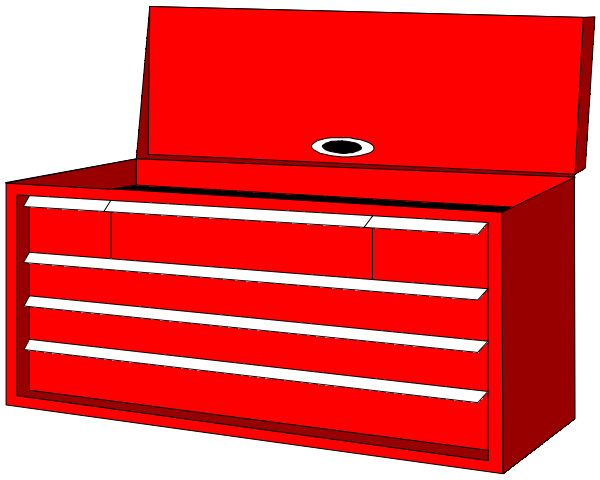
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Strip Layer 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

STRIP LAYER TOOL KIT
Table of Contents

Overview
Strip Layer

Job Summary

Strip Layers are responsible for manually filling magazines (also called hoppers) with wooden strips in order to keep up with the lumber stacker. The strips are then automatically placed by the magazines between stacks of lumber to aid the drying process in the kilns.

A Strip Layer will pick up strips from a strip cart/box, load them into the magazines, discard any broken strips, and clear jam-ups in the magazines. Less frequent duties may include using a conveyor to move strip carts in and out of the work area, placing shim sticks (also called lath) between smaller size boards, and general clean up of the workstation. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the job may include:

a) Continuous walking and standing
b) Repeatedly turning 180^{o} to work between strip carts and magazines
c) Repetitive motions of the hands, wrists, elbows, shoulders and back
d) Potentially awkward postures of the hands, wrists and shoulders
e) Repetitive gripping, pushing/pulling, and lifting of stacks of wooden strips

Mental Demands

Strip Layers generally do not report being mentally fatigued at the end of the work day, and do not report being worried about making mistakes while performing this job. Some decision making is involved when deciding which magazines need to be filled, and monitoring magazines for jam-ups.

Major Variations

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

a) The number of strips gripped/lifted at once varies depending on the workers' hand size. Typically a range of 5 to 10 strips were lifted at once (each strip weighs approximately 0.5 kg)
b) A Strip Layer may be assigned other duties for up to 30 minutes a day, such as painting and putting labels on loads.

Minor Variations

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

a) Unjamming magazines may be done by using: a pike pole, a picaroon, or a wooden strip.
b) Discarding broken strips may be done by collecting broken strips to the side of the workstations then carrying them in piles to a waste conveyer at a nearby station, or by throwing broken strips directly into a waste conveyer or chute at the workstation.

Physical Demands Analysis
Strip Layer

PDA General Instructions: Strip Layer

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

Task List

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

Sort, gather and pick up strips from strip cart/box

Individual kiln sticks are sorted into stacks so that they can be lifted and transferred to the magazines.

Does this task occur at your mill?

☐ Yes ☐ No

Load strips into magazines (also known as hoppers, stacker slots)

Stacks of strips are placed between the guides on the magazines, then pushed into place.

Does this task occur at your mill?

☐ Yes ☐ No

Discard broken strips

Broken strips are discarded by throwing them into a waste conveyor near the workstation.

Does this task occur at your mill?

☐ Yes ☐ No

Unjam magazines

When magazines are unjammed using a single strip or a hand tool (i.e. pry bar).

Does this task occur at your mill?

☐ Yes ☐ No

Use control panel to move empty strip cart/box outside, and move full strip cart inside.

The control panel operates the chains to move the strip cart/box into and out of the work area.

Does this task occur at your mill?

☐ Yes ☐ No

Manually place shim sticks onto stacks of lumber

Shim sticks are placed between stacks of lumber (instead of kiln strips) for certain loads.

Does this task occur at your mill?

☐ Yes ☐ No

Use bolt cutters or similar tool to cut banding on loads

Loads of strips may be wrapped together with metal banding. This banding must be cut off before strips can be separated.

Does this task occur at your mill?

☐ Yes ☐ No

Other tasks may include:

☐ Put labels on loads and paint

☐ Clean workstation

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 Strip Layer.

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

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

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Sort, gather and pick up strips (from strip cart/box)			✓		
	Load strips into magazines (also known as hoppers, stacker slots)			✓		
	Discard broken strips	✓				
	Unjam magazines		✓			
	Use control panel to move empty strip cart/box outside, and move full strip cart inside	✓				
	Manually place shim sticks onto stacks of lumber.		✓			
	Use bolt cutters or similar tool to cut banding on loads	✓				
	Put labels on loads and paint		✓			
	Clean workstation	✓				• *When time permits*
	Other:					

Organisational Factors

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

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

Length of shift	☐ *8 hours* ☐
Formal breaks	☐ *Two 10 minute breaks and 30 minutes for lunch* ☐
Informal breaks	☐ *Brief pauses between loads (2 – 15 minutes at a time), total of approximately 30 minutes per day* ☐
Work pace	☐ *Approximately 20 – 50 strips handled per minute (when working continuously)* ☐
Work pace control	☐ *Machine-paced*
Job rotation ☐ Yes *(Check one)* ☐ No	If **Yes:** Rotation with what job(s):_____ _____ How often: (e.g., every 2 hours)_____

