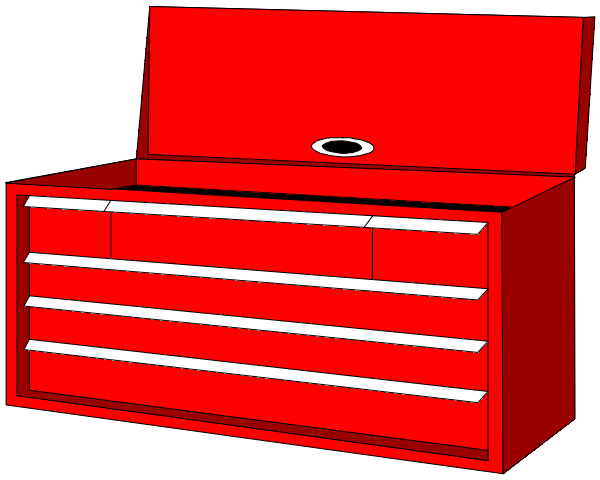
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Kiln Area 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

KILN AREA OPERATOR TOOL KIT
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Overview

Kiln Area Operator

Job Summary

A Kiln Area Operator is responsible for processing wet lumber through the kilns to produce a dry product, and operating mobile equipment. A Kiln Area Operator may load and unload kilns, check moisture, direct or drive the forklift, prepare loads, straighten kiln carts, computer/office work, label loads, clean-up and maintenance. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Kiln Area Operator may include:

a) Forceful movements of the shoulder, elbow/wrist and low back
b) Awkward postures of the shoulder, elbow/wrist and low back
c) Static postures of the back
d) Repetition of the shoulder and low back
e) Walking to load/unload kilns, check moisture, check inventory, guide forklifts, clean-up, and place spacers
f) Standing to guide forklift, place spacers, load/unload kilns, and adjust kiln carts.
g) Sitting to drive the forklift and to perform computer/office work
h) Climbing stairs and/or ladder to maintain kilns and kiln carts and up onto the loads
i) Crouching to grease kiln cart wheels
j) Pushing/pulling broken lumber, kiln carts and spacers/dunnage
k) Lifting/lowering spacers/dunnage
l) Carrying spacers/dunnage

Mental Demands

A Kiln Area Operator makes decisions about kiln dwell times based on the moisture content of the wood. A good understanding of the computer system and heating system is needed at this job. The worker must sustain alertness while working around mobile equipment.

Major Variations

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

1) A Kiln Area Operator may perform other jobs such as:
   a) Forklift Driver
   b) Clean-up
   c) Bander
   d) Tie-up/End Capper Operator

Minor Variations

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

1) To clean-up the mill yard a Kiln Area Operator may use a:
   a) Broom
   b) Shovel
   c) Picaroon
   d) Chainsaw

2) A Kiln Area Operator may measure moisture using:
   a) A wand moisture meter
   b) A power grip moisture meter

Physical Demands Analysis
Kiln Area Operator

PDA General Instructions: Kiln Area Operator

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Kiln Area 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 Kiln Area 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.

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Physical Demands Analysis
Kiln Area Operator

Task List

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

Load/unload kilns

Open/close doors

A Kiln Area Operator may open or close kiln doors when loading or unloading the kiln.

Does this task occur at your mill?

☐ Yes ☐ No

Adjust vents/bevels

A Kiln Area worker may adjust vent/bevels when loading or unloading the kiln.

Does this task occur at your mill?

☐ Yes ☐ No

Check moisture

A Kiln Area worker may check the moisture content of the wood to determine drying time.

Does this task occur at your mill?

☐ Yes ☐ No

Prepare loads

Place spacers

A Kiln Area Operator may place dunnage on the load.

Does this task occur at your mill?

☐ Yes ☐ No

Place strips

A Kiln Area Operator may place missing strips between the layers of lumber.

Does this task occur at your mill?

☐ Yes ☐ No

Prepare loads

Even the load

A Kiln Area Operator may cut off long ends of lumber with a chainsaw.

Does this task occur at your mill?

☐ Yes ☐ No

Waste lumber

A Kiln Area Operator may pull skewed pieces of lumber from the load.

Does this task occur at your mill?

☐ Yes ☐ No

Direct forklift

A Kiln Area Operator may direct the forklift, using hand signals, when positioning to pick up or drop off the load.

Does this task occur at your mill?

☐ Yes ☐ No

Operate forklift

A Kiln Area Operator may operate a forklift to move and/or stack loads or kiln carts.

Does this task occur at your mill?

☐ Yes ☐ No

If this occurs at your mill, see the Forklift Tool Kit for more details.

Straighten kiln carts

A Kiln Area Operator may straighten the kiln carts so they are situated on the tracks correctly.

Does this task occur at your mill?

☐ Yes ☐ No

Computer/office work

A Kiln Area Operator may perform computer and office work to ensure proper operation of the kilns.

Does this task occur at your mill?

☐ Yes ☐ No

Label loads

Spray paint

A Kiln Area Operator may label loads by spray painting markings onto the load.

Does this task occur at your mill?

☐ Yes ☐ No

Stapler

A Kiln Area worker may label loads by stapling labels on to the load.

Does this task occur at your mill?

☐ Yes ☐ No

Clean-up

A Kiln Area Operator may clean up the wood debris and dirt in the area around them.

Does this task occur at your mill?

☐ Yes ☐ No

Maintenance

Equipment

A Kiln Area Operator may maintain equipment such as kiln carts throughout the day.

Does this task occur at your mill?

☐ Yes ☐ No

Kilns

A Kiln Area Operator may perform some maintenance on the kilns throughout the day.

Does this task occur at your mill?

☐ Yes ☐ No

Job Profile

Date: _____

Company Name: _____ Division: _____

Employee Name: _____ Supervisor: _____

Phone: _____ Fax: _____

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

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

Describe:

_____

_____

_____

Length of shift _____ hours

Formal breaks

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

Informal breaks

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

Work pace control

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

Job rotation

☐ Yes ☐ No

Describe:

_____

_____

_____

_____

Work Organisation

Task Description

The table below contains a list of tasks performed by a Kiln Area 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%	
	Load/unload kilns					• *Frequency may vary depending on the number of kilns running and the drying time of the loads*
	Check moisture					• *Frequency depends on the number of kilns running and the drying time of the loads*
	Prepare loads					• *Frequency may vary depending on the length and condition of the loads*
	Direct forklift					• *Frequency may vary depending on the forklift's tasks*
	Drive forklift					• *See Forklift Tool Kit* • *Frequency may vary depending upon need*
	Straighten kiln carts					• *Frequency may vary depending on the number of carts needed during the shift*
	Computer/office work					• *Frequency depends on the office duties of the Kiln Area Operator* • *Inventory and venting of the kilns may be performed using the computer*
	Label loads					• *Frequency may vary depending on the number of loads in the shift that need to be labelled*
	Clean-up					• *See Clean-up Tool Kit* • *Frequency may vary depending on the condition of the yard and the kiln*
	Maintenance					• *Frequency may vary depending on need and whether maintenance is regularly scheduled*
	Other tasks:					

