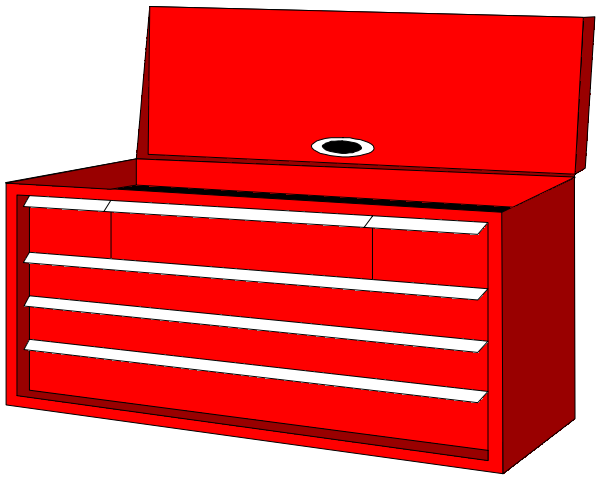
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Machine Stress Rater 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

MACHINE STRESS RATER TOOL KIT
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Overview

Machine Stress Rater

Job Summary

A Machine Stress Rater is responsible for testing lumber quality and maintaining automatic lumber testing machines. A Machine Stress Rater will perform tests, move sample boards, record data, monitor lumber, clear cross-ups, calibrate and maintain machines, and measure the size of lumber. Machine Stress Raters may also perform general clean-up duties. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Machine Stress Rater may include:

a) Forceful movements of the neck/shoulder, wrist, and low back
b) Repetitive movements of the neck/shoulder, wrist, and low back
c) Awkward postures of the neck, neck/shoulder, wrist, and low back
d) Static postures of the neck and feet
e) Vibration transmitted through the feet
f) Pushing and pulling lumber
g) Lifting, lowering, and carrying lumber and test bars

Mental Demands

A Machine Stress Rater must inspect each sample board and assess its given grade in order to decide on the criteria it must meet during testing. This requires a grading ticket and MSR training. A Machine Stress Rater constantly monitors numerous areas and therefore must be mentally alert for the duration of the shift.

Major Variations

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

1) Machine Stress Raters may:
   a) Perform bend and tension tests regularly
   b) Perform bend tests regularly
   c) Rarely or never perform tests

2) Machine Stress Raters may:
   a) Stand while monitoring lumber
   b) Sit while monitoring lumber
   c) Have the option to stand or sit while monitoring lumber

3) Due to the workstation design, Machine Stress Raters may:
   a) Have automatic in-feed and/or out-feed systems for moving sample boards
   b) Manually move sample boards to and/or from test area

4) Machine Stress Raters may:
   a) Perform clean-up duties regularly
   b) Rarely or never perform clean-up duties

Minor Variations

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

1) When maintaining and calibrating the Continuous Lumber Tester, the Machine Stress Rater may:
   a) Have a platform to stand on at the side of the machine
   b) Stand at floor level as no platform is available

Physical Demands Analysis
Machine Stress Rater

PDA General Instructions: Machine Stress Rater

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Machine Stress Rater. 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 Machine Stress Raters 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.

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Physical Demands Analysis
Machine Stress Rater

Task List

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

Test boards on Proof Tester

Machine Stress Raters are responsible for measuring the strength of sample boards on the Proof Tester machine.

Does this task occur at your mill?

☐ Yes ☐ No

Move sample boards onto and off of Proof Tester

Machine Stress Raters are required to move the sample boards onto the Proof Tester machine and remove them following the test.

Does this task occur at your mill?

☐ Yes ☐ No

Record data

Machine Stress Raters are responsible for recording the data from the tests in a logbook.

Does this task occur at your mill?

☐ Yes ☐ No

Monitor lumber

Machine Stress Raters are responsible for monitoring the flow of lumber through the Continuous Lumber Tester.

Does this task occur at your mill?

☐ Yes ☐ No

Clear cross-ups

Machine Stress Raters are responsible for clearing any cross-ups in the flow of lumber to the Continuous Lumber Tester.

Does this task occur at your mill?

☐ Yes ☐ No

Calibrate Continuous Lumber Tester

Machine Stress Raters are responsible for calibrating the continuous lumber tester so boards are tested accurately.

Does this task occur at your mill?

☐ Yes ☐ No

Maintain Continuous Lumber Tester

Machine Stress Raters are responsible for maintaining the continuous lumber tester in proper form. This can include blowing down the machine, cleaning the rollers, filling up paint sprayers and checking the boats.

Does this task occur at your mill?

☐ Yes ☐ No

Measure size of lumber

Machine Stress Raters are responsible for measuring the width and thickness of a sample of boards using callipers.

Does this task occur at your mill?

☐ Yes ☐ No

Clean-Up

Machine Stress Raters are responsible for general clean-up including sweeping and shovelling.

Does this task occur at your mill?

☐ Yes ☐ No

Perform tension test

Machine Stress Raters are responsible for performing tension tests on a sample of boards to measure their ability to withstand destruction.

Does this task occur at your mill?

☐ Yes ☐ No

Change bang board

Machine Stress Raters are responsible for changing the bang board which boards hit when changing direction on conveyors.

Does this task occur at your mill?

☐ Yes ☐ No

Manually move reject boards

Machine Stress Raters are responsible for manually moving reject boards to the appropriate area.

Does this task occur at your mill?

☐ Yes ☐ No

Job Profile

Date: _____

Company Name: _____ Division: _____

Employee Name: _____ Supervisor: _____

Phone: _____ Fax: _____

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

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

Describe:

_____

_____

_____

Length of shift _____ hours

Formal breaks

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

Informal breaks

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

Work pace control

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

Job rotation

☐ Yes ☐ No

Describe:

_____

_____

_____

_____

Work Organisation

Task Description

The table below contains a list of tasks performed by a Machine Stress Rater. 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%	
	Test boards on Proof Tester					• *Frequency = 5 to 10 boards in 4 hours (if intensive sample is needed frequency = 60 boards in 4 hours)* • *Cycle time = Approximately 25 to 50 minutes* • *Generally involves the use of a lever*
	Move sample boards onto and off of Proof Tester					• *Frequency = 5 to 10 boards in 4 hours (if intensive sample is needed frequency = 60 boards in 4 hours)* • *Cycle time = Approximately 5 to 15 minutes* • *Generally involves manually handling boards, and the use of push buttons, rocker switches, and/or rotary selector switches*
	Record data					• *Frequency = 5 to 10 boards in 4 hours (if intensive sample is needed frequency = 60 boards in 4 hours)* • *Cycle time = Approximately 5 to 15 minutes* • *Can be performed sitting or standing*
	Monitor lumber					• *Generally interspersed with other tasks*
	Clear cross-ups					• *Generally interspersed with other tasks* • *Performed as needed* • *A pike pole may be used to push and pull boards*
	Calibrate Continuous Lumber Tester					• *Frequency = 2 to 4 times per shift* • *Cycle time = Approximately 15 to 30 minutes*

