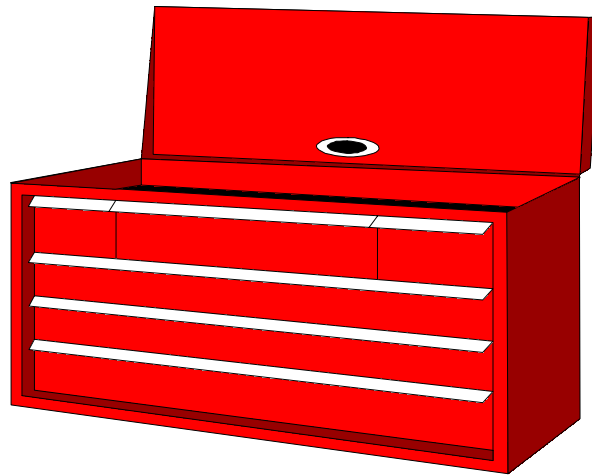


# INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

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## Common Industry Jobs (CIJs) Log Loader Tool Kit



**IMIRP** program coordinated by:

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Council of  
Forest  
Industries



Industrial  
Wood & Allied  
Workers of  
Canada



Advanced  
Ergonomics  
Inc.

In cooperation with the Workers' Compensation Board of British Columbia

# LOG LOADER TOOL KIT

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# Log Loader Tool Kit

## Overview

# Log Loader Operator

### (Wagner/Le Tourneau)

#### Job Summary

Log Loader Operators typically use models from one of two manufacturers, either Wagner or Le Tourneau. The responsibilities of the Log Loader Operator may include unloading logging trucks, sorting logs in the log yard, filling the log deck for the mill, and manually breaking bundle cables with a sledgehammer. Operating a log loader requires the use of a steering wheel, toggle switches, joysticks, levers, and foot pedals.

#### Physical Demands

The physical demands of the Log Loader Operator may include:

- a) Forceful exertions of the low back when breaking bundle cables
- b) Static and awkward postures of the neck, shoulder, low back, and ankle
- c) Repetitive movements of the shoulder and wrist
- d) Sitting on a vibrating surface for long periods of time

#### Mental Demands

A Log Loader Operator must stay alert at all times when operating mobile equipment. Operators have to be aware of other moving vehicles and stationary objects, and of pedestrians in the log yard. A Log Loader Operator has to co-ordinate the control of several levers, foot pedals, joysticks, and/or a steering wheel when operating mobile equipment. When sorting logs, a Log Loader Operator makes judgements on log sizes and species.

## **Major Variations**

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

- 1) Operating a Wagner requires repetitive movements of the shoulder, whereas operating a Le Tourneau requires static and awkward postures of the neck and shoulder.
- 2) In the Wagner, the seat and controls may be on a rotating or a stationary base.
- 3) Log Loader Operators may rotate their jobs by driving other types of equipment, or performing other tasks in the mill.

## **Minor Variations**

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

- 1) In-house modifications to the mobile equipment may have occurred.

# Physical Demands Analysis Log Loader Operator (Wagner/Le Tourneau)

## PDA General Instructions: Log Loader Operator

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

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

A PDA should be filled out for each individual worker following an injury. Subsequent changes in the work process may reduce the accuracy of any pre-existing physical demands assessments. The IMIRP Society accepts no responsibility for the use or misuse of this Physical Demands Analysis, or for the accuracy of the PDA as it applies to any specific workplace.

### 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 Log Loader Operator (Wagner/Le Tourneau)

## Task List

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

### **Operate a log loader**

The Log Loader Operator sits while operating either a Wagner or Le Tourneau.

*Does this task occur at your mill?*

Yes       No



### **Operate controls**

The Log Loader operator uses toggles switches, levers, foot pedals and a steering wheel to control various functions in a Wagner and Le Tourneau.

*Does this task occur at your mill?*

Yes       No



## Open bundles

A Log Loader Operator breaks the cables around the log bundles.

*Does this task occur at your mill?*

Yes       No



A Log Loader operator removes the cables after breaking bundles.

*Does this task occur at your mill?*

Yes       No



## Job Profile

Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Division: \_\_\_\_\_

Employee Name: \_\_\_\_\_

Supervisor: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

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

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

Describe:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Length of shift                      \_\_\_\_\_ hours

Formal breaks

- Two 10 minute breaks
- One 30 minute lunch break
- Other: \_\_\_\_\_

Informal breaks

- Yes, length of break varies
- Yes, \_\_\_\_\_ minutes/shift

Work pace control

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

Job rotation

Describe:

Yes    No

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Work Organisation

### Task Description

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

Task	Percent of Shift				Comments
	Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Operate a log loader</i>					<ul style="list-style-type: none"> <li>• <i>Continuous duration of sitting approximately 2 to 3 hours</i></li> </ul>
<i>Operate controls</i>					<ul style="list-style-type: none"> <li>• <i>Frequency of toggle use depends on the number of tasks performed</i></li> <li>• <i>Frequency of foot pedal use is less in the Le Tourneau than the Wagner (Le Tourneau uses toggles to operate speed, Wagner uses pedals)</i></li> <li>• <i>Rotating knob (suicide knob) used to assist in turning the steering wheel in Wagner equipment</i></li> </ul>
<i>Open bundles</i>					<ul style="list-style-type: none"> <li>• <i>May not be required for every load</i></li> <li>• <i>Frequency depends on number of loads unloaded per shift (e.g., average is between 60 to 80 loads per shift)</i></li> </ul>
<i>Other:</i>					
<i>Other:</i>					
<i>Other:</i>					

## **Workstation Characteristics**

### **Dimensions & Layout**

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

**Flooring, Displays and Seating**

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

Workstation Characteristics	Comments
<p><b>Flooring</b> (<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><b>Displays</b> (<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><b>Seating</b> (<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 Log Loader Operator. Use the left column to check off controls that are present at the work site. Highlight controls that may aggravate the injury, or which the worker finds difficult to use. The *Comments* section may be used to include any additional information. Further controls can be included under *Other*.

Type of Control	Function	Comments	
	<i>Steering Wheel</i>	<ul style="list-style-type: none"> <li>• <i>Control equipment direction</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Additional rotating knob attached to steering wheel for optional use</i></li> </ul>
	<i>Toggles</i>	<ul style="list-style-type: none"> <li>• <i>Operate boom (Le Tourneau)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Location of toggles may increase physical demands depending on frequency of use</i></li> </ul>
	<i>Buttons</i>	<ul style="list-style-type: none"> <li>• <i>Various</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Frequency of use is minimal</i></li> </ul>
	<i>Levers</i>	<ul style="list-style-type: none"> <li>• <i>Operate the directions of the boom (Wagner)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Location of levers may increase physical demands depending on frequency of use</i></li> </ul>
	<i>Foot pedals</i>	<ul style="list-style-type: none"> <li>• <i>Gas, brake, clutch</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Wagner operators use pedals frequently throughout the day</i></li> <li>• <i>Le Tourneau operators use pedals less frequently, with similar function being controlled by hand lever</i></li> </ul>
	<i>Other:</i>		
	<i>Other:</i>		
	<i>Other:</i>		

## Physical Demands



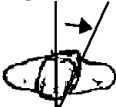

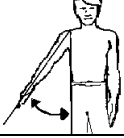

### Whole Body Physical Demands

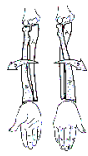

Identify each of the physical demands required by a Log Loader Operator and list the corresponding tasks in the second column. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, and cycle times.

Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Siting</i>	<ul style="list-style-type: none"> <li>Operate a log loader</li> </ul>				✓	<ul style="list-style-type: none"> <li>May leave cab during break or lunch</li> <li>Lumbar support may be inadequate in seats</li> <li>Some seats have damping mechanism for vibration</li> <li>Some seats have adjustable features, such as seat height and angle</li> </ul>
<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 Log Loader Operator related to tasks. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Shoulder Flexion</i>	• <i>Operate controls</i>		✓			• <i>Angle of reach varies with operator size and control location</i>
<b>Neck</b>						
<i>Flexion</i> 						
<i>Extension</i> 						
<i>Twisting</i> 						
<b>Shoulder</b>						
<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%	
<b>Forearm</b>						
<i>Rotation</i> 						
<b>Wrist</b>						
<i>Wrist Movements</i> 						
<b>Hand/Fingers</b>						
<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%	
<b>Back</b>						
<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 Log Loader Operator. Indicate tasks that require one or more of these activities, and fill in the weight of the objects, or the force required, for each action. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled. If necessary, please refer to Appendix A to calculate the weight of the wood being handled.

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

**Hand Tools**

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

Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<input type="checkbox"/> Sledge-hammer		6.9 to 9.2					
<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							

## Environmental Conditions

### Work Environment

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

Factor	Comments
<b>Vibration</b> ( <i>Indicate source</i> ) <input type="checkbox"/> Seat <input type="checkbox"/> Floor <input type="checkbox"/> Tool <input type="checkbox"/> Other: _____	
<b>Noise level</b>	
<b>Lighting level</b>	
<b>Other:</b>	

### 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 A of the PDA.

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

## Personal Protective Equipment

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

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

## Appendix A – Regional Map



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

# Risk Factor Identification Checklist

## Log Loader Operator

### Purpose

The Risk Factor Identification Checklist for a Log Loader Operator is used to **identify** potential ergonomic risk factors. Keep in mind that the purpose of this checklist is only to **identify** potential ergonomic risk factors, **not** to assess them.

The checklist can be used as part of your ergonomic intervention process, when workers express concerns about their work environment, during regular workplace inspections and observations, or when conducting an accident or injury investigation. Ideally, management and worker representatives who have completed the IMIRP Occupational Health & Safety Committee and Supervisor Ergonomic Training Session should complete this checklist. Try to view different workers in the same occupation when completing the checklist. Some specific examples are given to help answer the questions.

### Instructions

#### **General**

Except for the first two questions, all remaining questions will require an answer with an implied frequency. For appropriate questions indicate with a check mark whether the answer to the question is 'No' or 'Yes'. This way you will have a record indicating that all risk factors have been considered in the identification process.

If you indicate 'No', please continue to the next question. If the question refers to a situation which does not exist (e.g., there is no seating available), please indicate 'No' in the appropriate box and continue to the next question.

If your answer is 'Yes', please check the appropriate box and then circle the frequency ('S' for 'Sometimes' or 'O' for 'Often'). If you answer 'Yes – Sometimes', then this risk factor **may be** a potential area of concern. If you answer 'Yes – Often' then there is an increased likelihood that this risk factor **is** an issue. Each mill will be responsible for defining what 'Sometimes' and 'Often' will mean to them. It is important that all people who complete the checklist are consistent in how they determine if a risk factor occurs 'Sometimes' or 'Often'. Use the 'Comments' section to indicate specific tasks, or to make other notes about the direct risk factors.

Since ergonomic risk factors frequently occur in combinations, you may find similar questions in different sections. Answering all questions will ensure that the situations that involve combinations of ergonomic risk factors are identified. It is very important to recognise all risk factors that occur in the work area.

Please note that for some of the questions it will be beneficial to ask the worker for their input. Please take the opportunity to include the operator in the risk factor identification process as much as possible. Videotaping the job of interest and reviewing the checklist in a quiet area with the worker may allow for more discussion.

### **Summary Tables**

At the end of each body part section, summarise your findings in the table provided. If any of the direct risk factor sections contain a 'Yes', indicate 'Yes' in the appropriate section of the summary table. Answer the questions referring to injury statistics and discomfort survey findings. If there are only 'No' answers in a direct risk factor section, indicate 'No' in the summary table for that section. Use the summary information to determine how you will use the Work Manual.

## Risk Factor Identification Checklist – Log Loader Operator

Management Representative \_\_\_\_\_

Worker Representative \_\_\_\_\_

Date \_\_\_\_\_

Risk Identification completed:

- |   |
|---|
| <input type="checkbox"/> Before implementation of solutions |
| <input type="checkbox"/> 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.

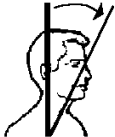
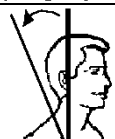
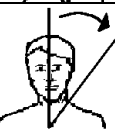
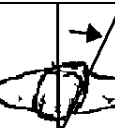
**Static Postures:** Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

**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.

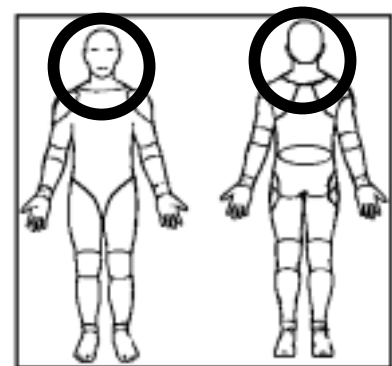
**Awkward Postures:** Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

**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 back and forth)			S	
			O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., looking over the shoulder)			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., reaching forward to operate a lever)			S	
			O	
Awkward Posture				
Flexion			S	
			O	
Extension			S	
			O	
Lateral Bending			S	
			O	
Rotation			S	
			O	



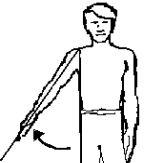
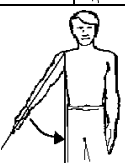
Please indicate whether the following direct risk factors were identified at the <b>NECK</b> .		
<b>Direct Risk Factors</b>	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/>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



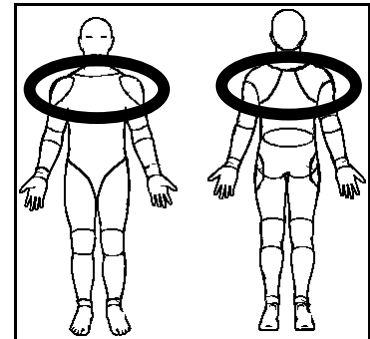
*Body parts within the circled area will be classified as NECK issues.*

## SHOULDER

<b>Force</b>	<b>N</b>	<b>Y</b>	<b>Comments:</b>
Is forceful physical handling performed? Such as: Lifting		S O	
Lowering		S O	
Pushing		S O	
Pulling		S O	
Carrying		S O	
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., pulling a lever back and forth)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating a steering wheel)		S O	
<b>Static Posture</b>			
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., holding the arm in front of you to reach controls)		S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., steering wheel)		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 <b>SHOULDER</b> .		
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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



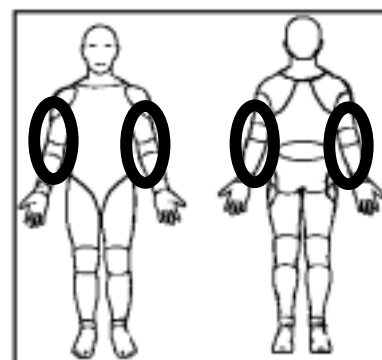
*Body parts within the circled area will be classified as **SHOULDER** issues.*

## ELBOW

Force		N	Y	Comments:
Is forceful physical handling performed? Such as:			S	
Lifting			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., levers or joysticks)			S	
			O	
Are objects handled in a pinch grip? (e.g., toggle switches, pulling buttons)			S	
			O	
Are objects handled in a hook grip? (e.g., oil cans, tire rims)			S	
			O	
Ask the worker: Do you wear gloves while performing your job? If the answer is <b>No</b> , check the <b>No</b> box and go to next section.			*	S
				O
*If the answer to the above question is <b>Yes</b> , ask the worker: Are the gloves too large/small?				S
				O
Does the thickness of the gloves cause problems with gripping?				S
				O
Repetition				
Are identical or similar motions performed over and over again? (e.g., turning a steering wheel)				S
				O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., steering)				S
				O




