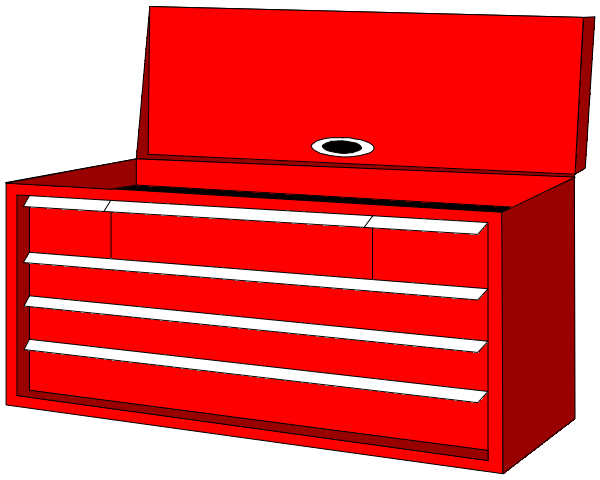
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

End Stacker Helper 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

END STACKER HELPER TOOL KIT
Table of Contents

Overview

End Stacker Helper

Job Summary

An End Stacker Helper is responsible for maintaining a constant flow of lumber to the End Stacker. The End Stacker Helper straightens lumber to ensure that the lugs are fed properly, turns lumber in order to inspect it for defects, clears any cross-ups or jam-ups that occur on the infeed deck, discards defective lumber, and controls the movement of infeed and outfeed conveyors. An End Stacker Helper may also be required to assist the Strip Layer and End Stacker. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the End Stacker Helper may include:

a) Forceful exertions of the shoulder, elbow and wrist
b) Repetitive and static postures of the neck
c) Frequent forward and lateral reaching involving repetitive movements of the shoulders, elbows, and wrists
d) Repetitive movements of the ankle
e) Awkward postures of the neck, wrist, shoulders, and back
f) Balancing while operating a foot pedal
g) Continuous standing on a vibrating surface
h) Pulling boards off the conveyor

Mental Demands

An End Stacker Helper has to make a judgement for every board. Rapid decision making is involved when deciding whether or not to pull waste lumber, and whether boards are properly oriented to feed into the End Stacker area. Response time is also required when clearing cross-ups or jam-ups. This job requires sustained alertness, constant visual inspection and continuous decision making. Most workers report feeling mentally fatigued after work.

Major Variations

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

1) An End Stacker Helper may be assigned other duties such as:
   a) Strip laying
   b) Painting and putting labels on loads
   c) Banding loads

Minor Variations

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

1) Discarding waste lumber:
   a) To the rear
   b) To the front
   c) Overhead

Physical Demands Analysis
End Stacker Helper

PDA General Instructions: End Stacker Helper

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of an End Stacker Helper. This PDA can be used to gather information about an individual's job and to assist in developing a rehabilitation and return-to-work plan. It is not intended for use in claims adjudication.

Where applicable, common industry job data (e.g., hand tools, tasks) have been included in the tables of this document. The information reported was collected from a sample of End Stacker Helpers in the BC Sawmill Industry. However, the PDA requires completion by the healthcare professional, with input from the injured worker to highlight tasks that aggravate the injury or prevent the worker from returning to their job. The worker's supervisor may be contacted for further information or verification of tasks.

A PDA should be filled out for each individual worker following an injury. Subsequent changes in the work process may reduce the accuracy of any pre-existing physical demands assessments.

PDA Table of Contents

Physical Demands Analysis
End Stacker Helper

Task List

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

Straightens lumber

If necessary, the End Stacker Helper straightens lumber so that it is properly oriented into the lugs.

Does this task occur at your mill?

☐ Yes ☐ No

Turns lumber

If necessary, the End Stacker Helper turns lumber in order to inspect it.

Does this task occur at your mill?

☐ Yes ☐ No

Clear cross-ups and jam-ups

A pike pole may also be used to push and pull boards.

Does this task occur at your mill?

☐ Yes ☐ No

In some situations, cross-ups and jam-ups are cleared by manually handling the lumber.

Does this task occur at your mill?

☐ Yes ☐ No

Discarding waste lumber

Waste lumber is pulled off of a conveyor into a drop chute behind the operator.

Does this task occur at your mill?

☐ Yes ☐ No

Waste lumber may also be pulled off of a conveyor and discarded to the front.

Does this task occur at your mill?

☐ Yes ☐ No

Waste lumber may also be pulled off of a conveyor and placed in a storage rack over top of the conveyor.

Does this task occur at your mill?

☐ Yes ☐ No

Control infeed/outfeed deck movement

Infeed/Outfeed chain movement is controlled using foot pedals.

Does this task occur at your mill?

☐ Yes ☐ No

Infeed/Outfeed chain movement is controlled using a control panel.

Does this task occur at your mill?

☐ Yes ☐ No

Job Profile

Date: _____

Company Name: _____ Division: _____

Employee Name: _____ Supervisor: _____

Phone: _____ Fax: _____

Is a Return-to-Work (RTW) strategy in place? ☐ Yes ☐ No

If yes, check all that apply: ☐ Modified Job ☐ Modified Worksite ☐ Graduated RTW

Describe:

_____

_____

_____

Length of shift _____ hours

Formal breaks
- ☐ Two 10 minute breaks
- ☐ One 30 minute lunch break
- ☐ Other: _____

Informal breaks
- ☐ Yes, length of break varies
- ☐ Yes, _____ minutes/shift

Work pace control
- ☐ Self-paced
- ☐ Time pressure (e.g., completing a task during the 30 minute lunch break)
- ☐ Other: _____

Job rotation

☐ Yes ☐ No

Describe:

_____

_____

_____

_____

Work Organisation

Task Description

The table below contains a list of tasks performed by an End Stacker Helper. Use the left column to check off (✓) tasks that are present. Estimate the *Percent of Shift* each task is performed and place a check mark (✓) in the appropriate column. The *Comments* section may be used to include information related to duration, frequency, and cycle times. Additional tasks can also be included under *Other*.

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Straighten boards					• *Frequency is 2 to 30 times per minute*
	Turn boards					• *Frequency is 1 to 30 times per minute*
	Clear cross-ups and jam-ups					• *Frequency is 1 to 5 times per minute*
	Pull waste lumber					• *Frequency is 1 to 12 times per minute*
	Control infeed/outfeed					• *Using foot pedal or hand control*
	Other:					

Workstation Characteristics

Dimensions & Layout

Sketch workstation(s) and indicate relevant measurements, such as working heights and reaches.

Flooring, Displays & 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. For the *Seating* section, describe and identify the features of the seat, if applicable. The *Comments* section may be used to include additional information, especially any workstation characteristics of concern.

Workstation Characteristics	**Comments**
Flooring *(Check all that apply)* ☐ Cement ☐ Wood ☐ Rubber matting ☐ Metal ☐ Other: _____	
Displays *(Check all that apply)* ☐ Lights on console ☐ Mirrors ☐ Video monitors ☐ Computer monitors ☐ Scrolling display ☐ Signal lights ☐ Other: _____	
Seating *(Check all that apply)* ☐ Armrests ☐ Backrest ☐ Swivel seat ☐ Slide track ☐ Lumbar support ☐ Foot rest ☐ Casters #: _____ *Indicate if adjustable:* ☐ Height ☐ Armrests ☐ Backrest ☐ Forward tilt	Height of seat: _____ cm Depth of seat: _____ cm Width of seat: _____ cm Covering type: _____

Equipment & Machinery Controls

The table below contains a list of the types of controls used by an End Stacker Helper. Use the left column to check off (✓) controls that are present at the work site. Highlight controls that may aggravate the injury, or which the worker finds difficult to use. The *Comments* section may be used to include any additional information. Additional controls can be included under *Other*.

	Type of Control	**Function**	**Comments**
	Foot pedals	• *Unscrambler* • *Pin stop* • *Lift skids* • *Chain advance with skid lift*	• *Frequency is 1 to 20 times per minute* • *0 to 3 pedals used*
	Push buttons	• *Unscrambler* • *Sideways table jog*	
	Rotary selector switch	• *Disable transfer deck*	
	Other:		

Physical Demands

Whole Body Physical Demands

Identify each of the physical demands required by an End Stacker Helper and list the corresponding tasks in the second column. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, and cycle times.