	Task	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Maintain Continuous Lumber Tester					• *Frequency = 4 to 6 times per shift* • *Cycle time = Approximately 10 to 30 minutes*
	Measure size of lumber					• *Frequency = 1 time per hour* • *Cycle time = Approximately 5 to 10 minutes* • *Generally interspersed with other tasks*
	Clean-Up					• *Cycle time = Approximately 45 minutes* • *Generally interspersed with other tasks* • *Includes sweeping and shovelling*
	Perform tension test					• *Frequency = 5 to 10 times per hour*
	Change bang board					• *Frequency = 1 time per shift*
	Manually move reject boards					• *Frequency = 5 boards per hour to 20 boards per minute* • *Cycle time = Approximately 2 to 4 hours*
	Other:					

Workstation Characteristics

Dimensions & Layout

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

Flooring, Displays and Seating

The table below lists several components of a workstation. For *Flooring* and *Displays* there are several options provided. Please indicate all of the options that apply to the workstation. 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 Machine Stress Rater. Use the left column to check off (✓) controls that are present at the work site. Highlight controls that may aggravate the injury, or which the worker finds difficult to use. The *Comments* section may be used to include any additional information. Additional controls can be included under *Other*.

	Type of Control	**Function**	**Comments**
	Lever	• *Operate Proof Tester*	• *Pushes and pulls lever approximately 30 times per board*
	Finger push buttons	• *Operate the movement of chains, Proof Tester, Continuous Lumber Tester, moisture meter, and/or first aid alarm*	
	Round Knob	• *Operate Proof Tester*	
	Rocker switch	• *Operate the movement of chains*	
	Rotary selector switches	• *Operate Proof Tester and/or Continuous Lumber Tester*	
	Handle on hoses	• *Operate air gun and/or washer*	• *Handle is generally small*
	Toggle switch	• *Operate Proof Tester and/or Continuous Lumber Tester*	
	Other:		
	Other:		

Physical Demands

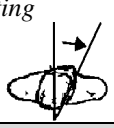
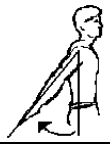
Whole Body Physical Demands

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

Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Example: Standing	• *Test boards on Proof Tester*			✓		• *Vibrating surface* • *For extended period* • *Movement up to 3 meters*
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

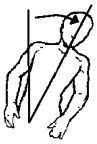
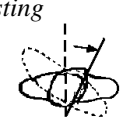
The table below outlines the body postures that may be adopted throughout the shift by a Machine Stress Rater, related to tasks. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

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: Back Flexion	• *Calibrate Continuous Lumber Tester*		✓			• *Worker may bend forward in order to reach into Continuous Lumber Tester*
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 Machine Stress Rater. Indicate tasks that require one or more of these activities, and fill in the weight of the objects, or the force required, for each action. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled. If necessary, please refer to Appendix A to calculate the weight of the wood being handled.

Activity	**Task Description**	**Weight (kg)**	**Percent of Shift**				**Comments**
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Pushing							
Pulling							
Lifting							
Lowering							
Carrying							

Hand Tools

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

	Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
				Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	Short Test Bar	• *Calibrate Continuous Lumber Tester*						• *1 to 2 times per shift*
	Long Test Bar	• *Calibrate Continuous Lumber Tester*						• *1 to 3 times per shift*
	Test Bar	• *Calibrate Proof Tester*						• *When there is a change in board size*
	Moisture Meter or Moisture Wand	• *Measure moisture content of board during test on Proof Tester*						• *1 time per board*
	Air Gun	• *Clean Continuous Lumber Tester and area*						• *Approximately 4 times per shift*
	Washer	• *Clean Continuous Lumber Tester*						• *Approximately 4 times per shift*
	Pike Pole	• *Clear cross-ups*						
	Picaroon	• *Clear cross-ups*						
	Bottles of Dye (4L)	• *Fill spray container during maintenance of Continuous Lumber Tester*						• *Approximately 4 times per shift*
	Varsol Sprayer	• *Apply varsol during maintenance of Continuous Lumber Tester*						• *Approximately 4 times per shift*
	Broom	• *Sweep during clean-up*						
	Shovel	• *Shovel during clean-up*						
	Hand Saw and/or Circular Saw	• *Clear cross-ups manually by cutting boards*						
	Callipers	• *Measure size of lumber*						
	Other:							

Environmental Conditions

Work Environment

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

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

Location of Workstation

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

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

Temperature

The table below contains a list of the geographical regions of British Columbia. Indicate the appropriate region with a check mark (✓) in the left column. Refer to the regional map in Appendix B of the PDA.

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

Personal Protective Equipment

The table below contains a list of the personal protective equipment (PPE). For the Machine Stress Rater at your mill, indicate with a check mark (✓) which of the PPE items are required.

	Gloves Type:		Hard Hat		Leather Apron
	Glove Liners		Steel-toed Boots		Dust Mask
	Eye Protection		Hearing Protection		Seat Belt
	Face Shield/Helmet		Life Jacket		Harness
	Knee Pads		Other:		Other:

Appendix A – Weight of Wood Equation

1. Type of Wood Handled

The table below contains a list of the types of wood processed in British Columbia. The weight per board foot wet and dry is given for each species. This information will be used in the table in *Section 4* to calculate the weight of the wood handled. Please indicate all of the types of wood processed.

	Wood Handled	Wet lb./ Board Foot	Dry lb./ Board Foot		Wood Handled	Wet lb./ Board Foot	Dry lb./ Board Foot
	Douglas Fir	3.60	2.83		Larch	3.48	N/A
	Hemlock	3.42	2.49		Spruce/Pine/Fir*	2.95	2.18
	Red Cedar	2.42	2.00		Alpine Fir	2.67	2.00
	Yellow Cedar	3.01	2.49		Lodge Pole Pine	3.26	2.41
	Sitka Spruce	2.76	2.23		White Spruce	2.93	2.15

*The Spruce/Pine/Fir values are an average of White Spruce, Lodge Pole Pine, and Alpine Fir.

2. Size of Wood*

The table below contains a list of different sizes or dimensions of wood. The percentage next to the size of the wood is the multiple used to compare the size of the board to a board foot (1" by 12" by 12"). This multiple will be used in the table in *Section 4* to calculate the weight of wood handled. Please indicate all of the applicable sizes of wood handled at the workstation. Add any other sizes to the bottom of the table if your particular size of wood is not listed.

