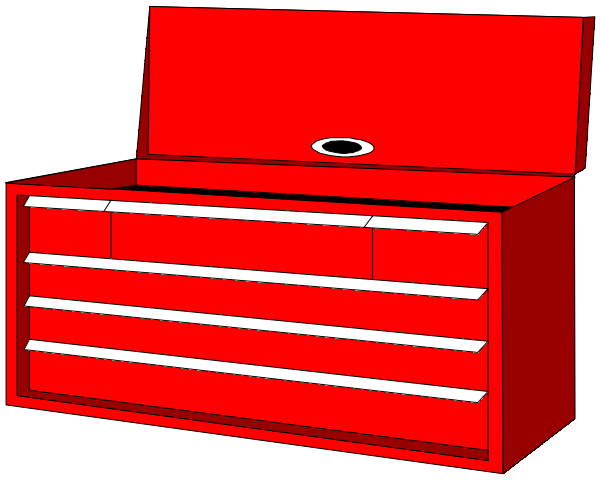
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Booth (revised) 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

BOOTH (REVISED) TOOL KIT
Table of Contents

Overview
Booth Operator

Job Summary

A Booth Operator is responsible for the operation of various types of controls and making rapid decisions to maximise the amount of lumber produced from logs. The Booth Operator will operate the infeed and outfeed via controls, perform visual observation and decision making, and may unjam wood and perform maintenance tasks. Refer to Physical Demands Analysis for more detail.

Booth jobs that are covered by this Tool Kit are Cant Saw Operator, Chip-n-Saw Operator, Chipper Canter Operator, Cut off Saw Operator, Debarker Operator, Edger Operator, Gang Saw Operator, Headrig Sawyer, Log Merchandiser, and Scragg Saw Operator.

Physical Demands

The physical demands of a Booth Operator may include:

a) Forceful movements of the elbow, wrist, and low back
b) Repetitive motions of the neck, shoulder, elbow, wrist, low back, and ankle
c) Awkward postures of the neck, shoulder, elbow, wrist, low back, and ankle
d) Static postures of the neck, shoulder, and low back
e) Whole body vibration affecting the low back
f) Hand transmitted vibration affecting the elbow/wrist and wrist/hand
g) Continuous standing/sitting while operating controls
h) Pulling/pushing while unjamming
i) Lifting/lowering while unjamming

Mental Demands

A Booth Operator is required to make rapid decisions on a continuous basis throughout their shift. Several decisions may have to be made at once to execute a physical action. These actions can occur as frequently as every 5 to 15 seconds for a duration of 2 hours at a time.

Many Booth Operators are also required to observe video monitors or computer monitors, which constantly provide process feedback. This task requires the Booth Operator to attend to the monitor(s) continuously throughout their shift, increasing their visual demands.

Major Variations

Depending on the mill, the following major variations may be found:

1) The Booth Operator console may consist of:
   a) A single console
   b) A split console
   c) Multiple consoles

2) In addition to the tasks mentioned in the Job Summary, a Booth Operator may have to:
   a) Unjam logs or lumber
   b) Clean photo eyes or scanners
   c) Change saws/knives
   d) Perform general clean-up duties

3) Hand tools used may include a:
   a) Pike pole
   b) Picaroon
   c) Peevee
   d) Chain saw
   e) Sledgehammer
   f) Crow bar
   g) Chain
   h) Air hose

4) Posture variations may include:
   a) Sitting
   b) Standing
   c) Vary between sitting and standing

Minor Variations

Depending on the mill, the following minor variations may be found:

1) Equipment operated may include:
   a) Conveyors
   b) Transfer decks
   c) Drop conveyors
   d) Kickers
   e) Pin stops
   f) Job-specific machinery

2) Control types used may include:
   a) Joystick
   b) Toggle switch
   c) Push button
   d) Foot pedals
   e) Rotary selector switches
   f) Touch screen

3) The booth structure may:
   a) Be sound proofed
   b) Have vibration damping

Physical Demands Analysis
Booth Operator

PDA General Instructions: Booth Operator

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Booth Operator. 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 Booth Operators 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.

Booth Operators assessed include:
1. Cant Saw Operator
2. Chip-n-Saw Operator
3. Chipper Canter Operator
4. Cut off Saw Operator
5. Debarker Operator
6. Edger Operator
7. Gang Saw Operator
8. Headrig Sawyer
9. Log Merchandiser
10. Scragg Saw Operator

Disclaimer

The IMIRP Society accepts no responsibility for the use or misuse of the PDA, or the accuracy of the PDA as it applies to any specific workplace.

PDA Table of Contents

Physical Demands Analysis
Booth Operator

Task List

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

Operate infeed with controls

A Booth Operator operates controls to move logs or lumber on to a transfer deck and infeed.

Does this task occur at your site?

☐ Yes ☐ No

Visual observation and decision making

A Booth Operator views logs or lumber, makes decisions, and operates machinery via controls.

Does this task occur at your site?

☐ Yes ☐ No

Operate outfeed with controls

A Booth Operator uses controls to move logs or lumber on to a transfer deck and the outfeed.

Does this task occur at your site?

☐ Yes ☐ No

Unjam wood

A Booth Operator uses various hand tools to unjam the wood.

Does this task occur at your site?

☐ Yes ☐ No

Maintenance tasks

A Booth Operator may clean photo eyes, help change saws, and perform other general clean-up duties.

Does this task occur at your site?

☐ 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

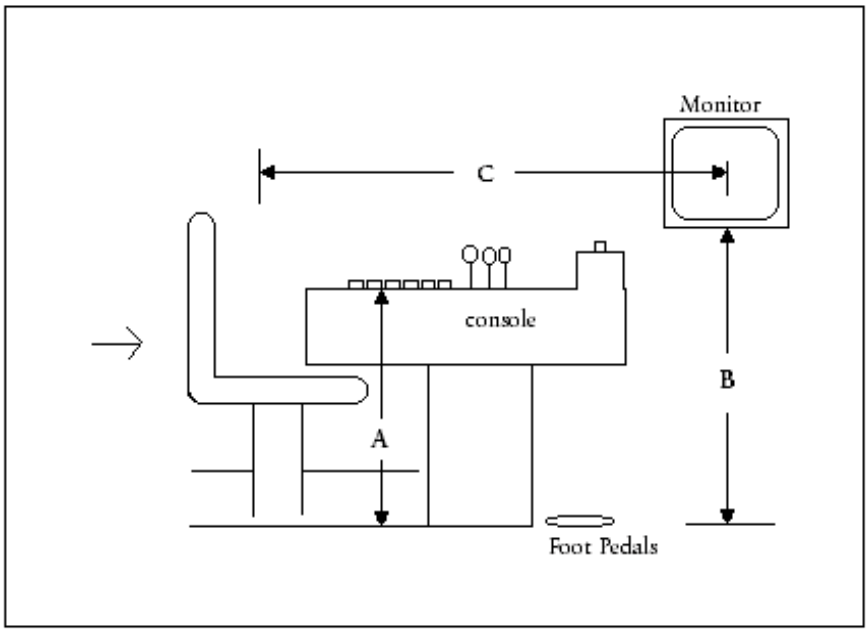
The table below contains a list of tasks performed by a Booth Operator. Use the left column to check off (✓) tasks that are present. Estimate the *Percent of Shift* each task is performed and place a check mark (✓) in the appropriate column. The *Comments* section may be used to include information related 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%	
	Operate infeed with controls					
	Visual observation and decision making					
	Operate outfeed with controls					
	Unjam wood using: ☐ *Controls in booth* ☐ *Pike pole* ☐ *Chainsaw* ☐ *Picaroon* ☐ *Peevee* ☐ *Manually (no tools used)* ☐ *Grapple*					
	Maintenance tasks ☐ *Change saws/knives* ☐ *Clean photo eyes* ☐ *General clean-up tasks*					
	Other:					

