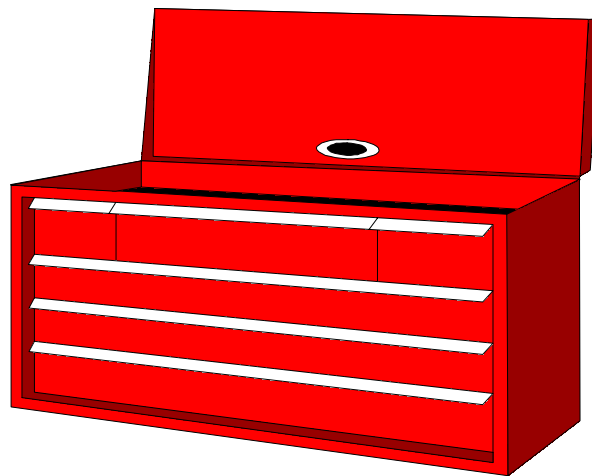


INDUSTRIAL MUSCULOSKELETAL INJURY REDUCTION PROGRAM

Common Industry Jobs (CIJs) Crane Operator 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

CRANE OPERATOR TOOL KIT

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Crane Operator
Tool Kit

Overview

Crane Operator

Job Summary

A Crane Operator is responsible for moving large or heavy objects inside and outside of the mill. A Crane Operator may be responsible for connecting an object to be moved to the crane (e.g., using a cable, chain, hook), and will operate levers or other controls to move the object into a desired position. The operator may also be responsible for removing a crane-object connection. In addition, a Mobile Crane Operator will drive the crane into an optimal position for moving an object. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Crane Operator may include:

- a) Forceful movements of the shoulder
- b) Repetitive movements of the neck, shoulder, wrist, low back
- c) Awkward postures of the neck, shoulder, wrist, low back
- d) Static postures of the neck, shoulder, wrist, low back
- e) Vibration of the low back
- f) Walking, sitting, standing, climbing
- g) Handling of cables, chains, or hooks

Mental Demands

A Crane Operator must be aware of the location of the boom and object being moved relative to other pieces of equipment, the building, and personnel. Particular attention is paid to other workers who may give hand signals to guide the movement of the object through the workspace.

Major Variations

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

- 1) A crane may be:
 - a) Mobile
 - b) Stationary
- 2) Objects to be moved may be connected and disconnected from the crane by:
 - a) Crane Operators
 - b) Other personnel
- 3) The Crane Operator may operate a crane with the boom:
 - a) Directly in front of the operator
 - b) To one side of the operator
- 4) The crane may have foot pedals for:
 - a) Several hand lever controls
 - b) Boom extension
- 5) The majority of hand lever controls are located:
 - a) At or slightly below shoulder level
 - b) At or slightly above waist level

Minor Variations

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

- 1) The number of levers used to control the movements of the machinery

Physical Demands Analysis Crane Operator

PDA General Instructions: Crane Operator

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

Where applicable, common industry job data (e.g., hand tools, tasks) have been included in the tables of this document. The information reported was collected from a sample of Crane Operator(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. The IMIRP Society accepts no responsibility for the use or misuse of this Physical Demands Analysis, or for the accuracy of the PDA as it applies to any specific workplace.

Disclaimer

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

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Physical Demands Analysis Crane Operator

Task List

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

Establish connection

A Crane Operator connects the object to be moved to the crane via a chain, cable, or hook.

Does this task occur at your mill?

Yes No



Operate controls to move object

Once the outriggers are in position, an object is moved using controls located in the cab of the crane. Depending on the situation, the operator may have to watch for signals from other workers to ensure the proper placement of the object.

Does this task occur at your mill?

Yes No



Remove connection

Once the object is moved into a desired position, the Crane Operator disconnects the object from the crane system.

Does this task occur at your mill?

- Yes No



Drive crane

A mobile crane is driven to areas within or outside of the mill.

Does this task occur at your mill?

- Yes No



Job Profile

Date: _____

Company Name: _____

Division: _____

Employee Name: _____

Supervisor: _____

Phone: _____

Fax: _____

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

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

Describe:

Length of shift _____ hours

Formal breaks

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

Informal breaks

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

Work pace control

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

Job rotation

Describe:

Yes No

Work Organisation

Task Description

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

Task		Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
	<i>Establish connection</i>					<ul style="list-style-type: none"> • <i>Cycle time depends on the size of the object, number of attachments to be made</i>
	<i>Operate controls to move object</i>					<ul style="list-style-type: none"> • <i>Levers are the most common means of moving object</i>
	<i>Remove connection</i>					<ul style="list-style-type: none"> • <i>Cycle time depends on the size of the object, number of attachments to be made</i>
	<i>Drive crane</i>					<ul style="list-style-type: none"> • <i>Frequency depends on need of use</i>
	<i>Other:</i>					
	<i>Other:</i>					
	<i>Other:</i>					

Workstation Characteristics

Dimensions & Layout

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

Flooring, Displays & 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 Crane Operator. Use the left column to check off controls that are present at the work site. Highlight controls that may aggravate the injury, or which the worker finds difficult to use. The *Comments* section may be used to include any additional information. Additional controls can be included under *Other*.

