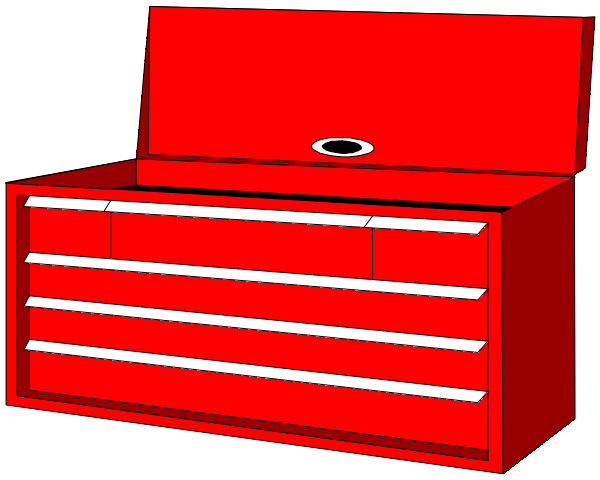
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Car Loader Tool Kit



IMIRP program coordinated by:

Council of Forest Industries

Industrial Wood & Allied Workers of Canada

Advanced Ergonomics Inc.

In cooperation with the Workers' Compensation Board of British Columbia

CAR LOADER TOOL KIT
Table of Contents

Overview
Car Loader

Job Summary

A Car Loader is responsible for loading train cars and flat bed trucks with lumber packages using a forklift. A Car Loader will load rail cars and flatbed trucks, and then secure loads with cables or straps. Other tasks may include moving rail cars, opening and closing rail car doors, placing spacers between loads, cleaning, and shovelling snow. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Car Loader may include:

a) Forceful movements of the back
b) Forceful and repetitive movements of the elbow/wrist/hand
c) Awkward and static postures of the neck, back, and knee
d) Contact stress on the knee
e) Continuous sitting when driving a forklift to load box cars
f) Occasional climbing to attach cables on top of rail cars
g) Frequent crouching to hook and attach cables on top of rail cars
h) Repeated handling of manual and air ratchets to secure loads

Mental Demands

A Car Loader must have good hand-eye control to operate a forklift. A Car Loader may also be required to work at high heights (i.e., working on top of loads on rail cars).

Major Variations

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

1) A Car Loader may load:
   a) Box cars
   b) Flatbed rail cars
   c) Flatbed trucks

2) A Car Loader may use the following to move cars:
   a) Skidder
   b) Front end loader
   c) Tractor

3) A Car Loader may use the following tools to tighten cables:
   a) Crow bar
   b) Manual ratchet
   c) Air ratchet

Minor Variations

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

1) A Car Loader may do the following to raise the cables:
   a) Use a pike pole
   b) Use a hook
   c) Have another Car Loader pass up the cables

Physical Demands Analysis
Car Loader

PDA General Instructions: Car Loader

This Physical Demands Analysis (PDA) identifies the physical demands of the Car Loader job as assessed by IMIRP ergonomists. The information reported was collected from a sample of Car Loaders in the BC Sawmill Industry. Where possible, state-of-the-art equipment and techniques were used in data collection and analysis to increase accuracy. However, some information is based on third party comments that are often subjective and not subject to verification.

Subsequent changes to the work process may reduce the validity of any pre-existing physical demands analysis. The IMIRP Society accepts no responsibility for the use or misuse of the Physical Demands Analysis, or for the accuracy of the PDA as it applies to any specific workplace.

To make the PDA specific to your workplace, determine which of the tasks identified are present in your mill. For each section, check off the items (e.g., tasks, tools, etc.) listed that reflect the Car Loader job at your mill.

Rehabilitation professionals are encouraged to verify and update critical information through the client and through workplace sources to ensure that the content (e.g., tasks, weights of objects handled, etc.) accurately reflects the job.

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 Supervisor 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.

PDA Table of Contents

Physical Demands Analysis
Car Loader

Task List

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

Load flat bed rail cars and trucks

A Car Loader loads rail cars or trucks with a forklift.

Does this task occur at your mill?

☐ Yes ☐ No

Secure loads

After loading, a Car Loader secures the load down with cables.

Does this task occur at your mill?

☐ Yes ☐ No

Move cars

A Car Loader moves the rail cars with a tractor, skidder, or front end loader.

Does this task occur at your mill?

☐ Yes ☐ No

Load box cars

A Car Loader uses a forklift to load box cars.

Does this task occur at your mill?

☐ Yes ☐ No

Clean up

A Car Loader cleans the box cars periodically.

Does this task occur at your mill?

☐ Yes ☐ No

Shovel snow

A Car Loader shovels snow off loads.

Does this task occur at your mill?

☐ Yes ☐ No

Open and close doors

A Car Loader opens and closes box car doors.

Does this task occur at your mill?

☐ Yes ☐ No

Place spacers between loads

A Car Loader places spacers between loads.

Does this task occur at your mill?

☐ Yes ☐ No

Job Profile

Date: _____

Company Name: _____ Division: _____

Employee Name: _____ Supervisor: _____

Phone: _____ Fax: _____

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

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

Describe:

_____

_____

_____

Length of shift _____ hours

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

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

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

Job rotation

☐ Yes ☐ No

Describe:

_____

_____

Work Organisation

Task Description

The table below contains a list of tasks performed on an everyday basis by a Car Loader. Use the left column to check off tasks that are present at your work site. 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%	
	Load flat bed rail cars and trucks					• *Cycle time approx. 30 minutes to load rail car* • *2 to 4 cars per shift* • *1 to 6 trucks per shift*
	Secure loads					• *Typically 36 cables per car*
	Move cars					• *Approx. 2 minutes* • *2 to 4 cars per shift*
	Load box cars					• *2 to 4 cars per shift*
	Clean up					
	Shovel snow					
	Open and close doors					
	Place spacers between loads					
	Other tasks:					