Workstation Characteristics

Dimensions & Layout

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

Flooring, Displays and Seating

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

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

Equipment & Machinery Controls

The table below contains a list of the types of controls used by a Kiln Area 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**
	Push/pull button	• *Emergency switch for kilns*	• *Frequency depends upon need*
	Touch buttons	• *Moisture meter controls*	• *Frequency depends on the number of tests being performed*
	Lever system	• *Open/close kiln doors*	• *Frequency depends on the drying time*
	Keyboard/mouse	• *Operate computer*	• *Frequency depends on computer use*
	Push buttons	• *Start/stop machines*	• *Frequency depends on use*
	Hand wheel	• *Open steam valve*	• *Frequency depends on use*
	Chain system	• *Open bevels/vents*	• *Frequency depends on drying time*
	Levers	• *Operate forklift*	• *See Forklift Tool Kit*
	Pedals	• *Operate forklift*	• *See Forklift Tool Kit*
	Steering wheel	• *Operate forklift*	• *See Forklift Tool Kit*
	Other:		

Physical Demands

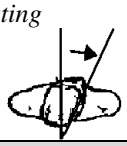
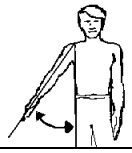
Whole Body Physical Demands

Identify each of the physical demands required by a Kiln Area 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%	
Example: Walking	• *Prepare loads*			✓		• *Frequency may depend upon the number of spacers needed to be placed*
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

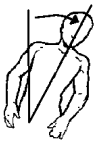
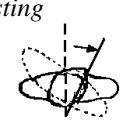
The table below outlines the body postures that may be adopted throughout the shift by a Kiln Area Operator, related to tasks. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

Body Posture	Task(s)	Percent of Shift				Comments
		Rarely 0 to 5%	Occasionally 6 to 33%	Frequently 34 to 66%	Constantly 67 to 100%	
Example: Shoulder Flexion	• *Prepare loads*			✓		• *Frequency may depend upon the number of spacers needed to be placed*
Neck						
Flexion 						
Extension 						
Twisting 						
Shoulder						
Flexion 						
Abduction/ adduction 						
Extension 						

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

Legend for Hand/Fingers

Handling	*Grasping, turning, holding, etc.*			
Fingering	*Picking, pinching, etc.*			
Gripping	*Power* 	*Pinch* 	*Hook* 	*Precision* 

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

Manual Material Handling

The table below contains a list of general manual material handling activities performed by a Kiln Area 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%	
Pushing							
Pulling							
Lifting							
Lowering							
Carrying							

Hand Tools

Indicate the hand tools used by a Kiln Area 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%	
	Stapler	• *Label loads*	*0.8*					
	Metal bar	• *Prepare loads*	*7.4*					
	Picaroon	• *Clean-up*	*0.3*					
	Shovel	• *Clean-up*	*1.4 to 3.1*					
	Broom	• *Clean-up*	*1.1*					
	Dunnage (3x4)	• *Prepare loads*	*4.5*					
	Dunnage (4x4)	• *Prepare loads*	*5.4*					
	Grease gun	• *Maintenance*	*1.2 to 2.0*					
	Chain saw	• *Prepare loads*	*5.4 to 7.2*					
	Ladder	• *Prepare loads* • *Maintenance*	*5.6*					
	Moisture meter	• *Check moisture*	*1.3 to 2.0*					
	Drill	• *Maintenance*	*1.2*					
	Solder iron	• *Maintenance*	*0.1*					

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%	
Wrenches	• *Maintenance*	*0.6 to 1.4*					
Mallet	• *Maintenance*	*1.1 to 2.0*					
Hammer	• *Maintenance*	*0.9*					
Jack	• *Maintenance*	*5.1*					
Bearings	• *Maintenance*	*0.8*					
Wheels	• *Maintenance*	*10.8 to 14.0*					
Flash light	• *Check moisture*	*1.8*					
Screwdriver	• *Maintenance*	*0.2*					
Temperature probe	• *Check moisture*	*0.2*					
Pliers	• *Maintenance*	*0.2*					
Other:							

Environmental Conditions

Work Environment

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

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

Location of Workstation

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

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

Temperature

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

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

Personal Protective Equipment

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

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

Appendix A – Weight of Wood Equation

1. Type of Wood Handled

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

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

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

2. Size of Wood*

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

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

* Conservative estimates of actual wood dimensions

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

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

3. Length of Wood

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

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

4. Weight of Wood Equation*

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

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

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

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

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

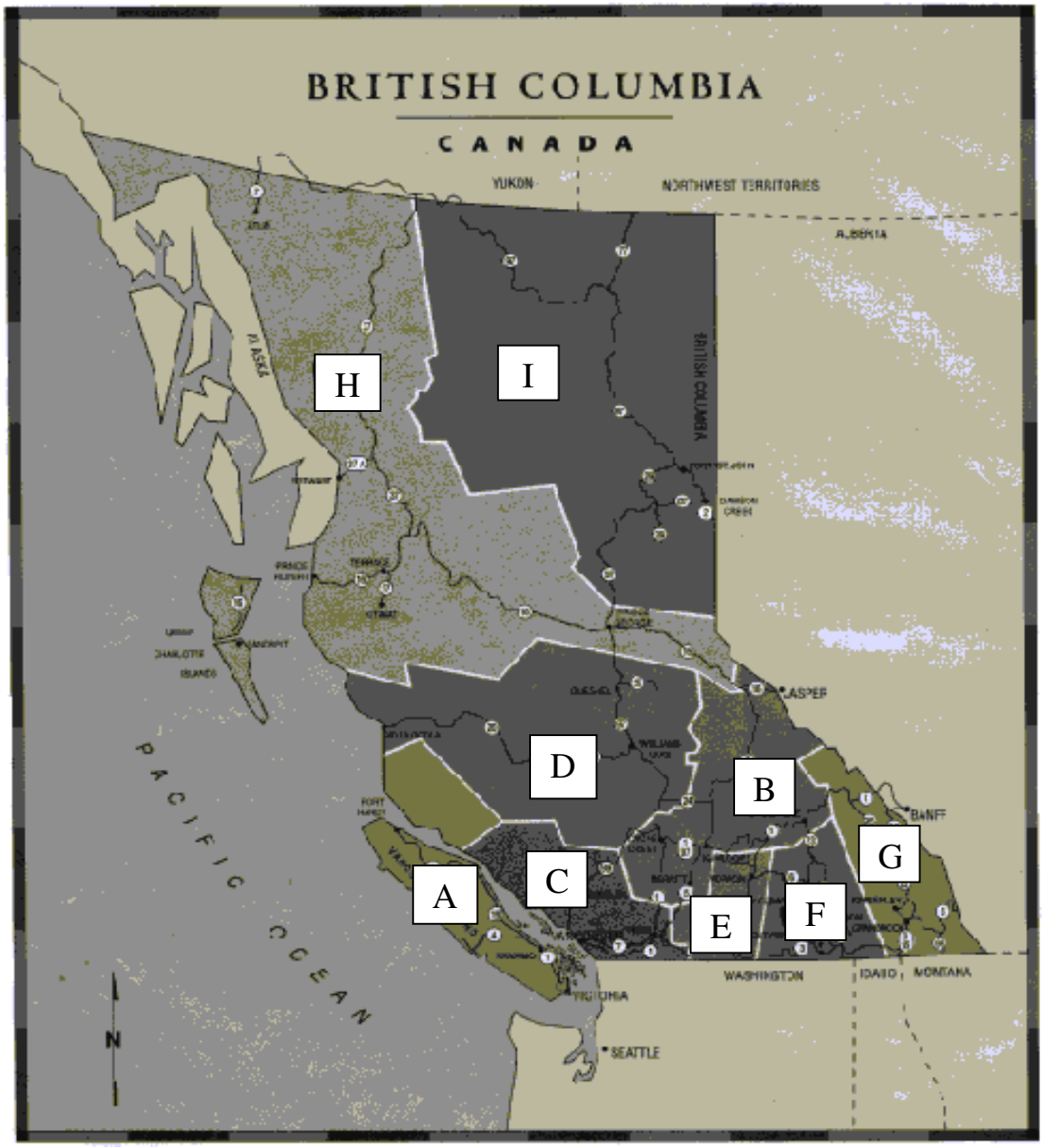
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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