Type of Control	Function	Comments	
	<i>Lever</i>	<ul style="list-style-type: none"> • <i>Adjust boom position (up/down movement of cable, extension/retraction and angle of boom)</i> 	
	<i>Foot pedals</i>	<ul style="list-style-type: none"> • <i>Gas, clutch, and brake</i> • <i>Duplicates the functions of the hand lever controls</i> 	
	<i>Steering wheel</i>	<ul style="list-style-type: none"> • <i>Move crane to desired position</i> 	
	<i>Push buttons</i>	<ul style="list-style-type: none"> • <i>Outrigger movement</i> 	<ul style="list-style-type: none"> • <i>Stabilises crane</i>
	<i>Other:</i>		
	<i>Other:</i>		

Physical Demands







Whole Body Physical Demands



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

Physical Demands	Tasks or Activity	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Sitting</i>	<ul style="list-style-type: none"> Operate controls to move object 				✓	<ul style="list-style-type: none"> Percentage of shift is dependent on whether additional personnel are available
<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 Crane Operator related to tasks. Check off (✓) the estimated *Percent of Shift*, and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
<i>Example: Shoulder Flexion</i>	<ul style="list-style-type: none"> Operate controls to move objects 			✓		<ul style="list-style-type: none"> Operator will often hold the shoulder position at the level of the levers
Neck						
<i>Flexion</i> 						
<i>Extension</i> 						
<i>Twisting</i> 						
Shoulder						
<i>Flexion</i> 						
<i>Abduction/adduction</i> 						
<i>Extension</i> 						

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

Legend for Hand/Fingers

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

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

Manual Material Handling

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

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

Hand Tools

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

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

Environmental Conditions

Work Environment

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

Factor	Comments
Vibration (<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 A of the PDA.

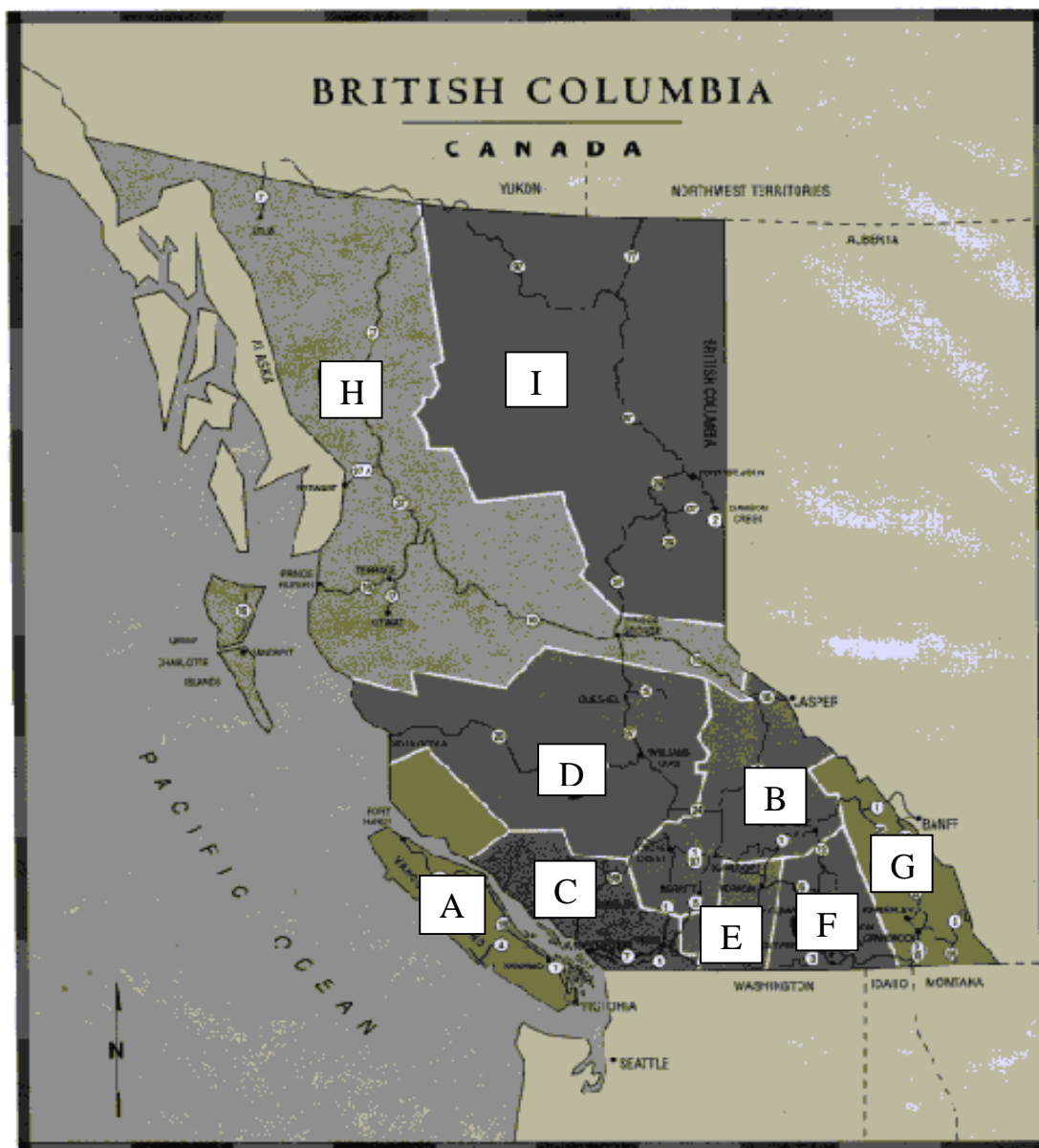
Region	Avg. Max July/Aug	Avg. Min Dec/Jan	Extreme Max.	Extreme Min.
<input type="checkbox"/> Vancouver Island	22.5 °C	-0.6 °C	36.1 °C	-18.8 °C
<input type="checkbox"/> Southwestern BC	22.9 °C	0.4 °C	35.6 °C	-18.3 °C
<input type="checkbox"/> Cariboo Chilcotin Coast	22.2 °C	-11.6 °C	36.4 °C	-42.5 °C
<input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

Personal Protective Equipment

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

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

Appendix A – Regional Map



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

Risk Factor Identification Checklist

Crane Operator

Purpose

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

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

Instructions

General

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

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

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

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

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

Summary Tables

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

Risk Factor Identification Checklist – Crane Operator

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

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

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

Definitions

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

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

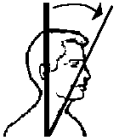
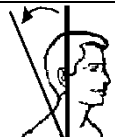
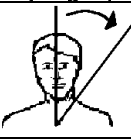
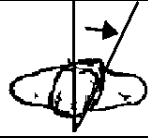
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