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%	
Example: Standing	• *Straighten and turn boards*				✓	
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

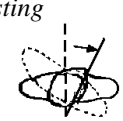
The table below outlines the body postures that may be adopted throughout the shift by an End Stacker Helper, related to tasks. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Example: Forearm rotation	• *Turn boards*				✓	• *Frequency is 12 times per minute*
Neck						
Flexion 						
Extension 						
Twisting 						
Shoulder						
Flexion 						
Abduction/ adduction 						
Extension 						

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm						
Rotation 						
Wrist						
Wrist Movements 						
Hand/Fingers						
**Handling*						
**Fingering*						
**Gripping*						

Legend for Hand/Fingers

Handling	*Grasping, turning, holding, etc.*			
Fingering	*Picking, pinching, etc.*			
Gripping	*Power* 	*Pinch* 	*Hook* 	*Precision* 

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back						
Flexion 						
Lateral Flexion 						
Twisting 						
Extension 						

Manual Material Handling

The table below contains a list of general manual material handling activities performed by an End Stacker Helper. Indicate tasks that require one or more of these activities, and fill in the weight of the objects, or the force required, for each action. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled. If necessary, please refer to Appendix A to calculate the weight of the wood being handled.

Activity	Task Description	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Pushing and pulling	• *Straighten lumber on conveyor*	*See weight of wood equation*					• *Lumber is pushed and pulled at the height of the conveyor* • *One or both hands are used*
Pushing and pulling	• *Clear cross-ups or jam-ups with pike pole or picaroon*	*See weight of wood equation*					• *Frequency of task is 1 to 20 times per hour* • *One or both hands are used*
Lifting	• *Lift lumber to straighten or flip*	*See weight of wood equation*					• *Lumber is pushed and pulled at the height of the conveyor* • *One or both hands are used*
Carrying							

Hand Tools

Indicate the hand tools used by an End Stacker Helper by placing a check mark (✓) in the far left column. Determine the weight of the hand tool and enter it in the appropriate column. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled.

	Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Pike pole	• *Clear cross-ups or jam-ups*						
	Picaroon	• *Clear cross-ups or jam-ups*						
	Other:							

Environmental Conditions

Work Environment

The table below contains a list of environmental conditions that may be of concern. If any of these factors aggravate the injury, describe in the *Comments* section.

Factor	Comments
Vibration *(Indicate source)* ☐ Seat ☐ Floor ☐ Tool ☐ Other: _____	
Noise level	
Lighting level	
Other:	

Location of Workstation

The table below contains a list of potential work environments. Indicate with a check mark (✓) in the left column which of the work environments apply to the specific workstation. For example, the workstation may be inside a building with both a local fan and heater, exposed to the outside by a doorway that is always open. In this situation, 'Inside exposed', 'Heater present', and 'Fan present' would all be checked.

	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. 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 End Stacker Helper at your mill, indicate with a check mark (✓) which of the PPE items are required.

	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.

	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.

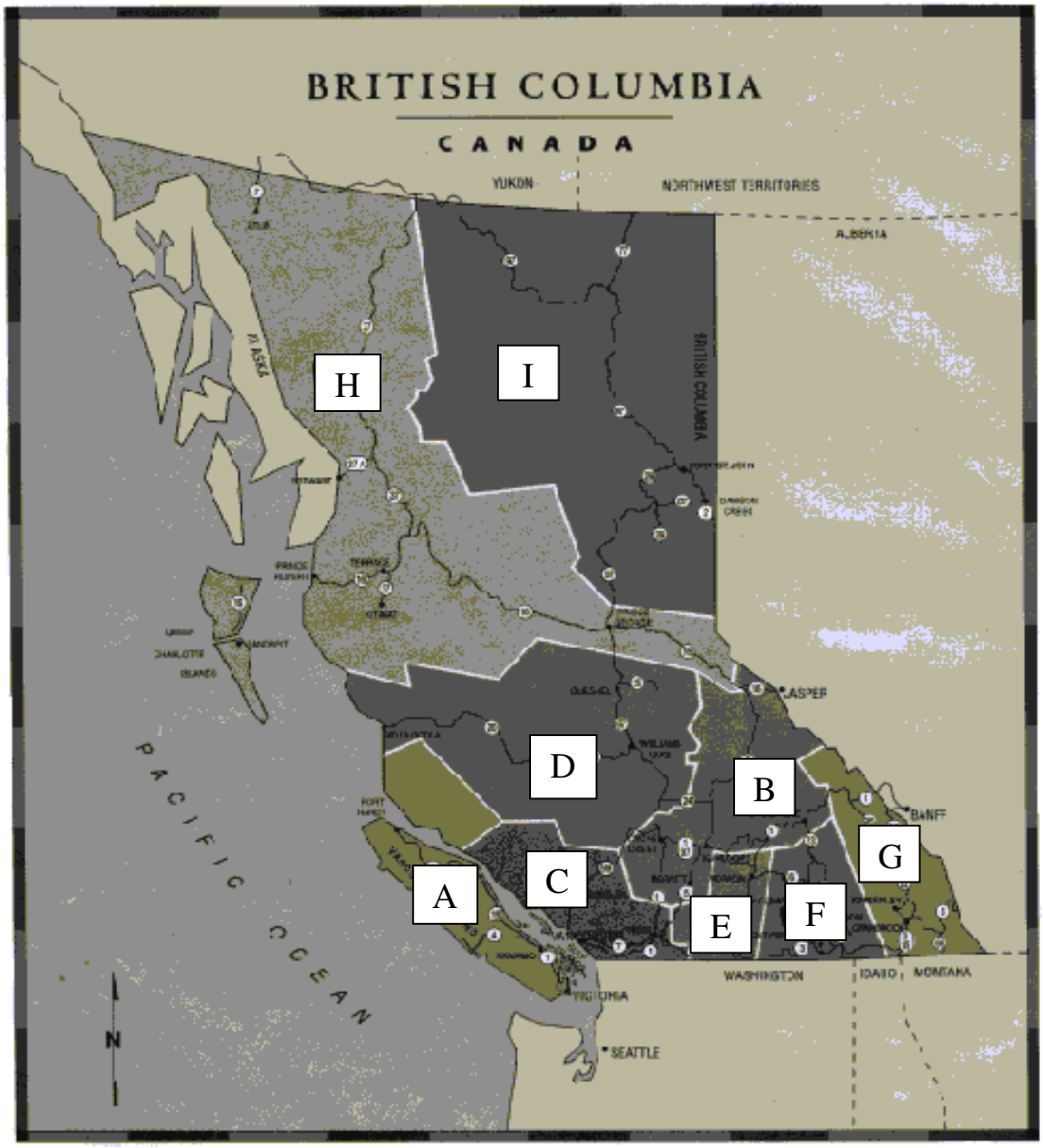
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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
End Stacker Helper

Purpose

The Risk Factor Identification Checklist for an End Stacker Helper 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 – End Stacker Helper

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.

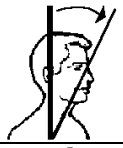
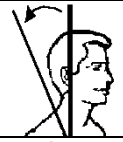
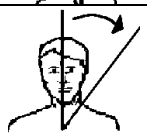
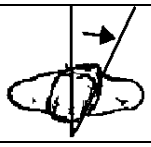
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

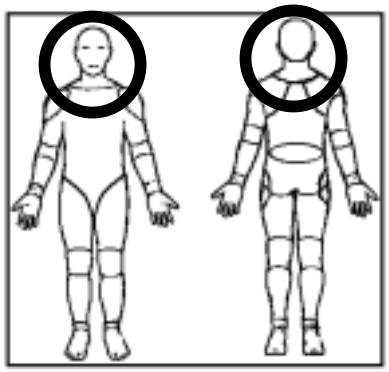
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 sideways frequently)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., monitoring infeed)				S O	
Static Posture					
Ask the worker: Do tasks require your neck or shoulders to be maintained in a fixed or static posture? (e.g., looking down at a lumber for a long period)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

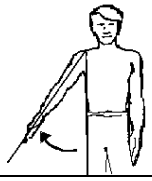
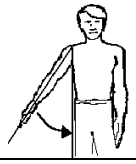
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



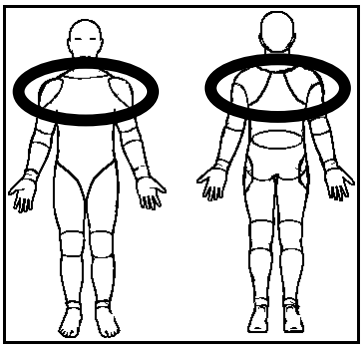
Body parts within the circled area will be classified as NECK issues.