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

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

Appendix B – Regional Map



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

Risk Factor Identification Checklist
Kiln Area Operator

Purpose

The Risk Factor Identification Checklist for a Kiln Area 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 – Kiln Area Operator

Management Representative _____

Worker Representative _____

Date _____

Risk Identification completed:

☐ Before implementation of solutions

☐ After implementation of solutions

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

Definitions

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

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

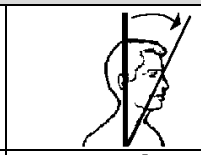
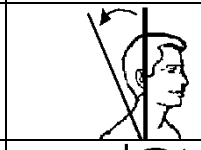
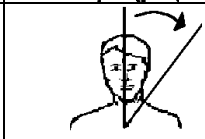
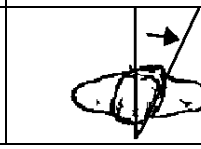
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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

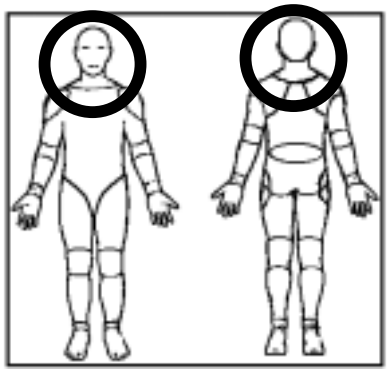
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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

NECK

Repetition		N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., looking up or down frequently)				S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., checking moisture)				S O	
Static Posture					
Ask the worker: Do tasks require your neck or shoulders to be maintained in a fixed or static posture? (e.g., looking down at a computer screen for a long period of time, looking up while working on a task)				S O	
Awkward Posture					
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Rotation				S O	

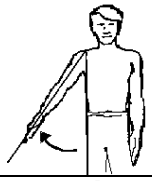
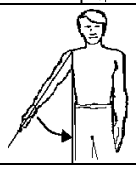
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



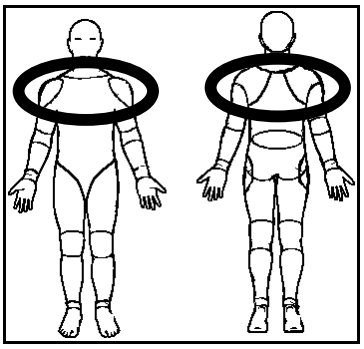
Body parts within the circled area will be classified as NECK issues.

SHOULDER

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again? (e.g., checking moisture)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., placing dunnage/spacers)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture?			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods? (e.g., moisture meter, grease gun)			S O	

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

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



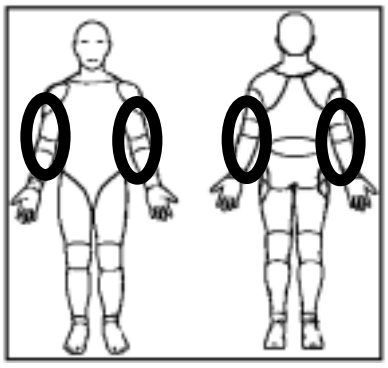
Body parts within the circled area will be classified as SHOULDER issues.

ELBOW

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., picaroon, broom, shovel) 			S O	
Are objects handled in a pinch grip? (e.g., dunnage) 			S O	
Are objects handled in a hook grip? (e.g., oil cans) 			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., placing dunnage)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., checking moisture)			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 a grease gun)			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?			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., hand tools that dig into the palm of the hand, metal edges of consoles or workstation digging into elbow)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment? (e.g., pneumatic drill)			S O	

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



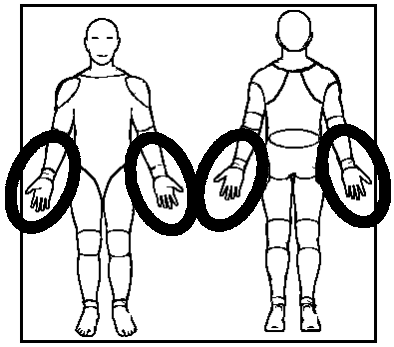
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., picaroon, boom, shovel) 			S O	
Are objects handled in a pinch grip? (e.g., dunnage) 			S O	
Are objects handled in a hook grip? (e.g., oil cans, kiln wheels) 			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., checking moisture)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., placing dunnage)			S O	

Static Posture	N	Y		Comments:
Ask the worker: Do tasks require any part of your arm or hand to be maintained in a fixed or static posture?			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., using automatic grease gun)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			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? (e.g., hand tools that dig into the palm of the hand)			S O	
Ask the worker: Do you use your hand like a hammer for striking?			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Ulnar Deviation 			S O	
Radial Deviation 			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	

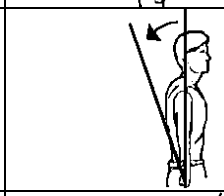
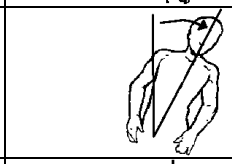
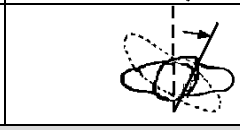
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there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



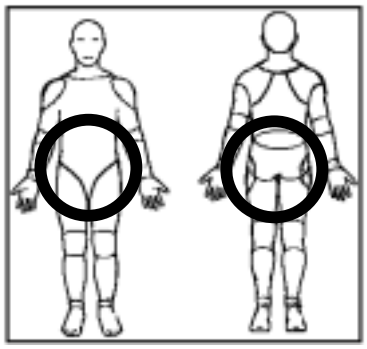
Body parts within the circled area will be classified as WRIST issues.

LOW BACK OR HIP/THIGH

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Repetition				
Are identical or similar motions performed over and over again?			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., bending to oil carts)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture?			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift? (e.g., sitting at a computer, standing for Swamper)			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh? (e.g., conveyors that dig into the hip or thigh)			S O	

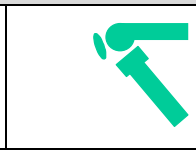
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift?				S O	

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

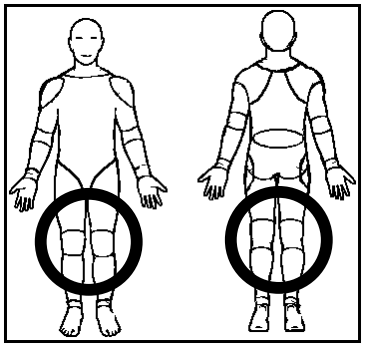


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

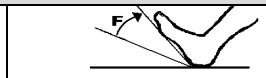
Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., climbing stairs, crouching)			S O	
Static Posture				
Ask the worker: Do tasks require you to maintain your knee(s) in a fixed or static posture?			S O	
Are workers required to sit or stand in a stationary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

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

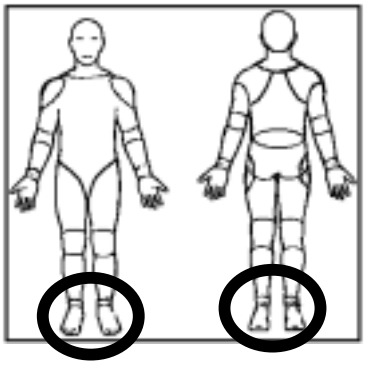


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

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

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



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

CHARACTERISTICS OF OBJECTS BEING HANDLED

	N	Y		Comments:
Are there problems handling a load due to its size or shape? (e.g., kiln carts)			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions? (e.g., oil)			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object? (e.g., hoists)			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., pneumatic tools, hand tools)			S O	
Ask the worker: Do any objects that you work with (other than tools or equipment) have handles? If the answer is **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? (e.g., forklifts)			S O	

