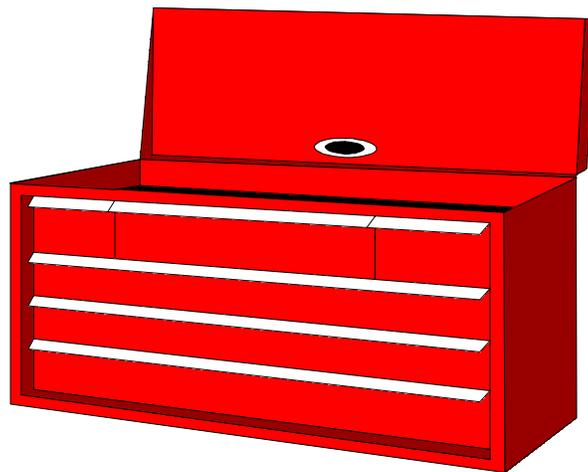


INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

Common Industry Jobs (CIJs) Grader (revised) Tool Kit



IMIRP program coordinated by:



Council of
Forest
Industries



Industrial
Wood & Allied
Workers of
Canada



Advanced
Ergonomics
Inc.

In cooperation with the Workers' Compensation Board of British Columbia

GRADER TOOL KIT

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Grader (revised)
Tool Kit

Overview

Grader

Job Summary

The Grader Tool Kit addresses ergonomic issues identified for the Grader and Grade Stamper.

A **Grader** determines a board's grade based on a specific set of criteria. A Grader will stand or sit at one side of the grading chain and inspect and turn boards to determine the appropriate grade. The Grader will mark a grade on the boards with a grading crayon or chalk. A Grader may pull boards to be trimmed and unjam boards on the chain when required.

A **Grader Stamper** identifies a specific grade on the boards and then places an identification stamp on these boards. The Grade Stamper may also re-ink the stamping pad when required.

Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the **Grader** may include:

- a) Forceful movements of the neck/shoulder, shoulder, elbow/wrist, and back
- b) Repetitive movements of the neck, neck/shoulder, shoulder, elbow/wrist, wrist, and back
- c) Awkward postures of the neck, neck/shoulder, shoulder, elbow/wrist, wrist, and back
- d) Static postures of the neck, neck/shoulder, back, and feet
- e) Pushing or pulling boards
- f) Standing or sitting while grading
- g) Turning boards

The physical demands of the **Grade Stamper** may include:

- a) Repetitive movements of the neck/shoulder, wrist, and back
- b) Awkward postures of the neck, neck/shoulder, shoulder, wrist, and back
- c) Static postures of the neck, neck/shoulder, back, and feet
- d) Standing or sitting while stamping

Mental Demands

Grading is a mentally demanding task because the Grader is required to make decisions, based upon a specific set of criteria, in a short period of time. The Grader has to view the boards for any defects and grade the quality of the boards based on these defects. This is a visually demanding task. Extensive training is needed to teach the worker what to look for. The Grader position requires the worker to have a grading ticket.

Grade Stamping involves fewer mental demands when compared to those of the Grader. The Grade Stamper's most demanding task is to look for and identify specific grading marks on the boards and react by stamping the board.

Major Variations

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

- 1) Turning boards may be done:
 - a) Manually – operator physically turns boards
 - b) Automatically – board turners are used
- 2) Marking boards may be accomplished by:
 - a) Using a grading crayon or chalk
 - b) Using a grading crayon or chalk in a holder
 - c) Pressing buttons that enter the grades into a computer
- 3) Postures while grading may include:
 - a) Standing
 - b) Sitting
 - c) Sit/standing, with a stool or other support

With different mills, the following major variations may be found for the **Grade Stamper**:

- 1) Relative to the chain table height, the stamping pad may be positioned:
 - a) Above the table
 - b) At or below the table

Minor Variations

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

- 1) The average work pace is 10 to 20 pieces per minute. This pace is:
 - a) Machine-paced
 - b) Group-paced
- 2) To pull the boards closer, the Grader may use aids such as:
 - a) A pike pole
 - b) A picaroon
 - c) Rollers

Physical Demands Analysis Grader

PDA General Instructions: Grader

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Grader and Grade Stamper. 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 Grader(s) and Grade Stamper(s) 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.

Disclaimer

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

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Physical Demands Analysis Grader

Task List

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

Inspect boards

A Grader inspects the entire length of the board looking for knots and other flaws.

Does this task occur at your site?

Yes

No



Turn boards

A Grader will turn boards by hand.

Does this task occur at your site?

- Yes No



A Grader will rely on automatic board turners to turn boards.

Does this task occur at your site?

- Yes No



Mark boards with grade

After a Grader inspects each side of the board, a grade is assigned. Often crayons or chalk are used to mark the boards.

Does this task occur at your site?

- Yes No



Pull boards to trim

A Grader will pull boards to be trimmed.

Does this task occur at your site?

Yes No



Unjam boards

A Grader will unjam boards whenever the situation arises.

Does this task occur at your site?

Yes No



Identify specific grade

A Grade Stamper will look for a specific grade mark on the board.

Does this task occur at your site?

Yes No



Stamp boards

Once the specific grade is identified, a Grade Stamper will place an identification stamp on the board.

Does this task occur at your site?

Yes No



Re-ink stamp pad

A Grade Stamper will re-ink the stamp pad as required.

Does this task occur at your site?

Yes No



Job Profile

Date: _____

Company Name: _____

Division: _____

Employee Name: _____

Supervisor: _____

Phone: _____

Fax: _____

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

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

Describe:

Length of shift _____ hours

Formal breaks

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

Informal breaks

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

Work pace control

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

Job rotation

Describe:

Yes No

Work Organisation

Task Description

The table below contains a list of tasks performed by a Grader and Grade Stamper. 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*.

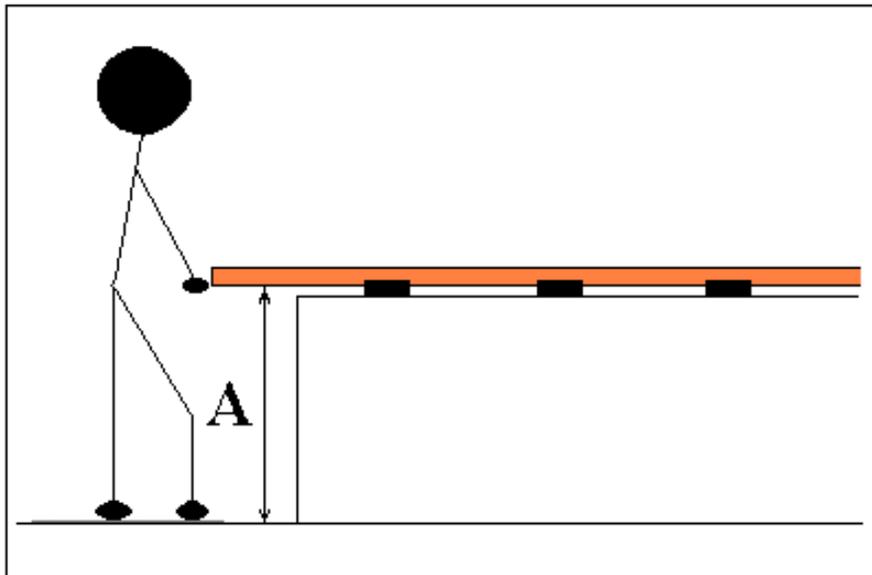
Task	Percent of Shift				Comments
	Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Inspect boards</i>					<ul style="list-style-type: none"> To inspect, manually turn, and mark the boards takes approximately 1 to 2 seconds
<i>Turn boards</i>					<ul style="list-style-type: none"> To inspect, manually turn, and mark the boards takes approximately 1 to 2 seconds
<i>Mark boards with grade</i>					<ul style="list-style-type: none"> To inspect, manually turn, and mark the boards takes approximately 1 to 2 seconds
<i>Pull boards to trim</i>					<ul style="list-style-type: none"> Task occurs at mills where Graders are required to trim
<i>Unjam boards</i>					<ul style="list-style-type: none"> Frequency depends on set-up of equipment
<i>Identify specific grade</i>					<ul style="list-style-type: none"> Determined by company and/or customer
<i>Stamp boards</i>					
<i>Re-ink stamp pad</i>					
<i>Other:</i>					

Workstation Characteristics

Dimensions & Layout

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

Workstation Dimensions	
(A) Chain height	cm
Trim conveyor height (if applicable)	cm



Grader chain height (Manual)

Flooring, Displays & Seating

The table below lists several components of a workstation. For *Flooring* and *Displays* there are several options provided. Please indicate all of the options that apply to the workstation. For the *Seating* section, describe and identify the features of the seat, if applicable. The *Comments* section may be used to include additional information, especially any workstation characteristics of concern.

