Small Workplace
Ergonomics Resource Guide

Questions and Answers

Hazard Identification

Forms and Checklists

Resources

OHC
MFL Occupational Health Centre

SAFE WORK

SAFE
SPOT THE HAZARD
ASSESS THE RISK
FIND A SAFER WAY
EVERYDAY
TM

Small Workplace Ergonomics Resource Guide

Published by

MFL Occupational Health Centre Inc.
102-275 Broadway
Winnipeg, MB
R3C 4M6
www.mflohc.mb.ca
(204) 949-0811
toll free 1-888-843-1229 (Manitoba Only)

Project Coordinator

Andrew Dolhy CPE, P. Kin

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MFL Occupational Health Centre

102-275 Broadway
Winnipeg, Manitoba
R3C 4M6

ph (204) 949-0811
fax (204) 956-0848
toll free 1-888-843-1229
(Manitoba only)

email: mflohc@mlfohc.com
website: www.mflohc.mb.ca

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Table of Contents

Preface

What are your thoughts on ergonomics? Do you know what ergonomics is? If you have a problem job or you know that workers are developing overuse injuries, do you think anything can be done to help? Do you think ergonomic fixes are costly?

Over the years I have met many managers and workers that have some understanding of ergonomics, however, they are unsure of how to deal with problem jobs or if making a change will actually work. There are those that have difficulties in showing value for their solution ideas or that solutions are cost effective. The idea for this resource guide and conducting case studies in small workplaces came from these experiences. Our goal was to show the community what ergonomic hazards are, how to assess the risk, provide examples of reasonable and practical solutions, their costs and any associated benefits.

There were two phases to this project. The first phase was to conduct ergonomic case studies in workplaces with less than 50 workers. A total of 32 case studies were completed in a wide range of workplaces. Each case study identifies the ergonomic hazard, how the risk was assessed, the solution implemented and its costs and benefits. The case studies referred to throughout this guide are available on the Internet at www.mflohc.mb.ca 'Small Business Ergonomic Case Studies – Hazards, Assessments, Solutions, Costs and Benefits.

The second phase was to develop a small workplace resource guide and to conduct ergonomic workshops throughout Manitoba. Eight workshops were conducted in Thompson, Winkler, Steinbach, Gimli, Brandon, Dauphin, Selkirk and Portage La Prairie. There were over 180 participants. Feedback from those who participated helped to develop this resource guide.

These two projects had positive outcomes for

- **Workers.** They now have safer jobs with less strain, a reduced risk of developing an injury and a better understanding of ergonomics.
- **Employers.** They did not lose skilled workers to injuries. The solutions were reasonable and practical and the resource guide is very useful.
- **All workers and employers in Manitoba**. They now have a resource that answers what ergonomics is, how to assess jobs, what are some solutions and how to tell if they are economically feasible.

Finally, there was a personal positive outcome - since small workplaces are a difficult group to target health and safety resources for, it was satisfying to have a project that benefits small workplaces directly and in the end, each workplace, employer and worker is now considered a friend.

I hope this resource helps you with your ergonomic initiatives. Please feel free to drop by the Occupational Health Centre and check out our health and safety resources or to just talk ergonomics.

Andrew Dolhy CPE, P. Kin
Certified Professional Ergonomist

Acknowledgements

First and foremost we would like to thank all the employers, health and safety representatives, workers and managers who participated in the projects. Under the confidentiality agreement governing this project, employers and participating individuals cannot be identified by name. So, to all who took part – thanks!

This project was made possible by a grant from the Community Initiatives and Research Program of the Workers Compensation Board of Manitoba (WCB). Thank you Janice Meszaros, Manager, Community Initiatives and Research Program, for providing advice and assistance throughout the project. Thanks to the MFL Occupational Health Centre's Occupational Health Specialist Maureen Grace, who helped conduct the rural training workshops and to all the staff at the MFL Occupational Health Centre for their work and support in developing this project.

There were two advisory committees providing feedback, comments and direction for both projects. The committee for the Ergonomic Intervention and Evaluation Case Studies consisted of Shaun Haas, formerly of the Manitoba Restaurant Association, Shannon Martin, Canadian Federation of Independent Business, Peter Wiebe, Workers Compensation Board of Manitoba and Justin Phillips former owner Digitech Marketing. We also want to thank past members, Shelly Wiseman and Janine Halbessma, Canadian Federation of Independent Business.

The advisory committee for this resource guide consisted of Shannon Martin, Canadian Federation of Independent Business, Peter Wiebe and Shannon Weiss, Workers Compensation Board of Manitoba, Morley Wishart, Prairie Implement Manufacturers Association, Blaine Duncan, Manitoba Government Employees Union and Sarrah Hayter, SAFE Hospitality.

Project Overview

Who Conducted the Project

This project was conducted by the MFL Occupational Health Centre (OHC) in Winnipeg MB, Canada (**www.mflohc.mb.ca**). The OHC is a community health centre funded by the Winnipeg Regional Health Authority and donations. The Centre helps workers, employers, and joint health and safety committees to improve workplace health and safety conditions and eliminate hazards. Our services are available free of charge.

Mission Statement

The MFL Occupational Health Centre is dedicated to attaining the highest level of occupational health and safety for Manitoba workers by delivering services that improve workplace conditions and by empowering individuals and groups to take action on workplace health and safety issues (1991).

Under Serviced Groups: Small Workplaces

The Occupational Heath Centre strives to reach under serviced groups. One of these groups is small businesses, specifically those that employ less than 50 workers. In Manitoba small businesses with less than 50 workers compromise 92% of all businesses and 36% of all employees work for those small businesses (Canadian Federation of Independent Business, 2001).

WCB Community Initiatives and Research Program

The Workers Compensation Board of Manitoba has established a community initiatives and research grant program (**www.wcb.mb.ca**). This program funds projects on injury and disease prevention, safety in the workplace, treatment of workplace injuries, support for injured workers and their families and scientific, medical or other issues related to workers compensation. Up to $1 million in funding is provided annually by the Board of Directors of the WCB.

In 2004, the OHC was awarded a grant by the WCB Community Initiatives Research program to provide ergonomic services to small businesses. Specifically, ergonomic case studies were conducted in a variety of sectors in which the before and after ergonomic hazards were evaluated, the costs of implementing the solutions recorded and any potential benefits quantified. A second grant was awarded in 2005 to develop a resource guide for small workplaces and to conduct training in rural areas of Manitoba.

Small Workplaces and Ergonomics

In terms of occupational health and safety, small workplaces are of significant concern because they have higher rates of injuries compared to larger workplaces. (Eakin 1992, Eakin et al, 2000 and Walters, 2001). This may be due to smaller workplaces having higher levels of risk factors and hazardous conditions, lower levels of participation in preventive management, fewer internal resources for preventing occupational injuries and less access to external assistance (Eakin et al, 2000).

In Manitoba 50-60% of lost time injury claims are from musculoskeletal injuries. A survey conducted by the National Centre for Health Statistics in the United States found that many high risk occupations for musculoskeletal injuries are small business related (National Research Council, 2001).

Ergonomics is a health and safety issue that is perceived to be costly, intimidating, and with unproven results by small business (Vavra, 2003, Hofmann, 1999 and Alexander, 2001). These perceptions may be due to the lack of awareness among small business employers concerning the fundamental concepts of ergonomics, the lack of published quantitative ergonomic evaluations reflecting small business issues and the problems of communicating these findings to small businesses (Sundstrom, 2000 and Westgaard and Winkel, 2000).

What to Do?

In order to reach small workplaces a combination of awareness and education, information sharing, access to technical expertise and other resources and possibly motivation through incentives are required. The Small Business Intervention and Evaluation Project and the Ergonomic Resource Guide Project endeavours to meet this criteria through

- marketing and communication of this project and the development of a resource guide and case study book.
- access to a qualified ergonomist and other health and safety resources.
- an 'Intervention Grant'. This was a monetary fund that provided small businesses with some money to pay for the physical improvements that the health and safety committee and ergonomist thought were reasonable and practical. The "Intervention Grant" program should motivate small businesses to improve problem jobs and allow access to their workplaces.

Objectives

The five project objectives were to

1) develop 25 case studies of ergonomic interventions, (32 were actually developed).

2) determine the average cost of ergonomic interventions for small businesses and to quantify the amount of risk reduction and other positive benefits.

3) increase the awareness and knowledge of health and safety issues in the small workplaces that participated in this project.

4) develop a resource guide for small workplaces

5) conduct training workshops in rural areas of Manitoba.

This guide does not replace the Workplace Safety and Health Act, regulations or Codes of practice. You can access this information at **www.gov.mb.ca/labour/safety/index.html** or call (204) 945-3446.

Small Workplace Ergonomics Resource Guide Overview

The process is the same for all your ergonomic problems. Do you need to:

- Investigate a problem job because of injuries, the reporting of issues, absenteeism, or production/quality issues.
- Prevent future problems, i.e., regular inspections, job hazard assessments, health and safety committee observations.
- Accommodate an injured worker and match job restrictions to the demands of the job.

Small Workplace Ergonomics Resource Guide Overview

		Completed	Results
Spot the Ergonomic Hazard	Read Section 2 and 3		
	Complete Form 1 – Ergonomic Hazard Inspection Checklist		
	Collect more information using additional methods		
	Review 32 ergonomic case studies, section 5		
Assess the Risk	Complete Ergonomic Checklist(s)		
	Perform Worker Consultations		
	Review Ergonomic Principles		
	Use Form 2 – Workplace Ergonomic Survey		
	Review the 20 common Ergonomic hazards/ solutions, section 4		
	Complete Form 3 – Ergonomic Hazard Assessment Worksheet		
Find a Safer Way	Determine Solution Options		
	Use Form 4 - Find a Safer Way Worksheet		
	Use Form 5 - Solution Brain Storming Tool		
	Evaluate Solution Options		
	Implement Appropriate Solutions		
	Follow up		
	Form 6 helps with Return to Work		
Everyday	Today and Tomorrow Use Form 7 to develop an Action Plan/ Perform a Self -Audit		
Comments			

Section 2: Ergonomics and Workplaces

Section 2: Ergonomics and Workplaces

Questions about Ergonomics and Work Related Sprains, Strains and Overuse Injuries

? Sprain, strain, overuse and overexertion injuries to the back, hands and arms are sometimes referred to as musculoskeletal injuries. What does this actually mean?

The term musculoskeletal refers to muscles, ligaments, tendons, nerves, bones and blood vessels of the body. 'Musculoskeletal injuries' is an umbrella term used to describe injuries from sprains, strains, overuse and overexertions. Specific injuries include:

Musculoskeletal injuries is an umbrella term used to describe injuries from sprains, strains, overuse and overexertions

Sprain/Strain Injury	Medical Term
tennis elbow	Lateral Epicondylitis
pitchers or swimmers arm	Rotator Cuff Tendinitis
game keepers thumb, Atari thumb and Blackberry thumb	De Quervain's Syndrome
tension neck syndrome or computer neck	Trapezius Myalgia
trigger finger	Stenosing Tenosynovitis
low back pain	One example can be from a Herniated Disc

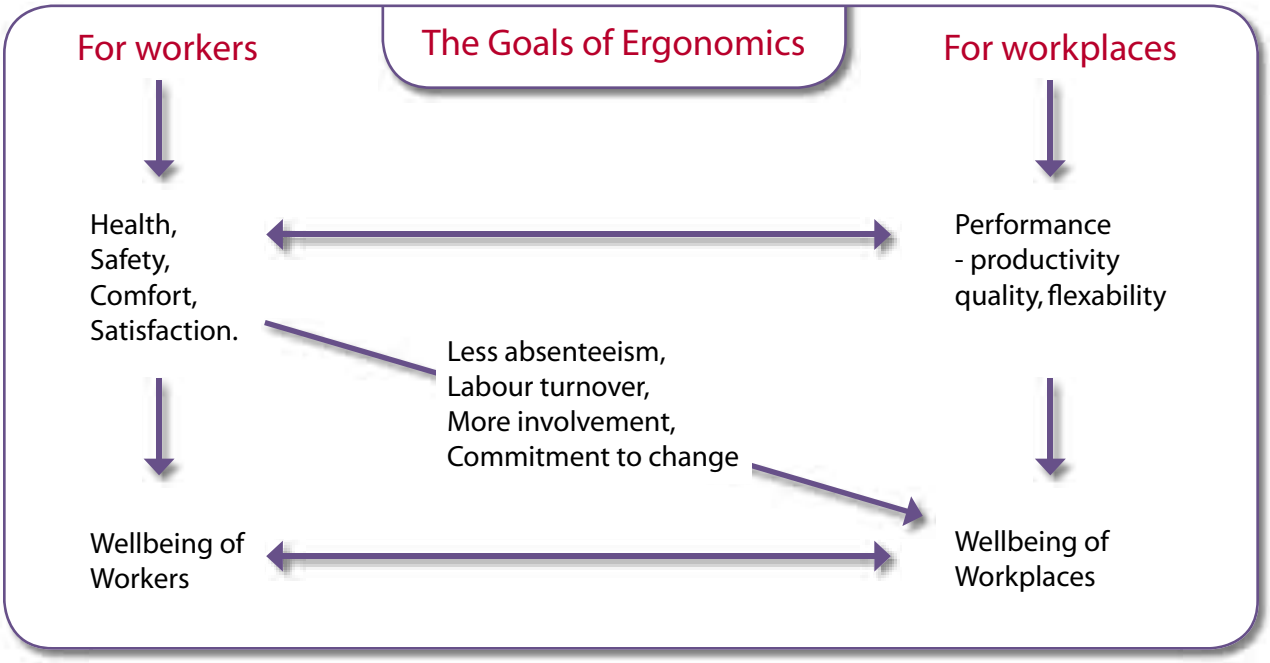
Did you know there are over 80 different low back injuries! People don't walk around saying they have 'facet joint irritation of the lumbar 3 vertebra', they say 'I have low back pain'. That is why umbrella words like overuse, sprain and strain and musculoskeletal injuries are used. They may appear to be vague but actually represent specific injuries.

What is ergonomics?

Ergonomics is a field of study that represents knowledge from human anatomy, occupational biomechanics, work physiology, industrial engineering, sports medicine, cognitive psychology, system design engineering, kinesiology and human factors. The science behind ergonomics is applied to workplace conditions and job demands in order to prevent musculoskeletal injuries. Ergonomics helps to make jobs safer, easier, more comfortable and performed with less mistakes.

Ergonomics can help to prevent musculoskeletal injuries by controlling hazards that are known to cause or aggravate these injuries.

In short ergonomics can help to prevent musculoskeletal injuries by controlling hazards that are known to cause or aggravate these injuries.



Do we need to consult an ergonomist?

Not necessarily. The use of this guide will help you to identify, assess and solve your problems. In the event the problem is bigger than you can handle or you want to make sure your changes will be effective then finding someone with the necessary education, experience and skills will be a benefit to you.

Are musculoskeletal injuries a problem?

The Workers Compensation Board of Manitoba's 2004 Annual report found 10,211 of their lost time claims are from sprains, strains, overuse and overexertion injuries. Researchers have found 40-60% of a workplaces lost time injuries are from musculoskeletal injuries. From a small employer perspective (under 50 workers) the percentage is around 51%, the average for larger employers (over 200 workers) is 66%.

Do you know how many musculoskeletal injuries have occurred in your workplace?

The cost of a time loss musculoskeletal injury is about $5000 annually (cost incurred in year of injury). This is about $2500 for treatment and wages, and $2500 for administation costs for managing the claim at the WCB. The cost over the 'life' of the claim, (may be more than one year), this will include costs for treatment of reoccurrences, etc, it is about $9000.

Do you know where you fall in Workers Compensation Board's firm rate and how much you actually pay in premiums?

There's more. Have you thought about the costs related to your business in terms of the loss of skilled workers due to injury, sick leave and absenteeism due to aches and pains, the cost of replacing and training new workers, the loss of production efficiency and quality problems due to temporary or new workers. What about the costs related to overtime because an injured worker is not there?

Included in this resource guide is a calculation that may help to show the direct costs and savings involved with making jobs better, safer and easier on workers. A blank form can be found in section 7 and a workplace example is shown in section 6.

Learn how to do this calculation and justifying reasonable and practical solutions becomes easy.

What about worker's health and well being?

Day to day aches and pains are one thing but pain, inability to move or constant discomfort takes a toll on workers physical and mental health. Financial pressure can also be a concern! Skilled and experienced workers don't just punch a clock, they add value to the entire organization directly and indirectly.

List 10 reasons how work related injuries affect worker's health, well being and their contributions to the workplace.

1) .....

2) .....

3) .....

4) .....

5) .....

6) .....

7) .....

8) .....

9) .....

10) .....

What can ergonomics do for our workplace?

The goal of ergonomics is to increase the well being of workers and the workplace. This involves identifying problems, investigating the cause and developing a solution that improves the job. This process uses resources such as time and money. Some people shy away from ergonomics because they think it's costly! However compared to other business improvement strategies, is it?