Workstation Characteristics

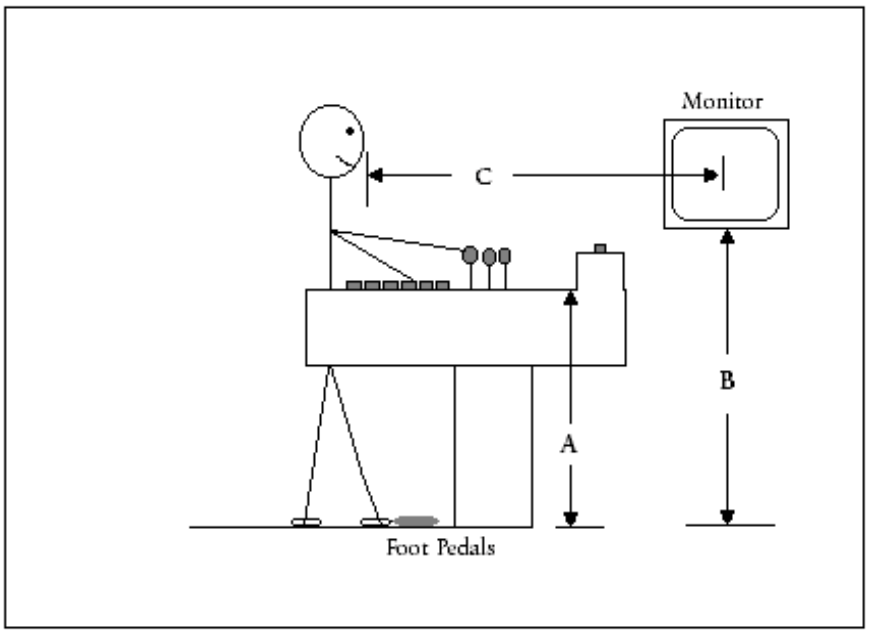
Dimensions & Layout

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



A – Console height
B – Monitor height
C – Viewing distance

Workstation - seated (side view)



Workstation - standing (side view)

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 a Booth Operator. Use the left column to check off (✓) controls that are present at the work site. Highlight controls that may aggravate an 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**
	Joystick	• *Operates infeed/outfeed* • *Operates log turners* • *Operates kickers* • *Operates pin stops* • *Operates press roller*	
	Toggle switch	• *Operates conveyors*	
	Push button	• *Start/stop* • *Changes saw widths* • *Operates kickers*	
	Turn dial	• *Operates gates*	
	Foot pedal	• *Operates infeed/outfeed* • *Operates kickers* • *Operates gates*	
	Touch screen	• *Start/stop* • *Display computer statistics*	
	Other		

Physical Demands

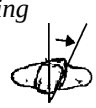
Whole Body Physical Demands

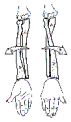
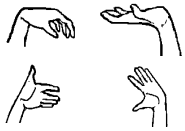
Identify each of the physical demands required by a Booth Operator and list the corresponding tasks in the second column. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, and cycle times.

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: Sitting	• *Operate outfeed with controls*				✓	• *Continuously for duration of 2 hours at one time*
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

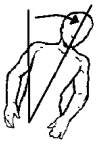
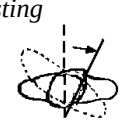
The table below outlines the body postures that may be adopted throughout the shift by a Booth Operator, related to tasks. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

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: Shoulder flexion	• *Operate outfeed with controls*				✓	• *Continuously for duration of 2 hours at one time*
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 a Booth Operator. 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%	
Pulling/Pushing	*Unjamming logs or lumber* • *Can be performed manually* • *Can be performed using tools (i.e., pike pole, picaroon, peevee)* • *Performed by a utility person or deck hand*	*Varies depending on type and size of wood. See weight of wood equation*					
Lifting/Lowering	• *Chainsaw to buck logs* • *Lifting guides* • *Lowering guides*						
Carrying	• *Assisting with saw changes may require carrying guides*						

Hand Tools

Indicate the hand tools used by a Booth Operator 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 the hand tools.

	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	• *Unjam wood*						
	Picaroon	• *Unjam wood*						
	Peevee	• *Unjam wood*						
	Chainsaw	• *Unjam wood*						
	Sledge hammer	• *Unjam wood*						
	Crow bar	• *Unjam wood*						
	Chain	• *Unjam wood*						
	Air hose	• *Maintenance tasks*						
	Wood block	• *Unjam wood*						
	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, include this information 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 Booth Operator at your site, 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.

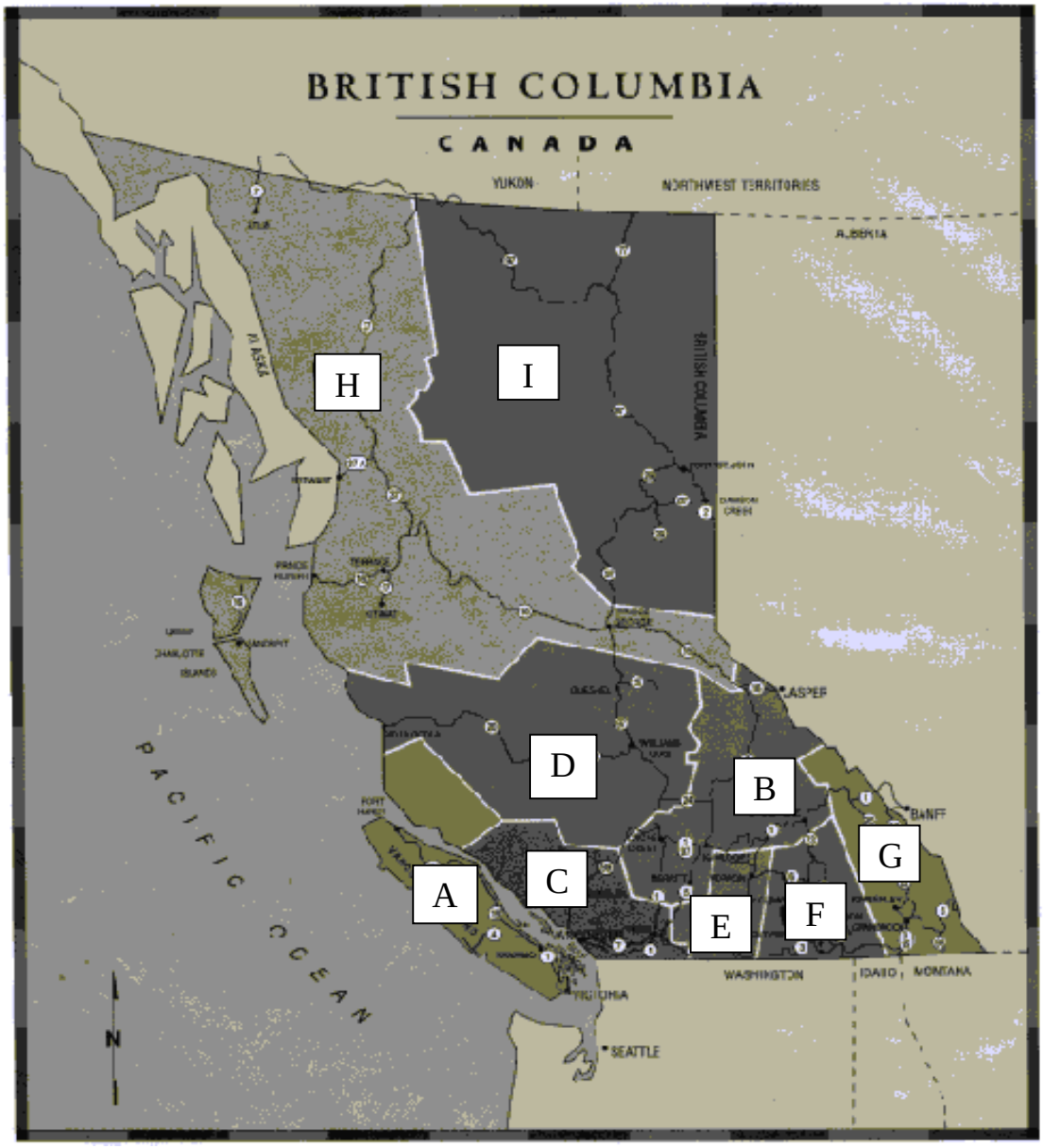
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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
Booth Operator

Purpose

The Risk Factor Identification Checklist for a Booth Operator 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 – Booth Operator