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., turning boards)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., holding arms out to the side)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			S O	

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

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



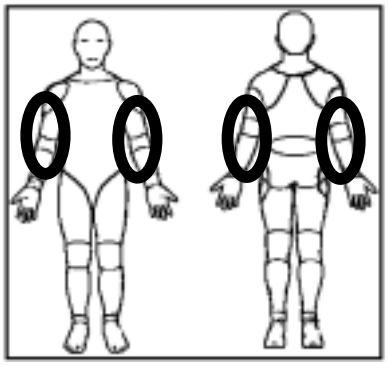
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

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

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

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



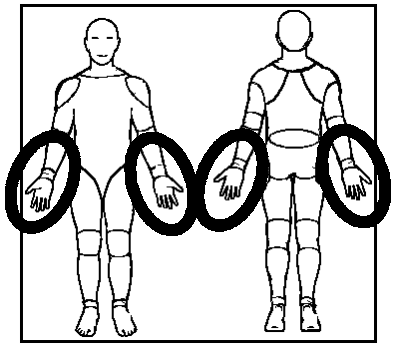
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

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

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

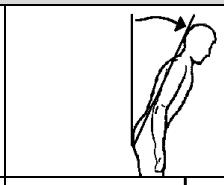
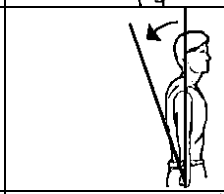
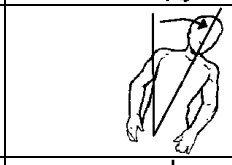
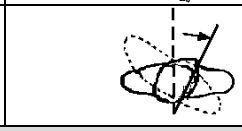
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



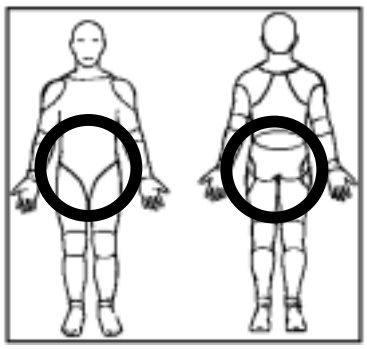
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again?			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., bending forward repetitively)			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., holding a forward bent position of the trunk)			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., conveyors that dig into the hip or thigh)			S O	

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

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

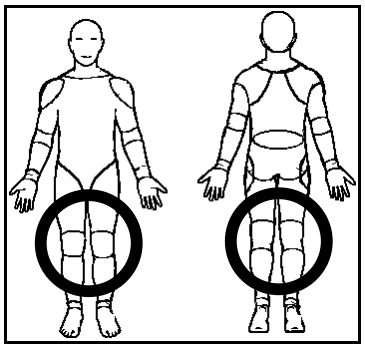


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., climbing stairs, crouching)			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture? (e.g., crouching)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Do workers kneel (with one or both knees)?			S O	
Contact Stress				
Ask the worker: Do **any** objects or parts of the workstation put pressure on your knee(s)? (e.g., kneeling on a hard surface)			S O	
Awkward Posture				
Extreme Flexion 			S O	

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

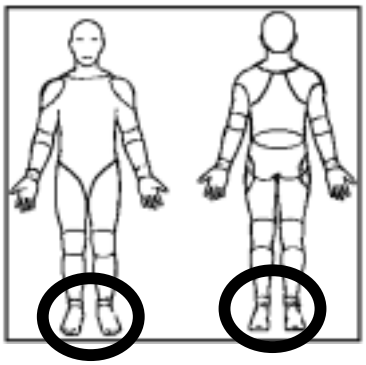


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., walking on uneven surfaces)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift?			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on a hard 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? (e.g., large pieces of lumber)			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? (e.g., hoists)			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., pike poles, picaroons)			S O	
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is **No**, check the **No** box and go to the next section.			S O	
If the answer to the above question is **Yes**, ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O	

ENVIRONMENTAL CONDITIONS

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

ENVIRONMENTAL CONDITIONS [CONTINUED]

Noise	N	Y		Comments:
Have there been complaints on the level of noise in the work area?			S O	
Ask the worker: Are there any distracting or annoying noises at the workstation? (e.g., air hoses, machinery)			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

End Stacker Helper

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

End Stacker Helper

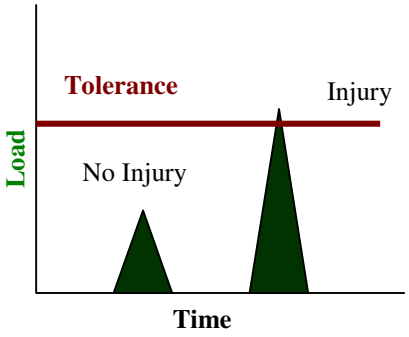
Disclaimer

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

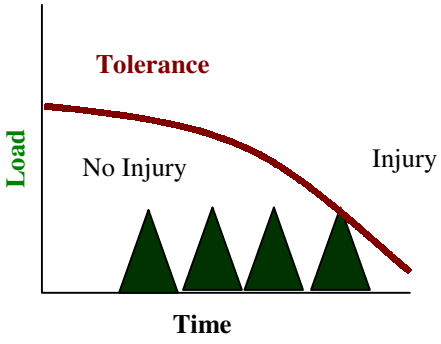
Injuries occur when …
Loads exceed tissue tolerances



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.

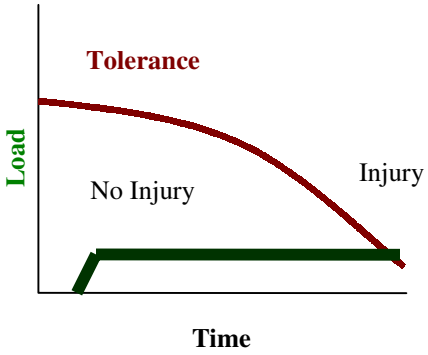
Example – a worker going over on their ankle and spraining it.



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 End Stacker Helper 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 End Stacker Helper. 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.

Major Risk Identification

IMIRP ergonomists have assessed the End Stacker Helper position and found that the elbow/wrist, shoulder, neck, and low back are the body parts of major concern while performing their duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

Elbow/Wrist: Major risks include force, awkward posture, and repetition with the elbow and/or wrist while turning boards, pulling boards, and unjamming cross-overs.

The following solutions are targeted at reducing the risk of injury to the elbow and/or wrist:

1. Camel back chains (page 92)
2. Drop gate (page 92)
3. Pin stops (page 92)
4. Maintenance of rollers
5. Alternating hands (page 98)
6. Alternating sides (page 98)
7. Avoid forceful forearm rotation (page 98)
8. Avoid over-gripping (page 98)
9. Board turner (page 98)
10. Neutral wrist position (page 98)
11. Two hands at once (page 99)
12. Turn boards in opposite direction (page 99)
13. Unnecessary handling (page 99)
14. Use entire body (page 99)
15. Pike pole use (page 99)
16. Modify tool handle friction (page 100)
17. Sticky palm gloves (page 100)

Shoulder: Major risks include force, awkward posture, static posture, and repetition with the shoulder while turning boards, pulling boards, and unjamming cross-overs.

The following solutions are targeted at reducing the risk of injury to the shoulder:

1. Camel back chains (page 92)
2. Drop gate (page 92)
3. Pin stops (page 92)
4. Maintenance of rollers
5. Alternating hands (page 98)
6. Alternating sides (page 98)
7. Avoid forceful movements (page 98)
8. Board turner (page 98)
9. Two hands at once (page 99)
10. Turn boards in opposite direction (page 99)
11. Unnecessary handling (page 99)
12. Use entire body (page 99)
13. Pike pole use (page 99)

Neck: Major risks include awkward posture, static posture and repetition with the neck while viewing the infeed and monitoring for jam-ups.

The following solutions are targeted at reducing the risk of injury to the neck:

1. Convex mirror (page 93)
2. Twist at the trunk (page 96)
3. View with eyes (page 96)
4. Stretches (page 94)

Low Back: Major risks include force, awkward posture, and repetition while turning boards, pulling boards or clearing cross-ups. Vibration and hard floor surfaces may contribute to the risk of discomfort or injury.