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

Equipment & Machinery Controls

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

Type of Control		Function	Comments
	<i>Foot pedal</i>	<ul style="list-style-type: none"> • <i>Control conveyor</i> • <i>Stop/start</i> 	<ul style="list-style-type: none"> • <i>Activated approximately 3 times per hour</i>
	<i>Push/pull button</i>	<ul style="list-style-type: none"> • <i>Stop/start</i> 	<ul style="list-style-type: none"> • <i>One to two times per shift</i>
	<i>Pull cord</i>	<ul style="list-style-type: none"> • <i>Stop/start</i> 	<ul style="list-style-type: none"> • <i>Activated approximately 3 times per hour</i>
	<i>Other:</i>		

Physical Demands

Whole Body Physical Demands

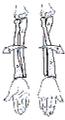
Identify each of the physical demands required by a Grader or Grade Stamper and list the corresponding tasks in the second column. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, and cycle times.

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%	
<i>Example: Sitting</i>	<ul style="list-style-type: none"> • <i>Inspect boards</i> • <i>Turn boards</i> 			✓		<ul style="list-style-type: none"> • <i>Work environment allows sitting or standing</i>
<i>Walking</i>						
<i>Sitting</i>						
<i>Standing</i>						
<i>Climbing</i>						
<i>Balancing</i>						
<i>Kneeling/ Crouching</i>						
<i>Other:</i>						

Body Postures

The table below outlines the body postures that may be adopted throughout the shift by a Grader or Grade Stamper, 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%	
<i>Example: Neck Flexion</i>	<ul style="list-style-type: none"> Inspect boards Mark boards with grade 			✓		<ul style="list-style-type: none"> Posture depends on height of the boards (chain surface) Neck flexion may be held
Neck						
<i>Flexion</i> 						
<i>Extension</i> 						
<i>Twisting</i> 						
Shoulder						
<i>Flexion</i> 						
<i>Abduction/ adduction</i> 						
<i>Extension</i> 						

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						
<i>Rotation</i> 						
Wrist						
<i>Wrist Movements</i> 						
Hand/Fingers						
<i>*Handling</i>						
<i>*Fingering</i>						
<i>*Gripping</i>						

Legend for Hand/Fingers

<i>Handling</i>	<i>Grasping, turning, holding, etc.</i>			
<i>Fingering</i>	<i>Picking, pinching, etc.</i>			
<i>Gripping</i>	<i>Power</i> 	<i>Pinch</i> 	<i>Hook</i> 	<i>Precision</i> 

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						
<i>Flexion</i> 						
<i>Lateral Flexion</i> 						
<i>Twisting</i> 						
<i>Extension</i> 						

Manual Material Handling

The table below contains a list of general manual material handling activities performed by a Grader or Grade Stamper. 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%	
<i>Pushing</i>							
<i>Pulling</i>							
<i>Lifting</i>							
<i>Lowering</i>							
<i>Carrying</i>							

Hand Tools

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

Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Grader's crayon</i>							
<i>Pike pole</i>							
<i>Ink crayon</i>							
<i>Stamp</i>							
<i>Other:</i>							

Environmental Conditions

Work Environment

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

Factor	Comments
Vibration (<i>Indicate source</i>) <input type="checkbox"/> Seat <input type="checkbox"/> Floor <input type="checkbox"/> Tool <input type="checkbox"/> 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.
<input type="checkbox"/> Vancouver Island	22.5 °C	-0.6 °C	36.1 °C	-18.8 °C
<input type="checkbox"/> Southwestern BC	22.9 °C	0.4 °C	35.6 °C	-18.3 °C
<input type="checkbox"/> Cariboo Chilcotin Coast	22.2 °C	-11.6 °C	36.4 °C	-42.5 °C
<input type="checkbox"/> High Country	26.3 °C	-9.9 °C	39.6 °C	-39.7 °C
<input type="checkbox"/> Okanagan Similkameen	26.5 °C	-8.4 °C	36.0 °C	-36.3 °C
<input type="checkbox"/> Kootenay Country	26.2 °C	-6.7 °C	38.5 °C	-32.0 °C
<input type="checkbox"/> British Columbia Rockies	24.7 °C	-12.3 °C	37.5 °C	-42.2 °C
<input type="checkbox"/> North by Northwest	19.5 °C	-11.7 °C	32.9 °C	-38.1 °C
<input type="checkbox"/> 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 Grader at your site, indicate with a check mark (✓) which of the PPE items are required.

<input type="checkbox"/>	Gloves Type:	<input type="checkbox"/>	Hard Hat	<input type="checkbox"/>	Leather Apron
<input type="checkbox"/>	Glove Liners	<input type="checkbox"/>	Steel-toed Boots	<input type="checkbox"/>	Dust Mask
<input type="checkbox"/>	Eye Protection	<input type="checkbox"/>	Hearing Protection	<input type="checkbox"/>	Seat Belt
<input type="checkbox"/>	Face Shield/Helmet	<input type="checkbox"/>	Life Jacket	<input type="checkbox"/>	Harness
<input type="checkbox"/>	Knee Pads	<input type="checkbox"/>	Other:	<input type="checkbox"/>	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.

$$[(\text{Dimensions of wood}) \times 12] / 144 = \text{Multiple}$$

For example: For a 5 by 5 piece of wood $[(5 \times 5) \times 12] / 144 = 2.08$

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	
8 foot		14 foot	
10 foot		16 foot	
		18 foot	
		20 foot	
		22 foot	
		24 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

$$2.95 \text{ (wet lb./ board foot)} \times 0.67 \text{ (size of wood multiple for 2" x 4")} \times 16 \text{ (length of board in feet)} = 32 \text{ lbs.}$$

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.

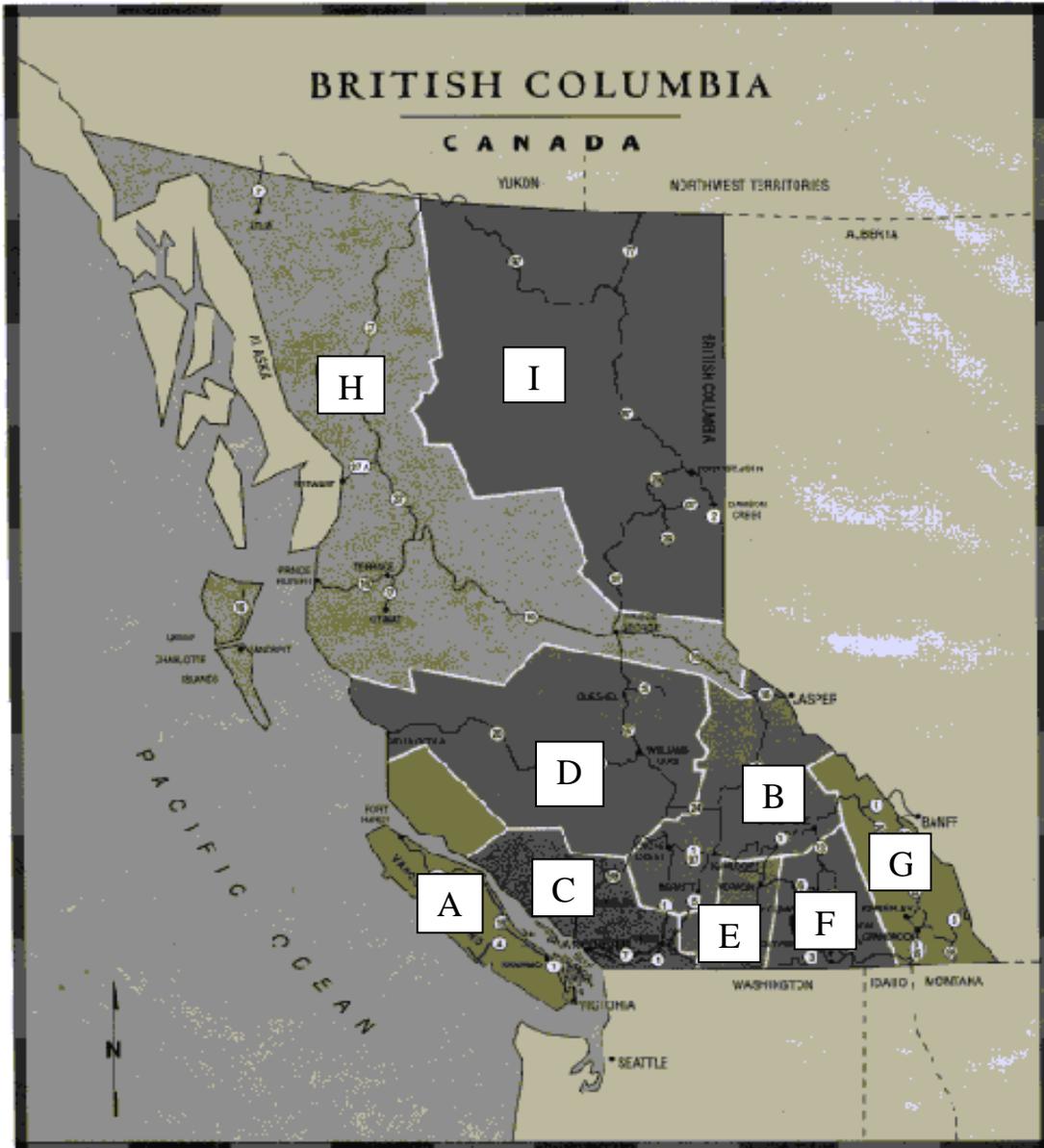
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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) <i>From Section 1</i>	x	Multiple (size of wood) <i>From Section 2</i>	x	Length of Wood <i>From Section 3</i>	=	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

Grader

Purpose

The Risk Factor Identification Checklist 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 – Grader or Grade Stamper

Management Representative _____

Risk Identification completed:

Worker Representative _____

Before implementation of solutions

Date _____

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.