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions

☐ After implementation of solutions

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

Definitions

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

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

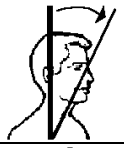
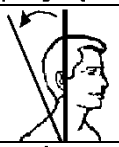
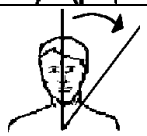
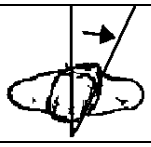
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

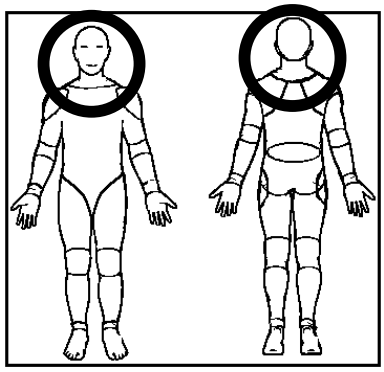
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition		N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., looking side-to-side frequently)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., observing machinery processes)				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 to the side for a long period, looking up at a monitor)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

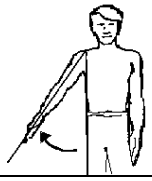
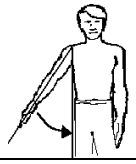
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



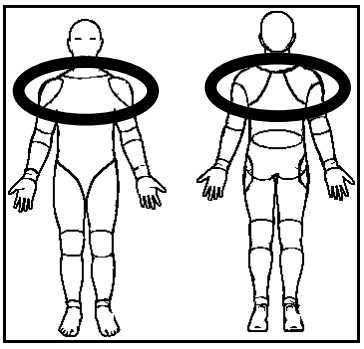
Body parts within the circled area will be classified as NECK issues.

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

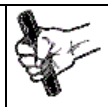
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Abduction				S O	
Adduction				S O	

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



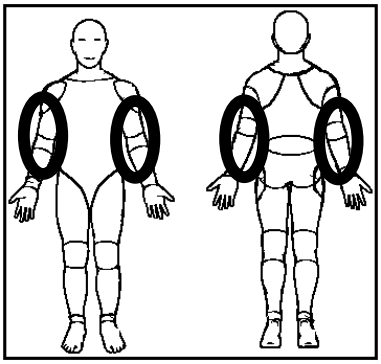
Body parts within the circled area will be classified as SHOULDER issues.

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? (e.g., joystick) 			S O	
Are objects handled in a pinch grip? 			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., forward-backward movement of joystick)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating infeed)			S O	

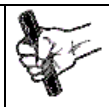
Static Posture	N	Y		Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture? (e.g., holding a joystick in place)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., activation of buttons on joystick)			S O	
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., resting elbow on hard surface)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., joystick)			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



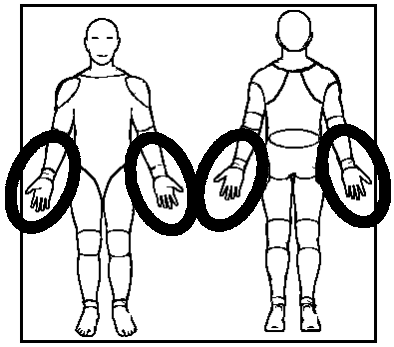
will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., using a pike pole) 			S O	
Are objects handled in a pinch grip? (e.g., grip used to pick up lumber) 			S O	
Are objects handled in a hook grip? (e.g., grip used to hold a joystick) 			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., operating joystick with bent wrist)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., using joystick to operate infeed)			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? (e.g., holding a joystick)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding down push button)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., metal edges of consoles or workstations)			S O	
Ask the worker: Do you use your hand like a hammer for striking? (e.g., striking a control)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Ulnar Deviation 			S O	
Radial Deviation 			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., joystick)			S O	

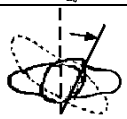
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



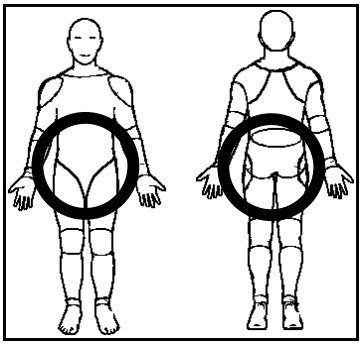
Body parts within the circled area will be classified as WRIST issues.

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 to unjam logs)			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., sitting continuously)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., sitting continuously)			S O	
Contact Stress				
Ask the worker: Do **<u>any</u>** objects, tools or parts of the workstation put pressure on **<u>any</u>** parts of your hip/thigh?			S O	

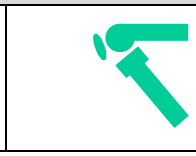
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing in vibrating booth)				S O	

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

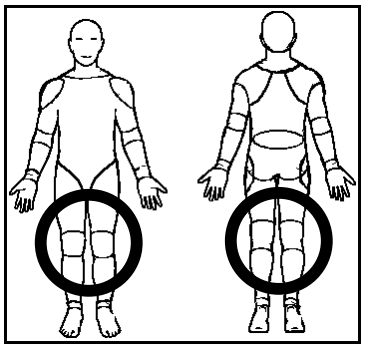


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

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

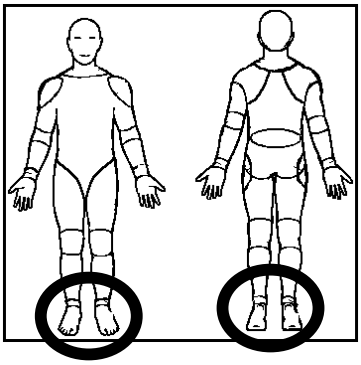


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., operating foot pedal)			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 in a vibrating booth)			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., logs)			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., control handles, pike poles)			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? (e.g., working under equipment)			S O	

ENVIRONMENTAL CONDITIONS [CONTINUED]

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

WORK ORGANISATION

	N	Y		Comments:
Is the work externally-paced or controlled by a machine or the process?			S O	
Do peak workloads or sudden increases in pace occur with the tasks? (e.g., working during mill downtime)			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

Booth Operator

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

Booth Operator

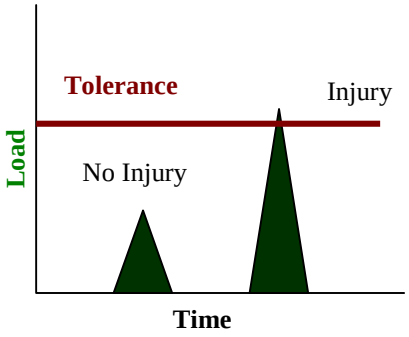
Disclaimer

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

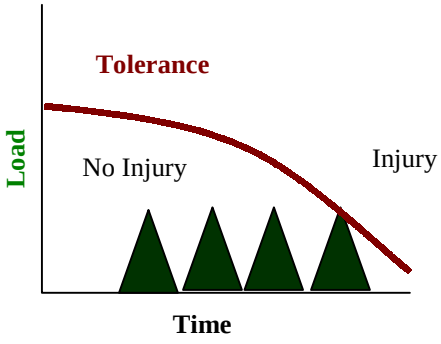
Injuries occur when …
Loads exceed tissue tolerances



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.

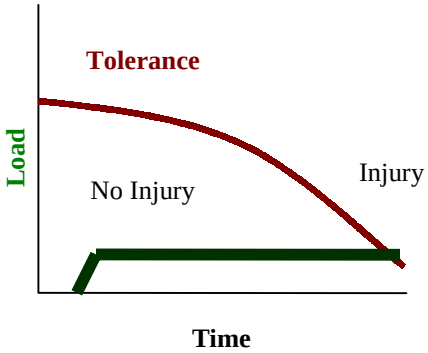
Example – a worker going over on their ankle and spraining it.



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 Booth Operator 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 Booth Operator. 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 Booth Operator position and found that the neck, neck/shoulder, wrist, 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.

Neck: Major risks include awkward and static postures, and repetition with the neck while observing monitors and the outside environment.

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

1. Research equipment or workstation layout with operators (page 79)
2. TV and computer monitors (page 85)
3. Mirrors (page 85)
4. Position of booth (page 86)
5. Stretches (page 87)
6. View with eyes (page 87)
7. Reduce glare (page 96)

Neck/Shoulder: Major risks include awkward and static postures, and repetition with the neck/shoulder while holding the arms away from the body in order to operate controls.