The following solutions are targeted at reducing the risk of injury to the low back:

1. Adjustable floor height (page 88)
2. Braced postures (page 89)
3. Anti-fatigue matting (page 89)
4. Anti-fatigue insoles (page 89)
5. Camel back chains (page 92)
6. Avoid forceful movements (page 98)
7. Board turner (page 98)
8. Two hands at once (page 99)
9. Turn boards in opposite direction (page 99)
10. Unnecessary handling (page 99)
11. Use entire body (page 99)
12. Pike pole use (page 99)
13. Drop gate (page 92)
14. Pin stops (page 92)
15. Maintenance of rollers
16. Power positions (page 97)
17. Manual material handling
18. Use entire body (page 99)
19. Pike pole use (page 99)

For additional stretching and strengthening exercises that would benefit an End Stacker Helper, refer to the Elbow, Wrist, Shoulder, Neck, and Back sections of the Body Manual.

NECK

Direct Risk Factors:
Awkward Postures
Static Postures

An End Stacker Helper may hold the head forward to inspect lumber.

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 is bent, the greater the load on the muscles and tendons.

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the neck muscles is increased because the head is held in a forward bent position when inspecting lumber at a low height.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 102 to 104.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK

Direct Risk Factors:
Repetition
Awkward Postures

An End Stacker Helper must repeatedly turn the head in order to view the infeed and monitor for jam-ups.

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

Repetition

- When the head is repeatedly turned to the side, 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.

Awkward Postures

- Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons.

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the neck muscles is increased because the orientation of the worker, with respect to the infeed, requires the operator to repeatedly twist the neck in order to monitor the work area.

CONSEQUENCES

- When the head is repeatedly turned to the side, 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 102 to 104.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Force
Repetition
Awkward Postures
Static Postures

An End Stacker Helper must turn boards in order to inspect pieces while the arms are held away from the body.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

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.

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The awkward arm postures of the End Stacker Helper can become more extreme if the transfer deck is too high for the operator. These extreme postures can lead to an increased risk of injury in the shoulder and neck tissues.

Characteristics of Objects Being Handled

Size and Shape

- Larger boards require more force from the End Stacker Helper when turning. This increased force can lead to injury, especially when it is repetitive.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 102 to 104.
- 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:
Force
Repetition
Awkward Postures

An End Stacker Helper may pull boards in order to remove waste pieces.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- An End Stacker Helper is required to pull waste lumber arriving at the workstation, forcing the arm to be extended back away from the body repeatedly throughout the day. The injury risks of this posture may be more significant if the workstation in not designed to suit the worker.

Characteristics of Objects Handled

Size and Shape

- The size and shape of the board may affect how the worker handles the board. The larger the board, the greater the force that is needed to manipulate the board.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled "Shoulder" in the Summary of Solutions on pages 102 to 104.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Force
Awkward Postures

An End Stacker Helper may reach forward with a pike pole or picaroon in order to clear cross-ups.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

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

INDIRECT RISK FACTORS

Characteristics of Objects Handled

Size and Shape

- The length of the tool used can affect the degree of awkward posture. The weight of the tool can affect the amount of force required.

CONSEQUENCES

- If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.
- Signs and symptoms include pain, tenderness, and decreased range of motion and strength in the shoulder joint.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled "Shoulder" in the Summary of Solutions on pages 102 to 104.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Repetition
Awkward Postures

An End Stacker Helper must grip boards in order to turn pieces.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

- The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection.

- The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip. Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Larger pieces of lumber require more force to turn. An End Stacker Helper uses a wider grip span to turn larger pieces, which can increase the force in the forearm and elbow.

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 102 to 104.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

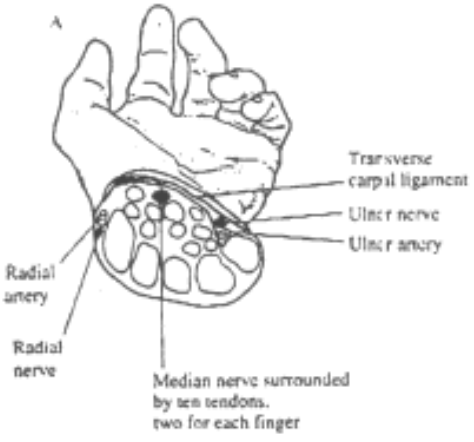
WRIST

Direct Risk Factors:
Force
Repetition
Awkward Postures

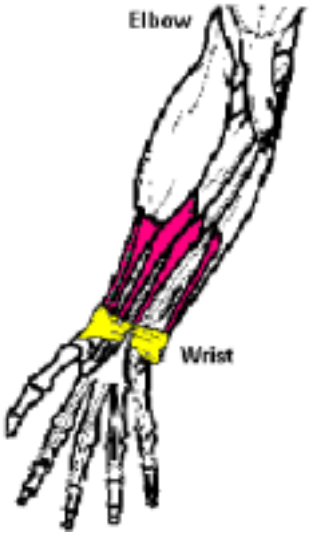
An End Stacker Helper may grip boards with the wrists bent in order to turn pieces.

BACKGROUND INFORMATION

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



The Carpal Tunnel



DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height of the workstation relative to the operator may affect the wrist posture.

Environmental Conditions

Cold Exposure

- Exposure to cold temperatures in combination with the above noted direct risk factors can increase the likelihood of injury to the wrist.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Wrist, please see the column labelled “Wrist” in the Summary of Solutions on pages 102 to 104.

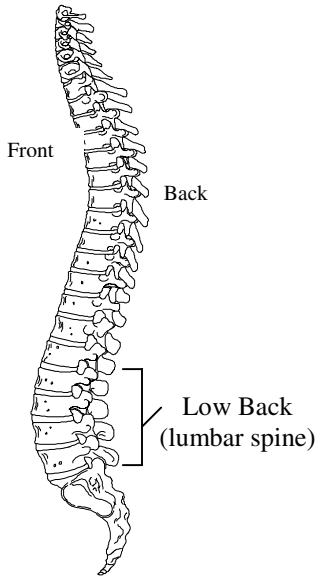
LOW BACK

Direct Risk Factors:
Force
Repetition
Awkward Postures

An End Stacker Helper may bend forward and to the side in order to reach pieces and clear cross-ups.

BACKGROUND INFORMATION

Neutral Spine



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

DIRECT RISK FACTORS

Force

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

Repetition

- Repeated forward or side 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.

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- The width of the conveyor and height of the operator affect the amount of forward lean required.

Working Heights

- The height of the conveyor in relation to the height of the worker affect the amount of forward lean required.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 102 to 104.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

LOW BACK

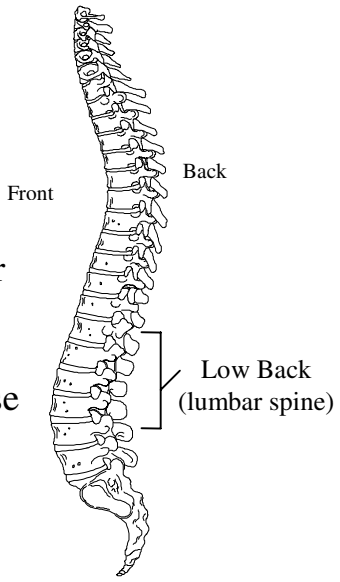
Direct Risk Factors:
Vibration

An End Stacker Helper continually stands on a vibrating surface.

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. Sitting will cause the pelvis to rotate out of a neutral posture, as the lumbar spine will flatten.

Neutral Spine



DIRECT RISK FACTORS

Vibration

- Whole body vibration is usually transmitted through the floor into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged standing while on a vibrating surface may contribute to the gradual weakening of the lumbar discs.

INDIRECT RISK FACTORS

Workstation Design

Floor Surfaces

- Hard floor surfaces contribute to low back discomfort.

Environmental Conditions

Vibration

- Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged standing on a vibrating surface may contribute to the gradual weakening of the lumbar discs.

Work Organisation

Task Variability

- Loading to the low back is increased if the End Stacker Helper does not have the opportunity to rotate to positions that do not require standing on a vibrating surface.

CONSEQUENCES

- Continually standing on a vibrating surface may lead to deformation in the disc walls and accelerated degeneration of the tissues.
- Signs and symptoms 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 102 to 104.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

HIP

Direct Risk Factors:
Force
Static Postures

An End Stacker Helper may balance on one leg while standing to operate a foot pedal control.

BACKGROUND INFORMATION

- The hip is designed for stability, as a result of the architecture of the bones. Muscles also contribute to the stability of the hip joint. Range of motion in the hip joint is primarily determined by the flexibility of muscles and soft tissues in this region.