<b>Static Posture</b>		N	Y	Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture? (e.g., holding arms out to pull on levers or joystick)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., operating levers)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., levers, joystick)			S O	
<b>Contact Stress</b>				
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., resting the wrist on the head of a lever or joystick)			S O	
<b>Vibration</b>				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., steering wheel)			S O	





Please indicate whether the following direct risk factors were identified at the <b>ELBOW</b> .	
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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	



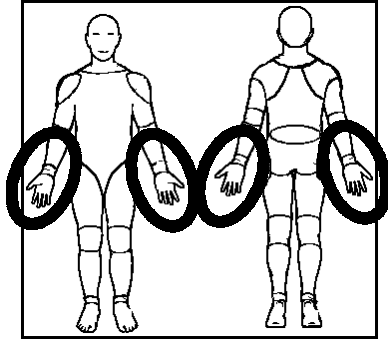
*Body parts within the circled area will be classified as ELBOW issues.*

## WRIST/HAND

Force		N	Y	Comments:
Is forceful physical handling performed? Such as:			S	
Lifting			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., levers or joysticks)			S	
			O	
Are objects handled in a pinch grip? (e.g., toggle switches)			S	
			O	
Are objects handled in a hook grip? (e.g., oil cans, tire rims)			S	
			O	
Ask the worker: Do you wear gloves while performing your job? If the answer is <b>No</b> , check the <b>No</b> box and go to next section.			*	S
				O
*If the answer to the above question is <b>Yes</b> , 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? (e.g., moving toggle switches)				S
				O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating a steering wheel)				S
				O

<b>Static Posture</b>		N	Y	Comments:
Ask the worker: Do tasks require any part of your arm or hand to be maintained in a fixed or static posture? (e.g., holding arms out to reach controls or steering wheel)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding a lever in its position)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., steering wheels)			S O	
<b>Contact Stress</b>				
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., resting the wrist on the head of a lever)			S O	
Ask the worker: Do you use your hand like a hammer for striking? (e.g., shutting off a button)			S O	
<b>Awkward Posture</b>				
Flexion			S O	
Extension			S O	
Ulnar Deviation			S O	
Radial Deviation			S O	
<b>Vibration</b>				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., steering wheel)			S O	





Please indicate whether the following direct risk factors were identified at the <b>WRIST/HAND</b> .		
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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



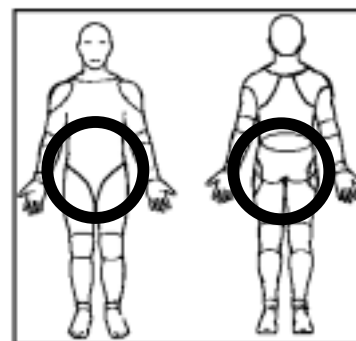
*Body parts within the circled area will be classified as WRIST issues.*

## 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., climbing up and down ladders)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., reaching to pull on levers)		S O	
Static Posture			
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., sitting)		S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., Mobile Equipment Operators)		S O	
Contact Stress			
Ask the worker: Do <u>any</u> objects, tools or parts of the workstation put pressure on <u>any</u> parts of your hip/thigh? (e.g., pressure on the back of the leg from a seat)		S O	


Awkward Posture		N	Y	Comments:
Flexion			S O	
Extension			S O	
Lateral Bending			S O	
Twisting			S O	
<b>Vibration</b>				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., sitting in mobile equipment)			S O	

Please indicate whether the following direct risk factors were identified at the <b>LOW BACK or HIP/THIGH</b> .		
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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

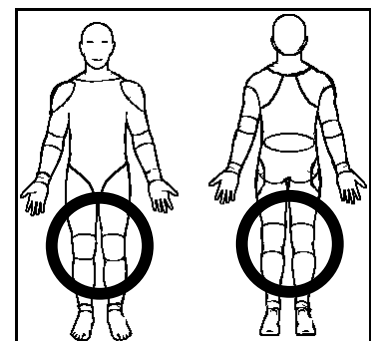


*Body parts within the circled area will be classified as LOW BACK issues.*

## KNEE



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

Please indicate whether the following direct risk factors were identified at the <b>KNEE</b> .		
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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

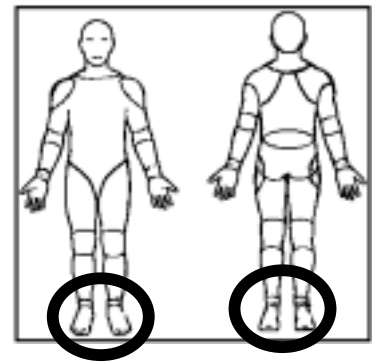


*Body parts within the circled area will be classified as KNEE issues.*

## ANKLE/FOOT

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

Please indicate whether the following direct risk factors were identified at the <b>ANKLE/FOOT</b> .		
<b>Direct Risk Factors</b>	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 <b>Injury Statistics</b> 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 <b>Discomfort Survey</b> 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., bundle cables)			S O
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions? (e.g., bundle cables)			S O
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object? (e.g., hoists)			S O
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., pneumatic tools, hand tools)			S O
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is <b>No</b> , check the <b>No</b> box and go to the next section.			S O
If the answer to the above question is <b>Yes</b> , ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O

## ENVIRONMENTAL CONDITIONS

<b>Temperature</b>			
Ask the worker: Are your hands or arms exposed to cold from exhaust air, cold liquids or solids?			S O
Ask the worker: Are you exposed directly to temperature extremes that may cause you to use more force or cause you to fatigue quicker than normal? (e.g., hot or cold, either by equipment or natural environment)			S O
<b>Lighting</b>			
Ask the worker: Do you assume awkward postures to overcome problems associated with glare, inadequate lighting, or poor visibility? (e.g., glare from sunset or sunrise)			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? (e.g., logging trucks)		S O	
Do peak workloads or sudden increases in pace occur with the tasks? (e.g., seasonal logging trucks)		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., seasonal overtime)		S O	
Ask the worker: Are there indications of excessive fatigue or adverse health effects due to shiftwork?		S O	
Ask the worker: Are rest periods or task variety insufficient to prevent the build-up of fatigue or the risk of adverse health effects? (e.g., sitting for long duration)		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**



# **Log Loader Operator (Wagner/Le Tourneau)**

This Work Manual contains information about the body parts found to be at risk of musculoskeletal injury (MSI) for the Log Loader Operator (Injury Education), and how to reduce the risk of MSIs using various control measures (Injury Prevention). Each Work Manual is intended to help Occupational Health and Safety Committee members establish effective solutions to reduce MSIs, and as a resource for workers to understand the MSI risks that they may encounter on the job.

The Body Manual, referenced throughout the Work Manual, is a separate document that contains information on how to prevent common MSIs through exercise. Please note exercises described in the Body Manual should only be used after consulting a healthcare practitioner.

The General Risk Factor Solutions Manual, referenced throughout the Work Manual, is a separate document that contains general, preventative information on Environmental Conditions and Work Organisation issues.

