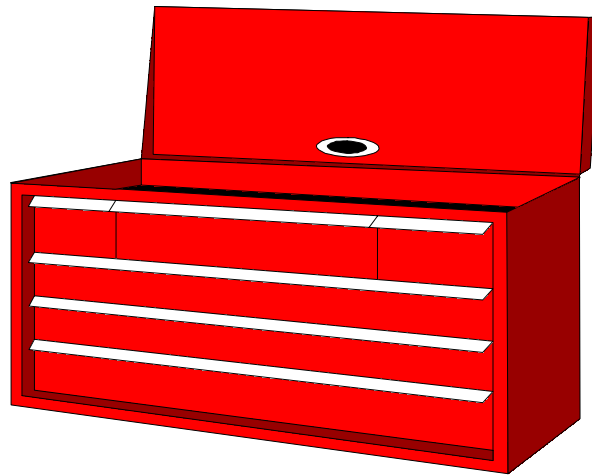


# INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

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## Common Industry Jobs (CIJs) Front End 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

# FRONT END LOADER OPERATOR TOOL KIT

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Front End Loader Operator  
Tool Kit

# Overview

## Front End Loader Operator

### Job Summary

A Front End Loader is responsible for moving material around the yard. A Front End Loader Operator will load, transport, and unload logs and chips, as well as removing debris and snow. An Operator uses both hand and foot controls to perform these tasks. Refer to the Physical Demands Analysis for more detail.

### Physical Demands

The physical demands of the Front End Loader may include:

- a) Repetitive motions of the neck and repetitive exertions of the shoulder and knee
- b) Awkward postures of the neck, shoulder, wrist, and knee
- c) Static postures of the wrist, low back, and knee
- d) Continuous sitting
- e) Climbing onto and out of the front end loader

### Mental Demands

A Front End Loader must continuously concentrate on what is happening in the yard while simultaneously operating the front end loader.

## **Major Variations**

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

- 1) The Front End Loader Operator may operate the machine to:
  - a) Load, transport, unload logs
  - b) Load, transport, unload chips
  - c) Remove landfill
  - d) Remove snow
- 2) Different models of front end loaders may include:
  - a) Models with air-ride seats
  - b) Models with stiffer operational controls
  - c) Models with climate control
- 3) The Front End Loader Operator may also:
  - a) Perform maintenance duties
  - b) Buck logs
  - c) Mark logs with a spray paint can

## **Minor Variations**

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

- 1) The pace the operator works at depends on the mill
- 2) The yard conditions may include:
  - a) Muddy, uneven terrain
  - b) Smooth, level, paved areas
  - c) Dusty, poor quality air conditions

# Physical Demands Analysis

# Front End Loader Operator

## PDA General Instructions: Front End Loader

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Front End 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 Front End 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 Front End Loader Operator

## Task List

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

### **Operate front end loader**

A Front End Loader Operator will load, transport, and unload logs, chips, and landfill.

*Does this task occur at your mill?*

Yes

No



**Sub-tasks include:**

**1) Operate steering wheel and controls**



**2) Operate foot pedals**



**3) Observe in front of and around the front end loader**



## Yard maintenance

A Front End Loader Operators may be responsible for keeping the yard clear of debris and removing snow in the wintertime.

*Does this task occur at your mill?*

- Yes       No



## Buck logs

A Front End Loader Operators may buck logs.

*Does this task occur at your mill?*

- Yes       No



## Mark logs

A Front End Loader Operators may use a paint can to mark logs.

*Does this task occur at your mill?*

- Yes       No



## **Maintenance duties**

These duties may include fuelling, washing, and greasing the loader, changing motor oil, and various mechanical tasks.

*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:

---

---

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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

---

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## Work Organisation

### Task Description

The table below contains a list of tasks performed by a Front End 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. Further 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 Front End Loader</i>  <i>Sub-tasks may include:</i> <ul style="list-style-type: none"> <li>• <i>Operate steering wheel and controls</i></li> <li>• <i>Operate foot pedals</i></li> <li>• <i>Observe in front of and around truck</i></li> </ul>					<ul style="list-style-type: none"> <li>• <i>Amount of control operation varies depending on the task</i></li> </ul>
<i>Yard maintenance</i>					<ul style="list-style-type: none"> <li>• <i>Amount of time varies between sawmills; typically &lt; 10% of work time</i></li> </ul>
<i>Buck logs</i>					<ul style="list-style-type: none"> <li>• <i>Amount of time varies between sawmills</i></li> </ul>
<i>Mark logs</i>					<ul style="list-style-type: none"> <li>• <i>Amount of time varies between sawmills</i></li> </ul>
<i>Maintenance duties</i>					<ul style="list-style-type: none"> <li>• <i>Amount of maintenance for which the operator is responsible varies greatly between sawmills</i></li> </ul>
<i>Other:</i>					

## **Workstation Characteristics**

### **Dimensions & Layout**

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



**Flooring, Displays & Seating**

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

Workstation Characteristics	Comments
<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 Front End 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>Controls movement of vehicle</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Constantly used when driving</i></li> </ul>
<i>Levers</i>	<ul style="list-style-type: none"> <li>• <i>Movement of bucket</i></li> <li>• <i>Gear shift</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Generally used on an occasional basis, as needed</i></li> </ul>
<i>Foot pedal</i>	<ul style="list-style-type: none"> <li>• <i>Accelerator</i></li> <li>• <i>Brake</i></li> <li>• <i>Clutch</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Right foot always on accelerator or brake pedal unless truck has cruise control</i></li> <li>• <i>Left foot operates clutch for manual transmission</i></li> </ul>
<i>Other:</i>		
<i>Other:</i>		