WORK ORGANISATION

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

Injury Education **Injury Prevention**

Work Manual

Industrial
Musculoskeletal
Injury
Reduction
Program

Kiln Area Operator

(Kiln Operator and Swamper/Blockman)

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

Kiln Area Operator

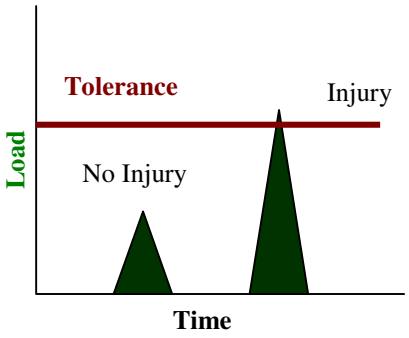
Disclaimer

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.

WM Table of Contents

Injury Education

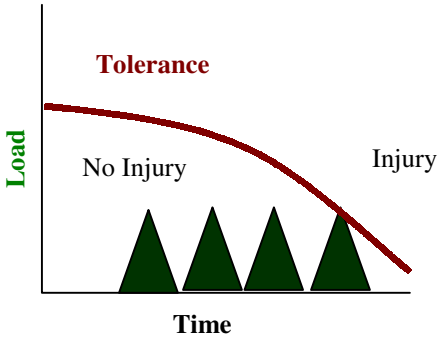
Injuries occur when …
Loads exceed tissue tolerances



Excessive Force

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

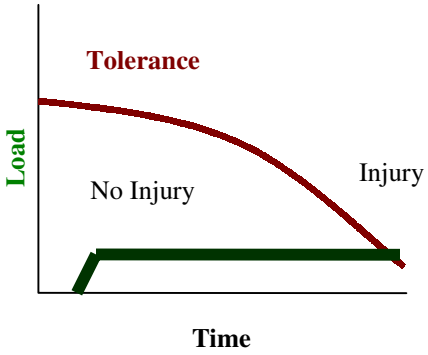
Example – a worker going over on their ankle and spraining it.



Excessive Repetition

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

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



Excessive Duration

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

Example – a Grader developing neck tension.

Body Parts at Risk

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

After all of the appropriate information is collected during the investigation of the Kiln Area Operator jobs (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 Kiln Area 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 Kiln Area Operator positions and found that the neck/shoulder, elbow/wrist, 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/Shoulder: Major risks include force, repetition and awkward posture with the neck/shoulder region while loading/unloading the kilns, placing dunnage, and checking moisture content. Straightening kiln carts and general maintenance duties may also contribute to the risk of discomfort or injury. The following solutions are targeted at reducing the risk of injury to the neck/shoulder:

1. Lightweight doors (page 78)
2. Lightweight spacer/dunnage (page 89)
3. Kiln door handle (page 76)

Elbow/Wrist: Major risks include force, awkward postures, and repetition with the elbow/wrist while placing dunnage and checking moisture content. The following solutions are targeted at reducing the risk of injury to the elbow/wrist:

1. Wand moisture meter (page 90)
2. Lightweight spacer/dunnage (page 89)
3. Stretches (page 85)

Low Back: Major risks include force, awkward postures, and repetition with the low back while loading/unloading kilns and handling dunnage. Kiln Area workers that drive forklifts may be at greater risk for low back injuries - see the Forklift Driver Work Manual for more details. The following solutions are targeted at reducing the risk of injury to the low back:

1. Raise height of dunnage bin (page 74)
2. Bend at knees (page 86)
3. Alternative to bending (page 87)

For additional stretching and strengthening exercises that would benefit a Kiln Area Operator, refer to the Neck, Shoulder, Elbow, Wrist, and Back sections of the Body Manual.

NECK/SHOULDER

Direct Risk Factors:
Force

A Kiln Area Operator may push or pull kiln doors in order to open and close kilns.

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

Force

- Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons.

INDIRECT RISK FACTORS

Workstation Design

Additional Workstation Design Options

- Loading on the shoulder muscles is increased when the doors of the kiln do not slide properly, due to bent guides, iced guides, jammed wheels, or other obstructions.
- Kiln doors of greater size and weight can place increased load on the tissues of the shoulder.

Environmental Conditions

Cold Exposure

- Loading on the shoulder muscles is increased when ice forms on the guides for the kiln doors. The operator may have to use more force to move frozen handles and doors.
- Fatigue of the shoulder muscles may develop more quickly when tissues are exposed to extreme temperature changes. A Kiln Area employee can experience large temperature changes when going from outside the kiln to warmer temperatures inside the kiln.

CONSEQUENCES

- Forceful pulling on kiln doors can lead to neck and/or shoulder strain.
- Signs and symptoms of neck and shoulder tissue injury include pain, tenderness, muscle spasm in the neck/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 94 to 97.
- To help prevent ***neck*** discomfort, see the upper trapezius stretch in the ***Neck section of the Body Manual.***

NECK/SHOULDER

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Kiln Area Operator may handle (lift, lower, push, pull, carry) load spacers, dunnage, kiln cart wheels, moisture meters, and other tools in order to prepare the loads, check moisture content and maintain the kilns. In all cases, these tasks may require repetitive forceful use of the arms in raised positions.

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. 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 and pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff.
- If the force placed on the rotator cuff exceeds tissue tolerances, injury may occur.

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on the tissues of the shoulder and upper back is increased when working with the arm raised to heights above the shoulder. This can occur when preparing the load or checking moisture content of wood.

Working Reaches

- Loading on tissues of the shoulder and upper back is increased when working with the arm raised and extended in the forward direction. This can occur when preparing the load or checking the moisture content of the wood.

Characteristics of Objects Being Handled

Load Condition and Weight Distribution

- Loading on the muscles of the shoulder increases as the number of pieces of dunnage/spacers handled at once increases. Handling a larger number of pieces of dunnage/spacers at once can create an off-balance load.

Container, Tools, and Equipment Handles

- Loading on the muscles of the shoulder is increased with the use of some types of moisture meters. Moisture meters that require probes to penetrate the wood in order to obtain a reading require more force to set than wand moisture meters that rest on the wood sample.

Environmental Conditions

Lighting

- Loading on the muscles of the shoulder can be increased with low lighting levels. The Kiln Area Operator may assume awkward arm postures to check the moisture content under low lighting levels.

CONSEQUENCES

- When using the arms handle spacers, dunnage, tools, and kiln carts, 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 94 to 97.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

ELBOW/WRIST

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Kiln Area Operator may grip spacers, dunnage, or moisture meters in order to prepare the load and check the moisture content of the wood.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

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

Repetition

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

Awkward Postures

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

- The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its neutral position. Bending the wrist forward or backward deviates from this position, and forearm muscles have to work harder to maintain grip. Consequently, gripping objects with the wrist bent increases tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.

INDIRECT RISK FACTORS

Characteristics of Objects Being Handled

Size and Shape

- Loading on the elbow/wrist may increase due to the size and shape of the load. The larger or more awkward the object is to handle, the more force required by the muscles of the elbow and wrist to grip the object.

