



# SAFE WORK

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F  
E

SPOT THE HAZARD  
ASSESS THE RISK  
FIND A SAFER WAY  
EVERYDAY

TM



# SAFE WORK

## FOR AN AGING WORKFORCE

### 40 CASE STUDIES OF OLDER WORKER ISSUES

- OFFICE
- AGRICULTURE
- MANUFACTURING

- CONSTRUCTION
- FOOD PROCESSING
- TRANSPORTATION

- RETAIL
- VARIOUS SERVICE INDUSTRIES

**A.DOLHY**  
ERGONOMICS INC.



# SAFE WORK

## FOR AN AGING WORKFORCE

### 40 CASE STUDIES OF OLDER WORKER ISSUES

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Community Initiatives and  
Research Grant Program

**Disclaimer**

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## Preface

Manitoba is experiencing an aging workforce and musculoskeletal injuries are increasing within this group. This increase may be due to the demographic shift in the Canadian workforce, the greater number of years workers are staying employed and the changing nature of work. There are many books, articles and opinion papers that reflect and discuss this topic but very few have described real world examples of older worker issues, risk assessment, solution implementation and economic benefits.

This project developed 40 case studies of ergonomic interventions for older workers in small businesses. The case study book uses SAFE Work as a format and includes problems, solutions, costs and benefits. The case studies cover a range of workplaces and include agriculture, food processing, manufacturing, construction, retail, office workstations, transportation and various service industries. The aging workforce issues include vision, hearing, lifting, work capacity, work design, cognitive capacity, extreme temperatures, chemicals and job accommodations.

The objectives of this case study resource guide are to provide insight into aging worker issues; the advantages of conducting ergonomic assessments; show potential solution options; and to document benefits (this benefit analysis does not include WCB related costs). By reviewing and reflecting on these case studies, it is believed that workplaces can make easy and cost effective solutions for improving jobs for older workers and to take action on the emerging health and safety issues of an aging workforce. To this last point, I hope this resource helps you with all your ergonomic initiatives and not just to prevent older workers' musculoskeletal injuries since good ergonomic design will benefit all workers.

Andrew Dolhy CPE  
Certified Professional Ergonomist  
Winnipeg, MB  
2013



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## Acknowledgements

I would like to thank all the employers, health and safety representatives, workers and managers who directly participated in this project by taking part in the case studies. Under the confidentiality agreement governing this project, employers and participating individuals cannot be identified by name. So, to all who took part – thank you!

This project was made possible by a grant from the Community Initiatives Research and Grant Program of the Workers Compensation Board of Manitoba (WCB). Thank you to WCB's Bruce Cielen and Janine Swanson, for providing advice and assistance throughout the project. An advisory committee was also an instrumental part of this project. I would like to thank current and former committee members: Sean Scott and the staff at the Construction Safety Association of Manitoba; Glen Blahey from CASA; Ruth Meltzer from Manitoba Hydro; Christine Panas and staff from Safe Hospitality; JoAnna Guerra from Workplace Safety and Health; and Peter Malegus from the WCB for their advice, feedback, comments and direction.

## Project Overview

### WCB Community Initiatives Research and Grant Program

A. Dolhy Ergonomics Inc. completed a CIRP project in 2008 involving the aging workforce. A two-day conference was held with specialists presenting a wide range of aging workforce issues. Over 150 participants participated in group discussions and helped to develop an aging workforce action plan. One outcome of the conference was the need for applied case studies involving older workers. Specifically, ergonomic examples of older worker issues and solutions were lacking. Therefore, this project's goal was to develop case studies of before and after ergonomic problems affecting older workers. A cost benefit analysis would be carried out and a follow up review to determine if the changes had any affect. All 40 of the case studies occurred in small businesses, as defined as workplaces with less than 50 workers.

### Aging Workforce

Canada's working population is getting older. The average age of a Canadian worker in 1980 was 35 and in 2007 it was 41. By 2010, 70% of the net increase in working age population will be in the 45-64 age group. This will have an impact on the workplace from a labour supply perspective in addition to becoming a potential workplace safety and health issue. Generally, in older workers the incident frequency tends to decrease as age increases; however, taking occupation and industry into account, the literature is contradictory. The literature does show that incident severity does increase with age. This applies to fatalities, permanent disabilities and the average number of lost days per incident; however, a negative relationship was found for temporary disabilities and for white collar and service workers (HRDC, 2002).

Specifically in Manitoba, "The average age of WCB clients rose from 34 years of age in 1982 to 39.9 years of age in 2012." Older workers generally take longer to recover from their injuries, experience more recurrences and suffer a disproportional number of fatalities and injuries with permanent impairment compared to younger workers. The Workers Compensation Board of Manitoba Statistics Report for 2000-2012 found claims for "those 55 years of age and older went from 6.8% in 2000 to 16% in 2012. Employment for the 55+ age group during this time rose 19% while claims rose 85%. Therefore, the increase in claims among 55+ cannot be solely explained by labour growth in the number of older workers." Not only are workers 55 and older increasing in the distribution of the workforce but they are also experiencing an increase in injuries. This trend is also supported by the Association of Workers' Compensation Boards of Canada's report on work injuries and diseases, 2011.

Some of the changes that occur with increasing age and may be linked to the increased risk of injury include:

**Strength** – in general workers lose 15-20% of their strength between the ages of 20 and 60.

**Posture and Balance** – it does become more difficult to maintain good posture and balance with age.

**Endurance** – aging may decrease work capacity.

**Vision and Hearing** – both of these attributes decrease with age.

**Reaction Time** – certain cognitive abilities can decrease with age.

Ergonomic literature considers older workers as part of the normal healthy working population. Therefore, work should be designed within the capacities and capabilities of this group. There is no standard definition for an older worker and there is no set age at which an individual is identified as an older worker. However, Labour Canada for purposes of its research identifies workers over the age of 55 as older workers. In contrast, the Canadian Standards Association CSA-Z12 Guideline on Office Ergonomics does not define older workers by age but identifies categories of age related changes to work capacity. CSA identifies primary and secondary affects of aging as genetic-biological declines in physiological/cognitive capacities and lifestyle, work history and other factors that affect the aging process.

## Ergonomics and The Case Studies

Ergonomics is a broad field of study that includes basic and applied research in human capabilities and how to match these capabilities to tasks. Everything and anything that people interact with can be designed to a range of human capabilities. In the workplace, ergonomic knowledge is used to improve workplace conditions, job demands and the working environment to make jobs better, safer, easier and performed with less error.

For this project, a total of 40 case studies were successfully developed that involved 9 different age related issues: vision (5); hearing (2); lifting (5); work capacity (9); work design(8); cognitive issues (2); temperature (2); chemical issues (2); and job accommodations (5).

The case studies were selected by contacting small employers directly through referrals, association contacts and by communications through various media. The 40 case studies included construction (9); office (9); food processing/ farm (6); manufacturing (5); and service (11). The service workplaces included: retail; childcare centre; automotive repair shop; moving company; transportation; laboratory; and landscaping.

Every task was identified as an issue by the health and safety committee or safety representative. Each case study was determined to be a problem job through the assessment process. Each case study was assessed with a checklist, by worker consultation, the use of technical tools and comparison to standards and guidelines.



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## Summary of Case Studies

Case Study	Health and Safety Identified Problem	Risk Reduction Solution
Vision: Office	Laptop height	Raised laptop
Vision: Manufacturing	Poor lighting	Cleaned bulbs
Vision: Agriculture	Blind spots	Blind spot maps
Vision: Retail	Poor lighting	Brighter light bulbs
Vision: Office	Glare	Changed monitor position

Hearing: Office	Noise distraction	Acoustic panels
Hearing: Landscaping	High sound levels	Hearing protection

Lifting: Construction	Lifting from ground level	Knee high saw horses
Lifting: Construction	Heavy lifting and carrying	Shoulder straps
Lifting: Manufacturing	Stooping	Raised bin
Lifting: Construction	Awkward carrying	Power grip tool
Lifting: Moving Service	Awkward pulling	Longer handles

Work Capacity: Construction	Shoveling mud	Ergonomic shovel
Work Capacity: Manufacturing	Continuous standing	Foot support
Work Capacity: Manufacturing	Awkward arm posture	Ratchet tool with longer arm
Work Capacity: Service	Awkward sitting postures	Ergonomic chair
Work Capacity: Service	High grip forces	Ergonomic tools
Work Capacity: Food Processing	Intensive use of a pressure washer	Hose swivel and education
Work Capacity: Housekeeping	Poor postures when using tools	'D' shaped handles
Work Capacity: Service	Awkward cart pushing and heavy mop	Larger wheels and lighter mop



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Case Study	Health and Safety Identified Problem	Risk Reduction Solution
Work Capacity: Office	Direct pressure hazard	Wrist rest
Work Capacity: Transportation	Vibration from steering wheel	Anti-vibration gloves
Work Design: Agriculture	Steep steps for tractors	Lowered first step
Work Design: Office	Overhead lifting	Changed location and education
Work Design: Office	Poor mouse position	New keyboard tray
Work Design: Construction	Standing and stooping	3 in 1 sit-stand chair
Work Design: Office	Small area to move mouse	Smaller keyboard
Work Design: Office	Lack of adjustability and poor fit	Chair, footrest, document holder and keyboard tray
Work Design: Office	Poor fit with a typewriter desk	New desk and chair
Cognitive Capacity: Agriculture	Tractor controls and errors	White board labeling
Cognitive Capacity: Food Processing	Slow reaction time	Lighter equipment and improved grip
Extreme Temperatures: Construction	Indoor and outdoor heat	Evaporative and cooling bandanas
Extreme Temperatures: Construction	Outdoor cold, moisture and need for fine grip	Urban tactical gloves
Chemicals: Service	Use of various chemicals	Proper PPE and work scheduling changes
Chemicals: Service	Strong odour and skin issues	Changed PPE and chemical substitution
Job Accommodation: Construction	Neck issues	Education and work rest schedule changes

Case Study	Health and Safety Identified Problem	Risk Reduction Solution
Job Accommodation: Office	Low back issues	Proper fitting chair
Job Accommodation: Construction	Knee issues	Knee pads with shin guards
Job Accommodation: Service	Hand – arm issues	Anti-vibration gloves and grip tape
Job Accommodation: Construction	Hand – wrist issues	Low density foam to reduce impact

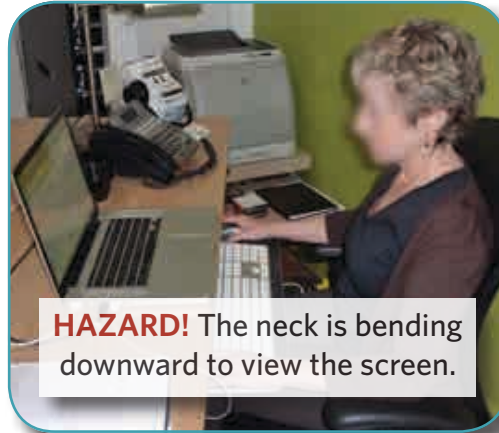
The case studies were developed with the WCB's SAFE Work program in mind. The SAFE Work program's goal is to increase awareness and knowledge of all Manitobans when it comes to health and safety in the workplace. It is funded by the Province of Manitoba and the Workers Compensation Board of Manitoba. The program centres around the personal risk management model: **S**pot the Hazard, **A**ssess the Risk, **F**ind a Safer Way, **E**veryday. This format was chosen for the case studies to help reinforce the SAFE Work message as it applies.



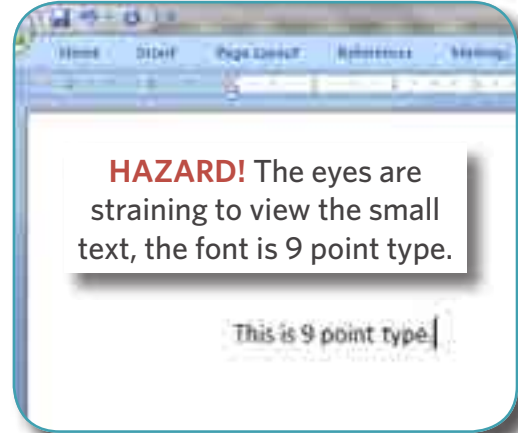
## VISION ISSUES

# Case Study 1 Office Workstation Use of a Laptop

## SPOT the HAZARD



**HAZARD!** The neck is bending downward to view the screen.



**HAZARD!** The eyes are straining to view the small text, the font is 9 point type.

This is 9 point type.

Are there vision changes with age that could lead to eye strain when viewing a computer screen?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk of injury.



**Worker Input** Reports of discomfort in the neck along with eye strain. Getting worse as the day progresses.



**Standards & Guidelines** Neck posture is greater than 20 degrees flexion, monitor height is 7.5cm (3") below guidelines and font is 3 points smaller than guidelines. References available in the Appendix.

**Aging Issues** Visual acuity decreases with age. Font size, viewing distance and contrast changes may improve visibility.



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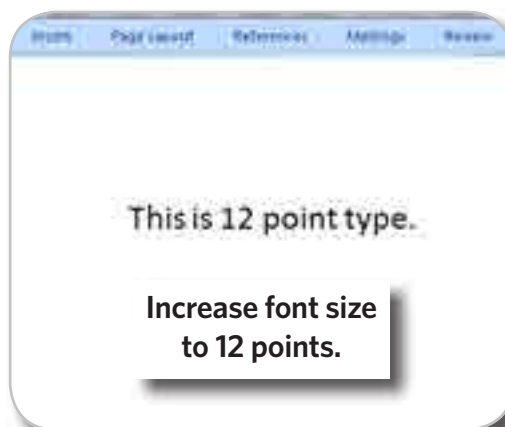




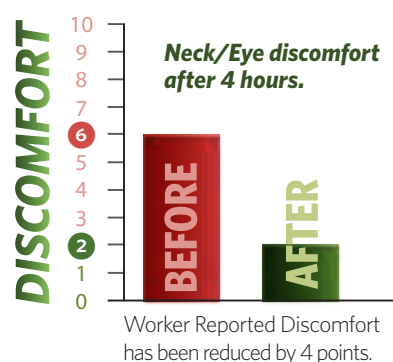
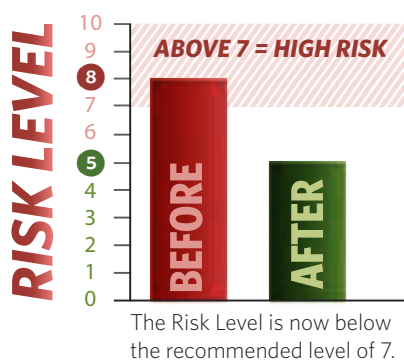
## FIND a SAFER WAY



### VISION ISSUES



For this case study, an increase in font size by 3 points and raising the height of the laptop was implemented.



## EVERYDAY



### Costs

Monitor stand  
Change software font  
Worker training

\$18



### Benefits

Productivity increased due to less time working in pain; specifically the last hour of the day is now pain free.



**Cost Benefit Analysis: Pay Back Period = 2 weeks**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the workstation was the problem. A worker's vision can change with time; however, the font size and screen height were the root cause of the discomfort.



## VISION ISSUES

# Case Study 2 Manufacturing Lighting Issues

## SPOT the HAZARD



Are there age related vision changes that could require workplaces to increase light levels?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk of injury.



**Worker Input** Reports of trips hazards and struck against objects due to shadows and more time to produce products due to poorly lit areas.



**Standards & Guidelines** The levels of light are below standards for a manufacturing workplace and the ratio between luminance and reflectance (an indicator of good lighting) was 1.2. References available in the Appendix.