Workstation Characteristics

Dimensions & Layout

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

Workstation Dimensions	
(A) Height of stairs into the forklift	cm
(B) Chair height	cm

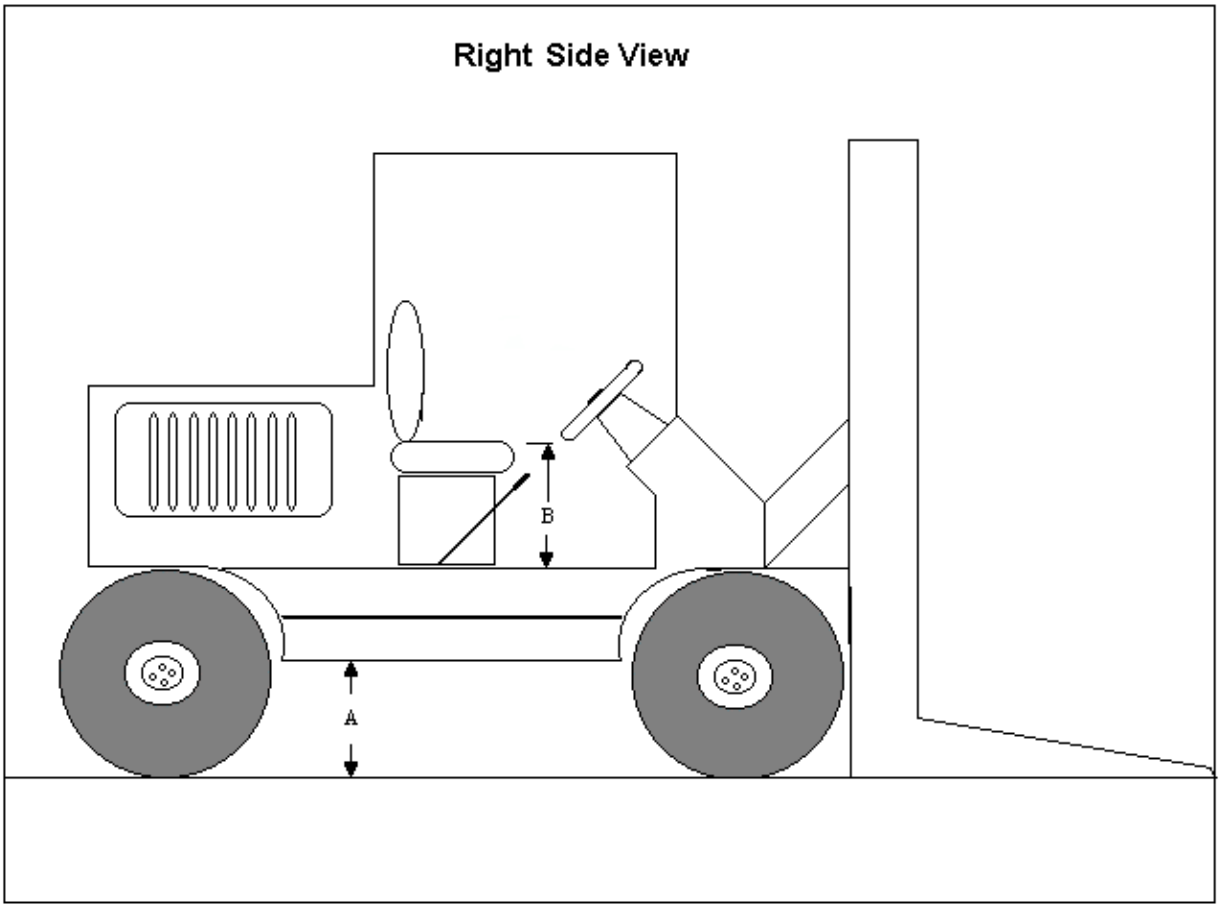


Figure 1: Forklift

Flooring, Displays and Seating

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

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

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Car Loader. Use the left column to check off controls that are present at your 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**
	Wheel	• *Steer forklift*	• *Constantly using when driving forklift*
	Wheel	• *Release brake on rail car*	• *Occurs only when loading rail cars* • *Force may be high if brake is not maintained* • *Repetitions 4 times a day*
	Foot pedal	• *Accelerate forklift* • *Decelerate forklift*	• *Constantly using when driving forklift* • *Constantly using when driving forklift*
	Levers	• *Controls fork position*	• *Constantly using when driving forklift*
	Trigger	• *Activate air ratchet*	• *Occurs only at workplaces with air ratchet system*
	Other:		

Physical Demands

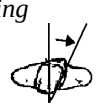
Whole Body Physical Demands

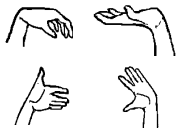
Identify each of the physical demands required by a Car Loader and place the appropriate task titles in the second column. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, and cycle times.

Physical Demands	Tasks or Activity	Percent of Task				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Walking	• *Secure loads*					• *Walking on top of loads*
Sitting	• *Load box car*					• *Driving forklift*
Standing	• *Secure loads*					• *Tightening cables or straps*
Climbing	• *Secure loads*					• *Climbing up ladder on flatbed rail car, and on loads*
Balancing	• *Secure loads*					• *Balancing on top of loads*
Kneeling/ Crouching	• *Secure loads*					• *Crouching over to hook cables*
Other:						

Body Postures

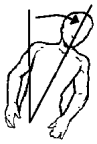
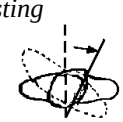
The table below outlines the body postures that may be held or repeated throughout the shift by a Car Loader, related to tasks. The *Comments* section may be used to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Neck						
Flexion 	• *Secure load*					• *Looking down to hook cable*
Extension 	• *Secure load*					• *Looking up when passing up cable*
Twisting 	• *Load box cars*					• *Looking over shoulder when driving forklift*
Shoulder						
Flexion 	• *Load box cars*					• *Operating levers when driving a forklift*
Abduction/adduction 	• *Secure load*					• *Hooking cables*
Extension 	• *Secure load*					• *Pushing down on ratchet to tighten cables*
Forearm						
Rotation 	• *Move cars*					• *Release brake*

