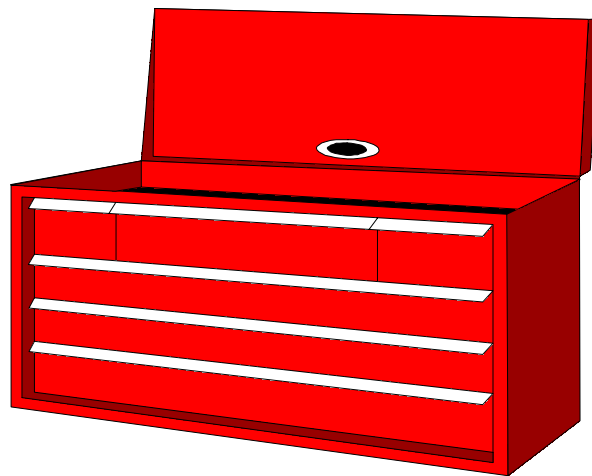


INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

Common Industry Jobs (CIJs)

Carrier Driver 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

CARRIER DRIVER TOOL KIT

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*Carrier Driver
Tool Kit*

Overview

Carrier Driver

Job Summary

A Carrier Driver is responsible for distributing loads within and around the mill. A Carrier Driver will pick up, transport, and drop off loads, construct carrier blocks, perform maintenance tasks, and position carrier blocks or dunnage. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Carrier Driver may include:

- a) Forceful movements of the elbow/wrist, back, and ankle
- b) Repetitive movements of the neck, neck/shoulder, elbow/wrist, back, and ankle
- c) Awkward postures of the neck, neck/shoulder, elbow/wrist, back, and ankle
- d) Static postures of the neck, neck/shoulder, and back
- e) Whole-body Vibration while sitting and operating the carrier
- f) Sitting while operating the carrier
- g) Pushing, pulling, and carrying carrier blocks

Mental Demands

A Carrier Driver must constantly be aware of their surroundings, especially the position of the loads relative to each other, pieces of equipment, buildings, other traffic, and personnel.

Major Variations

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

- 1) Carrier Drivers drive the carrier:
 - a) Constantly all day
 - b) Only half the day
 - c) Intermittently (only when required)

- 2) Pedals differ in terms of:
 - a) Spacing between them
 - b) Surface area
 - c) Orientation relative to the floor and operator

Physical Demands Analysis Carrier Driver

PDA General Instructions: Carrier Driver

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Carrier Driver. 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 Carrier Driver(s) in the BC Sawmill Industry. However, the PDA requires completion by the healthcare professional, with input from the injured worker to highlight tasks that aggravate the injury or prevent the worker from returning to their job. The worker's supervisor may be contacted for further information or verification of tasks.

A PDA should be filled out for each individual worker following an injury. Subsequent changes in the work process may reduce the accuracy of any pre-existing physical demands assessments.

Disclaimer

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

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Physical Demands Analysis Carrier Driver

Task List

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

Operate controls to pick up loads

A Carrier Driver uses controls, such as levers, to pick up loads from specific areas around the mill.

Does this task occur at your site?

Yes No



Operate controls to transport loads

A Carrier Driver transports loads between areas in and around the mill by manipulating the steering wheel, foot pedals, and gear shift.

Does this task occur at your site?

Yes No



Operate controls to drop off loads

A Carrier Driver uses controls, such as levers, to drop off loads in designated areas in and around the mill.

Does this task occur at your site?

Yes No



Position carrier blocks or dunnage

A Carrier Driver may be required to position carrier blocks or dunnage in the loading/unloading area.

Does this task occur at your site?

Yes No



Perform maintenance checks

At the beginning of the shift a Carrier Driver performs several maintenance checks (e.g., oil, fuel, tires).

Does this task occur at your site?

Yes No



Construct carrier blocks

As a result of the transportation process, carrier blocks may need to be replaced a few times during the year. A Carrier Driver often is given the responsibility to construct the carrier blocks.

Does this task occur at your site?

Yes

No

Job Profile

Date: _____

Company Name: _____

Division: _____

Employee Name: _____

Supervisor: _____

Phone: _____

Fax: _____

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

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

Describe:

Length of shift _____ hours

Formal breaks

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

Informal breaks

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

Work pace control

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

Job rotation

Describe:

Yes No

Work Organisation

Task Description

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

Task	Percent of Shift				Comments
	Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Operate controls to pick up loads</i>					<ul style="list-style-type: none"> Controls position the shoes (open/close) and lift loads
<i>Operate controls to transport loads</i>					<ul style="list-style-type: none"> Manual and automatic transmission systems affect the amount of shifting required
<i>Operate controls to drop off loads</i>					<ul style="list-style-type: none"> Controls position the shoes (open/close) and release loads
<i>Position carrier blocks or dunnage</i>					<ul style="list-style-type: none"> Task may not be responsibility of operator
<i>Perform maintenance checks</i>					<ul style="list-style-type: none"> A checklist may exist for operators to follow
<i>Construct carrier blocks</i>					<ul style="list-style-type: none"> Task may not be responsibility of operator
<i>Other:</i>					

Workstation Characteristics

Dimensions & Layout

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

Floor, Displays & Seating

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

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

Equipment & Machinery Controls

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

Type of Control	Function	Comments	
	<i>Steering wheel</i>	<ul style="list-style-type: none"> • <i>Control carrier movement</i> 	
	<i>Gear shifts</i>	<ul style="list-style-type: none"> • <i>Control carrier speed</i> 	
	<i>Foot pedals</i>	<ul style="list-style-type: none"> • <i>Clutch, brake, acceleration of carrier</i> 	
	<i>Levers</i>	<ul style="list-style-type: none"> • <i>Control positioning of shoes</i> 	
	<i>Other:</i>		

Physical Demands







Whole Body Physical Demands

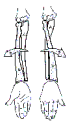

Identify each of the physical demands required by a Carrier Driver and list the corresponding tasks in the second column. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, and cycle times.

Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Sitting</i>	• Operate controls to transport loads				✓	• Very few breaks during the day
<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 Carrier Driver, related to tasks. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Neck Flexion</i>	<ul style="list-style-type: none"> Operate controls to pick up loads 		✓			<ul style="list-style-type: none"> View can be obstructed by pedals, or by relative positioning of load and porthole in the floor
Neck						
<i>Flexion</i> 						
<i>Extension</i> 						
<i>Twisting</i> 						
Shoulder						
<i>Flexion</i> 						
<i>Abduction/ adduction</i> 						
<i>Extension</i> 						

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Forearm						
Rotation 						
Wrist						
Wrist Movements 						
Hand/Fingers						
*Handling						
*Fingering						
*Gripping						

Legend for Hand/Fingers

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

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Back						
<i>Flexion</i> 						
<i>Lateral Flexion</i> 						
<i>Twisting</i> 						
<i>Extension</i> 						

Manual Material Handling

The table below contains a list of general manual material handling activities performed by a Carrier Driver. Indicate tasks that require one or more of these activities, and fill in the weight of the objects, or the force required, for each action. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information related to duration, frequency, cycle times, and characteristics of objects handled. If necessary, please refer to Appendix A to calculate the weight of the wood being handled.

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

Hand Tools

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

Type of Tool	Task(s)	Weight (kg)	Percent of Shift				Comments
			Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	

Environmental Conditions

Work Environment

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

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

Location of Workstation

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

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

Temperature

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

Region	Avg. Max July/Aug	Avg. Min Dec/Jan	Extreme Max.	Extreme Min.
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 Carrier Driver at your site, indicate with a check mark (✓) which of the PPE items are required.

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

Appendix A – Weight of Wood Equation

1. Type of Wood Handled

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

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

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

2. Size of Wood*

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

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

* Conservative estimates of actual wood dimensions

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

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

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

3. Length of Wood

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

Length of Wood			
6 foot		12 foot	18 foot
8 foot		14 foot	20 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

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

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

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

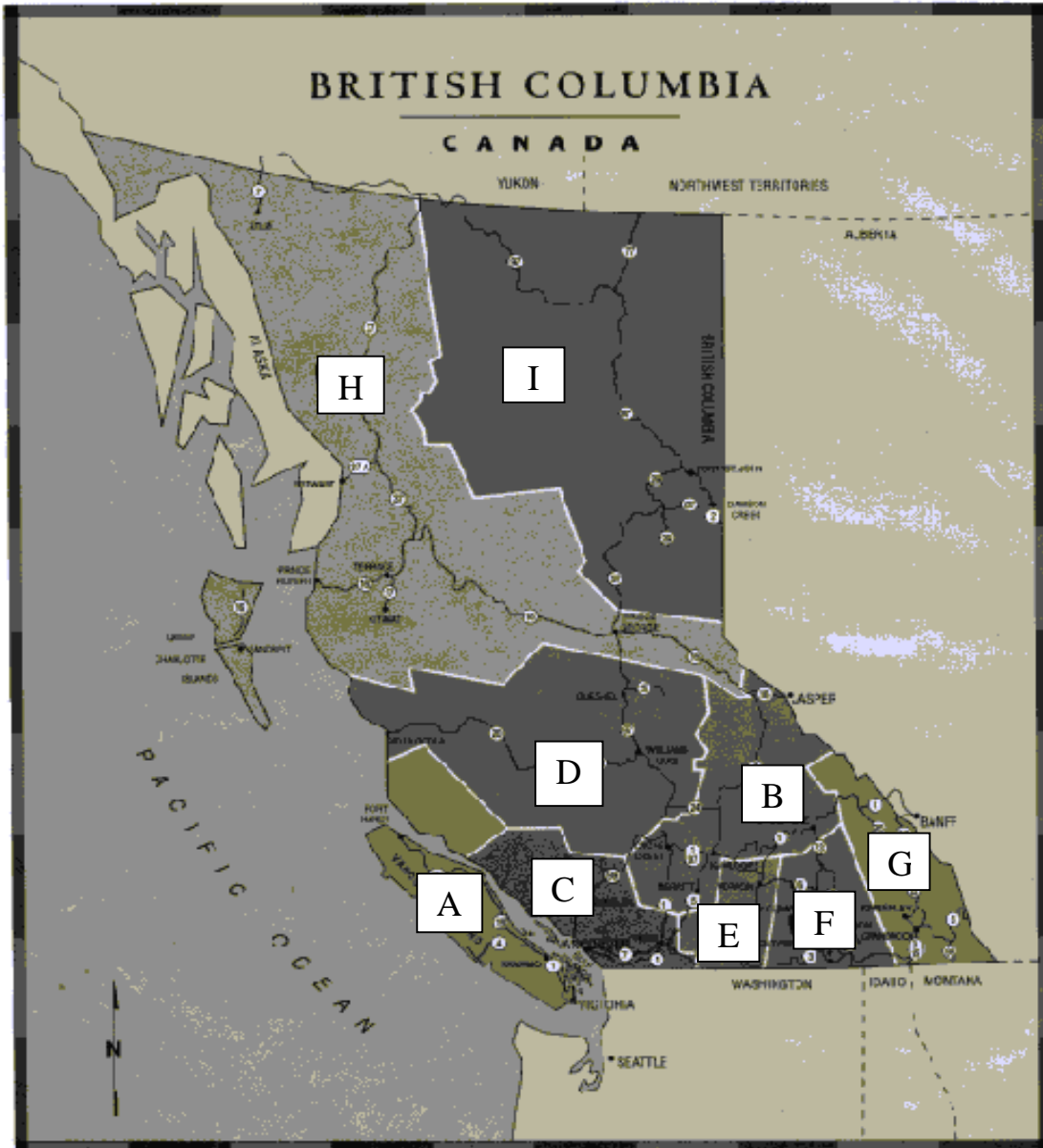
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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

