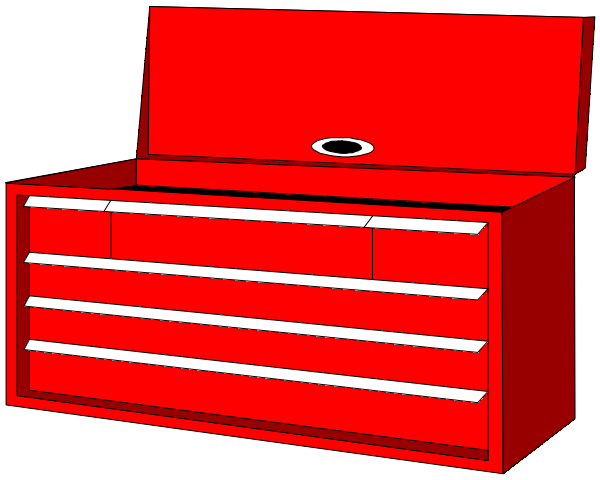
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Babbitman/Grinderman 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

BABBITMAN/GRINDERMAN TOOL KIT
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Overview

Babbitman/Grinderman

Job Summary

A Babbitman/Grinderman is responsible for the upkeep of knives and guides from machinery such as canters, edgers, and chippers. A Babbitman/Grinderman may change knives/guides, knock off babbit and scrape knives, sharpen knives using an auto-grinder, and pour/file babbit. Less frequent duties may include cleaning the workstation, maintaining equipment (e.g., auto-grinder), and assisting Saw Fitters/Filers with saw changes. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Babbitman/Grinderman may include:

a) Forceful movements of the elbow/wrist, wrist, and low back
b) Awkward postures of the neck, neck/shoulder, elbow/wrist, wrist, and low back
c) Static postures of the neck and elbow/wrist
d) Repetitive movements of the neck/shoulder, elbow/wrist, and wrist
e) Vibration exposure to the wrist
f) Continuous standing, with some intermittent walking
g) Manual handling of boxes of knives, side heads, babbit moulds, etc.

Mental Demands

A Babbitman/Grinderman relies upon previous training and experience to properly maintain knives and guides. A Babbitman/Grinderman should be familiar with proper lockout procedures of all machinery in which knives are changed.

Major Variations

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

1) The amount of manual work to grind knives may vary depending on how many of the machines in the sawmill use:
   a) Key knives, which are lighter than other knives, and don't require babbiting
   b) Flat knives or dome-top knives, which are heavy (up to 35 kg/box), and need daily babbit work.

2) Transporting knives from the work shop to the machines can be done in the following ways:
   a) Lifted and carried manually
   b) Lowered through the floor of the workshop using a hoist/pulley system, then lifted and carried to the machine
   c) Lowered through the floor using a hoist/pulley system, then transported on a cart, with minimal lifting and carrying

Minor Variations

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

1) Specialised fixtures and moulds are used:
   a) To make saw guides with babbit (in addition to maintaining knives)
   b) To knock babbit off of knives (e.g., using a pneumatic press) instead of hammering

2) Differences in auto-grinder design include:
   a) Location of hand-wheel crank (on top of machine or on the side of the machine)
   b) Movement of grinding wheel (it may pass over knives in a straight line back and forth or in a circular pattern)

Physical Demands Analysis
Babbitman/Grinderman

PDA General Instructions: Babbitman/Grinderman

This Physical Demands Analysis (PDA) identifies the physical demands of the Babbitman/Grinderman job as assessed by IMIRP ergonomists. The information reported was collected from a sample of Babbitmen/Grindermen 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 Babbitman/Grinderman 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
Babbitman/Grinderman

Task List

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

Change knives and/or guides

A Babbitman/Grinderman removes dull knives from machines such as canters, chippers, and edgers, and replaces them with sharpened knives.

Does this task occur at your mill?

☐ Yes ☐ No

Knock off babbit

The babbit may be removed from knives using a hammer and fixture.

Does this task occur at your mill?

☐ Yes ☐ No

Babbit may be removed from knives using an automatic press.

Does this task occur at your mill?

☐ Yes ☐ No

Scrape knives

Dirt and burnt residue are removed from knives by scraping with a stone, a metal scraper, or another knife before and/or after grinding.

Does this task occur at your mill?

☐ Yes ☐ No

Use auto-grinder to sharpen knives

Knives are fastened to the auto-grinder, which is programmed using a keypad, and manually adjusted using hand cranks.

Does this task occur at your mill?

☐ Yes ☐ No

Pour and file babbit

Knives are dried and placed into moulds. A Babbitman/Grinderman pours babbit into the moulds, removes the knives, and files off any rough edges. Pouring babbit into moulds and filing the solidified pieces may also be done to make guides.

Does this task occur at your mill?

☐ Yes ☐ No

Cut key knives

Some machines use small key knives instead of flat, dome-top, or other large knives. Before key knives can be used, they must be cut to the lengths required for the different machines.

Does this task occur at your mill?

☐ Yes ☐ No

Clean-up duties

A Babbitman/Grinderman may be responsible for some clean-up duties in the workshop, such as sweeping the floor.

Does this task occur at your mill?

☐ Yes ☐ No

Maintain equipment

A Babbitman/Grinderman may be required to perform simple maintenance tasks on equipment in the workshop such as oiling and greasing the auto-grinder.

Does this task occur at your mill?

☐ Yes ☐ No

Assist Saw Fitters/Filers with saw changes

A Babbitman/Grinderman may be required to assist with saw changes in the mill. Refer to the Benchman, Saw Filer, and Saw Fitter tool kits for more detail regarding this task.

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 Babbitman/Grinderman.

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

Check marks (✓) in the Percent of Shift columns correspond to percentages found during the ergonomic investigation. The Comments section may be used to elaborate on the task description (e.g., variations between mills, frequencies, cycle times, etc.).