Container, Tool, and Equipment Handles

- Loading on the elbow/wrist may increase due to the handles of the equipment. The larger or more awkward the handle is to use, the more force required by the muscles of the elbow and wrist to grip the object.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Elbow/Wrist, please see the column labelled “Elbow/Wrist” in the Summary of Solutions on pages 94 to 97.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

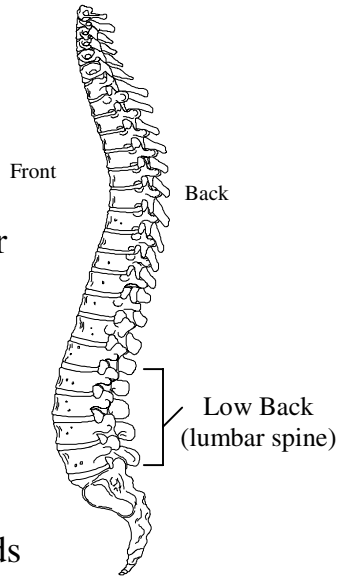
LOW BACK

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Kiln Area Operator may bend forward and/or to the side in order to pick up spacers and dunnage, straighten kiln carts, and perform cart maintenance.

BACKGROUND INFORMATION

Neutral Spine



- 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 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.

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- Loading on back muscles increases when working at low heights, such as ground level dunnage racks. In these positions, back muscles have to support the weight of the trunk and the load while bent forward.

Characteristics of Objects Being Handled

Size and Shape

- Loading on the back muscles is increased when a heavy load is lifted and lowered further away from the body, due to the size of the load.

CONSEQUENCES

- Repeatedly bending forward or to the side may lead to damage in the disc walls and other tissues of the back.
- 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 94 to 97.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

LOW BACK

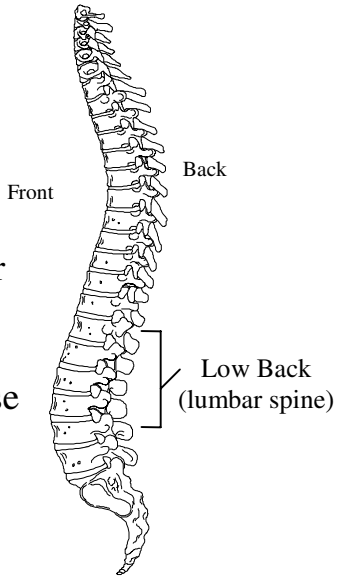
Direct Risk Factors:
Awkward Postures
Static Postures

A Kiln Area Operator may sit in order to operate kiln computers.

BACKGROUND INFORMATION

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

Neutral Spine



DIRECT RISK FACTORS

Awkward Postures
Static Postures

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

INDIRECT RISK FACTORS

Workstation Design

Seating

- Loading on the muscles of the back increases when little support is available from the seat back, or when that support is not used.

CONSEQUENCES

- 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 94 to 97.
- For exercises that can help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

Summary of Body Parts at Risk

NECK/SHOULDER

- A Kiln Area Operator may push or pull kiln doors in order to open and close kilns.

- A Kiln Area Operator may handle (lift, lower, push, pull, carry) load spacers, dunnage, kiln cart wheels, moisture meters, and other tools in order to prepare the loads, check moisture content and maintain the kilns. In all cases, these tasks may require repetitive forceful use of the arms in raised positions.

ELBOW/WRIST

- A Kiln Area Operator may grip spacers, dunnage, or moisture meters in order to prepare the load and check the moisture content of the wood.

LOW BACK

- A Kiln Area Operator may bend forward and/or to the side in order to pick up spacers and dunnage, straighten kiln carts, and perform cart maintenance.

- A Kiln Area Operator may sit in order to operate kiln computers.

Risk Factors by Body Part

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

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

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

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

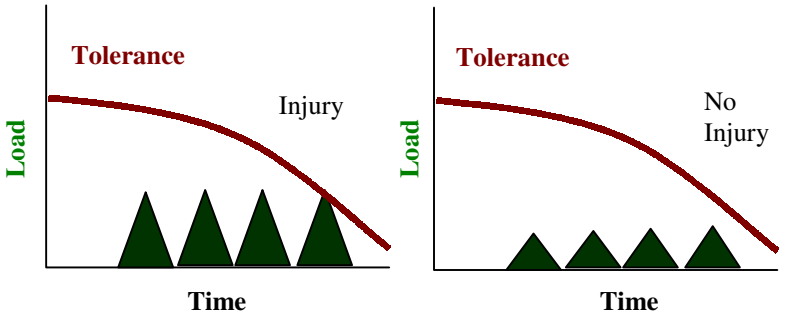
☐ = Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

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

✓ = Indicates that the risk factor was assessed as a contributor to the body part problem. Please see the Summary of Solutions Table on pages 94 to 97 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

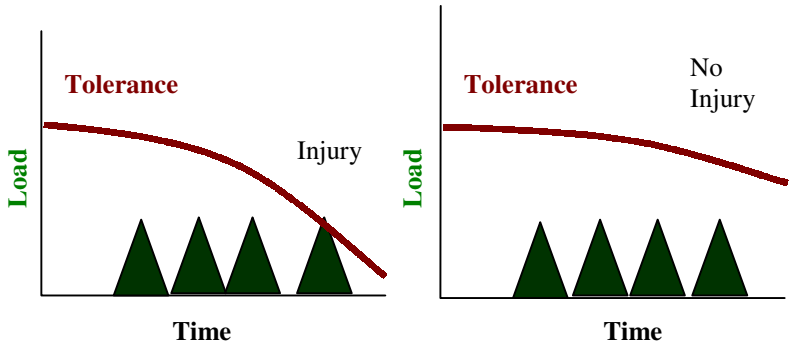
Injury Prevention

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

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

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

Risk Control Key

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

E

ENGINEERING CONTROLS

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

A

ADMINISTRATIVE CONTROLS

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

WP

WORK PRACTICE CONTROLS

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

PPE

PERSONAL PROTECTIVE EQUIPMENT

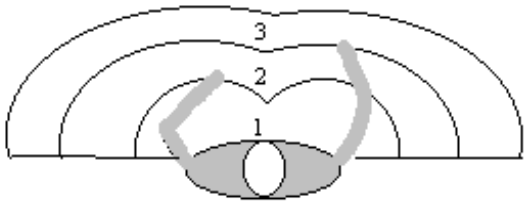
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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

Workstation Design

WORKING REACHES

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



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

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

Use light weight tools

E
WP

In order to decrease awkward shoulder and trunk postures during reaching, use a lightweight long pike pole or picaroon to straighten lumber and remove waste or crooked pieces from the stack. Provide various lengths of pike poles for different tasks and situations.

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 Kiln Area 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.

Raise height of dunnage bin

E
WP

In order to decrease awkward postures of the shoulder and back, keep dunnage bins at an optimal height. If purchasing or making new dunnage bins, have them closer to the optimal height between knuckle and shoulder level and consider decreasing the filled level.

Raise carts for greasing

E
WP

In order to reduce awkward postures of the shoulders and low back, stack kiln carts before greasing. Raising the height of the carts can also be achieved by placing the carts on a platform, or using a scissors lift.

Stacking the carts will provide a variety of cart heights to be greased, and as a result, provide a wider range of motion for the shoulders and the low back. The operator should only grease as high as is comfortable. Top carts can be taken down to grease.

Portable platform

E

In order to reduce awkward postures of the shoulders, make a portable platform (e.g., ladder, box) available to the Kiln Area worker to place spacers/dunnage on top of loads before the carts are moved into the kilns.

Raise the worker

WP

In order to reduce awkward postures of the shoulders, stand on kiln carts, dunnage, or another stationary platform to place spacers/dunnage on load.

