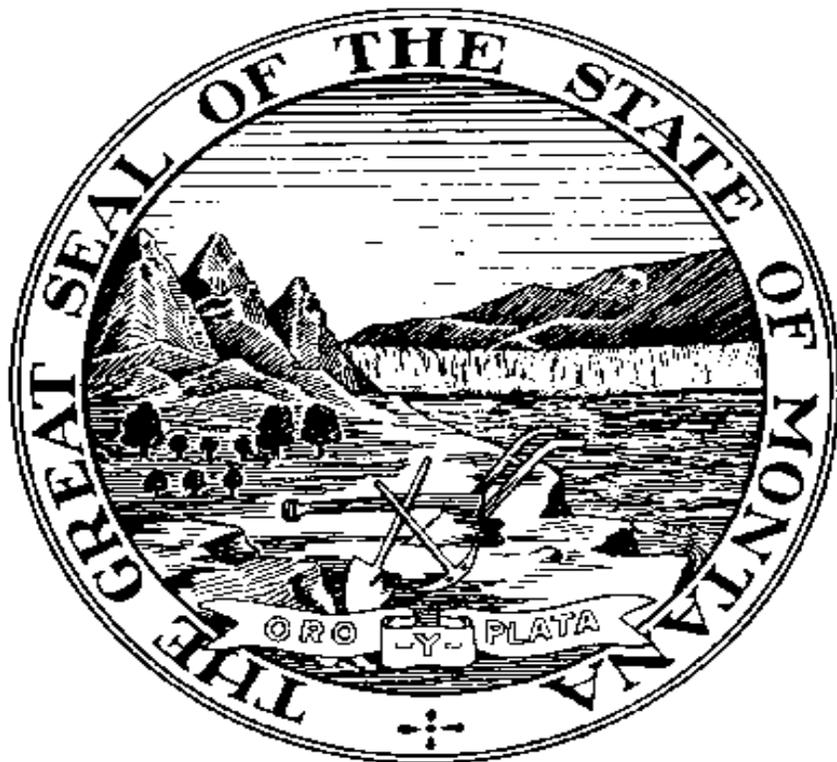


Ergonomics Prevention of CTD's

Occupational Safety & Health Bureau



Montana Department of Labor & Industry

**Prepared for Montana Employers
by the**

**Occupational Safety & Health Bureau
Department of Labor and Industry
P.O. Box 1728
Helena, Montana 59624-1728
(406) 444-6401**

CONTENTS

	Page
Introduction -----	3
I. Management Commitment and Employee Involvement -----	3
A. Commitment by Management -----	3
B. Written Program -----	4
C. Employee Involvement -----	4
D. Program Evaluation -----	4
II. Program Elements -----	4
A. Worksite Analysis -----	4
B. Hazard Prevention and Control -----	5
C. Medical Management -----	7
D. Training -----	7
III. Ergonomic Program Guidelines -----	9
A. Recommended Worksite Analysis -----	9
B. Hazard Prevention and Control Methods -----	11
IV. Description of CTDs -----	13
Conclusion -----	13
Resources -----	14
-	
Appendix 1. Symptoms Survey Checklist -----	15
Appendix 2. Worksite Analysis Checklist -----	17
Appendix 3. Manual Material Handling -----	19

Introduction

Ergonomics is the interaction between workers and the objects they use in their work environment. Workers are presented with several ergonomic hazards daily at work. These hazards can include: faulty work station layout, improper work methods, improper tools, excessive tool vibration, and job design problems.

Ergonomic hazards can lead to injuries and/or accidents that can cause serious pain, disability, lost work time, low-quality work, loss in production, and a loss of money. Employers have the responsibility to protect their employees from ergonomic hazards whenever possible.

The effective management of worker safety and health protection includes all work-related hazards, whether or not they are regulated by a specific federal standard. The Occupational Safety and Health Act of 1970 clearly states that the general duty of all employers is to provide their employees with a workplace free from recognized serious hazards. This includes the prevention and control of ergonomic hazards.

The goal of this ergonomic safety and health plan, presented in this booklet, is to help employers prevent injuries and illnesses by removing their causes. This program also presents information about several ergonomic hazards and cumulative trauma disorders (CTDs) so that employers can effectively train their workers.

There are four recommended program elements that should be included in every ergonomic program. The four recommended elements are (1) worksite analysis, (2) hazard prevention and control, (3) medical management, and (4) training and education. All of these elements are important but the one that should receive first attention is worksite analysis. Worksite analysis is finding out what actual or potential hazards presently exist in your worksite. This should be a careful, step-by-step look at your workplace to find out where hazards leading to CTDs exist.

Instituting programs in ergonomics can reduce CTDs and other injuries, and most likely improve productivity and worker moral.

I. Management Commitment and Employee Involvement

Commitment and involvement are essential elements of a solid safety and health plan. Commitment by management provides the organizational resources and motivating force necessary to deal effectively with ergonomic hazards.

A. Commitment by Management

Management must take an active role in the commitment to a safe workplace. All employees must fully understand that management has a serious commitment to the ergonomics program. An effective program should have a team approach, with top management as the team leader, and should include the following:

1. Management's concern for employee safety and health should be at the same level as for production. Employees will recognize management's concern and realize that the ergonomics program is serious.

2. The responsible implementation of this policy requires management to integrate production processes and safety and health protection to assure that this protection is part of the daily production activity within each facility.
3. Employer dedication to assign and communicate the responsibility for the various aspects of the ergonomics program so that all managers, supervisors, and employees involved know what is required of them.
4. Employer commitment to provide adequate authority and resources to all responsible parties, so that assigned responsibilities can be met.
5. Employer commitment to ensure that each manager, supervisor, and employee responsible for the ergonomic program in the workplace is accountable for carrying out those responsibilities.