**Aging Issues** Visual acuity decreases with age. Increased light levels and improved contrast may improve visibility.



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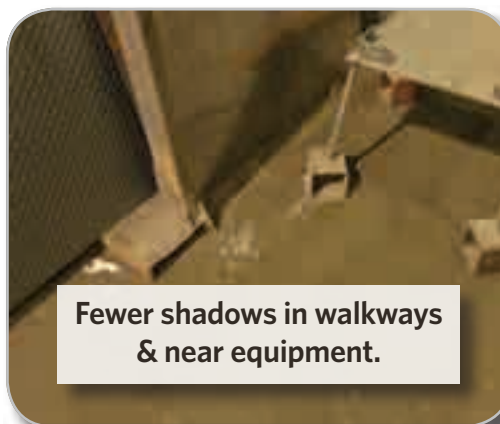
## FIND a SAFER WAY



VISION  
ISSUES

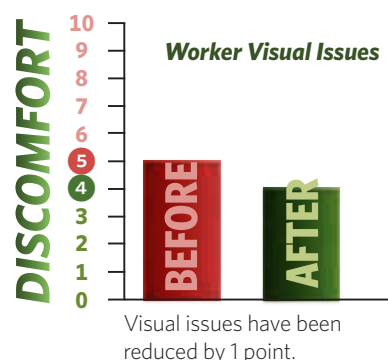
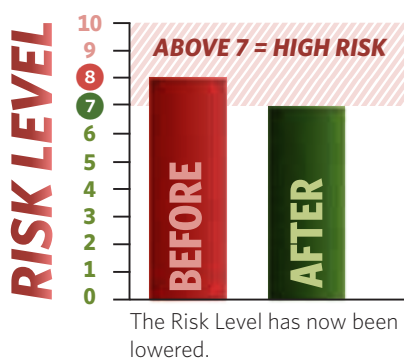


Clean light fixtures  
& replace old bulbs.



Fewer shadows in walkways  
& near equipment.

For this case study, cleaning light fixtures and replacing older light bulbs improved the lighting by 4 foot candles and the luminance ratio improved to 1.8.



## EVERYDAY



### Costs

Cleaning of lights  
Purchasing new bulbs  
Labour

\$962



### Benefits

Less time to investigate trip incidents. Improved quality of products (less rework).



**Cost Benefit Analysis: Pay Back Period = 10 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, poor light levels were the problem. A worker's vision can change with time; however, the poor light levels resulted in trip hazards and poor quality of work for all workers.



## VISION ISSUES

### Case Study 3 **Farming** Driving a Tractor

## SPOT the HAZARD



Are there vision changes with age such as a reduced field of view that could lead to driving hazards?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk of injury.



**Worker Input** Workers reported several near misses. Equipment and other workers have been in the blind spots.



**Standards & Guidelines** A Blind Spot Map revealed a 10 degree danger zone in the Useful Field of View. In order to compensate, a worker would need to twist their upper body/neck by more than 20 degrees. References available in the Appendix.

**Aging Issues** Peripheral vision may decrease slightly with age; however, neck and upper body flexibility may also reduce a worker's ability to see around blind spots.



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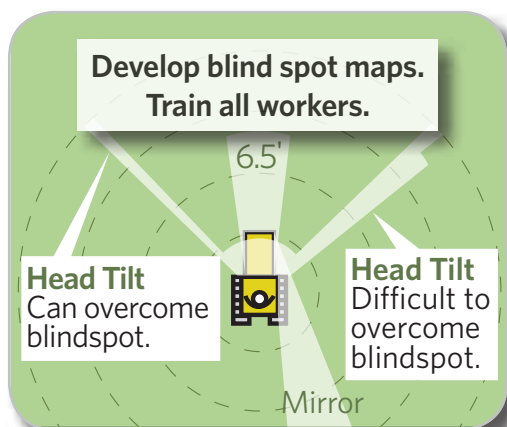
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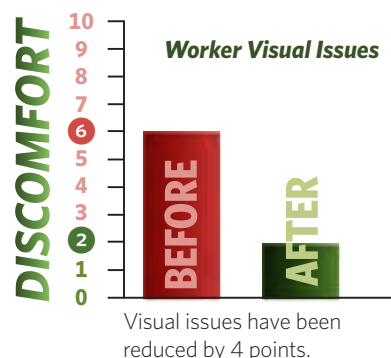
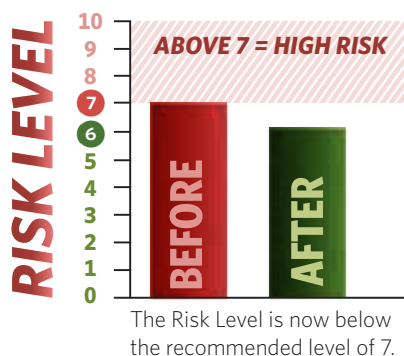
# FIND a SAFER WAY



## VISION ISSUES



For this case study, changes to the tractor could not be implemented except for the repositioning of one rear-view mirror. Therefore, Blind Spot Maps were developed for each piece of equipment, all workers were educated on blind spots, a yard management plan was developed and blind spot stickers were attached to areas that had blind spot hazards.



## EVERYDAY



### Costs

Create maps & stickers  
Training & education \$500



### Benefits

Efficiency increased due to less time required to investigate near misses and potential injuries/equipment damage.



**Cost Benefit Analysis: Pay Back Period = 4 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the tractor with additional monitors and other equipment was the problem. A worker's vision can change with time; however, the blind spots were significant enough to impair the field of view of all workers.





## VISION ISSUES

# Case Study 4

## Retail Lighting and Standing Issues

### SPOT the HAZARD



**HAZARD!** Low level lighting  
- trip hazard & eye strain.



**HAZARD!** Standing on a hard  
surface & balance issues.

Are there vision changes with age that could require increasing lighting for older workers and are there issues with standing for long periods of time?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low.



**Checklist** This task scored a 4 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of leg discomfort and trip hazards at the counter. Poor lighting of products and errors in quality control.



**Standards & Guidelines** Light levels were below retail space guidelines (12-14 foot candles) and up to 4 different trip hazards and shadows were present along the floor space around the front counter. References available in the Appendix.

**Aging Issues** Visual acuity decreases with age and balance issues can increase due to multiple factors such as leg discomfort, poor lighting and inattention. Increased light levels and reducing trip hazards may improve these issues.



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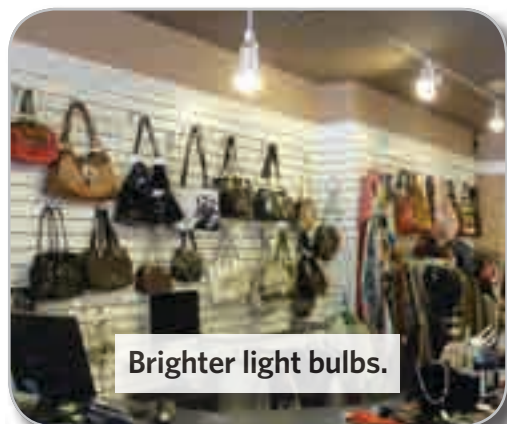
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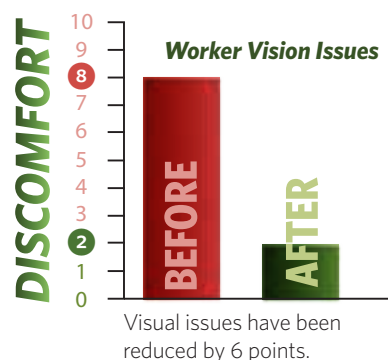
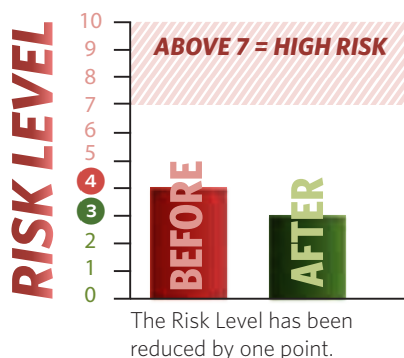
## FIND a SAFER WAY



VISION  
ISSUES



For this case study, the light levels improved by 10 foot candles, all trip hazards were eliminated and shadows reduced along the floor space of the front counter. The anti-fatigue matting also reduced leg discomfort from an 8 to a 2 on a 10 point scale.



## EVERYDAY



### Costs

Light bulbs  
Anti-fatigue matting  
Labour

\$860



### Benefits

Productivity increased due to fewer errors at the cash register and increased quality control of products.



**Cost Benefit Analysis: Pay Back Period = 9 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

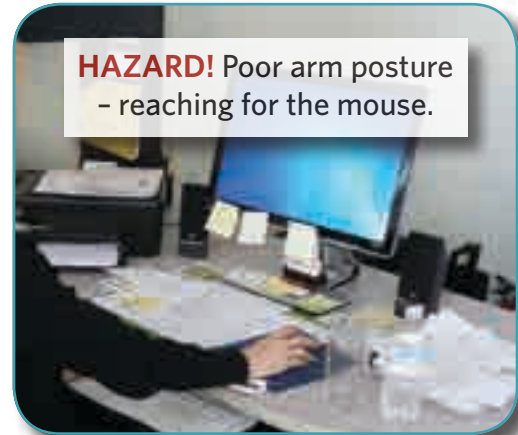
In this case study, the poor ergonomic design of the workplace was the problem. A worker's vision can change with time; however, the poor lighting, trip hazards on the floor and standing for long periods of time were of greater significance.



## VISION ISSUES

# Case Study 5 Office Workstation Lighting Issues

## SPOT the HAZARD



Are there vision changes with age that could lead to more susceptibility to glare? A secondary issue is the poor posture for the right arm.

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of neck and eye discomfort and headaches.



**Standards & Guidelines** The Unified Glare rating for this task (0.47) was above the standard for discomfort glare. Reaching 24" (60cm) is beyond standards for frequent reaching. References available in the Appendix.

**Aging Issues** There is an increase in the scattering of light with age, therefore glare can lead to an increase in visual discomfort. Reducing glare may improve vision.



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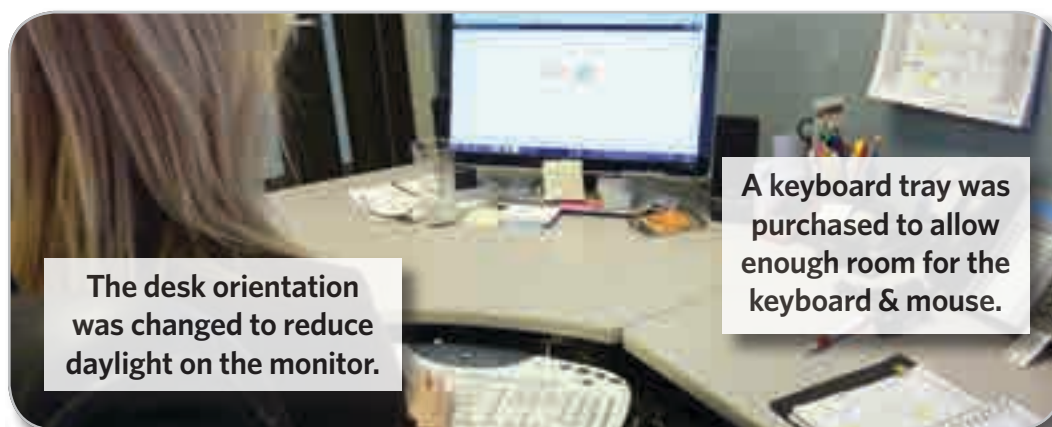




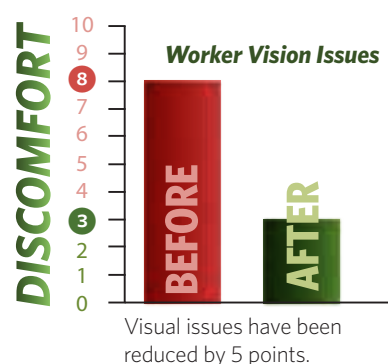
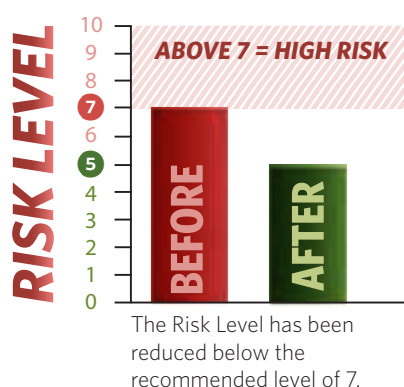
## FIND a SAFER WAY



### VISION ISSUES



For this individual, the change in monitor placement reduced the Unified Glare Rating to 0.21 and the reach for the mouse to under 8" (20cm).



## EVERYDAY



### Costs

Keyboard tray  
Labour to install                      \$275



### Benefits

Productivity increased due to less time working in discomfort, specifically when the sun shines on the monitor.



**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

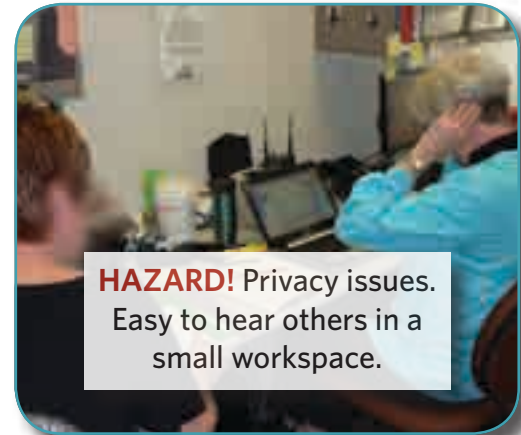
In this case study, the poor ergonomic design of the workstation was the problem. A worker's vision can change with time; however, the excessive glare and mouse position were the root cause of the problem.



## HEARING ISSUES

# Case Study 6 Office Workstation Sound Levels

## SPOT the HAZARD



Are there hearing changes with age that could lead to difficulty in hearing conversations?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of headaches and inability to hear conversations. Privacy issues when 3-4 staff are on the phone at the same time.



**Standards & Guidelines** The sound levels in this workspace were 65-70 decibels with 4 staff present. This is above standards for a call centre. References available in the Appendix.

**Aging Issues** Hearing ability decreases with age in the high frequency sound range. Sound level reduction and decreased sound reverberation may improve hearing.



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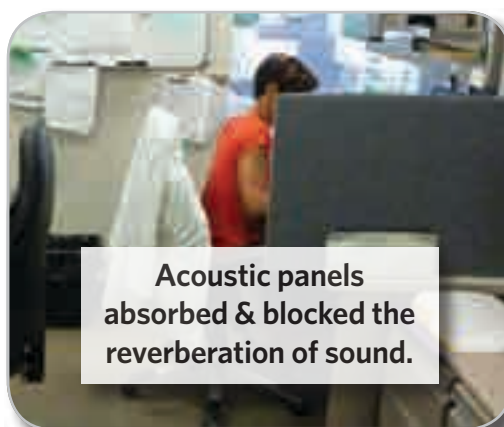
## FIND a SAFER WAY



HEARING  
ISSUES

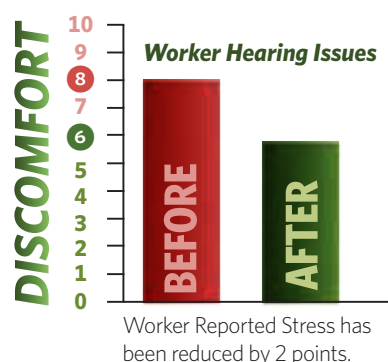
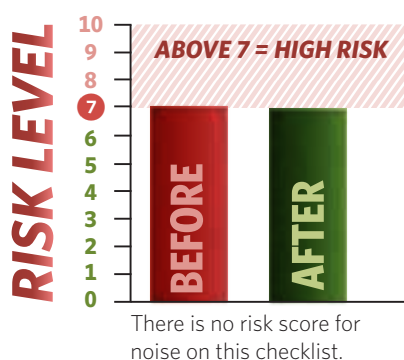


Acoustic panels separated  
three workstations.