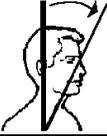
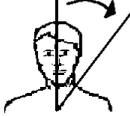
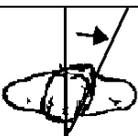
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

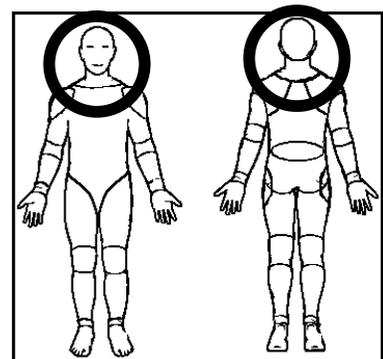
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 while inspecting boards)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., inspecting 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 down to inspect boards)			S O	
Awkward Posture				
Flexion			S O	
Extension			S O	
Lateral Bending			S O	
Rotation			S O	

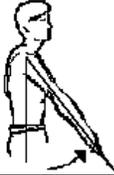
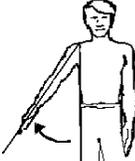
Please indicate whether the following direct risk factors were identified at the NECK .		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> No



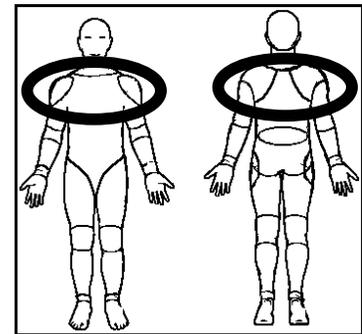
Body parts within the circled area will be classified as NECK issues.

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

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

Please indicate whether the following direct risk factors were identified at the SHOULDER .		
Direct Risk Factors	Force	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> No



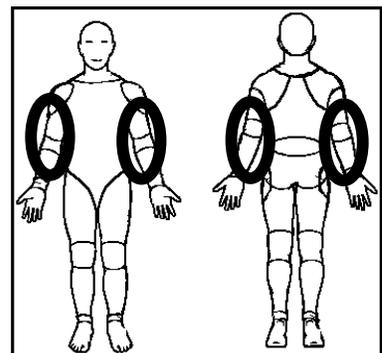
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force		N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting			S	
			O	
Lowering			S	
			O	
Pushing			S	
			O	
Pulling			S	
			O	
Carrying			S	
			O	
Turning materials			S	
			O	
Are objects handled in a power grip? (e.g., pike pole)			S	
			O	
Are objects handled in a pinch grip? (e.g., boards when turning for inspection, stamp)			S	
			O	
Are objects handled in a hook grip?			S	
			O	
Ask the worker: Do you wear gloves while performing your job? If the answer is No , check the No box and go to next section.			*	
			O	
*If the answer to the above question is Yes , ask the worker: Are the gloves too large/small?			S	
			O	
Does the thickness of the gloves cause problems with gripping?			S	
			O	

Repetition				
Are identical or similar motions performed over and over again? (e.g., gripping boards for turning, stamping boards)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., turning, marking, stamping 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?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., grading crayon, stamp)			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., grading crayon, stamp)			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 <input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition <input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture <input type="checkbox"/> Yes <input type="checkbox"/> No
	Contact Stress <input type="checkbox"/> Yes <input type="checkbox"/> No
	Vibration <input type="checkbox"/> Yes <input type="checkbox"/> No
In the Injury Statistics investigation, were there injury reports for the Elbow or Forearm? (see Worksheet 1 in the Implementation Guide) <input type="checkbox"/> Yes <input type="checkbox"/> No	
In the Discomfort Survey investigation, were there reports of discomfort for the Elbow or Forearm? (see Worksheet 2 in the Implementation Guide) <input type="checkbox"/> Yes <input type="checkbox"/> No	



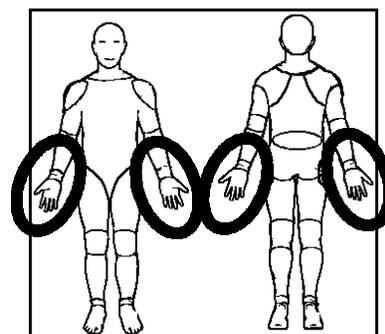
Body parts within the circled area will be classified as ELBOW issues.

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., boards, when turning for inspection)			S	
			O	
Are objects handled in a hook grip?			S	
			O	
Ask the worker: Do you wear gloves while performing your job? If the answer is No , check the No box and go to next section.			*	
			O	
*If the answer to the above question is Yes , ask the worker: Are the gloves too large/small?			S	
			O	
Does the thickness of the gloves cause problems with gripping?			S	
			O	

Repetition				
Are identical or similar motions performed over and over again? (e.g., gripping boards for turning, stamping boards)			S	
			O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., turning, marking, stamping 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?			S	
			O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., grading crayon, stamp)			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., grading crayon, stamp)			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	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Contact Stress	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Vibration	<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> No



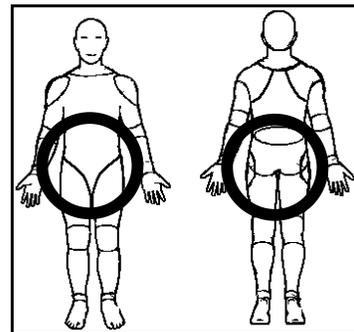
Body parts within the circled area will be classified as WRIST issues.

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., leaning forward when turning, marking, or stamping boards)			S O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., turning, marking, stamping 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., leaning forward when turning, marking, or stamping boards)			S O
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., grading area)			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., leaning forward when marking, turning, or stamping boards)			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?			S O	

Please indicate whether the following direct risk factors were identified at the LOW BACK or HIP/THIGH .		
Direct Risk Factors	Force	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Contact Stress	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Vibration	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the Injury Statistics investigation, were there injury reports for the Low Back or Hip/Thigh? (see Worksheet 1 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> 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)		<input type="checkbox"/> Yes <input type="checkbox"/> No

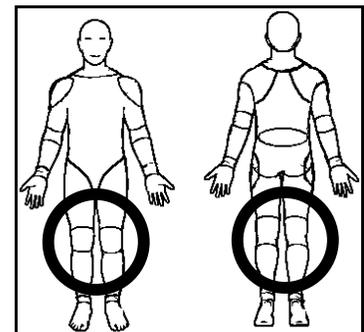


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

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

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

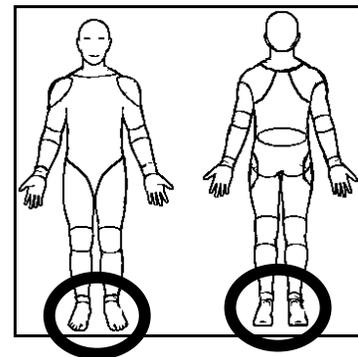


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., activating foot pedals)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift? (e.g., grading area)			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?			S O	

Please indicate whether the following direct risk factors were identified at the ANKLE/FOOT .		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Vibration	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the Injury Statistics investigation, were there injury reports for the Ankle or Foot? (see Worksheet 1 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> No
In the Discomfort Survey investigation, were there reports of discomfort for the Ankle or Foot? (see Worksheet 2 in the Implementation Guide)		<input type="checkbox"/> Yes <input type="checkbox"/> 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)			S O
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			S O
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., pike pole, stamp)			S O
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is No , check the No box and go to the next section.			S O
If the answer to the above question is Yes , ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O

ENVIRONMENTAL CONDITIONS

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

ENVIRONMENTAL CONDITIONS [CONTINUED]