B. Written Program

An effective ergonomics program must be a written plan for job safety, health, and ergonomics that is endorsed and advocated by the highest level of management and that outlines the employer's goals.

A written plan should identify the organizational structure, outline program goals, and provide a feasible timetable for achieving them.

C. Employee Involvement

Production employees often have insights into ways of improving their own jobs, especially if given training in ergonomic principles. Furthermore, participation often helps pave the way for accepting change. Mechanisms should be established to obtain input, choosing from a variety of options:

1. Department-level ergonomic teams.
2. Suggestion / complaint system.
3. Interviews with individuals when evaluations are made.
4. Employee surveys.
5. Small group discussions when certain jobs or areas are being addressed.
6. Encouragement to promptly and accurately report signs and symptoms of CTDs.
7. Safety and health committees that receive information on ergonomic problem areas, analyze, and make recommendations.

D. Program Evaluation

Every safety and health program needs regular program evaluations to monitor the progress accomplished. Top management should review the program regularly and semiannual reviews are recommended to

evaluate success in meeting its goals and objectives. Evaluation should include methods such as the following:

1. Analysis of trends in injury / illness rates.
2. Employee surveys.
3. Before and after survey / evaluations of job and worksite changes.
4. Review of results of workplace evaluations
5. Up-to-date records or logs of job improvements tried or implemented.

The results of management's review should be a written progress report and program update, which should be shared with all responsible parties and communicated to employees. Any deficiencies should be identified and corrective action taken.

II. Program Elements

An effective occupational safety and health program to address ergonomic hazards includes four major program elements: workplace analysis, hazard prevention and control, medical management, and training and education.

A. Worksite Analysis

The objectives of a worksite analysis are to recognize, identify, and correct all ergonomic hazards. (A recommended worksite analysis program is provided in Section III. A.)

1. Reviewing and analyzing injury and illness records should be the first step in implementing an analysis program.
 - a. Analyze medical, safety, and insurance records, including the OSHA-200 log and information compiled through the medical management program. Payroll records can also be used to evaluate employee lost work time.
 - b. Identify and analyze any apparent trends relating to particular departments, process units, job titles, operations, or workstations.
2. The worksite analysis should use a systematic method to identify those work positions needing a quantitative analysis of ergonomic hazards. This analysis should do the following:
 - a. Use an ergonomic checklist (See Appendix 2.)
 - b. Identify those work positions that put workers at risk of developing CTDs.
 - c. Verify low risk for light duty or restricted activity work positions.

- d. Determine if risk factors for a work position have been reduced or eliminated to the extent feasible.
 - e. Provide the results of the analysis to health care providers for use in assigning light duty jobs.
3. The analysis of ergonomics hazards should be routinely performed and documented.
4. Periodic surveys of the worksite should be conducted at least annually, or whenever operations change. This will identify new or previously unnoticed risk factors and deficiencies or failures in work practices or engineering controls, and to assess the effects of changes in the work processes.

Ergonomic programs must have a reliable system for employees to notify management about conditions that appear to be ergonomic hazards and to utilize their insight to determine appropriate worksite controls.

B. Hazard Prevention and Control

The next step in an ergonomics program is to design measures to prevent or control these hazards. Ergonomic hazards are prevented primarily by effective design of the workstation, tools, and job. Ergonomic controls include the following:

1. Engineering Controls

Engineering controls are the preferred method for control of ergonomic hazards. The focus of an ergonomics program is to make the job fit the person, not to force the person to fit the job. This can be accomplished by designing or modifying the work station, work methods, and tools to eliminate excessive exertion and awkward postures and to reduce repetitive motion.

a. *Work Station Design.* Workstations should be designed to accommodate the persons who actually work on a given job; it is not sufficient to design for the typical worker.

Workstations should be easily adjustable and either designed or selected to fit a specific task, so that they are comfortable for the employees using them. Adequate working space to perform the job task also should be considered in workstation design.

b. *Design of Work Methods.* Work methods should be designed to reduce static, extreme, and awkward postures, repetitive motion, vibration, and excessive force. Workstation design requires analysis of the production system to design or modify tasks to eliminate stressors.

c. *Tool and Handle Design.* Tools and handles, if well designed, reduce the risk of CTDs. For any tool, a variety of sizes should be available to achieve a proper fit and reduce ergonomic risk. Tools and handles should be selected to eliminate or minimize the following stressors:

- ! Chronic muscle contraction or steady force
- ! Excessive gripping, pinching, pressing with the hand and fingers.
- ! Extreme or awkward finger/hand/arm positions.
- ! Repetitive forceful motions.
- ! Tool vibration.

See section III. B for examples of some engineering controls to help eliminate ergonomic hazards.

2. Work Practice Controls

An effective program for ergonomic hazard control and prevention also includes procedures for safe and proper work that are understood and followed by managers, supervisors, and workers.