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## Work Manual

# Log Loader Operator

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### **Disclaimer**

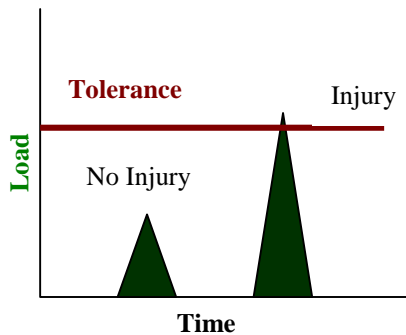
*The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness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

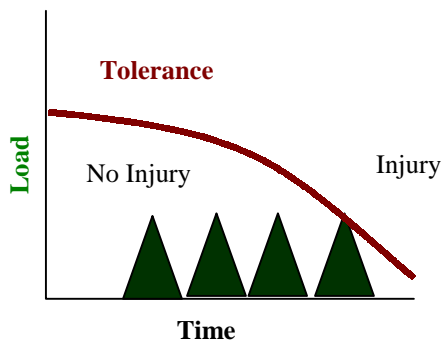
*Injuries occur when ...  
Loads exceed tissue tolerances*



## ***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.

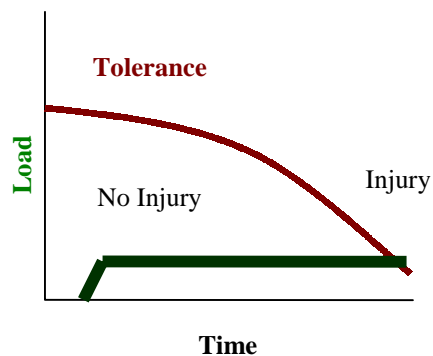
***Example – a worker going over on their ankle and spraining it.***



## ***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 Log Loader Operator job (i.e., injury statistics, discomfort surveys, results from the Identification Checklist), the next steps are to:

1. Match the body parts of concern from your investigation to those described in this section of the Work Manual.
2. Note the direct risk factors associated with each body part of concern.
3. Read the information on the page and try to understand why a body part, in combination with each of the direct risk factors, is of concern.
4. Discover which indirect risk factors are associated with a particular body part problem and the headings under which they are found in the Injury Prevention section of the Work Manual.
5. Note the consequences of the direct risk factor relative to a body part.
6. Note where the potential solutions can be found within the Injury Prevention section of the Work Manual. In addition, for many of the body parts, a reference may be provided to refer to specific sections of the Body Manual.

At the end of the Body Parts at Risk Section, there is a summary page of all the body parts of concern for the Log Loader Operator. In addition, a reference table, with a summary of the direct and indirect risk factors by body part, is provided.

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

## Major Risk Identification

IMIRP ergonomists have assessed the Log Loader Operator position and found that the Low Back and Wrist/Hand are the body parts of primary concern. Focussing on solutions that target these body areas will likely reduce the greatest risks associated.

**Low Back:** Major risks include awkward and static postures from sitting for long durations, impact and continuous vibration transmitted through the seat, and impact loading from jumping down from steps. Other tasks that may effect the back are lifting and hammering bundle cable clamps.

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

1. Good driving posture (page 71)
2. Stepping down (page 73)
3. Lumbar support (page 74)
4. Adjustable seating (page 74)
5. Vary body posture (page 74)
6. Seat maintenance (page 75)
7. Adjust seat spring (page 76)
8. Yard maintenance (page 77)

**Wrist/Hand:** Major risks include repetitive and awkward postures when operating levers, joysticks, and steering wheel. Another injury risk is localised contact stress on the tissues of the wrist and base of the hand from resting the wrist on levers and hard surfaces.

The following solutions are targeted at reducing the risk of injury to the Wrist/Hand.

1. Toggle extensions (page 84)
2. Padding for bar (page 85)
3. Maintain neutral postures
4. (page 85)
5. Gloves
6. (page 85)

For additional stretching and strengthening exercises that would benefit a Log Loader Operator refer to the Low Back and Wrist sections of the Body Manual.

## NECK

### Direct Risk Factors:

Awkward Posture

Static Posture

Repetition



**A Log Loader Operator may hold their head in a twisted posture to look behind when driving. This task may occur frequently, throughout the shift.**

## 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 Posture*

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

### *Static Posture*

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

### *Repetition*

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

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Additional Workstation Design Options**

- Loading on the neck muscles may increase when obstructions on the vehicle block the view of the operator, leading to awkward and static neck postures.

### *Environmental Conditions*

#### **Lighting**

- Loading on the neck muscles may increase when glare on the windows or poor lighting reduces visibility for the operator. This reduced visibility may force the operator to adopt awkward and/or static neck postures.

## CONSEQUENCES

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

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled “Neck” in the Summary of Solutions on pages 88 to 91.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

## NECK/SHOULDER

<b>Direct Risk Factors:</b> Awkward Posture Static Posture Repetition
--



**A Log Loader Operator frequently holds their arms away from the body in order to reach console controls. Controls on the Le Tourneau are farther away from the operator, leading to increased degrees of awkward arm posture.**

### 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

#### *Awkward Posture*

- 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 Posture*

- 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.

#### *Repetition*

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

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Reaches**

- Loading on the neck and shoulders occurs when operators reach in front of them for controls. The farther the operator reaches, the higher the load on the neck and shoulders.

## CONSEQUENCES

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

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck/Shoulder, please see the column labelled “Neck/Shoulder” in the Summary of Solutions on pages 88 to 91.
- For exercises that can help to prevent *neck* and *shoulder* injuries, see the *Neck* and *Shoulder sections of the Body Manual*.

## WRIST/HAND

### Direct Risk Factors:

Awkward Posture  
Static Posture  
Contact Stress



**A Log Loader Operator may operate levers or toggles with the wrists bent.**

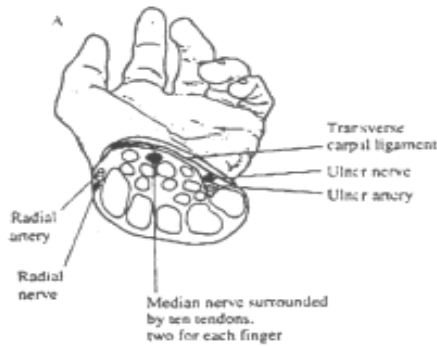
**A Log Loader Operator rests the wrist/hand on levers when operating the vehicle.**

**The cumulative effect of these types of loading on the wrist/hand may lead to an increased risk of injury.**

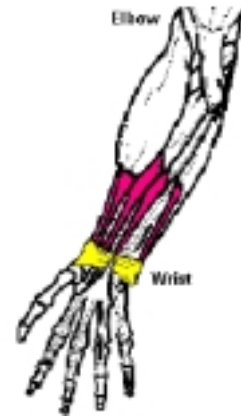


## BACKGROUND INFORMATION

- 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 (median nerve) run under a thick band (see pictures below), which forms the roof of the carpal tunnel.



The Carpal Tunnel



## DIRECT RISK FACTORS

### *Awkward Posture*

- 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.

### *Static Posture*

- When the wrist is held in a bent position, the tendon sheaths are under constant stress. If the duration of constant stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.

### *Contact Stress*

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

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Reaches**

- Loading on the tissues in the wrist may increase when the operator reaches forward and rests the wrist on a lever. The weight of the arm further increases the load on the wrist tissues.

## ***Characteristics of Objects Being Handled***

### **Size and Shape**

- The size and shape of controls handled may cause increased loading on the wrist from bent wrist postures. Smaller toggles and levers may require small finger movements, forcing the wrist to be in an awkward posture.

### **CONSEQUENCES**

- Holding the wrist in a bent position may lead to irritation and damage in the tendon sheaths.
- Continual exposure to contact stress increases the pressure on the carpal tunnel.
- Signs and symptoms may include pain, tenderness, numbness, inflammation in the wrist, and tingling in the hand area.

### **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the wrist/hand, please see the column labelled “Wrist” in the Summary of Solutions on pages 88 to 91.