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

WORK ORGANISATION

	N	Y	Comments:
Is the work externally-paced or controlled by a machine or the process?		S O	
Do peak workloads or sudden increases in pace occur with the tasks?		S O	
Ask the worker: Are there indications of excessive fatigue or pain, or symptoms of adverse health effects due to extended work days or overtime? (e.g., limited number of Graders at the mill)		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**



Grader

This Work Manual contains information about the body parts found to be at risk of musculoskeletal injury (MSI) for the Grader and Grade Stamper (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

Grader

Disclaimer

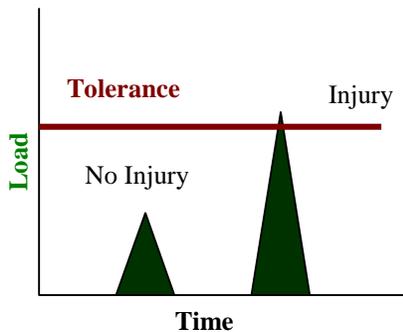
The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness 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

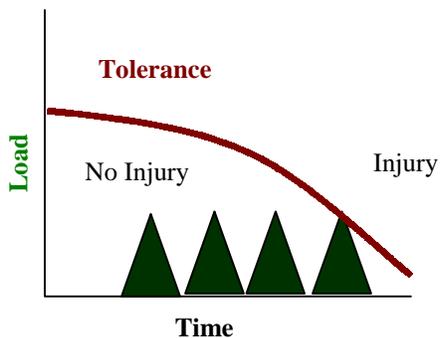
*Injuries occur when ...
Loads exceed tissue tolerances*



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.

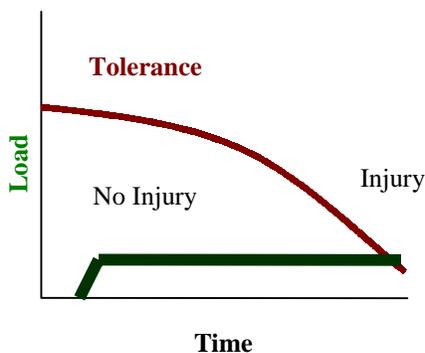
Example – a worker going over on their ankle and spraining it.



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 Grader 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 Grader. 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 Grader and Grade Stamper positions and found that the neck, neck/shoulder, elbow/wrist, and low back are the body parts of major concern while performing their duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

Neck: Major risks include repetitive movements and awkward and static postures of the neck while inspecting, turning, and marking or stamping boards.

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

1. Research equipment or workstation layout with operators (page 88)
2. Move eyes to inspect boards (page 93)
3. Determine optimal line speed (page 95)
4. Stretches (page 96)
5. Task lighting (page 102)
6. Job rotation (page 102)

Neck/Shoulder: Major risks include forceful and repetitive movements, and awkward and static postures of the neck/shoulder while pulling, turning, marking or stamping boards, and re-inking the stamp.

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

1. Standing work (page 88)
2. Research equipment or workstation layout with operators (page 88)
3. Position of grade or stamp on board (page 89)
4. Self-inking stamp (page 89)
5. Alternate hands when stamping (page 89)
6. Positioning rollers (page 89)
7. Low friction surfaces (page 90)
8. Re-establish grade or stamp position (page 89)
9. Chain height – manually turned (page 91)
10. Chain height – automatic turners (page 92)
11. Stamp pad location (page 93)
12. Determine optimal line speed (page 95)
13. Stretches (page 96)
14. Use large muscle groups to assist turns (page 99)
15. Job rotation (page 102)

Elbow/Wrist: Major risks include forceful and repetitive movements, and awkward postures of the elbow/wrist while gripping, turning, marking, and stamping boards.

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

1. Research equipment or workstation layout with operators (page 88)
2. Determine optimal line speed (page 95)
3. Stretches (page 96)
4. Turn large boards with two hands (page 99)
5. Use momentum to help turn boards (page 99)
6. Use large muscle groups to assist turns (page 99)
7. Sticky palm gloves (page 100)
8. Appropriate grip and movement for the crayon (page 100)
9. Wrist string (page 100)
10. Power grip stamp (page 101)
11. Insulated gloves (page 102)
12. Job rotation (page 102)

Low Back: Major risks include forceful and repetitive movements, and awkward and static postures of the low back while inspecting, marking, turning, stamping, and pulling boards, and while seated.

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

1. Research equipment or workstation layout with operators (page 88)
2. Position of grade or stamp on board (page 89)
3. Self-inking stamp (page 89)
4. Positioning rollers (page 89)
5. Re-establish grade or stamp position (page 89)
6. Determine optimal line speed (page 95)
7. Stretches (page 96)
8. Manual material handling (page 98)
9. Task lighting (page 102)
10. Job rotation (page 102)

For additional stretching and strengthening exercises that would benefit a Grader and Grade Stamper, refer to the Neck, Shoulder, Elbow, Wrist, and Back sections of the Body Manual.

NECK

Direct Risk Factors:
Awkward Postures
Static Postures



A Grader or Grade Stamper may hold the head forward in order to inspect and mark or stamp boards.

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the neck muscles is increased because the head is held in a forward bent position when viewing boards at approximately waist level.

Environmental Conditions

Lighting

- Low lighting levels may cause Graders to adopt awkward postures while grading.

CONSEQUENCES

- When the head is held in a forward 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 103 to 106.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

NECK

Direct Risk Factors: Repetition Awkward Postures



A Grader may repeatedly look up and down in order to inspect the entire length of boards.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on neck muscles is increased due to the length of the board that must be inspected. When long boards are inspected, extreme neck movements are required to view the entire length.

CONSEQUENCES

- When the head is repeatedly bent forward, 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 103 to 106.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

NECK/SHOULDER

Direct Risk Factors:

Force

Repetition



A Grader may pull boards closer in order to turn or trim them.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Repetitive movements from muscles of the neck and shoulder area are required when the chain system does not consistently position the boards close enough to the Grader.
- Excessive force may be required when the grading table surface provides resistance when the boards are pulled.

CONSEQUENCES

- Forceful and repeated pulling on boards 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 103 to 106.
- To help prevent *neck* discomfort, see the upper trapezius stretch in the *Neck section of the Body Manual*.

NECK/SHOULDER

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures



A Grader or Grade Stamper frequently works with the arms away from the body in order to mark or stamp boards, and to re-ink the stamp. Under some conditions the arms are held out from the body for long periods.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Graders and Grade Stampers often mark or stamp the boards outside of a comfortable reach envelope due to patterns established during training.
- For the Grade Stamper, the horizontal location of the stamp pad relative to the position of the stamped mark will influence the amount of reaching required.

Working Heights

- For the Grade Stamper, the vertical location of the stamp pad relative to the position of the stamped mark will influence the degree of arm and shoulder motion required.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the neck/shoulder, please see the column labelled “Neck/Shoulder” in the Summary of Solutions on pages 103 to 106.
- For exercises that can help to prevent *neck* and *shoulder* injuries, see the *Neck* and *Shoulder sections of the Body Manual*.

SHOULDER

Direct Risk Factors:

Force
Repetition
Awkward Postures



A Grader may manipulate boards in order to inspect each side.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- When the chain height is too high, some Graders will elevate the shoulders in order to turn the boards.

Seating

- Manually handling boards can increase the strain on the shoulder girdle if the Grader's seated posture is too low.

Characteristics of Objects Being Handled

Size and Shape

- The size, shape, and weight of large boards to be turned do not allow for a smooth transition from turning to marking. This factor is dependent on the speed of the chain.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the shoulder, please see the column labelled "Shoulder" in the Summary of Solutions on pages 103 to 106.
- For exercises that can help to prevent *shoulder* injuries, see the *Shoulder section of the Body Manual*.

ELBOW/WRIST

Direct Risk Factors:

Force
Repetition
Awkward Postures



To inspect each side of a board, a Grader may grip the board and turn it manually.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Large cuts of wood can require operators to use wider grip spans, leading to excessive grip forces. These large forces can lead to tissue fatigue over time.

Load Condition and Weight Distribution

- Most Graders will attempt to turn boards manually with only one hand. This may be appropriate only for smaller dimensioned boards.
- The movement of the chain can be used to assist in the turning of boards.
- Larger boards require larger muscles to be used to turn the boards.

Container, Tool and Equipment Handles

- Many Graders wear gloves while handling boards. Unfortunately loose fitting gloves can increase the amount of force required when gripping the boards.
- Over the course of the day, constant gripping of the crayon, crayon holder, or stamp can result in an increase in risk of injury to the wrist.

Environmental Conditions

Cold Exposure

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

Work Organisation

Task Variability

- The repetitive turning of boards without a sufficient rest of the elbow/wrist leads to increased risk of injury. This is especially true when large boards need to be turned manually during the grading process.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the elbow/wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 103 to 106.
- For exercises that can help to prevent *elbow* injuries, see the *Elbow section of the Body Manual*.