- Would you buy a new tool for your business if it could reduce your quality defects by 5% and therefore save you $50 a week?
- Would you invest in a system upgrade to your computer if it had a pay back period of eight months?
- Would you provide nutritional counselling to your staff if it were guaranteed to make them healthier?
- Would you start to look at your jobs, consult workers, identify and correct ergonomic problem jobs if 50-60% of these problems had a zero to $100 cost to fix?
- Would you move forward with a solution if it cost more than $1000 but had a pay back period of less than 19 months?
- If you could score a hazard and see how the solution will bring that score down, would you feel more confident in implementing the solution?
- If you could learn how to Spot the Hazard, Assess the Risk, Find a Safer Way, Everyday and see how the same ergonomic principles can apply to manufacturing, food production, office workstations, construction and other service sectors, would you feel more comfortable with ergonomics?

The Small Business Ergonomic Case Studies: Hazards, Assessment, Solutions, Costs and Benefits book is available from the OHC . See section 5 for details. Listed are 32 case studies in small businesses with less than 50 workers. The ergonomic solutions, their economic benefits, costs and results are discussed.

Can you find an example that matches your workplace?

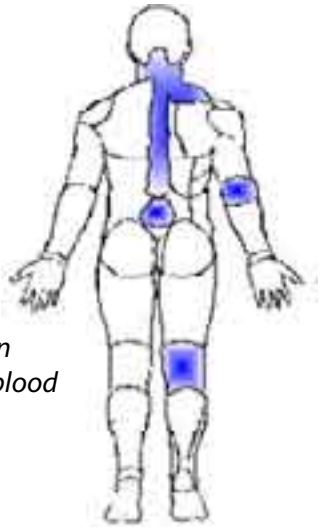
How do I know work is the problem?

Workers report an injury when they perceive pain. They decide the pain limits their ability to function or bothers them in other ways. Sometimes that pain is caused or aggravated by ergonomic hazards in the workplace, at home or other lifestyle activities. Some individuals are more susceptible than others to these injuries and previous injuries or medical conditions can be significant contributors as well.

Fatigue

Mechanical Strain – compression, shear and friction

Other Activities



Pressure on nerves or blood vessels

Individual Susceptibility

Individual Susceptibility

By identifying the hazard and assessing the risk, the employer can control problems in their workplace. How do you know the job did not cause the problem if you haven't looked at it first? How does the health care professional determine if another issue is causing the problem if no one has ruled out hazards in the current job? There is adequate scientific literature that relates poorly designed jobs to the increased risk of developing a musculoskeletal injury. The trick is to identify what is poorly designed work and how to fix it in a reasonable and practical manner.

See the Appendix section for more information on work related ergonomic risk factors.

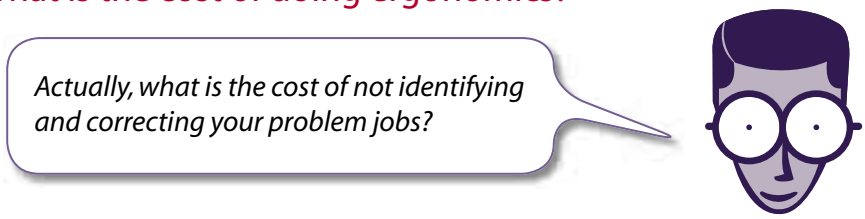
? How do I make jobs better?

By following a structured approach to identifying, assessing and developing an appropriate solution you will avoid making mistakes, buying products that don't fix the root cause of the problem and avoid complicating minor issues. Use this resource guide to learn how to Spot the ergonomic hazard, Assess the risk and to Find a safer way, Everyday. See the appendix **section (8)** to find local, provincial and additional help.

SAFE WORK

S SPOT THE HAZARD
A ASSESS THE RISK
F FIND A SAFER WAY
E EVERYDAY

What is the cost of doing ergonomics?



Costs are relative. Some small employers find it difficult to provide even small amounts of capital to reduce hazards while others don't even ask for an economic justification because they know safety is good business.

Use the example of a cost/benefit analysis from the section 6 and review the results from the Small Business Ergonomics Case Study book, section 5. When the full costs associated with musculoskeletal injuries are known then justifying fixes are easy. A blank form is provided in the forms section (7) of this guide.

Are there ergonomic regulations?

There are no specific references to ergonomics in Manitoba's Workplace Safety and Health Act as of the printing of this guide, but there are statutes that deal with musculoskeletal hazards. For example;

Section 4(1) says "Every employer shall in accordance with the objects and purposes of this Act

a) ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his workers;"

Section 4(2) says

(a) provide and maintain a workplace, necessary equipment, systems and tools that are safe and without risks to health, so far as is reasonably practicable;

(b) provide to all his workers such information, instruction, training, supervision and facilities to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his workers;

(c) ensure that all his workers, and particularly his supervisors, foremen, charge hands or similar persons, are acquainted with any safety or health hazards which may be encountered by the workers in the course of their service, and that workers are familiar with the use of all devices or equipment provided for their protection;"

Remember

Health and safety laws are written because hazards are known to hurt people…

…so creating a safe and healthy workplace is the right thing to do.

Musculoskeletal injuries can be work related, therefore the employer has the duty to provide a safe workplace. New ergonomic regulations may be developed soon, check with Manitoba Labour and Immigration, Workplace Safety and Health.

Have you ever had problems before?

If you have an identified and assessed problem job but no injuries to speak of, then congratulations, you are just like a smoker. Smoking is a hazard that has been identified to increase the risk of developing several cancers. You can smoke 3 packs of cigarettes a day for 30 years and no one can say for sure you will get a cancer. But if 50 people in your workplace smoked 3 packs a day for 30 years then over 50% will get some type of respiratory cancer. No one can say specifically who, but the probability is high and so is the 'risk'.

The same analogy applies to ergonomics. The risk of developing a low back injury due to lifting 40 lbs from the floor once every 5 minutes with a twisted back, is high but no one can say the individual will get a back injury. What if 50 workers perform the same task? Will more than a few develop a low back injury?

Workplaces that implement good health and safety practices save significant amounts of money. They identify hazards and correct them rather than wait for an injury to happen and then react to it.

Do you have money up front to make changes?

Start with the easy, low cost solutions. The key is to document the actual savings and then use the information to justify your higher cost fixes. If the pay back period is low enough then financing improvements will be economically justified. For examples of low/no cost solutions and their economic pay back periods, refer to the Small Business Ergonomic Case Study book, section 5 for information.

What about ergonomics and return to work?

Returning an injured worker to your workplace and getting some value added work is always better than paying for them to stay home. There is usually an administrative charge and increased premiums as well. From a medical perspective a worker heals better when they are back to a safe job.

Can ergonomics be used to make jobs safer for workers who are already injured? Yes, the same principles apply and the cost savings are significant. Contact the Workers Compensation Board of Manitoba for more information on this topic.

Workers Compensation Board of Manitoba

www.wcb.mb.ca

1-800-362-3340

Safe Manitoba Initiative

www.safemanitoba.com

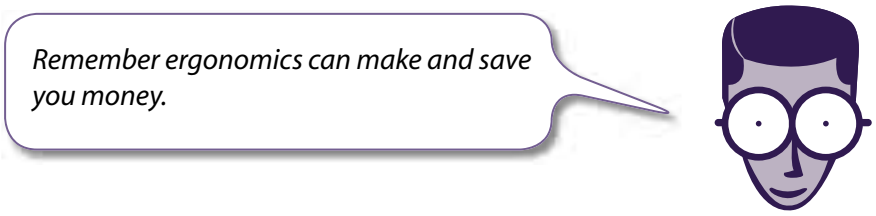
See Section 3: Find a Safer Way, for information on job accommodations from an ergonomics perspective and section 6 for an example of how ergonomics can help in the return to work process.

Do we have enough resources or time?

It's true there are no easily accessible and practical ergonomic resources for small employers. That's why this resource guide was developed.

However,

- If you have the time to do a health and safety walkthrough or make future training plans then you have the time to review your jobs for ergonomic hazards.
- If you can find resources that will make or save you money and help out the bottom line then you can find resources to fix your problem jobs.
- Would improving your systems, processes, tasks and workstations help with value added work, which can pay off in the long run?
- Have you ever thought of an internship for a student who may be interested in heath and safety?



What about your training budget?

What is your training time and budget? Ergonomics can be used to reduce training time and help new workers reduce learning errors. New workers also have a 'break in' period where their muscles and joints get used to the 'new job'. Better designed jobs can get workers up to speed quicker or reduce the strain on their muscles and joints so they don't get early onset injuries.

Have you looked at the time it takes to train a new worker? Are there many 'human errors' that may be attributed to poor workstation design?

Ergonomics can:

…reduce training time…

...reduce errors…

…allow muscles to adjust to new tasks…

What about stretching?

Muscle tension releasing exercises (stretches) should only be promoted after hazards have been identified, assessed and corrected.

If an ergonomic hazard exists with high stress on the body causing wear and tear, will stretching reduce the hazard or its effects? NO. If workers are performing tasks without adequate knowledge of proper lifting techniques, will stretching make them lift smarter and prevent the strain on the back? NO. Is stretching considered a form of personal protective equipment? NO. Are there well developed scientific studies that show stretching works? Not Really. Then why do so many articles on ergonomics talk about stretching? It depends on who is wrote the article. True ergonomists do not promote stretching as a prevention strategy for musculoskeletal injuries.

Stretches can also increase the strain on a body joint

Muscle tension releasing exercises (stretches) can also increase the strain on a body joint. Touching your toes or the hurdler's stretch are sport specific yet can increase the strain on a worker's back and knees. Follow the Resource Guide overview on page 6 and then offer stretches to your staff but only after they have cleared the specific stretches with their health care professional.

How do you encourage workers to follow safe work practices?

The best way to encourage workers to follow safe work practices or to use new equipment is to involve them in the identification of hazards, assessment of risk, and the solution development and implementation phase. Workers know their jobs and usually come up with solutions that will work for them.

Another strategy to encourage workers to follow safe work practices is to conduct tests of the new process or equipment. Documenting the problem, how you came up with the solution and evaluating the change before it's fully implemented can greatly minimize workers anxiety over change. Sometimes a great idea on paper just does not work as expected and 'new' is not necessarily better.

What can your workplace do to encourage Safe Work Practices?

Section 3: SAFE Work and Ergonomics

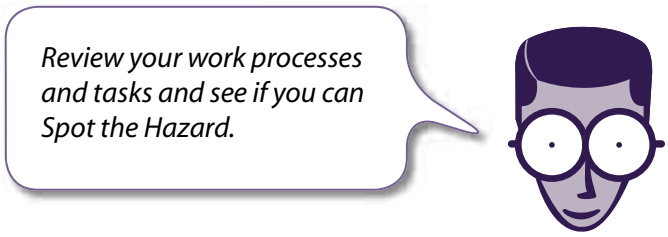
Section 3: SAFE Work and Ergonomics

The process of investigating, problem solving and developing a reasonable and practical solution is the same for large or small workplaces. The process involves learning how to Spot the ergonomic hazard, Assess the risk, Find a safer way and Everyday.

As you read through this section, think of how to use this information for performing inspections, health and safety committee walkthroughs, job hazard assessments, education and awareness training and even return to work job accommodations.

Spot the Ergonomic Hazard

Ergonomic hazards are workplace conditions and job demands that increase the risk of developing a musculoskeletal injury. The following list includes many common ergonomic hazards. These hazards are linked to the reporting of musculoskeletal injuries.



Step 1: Review tasks with the help of Form 1: Ergonomic Hazard Inspection Check List. There is only one question on the checklist, "Is there a hazard present, Yes or No?" Review section 4, 20 Common Ergonomic Hazards to better understand these hazards.

Ergonomic Hazards include:

1)	Forceful Exertions	**11)**	Sitting in a Poor Position
2)	Awkward Motions	**12)**	Kneeling and Squatting
3)	Far Reaching	**13)**	Constrained Body Positions
4)	Pinch Gripping	**14)**	Long Duration Work
5)	Poor Neck Positions	**15)**	Repetitive Work
6)	Poor Shoulder Positions	**16)**	Time Pressure and Focused Work
7)	Poor Wrist Positions	**17)**	Cold and Vibration
8)	Manual Material Handling	**18)**	Poor Lighting and Glare
9)	Stooping and Leaning	**19)**	Direct Pressure
10)	Standing Without Adequate Leg Support	**20)**	Stress Issues

Step 2: Add information to the inspection check list by using additional methods to Spot the Hazard.

Additional methods to identify ergonomic hazards include consultation with workers, reviewing injuries, first aid reports and researching more resources, see section 8.

Workers know their jobs and can tell you what the problem is. They also have a good idea about how to fix it.

Reviewing all incidents, near misses and first aid reports can give you some good insight into where the problems are and what may be the root cause. Do you consider near misses to be an 'incident' that will be reported?

You can also learn about ergonomic hazards from reviewing all your injury and first aid reports. For example, cuts may be due to sore and tired hands or poor workstation design!

There are plenty of resources available to help you identify problem jobs. Review the resource section 8 of this guide for additional help.

Spot the Hazard

Step 1: Fill Out Form #1

Step 2: Use Additional Methods to Complete the Review

Step 3: Prioritize Your Findings

Have you turned worker's comments and hazard issues into your own inspection checklist? That's what proactive workplaces do.

Good workplaces treat near misses as seriously as an actual injury.

Step 3: Prioritize or rank the hazards of the observed tasks if you are reviewing multiple tasks at the same time. This can include the number of workers affected, the number and severity of injuries or by the number of hazards found.

See the example in Section 6 to review how to Spot the Hazard.

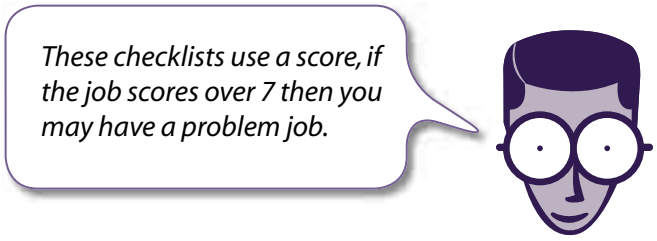
Assess the Risk

How do you assess ergonomic hazards to determine the level of risk? The best way for small workplaces to assess the risk is to use a combination of ergonomic checklists, consult workers and reference ergonomic principles. If there is still doubt then a technical assessment can be performed.

1) Ergonomic Checklist

An ergonomic checklist should be able to identify most hazards and give you some idea as to the level of risk. The Small Business Ergonomic Case Study Book (see section 5) used the Manitoba Labour and Immigration Workplace Safety and Health Division's Ergonomic Checklist. The checklist and how to use it is included in the Small Business Ergonomic Case Study book. There are three checklists. One for the Upper Extremity (arms), one for the Lower Extremity (back and legs) and one for Manual Material Handling (lifting, lowering, pushing, pulling and carrying).

The checklist may not be appropriate for every job but it still provides a good sense about the ergonomic hazards. The more you practice using these checklists the easier they become and you will get a better idea of the actual risk level in the jobs. It is also a good method to quickly assess many tasks.



Another option is to make up your own checklist. Use the ergonomic hazards listed in this section and combine them with job hazard assessment principles. Questions to ask may include,"What is the frequency of exposure to the hazard? What is the severity of the injury if it were to happen? What is the probability of the injury occurring? What priority would your health and safety representative or committee place on the assessment?"

2) Worker Consultation

It is important to consult with workers who perform the task. They have the best day-to-day insight into how and what tasks are performed. They may be able to indicate tasks or movements that are particularly fatiguing, strenuous, or difficult to perform.

Tools used to collect worker input include:

- Ergonomic Survey
- Body Mapping and/or Hazard Mapping
- Using a 10 Point Rating Scale of Perceived Effort

Ergonomic Survey

This is a good method for obtaining current information about workers' discomfort if injury records are not up to date or are not very detailed. It can measure the extent of symptoms in each department or area. It can determine problem jobs. It can measure workers' awareness of musculoskeletal injuries and it can be used as a method for workers to report discomfort.

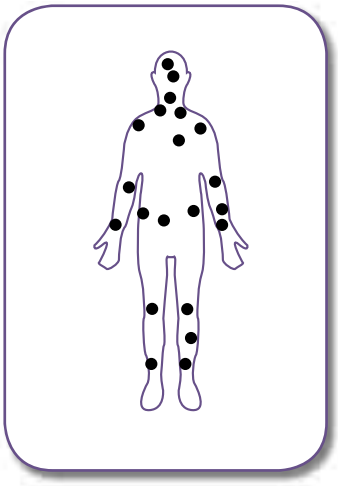
An example is provided in section 7 of this guide (Form 2). The survey should be made anonymous with only a general overall assessment of the survey results. Included with the survey is a blank section where workers can answer these two questions:

What do you think the problem is in this task?
What would you do to make it better?

The information gained from these two questions is valuable when trying to find the root cause of the problem and how to best control the hazard.

Body Mapping

Body mapping is a tool used to gather information about workers' health problems. A blank image of the body is used (best if front and back are used). Workers place stickers or draw circles in the areas where they believe their discomfort is related to their work. This can be done anonymously or in groups. The results may,



- show a clustering of issues such as in the left shoulder area
- show secondary issues that do not show up on injury reports such as sore feet or headaches
- start discussions about 'what's going on in the area'.