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Change knives and/or guides		✓			• *Approximately 1.5 to 2.0 hours per day*
	Knock off babbit		✓			• *From flat knives, chipper knives, etc.(not required for key knives)* • *Depending on the type of knife and each mill's process, this may be done before or after grinding*
	Scrape knives		✓			• *This task is done to clean the knives, and remove any dirt or burnt residue*
	Use auto-grinder to sharpen knives		✓			• *Auto-grinder runs for a majority of the shift* • *A Babbitman/Grinderman monitors the machine once the knives have been set up*
	Pour and file babbit		✓			
	Cut key knives	✓				• *10 hours/month*
	Clean-up duties	✓				
	Maintain equipment	✓				
	Assist Saw Fitters/Filers with saw changes	✓				
	Other:					

Organisational Factors

The table below contains a list of organisational factors for a Babbitman/Grinderman. 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	☐ *8.5 hours* ☐ *8 hours* ☐
Formal breaks	☐ *Two 10 minute breaks* ☐ *30 minute lunch* ☐
Informal breaks	☐ *Since the Babbitman/Grinderman must be available to change knives during regular breaks and lunch, breaks can be taken at the worker's discretion* ☐
Work pace	☐ *Depending on the number of knives to be routinely maintained in a shift, work pace may vary (42 to 190 knives* per shift)* ☐ *Other: _____* **Note: Key knives require much less manual work than flat knives and dome-top knives, since there is no babbit to be removed, reset, and filed.*
Work pace control	☐ *Self-paced* ☐ *Machine-paced (usually by auto-grinder)* ☐ *Time pressure associated with changing knives within a given time period* ☐
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.

Workstation Dimensions	
(A) Auto-grinder height (from floor to surface where knives are placed)	cm
(B) Height of hand wheel cranks	cm
(C) Work bench height(s)	cm
(D) Height of table-top grinder/buffer	cm
(E) Height of shelves where knife boxes are kept	cm

Flooring, Displays and Seating

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

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

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

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

Indicate their corresponding functions by checking off the applicable box(es). The Comments section may contain information that describes variations between mills.

	Type of Control	Function	Frequency	Comments
	Hand wheels/cranks	• *Adjust grinding wheel*	*Varies*	• *Intermittent use* • *Depends on number of sets of knives to be sharpened and work technique* • *If knives are of similar size, fewer adjustments are required between sets* • *Duration of approximately 30 seconds to 2 minutes at a time* • *Height of 70 to 90 cm*
	Finger push buttons	• *Set up auto-grinders on/off for grinding wheels/buffer*	*Varies*	• *Intermittent use* • *Depends on number of sets of knives to be sharpened and work technique* • *If knives are of similar size, fewer adjustments are required between sets* • *Duration of 10 to 30 seconds at a time*
	Turn dial	• *Adjust grinder*	*Varies*	• *Depends on number of sets of knives to be sharpened and work technique* • *If knives are of similar size, fewer adjustments are required between sets*
	Palm buttons	• *Operate press to knock off babbit*	*Once per knife, if applicable*	• *Up to 5 seconds at a time, generally repeated presses are required*
	Rocker switch	• *Turn table start/stop (auto grinder)*	*Varies*	• *Depends on number of knives to be sharpened*
	Other:			

Physical Demands

Whole Body Physical Demands

Identify each of the physical demands required by a Babbitman/Grinderman, 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, and should be used as a guideline only. Please note that frequency and duration of each physical demand will vary depending on workstation design, and individual working techniques.

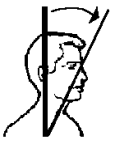
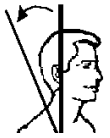
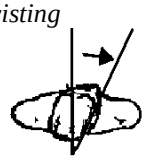
	Physical Demands	Tasks	Percent of Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Walking	• *Change knives and/or guides*		✓			• *Walking between machinery in sawmill and workshop area*
		• *Clean workstation*			✓		• *Sweeping floor, cleaning grinding machines*
		• *Use auto-grinder to sharpen knives*		✓			• *Checking knives as they are being sharpened* • *Walking between various machines and benches in shop area*
	Standing	• *Change knives and/or guides*				✓	• *Blowing off machinery with air hose* • *Sometimes workers stand to change knives* • *Most tasks in the shop are performed while standing*
		• *Knock off babbit*			✓		
		• *Scrape knives*				✓	
		• *Use auto-grinder to sharpen knives*				✓	
		• *Pour and file babbit*				✓	
		• *Cut key knives*				✓	
	Sitting	• *Cut key knives*			✓		• *This task may also be performed standing (depends on availability of stool/chair and worker preference*)
	Climbing (stairs)	• *Change knives and/or guides*	✓	✓			• *Ascending and descending stairs in sawmill to get to machines*
	Climbing (other)	• *Change knives and/or guides*	✓				• *Climbing into machinery*
	Balancing	• *Change knives and/or guides*		✓			• *May be required for some machines*
	Kneeling/ Crouching	• *Change knives and/or guides*		✓			• *Required to access side heads, cylinders, etc. for some machines*

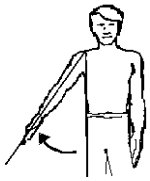
Body Postures

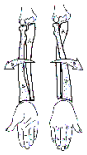
The table below outlines the body postures held or repeated throughout the shift by a Babbitman/Grinderman.

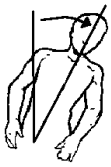
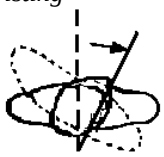
For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

Check marks (✓) in the **Percent of TASK** columns correspond to percentages found during the ergonomic investigation, and should be used as a guideline only. Please note that frequency and duration of each posture will vary depending on worker size and individual working techniques.

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 	• *Change knives and/or guides*			✓	✓	• *Viewing work inside of machines*
	• *Knock off babbit*			✓	✓	• *Looking down at work bench and/or fixture*
	• *Scrape knives*				✓	• *Looking down at work bench*
	• *Use auto-grinder to sharpen knives*		✓	✓		• *Setting up knives* • *Viewing/monitoring auto-grinder*
	• *Pour and file babbit*			✓	✓	• *Watching fixture when pouring*
	• *Cut key knives*				✓	• *Looking down at skill saw*
Extension 	• *Change knives and/or guides*	✓				• *Posture may occur when opening up machinery, changing knives on top heads, side heads, etc.*
Twisting 	• *Change knives and/or guides*	✓	✓			• *Viewing all knives/bolts from one location inside machine*
	• *Knock off babbit*	✓				
	• *Scrape knives*	✓				
	• *Use auto-grinder to sharpen knives*		✓			• *Watching auto-grinder (i.e., to adjust grinding wheel)*
	• *Pour and file babbit*	✓				• *Looking between babbit pot and knife fixture or mould*