DIRECT RISK FACTORS

Force

- Balancing on one leg requires the muscles surrounding the hip bearing the weight to contract and stabilise the weight of the whole body. This leads to an increased force being placed on the load-bearing hip.

Static Posture

- Balancing on one leg for prolonged periods requires the muscles surrounding the hip bearing the load to remain tense. With no time allowed for recovery, the constant state of tension in the hip muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height of the foot pedals can increase the amount of weight, which must be supported by the opposite leg.

CONSEQUENCES

- Repeated balancing on one side of the body can lead to muscle imbalance at the hip. This muscle imbalance may lead to excessive loading, which may cause degenerative changes in the hip, and possibly the knee and low back.
- Signs and symptoms include pain in the area around the hip joint and stiffness to one side. Muscle weakness in the affected side may also be noticed.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Hip, please see the column labelled “Hip” in the Summary of Solutions on pages 102 to 104.

ANKLE

Direct Risk Factors:
Repetition
Awkward Postures

An End Stacker Helper frequently activates foot pedals in order to control the infeed conveyor.

BACKGROUND INFORMATION

- The muscle responsible for pulling the foot upwards is found in the front of the shin. Its tendon runs beneath thick bands at the ankle before attaching to the foot bones.

DIRECT RISK FACTORS

Repetition

- Repetitive use of foot pedals may gradually cause small tears in the muscle on the front of the shin. If the repetitive stress is excessive, and recovery is not adequate, the small tears in the muscle on the front of the shin may progress to a more significant problem.

Awkward Postures

- Lifting the foot to activate a foot pedal puts the ankle into an awkward posture, which increases the loading in the muscle on the front of the shin. The further away from the neutral posture the ankle is, the greater the loading to this muscle. If the shoes worn are rigid or heavy, the loading is also increased.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Foot pedals with more height require larger ankle movements, increasing the risk of injury.

CONSEQUENCES

- Repeated use of foot pedals can cause damage to the tissues in the shin.
- Signs and symptoms include inflammation, and pain with walking.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Ankle, please see the column labelled “Ankle” in the Summary of Solutions on pages 102 to 104.

FOOT

Direct Risk Factors:
Static Postures
Vibration

An End Stacker Helper may continually stand on a hard, vibrating surface.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Static Postures

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

Vibration (whole body)

- Vibrating floors can increase the loading on the foot. Factors like vibration level and vibration frequency increase the amount of loading on the foot, and could lead to irritation. The longer the End Stacker Helper is exposed to vibration, the greater the risk of injury.

INDIRECT RISK FACTORS

Workstation Design

Seating

- The absence of appropriate seating at a workstation can require an End Stacker Helper to use a standing work posture all shift, increasing the loads on the feet.

Floor Surfaces

- Floors that are too hard can increase the vibration transmission to the feet. Uneven flooring can also cause discomfort in the feet with static standing.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled "Foot" in the Summary of Solutions on pages 102 to 104.
- For exercises that can help to prevent ***foot*** injuries, see the ***Foot section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- An End Stacker Helper may hold the head forward to inspect lumber.

- An End Stacker Helper must repeatedly turn the head in order to view the infeed and monitor for jam-ups.

NECK/SHOULDER

- An End Stacker Helper must turn boards in order to inspect pieces while the arms are held away from the body.

SHOULDER

- An End Stacker Helper may pull boards in order to remove waste pieces.

- An End Stacker Helper may reach forward with a pike pole or picaroon in order to clear cross-ups.

ELBOW/WRIST

- An End Stacker Helper must grip boards in order to turn pieces.

WRIST

- An End Stacker Helper may grip boards with the wrists bent in order to turn pieces.

LOW BACK

- An End Stacker Helper may bend forward and to the side in order to reach pieces and clear cross-ups.

- An End Stacker Helper continually stands on a vibrating surface.

HIP

- An End Stacker Helper may balance on one leg while standing to operate a foot pedal control.

ANKLE

- An End Stacker Helper frequently activates foot pedals in order to control the infeed conveyor.

FOOT

- An End Stacker Helper may continually stand on a hard, vibrating surface.

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	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

** 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*

*** 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.*

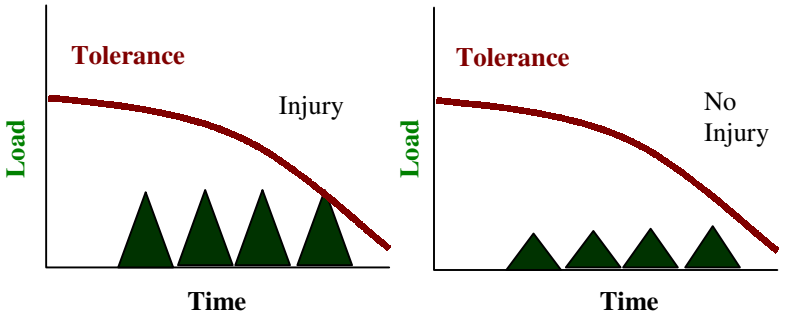
= Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 102 to 104 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

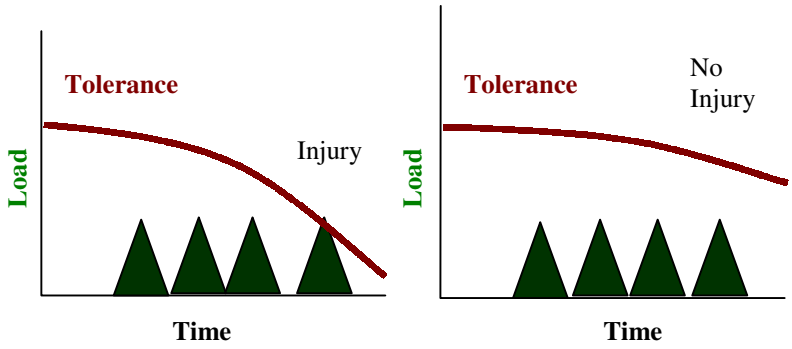
Injury Prevention

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 End Stacker Helper job. The solutions are presented under the headings of Workstation Design, Characteristics of Objects Being Handled, Environmental Conditions, and Work Organisation.

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

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

Risk Control Key

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

E

ENGINEERING CONTROLS

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

A

ADMINISTRATIVE CONTROLS

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

WP

WORK PRACTICE CONTROLS

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

PPE

PERSONAL PROTECTIVE EQUIPMENT

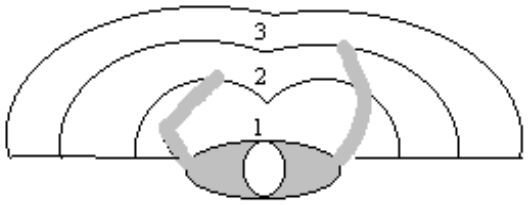
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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

Workstation Design

WORKING REACHES

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



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

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

WORKING HEIGHTS

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

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

To determine the appropriate work height specific for the End Stacker Helper, 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.

Adjustable floor height

E

A workstation that is adjustable in height would be preferable for multiple End Stacker Helpers. This can be accomplished in two ways:

1) Platforms can be built for individual workers if the height of the chain is above hip height. This will bring the workers up to the height of the chain, reducing the stress on the shoulder from awkward postures. The edges of the platform should be clearly marked, as the platform may be a potential tripping hazard at the workstation.

2) A pneumatic floor that the operator can adjust to a height that is optimal, can also minimise awkward shoulder and back postures. The difference in height should be apparent for the worker, as this may be a potential tripping hazard if the height difference is not well marked.

Braced postures

WP To reduce the load on the low back, an End Stacker Helper should use the safety rail or guard to brace the lower body. When reaching forward, bracing the lower body against the safety rail or guard reduces the amount of muscle activity in the low back. The safety rail or guard should be padded to avoid excessive contact stress. The End Stacker Helper should try to use a free arm to support the upper body when possible.

FLOOR SURFACES

Anti-fatigue matting

E In order to minimise fatigue in the low back and 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. In addition, anti-fatigue matting may also aid in damping vibration levels.

Anti-fatigue matting is a practical solution when a worker spends a majority of their time in one area, and the matting does not hinder the safety of the worker or the performance of the task.