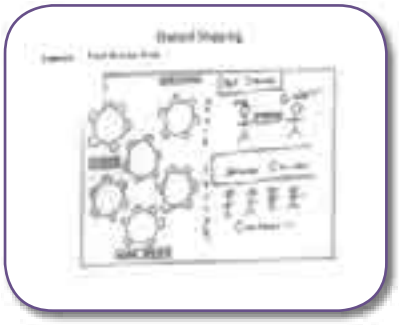
Body mapping, unlike the ergonomic survey, is designed to start discussions about potential workplace hazards immediately by the health and safety committee/group. It can be performed alone or in conjunction with hazard mapping. Studies have shown that properly conducted body maps are directly related to illness and injury in the workplace when compared to long term, in depth medical investigations.

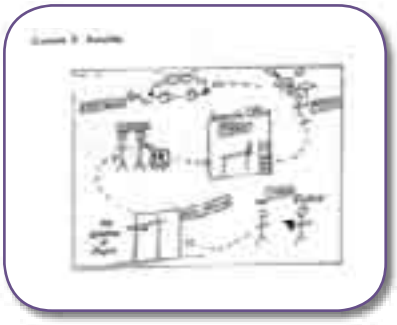
Hazard Mapping

Hazard mapping involves getting workers to draw their work area and identify potential hazards. The map may include the physical layout, location of other workers, equipment, environmental concerns and any other important features. The idea is to get workers to identify potential hazards. In this case we are interested in ergonomic hazards. Workers may place stickers or colour in areas that involve the 20 Ergonomic Hazards from this guide or simply identify tasks that involve:

- High Force,
- Awkward Postures,
- Highly Repetitive Work,
- Stress or Other Hazards (such as vibration)

An important point to this exercise is to discuss the findings. There are many examples of unknown hazards finding their way to the attention of the health and safety committee/representative by using hazard mapping. This is a good tool for new employees or those new to health and safety to learn about their workplace. This is also a good way to involve workers in the health and safety process.

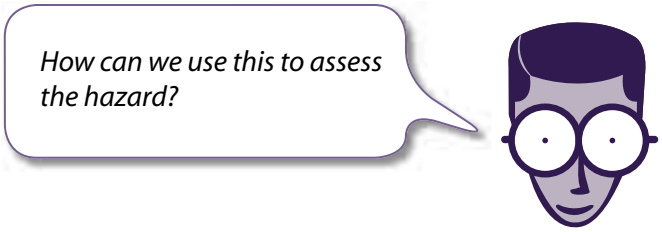




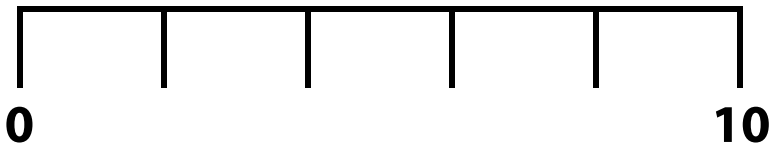
10 Point Rating Scale

Consulting workers is very important to identify the hazard, assess the risk, find a solution and implement appropriate controls. In some instances asking workers about their discomfort or what bothers them the most can lead to varying answers because people experience pain/discomfort differently. Furthermore, workers may not want to discuss their health issues with you. Another method to get workers input into the hazard assessment process is to ask them to rank the job. Many researchers have found workers are good at rating what they think is their effort to perform the task. In other words if you had a 10 point scale and asked several worker performing the same job to rate their perceived effort at that time most workers will rate the job around the same number.

If most workers rate their effort on the job as 8-9 out of 10, then we may have a problem. If the ratings are around 2-3 then it may not be a problem. What if workers rated their effort around 2-3 in the morning and 6-7 later in the shift? Is this due to normal fatigue or is this an indication of an ergonomic hazard that is putting strain on the workers?



What about a short term follow up tool after a change has been made? If your numbers go down a point or two compared to before the changes were made then the solution may be working.



3) Ergonomic Principles

These ergonomic principles can be used to evaluate a current job, used in the design of a new job or in the return to work process. These principles are based on good work practices, known ergonomic hazards and the experiences of ergonomists.

You can use these principles as another checklist to identify and assess the risk, in the evaluation of a current job or for new equipment coming into the workplace.

Design Workstations for Adjustability

a. Allow for the small person to reach and the large person to fit.
b. Keep reaches to within 22 inches (55cm).
c. Allow for adequate leg clearance.
d. Set the work height to just below elbow height (most of the time). Note work height is not table height. It must include the height of the object you are working on.

Reduce Excessive Forces

e. Use large muscle groups and position the body for maximum efficiency.
f. Transfer the load using equipment or other devices.
g. Use mechanical assists or power tools.
h. Improve the grip on the object.
i. Use the legs as well as the hands.

Minimize Fatigue and Static Load

j. Do workers keep their head or eyes static to watch a display?
k. Do workers keep constant pressure on a foot pedal?
l. Do tasks involve holding parts, tools, or objects for long periods?
m. Do standing workers lack seating, supports or footrests to vary posture?
n. Are any controls held longer than 30 seconds?

Tools and Equipment

o. Handle size must be appropriate for the worker in order to maintain control of torque-producing tools.
p. Handle shape determines the type of grip used, affecting wrist and elbow position.
q. Handle shape varies according to the task performed and the worker's grip and posture.
r. Properly designed handles allow push forces to be distributed over a relatively large area of the hand. They should allow use by either hand.
s. Poorly designed triggers can cause discomfort, fatigue, and risk of injury to the fingers and hand.
t. Is handle size too large to allow the worker's thumb and forefinger to slightly overlap around a closed grip?
u. Does the handle have features which may produce direct pressure stresses, such as sharp edges, grooves, seams, or excessive ribbing?
v. Is the handle surface slippery?
w. Does handle location or orientation require use of awkward hand or wrist postures, make the tool unbalanced, or increase force?
x. If gloves are required, are handles too small or too big?
y. Are the handles shaped so they are uncomfortable to hold?

4) Technical Assessments

A technical assessment may include measuring the actual stresses and strains on the body. If you can measure the forces acting on the low back or the amount of muscular activity in the arm muscles then you know how bad it is or not, how much or how far you have to go to fix it and whether you actually made it better. These tools are beyond the scope of this resource guide but ergonomic hazards can be quantified (measured with numbers). Review the 32 small business ergonomic case studies to get a feel for the range of possible technical assessment capabilities, see section 5.

Remember: most ergonomic hazards are not too difficult to identify and are usually easy to fix once you know what to look for.

See the example in section 6 to review how to Assess the Risk.

Find a Safer Way

This section includes how to develop reasonable and practical solutions. Refer to the list of 20 Common Ergonomic Hazards (section 4) and the Small Business Case Studies (section 5) for specific ideas, costs and benefits.

There are 4 steps to Finding a Safer Way.

- Determine Solution Options
- Evaluate Solution Options
- Implement Appropriate Solutions
- Follow up

Step 1: Determine Solution Options

There are three types of solution options:

1) Eliminating hazards at the **Source**. This means finding solutions that eliminate or significantly reduce the hazards. For example, using a lifting device eliminates the need to lift heavy objects from the floor. Eliminating hazards at the source usually involves engineering solutions. These engineering solutions make permanent changes to workstations, tools or equipment used on the job and therefore are the preferred solution method.

2) Reducing hazards along the **Path to the Worker**. This means solutions that reduce workers' time spent exposed to the hazard. Examples of reducing the hours of exposure include job rotation, changing work/rest schedules, introducing mini-breaks and proper maintenance and housekeeping. These solution ideas are **not permanent**, they **do not reduce the stress** in the task but are a good way to minimize exposure to the hazard while engineering solutions are implemented. Some types of personal protective equipment can reduce the exposure to the hazard. They include knee pads, gloves, back belts and wrist splints.

3) Reducing hazards at the **Level of the Worker**. This means solutions that involve increasing the coping skills of workers. For example, teaching proper lifting techniques, education on hazard awareness, stretching and developing safe work procedures all increase the coping skills of workers but **do not reduce** the level of risk to the hazard or their exposure. Educating workers to all hazards is a legislative requirement and developing safe work procedures is part of a good safety program but teaching lifting techniques and stretching will not help much when the object is very heavy, located on the floor and lifted every 5 minutes.

Gloves that do not fit properly can increase the effort required to grip because of the loss of sensitivity to touch.

Back belts and wrist splints have not been shown to protect workers from injuries and in some instances may be related to an increased risk of injury. Consult a health care professional if you are considering using these.

Step 2: Evaluate Solution Options

Select solutions that address the most hazards or the most serious hazards. It may help to rank the *effectiveness* of the solutions, i.e., the degree to which the solution controls the hazards.

This can be done by scoring the solution options on a scale from 1-4, with 1 being the most effective, see section 6 for an example of how to do this.

Another method to rank solutions is to use The Manitoba Labour and Immigration Workplace Safety and Health Division's Ergonomic checklist to score the task as if the solution was in place. Where would you rank a solution option if the checklist score was reduced from a 20 to 18 and cost $10 000? What about a solution option that reduced the score from a 20 to 11 and cost $1 500?

Don't forget to get worker input when deciding on the best solution option.

Step 3: Implement Appropriate Solutions

Implementation consists of making sure the solution idea works on a small scale, trial or mock up before the actual implementation.

A trial or test can be performed with one new product before you purchase many. A cardboard mock up can be build to see how it will fit. Several solutions can be tested by workers before a final decision is made.

Don't forget to include the affected workers in every stage of the solution process.

Don't forget to make appropriate modifications or revisions before a final solution is implemented. Sometimes a few changes have to be made before you get it right.

Step 4: Follow up

Follow up in the short term is very important to the ergonomic process and for workers to accept the changes that have been made. It is important to make sure,

- implemented solutions are successful in controling the hazards
- no new problems have been introduced
- an ergonomic checklist or a survey has been performed to evaluate any short term benefits.
- to confirm with workers who perform the job that the solution is working.

Follow up in the long term involves,

- measuring any reduction in the rate of injuries (# of claims).
- measuring the reduction in severity of injuries (days lost).
- finding an increase in work efficiency or product quality.
- finding a reduction in job turnover or absenteeism.

Form 4 Find a Safer Way Worksheet can be used to make documenting these four steps.

See example in section 6 to review how to Find a Safer Way.

Help with Finding Solutions.

Here is a brainstorming tool to help you identify the root cause of the problem and come up with solution options, (Form 5 Solution Brainstorming Tool, see section 6 for an example). There are six categories called Human, System, Method, Layout, Environment and Tools/Equipment. On a single page, write down Human in the middle and add what the problems are, i.e., low back strain. Next write down the other categories around the edges of the paper. Now ask yourself, what is it about the layout of the workstation that can result in low back problems? For example, the 180 degree twisting involved with reaching and grabbing the product. Continue with this method and the main issue should present itself.

Human - the problems may include injuries to various areas of the body, problems with making too many errors, vision issues, high task concentration problems, job accommodation issues or poor quality of work.

System - the process in which the task is a part of. How does work flow into the task and what are its outputs? This includes scheduling and other work organization factors.

Method - this is the method to perform the task. It includes manual material handling, fine dexterity work, semi-automation work, visual inspection and/or whole body movements.

Layout – the size and spacing of the workstation and product or interaction with products or clients.

Environment - this includes cold, noise, humidity or any other environmental condition.

Tools/Equipment - hand tools, workbenches, machines or anything the worker must use to perform their job.

Help with Conducting Safety Talks for the Back and Hands:

The Manitoba Workplace Safety and Health Act W210, section 4 (2b) states that the employer must "provide to all his workers such information, instruction, training, supervision and facilities to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his workers."

The safety, health and welfare of workers includes musculoskeletal injuries and therefore ergonomic related hazards.

Safety Talks may involve a few minutes of discussions between workers and supervisors concerning a safety issue in their workplace. Some workplaces have daily, weekly or monthly safety talks. Here are some points to keep in mind when you give Safety Talks to workers on backs and hands.

Safety Talk 1: Backs

The most important point when handling objects is to keep them as close to the body as possible. The second point is to handle the objects with a neutral low back position. This is also known as keeping the back straight or avoid rounding the low back.

Safety Talk 2: Hands

The key to minimizing strain in the hands is to be aware of how pressure builds up during the shift and what can be done to reduce it. Pressure builds up in the hands from too much pinch gripping, over gripping, using the hand as a hammer, excessive bending of the wrist and from direct pressure from a hard object or table edge.

Every situation and object is different. Keep these principles simple and remember to discuss with workers the hazards present in their jobs.

Help with Finding a Safer Way with Job Accommodations from an Ergonomic Perspective.

This guide discusses how reducing hazards from an injury prevention perspective can improve your ability to accommodate injured workers.

This resource guide is designed for prevention. It is easier, cheaper and better for everyone if injuries can be prevented. However, accommodating injured workers does need to be addressed. A functioning return to work program is the key to making the workplace better. The Workers Compensation Board of Manitoba has excellent resources for setting up and running a successful return to work program.

Job accommodations are driven by medical professional's opinions about the injury, their treatment and how best to prevent reoccurrences. Some information comes in the form of job restrictions or what the worker should not be doing. Other information comes in the form of abilities or what can the worker do. Either way refer to Form 6 in section 7 for help in finding safe jobs for injured workers and see the example in section 6.

Notice how the ergonomic hazards match up to the job restrictions or work abilities and how reducing the hazards can also accommodate more injured workers.

Other injury prevention tools/concepts that can be used for the return to work process includes

- the use of body mapping to identify jobs that can further aggravate an injured worker.
- using ergonomics to keep others from getting hurt in the first place.
- making changes to moderate risk level jobs so that injured workers can come back to those jobs safely without risk of re-injury.

See example in section 6 to review how to Find a Safer Way and Return to Work.

Everyday

Today – starts with a plan.

The plan includes reviewing this resource guide with your health and safety committee or safety representative. Use the following worksheet (Form 7 in section 7) to develop your plan or come up with your own.

Ergonomics Action Plan

	Beginning	Moving Forward	Succeeding
Spot the Hazard	Incident reports, other statistics and workers consulted to identify problem jobs. Body Mapping, Hazard Mapping conducted	Hazards identified using the Ergonomic Hazard Check List	Problem jobs have been prioritized for assessment. Workers have been educated on how to identify hazards
Assess the Risk	Body Mapping, Hazard Mapping used for assessment	Ergonomic surveys, checklist scores, ergonomic principles used.	Ergonomic standards and guidelines consulted
Find A Safer Way	Solution options are developed - elimination at the source is the best option	Solutions are properly evaluated	Solutions are implemented with worker(s) input and there is a follow up
Everyday	Health and Safety/ Ergonomics Plan developed	Moving forward on identified problems	Integrating health and safety /ergonomics into every day activities
Comments			

Along with this plan, you will have success if you:

- Integrate Health and Safety/Ergonomics into your regular business processes. Can these activities help your workplace reach their business objectives like improved quality, reduced absenteeism or improved customer satisfaction? By now you realize ergonomics can help workplaces in many different ways.
- Assess projects quantitatively. This means use numbers to assess the risk, justify your solution options and evaluate the project. Which statement is more meaningful,
  - A job scored a 20 on the ergonomic checklist (remember a score above 7 is a concern), the solution will bring the score down to an 8 and workers ratings of perceived effort on the trial version decreased from 8 to 5.
  - We would like to reduce stooping and we think workers will like it.
- Find and use resources. They may be available internally through the knowledge and experiences of employees, externally through suppliers, local safety professionals or the Occupational Health Centre?
- Identify and overcome objections or barriers to your ergonomic initiatives before they happen. Its' easier to climb a wall when you are prepared for it.

- Plan for an ergonomics culture change. Management and workers don't like change without being prepared for it. It is important to explain what is happening, how, when, where and especially how does it affect the worker's job.
- Ergonomic Program / Ergonomic Practice. Do not spend the next six months developing an ergonomics program and do little actual changes. There are plenty of opportunities where 'easy low cost' fixes can be made. This will show everyone what low cost or no cost improvements can be made and builds some credibility.

Tomorrow – continues with a team effort

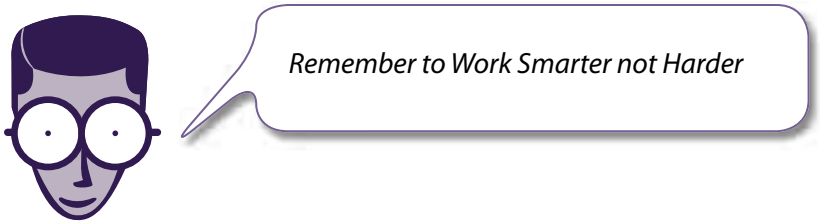
First of all, knowing your needs, assessing your resources, keeping good records and communicating with all employees is essential to any successful initiative. In this case:

- Do you have ergonomic problems in one area or over the entire workplace?
- Do you feel confident in figuring out most of your problem jobs or do you need additional help?
- Are you recording all pertinent information concerning near misses, incidents and injuries?
- Is everyone in your workplace informed. Does everyone know what is happening, why and how they can help?

Secondly, rarely does anyone succeed alone. Whether it's business, personal, health or spiritual goals, people need others to help them. That is why health and safety associations are popular and successful. They help to mentor workplaces, provide assistance, share best practices and other information that cannot be done alone.

Do you have a heath and safety group or other resources you can join? What about starting your own health and safety group in your community!

Review the list of resources, see section 8 and see if they can help you meet your health and safety and ergonomics goals.