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

1. Neutral posture (page 78)
2. Adjust chair (page 80)
3. Moving console (page 79)
4. Range of motion in controls (page 79)
5. Research equipment or workstation layout with operators (page 79)
6. Control distance while seated (page 79)
7. Arm supports (page 80)
8. Operate controls at appropriate heights (page 80)
9. Stretches (page 87)

Wrist: Major risks include force, awkward postures, and repetition with the wrist while gripping controls with the wrists bent in order to operate equipment.

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

1. Padding on console (page 78)
2. Moving console (page 79)
3. Range of motion in controls (page 79)
4. Research equipment or workstation layout with operators (page 28)
5. Arm supports (page 80)
6. Operate controls at appropriate heights (page 80)
7. Stretches (page 87)
8. Neutral wrist posture (page 90)
9. Neutral wrist posture – joystick use (page 90)

Low Back: Major risks include force, awkward and static postures, repetition, and vibration with the low back while bending forward and to the side in order to unjam logs or lumber and while sitting continually on a vibrating surface.

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

1. Moving console (page 79)
2. Research equipment or workstation layout with operators (page 28)
3. Control distance while seated (page 79)
4. Lumbar support (page 81)
5. Adjustable seating (page 81)
6. Vary body posture (page 82)
7. Seat maintenance (page 82)
8. Stretches (page 87)
9. Daily inspection of seat (page 82)
10. Stretches (page 87)
11. Power positions (page 90)
12. Manual material handling (page 91)
13. Pike pole use (page 94)
14. Lightweight, sharp tools (page 94)
15. Vibration (page 96)
16. Task variability (page 96)

For additional stretching and strengthening exercises that would benefit a Booth Operator, refer to the Neck, Shoulder, Wrist, and Low Back sections of the Body Manual.

NECK

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

A Booth Operator must look to the sides, or to one side only, in order to observe monitors and the mill environment. An operator may also look up to view monitors and mirrors.

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.
- Neck muscles must support the weight of the head while in a backward 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 twisted 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

- The heights of monitors and operator seating affects the degree of neck bending required.

Additional Workstation Design Options

- The position of booth windows and seating, with respect to the process that needs to be observed, can affect the neck postures required by the Booth Operator.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the neck, please see the column labelled "Neck" in the Summary of Solutions on pages 97 to 100.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

A Booth Operator frequently holds one or both arms away from the body in order to operate controls.

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

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 Reaches

- The distance to equipment controls can lead to awkward arm postures, especially for operators with shorter arms or in situations with non-adjustable seating.

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 97 to 100.
- For exercises that can help to prevent ***neck*** and ***shoulder*** injuries, see the ***Neck*** and ***Shoulder sections of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Booth Operator must grip joysticks and other controls in order to operate equipment.

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

Workstation Design

Working Reaches

- Extreme or obstructed working reaches can lead to awkward wrist postures, and an increase in forearm injury risk.

Additional Workstation Design Options

- Booth Operators occasionally use forceful gripping of controls to provide arm support when armrests are not present. This forceful gripping leads to increased forearm fatigue, and risk of injury.

Characteristics of Objects Being Handled

Size and Shape

- The style of control used can lead to awkward wrist postures. In combination with repetitive or sustained use, these postures can lead to elbow and forearm injuries.

Environmental Conditions

Vibration

- Vibration transmitted to the Booth Operator through controls can increase the risk of elbow and wrist injury.

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 97 to 100.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

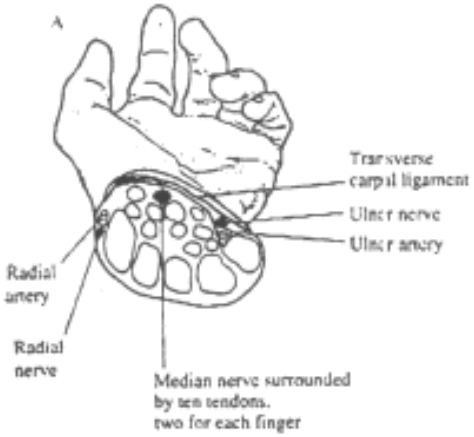
WRIST

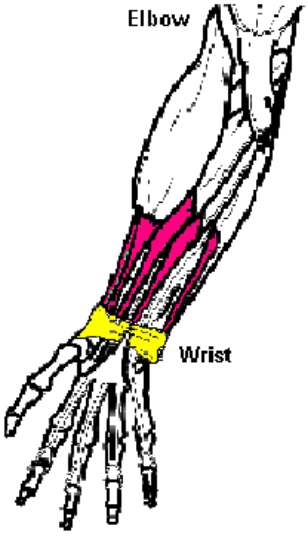
Direct Risk Factors:
Force
Repetition
Awkward Postures

A Booth Operator must grip controls with the wrists bent in order to operate equipment.

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, 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 Reaches

- Extreme or obstructed working reaches can lead to awkward wrist postures, and an increased injury risk.

Characteristics of Objects Being Handled

Size and Shape

- Some control types, such as toggle switches and joysticks, can require repetitive awkward wrist postures.

Environmental Conditions

Cold Exposure

- Exposure to cold temperatures, in combination with the previous risk factors, can increase the risk of wrist injury.

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 97 to 100.

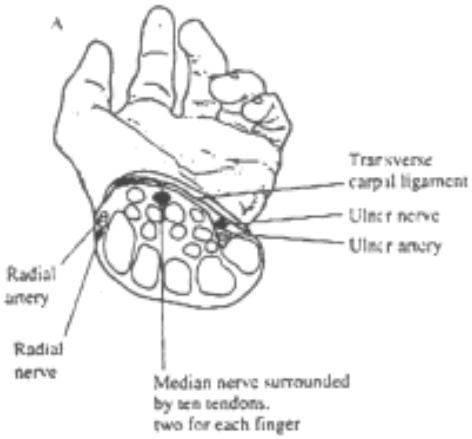
WRIST/HAND

Direct Risk Factors:
Contact Stress
Vibration

A Booth Operator rests the wrist/hand on controls or the console when using obstructed controls, or between the use of controls.

BACKGROUND INFORMATION

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



The Carpal Tunnel

DIRECT RISK FACTORS

Contact Stress

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

Vibration

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

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Obstructed access to frequently used controls leads to awkward wrist postures and contact stress.

Environmental Conditions

Vibration

- Continual exposure to hand/arm vibration occurs when there is a lack of vibration damping underneath consoles. The vibration is transmitted from outside environment to the booth and operator.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Wrist/Hand, please see the column labelled “Wrist/Hand” in the Summary of Solutions on pages 97 to 100.

LOW BACK

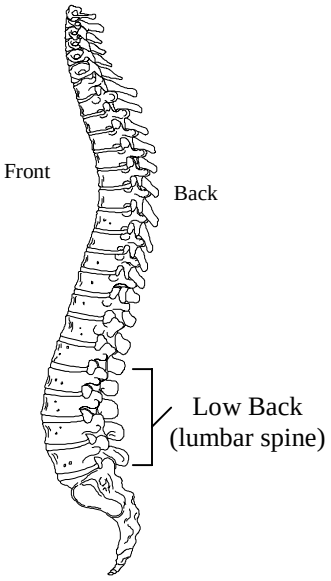
Direct Risk Factors:
Force
Repetition
Awkward Postures

A Booth Operator may bend forward and to the side in order to unjam logs or lumber.

A Booth Operator may also bend to observe process flow or equipment.

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 bending and lifting 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

Additional Workstation Design Options

- Booth Operators repeatedly bend forward or to the side because they are unable to see parts of the log flow through the windows of the booth.
- Forceful lifting occurs when there are jam-ups on log decks or transfer decks. Forceful lifting after sitting for long periods of time increases the likelihood of an injury.