Anti-fatigue insoles

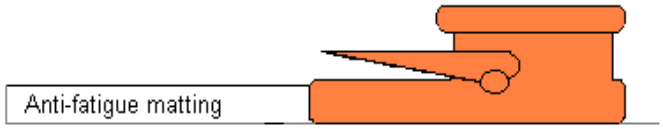
PPE If a worker must stand in several different areas for long periods of time, in order to minimise fatigue in the lower extremities, it may be more practical to use anti-fatigue insoles in work boots. The cushioned surface of the insole can absorb repeated impact from walking on metal catwalks, and may aid in damping vibration while standing in one spot.

FOOT PEDALS

Recessed foot pedals

E

In order to minimise awkward postures of the ankle and to decrease the amount of weight supported by the opposite leg, recess foot pedals into anti-fatigue matting to decrease the height of the foot pedal base. To recess foot pedals, and provide a more comfortable standing surface in the process, position anti-fatigue matting as close as possible to the foot pedal base. If the pedals are stationary, cut the matting to surround the front of the foot pedal. For moveable foot pedals, place the matting as close to the base of the foot pedal as possible. The height of the matting should not exceed the base of the foot pedal (see diagram below). It is important to ensure pedals are kept clean of debris and are well maintained.



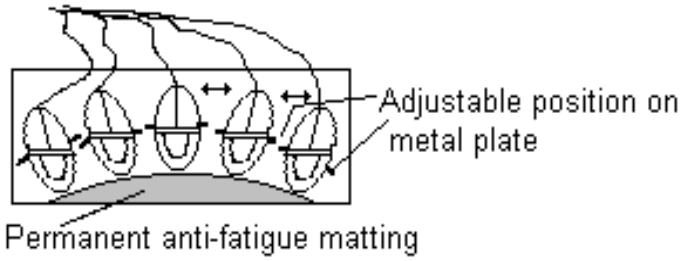
Moveable foot pedals

E
WP

In order to reduce awkward postures of the lower extremities, allow operators to choose the most appropriate position for the pedals, based on their body dimensions and the workstation design.

Securing the foot pedals may be required or desirable. Three solutions include:

1) Providing moveable foot pedals on a metal plate. The foot pedals are positioned in slide tracks cut into the metal, which allow pedals to move into the desired positions. The pedals are then fastened into place. The operator is able to move the set of foot pedals to any desired position in the workstation.



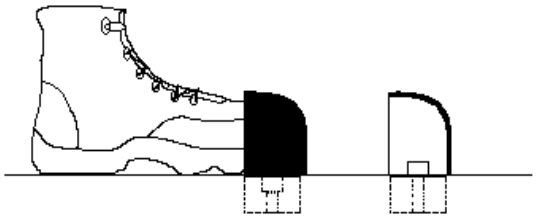
2) Providing several positions on the floor where clips or nails may be used to secure foot pedals. If this option is considered, make sure each possible position is highly visible to all operators, to prevent tripping or injuries.

3) Providing a physical link (e.g., a metal bar) between two foot pedals with the same function. This solution will allow the End Stacker Helper to alternate feet throughout the day, thereby equally distributing the load which is placed on the supporting leg (thus reducing duration of force at the hip joint).

Foot push buttons

E

In order to eliminate awkward ankle postures, foot buttons can be chosen over foot pedals in certain circumstances. In general, foot controls leave the upper body free to manipulate or handle items, while still maintaining control over the process or equipment. For processes or equipment that require a control to produce a discrete action (e.g., on/off, start/stop) or maintain a continuous process (e.g., movement of a chain), a foot push button may be appropriate. The desired operation (e.g., chain running) is easily activated by the weight of the operator on the push button. When the foot is removed, the switch is deactivated, causing the process to stop. For safety reasons, a foot push button needs to be protected from accidental activation. A guard, similar to those used on foot pedals, may be appropriate.



Alternate toe-heel activation

WP

In order to decrease repetitive and awkward postures, alternate using the toe of the foot and the heel of the foot to activate the foot pedals. This will use more muscles of the leg, increasing circulation in this area.

Appropriate footwear

PPE

In order to ensure healthy foot alignment, purchase appropriate footwear. Some additional features to consider include a good tread on the sole to prevent slipping on work surfaces. See the guidelines for footwear in the Foot section of the Body Manual.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Camel back chains

E

Boards may cross up at the workstation for a number of reasons. When they do cross up, the End Stacker Helper must exert force to uncross them. Uncrossing boards may also place the End Stacker Helper in awkward postures, placing stress on the shoulders, back, elbows, and wrists. By using camel back chains on the transfer deck, the number of cross-ups that occur at the workstation may be reduced. Since the camel back chains are smooth on the top they decrease the potential for large slivers on the wood getting caught in the chain, pulling the load out of alignment.

Drop gate

E

Add drop gates in place of power rollers or conveyors. When using the drop gate, unnecessary wood handling can be decreased because the worker no longer has to lift the lumber up, over, and into the waste conveyor. Power rollers aid in the movement of the lumber, but can cause unnecessary strain to the hands, arms, and shoulders if the worker does not let go of the lumber before the roller catches it.

Pin stops

E

End Stacker Helpers often have to exert force while in awkward postures to clear cross ups and turn lumber. This increases the risk of injury to the low back, shoulder, elbow, and wrist. Adding pin stops to the workstation can aid in flipping the larger pieces of lumber, if the pins are located close to the workstation. By having one end of the board over the pin (which is activated by the worker), the initial force needed to lift the lumber is decreased. This decreases the stress on the shoulders, elbows, and wrists.

Pins placed farther away from the workstation will allow the End Stacker Helper to have more control over the level or flow of lumber coming in to his/her workstation at once. For example, the operator would be able to straighten lumber that is coming in at an angle. This would decrease the risk of injury at the shoulder and low back.

Convex mirror

E

The End Stacker Helper may have to monitor the flow of product coming into the workstation. To do this, repetitive neck twisting is required, placing strain on the neck muscles and putting the worker at risk for an injury. To decrease this motion, install a convex mirror to give an overall view of the work areas. Only when a problem occurs does the operator have to turn their head to assess the corrective action necessary.

Mirrors increase the range of view for the worker, reducing awkward postures and decreasing the risk of injury.

Additional Work Practices

Stretches

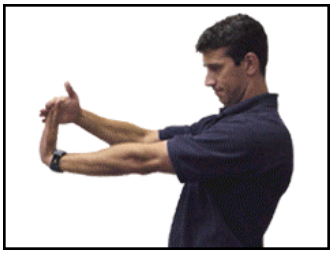
WP In order to minimise awkward and static posture of the neck, shoulder, wrist and low back, stretch these body parts throughout the day to enhance tissue tolerance for those muscle groups.

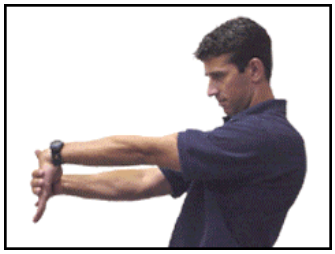
Chin Tuck (neck)
With your head upright, tuck chin in. You should feel a gentle stretch, in the back of the neck. Hold for 20 seconds and then relax. Repeat 3 times.


Shoulder Stretch
Gently pull elbow towards opposite shoulder. Stretch to the point of mild tingling and not beyond. When the tingling subsides deepen the stretch. Repeat until full range of motion is achieved.

Upper Back & Chest Stretch
Place the hands together in front of the body and push them outwards. Bring the arms behind the body and squeeze the shoulder blades together while pressing the shoulders down and keeping the chin tucked in. Repeat 5 times.

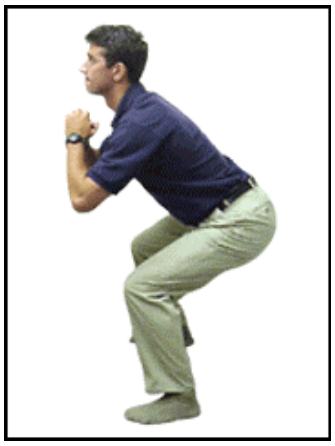

Wrist Flexor and Extensor Stretch





With your arm extended and fingers pointing up, gently pull hand towards your body until you feel a mild stretch in the forearm. (**Note:** do not stretch to the point where you feel pain or tingling). Hold for 15 – 30 seconds. Repeat with fingers pointing down. Repeat with the other arm.