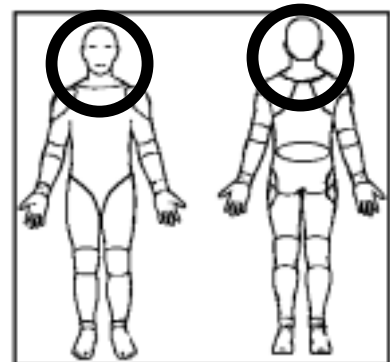
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., looking up or down while moving an object)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task?			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 up towards the end of boom to view signals from workers or the object itself)			S O	
Awkward Posture				
Flexion			S O	
Extension			S O	
Lateral Bending			S O	
Rotation			S O	

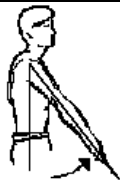

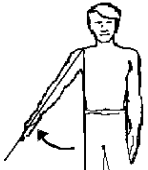
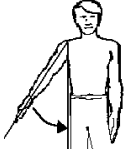
Please indicate whether the following direct risk factors were identified at the NECK .		
Direct Risk Factors	Repetition	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Static Posture	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Awkward Posture	<input type="checkbox"/> Yes <input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



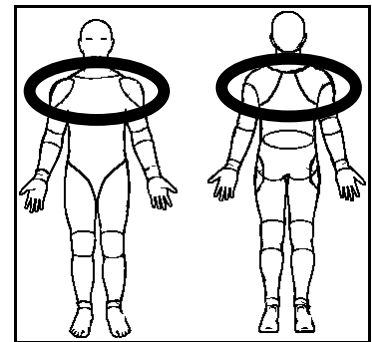
Body parts within the circled area will be classified as NECK issues.

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., moving levers back and forth to position object)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating lever controls)		S O	
Static Posture			
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., holding on lever controls at shoulder level while waiting for signals to move object)		S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., lever controls)		S O	




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

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



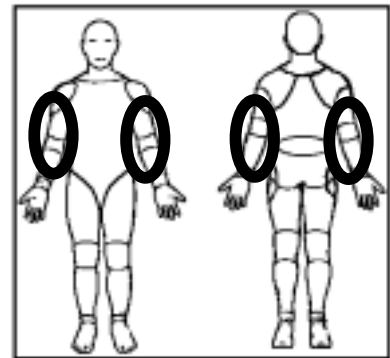
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force	N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting		S O	
Lowering		S O	
Pushing		S O	
Pulling		S O	
Carrying		S O	
Turning materials		S O	
Are objects handled in a power grip? (e.g., levers to operate boom)		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., moving levers back and forth to position object)		S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating lever controls)		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 on to lever controls while waiting for signals)			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., lever controls)			S O	
Contact Stress				
Ask the worker: Do any objects, tools or parts of the workstation put pressure on any parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm, elbow? (e.g., lever controls when pushing them away from the body)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., steering wheel while driving over uneven surfaces)			S O	





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



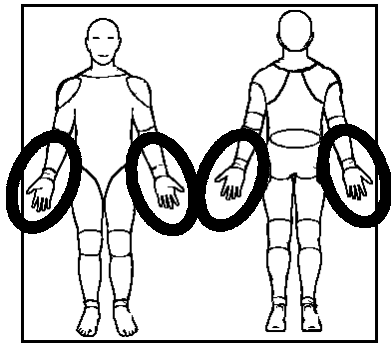
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting		S	
		O	
Lowering		S	
		O	
Pushing		S	
		O	
Pulling		S	
		O	
Carrying		S	
		O	
Turning materials		S	
		O	
Are objects handled in a power grip? (e.g., lever controls)		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., moving levers back and forth to position object)		S	
		O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., moving levers back and forth to position object)		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 on to lever controls while waiting for signals)			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., lever controls)			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? (e.g., activating lever controls)			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 while driving over uneven surfaces)			S O	





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



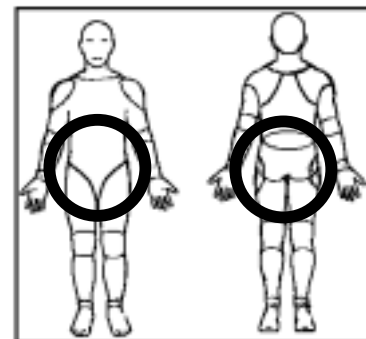
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y	Comments:
Is forceful physical handling performed? Such as: Lifting		S	
		O	
Lowering		S	
		O	
Pushing		S	
		O	
Pulling		S	
		O	
Carrying		S	
		O	
Repetition			
Are identical or similar motions performed over and over again?		S	
		O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., sitting in cab to operate controls)		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., while operating lever controls in the cab of crane)		S	
		O	
Contact Stress			
Ask the worker: Do any objects, tools or parts of the workstation put pressure on any parts of your hip/thigh?		S	
		O	


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

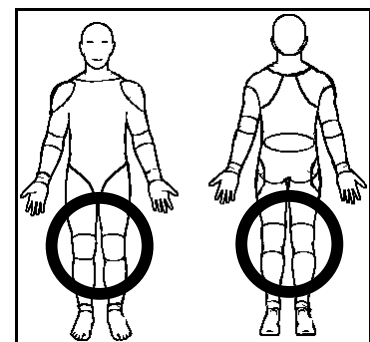


Body parts within the circled area will be classified as LOW BACK issues.

