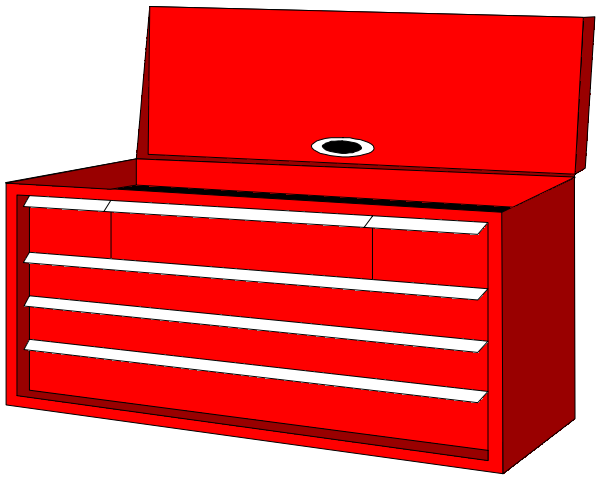
Industrial Musculoskeletal Injury Reduction Program

Common Industry Jobs (CIJs)

Tie-up/End Capper 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

TIE-UP/END CAPPER OPERATOR TOOL KIT
Table of Contents

Overview

Tie-up/End Capper Operator

Job Summary

A Tie-up/End Capper Operator is responsible for operating the tie-up machine to fasten bundles of siding together. A Tie-up/End Capper Operator may align bundles, place end caps on end, tie bundles, maintain equipment, saw off long ends, and replace misfit boards. Refer to the Physical Demands Analysis for more detail.

Physical Demands

The physical demands of the Tie-up/End Capper Operator may include:

a) Forceful exertions of the shoulder and elbow/wrist
b) Awkward postures of the neck, shoulder, elbow/wrist, low back, and ankle/foot
c) Repetitive movements of the neck, shoulder, elbow/wrist, low back, and ankle/foot
d) Continuous standing
e) Pushing and pulling bundles
f) Carrying siding

Mental Demands

A Tie-up/End Capper Operator may inspect the bundles, and decide on the appropriate label.

Major Variations

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

1) Workstation design may vary in terms of the worker getting closer to the bundles by:
   a) Infeed belts
   b) Cut outs in workstation

2) Size of bundles may vary in terms of:
   a) The length
   b) Width
   c) Depth

3) Different types and location of controls to operate infeed belts include:
   a) Foot pedals
   b) Finger push button controls

Minor Variations

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

1) Workplace environmental characteristics in terms of:
   a) Lighting
   b) Noise levels
   c) Vibration transmitted through the floor

Physical Demands Analysis
Tie-up/End Capper Operator

PDA General Instructions: Tie-up/End Capper Operator

The purpose of this PDA is to familiarise healthcare professionals with the physical demands of a Tie-up/End Capper 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 Tie-up/End Capper 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.

Disclaimer

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

PDA Table of Contents

Physical Demands Analysis

Tie-up/End Capper Operator

Task List

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

Align bundles

A Tie-up/End Capper Operator pulls bundles against a bar to aligned them.

Does this task occur at your mill?

☐ Yes ☐ No

Place end cap on end

A Tie-up/End Capper Operator will put an end cap or label on the end of the bundle.

Does this task occur at your mill?

☐ Yes ☐ No

Tie bundles

A Tie-up/End Capper Operator will tie the bundles together.

Does this task occur at your mill?

☐ Yes ☐ No

Maintenance

A Tie-up End Capper may maintain equipment.

Does this task occur at your mill?

☐ Yes ☐ No

Saw off long ends

A Tie-up/End Capper Operator may saw off long ends.

Does this task occur at your mill?

☐ Yes ☐ No

Replace misfit boards

A Tie-up/End Capper Operator may replace misfit boards by taking the board back to the racks then bringing back the proper board.

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 Tie-up/End Capper 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%	
	Align bundles					• *Production varies from 1000 to 3500 bundles per shift*
	Place end caps on end					• *Production varies from 1000 to 3500 bundles per shift*
	Tie bundles					• *Production varies from 1000 to 3500 bundles per shift*
	Maintenance					• *Maintenance is performed as needed. Time spent on maintenance varies*
	Saw off long ends					• *Rarely occurs*
	Replace misfit boards					• *Time spent replacing boards varies*
	Other:					

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 Tie-up/End Capper 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
	Foot pedals	• *Lifts end of bundle to help align siding* • *Fasten ties around bundle* • *Operates outfeed rolls*	• *Production varies from 1000 to 3500 bundles per shift* • *Foot pedal is activated once per bundle to lift ends, twice per bundle to fasten ties around bundle, and once per bundle to operate rolls*
	Finger push button	• *Fastens ties around bundle* • *Brings bundles towards worker on chain*	• *Production varies from 1000 to 3500 bundles per shift* • *Finger buttons are pressed twice per bundle to fasten ties around bundles, and once to bring bundles into worker*
	Other:		

Physical Demands

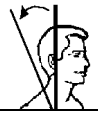
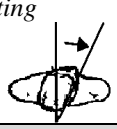
Whole Body Physical Demands

Identify each of the physical demands required by a Tie-up/End Capper 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: Standing	• *Align bundles*				✓	• *Majority of the day*
Walking						
Sitting						
Standing						
Climbing						
Balancing						
Kneeling/ Crouching						
Other:						

Body Postures

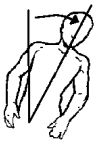
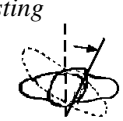
The table below outlines the body postures that may be adopted throughout the shift by a Tie-up/End Capper Operator, related to tasks. Check off (✓) the estimated *Percent of Shift,* and use the *Comments* section to include information describing posture duration, frequency, cycle times, and hand used.

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	• *Align bundles*		✓			• *Production varies from 1000 to 3500 bundles per shift* • *Worker goes into shoulder flexion when they reach for a bundle*
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 Tie-up/End Capper 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 Tie-up/End Capper 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%	
	Saw	• *Saw off long ends*	*Approximately 1*	✓				• *Rarely used*
	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 Tie-up/End Capper 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.

