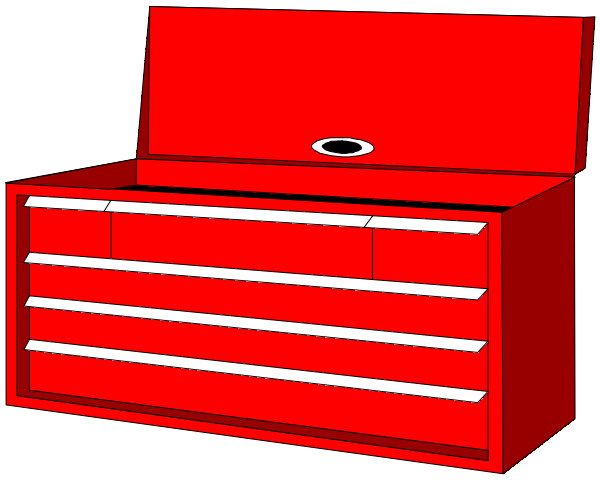
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Strip Piler 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 PILER TOOL KIT
Table of Contents

Overview
Strip Piler

Job Summary

A Strip Piler is responsible for evenly stacking strips from the mill into strip racks, also referred to as carriages, boxes, or carts. A Strip Piler will straighten strips, remove broken strips, remove and pile dunnage and reject boards, prepare strip racks, ensure strips are placed into strip racks, strap finished loads, advance chains, and clean-up around the workstation. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of a Strip Piler may include:

a) Forceful movements of the shoulders, elbows, wrists, and back
b) Repetitive movements of the neck, shoulders, elbows, and wrists
c) Awkward postures of the neck, shoulders, elbows, wrists, back, and knees
d) Static loading of the knee and foot
e) Contact stress of the wrist and hand
f) Walking while gathering and stacking strips, removing and piling dunnage and reject boards, cleaning up, strapping finished loads, and marking loads.
g) Standing while removing and piling reject boards, advancing the chain, gathering and stacking strips, marking loads, and monitoring and straightening strips
h) Sitting while monitoring and straightening strips
i) Climbing while monitoring and straightening strips, and cleaning up
j) Kneeling/crouching while removing and piling dunnage and reject boards
k) Pushing manual strapper handle to tighten strapping on a load
l) Pulling banding carts
m) Lifting dunnage, strips, manual, and pneumatic strappers
n) Carrying strips to racks and garbage bins

Mental Demands

Strip Pilers did not report being mentally fatigued at the end of the workday, or worrying about making mistakes while performing tasks. Some decision making is involved when strips need to be discarded, and while monitoring conveyors and racks for cross-ups.

Major Variations

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

1) Strips may be piled:
   a) Automatically
   b) Manually

2) In addition to the tasks mentioned in the Job Summary, a Strip Piler may:
   a) Mark loads
   b) Grease kiln cart wheels
   c) Cut strip lengths for reman

Minor Variations

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

1) The average work pace for a Strip Piler is between 4 and 20 loads of strips per shift. This pace may be:
   a) Machine paced
   b) Paced by the process before
   c) Determined by a dwell area
   d) Time limited

2) When performing clean up duties at the workstation a Strip Piler may use:
   a) A broom
   b) A shovel
   c) An air hose

3) When strapping/banding a load a Strip Piler may use a:
   a) Manual strapper
   b) Pneumatic strapper
   c) Band cutter
   d) Crimper to secure the load

Physical Demands Analysis
Strip Piler

PDA General Instructions: Strip Piler

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

PDA Table of Contents

Physical Demands Analysis
Strip Piler

Task List

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

Monitor and straighten strips (automatic workstation)

At an automatic workstation, a Strip Piler monitors and straightens strips piling into a strip rack.

Does this task occur at your mill?

☐ Yes ☐ No

Gather and stack strips (manual workstation)

At a manual workstation, a Strip Piler gathers strips and manually stacks them in a strip rack.

Does this task occur at your mill?

☐ Yes ☐ No

Remove waste strips

A Strip Piler removes waste strips from the strip pile.

Does this task occur at your mill?

☐ Yes ☐ No

Remove and pile dunnage or reject boards

A Strip Piler removes dunnage or reject boards from the conveyor system or strip pile, and piles these pieces.

Does this task occur at your mill?

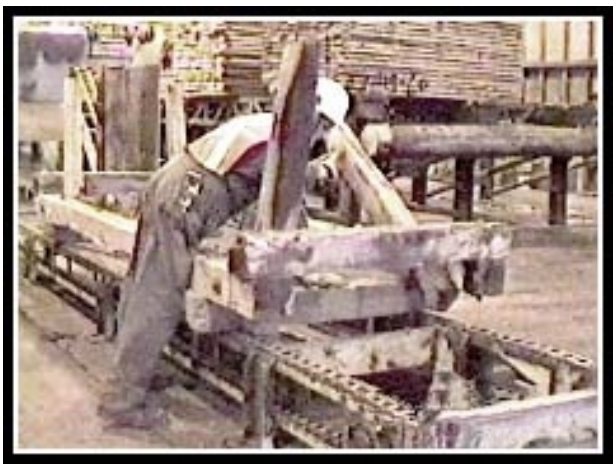
☐ Yes ☐ No

Prepare strip rack

A Strip Piler prepares a strip rack before strips can be piled into it. This preparation may include placing lumber or dunnage on the bottom or sides of the rack to hold the load.

Does this task occur at your mill?

☐ Yes ☐ No



Strap finished loads

A Strip Piler straps the finished load with banding.

Does this task occur at your mill?

☐ Yes ☐ No

Advance chains

A Strip Piler manually advances the chains to load the strips on to the rack.

Does this task occur at your mill?

☐ Yes ☐ No

Clean-up

A Strip Piler cleans up around the workstation.

Does this task occur at your mill?

☐ Yes ☐ No

Mark loads

A Strip Piler manually marks loads that are going to the Tilt Hoist Operator.

Does this task occur at your mill?

☐ Yes ☐ No

Grease kiln cart wheels

A Strip Piler greases the wheels of the kiln carts.

Does this task occur at your mill?

☐ Yes ☐ No

Cut strip lengths for reman

A Strip Piler cuts strip lengths for reman.

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 Strip Piler.

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

Values marked with a check mark (✔) 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%	
	Monitor and straighten strips(automatic workstation)			✔		• *At an automatic workstation, manual handling is minimal*
	Gather and stack strips (manual workstation)		✔	✔		• *At manual work stations, manual handling of strips is necessary to fill the strip carriages/racks*
	Remove waste strips	✔				• *Number of discarded strips varies depending on the condition of the strips*
	Remove and pile dunnage or reject boards	✔	✔			• *Number of reject boards or pieces of dunnage removed depends on mill practice*
	Prepare strip rack	✔				• *Tasks involved in the preparation of carriages/racks depends on the procedures of the mill*
	Strap finished loads	✔	✔			• *Number of loads strapped during the day depends of the type of wood being run* • *Some loads (e.g., 2x8 to 2x10) use more strips and fill up carts faster. Strapping for these loads would be greater than other dimensions.*

Task continued	Percent of Shift				Comments
	Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Advance chains	✔	✔			• *Frequency depends on worker technique and level of system automation*
Clean-up	✔	✔			• *Cycle time depends on the amount of down time and duties performed*
Mark loads	✔				
Grease kiln cart wheels	✔				
Cut strip lengths for reman			✔		
Other:					

Organisational Factors

The table below contains a list of organisational factors for a Strip Piler. 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* ☐ *30 minute lunch* ☐
Informal breaks	☐ *Less than 30 minutes* ☐ *30 minutes to 60 minutes (down-time)* ☐
Work pace	☐ *4 to 20 loads per shift* ☐
Work pace control	☐ *Machine paced* ☐ *Pace depends on the process before* ☐ *Dwell area* ☐ *Time limit*
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 and Figure 2 for the measurement locations.