KNEE



Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., climbing stairs/ladder in and out of cab)			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., while in cab of crane)			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)? (e.g., dashboard of cab)			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

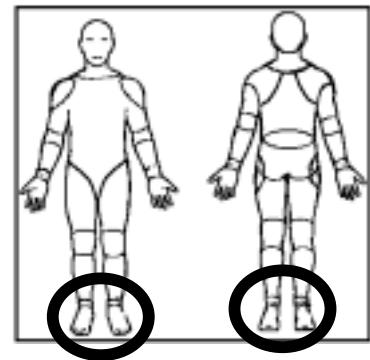


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition		N	Y	Comments:
Are identical or similar motions performed over and over again? (e.g., operating foot pedals)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift?			S O	
Awkward Posture				
Flexion			S O	
Extension			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., operating foot pedals while driving over uneven surfaces)			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., chains, cables, hooks)			S O
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions? (e.g., chains, cables)			S O
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			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?			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? (e.g., working during mill downtime)		S O	
Ask the worker: Are there indications of excessive fatigue or pain, or symptoms of adverse health effects due to extended work days or overtime? (e.g., extended weekend maintenance)		S O	
Ask the worker: Are there indications of excessive fatigue or adverse health effects due to shiftwork? (e.g., working during graveyards during mill construction or repair)		S O	
Ask the worker: Are rest periods or task variety insufficient to prevent the build-up of fatigue or the risk of adverse health effects? (e.g., Crane Operator spending long periods of time in the cab)		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**



Crane Operator

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

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

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

Work Manual

Crane Operator

Disclaimer

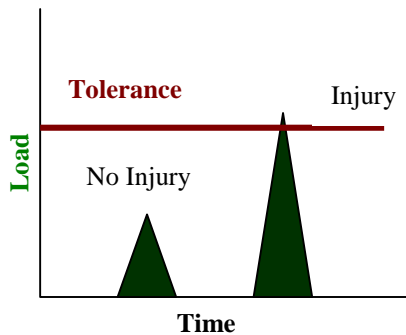
The BC sawmill IMIRP documents were developed by Advanced Ergonomics Inc. (AEI) based on analyses conducted in a number of voluntary, participating sawmills in British Columbia and should be considered applicable only to the BC sawmill industry. Modification to these documents may reduce their usefulness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

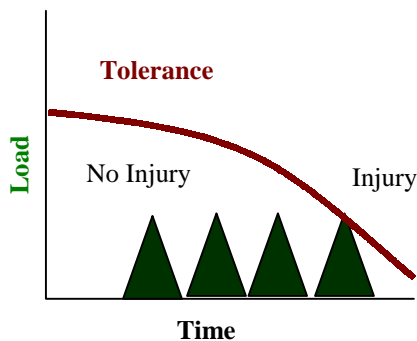
*Injuries occur when ...
Loads exceed tissue tolerances*



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.

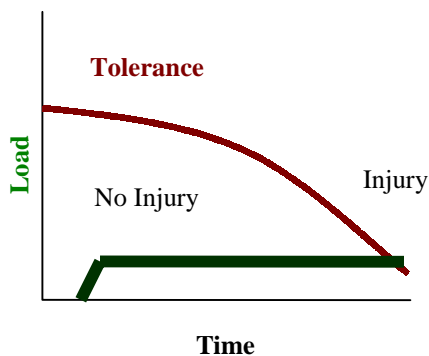
Example – a worker going over on their ankle and spraining it.



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

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

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

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

Major Risk Identification

IMIRP ergonomists have assessed the Crane Operator position and found that the neck, shoulder, and low back are the body parts of major concern while performing the duties. Focussing on solutions that target the areas of major concern will likely reduce the greatest risks associated with this job.

Neck: Major risks include repetitive, awkward, and static postures of the neck (extension) while watching the object being moved, the end of the boom, or signals from personnel.

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

1. Rest arms whenever possible (page 73)
2. View with eyes (page 75)
3. Hourly stretch breaks (page 84)

Shoulder: Major risks include repetitive, awkward, and static postures of the shoulder while operating controls at the outer range of the reach envelope. The amount of force required to manipulate the controls can also contribute to the risk of discomfort or injury.

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

1. Move closer to the controls (page 72)
2. Rest arms whenever possible (page 73)
3. Range of motion in controls (page 74)
4. Manipulate hook-up items below shoulder level (page 77)
5. Operate controls at appropriate heights (page 77)

Low Back: Major risks include constantly sitting in the cab of the crane while manipulating controls to move objects.

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

1. Stepping down (page 76)
2. Adjustable seating (page 79)
3. Vary body posture (page 79)
4. Seat maintenance (page 80)
5. Adjust seat spring (page 81)
6. Yard maintenance (page 82)
7. Control crane speed in yard (page 82)

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

NECK

Direct Risk Factors: Awkward Posture Static Posture Repetition
--



A Crane Operator may frequently look up in order to view signals, objects, or the crane boom.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Posture

- Neck muscles must activate when the neck is bent backwards while looking up. The more the neck is bent, the greater the load on the muscles and tendons. When the neck is bent backwards, there is increased compression between the bony joints of the spine.

Static Posture

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

Repetition

- When the head is repeatedly bent backward, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury. Repeated compression in the neck area may lead to deterioration of the bony joints of the spine.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the neck muscles and tendons, and joint facets is increased when the head is held in a backward bent posture while viewing areas above the level of the worker.

CONSEQUENCES

- When the head is held in a backward bent 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 or discomfort at the base of the head, 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 90 to 93.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

NECK

Direct Risk Factors: Awkward Posture Static Posture
--



A Crane Operator may hold the head in a twisted posture in order to view the area behind the mobile crane as it backs up.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Posture

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

Static Posture

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

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the neck muscles is increased while the head is held in a twisted position due to the positioning of the operator relative to the movement of the crane.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled “Neck” in the Summary of Solutions on pages 90 to 93.
- For exercises that can help to prevent *neck* injuries, see the *Neck section of the Body Manual*.