## Physical Demands



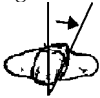

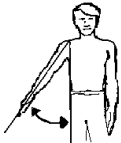

### Whole Body Physical Demands



Identify each of the physical demands required by a Front End 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>	• <i>Operate front end loader</i>				✓	• <i>Amount of time varies, but typically operators sit continuously for 2 hours</i>
<i>Walking</i>						
<i>Sitting</i>						
<i>Standing</i>						
<i>Climbing</i>						
<i>Balancing</i>						
<i>Kneeling/ Crouching</i>						
<i>Other:</i>						





## **Body Postures**





The table below outlines the body postures that may be adopted throughout the shift by a Front End 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>	<ul style="list-style-type: none"> <li>Operate steering wheel and controls</li> </ul>				✓	<ul style="list-style-type: none"> <li>Increased shoulder flexion for some operators, due to position of steering wheel</li> </ul>
<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

<b>Handling</b>	<i>grasping, turning, holding, etc.</i>			
<b>Fingering</b>	<i>picking, pinching, etc.</i>			
<b>Gripping</b>	<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 Front End 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.

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 Front End 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%	
Chainsaw	• Buck logs	7.8		✓			• Done when necessary
Paint can	• Mark logs			✓			• Done when necessary
Grease gun	• Maintenance duties	2.4	✓				• 5 to 10 minutes per day



## 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.

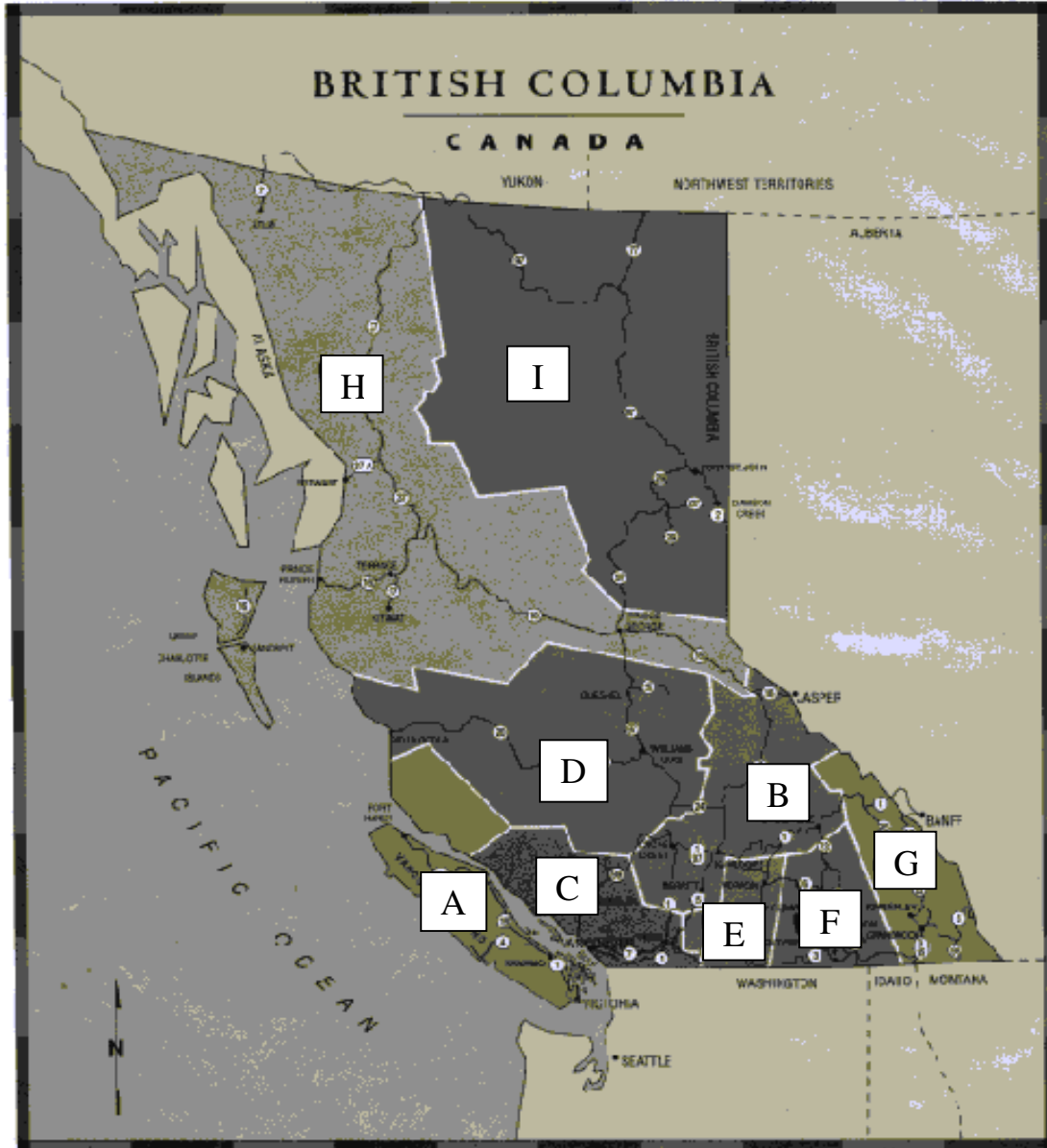
<b>Region</b>	<b>Avg. Max July/Aug</b>	<b>Avg. Min Dec/Jan</b>	<b>Extreme Max.</b>	<b>Extreme Min.</b>
Vancouver Island	22.5 °C	-0.6 °C	36.1 °C	-18.8 °C
Southwestern BC	22.9 °C	0.4 °C	35.6 °C	-18.3 °C
Cariboo Chilcotin Coast	22.2 °C	-11.6 °C	36.4 °C	-42.5 °C
High Country	26.3 °C	-9.9 °C	39.6 °C	-39.7 °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 Front End Loader Operator job at your mill, indicate with a check mark (✓) which of the PPE items are required.