Bringing the worker closer to the height of the work decreases awkward postures and forces at the shoulders.

Extend bevel/vent chains

E

In order to reduce awkward postures of the shoulder, have the chains for the bevels/vent drop to approximately waist height, allowing operators to pull the chain at lower levels instead of above shoulder height.

Crank for bevel/vents

E

In order to reduce awkward postures and decrease forces at the shoulder, install a crank system at waist height to open the bevel/vents.

Using cranks allows an operator to use mechanical advantage to open stuck bevels/vents, while still maintaining neutral shoulder postures.

Kiln door handle

E

In order to reduce awkward shoulder postures and excessive shoulder forces, avoid installing kiln door handles that are too high. Handle levers should be between hip and elbow height, to put operators in positions of maximum strength and comfortable posture while pushing down.

Handles too high lead operator to isolate shoulder muscles, forcing these muscles to do all of the work. Keeping the handles properly maintained and greased also helps minimise required force.

ADDITIONAL WORKSTATION DESIGN OPTIONS

Overhang for doors

E

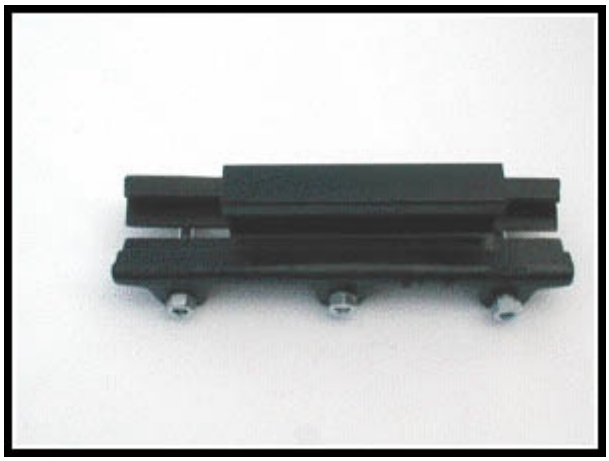
In order to reduce loading on the shoulder and low back, add an overhang above kiln doors to reduce ice and snow build up in wintertime. Limiting ice build-up will decrease force needed to pull doors open and shut.

I-Beam system

E

In order to reduce the loading on the shoulder and low back, investigate the use of an I-Beam system (below left) for the kiln doors instead of a track system (below right). The I-Beam system may not develop as much ice build-up in the winter, as it is located away from the door.

I-Beam system



Track system

Secure seal

E

In order to reduce loading on the shoulder and low back, ensure a secure seal of the doors.

Excess condensation or moisture due to escaping steam can lead to ice build-up on the kiln door tracks and on the ground surrounding the kilns. With a secure seal, less steam will escape, leading to less ice build-up on the doors and ground in the wintertime.

Lightweight doors

E In order to reduce loading on the shoulder and low back, chose kilns with lightweight doors when building new kilns. The reduction in the weight of the doors will minimise the effort needed to open and close them.

Heating system for door tracks

E In order to reduce loading on the shoulder and low back, heat the tracks of the kiln doors to reduce ice and snow build-up in wintertime.

Limiting ice build-up will decrease force needed to pull doors open and shut.

Winch system for kiln doors

E In order to minimise force on the shoulders and back, install a winch system to aid in opening kiln doors.

This door-opening winch system would reduce the force needed to open the kiln door.

Maintain kiln cart track

E

In order to reduce force on the shoulders and back when cleaning kiln cart tracks, use a pressure washer or blower to clean kiln cart tracks.

Position grease nipples

E

In order to minimise awkward postures of the shoulder and low back, change the location of the grease nipple to the outside of the wheel. By changing the greasing system to one where the grease nipples are on the outside decrease the amount of bending need to locate the nipple.

Guidelines for Office Work

The following office work guidelines are recommended for workers who have office duties in addition to their tasks throughout the sawmill.

WORKSTATION LAYOUT

Computer workstation layout

E
WP

In order to reduce awkward postures of the neck/shoulder, lay out the workstation so the computer can be used from a straight on position (Figure 1). This layout eliminates any twisting (awkward postures of neck and back) by the operator to work at the computer (Figure 2).

Figure 1 – computer in front of worker

Figure 2 – computer off to side

Keyboard placement

E
WP

If keyboard use is predominant, centre the middle of the letter keys in front of the worker, leaving the number pad out to the right-hand side. If the number pad is used more frequently, move the keyboard so that the number pad is in line with the right shoulder. This positioning will reduce awkward postures of the neck/shoulder and low back.

Adjustable keyboard and mouse trays

E
WP

An adjustable keyboard and mouse tray helps to decrease awkward postures of the wrists by allowing the operator to adjust the keyboard and mouse to the most comfortable height and reach distances. The keyboard should be at a height where the wrists are straight when the fingers are on the middle row of keys. This is also a good position for "hunt-and-peck" typists.

If the work surface does not adjust up or down, raise or lower the chair to a height where the worker can maintain neutral wrist postures. Keeping the wrists neutral will reduce the risk of wrist discomfort or injury.

Wrist support

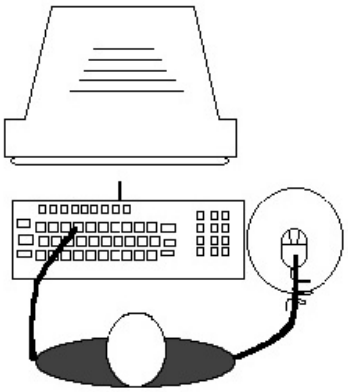
E

In order to minimise awkward postures of the wrists while typing or mousing, use a wrist support to help keep the wrists in neutral position. A wrist support made of soft material such as foam or gel will also reduce contact stress on the wrists.

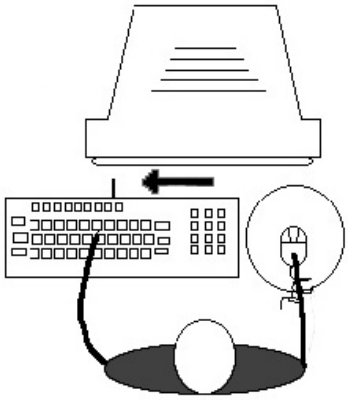
Mouse placement

E
WP

In order to reduce awkward postures of the shoulder, position the mouse close to, and at the same height as, the keyboard. If the mouse is used more frequently than the keyboard, position the mouse so that it is on the desk directly in front of the arm that uses the mouse.



Position for mainly keyboard use



Position for mainly mouse use

Monitor positioning

Proper positioning of the monitor can reduce several ergonomic risk factors:

E
WP

To reduce eyestrain and awkward postures of the neck, position the monitor approximately one arm's length distance from the worker. Larger monitors may need to be positioned further away for proper focus.

E
WP

In order to reduce awkward postures of the neck, adjust monitor height so that the top of the screen is at eye level.

Bifocal wearers may want to position the screen lower so that it is more comfortably viewed through the bottom half of the eyeglass lenses.

Suggestions for lowering the monitor:

- Take it off central processing unit and place it directly on desk
- Raise height of the chair

Suggestions for raising the monitor:

- Put book or other flat object under screen
- Place monitor on adjustable arm

WP

To minimise glare on the monitor due to overhead lights, tilt monitor downward slightly and locate it perpendicular to windows. Minimising glare will reduce eyestrain.

Desk workstation layout

E

In order to reduce awkward postures of the upper body, organise items on the desk to correspond with the frequency of daily tasks. The most frequently used items (e.g., keyboard and mouse) should be placed within forearm's reach. Less frequently used items (e.g., phone) should be placed within a comfortable arm's reach, and infrequently used items (e.g., reference books) can be placed further away.