Workstation Dimensions	
(A) Chain heights (automatic)	cm
(A) Infeed table/chain height (manual)	cm
(B) Strip rack heights (manual & automatic)	cm
(C) Control heights	cm
Dunnage/reject board rack heights *(not shown)*	cm

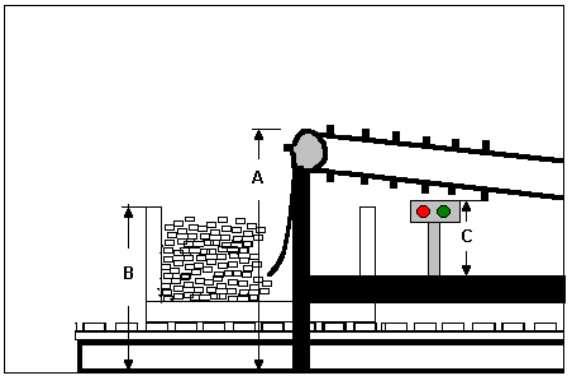


Figure 1: Automatic Workstation (side view)

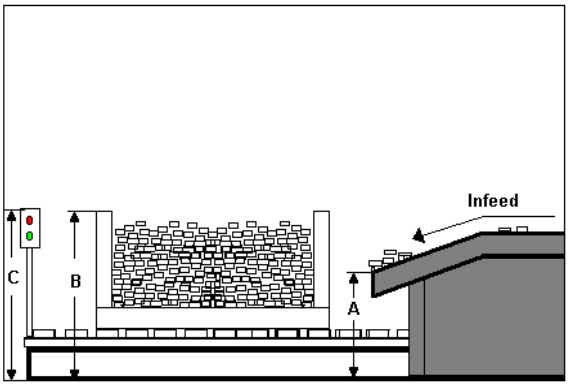


Figure 2: Manual Workstation (side view)

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 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 Strip Piler.

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

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

	Type of Control	Function	Frequency	Comments
	Push/pull button	• *Start/stop conveyors, belts, racks, or chains*	*Varies depending on demand*	
	Push button	• *Start/stop conveyors, belts, racks, or chains*	*Varies depending on demand*	
	Lever switch	• *Lock out controls* • *Start/stop conveyors*	*Varies depending on demand*	
	Lever switch	• *Cut strip lengths for reman*	*Varies depending on demand*	
	Pressure switch	• *Start/stop conveyors, belts, racks, or chains*	*Varies depending on demand*	
	Other:			

Physical Demands

Whole Body Physical Demands

Identify each of the physical demands required of a Strip Piler, 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.

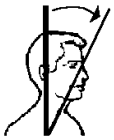
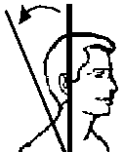
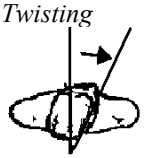
	Physical Demands	Tasks or Activity	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Walking	• *Gather and stack strips* • *Remove and pile dunnage and reject boards* • *Clean-up* • *Strap finished loads* • *Mark loads*	✔	✔	✔	✔	• *Manual workstations require more walking and less standing than automatic workstations*
	Sitting	• *Monitor and straighten strips*		✔			• *Ability to work while seated depends on the layout of the workstation* • *Only seen at an automatic workstation*
	Standing	• *Remove and pile dunnage and reject boards* • *Advance chains* • *Gather and stack strips* • *Mark loads* • *Monitor and straighten strips*		✔	✔	✔	• *Automatic workstations require less walking and more standing than manual workstations*
	Climbing (stairs)	• *Monitor and straighten strips*	✔				• *Frequency depends on the layout of the workstation*
	Climbing (other)	• *Clean-up*	✔				• *Frequency depends on the layout or design of the workstation*
	Balancing						*Not Applicable*
	Kneeling/ Crouching	• *Remove and pile dunnage and reject boards* • *Clean-up* • *Strap finished loads*	✔				• *Frequency depends on the height of the workstation*
	Other:						

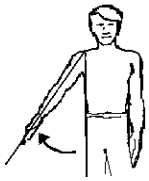
Body Postures

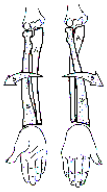
The table below outlines the body postures held or repeated throughout the shift by a Strip Piler.

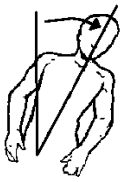
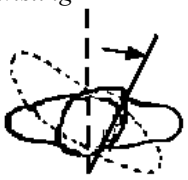
For each of the postures identified, indicate whether it occurs by placing a check mark (✔) in the far left column.

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

	Body Posture	Task(s)	Percent of Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck							
	Flexion 	• *Monitor and straighten strips*		✔			• *Frequency depends on the height of the operator and the height of the workstation*
		• *Remove and pile dunnage or reject boards*		✔			
		• *Remove waste strips*		✔			
		• *Gather and stack strips*			✔		
		• *Strap finished loads*	✔				
	Extension 	• *Advance chains*		✔			• *Frequency depends on the height of the operator and the height of the workstation*
		• *Gather and stack strips*		✔			
		• *Strap finished loads*	✔				
		• *Prepare racks*	✔				
		• *Remove and pile dunnage or reject boards*	✔				
	Twisting 	• *Advance chains*		✔			• *Frequency depends on the layout of the workstation and associated tasks*
		• *Remove waste strips*		✔			
		• *Gather and stack strips*	✔	✔			
		• *Monitor and straighten strips*		✔			
		• *Remove and pile dunnage or reject boards*		✔			

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 	• *Remove and pile dunnage*		✔	✔		• *Frequency varies depending on the height of the operator and the height of the workstation* • *Work technique may also vary the amount of shoulder flexion*
	• *Gather and stack strips*		✔			
	• *Remove waste strips*	✔				
	• *Remove and pile reject boards*	✔				
	• *Monitor and straighten strips*		✔	✔		
	• *Prepare racks*		✔			
	• *Strap finished loads*		✔			
Abduction 	• *Advance chains*			✔		• *Frequency varies depending on the height of the operator and the height of the workstation.* • *Work technique may also vary the amount of shoulder abduction*
	• *Monitor and straighten strips*			✔		
	• *Remove and pile dunnage*		✔	✔		
	• *Remove waste strips*	✔				
	• *Strap finished loads*	✔				
	• *Gather and stack strips*	✔	✔			
	• *Remove and pile reject boards*	✔				
Extension 	• *Gather and stacking strips*	✔	✔			• *Shoulder extension varies depending on the height of the operator and the height of the workstation* • *Work technique may also increase or decrease the amount of shoulder extension*
	• *Monitor and straighten strips*		✔	✔		
	• *Strap finished loads*	✔				
	• *Remove and pile dunnage*		✔			