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

## Appendix A – Regional Map



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

# Risk Factor Identification Checklist

## Front End Loader Operator

### Purpose

The Risk Factor Identification Checklist for a Front End 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 – Front End 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.

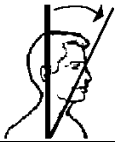
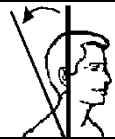
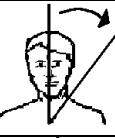

**Static Postures:** Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

**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.

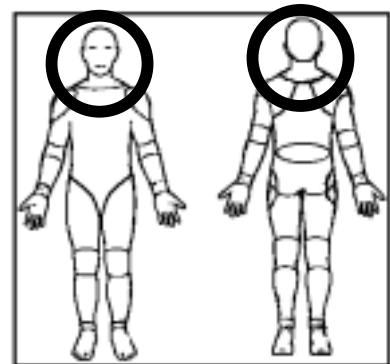
**Awkward Postures:** Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

**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., frequently looking over the shoulder)			S	
			O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating front end loader)			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., holding arms away to operate controls)			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> .		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
In the <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



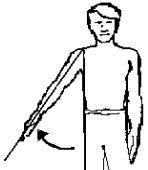
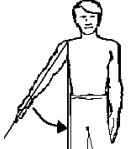


*Body parts within the circled area will be classified as NECK issues.*

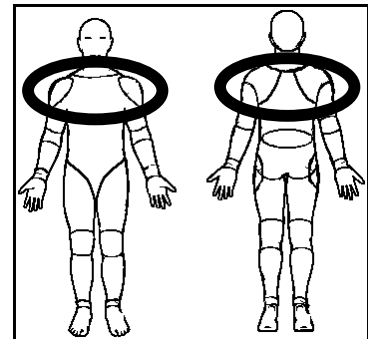
## SHOULDER

<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., operating controls)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating front end loader)		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 arms away from the body when operating controls)		S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., holding controls)		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



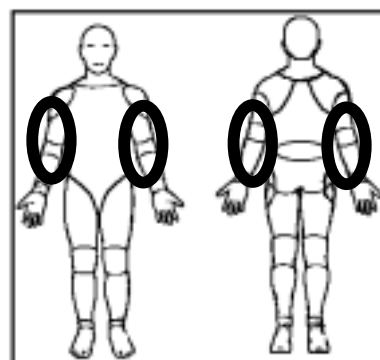
*Body parts within the circled area will be classified as SHOULDER issues.*

## ELBOW

Force	N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting		S O	
Lowering		S O	
Pushing		S O	
Pulling		S O	
Carrying		S O	
Turning materials		S O	
Are objects handled in a power grip? (e.g., steering wheel)		S O	
Are objects handled in a pinch grip? (e.g., controls)		S O	
Are objects handled in a hook grip? (e.g., 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	
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., operating controls)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating front end loader)		S O	




Static Posture		N	Y	Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture? (e.g., holding controls)			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding steering wheel)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., holding steering wheel)			S O	
Contact Stress				
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., edges of consoles digging into elbow)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	





Please indicate whether the following direct risk factors were identified at the <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



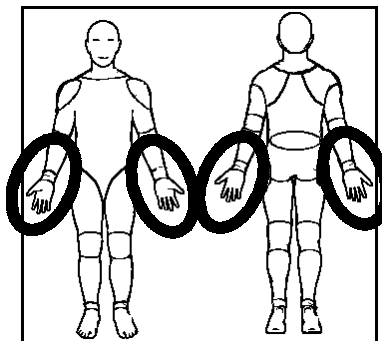
*Body parts within the circled area will be classified as ELBOW issues.*

## WRIST/HAND

<b>Force</b>	N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting		S O	
Lowering		S O	
Pushing		S O	
Pulling		S O	
Carrying		S O	
Turning materials		S O	
Are objects handled in a power grip? (e.g., holding steering wheel) 		S O	
Are objects handled in a pinch grip? (e.g., holding controls) 		S O	
Are objects handled in a hook grip? (e.g., 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	
<b>Repetition</b>			
Are identical or similar motions performed over and over again? (e.g., operating controls)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating front end loader)		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 steering wheel)			S		
			O		
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., holding steering wheel)			S		
			O		
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., holding steering wheel)			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., pressure from controls on hands)			S		
			O		
Ask the worker: Do you use your hand like a hammer for striking?			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?			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