	1" Sizes	Multiple		2" Sizes	Multiple		4" Sizes	Multiple		6" Sizes	Multiple		8" Sizes	Multiple
	1 by 4	0.33		2 by 4	0.67		4 by 4	1.33		6 by 6	3.00		8 by 8	5.33
	1 by 6	0.50		2 by 6	1.00		4 by 6	2.00		6 by 8	4.00		8 by 10	6.67
	1 by 8	0.67		2 by 8	1.33		4 by 8	2.67		6 by 10	5.00		8 by 12	8.00
	1 by 10	0.83		2 by 10	1.67		4 by 10	3.33		6 by 12	6.00			
	1 by 12	1.00		2 by 12	2.00		4 by 12	4.00						

* Conservative estimates of actual wood dimensions

If the size of the board is different from those in this table, use this equation to find out the multiple value.

[(Dimensions of wood) x 12] / 144 = Multiple
For example: For a 5 by 5 piece of wood [(5x5) x 12]/144 = 2.08

3. Length of Wood

The table below contains a list of the common lengths of wood. Please indicate which of these lengths are being handled at this particular workstation. Add additional lengths to the table if necessary. This information will be used in the table in *Section 4*.

Length of Wood							
	6 foot		12 foot		18 foot		22 foot
	8 foot		14 foot		20 foot		24 foot
	10 foot		16 foot		Other:		Other:

4. Weight of Wood Equation*

The table below is used to calculate the weight of the boards being handled. The weight is calculated by multiplying the species weight/board foot (*Section 1 value*) by the size of wood multiple (*Section 2 value*) and by the length of wood (*Section 3 value*).

Example: For a run of wet Spruce/Pine/Fir, 2" x 4", 16 feet long

2.95 *(wet lb./ board foot)* x **0.67** *(size of wood multiple for 2" x 4")* x **16** *(length of board in feet)* = **32 lbs**.

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

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

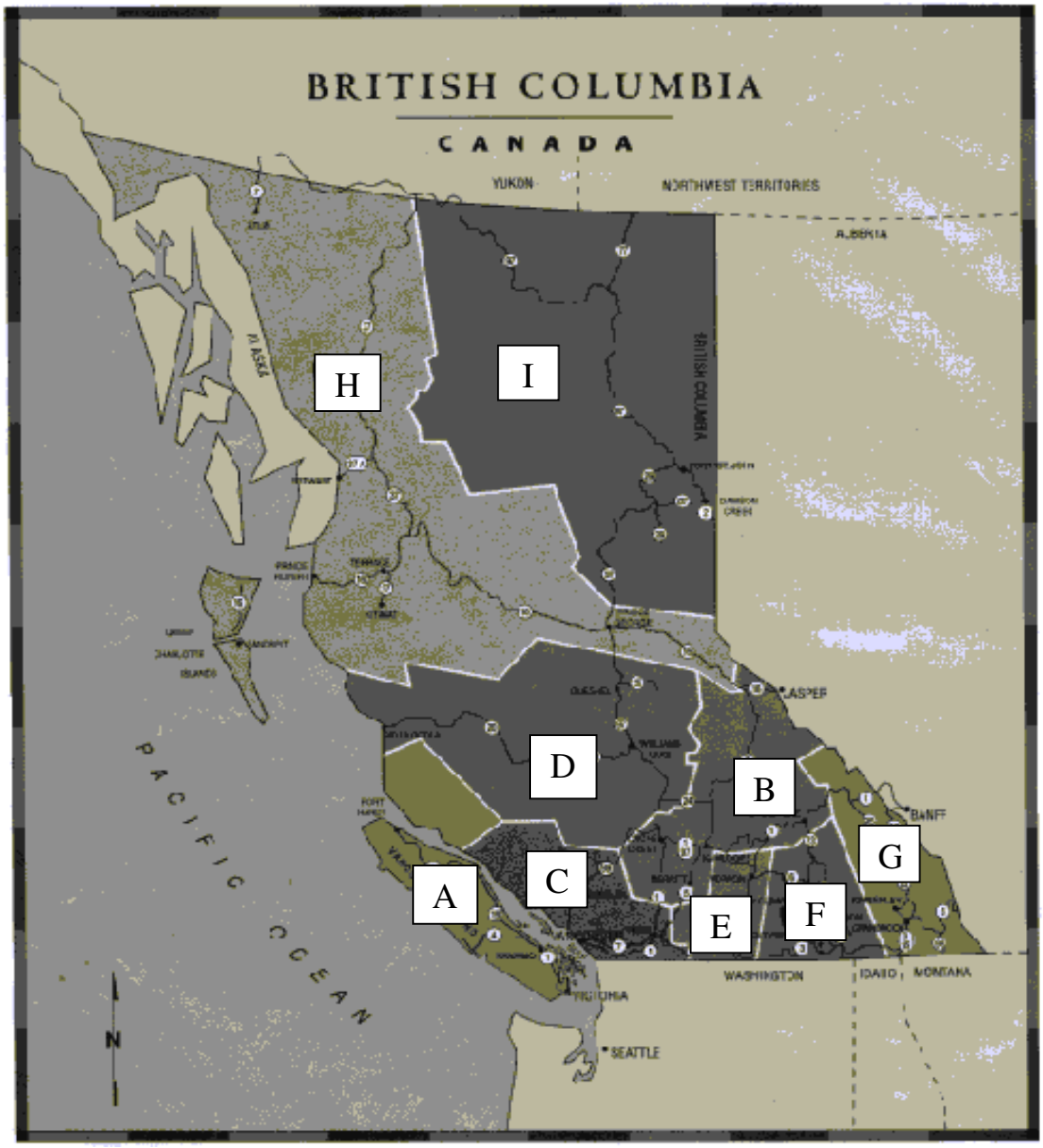
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

If required, divide the pound value by 2.2 to obtain the weight of the board in kilograms.

Type of Wood Handled (lb./ board foot) *From Section 1*		**x**	**Multiple (size of wood)** *From Section 2*	**x**	**Length of Wood** *From Section 3*	**=**	**Weight of the Board in pounds**	**Divide by 2.2 to calculate value in kilograms**
Heaviest Species Handled		x		x		=		
Most Common Species Handled		x		x		=		
Lightest Species Handled		x		x		=		

* Weight may vary from the above calculation depending on the cell moisture content of the wood, actual wood dimensions, and wood density.

Appendix B – Regional Map



A - Vancouver Island	**F** - Kootenay Country
B - High Country	**G** - British Columbia Rockies
C - Southwestern BC	**H** - North by Northwest
D - Cariboo Chilcotin Coast	**I** - Peace River Alaska Highway
E - Okanagan Similkameen	

Risk Factor Identification Checklist
Machine Stress Rater

Purpose

The Risk Factor Identification Checklist for a Machine Stress Rater 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 – Machine Stress Rater

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.