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 	• *Change knives and/or guides*		✓	✓		• *Using impact wrench* • *Manoeuvring objects inside machinery*
	• *Knock off babbit*	✓	✓			• *Placing knives into jigs/fixtures* • *Reaching for tools* • *Hammering*
	• *Scrape knives*		✓	✓		• *Using whet stone*
	• *Use auto-grinder to sharpen knives*		✓			• *Placing knives into and removing knives from auto-grinder* • *Adjusting knives in auto-grinder*
	• *Pour and file babbit*		✓			• *Using air hose* • *Reaching for babbit pot with ladle* • *Filing edges*
	• *Cut key knives*			✓		• *Using skill saw*
Extension 	• *Change knives and/or guides*		✓			• *Blowing off equipment with air hose*
Abduction 	• *Change knives and/or guides*		✓	✓		• *Using air hose to clean machines* • *Reaching for knives, tools, etc.*
	• *Knock off babbit*		✓			• *Placing knives into jigs/fixture*
	• *Scrape knives*		✓			• *Sideways scraping motion*
	• *Use auto-grinder to sharpen knives*		✓			• *Placing knives into, and removing knives from, auto-grinder* • *Adjusting grinder with hand crank*
	• *Pour and file babbit*	✓				• *Hammering to tap knives/ babbit out of moulds* • *Reaching to objects on work bench*

Body Posture		Task(s)	Percent of Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm							
	Rotation 	• *Change knives and/or guides*		✓			• *Using impact wrench*
		• *Use auto-grinder to sharpen knives*		✓			• *Using wrench to attach knives to auto-grinder*
		• *Pour and file babbit*		✓			• *Small motion to pour babbit into mould* • *Tapping babbit out of mould*
Wrist							
	Flexion 	• *Change knives and/or guides*		✓			• *Removing knives and replacing knives in machines*
		• *Use auto-grinder to sharpen knives*		✓			• *Placing knives on and removing from auto-grinder*
		• *Pour and file babbit*	✓	✓			• *Using air hose to dry knives* • *Filing around corners*
	Extension 	• *Change knives and/or guides*	✓	✓			• *Using impact wrench in confined spaces* • *Removing knives and replacing knives in machines*
		• *Pour and file babbit*		✓			• *Using air hose to dry knives* • *Filing babbit*
	Ulnar Deviation 	• *Change knives and/or guides*		✓			• *Using impact gun in confined spaces*
		• *Knock off babbit*		✓			• *Hammering*
		• *Scrape knives*		✓	✓		• *May be forceful and repetitive when manually scraping burnt residue off of key knives*
		• *Pour and file babbit*		✓			• *Using hammer and air hose* • *Pouring babbit with ladle and filing/dulling knives*
	Radial Deviation 	• *Knock off babbit*		✓			• *Using air hose and hammer*
		• *Pour and file babbit*		✓			• *Tapping babbit out of moulds*
		• *Pour and file babbit*	✓				• *Setting up knives on moulds*

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 	• *Change knives and/or guides*		✓		✓	• *Climbing in and out of machinery* • *Reaching forward to work on cylinders or heads* • *Some workers may sit during this task*
	• *Knock off babbit*	✓	✓			• *Placing knives into fixtures* • *Reaching for tools under work bench*
	• *Scrape knives*		✓			• *Scraping planer knives (or other long knives)*
	• *Use auto-grinder to sharpen knives*	✓	✓	✓		• *Placing knives into and removing knives from auto-grinder* • *Posture varies depending on design of auto-grinder*
	• *Pour and file babbit*		✓			• *Filing knives – reaching forward*
Lateral Flexion 	• *Change knives and/or guides*		✓			• *Reaching for bolts to remove/replace knives*
Twisting 						*Not Applicable*
Extension 						*Not Applicable*

Hand Grips

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

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, and should be used as a guideline only. Please note that frequency and duration of each posture will vary depending on worker size and individual working techniques. 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 	• *Change knives*		✓			• *Using impact wrench 2.2 to 2.8 kg (heavier impact wrenches may weigh ~12 kg, however, these are rarely used)*
		• *Pour and file babbit*			✓		• *No proper handle on file*
		• *Knock off babbit*		✓			• *Hammers weigh 0.6 to 1.2 kg* • *Handle diameter ~10 cm*
	Pinch 	• *Scrape knives*			✓		• *Whet stones, scrapers*
		• *Handling knives*		✓			
	Hook 						*Not Applicable*
	Precision 						*Not Applicable*

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 Babbitman/Grinderman.

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, and should be used as a guideline only. Please note that frequency and duration of each posture will vary depending on worker size and individual working techniques. 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%	
	• *Pour and file babbit: pushing and pulling fixtures/moulds for knocking babbit off and pouring babbit*	*12.7 to 30.4*		✓			• *7.2 to 10.2 kg horizontal push/pull force*
	• *Change knives/guides: lifting and carrying knives to grinder*	*up to 35*		✓			• *Carrying is generally for short distances (less than 10 metres)* • *Depends on number of knives lifted at once*
	• *Change knives/guides: lifting guides*	*9.5 to 14.5*	✓				
	• *Change knives/guides: carrying boxes of knives to and from machines*	*3.6 to 35.0*					• *Distance carried varies from mill to mill* • *Depends on type and number of knives* • *If work shop is far from machinery to be changed, hoists and dollies are often used to transport boxes of knives*
	• *Assisting Saw Fitters/Filers with saw changes: lifting side head segments to be transported to machinery*	*16.0 to 66.0*	✓				• *These may be stored on the floor, and therefore must be lifted from the floor*

Hand Tools

Indicate the hand tools used by a Babbitman/Grinderman 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, and should be used as a guideline only. Please note that frequency and duration of each posture will vary depending on worker size and individual working techniques. The Comments section may contain information relating to duration and frequencies 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%	
	Impact wrench	• *Change knives and/or guides*	*2.2 to 2.8*			✓		• *On rare occasions, a heavier impact wrench may be used, which weighs ~ 12 kg*
	Hammer (small)	• *Knock off babbit*	*0.4 to 2.0*		✓			• *Where an automatic press is available, use of a hammer will be less frequent*
	Hammer (large)	• *Pour and file babbit*	*1.4*	✓				• *Removing knives from mould*
	Chisel	• *Knock off babbit*	*0.6*		✓			• *Where an automatic press is available, use of a chisel will be less frequent*
	Whet stones, blocks, scrapers, etc.	• *Scrape knives*	*less than 0.5*			✓		
	Wrench	• *Change knives and/or guides*	*less than 1.0*		✓			• *Used to manually tighten bolts after impact gun is used*
		• *Use auto-grinder to sharpen knives*	*less than 0.5*		✓			• *Attaching knives to grinder*
	File	• *Pour and file babbit*	*less than 0.5*			✓		• *Most files have no real handle to grip*
	Ladle	• *Pour and file babbit*	*less than 1.0*			✓		
	Other:							

Environmental Conditions

Work Environment

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

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

Noise level (dB)	*Range found: 68.4 to 93.3* *Mill Specific:*
Lighting level (lux)	*Range found:* *Work bench : 270 to 990* *Auto-grinder: 425 to 884* *Mill Specific:*
Temperature (^{o}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 Babbitman/Grinderman 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.