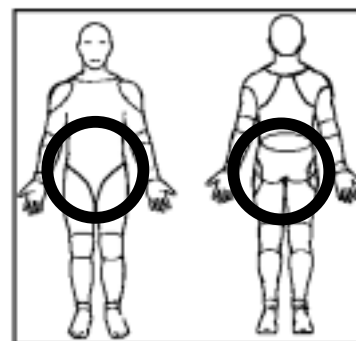
*Body parts within the circled area will be classified as WRIST issues.*

## 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?		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating front end loader)		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 for long periods)		S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?		S O	
Contact Stress			
Ask the worker: Do <b>any</b> objects, tools or parts of the workstation put pressure on <b>any</b> parts of your hip/thigh? (e.g., seat digging into the back of the thigh)		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 on vibrating chair)			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



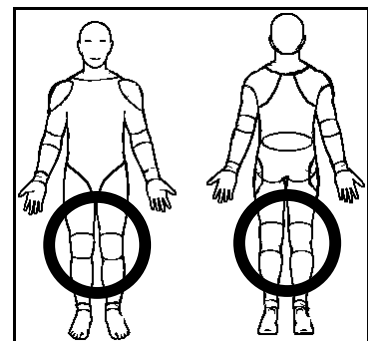
*Body parts within the circled area will be classified as LOW BACK issues.*



## KNEE



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

Please indicate whether the following direct risk factors were identified at the <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

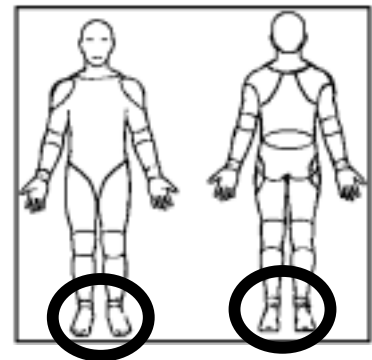


*Body parts within the circled area will be classified as KNEE issues.*

## ANKLE/FOOT

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

Please indicate whether the following direct risk factors were identified at the <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., tires)			S O
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object? (e.g., hoists)			S O
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., controls)			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., working at night)			S O

## ENVIRONMENTAL CONDITIONS [CONTINUED]

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

## WORK ORGANISATION

	N	Y	Comments:
Is the work externally-paced or controlled by a machine or the process?		S O	
Do peak workloads or sudden increases in pace occur with the tasks?		S O	
Ask the worker: Are there indications of excessive fatigue or pain, or symptoms of adverse health effects due to extended work days or overtime? (e.g., extended weekend maintenance)		S O	
Ask the worker: Are there indications of excessive fatigue or adverse health effects due to shiftwork? (e.g., working on graveyards)		S O	
Ask the worker: Are rest periods or task variety insufficient to prevent the build-up of fatigue or the risk of adverse health effects?		S O	
Ask the worker: Are tasks in a job rotation program similar to one another, and therefore not providing a variation in movements?		S O	

# **Work Manual**

**Industrial  
Musculoskeletal  
Injury  
Reduction  
Program**



# **Front End Loader Operator**

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

# Front End Loader Operator

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### **Disclaimer**

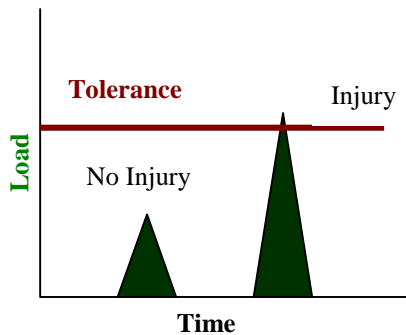
*The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness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

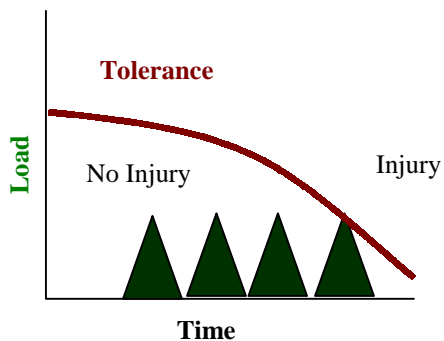
*Injuries occur when ...  
Loads exceed tissue tolerances*



## *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.

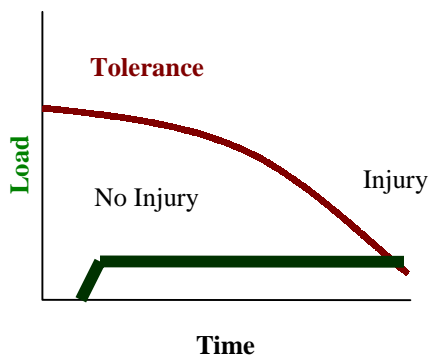
*Example – a worker going over on their ankle and spraining it.*



## *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 Front End 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 Front End 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 Front End Loader Operator position and found that the neck and low back are the body parts of major concern while performing the duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

**Neck:** Major risks include repetitive and awkward posture of the neck (twisting) while backing up the vehicle.

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

1. Windshield wipers (page 79)
2. Window cleaning (page 79)
3. Hourly stretch breaks (page 80)
4. Alternate looking over both shoulders (page 82)
5. Flood lighting (page 85)
6. Task variability (page 86)

**Low Back:** Major risks include constant sitting in the cab of the Front End Loader while manipulating controls to move objects. The seated posture places the spine in a static position. Whole-body vibration is also transmitted to the tissues of the back through the seat.