Workstation Characteristics

Dimensions & Layout

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

Workstation Dimensions	
Top layer of strips in strip cart/box *- empty* *- full*	*cm* *cm*
Magazines/hoppers *- minimum loading height* *- maximum height (full)*	*cm* *cm*
Other:	*cm*

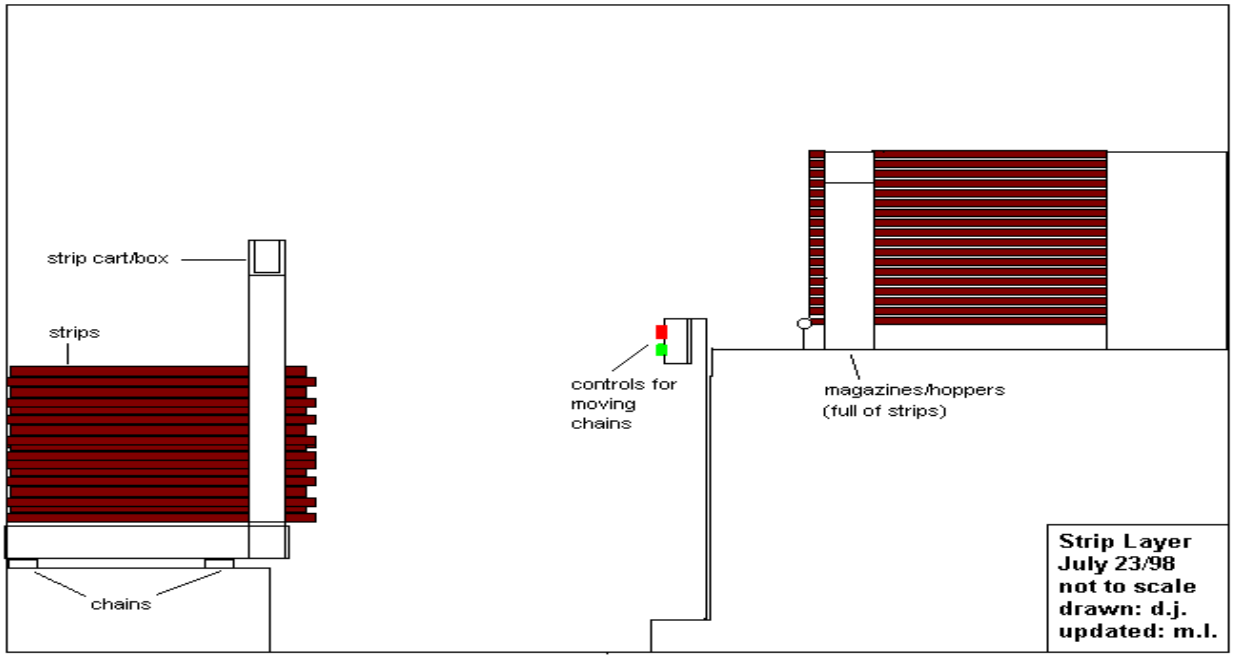


Figure 1: Workstation (right side view)

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, which apply to the workstation at your mill.

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

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

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
	Push buttons	• *Controls jog chain to move strip carts/boxes in and out of work area*	*1 – 2 times per hour*	
	Push button	• *Stop/start button for waste conveyer*	*Approx. once per day*	
	Push button	• *Emergency stop*	*Rarely used (less than once per day)*	
	Lever (gate)	• *Stops/opens magazine (hopper)*	*6 times per hour*	
	Other:			

Physical Demands

Whole Body Physical Demands

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

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

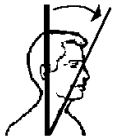
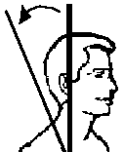
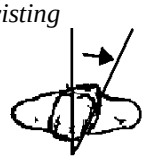
	Physical Demands	Tasks or Activity	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Walking	• *Monitoring magazines* • *Walking between strip cart and magazines* • *Discarding waste strips* • *Going to and from bundles to be labelled*			✓		• *Walking and standing (combined) are required constantly throughout the shift; duration of walking and standing is 2 hours at once*
	Sitting	• *Picking up and loading strips into magazines/hoppers* • *Moving strip carts/boxes in and out of work area* • *Micro breaks*			✓		• *As above*
	Standing	• *Sitting on end of strip cart between loads*	✓				
	Climbing (stairs)	• *Going to and from bundles to be labelled* • *Occasional communication with Stacker Operator*	✓				
	Climbing (other)						*Not Applicable*
	Balancing						*Not Applicable*
	Kneeling/ Crouching						*Not Applicable*
	Other:						

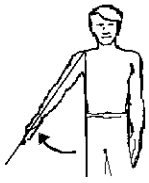
Body Postures

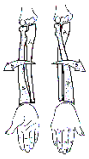
The table below outlines the body postures held or repeated throughout the shift by a Strip Layer.

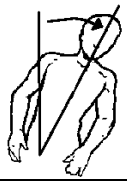
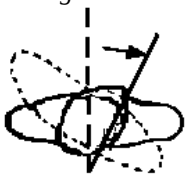
For each of the postures identified, indicate whether it occurs by placing a check mark (✓) in the far left column.