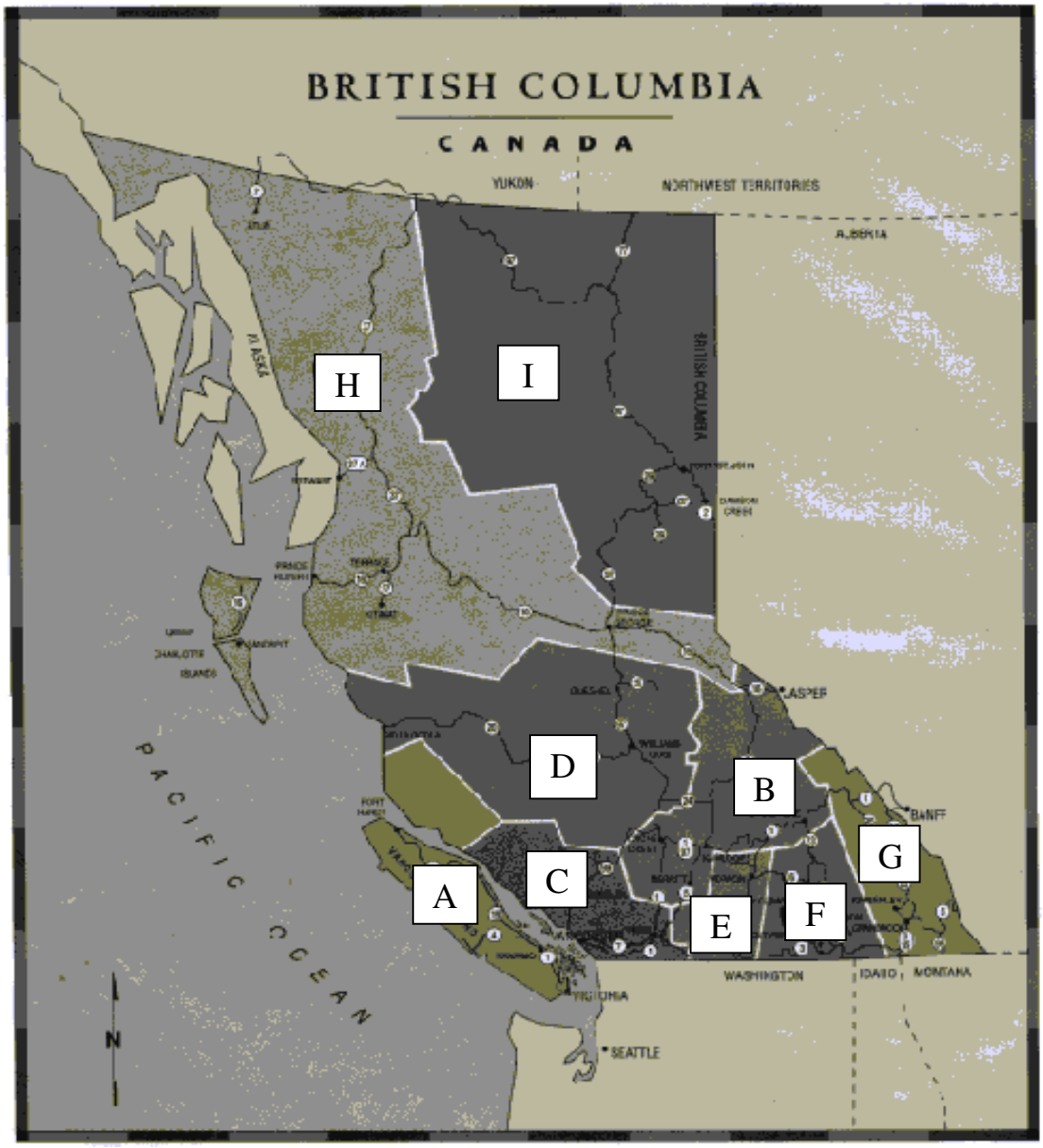
For the lightest species handled, enter the lb./board foot value, the multiple for the smallest size of wood, and the shortest length of this wood. Multiply these values together to determine the weight of the board in pounds.

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
Tie-up/End Capper Operator

Purpose

The Risk Factor Identification Checklist for a Tie-up/End Capper 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 – Tie-up/End Capper 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.

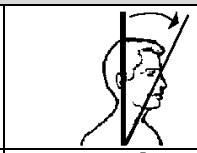
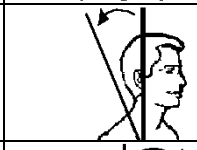
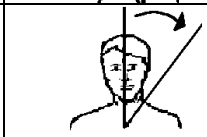
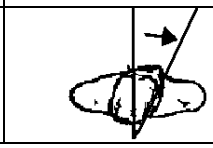
Static Postures: Static loading (sustained exertions) is physical effort (body postures) that is held, requiring muscle contraction for more than a short time.

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.

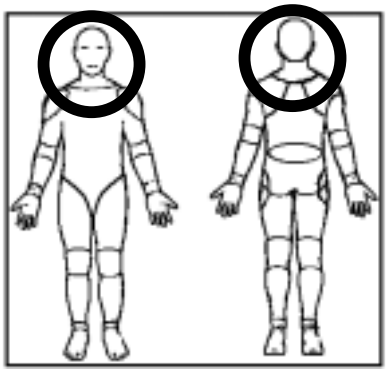
Awkward Postures: Awkward postures occur when there is a deviation from a power working posture. Some examples of awkward postures typically include reaching behind, twisting, working overhead, and forward or backward bending.

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 down or sideways frequently)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., operating tie-up machine)			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 bundles for long periods)			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Lateral Bending 			S O	
Rotation 			S O	

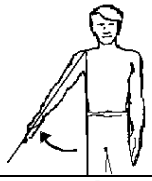
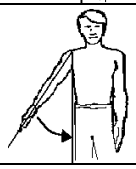
Please indicate whether the following direct risk factors were identified at the **NECK**.		
Direct Risk Factors	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
In the **Injury Statistics** investigation, were there injury reports for the Neck or Head/Eye or Upper Back? (see Worksheet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



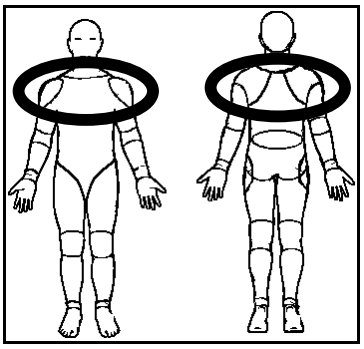
Body parts within the circled area will be classified as NECK issues.