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

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

Appendix B – Regional Map



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

Risk Factor Identification Checklist

Carrier Driver

Purpose

The Risk Factor Identification Checklist for a Carrier Driver 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 – Carrier Driver

Management Representative _____

Risk Identification completed:

Worker Representative _____

Before implementation of solutions

Date _____

After implementation of solutions

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

Definitions

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

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


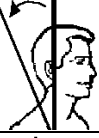
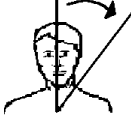
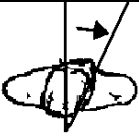
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

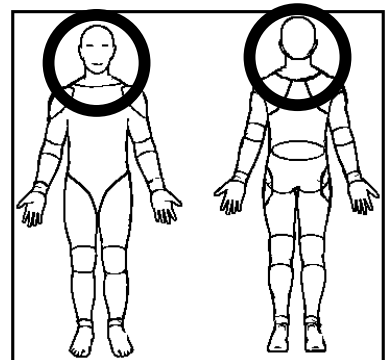
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again?				S O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., looking down at the load)				S O
Static Posture				
Ask the worker: Do tasks require your neck or shoulders to be maintained in a fixed or static posture? (e.g., looking down at the load, looking behind the carrier while driving)				S O
Awkward Posture				
Flexion				S O
Extension				S O
Lateral Bending				S O
Rotation				S O



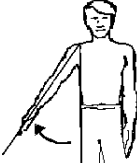
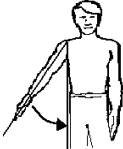
Please indicate whether the following direct risk factors were identified at the NECK .		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input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



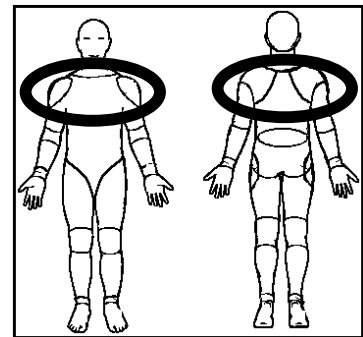
Body parts within the circled area will be classified as NECK issues.

SHOULDER

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




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

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



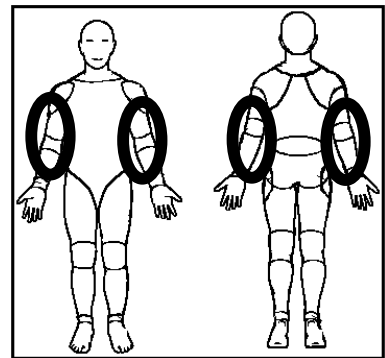
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force		N	Y	Comments:
Is forceful physical handling performed? Such as:				S
Lifting				O
Lowering				S
				O
Pushing				S
				O
Pulling				S
				O
Carrying				S
				O
Turning materials				S
				O
Are objects handled in a power grip? (e.g., steering wheel)				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 the steering wheel)				S
				O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., driving)				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 the steering wheel)			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., steering wheel)			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?			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	





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



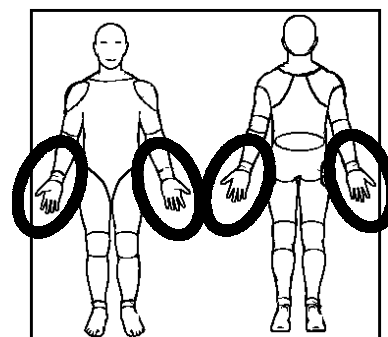
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force		N	Y	Comments:
Is forceful physical handling performed? Such as:			S	
Lifting			O	
Lowering			S	
			O	
Pushing			S	
			O	
Pulling			S	
			O	
Carrying			S	
			O	
Turning materials			S	
			O	
Are objects handled in a power grip? (e.g., steering wheel)			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 the steering wheel)				S
				O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., driving)				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? (e.g., holding the steering wheel)				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., steering wheel)				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?				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? (e.g., steering wheel)				S	
				O	


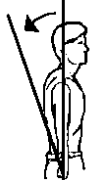


Please indicate whether the following direct risk factors were identified at the WRIST/HAND .		
Direct Risk Factors	Force	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/>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



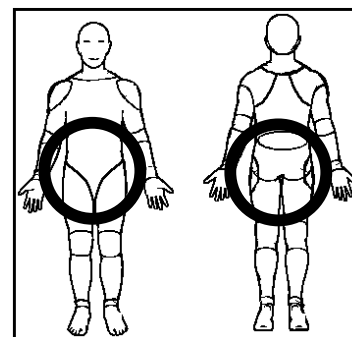
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y	Comments:
Is forceful physical handling performed? Such as:			S
Lifting			O
Lowering			S
			O
Pushing			S
			O
Pulling			S
			O
Carrying			S
			O
Repetition			
Are identical or similar motions performed over and over again? (e.g., leaning forward or to the side to view the load)			S
			O
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., bending to view the loads below the carrier)			S
			O
Static Posture			
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture?			S
			O
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., sitting while driving)			S
			O
Contact Stress			
Ask the worker: Do any objects, tools or parts of the workstation put pressure on any parts of your hip/thigh? (e.g., dashboard that digs into legs)			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., driving in a bumpy yard)			S O	

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

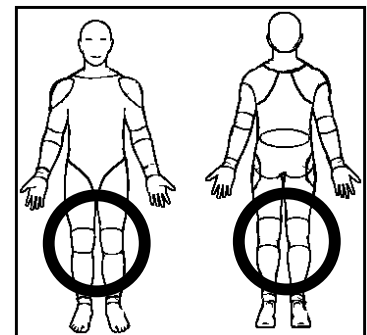


Body parts within the circled area will be classified as LOW BACK issues.