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Wrist						
Wrist Movements 	• *Load box cars*					• *Gripping the steering wheel when driving forklift*
Hand/Fingers						
**Handling*						
**Fingering*						
**Gripping*	• *Secure load*					• *Gripping ratchet*

Legend for Hand/Fingers

Handling	*grasping, turning, holding, etc.*			
Fingering	*picking, pinching, etc.*			
Gripping	*Power* 	*Pinch* 	*Hook* 	*Precision* 

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back						
Flexion 	• *Secure load*					• *Bending over to hook cable*
Lateral Flexion 	• *Move cars*					• *Bending sideways when releasing brake*
Twisting 	• *Load box car*					• *Turning to look behind when driving forklift*
Extension 	• *Secure load*					• *Lifting cable up to person on top of load*

Manual Material Handling

The table below contains a list of general manual material handling activities performed by a Car Loader. 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. The *Comments* section may be used 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%	
Pushing	• *Secure load*	*Bar 2.2*					• *Pushing down on bar to tighten cables* • *36 times per car* • *2 to 4 cars per shift* • *4 to 10 seconds per time*
Pulling	• *Load box cars*	*Force varies on size and type of door*					• *Pulling doors closed* • *2 to 4 cars per shift*
Lifting	• *Secure load*	*Hook 2.9*					• *Lifting up cables with hook* • *36 times per car* • *2 to 4 cars per shift*
Lowering							
Carrying	• *Secure load*	*2.9*					• *Carrying ratchet when tightening cables* • *36 times per car* • *2 to 4 cars per shift*

Hand Tools

Indicate the hand tools used by a Car Loader at your mill by placing a check mark (✓) in the far left column. Determine the weight of the hand tool and enter it in the appropriate column.

The *Comments* section may be used to include information related to duration, frequency, cycle times, and characteristics of objects handled.

Type of Tool	Task(s)	Weight (kg)	Percent of Task				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Crow Bar	• *Secure loads*	*2.2 to 3.2*					• *Tightening cable*
Ratchet	• *Secure loads*	*2.9*					• *Tightening cable*
Air Ratchet	• *Secure loads*	*1.6*					• *Tightening cable*
Pike pole	• *Secure loads*	*2.5*					• *Lifting up cables*
Hook	• *Secure loads*	*2.9*					• *Lifting up cables*
Shovel	• *Shovel snow*	*1.7 to 2.9*					
Load strapper	• *Secure loads*	*1.0 to 6.4*					• *Strapping load together*
Crimper	• *Secure loads*	*2.9*					• *Fastens strapping*
Other:							

Environmental Conditions

Work Environment

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

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

Location of Workstation

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

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

Temperature

The table below contains a list of the geographical regions of British Columbia.

For your mill, indicate the appropriate region with a check mark (✓) in the left column.

Refer to the regional map in Appendix B of the PDA.

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

Personal Protective Equipment

The table below contains a list of the personal protective equipment (PPE).

For the Car Loader job at your mill, indicate with a check mark (✓) which of the PPE items are required.

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

Appendix A – Weight of Wood Equation

1. Type of Wood Handled

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

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

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

2. Size of Wood*

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

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

* Conservative estimates of actual wood dimensions

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

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

3. Length of Wood

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

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

4. Weight of Wood Equation*

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

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

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

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

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

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

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

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

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

Appendix B – Regional Map

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

Risk Factor Identification Checklist
Car Loader

Purpose

The Risk Factor Identification Checklist for a Car Loader 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 – Car Loader

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions

☐ After implementation of solutions

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

Definitions

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

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

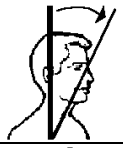
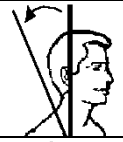
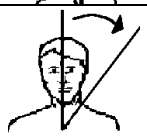
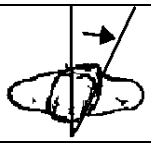
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

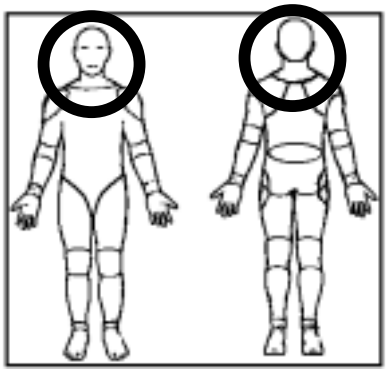
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition		N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., looking down and up)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., driving forklift)				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 steering wheel)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

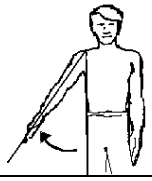
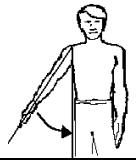
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



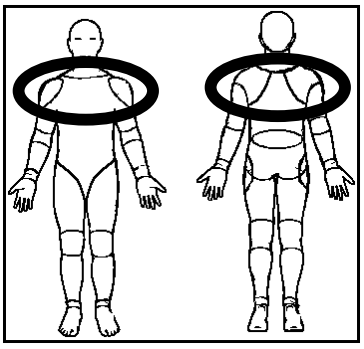
Body parts within the circled area will be classified as NECK issues.