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

	Body Posture	Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck							
	Flexion 	• *Looking down when gathering strips and loading into magazines* • *Placing shim sticks onto stacks of lumber*		✓			• *Degree of flexion depends on height of worker, strip carts, and magazines*
	Extension 	• *Looking up when gathering strips from a full strip cart*	✓	✓			• *Percentage of shift depends on height of worker, and height of top layer of strips when strip cart is full*
	Twisting 	• *Looking back and forth between strip cart and magazines* • *Monitoring magazines* • *Transporting full strip carts to work area ,and empty strip carts out of work area*		✓	✓		• *Percentage of shift in this posture may vary depending on worker's technique when transporting strips from cart to magazines*

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Shoulder						
Flexion 	• *Sorting and gathering strips* • *Loading strips into magazines* • *Placing shim sticks onto stacks of lumber* • *Unjamming magazines*			✓		• *Posture is held for 2 to 5 seconds at a time* • *Frequency of posture is 4 to 15 times per minute.*
Abduction 	• *Lifting strips out of strip cart* • *Loading strips into magazines*			✓		• *Degree of abduction varies depending on working technique*
Extension 	• *Pulling strips out of strip cart* • *Loading strips into magazines*		✓	✓		• *Frequency of extension depends on working technique*

Body Posture		Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm							
	Rotation 	• *Sorting and gathering strips*		✓			• *Frequency varies depending on working technique (i.e., how many strips are stacked at once)*
Wrist							
	Flexion 	• *Gripping stacks of strips while lifting strips out of strip cart and loading into magazines*		✓	✓		• *This posture is held for less than 5 seconds at a time: the frequency of this working posture may be up to 15 times per minute* • *Frequency varies depending on working technique*
	Extension 	• *Pushing stacks of strips into magazines*		✓			• *This posture is held for less than 2 seconds at a time* • *Frequency varies depending on working technique*
	Ulnar Deviation 	• *Gripping stacks of strips while lifting out of strip cart and loading magazines* • *Unjamming magazines*		✓			• *This posture is held for less than 5 seconds at a time* • *Frequency varies depending on working technique*
	Radial Deviation 	• *Pulling strips out of strip cart* • *Gripping stacks of strips*		✓			• *This posture is held for less than 2 seconds at a time*

Body Posture		Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back							
	Flexion 	• *Sorting and lifting stacks of strips* • *Loading strips into magazines* • *Placing shim sticks onto stacks of lumber*		✓	✓		• *This posture is held for less than 5 seconds at once* • *Degree and frequency of flexion depends on height of worker, strip carts, and magazines*
	Lateral Flexion 						*Not Applicable*
	Twisting 	• *Transferring stacks of strips from strip cart to magazines*		✓			• *Frequency of trunk twisting varies depending on working technique*
	Extension 						*Not Applicable*
Other:							

Hand Grips

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

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

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

	Type	Task(s)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Power 	• *Using hand tools (pike pole, picaroon, pry bar, binding cutter)*	✓				• *Generally both hands are used*
	Pinch 	• *Gripping strips to lift out of strip cart and transfer to magazines*		✓	✓		• *Grip span, grip force and frequency varies depending on the number of strips handled at once* • *Generally both hands are used*
	Hook 	• *Gripping strip to use for unjamming magazines*	✓				• *Generally both hands are used*
	Precision 						*Not Applicable*
	Other:						

Manual Material Handling

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

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

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

	Task Description	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pulling stacks of strips out of strip cart/box	*Approx. 2.5 to 4.0*		✓			• *Weight of stack varies depending on number of strips in stack (worker's preference)* • *Height of pulling varies between approx. 70 and 190 cm depending on height of top layer of strips in strip cart* • *Frequency of task is 4 to 15 times per min*
	Pushing stacks of strips into magazines	*Approx. 2.5 to 4.0*		✓			• *Weight of stack varies depending on number of strips in stack (worker's preference)* • *Height of push varies between approx. 60 and 121 cm, depending on how full magazines are when filled (worker's preference)* • *Frequency of task is 4 to 15 times per min*
	Lifting/lowering stacks of strips from strip cart/box	*Approx. 2.5 to 4.0*		✓			• *Weight of stack varies depending on number of strips in stack (worker's preference)* • *Vertical distance of lift/lower depends on height of strips in strip cart/box* • *Frequency of task is 4 to 15 times per min*
	Carrying binding cutter from side of workstation to strip cart	*3.5*	✓				• *Generally both hands are used*

Hand Tools

Indicate the hand tools used by a Strip Layer at your mill by placing a check mark (✓) in the far left column. Determine the weight of the hand tool and enter it in the appropriate column.

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

	Type of Tool	Task(s)	Weight of Tool (kg)	Percent of Shift				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pry bar	• *Unjamming magazines*	*4.0-6.1*	✓				
	Picaroon	• *Unjamming magazines*	*1.5*	✓				
	Strips	• *Unjamming magazines*	*0.4-0.6*	✓				
	Pike pole	• *Unjamming magazines*	*approx.1*	✓				
	Cutters	• *Cut banding on loads*	*3.5*	✓				
	Other:							

Environmental Conditions

Work Environment

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

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

Noise level	*Range found: 88 to 93 dB* *Mill specific:*
Lighting level	*Range found: 50-680 lux (over magazines)* *24-512 lux (over strip cart)* *Mill specific:*
Other:	

Location of Workstation

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

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

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

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

Temperature

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

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

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

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

Personal Protective Equipment

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

For the Strip Layer 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.