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 	• *Monitor and straighten strips*		✔			• *Frequency of turning the strips(straighten or gather) varies depending on work technique*
		• *Gather and stack strips*		✔			
Wrist							
	Flexion 	• *Gathering and stacking strips*		✔	✔		• *Frequency varies depending on work technique and tasks*
		• *Remove and pile reject boards*		✔			
		• *Monitor and straighten strips*					
	Extension 	• *Advance chains*			✔		• *Frequency varies depending on work technique, workstation layout, and tasks*
		• *Remove and pile dunnage*	✔	✔			
		• *Remove waste strips*	✔				
		• *Gather and stack strips*		✔			
		• *Remove and pile reject boards*		✔			
		• *Strap finished loads*	✔				
	Ulnar Deviation 	• *Gather and stack strips*		✔			• *Frequency varies depending on work technique and tasks*
		• *Remove and pile reject boards*		✔			
		• *Strap finished loads*	✔				
		• *Monitor and straighten strips*			✔		
	Radial Deviation 						*Not Applicable*

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 	• *Gather and stack strips*		✔	✔	• *Back flexion varies depending on the height of the operator and the height of the workstation*
		• *Remove and pile dunnage or reject boards*		✔		
		• *Prepare racks*	✔			
	Lateral Flexion 	• *Strap finished loads*	✔			• *Back lateral flexion varies depending on the height of the operator and the height of the workstation.*
	Twisting 	• *Remove and pile dunnage*			✔	• *Back twisting varies depending on the location of the layout or design of the workstation and associated tasks*
		• *Remove waste strips*			✔	
		• *Gather and stack strips*		✔		
		• *Prepare racks*			✔	
		• *Monitor and straighten strips*		✔		
	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 Piler.

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 Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Power 	• *Clean-up*	✔	✔	✔		• *Using a broom, air hose or shovel* • *Frequency of clean-up depends on the amount of down–time during the shift*
		• *Strap finished loads*	✔				• *Using a strapper* • *Number of loads strapped during the day depends on the type of wood being run*
	Pinch 	• *Monitor and straighten strips*			✔		• *Gripping the strips* • *Frequency of gripping the strips, to straighten or gather, may vary depending on work technique of the operator*
		• *Cut strip lengths for reman*		✔			• *Gripping the lumber*
	Hook 	• *Gather and stack strips*			✔		• *Gripping strips* • *This occurs at the manual workstation*
	Precision 						*Not Applicable*
	Other: Modified Pinch Hook	• *Gripping the strips to: Monitor and straighten strips*			✔		• *Gripping strips using the fingers as a hook and the thumb to keep the boards in place* • *Frequency of gripping the strips (to straighten or gather), may vary depending on work technique of the operator*

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 Piler.

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.

	Handling Description	Weight (kg)	Percent of Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pushing up on a manual strapper lever to tighten strapping around a load				✔		• *Force depends on the type of strapper and operators technique*
	Pulling a banding cart to a load in order to strap the finished load.		✔				• *6 to 17.2 of force* • *Force depends on banding cart construction, weight of strapping, and any other equipment attached to the cart* • *Frequency depends on the number of loads strapped during the shift*
	Lifting/lowering strips	*0.6 to 0.9 per strip*			✔		• *Weight depends on the number of strips handled at once*
	Lifting/lowering dunnage		✔				• *Weight depends on the number of pieces of dunnage handled at once*
	Lifting a pneumatic or manual strapper	*5.9 to 6.4*	✔				
	Carrying strips to a strip rack	*0.6 to 0.9 per strip*			✔		• *Weight depends on the number of strips handled at once*
	Carrying 2x4s to cut into strip lengths	*2.4*			✔		
	Other:						

Hand Tools

Indicate the hand tools used by a Strip Piler 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 (kg)	Percent of Task				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pneumatic stapper	• *Strap finished loads*	*6.2*		✔			
	Manual strapper	• *Strap finished loads*	*5.9*			✔		
	Strap cutters	• *Strap finished loads*	*0.7*	✔				
	Crimper	• *Strap finished loads*	*2.4 to 2.9*	✔				
	Broom	• *Clean-up*	*1.3 to 1.8*		✔			• *Frequency of use depends on the type of clean-up being done*
	Shovel	• *Clean-up*	*1.4 to 1.6*		✔			• *The frequency of use of the shovel depends on the type of clean-up being done*
	Air hose	• *Clean-up*	*1.0*		✔			• *The frequency of use of the air hose depends on the type of clean-up being done*
	Pneumatic oil gun	• *Grease kiln cart wheels*	*1.2*					
	Banding cart (equipment)	*Carries banding and other tools to:* • *Strap finished loads*		✔		✔		• *Weight depends on design, construction material, weight of tools, and the banding weight*
	Pike Pole	• *Clearing cross-ups*	*1.2 to 2.6*			✔		
	Other:							

Environmental Conditions

Work Environment

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

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

Noise level (dB)	*Range found: 92.7 to 97.6* *Mill Specific:*
Lighting level (lux)	*Range found: 160 to 6600 (Strip Piler workstation)* *Mill Specific:* *N.B. – The lighting level at a Strip Piler workstation may vary depending upon the time of day, exposure of the workstation to the sunlight, and the workstation layout*
Temperature (^{0}C)	*See Regional Temperatures on the next page*

Location of Workstation

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

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

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

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

Temperature

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

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

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

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

Personal Protective Equipment

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

For the Strip Piler 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.

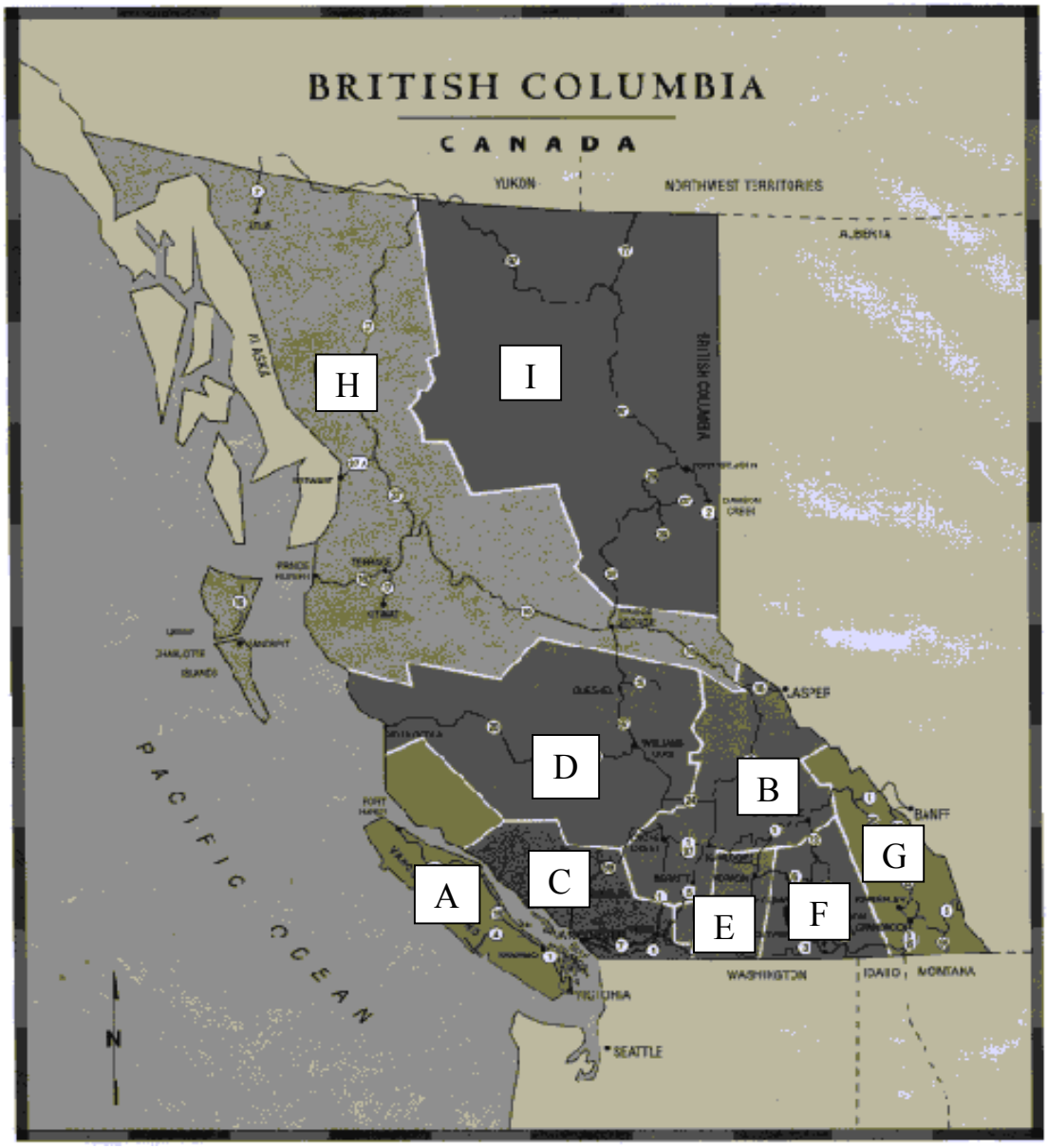
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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 Piler