SHOULDER

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., tightening cables)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., driving forklift)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., holding steering wheel)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., pike pole)			S O	

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

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



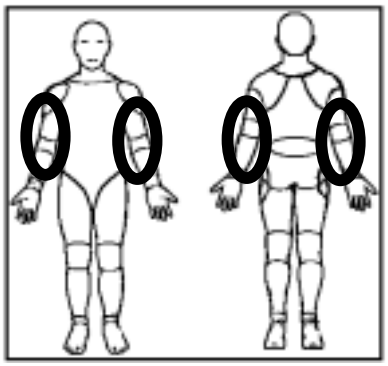
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., pike pole) 			S O	
Are objects handled in a pinch grip? 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., tightening cables)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., tightening cables)			S O	

Static Posture	N	Y		Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture?			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., pike pole)			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., pushing down on bar or ratchet when tightening cables)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	

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



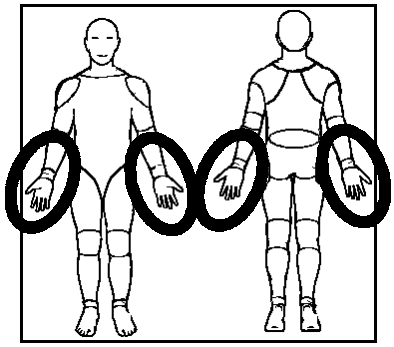
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., pike pole) 			S O	
Are objects handled in a pinch grip? 			S O	
Are objects handled in a hook grip? 			S O	
Ask the worker: Do you wear gloves while performing your job? If the answer is **No**, check the **No** box and go to next section.		*	S O	
*If the answer to the above question is **Yes**, ask the worker: Are the gloves too large/small?			S O	
Does the thickness of the gloves cause problems with gripping?			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., gripping hand tools)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., tightening cables)			S O	

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

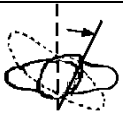
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



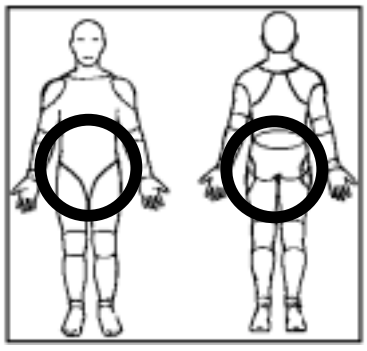
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again?			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., bending forward to secure load)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., bending forward to secure load)			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 **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh?			S O	

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

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

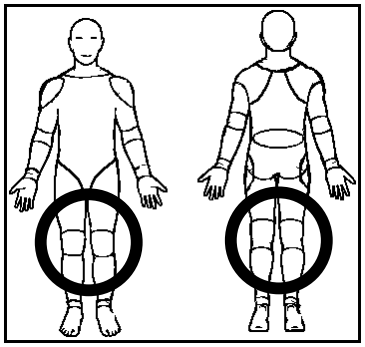


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again?			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture? (e.g., kneeling)			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 **any** objects or parts of the workstation put pressure on your knee(s)?			S O	
Awkward Posture				
Extreme Flexion 			S O	

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

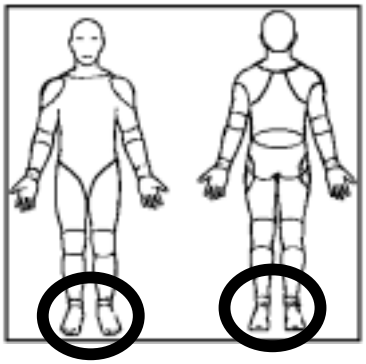


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

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

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



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y		Comments:
Are there problems handling a load due to its size or shape?			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., hand tools)			S O	
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is **No**, check the **No** box and go to the next section.			S O	
If the answer to the above question is **Yes**, ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O	

ENVIRONMENTAL CONDITIONS

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

ENVIRONMENTAL CONDITIONS [CONTINUED]

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

WORK ORGANISATION

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

Work Manual

Industrial
Musculoskeletal
Injury
Reduction
Program

Car Loader

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

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

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

Work Manual

Car Loader

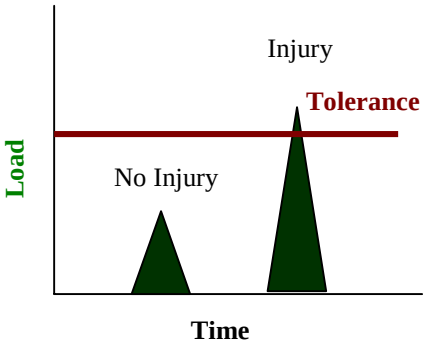
Disclaimer

The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness and/or lead to hazardous situations. Individuals or committees wishing to make Physical Demands Analyses (PDAs) site-specific, or wishing to implement options from the Work Manuals, are advised to first complete the two-day OHSC and Supervisors Ergonomics Training Session. Modifications to a PDA must be within the scope of competence of those individuals making the changes and must be reported to any rehabilitation professional using the PDA. Neither AEI nor the IMIRP Society accepts any responsibility for the use or misuse of these documents.

WM Table of Contents

Injury Education

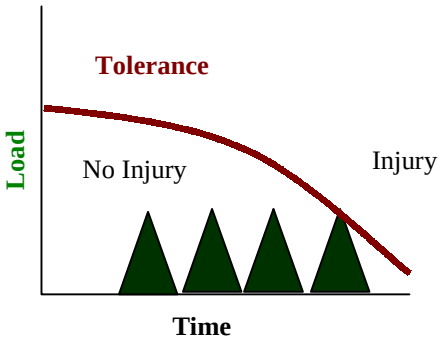
Injuries occur when …
Loads exceed tissue tolerances



Excessive Force

This type of injury occurs from a single event, where the loads or forces are so great they exceed tissue tolerances and cause an immediate injury. This type of injury is more common with trips and falls.

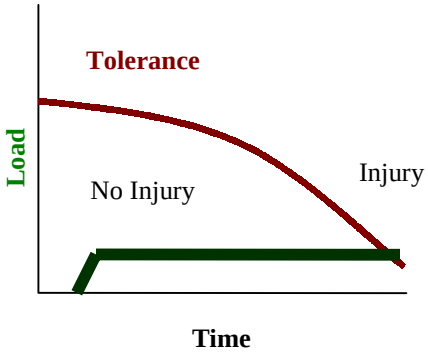
Example – a worker going over on their ankle and spraining it.