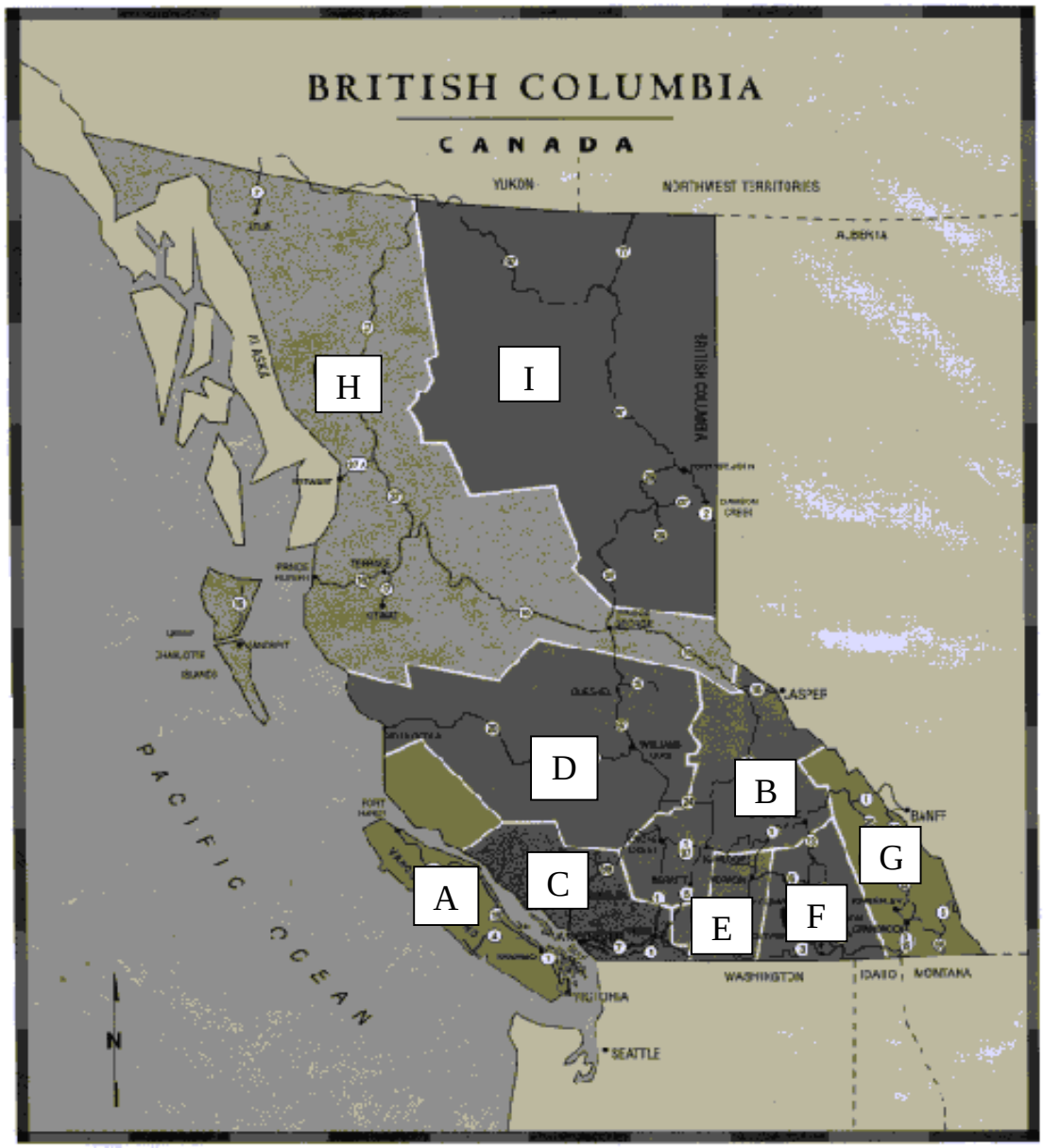
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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
Strip Layer

Purpose

The Risk Factor Identification Checklist for a Strip Layer 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 – Strip Layer

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions

☐ After implementation of solutions

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

Definitions

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

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

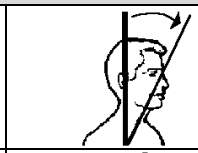
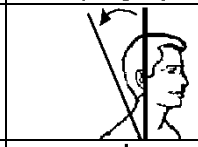
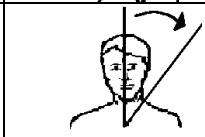
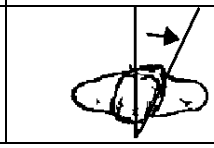
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

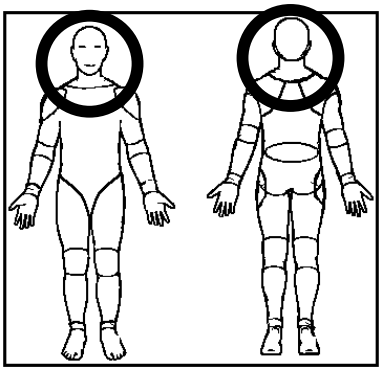
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

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

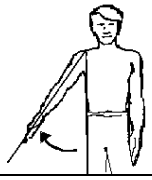
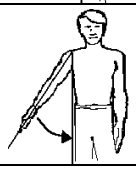
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



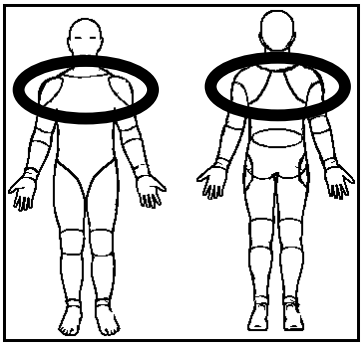
Body parts within the circled area will be classified as NECK issues.