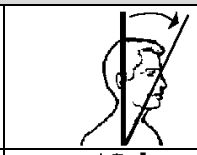
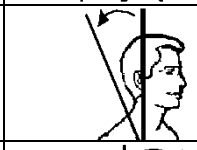
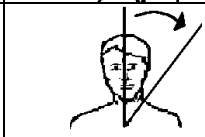
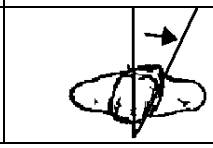
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

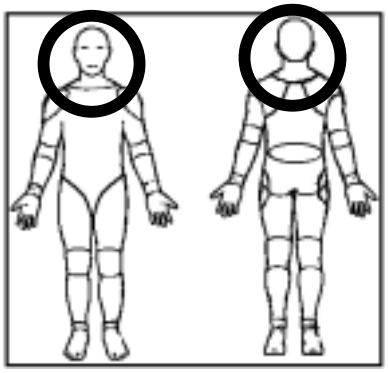
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 up or down frequently)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., monitoring boards)			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 into CLT for a long period, looking up while watching in-feed)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Lateral Bending 			S O	
Rotation 			S O	

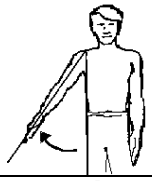
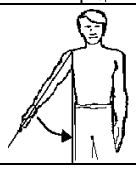
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



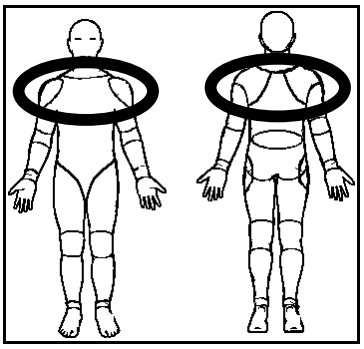
Body parts within the circled area will be classified as NECK issues.

SHOULDER

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., lifting boards)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., testing boards on Proof Loader)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., blowing down CLT)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., air gun)			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



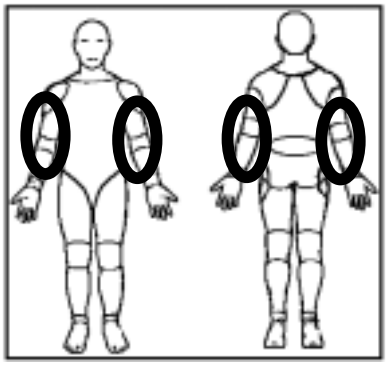
Body parts within the circled area will be classified as SHOULDER issues.

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., lever on Proof Loader) 			S O	
Are objects handled in a pinch grip? (e.g., boards) 			S O	
Are objects handled in a hook grip? (e.g., bottles of dye) 			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., using lever on Proof Loader)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., manipulating boards)			S O	

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

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



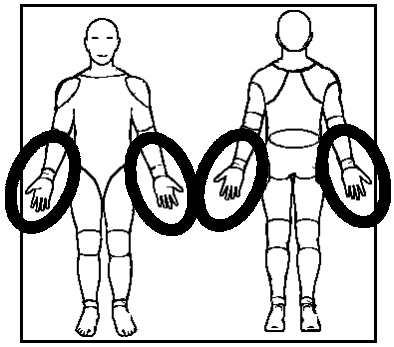
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., pike pole) 			S O	
Are objects handled in a pinch grip? (e.g., test bars) 			S O	
Are objects handled in a hook grip? (e.g., bottles of dye) 			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., turning boards)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., manipulating boards)			S O	

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

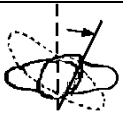
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



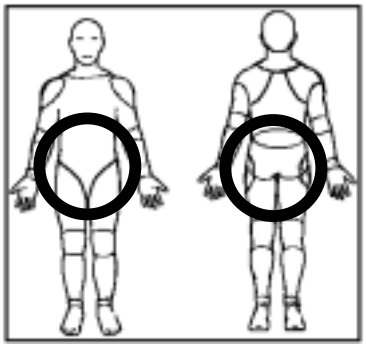
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., moving boards onto and off of Proof Loader)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., manipulating boards)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending to reach into the CLT)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., standing while monitoring boards)			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh? (e.g., conveyors that dig into the hip or thigh, edges of consoles or workstation)			S O	

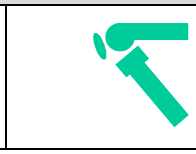
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on catwalks, platforms, and machinery)				S O	

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

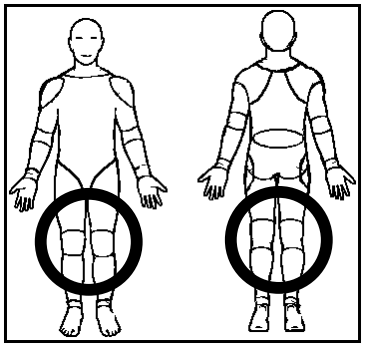


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

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

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

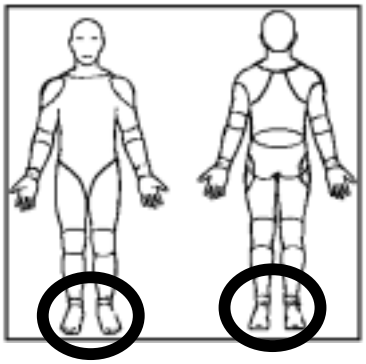


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., walking on uneven surfaces)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift? (e.g., standing at Proof Loader, at CLT, while monitoring boards)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on catwalks, platforms, and machinery)			S O	

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



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y		Comments:
Are there problems handling a load due to its size or shape? (e.g., large boards, test bars)			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions? (e.g., bottles of dye)			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object? (e.g., hoists when lifting heavy test bars, or lid to CLT)			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., air gun)			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., looking into CLT)			S O	

ENVIRONMENTAL CONDITIONS [CONTINUED]

Noise	N	Y		Comments:
Have there been complaints on the level of noise in the work area?			S O	
Ask the worker: Are there any distracting or annoying noises at the workstation? (e.g., air hoses, in-feed boards banging)			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., calibrating CLT during 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? (e.g., extended weekend maintenance)			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

Machine Stress Rater

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

Machine Stress Rater

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.