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

1. Control distance (page 68)
2. Lumbar support (page 72)
3. Vary body posture (page 72)
4. Adjustable seating (page 73)
5. Seat maintenance (page 74)
6. Adjust seat spring (page 75)
7. Yard, Equipment and Tire maintenance (page 29)
8. Hourly stretch breaks (page 80)
9. Task variability (page 86)

For additional stretching and strengthening exercises that would benefit a Front End Loader Operator, refer to the Neck and Low Back sections of the Body Manual.

## NECK

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



**Front End Loader Operators must repeatedly turn their head to the side when driving backwards.**

## 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 further the head is turned to the side, the greater the load on the muscles and tendons.

### *Repetition*

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

## INDIRECT RISK FACTORS

### *Environmental Conditions*

#### **Lighting**

- With poor visibility at night, workers may turn their heads and hold this posture for longer duration.

## CONSEQUENCES

- When the head is repeatedly twisted, 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 87 to 89.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

## SHOULDER

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



**A Front End Loader Operator may repeatedly use controls with the arm away from the body.**

### BACKGROUND INFORMATION

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

### DIRECT RISK FACTORS

#### *Awkward Posture*

- Muscles in the shoulder joint support the weight of arms when they are held away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.

#### *Repetition*

- If the repetitive stress is excessive, and recovery is not adequate, the shoulder muscles may fatigue to the point of injury.

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Working Reaches**

- Loading on the shoulder joint is increased when the controls for the Front End Loader require excessive reaching.

## CONSEQUENCES

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

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled “Shoulder” in the Summary of Solutions on pages 87 to 89.
- For exercises that can help to prevent *shoulder* injuries, see the *Shoulder section of the Body Manual*.

## WRIST

### Direct Risk Factors:

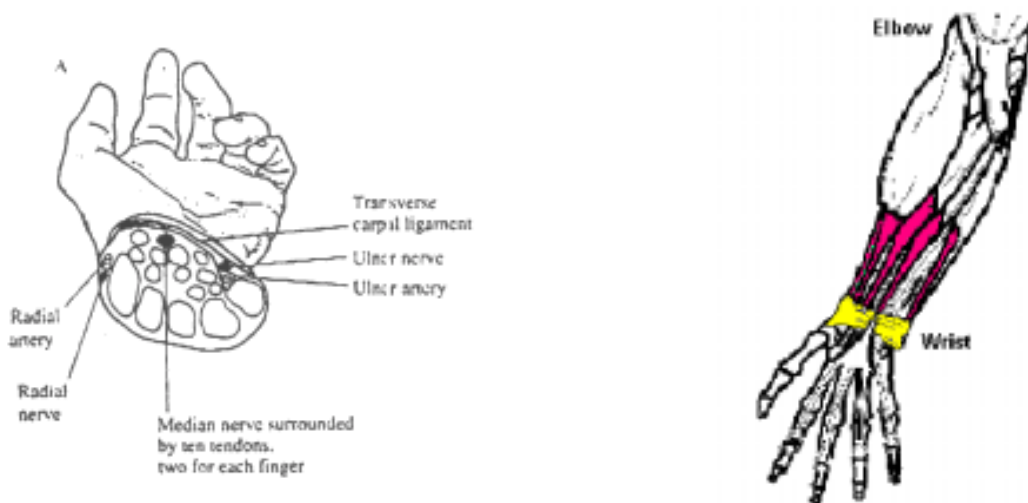
Awkward Posture  
Static Posture  
Vibration



**A Front End Loader Operator continuously grips controls when manoeuvring the machine.**

## BACKGROUND INFORMATION

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



The Carpal Tunnel

## **DIRECT RISK FACTORS**

### ***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.

### ***Vibration***

- Exposure to vibration, through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and vibration frequency influence the amount of mechanical stress.

## **INDIRECT RISK FACTORS**

### ***Workstation Design***

#### **Working Heights**

- The height of controls will determine if the wrist has to adopt an awkward posture.
- Wrist postures may become more awkward when levers have too much play.

## **CONSEQUENCES**

- Holding the wrist in a bent position may lead to irritation and damage in the tendon sheaths.
- Signs and symptoms include pain, tenderness, and inflammation in the wrist area.

## **SUGGESTED SOLUTIONS**

- For specific solutions that may prevent injuries to the wrist, please see the column labelled “Wrist” in the Summary of Solutions on pages 87 to 89.