Section 4: 20 Common Ergonomic Hazards and Solution Ideas

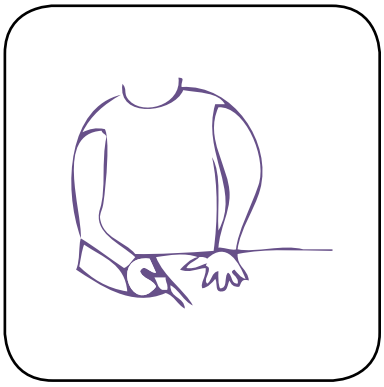
MFL Occupational Health Centre

SAFE WORK
S SPOT THE HAZARD
A ASSESS THE RISK
F FIND A SAFER WAY
E EVERYDAY
™

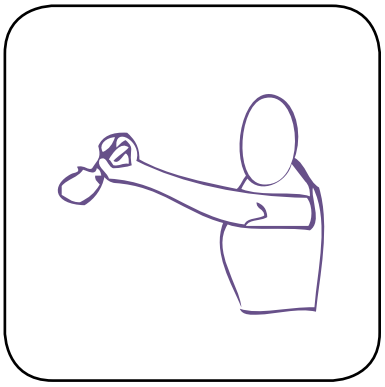
Forceful Exertions

Tasks involving forceful exertions are associated with increased risk of injury. Forceful exertions include lifting, lowering, pushing, pulling, carrying, gripping or any other movements that require moderate to high effort. Increase strain on the body may result in over exertion injuries.

Is this a concern in the workplace?



Does the job require obvious efforts or holding onto heavy objects?

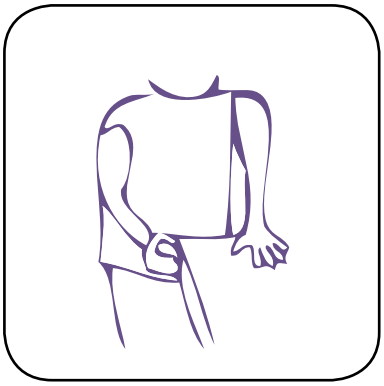


Do worker's facial expressions show a forceful effort?

The risk of injury increases when:

- There is poor body positions when the exertion occurs.
- The exertions are frequent and long in duration.
- The exertion is in a static position for long periods of time.

What can we do?



1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include new tools that reduce the effort required.

2) Another option that minimizes the risk at the **Source** involves reducing the weight or the effort required to perform the task.

3) Reducing the level of risk along the **Path** to the worker may include using job rotation, performing regular maintenance on equipment and/or using team lifting.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #3, 10, 12, 13, 14, 16, 18, 21, 22, 23, 24, and 25 for real world examples, see section 5

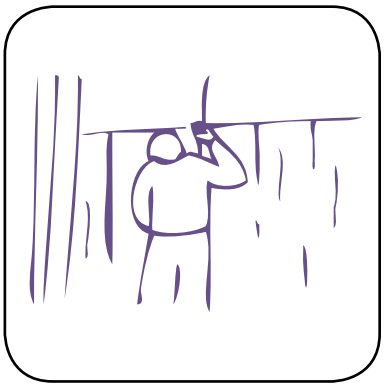
Awkward Motions

Jerky or awkward motions are considered hazards. Unexpected forceful exertions or motions that are not smooth can increase wear and tear strain on the body. Some injuries can occur due to one forceful, awkward exertion. Other injuries can accumulate over time when there is inadequate recovery.

Is this a concern in the workplace?

Are motions smooth or do you observe workers struggling in their tasks?

Are motions usually smooth but every once in a while there is an unexpected stop, jerky or awkward motion?



The risk of injury increases when:

- The body is in a poor position when the abrupt motion happens. Example, pushing a cart with the elbows 'winging out' and a wheel gets caught on something.
- The jerky or awkward motion occurs continuously throughout the shift.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include using equipment that is stable.

2) Another option that minimizes the risk at the **Source** may involve bigger wheels on carts or changing their pivoting capability.

3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation, reducing unexpected forces on the body and better designed handles.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #1,3, 8, 11, 14, 16, 20, 21, and 29 for real world examples, see section 5.

Far Reaching

A far reach, whether standing or sitting, is a hazard because of increased strain to the body. Reaching far while seated places the shoulder and lower back in a poor position. There is also an increased strain to these areas because of the added torque (force on the joint caused by the weight of the object and the distance away from the pivot point).

Is this a concern in the workplace?

Do workers have to stretch to reach for objects?

Are there frequent reaches to the side or behind the body?

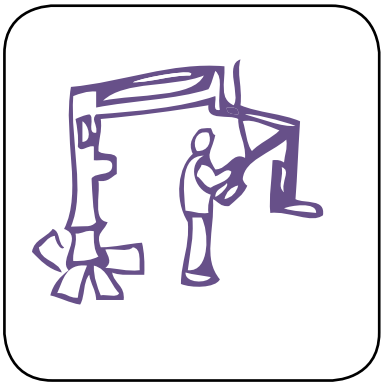
The risk of injury increases when:

- The reach is past the worker's comfortable reach distance.
- The reach is performed frequently and occurs throughout the shift.
- The far reach results in awkward body positions.

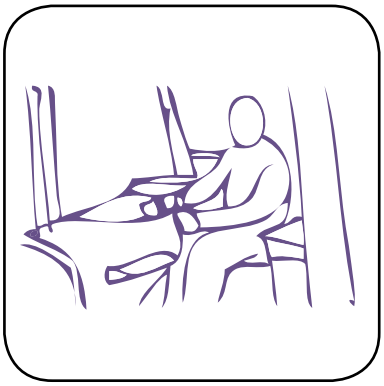
What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include placing frequently used objects in the 2 o'clock or 10 o'clock position and within a comfortable reach.



2) Another option that minimizes the risk at the **Source** involves using extenders or other devices to help reach objects.



3) Reducing the level of risk along the **Path** to the worker may include using job rotation, taking frequent mini-breaks or increasing the variety of work.

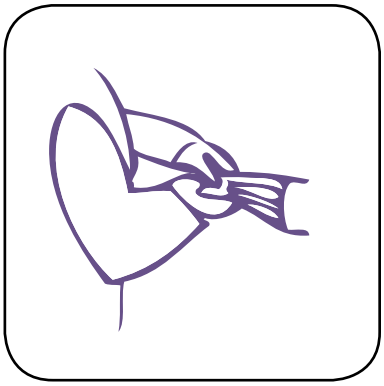
4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #2, 4, 11, 13, 17, 25, 30 and 31, for real world examples, see section 5.

Pinch Gripping

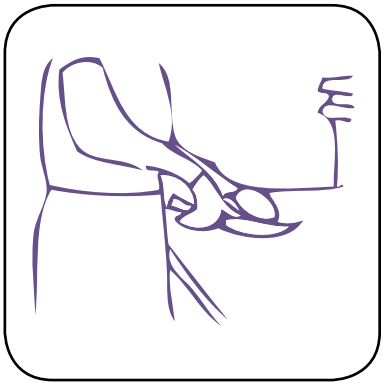
Pinch gripping is a hazard because squeezing the fingers together in a pinch grip increases the internal force within the wrist and the forearm muscles have to work harder. The most efficient grip is a power grip or 'C' grip, like holding onto bicycle handles. This minimizes strain in the wrist and lets the forearm muscles work efficiently. A pinch grip increases the strain in the wrist and is not an efficient use of the forearm muscles. Injuries may include forearm muscle pain or a strain in the wrist area.

Is this a concern in the workplace?



Do workers struggle with tasks that involve pinch gripping?

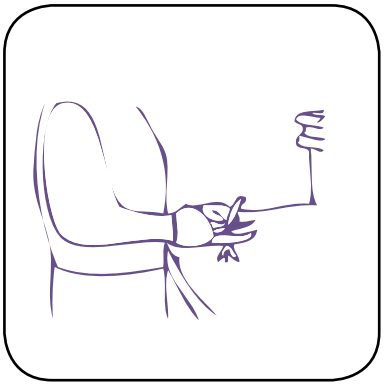
Is there continuous holding onto objects with a pinch grip?



The risk of injury increases when:

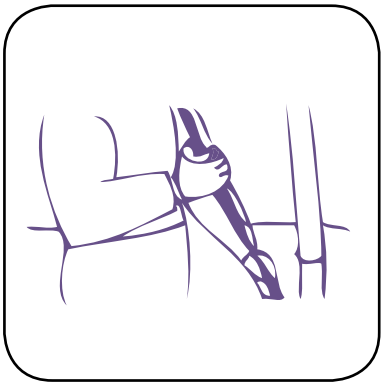
- There is wrist bending with the pinch grip.
- Big or bulky gloves are worn. Gloves increase the required grip force.
- There are other hazards present such as repetitive motions, or increased grip force.

What can we do?

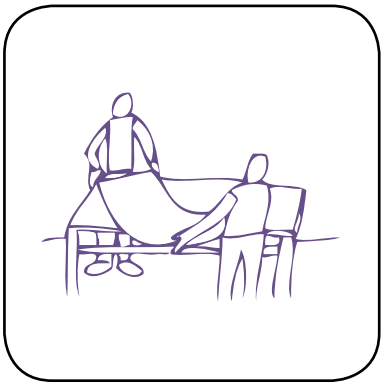


1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include a change in tools to eliminate pinch gripping.



2) Another option that minimizes the risk at the **Source** involves adding thickness to objects in order to reduce pinching.



3) Reducing the level of risk along the **Path** to the worker may involve using proper fitting gloves, job rotation or reducing pinch grip forces.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #8, 14, 18, 19, and 24 for real world examples, see section 5.

Poor Neck Position

Poor neck positions include bending the neck forward, backward, to the side or twisting. These positions increase the stress on bones, ligaments and nerves along with increasing strain to the muscles. Injuries to the neck area include tension neck syndrome, joint irritation and nerve impingement and headaches.

Is this a concern in the workplace?

Do workers bend and hold the neck in a poor position for long periods of time?

Is there bending of the neck backward, even slightly, occurring in the workplace, especially when viewing a monitor?

The risk of injury increases when:

- The poor neck position is held for long periods of time.
- There is repetitive bending of the neck.
- There is direct or indirect glare on the monitor or work surface.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include changing the layout of equipment or tools.

2) Another option that minimizes the risk at the **Source** involves reducing direct or indirect glare.

3) Reducing the level of risk along the **Path** to the worker may include job rotation, taking frequent breaks or improving lighting or monitor font size.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #2, 4, 8 and 28, for real world examples, see section 5.

Poor Shoulder Positions

An awkward shoulder posture is a hazard. Poor shoulder positions increase fatigue in shoulder muscles and stress to the shoulder joint. There are small muscles that surround the shoulder. These small muscles are designed for range of movement but can become easily fatigued and injured. When the elbow is positioned away from the body, an increased strain is placed on the bones, ligaments and tendons of the shoulder joint. Injuries to this area include rotator cuff tendonitis, tension neck syndrome and bursitis.

Is this a concern in the workplace?

Are workers continuously 'winging' their elbows out, away from the body?

Is there reaching behind the body? Is there pulling into the body with the elbow positioned behind the body?

The risk of injury increases when:

- The length of time the elbow is 'winged' out away from the body is more than 25% of the job cycle.
- There is weight in the hands or a forceful exertion occurs when the elbow is 'winging out'.
- There is shrugging of the shoulders or the shoulders are unbalanced.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include the purchase of a height adjustable platform.

2) Another option that minimizes the risk at the **Source** involves changing the layout to reduce reaching.

3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation or purchasing tools that keep the elbow in close to the body.

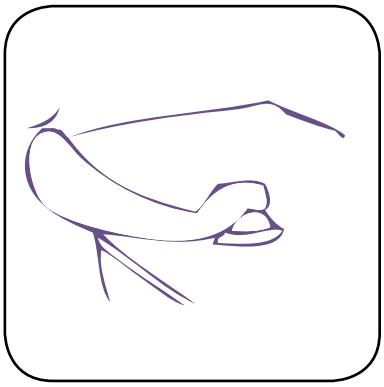
4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #2, 4, 8, 13, 16, 18, 20, 25, 27, 30 and 31, for real world examples, see section 5.

Poor Wrist Positions

Bending the wrists backward, forward, or to either side is considered a hazard because these positions increase the stress in the hands. There is more internal force and pressure in the hands/wrists. This has been shown to cause tendonitis or nerve injuries.

Is this a concern in the workplace?



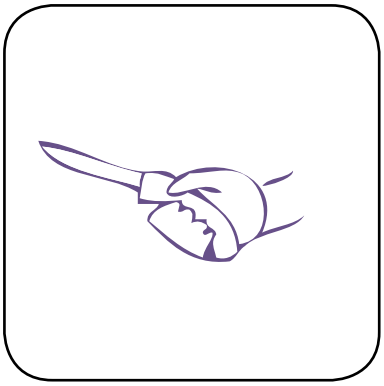
Do workers rapidly bend their wrists? Are wrists in a poor position for long periods of time?

Are there situations where extreme bending of the wrists occurs?

The risk of injury increases when:

- The speed of work and wrist bending is fast.
- These positions are held for long periods of time.
- There is pinching or heavy gripping involved.

What can we do?



1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include getting the right tool for the job.

2) Another option that minimizes the risk at the **Source** involves changing the layout of the workstation.

3) Reducing the level of risk along the **Path** to the worker may involve reducing the exposure to the hazard by implementing job rotation, a varying work/rest schedule or introducing safe work procedures.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

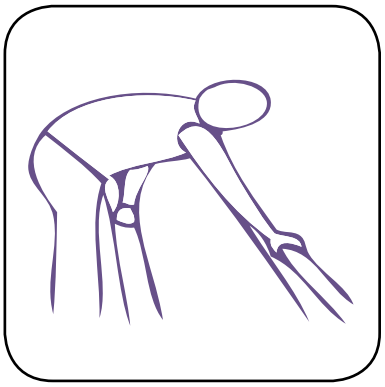
Refer to Small Business Case Studies #4, 6, 13, 14, 16, 20, 27, 28, and 29 for real world examples, see section 5.

Manual Material Handling

Handling objects below knee level, above the shoulder or far away from the body are hazards because the low back is usually in a poor position and there is added stress to the lower back due to the weight of the upper body. Gravity wants to pull the upper body down. The low back muscles have to hold the upper body and lift up the object.

Is this a concern in the workplace?

Do workers lift objects from or near the floor? Are there far reaches while holding onto an object even if the weight is low?



Its' only 5 lbs (2.2kg)! Don't forget about the weight of the upper body. Gravity wants to pull it down, so the back muscles have to work harder to keep you up.

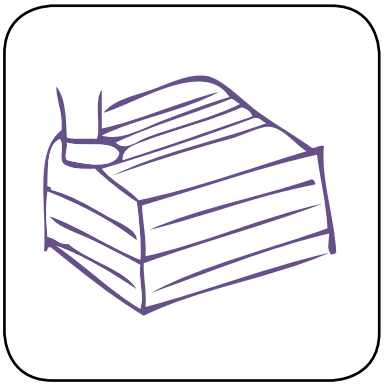
The risk of injury increases when:

- The weight of the object increases.
- The object is held farther away from the body.
- The lower back is 'rounded' and not in a 'neutral' position.
- The legs are 'straight' instead of bending at the knees and hips.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may be a lifting device.



2) Another option that minimizes the risk at the **Source** involves building platforms or stands to allow workers to load/unload material near knee height.

3) Reducing the level of risk along the **Path** to the worker may involve reducing the exposure to the hazard such as implementing job rotation, a varying work/rest schedule or introducing team lifting.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #3, 9, 10, 11, 12, 15, 18, and 21-25, for real world examples, see section 5.

Stooping and Leaning

Stooping and leaning is a hazard because there is a combination of poor low back posture and strain to the low back. When workers stoop or lean to perform their work, there is the potential to 'round' the lower back. This places the low back spine in a poor position. There is also the weight of their upper body to consider. When stooping or leaning, gravity wants to pull the upper body down and low back muscles have to strain to keep the upper body upright.

Is this a concern in the workplace?

Are workers stooping or leaning more than 15 degrees?

Is there stooping and leaning while lifting or holding a heavy object?

The risk of injury increases when:

- The frequency and/or duration of stooping or leaning increases when manual material hazards are present.
- The greater the distance is between the upper body's centre of mass and the low back pivot point.
- The more 'rounded' the lower back is.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include eliminating the need to stoop by purchasing a mechanical lifting device or a tool to reduce reaching to the floor.

2) Another option that minimizes the risk at the **Source** involves reducing the reach distance.

3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation or adding a support for the worker to hold onto when stooping.

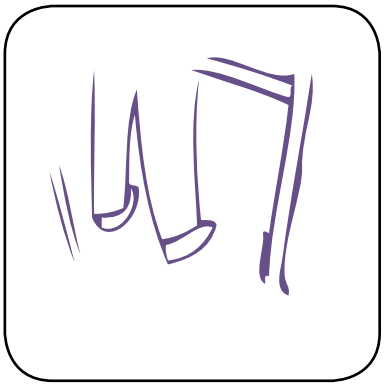
4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #2, 4, 5, 9, 11, 18, 21, 22, 23, 24, and 25 for real world examples, see section 5.