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., lifting stacks of strips)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., gripping strips to fill magazines)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., operating controls)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., pike pole)			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



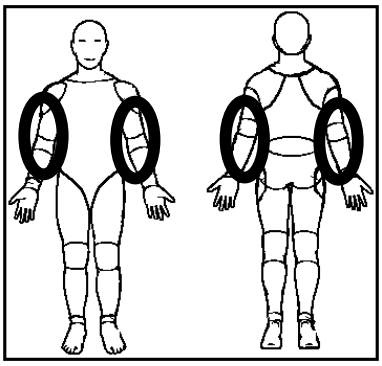
Body parts within the circled area will be classified as SHOULDER issues.

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., pike pole) 			S O	
Are objects handled in a pinch grip? (e.g., strips) 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., gripping strips)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., filling magazines with strips)			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., pike pole)			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., hand tools that dig into the palm of the hand)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	

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



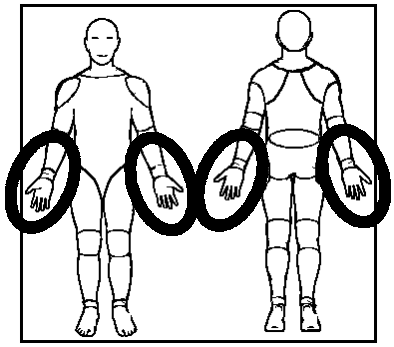
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., pike pole) 			S O	
Are objects handled in a pinch grip? (e.g., strips) 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., gripping strips)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., filling magazine with strips)			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., pike pole)				S O	
Contact Stress					
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., hand tools that dig into the palm of the hand)				S O	
Ask the worker: Do you use your hand like a hammer for striking?				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Ulnar Deviation				S O	
Radial Deviation				S O	
Vibration					
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?				S O	

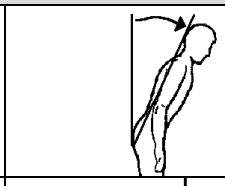
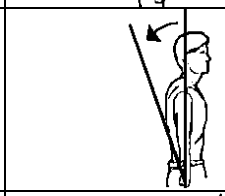
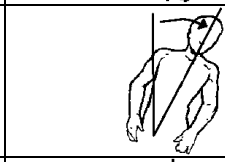
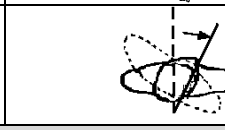
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



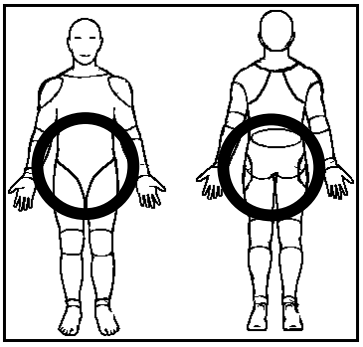
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., bending to pick up strips)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., filling magazines)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending forward to place shim sticks)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh? (e.g., workstation that digs into the hip or thigh)			S O	

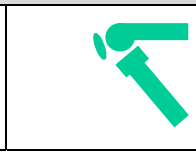
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on vibrating surface)				S O	

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

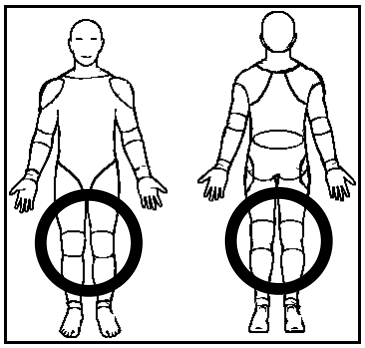


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

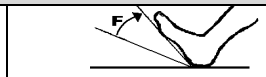
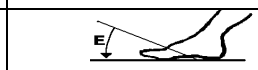
Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture?			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Do workers kneel (with one or both knees)?			S O	
Contact Stress				
Ask the worker: Do **<u>any</u>** objects or parts of the workstation put pressure on your knee(s)?			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

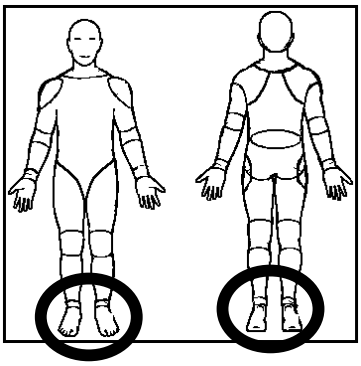


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift?			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on vibrating surface)			S O	

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



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

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

ENVIRONMENTAL CONDITIONS

Temperature				
Ask the worker: Are your hands or arms exposed to cold from exhaust air, cold liquids or solids? (e.g., handling wet strips)			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

Strip Layer

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

Strip Layer

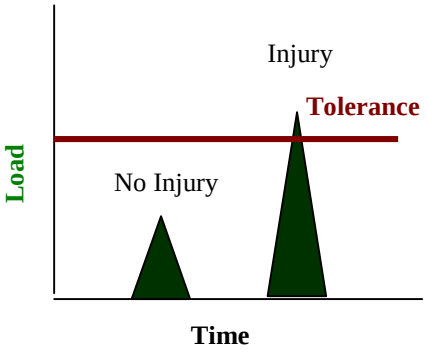
Disclaimer

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

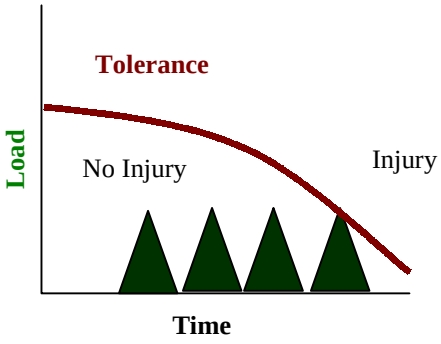
Injuries occur when …
Loads exceed tissue tolerances



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.