## LOW BACK

### Direct Risk Factors:

Awkward Posture  
Static Posture  
Vibration

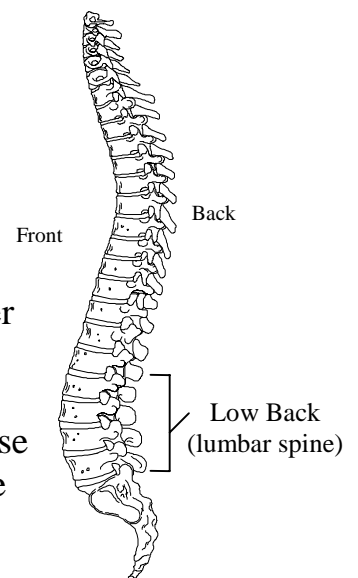


**A Front End Loader Operator must sit for long periods, driving over rough terrain.**

*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 and 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 back is increased when operators have to lean forward to reach controls.

#### **Seating**

- Loading on the back is increased when seating is poor, or is not properly adjusted and maintained.

### ***Environmental Conditions***

#### **Vibration**

- Vibration and loading on the back is increased when the driving surface is rough. Yards with poor drainage tend to develop more ruts, increasing loading on the back.

## **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 87 to 89.
- For exercises that can help to prevent **back** injuries, see the ***Back section of the Body Manual***.

## KNEE

### Direct Risk Factors:

Awkward Posture

Static Posture

Repetition



**A Front End Loader Operator must continuously activate foot pedals with the knees bent.**

## BACKGROUND INFORMATION

- Muscles in the front of the thigh that attach near the knee (quadriceps) contract when activating foot pedals. At the knee joint, the kneecap (patella) is held in place over the thighbone (femur) by these muscles which are attached to connective tissue. When the leg is straight, there is little or no contact between these two bones. However, as the knee bends, the muscles will contract more, and contact stress will increase between the kneecap and the thighbone.

## DIRECT RISK FACTORS

### *Awkward and Static Posture*

- Activating foot pedals with a bent knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees.

### *Repetition*

- Repeated activation of foot pedals with bent knee may gradually irritate the knee.

## INDIRECT RISK FACTORS

### *Workstation Design*

#### **Seating**

- Loading on the knee is increased if the cab has a fixed seat location, and/or the design of the cab causes excessive bending of the knee.

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

- Loading on the knee is increased if the force required to activate foot pedals is high.

## CONSEQUENCES

- Repeated or continuous activation of foot pedals could cause inflammation under the knee cap, which may cause pain and may change the mechanics of knee cap tracking. Changes in knee cap tracking may lead to premature wear of the knee cap and/or the thigh bone.
- Signs and symptoms include muscle wasting around the inner knee, creaking in the knee, and chronic pain if left unchecked.

## SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Knee, please see the column labelled “Knee” in the Summary of Solutions on pages 87 to 89.
- For exercises that could help to prevent *knee* injuries, see the *Knee section of the Body Manual*.

## Summary of Body Parts at Risk

### NECK

- Front End Loader Operators must repeatedly turn their head to the side when driving backwards.



### SHOULDER

- A Front End Loader Operator may repeatedly use controls with the arm away from the body.



### WRIST

- A Front End Loader Operator continuously grips controls when manoeuvring the machine.



## **LOW BACK**

- A Front End Loader Operator must sit for long periods, driving over rough terrain.



## **KNEE**

- A Front End Loader Operator must continuously activate foot pedals with the knees bent.



# Risk Factors by Body Part

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

Indirect Risk Factors		Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Finger	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	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

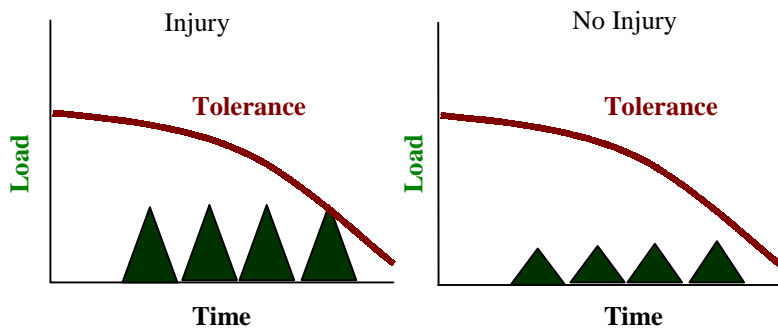
\* Extended exposure to any risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual

\*\* 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 87 to 89 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

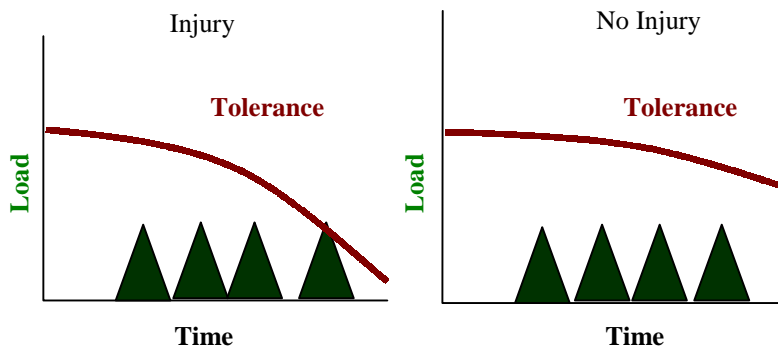
# Injury Prevention

*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 Front End 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**

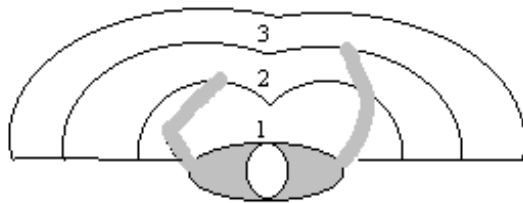
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

**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

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 and shoulder, 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 for Front End Loaders 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 Front End 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 Front End 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 postures of the shoulders and wrists 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 awkward postures of the wrist.

