeping the body in an upright posture will minimise loading on the body.

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

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

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

Reaching overhead:

When reaching overhead to turn the hand wheel, the shoulder joint is being loaded and shoulder impingement occurs.

Repositioning handles

E To reduce loading on the shoulder the hand wheel could be placed at a lower height. Positioning the hand wheel between elbow and shoulder height will allow workers to adopt a stronger body posture to perform the task.

Maintaining equipment

WP

To reduce loading on the shoulder and wrist tissues due to forceful exertions, the hand wheel should be kept well greased and free of debris. Good maintenance practises will keep equipment running more efficiently and reduce the amount of stress on the shoulder joint.

Provide a mirror

WP

To reduce loading on the neck and back muscles when inspecting and gauging teeth, a mirror with a handle (similar to mirror used by dentists) can be placed underneath bandsaw teeth to inspect underside.

Provide foam or custom earplugs

PPE

Loading on the neck muscles is increased when the head is bent forward. Wearing earmuff hearing protection adds weight to the head, increasing the load on the neck. Providing foam earplugs or custom earplugs will decrease the loading on the neck.

FLOOR SURFACES

Anti-fatigue matting

E

To minimise fatigue in the lower extremities, anti-fatigue matting can be provided. The use of anti-fatigue matting in the work area can 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.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Provide footrests

E

To reduce fatigue in the lower limbs from prolonged standing, provide footrests for a Saw Fitter. The footrest encourages occasional changes in posture, increasing blood circulation in the lower limbs.

Characteristics of Objects Being Handled

Digital display gauge

E

To reduce loading on the neck and low back when gauging bandsaw teeth, a gauge with a digital display and with better hand grip design should be provided. The display should have high contrast, with numbers large enough to see from a minimum of 0.5 metre away.

Tool balancer

E

To reduce the load on the shoulder and low back from lifting and lowering the swager onto the bandsaw, a tool balancer can be used to counter-balance the weight of the tool.

Tool balancer

Provide hoist for lifting

E

To reduce the load on the shoulders and low back from lifting and lowering the bandsaws, a hoist can be provided to assist Saw Fitters when handling the awkward load.

Automatic swagers and shapers

E

To reduce the load on the shoulder, elbow, wrist, and hand when swaging and shaping, automatic swagers and shapers can be used.

Pneumatic swagers

E

To reduce the amount of force required to swage a saw, a pneumatic swager can be used.

Activator bar attachment for swagers

E

To reduce the amount of repeated gripping of a pneumatic swager an activator bar attachment can be installed. This activator bar removes the need to repeatedly squeeze the trigger of the pneumatic swager.

Anti-vibration gloves

PPE

To reduce the amount of contact stress in the palm of the hand, anti-vibration gloves (gloves with a specially designed padded centre) may be worn. It is important to obtain the appropriate size to avoid over-gripping due to a poor fit. Some types of gloves are more effective than others. These should be investigated before purchasing.

Environmental Conditions

Improve lighting

E

Provide task lighting if current lighting levels are inadequate. Loading is increased on the neck and back muscles when a worker has to bend to get a better view of the task being performed.

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	Hand	Low Back	Hip	Knee	Ankle	Foot
Lifting postures	**85**	**S**	**F A**	**F A**	**F A**			**A S F**				
Repositioning handles	**86**	**A**	**A**	**A**	**F**			**A**				
Maintaining equipment	**87**		**F A**	**F A S**								
Provide a mirror	**87**	**A**	**A**									
Provide foam or custom earplugs	**87**	**A S**	**A**									
Anti-fatigue matting	**88**							**A S**				**S**
Provide footrests	**88**			**F**	**F R A**			**S**				
Digital display gauge	**88**	**A S**						**A S**				
Tool balancer	**88**			**F**					**F A**			

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand	Low Back	Hip	Knee	Ankle	Foot
Provide hoist for lifting	**89**			**F A**				**A**				
Automatic swagers and shapers	**89**	**A S**		**F R A**	**F R A**	**F R A**	**F R A**		**F,A**			
Pneumatic swagers	**89**			**F**	**F**	**F**						
Activator bar attachment for swagers	**89**					**R**	**C**					
Anti-vibration gloves	**89**						**C**					
Improve lighting	**90**	**A**										
Heat Exposure	◆	indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Job Rotation	◆	indirectly reduces risk of injury to the body										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