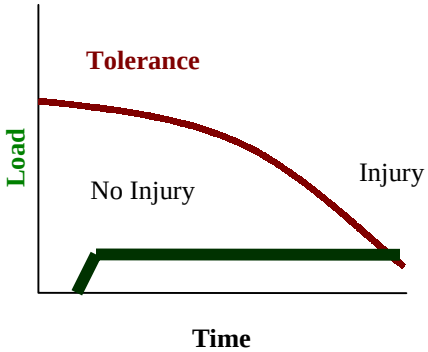
Example – a worker going over on their ankle and spraining it.



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 Strip Layer 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 Strip Layer. 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/SHOULDER

Direct Risk Factors:
Awkward Postures
Repetition

A Strip Layer frequently works with the arms away from the body in order to reach and place strips.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Strip Layers repeatedly work with their arms away from the body because they have to reach into the strip cart/box to pick up a stack of strips, and toward the magazines to load strips. These extreme working reaches result in non-neutral shoulder postures, which can lead to fatigue and injury when repeated.

Working Heights

- At some workstations, strips are piled high in the strip cart and/or magazines are higher than waist height. In these situations, Strip Layers are required to reach at or above chest level to pull strips out of the strip cart and to load magazines. These working heights cause awkward postures of the shoulders, and increase the risk of injury.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 72 & 73.
- 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
Repetition

A Strip Layer must grip stacks of strips in order to transfer them from the cart to the magazine.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- A Strip Layer may have to work with a bent wrist because of the height at which strips must be loaded into the magazine. This awkward wrist posture can increase the risk of tissue injury.

Characteristics of Objects Being Handled

Size and Shape

- Increased grip force is required, due to the wide grip span used to hold stacks of 5 to 11 strips at once.

Load Condition and Weight Distribution

- In the winter, strips are often frozen together, requiring more force to separate them. Strips are also slippery when frozen, requiring more grip force from the Strip Layer.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

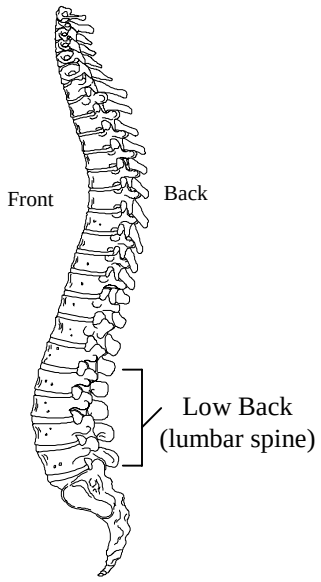
- For specific solutions that may prevent injuries to the Elbow/Wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 72 & 73.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

LOW BACK

Direct Risk Factors:
Awkward Postures
Repetition

A Strip Layer frequently bends down to sort strips when carts are less than 1/3 full, to place shim sticks on to stacks of lumber, and to unjam magazines.

Neutral Spine



BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The back is repeatedly bent when Strip Layers have to sort strips into stacks when the strip cart/box is less than 1/3 full. Taller workers will have to bend lower and more often than shorter workers.

CONSEQUENCES

- Repeatedly bending forward may lead to damage in the disc walls.
- Signs and symptoms may include muscle spasm and sharp or radiating pain in the back and/or lower extremities.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 72 & 73.
- For exercises that could help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

Summary of Body Parts at Risk

NECK/SHOULDER

- A Strip Layer frequently works with the arms away from the body in order to reach and place strips.

ELBOW/WRIST

- A Strip Layer must grip stacks of strips in order to transfer them from the cart to the magazine.

LOW BACK

- A Strip Layer frequently bends down to sort strips when carts are less than 1/3 full, to place shim sticks on to stacks of lumber, and to unjam magazines.

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.*

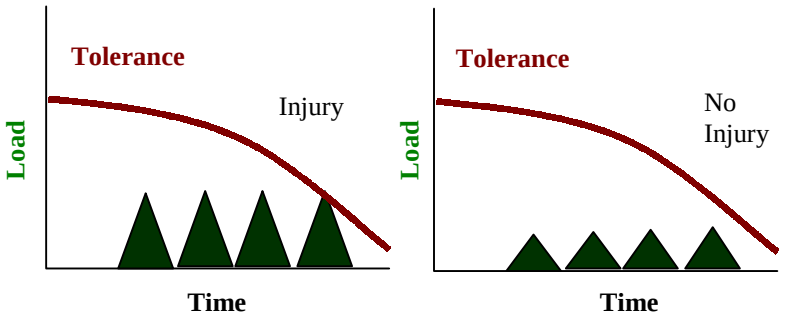
= Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 72 & 73 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

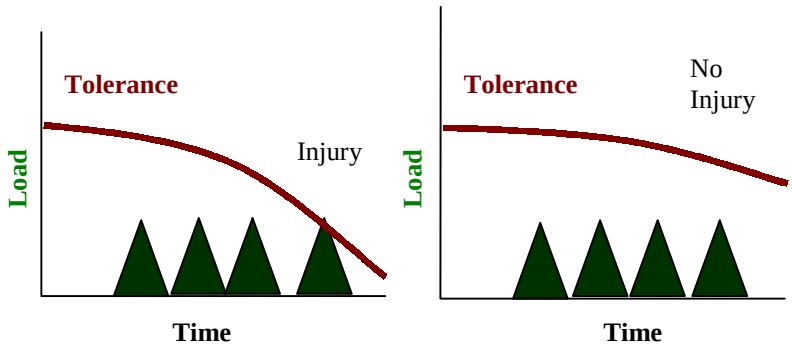
Injury Prevention

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 Strip Layer 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