WP

Front End Loader Operators should be encouraged to use the arm supports to reduce awkward postures of the wrist 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

Front End Loader Operators are required to sit when operating the equipment. 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 operator does not maintain a neutral spine (see Injury Education for the Low Back on page 57).

### *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.



### *Vary body posture*

WP

In order to reduce awkward and static postures in the low back encourage the Front End 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.



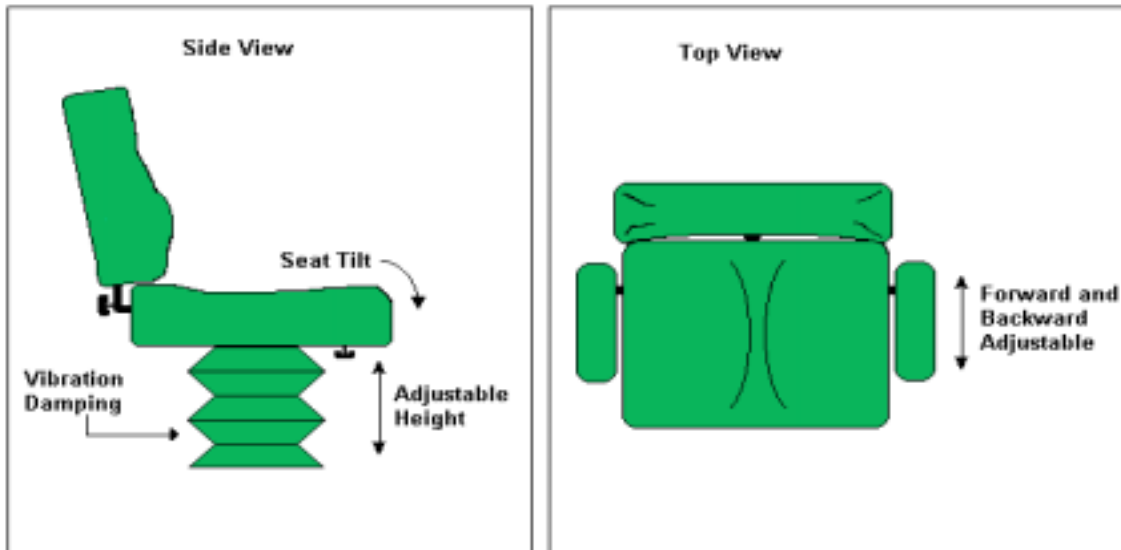
*Occasional breaks from the seated posture can help restore tissue properties.*



### *Adjustable seating*

E  
WP

In order to minimise awkward and static postures of the low back, seating should have several adjustable features 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

## ***Seat maintenance***

E	Vehicle seats and supports are the only layer of protection between an operator and the whole-body vibration transmitted from mobile equipment.
A	
WP	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 Front End 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 Front End 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 Front End 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 Front End Loader when driving through the yard.

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

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

 To reduce loading on the knee, 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.*

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

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

 To reduce loading on the knee 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.

### *Knee angle*

WP

To reduce the loading on the knee, move the seat back or increase the seat height. This change will straighten the leg and make it easier for the muscles above the knee to perform work.



*Knee in flexed position while operating foot pedals.*



*Safer knee position for operating foot pedals.*

The position of any vehicle seat needs to be a compromise of close reaches to minimise shoulder fatigue and adequate separation distance to minimise knee angle. Alternating between positions will more evenly distribute loading between the tissues.

### ***Windshield wipers***

E

To improve visibility and reduce awkward neck postures, install and maintain windshield wipers on both the front and back windows. This should be a clearly outlined job duty for either the Front End 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.

## Additional Work Practices

### *Hourly stretch breaks*

WP

In order to improve the body's tolerance for work, encourage Front End 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 over-stretching.



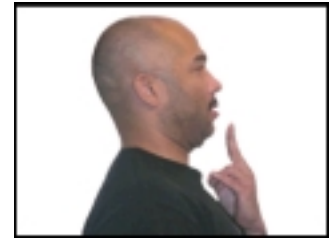
To reduce loading on the neck from poor posture, perform the wall exercise 4 times for 15 seconds after every hour of driving. Re-align the spine by placing the feet out from the wall, and flattening the low back against the wall. Bend the elbows to 90 degrees, with the hands and wrists above shoulder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



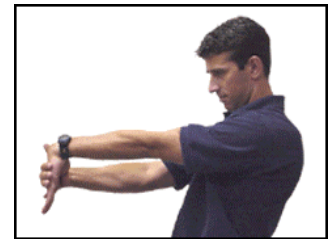
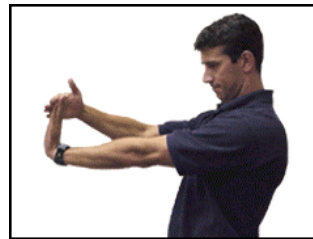
### **Shoulder Stretch**

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.