Phone placement

E

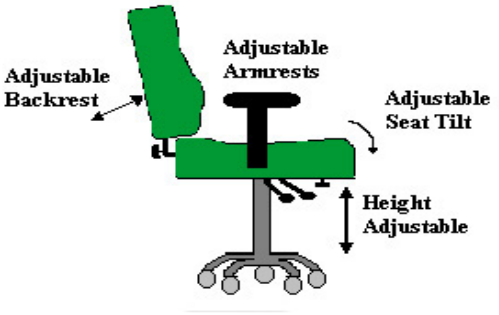
In order to reduce awkward postures of the upper body, place the phone on the non-dominant side. For example, a right-handed worker should place the phone on the left side of the workstation. This positioning allows the worker to write while on the phone without the phone cord in the way.

SEATING

Adjustable seating

E
WP

To avoid awkward and static postures, seating should have several adjustable features to allow for continual postural adjustments. Workers should be trained on how and why to use adjustable features. Poor chairs can contribute to back stress, circulation problems, fatigue, and discomfort. A good chair should have the following:



- Adjustable height
- Adjustable backrest
- Adjustable backrest height
- Adjustable arm rests
- Adjustable seat tilt
- Waterfall edge to seat
- Five legs
- Swivel seat
- Durable/breathable fabric

Vary body posture

WP

In order to reduce awkward and static postures, encourage the worker to get up from the seated posture throughout the day. This posture change reduces load on the spine, allows discs to equalise, and allows ligaments to regain their stiffness after being stretched out from sitting.

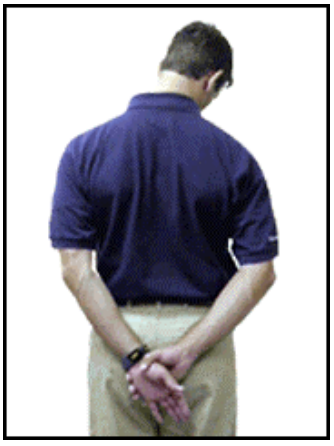
Additional Work Practices

Stretches

WP In order to minimise awkward and static posture of the shoulder, elbow/wrist and low back, stretch these body parts throughout the day to enhance tissue tolerance for those muscle groups. See additional stretches in the Body Manual.

Neck Stretch

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

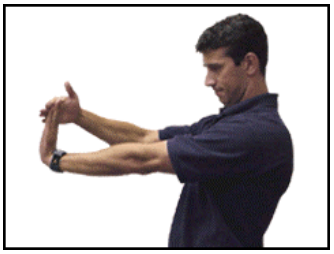


Shoulder Stretch

Gently pull elbow towards opposite shoulder. Stretch to the point of mild tingling and not beyond. When the tingling subsides deepen the stretch. Repeat until full range of motion is achieved.

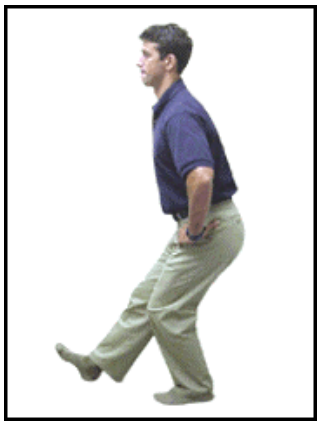
Wrist Flexor and Extensor Stretch

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.



Hamstring Stretch

Place one foot in front of the other and squat down. Hold for 5 seconds. Repeat 3 times with each leg.



Bend at knees

WP In order to reduce awkward postures of the neck/shoulder and low back, crouch or kneel down when working at cart level so that you are closer to the load.

Alternate sides

WP In order to reduce awkward postures and repetitive movements of the shoulder and low back, switch sides for lifting dunnage while preparing a load. This technique will reduce repetitive movements typically done on one side only.

Alternative to bending

WP In order to reduce the frequency of awkward postures of the neck/shoulder and low back, try moving kiln carts with the legs and feet. It is important to have a solid base of support and good traction when pushing objects with the feet. Alternate using both feet and make smooth rather than quick movements.

Two person push

A WP In order to reduce forces in the shoulder and low back, get help to open the kiln doors in tough situations, such as windy days or freezing conditions.

Rest stretch

WP In order to counteract the effects of awkward shoulder postures when working overhead, take stretch breaks every few minutes, or alternate overhead work with other tasks that can be done in a neutral posture.

Characteristics of Objects Being Handled

Power positions

WP Use power positions when handling loads or exerting force on objects. Using larger and stronger muscles when doing heavy or forceful work reduces the risk of muscle strain. For lifting, a power position is adopted when a worker remembers to 'lift with the legs, not the back'. This phrase is based on the fact that the muscles of the thighs are larger and more powerful than the muscles of the low back. Other examples of using power positions include using leverage to help move heavy objects and lumber when possible, and using the hips and legs to push debris on the floor when sweeping.

Manual material handling

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

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

SIZE AND SHAPE

Two hands at once

WP In order to reduce loading on the elbow/wrist when handling lumber, use both hands to push, pull, lift, or lower larger spacers. This coupling will significantly decrease the load on one hand and arm when doing the same task.

LOAD CONDITION AND WEIGHT DISTRIBUTION

Lightweight spacer/dunnage

E — In order to reduce the force on the shoulder, elbow/wrist, and low back, investigate the use of lightweight spacers/dunnage made of plastic or fibreboard.

Carry loads within your limits

WP — In order to reduce the force on the shoulders, elbow/wrist, and low back when manually handling dunnage/spacers or kiln cart wheels, carry loads within your limits. Workers should not feel any straining when lifting and carrying within body limits.

Wheelbarrow

WP — In order to reduce the force on the low back, use a carrying aid, such as a wheelbarrow, to move kiln wheels.

Lightweight, sharp tools

A WP — In order to decrease the force required when placing spacers and performing clean-up and maintenance, ensure that tools used to manipulate wood (e.g., picaroons, chainsaws) are lightweight and sharp.

CONTAINER, TOOL AND EQUIPMENT HANDLES

Wand moisture meter

E

In order to reduce awkward, repetitive, and forceful postures of the shoulder and elbow/wrist, use a wand-style moisture meter instead of the power grip moisture meter. The power grip moisture meter requires the operator to repeatedly bang the handle of the probe to push the sensors into the sample lumber. For the wand, the sensor is simply placed between the pieces and then held up or down to take the reading.

Power grip moisture meter

Wand moisture meter

Sticky palm gloves

PPE

In order to reduce grip forces required by the Kiln Area Operator worker, the operator should wear thin, close fitting gloves with a "sticky" palm surface to increase the friction between the gloves and the dunnage or tool handles.

Environmental Conditions

LIGHTING

Outdoor lighting

E

In order to reduce awkward postures of the shoulder and low back when working outside the kilns at night, provide ample illumination with outdoor floodlights.

Headlamp

PPE

In order to reduce awkward postures of the shoulder and low back when monitoring moisture content in the kilns, have operators wear a headlamp similar to what a miner or a cyclist wears.

Headlamps can increase the task lighting level in the kiln while leaving the hands free to check and record moisture levels and operate bevels or vents.

Reduce glare

PPE To minimise awkward neck postures due to glare, operators may wear sunglasses, to filter sunlight.

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

Work Organisation

Job rotation

A

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

Store dunnage

E
A

In order to reduce force on the shoulder, elbow/wrist, and low back, store dunnage/spacers in a covered area. This storage will reduce the amount of moisture the dunnage absorbs, decreasing the weight.