NECK/SHOULDER

Direct Risk Factors:

Awkward Posture

Static Posture

Repetition



A Crane Operator often holds their arms away from the body at shoulder level as levers are activated or while waiting for signals.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Awkward Posture

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

Static Posture

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Loading on the neck, shoulder, and upper back muscles increases because the control levers are outside a comfortable reaching distance from the operator.

Working Heights

- Loading on the neck, shoulder, and upper back muscles increases because the control levers are at a height near to shoulder level.

CONSEQUENCES

- When the arms are held, or work is done 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 90 to 93.
- For exercises that can help to prevent *neck* and *shoulder* injuries, see the *Neck* and *Shoulder sections of the Body Manual*.

SHOULDER

Direct Risk Factors:

Force
Awkward Posture
Repetition



A Crane Operator may push or pull levers in order to position the crane boom.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

- The rotator cuff stabilises the shoulder joint when objects are pushed or pulled. The larger the force required, the greater the load on the rotator cuff.
- If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur.

Awkward Posture

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- Loading on the shoulder joint is increased when the control levers are not close enough to the operator to generate the desired force to manipulate the controls.

Working Heights

- Loading on the shoulder joint is increased when the controls of the crane are manipulated at or near shoulder height.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Shoulder, please see the column labelled “Shoulder” in the Summary of Solutions on pages 90 to 93.
- For exercises that can help to prevent *shoulder* injuries, see the ***Shoulder section of the Body Manual***.

WRIST

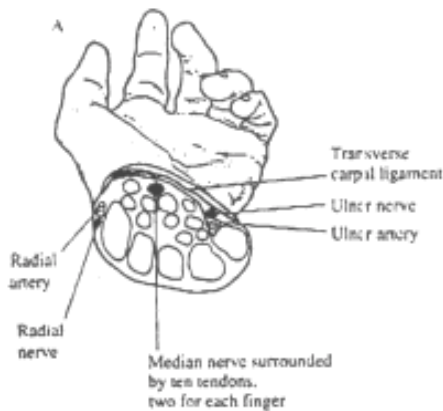
Direct Risk Factors:
Awkward Posture
Static Posture
Repetition



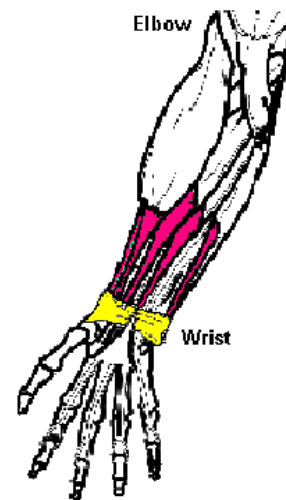
A Crane Operator may operate control levers with the wrists in various bent positions.

BACKGROUND INFORMATION

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



The Carpal Tunnel



DIRECT RISK FACTORS

Awkward Posture

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

Static Posture

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

Repetition

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

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading to the wrists is increased when the shape and orientation of the control levers encourages performing job tasks with bent wrists.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Wrist, please see the column labelled “Wrist” in the Summary of Solutions on pages 90 to 93.

LOW BACK

Direct Risk Factors:

Force
Awkward Posture
Repetition

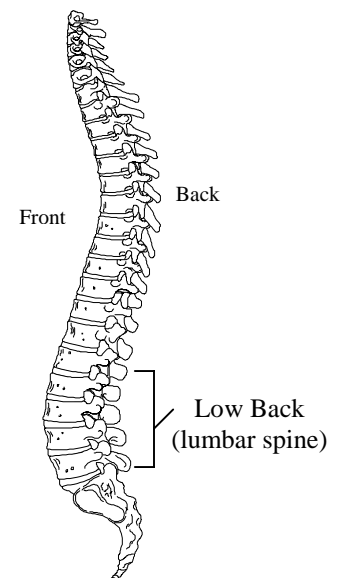


A Crane Operator may bend forward in order to lift a chain, cable, or hook to the object to be moved. This often involves working at or below knee level.

Neutral Spine

BACKGROUND INFORMATION

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



DIRECT RISK FACTORS

Force

- Lifting increases the loading on the spine. Weight held in the hands is transmitted to the low back. The greater the weight, the greater the loading on the structures of the low back.

Awkward Posture

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

Repetition

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the low back muscles is increased when the object to be connected to the crane is at or below knee height.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled “Back” in the Summary of Solutions on pages 90 to 93.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual***.

LOW BACK

Direct Risk Factors:
Awkward Posture
Static Posture
Vibration

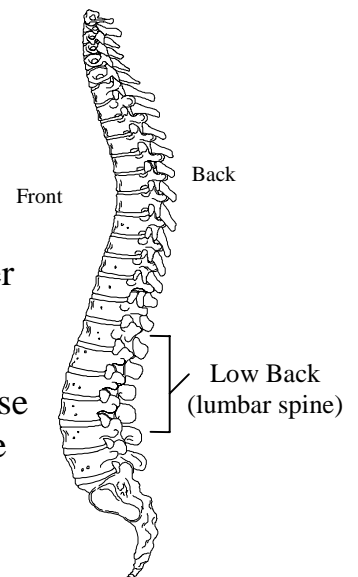


A Crane Operator continually sits while operating the crane. If the crane is driven on an uneven surface, vibration can be transmitted through the seat to the low back.

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 & Static Posture

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

Vibration

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

INDIRECT RISK FACTORS

Work Organisation

Task Variability

- Loading on the low back is increased when the operator spends a majority of the time sitting in the cab (either manipulating controls or waiting for signals).

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 90 to 93.
- For exercises that can help to prevent *back* injuries, see the ***Back section of the Body Manual.***

Summary of Body Parts at Risk

NECK

- A Crane Operator may frequently look up in order to view signals, objects, or the crane boom.