KNEE



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

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

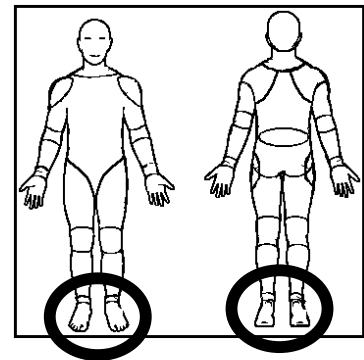


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

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

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



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y	Comments:
Are there problems handling a load due to its size or shape? (e.g., carrier blocks)			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?			S O
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is No , check the No box and go to the next section.			S O
If the answer to the above question is Yes , ask the worker: Are the handles an inappropriate size or shape for the characteristics of the object?			S O

ENVIRONMENTAL CONDITIONS

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



Carrier Driver

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

Carrier Driver

Disclaimer

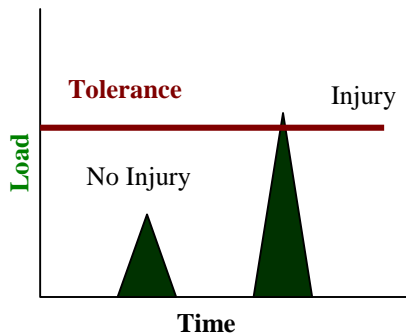
The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness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

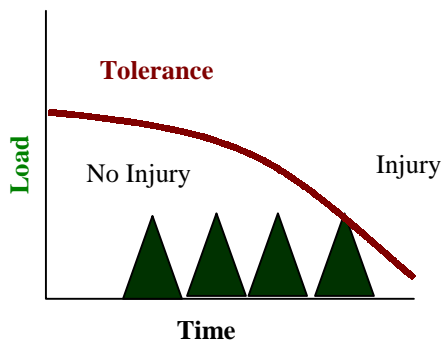
*Injuries occur when ...
Loads exceed tissue tolerances*



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.

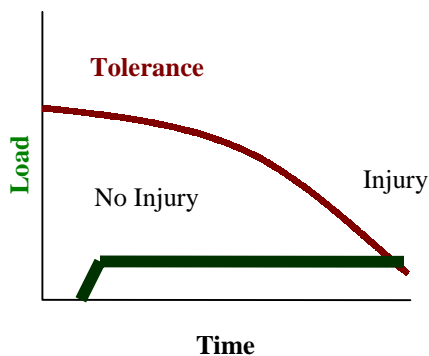
Example – a worker going over on their ankle and spraining it.



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

Neck: Major risks include repetition and awkward postures of the neck while viewing the work area as loads are picked up, transported (operator is moving the vehicle backwards), and dropped off.

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

1. Good driving posture (page 74)
2. Research equipment or workstation layout with operators (page 75)
3. Enlarge hole in cab floor (page 82)
4. Reflective surfaces (page 82)
5. Windshield wipers (page 84)
6. Window cleaning (page 84)
7. Stretches (page 85)
8. View with eyes (page 87)
9. Alternate looking over shoulders (page 87)
10. Flood lighting (page 89)
11. Reduce glare (page 89)
12. Task variability (page 90)
13. Job rotation (page 90)

Low Back: Major risks include force, repetition, awkward and static postures, and vibration with the low back while viewing the area below the vehicle, and pushing or pulling carrier blocks, and seated in the carrier.

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

1. Good driving posture (page 74)
2. Research equipment or workstation layout with operators (page 75)
3. Use a trolley, cart, or wheelbarrow to move carrier blocks (page 76)
4. Stepping down (page 78)
5. Adjustable lumbar support (page 79)
6. Adjustable seating (page 79)
7. Seat maintenance (page 80)
8. Vary body posture (page 81)
9. Adjust seat spring (page 81)
10. Seat belts (page 81)
11. Yard maintenance (page 82)
12. Equipment maintenance (page 82)
13. Tire maintenance (page 83)
14. Control carrier speed in yard (page 83)
15. Stretches (page 85)
16. Manual material handling (page 88)
17. Task variability (page 90)
18. Job rotation (page 90)

For additional stretching and strengthening exercises that would benefit a Carrier Driver, refer to the Neck and Back sections of the Body Manual.

NECK

Direct Risk Factors:

Repetition
Awkward Postures
Static Postures



A Carrier Driver may repeatedly hold the neck in an awkward position to look down, to the side, or behind the vehicle in order to view the work area.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the neck muscles is increased because the view required of the load below the carrier is obstructed. This obstruction is due to the position of the worker with respect to the loads and the construction of the carrier.

Additional Workstation Design Options

- Loading on the neck muscles is increased because the operator is seated in a forward facing position while turning the head and neck to move the vehicle in a backward direction.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the neck, please see the column labelled “Neck” in the Summary of Solutions on pages 91 to 94.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

NECK/SHOULDER

Direct Risk Factors: Repetition Awkward Postures Static Postures
--



A Carrier Driver frequently holds their arms away from the body while twisting the torso and neck in order to position the vehicle.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Loading on the muscles of the neck/shoulder is increased when hands remain positioned at the top of the steering wheel while driving and while manipulating levers as shoes are positioned to pick up or drop off loads.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the neck/shoulder, please see the column labelled “Neck/Shoulder” in the Summary of Solutions on pages 91 to 94.
- For exercises that can help to prevent *neck* and *shoulder* injuries, see the *Neck* and *Shoulder sections of the Body Manual*.

ELBOW/WRIST

Direct Risk Factors:

Force
Repetition
Awkward Postures



A Carrier Driver may grip the steering wheel or knob in order to move the vehicle.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

- The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading on the structures of the elbow and wrist is increased when the steering knob is forcefully gripped while turning the carrier.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the elbow/wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 91 to 94.
- For exercises that can help to prevent *elbow* injuries, see the *Elbow section of the Body Manual*.