Purpose

The Risk Factor Identification Checklist for a Strip Piler 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 Piler

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.

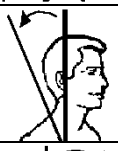
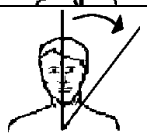
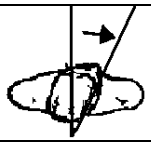
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

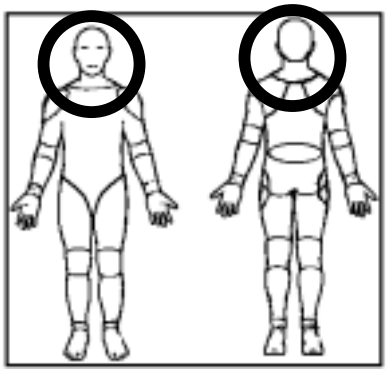
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 down and up frequently)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., stacking strips)			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	

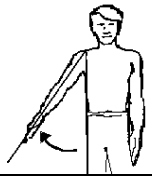
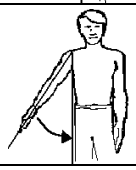
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



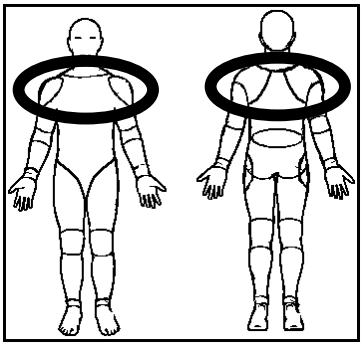
Body parts within the circled area will be classified as NECK issues.

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., sorting or straightening strips at the workstation)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., stacking strips)			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., pneumatic strapper)			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



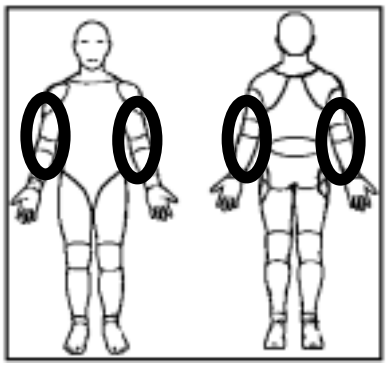
Body parts within the circled area will be classified as SHOULDER issues.

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? (e.g., grip used to carry strips) 			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., sorting or straightening strips at the workstation)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., stacking 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., pneumatic strapper)			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? (e.g., pneumatic strapper)			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



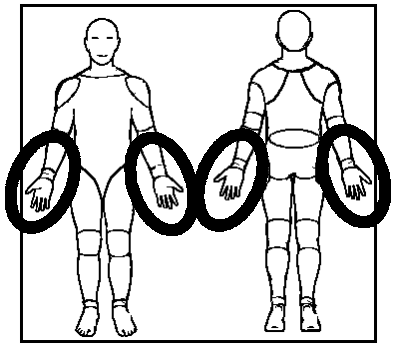
Body parts within the circled area will be classified as ELBOW issues.

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? (i.e., grip used to carry strips) 			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., stacking 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?			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? (e.g., pneumatic strapper)			S O	

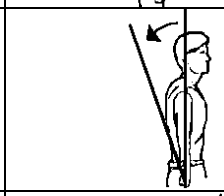
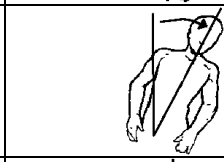
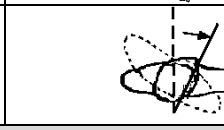
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there 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



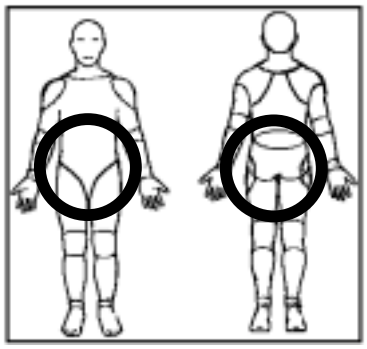
Body parts within the circled area will be classified as WRIST issues.

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 forward to advance chain)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., stacking strips)			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 advance chain)			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	

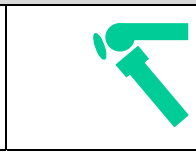
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on vibrating surface)				S O	

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

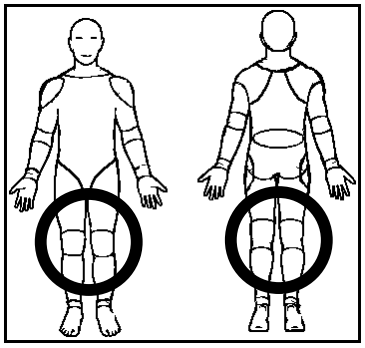


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

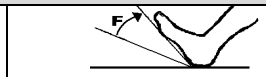
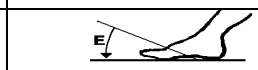
Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture?			S O	
Are workers required to sit or stand in a stationary position for long periods of time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

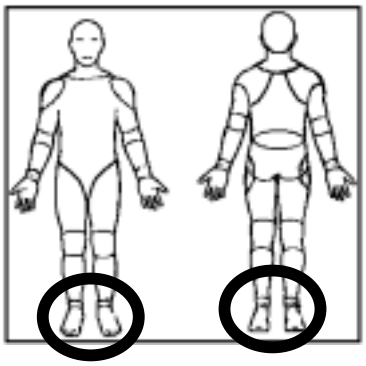


Body parts within the circled area will be classified as KNEE issues.