Acoustic panels  
absorbed & blocked the  
reverberation of sound.

For this case study, the acoustic panels lowered the sound levels by 10 decibels when all 4 staff were communicating.



## EVERYDAY



### Costs

Acoustic panels  
Labour to install                      \$250



### Benefits

Productivity increased due to workers having fewer headaches, improved communication and fewer errors.



**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the workspace was the problem. A worker's hearing ability can change with time; however, the noise levels in the workspace were of greater significance.



## HEARING ISSUES



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## Case Study 7 Landscaping Tool Use

### SPOT the HAZARD



Are there hearing changes with age that could result in difficulties in using personal protective equipment?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of difficulty in hearing conversations when using PPE. Some older workers don't use PPE because of short duration tool use.



**Standards & Guidelines** The sound levels were above 85 decibels for several tools and pieces of equipment. References available in the Appendix.

**Aging Issues** Hearing ability decreases with age in the high frequency range. Decreasing sound levels or easier use of PPE may improve compliance with hearing conservation programs.

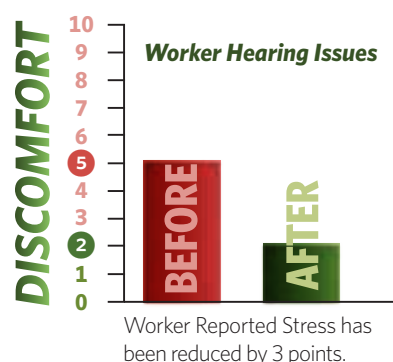
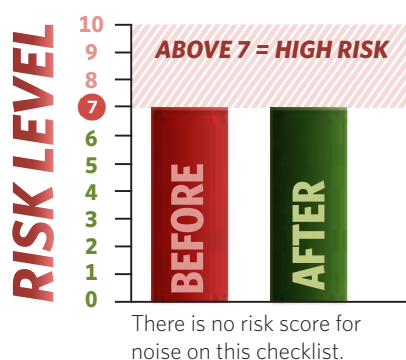
## FIND a SAFER WAY



HEARING  
ISSUES



For this case study, the custom calibrated hearing protection reduced high sound levels at the ear while allowing conversation level sounds to be heard.



## EVERYDAY



### Costs

Custom calibrated hearing protection

\$289



### Benefits

Productivity increased due to improved communication and fewer headaches from noise.



**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the noise levels were controlled by using hearing protection, but hearing conversations was difficult. A worker's hearing can change over time and hearing conversations is more difficult when using hearing protection. This issue can be improved by the use of custom calibrated hearing protection.





## LIFTING

# Case Study 8

## Construction Lifting from Ground Level

### SPOT the HAZARD



Are there age related changes to low back strength that could lead to an increased risk of injury?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is high.



**Checklist** This task scored a 16 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of low back injuries when lifting materials from ground level.



**Standards & Guidelines** Ergonomic assessment tools rated this task as high risk. The main issues were the weight and low back posture. References available in the Appendix.

**Aging Issues** Low back strength and capacity can decrease with age. Lifting less weight, lifting less frequently and mechanization to reduce lifting may help older workers.



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Project conducted by



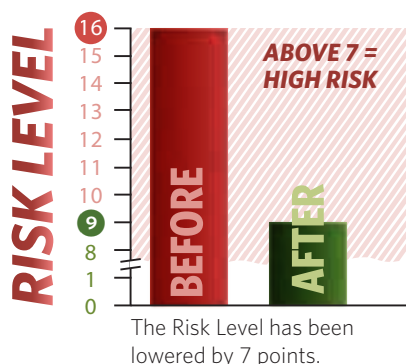
## FIND a SAFER WAY



LIFTING



For this case study, raising objects to knee height reduced low back strain. A biomechanical model of low back strain showed a reduction from 2287 Newtons to 1747 Newtons of compression force. This task has a significantly lower risk of injury.



## EVERYDAY



### Costs

Saw horse kit X 4  
Lumber & labour \$180



### Benefits

Productivity increased due to less time working with back pain and better efficiency from grasping objects at waist height.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the frequent lifting of heavy objects from the ground was the problem. A worker's low back strength and capacity can change with time; however, the physical demands and poor posture were the root cause of the injuries.



LIFTING

## Case Study 9

### Moving Company Lifting and Carrying

## SPOT the HAZARD



**HAZARD!** Lifting & carrying heavy & awkward objects.



**HAZARD!** Carrying large & heavy objects on stairs.

Are there age related changes to low back strength that could lead to an increased risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is high.



**Checklist** This task scored a 17 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of injuries from over-exertions, twisting and long duration work.



**Standards & Guidelines** Ergonomic assessment tools rated this task as high risk, even with two persons lifting. The main issues were the size, weight and grip with carrying on stairs. References available in the Appendix.

**Aging Issues** Low back strength and capacity can decrease with age. Lifting less weight, improving grip and safe lifting methods may help older workers.



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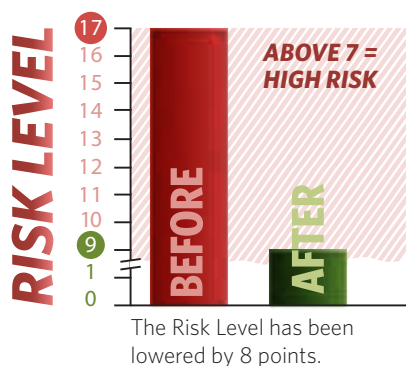
## FIND a SAFER WAY



### LIFTING



For this case study, providing lifting equipment improved low back posture, reduced grip forces and reduced biomechanical strain on the back from 1559 Newtons to 533 Newtons of compression force. This task has a significantly lower risk of injury.



## EVERYDAY



### Costs

Shoulder straps  
Training on proper use      \$50



### Benefits

Productivity increased due to quicker handling of objects on stairs, in/out of homes and less absenteeism.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the heavy and awkward lifting and carrying of objects up and down stairs were the problem. A worker's low back strength and capacity can change with time; however, the physical demands and poor grip were the root cause of the injuries.



## LIFTING

### Case Study 10

## Manufacturing Lifting Small Parts

### SPOT the HAZARD



Are there age related changes to low back strength and capacity that could lead to an increased risk of injury?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 13 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of fatigue and low back stiffness. Getting worse as the day progresses.



**Standards & Guidelines** Ergonomic assessment tools rated this task as high risk. The main issues were the repetition and low back posture. References available in the Appendix.

**Aging Issues** Low back strength and capacity can decrease with age. Lifting less frequently and mechanization to reduce lifting may help older workers.



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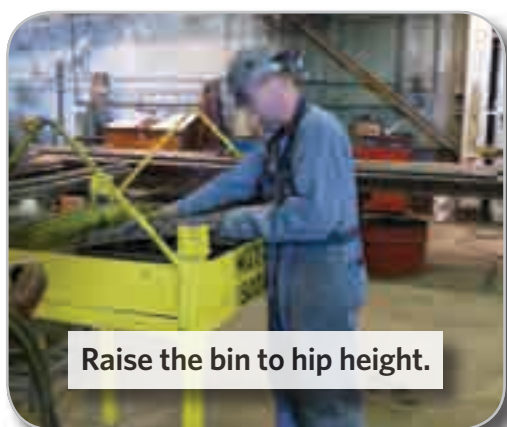
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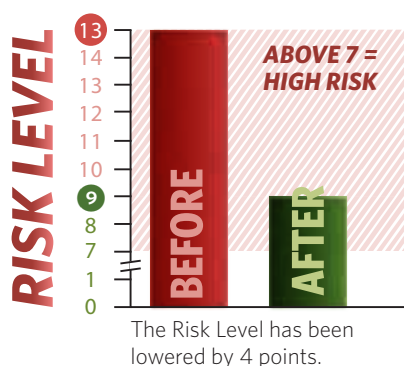
## FIND a SAFER WAY



### LIFTING



For this case study, raising materials to hip height reduced low back strain. The NIOSH lifting equation calculated a Lifting Index of 1.1 before the improvement and 0.9 after. This task is now of lower risk.



## EVERYDAY



### Costs

Material  
Labour

\$120



### Benefits

Productivity increased due to less time stooping for objects and reduced absenteeism.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the frequent lifting of objects from below knee height was the problem. A worker's low back strength and capacity can change with time; however, the physical demands and poor posture were the root cause of the discomfort.



## LIFTING

### Case Study 11

## Construction Carrying Sheets of Material

### SPOT the HAZARD



Are there age related changes to low back strength that could lead to an increased risk of injury?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 10 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of awkward and difficult lifts with pressure in the hands.



**Standards & Guidelines** Ergonomic lifting and carrying guidelines found these carrying demands to be acceptable to only 60% of all workers. The pinch grip required to hold onto this material while carrying is within guidelines but there is contact stress on the fingers. References available in the Appendix.

**Aging Issues** Low back strength and capacity can decrease with age. Lifting and carrying tasks should be designed to meet the capabilities of 90% of all workers. This would account for any age-related decreases in strength.



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Project conducted by

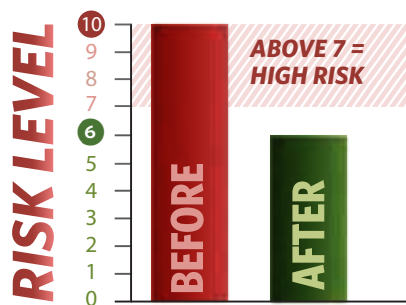


## FIND a SAFER WAY

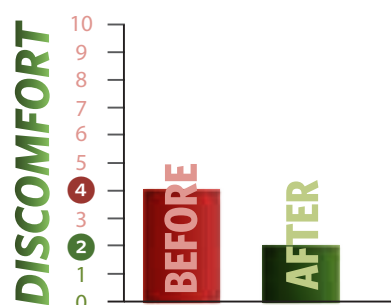


### LIFTING

For this case study, a tool was provided to improve grip and posture. Two grippers can be used for larger materials and carrying upstairs. Ergonomic lifting and carrying guidelines found these carrying demands to now be acceptable to 90% of all workers.



The Risk Level is now below the recommended level of 7.



Worker Reported Discomfort has been reduced by 2 points.

## EVERYDAY



### Costs

Gripper  
 $\$49.50 \times 2 = \$99$



### Benefits

Productivity increased due to less time required to stop and take a break when carrying long distances.



**Cost Benefit Analysis: Pay Back Period = 3 weeks**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the carrying of materials could increase the risk of injury for any worker. A worker's strength can change with time; however, frequent pinch gripping and awkward postures can fatigue and strain any worker.

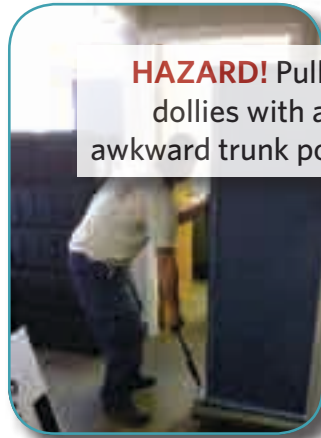




## LIFTING

# Case Study 12 Moving Company Handling Dollies

## SPOT the HAZARD



**HAZARD!** Pulling dollies with an awkward trunk posture.



**HAZARD!** Lifting a heavy dolly over the edge of a tailgate.

Are there age related changes to low back strength that could lead to an increased risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 9 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of lower back pain and overall discomfort from all moving related tasks.



**Standards & Guidelines** A biomechanical model found the lifting of the dolly over the tailgate results in 4161 Newtons of force on the low back. This is in the Action Limit range and requires corrective actions. The pulling of these specific dollies is acceptable to 70% of the working population based on the stooped posture. References available in the Appendix.

**Aging Issues** Strength decreases with age; however, it varies per the individual and is muscle specific. Lifting and pulling tasks should be designed to meet the capabilities of 90% of all workers. This would account for any age-related decreases in strength.



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Project conducted by



## FIND a SAFER WAY

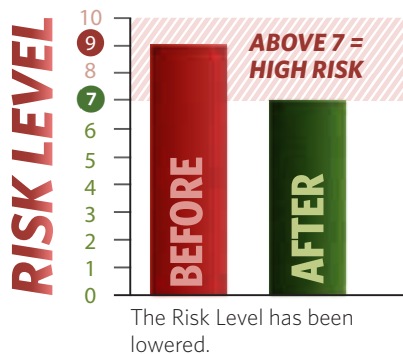


### LIFTING

Longer straps improve back & arm posture, reducing the strain on those joints.



For this case study, increasing the length of the straps from 22" (56cm) to 32" (81cm) allows for an improved upper body posture. Workers can now pull and lift with a straighter back. This reduces the strain on the back to 3106 Newtons of force, a decrease of 25%. The cumulative load on the back can be reduced by 5-10%. The pulling capacity of workers is increased by 20%.



## EVERYDAY



### Costs

Longer straps for 100 dollies  
\$200 + labour to install \$250 = \$450.



### Benefits

Productivity increased due to less fatigue on the lower back. Workers slow down when their backs are strained.

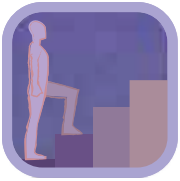


### Cost Benefit Analysis: Pay Back Period = 6 months

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the short straps placed workers in a poor lifting and pulling position. This could strain any worker's lower back even if there was a decrease in strength due to age.



## WORK CAPACITY

# Case Study 13 Construction Shoveling

## SPOT the HAZARD



Are there strength changes with age that could lead to an increased risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 9 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of strain in the elbows and hands along with quickly fatiguing the whole body.



**Standards & Guidelines** An Energy Expenditure assessment tool found that shoveling mud at a rate of 1 shovel per 10 seconds would tire the average worker in 5 minutes and an older worker in 4 minutes. References available in the Appendix.

**Aging Issues** An individual maximum cardiovascular endurance level decreases with age; however, an individual's sub-maximum effort level does not. Therefore, if the task does not overly fatigue a worker, then age should not be a concern. An individual's fitness level will be more of a factor.

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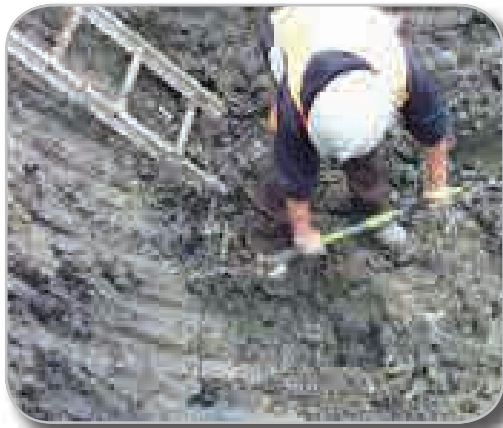


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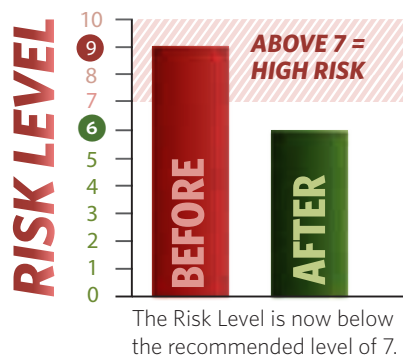


## FIND a SAFER WAY



**WORK  
CAPACITY**

For this case study, the 'O' ring shovel was provided to improve grip, reduce awkward arm postures and decrease the amount of heavy mud lifted on the narrower blade. This resulted in an 8% decrease in physical exertion (energy expenditure) even though there was a net increase in shoveling. The arm posture is improved when digging in various directions and there is always a power grip.