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., reaching for bundles)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., handling bundles)			S O	
Static Posture				
Ask the worker: Do tasks require your shoulders to be maintained in a fixed or static posture? (e.g., working on machinery)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			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



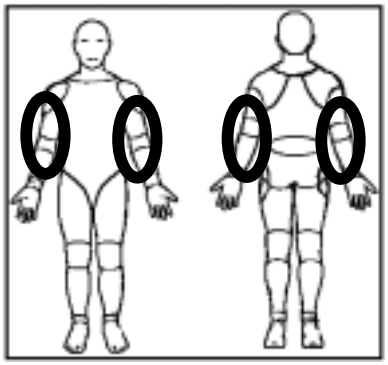
Body parts within the circled area will be classified as SHOULDER issues.

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., tools) 			S O	
Are objects handled in a pinch grip? (e.g., siding) 			S O	
Are objects handled in a hook grip? (e.g., bundles) 			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., handling bundles)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., handling bundles)			S O	

Static Posture	N	Y		Comments:
Ask the worker: Do tasks require your hand and arm to be maintained in a fixed or static posture?			S O	
Ask the worker: Do you apply constant pressure on controls/objects with your hand? (e.g., activating infeed rollers)			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., bracing body with hand against guards)			S O	
Vibration				
Ask the worker: Is vibration transmitted to your hand through a tool or piece of equipment?			S O	

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



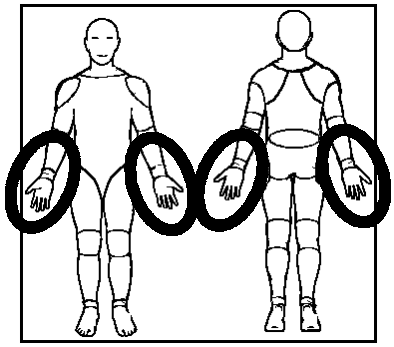
Body parts within the circled area will be classified as ELBOW issues.

WRIST/HAND

Force	N	Y		Comments:
Is forceful physical handling performed? Such as: Lifting			S O	
Lowering			S O	
Pushing			S O	
Pulling			S O	
Carrying			S O	
Turning materials			S O	
Are objects handled in a power grip? (e.g., tools) 			S O	
Are objects handled in a pinch grip? (e.g., siding) 			S O	
Are objects handled in a hook grip? (e.g., bundles) 			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., handling bundles)			S O	
Ask the worker: Do you spend a large percentage of the day performing one action or task? (e.g., handling bundles)			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., operating controls to activate tie-up machine)			S O	
Ask the worker: Do you hold parts, tools, or objects for long periods?			S O	
Contact Stress				
Ask the worker: Do **<u>any</u>** objects, tools or parts of the workstation put pressure on **<u>any</u>** parts of your hand or arm, such as the backs or sides of fingers, palm or base of the hand, forearm? (e.g., bracing upper body with hand against guards)			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	

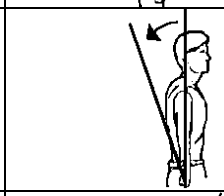
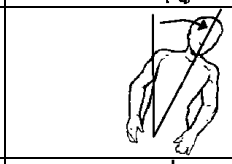
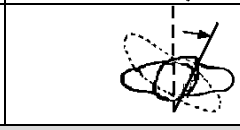
Please indicate whether the following direct risk factors were identified at the **WRIST/HAND**.		
Direct Risk Factors	Force	☐Yes ☐No
	Repetition	☐Yes ☐No
	Static Posture	☐Yes ☐No
	Contact Stress	☐Yes ☐No
	Awkward Posture	☐Yes ☐No
	Vibration	☐Yes ☐No
In the **Injury Statistics** investigation, were there 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



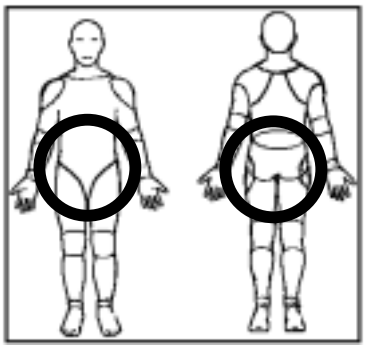
Body parts within the circled area will be classified as WRIST issues.

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., reaching forward for bundles)			S O	
Static Posture				
Ask the worker: Do tasks require your trunk and upper body to be maintained in a fixed or static posture? (e.g., working on machinery)			S O	
Are workers required to sit or stand in a stationary position for long periods of time during the shift?			S O	
Contact Stress				
Ask the worker: Do **any** objects, tools or parts of the workstation put pressure on **any** parts of your hip/thigh? (e.g., guards that dig into the hip or thigh)			S O	

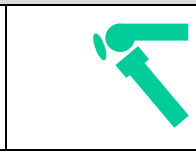
Awkward Posture		N	Y		Comments:
Flexion				S O	
Extension				S O	
Lateral Bending				S O	
Twisting				S O	
Vibration					
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift?				S O	

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

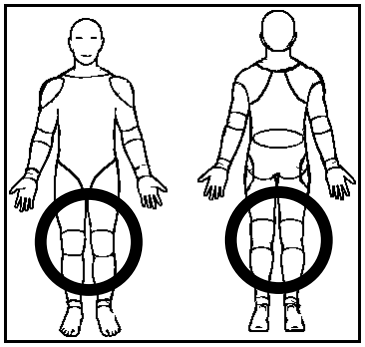


Body parts within the circled area will be classified as LOW BACK issues.

KNEE

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

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

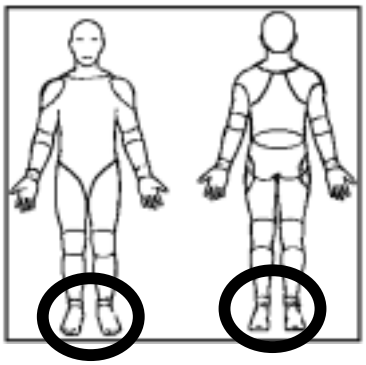


Body parts within the circled area will be classified as KNEE issues.