LOW BACK

Direct Risk Factors:
Repetition
Awkward Postures

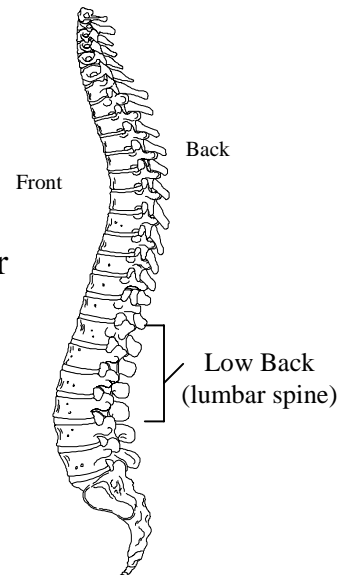


A Carrier Driver frequently bends forward and/or to the side to view loads below the vehicle.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the back muscles is increased because the view to the area below the carrier is obstructed. This risk factor occurs due to the position of the worker with respect to the loads, and the construction of the carrier.

CONSEQUENCES

- Repeatedly bending forward or to the side 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 91 to 94.
- For exercises that could help to prevent *back* injuries, see the *Back section of the Body Manual*.

LOW BACK

Direct Risk Factors: Force Awkward Postures
--



A Carrier Driver pushes or pulls carrier blocks in order to set up areas to place loads.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Carrier blocks are pushed or pulled with one end at ground level. This position increases the risk of injury to the low back by forcing drivers to adopt awkward trunk postures.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the back, please see the column labelled “Back” in the Summary of Solutions on pages 91 to 94.
- For exercises that can help to prevent *back* injuries, see the *Back section of the Body Manual*.

LOW BACK

Direct Risk Factors:
Awkward Postures
Static Postures
Vibration

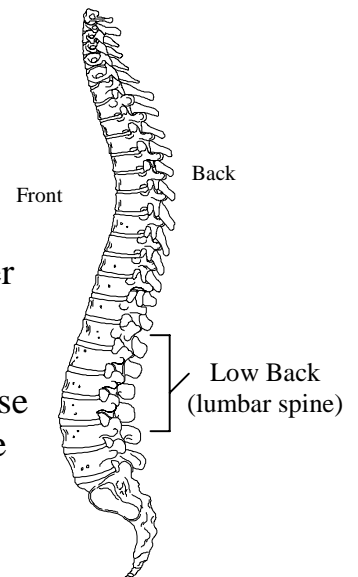


A Carrier Driver continually sits on a vibrating surface while operating the vehicle.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Awkward Postures

Static Postures

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

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

- The carrier is an older piece of equipment. As such, the seats are often worn out, or have not been maintained properly.

Work Organisation

Task Variability

- In some cases, a Carrier Driver may be assigned to this job for the entire day. If so, the tendency is for the operator to remain in the cab for long periods of time, increasing the duration of exposure to risk factors.

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 91 to 94.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual***.

ANKLE

Direct Risk Factors:

Force
Repetition
Awkward Postures



A Carrier Driver frequently activates foot pedals in order to operate the vehicle.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

- The initial force required to activate a pedal may be significant, gradually causing small tears in the muscle on the front of the shin. If the force required is excessive, and recovery is not adequate, the likelihood of discomfort in the lower leg and ankle area is increased.

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height and angle of the foot pedals may not work comfortably with the positioning of the ankle and leg while the operator is seated.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the ankle, please see the column labelled “Ankle” in the Summary of Solutions on pages 91 to 94.

Summary of Body Parts at Risk

NECK

- A Carrier Driver may repeatedly hold the neck in an awkward position to look down, to the side, or behind the vehicle in order to view the work area.



NECK/SHOULDER

- A Carrier Driver frequently holds their arms away from the body while twisting the torso and neck in order to position the vehicle.



ELBOW/WRIST

- A Carrier Driver may grip the steering wheel or knob in order to move the vehicle.



LOW BACK

- A Carrier Driver frequently bends forward and/or to the side to view loads below the vehicle.
- A Carrier Driver pushes or pulls carrier blocks in order to set up areas to place loads.
- A Carrier Driver continually sits on a vibrating surface while operating the vehicle.



ANKLE

- A Carrier Driver frequently activates foot pedals in order to operate the vehicle.



Risk Factors by Body Part

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

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

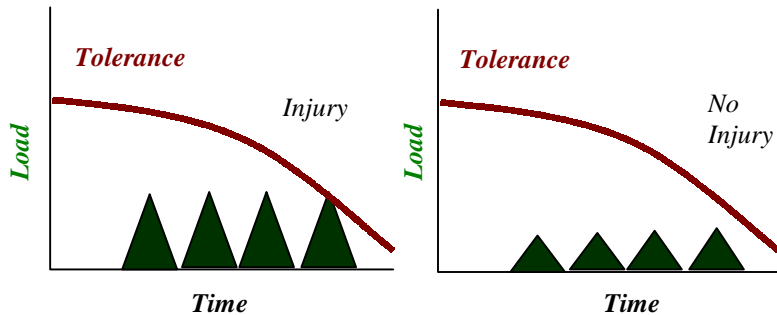
* Extended exposure to any risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual

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

- = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.
- = Indicates that the risk factor assessed is commonly found in sawmills, and may need to be addressed at your mill. See the appropriate section of the General Risk Factor Solutions Manual for more information.
- = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 91 to 94 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