The elements for a work practice program for ergonomics includes proper work techniques, employee conditioning (exercise & stretching), regular monitoring, feedback, maintenance, adjustments and modifications, and enforcement.

a. *Proper Work Techniques.* A program for proper work techniques, such as the following, includes appropriate training and practice time for employees:

- ! Proper cutting techniques, including work methods that improve posture and reduce stress on extremities.
- ! Tool care, well-maintained tools require less stress and strain to operate than mishandled tools.
- ! Correct lifting techniques
- ! Proper use and maintenance of pneumatic and power tools.

b. *New Employee Conditioning Period*

New and returning employees should be gradually integrated into a full workload as appropriate for specific jobs and individuals.

c. *Monitoring.* Regular monitoring at all levels of operation to ensure that employees continue to use proper work practices. The monitoring should include a periodic review of the techniques in use and their effectiveness, including determining whether the procedures in use are those specified; if not, then it should be determined why changes have occurred and whether corrective action is necessary.

d. *Adjustments and Modifications.* Modify work practice controls when the dynamics of the workplace change. These modifications include the following:

- ! Line speeds.
- ! Number of workers at position.
- ! Type, size, weight, or temperature of the materials handled.

3. Personal Protective Equipment (PPE)

PPE should be selected with ergonomic stresses in mind. A variety of sized of PPE should be available and should not contribute to extreme postures and excessive forces. The following factors need to be considered when selecting PPE:

- a. Proper Fit. For example gloves that are too thick or too tight can reduce blood circulation and sensory feedback, contribute to slippage, and require excessive grip strength.
- b. Proper protection against cold stress (usually considered less than 40 degrees Fahrenheit) is necessary to minimize stress on joints.
- c. Braces, splints, back belts, and other similar devices are not considered PPE.

4. Administrative Controls

A solid overall ergonomics program includes administrative controls that reduce the duration, frequency, and severity of exposures to ergonomic stressors. Examples of administrative controls include the following:

- a. Reducing the total number of repetitions per employee. This can be done by decreasing production rates and limiting overtime work.
- b. Increasing the number of employees assigned to a task to alleviate severe conditions, especially in lifting heavy objects.
- c. Providing rest breaks to relieve fatigued muscle-tendon groups.
- d. Job rotation can be used as a preventive measure but not as a response to symptoms. If rotation is used, the job analysis must be reviewed by a qualified person to ensure that the same muscle-tendon groups are not used.
- e. Job enlargement with is adding several specialized tasks to a job so that repetitive motions are limited.
- f. Implementing preventive maintenance programs to keep tools and good shape. This may also include vibration monitoring.
- g. Perform maintenance regularly and whenever workers report suspected problems. Sufficient numbers of spare tools should be available to facilitate regular maintenance.
- h. A knife sharpening program should be implemented to keep knives sharp and easy to use.
- I. Effective housekeeping programs to minimize slippery and related hazards such as slips and falls.

C. Medical Management

An effective medical management program for CTDs an essential part of an employers ergonomic plan. Proper medical management is necessary both to eliminate or materially reduce the risk of the development of CTD signs and symptoms through early detection and treatment and to prevent future problems through development of information sources.

The medical management program should address the following:

- ! Injury and illness record keeping
- ! Early recognition and reporting
- ! Systematic evaluation and referral
- ! Conservative treatment
- ! Conservative return to work
- ! Systematic monitoring
- ! Adequate staffing and facilities
- ! Training in which employees are instructed how and when to report problems

Overall medical management activities should be reviewed by top management regularly to insure the objectives are being met and program modified accordingly.

D. Training

Training and education are critical components of ergonomics programs for employees potentially exposed to ergonomic hazards. The purpose of training and education is to ensure that employees are sufficiently informed about the ergonomic hazards to which they may be exposed and thus are able to participate actively in their own protection.

A training program should include the following individuals:

- ! All affected employees.
- ! Supervisors.
- ! Managers.
- ! Engineers and maintenance personnel.
- ! Health care providers.
- ! Employees involved in job analysis.

The program should be designed and implemented by qualified persons. Appropriate special training should be provided for personnel responsible for administering the program.

It should provide an overview of the potential risk of illnesses and injuries, their causes, and early symptoms, the means of prevention, and treatment. The program should also include a means for adequately evaluating its effectiveness. The evaluation process might include employee interviews, testing, and observing work practices, to determine if those who received training understand the material and the work practices to be followed.

Training for employees in problem jobs should consist of ergonomic awareness and job-specific training:

1. Ergonomic Awareness Training

Ergonomic awareness training should train employees to:

- ! Recognize risk factors in the workplace and the methods for controlling them.
- ! Identify the signs and symptoms and the health effects of exposure to risk factors, and be familiar

with the employer's medical management procedures.

- ! Know the process the employer is undertaking to address and control risk factors, the employee's role in the process, and how to actively participate in the ergonomic safety and health program.
- ! Know the procedures for reporting risk factors and musculoskeletal disorders, including the designated person(s) for receiving reports
- ! Know how to obtain additional information on ergonomics and CTDs.

2. Job-Specific Training

New employees and reassigned worker should receive an initial orientation and hands-on training prior to being placed in a full-production position.

The initial training program should include the following:

- ! Care, use, and handling techniques for specialized tools.
- ! Use of appropriate guards and safety equipment including PPE.
- ! Use of proper lifting techniques and devices.
- ! Specific results of job analysis and surveys.
- ! Control measures used to deal with risk factors.
- ! The procedures to follow to report problems or ideas for changes in control measures and equipment.

On-the-job training should emphasize employee development and use of safe and efficient techniques.

3. Training for Supervisors

Supervisors are responsible for assuring that employees follow safe work practices and receive suitable training to enable them to do so. Supervisors therefore should undergo training comparable to that of the employees, and such additional training that will enable them to recognize early signs and symptoms of CTDs, to recognize hazardous work practices, to correct poor work practices, and to reinforce the employer's ergonomic program.

4. Training for Managers

Managers should be aware of their safety and health responsibilities and should receive sufficient training pertaining to ergonomic issues at each workstation and in the production process as a whole so that they can effectively carry out their responsibilities.