Standing Without Adequate Leg Support

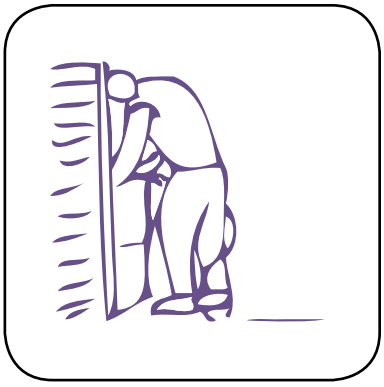
Standing without adequate leg support is a hazard to the low back and legs. This position, over time, builds up muscle tension in the lower back and legs leading to discomfort and pain in these areas.

Is this a concern in the workplace?



Are workers standing stationary for long periods of time without adequate leg support?

Do workers report low back, leg and feet discomfort?



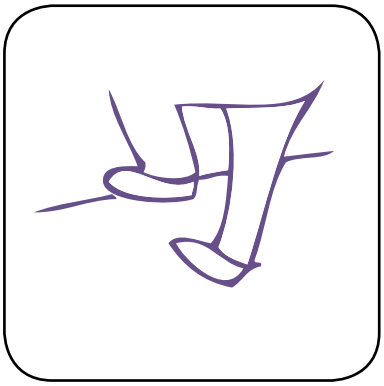
The risk of injury increases when:

- Workers are standing on a hard surface such as concrete.
- The design of the workstation does not allow for changes in leg position.
- There are other hazards involved such as cold or highly focused work.

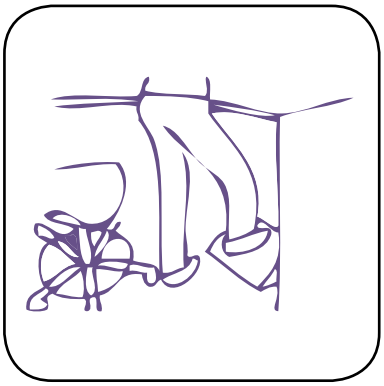
What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include providing an industrial chair, allowing the worker to sit instead of standing.



2) Another option that minimizes the risk at the **Source** involves providing a foot support.



3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation or encourage frequent changes of posture.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #4, 8, 12, 14, 16, 17 and 26 for real world examples, see section 5.

Sitting in a Poor Position

Sitting in a poor position increases the strain to the lower back, legs and neck. Sitting in a poor position results in a 'rounding' of the lower back, stretching of muscles and ligaments in the lower back, increased pressure on the legs and changes the alignment of the spine and, therefore can lead to neck discomfort.

Is this a concern in the workplace?

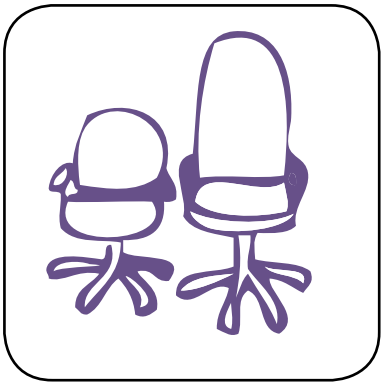
Do workers know how to adjust their chair and do they?

Is there slouching or sitting without adequate back support?

The risk of injury increases when:

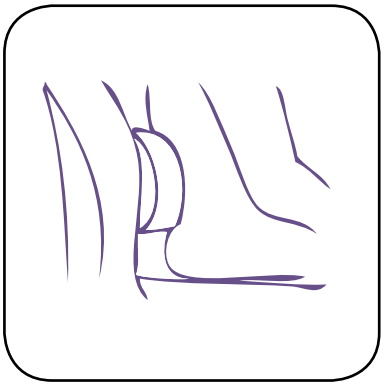
- There is a poor sitting position for long periods of time.
- There is inadequate lumbar support for the lower back.
- The knee is in a position that is lower or higher in height than the hip.

What can we do?



1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include the purchase of a chair with adjustable features and adequate lumbar support.



2) Another option that minimizes the risk at the **Source** involves adding a lumbar support cushion and a footrest.

3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation, making frequent adjustments to the chair or remembering to get out of the chair every once in a while.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

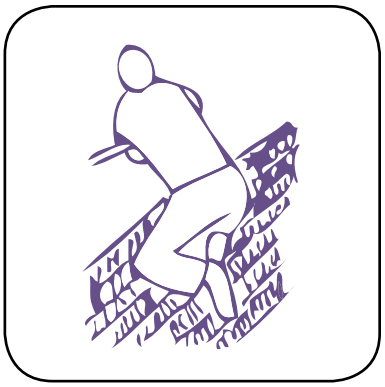
Refer to Small Business Case Studies # 11, 26, 28 and 32 for real world examples, see section 5.

Kneeling and Squatting

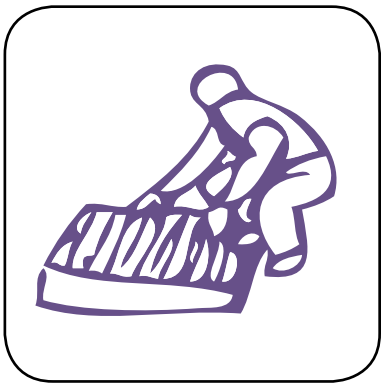
Tasks involving kneeling and squatting positions are associated with low back, hip, knee and ankle injuries. These postures increase the strain on those joints because the body positions are at or near their end range of motion. End range of motion positions are mechanically inefficient postures and, therefore, there is more joint stress.

Is this a concern in the workplace?

Are workers kneeling and squatting continuously?



Do workers kneel on a hard surface?



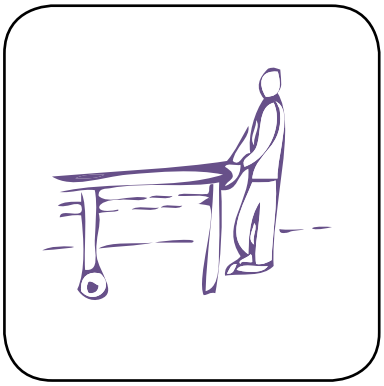
The risk of injury increases when:

- These postures are held for long periods of time or occur frequently.
- There are forceful exertions or a heavy weight held in the hands when in a kneeling or squatting position.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include changing the working height to eliminate kneeling and squatting.



2) Another option that minimizes the risk at the **Source** involves purchasing equipment that reduces the amount of squatting or kneeling.

3) Reducing the level of risk along the **Path** to the worker may include using job rotation, knee pads or other assistive devices.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

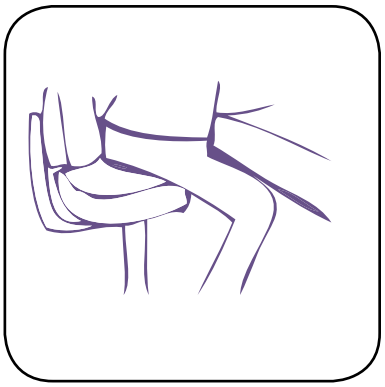
Refer to Small Business Case Studies # 3, 5, and 13, for real world examples, see section 5.

Constrained Body Positions

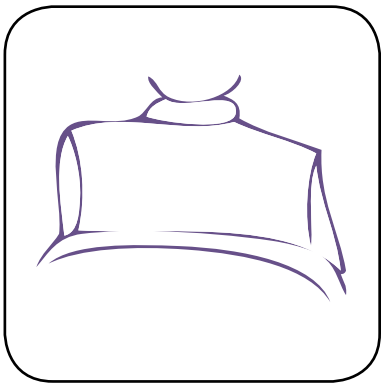
A constrained body position occurs when a posture is held for long periods of time. These positions are a hazard because it increases the mechanical strain to the body joint along with impinging blood vessels and nerves. Injuries can occur to the neck, shoulder, hands, back and legs.

Is this a concern in the workplace?

Are poor body positions held for long periods of time?



Is there a poor 'fit' between the worker and their workstation?



The risk of injury increases when:

- The duration of constrained posture increases.
- There are forceful exertions in combination with the constrained body position.
- The work is more static than dynamic. For example, lack of body movement.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include a headset to eliminate holding the phone in an awkward position.

2) Another option that minimizes the risk at the **Source** involves improving the leg clearance at the workstation.

3) Reducing the level of risk along the **Path** to the worker may include using job rotation, taking frequent mini-breaks or increasing the variety of work.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #4, 8, 17, 20, 27 and 29 for real world examples, see section 5.

Long Duration Work

Long duration work is a hazard because both mental and physical strain increases with longer hours of work. Eight, ten and 12 hour shifts are associated with increased sprain and strains along with errors and incidents. Shift work could also be considered a hazard under this category.

Is this a concern in the workplace?

Is there long duration work and lack of task variety?

Do you have incidents or near misses that can be traced to long duration work?

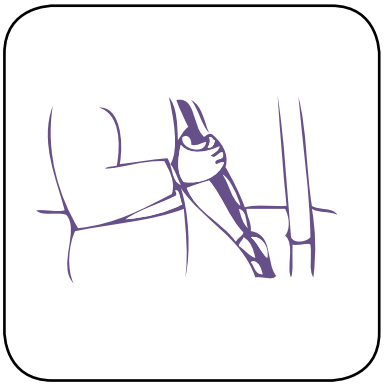
The risk of injury increases when:

- There are other physical or mental stresses involved in the task.
- The organization of shift work is inadequate.
- There is lack of control over the pace of work.

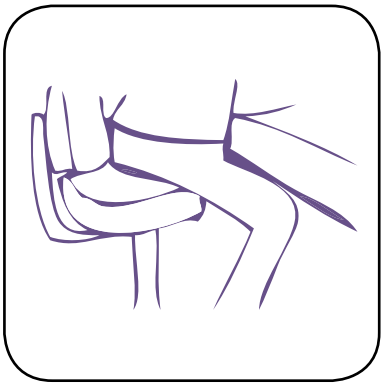
What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include changing the organization of work.



2) Another option that minimizes the risk at the **Source** involves reducing other physical and mental hazards. Example, reducing the vibration and improving the grip.



3) Reducing the level of risk along the **Path** to the worker may include job rotation, taking frequent breaks or improving shift work schedules.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

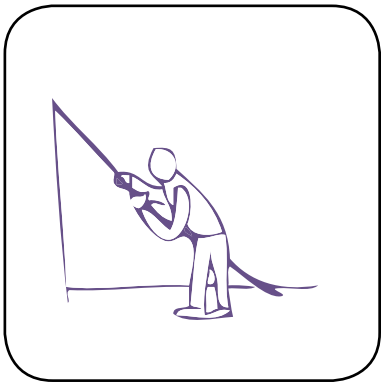
Refer to Small Business Case Studies # 7,8,9 and 32 for real world examples, see section 5.

Repetitive Work

There is no standard definition of repetitive work. This hazard depends on other hazards such as body position, forceful exertions and duration of exposure. Repetitive work is considered a hazard because the faster work is performed, the more fatigue and strain there is on the body. Researchers have found repetitive work to be a concern in assembly line tasks and jobs with a lack of variety. Some jobs may not have repetitive cycles but there is still repetitive body motions like maintenance work. There can be repetitive bending and stooping over the length of the day.

Is this a concern in the workplace?

Do workers perform the same motions continuously throughout the shift?



Do tasks lack variety in terms of body motions or positions?

The risk of injury increases when:

- The speed of work is fast and the length of time performing this task is long.
- There are other hazards present such as poor body positions and forceful exertions.
- There are insufficient mini-breaks or rest allowances.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include the development of new procedures or equipment that eliminates repetitive motions.

2) Another option that minimizes the risk at the **Source** involves adding a variety of work to the task.

3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation or adding mini-breaks.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #2, 4, 5, 7, 8, 9, 10, 11, 13, 16, 17, 18, 20, and 22-32 , for real world examples, see section 5.

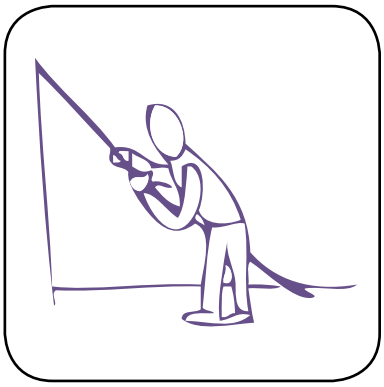
Time Pressure and Focused Work

Time pressure and focused work is a hazard because it increases the physiological strain (blood flow, energy consumption, mental alertness) on the body and may increase the risk of injury due to other hazards. Workers that are under time pressure or are very focused on their work tend to have increased blood pressure, increased muscle tension and fatigue quicker. This does not cause musculoskeletal injuries but amplifies the effects of other hazards such as constrained postures, tight gripping and long duration work.

Is this a concern in the workplace?

Are workers showing signs of stress?

Is there time pressure on workers?



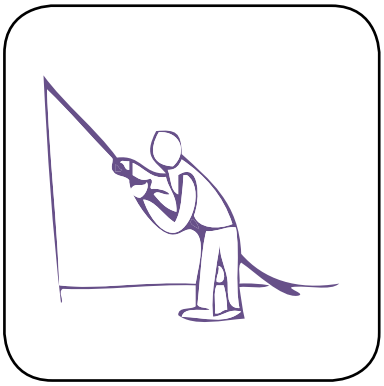
The risk of injury increases when:

- There are other ergonomic hazards present in the task.
- There are no adequate work/rest breaks given to or taken by workers.
- The stress or focused work is constant and prolonged.

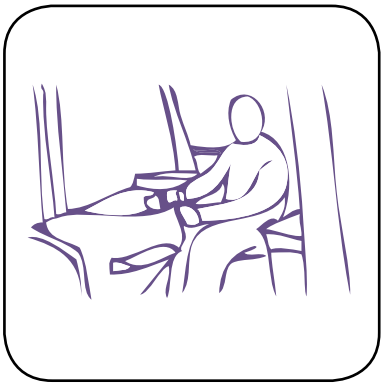
What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include reorganizing the work to eliminate deadline pressure.



2) Another option that minimizes the risk at the **Source** includes minimizing other ergonomic hazards.



3) Reducing the level of risk along the **Path** to the worker may involve the use of job rotation or adding reminders to take mini-breaks and release muscle tension.

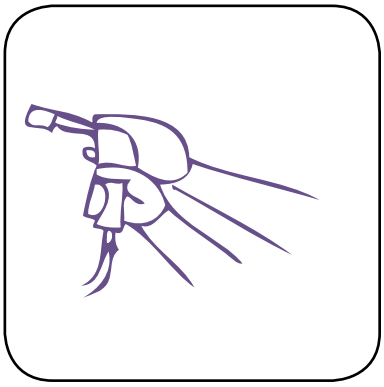
4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #4, 5-11, 16,17, and 26-32 for real world examples, see section 5.

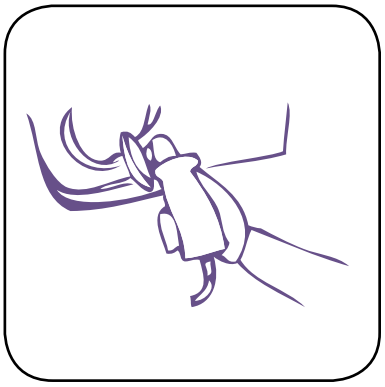
Cold and Vibration

Working in the cold with vibrating equipment has been linked to vibration white finger disease and carpal tunnel syndrome. Exposure can cause physical damage to the blood vessels and nerves. Some workers who are at risk include construction, forestry, railroad, manufacturing, agriculture, mining and food processing.

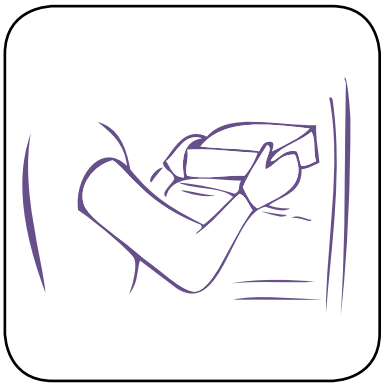
Is this a concern in the workplace?



Are workers in a cold environment? Are workers exposed to hand tool vibration?



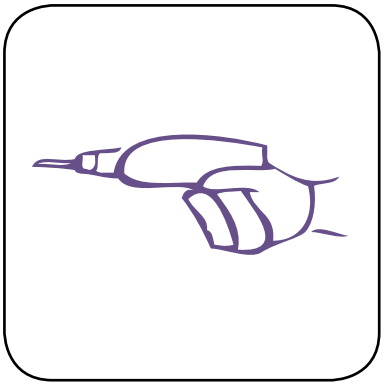
Do gloves fit properly and do they dampen the vibration?



The risk of injury increases when:

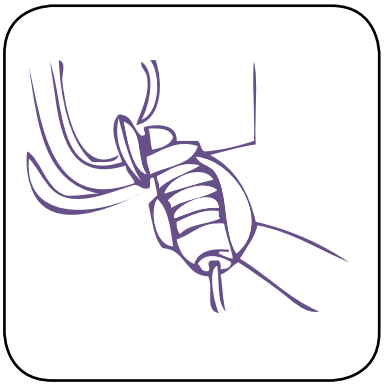
- Exposure to vibrating tools and cold is constant and long in duration.
- There is tight gripping involved with the tool.

What can we do?



1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include purchasing anti-vibration tools.



2) Another option that minimizes the risk at the **Source** involves maintaining equipment in good working order.

3) Reducing the level of risk along the **Path** to the worker may involve reducing the exposure to the hazard by using anti-vibration gloves, proper fitting gloves or wrapping the tool in anti-vibration tape.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #1, 6, 7, 8, and 15 for real world examples, see section 5.