ANKLE/FOOT

Repetition	N	Y		Comments:
Are identical or similar motions performed over and over again? (e.g., walking on uneven surfaces)			S O	
Static Posture				
Are workers required to stand in a stationary position for long periods of time during the shift?			S O	
Awkward Posture				
Flexion 			S O	
Extension 			S O	
Vibration				
Ask the worker: Is your whole body exposed to vibration for significant portions of the work shift? (e.g., standing on vibrating floors)			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., long bundles)			S O	
Are there problems handling a load due to its fragile, unbalanced, or non-rigid conditions?			S O	
Ask the worker: Do you experience situations where mechanical aids or equipment are not readily available to assist with manipulating an object?			S O	
Are handles for tools and equipment inappropriate in terms of size or shape? (e.g., pike poles)			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]

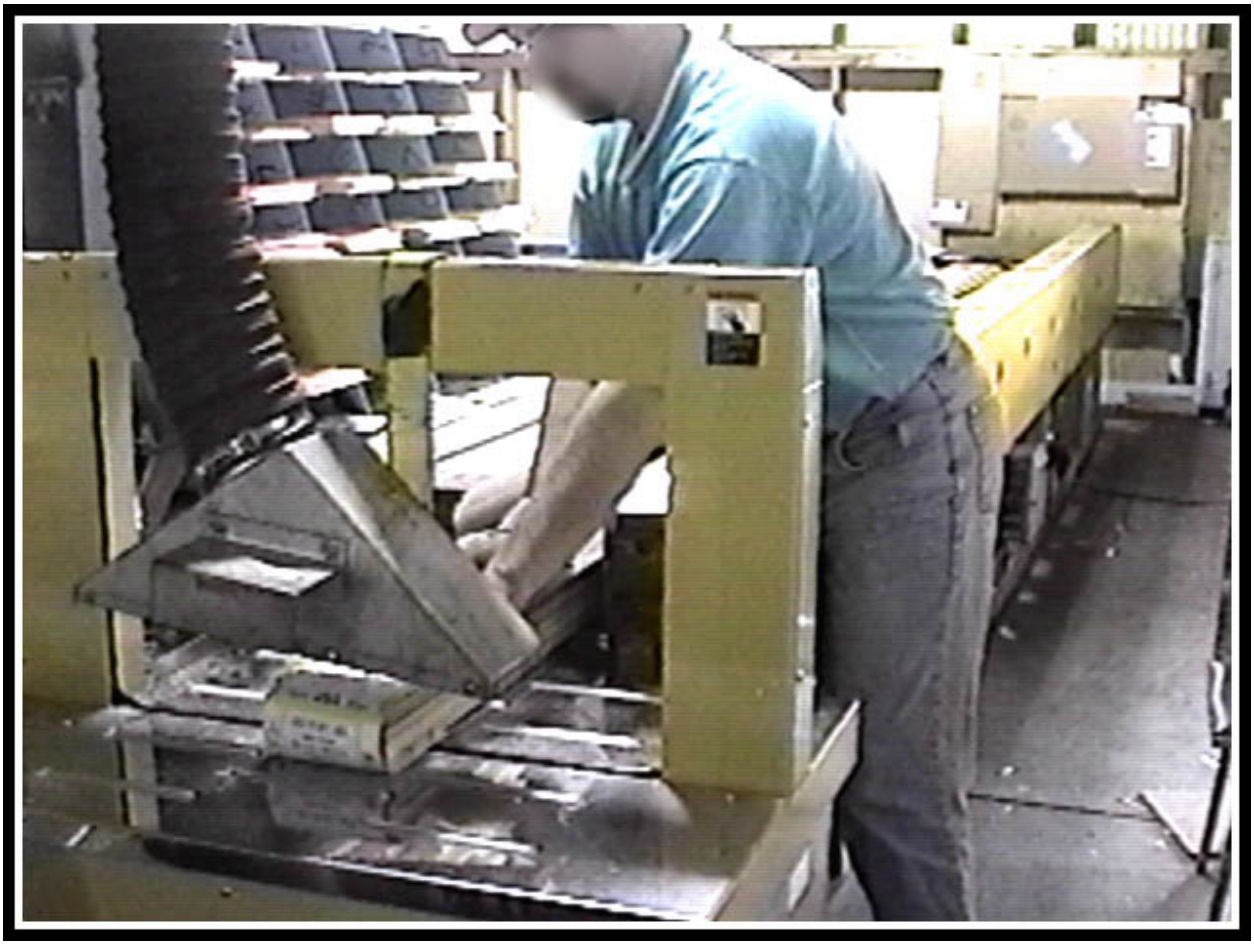
Noise	N	Y		Comments:
Have there been complaints on the level of noise in the work area?			S O	
Ask the worker: Are there any distracting or annoying noises at the workstation? (e.g., machinery)			S O	

WORK ORGANISATION

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

Work Manual

Industrial
Musculoskeletal
Injury
Reduction
Program



Tie-up/End Capper Operator

This Work Manual contains information about the body parts found to be at risk of musculoskeletal injury (MSI) for the Tie-up/End Capper 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.

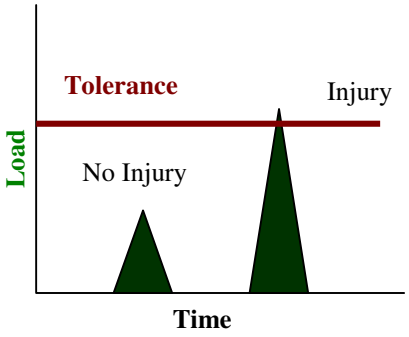
Work Manual

Tie-up/End Capper Operator

WM Table of Contents

Injury Education

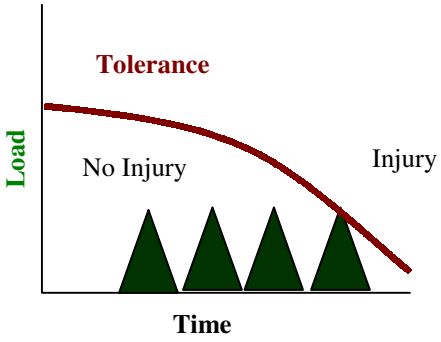
Injuries occur when …
Loads exceed tissue tolerances



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.