NECK

- A Crane Operator may hold the head in a twisted posture in order to view the area behind the mobile crane as it backs up.



NECK/SHOULDER

- A Crane Operator often holds their arms away from the body at shoulder level as levers are activated or while waiting for signals.



SHOULDER

- A Crane Operator may push or pull levers in order to position the crane boom.



WRIST

- A Crane Operator may operate control levers with the wrists in various bent positions.



LOW BACK

- A Crane Operator may bend forward in order to lift a chain, cable, or hook to the object to be moved. This often involves working at or below knee level.



LOW BACK

- A Crane Operator continually sits while operating the crane. If the crane is driven on an uneven surface, vibration can be transmitted through the seat to the low back.



Risk Factors by Body Part

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

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

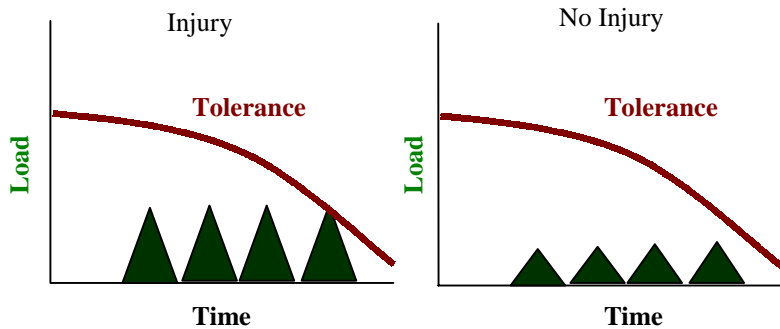
* Extended exposure to any risk factor can increase the likelihood of injury. For solutions designed to decrease the duration of exposure to any risk factor please refer to the Work Organisation section of the General Risk Factor Solutions Manual

** 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 90 to 93 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

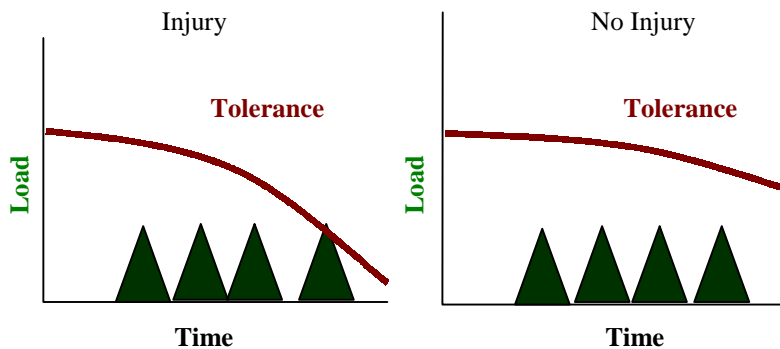
Injury Prevention

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

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

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

Risk Control Key

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

E

ENGINEERING CONTROLS

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

A

ADMINISTRATIVE CONTROLS

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

WP

WORK PRACTICE CONTROLS

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

PPE

PERSONAL PROTECTIVE EQUIPMENT

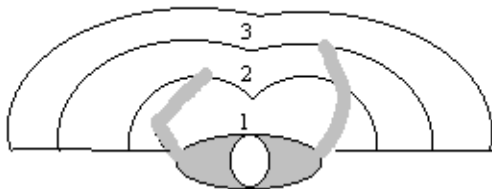
These are devices worn by a worker to reduce the risk of injury, including gloves, knee pads, hearing protection, and leather aprons.

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 used most frequently |
| 2 = Controls used less frequently |
| 3 = Controls used least frequently |

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.

Tilt steering

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



Good driving posture

WP

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



Slouching while driving.



Good driving posture.

Move closer to the controls

E
WP

In order to reduce loading on the neck and shoulder move as close to the controls as possible. This may be achieved by moving the seat forward on slide track by extending controls into safe reach envelopes or upward to minimise the distance between levers and the operator. When moving closer to the controls, contact with the steering wheel or dashboard should be avoided.



Crane Operators will often manipulate controls when their arms are fully extended from the body. Depending on the force required, it may be difficult to generate sufficient force when the arms are at the extreme range of movement.



If the distance between the body and the lever controls can be minimised, greater forces can be generated with less strain on the body. In this picture the levers are operated in a comfortable reaching distance. If a significant amount of force is needed to hold the levers in this position, it will be easier in this position.



Depending on the type of lever control manipulation being performed, it may be ideal to have the operator/control distance relationship within this reach envelope.

Rest arms whenever possible

WP

In order to reduce awkward, static postures of the shoulder while waiting for signals from other workers, whenever possible Crane Operators should rest their arms on their legs or arm supports rather than continue to hold on to the controls.



Often arms are extended from the body due to the levers having to be held in this position while waiting for signals. This static posture can produce undue stress on the muscles of the neck and shoulder.



If the levers do not have to be held in a particular position, operators should be encouraged to let go of the levers and rest their arms on their legs or arm supports whenever possible.

Range of motion in controls

E

In order to reduce awkward postures of the shoulders, lever controls should have limited play so as to decrease the amount of stress to the shoulder joint.



The amount of play of the lever controls will determine the amount of shoulder movement the Crane Operator 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 increase in the risk of injury. Crane Operators may have to move far beyond a comfortable reaching distance due to the amount of play in the controls.

Research mobile equipment with operators

A

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

WORKING HEIGHTS

A working height that is too high for the worker will require stressful shoulder and arm postures, while a height that is too low will require stressful bending of the neck and trunk. The height of a work surface should allow room to change position and move the legs and feet (WCB Draft Ergonomic Regulations, 1994).

The ideal workstation is height adjustable, allowing a large percentage of the population to adjust the work surface height to suit their dimensions.

To determine the appropriate work height specific for the Crane Operator, identify the body part of most concern. If the main concern is the:

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

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

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

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

Arm supports

E

In order to reduce awkward and static postures of the neck/shoulder when operating controls, consider the height of the controls and arm supports.