5. Training for Engineers and Maintenance Personnel

Plant engineers and maintenance personnel should be trained in the prevention and correction of ergonomic hazards through job and workstation designs and proper maintenance.

6. Employees Involved in Job Analysis Training

Employees selected to perform job analysis should undergo extra training that should include:

- ! Human anatomy and how certain body parts interact, especially the muscles, nerves, and tendons.
- ! Musculoskeletal disorders and causes.
- ! Cumulative Trauma Disorders and what risk factors cause them.
- ! Risk factors.
- ! Manual handling and how to analyze lifting, lowering, pushing, pulling, and carrying.
- ! How to administer and evaluate risk factor checklists.
- ! Hand tools
- ! Anthropometry or human measurements, and how this affects exposure to risk factors.

Employers must also evaluate the effectiveness of each training program and make changes were needed. Employers must also ensure that every employee involved in the training program understands the material covered in their training.

III. Ergonomics Program Guidelines

A. Recommended Worksite Analysis Program for Ergonomics

While complex analyses are best performed by a professional ergonomist, the ergonomics team or any qualified person can use this program to identify stressors in the workplace. The purpose of the outline that follows is to give a starting point for finding and eliminating those tools, techniques, and conditions which may be the source of ergonomic problems.

Outline. The discussion of the recommended program for worksite analysis is divided into four main parts:

- ! Gathering information from available sources;
- ! Performing baseline screening surveys to determine which jobs need a closer analysis;
- ! Conducting ergonomic job hazard analysis of those work stations with identified risk factors; and after implementing control measures;
- ! Conducting periodic surveys and follow-up to evaluate changes.

1. Informational Sources

a. *Records Analysis and Tracking.* The first thing that needs to be done in workplace analysis is to develop the information necessary to identify ergonomic hazard in the workplace. Medical records, payroll, safety, accident, and insurance records, including OSHA-200 logs, should be analyzed for evidence of injuries or disorders associated with CTDs. Health care providers should participate in this process to ensure confidentiality of patient records.

To determine how many workers have symptoms or have been diagnosed as having a form of CTD, the following information is needed:

- ! Total number of CTD and back injury cases reported.
- ! The date each case was reported.
- ! The department or job of the injured worker.
- ! The number of workers on the same job or in the same department.

b. *Incidence Rates.* Incidence rates for upper extremity disorders and/or back injuries should be calculated by counting the incidences of CTDs and reporting the incidences per 100 full time workers per year per facility.

$$\text{Incidence Rate} = \frac{(\text{Number of new cases/yr}) \times (200,000 \text{ work hrs})}{\text{Number of hours worked/ facility/ yr}}$$

Any review of records should be done very carefully and interpreted with caution. This process should be considered only a starting point for a subsequent worksite investigation and analyses. Companies or unions who desire in-depth analyses of plant records for indications of CTDs should consult with specialists who have experience in surveillance research.

2. Screening Surveys

The second step in worksite analysis is to conduct worker screening surveys. Detailed baseline screening surveys identify jobs that put employees at risk of developing CTDs. The survey can assist in identifying new or preclinical cases of CTDs in the workplace. Since almost all types of CTDs will produce some symptoms of pain or discomfort, the most direct approach is to ask workers if they experience pain or other symptoms of CTDs.

a. *Checklist.* The survey is performed with an ergonomic symptoms survey checklist (see Appendix 1. for a sample checklist, this checklist was provided by Putz-Anderson in Cumulative Trauma Disorders, p. 43.)

b. *Ergonomic Risk Factors.* Identification of ergonomic hazards is based on ergonomic risk factors: conditions of job process, work method, or work station design that contribute to risk of developing CTDs.

c. *CTD Risk Factors.* CTD risk factors include:

- ! Repetitive and/or prolonged activities.
- ! Forceful exertions, usually with the hands.
- ! Prolonged static postures or excessive gripping.
- ! Awkward postures, including reaching above the shoulders or behind the back, and twisting the wrist and other joints.
- ! Continued physical contact with work surfaces like sharp edges.
- ! Excessive vibration from power tools or vehicles.
- ! Cold temperatures
- ! Inadequate or inappropriate hand tools.

d. *Back Disorder Risk Factors* (please see Appendix 3. Manual Material Handling).

- ! Poor body mechanics such as (1) continued bending over at waist; (2) continued lifting from below the knuckles or above the shoulders; and (3) twisting at the waist.
- ! Lifting or moving objects of excessive weight or asymmetric size.
- ! Prolonged sitting, especially with poor posture.
- ! Lack of adjustable chairs, footrests, body supports, and work surfaces at work stations.
- ! Poor grips on handles or lack of handles.
- ! Slippery or uneven footing.
- ! Jostling or vibration of seat as for equipment operators.

3. Ergonomic Job Hazard Analyses

An ergonomic Job hazard analyses should be routinely performed by a qualified person for jobs that put workers at risk of developing CTDs.

a. *Work Station Analysis.* An adequate analysis would be expected to identify all risk factors present in each job or work station.

For upper extremities, three measurements of repetitiveness are the total hand manipulations per cycle, the time, and the total manipulations or cycles per work shift.

Force measurements may be noted as an estimated average effort, and a peak force. They may be recorded

as Alight,≡ Amoderate,≡ and Aheavy.≡ (See Putz-Anderson.p.11)
Tools should be check for excessive vibration.

The tools, personal protective equipment, and dimensions and adjustability of the work station should be noted for each job hazard analysis.