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 Piler

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

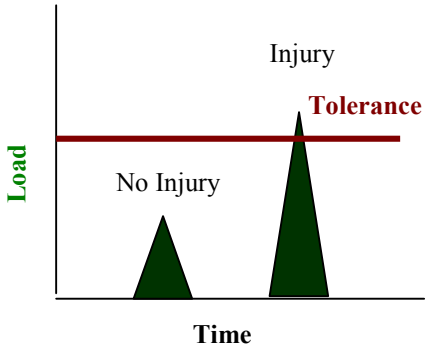
Disclaimer

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

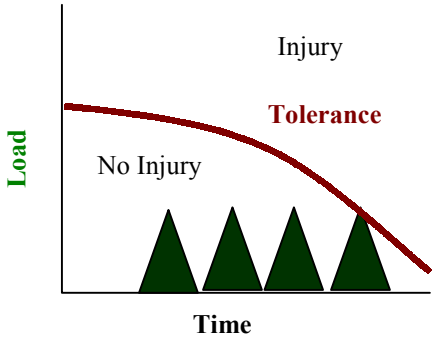
Injuries occur when ...
Loads exceed tissue tolerances



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.

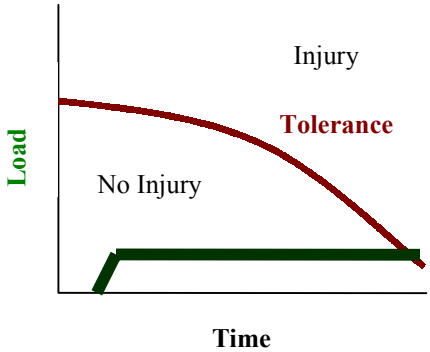
Example – a worker going over on their ankle and spraining it.



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 Piler 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 Piler. In addition, a reference table, with a summary of the direct and indirect risk factors by body part, is provided.

In the last section on Injury Prevention, the Work Manual discusses specific solution options for each of the body parts at risk.

NECK

Direct Risk Factors:
Awkward Postures
Repetition

A Strip Piler looks down and/or to the side in order to monitor the flow, and straighten and sort strips.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

- Neck muscles must support the weight of the head while in a forward bent position. The more the neck bends, the greater the load on the muscles and tendons.
- Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons.

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The loading on the neck is increased with the height of the workstation. If the workstation is too low the operator has to look forward to view the strips consequently the more the neck bends, the greater the load on the muscles.

Additional Workstation Design Options

- The loading on the neck may increase with a poor workstation layout. If the layout of the workstation causes the operator to repeatedly turn their neck, the muscles of the neck are subjected to repeated stress with little time for recovery.

Work Organisation

Task Variability

- The duration of loading on the muscles of the neck is increased due to the lack of variability at the Strip Piler workstation. The Strip Piler is required to perform the same motions over the duration of the shift consequently the muscles of the neck are subjected to repeated stress with little time for recovery.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 88 & 89.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Force
Repetition

A Strip Piler lifts piles of strips or dunnage in order to stack them into loads.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

- When workers repeatedly lift piles of strips or dunnage, the muscles of the neck and shoulder are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- The loading on the muscles of the neck and shoulder can increase due to the size and shape of the load. The larger the size or weight of the object, the larger the force required by the neck and shoulder muscles.

Work Organisation

Work Pace

- The loading of the neck and shoulders can increase due to the speed of the work. The greater the speed of the chain/conveyor, the faster paced the job becomes. This will increase the frequency of the highly repetitive movements of the upper extremities.

CONSEQUENCES

- Forceful and repeated lifting of piles of strips or dunnage can lead to neck and/or shoulder strain.
- Signs and symptoms include pain, tenderness, muscle spasm in the neck/shoulder area, and headaches.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 88 & 89.
- To help prevent ***neck*** discomfort, see the upper trapezius stretch in the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Awkward Postures
Repetition

A Strip Piler frequently works with the arms away from the body in order to gather and straighten strips, operate controls, clear cross ups and remove waste strips.

BACKGROUND INFORMATION

- The neck and shoulder 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 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

- Loading on the neck and shoulder muscles is increased with increased working reaches. A Strip Piler must reach controls in order to advance the chains. The working reaches outside of a natural range can cause awkward postures of the neck and shoulder.

Working Height

- Loading on the neck and shoulder muscles increases with working height. When a Strip Piler must manipulate or gather strips and pile them, a high working height can cause the worker to assume an awkward posture.

Characteristics of Objects Being Handled

Size and Shape

- The size and shape of the load increase loading on the neck and shoulder muscles. The larger or more awkward the object is to handle, the farther away from the centre of gravity the load has to be carried, increasing the load on the neck and shoulder 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 88 & 89.
- For exercises that can help to prevent ***neck*** and ***shoulder*** injuries, see the ***Neck*** and ***Shoulder sections of the Body Manual.***

SHOULDER

Direct Risk Factors:
Awkward Postures
Repetition

A Strip Piler works with the arms overhead in order to remove dunnage, and to strap loads.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

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

Repetition

- The rotator cuff tendon can fray from repeated rubbing against bone. If the repetitive stress is excessive, and recovery is not adequate, the tendon may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the shoulder can increase with the height of the load. A high working height can cause the worker to assume an awkward posture, increasing the load on the shoulder muscles.

Characteristics of Objects Being Handled

Load Condition and Weight Distribution

- The loading on the shoulder muscles can increase depending on the weight distribution of the dunnage while the operator is removing it. An awkward shoulder posture may be needed to accommodate the shifting load. This awkward shoulder posture leads to increased loading on the shoulder.

CONSEQUENCES

- Repeatedly lifting the arms overhead may lead to fraying in the tendon, as a result of the friction between the tendon and the bone.
- Rotator cuff muscles may become weakened.
- Signs and symptoms include pain when lifting the arm to the side, above shoulder height.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled "Shoulder" in the Summary of Solutions on pages 88 & 89.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Awkward Postures
Repetition

A Strip Piler grips strips in order to manipulate, gather, and sort them.

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 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.

Repetition

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading on the elbow/wrist may increase due to the size and shape of the load. The larger or more awkward the object is to handle, the more force required by the muscles of the elbow and wrist to grip the object.

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 88 & 89.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

WRIST/HAND

Direct Risk Factors:
Contact Stress

A Strip Piler straightens strips by striking them with the palm of the hand.

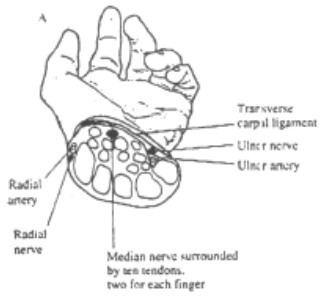
BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Contact Stress

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



The Carpal Tunnel

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the tissues of the hand increases with poor design of the equipment at the Strip Piler workstation. Strips falling off of the automatic strip placer may fall to land crooked on the load. To straighten strips that fell crooked, the operator may strike the strip with the palm of their hand. This causes contact stress to the palm of the hand and an awkward posture of the wrist.

Characteristics of Object Being Handled

Work Technique

- Loading on the hand may increase with poor work technique. Uneven stacking of the strips may cause them to shift and fall. To straighten them out, the operator may hit the ends of the strips with the palm of their hand. This causes contact stress to the palm of the hand and an awkward posture of the wrist.

CONSEQUENCES

- Continual exposure to contact stress increases the pressure on the carpal tunnel.
- Signs and symptoms include pain, numbness, and tingling in the hand area.