Squats (low back)

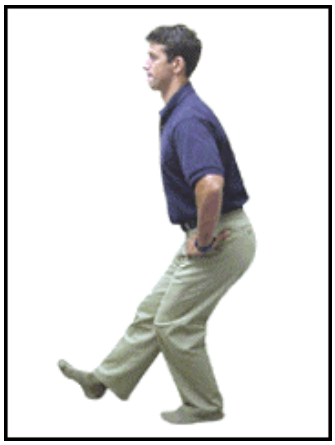


Place feet shoulder width apart, sit down and then stand back up. Repeat 5 times.

Hip Flexor Stretch

Place one foot in front of the other and lunge forward, keeping your pelvis tilted. Hold for 5 seconds. Repeat 3 times with each leg.

Hamstring Stretch (low back)
Place one foot in front of the other and squat down. Hold for 5 seconds. Repeat 3 times with each leg.



Keep chin tucked in

WP When the neck is flexed, try to keep the chin tucked in. This will reduce the amount of awkward posture at the neck.

Maintenance of rollers

WP To minimise force on the shoulder, wrist, elbow, and low back when pulling lumber off rollers, the rollers should be well maintained and free of debris that may restrict movement.

Twist at the trunk

WP When twisting the neck to view the work area, keep the chin tucked in and the ears in alignment with the shoulders. Keep in mind that twisting at the trunk should not be done in combination with a lift.

View with eyes

WP In order to reduce awkward postures of the neck, rotate the eyes and neck, not just the neck, to view the work area. If neck twisting cannot be avoided, try to alternate turning the head in both directions.

Characteristics of Objects Being Handled

Power positions

WP

Use power positions when handling loads or exerting force on objects. Using larger and stronger muscles when doing heavy or forceful work reduces the risk of muscle strain. For lifting, a power position is adopted when a worker remembers to 'lift with the legs, not the back'. This phrase is based on the fact that the muscles of the thighs are larger and more powerful than the muscles of the low back. Other examples of using power positions include using leverage to help move heavy objects and lumber when possible, and using the hips and legs to push debris on the floor when sweeping.

Manual material handling

WP

The following work practices refer specifically to manual material handling tasks. These tasks include lifting, lowering, pushing, pulling, carrying, and holding objects.

- Use the entire body, especially the large muscle groups of the lower body, to perform a movement.
- To reduce loading on the soft tissues of the back, lift heavy objects with a neutral back posture while maintaining the 3-point curve (the natural "S" shaped curve of the back – see the Injury Education section for more information). Do not use pelvic tilt to position the trunk for lifting.
- Do not twist while holding or moving a load. This places the back in a weaker posture that can lead to injury.
- When possible, balance loads being carried on each side of the body. This minimises loading on the soft tissues of the back and hips.
- When lifting, carrying, or holding objects, keep them as close to the body as possible. The farther the load is away from the body, the more stress it puts on the back.

LOAD CONDITION AND WEIGHT DISTRIBUTION

Alternating hands

WP Alternating hands to turn the lumber will decrease the load taken on by one hand individually. The one-handed technique should only be used when handling smaller lumber. By using both the right and left hands evenly to turn lumber, the risk of injury to the shoulder, elbow, and wrist is reduced by sharing the load.

Alternating sides

WP To decrease loading on one side of the body, alternate sides when pulling boards off the conveyor.

Avoid forceful forearm rotation

WP Avoid forearm rotation with a forceful grip when handling lumber to reduce force at the elbow and wrist.

Avoid forceful movements

WP Avoid sudden forceful movements of the arms when handling lumber to reduce forces at the shoulder. Use smooth motions while keeping the arms close to the body.

Avoid over-gripping

WP To reduce force at the wrist and elbow, avoid over-gripping lumber; use only as much force as necessary.

Board turner

E Turning boards to inspect the lumber for defects places stress on the shoulders, elbows, and wrists of the End Stacker Helper. Adding a board turner to use for turning larger or heavier pieces of lumber would decrease the load on the wrist, elbow, and shoulders.

Neutral wrist position

WP To reduce awkward wrist postures, keep the wrists in a neutral position when handling lumber. This will allow grip forces to be more easily generated.

Two hands at once

WP Using both hands to flip larger pieces of lumber will significantly decrease the load on one hand when doing the same task. This will reduce force at the shoulder, elbow, and wrist.

Turn boards in opposite direction

WP Turn boards in the opposite direction to the movement of the chain. This technique will allow the momentum of the chain to help turn the board, reducing the necessary force at the shoulder, elbow, and wrist.

Unnecessary handling

WP Handling every piece of lumber can increase the chance of injury to the wrist, elbow, shoulder, and back of the operator. Try not to unnecessarily handle every piece of lumber going by, to reduce the risk of injury.

Use entire body

WP Use the entire body, especially the large muscle groups of the lower body, to turn large pieces of wood. This will reduce loading on the back and upper body.

Pike pole use

WP In order to reduce loading and awkward postures of the shoulder and back when handling lumber on the end of pike poles, pick the appropriate pike pole for the job. Use a sharp, lightweight long pike pole or picaroon to straighten lumber and remove waste pieces. Provide various lengths of pike poles for different tasks or situations. The pike pole should be longer than the distance from the operator to the object to be retrieved. This extra distance will prevent the pike pole from striking the operator if the pike pole detaches from the object, and will also give the operator some extra grip length if the pike pole pulls away from the operator. Two hands should be used when handling the pike pole. Once the sharp end of the pike pole is stuck in the lumber, only pull on it twice before removing it from the wood. Repeat this process until the lumber is uncrossed or the jam is cleared. Also, keep the body in a strong posture by keeping arms close to the body, with elbows bent and wrists straight.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Modify tool handle friction

E

In order to reduce the force required to grip hand tools, increase the friction between the tool handles and the operator's glove. Due to the smooth, slippery surface of metal or wooden tool handles (e.g., pike pole, picaroon) an End Stacker Helper must use a higher grip force in order to maintain control of the tool. This can put the elbow, and possibly the wrist and hand, at risk of injury. Wrapping the tool handles with foam, rubber, medical/athletic tape, or modifying the surface using other friction increasing material (e.g., gritty paint if plastic substances are not allowed) would increase the friction between the handle and the End Stacker Helper's glove, and thus decrease the grip forces required.

Sticky palm gloves

PPE

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

Environmental Conditions

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

Work Organisation

Job rotation

A

To reduce loading on the body parts of concern listed in this Work Manual, the End Stacker Helper can be rotated to other job positions that require different physical and mental demands. By rotating to jobs that require different physical demands the working muscles get a chance to recover and repair, decreasing the risk of injury. Job rotation is more effective if it occurs intermittently throughout the shift, for example, every hour or every two hours. The duration of exposure to risk has a large effect on the amount of time required for the tissue to recover.

Task variability

A
WP

In order to reduce exposure to risk factors associated with End Stacker Helpers, workers should vary tasks throughout their shift. Taking short breaks to walk around the work area whenever possible.

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
Adjustable floor height	**88**		**A**					**A**				
Braced postures	**89**							**F**				
Anti-fatigue matting	**89**							**V**				**S V**
Anti-fatigue insoles	**89**							**V**				**S V**
Recessed foot pedals	**90**										**A**	
Moveable foot pedals	**90**								**F**			
Foot push buttons	**91**										**A**	
Alternate toe-heel activation	**91**										**A R**	
Appropriate footwear	**91**										**A**	**A**
Camel back chains	**92**			**F A**	**F A**	**F A**		**F A**				
Drop gate	**92**			**F A**	**F A**	**F A**		**F A**				
Pin stops	**92**			**F A**	**F A**	**F A**		**F A**				
Convex mirror	**93**	**A R**										

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Stretches	**94**	directly reduces risk of injury to the body										
Keep chin tucked in	**96**	**A**										
Maintenance of rollers	**96**			**F**	**F**	**F**		**F**				
Twist at the trunk	**96**	**A R**										
View with eyes	**96**	**A**										
Power positions	**97**							**F A**				
Manual material handling	**97**							**F A**				
Alternating hands	**98**			**R**	**R**	**R**						
Alternating sides	**98**			**R**	**R**	**R**		**R**				
Avoid forceful forearm rotation	**98**				**F**	**F**						
Avoid forceful movements	**98**			**F**								
Avoid over-gripping	**98**				**F**	**F**						
Board turner	**98**			**F R**	**F R**	**F R**						
Neutral wrist position	**98**				**F A**	**F A**						