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

SAW FITTER MSI SAFETY GUIDE

OBJECTIVE: To identify ergonomic risks involved in Saw Fitter job tasks and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Saw Fitter.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Saw Fitter may hold the head forward or to the side when swaging and shaping a bandsaw, gauging and inspecting a bandsaw. A Saw Fitter may hold the head forward or to the side when dressing the grinding stone.	**Awkward Postures** **Static Postures**	• 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. • When the neck is held still in a forward or side bent 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.	• To reduce loading on the neck muscles when inspecting and gauging teeth, a mirror with a handle (similar to mirror used by dentists) can be used to inspect the underside of bandsaw teeth. • Provide foam or custom earplugs, which will decrease loading on the neck muscles. • For exercises that can help prevent ***neck*** injuries, ***see the Neck section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder A Saw Fitter lifts and lowers equipment and bandsaws.	**Force** **Awkward Postures**	• 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. • 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.	• Store heavy and frequently handled objects in locations where a worker can get close to them. This reduces force and awkward postures in the neck and shoulder by limiting heavy handling with the arms extended. Keeping the body in an upright posture will also minimise loading on the body. • For exercises that can help prevent ***neck*** and ***shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder A Saw Fitter may frequently push and/or pull on the swaging handle to swage a bandsaw. A Saw Fitter may push with a dressing stone to sharpen the grinding stone.	**Force** **Awkward Postures** **Repetition**	• The rotator cuff stabilises the shoulder joint when objects are pushed or pulled. The larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff. • When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.	• To minimise loading on the shoulder, keep objects close to the body by storing them in locations where a worker can get close to the object. Keeping the body in a strong posture will also minimise loading on the body. • For exercises that can help prevent ***shoulder*** injuries, ***see the Shoulder section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder A Saw Fitter may work with the arms overhead in order to adjust grinding stone position.	**Force** **Awkward Postures** **Static Postures**	• The rotator cuff stabilises the shoulder joint when objects are manipulated. The larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • A rotator cuff tendon may rub up against bone (impingement) when the arms are lifted overhead. The friction between the tendon and the bone increases as the arm is lifted higher. In addition, the rotator cuff must stabilise the weight of the arms when working overhead, increasing the tension in the tendon. The combination of impingement and tension increases the stress on this tendon. • The rotator cuff tendons can become stretched at their end range of motion when arms are held overhead. If the duration is excessive, and recovery is not adequate, the tendon may stretch and make the joint unstable.	• To minimise loading on the shoulder, keep objects close to the body by storing them in locations where a worker can get close to the object. Keeping the body in a strong posture will also minimise loading on the body. • Keep the hand wheel well greased and free of debris. Good maintenance practises will keep equipment running more efficiently and reduce the amount of stress on the shoulder joint. • For exercises that can help prevent ***shoulder*** injuries, ***see the Shoulder section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Saw Fitter may grip and pull the handle of the shaper across the body, to shape bandsaw teeth.	**Force** **Awkward Postures** **Repetition**	• 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. • Loading on the ligaments and tendons of the elbow increases when the forearm is placed in postures near the end range of motion. Active pronation and wrist flexion (forearm goes from palm up to palm down) increases the loading on the elbow joint leading to fatigue. • To use forearms muscles most efficiently, the wrist posture should be kept in a natural relaxed (neutral) position. Bending the wrist forward or backward makes the forearm muscles, work harder to maintain the grip. Gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection. • Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury.	• Provide adequate breaks to allow recovery of the working muscles in the hand and forearm. • Keep the wrists in neutral postures when performing this task. • For exercises that can help prevent ***elbow*** injuries, ***see the Elbow section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Hand A Saw Fitter may be exposed to contact stress when swaging and shaping a bandsaw.	**Contact Stress**	• Contact on the palm of the hand between the two fat pads can press upon a branch of the ulnar nerve, which is vulnerable to local pressure. • Continual contact with hard or sharp surfaces may damage the nerve and cause injury.	• To reduce the amount of contact stress in the palm of the hand, anti-vibrating gloves (gloves with a specially designed padded centre) may alleviate some of the pressure on the hand. It is important to get the appropriate size to avoid over gripping due to a poor fit.
	Low Back A Saw Fitter bends down and/or to the side to swage, shape, gauge and inspect bandsaws.	**Awkward Postures** **Static Postures**	• Back muscles must support the weight of the upper body when leaning forward or to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs. • Holding a forward or side bending posture can gradually fatigue the structures of the low back. If the duration of the static posture is excessive, and recovery is not adequate, the muscles of the lumbar spine will fatigue and lead to injury.	• To minimise loading on the low back, keep objects close to the body by storing them in locations where a worker can get close to the object. Keeping the body in a strong posture will also minimise loading on the body. • For exercises that can help prevent ***low back*** injuries***, see the Low Back section of the Body Manual***.
	Foot A Saw Fitter stands on a hard surface throughout the day.	**Static Postures**	• While standing, the weight of the body loads the plantar fascia. If the duration of standing is excessive, and recovery is not adequate, the fascia may deform to the point of injury.	• Alternating between sitting and standing will alleviate some of the pressure placed upon the foot. • For exercises that can help prevent ***low back*** injuries, ***see the Low Back section of the Body Manual***.