An operator's elbows and forearms should sit comfortably on the arm supports with the shoulders relaxed and the wrists free for using controls.

Arm supports that are well-padded and height-adjustable, independent of the height of the seat, are preferred. The support provided by these arm supports reduces muscle tension and fatigue in the neck and shoulder.

WP

Crane Operators should be encouraged to use the arm supports to relax the muscles in the neck/shoulder region when there is a break in the workload.

Placing the elbows, forearms, and wrists on the arm supports while taking these microbreaks will allow working muscles to recover and repair.

View with eyes

WP

In order to reduce awkward and static postures of the neck use the eyes and neck, not just twisting of the neck, to view work area.

Stepping down

WP

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

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



Climbing into cab

E
WP

Handholds should be low enough so operators do not find it necessary to jerk themselves upward. This motion can place large loads on the shoulders when they are in a flexed position.

Manipulate hook-up items below shoulder level

WP In order to reduce awkward postures of the shoulder, operators should only lift hook-up items above waist level when absolutely necessary. In addition, the item to be lifted should be as close to the body as possible.



A majority of the manipulation of the chain or cable should be done at a lower level (at the level of the hook) instead of at or above shoulder level.

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 crane cabs are not designed to have operators use the controls at an appropriate height. As such, 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

Crane Operators are required to sit when operating the crane. 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 Crane Operator does not maintain a neutral spine (see Injury Education for the Low Back on page 62).

Lumbar support

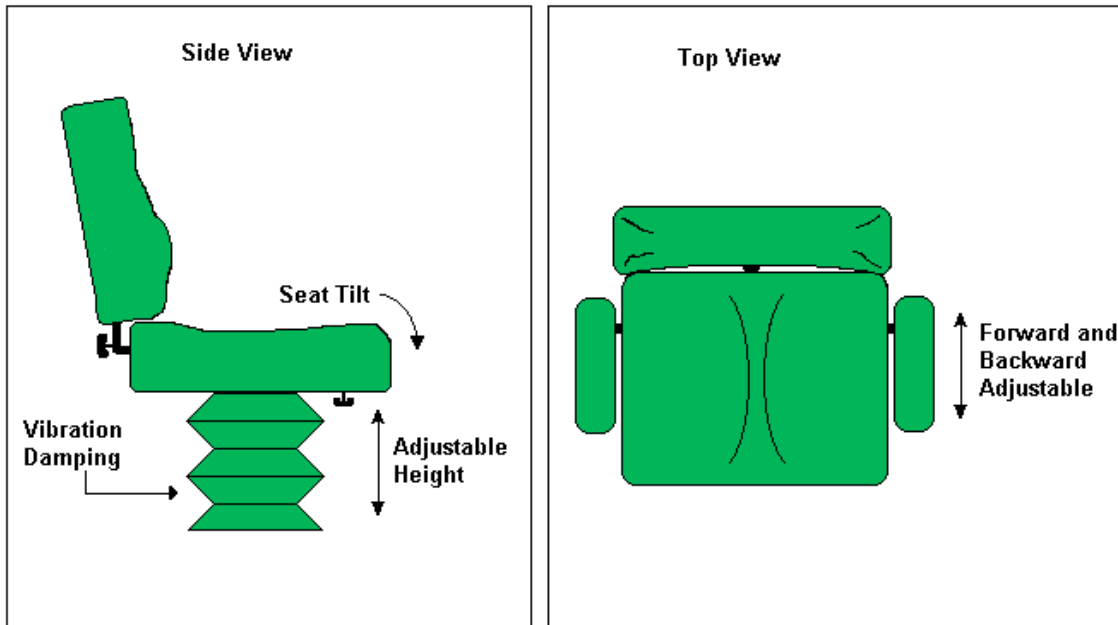
E

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



Adjustable seating

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



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

Vary body posture

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

Seat maintenance

E
A
WP

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

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

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

Regular seat maintenance

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

Daily inspection of seat

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

Adjust seat spring

WP



Many mobile cranes 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 appropriately 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 have to wear a seat belt. These seat belts can also be useful in helping to maintain lumbar curve by holding the low back against the seat and avoiding slouching.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Yard maintenance

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

Equipment maintenance

A In order to reduce loading on the back from whole body vibration, 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 crane 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 mobile crane 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 either the Crane Operator or the Heavy Duty Mechanic.



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

Hourly stretch breaks

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



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



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



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



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

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

Chin Tuck

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



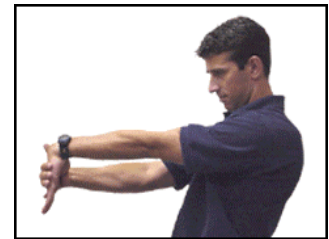
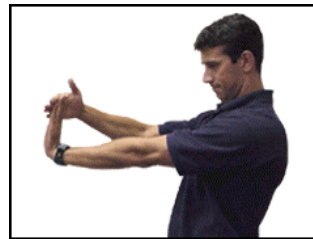
Shoulder Stretch

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



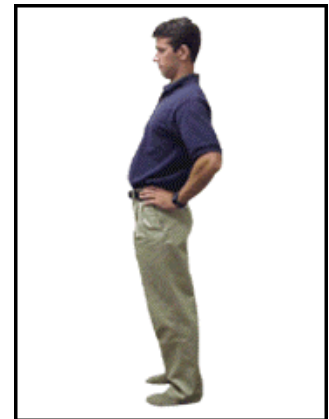
Wrist Flexor and Extensor Stretch

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



Back Extension

Start by standing in an upright position (the back is in neutral posture). Lean backwards slightly, pushing the hips gently forward. Hold for 5 seconds. Repeat 3 times.