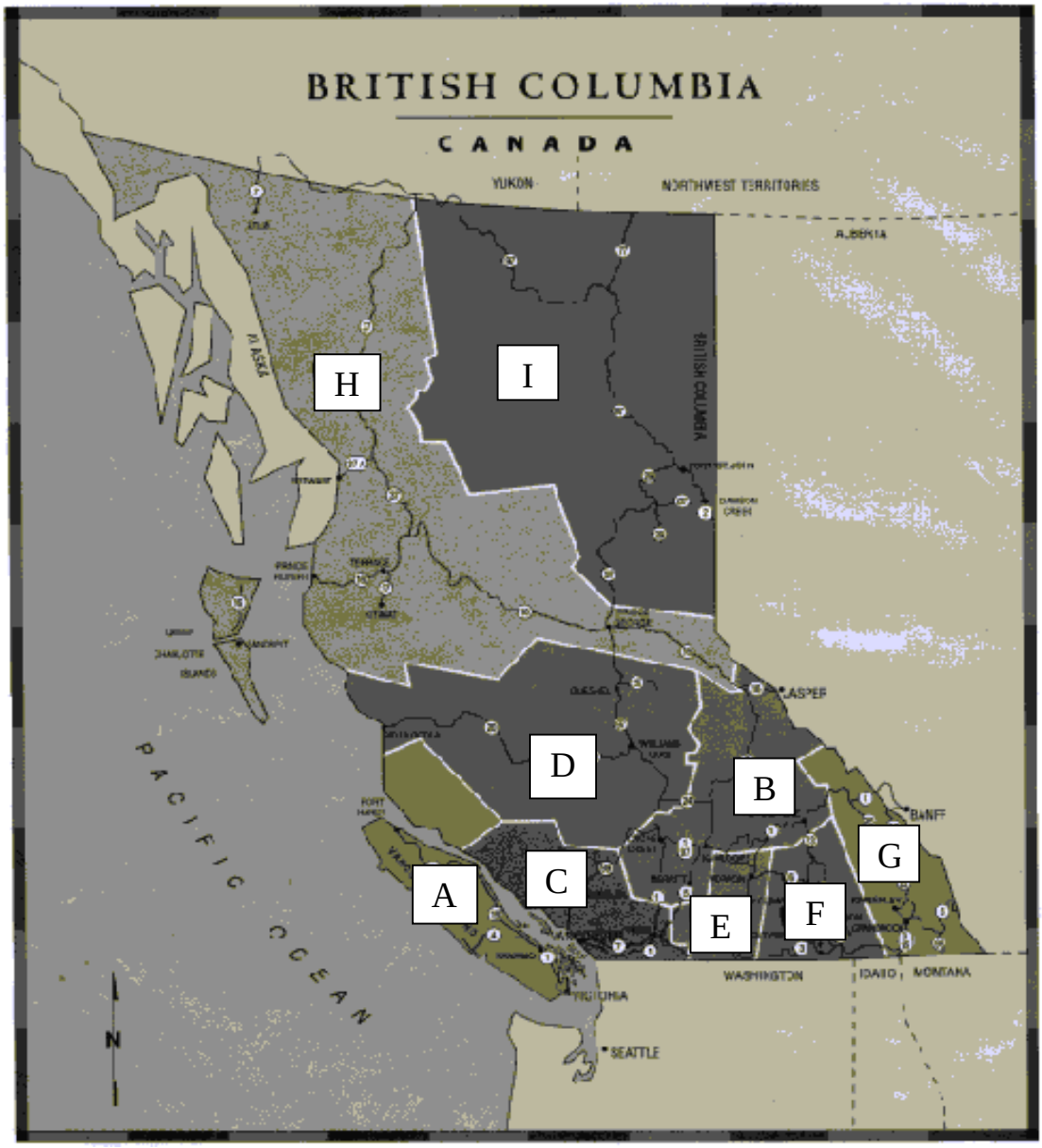
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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
Babbitman/Grinderman

Purpose

The Risk Factor Identification Checklist for a Babbitman/Grinderman 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 – Babbitman/Grinderman

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.

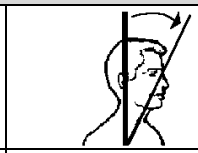
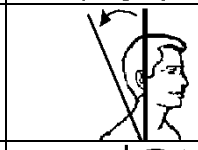
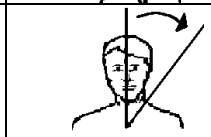
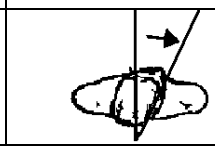
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

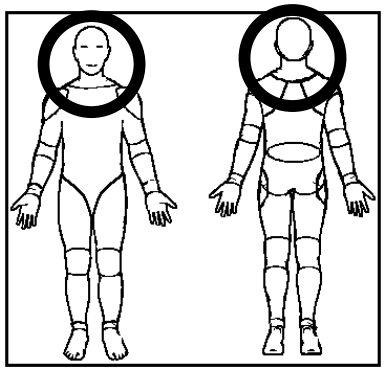
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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., hammering)			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 the neck forward while at a work bench)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Lateral Bending 			S O	
Rotation 			S O	

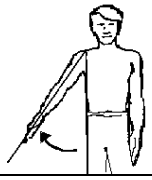
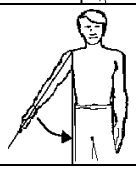
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



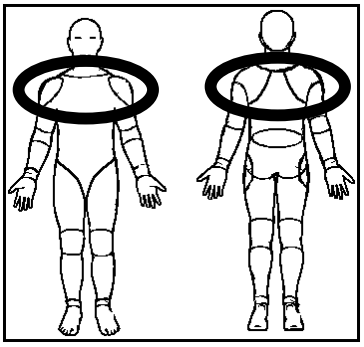
Body parts within the circled area will be classified as NECK issues.