Poor Lighting and Glare

Glare, too much or not enough light is a hazard because workers do not perform well in less than an ideal environment. A worker may strain their eyes or adopt poor body positions to see better. Glare can be direct from light sources or indirect from reflective surfaces. Overly bright areas or poor contrast between one's work and background may result in squinting.

Is this a concern in the workplace?

Are there shadows over the work area or too much brightness?

Do workers strain or squint to see their work?

The risk of injury increases when:

- Exposure to poor lighting conditions occurs frequently or over long periods of time.
- The poor lighting conditions result in poor body positions.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include changing the type of lighting or position of equipment.

2) Another option that minimizes the risk at the **Source** involves using diffusers or shields to minimize glare on the computer monitor.

3) Reducing the level of risk along the **Path** to the worker may include using task lighting, blinds or changing the contrast or colours on a monitor.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #27 and 28 for real world examples, see section 5.

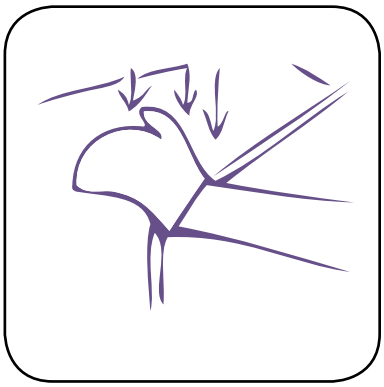
Direct Pressure

Direct pressure is a hazard because resting, leaning or placing the palm of the hand, wrist, elbow or other soft body parts on a hard edge can reduce blood flow and increase the pressure on nerves. The direct pressure can come from tools, the edge of a desk or equipment. Direct pressure can also be called mechanical compression or contact stress.

Is this a concern in the workplace?

Do you have tools that put pressure in the palm of the hand?

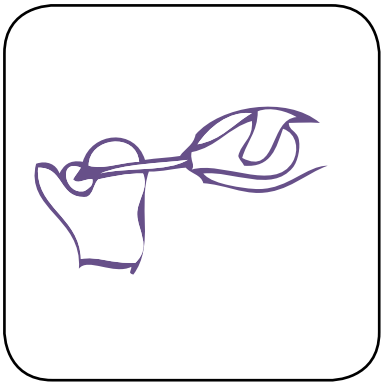
Are your workers leaning on a hard edge with their wrists or elbows?



The risk of injury increases when:

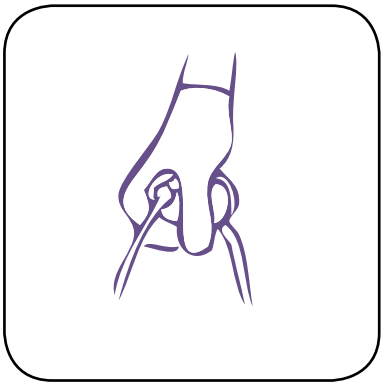
- The speed of work and wrist bending is fast.
- The task occurs every day or the duration of the task is long.
- There is rubbing as well as direct pressure.
- The hand is used as a hammer.

What can we do?

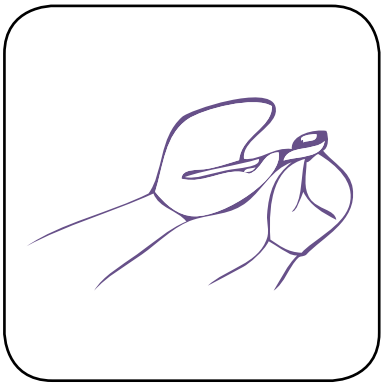


1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include getting the right tool for the job. Example, a tool with a rounded handle.



2) Another option that minimizes the risk at the **Source** involves adding a variety of work to the job like the many different tasks housekeeping involves.



3) Reducing the level of risk along the **Path** to the worker may involve requiring the use of a mallet, padded gloves or padding the edge of the workstation.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies #1, 29, and 31 for real world examples, see section 5.

Stress Issues

Stress issues involve a person's work environment. These issues include time pressures or deadlines, poor organizational communication, a lack of job control and poor job satisfaction. These factors have been linked to the reporting of injuries. They do not necessarily cause injuries but they do amplify the strain due to other physical hazards.

Is this a concern in the workplace?

Are there time pressures or deadlines to meet and are they adding stress to workers?

Would you consider your workplace to have a good safety culture and an environment that promotes safety, communication and respect?

The risk of injury increases when:

- There are physical hazards on workers that increase the risk of injury.
- There is a lack of communication throughout the organization.
- There is a lack of input from workers on how jobs are organized, designed and performed.

What can we do?

1) The preferred option is to eliminate the hazard at the **Source** with engineering controls.

An example may include the reorganization of tasks to eliminate time pressure such as multiple small deadlines instead of one deadline.

2) Another option that minimizes the risk at the **Source** involves adding variety of work to the job like the many different tasks housekeeping involves.

3) Reducing the level of risk along the **Path** to the worker may involve improving the lines of communication between workers and management, i.e., written feedback when workers make suggestions for improvement.

4) Reducing the risk at the **Worker level** may involve educating workers on the hazards, what to be aware of and safe work practices.

Refer to Small Business Case Studies # 2, 11, and 16 for real world examples, see section 5.

Section 5: 32 Small Business Ergonomic Case Studies

MFL Occupational Health Centre

SAFE WORK
SPOT THE HAZARD
ASSESS THE RISK
FIND A SAFER WAY
EVERYDAY
TM

MFL Occupational Health Centre

102-275 Broadway
Winnipeg, Manitoba
R3C 4M6

ph (204) 949-0811
fax (204) 956-0848
toll free 1-888-843-1229
(Manitoba only)

email: mflohc@mlfohc.com
website: www.mflohc.mb.ca

SAFE WORK
S SPOT THE HAZARD
A ASSESS THE RISK
F FIND A SAFER WAY
E EVERYDAY

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Ergonomics and The Case Studies

For more information on the case studies below please visit www.mflohc.mb.ca to download a pdf of the Small Business Ergonomics Case Studies or call (204) 949-0811 or toll free at 1-888-843-1229 to request a booklet.

List of Case Studies

Case Study	Health and Safety Identified Problem	Risk Reduction Solution
Automotive Repair: Tool Use	Vibration and direct pressure	Mechanics gloves and anti-vibration gloves
Automotive Repair: Stooping	Stooping into hoods	Work/Rest schedules
Bakery: Lifting	Awkward and heavy lifting	Lifting eliminated
Bakery: Work Table Height	Working height is too low	Risers for work table
Construction: Muscle Tension	Static postures	Scientific based stretches
Construction: Tool vibration	Vibration from a tool	Grip tape
Construction: Whole body vibration	Vibration from operating heavy equipment	Anti-vibration seat pad
Construction: Awkward Posture	Grip force and arm position	Increase diameter of tool
Construction: Stooping	Stooping to the ground	New tool
Day Care: Part 1- Lifting	Clothing children, stooping	Adult chairs
Day Care: Part 2 - Stooping	Cleaning tables and lifting	Tools to clean tables
Food Production: lifting	Heavy lifting of trays	New lighter and stackable trays
Food Production: Whole Body Posture	Scrubbing to clean fixtures	Cleaning tub to soak fixtures
Hair Salon	Clearance and posture	Change of work positions
Manufacturing: Lifting	Manual lifting from carts	Lifting device
Manufacturing: Tool Use	Poorly designed tool	Properly designed tool
Manufacturing: Arm Posture	Awkward postures	Education and training
Manufacturing: Material Handling	Heavy and awkward material handling	Tool to help with lift
Manufacturing: Lifting	Lifting from the floor level	Tool to aid lifting
Metal Fabrication: Lifting	Material handling from a pallet	Low level cart
Metal Fabrication: Material Handling	Awkward and heavy material handling	Work table on wheels
Metal Fabrication: Material Handling II	Handling dies	Lifting device
Office: Sitting and Standing	Inadequate foot support	Footrests and education
Office: Mouse Position and Lighting	Poor shoulder position and too much light	Improved mouse position and better lighting
Office: Mouse, Monitor and Chair	Poor placement of equipment	Improved placement of equipment

MFL Occupational Health Centre

102-275 Broadway
Winnipeg, Manitoba
R3C 4M6

ph (204) 949-0811
fax (204) 956-0848
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email: mflohc@mlfohc.com
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SAFE WORK
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EVERYDAY

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List of Case Studies

Case Study	Health and Safety Identified Problem	Risk Reduction Solution
Office: Mouse Wrist Rest	Too much use of the wrist	Removed wrist rest and provided education
Office: Keyboard Tray	Poor shoulder position	Improved keyboard placement
Office: Reaching	Poor layout of equipment	Improved layout
Office: Chair Position	Lack of adjustability	New adjustable chair
Total - 32	Health and Safety Identified Problem	Risk Reduction Solution

Section 6: Scrubbing and Cleaning Task Example

Section 6: Scrubbing and Cleaning Task Example

This example is based on Case Study #13 of the Small Business Ergonomic Case studies found in Section 5.

Problem – reports of sore arms and backs with a scrubbing and cleaning task with 1 worker off work due to an injury. Complete a Job Hazard Assessment.

Use Section 1: Small Workplace Ergonomic Resource Guide Overview as a checklist for your investigation. Note: this is a full investigation, most ergonomic assessments may not require this much detail or work.

Small Workplace Ergonomics Resource Guide Overview

		Completed	Results
Spot the Ergonomic Hazard	Read Section 2 and 3	X, April 12th	13 hazards found for this task mostly due to awkward body positions and forceful exertions.
	Complete Form 1 – Ergonomic Hazard Inspection Checklist	X, April 12th	
	Collect more information using additional methods	X, April 13th 2 new hazards found	
	Review 32 ergonomic case studies, section 5	X	
Assess the Risk	Complete Ergonomic Checklist(s)	X, April 15th	Task scored a 9. Workers noted increased discomfort after 1.5 hrs. There are multiple hazards in combination. 2 hazards are high and 8 are moderate.
	Perform Worker Consultations	X, April 15th	
	Review Ergonomic Principles	X, April 16th	
	Use Form 2 – Workplace Ergonomic Survey	X, April 17th	
Find a Safer Way	Determine Solution Options	X, April 15th	4 ideas
	Use Form 4 - Find a Safer Way Worksheet	X, April 15th	Fixing at the source is the best solution
	Use Form 5 - Solution Brain Storming Tool	X, April 16th	Work Method is the main issue
	Evaluate Solution Options	X, April 17th	Costs, benefits and worker acceptance
	Implement Appropriate Solutions	X, April 17th	Follow Up – beyond expectations
	Follow up	X, May 25th	Now can accommodate an injured worker.
	Use Form 6 to help with Return to Work	X, May 25th	
Everyday	Today and Tomorrow Use Form 7 to develop an Action Plan/ Perform a Self -Audit	Add to action plan – will look at other cleaning tasks	
Comments	Idea came from a worker. All hazards significantly reduced Reduced time from 3 hours to 1.5 hours. Pay back period of 3 months.		

Form 1: Ergonomic Hazard Inspection Check List (Section 6 Example)

Potential Hazard	Yes/No	Comments
Work Motion and Exertions:		
Forceful Exertions • Does the job require obvious efforts or holding onto heavy objects? • Do workers' facial expressions show a forceful effort?	✓	Gripping and scrubbing
Awkward Motions • Are motions smooth or do you observe workers struggling in their tasks? • Are motions usually smooth but every once in a while there is an unexpected stop, jerky or awkward motion?	✓	Scrubbing difficult areas
Far Reaching • Do workers have to stretch to reach for objects? • Are there frequent reaches to the side or behind the body?	✓	Full outward reach and too the floor
Pinch Gripping • Do workers struggle with tasks that involve pinch gripping? • Is there continuous holding onto objects with a pinch grip?		
Work Posture:		
Poor Neck Positions • Do workers bend and hold the neck in a poor position for long periods of time? • Is there bending of the neck backward, even slightly, occurring in your workplace, especially when viewing a monitor?	✓	Looking down continuously
Poor Shoulder Positions • Are workers continuously 'winging' their elbows out, away from the body? • Is there reaching behind the body? Is there pulling into the body with the elbow positioned behind the body?	✓	
Poor Wrist Positions • Do workers rapidly bend their wrists? • Are wrists in a poor position for long periods of time? • Are there situations where extreme bending of the wrists occurs?	✓	Place coils on the floor
Manual Material Handling • Do workers lift objects from or near the floor? • Are there far reaches while holding onto an object even if the weight is low?	✓	
Stooping and Leaning • Are workers stooping or leaning more than 15 degrees? • Is there stooping and leaning while lifting or holding a heavy object?	✓	
Standing Without Adequate Leg Support • Are workers standing stationary for long periods of time without adequate leg support? • Do workers report low back, leg and feet discomfort?	✓	Concrete floor
Sitting in a Poor Position • Do workers know how to adjust their chair and do they? • Is there slouching or sitting without adequate back support?		

Potential Hazard	Yes/No	Comments
Kneeling and Squatting • Are workers kneeling and squatting continuously? • Do workers kneel on a hard surface?		
Constrained Body Positions • Are poor body positions held for long periods of time? • Is there a poor 'fit' between the worker and their workstation?		
Work Timing:		
Long Duration Work • Is there long duration work and lack of task variety? • Do you have incidents or near misses that can be traced to long duration work?		
Repetitive Work • Do workers perform the same motions continuously throughout the shift? • Do tasks lack variety in terms of body motions or motions?		
Time Pressure and Focused Work • Are workers showing signs of stress? • Is there time pressure on workers?	✓	
Other Common Work Factors:		
Cold and Vibration • Are workers in a cold environment? • Are workers exposed to hand tool vibration? • Do gloves fit properly and do they dampen the vibration?		
Poor Lighting and Glare • Are there shadows over the work area, not enough light or too much brightness? • Do workers strain or squint to see their work?	✓	Shadows
Direct pressure • Do you have tools that put pressure in the palm of the hand? • Are your workers leaning on a hard edge with their wrists or elbows?		
Stress Issues • Are there time pressures or deadlines to meet and are they adding stress to workers? • Would you consider your workplace to have a good safety culture and an environment that promotes safety, communication and respect?		
Your own Unique Work Hazards:		
1) Environment is humid	✓	
2) Task duration is 3 hours however other tasks involve similar work	✓	

Sketch the Task, List Task Elements, Equipment used, Task Timing and Duration Information

1) Retrieve coils from equipment room.
2) Scrub coils with rag and disinfectant.
3) Place coils on the floor.
4) Change bucket of disinfectant regularly

This task occurs daily for three hours. It is self-paced yet continuous work, with time pressure due to working with others.

Form 3: Ergonomic Hazard Assessment Work Sheet (Section 6 Example)

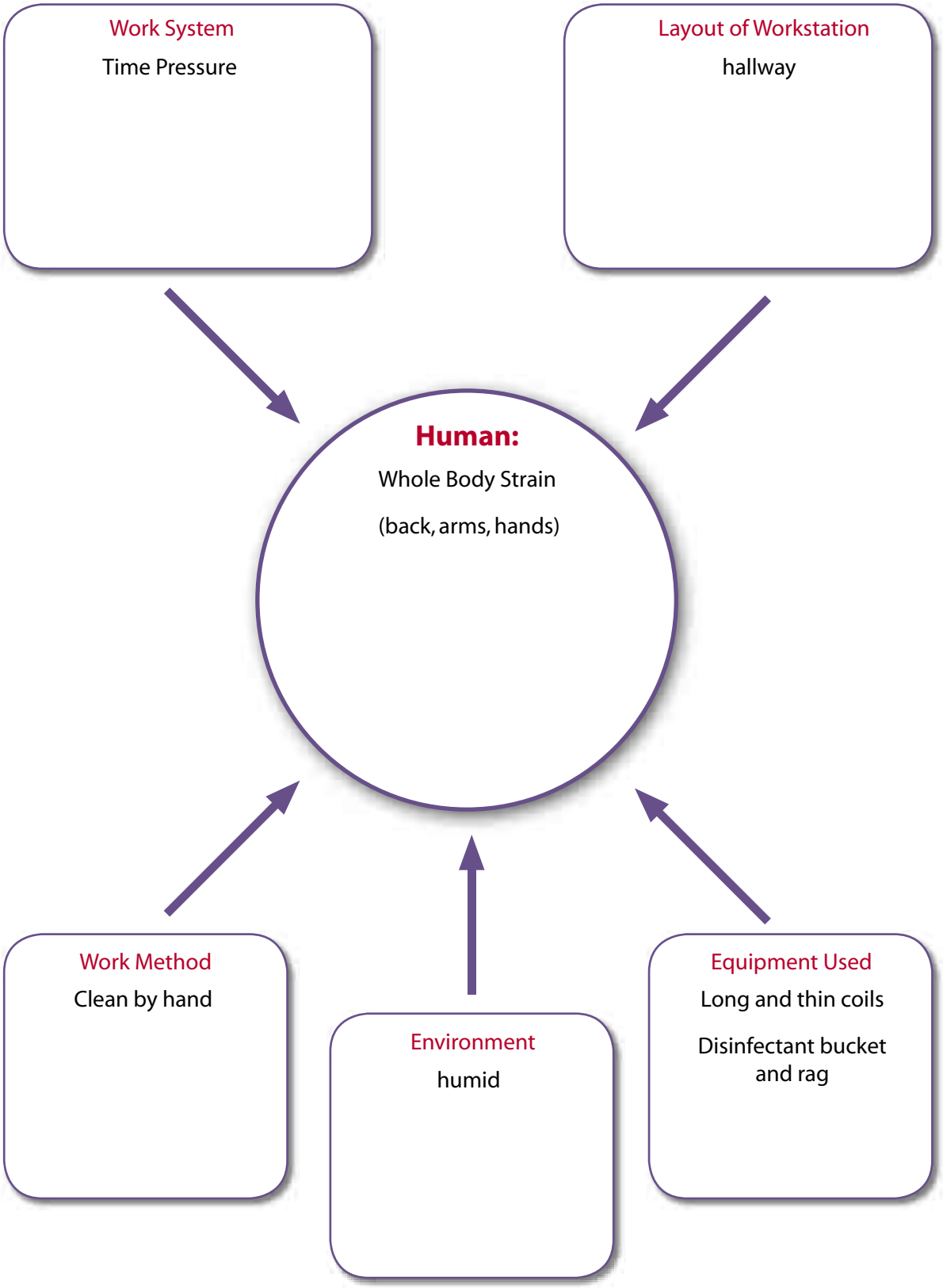
Potential Hazard	Level of Risk	Priority	Comments
Work Motion and Exertions:			
Forceful Exertions Awkward Motions Far Reaching Pinch Gripping	**High**, worker consultation, ergonomic checklist score, and the combination of hazards indicates this to be a high hazard task.	**1**	Need to eliminate or greatly reduce these hazards.
Work Posture:			
Poor Neck Positions Poor Shoulder Positions Poor Wrist Positions Manual Material Handling Stooping and Leaning Standing Without Adequate Leg Support Sitting in a Poor Position Kneeling and Squatting Constrained Body Positions	**Moderate**, worker consultation, ergonomic checklist score, and the combination of hazards indicates this to be a moderate hazard task. There are awkward postures yet there is a variety of body positions and movements which allow some breaks.	**2a**	Improving the postures will greatly reduce the overall hazards in this task. Should focus on far reaching and stooping.