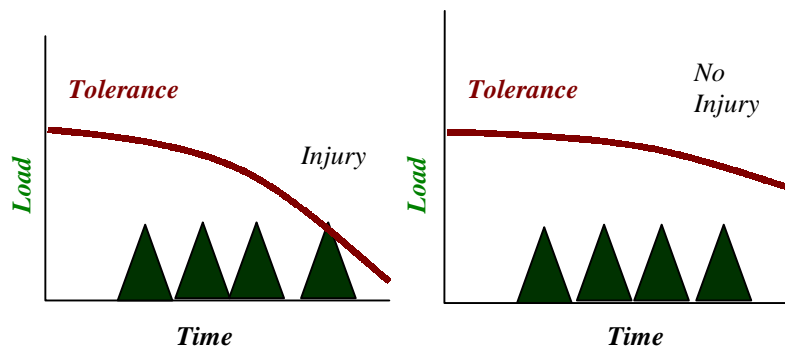
Injury Prevention

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

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

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

Risk Control Key

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

E

ENGINEERING CONTROLS

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

A

ADMINISTRATIVE CONTROLS

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

WP

WORK PRACTICE CONTROLS

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

PPE

PERSONAL PROTECTIVE EQUIPMENT

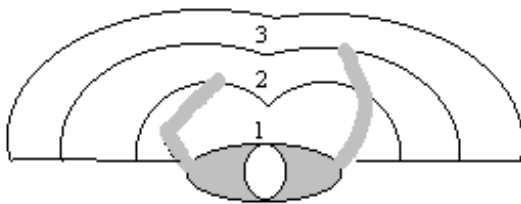
These are devices worn by a worker to reduce the risk of injury, including gloves, knee pads, hearing protection, and leather aprons.

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

Workstation Design

WORKING REACHES

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



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

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

Control distance while seated

E
WP In order to reduce loading on the neck/shoulder, elbow/wrist, back, and ankles 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.

Good driving posture

WP In order to reduce loading on the neck and back while driving, encourage workers to adopt good driving postures. Place the back against the backrest, and avoid holding the head in a forward posture where the head and eyes are continually pointed down at ground level work. When driving in open areas, eyes should be focused into the horizon and not at the front end of the carrier.

Range of motion in controls

E

In order to reduce awkward postures of the shoulder and wrists and tissue fatigue in the neck and shoulder area, lever controls should have limited play.



The amount of play of the lever controls will determine the amount of shoulder movement the Carrier Driver must make during the course of the day. This picture illustrates the minimum amount of shoulder movement required.



When movements of this range must be made continually over the course of the day, there is an increased risk of injury. Carrier Drivers may have to move far beyond a comfortable reaching distance due to the amount of play in the controls.

Research equipment or workstation layout with operators

A

A Carrier Driver can effectively identify potential challenges with awkward and static postures during any retrofit process. If possible, mock-up the workstation area and attempt to anticipate issues that may arise.

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 Carrier Driver, 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.

Use a trolley, cart, or wheelbarrow to move carrier blocks

E WP	In order to decrease the duration of awkward back postures, lift carrier blocks on to a trolley, cart, or wheelbarrow and push the trolley, cart, or wheelbarrow to the appropriate spot. Remove the carrier blocks and place them in the desired position on the ground. A dolly can also be used to move a stack of blocks.
---------	---

Adjust pedal positioning

E

In order to decrease awkward postures of the ankle, the height of pedals should be adjusted so that the top of the foot does not need to be pulled towards the shin in order to activate the pedal. It may also be necessary to adjust the angle of the pedal on the activation rod in order to achieve a proper coupling between foot and pedal.



The pedal is almost vertical, making it difficult for the operator to assume a position to activate the pedal properly.

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 and back tissues are more susceptible to an acute injury resulting from the impact of jumping down. If applicable, make sure that you have secure foot and hand holds as you lower yourself off machinery. Safe locations for hand and foot placement should be well-marked.



Operate controls at appropriate heights

**E
WP** In order to decrease awkward shoulder and wrist postures, controls should be located in the waist to mid-chest level while seated. Some cabs are not designed to have operators use the controls at an appropriate height. In these cases, it may be necessary for the operator to move closer to the controls by adjusting the seat forward/backward or up/down, keeping in mind possible obstructions such as the steering wheel and dashboard.



The lowest level of operator controls should be slightly above waist level while sitting down.



The highest level of operator controls should be located around mid-chest level while sitting down.

SEATING

Carrier Drivers are required to sit when operating the vehicle. 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 Carrier Driver does not maintain a neutral spine (see Injury Education for the Low Back on page 63).

Adjustable lumbar support

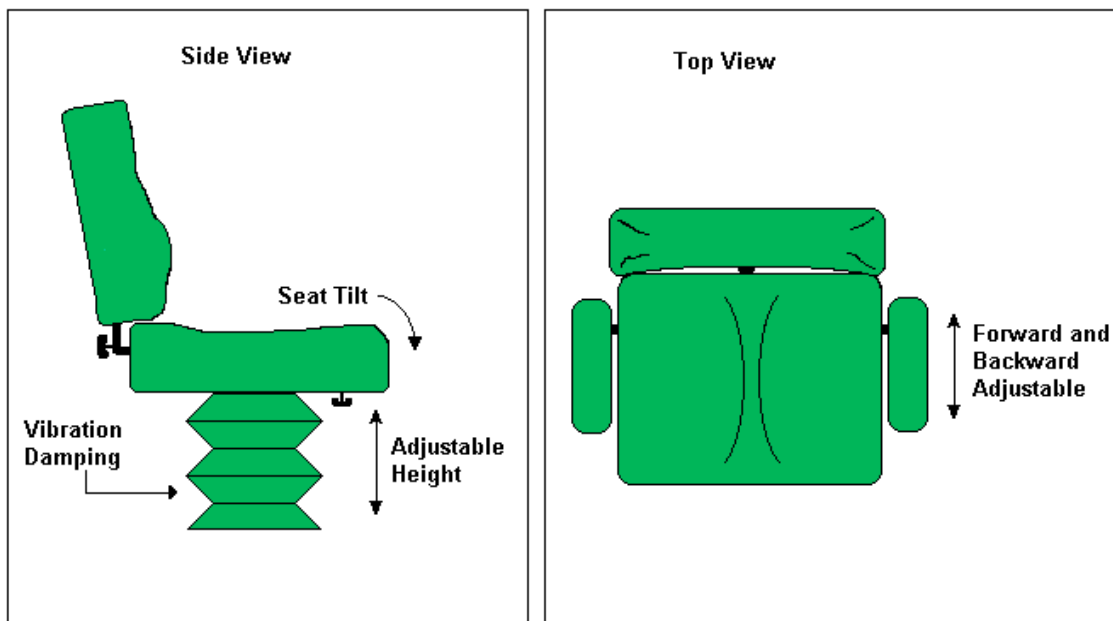
E

In order to reduce awkward postures in the low back while seated, adjustable lumbar support should be provided. Seats that wrap around the low back and allow the curve in the low back to be maintained should be considered for purchase. Padded lumbar cushions can also be added to existing seats.