CONSEQUENCES

- Repeatedly bending forward and 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

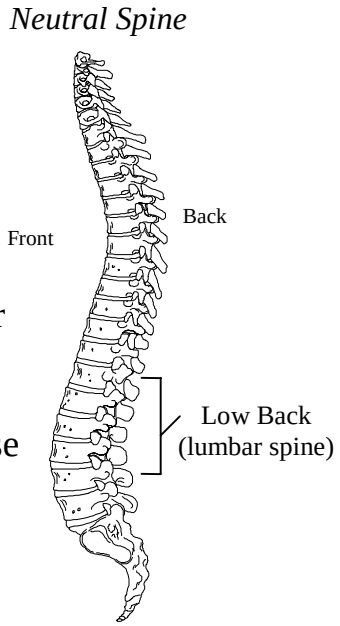
- For specific solutions that may prevent injuries to the back, please see the column labelled “Back” in the Summary of Solutions on pages 97 to 100.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

LOW BACK

Direct Risk Factors:
Awkward Postures
Static Postures
Vibration

A Booth Operator continually sits 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.

DIRECT RISK FACTORS

Awkward Postures
Static Postures

- Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury.

Vibration

- Whole body vibration is usually transmitted through the seat 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 sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs.

INDIRECT RISK FACTORS

Workstation Design

Seating

- Sitting for long periods of time without adequate lumbar support will increase muscle fatigue in the back.
- Vibration can be transmitted to the Booth Operator through poorly damped seating.

Environmental Conditions

Vibration

- Vibration from the machinery outside of the booth is transmitted to the seat and console.

Work Organisation

Task Variability

- Sitting for prolonged periods stresses the tissues of the low back. Allowing these tissues to recover from stress can prevent injuries and increase tolerances.

CONSEQUENCES

- Continually sitting 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 97 to 100.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

ANKLE

Direct Risk Factors:
Repetition
Awkward Postures

A Booth Operator frequently activates foot pedals in order to operate loaders and deck chains.

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 97 to 100.

Summary of Body Parts at Risk

NECK

- A Booth Operator must look to the sides, or to one side only, in order to observe monitors and the mill environment. An operator may also look up to view monitors and mirrors.

NECK/SHOULDER

- A Booth Operator frequently holds one or both arms away from the body in order to operate controls.

ELBOW/WRIST

- A Booth Operator must grip joysticks and other controls in order to operate equipment.

WRIST

- A Booth Operator must grip controls with the wrists bent in order to operate equipment.

WRIST/HAND

- A Booth Operator rests the wrist/hand on controls or the console when using obstructed controls, or between the use of controls.

LOW BACK

- A Booth Operator may bend forward and to the side in order to unjam logs or lumber.

- A Booth Operator may also bend to observe process flow or equipment.

LOW BACK

- A Booth Operator continually sits on a vibrating surface.

ANKLE

- A Booth Operator frequently activates foot pedals in order to operate loaders and deck chains.

Risk Factors by Body Part

Direct Risk Factors	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	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
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.*

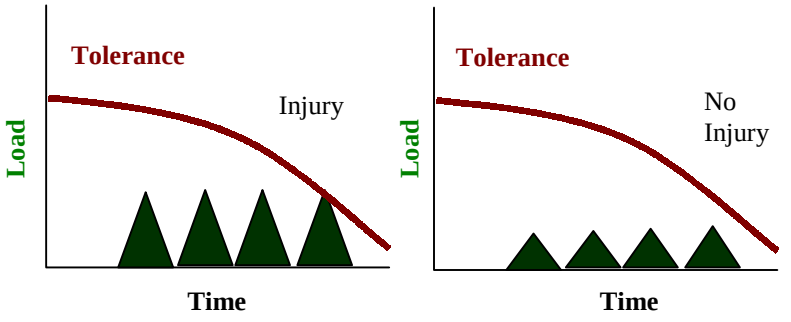
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 97 to 100 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

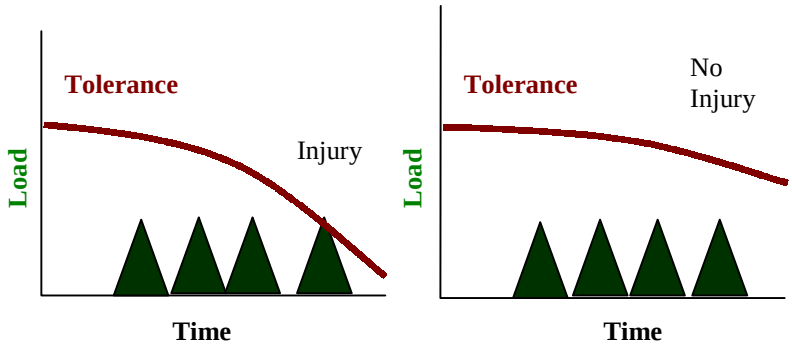
Injury Prevention

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 Booth Operator 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

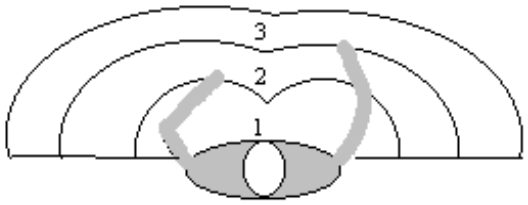
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

Neutral posture

WP

Keeping shoulders in a neutral posture throughout the workday will decrease the amount of strain in the shoulder joint and the shoulder muscles.

Padding on console

E

Contact stress at the elbow is caused when console surfaces do not have any padding supporting the forearm. The padding should be wide enough to support the whole forearm and the height of the padding should be high enough to maintain a neutral wrist posture when operating controls, especially joystick type controls.

Moving console

E

Holding the arms away from the body places an increased load on the shoulder. Some split consoles have a large distance between them and require the operators to hold their arms away from the body.

To decrease this load on the shoulder, consoles should be put on moveable tracks to allow the operators to bring them closer. By moving the consoles closer to the body, the amount of shoulder abduction will be decreased.

Range of motion in controls

E

In order to reduce loading on the shoulder, limit the amount of travel in the levers to operate equipment.

In order to reduce awkward postures of the wrist/hand, decrease the range of motion (ROM) of the joysticks. By decreasing the ROM of the joysticks the wrist will be in a more neutral posture more often.

Research equipment or workstation layout with operators

A

A Booth Operator can effectively identify potential challenges with awkward and static postures by being part of the purchasing process. If possible, mock-up the workstation area and attempt to anticipate issues that may arise. In some cases it may be practical to speak with suppliers about using their equipment for a trial period. Investigating with operators will minimise the need to retrofit equipment and workstations.

Control distance while seated

E
WP

In order to reduce loading on the neck, shoulder, and back keep controls close to the body by moving the seat forward on slide tracks and/or extending controls into safe reach envelopes. This adjustability is important to accommodate operators of different sizes.

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 Booth Operator, 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.

Adjust chair

WP

Adjust the height of the chair to reduce shoulder elevation.

Arm supports

E
WP

In order to reduce awkward and static postures of the neck/shoulder and wrist when operating controls while seated, consider the height of the controls and arm supports. A Booth Operator's elbows and forearms should sit comfortably on the arm supports with the shoulders relaxed and the wrists free for using controls. Arm supports that are well-padded are preferred. The support provided by these arm supports reduces muscle tension and fatigue in the neck and shoulder.

Booth Operators should be encouraged to use the arm supports to relax the muscles in the neck/shoulder region when there is a break in the workload when in a seated position. Placing the elbows and forearms on the arm supports while taking these microbreaks will allow working muscles to recover and repair.

Operate controls at appropriate heights

E
WP

In order to decrease awkward shoulder and wrist postures, controls should be located in the waist to mid-chest level while seated. It may be necessary for the operator to move closer to the controls by adjusting the seat forward/backward or up/down (keeping in mind possible obstructions).

SEATING

Many Booth Operators are required to sit when operating controls. Sitting for long periods of time increases the load on the spine, which stresses the ligaments and discs of the low back. The load is increased when the Booth Operator does not maintain a neutral spine (see Injury Education for the Low Back on page 67).