SUGGESTED SOLUTIONS

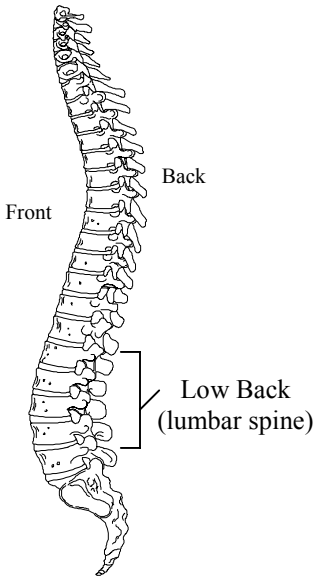
- For specific solutions that may prevent injuries to the Wrist/Hand, please see the column labelled "Wrist/Hand" in the Summary of Solutions on pages 88 & 89.

LOW BACK

Direct Risk Factors:
Force
Awkward Postures
Repetition

A Strip Piler frequently bends forward to stack strips and pile reject boards.

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 hand is transmitted to the low back. The greater the weight, the greater the loading.

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 & Reaches

- Loading on the tissues of the back increases when the torso is held in front or side bent postures. The height of the chains or strip racks and the working reaches at the workstation can greatly increase the loading on the tissues.

Additional Workstation Design Options

Workstation Layout

- Loading on the muscles of the back can increase if the workstation layout demands awkward postures, such as twisting, forward, side, or backward bending. The farther away from the centre of gravity the body is held, the greater the force required by the back to maintain that posture.

Characteristics of Objects Being Handled

Size and Shape

- Loading on the tissues of the back can increase with the size and shape of the load. Handling objects with large or awkward shapes can result in awkward postures, where the object load is farther away from the body. This increased distance between operator and object leads to increased loads on the tissues of the spine.

Load Condition and Weight Distribution

- Loading of the spine may be increased by the weight distribution of the object. When the operator is handling long strips and he/she is not holding/supporting at the place near the strips centre of gravity. When the centre of gravity of the strips is away from the body, the load increases on the tissues of the spine.

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 88 & 89.
- For exercises that could help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

KNEE

Direct Risk Factors:
Awkward and Static Postures
Repetition

A Strip Piler frequently squats to strap a load, pile dunnage and clean up.

BACKGROUND INFORMATION

- At the knee joint, the kneecap (patella) is held in place over the thighbone (femur) by connective tissue. When the leg is straight, there is little or no contact between these two bones. However, as the knee bends, the knee cap can come into contact with the thigh bone.

DIRECT RISK FACTORS

Awkward & Static Postures

- Bending the knee increases the contact stress between the knee cap and the thigh bone. Contact stress increases significantly when the knee is bent over 90 degrees.

Repetition

- Repeated squatting and kneeling may gradually irritate the knee. Irritation of the knee may lead to muscle wasting, which in turn leads to poor tracking of the knee cap on the thigh bone and increased contact stress between these bones.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the tissues of the knee may be increased due to the height of the workstation. A workstation that is too low requires an operator to adopt awkward knee posture (crouching) in order to maintain a neutral back posture. If Strip Pilers repetitively crouch or kneel, the tissues of the knee may be stressed to the point of injury.

CONSEQUENCES

- Repeated squatting and kneeling could cause inflammation under the knee cap, which may cause pain and may change the mechanics of knee cap tracking. Changes in knee cap tracking may lead to premature wear of the knee cap and/or the thigh bone.
- Signs and symptoms include muscle wasting around the inner knee, creaking in the knee, and chronic pain if left unchecked.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Knee, please see the column labelled "Knee" in the Summary of Solutions on pages 88 & 89.
- For exercises that could help to prevent ***knee*** injuries, see the ***Knee section of the Body Manual.***

FOOT

Direct Risk Factors:
Static Postures
Repetition

A Strip Piler walks and stands on hard surfaces in order to pile dunnage, sort and pile strips, mark and strap loads, and clean up work area.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Static Postures

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

Repetition

- During walking, impact between the ground and the feet loads the plantar fascia. If the duration of walking is excessive, and recovery is not adequate, the fascia may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Loading of the lower extremities of the body may increase if the most frequently used controls are located away from the main work area. The worker may have to run or walk on hard surface to get to the controls in time to prevent jam-ups from occurring.

Floor Surfaces

- Loading on the lower extremities of the body may increase with some types of floor surfaces. Metal catwalks and concrete floors provide a hard surface to walk on. Walking or running on a hard surface for a long period of time could lead to fatigue in the muscles of the lower extremity.
- Frequent use of the stairs may cause increased impact load on the hip, knee, and ankle joints.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled "Foot" in the Summary of Solutions on pages 88 & 89.
- For exercises that can help to prevent ***foot*** injuries, see the ***Foot section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Strip Piler may look down and /or to the side in order monitor the flow, and straighten and sort the strips

NECK/SHOULDER

- A Strip Piler may lift piles of strips or dunnage in order to stack them into loads.

- A Strip Piler frequently works with the arms away from the body in order to gather and straighten the strips, operate controls, and remove waste strips.

SHOULDER

- A Strip Piler may work with the arms overhead in order to remove dunnage.

ELBOW/WRIST

- A Strip Piler may grip strips in order to manipulate, gather and sort them.

WRIST/HAND

- A Strip Piler strikes the strips with the palm of their hand when straightening the strips.

LOW BACK

- A Strip Piler frequently bends forward to stack strips and pile reject boards.

KNEE

- A Strip Piler frequently squats to strap a load, pile dunnage, and clean up.

FOOT

- A Strip Piler must walk and stand on a hard surfaces in order to pile dunnage, sort and pile strips, clean up work area, strap load and mark loads.

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.*

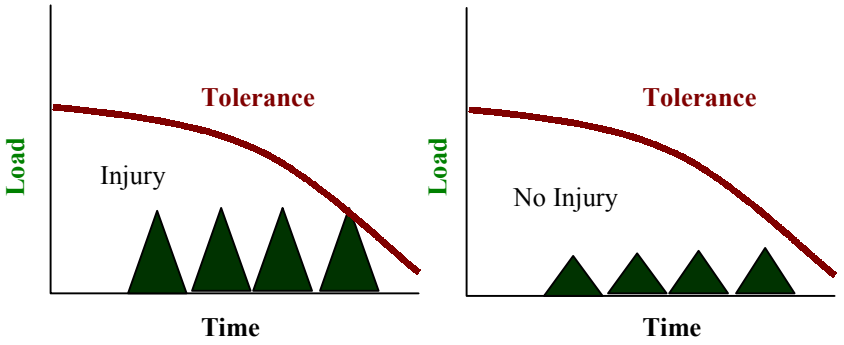
= Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 34 & 35 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

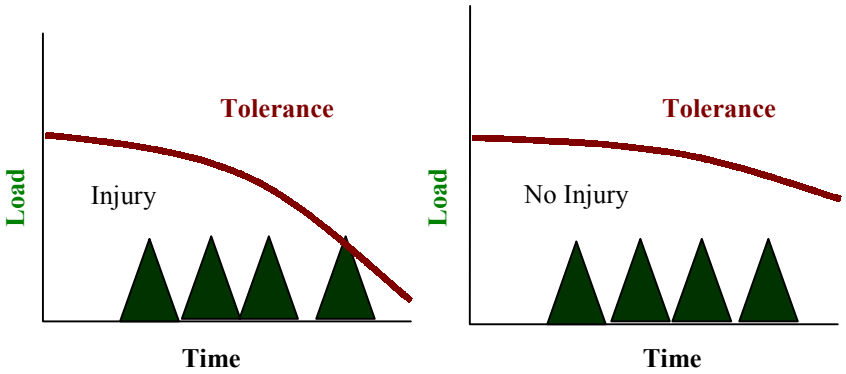
Injury Prevention

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 Piler 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.