## LOW BACK

<b>Direct Risk Factors:</b>
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Force
-------

Awkward Posture
-----------------



**A Log Loader Operator may jump down from steps of the log loader.**

**A Log Loader Operator may be required to use a sledgehammer to break bundle cables from each load.**

**The cumulative load of these tasks may increase the risk of injury to the low back.**



## 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*

- Forceful lifting and hammering requires back muscles to stabilise the spine. The greater the force, the greater the tension developed in the muscles.
- Impact forces from jumping down increases the loading on the back muscles, ligaments, tendons and discs in the back. The higher the force, the greater the risk of injury.
- If the force placed on the back muscles exceeds the tissue tolerances, injury may occur.

### ***Awkward Posture***

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

## **INDIRECT RISK FACTORS**

### ***Workstation Design***

#### **Working Heights**

- Loading on the back increases when jumping down from steps. The higher the operator jumps from, the greater the load on the back.

## **CONSEQUENCES**

- Repeated forceful lifting and lowering can strain the back muscles.
- Repeated forceful impact loading on the back can strain back muscles.
- Signs and symptoms include pain, stiffness, and possible muscle spasms.

## **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the Back, please see the column labelled “Back” in the Summary of Solutions on pages 88 to 91.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual***.

# LOW BACK

**Direct Risk Factors:**  
Awkward Posture  
Static Posture  
Vibration



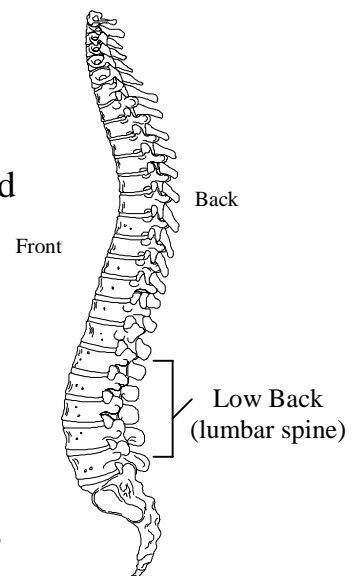
**A Log Loader Operator continually sits on a vibrating surface. Sitting in a cab for long periods, in combination with impact forces from rough ground conditions, provides a major injury risk.**



*Neutral Spine*

## BACKGROUND INFORMATION

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



## DIRECT RISK FACTORS

### *Awkward & Static Posture*

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

### *Vibration*

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

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Reaches**

- Loading on the low back may increase when an operator has to lean forward to reach console controls.

#### **Seating**

- Loading on the low back may increase without adequate lumbar support in the operator's seat.
- Fixed seating may increase loading on the back, especially when the operator twists in the seat to look behind them.

## CONSEQUENCES

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

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 88 to 91.
- For exercises that can help to prevent *back* injuries, see the *Back section of the Body Manual*.

## ANKLE

**Direct Risk Factors:**  
Awkward Posture  
Repetition



**A Log Loader Operator frequently activates foot pedals in order to operate gas, brake, and clutch.**

### BACKGROUND INFORMATION

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

### DIRECT RISK FACTORS

#### *Awkward Posture*

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

#### *Repetition*

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

## **INDIRECT RISK FACTORS**

### ***Workstation Design***

#### **Seating**

- Loading on the ankles may increase if seating is not adjusted to allow operators to use the muscles in the leg and foot to operate foot pedals. If seating is too high only the ankle will be able to generate the force to operate pedals.

#### **Additional Workstation Design Options**

- The angle of the footrests and foot pedals in the log loader may cause additional loading on the tissues around the ankle.

## **CONSEQUENCES**

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

## **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the Ankle, please see the column labelled “Ankle” in the Summary of Solutions on pages 88 to 91.

# Summary of Body Parts at Risk

## NECK

- A Log Loader Operator may hold their head in a twisted posture to look behind when driving. This task may occur frequently, throughout the shift.



## NECK/SHOULDER

- A Log Loader Operator frequently holds their arms away from the body in order to reach console controls. Controls on the Le Tourneau are farther away from the operator, leading to increased degrees of awkward arm posture.



## WRIST/HAND

- A Log Loader Operator may operate levers or toggles with the wrists bent.
- A Log Loader Operator rests the wrist/hand on levers when operating the vehicle.
- The cumulative effect of these types of loading on the wrist/hand may lead to an increased risk of injury.



## LOW BACK

- A Log Loader Operator may jump down from steps of the log loader.
- A Log Loader Operator may be required to use a sledgehammer to break bundle cables from each load.
- The cumulative load of these tasks may increase the risk of injury to the low back.



## LOW BACK

- A Log Loader Operator continually sits on a vibrating surface. Sitting in a cab for long periods, in combination with impact forces from rough ground conditions, provides a major injury risk.



## ANKLE

- A Log Loader Operator frequently activates foot pedals in order to operate gas, brake, and clutch.



# Risk Factors by Body Part

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

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

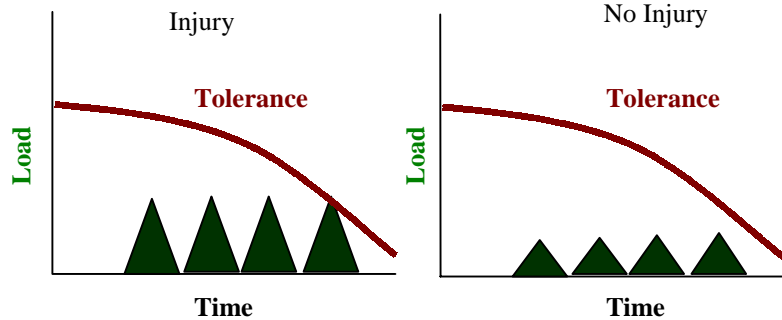
\* Extended exposure to any risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual

\*\* 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 88 to 91 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

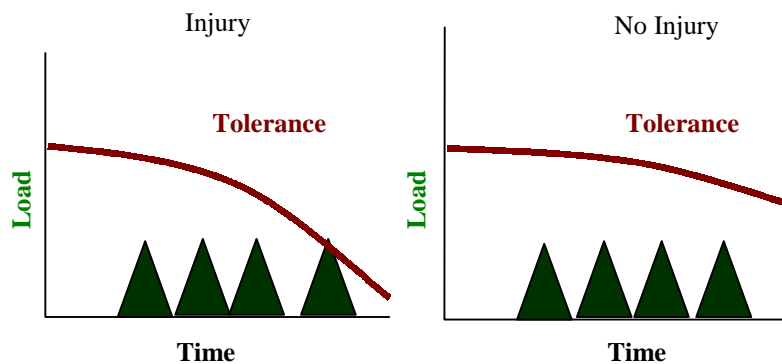
# Injury Prevention

*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 Log Loader Operator job. The solutions are presented under the headings of Workstation Design, Characteristics of Objects Being Handled, Environmental Conditions, and Work Organisation.

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

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

# Risk Control Key

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

E

## **ENGINEERING CONTROLS**

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

A

## **ADMINISTRATIVE CONTROLS**

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

WP

## **WORK PRACTICE CONTROLS**

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

PPE

## **PERSONAL PROTECTIVE EQUIPMENT**

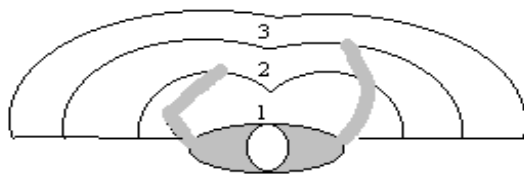
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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

# Workstation Design

## WORKING REACHES

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



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

For some mobile equipment, such as Wagners, controls may also be positioned behind the operator. The floating seat allows access to these controls.

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

### ***Control distance***

E  
WP

In order to reduce loading on the neck, shoulder, and low back, keep controls close to the body by moving the seat forward on slide tracks and/or extending controls into safe reach envelopes. This adjustability is important to accommodate operators of different sizes. The following pictures illustrate how the adjustable seat mechanism can allow an operator to move closer to any controls.