Lumbar support

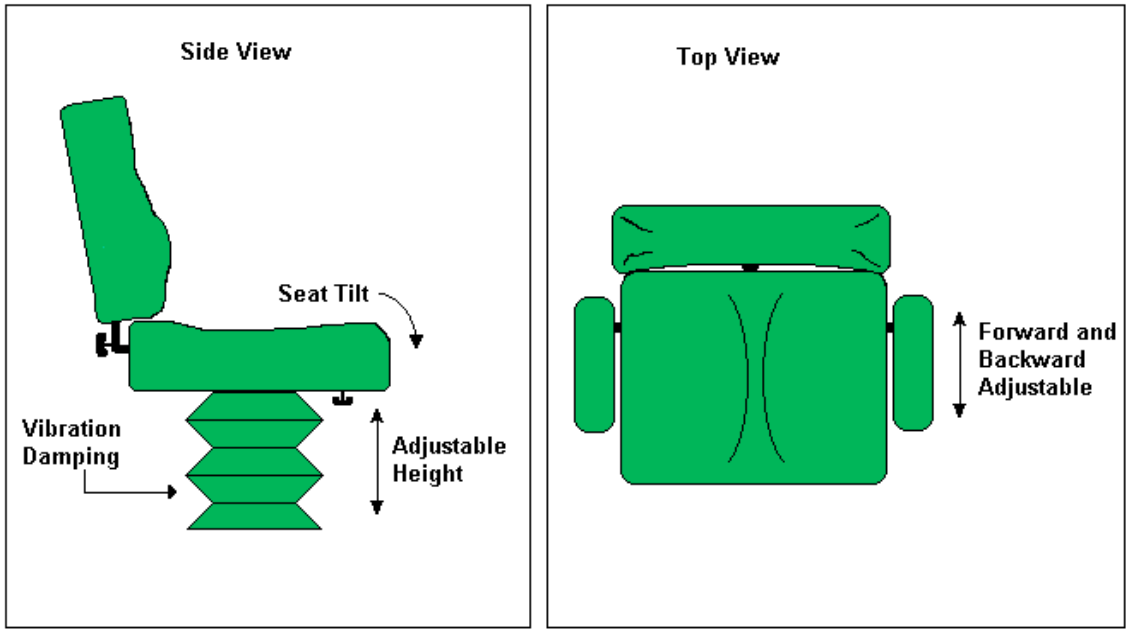
E

In order to reduce awkward postures in the low back while seated, adjustable lumbar support should be provided. Seats that wrap around the low back and allow the curve in the low back to be maintained should be considered for purchase. Padded lumbar cushions can also be added to existing seats.

Adjustable seating

E

In order to minimise awkward and static postures of the low back, seating should have several adjustable features (see list below) to accommodate various operators, and allow for continual postural adjustments.



- Seating should have adjustable lumbar support
- Seats should be adjustable forward/backward and up/down
- Seats should have seat pans which tilt forward and backward
- Seats should be air-ride, or have vibration damping cushions
- Seats should be covered with a breathable, non-slip material

Vary body posture

WP

In order to reduce awkward and static postures in the low back, encourage the Booth Operator to get up from the seated posture throughout the day. This alleviates the load on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting.

Seat maintenance

E
A
WP

Seats and supports are the only layer of protection between an operator and whole-body vibration transmitted from equipment. For these reasons, seats need to be properly maintained to help prevent injuries.

Seat maintenance should begin when a workstation is being created or renovated. Many equipment manufacturers offer a selection of seats. Use the information on the previous page to select a seat that satisfies your ergonomic criteria. Where possible, have the intended operators try several different seat styles before deciding on a seat design. If the manufacturer does not offer seats of suitable quality, it might be necessary to order a custom seat. Remember: heavy equipment manufacturers do not specialise in ergonomic seat design. Good quality seats may require separate ordering and installation.

Any new seat should come with a clear set of instructions for adjustment and use. Photocopy a set of these instructions for each operator, and laminate another copy for prominent viewing in the work area. Make sure all operators are familiar with the purpose and use of all seat features.

Regular seat maintenance

Regular seat maintenance should follow a schedule based on duration of use. At the prescribed time, all components of the seat should be inspected for wear, and damaged parts should be replaced. This inspection should include seat suspension, seat cushioning, seat covering, and arm supports. Seats should be replaced when they are too worn, or when they can no longer be repaired to safe working levels. Seats, like work boots, have a life span limited by their daily exposure to vibration, shock impact, and continuous load bearing.

Daily inspection of seat

A
WP

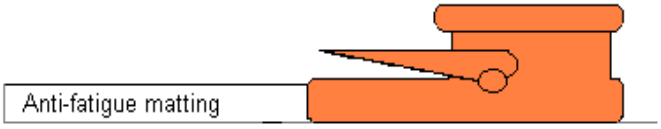
Seat users should also be responsible for ongoing maintenance. A short daily inspection of the vehicle seat could identify wear or damage before it becomes a major problem. Keeping the seat as clean as possible and regularly using all adjustments on the chair can also help to minimise uneven wear and prevent damage.

FOOT PEDALS

Recessed foot pedals

E

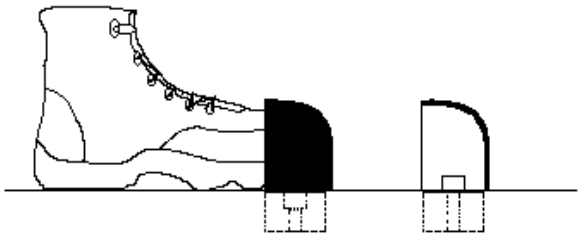
In order to minimise awkward postures of the ankle, recess foot pedals into anti-fatigue matting to decrease the height of the foot pedal base. To recess foot pedals, and provide a more comfortable standing surface in the process, position anti-fatigue matting as close as possible to the foot pedal base. 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.



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.



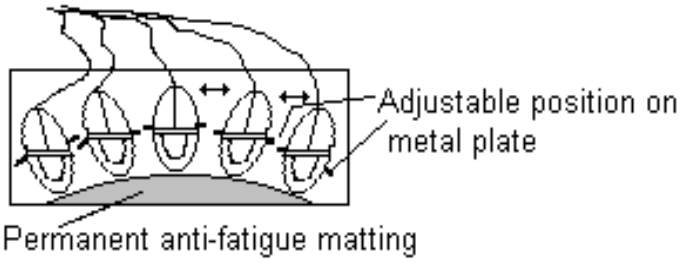
Moveable foot pedals

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 is most appropriate where a worker may move to manipulate lumber but still needs to operate the foot pedals.

ADDITIONAL WORKSTATION DESIGN OPTIONS

TV and computer monitors

E

- Monitors that have to be observed repeatedly throughout the day should be placed in front of the operator so they are able to see the monitor(s) more easily.
- Avoid putting cameras monitoring the process on vibrating surfaces. A vibrating video display can be a source of eyestrain.
- The flow of information between the monitors should reflect the flow of the process. For example, if the flow of a cant is from left to right, then the monitors should reflect that flow.
- Position the most important monitor information within easy view of the operator, directly in front of the operator.
- Provide a minimal number of monitors to view the necessary components of the process. A split-screen can be used to view a number of processes or different views of the same process rather than using individual monitors. Additional monitors can be provided but they should not be positioned directly in front of the operator if they are only used occasionally.
- Provide colour monitors whenever possible. Do not use both black and white and colour monitors in the same viewing area.
- Constant movement of horizontal lines through the viewing monitors is an annoyance to operators. During set-up make sure the refresh rate of the screens is sufficient and that interference from electrical sources is minimised.
- Position monitors so that glare from light sources is not a problem.

Mirrors

WP

- Position of mirrors should be easily adjustable for all operators.
- Keep mirrors clean to make viewing easier for operators.
- The reflective properties of the mirror should provide an undistorted area view.
- Be aware of reflections that may bother other operators in the area during specific times of the day.
- Take short breaks. Look down and close the eyes to allow them to re-lubricate, and to allow eye muscles to relax.

Position of booth

E

In order to reduce the amount of neck twisting, position the control booth as far back as possible to centralise the processes being monitored.

Button controls

E

In order to reduce force and awkward postures in the hand/fingers, use controls (buttons, rocker switches) that are easy to activate. Buttons should be spaced so that the thumb or fingers do not assume awkward postures to activate them.

Additional Work Practices

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. When twisting the head, keep the chin tucked in and the ears in alignment with the shoulders.

Stretches

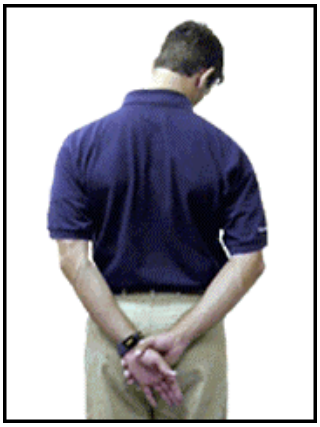
WP In order to minimise awkward and static postures of the body related to warehouse work, use these stretches throughout the day to enhance tissue tolerance for those muscle groups. For additional stretches see the **Body Manual**.