Alternate looking over shoulders

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



Characteristics of Objects Being Handled

SIZE AND SHAPE

Lever controls

E

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



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



Hard lever handles can lead to contact stress.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Maintain neutral postures

WP



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

Environmental Conditions

Flood lighting

E

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



Winter clothing

PPE

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

Reduce glare

PPE

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

Work Organisation

Task variability

A
WP

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

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Tilt steering	70		A S									
Good driving posture	71	A S						A S				
Move closer to the controls	72		A S	F A S								
Rest arms whenever possible	73		A S	F A S								
Range of motion in controls	74		A S	F A S								
Research mobile equipment with operators	74	R A S	R A S	F R A			R A S	R A S V				
Arm supports	75		A S									
View with eyes	75	A S										
Stepping down	76							V				
Climbing into cab	76			F								
Manipulate hook-up items below shoulder level	77			F A								

Direct Risk Factors

F = Force

S = Static Posture

R = Repetition

C = Contact Stress

A = Awkward Posture

V = Vibration

Summary of Solutions

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		Injury Prevention Potential										
SOLUTIONS	Page	Neck	Neck/ Shoulder	Shoulder	Elbow/ Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Operate controls at appropriate heights	77			A		A						
Lumbar support	78							A				
Adjustable seating	79							A S				
Vary body posture	79							A S				
Seat maintenance	80							V				
Adjust seat spring	81							V				
Seat belts	81							A				
Yard maintenance	82							V				
Equipment maintenance	82							V				
Tire maintenance	82							V				
Control crane speed in yard	82							V				

Direct Risk Factors

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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
Windshield wipers	83	A										
Window cleaning	83	A										
Hourly stretch breaks	84	R A S	R A S	F R A			R A S	R A S V				
Alternate looking over shoulders	86	R A										
Lever controls	87					A						
Maintain neutral postures	87					A						
Flood lighting	88											
Winter clothing	88				F							
Reduce glare	88	A S						A S				
Task variability	89	R A S	R A S	F R A			R A S	R A S V				

Direct Risk Factors

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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
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										

◆ = See *General Risk Factor Solutions Manual*

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck</p> <p>A Crane Operator may hold the head in a twisted posture in order to view the area behind the mobile crane as it backs up.</p>	<p>Awkward Posture</p> <p>Static Posture</p>	<ul style="list-style-type: none"> • Neck muscles are required to turn the head to the side. The further the head is turned to the side, the greater the load on the muscles and tendons. • When the neck is held still in a twisted position, the muscles of the neck must remain tense to support the weight of the head. With no time allowed for recovery, the constant state of tension in the neck muscles may cause fatigue. If the constant stress is sufficient, and recovery is not adequate, the tissues may fatigue to the point of injury. 	<ul style="list-style-type: none"> • Stretch the muscle groups in the neck to maintain flexibility and increase blood flow. • For exercises that can help prevent <i>Neck</i> injuries, <i>see the Neck section of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Neck/Shoulder</p> <p>A Crane Operator often holds their arms away from the body at shoulder level as levers are activated or while waiting for signals.</p>	<p>Awkward Posture</p> <p>Static Posture</p> <p>Repetition</p>	<ul style="list-style-type: none"> • 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. • 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. 	<ul style="list-style-type: none"> • Avoid “resting” the hand on controls or gearshift. Use armrests - when properly adjusted they keep the shoulder in a more neutral position • 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. • Use tilt steering features, where available, to move the steering wheel closer 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 more exercises that can help prevent <i>Neck</i> and <i>Shoulder</i> injuries, <i>see the Neck and Shoulder sections of the Body Manual.</i>

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Shoulder</p> <p>A Crane Operator may push or pull levers in order to position the crane boom.</p>	<p>Force</p> <p>Awkward Posture</p> <p>Repetition</p>	<ul style="list-style-type: none"> • The rotator cuff stabilises the shoulder joint when objects are pushed or pulled. The larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds the tissue tolerances, injury may occur. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff. • When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. 	<ul style="list-style-type: none"> • Move yourself as close as comfortable to the levers by adjusting seat position. • Remember that maximum force available from the shoulders cannot be generated when the arms are fully extended in front of the body. • For exercises that can help prevent Shoulder injuries, see the Shoulder section of the Body Manual.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Wrist</p> <p>A Crane Operator may operate control levers with the wrists in various bent positions.</p>	<p>Awkward Posture</p> <p>Static Posture</p> <p>Repetition</p>	<ul style="list-style-type: none"> • As the wrist is bent, the tendon sheaths will rub up against the walls of the carpal tunnel. The farther the wrist is bent, the more friction experienced in the tendon sheaths. • When the wrist is held in a bent position, the tendon sheaths are under constant stress. If the duration of constant stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • Repeated bending of the wrist causes stress to the tendon sheaths. If the repetitive stress is excessive, and recovery is not adequate, the tendon sheaths may fatigue to the point of injury. 	<ul style="list-style-type: none"> • Maintain neutral wrist postures when operating controls. • Release the hand from the controls whenever it is possible. • Sit back and use armrests when there is a break in the workflow. • 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. • For exercises that can help prevent Wrist injuries, <i>see the Wrist section 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 Crane Operator continually sits while operating the crane. If the crane is driven on an uneven surface, vibration can be transmitted through the seat to the low back.</p>	<p>Awkward Posture</p> <p>Static Posture</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"> • Remember to wear your seatbelt, both for safety and as a reminder to improve posture. • Control crane 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. Jumping down from the cab, particularly after a long period of driving, can cause injury because the prolonged seated posture has already stressed the tissues of the low back.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	<p>Low Back (continued)</p>			<ul style="list-style-type: none"> • Get up from the seated posture throughout the day, and stretch when possible. This alleviates the load on the spine, allows the discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting. • 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. • For more exercises that can help prevent Back injuries, <i>see the Back section of the Body Manual.</i>