Hand, arm, and shoulder postures and movements should be assessed for levels of risk.

b. *Lifting Hazards.* For manual material handling the maximum weight-lifting values should be calculated. (See *Reducing Lifting Related Back Injuries* in the Resources section.p11)

< Ergonomic analysis is not complete without implementation of proper controls.

B. Hazard Prevention and Control Methods

Engineering methods, where feasible, are the preferred method of control for ergonomic hazards. The focus of an ergonomic program is to make the job fit the person.

1. Work station Design

Work stations should be designed to accommodate the persons who actually work on a given job. Work stations should be easily adjustable and either designed or selected to fit a specific task. Work station space should be large enough to allow for the full range of motion of required movements. Listed in this section are some examples of how to eliminate ergonomic hazards.

a. Reduction of extreme and awkward postures.

- ! Adjustable fixtures and rotating tables.
- ! Work stations and delivery bins that can accommodate the heights and reach limitations of various sized workers.
- ! Work platforms that move up and down.
- ! Rotating the part in front of the worker so the wrist and waist can be straight.
- ! Provide document holders, wrist rests, and keyboard trays for workers at video display terminals (VDTs).

b. Reduction of excessive force.

- ! Mechanical or powered assists to eliminate the use of extreme force.
- ! Suspension of heavy tools.
- ! Use several lighter containers instead of one heavy container.
- ! Design work stations that keep heavy loads close to the workers body.

c. *Reduction of highly repetitive movements.*

! Use conveyors to move loads.

! Mechanize the process.

2. Design of Work Methods

Tasks should be evaluated and altered to reduce awkward posture, twisting, bending, reaching over head, excessive weight, and repetition.

a. *Reduction of extreme and awkward postures.*

! Worker should be able to perform work with two hands when possible.

! Conforming with the *NIOSH Work Practices Guide for Manual Lifting*.

b. *Reduction of excessive force.*

! Substitute power tools for manual tools.

! Use of articulated arms and counter balances.

c. *Reduction of highly repetitive movements.*

! Use automation when ever possible.

! Designing jobs to allow self-pacing, when feasible.

! Design jobs to allow sufficient rest pauses.

! Increase the number of workers performing a task.

! Combing jobs to increase cycle time (job enlargement).

3. Tool and Handle Design.

Careful selection and design of tools can help reduce the risk factors involved with CTDs.

! Provide a variety of tool sizes for each type of tool, if feasible.

! Use the proper tool for the task.

! Design or select the tool handle so that extreme and awkward postures are minimized.

! Use handles and grips that distribute pressure evenly over the palm of the hand.

- ! Use tool handles with textured grips in preference to those with ridges or grooves.
- ! Provide tools for both left and right handed workers whenever possible.
- ! Select power tools that have minimum vibration.
- ! Use tools with triggers that depress easily and are activated by two or more fingers.

Vibration

An effective ergonomics program should include controls for reducing vibrations of equipment and tools, when applicable.

One CDT that is associated with excessive vibration is Raynaud=s phenomenon. This is a condition caused in part by forceful gripping and prolonged use of vibrating tools, such as pneumatic hammers, chain saws, and power grinders.

Common symptoms include numbness and tingling in the fingers, pale skin color, and eventual loss of sensation and control in the fingers and hands. When cold temperatures are combined with vibration there is an increased risk for developing CDTs..

IV. Description of CTDs

Cumulative trauma disorders (CTDs) refer to physical signs and symptoms due to chronic musculoskeletal injuries where the causes appear to be related to aspects of repetitive work. Employers should train their employees in the signs and symptoms of CTDs so that they can recognize problems before they progress into more serious injuries. Listed below are brief descriptions of several common CTDs.

a. *Tendon disorders* often occur at or near the joints where tendons rub nearby ligaments and bones. Tendons are strong rope-like material that attaches muscle to bone. The most frequently noted symptoms are a dull aching sensation over the tendon, discomfort with specific movements, and tenderness to the touch. Recovery is slow and the condition may become chronic if the cause is not eliminated.

Tendinitis, is a form of tendon inflammation that occurs when a muscle/tendon unit is repeatedly tensed. Some fibers that make up the tendon can become frayed or tear apart. The tendon becomes thickened and bumpy, and can may calcify. Without rest and recovery time for the tissue to heal, the tendon may become permanently weakened.

Tenosynovitis is a repetitive-induced tendon injury involving the tendon (synovial) sheath. With extreme repetition, the sheath will be stimulated to produce excessive amounts of synovial fluid. The excess fluid accumulates and the sheath becomes swollen and painful.

b. *Nerve disorders* occur when repeated or sustained work activities expose the nerves to pressure from hard, sharp edges of the work surface, tools, or nearby bones, ligaments, and tendons.

Carpal tunnel syndrome is a painful disorder were the tendons in the carpal tunnel of the wrist become

swollen and pinch the median nerve and blood vessels that pass under the carpal ligament. Symptoms of carpal tunnel syndrome include: pain, numbness, and tingling of the hands and arms.

Conclusion

There are many benefits of a solid ergonomics program in the workplace. These benefits include: improved safety and health of workers, increase productivity, increased operator acceptance, lower workers compensation premiums, improved attitudes toward safety and health, greater job satisfaction, decreased worker turnover, and OSHA compliance.

Resources

Additional information about ergonomics is available from the following sources.

Books and Manuals

Ayoub, M.M., and Mital, A. *Manual Materials Handling*. Taylor & Francis, London, 1989.

OSHA. *Ergonomic Program: Management Guidelines For Meatpacking Plants*. Washington D.C., 1991.

Vern-Putz-Anderson. *Cumulative Trauma Disorders: A Manual for Musculoskeletal Diseases of the Upper Limbs*. Taylor & Francis. London, 1994.