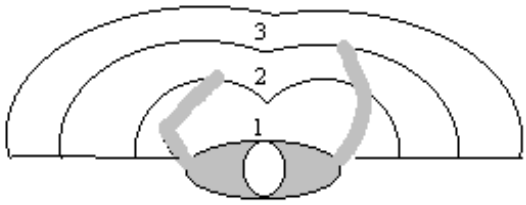
On the following pages, the icons next to the solution options indicate the type of risk control.

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. The increase in working reach may also be due to the container design (too wide and/or too far away), loads (too wide sometimes) and conveyor design (strips on the conveyors could be too far from the operator sometimes). The ideal would be to have all parts of the workstation easily accessible to the worker.



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.

Control location

E In order to reduce the need to reach to use the controls for the chains, reducing awkward postures of the neck, shoulders and lower back, place the controls closer to the operator and make the console height adjustable the height.

E In order to reduce repetitive and awkward movements when using the controls for the chains, look at feasibility of two control panels. One control panel would house controls that are used regularly on production runs, and one would include controls for set-ups, maintenance procedures, and speciality products.

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, knees 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 Piler, 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.

Working heights and reaches were identified as a risk factor for shoulder, wrist, and low back. When strip racks are filled too full, workers must reach above shoulder height (an awkward posture) to stack strips. Alternately, when the strip rack is approximately 1/3 full, the working height may be too low, causing workers to bend their backs while stacking strips (awkward and/or static posture).

The ideal working height when sorting and gathering strips is at waist level, slightly below elbow height. A good range of working heights is between hip and chest height.

Level of racks

A

In order to reduce awkward neck and shoulder postures while stacking strips, the strip rack should only be partially filled (i.e. two/thirds to three/quarters). This is so workers do not have to reach as high when stacking strips into the top of the rack. This will also help decrease the risk for injury at the Strip Layer station. If the strips start at a lower height, the Strip Layers won't have to reach as high to take them off of the top of the load.

Pallet Lifter

E

In order to reduce awkward and repetitive neck, shoulder, and low back postures, strip racks can be placed on a pallet lifter with a spring mechanism. This allows the strips to be stacked into the rack at the same height whether it is empty or full (i.e. as the strip cart empties, the spring-loaded pallet lifter rises).

Platforms

E

In order to reduce awkward neck, shoulder, and low back postures and repetitive movements at a Strip Piler station, build platforms for individual workers. This will bring workers up to the height of the load, reducing the stress on the shoulder. The edges of the platform should be clearly marked, as they may be a potential tripping hazard at the workstation.

Adjust chain heights

E

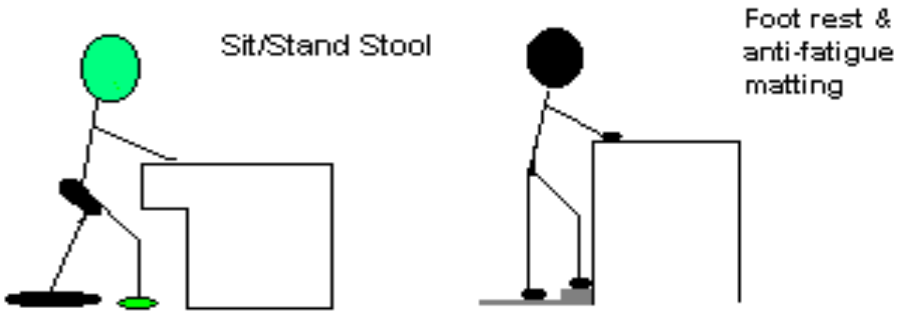
In order to reduce awkward and static neck, shoulder, and low back postures and repetitive movements at a Strip Piler workstation, increase the height of the chain if the worker has to stoop, and decrease the height if the worker is working at or above shoulder height. This will bring the load to the height of the worker, reducing stress on the neck, shoulder, and low back.

SEATING

Sit/stand stool & foot rests

E
WP

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



FLOOR SURFACES

Anti-fatigue matting

E

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

Anti-fatigue insoles

A
PPE

In order to minimise fatigue in the lower extremities anti-fatigue insoles can be worn by the worker. The use of anti-fatigue insoles in the worker's footwear will help to increase comfort and reduce muscle fatigue.

Appropriate footwear

PPE

In order to reduce contact stress or improving comfort of the foot, the worker should purchase appropriate footwear. See the guidelines for footwear in the Body Manual for the Foot.

Kneepads

PPE

In order to disperse contact stress on the kneecap when kneeling or squatting, use kneepads or wear coveralls with foam inserts in the knees.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Automation of strip piling

E

In order to reduce the force and repetition of handling strips when manually gathering and stacking them, automate the strip piling process. The automated process stacks the strips into the racks as they come off of the feed belt, therefore the operator would be required to handle fewer strips than manually stacking. Ideally the operator would only have to remove reject strips and monitor the flow of the strips into the racks. Note: In order to speed up the automatic stacking process, workers may want to handle the strips more than necessary, this may increase the workers chance of injury.

Guide for strips

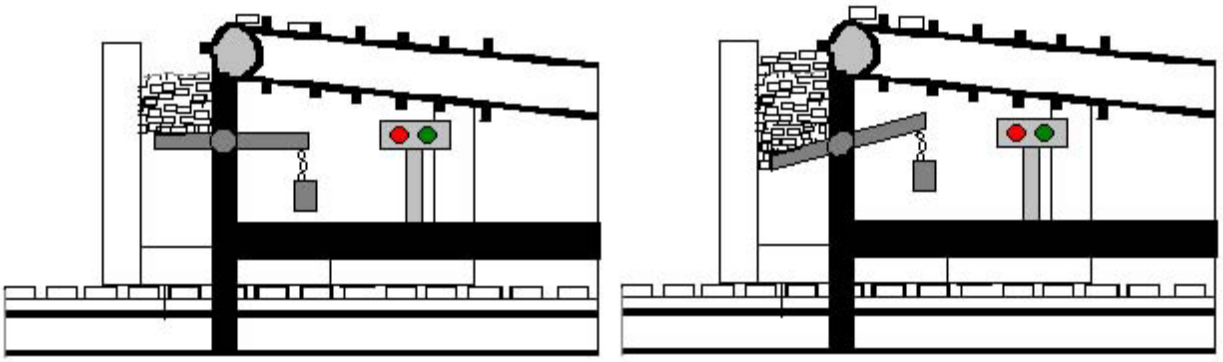
E

In order to reduce contact stress of the hand and awkward postures of the neck/shoulder and low back, add a guide from the top of the infeed chain that will reduce the number of cross-ups that occurs. The guide allows the strip to fall to the base of the rack straight. A flexible piece of rubber or a metal waterfall that guides the strips to the bottom of the cart is suggested to prevent strips from bouncing around when they fall.