Potential Hazard	Level of Risk	Priority	Comments
Work Timing:			
Long Duration Work Repetitive Work Time Pressure and Focused Work	**Moderate**, repetitive motions, focused work and time pressures in combination with poor postures and forceful gripping. Currently 3 hours to complete – workers noted 1.5 hours before discomfort sets in.	**2b**	Need to focus on posture and forceful gripping.
Other Common Work Factors:			
Cold and Vibration			
Poor Lighting and Glare?	**Low**, bright area but no squinting or eye strain		
Direct pressure			
Stress Issues			
Your own Unique Work Hazards:			
1) Environment is humid	**Low**, temperature and humidity not a concern to workers		
2) Task duration is 3 hours , Other	Moderate, other tasks include the same motions	**3**	Should review other tasks.

Form 4: Find a Safer Way Worksheet (Section 6 Example)

	Solutions Ideas			
Date: **Task:**	At the Source Idea #1	At the Source Idea #2	Along the Path to the Worker	At the Level of the Worker
Step 1: Determine Solution Options	Design a tub to hold disinfectant and coils	Develop a tool to scrub	Job Rotation	Train workers to keep their elbows in, reduce stooping and reduce grip
Step 2: Evaluate Solution options Effectiveness: Practicable: Worker Acceptance: Costs/other Benefits:	All hazards are eliminated or significantly reduced.	Only reduces grip and some shoulder posture improvement	Duration of exposure to hazards can only be reduced by 20%	Hazards are still present
Step 3: Implement appropriate solution.	Tested for quality of work, costing of building the tub and filling with water at another location			
Step 4: Follow Up Short Term: Long Term:	Reduced time by half. Checklist score and worker survey are greatly improved			
Comments	Idea came from a worker			

Form 5: Solution Brainstorming Tool



Form 6: Ergonomic Hazards and Job Restrictions Work Sheet (Section 6 Example)

An injured workers restrictions included 1) No use of the right arm 2) No sitting or standing for more than half an hour 3) Time restriction of 4 hours per shift.

Notice how the ergonomic hazards match up to the job restriction or work abilities and how reducing the hazards can also accommodate more injured workers.

Potential Hazard	Level of Risk	Body Parts Affected	Job Restriction/ Work Abilities	Solutions for Prevention/ Job Accommodation
Work Motion and Exertions:				
Forceful Exertions	Moderate	Arms (Both)	X	No exertions
Awkward Motions	High	Whole body	X	Good postures
Far Reaching	Moderate	Arms Both	X	No far reaching
Pinch Gripping				
Work Posture:				
Poor Neck Positions	Moderate	Neck		
Poor Shoulder Positions	High	Both	X	Good postures
Poor Wrist Positions	Moderate	Both	X	Good postures
Manual Material Handling	Low	Back		
Stooping and Leaning	Moderate	Back		
Standing without adequate Leg Support	Moderate	Legs	X	walking
Sitting in a Poor Position				
Kneeling and Squatting				

Potential Hazard	Level of Risk	Body Parts Affected	Job Restriction/ Work Abilities	Solutions for Prevention/ Job Accommodation
Work Timing:				
Constrained Body Positions				
Long Duration Work				
Repetitive Work				
Time Pressure and Focused Work	Moderate	Whole body	X	No time pressure
Other Common Work Factors:				
Cold and Vibration				
Poor Lighting and Glare?	Low	Eyes, Neck		Still present but no restrictions
Direct pressure				
Stress Issues				
Your own Unique Work Hazards:				
1) Environment is humid	Low	Skin		Still present but no restrictions
2) Task duration is 3 hours	Moderate	Whole Body		Now 1.5 hours

Section 7: Forms

Form 1: Ergonomic Hazard Inspection Check List

Potential Hazard	Yes/No	Comments
Work Motion and Exertions:		
Forceful Exertions • Does the job require obvious efforts or holding onto heavy objects? • Do worker's facial expressions show a forceful effort?		
Awkward Motions • Are motions smooth or do you observe workers struggling in their tasks? • Are motions usually smooth but every once in a while there is an unexpected stop, jerky or awkward motion?		
Far Reaching • Do workers have to stretch to reach for objects? • Are there frequent reaches to the side or behind the body?		
Pinch Gripping • Do workers struggle with tasks that involve pinch gripping? • Is there continuous holding onto objects with a pinch grip?		
Work Posture:		
Poor Neck Positions • Do workers bend and hold the neck in a poor position for long periods of time? • Is there bending of the neck backward, even slightly, occurring in your workplace, especially when viewing a monitor?		
Poor Shoulder Positions • Are workers continuously 'winging' their elbows out, away from the body? • Is there reaching behind the body? Is there pulling into the body with the elbow positioned behind the body?		
Poor Wrist Positions • Do workers rapidly bend their wrists? • Are wrists in a poor position for long periods of time? • Are there situations where extreme bending of the wrists occurs?		
Manual Material Handling • Do workers lift objects from or near the floor? • Are there far reaches while holding onto an object even if the weight is low?		
Stooping and Leaning • Are workers stooping or leaning more than 15 degrees? • Is there stooping and leaning while lifting or holding a heavy object?		
Standing without adequate Leg Support • Are workers standing stationary for long periods of time without adequate leg support? • Do workers report low back, leg and feet discomfort?		

Potential Hazard	Yes/No	Comments
Sitting in a Poor Position • Do workers know how to adjust their chair and do they? • Is there slouching or sitting without adequate back support?		
Kneeling and Squatting • Are workers kneeling and squatting continuously? • Do workers kneel on a hard surface?		
Constrained Body Positions • Are poor body positions held for long periods of time? • Is there a poor 'fit' between the worker and their workstation?		
Work Timing:		
Long Duration Work • Is there long duration work and lack of task variety? • Do you have incidents or near misses that can be traced to long duration work?		
Repetitive Work • Do workers perform the same motions continuously throughout the shift? • Do tasks lack variety in terms of body motions or motions?		
Time Pressure and Focused Work • Are workers showing signs of stress? • Is there time pressure on workers?		
Other Common Work Factors:		
Cold and Vibration • Are workers in a cold environment? • Are workers exposed to hand tool vibration? • Do gloves fit properly and do they dampen the vibration?		
Poor Lighting and Glare • Are there shadows over the work area, not enough light or too much brightness? • Do workers strain or squint to see their work?		
Direct pressure • Do you have tools that put pressure in the palm of the hand? • Are your workers leaning on a hard edge with their wrists or elbows?		
Stress Issues • Are there time pressures or deadlines to meet and are they adding stress to workers? • Would you consider your workplace to have a good safety culture and an environment that promotes safety, communication and respect?		
Your own Unique Work Hazards:		
1)		
2)		
3)		

Form 2: Workplace Ergonomics Survey

This questionnaire is strictly **CONFIDENTIAL** and will not be shown to anyone in your company. Please answer all questions truthfully and to the best of your ability.

1. **Date:** _____ / _____ / _____
   Month Day Year

2. **Work Location:** _____

3. **Job Title:** _____ **Shift:** _____

4. **Describe the type of work you perform and the amount of time each day spent on these activities.**

Tasks	Time

5. **How long have you been working for this company?**

_____

_____

6. **How long have you been working on this job/area?**

_____

_____

7. **Do you rotate jobs with other employees, (informally, hourly, daily, what other jobs)?**

_____

_____

_____

Personal Information:

8. Birth Date: _____
Year

9. Height: _____ feet and inches, **or**

_____ cm

10. Sex (circle number): 1) male 2) female

11. Which hand do you normally write with? (circle one number)

1) left 2) right 3) either

12. Have you ever had any pain or discomfort during the last year that you believe is related to your work? (circle number)

1) Yes 2) No (if no, stop here)

13. If YES, Please complete the Physical Assessment Survey.

Workstation Survey

The following questions are designed to obtain your opinions and suggestions regarding your job and work environment. Please provide comments on the following areas, as they pertain to your job and work space. Use the space provided or the back of the page as required.

Please describe specific problems with your job or the physical environment in which you work.

How would you change your work area to make it easier, safer, and more efficient for you to work?

Form 3: Ergonomic Hazard Assessment Work Sheet

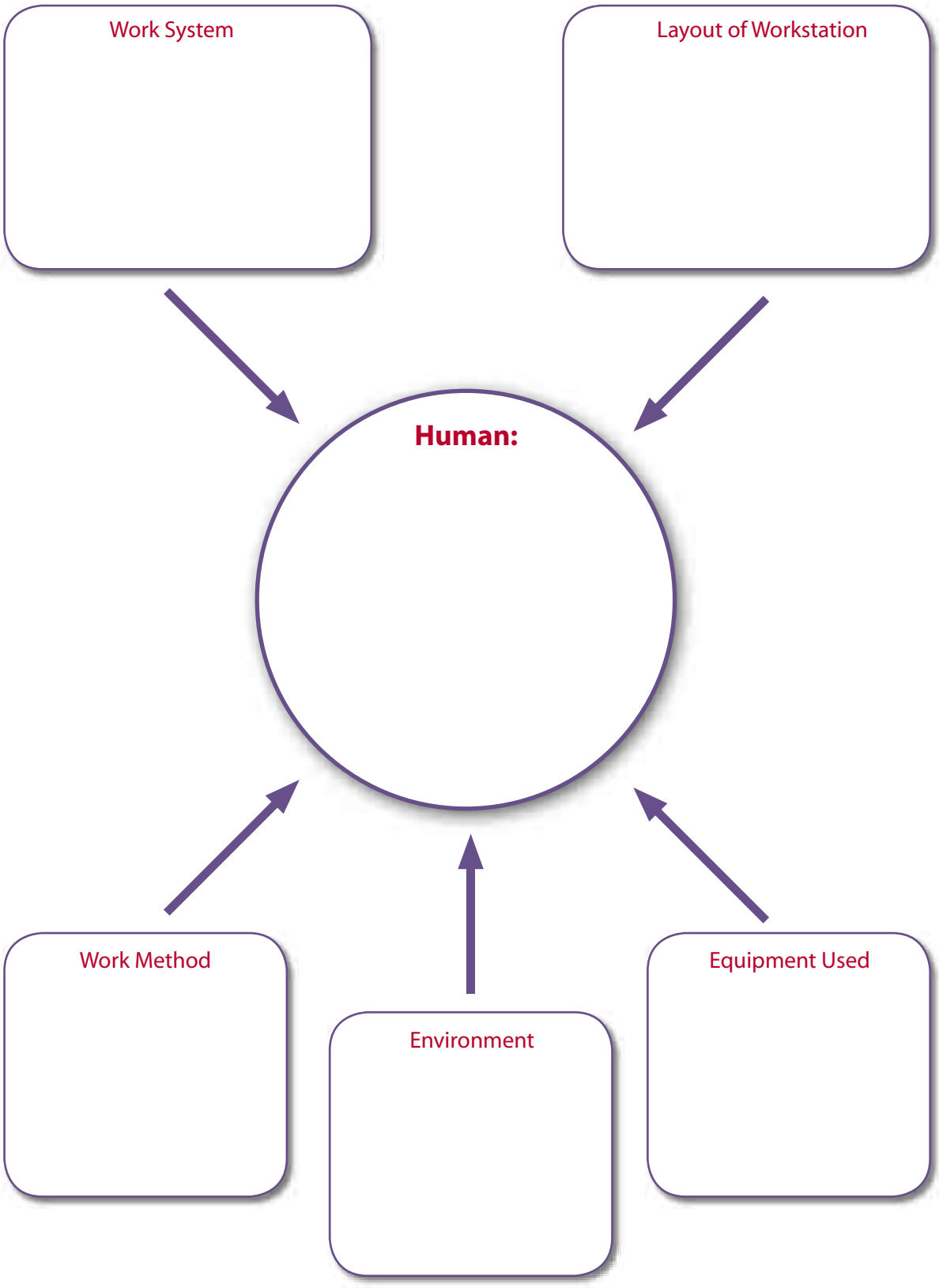
Potential Hazard	Level of Risk	Priority	Comments
Work Motion and Exertions:			
Forceful Exertions			
Awkward Motions			
Far Reaching			
Pinch Gripping			
Work Posture:			
Poor Neck Positions			
Poor Shoulder Positions			
Poor Wrist Positions			
Manual Material Handling			
Stooping and Leaning			
Standing without adequate Leg Support			
Sitting in a Poor Position			
Kneeling and Squatting			
Constrained Body Positions			

Potential Hazard	Level of Risk	Priority	Comments
Work Timing:			
Long Duration Work			
Repetitive Work			
Time Pressure and Focused Work			
Other Common Work Factors:			
Cold and Vibration			
Poor Lighting and Glare?			
Direct pressure			
Stress Issues			
Your own Unique Work Hazards:			

Form 4: Find a Safer Way Worksheet

	Solutions Ideas			
Date: **Task:**	At the Source Idea #1	At the Source Idea #2	Along the Path to the Worker	At the Level of the Worker
Step 1: Determine Solution Options				
Step 2: Evaluate Solution options Effectiveness: Practicable: Worker Acceptance: Costs/other Benefits:				
Step 3: Implement appropriate solution.				
Step 4: Follow Up Short Term: Long Term:				
Comments				

Form 5: Solution Brainstorming Tool



Form 6: Ergonomic Hazards and Job Restrictions Work Sheet

Potential Hazard	Level of Risk	Body Parts Affected	Job Restriction/ Work Abilities	Solutions for Prevention/ Job Accommodation
Work Motion and Exertions:				
Forceful Exertions				
Awkward Motions				
Far Reaching				
Pinch Gripping				
Work Posture:				
Poor Neck Positions				
Poor Shoulder Positions				
Poor Wrist Positions				
Manual Material Handling				
Stooping and Leaning				
Standing without adequate Leg Support				
Sitting in a Poor Position				
Kneeling and Squatting				
Constrained Body Positions				

Potential Hazard	Level of Risk	Body Parts Affected	Job Restriction/ Work Abilities	Solutions for Prevention/ Job Accommodation
Work Timing:				
Long Duration Work				
Repetitive Work				
Time Pressure and Focused Work				
Other Common Work Factors:				
Cold and Vibration				
Poor Lighting and Glare?				
Direct pressure				
Stress Issues				
Your own Unique Work Hazards:				

Form 7: Ergonomics Action Plan

	Beginning	Moving Forward	Succeeding
Spot the Hazard	Incident reports, other statistics and workers consulted to identify problem jobs. Body Mapping / Hazard Mapping	Hazards identified using the Ergonomic Hazard Check List	Problem Jobs have been prioritized for assessment. Workers have been educated on how to identify hazards
Assess the Risk	Body Mapping Hazard Mapping used for assessment	Ergonomic surveys, checklist scores, ergonomic principles used.	Ergonomic standards and guidelines consulted
Find A Safer Way	Solution options are developed - elimination at the source is the best option	Solutions are properly evaluated	Solutions are implemented with worker input and there is a follow up
Everyday	Health and Safety / Ergonomics Plan developed	Moving forward on identified problems	Integrating health and safety / ergonomics into every day activities
Comments			