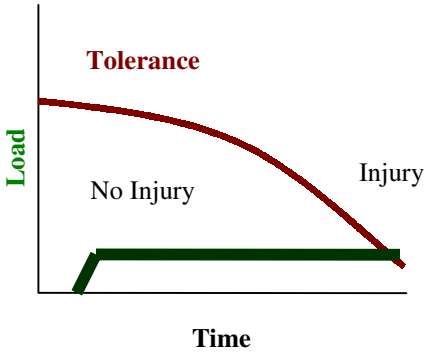
Example – a worker going over on their ankle and spraining it.



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 Tie-up/End Capper Operator job (i.e., injury statistics, discomfort surveys, results from the Identification Checklist), the next steps are to:

1. Match the body parts of concern from your investigation to those described in this section of the Work Manual.

2. Note the direct risk factors associated with each body part of concern.

3. Read the information on the page and try to understand why a body part, in combination with each of the direct risk factors, is of concern.

4. Discover which indirect risk factors are associated with a particular body part problem and the headings under which they are found in the Injury Prevention section of the Work Manual.

5. Note the consequences of the direct risk factor relative to a body part.

6. Note where the potential solutions can be found within the Injury Prevention section of the Work Manual. In addition, for many of the body parts, a reference may be provided to refer to specific sections of the Body Manual.

At the end of the Body Parts at Risk Section, there is a summary page of all the body parts of concern for the Tie-up/End Capper 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 Tie-up/End Capper Operator position and found that the 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.

Shoulder: Major risks include forceful and repetitive movements of the shoulder while reaching forward for bundles. The workstation design will affect the amount of reaching and force required to move bundles.

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

1. Infeed rollers (page 71)
2. Workstation cut-out (page 72)
3. Job rotation (page 78)

Elbow/wrist: Major risks include forceful and repetitive gripping with the wrist in awkward positions while handling bundles. The workstation design will affect wrist postures and the amount of force required for handling boards.

The following solutions are targeted at reducing the risk of injury to the elbow/wrists:

1. Workstation height (page 73)
2. Stretches (page 75)
3. Job rotation (page 78)

Low back: Major risks include awkward and repetitive bending and twisting of the back while reaching for bundles and guiding bundles into the tie-up machine. Workstation height will affect the amount of back bending.

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

1. Workstation height (page 73)
2. Back stretch (page 76)
3. Job rotation (page 78)

For additional stretching and strengthening exercises that would benefit a Tie-up/End Capper Operator, refer to the Shoulder, Elbow, Wrist, and Back sections of the Body Manual.

NECK

Direct Risk Factors:
Repetition
Awkward Postures

A Tie-up/End Capper Operator may look down and to the side in order to align the bundles.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

- Neck muscles are required to turn the head to the side. The farther the head is turned to the side, the greater the load on the muscles and tendons.
- Neck muscles must support the weight of the head while in a forward position. The more the neck bends, the greater the load on the muscles and tendons.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height of the workstation will affect neck posture. Infeed chains that are too low will increase neck flexion, placing more stress on the tissues of the neck.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Neck, please see the column labelled "Neck" in the Summary of Solutions on pages 79 to 80.
- For exercises that can help to prevent ***neck*** injuries, see the ***Neck section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Force
Repetition
Awkward Postures

A Tie-up/End Capper Operator may pull bundles in to align them.

The operator also pushes the bundles through the tie-up machine.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Force

- The rotator cuff stabilises the shoulder joint when objects are pushed and pulled. The heavier the object, or the larger the force required, the greater the load on the rotator cuff.

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- The design of the workstation will affect shoulder posture and force requirements for moving bundles. Workstations with infeed rollers require less force to align bundles, and reduce the amount of shoulder flexion required to reach bundles.

CONSEQUENCES

- When using the arms to push and pull bundles, 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 79 to 80.
- For exercises that can help to prevent ***shoulder*** injuries, see the ***Shoulder section of the Body Manual.***

SHOULDER

Direct Risk Factors:
Repetition
Awkward Postures

A Tie-up/End Capper Operator may work with the arms at or above shoulder height when reaching for labels.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

- The rotator cuff tendon can fray from repeated rubbing against bone. If the repetitive stress is excessive, and recovery is not adequate, the tendon may fatigue to the point of injury.

Awkward Postures

- A rotator cuff tendon may rub up against bone (impingement) when the arms are raised at or above shoulder height. The friction between the tendon and the bone increases as the arm is lifted higher. In addition, the rotator cuff must stabilise the weight of the arms when working away from the body, increasing the tension in the tendon. The combination of impingement and tension increases the stress on this tendon.

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- The location of the label rack will affect shoulder posture. Label racks that are too far from the operator will increase shoulder flexion and stress on the rotator cuff tendon.

Working Heights

- The location of the label rack will affect shoulder posture. Label racks that are too high increase shoulder flexion and stress on the rotator cuff tendon.

CONSEQUENCES

- Repeatedly lifting the arms at or above shoulder height may lead to fraying in the tendon, as a result of the friction between the tendon and the bone.
- Rotator cuff muscles may become weakened.
- Signs and symptoms include pain when lifting the arm to the side, above shoulder height.

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 79 to 80.
- 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 Tie-up/End Capper Operator may grip bundles to align them and guide them into the tie-up machine.

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 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 natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip. Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.

INDIRECT RISK FACTORS

Workstation Design

Working Heights

- The height of the workstation affects wrist posture. Workstations that are too high may contribute to poor wrist postures, increasing stress on the wrist area.

Characteristics of Objects Being Handled

Size and Shape

- The size of the bundle affects the grip width. Bundles with 8 or 10 pieces of siding require wider grip spans, increasing stress on forearm muscles.

CONSEQUENCES

- Repeated forceful gripping may lead to fatigue at the tendon/bone connection near the elbow, or in the tissues of the wrist.
- Signs and symptoms include pain in the elbow and wrist area and possibly restricted range of motion in the wrist area.