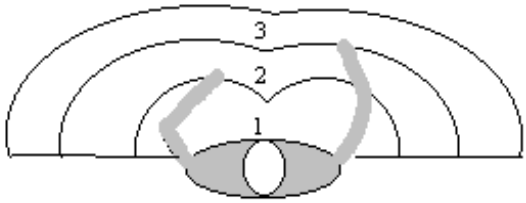
PERSONAL PROTECTIVE EQUIPMENT
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

Minimising working reaches

E

In order to minimise working reaches at the Strip Layer workstation, there should not be any obstacles between the worker and the strip carts/boxes and magazines. Workstation components, such as waste conveyors and control panels, should be to the side of the workstation.

WORKING HEIGHTS

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

The ideal workstation is height adjustable, allowing a large percentage of the population to adjust the work surface height to suit their dimensions.

To determine the appropriate height specific for the Strip Layer workstation, 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.

Fill height on strip carts

A WP

Strip carts should be only partially filled (i.e. two/thirds to three/quarters), so that workers do not have to reach as high when pulling strips out of the top of the cart.

Height of strip cart

E

The strip carts can be placed on a pallet lifter with a spring mechanism that raises the cart as the strip level decreases. This keeps the strips at the same height, whether the cart is empty or full, reducing awkward back and shoulder postures.

Place visual fill cue on magazine

A WP

Workers should be taught to load magazines between elbow and hip height, to reduce awkward wrist, shoulder, and back postures. As a visual cue, a worker could put a mark on a post on either side of each magazine, indicating when the strips have been reduced to hip level and should be re-loaded.

Height of magazine

E

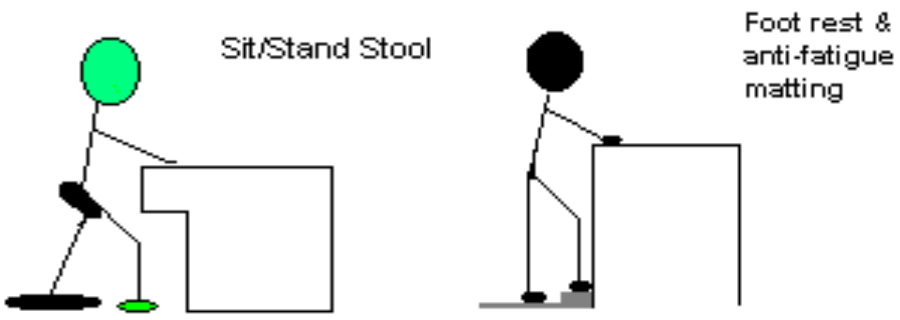
Magazines should be designed so workers can load strips into them between hip and elbow height. Any solid metal end on a magazine should be below hip height for all workers, or workers should be raised on a walkway to achieve the same effect.

SEATING

Sit/stand stool

E
WP

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



FLOOR SURFACES

Anti-fatigue matting

E

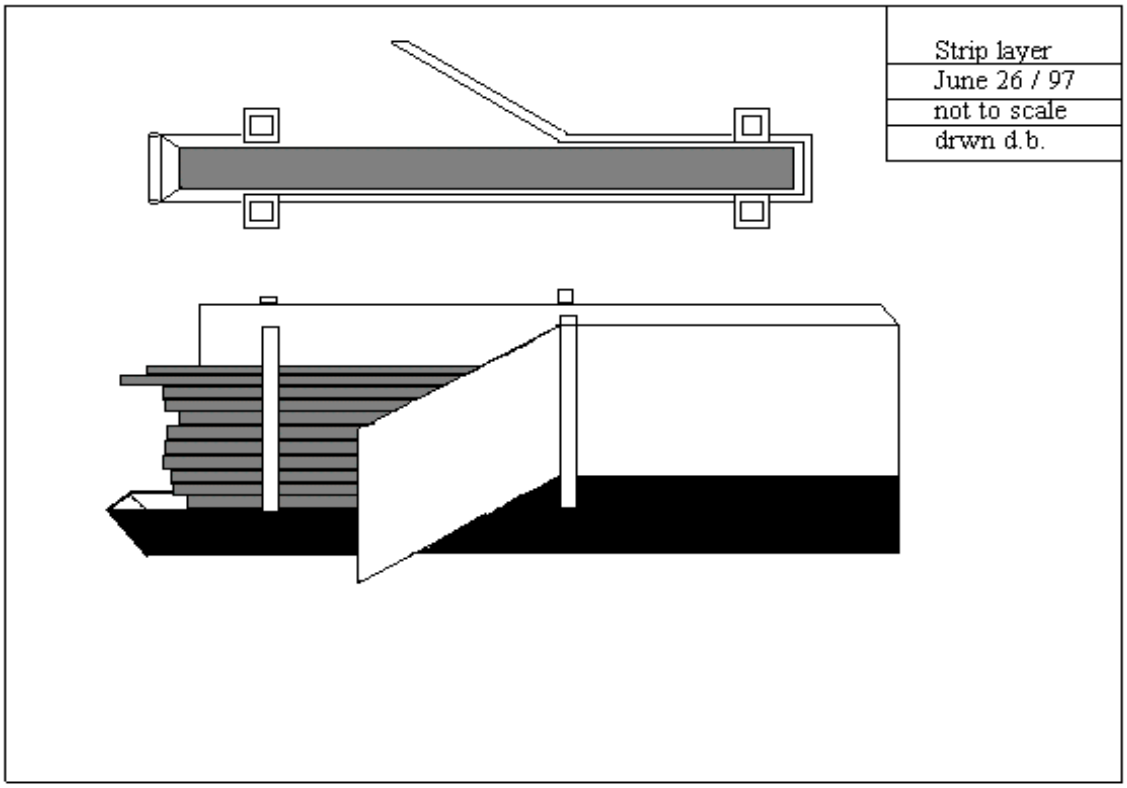
In order to minimise fatigue in the lower extremities, anti-fatigue matting can be installed. The use of anti-fatigue matting in the work area will help to increase comfort and reduce muscle fatigue. The cushioned surface encourages continuous micro-movements of the feet, which minimises blood pooling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