*Extended reach to steering wheel.*



*Steering wheel within safer reach envelope.*

### ***Tilt steering***

WP

In order to reduce loading on the shoulder in vehicles with tilt steering, move the steering wheel closer to the body. This tilting brings the full circumference of the steering wheel closer to the operator.



*Shoulder flexion to operate steering wheel.*



*Safer shoulder posture with tilt steering.*

### ***Good driving posture***

WP

In order to reduce loading on the neck and back, encourage workers to adopt good driving postures. Place back against the backrest, and avoid a static head forward posture where the head and eyes are continually pointed down at ground level work.



*Slouching while driving.*



*Good driving posture.*

### ***Research mobile equipment with operators***

A

Operators can effectively identify potential challenges with awkward and static postures through an equipment trial period prior to purchasing. Most equipment dealers support such a trial period. Investigating mobile equipment with Log Loader operators will minimise the need to retrofit equipment.

## 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 Log Loader Operator, identify the body part of most concern. If the main concern is the:

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

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

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

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

### *Arm supports*

E

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

WP

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

### ***Stepping down***

WP

To significantly reduce loading on the back, avoid jumping down from equipment. After prolonged exposure to vibration in a static posture, the spine is more susceptible to an acute injury resulting from the impact of jumping down.

Ensure that you have secure foot and hand placement as you lower yourself off the machinery. Safe locations for hand and foot placement should be well-marked.

### ***Climbing into cab***

E  
WP

Handholds should be low enough so that operators do not have to jerk themselves upward, which can place large loads on the shoulders when they are in a flexed position.

## SEATING

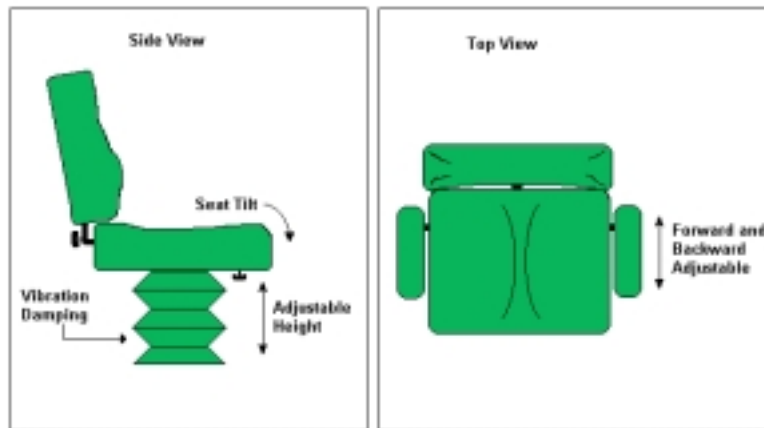
Many Log Loader Operator operators are required to sit when operating a Log Loader. Sitting for long periods of time increases the load on the spine, which stresses the ligaments and discs of the low back. The load is increased when the Log Loader Operator does not maintain a neutral spine (see Injury Education for the Low Back on page 58).

### *Lumbar support*

**E** To improve the posture of the low back, install seats with good lumbar support. Seats that wrap around the low back and encourage proper posture, helping to maintain the curve of the lower back, have good lumbar support.

### *Adjustable seating*

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



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

### *Vary body posture*

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

## ***Seat maintenance***

E  
A  
WP

Vehicle seats and supports are the only layer of protection between an operator and the whole-body vibration transmitted from mobile equipment. In many cases, the seat also provides the only suspension between the user and the vibration and impact from rough terrain. For these reasons, seats need to be properly maintained to help prevent injuries.

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

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

### ***Regular seat maintenance***

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

### ***Daily inspection of seat***

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

### *Adjust seat spring*

WP In order to reduce vibration transmitted to the low back, operators should adjust seat spring to an appropriate level.



Many Log Loaders have air ride seats. If the seats are too stiff more vibration may be transmitted from the seat to the back. If the seats are not stiff enough, bottoming out will increase impact loading to the spine.

### *Seat belts*

WP In order to improve the posture of the low back, encourage the operator to use a seat belt.



Safety regulations state that vehicle operators have to wear a seat belt. These seat belts can also be useful in helping to maintain lumbar curve by holding the low back against the seat and avoiding slouching.

## ADDITIONAL WORKSTATION DESIGN OPTIONS

### *Yard maintenance*

A In order to reduce loading on the back from whole body vibration, maintain the yard and repair potholes.

### *Equipment maintenance*

A In order to reduce loading on the back from whole body vibration from jerky movements, maintain the machine properly and allow the machine to warm-up first.

### *Tire maintenance*

E  
A In order to reduce loading on the back from whole body vibration:

- Ensure tires are inflated properly
- Look at the type of tread on the tires - knobby tires may increase vibration when Log Loaders are driving on harder surfaces
- Install radial instead of ply tires for better control and less vibration



*Smooth tires are preferred on hard surfaces to decrease vibration.*



*Knobby tires are suitable for softer terrain, where traction is required.*

### *Control Log Loader speed in yard*

WP In order to reduce loading on the back from whole body vibration caused by excessive bouncing, control the speed of the Log Loader when driving through the yard.

### ***Force to activate foot pedals***

- |   |
|---|
| E |
|---|

 To reduce loading on the ankle, decrease the force required to activate foot pedals. It is important to ensure pedals are kept clean of debris and are well-maintained.



*Foot pedals and floor areas should be free of obstruction.*

### ***Angle of foot pedal***

- |   |
|---|
| E |
|---|

 To reduce loading on the ankle, decrease the angle of the foot pedal.



*Foot pedals with a vertical surface place more loading on the ankle.*



*Horizontal foot pedals require less ankle flexion to operate.*

### ***Foot pedal maintenance***

- |   |
|---|
| E |
| A |

 To reduce loading on the ankle from activating foot pedals, remove debris under the pedals, and lubricate the rockers on the pedals to ensure they move freely.

To reduce the force required to maintain foot contact and activate foot pedals, maintain the rubber covering on the pedal.

### ***Foot placement on foot pedal***

WP

To reduce loading on the ankle, use the ball of the foot to activate the pedal. Activation on the lower portion of the pedal or using the tip of the foot increases the force required to operate.



*Good Technique:  
Using the ball of the foot to activate the foot pedal.*



*Poor Technique:  
Using the tip of the foot to activate the foot pedal.*

### ***Proper-fitting shoes or boots***

PPE

When operating pedals for long duration, try to wear boots with more flexibility in the ankle region. Safety shoes or boots with shorter ankle supports allow for easier movement of the ankle and foot, decreasing muscle fatigue.

### ***Windshield wipers***

E

To improve visibility and reduce awkward neck postures, install and maintain windshield wipers on both the front and back windows, if present. This should be a clearly outlined job duty for either the Log Loader Operator or the Heavy Duty Mechanic.



### ***Window cleaning***

A

To improve visibility and reduce awkward neck postures, clean windows regularly. Hinged window caging can be opened to make cleaning more convenient.

### ***Footrests***

E

A Log Loader Operator should have their feet well supported by either the floor or the footrests. There should be little or no pressure on the backs of the legs when sitting in the seat. If contact stresses do exist, footrests should be modified to fit the worker.

## Additional Work Practices

### *Hourly stretch breaks*

WP

In order to improve the body's tolerance for work, encourage Log Loader Operators to take stretch breaks every hour. Stretches should be done with the vehicle off and safely parked. Make sure that the ground is flat and dry for personal safety. Suggested stretches are listed below.



To help relax back muscles, stretch the low back by hanging off the equipment. Place feet at 45 degrees and bend the knees, keeping the low back straight. This will stretch one side of the back. Alternate sides.