Form 8: Manitoba Labour and Immigration's Ergonomic Checklist

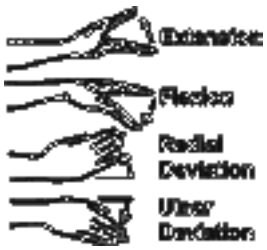
(adapted from their publication – Ergonomics: a guide to program development and implementation)

ERGONOMIC RISK FACTOR CHECKLIST

UPPER EXTREMITY RISK FACTOR CHECKLIST

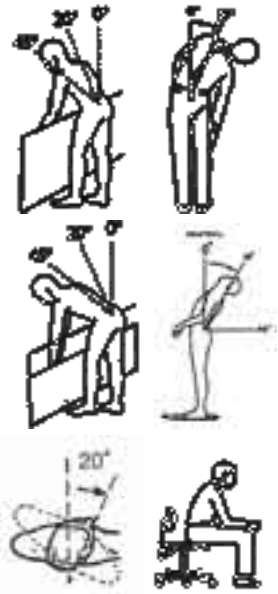
Date: _____ Analyst: _____ Job: _____ Location:

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of total job time	25% to 50% of time	50% to 100% of time	If total time for job is >8hrs, add 0.5 per hour	
Upper Limb Movements	**1.** Moderate: Steady motion with regular pauses	☐ YES ☐ NO	0	1	2		
	2. Intensive: Rapid steady motion without regular pauses	☐ YES ☐ NO	1	2	3		
Keyboard Use 	**3.** Intermittent Keying	☐ YES ☐ NO	0	0	1		
	4. Intensive Keying	☐ YES ☐ NO	0	1	3		
Hand Force (Repetitive or Static) 	**5.** Squeezing Hard with the Hand in a Power Grip	☐ YES ☐ NO	0	1	3		
	6. Pinch More than 2 pounds	☐ YES ☐ NO	1	2	3		
Awkward Postures  	**7.** Neck: Twist/Bend (twisting neck >20°, bending neck forward >20° or back < 5°)	☐ YES ☐ NO	0	1	2		
	8. Shoulder: Unsupported arm or elbow above mid-torso height	☐ YES ☐ NO	1	2	3		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
	**9.** Rapid Forearm Rotation	☐ YES ☐ NO	0	1	2		
	**10.** Wrist: Bend or Deviate	☐ YES ☐ NO	1	2	3		
Contact Stress 	**11.** Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	12. Using the Palm of the Hand or Wrist as a Hammer	☐ YES ☐ NO	1	2	3		
Vibration  	**13.** Localized Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
	14. Whole-body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Environment	**15.** Lighting (poor illumination or glare)	☐ YES ☐ NO	0	0	1		
	16. Adverse Temperatures	☐ YES ☐ NO	0	0	1		
Control Over Work Pace	**17.** One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
TOTAL UPPER EXTREMITY SCORE							

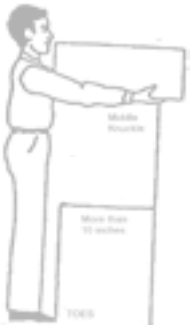
BACK AND LOWER EXTREMITY RISK FACTOR CHECKLIST

Date: _____ Analyst: _____ Job: _____ Location:

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Awkward Postures 	**18.** Mild Forward or Side Bending of Torso More than 20° but Less than 45°	☐ YES ☐ NO	0	1	2		
	19. Severe Forward Bending of Torso More than 45°	☐ YES ☐ NO	1	2	3		
	20. Backward Bending of Torso	☐ YES ☐ NO	0	1	2		
	21. Twisting of Torso	☐ YES ☐ NO	1	2	3		
	22. Prolonged Sitting Without Adequate Back Support	☐ YES ☐ NO	0	1	2		
	23. Standing Stationary or Inadequate Foot Support While Seated	☐ YES ☐ NO	0	0	1		
	24. Foot action (pedal), Standing Stationary with Inadequate Foot Support, Balancing	☐ YES ☐ NO	0	1	2		
	25. Kneeling/ Squatting	☐ YES ☐ NO	1	2	3		
	**26.** Hip Abduction (Repetitive/ Prolonged)	☐ YES ☐ NO	0	1	2		
	27. Repetitive Ankle Extension/ Flexion	☐ YES ☐ NO	0	1	2		

RISK FACTOR CATEGORY	RISK FACTORS	EXPOSURE Is the risk factor present within the job or task?	TIME				SCORE
			0% to 25% of job time	25% to 50% of time	50% to 100% of time	If job time is >8hrs, add 0.5 per hour	
Contact Stress	**28.** Hard/Sharp objects Press into Skin	☐ YES ☐ NO	0	1	2		
	29. Using the Knee as a Hammer or Kicker	☐ YES ☐ NO	1	2	3		
Vibration 	**30.** Whole-Body Vibration (without dampening)	☐ YES ☐ NO	0	1	2		
Push/Pull	**31.** Moderate Load	☐ YES ☐ NO	0	1	2		
	32. Heavy Load	☐ YES ☐ NO	1	2	3		
Control Over Work Pace	**33.** One control factor present = 1 Two or more control factors present = 2	☐ YES ☐ NO					
MANUAL HANDLING CHECKLIST SCORE (Add scores 2 & 3 from page 3 and insert total here)							
TOTAL BACK AND LOWER EXTREMITY SCORE							

MANUAL HANDLING CHECKLIST

34(a). STEP I:	NEAR LIFT	MIDDLE LIFT	FAR LIFT
Determine If the Lift is Near, Middle, or Far (Body to Hands) - Use an average horizontal distance if a lift is made every 10 minutes or less. - Use the largest horizontal distance if more than 10 minutes pass between lifts.			

34(b). STEP II:	NEAR LIFT		MIDDLE LIFT		FAR LIFT	
Estimate the Weight Lifted (Pounds) - Use an average weight if a lift is made every 10 minutes or less. - Use the heaviest weight if more than 10 min. pass between lifts. - Enter 0 in the total score if the weight is 10 lb or less.	**DANGER ZONE**	More than 51 lb 5* points	**DANGER ZONE**	More than 35 lb 6 points	**DANGER ZONE**	More than 28 lb 6 points
	CAUTION ZONE	17 to 51 lb 3 points	**CAUTION ZONE**	12 to 35 lb 3 points	**CAUTION ZONE**	10 to 28 lb 3 points
	SAFE ZONE	Less than 17 lb 0 points	**SAFE ZONE**	Less than 12 lb 0 points	**SAFE ZONE**	Less than 10 lb 0 points

*If lifts are performed more than 15 times per shift, use 6 points. **STEP II SCORE:**

STEP III:	Factor	Occasional lifts (<1 hr/shift)	Frequent lifts (>1 hr/shift)	
Determine the Points for Other Risk Factors - Use occasional lifts if more than 10 minutes pass between lifts - Use the more than 1 hour points if the risk factor occurs with most lifts and lifting is performed for more than 1 hour	**35.** Twist torso during lift	1	1	
	36. Lift one-handed	1	2	
	37. Lift unexpected loads	1	2	
	38. Lift 1-5 times/minute	1	1	
	39. Lift > 5 times/minute	2	3	
	40. Lift above the shoulder	1	2	
	41. Lift below the knuckle	1	2	
	42. Carry objects 10 - 30 feet	1	2	
	43. Carry objects > 30 feet	2	3	
	44. Lift while seated or kneeling	1	2	
		STEP III SCORE:		

Form 9: Ergonomic Cost Benefit Analysis Worksheet for Small Workplaces

This method looks at productive work hours and the costs associated with absenteeism as it relates to health and safety issues. This method does not involve generalizations about future injuries but makes accurate determinations of real employment costs. It can be applied in any particular work area, on a la rge or small scale or with one or more workers.

Costs and Benefits of Ergonomics Based on Productivity

	Calculations	Example
Step 1 Calculate Productive Time as a percentage of Paid Time	Productive Time = Total Hours available to work minus planned and unplanned absences Absences include planned holidays, training leaves etc and unplanned absences, sick leave etc.	An Automotive Repair Shop has 3 mechanics **There were:** 1976 hours for work 295 planned absences 30 hours of short term illness and 20 hours of other absences Productive time as a percentage of paid time is (1976 – 295 -50) / 1976 =82.5%
Step 2 Calculate the Wage Costs per Hour Worked	Determine the wage paid plus benefits. Add administrative costs, overhead and other costs such as WCB premiums, taxes and other worker related costs	The hourly wage, benefits, overhead and all worker related costs is $40/hour
Step 3 Employee Turnover and Training Costs per hour worked	Determine the cost per hour for the time it takes for new employees to achieve full productivity, production and quality costs due to learning the job and the costs involved in hiring and new employee orientation.	The cost for each new mechanic was $2 per productive hour.
Step 4 Production and product/ service quality losses due to poor work conditions.	Determine the cost associated with overtime, over employment, replacement workers, quality issues and production losses.	The cost per hour worked due to extra overtime from absenteeism and missed labour standards due to sore hands was $5 per productive hour for the year.
Step 5 Any remaining costs associated with injuries	Determine the costs associated with health and safety investigations, additional training, external consultants, medical appointments, etc.	There was an additional charge of $2 per productive hour for these issues.

Cost and Benefits of Ergonomics Based on Productivity

	Calculations	Example
Step 6 Final Efficiency Calculation	Wage costs per hour worked multiplied by the Productive time as a percentage of paid time minus Additional costs (steps 3-5)	$40/hr * 82.5% - (2+5+2) = 40*0.825 - 9 = $24.00
Step 7 The Benefits Determine the problems and find solutions	Conduct an ergonomic investigation of the work conditions, job demands and causes of absenteeism. Determine the cost of the solution and if the problem is eliminated, significantly reduced or marginally controlled.	The ergonomic assessment found sore hands, missed labour standards, sick leave and down time due to vibration and direct pressure in the hands. $147 was spent on anti-vibration gloves and padded mechanics gloves for 3 workers.
Step 8 Calculate the benefits	Productive time as a percentage of paid time is now (1976 – 295 -40) / 1976 =83% Efficiency Calculation Wage costs per hour worked multiplied by the Productive time as a percentage of paid time minus Predicted additional costs 40/hr * 83% - (2+3+2) = 40*0.825 - 7 = $26.20	The solution significantly reduces the hazards. A short term test found workers with sore hands could keep to labour standards and their hands were not sore at the end of the day. Prediction – unplanned absenteeism can be reduced to 20 hours and productivity costs resulting from overtime and missed labour standards can be reduced to $3 per hour.
Step 9 Overall Benefits	Overall Benefits = New Efficiency – Old Efficiency Productivity gains for the year Pay Back Period = Initial cost/savings per month	$26.20 - $24.00 = $2.20 $2.20 * (1976 – 295 -40) = $3610.20 Pay Back Period = $149/ (3610.20/12) = 0.5 months.

Section 8: Appendix

Appendix

i Resources

MFL Occupational Health Centre
102-275 Broadway, Winnipeg, MB, R3C 4M6
Phone: (204) 949-0811
Fax: (204) 956-0848
E-mail: mflohc@mflohc.mb.ca
Website: www.mflohc.mb.ca
Toll free 1-888-843-1229 (Manitoba Only)

Workers Compensation Board of Manitoba
333 Broadway, Winnipeg, MB, R3C 4W3
Phone: (204) 954-4922
Toll Free 1-800-362-3340 (in Manitoba Only)
Website: www.wcb.mb.ca

Manitoba Labour and Immigration
Workplace Safety and Health
200-401 York Avenue, Winnipeg, MB, R3C 0P8
Client Service Desk: (204) 945-6848
Toll Free 1-800-282-8069 (Manitoba Only)
Website: www.gov.mb.ca/labour/safety

SAFE Manitoba Initiative
Website: www.safemanitoba.com

Evidence for Work Related Musculoskeletal Injuries and Ergonomic Risk Factors

Is there an association between poorly designed work and musculoskeletal injuries, what are the ergonomic risk factors for these injuries and where can I find scientific studies and reports describing this link?

These web sites contain documents that can answer these questions.

1) **National Academy of Sciences: Work-Related Musculoskeletal Disorders: A Review of the Evidence, 1998**
www.nap.edu/catalog/6309.html
2) **OSHA - ergonomic report exerts and control success stories**
www.osha-lc.gov/SLTC/ergonomics/ergonomicreports_pub/index.html
www.osha-slc.gov/SLTC/ergonomics/success_stories.html
3) **Canadian Centre for Occupational Health and Safety**
www.ccohs.ca/oshanswers/occup_workplace/cab_manu.html
4) **Manitoba Labour and Immigration: Ergonomics A Guide to Program Development and Implementation - Appendix H**
www.gov.mb.ca/labour/safety/publication/guidelines/ergonomics/index.html
5) **Ergonomics Success Stories and Demonstration Projects- Washington State**
www.lni.wa.gov/wisha/ergo/succstories/default.htm
www.lni.wa.gov/wisha/ergo/demoproj-rpts.htm
6) **California State Occupational Safety and Health – Easy Ergonomics**
www.cbs.state.or.us/osha/pdf/pubs/3347.pdf
7) **NIOSH Epidemiological Review of Evidence, 1997**
www.cdc.gov/niosh/ergopage.html#ss

ii Glossary of Terms

Anthropometry: The measurement of humans, the different body sizes and proportions of individuals belonging to different populations.

Awkward posture: Deviation from the ideal working posture of elbows at the side of the torso, with the wrists neutral. Awkward postures typically include reaching behind, twisting forward or backward bending, pinching, and squatting.

Biomechanics: The mechanics of biological and especially muscular activity.

Chronic low back pain: General soreness and fatigue of the low back; pain is usually constant, and accompanies most activities.

Electromyography: An instrument that converts the electrical activity associated with functioning skeletal muscle into a visual record.

Engineering controls: A method of controlling worker exposure to risk factors by redesigning equipment, tools, and workstations. Engineering controls are part of hazard prevention and control.

Ergonomics: The scientific study of human work. The term comes from the Greek words "ergos" meaning work, and "nomos," meaning natural laws of. Ergonomics considers the physical and mental capabilities and limits of the worker as he or she interacts with tools, equipment, work methods, tasks, and the working environment.

Ergonomics program: A systematic method (similar to an accident prevention or quality improvement program) used to evaluate, prevent and manage workrelated musculoskeletal disorders. The four elements of a typical ergonomics program are worksite analysis, hazard prevention and control, medical management, and training and education.

Ergonomist: Individuals with specialized training in ergonomics. They contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people.

Fatigue: A condition that results when the body cannot provide enough energy for the muscles to perform a task.

Forcefulness: The amount of physical effort a person uses to do a task.

Hand-arm vibration: Vibration (generally from a hand tool) that goes through the hand, then travels through the rest of the body.

Hazard: A danger or source of danger, especially one threatening human health or safety.

Hazard prevention and control: Eliminating or minimizing the hazards identified in the worksite analysis. It is changing the jobs, workstations, tools or environment to fit the worker. Hazard prevention and control is an element of the ergonomics program.

Health and Safety Committee: Manitoba Regulation MR106/88R stipulates the requirements, characteristics and processes for forming a joint employer and worker health and safety committee.

Lumens: is the international system of units for luminous flux. It is the measure of the perceived power of light.

Mechanical Pressure (contact stress): The contact of the body with a hard surface or edge that results in the compression of tissue. Can also result when using a part of the body as a hammer or striking instrument.

Moment of Force: is a quantity that represents the magnitude of force applied to a rotational system at a distance from the axis of rotation.

Musculoskeletal disorders: Illnesses and injuries that affect one or more parts of the musculoskeletal system.

Musculoskeletal system: The soft tissue and bones in the body. The parts of the musculoskeletal system are bones, muscles, tendons, ligaments, cartilage, nerves, and blood vessels.

Neutral posture: Comfortable working posture that reduces the risk of musculoskeletal disorders. The joints are naturally aligned with elbows at the side of the body and wrists straight.

Newton: The unit of force in the meter-kilogram-second system equal to the force required to impart an acceleration of one meter per second squared (m/s^2) to a mass of one kilogram.

Newton-Meter: is the sysmbal for moment in the international system of units. It is abbreviated N m or N•m, and sometimes hyphenated newton-metre. It is a compound unit of torque corresponding to the force of one newton applied over a distance arm of one metre.

Risk factors: An aspect of a job that increases the worker's chance of getting a work related musculoskeletal disorder.

Sprain: Overstretching or overexertion of a ligament that results in a tear or rupture of the ligament.

Static loading: Physical effort or posture that is held and requires muscle contraction for more than a short time. As muscles remain contracted, the blood flow to the muscles is reduced.

Strain: Overstretching or overexertion of a muscle or tendon.

Tendinitis: Inflammation of the tendon inside the sheath of the tendon.

Tendinosis: The suffix "osis" implies a pathology of chronic degeneration without inflammation. Tendinosis is an accumulation over time of microscopic injuries.

Vibration induced white finger: Is a secondary form of Raynaud's Disease, an industrial injury triggered by continuous use of vibrating hand-held machinery.

Work practice controls: Procedures for safe and proper work that are used to reduce the duration, frequency or severity of exposure to a hazard. They include work methods training, job rotation, and gradual introduction to work. Work practice controls are part of hazard prevention and control.

iii References sited in this project

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Westgaard, R. and Winkel, J. (2000). Ergonomic Intervention Studies for Improved Musculoskeletal Health: A review of the literature and some implications for practitioners. Proceedings of the International Ergonomics Association 2000 Congress, 5, 490-494