ADDITIONAL WORKSTATION DESIGN OPTIONS

Flared magazines

E

Magazines with one side flared and the other side flush would help workers load the magazines more easily, by decreasing the precision required for this task. This would decrease the grip force used to load strips, and place less stress on the shoulder muscles used to guide the strips.



Characteristics of Objects Being Handled

SIZE AND SHAPE

A wide grip span is used to hold stacks of strips when loading into magazines. Strip Layers have been observed to grip stacks containing between 5 and 11 wooden strips.

Reduce number of strips lifted at once

WP

Because each worker's hand size is different, the appropriate number of strips that should be handled at once is variable. However, a worker should reduce the number of strips handled if they are having persistent forearm, wrist, or hand discomfort. Reducing the number of strips also reduces the weight handled, which helps to reduce the grip force required to handle strips.

Use lighter, thinner strips

A

Lighter and/or thinner strips should be used, without affecting production or quality. Laminated plywood strips are available which are lighter than typical kiln strips and last 8 times longer. These new strips would reduce the span required when gripping, and would decrease the load on the upper body due to the reduced weight of the loads handled.

LOAD CONDITION AND WEIGHT DISTRIBUTION

Use your hip

WP

Supporting stacks of strips against the side of the hip, while transferring them to the magazines, keeps the load close to the body, placing less stress on the shoulders. This technique also allows workers to use a hook grip rather than a pinch grip, putting less stress on wrists and elbows.

Store strips in dry area

A
WP

To avoid this problem, strips should be kept in covered containers outdoors, or indoors if possible. Some mills keep strip carts near burners, or other areas where the mill generates heat, to prevent strips from freezing.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Proper gloves

PPE

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

Environmental Conditions

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

Work Organisation

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/Hand	Low Back	Hip	Knee	Ankle	Foot
Minimising working reaches	**66**		**A R**		**R**							
Fill height on strip carts	**67**		**A R**		**A R**			**A R**				
Height of strip cart	**67**		**A R**		**A R**			**A R**				
Place visual fill cue on magazine	**67**		**A**		**A**							
Height of magazine	**68**		**A**		**A**			**A**				
Sit/stand stool	**68**							**S**				
Anti-fatigue matting	**68**							**S**				**S**
Flared magazines	**69**		**R**		**F**							
Reduce number of strips lifted at once	**70**				**F A**							
Use lighter, thinner strips	**70**		**F**		**F**							
Use your hip	**70**		**F**									
Store strips in dry area	**70**		**F**		**F**							
Proper gloves	**71**				**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
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*

STRIP LAYER MSI SAFETY GUIDE

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

CHECK IF THIS APPLIES	ACTIVITY OF RISK	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder A Strip Layer frequently works with the arms away from the body in order to reach and place strips.	**Awkward Postures** **Repetition**	• Neck and shoulder muscles must support the weight of the arms when they are away from the body. The farther away the arms are from the body, the greater the load on the muscles and tendons. • When the arms are repeatedly 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.	• Try to keep the arms as close to the body as possible while handling strips. • Supporting the stack against your hip will decrease the force required by the upper body muscles. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • For exercises that can help prevent ***neck*** and ***shoulder*** injuries, ***see the neck and shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Strip Layer must grip stacks of strips in order to transfer them from the cart to the magazine.	**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 affects how much muscle tension needs to be generated. Using either an overly large or a small grip requires more muscle force, and can lead to tissue fatigue at the tendon/bone connection. • The position of the wrist also affects how much muscle tension needs to be generated. Gripping objects with the wrist bent increases the tension generated by muscles. • Repeated stress to the elbow without adequate rest could fatigue tissues to the point of injury.	• Use thinner gloves for handling stacks of strips as this will result in less force needed to hold the strips. • Wear dry gloves. • Pick up fewer strips at a time to reduce weight of stacks. • 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	ERGONOMIC RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Strip Layer frequently bends down to sort strips when carts are less than 1/3 full, to place shim sticks on to stacks of lumber, and to unjam magazines.	**Awkward Postures** **Repetition**	• Back muscles must support the weight of the upper body when leaning forward. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs. • Repeated forward bending can gradually fatigue the structures of the low back. If the repetitive stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury.	• Try to keep the back in a neutral position (ears, shoulders, and hips aligned). • When lifting, hold stacks of strips close to the body. • For exercises that can help prevent ***back*** injuries, ***see the back section of the Body Manual***.