Adjustable seating

E

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



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

Seat maintenance

E
A
WP

Seats and supports are the only layer of protection between an operator and whole-body vibration transmitted from equipment. For these reasons, seats need to be properly maintained to help prevent injuries.

Seat maintenance should begin when a workstation is being created or renovated. 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 viewing in the work area. 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. 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 as clean as possible and regularly using all adjustments on the chair can also help to minimise uneven wear and prevent damage.

Vary body posture

WP

In order to reduce awkward and static postures in the low back, encourage the Carrier Driver to get up from the seated posture throughout the day. This posture change alleviates loading on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting.

Adjust seat spring

WP



Many carriers have spring damped seats. If the seats are too stiff more vibration may be transmitted from the seat to the back. In order to reduce vibration transmitted to the low back, operators should adjust seat spring to the appropriate level.

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 must 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

Enlarge hole in cab floor

E The Carrier Driver has to monitor the position of the load below the vehicle. In many cases a hole has been created in the bottom of the cab but it is too small to be useful. If possible the hole should be large enough to allow for easy viewing. It may be necessary to create a wire mesh system so that the view is improved while the safety of the driver is not compromised.

Reflective surfaces

E The Carrier Driver has to monitor the position of the load below the vehicle. To do this, repetitive forward or twisting neck postures are required. These positions place strain on the neck muscles and put the worker at risk for an injury. Ideally, mirrors would be used to provide expanded view around the carrier. Due to the closeness of the loads to each other, however, mirrors extending beyond the carrier may not be practical. To decrease this movement, use reflective surfaces such as the back of light fixtures or proper mirrors to give a better view of the load.



Reflective surfaces increase the range of view for the worker, reducing awkward postures and decreasing the risk of injury.

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, maintain the machine properly and allow the machine to warm-up before using it.

Tire maintenance

E
A

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

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



Tire pressure can effect vibration transmitted to the low back. Smooth tires are preferred on hard surfaces to decrease vibration. Knobby tires are suitable for softer terrain where traction is required.

Control carrier 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 carrier when driving through the yard.

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 the Carrier Driver.



Window cleaning

A

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

Additional Work Practices

Stretches

WP

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

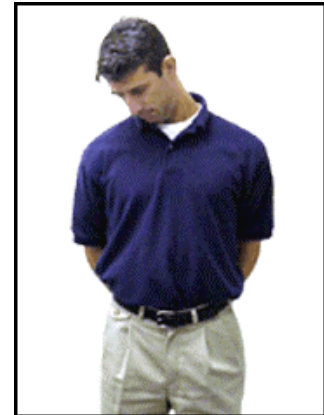
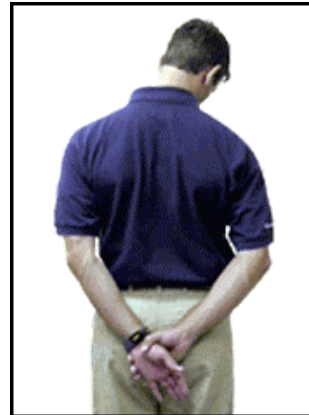
Chin Tuck

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



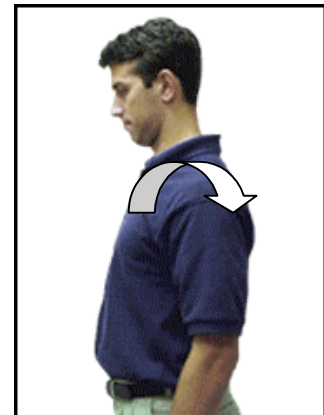
Neck Stretch

Turn the head slightly to one side and reach for the ground behind you with the opposite arm. Hold for 10 seconds. Repeat 3 times on each side.



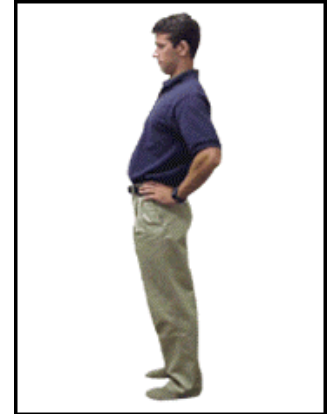
Shoulder Circles

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



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.



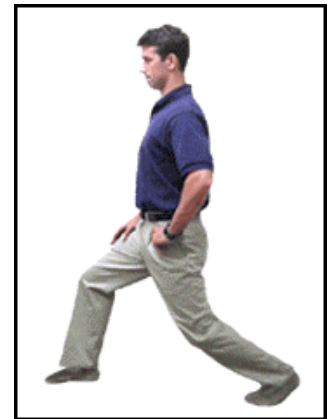
Squats (low back)

Place feet shoulder width apart, sit down and then stand back up. Repeat 5 times.



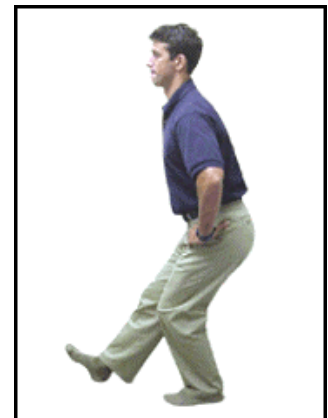
Hip Flexor Stretch

Place one foot in front of the other and lower the body, keeping your pelvis tilted. You should feel this stretch in the front hip and thigh of the back leg. Hold for 5 seconds. Repeat 3 times with each leg.