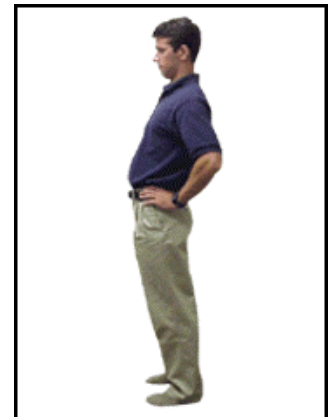
### **Wrist Flexor and Extensor Stretch**

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 both shoulders***

WP To avoid muscle imbalance in the neck, try to alternate looking over both shoulders when driving backwards.



# Characteristics of Objects Being Handled

## SIZE AND SHAPE

### *Lever controls*

E

In order to minimise contact stress in 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.*

## 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*

F

To minimise vibration transmission and contact stress in 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 Front End 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 Front End 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, Front End 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 Front End 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	Hand/ Finger	Low Back	Hip	Knee	Ankle	Foot
Control distance	68	A		A				A S		A S		
Tilt steering	68			A		A		A				
Good driving posture	69	A						S				
Research mobile equipment with operators	69	A		A		A S		A S		A S		
Arm supports	70			A		A						
Stepping down	71							V				
Climbing into cab	71			F								
Lumbar support	72							A				
Vary body posture	72							A S				
Adjustable seating	73							A S				
Seat maintenance	74							S V				
Adjust seat spring	75							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.

		<b>Injury Prevention Potential</b>										
<b>SOLUTIONS</b>	<b>Page</b>	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Hand/ Finger	Low Back	Hip	Knee	Ankle	Foot
Seat belts	75							A				
Yard maintenance	76							V				
Equipment maintenance	76							V				
Tire maintenance	76							V				
Control Front End Loader speed in yard	76							V				
Force to activate foot pedals	77									A S		
Foot pedal maintenance	77									A S		
Knee angle	78									A S		
Windshield wipers	79	A										
Window cleaning	79	A										
Hourly stretch breaks	80	A R		A R		A S V		A S V		A S R		
Alternate looking over both shoulders	82	A R										

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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	Hand/ Fingers	Low Back	Hip	Knee	Ankle	Foot
Lever controls	83					A						
Maintain neutral postures	84					A						
Padding for levers	84					A V						
Gloves	84					A V						
Flood lighting	85	A R						A S				
Winter clothing	85	A				A						
Reduce glare	85	A						A S				
Task variability	86	A R		A R		A S V		A S V		A S R		
Heat Exposure	♦	indirectly reduces risk of injury to the body										
Cold Exposure	♦	indirectly reduces risk of injury to the body										
Lighting	♦	indirectly reduces risk of injury to the body										
Noise	♦	indirectly reduces risk of injury to the body										
Vibration	♦	directly reduces risk of injury to the back and wrist										
Rest breaks	♦	indirectly reduces risk of injury to the body										
Job Rotation	♦	indirectly reduces risk of injury to the body										
Task Rotation	♦	indirectly reduces risk of injury to the body										
Work Pace	♦	indirectly reduces risk of injury to the body										
Scheduling	♦	indirectly reduces risk of injury to the body										

## Direct Risk Factors

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♦ = See General Risk Factor Solutions Manual

## FRONT END LOADER OPERATOR MSI SAFETY GUIDE

### OBJECTIVE:

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

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p><b>Neck</b></p> <p>A Front End Loader Operator must repeatedly turn their head to the side when driving backwards..</p>	<p><b>Awkward 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 further 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 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>Shoulder</b></p> <p>A Front End Loader Operator may repeatedly use controls with the arm away from the body.</p>	<p><b>Awkward Posture</b></p> <p><b>Repetition</b></p>	<ul style="list-style-type: none"> <li>• Muscles in the shoulder joint support the weight of arms when they are held away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.</li> <li>• If the repetitive stress is excessive, and recovery is not adequate, the shoulder muscles 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, see the <i>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</b></p> <p>A Front End Loader Operator may continuously grip controls when manoeuvring the machine.</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>• 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>• Exposure to vibration, through contact with other vibrating objects, places a unique form of mechanical stress on the tissues of the hand and wrist. Factors like vibration level and vibration frequency influence the amount of mechanical stress.</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 Front End Loader Operator must sit for long periods, and drive over bumpy terrain.</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 Front End 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>Knee</b></p> <p>A Front End Loader Operator must constantly activate foot pedals with the knees bent..</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>• Bending the knee increases the contact stress between the knee cap and the thigh bone. Contact stress increases significantly when the knee is bent over 90 degrees.</li> <li>• Repeated activation of foot pedals may gradually irritate the knee.</li> </ul>	<ul style="list-style-type: none"> <li>• To reduce loading on the knee, place the foot properly on the pedal. Pushing lower on the pedal increases the force required to activate the pedal.</li> <li>• To reduce the loading on the knee, move the seat back or increase seat height. This change will straighten the leg and make it easier for the muscles above the knee to work.</li> <li>• Remove debris from under foot pedals, and lubricate the rockers on pedals to ensure they move freely, reducing loading on the knee.</li> <li>• Avoid jumping down from the vehicle.</li> <li>• For exercises that can help prevent <i>knee</i> injuries, <i>see the Knee section of the Body Manual.</i></li> </ul>