WRIST

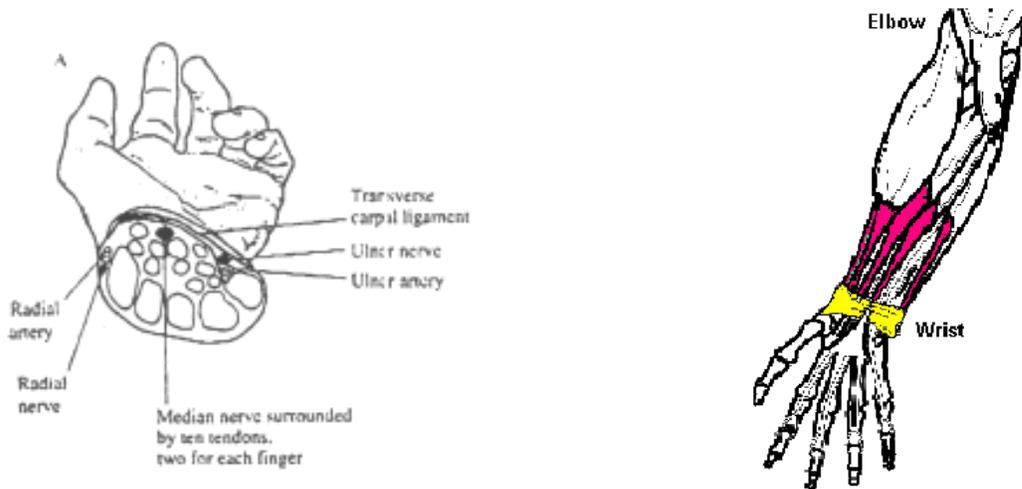
Direct Risk Factors:
Repetition
Awkward Postures



A Grader may repeatedly mark boards, and a Grade Stamper stamp boards, with the wrists bent.

BACKGROUND INFORMATION

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



The Carpal Tunnel

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Excessive working reaches may occur when marking boards due to the layout of the workstation and the position of the boards or when a Grader or Grade Stamper relies solely on wrist movements to perform the marking.

Characteristics of Objects Being Handled

Size and Shape

- The small diameter and short length of grading crayons and stamps may contribute to the need for bent wrist postures.

Container, Tool and Equipment Handles

- Crayon holders are often dropped. Graders tend to continually hold onto the crayon holders to avoid dropping them.
- Graders and Grade Stampers are often unaware of the importance of establishing neutral wrist postures and smooth motions while marking the boards.

Environmental Conditions

Cold Exposure

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

CONSEQUENCES

- Holding the wrist in a bent position 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 103 to 106.

LOW BACK

Direct Risk Factors:
Repetition
Awkward Postures
Static Postures

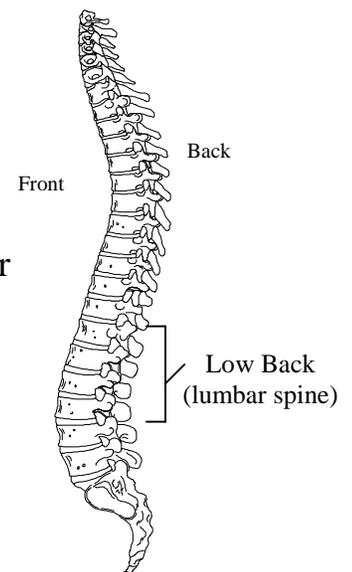


A Grader or Grade Stamper frequently bends forward in order to inspect, and then either mark or stamp boards. Under some conditions, the trunk is held in a forward flexed position.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Repetition

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

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.

Static Postures

- When the back is held in a forward position, the muscles of the back must remain tense to support the weight of the upper body. With no time allowed for recovery, the constant state of tension in the back 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 Reaches

- Excessive working reaches may be necessary when marking boards, due to the layout of the workstation and the position of the boards.

Working Heights

- The height of the chain relative to the worker affects the amount of forward lean required to inspect and mark or stamp boards.

Seating

- Manually handling boards from a seated posture can increase strain on the back.

CONSEQUENCES

- Repeatedly bending forward may lead to damage in the disc walls.
- When the back is held in a forward posture, muscles and soft tissues of the back may fatigue. Fatigue leads to an accumulation of waste products and/or a decrease in the ability to tolerate additional stress.
- Signs and symptoms may include muscle spasm and sharp or radiating pain in the back and/or lower extremities.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the back, please see the column labelled “Back” in the Summary of Solutions on pages 103 to 106.
- For exercises that could help to prevent *back* injuries, see the *Back section of the Body Manual*.

LOW BACK

Direct Risk Factors: Force Repetition
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A Grader may pull on boards in order to bring them closer for inspection, turning, or marking.

BACKGROUND INFORMATION

- The spine is designed to protect the spinal cord. The muscles surrounding the spine are designed to provide the support necessary to keep the spine in an upright position.

DIRECT RISK FACTORS

Force

- Pulling on boards requires back muscles to stabilise the spine. The greater the pull, the greater the tension developed in the muscles.
- If the force placed on the back muscles exceeds the tissue tolerances, injury may occur.

Repetition

- Repeated forceful pulling could gradually fatigue the muscles in the back. If the repetitive stress is excessive, and recovery is not adequate, the muscles may fatigue to the point of injury.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- When the board to be inspected is outside of a comfortable reach envelop the Grader must flex the lower back in order to reach the board.

Characteristics of Objects Being Handled

Size and Shape

- The size, shape, and weight of large boards to be turned do not allow for a smooth transition from turning to marking. This factor is dependent on the speed of the chain.

CONSEQUENCES

- Repeated forceful pulling can strain the back muscles.
- Signs and symptoms include pain and stiffness. Muscle spasms may also be present.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the back, please see the column labelled “Back” in the Summary of Solutions on pages 103 to 106.
- For exercises that can help to prevent *back* injuries, see the *Back section of the Body Manual*.

LOW BACK

Direct Risk Factors:
Awkward Postures
Static Postures

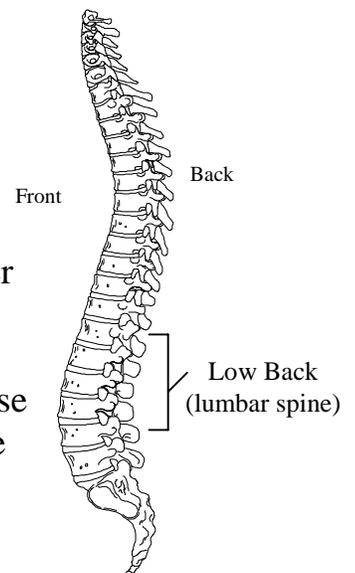


A Grader or Grade Stamper may sit for long periods of time while performing their job.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Awkward Postures

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Seating

- Often the seat used by Graders or Grade Stampers is not appropriate for the type of work to be performed. The seated position established should allow the operator to quickly get up if necessary while providing some benefit from the strength of the lower body while turning and pulling boards.

CONSEQUENCES

- Continually sitting may lead to deformation in the disc walls and degeneration of the tissues.
- Signs and symptoms include muscle spasm and sharp or radiating pain in the back and/or lower extremities.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the back, please see the column labelled “Back” in the Summary of Solutions on pages 103 to 106.
- For exercises that can help to prevent *back* injuries, see the *Back section of the Body Manual*.

FOOT

Direct Risk Factors:
Static Postures



A Grader or Grade Stamper may stand on a hard surface for long periods when performing their job requirements.

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.

INDIRECT RISK FACTORS

Workstation Design

Seating

- Loading on the feet is increased due to the inability of the Grader or Grade Stamper to perform some of their tasks while in a seated posture. Often the option of sitting is not available.

Floor Surfaces

- Loading on the feet is increased due to the hard surface that Graders or Grade Stampers must stand on during the course of the day.

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 103 to 106.
- 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 Grader or Grade Stamper may hold the head forward in order to inspect and mark or stamp boards.
- A Grader may repeatedly look up and down in order to inspect the entire length of boards.



NECK/SHOULDER

- A Grader may pull boards closer in order to turn or trim them.



- A Grader or Grade Stamper frequently works with the arms away from the body in order to mark or stamp boards, and to re-ink the stamp. Under some conditions the arms are held out from the body for long periods.



SHOULDER

- A Grader may manipulate boards in order to inspect each side.



ELBOW/WRIST

- To inspect each side of a board, a Grader may grip the board and turn it manually.



WRIST

- A Grader may repeatedly mark boards, and a Grade Stamper stamp boards, with the wrists bent.



LOW BACK

- A Grader or Grade Stamper frequently bends forward in order to inspect, and then either mark or stamp boards. Under some conditions, the trunk is held in a forward flexed position.



LOW BACK

- A Grader may pull on boards in order to bring them closer for inspection, turning, or marking.