Excessive Repetition

This type of injury occurs from repeated loading weakening tissue to the point of failure. It progresses slowly to the point where a subfailure load can cause an injury. This type of injury is more common with repetitive tasks.

Example – a worker pulling lumber off a chain developing a herniated disc.



Excessive Duration

This type of injury occurs from constant loading weakening tissue to the point of failure. This type of injury is more common with tasks that require workers to adopt static or awkward postures for extended periods.

Example – a Grader developing neck tension.

Body Parts at Risk

The previous page on injury education explains how injuries can occur. The Injury Education section of this Work Manual expands on these principles, relating them to the specific body parts at risk of being injured.

After all of the appropriate information is collected during the investigation of the Car Loader 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 Car Loader. 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.

NECK

Direct Risk Factors:
Awkward Postures
Static Postures

Some Car Loaders must hold the head in a twisted posture in order to look out the back window of mobile equipment used to move rail cars.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Postures

- Neck muscles 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.

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Additional Design Options

- The size and location of cab may cause operators to twist their neck while driving.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 82 & 83.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Repetition

A Car Loader must forcefully grip a ratchet or a crow bar to tighten cables when securing a load.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Container, Tool, and Equipment Handles

- Loading on the elbow and wrist may be increased if the handle of the ratchet or bar is slippery and requires more forceful gripping.

Environmental Conditions

Cold Exposure

- Exposure to cold weather may make soft tissue more brittle and more susceptible to injury.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Elbow/Wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions pages 82 & 83
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***
- For exercises that can help to prevent ***wrist*** injuries, see the ***Wrist section of the Body Manual.***

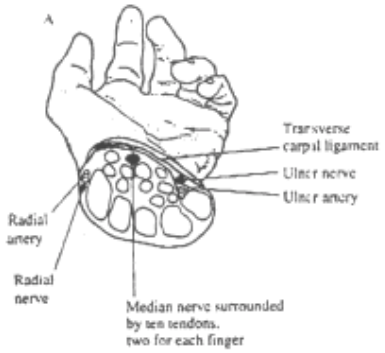
WRIST/HAND

Direct Risk Factors:
Contact Stress
Repetition

A Car Loader's palm is pressed up against the ratchet or bar when tightening loads to secure loads.

BACKGROUND INFORMATION

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



DIRECT RISK FACTORS

Contact Stress

- Contact between hard or sharp surfaces and the base of the palm places stress on the tendons and nerves in the carpal tunnel.

Repetition

- Repeated stress to the palm can progressively damage tissues to the point of injury.

INDIRECT RISK FACTORS

Characteristics of Object Being Handled

Container, Tool, and Equipment Handles

- Loading on the palm is increased when the handle diameter is small and has a hard metal surface.

CONSEQUENCES

- Continual exposure to contact stress increases the pressure on the carpal tunnel.
- Signs and symptoms include pain, numbness, and tingling in the hand area.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Wrist/Hand, please see the column labelled “Wrist/Hand” in the Summary of Solutions on pages 82 & 83.

LOW BACK

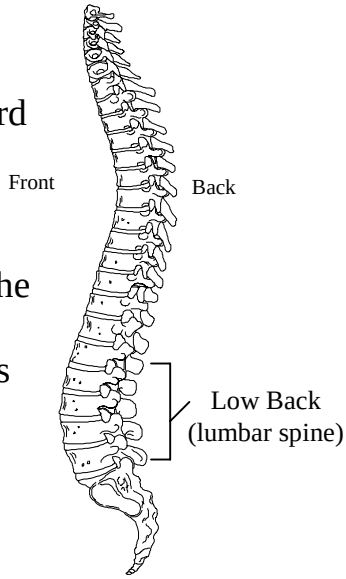
Direct Risk Factors:
Awkward Postures
Repetition

A Car Loader must repeatedly bend forward in order to fasten cables to secure the load.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Awkward Postures

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the back is increased when cables are handled below knee height.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled “Back” in the Summary of Solutions on pages 82 & 83.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

LOW BACK

Direct Risk Factors:
Force

A Car Loader must forcefully push or pull on box car doors to open and close the car doors.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

- Pushing and pulling on box car doors requires back muscles to stabilise the spine. The greater the push or pull, the greater the tension developed in the muscles.
- If the force placed on the back muscles exceeds the tissue tolerances, injury may occur.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading on the back is increased because of the size of the door. If the doors are not properly maintained, more force may be required to move them.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

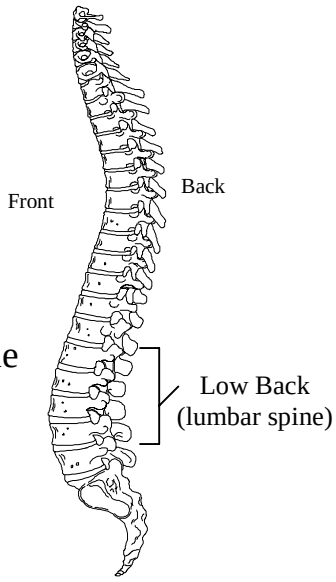
- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 82 & 83.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

LOW BACK

Direct Risk Factors:
Static Postures
Vibration

Some Car Loaders continually sit in a forklift and are exposed to vibration.

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

Static Postures

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

Vibration

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

INDIRECT RISK FACTORS

Workstation Design

Seating

- Poorly designed or maintained seats can also contribute to low back injuries. Seats should be adjustable, with good back support and a comfortable seat pan.
- Seats with vibration damping (e.g., springs, and pneumatic shock absorbers) can also help to minimise injury risks in the low back.

Work Organisation

Task Variability

- Prolonged sitting without any intermittent standing can lead to low back discomfort or injury. The disc structures of the back need occasional relief from the compression that occurs during sitting.