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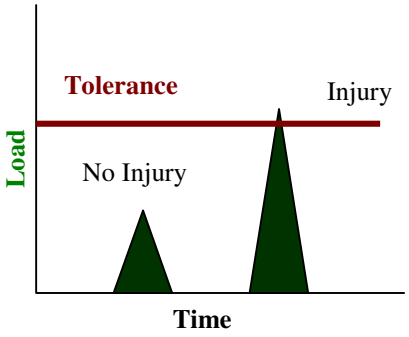
Injury Education

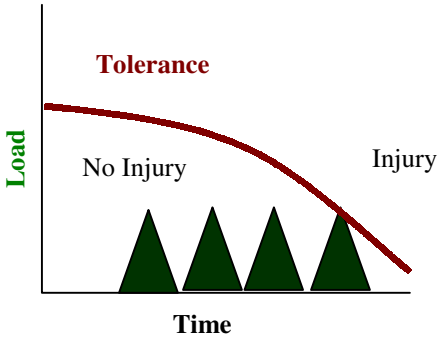
Injuries occur when …
Loads exceed tissue tolerances



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.

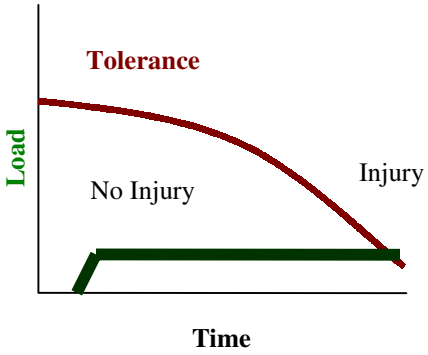
Example – a worker going over on their ankle and spraining it.



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 Machine Stress Rater 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 Machine Stress Rater. 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 Machine Stress Rater position and found that the neck/shoulder and low back are the body parts of major concern while performing the duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

Low Back: Major risks include awkward postures, repetition, and forceful exertion while lifting boards and test bars, maintaining the CLT, clearing cross-ups, and performing tests.

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

1. Golfer's lift to reach into CLT (page 71)
2. Store test bars in appropriate spot (page 73)
3. Platform to stand on (page 74)

Neck/Shoulder: Major risks include awkward postures, repetition, and forceful exertion while working with the arms raised and away from the body. These risks occur while lifting and manipulating boards and test bars, maintaining the CLT, and performing tests.

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

1. Automatic infeed and outfeed (page 75)
2. Drop bin or kickers (page 75)
3. Lifting aids (page 79)

For additional stretching and strengthening exercises that would benefit a Machine Stress Rater, refer to the Neck, Shoulder, and Back sections of the Body Manual.

NECK

Direct Risk Factors:
Awkward Postures
Static Postures

A Machine Stress Rater may look up, down, and/or to the side in order to view the task at hand.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

- Neck muscles must support the weight of the head while in a forward, backward, and/or twisted position. The more the neck is bent, the greater the load on the muscles and tendons.

Static Postures

- When the neck is held still in a forward, backward, and/or 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

- Loading on the neck muscles is increased because the head is held in a forward, backward, and/or twisted position in order to view boards, machines, monitors, and mirrors.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 83 to 85.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Machine Stress Rater may work with the arms raised and away from the body in order to lift and manipulate boards and test bars, maintain the CLT, and perform tests.

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. Deeper muscles stabilise the shoulder joint as well as produce movement. These deeper muscles and their tendons are referred to as the rotator cuff.

DIRECT RISK FACTORS

Force

- Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons.
- The rotator cuff stabilises the shoulder joint when objects are manipulated. The heavier the object, or the larger the force required, the greater the load on the rotator cuff.
- If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.

Repetition

- When the arms are repeatedly 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.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on tissues of the shoulder and upper back is increased when working with the arms raised above shoulder height when blowing out the CLT.

Working Reaches

- Loading on the tissues of the shoulder and upper back is increased when working with the arms raised and extended in front and/or to the side when manipulating boards for testing on the Proof Loader.

CONSEQUENCES

- Forceful and repeated manipulation of boards and test bars can lead to neck and/or shoulder strain.
- Signs and symptoms of neck and shoulder tissue injury include pain, tenderness, muscle spasm in the neck/shoulder area, and headaches.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled "Neck/Shoulder" in the Summary of Solutions on pages 83 to 85.
- To help prevent ***neck*** and ***shoulder*** discomfort, see the upper trapezius stretch in the ***Neck and Shoulder sections of the Body Manual.***

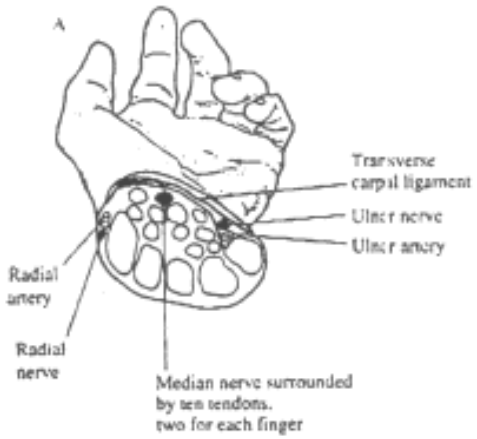
WRIST

Direct Risk Factors:
Force
Repetition
Awkward Postures

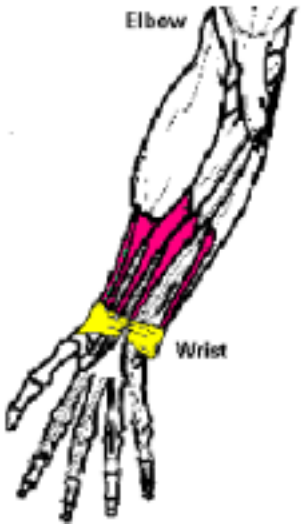
A Machine Stress Rater may grip boards, test bars, and controls with the wrists bent in order to manipulate them and perform tests.

BACKGROUND INFORMATION

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



The Carpal Tunnel



DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading on tissues of the wrist is increased when grip size has to expand for manipulating larger boards.
- Loading on the tissues of the wrist is increased when the shape of the object, such as boards or controls, forces awkward wrist postures to be used.

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 83 to 85.
- For exercises that can help to prevent ***wrist*** injuries, see the ***Wrist section of the Body Manual.***

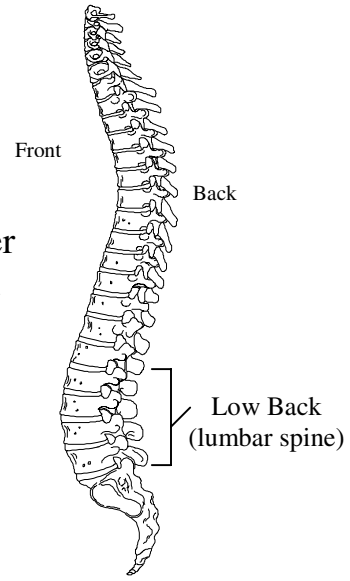
LOW BACK

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Machine Stress Rater may bend forward in order to lift boards and test bars, maintain the CLT, clear cross-ups, and perform tests.