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 79 to 80.
- For exercises that can help to prevent ***elbow*** injuries, see the ***Elbow section of the Body Manual.***

LOW BACK

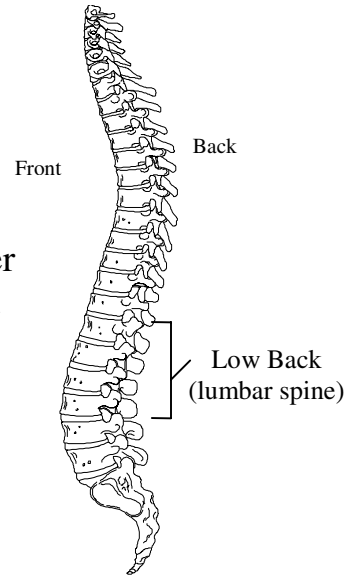
Direct Risk Factors:
Repetition
Awkward Postures

A Tie-up/End Capper Operator may frequently bend down to reach for bundles.

Operators are also required to twist their trunk to feed bundles into the tie-up machine.

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

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Working Reaches

- The workstation design affects the posture of the low back. Workstations that require workers to reach for incoming bundles lead to more trunk bending and increased stress on the tissues of the back.

Working Heights

- The height of the workstation affects the posture of the low back. Workstations that are too low increase back bending and stress to the back.

CONSEQUENCES

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

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Back, please see the column labelled "Back" in the Summary of Solutions on pages 79 to 80.
- For exercises that could help to prevent ***back*** injuries, see the ***Back section of the Body Manual.***

ANKLE/FOOT

Direct Risk Factors:
Repetition
Awkward Postures

A Tie-up/End Capper Operator may press foot pedals in order to activate controls.

BACKGROUND INFORMATION

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

DIRECT RISK FACTORS

Repetition

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

Awkward Postures

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

INDIRECT RISK FACTORS

Workstation Design

Floor Surfaces

- The type of foot pedal used will affect the loading on the lower extremities. If the foot pedal requires a large force to activate, there will be more stress on the calf area. If the foot pedal is too high, there will be more stress applied to muscles in the front compartment (shin) of the lower leg to lift the foot.

CONSEQUENCES

- Repeated use of foot pedals can cause damage to the tissues in the lower extremities (calf and shin area).
- Signs and symptoms include inflammation, tightness, and pain with walking.

SUGGESTED SOLUTIONS

- For specific solutions that may prevent injuries to the Ankle, please see the column labelled "Ankle" in the Summary of Solutions on pages 79 to 80.

Summary of Body Parts at Risk

NECK

- A Tie-up/End Capper Operator may look down and to the side in order to align the bundles.

SHOULDER

- A Tie-up/End Capper Operator may pull bundles in to align them.
- The operator also pushes the bundles through the tie-up machine.

SHOULDER

- A Tie-up/End Capper Operator may work with the arms at or above shoulder height when reaching for labels.

ELBOW/WRIST

- A Tie-up/End Capper Operator may grip bundles to align them and guide them into the tie-up machine.

LOW BACK

- A Tie-up/End Capper Operator may frequently bend down to reach for bundles.
- Operators are also required to twist their trunk to feed bundles into the tie-up machine.

ANKLE/FOOT

- A Tie-up/End Capper Operator may press foot pedals in order to activate controls.

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.*

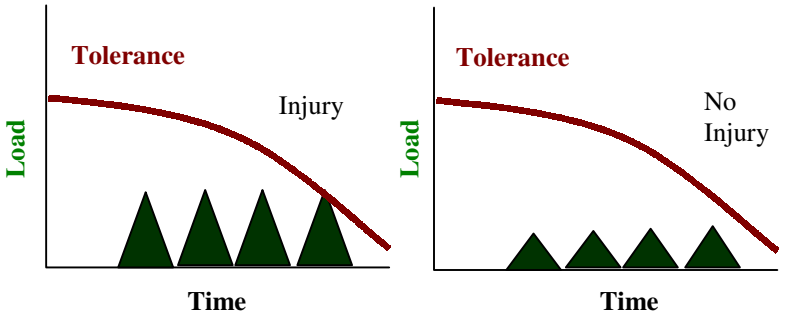
= Indicates that the risk factor was assessed and was not found to be a contributor to the body part problem.

♦ = 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 79 to 80 for specific problem/solution information. Additional information on some risk factors can be found in the General Risk Factor Solutions Manual.

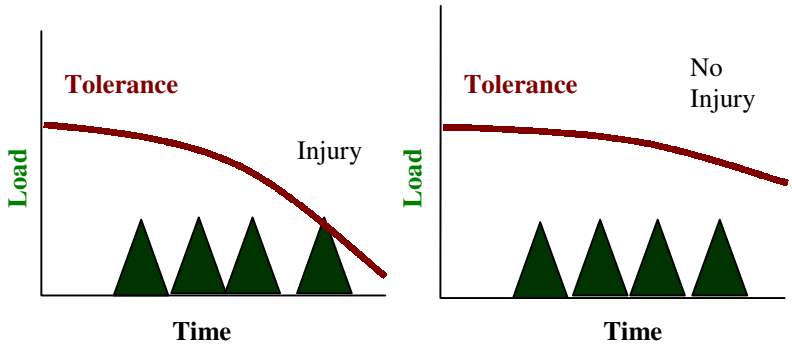
Injury Prevention

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 Tie-up/End Capper 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

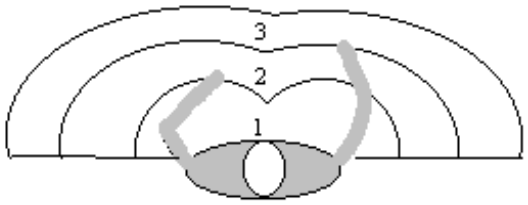
These are devices worn by a worker to reduce the risk of injury, including gloves, kneepads, hearing protection, and leather aprons.

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.

Infeed rollers

E

To reduce loading on the shoulder and back, install infeed rollers to advance the bundles into the operator's station. Allowing the rollers to help bring the bundles into the workstation avoids unnecessary reaching by the operator.

Workstation cut-out

E

To reduce loading on the shoulder and the back, have a cutout in the station to allow the worker to step closer to the bundles. Leaning over guards increases the amount of reaching required.

Full guard forces worker to assume extreme trunk flexion to handle bundles.

Worker reaching over guard to handle pieces.