The 'O' ring handle, stronger shaft and smaller blade improves shoulder, elbow and wrist postures, allows for more use of a power grip and reduces exertion.

## EVERYDAY



### Costs

'O' ring shovel

\$40



### Benefits

Productivity increased due to less time required to stop and take a break due to over-exertion.

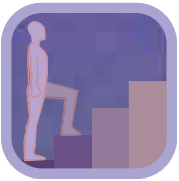


**Cost Benefit Analysis: Pay Back Period = 4 weeks**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the physical exertion would fatigue any worker. A worker's physical endurance can decrease with time; however, poor gripping, awkward postures and lifting heavy loads can fatigue and strain all workers.



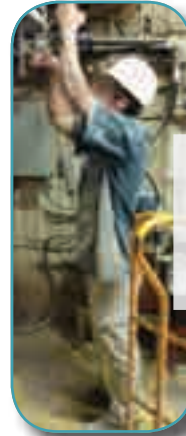
WORK  
CAPACITY

## Case Study 14 Manufacturing Standing

### SPOT the HAZARD



**HAZARD!** Standing for long periods of time.



**HAZARD!** Back bending and overhead reaching.

Are there stamina issues with continuous standing that can change with age?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 6 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of discomfort in the low back and legs when standing at a workbench and working overhead.



**Standards & Guidelines** The standing posture, given the frequency, duration and static nature of the task, was acceptable. Overhead work with backwards bending occurred less than 5% of the time. References available in the Appendix.

**Aging Issues** Decreases in stamina due to static postures is associated with age. The decreases can vary for many reasons including how the task is performed, the postures involved and the amount of forceful exertions.



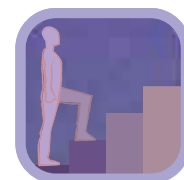
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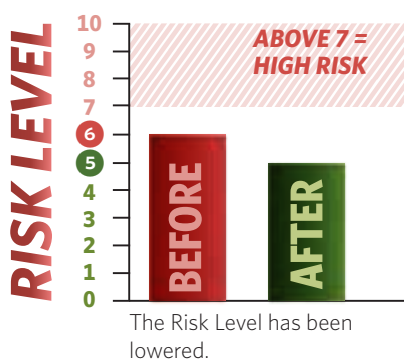


## FIND a SAFER WAY



WORK  
CAPACITY

For this case study, adding a foot rail to the workbench and providing a pail/step stool allowed the worker to change postures and reduce cumulative strain. The percentage of time in a static low back posture decreased by 20%.



## EVERYDAY



### Costs

Foot rail:  
Material & labour \$60



### Benefits

Productivity increased due to reduced fatigue and leg discomfort. Quality of work improved.

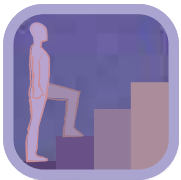


**Cost Benefit Analysis: Pay Back Period = 2 weeks**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

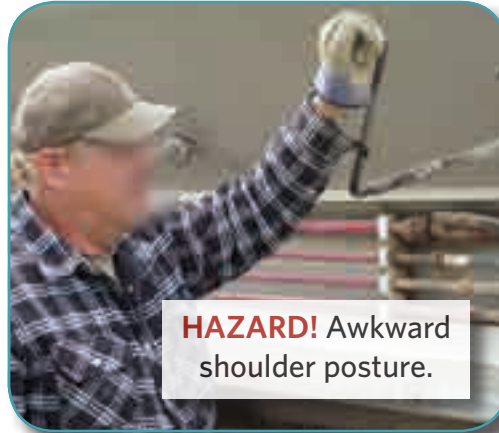
In this case study, the physical demands of the task was within standards; however, those standards may not take into account older worker stamina issues. An improvement to the task allowed for changes to posture, which reduced muscle fatigue for all workers.



## WORK CAPACITY

# Case Study 15 Transportation Opening of Hoppers

## SPOT the HAZARD



Are there arm strength issues related to age that could lead to shoulder strain?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk of injury.



**Worker Input** Shoulder injuries when pushing on the tool.



**Standards & Guidelines** A biomechanical model calculated the shoulder strength required to push on the tool with the arm in an awkward position. Only 68% of the 'working' population had sufficient capacity to open the hoppers. Guidelines suggest 90-95% of workers should be able to perform tasks which require strength. References available in the Appendix.

**Aging Issues** Upper arm strength decreases with age. The decrease should not be significant if the task is designed within standards.



**SAFE**  
**WORK**

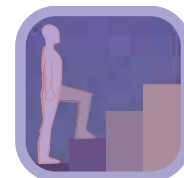
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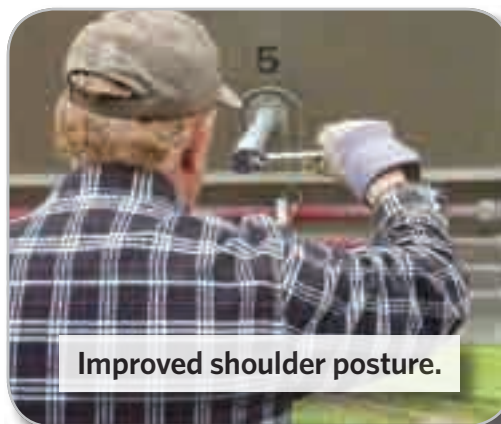
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## FIND a SAFER WAY



WORK  
CAPACITY



For this case study, a ratchet with a longer handle was provided. The force to turn the hopper open was the same; however, the shoulder is in a neutral position. The biomechanical model calculated that 99% of workers are now able to perform this task.



## EVERYDAY



### Costs

Ratchet with extension \$75



### Benefits

Productivity increased due to less time off work with shoulder injuries.



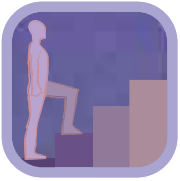
**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the tool was the problem. A worker's strength can change with time; however, the poor shoulder position resulted in an internal shoulder joint stress that significantly increased the risk of injury for all workers.



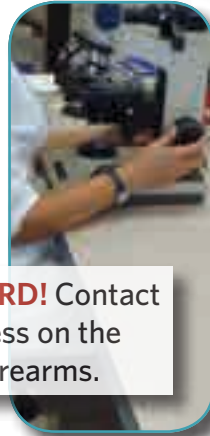


WORK  
CAPACITY

## Case Study 16

### Laboratory Microscope & Fume Hoods

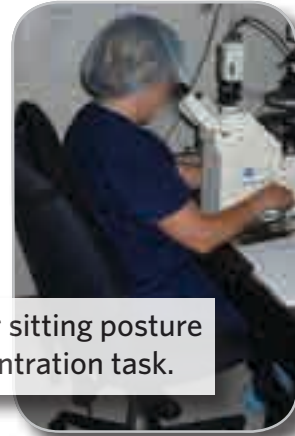
## SPOT the HAZARD



**HAZARD!** Contact stress on the forearms.



**HAZARD!** Poor sitting posture & high concentration task.



Are there flexibility and range of motion issues with age that would lead workers to require more adjustable equipment?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored an 11 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk of injury.



**Worker Input** Reports of discomfort in the low back, forearms, neck and eye strain.



**Standards & Guidelines** This is a high concentration visual task. The poor sitting posture is due to the height of the knee being lower than the hips, the lack of chair lumbar support and the armrests do not provide enough support. There is also contact stress on the forearms. References available in the Appendix.

**Aging Issues** Flexibility and range of motion decreases with age; however, it is highly variable within individuals. Limitations in flexibility and range of motion can be overcome by making workstations adjustable.



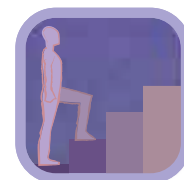
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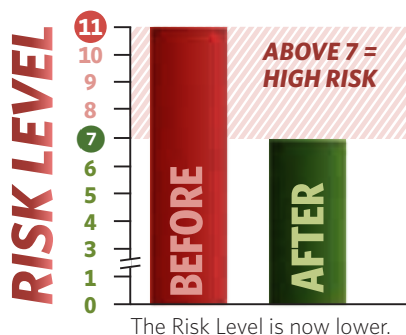


## FIND a SAFER WAY



**WORK  
CAPACITY**

For this case study, a new chair with improved lumbar support, a footrest and forearm supports were provided. The neck and sitting posture is much improved while there is adequate support for the feet and forearms.



## EVERYDAY



### Costs

Footrest, chair & arm supports.

\$1150



### Benefits

Productivity increased due to less time working in pain that led to improved visual inspection and fewer errors.



**Cost Benefit Analysis: Pay Back Period = 7 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

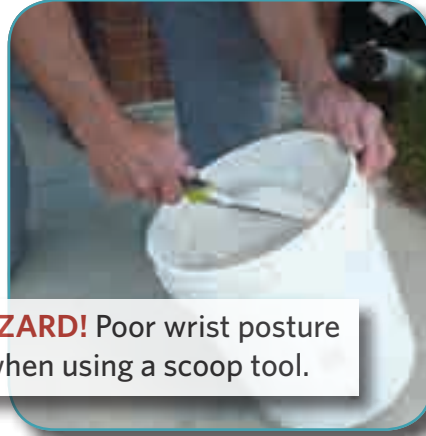
In this case study, the poor ergonomic design of the workstation was the problem. A worker's joint range of motion can change with time; however, the lack of adjustability was the root cause of the discomfort.



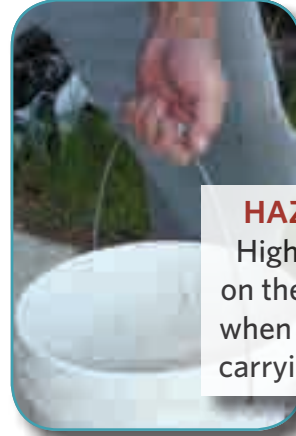
WORK  
CAPACITY

## Case Study 17 Construction Hand Tools

### SPOT the HAZARD



**HAZARD!** Poor wrist posture when using a scoop tool.



**HAZARD!** High forces on the fingers when lifting & carrying pails.

Are there arm strength issues related to age that could lead to forearm and wrist strain?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 10 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of hand discomfort with work aggravating the wrist and forearm when continuously using the scoop and carrying pails.



**Standards & Guidelines** A biomechanical calculation of grip strength found that 94% of workers were capable of performing the scooping task repetitively and 89% of workers were capable of lifting the pail with a hook grasp. Good ergonomic design suggests that 90% of workers (which includes older workers) should have the capacity to perform various tasks. References available in the Appendix.

**Aging Issues** The absolute strength capacity of workers decreases with age to varying degrees; however, the position of the wrist and type of grip can significantly increase the strain within the wrist joint, thereby reducing the worker's strength capacity.



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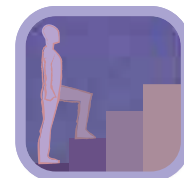


Project conducted by





## FIND a SAFER WAY



WORK  
CAPACITY

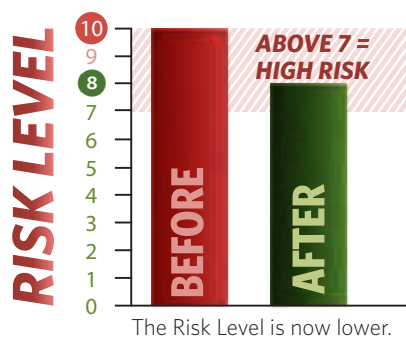


Scoop with ergonomic handle: keeps the wrist in a neutral position.



A pail handle gripper reduces pressure on the fingers.

For this case study, an ergonomic scoop with curved handle and a pail handle gripper were provided. The capacity of workers to perform this task increased to 97% for the scoop task and 99% for the lifting task. A straighter wrist and a power grip reduces internal joint forces which allows for more capacity to perform tasks.



## EVERYDAY



### Costs

Scoop with ergonomic pail handle gripper

\$20



### Benefits

Productivity increased due to less time working in pain, less absenteeism and time away from work.

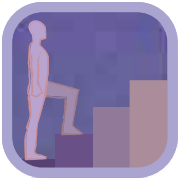


**Cost Benefit Analysis: Pay Back Period = 4 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the tools and tasks was not within standards. A worker's strength can decrease with age; however, the position of the body and type of grip can play a significant role in determining an individual's capacity to perform work.



WORK  
CAPACITY

## Case Study 18

### Food Processing Pressure Washer

## SPOT the HAZARD



**HAZARD!** Continuous  
& repetitive work.



**HAZARD!** Drag on the  
hose from coiling work.

Are there endurance changes with age that could lead to increased fatigue and risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored an 11 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of whole body fatigue and wrist strain for all workers.



**Standards & Guidelines** An upper body energy expenditure assessment found this task to use 40% of a 'fit' worker's capacity and the workers would require 15 minutes of rest for every 1.5 hrs of work. The force to pull on a coiled hose was up to 9kg (20 lbs). These calculations take into account the least fit workers. References available in the Appendix.

**Aging Issues** Endurance and work capacity decreases with age. The decreases can vary for many reasons including how the task is being performed, the postures involved and the amount of forceful exertions.



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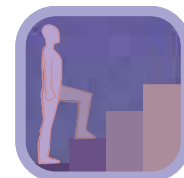


## FIND a SAFER WAY

360° degree hose swivel.

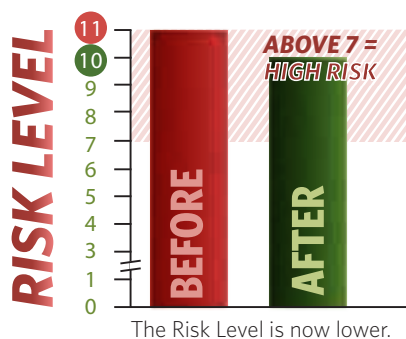


Administrative controls:  
education &  
body posture  
awareness.



WORK  
CAPACITY

For this case study/individual, adding a 360 degree swivel to the hose reduced drag forces by 2.5kg (6 lbs) and frequent twisting motions. Workers were educated on proper body postures and the importance of minimizing continuous gripping.



## EVERYDAY



### Costs

360 degree swivel \$30



### Benefits

Productivity increased due to less time wasted untwisting the hose and less overall fatigue leading to more efficient work.

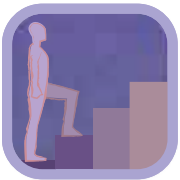


**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the design of the tool was the problem. A worker's endurance can change with time; however, the poor postures along with the force required to pull on the hose were the most significant issues.



WORK  
CAPACITY

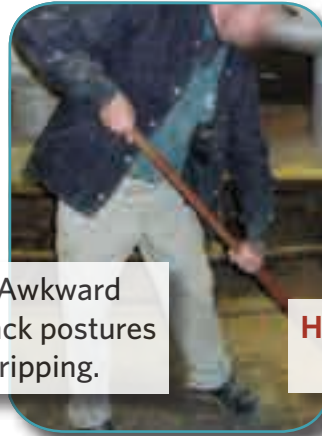
## Case Study 19

### Housekeeping Sweeping, Shoveling & Scraping

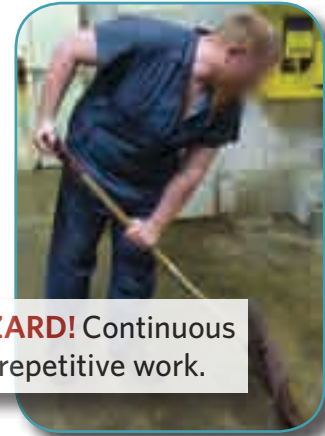
## SPOT the HAZARD



**HAZARD!** Awkward shoulder & back postures forceful gripping.



**HAZARD!** Continuous & repetitive work.



Are there endurance changes with age that could lead to increased fatigue and risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of whole body fatigue during long duration housekeeping work.