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/or 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. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Increased loading is placed on the tissues of the low back when performing tasks at heights that require bent postures of the trunk, such as when calibrating the CLT.

Working Reaches

- Increased loading is placed on the tissues of the low back when performing tasks at reaching distances that require bent postures of the trunk, like reaching to clear cross-ups or retrieve test samples.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Low Back, please see the column labelled “Low Back” in the Summary of Solutions on pages 83 to 85.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

FOOT

Direct Risk Factors:
Static Postures
Vibration

A Machine Stress Rater may stand on a hard, vibrating surface for prolonged periods while monitoring boards and performing tests.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Static Postures

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

Vibration

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

INDIRECT RISK FACTORS

Workstation Design

Floor Surfaces

- Loading on the feet can be increased when standing continuously for long periods of time on a vibrating surface.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Foot, please see the column labelled "Foot" in the Summary of Solutions on pages 83 to 85.
- For exercises that can help to prevent ***foot*** injuries, see the ***Foot section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Machine Stress Rater may look up, down, and/or to the side in order to view the task at hand.

NECK/SHOULDER

- A Machine Stress Rater may work with the arms raised and away from the body in order to lift and manipulate boards and test bars, maintain the CLT, and perform tests.

WRIST

- A Machine Stress Rater may grip boards, test bars, and controls with the wrists bent in order to manipulate them and perform tests.

LOW BACK

- A Machine Stress Rater may bend forward in order to lift boards and test bars, maintain the CLT, clear cross-ups, and perform tests.

FOOT

- A Machine Stress Rater may stand on a hard, vibrating surface for prolonged periods while monitoring boards and performing tests.

Risk Factors by Body Part

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

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

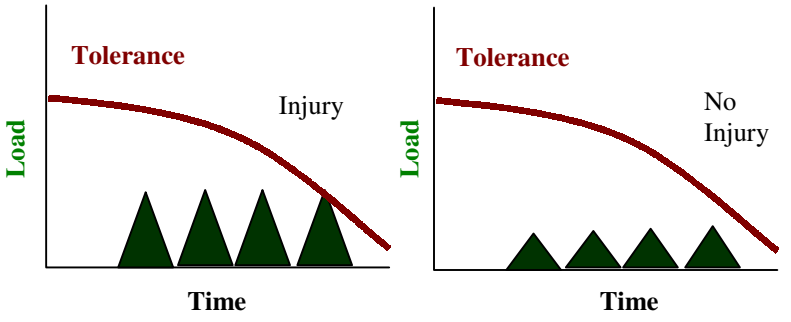
** Extended exposure to <u>any</u> risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual*

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

	= Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.
♦	= Indicates that the risk factor assessed is commonly found in sawmills, and may need to be addressed at your mill. See the appropriate section of the General Risk Factor Solutions Manual for more information.
✓	= Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 83 to 85 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

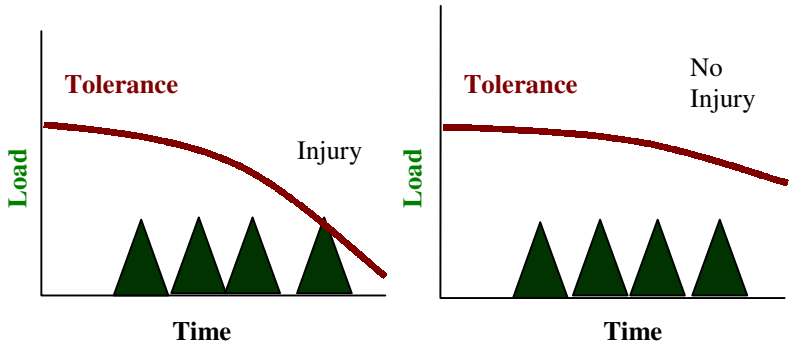
Injury Prevention

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 Machine Stress Rater 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

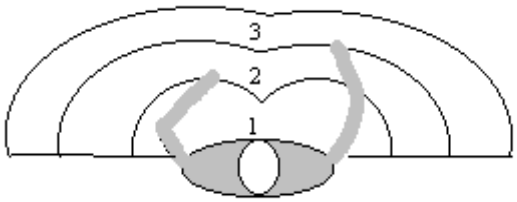
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

Golfer's lift to reach into CLT

WP

In order to reduce awkward postures of the low back when reaching into the CLT during calibration and maintenance, implement the golfer's lift (as shown below). Since this position requires the use of one arm for support, it should not be used when lifting heavy bars.

A golfer's lift reduces the bent forward posture of the back when reaching into the CLT, decreasing the risk of injury.

Supported postures

WP

To reduce load on the low back, a Machine Stress Rater should use a free arm to support the upper body when possible (as shown below). When reaching forward, supporting the upper body against the guard reduces the amount of muscle activity in the low back. The guard should be padded to avoid excessive contact stress.

The Machine Stress Rater is using his free arm to support himself on the guard of the CLT. This support will reduce load in the low back, decreasing the risk of injury.

Reduce reaching

E
A
WP

In order to decrease awkward postures from reaching, use a long pike pole or picaroon to clear cross-ups and remove waste pieces. Provide various lengths of pike poles for different tasks or situations. In order to decrease the force required by a Machine Stress Rater when reaching to clear cross-ups, ensure that the pike poles and picaroons are lightweight and sharp.

Standing work

WP

To minimise loading on the low back, pulling, pushing, and lifting of wood should be performed while standing. With both feet planted on the floor, the Machine Stress Rater has more stability and can recruit the larger muscle groups from the legs to meet the physical demands of handling pieces.

Some Machine Stress Raters sit while manipulating boards. Heavy handling from this seated posture will increase the amount of reaching necessary, place more stress on the muscle groups of the upper body, and increase the risk of injury.

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 Machine Stress Rater, identify the body part of most concern. If the main concern is the:

Neck - minimise forward bending of the neck by increasing working height.
Neck/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.

Store test bars in appropriate spot

E
WP

In order to reduce awkward postures and force at the neck/shoulder and low back, store test bars at the same height and close to the machine so they may be easily slid into place during calibration, instead of lifted.

Platform to stand on

E

In order to reduce awkward postures of the low back and neck/shoulder, install a platform at the front of the CLT for workers to stand on during calibration and maintenance.

Monitors and mirrors at eye level

E

In order to reduce awkward postures of the neck ensure that monitors and mirrors are at eye level.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Automatic infeed and outfeed

E

In order to reduce awkward postures and force on the low back and neck/shoulder when lifting sample boards onto and off of the Proof Tester, provide automatic infeed and outfeed systems. The desired number of sample boards can be automatically brought into the dwell area close to the Proof Loader (top photo below). After each test, the board can be guided to the automatic outfeed area (bottom photo below).