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 82 & 83.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

KNEE

Direct Risk Factors:
Awkward Postures
Contact Stress
Repetition

A Car Loader frequently squats and kneels in order to strap loads and close box car doors.

BACKGROUND INFORMATION

- At the knee joint, the knee cap (patella) is held in place over the thigh bone (femur) by connective tissue. When the leg is straight, there is little or no contact between these two bones. However, as the knee bends, the knee cap can come into contact with the thigh bone.

DIRECT RISK FACTORS

Awkward Postures

- Bending the knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees.

Contact Stress

- Kneeling on a hard surface increases the contact stress between the knee cap and the thigh bone.

Repetition

- Repeated squatting and kneeling may gradually irritate the knee. Irritation of the knee may lead to muscle wasting, which in turn leads to poor tracking of the knee cap on the thigh bone and increased contact stress between these bones.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the knee is increased when working at low height to close doors.

Floor Surfaces

- Loading on the knee is increased when kneeling on hard surfaces.

CONSEQUENCES

- Repeated squatting and kneeling could cause inflammation under the kneecap, which may cause pain and may change the mechanics of kneecap tracking. Changes in kneecap tracking may lead to premature wear of the kneecap and/or the thighbone.
- 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 82 & 83.
- For exercises that could help to prevent ***knee*** injuries, see the ***Knee section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- Some Car Loaders must hold the head in a twisted posture in order to look out the back window of mobile equipment used to move rail cars.

ELBOW/WRIST

- A Car Loader must forcefully grip a ratchet or a crow bar to tighten cables when securing a load.

WRIST/HAND

- A Car Loader's palm is pressed up against the ratchet or bar when tightening loads to secure loads.

LOW BACK

- A Car Loader must repeatedly bend forward in order to fasten cables to secure the load.

LOW BACK

- A Car Loader must forcefully push or pull on box car doors to open and close the car doors.

LOW BACK

- Some Car Loaders continually sit in a forklift and are exposed to vibration.

KNEE

- A Car Loader frequently squats and kneels in order to strap loads and close box car doors.

Risk Factors by Body Part

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

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

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

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

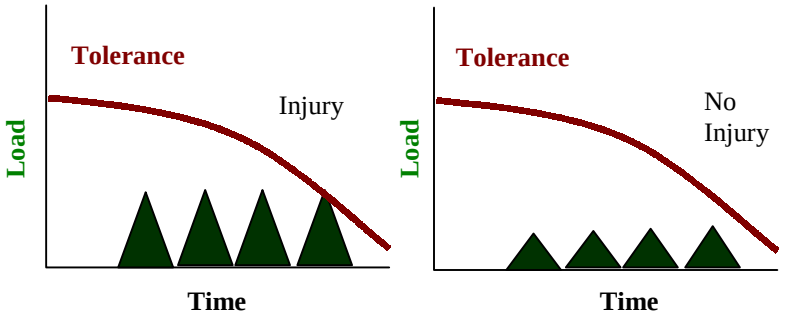
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = Indicates that the risk factor assessed is commonly found in sawmills, and may need to be addressed at your mill. See the appropriate section of the General Risk Factor Solutions Manual for more information.

✓ = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 82 & 83 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

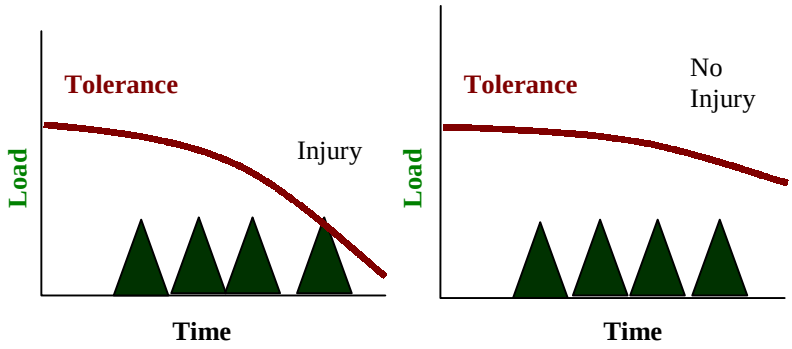
Injury Prevention

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 Car Loader 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 HEIGHTS

Maintain neutral spine

WP To minimise bending of the back, bend at the hips. Stretch hamstrings to help maintain neutral spine when bending over.

Bending forward with straight legs can lead to increase back bending and increase risk of injury.

Cable hook

E To reduce the frequency of back bending when lifting the cables, use a hook.

Some mills use pike poles to reach down and grab the cables. Occasionally, the cable will slip out of the pike pole and drop to the ground requiring the Car Loader to bend over again to hook the cable.

Bar with a hook on the ends. If the bar has hooks on both ends, the bar can be hung on the wire used for fall protection. This will free up both of the Car Loaders hands making it easier to fasten the cables.

Assistance in lifting cables

WP To reduce the amount of back bending when lifting the cables, have a person on the ground pass up the cables.

Some mills have one person securing the loads. The amount of back bending is increased because the one worker has to bend over to raise the cables and then fasten them down.

Ground workers can use a bar to pass up the cables.

Avoid deep knee squats

WP To reduce loading on the knee, avoid deep knee squats. Try to avoid bending the knee past 90 degrees.

Car Loader squatting past 90 degrees to close a car door.

Worker kneeling with a 90 degree knee angle.

Kneepads and foam inserts

PPE To reduce contact stress on the knee, workers who kneel frequently should use kneepads or place foam inserts into their coveralls.

Skidder

E To reduce neck twisting, use a skidder to move cars around or simply instruct the Car Loader to walk around the rail car before moving it, and avoid extreme twisting of the neck.

Car Loaders that drive this style of tractor tend to lean back and turn their head significantly. If the Car Loader has to hold this position for a long period, they may develop neck pain.

Skidder being used to move cars.