**Standards & Guidelines** Whole body energy expenditure calculations found this job to be acceptable for the specific task variables. These calculations take into account the least fit workers. References available in the Appendix.

**Aging Issues** Endurance can decrease with age. The decreases can vary for many reasons including how the task is being performed, the postures involved and the amount of forceful exertions.



**SAFE**  
**WORK**

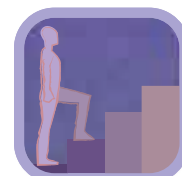
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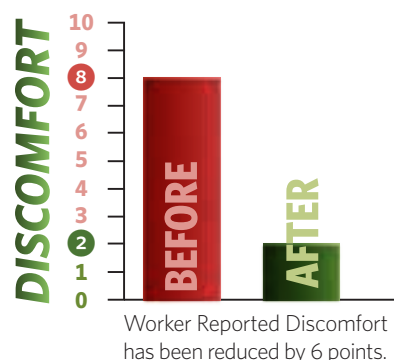
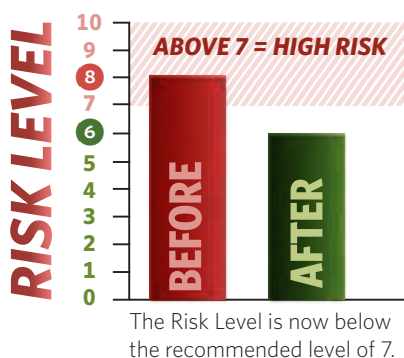


## FIND a SAFER WAY



WORK  
CAPACITY

For this case study, mechanical advantage was improved by adding 'D' shaped handles to the shaft of the tools and a 90 degree power grip handle on the end of some tools. This reduced stooping posture and improved upper body arm postures. There was less gripping effort in the hands. The whole body energy calculation decreased by 35 Watts of energy.



## EVERYDAY



### Costs

"D" handles x 2

\$70



### Benefits

Productivity increased due to less fatigue and more efficiency. Workers with job restrictions are now able to perform this task.



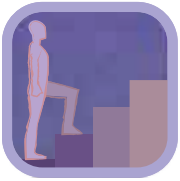
**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the physical demands of the task was within standards which included a protection for older workers. The addition of handles reduced grip effort and improved arm and back postures.





## WORK CAPACITY

## Case Study 20

### Day Care Centre Room Preparation Work

## SPOT the HAZARD



Are there endurance changes with age that could lead to a higher risk of injury?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of discomfort in the low back and knees. Of all the day care tasks, mopping and pushing heavy carts were rated as giving the most strain. Older workers perform these tasks at a slower pace and believe that it affects them throughout the day.



**Standards & Guidelines** The push forces with a full load in the cart was 25 lbs (11.4kg). The cart has 2 fixed and 2 swivel wheels. This task is within ergonomic guidelines due to the low frequency of use, although all four wheels should swivel for easier handling. For mopping, the physiological strain as measured by heart rate was within guidelines for endurance: 29% of a worker's maximum capacity for 30 minutes. References available in the Appendix.

**Aging Issues** Endurance can decrease with age. The decreases can vary for many reasons including how the task is being performed, the postures involved and the ability to have adequate recovery periods.



**SAFE**

SPOT THE HAZARD  
ASSESS THE RISK  
FIND A SAFER WAY  
EVERYDAY

Supported by

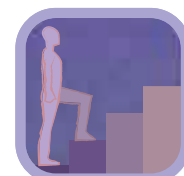
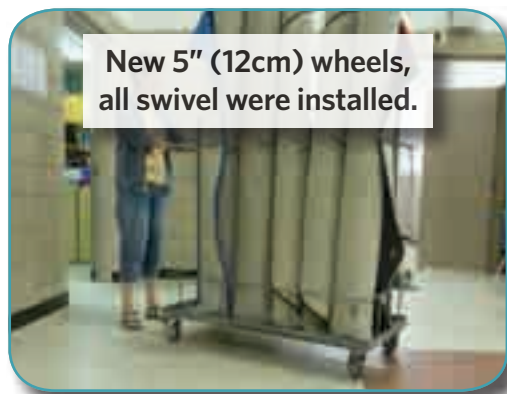


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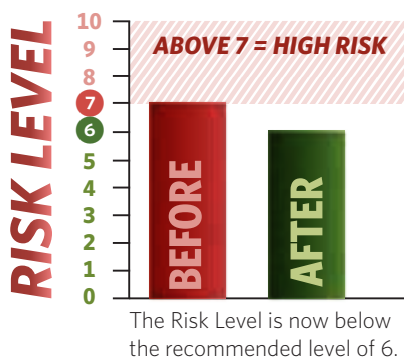


## FIND a SAFER WAY



WORK  
CAPACITY

For this case study/individual, the cart's wheels were changed from 2" to 5" (12cm) diameter with all wheels being 360-degree swivel. A new mop with a lighter mop head; 3lbs (1.4kg) down to 1lbs (0.5kg) and a shorter handle were provided. The push forces for the cart were reduced from 25lbs(11.4kg) to 12lbs(5.5kg) and the heart rate for mopping was reduced by 5 beats/minute. This works out to ~20% of a worker's maximum capacity for 30 minutes.



## EVERYDAY



### Costs

Mop, wheels & maintenance time to install    \$125



### Benefits

Productivity increased due to the reduced fatigue and strain which led to completing other tasks quicker.



**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates an positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, absenteeism or other factors.

## SUMMARY

In this case study, the ergonomic design of the workstation was low risk but not optimal. A worker's ability to withstand push and pull forces over time (endurance) can change with time, therefore tasks that are deemed to be safe may actually fatigue the worker and result in cumulative fatigue over the shift.



WORK  
CAPACITY

## Case Study 21

### Office Workstation Wrist/Forearm Issues

## SPOT the HAZARD



Are there soft tissue compression changes with age that could lead to increased risk for injuries to tendons, blood vessels and nerves?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 10 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of poor circulation in the hands and forearms along with general discomfort in the forearms.



**Standards & Guidelines** Contact stress is a hazard due to the effects of compression on soft tissues against a hard and sharp object. The location (wrist and forearm), duration (5-6 hours) and frequency (constant leaning and rubbing) significantly increase the risk of injury. References available in the Appendix.

**Aging Issues** There are no known aging effects for increasing the risk of soft tissue compression injuries.



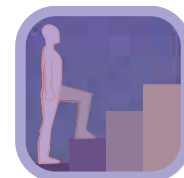
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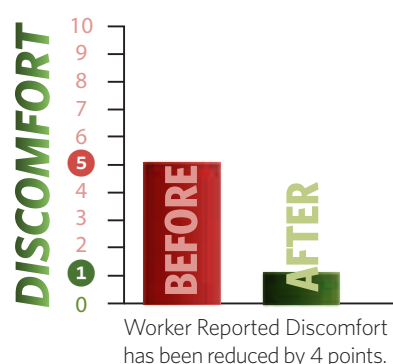
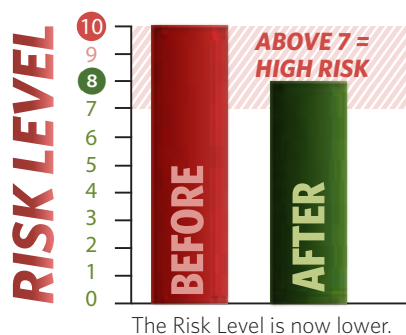
## FIND a SAFER WAY



WORK  
CAPACITY



For this case study, a wrist rest reduced the contact stress on the wrist and forearm. The worker is able to perform continuous and repetitive work without the direct pressure of the hard edge on the soft tissues.



## EVERYDAY



### Costs

Wrist rest \$16.00



### Benefits

Productivity increased due to less time working in pain. Work tasks were completed faster.

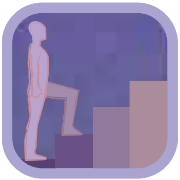


**Cost Benefit Analysis: Pay Back Period = 2 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the contact stress hazard was the problem. The desk height was a little too high and the chair could not be raised any higher; however, there is no evidence that older workers are at higher risk of contact stress hazards.



## WORK CAPACITY

## Case Study 22

## Transportation Long Distance Driving

## SPOT the HAZARD



**HAZARD!** Long duration sitting.



**HAZARD!** Vibration into hands from wheel.

Are there muscle fatigue changes with age that are related to long duration sitting and vibration?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 6 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of discomfort in the low back when driving for long periods.



**Standards & Guidelines** Vibration from the steering wheel was measured at  $3.3 \text{ m/s}^2$  over 2 hours. Electromyography (EMG) readings of low back muscle activity found increases of 20% over a period of 2 hours. These measurements are within guidelines. References available in the Appendix.

**Aging Issues** Muscle endurance may decrease and susceptibility to vibration may increase with age. The changes can vary for many reasons including the length of time performing the task, the postures involved and environmental conditions.



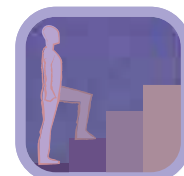
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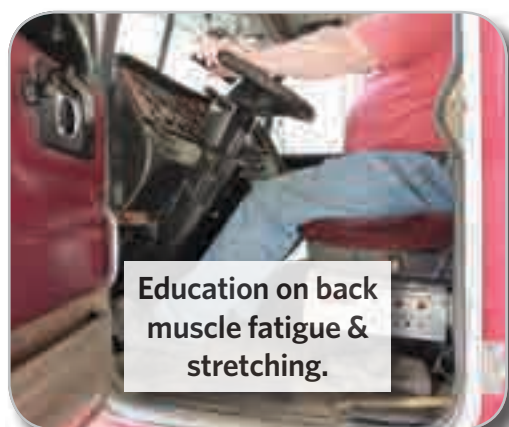
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## FIND a SAFER WAY



WORK  
CAPACITY

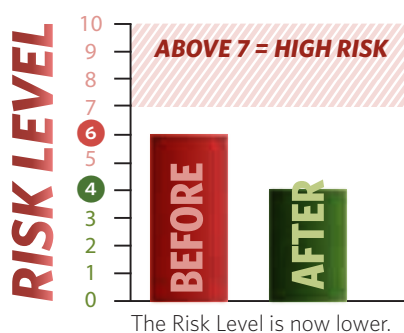


Education on back  
muscle fatigue &  
stretching.



Anti-vibration gloves.

For this case study, the provision of anti-vibration gloves reduced vibration from the steering wheel down to 1.9 m/s<sup>2</sup>. Stretching the low back muscles while driving kept muscle activity near resting activity levels.



## EVERYDAY



### Costs

Anti-vibration gloves  
Work/rest awareness  
training

\$25



### Benefits

Productivity increased due to less time working in discomfort. Non-driving related tasks were performed more efficiently.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the physical demands of the task was within standards. However, these standards may not take into account older worker issues. The provision of anti-vibration gloves and educating drivers on muscle fatigue and stretches that can be performed in the cab, reduced low back muscle activity and vibration.





WORK  
DESIGN



Supported by



Project conducted by



## Case Study 23

### Farming Climbing into a Tractor

## SPOT the HAZARD



**HAZARD!** Awkward knee angle on first step.

Are buildings, structures, machines, equipment and tools designed for an aging workforce? Are tractor steps designed to accommodate all workers' capabilities?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low.



**Checklist** This task scored a 1 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of knee discomfort and difficulty climbing tractor steps.



**Standards & Guidelines** The first step is within standards; however, on uneven ground in the field, the first step was measured to be 9cm (3.5") higher. References available in the Appendix.

**Aging Issues** Joint flexibility decreases with age. Research on comfortable and maximum first step heights has recommended that standard step heights be decreased by ~1" for workers over 60 years old.



## FIND a SAFER WAY



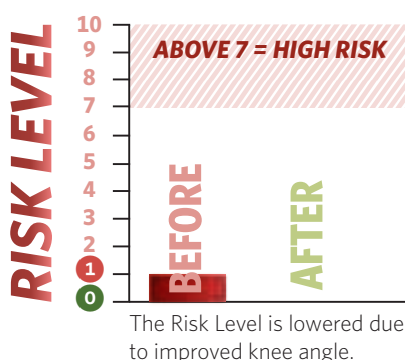
### WORK DESIGN



The first step was extended (lowered).

The first step side supports are rubber to allow for obstructions.

For this case study, extending the first step by 5cm (2") was implemented. This allowed for an improved knee angle, especially when working on uneven ground.



## EVERYDAY



### Costs

Material  
Labour

\$60



### Benefits

Productivity increased due to less pain getting in/out of tractor. Less knee strain equalled less medical treatment.



**Cost Benefit Analysis: Pay Back Period = 2 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the step was within standards for tractors. However, it did not account for an aging worker's decreased knee flexibility or standing on uneven ground.



## WORK DESIGN

# Case Study 24 Office Workstation Reaching Overhead

## SPOT the HAZARD



**HAZARD!** Reaching above head height.



**HAZARD!** Reaching with the arm “winging” out.

Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health’s ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of shoulder pain and dropped objects.



**Standards & Guidelines** Office ergonomic standards indicate that large or heavy objects be located at waist height. The standing reach distance is 185cm (73”). This is slightly more than the maximum reach capacity of most females. Therefore, poor postures are used to reach for the large binders. References available in the Appendix.

**Aging Issues** Reaching and lifting capacity can change with age. Placing binders in a better position, lowering the shelf or two-handed lifting may reduce the risk of injury.



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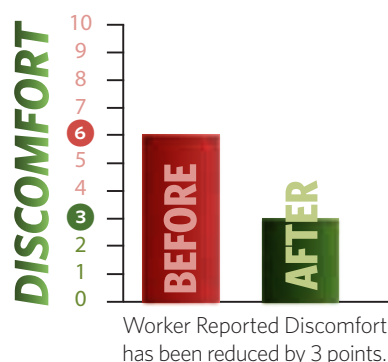
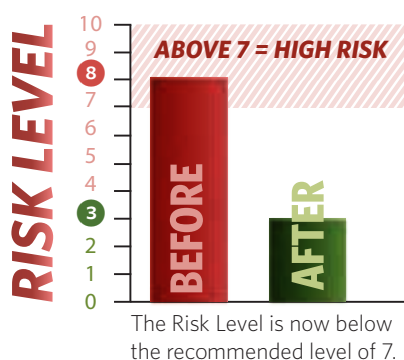
## FIND a SAFER WAY



### WORK DESIGN



For this case individual, changing the location of the large binders to waist level and training workers to keep the elbows close to the body was implemented.



## EVERYDAY



### Costs

Housekeeping  
Training

\$30



### Benefits

Productivity increased due to fewer dropped binders and improved housekeeping.



**Cost Benefit Analysis: Pay Back Period = 2 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

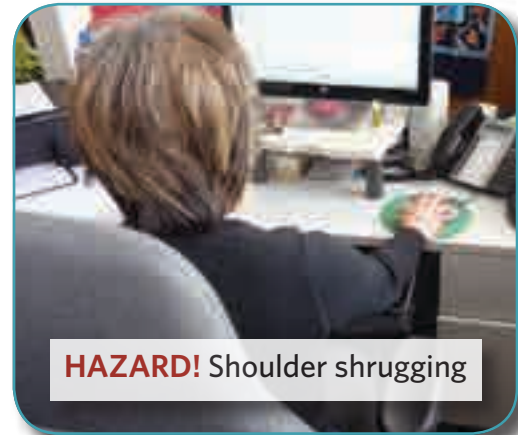
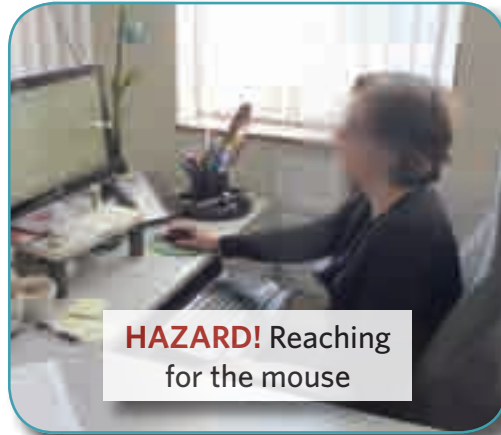
In this case study, the placement of large and heavy binders overhead was the problem. A worker's reaching and work capacity can change with time; however, the poor ergonomic design was the root cause of the discomfort. Office workstation design guidelines do take into account older worker issues.