To improve the posture of the low back when driving, stretch the back of the legs by putting one foot on the bucket. Keep the back straight and bend at the hips. Stretch each leg for 30 seconds after each hour of work.



To help relax neck muscles, stretch the neck for 30 seconds each side after every hour of driving. Reach for the ground or hold onto equipment and turn head slightly to the side. Stretch by lowering the head. Avoid overstretching.

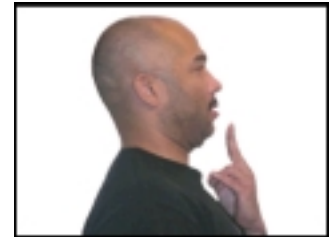


To reduce loading on the neck from poor posture, perform the wall exercise 4 times for 15 seconds after every hour of driving. Re-align the spine by placing the feet out from the wall, and flattening the low back against the wall. Bend the elbows to 90 degrees, with the hands and wrists above shoulder height. Press the forearms back against the wall. Keep chin tucked in.

**When time permits these stretches would complement the suggested hourly stretches.**

### **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.



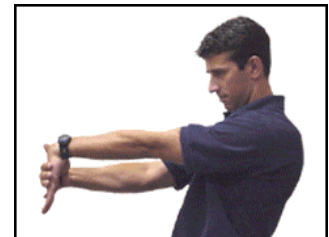
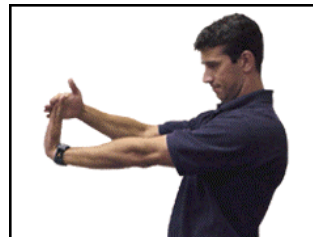
### **Shoulder Stretch**

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



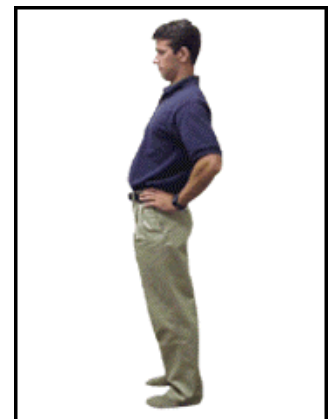
### **Wrist Flexor and Extensor Stretch**

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



### **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.



*Alternate looking over shoulders*

WP To avoid muscle imbalance in the neck and shoulders, try to alternate looking over each shoulder while driving backwards.



# Characteristics of Objects Being Handled

## SIZE AND SHAPE

### *Lever controls*

E In order to minimise contact stress on the hands controls should have cylindrical rather than ball shaped handles. This would allow for a more even distribution of contact with the lever. Grips should be made of a material that allows for good contact and is not slippery (e.g., bike handle foam coverings). Regardless of the shape of the lever control, the wrist should remain in a neutral position as often as possible.



*Contoured lever grips are preferred to reduce contact stress and promote neutral wrist postures.*



*Hard lever handles can lead to contact stress.*

### *Toggle extensions*

E To reduce awkward postures of the wrist/hand, extend the shaft of toggles in the Le Tourneau, as shown below. This change will provide more leverage, and may keep the wrist in neutral postures.



*Overview of a modified Le Tourneau console.*

*Padded hand/wrist protection in a Le Tourneau*

### *Padding for bar*

E

To reduce contact stress on the wrist/hand, the bar located on the console of the Le Tourneau should be padded, as shown above. The harder the surface that the wrist/hand rests on, the greater the localised contact stresses.

Operators should not rest their wrists on this bar while operating controls, as this will lead to awkward wrist postures.

## **CONTAINER, TOOL, AND EQUIPMENT HANDLES**

### *Maintain neutral postures*

WP



In order to reduce awkward postures of the wrist maintain a neutral posture (straight wrist) whenever possible while operating lever controls.

### *Padding for levers*

E

To minimise contact stress to the wrist/hand, provide some padding to the area to be gripped by the operator.

### *Gloves*

PPE

In order to reduce grip forces required by the Log Loader Operator, the operator should wear thin, close fitting gloves with a “sticky” palm surface to increase the friction between the gloves and control levers.

## Environmental Conditions

### *Flood lighting*

E

To improve visibility at night, install high-power floodlights on the front and back of the Log Loader to ensure adequate lighting. External floodlights on frequent work areas (e.g, log yard, gravel depot) can also improve visibility.



### *Winter clothing*

PPE

In order to reduce loading on the wrists from over-gripping, Log Loader Operators should be encouraged to wear proper winter clothing, including well-insulated gloves, when working in cold temperatures.

### *Reduce glare*

PPE

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

# Work Organisation

## *Task variability*

A
WP

In order to reduce exposure to risk factors associated with Log Loader Operators, workers should vary tasks throughout their shift. Taking short breaks just to get out of the cab and stand will help to re-align the spine.

*Please refer to the General Risk Factor Solutions Manual for solutions regarding Environmental and Work Organisation risk factors.*

## Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Control distance	70		A S					A S				
Tilt steering	70		A S									
Good driving posture	71	A S	A S					A S				
Research mobile equipment with operators	71	A S	A S				A S	A S			A S	
Arm supports	72		A S									
Stepping down	73							V				
Climbing into cab	28		F									
Lumbar support	74							A				
Adjustable seating	74							A S				
Vary body posture	74							A S				
Seat maintenance	75							A S V				
Adjust seat spring	76							V				

### Direct Risk Factors

**F** = Force

**S** = Static Posture

**R** = Repetition

**C** = Contact Stress

**A** = Awkward Posture

**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
Seat belts	76							A				
Yard maintenance	77							V				
Equipment maintenance	77							V				
Tire maintenance	77							V				
Control Log Loader speed in yard	77							V				
Force to activate foot pedals	78										A	
Angle of foot pedal	78										A	
Foot pedal maintenance	78										A	
Foot placement on foot pedal	79										A	
Proper-fitting shoes or boots	79										A	
Windshield wipers	80	A										
Window cleaning	80	A										
Footrests	80										A	

### Direct Risk Factors

**F** = Force

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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.

		<b>Injury Prevention Potential</b>										
<b>SOLUTIONS</b>	<b>Page</b>	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Hourly stretch breaks	81	A S R	A S R				A S	F A S V				
Alternate looking over shoulders	83	A R										
Lever controls	84						A C					
Toggle extensions	84						A					
Padding for bar	85						C					
Maintain neutral postures	85						A					
Padding for levers	85						C					
Gloves	85						A C					
Flood lighting	86	A S										
Winter clothing	86						A C					
Reduce glare	86	R A S										
Task variability	87	R A S	R A S				A S C	F A S V			A R	

## Direct Risk Factors

**F** = Force

**S** = Static Posture

**R** = Repetition

**C** = Contact Stress

**A** = Awkward Posture

**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.

		<b>Injury Prevention Potential</b>
<b>Heat Exposure</b>	◆	indirectly reduces risk of injury to the body
<b>Cold Exposure</b>	◆	indirectly reduces risk of injury to the body
<b>Lighting</b>	◆	indirectly reduces risk of injury to the body
<b>Noise</b>	◆	indirectly reduces risk of injury to the body
<b>Vibration</b>	◆	directly reduces risk of injury to the back and wrist
<b>Rest breaks</b>	◆	indirectly reduces risk of injury to the body
<b>Job Rotation</b>	◆	indirectly reduces risk of injury to the body
<b>Task Rotation</b>	◆	indirectly reduces risk of injury to the body
<b>Work Pace</b>	◆	indirectly reduces risk of injury to the body
<b>Scheduling</b>	◆	indirectly reduces risk of injury to the body

◆ = See *General Risk Factor Solutions Manual*

## LOG LOADER OPERATOR MSI SAFETY GUIDE

**OBJECTIVE:** To identify ergonomic risks involved in the Log Loader Operator position, and to reduce the potential for musculoskeletal injuries.