B. Mustafa Pulat. *Fundamentals of Industrial Ergonomics*. Waveland Press, Prospect Heights, IL, 1997.

Tichauer, E. R. and Gage, H. A. Ergonomic Principles Basic to Hand Tool Design. ≡ American Industrial Hygiene Association Journal. Vol. 38, pp. 622-634, 1977.

Green, William D. Jr CSP, Safeco Insurance. *Reducing Lifting Related Back Injuries: Revised NIOSH Lifting Equation*. 1995.

U.S. Department of Health and Human Services, -CDC, *Cumulative Trauma Disorders In The Workplace*. Cincinnati, Ohio. 1995.

U.S. Department of Health and Human Services, -CD, NIOSH, *Participatory Ergonomic*

Interventions in Meatpacking Plants. Cincinnati, Ohio.

< Copies of this NIOSH document are available from:

Publication Dissemination, DSDTT
National Institute for Occupational Safety & Health
4676 Columbia Parkway
Cincinnati, Ohio 45226

Web Sites and Contact Number

National Institute for Occupational Safety and Health. Department of Health and Human Services,
200 Independence Ave. SW 317B, Washington, DC 20201.
1-800-356-4674, 1-800-35-NIOSH
www.niosh.gov

U.S. Department of Labor, **Occupational Safety & Health Administration**, Public Affairs Office
-Room 3647, 200 Constitution Ave, Ashington, D.C. 20210.
1-202-693-1999
www.osha.gov

Private / Commercial Sites

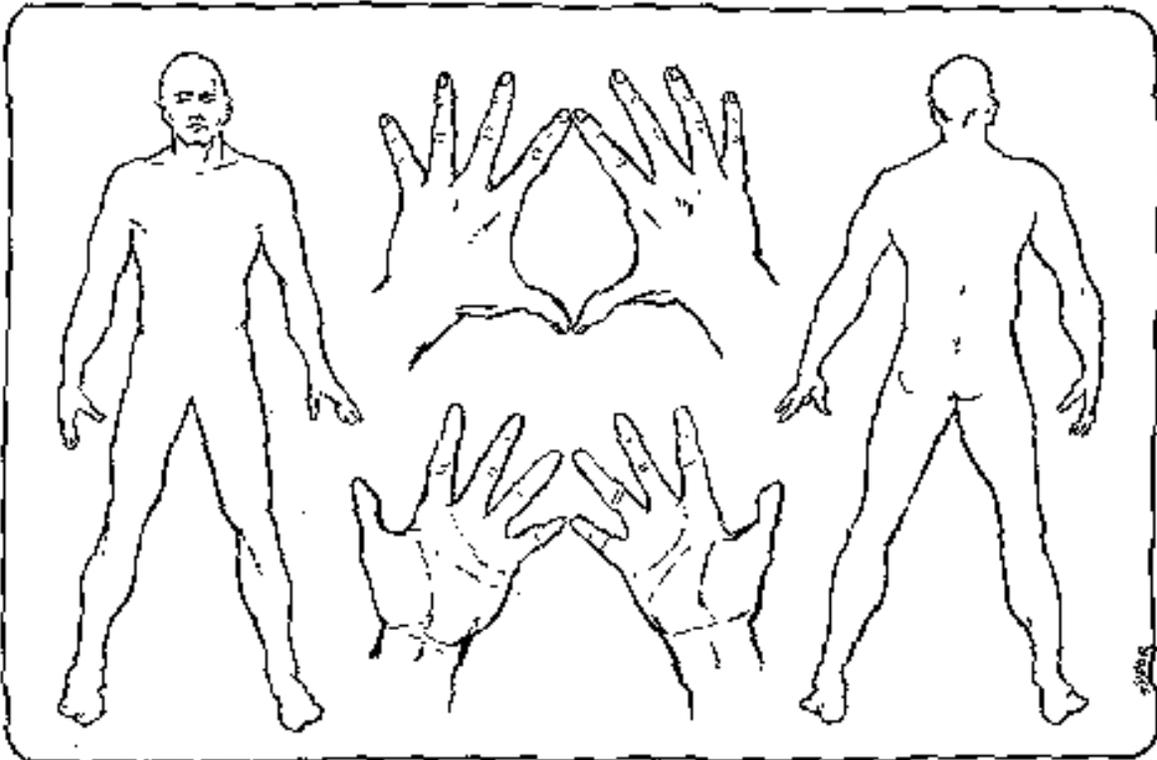
CTD News
1-215-781-0941
www.ctdnews.co

Appendix 1. Symptoms Survey Checklist

Ergonomic Employee Symptoms Survey Checklist

Employee Name: _____ Job Position _____
Years in present position: ____ Years with company: ____ Department: _____
Previous jobs: _____
Date of Survey: _____

1. Are you experiencing or have recently experienced any numbness, pain, tingling, soreness, discomfort, or fatigue during or after work? Circle one: YES NO
2. If you answered yes to question 1, please mark on the picture below the areas where you have experienced repeated pain within the last month. Place an "N" for numbness, "P" for pain, AT≡ for tingling, AS≡ for soreness, AD≡ for discomfort, and/or AF≡ for fatigue.