The workstation is designed with an automatic system to bring boards to the Proof Loader for testing. Using this system reduces the amount of lifting and decreases awkward postures and force for the low back and neck/shoulder.

The Machine Stress Rater is guiding the board to the outfeed rollers following a test on the Proof Loader. By eliminating the lifting of boards, injury risks for the low back and neck/shoulder are reduced.

Automatic board flippers

E

In order to reduce awkward postures and force in the wrist, automatic board flippers can be installed to eliminate manual handling of boards.

Drop bin or kickers

E

In order to reduce awkward postures and force at the wrist and neck/shoulder, a drop gate or kickers can be provided in order to remove waste pieces.

Vary body posture

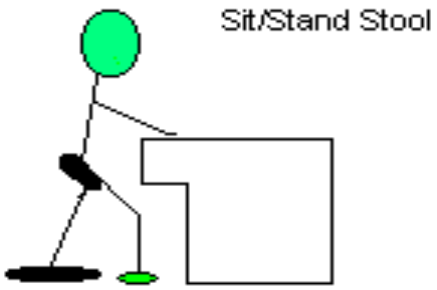
WP

In order to reduce awkward postures of the low back, encourage the Machine Stress Rater to regularly alternate between seated tasks, such as monitoring the lumber, and standing tasks, such as testing the boards on the Proof Loader. This change of posture alleviates some load from the spine, allowing discs to equalise and ligaments to regain their stiffness after being stretched out from sitting.

Sit/stand stool

E
WP

For Machine Stress Raters who stand for longer periods while monitoring boards, sit/stand stools can be provided. Sit/stand stools are preferred over regular stools, as the angled sit/stand design makes it easier to alternate between sitting and standing while allowing the larger muscles of the lower extremities to be recruited when manipulating boards. If sit/stand stools are not possible, foot rests or foot rails can be provided to encourage frequent changes in lower extremity posture.



Convex mirror

E

The Machine Stress Rater has to simultaneously monitor numerous areas. This monitoring can require awkward postures of the neck, placing strain on neck muscles. Placing convex mirrors to provide overall views of different work areas will help decrease the risk of neck injury.

Mirrors expand a worker's range of view while reducing awkward neck postures and decreasing the risk of injury.

Anti-fatigue matting

E

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

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

Anti-fatigue insoles

WP
PPE

If a worker must stand in several different areas for long periods of time, anti-fatigue boot insoles may be more practical for protecting the feet. The cushioned surface of the insole can absorb repeated impact from walking on metal catwalks, and may aid in damping vibration while standing in one spot.

Additional Work Practices

Stretches

WP In order to minimise risk factors of the neck, neck/shoulder, wrist, and low back, stretch these body parts throughout the day to enhance tissue tolerance for those muscle groups. See stretch exercises in the Body Manual

Chin Tuck

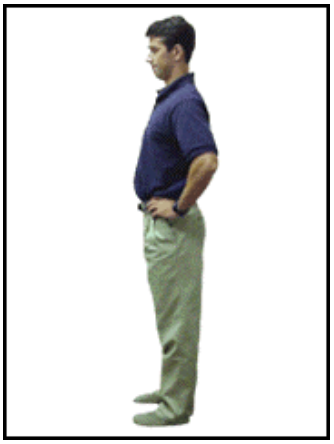
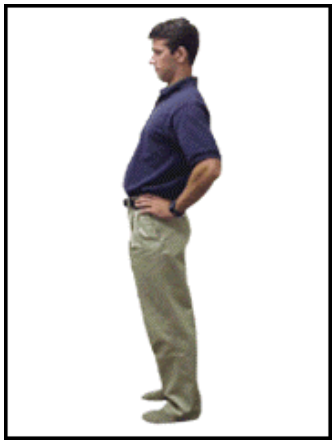
With your head upright, tuck chin in. You should feel a gentle stretch, in the back of the neck. Hold for 20 seconds and then relax. Repeat 3 times.


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.

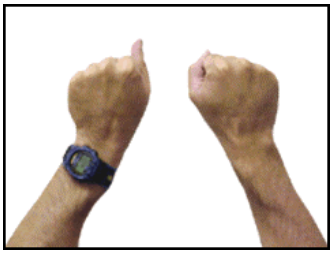

Back Extension

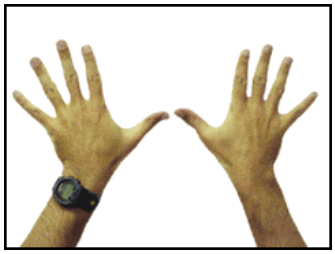
Start by standing in an upright position (the back is in neutral posture). Lean backwards slightly, pushing the hips gently forward. Hold for 5 seconds. Repeat 3 times.

Hands and Fingers Stretch

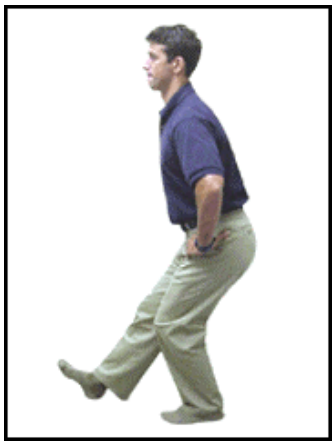
Clench both fists and hold for 3 seconds. Then open your hands and spread fingers apart. Hold for 3 seconds. Repeat.





Hamstring Stretch

Place one foot in front of the other and squat down. Hold for 5 seconds. Repeat 3 times with each leg.



Lifting aids

E
WP

In order to reduce loading on the low back and neck/shoulder, lifting aids or counter balances can be used to decrease the force required to move heavy test bars and other objects.

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.

Turn body

WP

In order to reduce awkward postures of the neck, turn the trunk and the eyes, not just the neck, to monitor lumber.

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. Another example of using power positions is using leverage to help move lumber and test bars when possible.

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 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.

Characteristics of Objects Being Handled

SIZE AND SHAPE

Maintain neutral wrist postures

WP

In order to reduce awkward postures and injury risk for the wrist, maintain a neutral posture (straight wrist) whenever possible. Manipulating lumber and operating lever controls with a straight wrist helps to reduce stress in the tissues of the wrist.

Two hands at once

WP

In order to reduce loading on the wrist when handling lumber, use both hands to push, pull, lift, or lower larger pieces of lumber. This coupling will significantly decrease the load on one hand and arm when doing the same task.

Sticky palm gloves

WP
PPE

In order to reduce grip forces required when manipulating boards, operators should wear thin, close fitting gloves with a "sticky" palm surface. This design increases the friction between gloves and lumber.