Thigh pad

E

In order to reduce awkward postures of the shoulder and back, install thigh pads. These pads encourage the worker to get closer to the work without introducing any contact stress in the hip area.

Worker leaning against thigh pad while handling bundles.

Bumper alignment

E

In order to reduce awkward postures of the shoulder and back when reaching for boards, and to reduce loading on the elbow/wrist from extra handling of bundles, ensure all bumpers are at the same height. Some workplaces use bumpers to spread out the bundles entering the workstation. When these bumpers are not all at the same height, bundles can become skewed and more handling is required to align bundles.

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 Tie-up/End Capper 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.

Workstation height

E To reduce loading on the neck, shoulders, and back, the infeed chain needs to be positioned at the proper height. If the chain is too low, back bending and neck flexion will be increased. If the chain is too high, the shoulders and arms will be elevated, leading to more static loading on the neck and shoulder area.

Label rack height

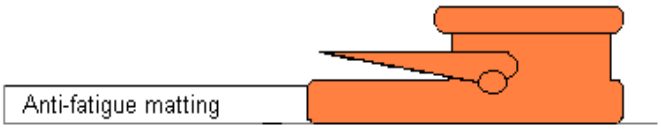
E To reduce awkward postures of the shoulder, place the label rack at a height that avoids excessive forward reaching or arm elevation.

FLOOR SURFACES

Recessed foot pedals

E

In order to minimise awkward postures of the ankle, recess foot pedals into anti-fatigue matting to decrease the height of the foot pedal base. To recess foot pedals, position anti-fatigue matting as close as possible to the foot pedal base. If the pedals are stationary, cut the matting to surround the front of the foot pedal. For moveable foot pedals, place the matting as close to the base of the foot pedal as possible. The height of the matting should not exceed the base of the foot pedal (see diagram below). It is important to ensure pedals are kept clean of debris and are well maintained.



Foot bar

E

To reduce loading on the shoulder and back from reaching for boards, install a foot bar instead of foot pedals. A foot bar allows the operator to activate equipment from any position along the bar. Operators can work from positions where shoulder and trunk postures remain more neutral, while still controlling the process with the foot bar.

A foot bar for activating equipment lets an operator control the process from a range of positions along the table.

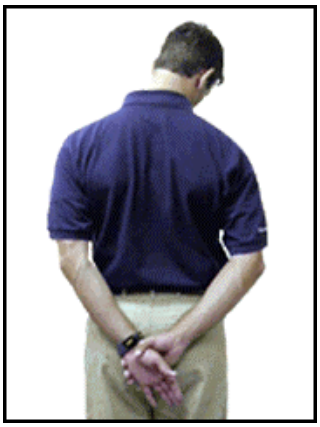
Additional Work Practices

Stretches

WP In order to minimise awkward and static posture of the neck, 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.

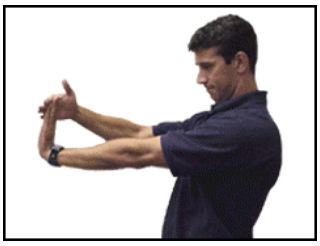


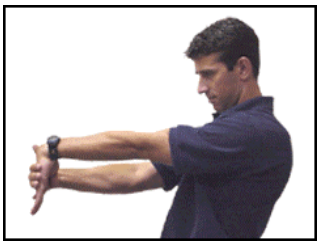
Upper Back & Chest Stretch

Place the hands together in front of the body and push them outwards. Bring the arms behind the body and squeeze the shoulder blades together while pressing the shoulders down and keeping the chin tucked in. Repeat 5 times.

Wrist Flexor and Extensor Stretch

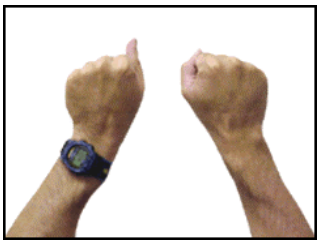
With your arm extended and fingers pointing up, gently pull hand towards your body until you feel a mild stretch in the forearm. (Note: do not stretch to the point where you feel pain or tingling). Hold for 15 – 30 seconds. Repeat with fingers pointing down. Repeat with the other arm.

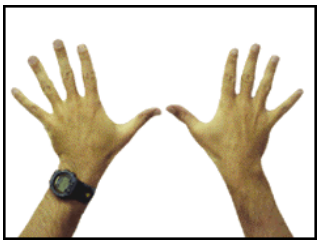




Hands and Fingers Stretch

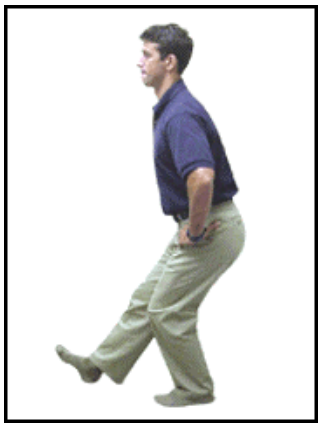
Clench both fists and hold for 3 seconds. Then open your hands and spread fingers apart. Hold for 3 seconds. Repeat.





Hamstring Stretch

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



Back stretch

WP In order to keep back muscles loose, perform the hanging stretch. Place the feet at a 45-degree angle and lean straight back. Hold for 10 seconds and repeat on other side.

View with eyes

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

Characteristics of Objects Being Handled

SIZE AND SHAPE

Alignment bars

E To reduce loading on the elbow/wrist from forcefully gripping, install a bar that will press against the bundles to align them.

Maintain rollers

A To reduce loading on the shoulder and elbow/wrist ensure infeed rollers are working properly.

Gravity-assisted rollers

E To reduce loading on the shoulder and elbow/wrist install gravity assisted rollers to help guide bundles into the tie-up machine.

Gloves

PPE In order to reduce stress in wrist and elbow tissues due to overgripping, use gloves that fit properly. Where multiple glove sizes are not available, some workers tie the elastic in the back of the gloves to improve fit.

Environmental Conditions

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 Tie-up/End Capper Operator can be rotated to other job positions that require different physical and mental demands. By rotating to jobs that require different physical demands the working muscles get a chance to recover and repair, decreasing the risk of injury. Job rotation is more effective if it occurs throughout the shift, every hour or every two hours. The duration of exposure to risk has a large effect on the amount of time required for the tissue to recover.