Load starter

E

In order to reduce awkward postures of the neck, shoulder, and back and contact stress of the hand while starting a load at an automated system, add a counter-balanced bar mid–way up the load. With this device you can start the load at a greater height, and when sufficient weight is on the load, the bar will come down and the load will drop a short distance to the bottom of the carriage/rack. Since the load is only dropping a short distance, the strips should not cross.



Characteristics of Objects Being Handled

SIZE AND SHAPE

Number of strips

WP

In order to reduce the force and awkward posture of the elbow/wrist, reduce the number of strips handled. 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, hand, or low back discomfort. Decreasing the number of strips also reduces the weight handled, which lowers the grip force required to handle strips. Decreasing the number of strips handled each time does reduce the load on the upper extremities, however, it also increases the repetition. This must be considered if this technique is implemented.

Laminated plywood strips

A

To reduce force at the elbow/wrist, shoulder, and low back, lighter strips should be used, if this does not effect the quality of the lumber while drying. Some laminated plywood strips are available which are lighter than typical kiln strips. Although these lightweight strips are more expensive, they last approximately eight times longer than typical kiln strips. This would reduce the grip force required and reduce the load on the upper body due to the decreased weight of the loads handled.

LOAD CONDITION AND WEIGHT DISTRIBUTION

Load distribution

WP

To reduce the force and awkward postures of the low back and shoulders, decrease the number of strips carried. The number of strips carried affects the load condition and weight distribution of the load, with more strips creating less stable loads. The worker may have to assume awkward postures to accommodate for the shifting of the strips while carrying them. To reduce the chance of awkward postures when a load shifts, decrease the number of strips carried.

Environmental Conditions

Please refer to the General Risk Factor Solutions Manual for other solutions regarding environmental condition 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
Control location	**81**	**A**		**A**				**A**				**R**
Level of racks	**82**	**A**	**A**	**A**								
Pallet Lifter	**83**	**A R**	**A**	**A**				**A R**				
Platforms	**83**	**A R**	**A**	**A**				**A R**				
Adjust chain heights	**83**	**A R**	**A**	**A**				**A R**				
Sit/stand stool & foot rests	**83**	**A R**						**A S**				**S**
Anti-fatigue matting	**84**											**S**
Anti-fatigue insoles	**84**											**S**
Appropriate footwear	**84**											**S**
Kneepads	**84**									**C**		
Automation of strip piling	**85**		**A R F**		**A R F**		**C**	**A R 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 work techniques 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
Guide for strips	**85**		**A**				**C**	**A**				
Load starter	**85**		**A**				**C**	**A**				
Number of strips	**86**				**F**							
Laminated plywood strips	**86**		**F**		**F** **R**			**F**				
Load distribution	**86**		**A** **F**					**F** **A**				
Heat Exposure	◆	Indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Job Rotation	◆	indirectly reduces risk of injury to the body										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Postures*

S = *Static Postures* **C** = *Contact Stress* **V** = *Vibration*

◆ = *See General Risk Factor Solutions Manual*

STRIP PILER MSI SAFETY GUIDE

OBJECTIVE: To identify ergonomic risks involved in strip piling 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 Piler.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Strip Piler looks down and/or to the side in order to monitor the flow, and straighten and sort strips.	**Awkward Postures** **Repetition**	• 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. • Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons. • When the head is repeatedly turned to the side or bent forward/backward, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury.	• Try to vary neck postures as much as possible during the shift, to decrease chance for injury. For example, if you are constantly looking down, look up for about five seconds. This will help counter-act the injury mechanism. • 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 Strip Piler may lift piles of strips or dunnage in order to stack them into loads. A Strip Piler frequently works with the arms away from the body in order to gather and straighten the strips, operate controls and remove waste strips.	**Force** **Repetition** **Awkward Postures**	• Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object and/or greater the downward pulling force, the greater the load on the muscles and tendons. • When workers repeatedly lift piles of strips or dunnage, the muscles of the neck and shoulder are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury. • 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. • 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.	• To decrease the chance of awkward, forceful postures when the strips shift, decrease the number of strips carried. (Be careful when considering this suggestion as it may increase repetition at the work site.) • When possible try to minimise extra manual handling of the strips. For example wait for the strips to come to you instead of pulling the strips to you. • For exercises that can help prevent ***neck/shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder A Strip Piler may work with the arms overhead in order to remove dunnage.	**Awkward Postures** **Repetition**	• A rotator cuff tendon may rub up against bone (impingement) when the arms are lifted overhead. The friction between the tendon and the bone increases as the arm is lifted higher. In addition, the rotator cuff must stabilise the weight of the arms when working overhead, increasing the tension in the tendon. The combination of impingement and tension increases the stress on this tendon. • The rotator cuff tendon can fray from repeated rubbing against bone. If the repetitive stress is excessive, and recovery is not adequate, the tendon may fatigue to the point of injury.	• Try to decrease the weight of the load when working overhead. If usual practice is to grab two or more items, decrease that number to decrease the strain on your shoulder. • For exercises that can help prevent ***shoulder*** injuries, ***see Shoulder section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Strip Piler must grip strips in order to manipulate, gather and sort them.	**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 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 without adequate rest could slowly fatigue tissues to the point of injury.	• 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 decreases the weight handled, which also minimises the grip force required to handle strips. • For exercises that can help prevent ***elbow/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
	Wrist/Hand A Strip Piler strikes the strips with the palm of their hand when straightening the strips.	**Contact Stress**	• Contact between hard or sharp surfaces and the base of the palm places stress on the tendons and nerves in the carpal tunnel. • Continual contact with hard or sharp surfaces may damage the nerve and/or gradually weaken the tendons, and cause injury.	• Try to use tools or other strips to push in strips where possible. This will reduce the direct contact of the strip to the palm. • For exercises that can help prevent ***wrist/hand*** injuries, ***see the Wrist/Hand section of the Body Manual.***
	Low Back A Strip Piler frequently bends forward to stack strips and piling reject boards.	**Force** **Awkward Postures** **Repetition**	• Lifting increases the loading on the spine. Weight held in the hand is transmitted to the low back. The greater the weight, the greater the loading. • 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.	• To decrease the chance of awkward, forceful postures when the strips shift, decrease the number of strips carried. (Be careful when considering this suggestion as it may increase repetition at the work site.) • For exercises that can help prevent ***low back*** injuries, ***see the Back section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Knee A Strip Piler frequently squats to clean up, strap a load and pile dunnage.	**Awkward/ Static Postures** **Repetition**	• Bending the knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees. • Repeated squatting and kneeling may gradually irritate the knee. Irritation of the knee may lead to muscle wasting, which in turn leads to poor tracking of the knee cap on the thigh bone and increased contact stress between these bones.	• For exercises that can help prevent ***knee*** injuries, ***see the Knee section of the Body Manual***.
	Foot A Strip Piler must walk and stand on a hard surface in order to pile dunnage, sort and pile strips, clean up work area, strap load, and mark loads.	**Static Postures** **Repetition**	• While standing, the weight of the body loads the plantar fascia. If the duration of standing is excessive, and recovery is not adequate, the fascia may deform to the point of injury. • During walking, impact between the ground and the feet loads the plantar fascia. If the duration of walking is excessive, and recovery is not adequate, the fascia may fatigue to the point of injury.	• In order to ensure healthy foot alignment, purchase appropriate footwear. See the guidelines for footwear in the Body Manual for the Foot. • For exercises that can help prevent ***foot*** injuries, ***see the Foot section of the Body Manual***.