		Yes	No
3. What time does your pain or discomfort regularly occur?	Mornings	<input type="checkbox"/>	<input type="checkbox"/>
	Afternoons	<input type="checkbox"/>	<input type="checkbox"/>
	Evenings	<input type="checkbox"/>	<input type="checkbox"/>
	Night	<input type="checkbox"/>	<input type="checkbox"/>
	No Pain/Discomfort	<input type="checkbox"/>	<input type="checkbox"/>
4. Does Discomforts in your wrist, arm, or shoulder interfere with your daily activities (eating, writing, spots, etc?)		Yes <input type="checkbox"/>	No <input type="checkbox"/>
5. Have you ever received medical treatment for this pain and/or discomfort?		<input type="checkbox"/>	<input type="checkbox"/>
6. Have you ever received medical help (either company or private doctor) for any of the following:			
	Carpal tunnel syndrome?	<input type="checkbox"/>	<input type="checkbox"/>
	Ganglionic cysts?	<input type="checkbox"/>	<input type="checkbox"/>
	Tendinitis?	<input type="checkbox"/>	<input type="checkbox"/>
	Thoracic outlet syndrome?	<input type="checkbox"/>	<input type="checkbox"/>
	Back injuries?	<input type="checkbox"/>	<input type="checkbox"/>
	Cervical strain?	<input type="checkbox"/>	<input type="checkbox"/>
7. If yes to (5.), have you ever had surgery for any of these conditions?		<input type="checkbox"/>	<input type="checkbox"/>
8. Does your current job require arm, hand, or finger actions to be repeated many times each hour and shift?		<input type="checkbox"/>	<input type="checkbox"/>
9. During what task does the pain and/or discomfort appear? _____ (If experiencing no pain write NONE)			
10. Have any of the above symptoms caused you to be awakened while sleeping		<input type="checkbox"/>	<input type="checkbox"/>
11. Any other problems or comments? _____			

Appendix 2. Worksite Analysis Checklist

Ergonomic Worksite Analysis

This is an example of a general workplace analysis, employers should develop specific checklists for their specific industry or employee tasks. The goal of the worksite analysis is to determine what jobs have ergonomic problems and what should be done to correct them. Each workstation and worker should be evaluated.

Employee Name: _____ Job Position _____
 Years in present position: ____ Years with company: ____ Department: _____
 Job Description: _____

 Work phone number: _____ Home phone number: _____
 Date of Survey: _____

1. Body Position (Goal: No)

Watch the employee's body position as they work. Record any awkward positions.

Hand / Wrist	Yes	No
Wrist bent up / down	<input type="checkbox"/>	<input type="checkbox"/>
Wrist bent side to side	<input type="checkbox"/>	<input type="checkbox"/>
Twisting of arm	<input type="checkbox"/>	<input type="checkbox"/>
Wrist resting against sharp or hard surface	<input type="checkbox"/>	<input type="checkbox"/>
Upper Arm / Shoulder	Yes	No
Holding arm above neutral height - Static	<input type="checkbox"/>	<input type="checkbox"/>
Reaching side to side	<input type="checkbox"/>	<input type="checkbox"/>
Reaching behind or forward	<input type="checkbox"/>	<input type="checkbox"/>
Back / Neck	Yes	No
Twisting of head - Static	<input type="checkbox"/>	<input type="checkbox"/>
Side to side bending of the neck	<input type="checkbox"/>	<input type="checkbox"/>
Head leans forward	<input type="checkbox"/>	<input type="checkbox"/>
Twisting at the waist	<input type="checkbox"/>	<input type="checkbox"/>
Side to side bending at the waist	<input type="checkbox"/>	<input type="checkbox"/>
Forward bending at the waist	<input type="checkbox"/>	<input type="checkbox"/>
Lower Limbs	Yes	No
Legs cramped under work area	<input type="checkbox"/>	<input type="checkbox"/>
Twisting at the knees	<input type="checkbox"/>	<input type="checkbox"/>
Crouching or kneeling	<input type="checkbox"/>	<input type="checkbox"/>

[AYes responses are indicative of conditions associated with the risk of CTDs.]

2. Work Area and Task Checklist (Goal: Yes)

Repetitiveness	Yes	No
Is the cycle time of the task more than 30 seconds?	<input type="checkbox"/>	<input type="checkbox"/>
Can the job be done without unnecessary lifting or double-handling materials?	<input type="checkbox"/>	<input type="checkbox"/>
Is employee using different muscle groups for every task?	<input type="checkbox"/>	<input type="checkbox"/>
Force	Yes	No
Are heavy loads or equipment lifted or used <u>close</u> to the body?	<input type="checkbox"/>	<input type="checkbox"/>
Does the job require exertion of less than 10 pounds of force?	<input type="checkbox"/>	<input type="checkbox"/>
Can the job be done without finger pinch grip?	<input type="checkbox"/>	<input type="checkbox"/>
Can the job be performed without pushing and/or pulling heavy loads?	<input type="checkbox"/>	<input type="checkbox"/>
Does the worker lift only balanced loads?	<input type="checkbox"/>	<input type="checkbox"/>
Are mechanical lifts available and used whenever possible?	<input type="checkbox"/>	<input type="checkbox"/>
Can work be done with out wearing bulky or too tight gloves?	<input type="checkbox"/>	<input type="checkbox"/>
Environment	Yes	No
Is their adequate lighting in the work area?	<input type="checkbox"/>	<input type="checkbox"/>
Is the work area a comfortable temperature?	<input type="checkbox"/>	<input type="checkbox"/>
Tool Design / Maintenance	Yes	No
Do tools promote proper worker postures?	<input type="checkbox"/>	<input type="checkbox"/>
Is the weight of the tool less than 5 pounds?	<input type="checkbox"/>	<input type="checkbox"/>
Do the tools used fit the workers hands?	<input type="checkbox"/>	<input type="checkbox"/>
Are triggers easy to use and without heavy pressure?	<input type="checkbox"/>	<input type="checkbox"/>
Do tools have rounded edges on handles that do not dig into workers hands?	<input type="checkbox"/>	<input type="checkbox"/>
Tool handles do not pinch workers hands?	<input type="checkbox"/>	<input type="checkbox"/>
Tools that are used do not create excessive vibration?	<input type="checkbox"/>	<input type="checkbox"/>
Are handles on tools easy to operate?	<input type="checkbox"/>	<input type="checkbox"/>
Tools can be used with either or both hands?	<input type="checkbox"/>	<input type="checkbox"/>