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., hammering)			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?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., hammer)			S O	

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

Please indicate whether the following direct risk factors were identified at the **SHOULDER**.		
Direct Risk Factors	Force	☐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



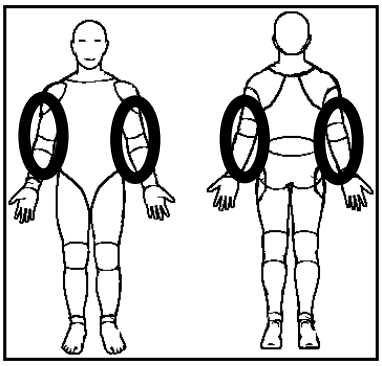
Body parts within the circled area will be classified as SHOULDER issues.

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

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



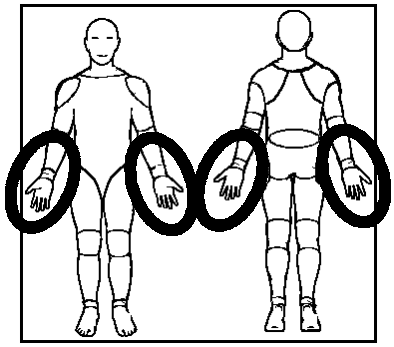
Body parts within the circled area will be classified as ELBOW issues.

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

Static Posture		N	Y		Comments:
Ask the worker: Do tasks require any part of your arm or hand to be maintained in a fixed or static posture?				S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand?				S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., hammer)				S O	
Contact Stress					
Ask the worker: Do **<u>any</u>** objects, tools or parts of the workstation put pressure on **<u>any</u>** 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? (e.g., knocking knives loose when changing knives)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Ulnar Deviation				S O	
Radial Deviation				S O	
Vibration					
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., impact wrench)				S O	

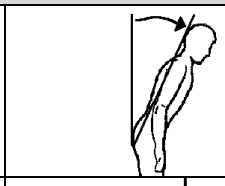
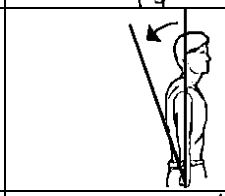
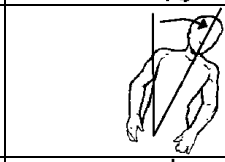
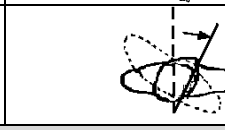
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



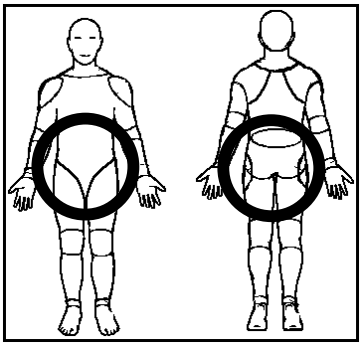
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again?			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			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 while at a workbench)			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	

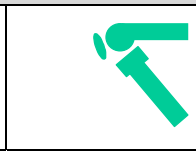
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., through the floor)				S O	

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

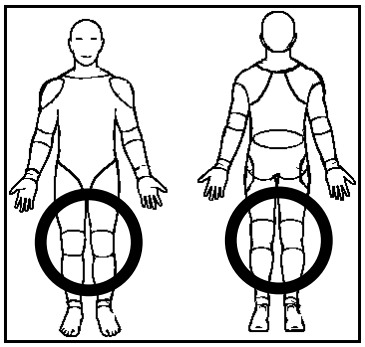


Body parts within the circled area will be classified as LOW BACK issues.

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 **any** objects or parts of the workstation put pressure on your knee(s)? (e.g., kneeling on hard surfaces)			S O	
Awkward Posture				
Extreme Flexion 			S O	

Please indicate whether the following direct risk factors were identified at the **KNEE**.		
Direct Risk Factors	Repetition	☐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

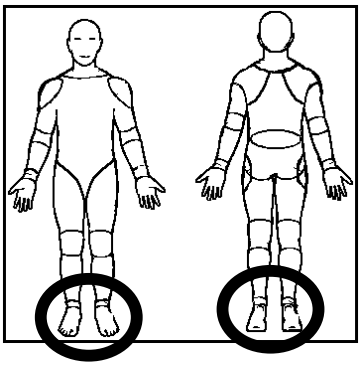


Body parts within the circled area will be classified as KNEE issues.

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

ENVIRONMENTAL CONDITIONS

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

ENVIRONMENTAL CONDITIONS [CONTINUED]

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

WORK ORGANISATION

	N	Y		Comments:
Is the work externally-paced or controlled by a machine or the process?			S O	
Do peak workloads or sudden increases in pace occur with the tasks?			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

Babbitman/Grinderman

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

Babbitman/Grinderman

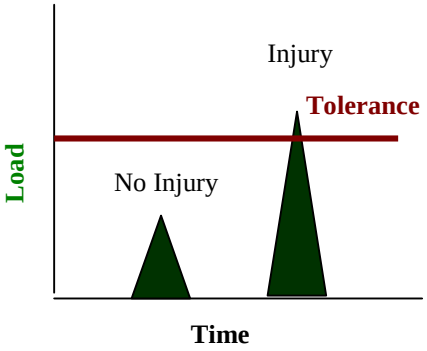
Disclaimer

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

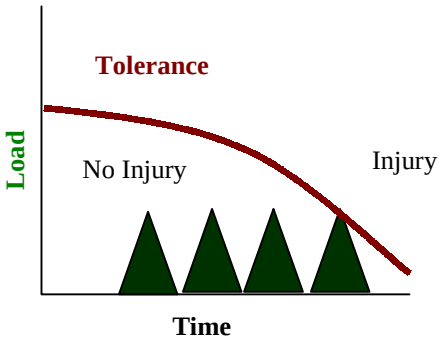
Injuries occur when …
Loads exceed tissue tolerances



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.

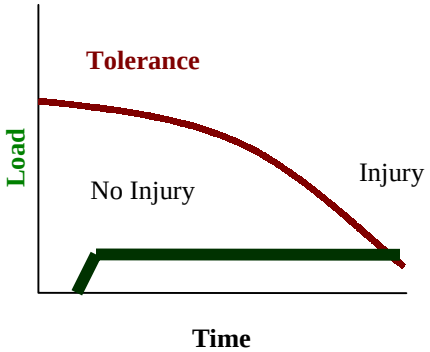
Example – a worker going over on their ankle and spraining it.