## WORK DESIGN

# Case Study 25 Office Workstation Mouse Position

## SPOT the HAZARD



Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored an 11 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of wrist and shoulder pain.



**Standards & Guidelines** Shoulder posture is shrugged and flexed greater than 45 degrees with a reach of 61cm (24"). These are not recommended postures for long duration tasks. References available in the Appendix.

**Aging Issues** Reaching and work capacity can decrease with age. Bringing the mouse closer or changing the type of input device may improve the shoulder posture.



Supported by



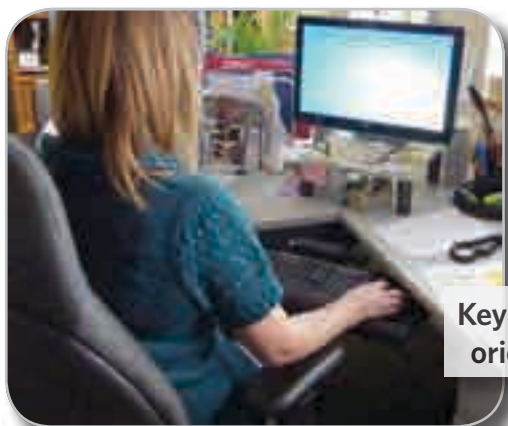
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## FIND a SAFER WAY

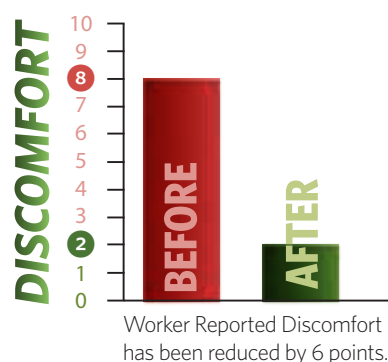
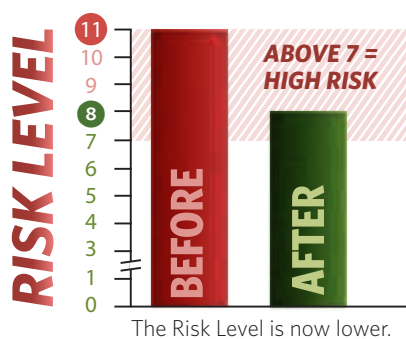


### WORK DESIGN



Keyboard tray & desk orientation change.

For this case study, a 69cm (27") long keyboard tray was provided and the orientation of the desk was changed to allow for enough room for the keyboard and mouse.



## EVERYDAY



### Costs

Keyboard tray  
Labour to change desk      \$340



### Benefits

Productivity increased due to less time working in pain, resulting in more data entry and fewer errors.



**Cost Benefit Analysis: Pay Back Period = 4 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the workstation was the problem. A worker's reach and work capacity can change with time; however, the far reaching and poor shoulder posture were the root cause of the discomfort. Office workstation design guidelines do take into account older worker issues.





## WORK DESIGN

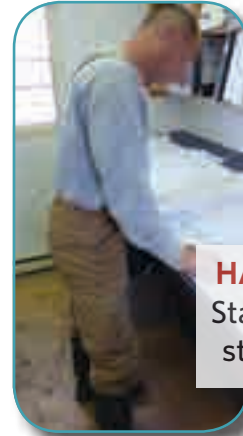
### Case Study 26

## Construction Workstation Sitting & Standing

### SPOT the HAZARD



**HAZARD!** Lack of chair support.



**HAZARD!** Standing & stooping.

Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 3 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of leg and back pain in the office after long hours of physically demanding work on the construction site.



**Standards & Guidelines** Standing and sitting at this workstation occurs less than 10% of the work day and stooping is less than 15 degrees. These issues are within standards and guidelines. References available in the Appendix.

**Aging Issues** Sitting and standing tolerance can decrease with age. Purchasing an ergonomic chair and height adjustable table may reduce strain on the body.



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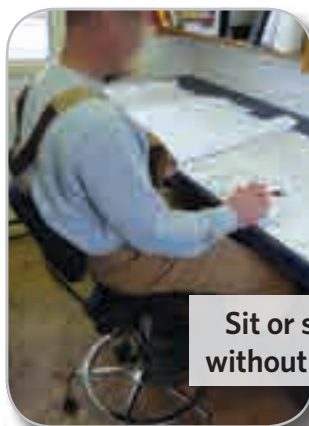
## FIND a SAFER WAY



### WORK DESIGN

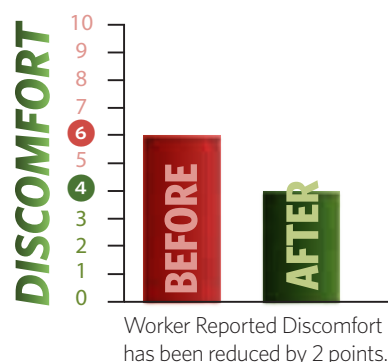
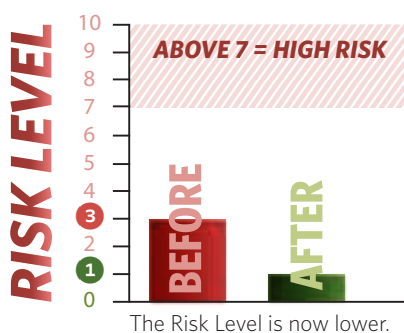


A 3-in-1 sit stand chair.



Sit or stand with or without back support.

For this case study, a chair that provides support when sitting at a desk, high counter or used as a semi-standing perch allowed for improved posture and support.



## EVERYDAY



### Costs

3-in-1 chair

\$500



### Benefits

Productivity increased due to fewer errors made because concentration improved while reviewing plans and other documents.



**Cost Benefit Analysis: Pay Back Period = 3 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the workstation was within standards. However the other 'high' physical demands of the job did reduce the older workers' capacity. Improved sitting and standing was needed. Office workstation design guidelines do take into account older worker issues.



## WORK DESIGN



Supported by



Project conducted by



## Case Study 27

### Office Workstation Mouse Area

## SPOT the HAZARD



**HAZARD!** Small wrist motions to move the mouse.

Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low moderate.



**Checklist** This task scored a 10 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of wrist pain.



**Standards & Guidelines** Over 90% of the time, the wrist was used to move the mouse. The shoulder and forearm were frequently in a static posture. These motions or lack of is not recommended for long duration work. References available in the Appendix.

**Aging Issues** Muscle strength and endurance can decrease with age. Purchasing a larger keyboard tray or changing the input device may allow for improved postures.

## FIND a SAFER WAY

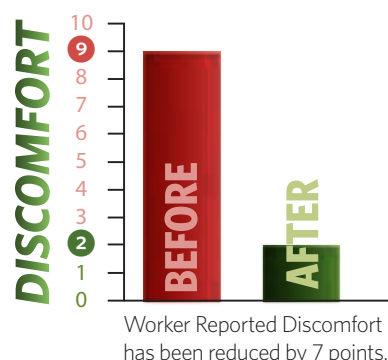
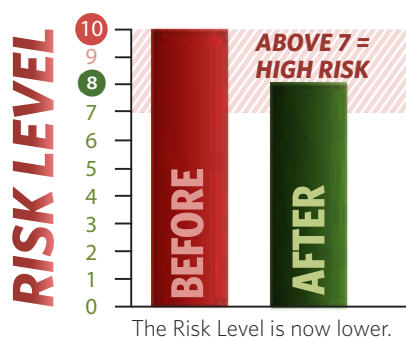


### WORK DESIGN



Shorter keyboard.

For this case individual, a shorter keyboard (detached number pad) was provided. This increased the space to move the mouse by 10cm (4"). The worker is now able to move the mouse with mostly shoulder motions with some elbow and wrist movements. The wrist is now used less than 25% of the time to move the mouse.



## EVERYDAY



### Costs

Mini-keyboard

\$70



### Benefits

Productivity increased due to less time working in pain, specifically the last half of the day, and less absenteeism.



**Cost Benefit Analysis: Pay Back Period = 2 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the workstation was the problem. A worker's muscular strength and endurance can change with time; however, the small area to move the mouse was the problem. Office workstation design guidelines do take into account older worker issues.

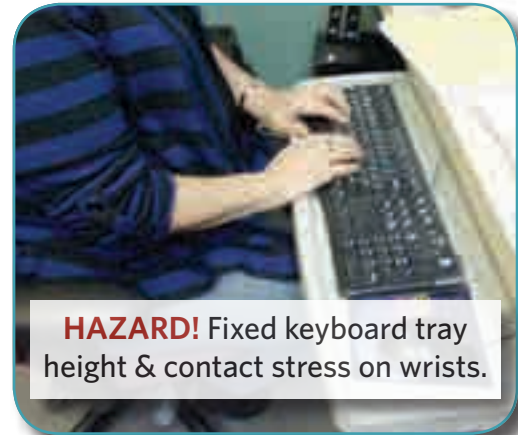


## WORK DESIGN

### Case Study 28

## Office Workstation Adjustability & Fit

### SPOT the HAZARD



Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored an 11 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of neck, back and wrist pain.



**Standards & Guidelines** Neck twisting is greater than 45 degrees for the monitor and documents. The height of the knee is lower than the hips, the chair lacks a lumbar support and the armrests do not provide support. There is contact stress on the wrists and the keyboard tray is too low. References available in the Appendix.

**Aging Issues** Flexibility and range of motion decreases with age. Purchasing an ergonomic chair and height adjustable keyboard tray may reduce strain on the body.



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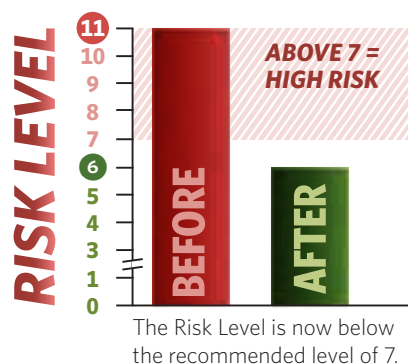
## FIND a SAFER WAY



### WORK DESIGN



For this case study, an ergonomic chair with lumbar support, standard adjustable features and pivoting armrests were provided along with a footrest. A height adjustable keyboard tray with wrist support and document holder were also provided. The monitor was positioned in the centre of the workstation.



## EVERYDAY



### Costs

Chair, footrest, keyboard tray, document holder \$1,400



### Benefits

Productivity increased due to less time working in pain, less time off work and efficiency of motion (looking through documents).



**Cost Benefit Analysis: Pay Back Period = 4 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the workstation was the problem. A worker's flexibility and range of motion can change with time; however, the lack of support, adjustability and contact stress was the cause of the discomfort. Office workstation design guidelines do take into account older worker issues.



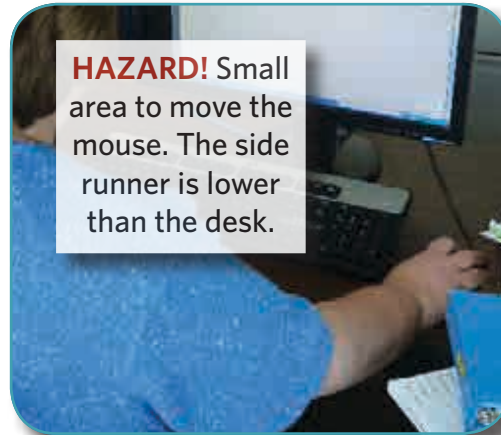


## WORK DESIGN

### Case Study 29

## Office Workstation Furniture & Equipment Design

### SPOT the HAZARD



Are buildings, structures, machines, equipment and tools designed for an aging workforce? Do office workstation design guidelines account for older worker issues?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is moderate - high.



**Checklist** This task scored a 13 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of discomfort over the whole body as the day progresses. The last 2 hours of work is difficult to complete due to neck and shoulder pain.



**Standards & Guidelines** An ergonomic assessment found the workstation dimensions to be inadequate along with a lack of standard chair features. The desk height is 25.5" (65cm) high. This fits the shorter stature worker; however, the space to move the mouse is too small. The wrist is used exclusively to move the mouse. The chair's armrests are not adjustable, there is no lumbar support and the feet are dangling near floor level. References available in the Appendix.

**Aging Issues** Flexibility and range of motion decreases with age. However, it varies by individual and which body joint is of concern, i.e., the shoulder vs the hip. Equipment and furniture should be designed to meet a range of individual's body sizes and reach capabilities.



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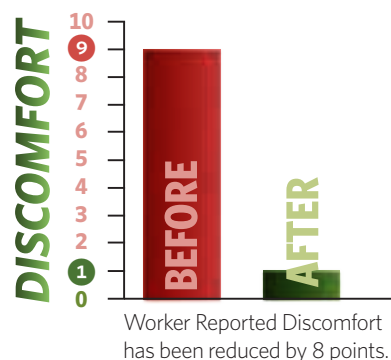
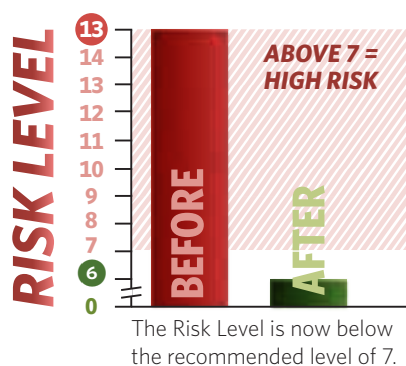
## FIND a SAFER WAY



### WORK DESIGN



For this case study, the equipment, furniture and worker's smaller stature led to the difficulties. A desk with a higher side runner allowed for a longer keyboard tray. A monitor arm was provided to lower the monitor. A chair was provided for proper support long with a footrest.



## EVERYDAY



### Costs

Footrest, desk, chair, keyboard tray & monitor arm \$1849



### Benefits

Productivity increased due to less time working in pain, specifically the last 2 hours of the day. This resulted in less overtime to catch up on deadline tasks such as payroll.



**Cost Benefit Analysis: Pay Back Period = 7 months**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of equipment and furniture and the worker's smaller stature led to the difficulties. Age played a part in that the discomfort was always there but now it is more difficult to deal with. If your workforce has existing musculoskeletal issues, then this solution may also help with making accommodations.



COGNITIVE  
CAPACITY

## Case Study 30

### Farming Tractor Controls

## SPOT the HAZARD



Are there short-term memory changes with age that could lead to increased errors in operating controls – forgetting which hydraulics are linked to the cabin controls?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 5 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of errors in the control of implement functions, opens when it should close, turns right instead of forward and near misses when these errors occur when other workers or equipment are near.



**Standards & Guidelines** The design of ergonomic controls includes providing good discriminatory coding. These controls do not have different shapes, colour, position nor have any labeling. References available in the Appendix.

**Aging Issues** A general decline in cognitive performance such as short term memory can be observed with age; however, significant declines are only observed in post retirement age groups.