SEATING

Good lumbar support and cloth seats

E To reduce awkward postures of the back, forklift seats should have good lumbar support.

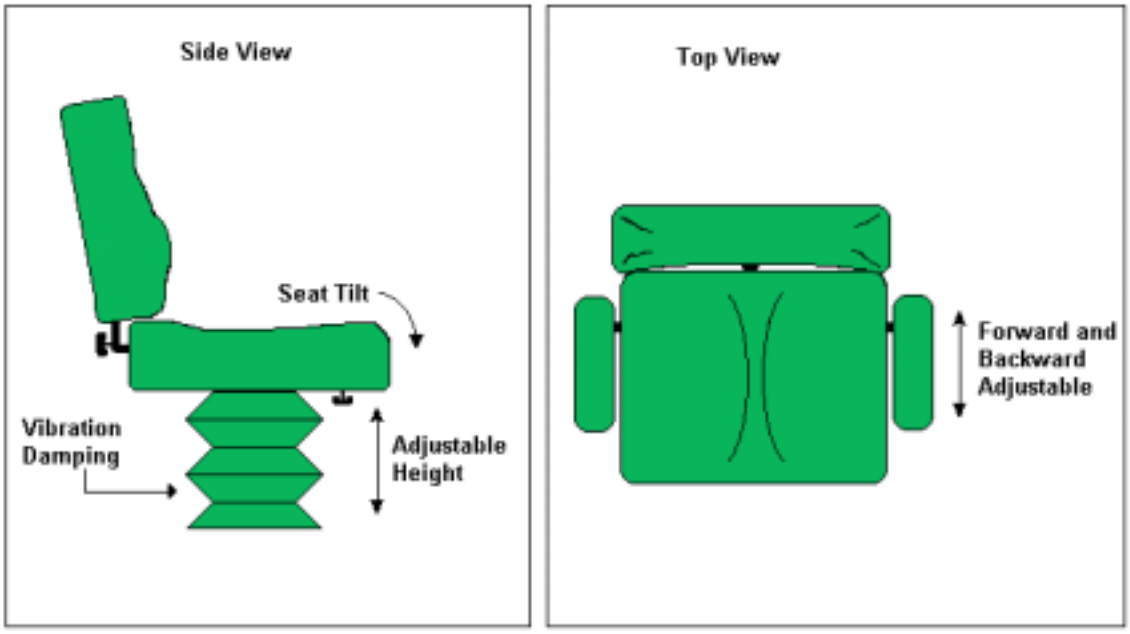
Chairs without good lumbar support. Poorly designed chairs allow the back to loose its natural curve, which increases the risk of injury.

Chair with good lumbar support.

Adjustable seats

E

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



Chair Features

- 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

Standing breaks

WP

To reduce awkward and static postures in the low back, encourage Car Loaders 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.

Characteristics of Objects Being Handled

SIZE AND SHAPE

Forklift and come-along to move car doors

WP To reduce loading on the back, use the forklift (and if necessary chains), to open and close the car doors. A come-along can also be used to open and close doors.

Manually closing door.

Using forklift to open door.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Wrap tool handles

E To reduce the force required to grip the ratchet, increase the friction between the tool handles and the operator's glove. Due to the smooth, slippery surface of metal tool handles, a Car Loader must use a higher grip force. This can put the elbow, and possibly the wrist and hand, at risk of injury. Wrapping the tool handles with foam, rubber, medical/athletic tape, or modifying the surface using other friction increasing material (e.g., gritty paint if plastic substances are not allowed) would increase the friction between the handle and the Car Loader's glove, and thus decrease the grip forces required.

Properly fitting gloves

PPE

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

Impact gloves

PPE

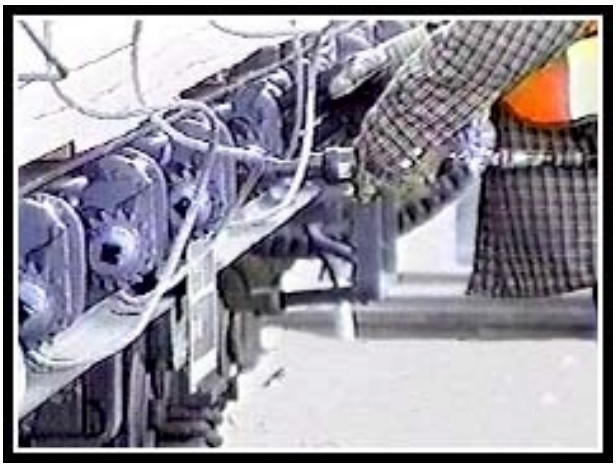
To reduce contact stress on the palm of the hand, wear impact gloves or gloves with a lot of cushioning.

Air ratchet

E

To reduce grip force, use an air ratchet to tighten cables. Forceful gripping of the ratchet can significantly load tissue in the forearm and hand.

Manually tightening cables using a ratchet.



Tightening the cables using an air ratchet. Ensure the ratchet is properly positioned to avoid awkward wrist postures.

Environmental Conditions

Spiked work boots

PPE

To reduce the risks of slipping in wintertime, encourage workers to wear work boots with spikes in the soles. Work boots with spikes are appropriate for icy conditions, and not when working over metal surfaces (i.e., rails).

Work boots with spiked soles.

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

Work Organisation

Please refer to the General Risk Factor Solutions Manual for solutions regarding work organisation risk factors.