Environmental Conditions

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

Work Organisation

Task variability

A
WP

In order to reduce exposure to risk factors associated with Machine Stress Raters, workers should vary tasks throughout their shift. For example, after working with a bent back, stand and stretch briefly, or perform a task that requires some walking. Also, alternate between standing and sitting tasks.

Job rotation

A

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

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
Golfer's lift to reach into CLT	**71**							**A**				
Supported postures	**72**							**F**				
Reduce reaching	**72**		**F A**					**F A**				
Standing work	**72**		**F A**					**F A**				
Store test bars in appropriate spot	**73**		**F A**					**F A**				
Platform to stand on	**74**		**A**					**A**				
Monitors and mirrors at eye level	**74**	**A**										
Automatic infeed and outfeed	**75**		**F A**					**F A**				
Automatic board flippers	**75**					**F A**						
Drop bin or kickers	**75**		**F A**			**F A**						
Vary body posture	**76**							**A**				
Sit/stand stool	**76**											**S**

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Convex mirror	**76**	**A**										
Anti-fatigue matting	**77**											**S V**
Anti-fatigue insoles	**77**											**S V**
Stretches	**78**	directly reduces risk of injury to the body										
Lifting aids	**79**		**F**					**F**				
View with eyes	**79**	**A**										
Turn body	**79**	**A**										
Power positions	**80**		**F A**					**F A**				
Manual material handling	**80**		**F A**					**F A**				
Maintain neutral wrist postures	**81**					**A**						
Two hands at once	**81**					**F**						
Sticky palm gloves	**81**					**F**						
Task variability	**82 ◆**	indirectly reduces risk of injury to the body										
Job rotation	**82 ◆**	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*

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Heat Exposure	◆	indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

◆ = *See General Risk Factor Solutions Manual*

MACHINE STRESS RATER MSI SAFETY GUIDE

OBJECTIVE:

To identify ergonomic risks involved in Machine Stress Rater and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Machine Stress Rater.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Machine Stress Rater may look down, up and/or to the side in order to see the task at hand.	**Awkward Postures** **Static Postures**	• Neck muscles must support the weight of the head while in a forward, backward, and/or twisted position. The more the neck is bent, the greater the load on the muscles and tendons. • When the neck is held still in a forward, backward, and/or 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.	• 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. • Turn the trunk and the eyes, not just the neck, to monitor lumber. • Vary tasks throughout the shift. For example, after looking down for a prolonged period, perform a task that requires looking up or to the side. • 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 Machine Stress Rater may work with the arms raised and away from the body in order to lift and manipulate boards and test bars, maintain the CLT, and perform tests	**Force** **Repetition** **Awkward Postures**	• Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons. • The rotator cuff stabilises the shoulder joint when objects are manipulated. The heavier the object, or the larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • 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.	• Use a pike pole (various lengths) or picaroon to clear cross-ups and remove waste pieces. Ensure that the pike poles and picaroons are lightweight and sharp. • Pulling, pushing, and lifting of wood should be performed while standing. • Store test bars at the same height and close to the machine so they may be slid in during calibration, instead of lifted. • Use the platform at the side of the CLT to stand on during calibration. • Use lifting aids or counter balances to move heavy test bars and other objects. • Use power positions when handling loads or exerting force on objects. For example, use leverage to help move lumber and test bars.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder (continued)			• When lifting, the shift. For example, after working with arms above shoulder height, perform a task that keeps the arms close to the body, such as recording data. • For exercises that can help prevent ***Neck/Shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual.***

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Wrist A Machine Stress Rater may grip boards, test bars, and controls with the wrists bent in order to manipulate them and perform tests	**Force** **Repetition** **Awkward Postures**	• 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. • 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. • 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.	• Maintain a neutral posture (straight wrist) while manipulating lumber and/or operating lever controls. • Use both hands to push, pull, lift, or lower larger pieces of lumber. • Wear thin, close fitting gloves with a "sticky" palm surface. • For exercises that can help prevent ***Wrist*** injuries, ***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 Machine Stress Rater may bend forward in order to lift boards and test bars, maintain the CLT, clear cross-ups, and perform tests	**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/or 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. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.	• Use the golfer's lift when reaching into the CLT during calibration and maintenance. This refers to reaching into the machine with one arm while supporting your weight on one leg and allowing the other leg to remain straight and come off the floor (see photo in Work Manual for further instruction). Since this position requires the use of one arm it should **not** be used when lifting heavy bars. • Use a free arm to support the upper body when reaching. • Use a pike pole (various lengths) or picaroon to clear cross-ups and remove waste pieces. Ensure that the pike poles and picaroons are lightweight and sharp. • Pulling, pushing, and lifting of wood should be performed while standing. • Store test bars at the same height and close to the machine so they may be slid in during calibration, instead of lifted.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back (continued)			• Use the platform at the side of the CLT to stand on during calibration. • Alternate seated tasks, such as monitoring the lumber, with standing tasks, such as testing the boards on the Proof Loader, regularly. • Use lifting aids or counter balances to move heavy test bars and other objects. • Use power positions when handling loads or exerting force on objects. For lifting, a power position is adopted when a worker remembers to 'lift with the legs, not the back'. • Lift heavy objects with a neutral back posture while maintaining the 3-point curve (the natural "S" shaped curve of the back). Do not use pelvic tilt to position the trunk for lifting. Do not twist while holding or moving a load. When lifting, carrying, or holding objects, keep them as close to the body as possible. • Vary tasks throughout the shift. For example, after working with a bent back, stand and stretch briefly, or perform a task that requires some walking. • For exercises that can help prevent ***Low Back*** injuries***, see the Back section of the Body Manual***

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Foot A Machine Stress Rater may stand on a hard, vibrating surface for prolonged periods while monitoring boards and performing tests	**Static Postures** **Vibration**	• While standing, the weight of the body loads the plantar fascia. If the duration of standing is excessive, and recovery is not adequate, the fascia may deform to the point of injury. • Vibrating floors can increase the loading on the foot. Factors like vibration level and vibration frequency increase the amount of loading on the foot, and could lead to irritation. The longer the Machine Stress Rater is exposed to vibration, the greater the risk of injury.	• Alternate seated tasks, such as monitoring the lumber, with standing tasks, such as testing boards, regularly. • Use a sit/stand stool. If a sit/stand stool is not possible, foot rests or foot rails can be used to encourage frequent changes in posture. • Use anti-fatigue matting (if the majority of time is spent in one area) or anti-fatigue insoles (if standing in several different areas for long periods). • For exercises that can help prevent ***Foot*** injuries, ***see the Foot section of the Body Manual***.