[ANo≡ response indicates increased risk to CDTs]

Other observations / comments: _____

Appendix 3. Manual Material Handling

Manual Material Handling: Eliminating Risk

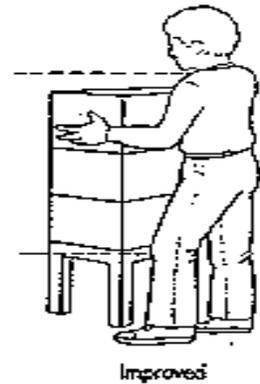
Listed below are some methods that can be used to control the risks associated with manual material handling. By redesigning the work station using these methods, employers can decrease the risks of workers developing back injuries.

I. Minimizing Awkward Body Postures and Motions

1. Reduce Bending Motions

A. Eliminate the need to bend by:

- ! Use mechanical assists whenever possible.
- ! Raise work level to the appropriate height.
- ! Lower the worker to the work level.
- ! Provide all material at work level.



2. Reduce Reaching Motions.

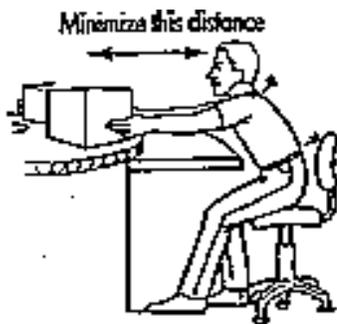
A. Eliminate the need to reach by:

- ! Provide tools and machine controls close to the worker, to eliminate horizontal reaches over 16 inches.
- ! Placing materials as near to workers as possible.
- ! Reducing carton or pallets sizes being loaded.
- ! Reducing the size of objects being handled.
- ! Allowing the object to be kept close to the body.

3. Reduce Twisting Motions.

A. Eliminate the need to twist by:

- ! Providing sufficient work space for the whole body turn.
- ! Providing adjustable swivel chairs for seated workers.
- ! Improving work area layout.
- ! Providing all materials in front of worker.
- ! Using conveyors, chutes, slides, or turntables to change direction of material flow.



II. Reduce Object Weight/Required Force

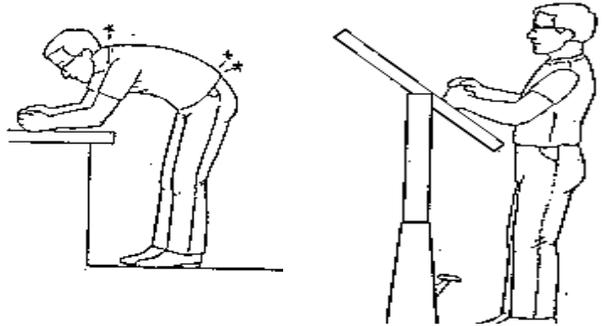
1. Reduce Lifting and Lowering Forces

A. Eliminate the need to lift or lower manually by:

- ! Using lift trucks, cranes, hoists, drum and barrel dumpers, lift tables, work dispensers.
- ! Using gravity dumps and chutes.
- ! Lowering the operator.
- ! Raising the work level.

B. Reducing the weight of the object by:

- ! Reducing the number of objects lifted or lowered at one time.
- ! Reducing the size of the objects.
- ! Reducing the capacity of containers.
- ! Reducing the weight of the container.
- ! Reducing the load in the container.



C. Increase the weight of the objects so that it must be handled mechanically:

- ! Use palletized loads.
- ! Load as units instead of individual containers, using mechanical assists.

D. Reduce the hand distance by:

- ! Changing object shape.
- ! Providing grips or handles.
- ! Providing better access to objects.
- ! Improving work area layout.

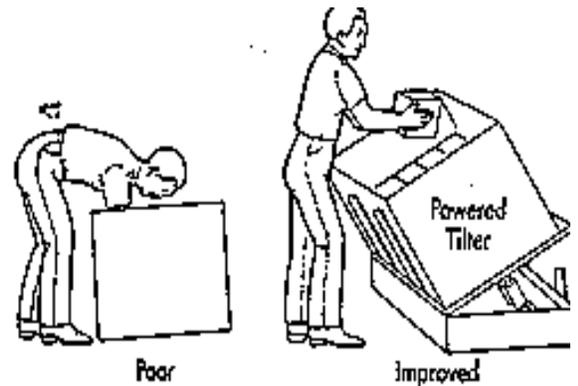
2. Reduce Pushing and Pulling Forces

A. Eliminate the need to push or pull by:

- ! Using powered trucks and conveyer
- ! Using slides and chutes.

B. Reducing the required force by:

- ! Reducing the weight of the load.
- ! Using four wheeled hand trucks and dollies with large wheels.
- ! Providing good maintenance of floor surfaces, hand trucks, and lifting equipment.
- ! Treating surfaces to reduce friction.



3. Reduce Carrying Forces

A. Eliminate the need to carry by converting to pushing or pulling.

- ! Use conveyors, ball caster tables, air bearings, slides, and chutes.
- ! Use lift trucks, hand trucks, dollies, and similar aids.