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Use light weight tools	**73**		**A**					**A**				
Raise height of dunnage bin	**74**		**A**					**A**				
Raise carts for greasing	**74**		**A**					**A**				
Portable platform	**75**		**A**									
Raise the worker	**75**		**A**									
Extend bevel/vent chains	**75**		**A**									
Crank for bevel/vents	**75**		**A F**									
Kiln door handle	**76**		**A F**									
Overhang for doors	**77**		**F**					**F**				
I-Beam system	**77**		**F**					**F**				
Secure seal	**77**		**F**					**F**				
Lightweight doors	**78**		**F**					**F**				
Heating system for door tracks	**78**		**F**					**F**				
Winch system for kiln doors	**78**		**F**					**F**				

Direct Risk Factors

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle	Foot
Maintain kiln cart track	**79**		**F**					**F**				
Position grease nipples	**79**		**A**					**A**				
Computer workstation layout	**80**		**A**									
Keyboard placement	**80**		**A**		**A**			**A**				
Adjustable keyboard and mouse trays	**81**				**A**							
Wrist support	**81**				**A**							
Mouse placement	**82**		**A**									
Monitor positioning	**82**		**A**									
Desk workstation layout	**83**		**A**		**A**							
Phone placement	**83**		**A**		**A**							
Adjustable seating	**84**		**A**		**A**			**A S**				
Vary body posture	**84**		**A**		**A**			**A S**				
Stretches	**85**	directly reduces risk of injury to the body										
Bend at knees	**86**		**A**					**A**				
Alternate sides	**86**		**A R**					**A R**				

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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
Alternative to bending	**87**		**A**					**A**				
Two person push	**87**		**F**					**F**				
Rest stretch	**87**		**A**									
Power positions	**88**		**F**		**F**			**F**				
Manual material handling	**88**		**F** **A**		**F** **A**			**F** **A**				
Two hands at once	**88**				**F**							
Lightweight spacer/dunnage	**89**		**F**		**F**			**F**				
Carry loads within your limits	**89**		**F**		**F**			**F**				
Wheelbarrow	**89**							**F**				
Lightweight, sharp tools	**89**		**F**		**F**			**F**				
Wand moisture meter	**90**		**F** **R** **A**		**F** **R** **A**							
Sticky palm gloves	**90**				**F**							
Outdoor lighting	**91**		**A**					**A**				
Headlamp	**91**		**A**					**A**				

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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
Reduce glare	**92**		**A**									
Job rotation	**93◆**	indirectly reduces risk of injury to the body										
Store dunnage	**93**		**F**		**F**			**F**				
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										
Task Rotation	◆	indirectly reduces risk of injury to the body										
Work Pace	◆	indirectly reduces risk of injury to the body										
Scheduling	◆	indirectly reduces risk of injury to the body										

Direct Risk Factors

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

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◆ = *See General Risk Factor Solutions Manual*

KILN AREA OPERATOR MSI SAFETY GUIDE

OBJECTIVE:
To identify ergonomic risks involved for a Kiln Area Operator and to reduce the potential for musculoskeletal injuries.
More detailed information about risk reducing recommendations can be found in the Work Manual for the Kiln Area Operator.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder A Kiln Area Operator may push or pull kiln doors in order to open and close kilns.	**Force**	• Neck and shoulder muscles support the weight of objects held in the hands. The heavier the object, the greater the load on the muscles and tendons.	• Get help to open the kiln doors in a windy or winter day, when the doors require more force to open them. • For exercises that can help prevent ***Neck/Shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck/Shoulder A Kiln Area Operator may handle (lift, lower, push, pull, carry) load spacers, dunnage, kiln cart wheels, moisture meters, and other tools in order to prepare the loads, check moisture content and maintain the kilns. In all cases, these tasks may require repetitive forceful use of the arms in raised positions.	**Force** **Repetition** **Awkward Postures**	• The rotator cuff stabilises the shoulder joint when objects are pushed and pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff. • If the force placed on the rotator cuff exceeds tissue tolerances, injury may occur. • When the arms are repeatedly lifted, muscles of the neck and shoulders are subjected to repeated stress with little or no time for recovery. If repetitive stress is excessive, and recovery is not adequate, tissues may fatigue to the point of injury. • Neck and shoulder muscles must support the weight of the arms when they are away from the body. The farther away the arms are from the body, the greater the load on muscles and tendons.	• When working with the arms above shoulder height, take stretch breaks every few minutes. • Alternate overhead work with other tasks that can be done in a neutral posture. • Vary your tasks as much as possible throughout the day. This will reduce the repetition of any one awkward posture. • For exercises that can help prevent ***Neck/Shoulder*** injuries, ***see the Neck and Shoulder sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Kiln Area Operator may grip spacers, dunnage, or moisture meters in order to prepare the load and check the moisture content of the wood.	**Force** **Repetition** **Awkward Postures**	• Gripping an object requires activation of the forearm muscles, which generates tension at the tendon/bone connection of the elbow. The harder that an object must be gripped, the greater the load on the tendon/bone connection. • Repeated stress to the elbow without adequate rest could slowly fatigue tissues to the point of injury. • The width of an object affects how much muscle tension needs to be generated. There is an optimal grip width where the forearm muscles work efficiently. Outside this width, muscles have to work harder to generate equivalent tension. Consequently, objects that are too large (e.g., large cuts of wood) or too small (e.g., narrow tool handles) could increase the tension generated by muscles, and lead to tissue fatigue at the tendon/bone connection. • The position of the wrist also affects how much muscle tension needs to be generated. There is an optimal wrist position where the forearm muscles work efficiently. This occurs when the wrist is in its neutral position. Bending the wrist forward or backward deviates from this position, and forearm muscles have to work harder to maintain grip. Consequently, gripping objects with the wrist bent increases tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.	• Keep the load close to the body when lifting and lowering. • Use aids, such as a wheelbarrow, to move kiln cart wheels. • Lift fewer pieces of dunnage/spacers at once to decrease the required force. • Lift with two hands • For exercises that can help prevent ***Elbow/Wrist*** injuries, ***see the Elbow and Wrist sections of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Low Back A Kiln Area Operator may bend forward and/or to the side in order to pick up spacers and dunnage, straighten kiln carts, and perform cart maintenance.	**Force** **Repetition** **Awkward Posture**	• Lifting increases 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. • Repeated forward bending, side bending, and/or lifting can gradually fatigue structures of the low back. If repetitive stress is excessive and recovery is not adequate, disc walls may fatigue to the point of injury. • Back muscles must support the weight of the upper body when leaning forward/to the side. Increased bending of the back increases loading on the spine and pressure on the walls of the discs.	• Keep the load close to the body when lifting and lowering. • Use aids, such as a wheelbarrow, to move the kiln cart wheels. • Lift fewer wheels at once to decrease the required force. • For exercises that can help prevent ***Back*** injuries, ***see the Back section of the Body Manual***.
	A Kiln Area Operator may sit in order to operate kiln computers.	**Awkward Postures** **Static Postures**	• Sitting increases loading on the walls of the discs. If the duration of sitting is excessive, and recovery is not adequate (e.g., spine not returned to neutral posture for long duration), tissues may deform to the point of injury.	• When sitting, keep the back in a natural position (ears, shoulders, and hips aligned). • Make slight posture variations/chair adjustments throughout the shift. • Try standing during formal breaks rather than sitting. • For exercises that can help prevent ***Back*** injuries, ***see the Back section of the Body Manual***.