Supported by



Project conducted by



## FIND a SAFER WAY

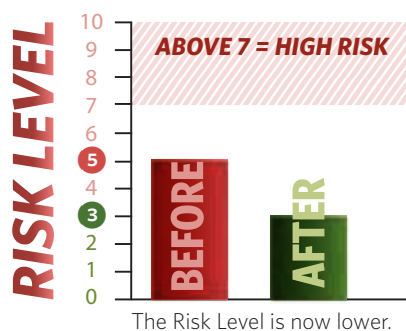


COGNITIVE  
CAPACITY



Use of a white board  
to label controls.

For this case study, labeling the controls based on the type and function of attached implement eliminated errors and near misses. The operator does not have to rely on memory when deciding which controls to activate.



## EVERYDAY



### Costs

Whiteboard & markers      \$21.00



### Benefits

Productivity increased due to fewer errors in operation, less waste and reduced near misses



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

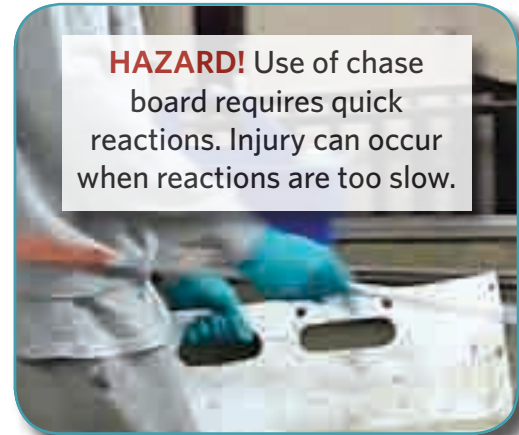
In this case study, the poor ergonomic design of the controls was the problem. A worker's memory can change with time; however, a lack of labeling and making the controls distinct was the root cause of the errors.



## COGNITIVE CAPACITY

# Case Study 31 Food Processing Reaction Time

## SPOT the HAZARD



Are there reaction time changes with age that could lead to 'struck against' injuries in the food processing industry?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways - for this task the ergonomic risk level is moderate - high.



**Checklist** This task scored an 11 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of tired arms at the end of the day. Struck against incidents occurred when workers believed they were too slow to react to changes.



**Standards & Guidelines** The weight of the chase board is 5kg and the handle size is 9mm in thickness with 35mm in depth. This does not lead to an efficient grip. Ergonomic assessment tools have shown this task to be above acceptable levels for arm and hand fatigue. References available in the Appendix.

**Aging Issues** Reaction time decreases with age. However, studies have shown fatigued arms can result in a 20-30% decrease in reaction time.



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## FIND a SAFER WAY

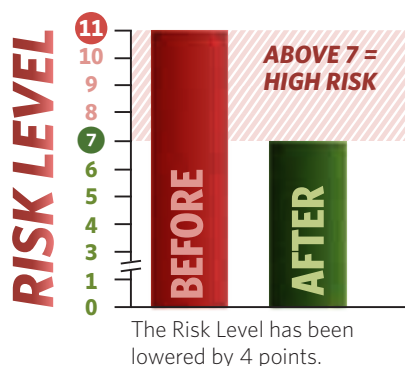


Chase board was made lighter and the handle was changed from a hook to a power grip.



COGNITIVE  
CAPACITY

For this case study, the chase board was made lighter (4.2kg) and a rounded handle was added (12cm diameter). The lighter material and power grip resulted in an improvement as measured by ergonomic assessment tools to the acceptable level. Reaction time was not measured; however, workers indicated less fatigued arms and quicker movements with the chase board.



## EVERYDAY



### Costs

New materials & labour to make 5 new chase boards \$450



### Benefits

There was a 20% decrease in "Struck Against" injuries over 6 months.



**Cost Benefit Analysis: Pay Back Period = 4 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the poor ergonomic design of the chase board was the problem. A worker's reaction time can decrease with age; however, fatigue in the arms was a greater concern.



**EXTREME  
TEMP.**

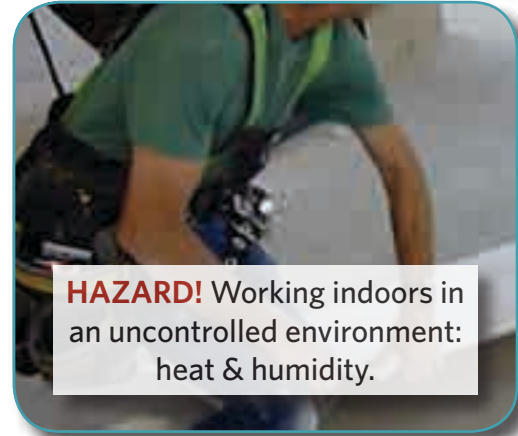
## Case Study 32

### Construction Indoor & Outdoor Heat

## SPOT the HAZARD



**HAZARD!** Working outdoors in the extreme heat.



**HAZARD!** Working indoors in an uncontrolled environment: heat & humidity.

Are there temperature regulation changes with age that could lead to an increased risk of heat stress?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways – for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of heat stress and excessive perspiration in outdoor and indoor work.



**Standards & Guidelines** According to Manitoba Labour Workplace Safety and Health's Thermal Stress Guideline, the outdoor heavy task work had a humidex of 40 °C and the indoor moderate task work was 30°C. Both values indicate prevention and control measures are required. References available in the Appendix.

**Aging Issues** Thermal sense – the perception of warmth or cold – decreases with age. Therefore, older individuals may be more susceptible to heat stress than young workers even when humidity, air velocity and acclimatization is taken into account.



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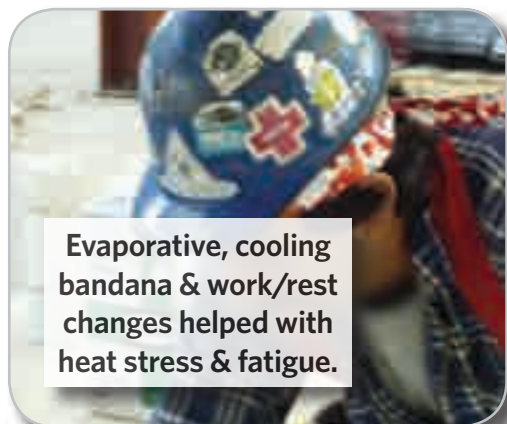
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## FIND a SAFER WAY



**EXTREME  
TEMP.**

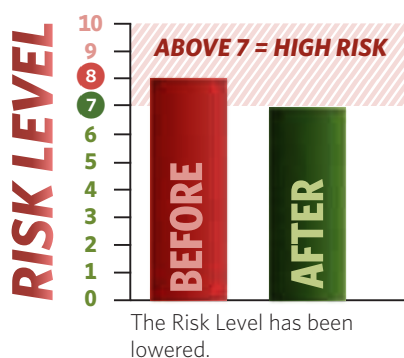


Evaporative, cooling  
bandana & work/rest  
changes helped with  
heat stress & fatigue.



Use of the bandana in  
tasks with high humidity.

For this case study, a cooling material inserted in a bandana resulted in a cooling effect and less sweat getting into the eyes. Outdoor work on hot days resulted in more rest time per hour according to guidelines. Awareness training on heat stress was provided to all workers.



## EVERYDAY



### Costs

Cooling head bands  
Awareness & education  
More rest periods

\$100



### Benefits

Productivity was balanced with rest breaks due to less time wiping perspiration from eyes and reduced fatigue.



**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the high temperatures and humidity even with an acclimatized workforce was the problem. Even though older workers may lose some thermal sense and therefore may be at greater risk of heat stress, the control, education and awareness of heat stress must be provided to all workers.



**EXTREME  
TEMP.**

## Case Study 33 **Construction** Working in the Cold

### **SPOT** the HAZARD



Are there temperature regulation changes with age that increase the risk of cold weather injuries?

### **ASSESS** the RISK

Ergonomic risks are evaluated by assessing a task in several different ways – for this task the ergonomic risk level is moderate.



**Checklist** This task scored a 9 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Workers have tried different safety gloves; however, they do not have the required grip, warmth and water resistance. Workers would rather perform tasks in the cold with bare hands and have a good grip.



**Standards & Guidelines** According to Manitoba Labour Workplace Safety and Health's Thermal Stress Guideline, the construction work had a temperature of 3 °C. Furthermore, the safety gloves that had a good grip did not provide adequate moisture protection. Therefore, prevention and control measures are required. References available in the Appendix.

**Aging Issues** Thermal sense; the perception of warmth or cold decreases with age. Therefore, older individuals may be more susceptible to hypothermia than young workers even when humidity, air velocity and acclimatization is taken into account.



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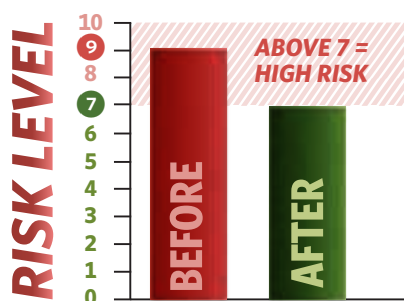
## FIND a SAFER WAY



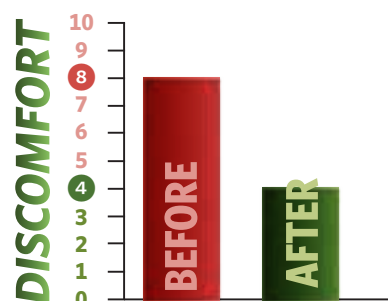
**EXTREME  
TEMP.**



For this case study, an effective choice in safety gloves helped to keep the moisture off the hands, provided a good grip on objects and allowed workers to keep working without having to take more warm up breaks.



The Risk Level has been lowered.



Worker Reported Discomfort has been reduced by 4 points.

## EVERYDAY



### Costs

Specific type of gloves \$97



### Benefits

Productivity increased due to improved grip and less time recovering from the cold.



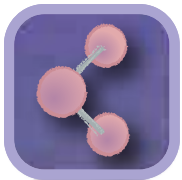
**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the lack of proper personal protective equipment was the problem. A worker's thermal sense can change with age; however, the cold and wet tasks were a problem for all workers.





## CHEMICALS

### Case Study 34

## Landscaping Use of Various Chemicals

### SPOT the HAZARD



Are there chemical resistance changes with age that could lead to a higher risk of illness?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways – for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** No reports of illness; however, workers apply mosquito repellent and then spray a herbicide. There are concerns regarding the mixture of chemicals.



**Standards & Guidelines** The WHMIS MSDS for the herbicide indicate the use of gloves and to cover the skin. Research into the mosquito repellent indicated it can 'open skin pores'. Therefore, there is a higher risk of other chemicals absorbing into the skin.

**Aging Issues** Chemical resistance may vary with age. Consult the guide Adjusting TLVs for more information on aging affects. References available in the Appendix.



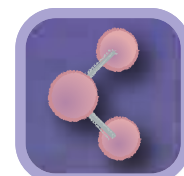
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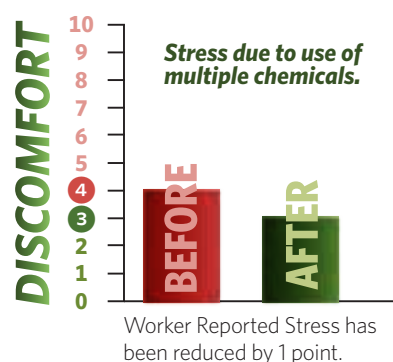
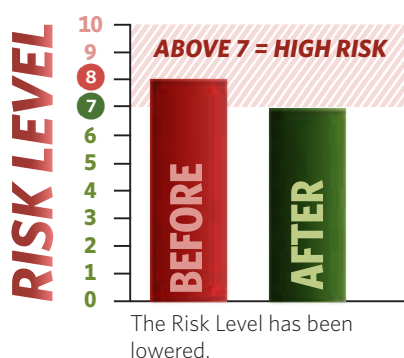


## FIND a SAFER WAY



CHEMICALS

For this case study, using appropriate personal protective equipment and changing the work organization helped to reduce exposure to multiple chemicals.



## EVERYDAY



### Costs

PPE suit & gloves  
Worker training & education \$222



### Benefits

Productivity improved from less time cleaning up and from overspray. Better organization and task scheduling.

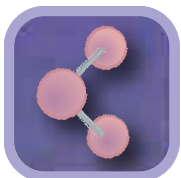


**Cost Benefit Analysis: Pay Back Period = 3 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the exposure to multiple chemicals was the problem. A worker's chemical resistance can change, therefore more information is required about chemical use and adjusting exposures for older workers.



## CHEMICALS

### Case Study 35

## Automotive Repair Personal Protective Equipment

### SPOT the HAZARD



**HAZARD!** Strong odours from a cleaning agent.



**HAZARD!** Chemicals irritating the skin, even when using gloves.

Are there chemical resistance changes with age that could lead to a higher risk of illness?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task in several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 6 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of lung and skin irritation due to use of two different chemicals used to clean parts.



**Standards & Guidelines** The WHMIS MSDS indicated a respirator should be used with one of the chemicals and that nitrile gloves be used with the other. Rubber gloves were being used.

**Aging Issues** Chemical resistance may vary with age. Consult the guide Adjusting TLVs for more information on aging affects. References available in the Appendix.



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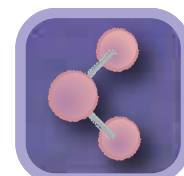
## FIND a SAFER WAY



One chemical was changed for a less hazardous cleaner.

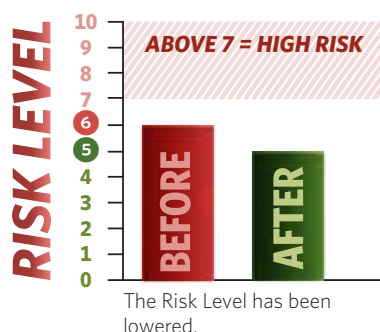


Nitrile gloves were provided. an extra eye-wash station was added to reduce walking distance in an emergency.



CHEMICALS

For this case study, the proper type of glove and a chemical substitution controlled for the chemical exposures. An extra eye wash station was added for an older worker with a hip problem. He would take longer to reach the main eye wash station.



## EVERYDAY



### Costs

New gloves, chemicals,  
& eye wash station \$465



### Benefits

Productivity increased due to improved quality of cleaning parts - workers are not rushing the job.



**Cost Benefit Analysis: Pay Back Period = 7 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the lack of awareness of MSDS recommendations was the problem. A worker's chemical resistance can change with age; however, the harsh chemicals were a problem for all workers.



## JOB ACCOM- MODATION



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## Case Study 36 Construction Neck Issues

### SPOT the HAZARD



### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low-moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports chronic neck issues that flare up occasionally.



**Standards & Guidelines** Neck posture is within standards for static and dynamic movement. Long duration work (10-12 hrs) would increase the risk of neck discomfort. References available in the Appendix.

**Aging Issues** The prevalence of chronic illnesses and diseases increase with age and can affect an older worker's functional capacity. Job accommodations may be required even if the work tasks are found to have a low risk of injury.



## FIND a SAFER WAY

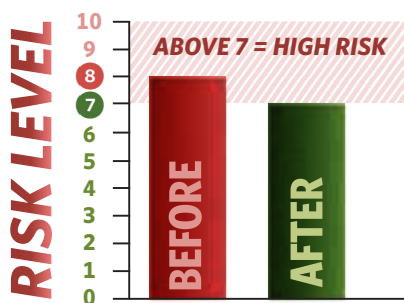


Education on neck posture, stretching and changes to work/rest schedule.



**JOB  
ACCOM-  
MODATION**

For this individual, a change in the work/rest schedule (more frequent mini-breaks), education on neck posture and static loading and advice from a health care professional on specific stretches was implemented.