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	**Neck**	**Neck/ Shoulder**	**Shoulder**	**Elbow/ Wrist**	**Wrist**	**Wrist/ Hand**	**Low Back**	**Hip**	**Knee**	**Ankle**	**Foot**
Maintain neutral spine	**74**							**A S**				
Cable hook	**74**							**A S**				
Assistance in lifting cables	**75**							**A S**				
Avoid deep knee squats	**75**									**A S**		
Kneepads and foam inserts	**76**									**C**		
Skidder	**76**	**A S**										
Good lumbar support and cloth seats	**77**							**A S**				
Adjustable seats	**78**							**A S**				
Standing breaks	**78**							**A S**				
Forklift and come-along to move car doors	**79**							**F**				

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	**Neck**	**Neck/ Shoulder**	**Shoulder**	**Elbow/ Wrist**	**Wrist**	**Wrist/ Hand**	**Low Back**	**Hip**	**Knee**	**Ankle**	**Foot**
Wrap tool handles	**79**				**F**		**C**					
Properly fitting gloves	**80**				**F**		**C**					
Impact gloves	**80**						**C**					
Air ratchet	**80**				**F R**		**C R**					
Spiked work boots	**81**											
Heat Exposure	◆	indirectly reduces risk of injury to the body										
Cold Exposure	◆	indirectly reduces risk of injury to the body										
Lighting	◆	indirectly reduces risk of injury to the body										
Noise	◆	indirectly reduces risk of injury to the body										
Vibration	◆	directly reduces risk of injury to the back and wrist										
Rest breaks	◆	indirectly reduces risk of injury to the body										
Job Rotation	◆	indirectly reduces risk of injury to the body										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

F = *Force* **R** = *Repetition* **A** = *Awkward Postures*

S = *Static Postures* **C** = *Contact Stress* **V** = *Vibration*

◆ = *See General Risk Factor Solutions Manual*

CAR LOADER MSI SAFETY GUIDE

OBJECTIVE: To identify ergonomic risks involved in car loading, and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Car Loader.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck Some Car Loaders must hold the head in a twisted posture in order to look out the back window of mobile equipment used to move rail cars.	**Awkward Posture** **Static 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. • When the neck is held still in a twisted position, the muscles of the neck must remain tense to support the weight of the head. With no time allowed for recovery, the constant state of tension in the neck muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury.	• To reduce neck bending, instruct the Car Loader to walk around the rail car before moving it, and avoid extreme twisting of the neck. • For exercises that can help prevent ***neck*** injuries, ***see the Neck section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Car Loader must forcefully grip a ratchet or a crow bar to tighten cables when securing a load.	**Force** **Repetition**	• Gripping an object requires activation of the forearm muscles, which generates tension at the tendon near the elbow and wrist. The harder that an object must be gripped, the greater the load on the tendon. • Repeated stress to the elbow and wrist without adequate rest could slowly fatigue tissues to the point of injury.	• To reduce grip forces required by the Car Loader, the operator should wear thin, close fitting gloves with a "sticky" palm surface to increase the friction between the gloves and the tool handles. • Properly position ratchet to avoid awkward wrist postures. • For exercises that can help prevent ***elbow*** injuries, ***see the Elbow section of the Body Manual***. • For exercises that can help prevent ***wrist*** injuries, ***see the Wrist section of the Body Manual***.
	Wrist/Hand A Car Loader's palm is pressed up against the ratchet or bar when tightening loads to secure loads.	**Contact Stress** **Repetition**	• Contact between hard or sharp surfaces and the base of the palm places stress on the tendons and nerves in the carpal tunnel. • Repeated stress to the palm can progressively damage tissues to the point of injury.	• To reduce contact stress on the palm of the hand, wear impact gloves or gloves with a lot of cushioning. • For exercises that can help prevent ***wrist*** injuries, ***see the wrist section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Car Loader must repeatedly bend forward in order to fasten cables to secure the load.	**Awkward Posture** **Repetition**	• Back muscles must support the weight of the upper body when leaning forward. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs. • Repeated forward can gradually fatigue the structures of the low back. If the repetitive stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury.	• To reduce bending of the back, bend at the hips. • To reduce the amount of back bending when lifting the cables, if possible, have a person on the ground pass-up the cables. • For exercises that can help prevent ***back*** injuries, ***see the Back section of the Body Manual***.
	Low Back A Car Loader must forcefully push or pull on box car doors to open and close the car doors.	**Force**	• Pushing and pulling on box car doors requires back muscles to stabilise the spine. The greater the push or pull, the greater the tension developed in the muscles. • If the force placed on the back muscles exceeds the tissue tolerances, injury may occur.	• To reduce loading on the back, use the forklift (and if necessary chains), to open and close the car doors. Come-along can also be used to open and close doors. • For exercises that can help prevent ***back*** injuries, ***see the Back section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back Some Car Loaders continually sit in a forklift and are exposed to vibration.	**Static Posture** **Vibration**	• Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury. • Whole body vibration is usually transmitted through the seat into the low back. Exposure to whole body vibration introduces a unique mechanical stress to the structures of the spine that can significantly increase the loading on the low back. Prolonged sitting on a vibrating surface may contribute to the gradual weakening of the lumbar discs.	• To reduce awkward and static postures in the low back, encourage Car Loaders to get up from the seated posture throughout the day. This alleviates the load on the spine, allows the discs to equalize, and allows ligaments to regain their stiffness after being stretched out from sitting. • For exercises that can help prevent ***back*** injuries, ***see the Back section of the Body Manual***.
	Knee A Car Loader frequently squats and kneels in order to strap loads and close box car doors.	**Awkward Posture** **Contact Stress** **Repetition**	• Bending the knee increases the contact stress between the kneecap and the thighbone. Contact stress increases significantly when the knee is bent over 90 degrees. • Kneeling on a hard surface increases the contact stress between the kneecap and the thighbone. • Repeated squatting and kneeling may gradually irritate the knee. Irritation of the knee may lead to muscle wasting, which in turn leads to poor tracking of the knee cap on the thigh bone and increased contact stress between these bones.	• To reduce loading on the knee, avoid deep knee squats. Try to avoid bending the knee past 90 degrees. • To reduce contact stress on the knee, workers who kneel frequently should use kneepads or place foam inserts into their coveralls. • For exercises that can help prevent ***knee*** injuries, ***see the Knee section of the Body Manual***.