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SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Two hands at once	**99**			**F**	**F**	**F**						
Turn boards in opposite direction	**99**			**F**	**F**	**F**						
Unnecessary handling	**99**			**R**	**R**	**R**		**R**				
Use entire body	**99**			**F**	**F**	**F**		**F**				
Pike pole use	**99**			**F A**				**F A**				
Modify tool handle friction	**100**				**F**	**F**						
Sticky palm gloves	**100**				**F**	**F**						
Job rotation	**101** ◆	indirectly reduces risk of injury to the body										
Task variability	**101** ◆	indirectly reduces risk of injury to the body										
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										
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*

END STACKER HELPER MSI SAFETY GUIDE

OBJECTIVE:

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

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck An End Stacker Helper may hold the head forward to inspect lumber.	**Awkward Postures** **Static Postures**	• Neck muscles must support the weight of the head while in a forward bent position. The more the neck is bent, the greater the load on the muscles and tendons. • When the neck is held still in a forward bent position, the muscles of the neck must remain tense to support the weight of the head. With no time allowed for recovery, the constant state of tension in the neck muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.	• Try to keep the head in an upright position while viewing the lumber. • Use the eyes and the neck (not just the neck) to view the lumber. • When the neck is flexed, try to keep the chin tucked in. • Use a sit/stand stool to bring the head closer to the height of the work. • To reduce the loading on neck muscles, avoid wearing earmuffs. Use earplugs, or custom fitted earpieces if more protection is needed, to reduce loading on the neck. • 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 An End Stacker Helper must repeatedly turn the head in order to view the infeed and monitor for jam-ups.	**Awkward Postures** **Static Postures**	• Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons. • When the head is repeatedly turned to the side, 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.	• Turn the whole body, instead of just the neck, to view the incoming lumber. • When twisting the neck, keep the chin tucked in and the ears in alignment with the shoulders (i.e. twist at the trunk). • 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 An End Stacker Helper must turn boards in order to inspect pieces while the arms are held away from the body.	**Force** **Awkward Postures** **Static Postures** **Repetition**	• Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons. • Neck and shoulder muscles must support the weight of the arms when they are away from the body. The farther away the arms are from the body, the greater the load on the muscles and tendons. • When the arms are repeatedly held away from the body, the muscles of the neck and shoulder must remain tense to support the weight. If the duration of constant tension is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • 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.	• Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • Alternating hands to turn the lumber will decrease the load taken on by one shoulder individually. • Using both hands to flip larger pieces of lumber will significantly decrease the load on one shoulder when doing the same task. • Turn boards in the opposite direction to the movement of the chain. This technique will allow the momentum of the chain to help turn the board, reducing the necessary force. • Use the entire body, especially the large muscle groups of the lower body, to perform the turn. This will reduce loading on the back and upper body. • Handling every piece of lumber can increase the chance of injury to the shoulder of the operator. Try not to unnecessarily handle every piece of lumber going by, to reduce the risk of injury.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder An End Stacker Helper may pull boards in order to remove waste pieces.	**Force** **Awkward Postures** **Repetition**	• The rotator cuff stabilises the shoulder joint when objects are pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff. • When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.	• Keep the body in a strong posture by keeping arms close to the body, with elbows bent and wrists straight. • Two hands should be used when handling the pike pole. This reduces the loading on one shoulder when only one hand is used. • For exercises that can help prevent ***Shoulder*** injuries, ***see the Shoulder section of the Body Manual***.
	Shoulder An End Stacker Helper may reach forward with a pike pole or picaroon in order to clear cross-ups.	**Force** **Awkward Postures**	• The rotator cuff stabilises the shoulder joint when objects are pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.	• Try to minimise the amount of backward motion of the arms. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • Try to alternate sides of the body. • For exercises that can help prevent ***Shoulder*** injuries, ***see the Shoulder section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist An End Stacker Helper must grip boards in order to turn pieces.	**Force** **Awkward Postures** **Repetition**	• Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. The harder that an object must be gripped, the greater the load on the tendon/bone connection. • The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection. • The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip. Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection. • Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury.	• Avoid over-gripping the lumber; use only as much force as is necessary. • To reduce grip force requirements, wear thinner gloves with less stiffness and a high friction surface (e.g. rubber). • Grip with both hands to reduce grip force requirements. • Avoid forearm rotation with a forceful grip. • Alternating hands to turn the lumber will decrease the load taken on by one hand individually. The one-handed technique should only be used when handling smaller lumber. By using both the right and left hands evenly to turn lumber, the risk of injury is reduced by sharing the load. • Handling every piece of lumber can increase the chance of injury to the wrist, elbow, shoulder, and back of the operator. Try not to unnecessarily handle every piece of lumber going by, to reduce the risk of injury.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist An End Stacker Helper may grip boards with the wrists bent in order to turn pieces.	**Force** **Awkward Postures** **Repetition**	• Gripping an object requires activation of the forearm muscles, which generates tension in the tendons and tendon sheaths running through the wrist. The harder an object is gripped, the greater the tension in the tendons. As tension increases, the pressure within the carpal tunnel may also increase. • As the wrist is bent, the tendon sheaths will rub up against the walls of the carpal tunnel. The further the wrist is bent, the more friction experienced in the tendon sheaths. • Repeated gripping and/or repeated bending of the wrist causes stress to the tendon sheaths. If the repetitive stress is excessive, and recovery is not adequate, the tendon sheaths may fatigue to the point of injury.	• Keep wrists in a neutral (straight) wrist position. • For exercises that can help prevent ***Wrist*** injuries, ***see the Back section of the Body Manual.***

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back An End Stacker Helper may bend forward and to the side in order to reach pieces and clear cross-ups..	**Force** **Awkward Postures** **Repetition**	• Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back. • Back muscles must support the weight of the upper body when leaning forward or to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs. • Repeated forward or side 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.	• When stooping down, bend with the hips and knees, not with the back. • Try to keep the back in a neutral position (ears, shoulders, and hips aligned). • When lifting, hold object close to the body and do not twist the torso. • For exercises that can help prevent ***Back*** injuries, ***see the Back section of the Body Manual.***
	Low Back An End Stacker Helper continually stands on a vibrating surface.	**Vibration**	• Whole body vibration is usually transmitted through the floor into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged standing while on a vibrating surface may contribute to the gradual weakening of the lumbar discs.	• Anti-fatigue insoles can help to dampen the vibration and thereby reduce the stress on the low back.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Hip An End Stacker Helper may balance on one leg while standing to operate a foot pedal control.	**Force** **Static Postures**	• Balancing on one leg requires the muscles surrounding the hip bearing the weight to contract and stabilise the weight of the whole body. This leads to an increased force being placed on the load-bearing hip. • Balancing on one leg for prolonged periods requires the muscles surrounding the hip bearing the load to remain tense. With no time allowed for recovery, the constant state of tension in the hip muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.	• Alternate the leg which bears the majority of the body weight on a regular basis. • Stretch to alleviate the strain in the hips – perform the hip extensor stretch in the ***Back section of the Body Manual.***

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Ankle An End Stacker Helper frequently activates foot pedals in order to control the infeed conveyor.	**Awkward Posture** **Repetition**	• Lifting the foot to activate a foot pedal puts the ankle into an awkward posture, which increases the loading in the muscle on the front of the shin. The further away from the neutral posture the ankle is, the greater the loading to this muscle. If the shoes worn are rigid or heavy, the loading is also increased. • Repetitive use of foot pedals may gradually cause small tears in the muscle on the front of the shin. If the repetitive stress is excessive, and recovery is not adequate, the small tears in the muscle on the front of the shin may progress to a more significant problem.	• Stretch the ankles before and during work to make sure the muscles and ligaments are loose. • If possible, alternate using the right and left foot throughout the day to balance the stress on the muscles of the lower leg and foot. • Alternate using the toe of the foot and the heel of the foot to activate the foot pedals. This will use more muscles of the leg, thereby increasing circulation and minimising fatigue in this area. • For exercises that can help prevent ***Ankle/Foot*** injuries, ***see the Foot section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Foot An End Stacker Helper may continually stand on a hard, vibrating surface.	**Static Posture** **Vibration**	• 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. • Vibrating floors can increase the loading on the foot. Factors like vibration level and vibration frequency increase the amount of loading on the foot, and could lead to irritation. The longer the End Stacker Helper is exposed to vibration, the greater the risk of injury.	• In order to minimise fatigue in the lower extremities, anti-fatigue insoles should be used. • For exercises that can help prevent ***Foot*** injuries, ***see the Foot section of the Body Manual***.