The Risk Level is now at the recommended level of 7.



Worker Reported Discomfort has been reduced by 2 points.

## EVERYDAY



### Costs

Time to take mini-breaks to stretch

\$0



### Benefits

Productivity increased due to improved concentration on work, especially during a 10 or 12 hour day.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the equipment and task was within standards. Due to various personal health issues, including age related health issues, a worker may require specific job accommodations.



JOB  
ACCOM-  
MODATION



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## Case Study 37

### Office Workstation Low Back Issues

## SPOT the HAZARD



Are there chronic 'age' related illnesses and diseases that require special accommodations for older workers?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 5 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



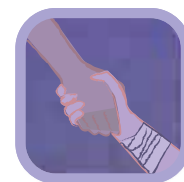
**Worker Input** Reports of chronic low back discomfort, increasing as the day progresses.



**Standards & Guidelines** The chair's seat pan length and armrest height is within standards; however, the seat pan is too short for this worker and the armrest does not provide adequate support. References available in the Appendix.

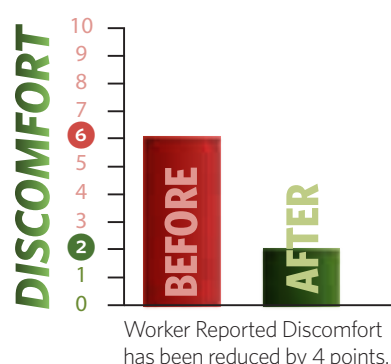
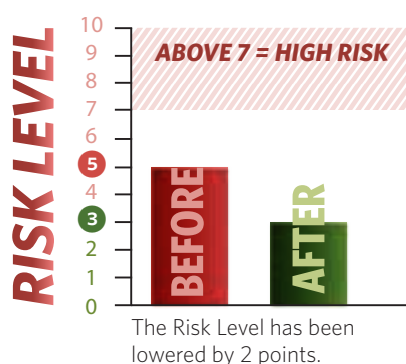
**Aging Issues** The prevalence of chronic illnesses and diseases increase with age and can affect an older worker's functional capacity. Job accommodations may be required even if the work tasks are found to have a low risk of injury.

## FIND a SAFER WAY



**JOB  
ACCOM-  
MODATION**

For this individual, an ergonomic chair with a longer than standard seat pan and swiveling armrests was provided.



## EVERYDAY



### Costs

Ergonomic chair

\$765



### Benefits

Productivity increased due to less time working in pain, specifically the last half of the day is now pain free.



**Cost Benefit Analysis: Pay Back Period = 4 months.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the equipment was within standards. Due to various personal health issues, including age related health issues, a worker may require specific job accommodations.



## JOB ACCOM- MODATION



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## Case Study 38 Construction Knee Issues

### SPOT the HAZARD



Are there chronic 'age' related illnesses and diseases that require special accommodations for older workers?

### ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored a 9 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of chronic knee issues, increases with length of time kneeling.



**Standards & Guidelines** Bending the knee near its maximum range of motion is only acceptable for slow infrequent movements. In this case the work performed outdoors is acceptable but the concrete work indoors was not. References available in the Appendix.

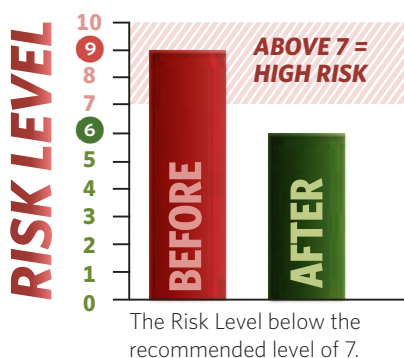
**Aging Issues** The prevalence of chronic illnesses and diseases increase with age and can affect an older worker's functional capacity. Job accommodations may be required even if the work tasks are found to have a low risk of injury.

## FIND a SAFER WAY



**JOB  
ACCOM-  
MODATION**

For this individual, a set of knee pads that extend over the shin, has a flat knee cap (less rocking motion) and a higher thigh-leg knee angle was provided. Used on rocky surfaces, crawl spaces and hard surfaces.



## EVERYDAY



### Costs

Knee pads \$70



### Benefits

Productivity increased due to less time working in pain, specifically tasks that include crawling and kneeling.



**Cost Benefit Analysis: Pay Back Period = 2 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the task was partially within standards. Due to various personal health issues, including age related health issues, a worker may require specific job accommodations.





JOB  
ACCOM-  
MODATION

## Case Study 39

### Landscaping Hand/Arm Issues

## SPOT the HAZARD



Are there chronic 'age' related illnesses and diseases that require special accommodations for older workers?

## ASSESS the RISK

Ergonomic risks are evaluated by assessing a task several different ways - for this task the ergonomic risk level is low - moderate.



**Checklist** This task scored an 8 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of numbness and tingling in the hands and a lack of grip strength due to previous injuries.



**Standards & Guidelines** The amount of vibration and duration of use is within standards. However, individuals with signs and symptoms of vibration related issues, should have their exposure reduced. References available in the Appendix.

**Aging Issues** The prevalence of chronic illnesses and diseases increase with age and can affect an older worker's functional capacity. Job accommodations may be required even if the work tasks are found to have a low risk of injury.



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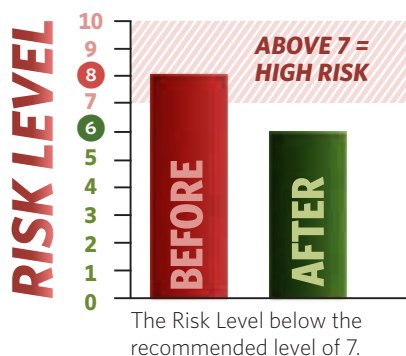


## FIND a SAFER WAY



**JOB  
ACCOM-  
MODATION**

For this individual, anti-vibration grip tape and gloves were provided. The vibration readings were within guidelines; however, the anti-vibration gloves/tape decreased the vibration by 20-25%. The anti-vibration grip tape allowed for increased convenience and was useful for shared equipment.



## EVERYDAY



### Costs

Anti-vibration gloves  
& grip tape

\$110



### Benefits

Productivity increased due to less time having to rest from the numbness and tingling.



**Cost Benefit Analysis: Pay Back Period = 3 weeks.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the tools and tasks was within standards. Due to various personal health issues, including age related health issues, a worker may require specific job accommodations.



**JOB  
ACCOM-  
MODATION**



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## Case Study 40 **Construction** Hand/Wrist Issues

### **SPOT** the **HAZARD**



Are there chronic 'age' related illnesses and diseases that require special accommodations for older workers?

### **ASSESS** the **RISK**

Ergonomic risks are evaluated by assessing a task several different ways – for this task the ergonomic risk level is low.



**Checklist** This task scored a 7 on the Workplace Safety and Health's ergonomic checklist. Scores above 7 indicate a higher risk.



**Worker Input** Reports of chronic hand/wrist issues . Long duration work and jerky motions of the controls seem to aggravate the wrist.



**Standards & Guidelines** The design of the controls along with ergonomic assessment tools which deal specifically with the hand, wrist and forearm risks found this task to be within standards. There is an issue with pressure in the palm of the hands when there are jarring motions, i.e., digging into hard ground/rocks. References available in the Appendix.

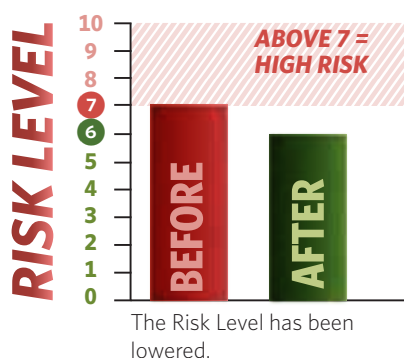
**Aging Issues** The prevalence of chronic illnesses and diseases increase with age and can affect an older worker's functional capacity. Job accommodations may be required even if the work tasks are found to have a low risk of injury.

## FIND a SAFER WAY



**JOB  
ACCOM-  
MODATION**

For this individual, adding a low density foam to the controls was implemented. Each control was also covered with leather material to protect the foam. This reduced the jarring motions of the controls when digging into harder ground. The amount of force reduction was not measured; however, the worker felt less strain on the wrists.



## EVERYDAY



### Costs

Low density foam & leather cover

\$25



### Benefits

Productivity increased due to less time working in pain and less time away.



**Cost Benefit Analysis: Pay Back Period = 1 week.**

The Pay Back Period is the time required to make or save money in order to pay for the initial costs. A Pay Back Period of less than 1 year indicates a positive project. This analysis does not include WCB rate changes, legislative compliance, morale, job satisfaction, customer service or other indirect benefits.

## SUMMARY

In this case study, the ergonomic design of the tools and tasks were within standards. Due to various personal health issues, including age related wrist issues, a worker may require specific job accommodations.

## Project Outcomes

### Age and Workplace Risks

**A high level of risk and poorly designed work accounted for 75% of the problem jobs.**

**Possible age related factors and specific individual job accommodation needs accounted for the other 25%.**

- Thirty of the forty case studies involved work related issues where the risk of injury was greater due to the job demands and workplace conditions. The jobs with a higher risk of injury due to their job demands and workplace conditions just happen to have older workers performing those tasks.
- The risk assessment found age/individual related issues to be an issue in only 10 of the 40 problem jobs. These jobs had a low risk of injury.
- Of the 10 age/individual related issues, 5 were job accommodations required due to previous injury/age related issues and 5 that were believed to be solely age related. These could not be 100% teased out due to personal health information privacy and internal disability management issues. The specific job accommodation issues involved a neck injury, low back pain, a knee injury and two hand injuries. The 5 individual/age related issues involved hearing, standing, driving, stepping and sitting.

### Risk Assessment

**The average risk assessment score was 8.5. Scores greater than 7 indicate a higher risk of injury.**

**The average risk reduction was 2.5 with every case study having at least a 1-point reduction, except the hearing case studies.**

**Ergonomic standards and guidelines were not met in 30 of the case studies. Note: the design criteria for these standards and guidelines included older worker capabilities.**

**Worker discomfort on a 10-point scale averaged 6.2. After changes were made, the average score decreased by 36%.**



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- After solutions were implemented the average score was 6 with the highest reduction being 8 points. Each case study was able to find at least some improvement, i.e., at least a 1-point reduction, except for the hearing case studies which do not have a score for sound levels on the checklist. The average risk reduction was 2.5.
- Standards and guidelines for ergonomic design principles were not met in 30 of the 40 case studies. Every standard and guideline referenced included older workers in their design criteria. Therefore, applying these design criteria can be made with confidence that it protects, or is designed to include, older workers.
- Worker discomfort surveys were conducted before and after changes were made to the jobs. On a 10-point scale, the average discomfort score was 6.2. After solutions were implemented the average was 3.6. This represents a 36% decrease in discomfort.

### **Solutions, Costs and Benefits**

**The majority of risk reduction measures were engineering solutions and other changes at the source of the problem.**

**Half the case studies required less than \$100 to fix the problems.**

**The highest cost was \$1,850 and the median cost was \$105.**

**The cost benefit analysis found 25 case studies to have a pay back period of less than 1 month with the others having an average of 4.5 months.**

- Solutions required to improve the problem jobs included:
  - 27 Engineering controls: the workplace provided tools, equipment or positioned materials to reduce the risk.
  - 10 Personal Protective Equipment items were provided to the workers to reduce the risk of injury.
  - 2 solutions involved training and changes to work timing.
- The cost incurred to improve the 40 case studies was \$12,238. The average cost to improve the case studies was \$306 with 20 case studies requiring less than \$100 to fix the problems. The highest cost case study was \$1,849 and the median cost was \$105.
- Pay Back Period is a cost-benefit analysis measure where the length of time required to make or save the initial outlay of money is calculated. A pay back period of less than 2 years is a good project to implement. Direct cost savings and quality/efficiency benefits were found for every task with 25 case studies having a pay back period of less than 1 month. The average for the other 15 case studies was 4.5 months with the longest one being 10 months. These benefits included only quality and process/efficiency improvements. No health and safety or WCB benefits were included.



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## Recommendations

- Conduct a risk assessment of problem jobs before any conclusion is made regarding older worker issues.
- Older workers are not a health and safety risk; however, they may require specific job accommodations due to chronic conditions.
- Include a discomfort survey of all workers with your ergonomic risk assessment.
- Focus on engineering solutions and fixes at the source of the problem.
- Most ergonomic solutions are low cost; however, larger cost solutions usually have short pay back periods if you account for quality and process/efficiency benefits.
- There are many benefits to improved jobs beyond WCB and health and safety. Look for all benefits to make your cost benefit analysis even more favourable.
- Incorporate the SAFE Work for an Aging Workforce Action Plan into your overall Health and Safety Program; see next section.

## SAFE Work for an Aging Workforce Action Plan

- Develop a Health and Safety Program. Include aging workforce issues in areas such as job hazard analysis, new employee orientation and inspections.
- Review tasks for good ergonomic design. Poorly designed jobs will affect all workers including older workers.
- Conduct a worker survey. Questions may include work discomfort, identifying problem jobs and solution ideas.
- Assess the organization's ability to provide a flexible, respectful and inclusive work environment. Promote work-life balance and reduce rigid working conditions.
- Develop health promotion activities. Investigate health and fitness alternatives for older workers and increase awareness of chronic illnesses.
- Open communication throughout the workplace is required to address older workers reluctance to discuss health issues or work related pain due to perceived negative consequences.
- Provide opportunities for older workers to use and share their knowledge, experience and adaptability to reduce health and safety risks.

# APPENDICES



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## Resources

### Manitoba Labour

#### Workplace Safety and Health Division

200-401 York Avenue, Winnipeg, MB, R3C 0P8

Client Service Desk: (204) 945-6848

Toll Free (in Manitoba only): 1-800-282-8069

Website: [www.safemanitoba.ca](http://www.safemanitoba.ca)

### Workers Compensation Board of Manitoba

333 Broadway, Winnipeg, MB, R3C 4W3

Phone: (204) 954-4922

Toll Free (in Manitoba only): 1-800-362-3340

Website: [www.wcb.mb.ca](http://www.wcb.mb.ca)

### 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](mailto:mflohc@mflohc.mb.ca)

Website: [www.mflohc.mb.ca](http://www.mflohc.mb.ca)

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Association of Workers' Compensation Boards of Canada. Work Injuries and Diseases: National Work Injuries Statistics program, Canada 2000-2010. Mississauga: 2011.

Human Resources Development Canada Challenges of an Aging Workforce: An overview of the issue, May 2002.

Workers Compensation Board of Manitoba Statistics report for 2000-2012. October 2013

## Standards, Guidelines and Assessment Tools

CSA-Z412-00 (R2005)-Guidelines on Office Ergonomics

ISO/TR 22411(2008) Ergonomics Data and Guidelines for the Application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities

ISO 6385:2004 Ergonomic principles in the design of work

ANSI/IESNA RP -7-01 Recommended Practice for Lighting Industrial Facilities 2001

ANSI/IESNA RP-1-04 American National Standard Practice for Office Lighting by the Illuminating Engineering Society of America

BS EN 1005-4:2005 Part 4: Evaluation of working postures and movements in relation to machinery

BS EN 1005-3:2008 Part 3: Recommended force limits for machinery operation

BS EN 1005-2:2003 Part 2: Manual handling of machinery and component parts of machinery

ISO11226. 2000 Ergonomics – Evaluation of static working posture, International Standard. *International Organization for Standardization*.

ISO/TS 20646-1:1004(E). 2004. Ergonomic procedures for the improvements of local musculoskeletal workloads – Part 1: Guidelines for reducing the local muscular workloads. *International Organization for Standardization*.

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