- A Grader or Grade Stamper may sit for long periods of time while performing their job.



FOOT

- A Grader or Grade Stamper may stand on a hard surface for long periods when performing their job requirements.



Risk Factors by Body Part

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

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

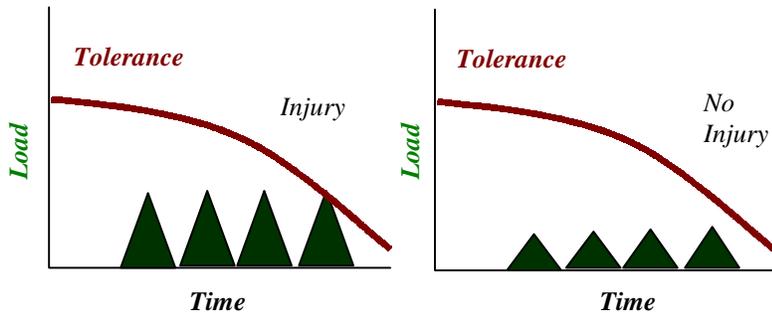
* Extended exposure to any risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual

** 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 103 to 106 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

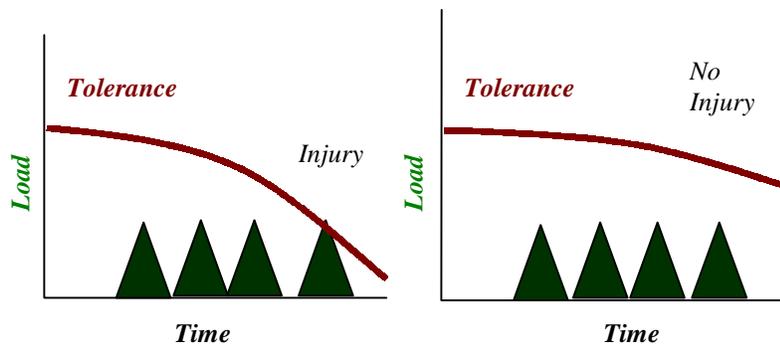
Injury Prevention

*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 Grader 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

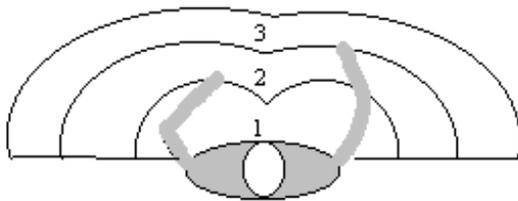
These are devices worn by a worker to reduce the risk of injury, including gloves, knee pads, hearing protection, and leather aprons.

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.

Standing work

WP

To minimise loading on the neck, shoulders, and low back, pulling, pushing, and lifting of wood should be performed while standing. With both feet planted on the floor, the Grader has more stability and can recruit the larger muscle groups from the legs to assist with the physical demands. Sitting will increase the amount of reaching necessary, place increased stress on the muscle groups of the upper body, and increase the risk of injury.

Research equipment or workstation layout with operators

A

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

Position of grade or stamp on board

A
WP To minimise repetitive movements and awkward postures of the neck, shoulder, and wrist encourage Graders and Grade Stampers to mark the boards at a comfortable reach distance along the boards. Steps should be taken to discuss with the customer the importance or relevance of the position of the mark on the board before proceeding. To judge the best position for a mark based on a good work posture, a Grader or Grade Stamper should try to maintain a 90-degree angle at the elbow and keep the arms close to the body.

Re-establish grade or stamp position

A
WP In order to minimise repetitive movements of the neck, shoulder, and low back, have supervisors re-train workers on the preferred location of the grade or stamp marks. Based on ergonomic considerations, the marking position should be within a normal reach envelope.

Self-inking stamp

E To minimise repetitive, awkward postures of the neck, shoulder, and low back that are required when re-inking the stamp, purchase self-inking type stamps. This design will eliminate the need to re-ink the stamp prior to making a mark on a board.

Alternate hands when stamping

WP To minimise repetitive, awkward postures of the neck and shoulder on one side of the body, encourage Grade Stampers to change the arm used to stamp the boards when there is a break in the flow.

Positioning rollers

E To minimise repetitive, awkward postures of the neck, shoulder, and low back, positioning rollers with an appropriate stop system can be placed in front of the grading area. The rollers would bring the boards to the desired position. Ideally, the stopping position should be adjustable to account for differences in Grader reach distances. The rollers should be well maintained and free of any debris that may restrict movement.

Low friction surfaces

E To minimise forceful movements of the neck, shoulder, and back when pulling boards, provide a low friction surface such as rollers or ultra high molecular weight polyethylene (UHMWPE).

Move entire arm when marking boards

WP Move the entire arm, not just the wrist, when grading and marking boards. Moving the shoulder, elbow, and wrist to mark boards can reduce awkward wrist postures.

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 Grader, identify the body part of most concern. If the main concern is the:

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

Shoulders - minimise elevation of the arms by lowering working height.

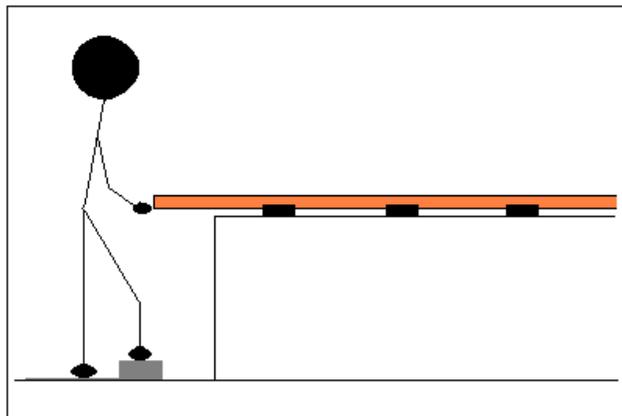
Low Back - minimise forward bending of the back by increasing working height.

For more specific guidelines on matching the working heights with the tasks performed please consult anthropometric tables or an ergonomist.

Chain height – manually turned

E

When boards are turned manually, the chain height should be between the worker's elbow and hip to facilitate heavy work and reduce forward lean. If the heights of the Graders vary greatly, individual platforms, chairs, or sit/stand stools can be provided so that every Grader works close to this height. Please note that the desired height may change dependent on the size and weight of the boards to be turned.

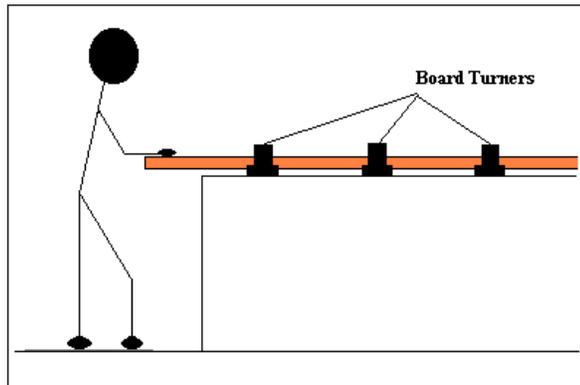


Grader chain height (Manual)

Chain height – automatic turners

E

When automatic board turners are used, chain height should be at the height of the worker's elbows, to minimise the forward neck flexion necessary for inspecting boards and awkward elbow and wrist postures while marking the boards. Again, if the heights of the Graders vary greatly, individual platforms, chairs, or sit/stand stools can be provided so that every Grader works close to a comfortable height.



Grader chain height (Automatic)

Stamp pad location

E To minimise repetitive loading and awkward postures of the neck and shoulder, the height of the stamp pad should be located close to the height of the top of the boards. For stamp pads below board level, some sort of singulation needs to be performed in order to provide sufficient space between the boards for safe stamping.

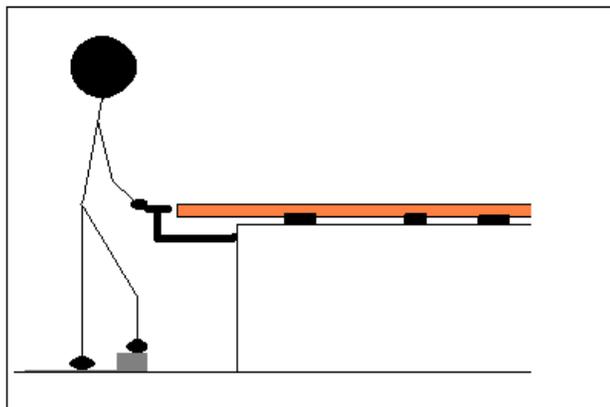
Ideally the stamp pad should be located near to the end of the boards at approximately board height, with adjustable positioning for different sizes of boards and Grade Stamper preferences.