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

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Neck</b></p> <p>A Log Loader Operator may hold their head in a twisted posture to look behind when driving. This task may occur frequently throughout the shift.</p>	<p><b>Awkward Posture</b></p> <p><b>Static Posture</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• Neck muscles are required to turn the head to the side. The farther the head is turned to the side, the greater the load on the muscles and tendons.</li> <li>• When the head is repeatedly turned to the side, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury.</li> </ul>	<ul style="list-style-type: none"> <li>• Alternate looking over both shoulders when driving backwards.</li> <li>• Clean windows regularly.</li> <li>• Stretch neck to relax neck muscles after extended periods of driving. Reach for the ground or hold onto equipment and turn head slightly to the side. Lower the head to stretch. Avoid overstretching.</li> <li>• Re-align the spine by placing the feet out from the wall, and flattening the low back against the wall. Place the arms at 90 degrees and press the forearms back against the wall. Keep chin tucked in. Perform the wall exercise for 15 seconds four times after every hour of driving.</li> <li>• For more exercises that can help prevent <i>Neck</i> injuries, <i>see the Neck section of the Body Manual</i>.</li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Neck/Shoulder</b></p> <p>A Log Loader Operator frequently holds their arms away from the body in order to reach console controls. Controls on the Le Tourneau are farther away from the operator.</p>	<p><b>Awkward Posture</b></p> <p><b>Static Posture</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid “resting” the hand on controls or gearshift. Use armrests - when properly adjusted they keep the shoulder in a more neutral position</li> <li>• Adjust the distances between the seat and driving controls. Position yourself to allow for neutral or near neutral postures of the shoulders. The shoulders should be relaxed and the elbows close to the body.</li> <li>• Use tilt steering features, where available, to move the steering wheel closer to the body.</li> <li>• To stretch the shoulder, hang onto the machine and turn the body until a gentle stretch is experienced in the back part of the shoulder.</li> <li>• For more exercises that can help prevent <i>Neck</i> and <i>Shoulder</i> injuries, <i>see the Neck and Shoulder sections of the Body Manual.</i></li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Wrist/Hand</b></p> <p>A Log Loader Operator may operate levers or toggles with the wrists bent.</p> <p>A Log Loader Operator rests the wrist/hand on levers when operating a log loader.</p> <p>The cumulative effect of these types of loading on the wrist/hand may lead to an increased risk of injury.</p>	<p><b>Awkward Posture</b></p> <p><b>Static Posture</b></p> <p><b>Contact Stress</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• When the wrist is held in a bent position, the tendon sheaths are under constant stress. If the duration of constant stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury.</li> <li>• Contact between hard or sharp surfaces at the base of the palm or on wrist places stress on the tendons and nerves in the carpal tunnel.</li> <li>• Continual contact with hard or sharp surfaces may damage the nerve and/or gradually weaken the tendons, and cause injury.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain neutral wrist postures when operating controls.</li> <li>• Release the hand from the controls whenever it is possible.</li> <li>• Sit back and use armrests when there is a break in the workflow.</li> <li>• Protect the base of the hand - try to keep minimise contact stress in this area.</li> <li>• Operators should be encouraged to wear proper winter clothing, including well-insulated gloves, to reduce over-gripping.</li> <li>• For exercises that can help prevent <b>Wrist</b> injuries, <i>see the Wrist section of the Body Manual.</i></li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Low Back</b></p> <p>A Log Loader operator may jump down from steps of Log Loader.</p> <p>A Log Loader Operator may be required to use a sledgehammer to break bundle cables from each load.</p> <p>The cumulative load of these tasks may increase the risk of injury to the Low Back.</p>	<p><b>Force</b></p> <p><b>Awkward Posture</b></p>	<ul style="list-style-type: none"> <li>Forceful lifting and hammering requires back muscles to stabilise the spine. The greater the force, the greater the tension developed in the muscles.</li> <li>Impact forces from jumping down increases the loading on the back muscles, ligaments, tendons and discs in the back. The higher the force the greater the risk of injury</li> <li>If the force placed on the back muscles exceeds the tissue tolerances, injury may occur.</li> <li>Back muscles must support the weight of the upper body when leaning forward or to the side. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.</li> </ul>	<ul style="list-style-type: none"> <li>When breaking bundle cable clamps, try to use gravity and momentum to increase hammer impact force without increasing the amount of physical force required to break the clamp.</li> <li>For exercises that can help prevent <b>Back</b> injuries, <i>see the Back section of the Body Manual.</i></li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Low Back</b></p> <p>A Log Loader Operator continually sits on a vibrating surface.</p> <p>Exposure to vibration while sitting in a cab for long duration, in addition to impact forces from rough ground conditions, is a major risk for injury.</p> <p>The cumulative effect of vibration loading leads to an increased risk of injury.</p>	<p><b>Awkward Posture</b></p> <p><b>Static Posture</b></p> <p><b>Vibration</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Whole body vibration is usually transmitted through the seat into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs</li> </ul>	<ul style="list-style-type: none"> <li>• Remember to wear your seatbelt, both for safety and as a reminder to improve posture.</li> <li>• Control Log Loader speed to reduce bouncing, and exposure to whole body vibration.</li> <li>• In order to reduce loading on the back from whole body vibration, ensure tires are properly inflated and maintained.</li> <li>• Know how to adjust your seat, including the suspension.</li> <li>• Identify wear and damage of your seat before it becomes a major problem.</li> <li>• When getting out of the cab, climb down instead of jumping down. Jumping down from the cab, particularly after a long period of driving, can cause injury because the prolonged seated posture has already stressed the tissues of the low back.</li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Low Back</b> (continued)</p>			<ul style="list-style-type: none"> <li>• Get up from the seated posture throughout the day, and stretch when possible. This alleviates the load on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting.</li> <li>• To help relax back muscles, stretch the low back while hanging onto the equipment. Place feet at 45 degrees and bend the knees, keeping the low back straight. This will stretch one side of the back. Alternate sides.</li> <li>• To improve driving posture, stretch the back of the legs. Put one foot on a raised surface. Keep the back straight and bend at the hips. Stretch each leg for 30 seconds.</li> <li>• For more exercises that can help prevent <b>Back</b> injuries, <i>see the Back section of the Body Manual.</i></li> </ul>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Ankle</b></p> <p>A Log Loader Operator frequently activates foot pedals in order to operate gas, brake, and clutch.</p>	<p><b>Awkward Posture</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• Lifting the foot to activate a foot pedal puts the ankle into an awkward posture, which increases the loading in the muscle on the front of the shin. The further away from the neutral posture the ankle is, the greater the loading to this muscle. If the shoes worn are rigid or heavy, the loading is also increased.</li> <li>• Repetitive use of foot pedals may gradually cause small tears in the muscle on the front of the shin. If the repetitive stress is excessive, and recovery is not adequate, the small tears in the muscle on the front of the shin may progress to a more significant problem.</li> </ul>	<ul style="list-style-type: none"> <li>• Place the foot properly on the pedal. Activation on the lower portion of the pedal or using the tip of the foot increases the force required to operate.</li> <li>• Remove debris from under foot pedals, and lubricate the rockers on pedals to ensure they move freely, reducing loading on the ankle.</li> <li>• Avoid jumping down from the Log Loader.</li> <li>• When operating pedals for long duration, try to wear boots with more flexibility in the ankle region. Safety shoes or boots with shorter ankle supports allow for easier movement of the ankle and foot, decreasing muscle fatigue.</li> <li>• Stretch the ankles before and during work to make sure they are loose.</li> <li>• For exercises that can help prevent <i>Ankle/Foot</i> injuries, <i>see the Foot section of the Body Manual</i>.</li> </ul>