Hamstring Stretch

Place the heel of one foot in front of the body, and bend the other leg. Keep your back upright and in the neutral position. You should feel this stretch in the back of the thigh of the forward leg. Hold for 5 seconds. Repeat 3 times with each leg.



View with eyes

WP

In order to reduce awkward postures of the neck, rotate the eyes and neck, not just the neck, to view the work area. If neck twisting cannot be avoided, try to alternate turning the head in both directions. When twisting the head, keep the chin tucked in and the ears in alignment with the shoulders.

Alternate looking over shoulders

WP

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



Characteristics of Objects Being Handled

SIZE AND SHAPE

Manual material handling

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

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

Two hands at once

WP In order to reduce loading on the elbows and wrists use both hands when steering the carrier. This coupling will distribute the load through both hands and arms.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Padding for steering wheel

E In order to reduce stress to the elbow and wrist when gripping, place steering wheel padding on the steering wheel and knob. This padding will reduce the amount of gripping required to control the motion of the vehicle.

Sticky palm gloves

PPE In order to reduce grip forces required by the Carrier Driver, the operator should wear thin, close fitting gloves with a “sticky” palm surface to increase the friction between the hands and the steering wheel and knob.

Environmental Conditions

Flood lighting

E

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



Winter clothing

PPE

In order to reduce loading on the wrists from over-gripping, Carrier Drivers 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.

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

Work Organisation

Task variability

A WP

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

Job rotation

A

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

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Control distance while seated	74		A S		A						F R A	
Good driving posture	74	A S						A S				
Range of motion in controls	75		A S		A							
Research equipment or workstation layout with operators	75	R A S	R A S		F R A			F R A S V			F R A	
Use a trolley, cart, or wheelbarrow to move carrier blocks	76							F A S				
Adjust pedal positioning	77										F A	
Stepping down	78							F V				
Operate controls at appropriate heights	78		A S		A							

Direct Risk Factors

F = Force

S = Static Postures

R = Repetition

C = Contact Stress

A = Awkward Postures

V = Vibration

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Adjustable lumbar support	79							A S V				
Adjustable seating	79							A S V				
Seat maintenance	80							A S V				
Vary body posture	81							A S				
Adjust seat spring	81							V				
Seat belts	81							A				
Enlarge hole in cab floor	82	A S										
Reflective surfaces	82	R A										
Yard maintenance	82							V				
Equipment maintenance	82							V				
Tire maintenance	83							V				

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Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Control carrier speed in yard	83							V				
Windshield wipers	84	A										
Window cleaning	84	A										
Stretches	85	directly reduces risk of injury to the body										
View with eyes	87	A										
Alternate looking over shoulders	87	A R	A R									
Manual material handling	88							F A				
Two hands at once	88				F							
Padding for steering wheel	88				F							
Sticky palm gloves	88				F							

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Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Flood lighting	89	R A										
Winter clothing	89				F							
Reduce glare	89	A S										
Task variability	90	R A S	R A S		F R A			F R A S V			F R A	
Job rotation	90	R A S	R A S		F R A			F R A S V			F R A	
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

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♦ = See General Risk Factor Solutions Manual

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck/Shoulder</p> <p>A Carrier Driver frequently holds their arms away from the body while twisting the torso and neck in order to position the vehicle.</p>	<p>Repetition</p> <p>Awkward Postures</p> <p>Static Postures</p>	<ul style="list-style-type: none"> • When the arms are repeatedly lifted, the muscles of the neck and shoulder are subjected to repeated stress with little or no time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • Neck and shoulder muscles must support the weight of the arms when they are away from the body. The farther away the arms are from the body, the greater the load on the muscles and tendons. • When the arms are repeatedly held away from the body, the muscles of the neck and shoulder must remain tense to support the weight. If the duration of constant tension is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. 	<ul style="list-style-type: none"> • 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. • 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. • For exercises that can help prevent <i>neck</i> and <i>shoulder</i> injuries, <i>see the Neck and Shoulder sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Elbow/Wrist</p> <p>A Carrier Driver may grip the steering wheel or knob in order to move the vehicle.</p>	<p>Force</p> <p>Repetition</p> <p>Awkward Postures</p>	<ul style="list-style-type: none"> • Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. The harder that an object must be gripped, the greater the load on the tendon/bone connection. • Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury. • The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection. 	<ul style="list-style-type: none"> • Release the hand from the controls whenever it is possible. • Protect the base of the hand - try to keep minimise contact stress in this area. • Operators should be encouraged to wear proper winter clothing, including well-insulated gloves, to reduce over-gripping in cold temperatures. • For exercises that can help prevent <i>elbow</i> and <i>wrist</i> injuries, <i>see the Elbow and Wrist sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Low Back</p> <p>A Carrier Driver continually sits on a vibrating surface while operating the vehicle.</p>	<p>Awkward Postures</p> <p>Static Postures</p> <p>Vibration</p>	<ul style="list-style-type: none"> • Sitting increases the loading on the walls of the discs. If the duration of sitting is excessive, and the recovery is not adequate (e.g., spine not returned to neutral posture), the tissues may deform to the point of injury. • 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. 	<ul style="list-style-type: none"> • Periodically stand up straight, walk around, and perform the back extension stretch. • Remember to wear your seatbelt, both for safety and as a reminder to improve posture. • Control carrier speed to reduce bouncing and exposure to whole body vibration. • In order to reduce loading on the back from whole body vibration, ensure tires are properly inflated and maintained. • Know how to adjust your seat, including the suspension. • Identify wear and damage of your seat before it becomes a major problem. • When getting out of the cab, climb down instead of jumping down. • Get up from the seated posture throughout the day, and stretch when possible. • 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. • 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. • Ensure that your seat is properly adjusted to support the curve in your lower spine. • For exercises that can help prevent <i>low back</i> injuries, <i>see the Back section of the Body Manual.</i>