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 Babbitman/Grinderman 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 Babbitman/Grinderman. 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 Babbitman/Grinderman may bend the neck forward continuously while:

- **working at the work bench,**

- **changing knives, and**

- **setting up and removing knives from an auto-grinder.**

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

Static Postures

- When the neck is held still in a forward bent 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 because the head is held in a forward bent position during many different tasks. This continuous neck bending is a result of viewing tasks on low work surfaces (work benches, auto-grinders, and sawmill machinery) and has a cumulative effect over the course of a shift. The lower the height of the work surface, the greater the amount of neck bending and muscle activation required to support the weight of the head.

Environmental Conditions

Lighting

- Loading on the neck muscles is increased when the neck is held in a forward bent position for a long duration. Low lighting levels over work benches can cause workers to adopt a forward bent neck posture in order to visually inspect knives and other objects.

CONSEQUENCES

- When the head is held in a forward 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.
- Signs and symptoms include pain, tenderness, muscle spasm in the neck area, and headaches.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled “Neck” in the Summary of Solutions on pages 78 & 79.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Awkward Postures
Repetition

A Babbitman/Grinderman works with the arms in front of the body during many tasks (e.g., changing knives/guides, knocking off babbit, scraping knives).

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

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the muscles of the neck and shoulder are increased if the arms are raised to work at a bench or machine that is too high. Accommodating high work surfaces repetitively also increases loading to these muscles.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 78 & 79.
- For exercises that can help to prevent ***neck*** and ***shoulder*** injuries, see the ***Neck*** and ***Shoulder sections of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Awkward Postures
Static Postures
Repetition

A Babbitman/Grinderman may grip tools such as whet stones, scrapers, and files in order to scrape knives. The opposite hand may grip the knife continuously to stabilise it while scraping.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

- The width of an object (whet stones, scrapers, and files) and the position of the wrist also affect how much muscle tension needs to be generated. Bending the wrist forward or backward, or gripping an object that is too large or too small, deviates from the optimal position, and the forearm muscles have to work harder to maintain the grip. As muscles generate increased tension, tissue fatigue can occur at the tendon/bone connection.

Static Postures

- Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. If the duration of muscle tension is significant, and recovery is not adequate, the tissues may fatigue to the point of injury.

Repetition

- Repeated stress to the elbow (e.g., gripping while moving the arm back and forth to scrape and/or file) without adequate rest could slowly fatigue tissues to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the soft tissues of the elbow/wrist increases when a work bench that is too high causes awkward postures of the wrist.

Characteristics of Objects Being Handled

Size and Shape

- Loading on the forearm muscles increases when objects are gripped with the wrist in an awkward posture. Awkward wrist postures may result when the corners/edges of knives and guides are filed and scraped.

Container, Tool, and Equipment Handles

- Loading on the forearm muscles increases when using a tool with a small grip span, since the muscles must work harder to hold these tools. Examples include using files, scrapers, and whet stones.

Work Organisation

Work-Recovery Cycles

- Loading on the forearm muscles increases when they are used for prolonged periods of time without a break. Since the majority of filing and scraping is done at one time without a break, fatigue or discomfort is likely to occur.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Elbow/Wrist, see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 78 & 79.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

WRIST

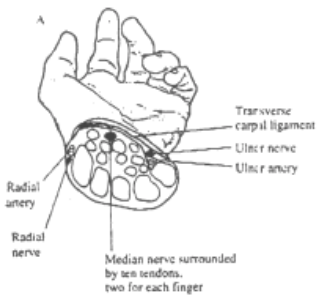
Direct Risk Factors:
Force
Awkward Postures
Repetition
Vibration

A Babbitman/Grinderman may grip an impact wrench with a bent wrist when changing knives and/or guides.

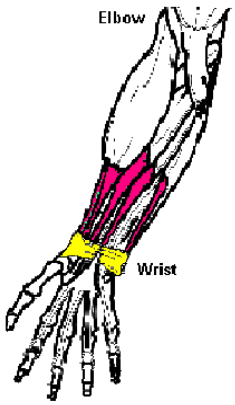
Manual wrenches are also gripped with a bent wrist when fastening knives to machinery and auto-grinders.

BACKGROUND INFORMATION

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



The Carpal Tunnel



DIRECT RISK FACTORS

Force

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

Awkward Postures

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

Repetition

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

Vibration

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

INDIRECT RISK FACTORS

Workstation Design

Working heights and reaches

- When changing knives, a Babbitman/Grinderman must climb into machines and work in areas that were not primarily designed to accommodate people. Therefore, workers often work in awkward postures when reaching around obstacles to use an impact wrench.

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Vibration and torque (kickback) associated with using a pneumatic air gun may require a Babbitman/Grinderman to grip more forcefully.
- The type of tool handle in relation to the work surface orientation could cause awkward postures. For example, using a pistol-shaped handle on a horizontal working surface can cause extreme bending of the wrist.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

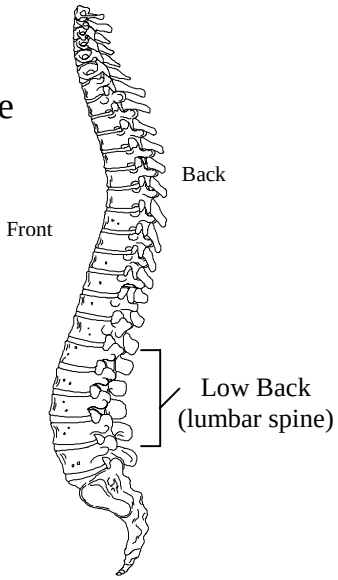
- For specific solutions that may prevent injuries to the Wrist, please see the column labelled “Wrist” in the Summary of Solutions on pages 78 & 79.

LOW BACK

Direct Risk Factors:
Force
Awkward Postures

A Babbitman/Grinderman may bend forward when lifting and lowering boxes of knives.

Neutral Spine



BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- When boxes of knives are stored on the floor or on low shelves, more bending is required to lift and lower them before, during, and after knife changes.

Characteristics of Objects Being Handled

Load Condition and Weight Distribution

- Uneven loading on the spine occurs when one box is carried with one hand or on one shoulder, or if boxes of different weights are carried in each hand or on each shoulder.

CONSEQUENCES

- Forceful lifting and lowering may lead to damage in the discs, or muscle strains.
- Signs and symptoms may include muscle spasm and sharp or radiating pain in the back and/or lower extremities.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled “Back” in the Summary of Solutions on pages 78 & 79.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Babbitman/Grinderman may bend the neck forward continuously while working at the work bench, changing knives, and setting up and removing knives from an auto grinder.