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

Summary of Solutions

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

		Injury Prevention Potential										
SOLUTIONS	**Page**	Neck	Neck/ Shoulder	Shoulder	Elbow/Wrist	Wrist	Wrist/ Hand	Low Back	Hip	Knee	Ankle/Foot	Foot
Infeed rollers	**71**			**F A R**				**A R**				
Workstation cut-out	**72**			**F A R**				**A R**				
Thigh pad	**72**			**F A**				**A**				
Bumper alignment	**72**			**F A R**	**F A R**			**F A R**				
Workstation height	**73**	**A R**		**A**				**A R**				
Label rack height	**73**			**A**								
Recessed foot pedals	**74**										**A**	
Foot bar	**74**			**F A R**				**A R**				
Stretches	**75**	directly reduces risk of injury to the body										
Back stretch	**76**							**A S**				
View with eyes	**76**	**A R**										

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	Foot
Alignment bars	**77**				**F A R**							
Maintain rollers	**77**			**F**	**F**							
Gravity-assisted rollers	**77**			**F**	**F**							
Gloves	**77**				**F**							
Job rotation	**78 ◆**	indirectly reduces risk of injury to the body										
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*
S = *Static Postures* **C** = *Contact Stress* **V** = *Vibration*
◆ = *See General Risk Factor Solutions Manual*

TIE-UP/END CAPPER OPERATOR MSI SAFETY GUIDE

OBJECTIVE:

To identify ergonomic risks involved for the Tie-up/End Capper 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 Tie-up/End Capper Operator.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Neck A Tie-up/End Capper Operator may look down and to the side in order to align the bundles.	**Repetition** **Awkward Postures**	• When the head is repeatedly turned to the side or bent forward, the muscles of the neck are subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues can fatigue to the point of injury. • Neck muscles are required to turn the head to the side. The farther the head is turned to the side, the greater the load on the muscles and tendons. • Neck muscles must support the weight of the head while in a forward position. The more the neck bends, the greater the load on the muscles and tendons.	• To reduce loading on the neck, avoid ear muffs, and use instead lightweight custom fitted ear plugs. • In order to reduce awkward postures of the neck, rotate the eyes and neck, not just the neck, to view the work area. If neck twisting cannot be avoided, try to alternate turning the head in both directions. When twisting the head, keep the chin tucked in and the ears in alignment with the shoulders. • For exercises that can help prevent ***Neck*** injuries, ***see the Neck Section of the Body Manual***.

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Shoulder A Tie-up/End Capper Operator may pull bundles in to align them. The operator also pushes the bundles through the tie-up machine.	**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. • When the arms are repeatedly raised, the rotator cuff is subjected to repeated stress with little time for recovery. If the repetitive stress is excessive, and recovery is not adequate, the tissues may fatigue to the point of injury. • The rotator cuff stabilises the shoulder joint when the arms are away from the body. The farther away the arms are from the body, the greater the load on the rotator cuff.	• If your workplace has infeed rollers, ensure the infeed rollers are working properly and are free of debris to reduce effort required to guide bundles. • For exercises that can help prevent ***Shoulder*** injuries, ***see the Shoulder Section of the Body Manual***.
	A Tie-up/End Capper Operator may work with the arms at or above shoulder height when reaching for labels.	**Repetition** **Awkward Postures**	• The rotator cuff tendon can fray from repeated rubbing against bone. If the repetitive stress is excessive, and recovery is not adequate, the tendon may fatigue to the point of injury. • A rotator cuff tendon may rub up against bone (impingement) when the arms are raised at or above shoulder height. The friction between the tendon and the bone increases as the arm is lifted higher. In addition, the rotator cuff must stabilise the weight of the arms when working away from the body, increasing the tension in the tendon. The combination of impingement and tension increases the stress on this tendon.	

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Elbow/Wrist A Tie-up/End Capper Operator may grip bundles to align them and guide them into the tie-up machine.	**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 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 natural relaxed (neutral) position. Bending the wrist forward or backward deviates from this position, and the forearm muscles have to work harder to maintain the grip. Consequently, gripping objects with the wrist bent increases the tension generated by muscles, and could lead to tissue fatigue at the tendon/bone connection.	• In order to reduce the amount stress to the wrist and the elbow, use gloves that fit properly. Some workers tie the back of the gloves to improve their fit. • For exercises that can help prevent ***Elbow*** and ***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 Tie-up/End Capper Operator may frequently bend down to reach for bundles. Operators are also required to twist their trunk to feed bundles into the tie-up machine.	**Repetition** **Awkward Postures**	• Repeated forward bending and twisting can gradually fatigue the structures of the low back. If the repetitive stress is excessive, and recovery is not adequate, the disc walls may fatigue to the point of injury. • Back muscles must support the weight of the upper body when leaning forward. Increased bending of the back increases the loading on the spine and increases the pressure on the walls of the discs.	• If your workplace has infeed rollers, allow the infeed rollers to bring the bundles into the workstation, and avoid unnecessary reaching. • For exercises that can help prevent ***Low Back*** injuries, ***see the Back Section of the Body Manual***

CHECK IF THIS APPLIES	ACTIVITY OF RISK	DIRECT RISK FACTOR(S)	POTENTIAL HAZARDS	SUGGESTED SOLUTIONS
	Ankle/Foot A Tie-up/End Capper Operator may press foot pedals in order to activate controls.	**Repetition** **Awkward Postures**	• Repetitive use of foot pedals may gradually cause small tears in the muscle on the front of the shin. If the repetitive stress is excessive, and recovery is not adequate, the small tears in the muscle on the front of the shin may progress to a more significant problem. • Lifting the foot to activate a foot pedal puts the ankle into an awkward posture, which increases the loading in the muscle on the front of the shin. The further away from the neutral posture the ankle is, the greater the loading to this muscle. If the shoes worn are rigid or heavy, the loading is also increased.	• In order to ensure healthy foot alignment, purchase appropriate footwear. Some additional features to consider include a good tread on the sole to prevent slipping on work surfaces. See the guidelines for footwear in the Body Manual for the Foot. • For exercises that can help prevent ***Ankle/Foot*** injuries, ***see the Ankle and Foot Sections of the Body Manual***