Chin Tuck

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.

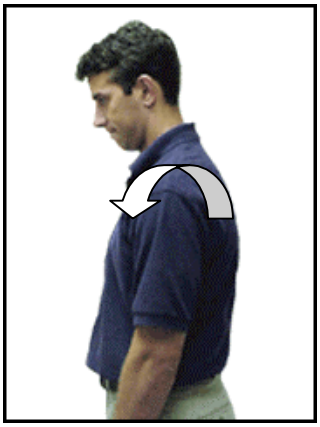
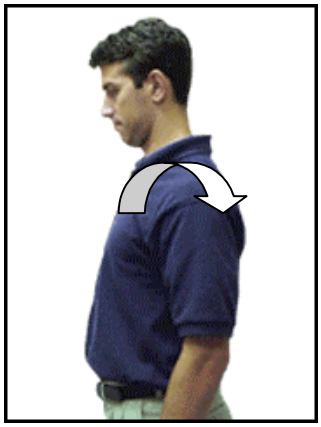

Neck Stretch

Turn the head slightly to one side and reach for the ground behind you with the opposite arm. Hold for 10 seconds. Repeat 3 times on each side.




Shoulder Circles

Rotate the shoulders in forward circles for 5 rotations. Repeat rotating the shoulders backward.

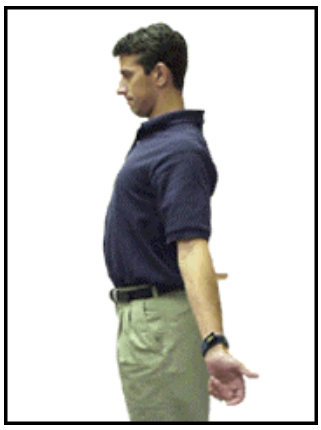



Shoulder Stretch

Gently pull elbow towards opposite shoulder, keeping both shoulders relaxed. You should feel a mild stretch in the back of the shoulder. Hold for 5 seconds. Repeat with the other arm.

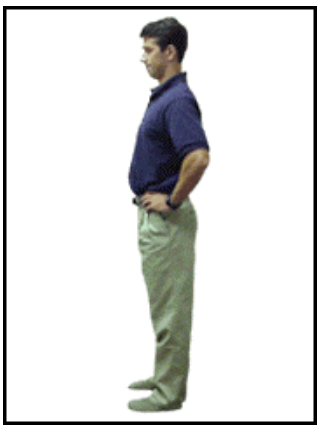
Upper Back & Chest Stretch

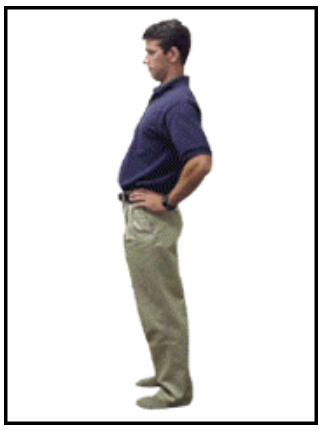
Place the hands together in front of the body and push them outwards. Bring the arms behind the body and squeeze the shoulder blades together while pressing the shoulders down and keeping the chin tucked in. Repeat 5 times.



Back Extension

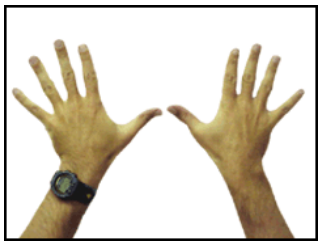
Start by standing in an upright position (the back is in neutral posture). Lean backwards slightly, pushing the hips gently forward. Hold for 5 seconds. Repeat 3 times.



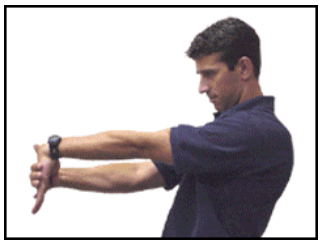


Hands and Fingers Stretch

Clench both fists and hold for 3 seconds. Then open your hands and spread fingers apart. Hold for 3 seconds. Repeat.

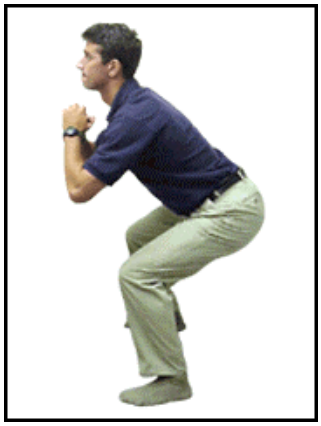


Wrist Flexor and Extensor Stretch



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 to 30 seconds. Repeat with fingers pointing down. Repeat with the other arm.

Squats (low back)

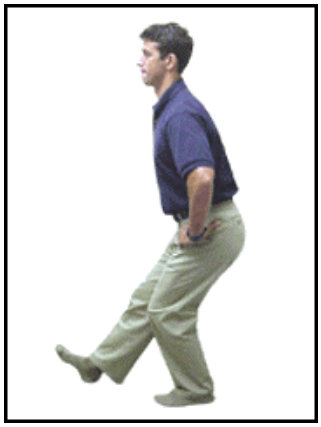


Place feet shoulder width apart, sit down and then stand back up. Repeat 5 times.

Hip Flexor Stretch

Place one foot in front of the other and lower the body, keeping your pelvis tilted. You should feel this stretch in the front hip and thigh of the back leg. Hold for 5 seconds. Repeat 3 times with each leg.

Hamstring Stretch



Place the heel of one foot in front of the body, and bend the other leg. Keep your back upright and in the neutral position. You should fell this stretch in the back of the thigh of the forward leg. Hold for 5 seconds. Repeat 3 times with each leg.

Characteristics of Objects Being Handled

Booth Operators are required to perform movements of the hand, wrist and shoulder repetitively throughout the shift. The types of controls used can effect the amount of force and type of movement that is required. The following sections outline work practises for workers and design considerations for console controls.

Neutral wrist posture

WP Keep wrists in a neutral posture (straight wrist), when operating controls.

Neutral wrist posture – joystick use

WP If operating a joystick type control for long periods of time, provide soft padding in front of the joystick, high enough to keep the wrist in a neutral posture.

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.

SIZE AND SHAPE

Push button

E

- As the button is activated, resistance should increase gradually, and then rapidly disappear.
- The top of the button should prevent fingers, hands, or feet from sliding off. Ideally, finger activated buttons are concave on top.
- Button activation should be associated with a sound or light display, especially in low light environments.
- Large push buttons, operated by the heel of the hand, are not recommended if a foot or finger operated control can be used. For foot push buttons, only the front of the foot is used to produce the necessary small forces and strokes.

Toggle switch (2- or 3-position)

E

- When control panel space is limited, toggle switches are used.
- Toggle switch activation should be indicated by an associated sound.
- If a number of switches are used, horizontal rather than a vertical placement is preferable. Vertical placement requires more space in order to avoid accidental operation.
- Three-position toggle switches (e.g., switches activating high, medium, and low settings) cannot be operated as quickly as 2-position toggle switches.

Rotary selector switch (cylindrical or wedged)

E

- The winged version has a pair of 'wings' above the cylindrical part acting as positional markers and as a finger grip.
- These switches require a relatively large amount of space for hand activation.
- Use as little of the control's 360-degree rotation to accommodate the number of values required.
- Provide physical and/or auditory stops for each value in the range so that the operator may count the appropriate number of steps if visual control is not possible.

Knob

E

- Sufficient space must be around the knob so fingers do not obscure the scale of the knob and proper grasping is possible.

Lever

E

- Levers requiring considerable force should be activated at shoulder level for standing work, at elbow level for seated work, and preferably somewhat to one side, not directly in front of the operator. The lever should move toward the axis of the body so that the body is subjected to as little torsion as possible. The location of the lever should be within the reach envelope.
- Lever length is dependent upon the task. For small displacements (less than 30 degrees)
- In order to minimise contact stress on the hands, controls should have cylindrical rather than ball shaped handles. This shape would allow for a more even distribution of contact with the lever. Grips should be made of a material that allows for good contact and is not slippery (e.g., bike handle foam coverings). Regardless of the shape of the lever control, the wrist should remain in a neutral position as often as possible.