NECK/SHOULDER

- A Babbitman/Grinderman works with the arms in front of the body during all tasks (i.e. changing knives/guides, knocking off babbit, scraping knives, etc.).

ELBOW/WRIST

- A Babbitman/Grinderman may grip tools such as whet stones, scrapers, and files in order to scrape knives. The opposite hand may grip the knife to stabilise it while scraping.

WRIST

- A Babbitman/Grinderman may grip an impact wrench with a bent wrist bent when changing knives and/or guides.

- Manual wrenches are also gripped with a bent wrist when fastening knives to machinery and auto grinders.

LOW BACK

- A Babbitman/Grinderman may bend forward when lifting and lowering boxes of knives.

Risk Factors by Body Part

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

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

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

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

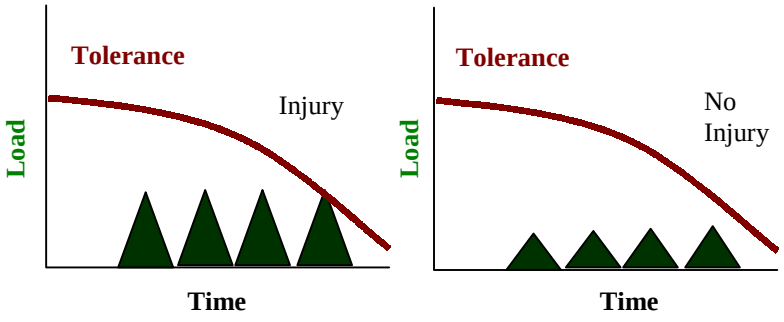
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

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

✓ = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 78 & 79 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

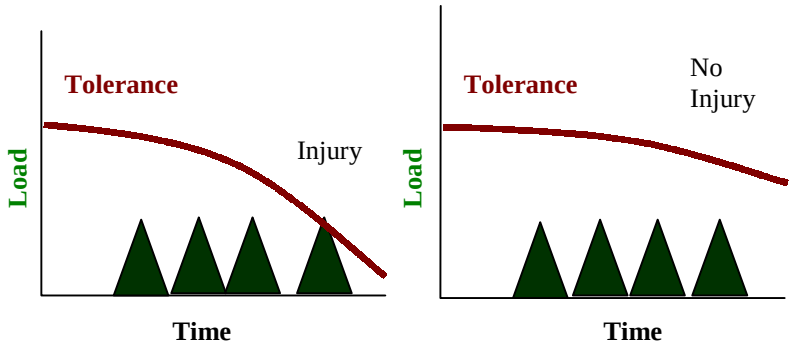
Injury Prevention

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 Babbitman/Grinderman job. The solutions are presented under the headings of Workstation Design, Characteristics of Objects Being Handled, Environmental Conditions, and Work Organisation.

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

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

Risk Control Key

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

E

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

A

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

WP

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

PPE

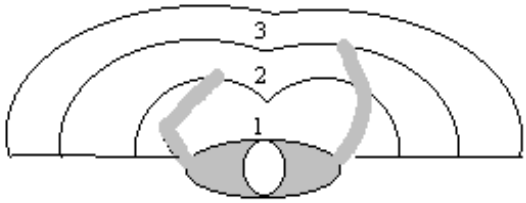
PERSONAL PROTECTIVE EQUIPMENT
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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

Workstation Design

WORKING REACHES

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



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

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

WORKING HEIGHTS

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

Height-adjustable work bench

E

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 Babbitman/Grinderman, 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.

A Babbitman/Grinderman usually works at or below waist height. This is ideal for the majority of his/her tasks, since moderate force is required to knock off babbit, scrape knives, handle babbit moulds, etc. However, this working height causes workers to bend their neck forward for the majority of the shift in order to view their work.

Workbench at elbow height

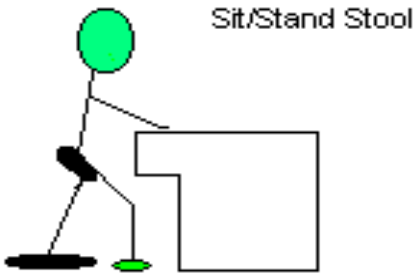
E

Depending on the design of the babbit moulds, pouring babbit may require some precision. If so, it may be helpful to raise a part of the workbench to elbow height to reduce the amount of neck bending involved when pouring babbit.

Sit/Stand Stool

E
WP

As mentioned earlier, the ideal workstation is height adjustable. Raising the work surface can reduce bending of the neck. Another option is to provide a sit/stand stool for taller workers (or low work benches), which also brings the worker closer to the work surface. Sit/stand stools are preferred over regular stools, as the design makes it easier to alternate between sitting and standing. They also can reduce fatigue in the lower extremities.



Stretches for the neck muscles

WP

Due to the nature of the Babbitman/Grinderman tasks, it may not be possible to reduce bending of the neck, even if work surface heights are increased. Also, the height to which a work surface can be raised is limited, since it is important that stress on the shoulder is not increased when trying to decrease bending of the neck. Therefore, it is beneficial to stretch throughout the shift, as time permits (for example, 3 minutes every hour). The following stretches are recommended and can be found in the Neck section of the Body Manual: Chin Tucks and Upper Trapezius Stretch.

Working height suggestions

Another problem of working height is that shorter employees may find themselves raising their arms (while hammering, filing, etc.), or bending their wrists (while pouring babbit, filing, etc.) when working at a bench that is too high.

E

In this case, a wooden platform may be built so that the Babbitman/Grinderman could work at waist height for tasks such as knocking babbit off of knives and scraping knives. A similar solution would be to lower a section of the workbench.

Pneumatic press

E

A pneumatic press can be useful for removing babbit from knives. This press will reduce the amount of hammering involved. Ideally, buttons used to activate the press should be located at approximately elbow height.

The height of heavy objects such as knife boxes and side heads (and other spare parts for machinery) can be a risk for injury, since a Babbitman/Grinderman often picks up heavy objects from the floor or low shelves.

Proper lifting mechanics

E

It is important that workers are aware of good lifting mechanics in order to reduce the risk for low back injury. For example, a neutral spine (maintaining the natural curves in the back) should be maintained throughout a lifting, lowering, and/or carrying task. The following pictures illustrate the difference between safe and unsafe positions of the back while lifting 2 knife boxes.

SAFE

UNSAFE

Carts and/or hoist system

E
A

If heavy objects are frequently transported to and from different areas in the mill, carts and/or a hoist system should be made available to reduce the amount of carrying. Workers should also be trained on how to effectively use this equipment.