Stamp pad above table height



Stamp pad below boards on table



Adjustable height and distance of stamp pad

Move eyes to inspect boards

WP Move the eyes downward to inspect the boards. This action should reduce the repetition and duration of awkward neck postures.

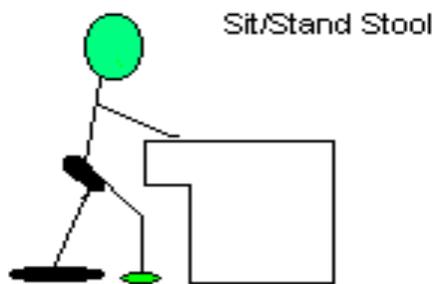
SEATING

Many Graders and Grade Stampers are required to sit when grading or stamping boards. Sitting for long periods of time increases the load on the spine, which stresses the ligaments and discs of the low back. The load is increased when the Grader or Grade Stamper does not maintain a neutral spine (see Injury Education for the Low Back on page 76).

Sit/stand stool

E
WP

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



FLOOR SURFACES

Anti-fatigue matting

E

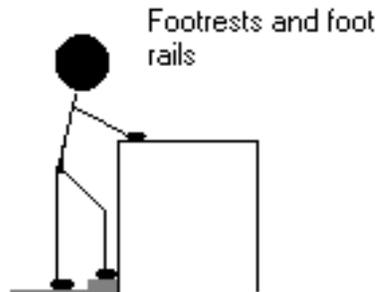
In order to minimise fatigue in the lower extremities, anti-fatigue matting can be installed. The use of anti-fatigue matting in the work area will help to increase comfort and reduce muscle fatigue. The cushioned surface encourages continuous micro-movements of the feet, which minimises blood pooling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

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

Footrests and foot rails

E

To reduce fatigue in the low back and feet, footrests or foot rails can be built into the workstation. Encourage the use of footrests or rails when there is a break in flow. Using foot rails is also a good practice while working, encouraging postural changes (left foot up, right foot up), and reducing the load associated with static standing.



Anti-fatigue insoles

PPE

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

Appropriate footwear

PPE

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

ADDITIONAL WORKSTATION DESIGN OPTIONS

Determine optimal line speed

A

In order to reduce repetitive movements and awkward and static postures of the neck, shoulders, wrist, and low back, determine the optimal line speed based on the time required to properly grade the boards versus production requirements.

If the line speed is too fast, Graders are more likely to make errors on their grading, resulting in more boards being recycled through the system. If the line speed is too slow, Graders will make fewer errors but there will be less wood produced (of any grade) at the end of the day. An optimal line speed based on quality of output and production may take some time to identify.

Additional Work Practices

Stretches

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

Chin Tuck

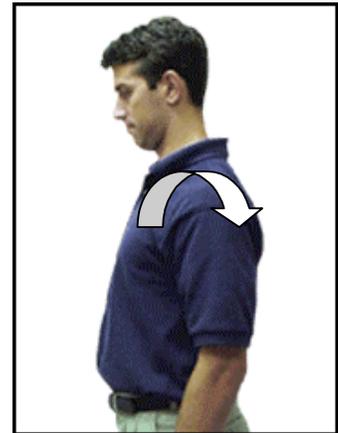
With your head upright, tuck chin in. You should feel a gentle stretch, in the back of the neck.

Hold for 20 seconds and then relax. Repeat 3 times.



Shoulder Circles

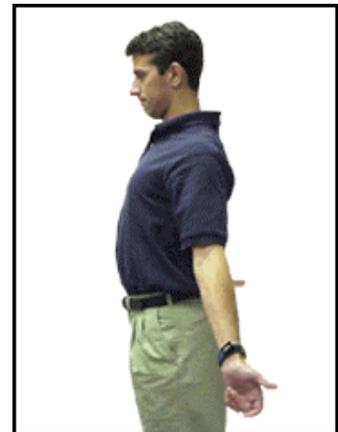
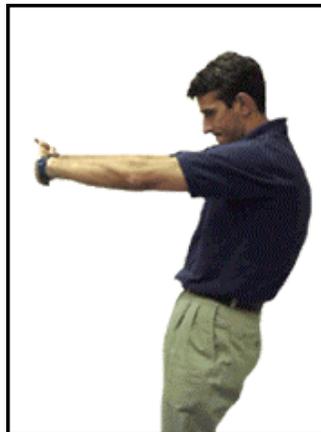
Rotate the shoulders in forward circles for 5 rotations. Repeat rotating the shoulders backward.



Upper Back & Chest Stretch

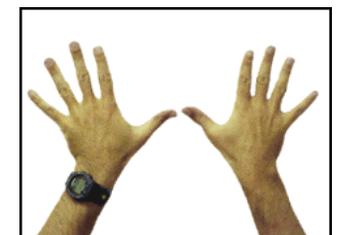
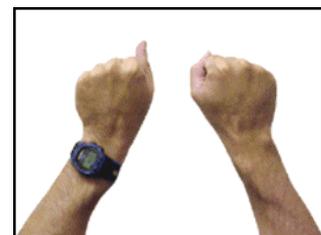
Place the hands together in front of the body and push them outwards. Bring the arms behind the body and squeeze the shoulder blades together while pressing the shoulders down and keeping the chin tucked in.

Repeat 5 times.



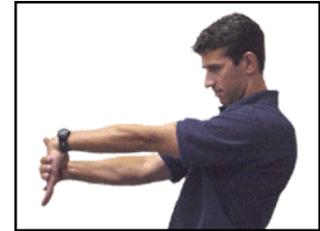
Hands and Fingers Stretch

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



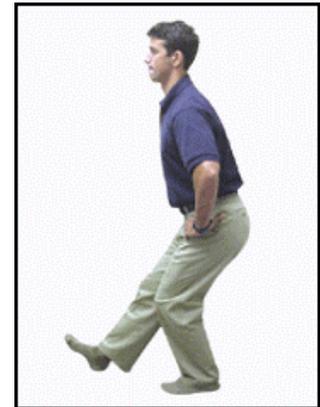
Wrist Flexor and Extensor Stretch

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



Hamstring Stretch

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



Hip Flexor Stretch

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



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.



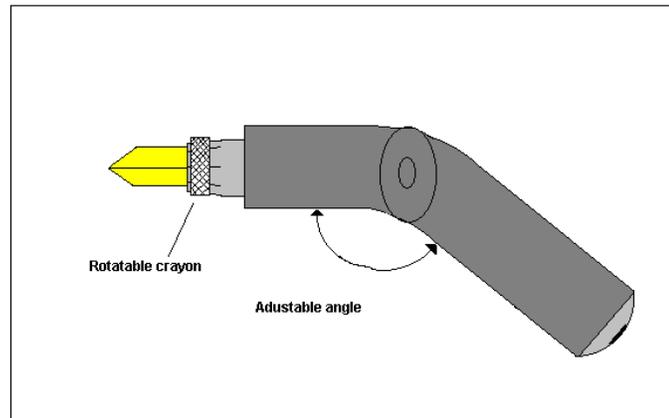
Characteristics of Objects Being Handled

SIZE AND SHAPE

Crayon holder

E

Holders for grading crayons should be angled down so that there is minimal bending in the wrist when marking the grade. Crayons holders with a string at the end allow for reduced static gripping, as the unit can swing down out of the Grader's hand when not in use.



Prototype Crayon Holder

Manual material handling

WP

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

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

LOAD CONDITION AND WEIGHT DISTRIBUTION

Turn large boards with two hands

WP In order to reduce loading on the elbow/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.



Good technique



Poor technique for large boards

Use momentum to help turn boards

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

Use large muscle groups to assist turns

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

CONTAINER, TOOL AND EQUIPMENT HANDLES

Sticky palm gloves

WP
PPE

In order to reduce grip forces required by the Grader, the operator should wear thin, close fitting gloves with a “sticky” palm surface to increase the friction between the gloves and the boards handled. These same thin gloves should improve handling and decrease the grip force required to use the grading crayon.

Appropriate grip and movement for the crayon

WP

Encourage Graders to grip the crayon or crayon holder with only as much force as is necessary. Often these tools are gripped with excessive force. Also, use a smooth, slow motion to mark the grade. Try not to make fast motions, or ‘flick’ the wrist, while marking.

Wrist string

E
WP

Use wrist strings to hold the crayons when not in use. This technique will reduce prolonged periods of crayon holding, and it will allow for board turning with both hands.

Maintain neutral wrist postures

WP

In order to reduce awkward postures of the wrist, maintain a neutral posture (straight wrist) whenever possible while marking the grade on boards or stamping boards. By maintaining this posture, the risk of injury to the wrist is decreased.