LOAD CONDITION AND WEIGHT DISTRIBUTION

Pike pole use

WP

In order to reduce loading on the shoulder and back when handling logs on the end of pike poles, pick the appropriate pike pole for the job. 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 log, only pull on it twice before removing it from the wood. Repeat this process until 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.

Lightweight, sharp tools

A
WP

In order to decrease the force required on the shoulder and back by a Booth Operator, ensure that the tools used to manipulate the wood (e.g., pike poles, picaroons) are lightweight and sharp.

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) a Booth Operator 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 Booth Operator's glove, and thus decrease the grip forces required.

Padding for levers

E

In order to reduce stress to hands, place foam covers on control handles. These covers reduce contact stress and damp vibration transmitted to the hands.

Gloves

PPE

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

Environmental Conditions

Vibration

E

In order to minimise the level of vibration within the booth, the booth should be isolated from the vibration source, and the worker should be provided with damping devices (air cushioned chair, etc.). In some cases, the vibration created within the booth is a result of logs or cants hitting against metal during the process. Padding the metal surfaces with shock resistant or shock damping material should lower the level of vibration and noise inside the booth.

Reduce glare

PPE

To minimise awkward neck postures due to glare, operators may wear sunglasses, or windows can be treated to filter sunlight.

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

Work Organisation

Task variability

A
WP

To reduce exposure to static sitting, encourage workers to occasionally perform duties that require standing.

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
Neutral posture	**78**		**A S**									
Padding on console	**78**					**A**	**C**					
Moving console	**79**		**R A S**			**R A**		**R A S**				
Range of motion in controls	**79**		**A**			**A**						
Research equipment or workstation layout with operators	**79**	**R A S**	**R A S**		**F R A**	**F R A**	**C V**	**F R A S V**			**A S**	
Control distance while seated	**79**		**A**					**A**				
Adjust chair	**80**		**A S**									
Arm supports	**80**		**A S**			**A S**						
Operate controls at appropriate heights	**80**		**A**			**A**						

Direct Risk Factors

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

Summary of Solutions

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		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Lumbar support	**81**							**A**				
Adjustable seating	**81**							**A S**				
Vary body posture	**82**							**A S**				
Seat maintenance	**82**							**A V**				
Daily inspection of seat	**82**							**A V**				
Recessed foot pedals	**83**										**A**	
Foot push buttons	**83**										**A**	
Moveable foot pedals	**84**										**A**	
TV and computer monitors	**85**	**A R**										
Mirrors	**85**	**A R**										
Position of booth	**86**	**A R**										
Button controls	**86**						**F A**					
View with eyes	**87**	**A**										
Stretches	**87**	**directly reduces risk of injury to the body**										

Direct Risk Factors

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SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Neutral wrist posture	**90**					**A**						
Neutral wrist posture – joystick use	**90**					**A**						
Power positions	**90**							**F A**				
Manual material handling	**91**							**F A**				
Push button	**92**						**C**					
Toggle switch (2- or 3-position)	**92**					**F A**						
Rotary selector switch (cylindrical or wedged)	**92**					**A**						
Knob	**92**					**A**						
Lever	**93**						**C**					
Pike pole use	**94**							**F A**				
Lightweight, sharp tools	**94**							**F**				

Direct Risk Factors

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SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Modify tool handle friction	**95**				**F**							
Padding for levers	**95**						**C V**					
Gloves	**95**				**F**							
Vibration	**96**						**V**	**V**				
Reduce glare	**96**	**A**										
Task variability	**96**							**S**				
Heat Exposure	◆	indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Job Rotation	◆	indirectly reduces risk of injury to the body										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

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

BOOTH OPERATOR MSI SAFETY GUIDE

OBJECTIVE:

To identify ergonomic risks involved in the Booth Operator 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 Booth Operator.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Booth Operator must look to the sides, or to one side only, in order to observe monitors and the mill environment. An operator may also look up to view monitors and mirrors.	**Repetition** **Awkward Posture** **Static Postures**	• When the head is repeatedly turned to the side or bent backward, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury. • 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. • Neck muscles must support the weight of the head while in a backward 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 twisted position, the muscles of the neck must remain tense to maintain that position. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.	• If twisting cannot be avoided, try to alternate turning the head in both directions. • When twisting the head, keep the chin tucked in and the ears in alignment with the shoulders. • Turn with the eyes and neck, not just the neck, to inspect work. • For exercises that can help prevent ***neck*** injuries, ***see the Neck section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder A Booth Operator frequently holds one or both arms away from the body in order to operate controls.	**Repetition** **Awkward Postures** **Static Postures**	• When the arms are repeatedly lifted, the muscles of the neck and shoulder are subjected to repeated stress with little or no time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • Neck and shoulder muscles must support the weight of the arms when they are away from the body. The 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.	• Try to keep the arms as close to the body as possible. • Try to keep the arms supported on padding or evenly across the console. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • For exercises that can help prevent ***neck*** and ***shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Booth Operator must grip joysticks and other controls in order to operate equipment.	**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. • The width of an object affects how much muscle tension needs to be generated. Using either an overly large or a small grip requires more muscle force, and can lead to tissue fatigue at the tendon/bone connection.	• Grip controls lightly so that tension in the forearm muscles/tendons is reduced. • Keep wrists in a neutral (straight) position. • For exercises that can help prevent ***elbow*** injuries, ***see the Elbow section of the Body Manual***.
		Repetition	• Repeated stress to the elbow without adequate rest could fatigue tissues to the point of injury.	
		Awkward Postures	• The position of the wrist also affects how much muscle tension needs to be generated. Gripping objects with the wrist bent increases the tension generated by muscles.	

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist A Booth Operator must grip controls with the wrists bent in order to operate equipment.	**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.	• Try to keep the arms supported on padding or evenly across the console. • Protect the base of the hand - try to keep pressure away from this area of the body.
		Repetition	• Repeated gripping and 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.	• Grip controls lightly so that tension in the forearm muscles/tendons is reduced. • Keep wrists in a neutral (straight) position.
		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.	• ***See the Wrist section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist/Hand A Booth Operator rests the wrist/hand on controls or the console when using obstructed controls, or between the use of controls.	**Contact Stress** **Vibration**	• Contact between hard or sharp surfaces and the base of the palm places stress on the tendons and nerves in the carpal tunnel. • Continual contact with hard or sharp surfaces may damage the nerve and/or gradually weaken the tendons, and cause injury. • Exposure to vibration, through the use of power tools or through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and vibration frequency influence the amount of mechanical stress. • Continual exposure to hand/arm vibration may gradually damage neurovascular tissue (nerves and blood vessels) in the hand, and may contribute to problems in the wrist.	• Try to keep the arms supported on padding or evenly across the console. • Protect the base of the hand - try to keep pressure away from this area of the body. • ***See the Wrist section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Booth Operator may bend forward and to the side in order to unjam logs or lumber. A Booth Operator may also bend to observe process flow or equipment.	**Force** **Repetition** **Awkward Postures**	• Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back. • Repeated forward bending and lifting 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. • 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.	• 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. • Maintain neutral postures while working in a vibrating environment (ears, shoulders, and hips aligned). Avoid twisting, bending, and slouching. • Ensure that your seat is properly adjusted to support the curve in your lower spine. • For exercises that can help prevent ***low back*** injuries, ***see the Back section of the Body Manual***.
	Low Back A Booth Operator continually sits on a vibrating surface.	**Awkward Postures** **Static Postures** **Vibration**	• Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury. • Whole body vibration is usually transmitted through the seat 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 sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs.	

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Ankle/Foot A Booth Operator must repeatedly use a foot pedal control.	**Repetition** **Awkward Postures**	• The repetitive ankle flexion and extension that occurs when pressing foot pedals requires the muscles of the foot and lower leg to repeatedly contract, with little time for recovery. This can lead to fatigue and can cause small tears to develop in the muscles and tendons of the foot and lower leg. • 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.	• 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***.