Shelf heights

WP
E

When possible, heavy items that must be manually handled should be stored on shelves between knee and chest height to reduce the amount of bending when lifting and lowering. Carts and dolleys used to transport these objects (i.e. to and from the mill) should also be designed to allow objects to be lifted from and lowered to these heights.

Characteristics of Objects Being Handled

CONTAINER, TOOL AND EQUIPMENT HANDLES

A Babbitman/Grinderman must use significant grip force in order to use small tools such as whet stones and scrapers, or tools without real handles such as a metal file. This can cause discomfort to the elbow, wrist, and hand, and possibly lead to injury.

Whet stones and scrapers

E

Choosing slightly larger stones and scrapers, as well as a file with a good handle, will reduce the grip forces required. Stones and scrapers should be slightly smaller than the natural curve of the hand while at rest. An appropriate handle will not cause pressure points on the hand, and if held in a power grip, the thumb and fingers should touch slightly, without overlap.

Proper work gloves

PPE
WP

A Babbitman/Grinderman should wear close fitting gloves with as little excess bulk as possible to optimise gripping ability when performing all tasks requiring hand tools.

Another tool that should be addressed is the impact wrench used to change knives in sawmill machinery. This tool may be used in awkward wrist postures when accessing different areas inside of the machines.

Impact wrench handle design

E

Appropriate tools should be selected, depending on the orientation of the worker and parts inside the machine. For example, in-line impact wrenches should be used when removing knives from a horizontal surface. Pistol-shaped impact wrenches are more common in the sawmill industry, and are appropriate for vertical work surfaces.

Environmental Conditions

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

Work Organisation

WORK-RECOVERY CYCLES

Since most of the Babbitman/Grinderman's shop tasks are self-paced, the opportunity to vary work tasks throughout the shift is at their own discretion.

Workshop task rotation

WP Scraping residue off of knives, and filing rough edges of babbit have been observed to require forceful gripping and repetitive motions of the elbow. These tasks should be rotated with other tasks whenever possible. For example, if 40 knives require babbit, it is more desirable to pour babbit for 1 to 3 knives, then file, and repeat, rather than pouring babbit for 40 knives, then filing them all at once.

Stretch muscles of the hand and forearm

WP Workers performing the above tasks should be encouraged to stretch the muscles of the hand and forearm as time permits. The Flexor and Extensor Stretch in the Elbow section of the Body Manual is recommended.

Please refer to the General Risk Factor Solutions Manual for additional solutions regarding work organisation risk factors.

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Height-adjustable work bench	**73**	**A S**	**A R**		**A R**							
Workbench at elbow height	**73**	**A S**										
Sit/Stand Stool	**74**	**A S**										**S**
Stretches for the neck muscles	**74**	**S**	**S**									
Working height suggestions	**74**		**A R**		**A R**							
Pneumatic press	**74**			**F A R**	**F**							
Proper lifting mechanics	**75**							**A**				
Carts and/or hoist system	**75**							**F A**				
Shelf heights	**75**							**A**				
Whet stones and scrapers	**76**				**F A**							
Proper work gloves	**76**				**F**		**F**					

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Impact wrench handle design	**76**				**A**	**A**	**A**					
Workshop task rotation	**77**		**R**		**R**							
Stretch muscles of the hand and forearm	**77**				**S**		**S**					
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*

BABBITMAN/GRINDERMAN MSI SAFETY GUIDE

OBJECTIVE: To identify ergonomic risks involved in the Babbitman/Grinderman 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 Babbitman/Grinderman.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Babbitman/ Grinderman may bend the neck forward continuously while working at the work bench, changing knives, and setting up and removing knives from an auto grinder.	**Awkward Postures** **Static Postures**	• Neck muscles must support the weight of the head while in a forward, 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 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 tension in the neck muscles may cause fatigue. If the stress is sufficient, and recovery is not adequate, tissues may fatigue to the point of injury.	• It is beneficial to stretch the muscles of the neck throughout the shift, as time permits (for example, 3 minutes every hour). The following stretches are recommended and can be found in the Neck section of the Body Manual: Chin Tucks and Upper Trapezius Stretch. • 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 Babbitman/ Grinderman works with the arms in front of the body during many tasks.	**Awkward Postures** **Repetition**	• Neck and shoulder muscles must support the weight of the arms when they are away from the body. The further away the arms are from the body, the greater the load on the muscles and tendons. • When the arms are repeatedly lifted, the muscles of the neck and shoulder are repeatedly stressed 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.	• In addition to the neck stretches above, muscles of the shoulder should be stretched as well. For stretches and 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 Babbitman/ Grinderman may grip tools such as whet stones, scrapers, and files in order to scrape knives. The opposite hand may grip the knife continuously to stabilise it while scraping.	**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. • The width of an object (whet stones, scrapers, and files) and the position of the wrist also affect how much muscle tension needs to be generated. Bending the wrist forward or backward, or gripping an object that is too large or too small, deviates from the optimal position, and the forearm muscles have to work harder to maintain the grip. As muscles generate increased tension, tissue fatigue can occur at the tendon/bone connection. • Repeated stress to the elbow (i.e. gripping while moving the arm back and forth to scrape and/or file) without adequate rest could slowly fatigue tissues to the point of injury.	• Workers should wear close fitting gloves with as little excess bulk as possible to optimise the gripping ability when doing all tasks requiring hand tools. • Shop tasks should be rotated whenever possible. For example, if 40 knives require babbit: it is more desirable to pour babbit for 1 to 3 knives, then file, and repeat, rather than pouring babbit for 40 knives, then filing them all at once. • Workers performing the above tasks should be encouraged to stretch the muscles of the hand and forearm as time permits. The Flexor and Extensor Stretch in the Elbow section of the Body Manual is recommended. For exercises that can help prevent ***elbow*** and ***wrist*** injuries, ***see the Elbow and Wrist sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Babbitman/ Grinderman may bend forward when lifting and lowering boxes of knives.	**Force** **Awkward Postures**	• Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back. • Back muscles must support the weight of the upper body and boxes of knives when bending forward. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.	• It is important that workers are aware of good lifting techniques in order to reduce the risk for low back injury. For example, a neutral spine (maintaining the natural curves in the back) should be maintained throughout a lifting, lowering, and/or carrying task. • For more information on the ***back***, and exercises that can help prevent injuries, ***see the Back section of the Body Manual***.