An example of a neutral wrist posture while seated

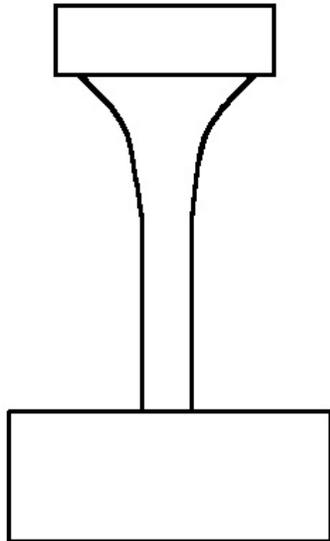


An example of a neutral wrist posture while standing

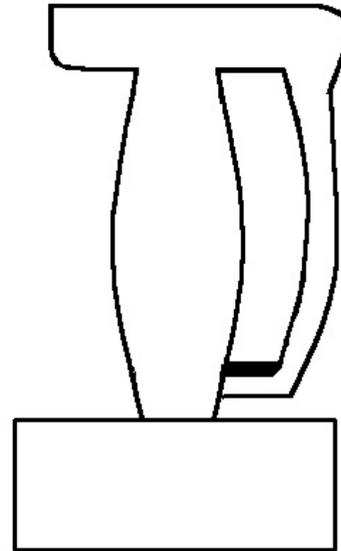
Power grip stamp

E

A lightweight stamp could be constructed that allowed a power grip rather than a pinch-type grip. This type of stamp should minimise the grip force necessary to stamp the boards.



Pinch grip used – poor design



Power grip with padding on the lower part of the handle – better design

Environmental Conditions

COLD EXPOSURE

Insulated gloves

E In order to decrease the impact of cold temperature on the amount of grip force required to hold tools such as a grading crayon, grading crayon holder, or stamp, insulated gloves are recommended. Gloves with thin insulation to protect against cold temperature are recommended.

LIGHTING

Task lighting

E In order to decrease awkward neck and back postures, the lighting level in the area of decision making should be appropriate for the type of inspection. Different types of lighting may be able to highlight specific defects of interest. Please review the information in the General Risk Factor Solutions Manual for more detail.

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

Work Organisation

TASK VARIABILITY

Job rotation

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

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
Standing work	88		F	F				F				
Research equipment or workstation layout with operators	88	R A S	F R A S	F R A	F R A	R A		F R A S				S
Position of grade or stamp on board	89		R A	R A		R A		R A S				
Re-establish grade or stamp position	89		R A S					R A S				
Self-inking stamp	89		R A	R A				R A S				
Alternate hands when stamping	89		R A	R A								
Positioning rollers	89		R A					R A				
Low friction surfaces	90		F	F				F				
Move entire arm when marking boards	90					A						
Chain height – manually turned	91		A			A		A				
Chain height – automatic turners	92		A			A						

Direct Risk Factors

F = Force

S = Static Postures

R = Repetition

C = Contact Stress

A = Awkward Postures

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
Stamp pad location	93		R A S	R A								
Move eyes to inspect boards	93	R A										
Sit/stand stool	94											S
Anti-fatigue matting	94											S
Footrests and foot rails	95							S				S
Anti-fatigue insoles	95											S
Appropriate footwear	95											S
Determine optimal line speed	95	R A S	R A S	F R A	R A	R A		R A S				
Stretches	96	directly reduces risk of injury to body										
Crayon holder	98					R A						
Manual material handling	98		F A	F A				F A				
Turn large boards with two hands	99				F R A							

Direct Risk Factors

F = Force

S = Static Postures

R = Repetition

C = Contact Stress

A = Awkward Postures

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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
Use momentum to help turn boards	99		F	F	F			F				
Use large muscle groups to assist turns	99		F	F	F			F				
Sticky palm gloves	100				F							
Appropriate grip and movement for the crayon	100				F	R A						
Wrist string	100				F							
Maintain neutral wrist postures	100					A						
Power grip stamp	101				F							
Insulated gloves	102				F							
Task lighting	102	A						A				
Job rotation	102	R A S	F R A S	F R A	F R A	R A		F R A S				S

Direct Risk Factors

F = Force

S = Static Postures

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V = Vibration

Summary of Solutions

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

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

Direct Risk Factors

♦ = *See General Risk Factor Solutions Manual*

GRADER AND GRADE STAMPING MSI SAFETY GUIDE

OBJECTIVE:

To identify ergonomic risks involved in Grading and Grade Stamping and to reduce the potential for musculoskeletal injuries.

More detailed information about risk reducing recommendations can be found in the Work Manual for the Grader.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck</p> <p>A Grader or Grade Stamper may hold the head forward in order to inspect and mark or stamp boards.</p>	<p>Awkward Postures</p> <p>Static Postures</p>	<ul style="list-style-type: none"> • Neck muscles must support the weight of the head while in a forward 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 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. 	<ul style="list-style-type: none"> • When bending the head forward, keep the chin tucked in and the ears and shoulders aligned. • Try to keep the head in an upright position while viewing the boards. • Train yourself to look up from time to time to relax the neck muscles. • Turn the eyes and the neck (not just the neck) to inspect the boards. • Adjust viewing angles by periodically sitting or using a sit/stand stool. • Try to vary neck postures by returning to the neutral position as often as possible. • For exercises that can help prevent <i>neck</i> injuries, <i>see the Neck section of the Body Manual</i>.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck/Shoulder</p> <p>A Grader may pull boards closer in order to turn or trim them.</p>	<p>Force</p> <p>Repetition</p>	<ul style="list-style-type: none"> • 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. • When workers repeatedly pull on boards, the muscles of the neck and shoulder are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury. 	<ul style="list-style-type: none"> • Position yourself as close to the boards as possible. • Avoid sudden forceful movements of the arms. Use smooth motions while keeping the arms close to the body. • For exercises that can help prevent <i>neck</i> and shoulder injuries, <i>see the Neck and Shoulder sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Elbow/Wrist</p> <p>To inspect each side of a board, a Grader may grip the board and turn it manually.</p>	<p>Force</p> <p>Repetition</p> <p>Awkward Postures</p>	<ul style="list-style-type: none"> • Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. The harder that an object must be gripped, the greater the load on the tendon/bone connection. • Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury. • The width of an object and the position of the wrist also affect how much muscle tension needs to be generated. Bending the wrist forward or backward, or gripping an object that is too large or too small, deviates from this position, and the forearm muscles have to work harder to maintain the grip. As muscles generate increased tension, tissue fatigue can occur at the tendon/bone connection. 	<ul style="list-style-type: none"> • Use the entire body including large muscle groups of the lower extremities, to turn boards. • Turn the boards using both hands. • Turn boards in the direction opposite to the chain direction, using the momentum of the chain to help turn the board. • Do not “flick” or make fast motions at the wrist while marking. Use a smooth motion and keep the wrist straight. • Move the elbow and shoulder, not just the wrist. • Use power positions when handling heavy objects. Keep the arms close to the body. • Use thinner gloves for grading, as this will result in less force needed to grip the boards and hold the crayon. Wear dry gloves. • Maintain a straight wrist position. • For exercises that can help prevent <i>elbow</i> and <i>wrist</i> injuries, <i>see the Elbow and Wrist sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Low Back</p> <p>A Grader may pull on boards in order to bring them closer for inspection, turning, or marking.</p>	<p>Force</p> <p>Repetition</p>	<ul style="list-style-type: none"> • Pulling on boards requires back muscles to stabilise the spine. The greater the pull, the greater the tension developed in the muscles. • If the force placed on the back muscles exceeds the tissue tolerances, injury may occur. • Repeated forceful pulling could gradually fatigue the muscles in the back. If the repetitive stress is excessive, and recovery is not adequate, the muscles may fatigue to the point of injury. 	<ul style="list-style-type: none"> • Avoid sudden forceful movements of the back. Use smooth motions while keeping the arms close to the body. • Keep the back in a neutral posture (ears, shoulders, and hips in alignment). • When pushing, pulling, or lifting, get as close to the object as possible. • Lower the body by slightly squatting at the knees rather than bending at the back. • For exercises that can help prevent <i>low back</i> injuries, <i>see the Back section of the Body Manual</i>.
	<p>Low Back</p> <p>A Grader or Grade Stamper may sit for long periods of time while performing their job.</p>	<p>Awkward Postures</p> <p>Static Postures</p>	<ul style="list-style-type: none"> • Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury. 	<ul style="list-style-type: none"> • Periodically stand up straight, walk around, and perform the back extension stretch. • For exercises that can help prevent <i>low back</i> injuries, <i>see the Back section of the Body Manual</i>.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Foot</p> <p>A Grader or Grade Stamper may stand on a hard surface for long periods when performing their job requirements.</p>	<p>Static Postures</p>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Wear anti-fatigue insoles. • If anti-fatigue matting is available, place it in frequent work areas. • For exercises that can help prevent <i>foot</i> injuries, <i>see the Foot section of the Body Manual.</i>