Voluntary Ergonomics Guideline

For the Furniture Manufacturing Industry

American Furniture Manufacturers Association

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American Furniture Manufacturers Association

Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry

U.S. Department of Labor

Assistant Secretary for
Occupational Safety and Health
Washington, D.C. 20210

Mr. Steve Kincaid, President
American Furniture Manufacturers Association
Post Office Box HP-7
High Point, NC 27261

Dear Mr. Kincaid:

On behalf of the Occupational Safety and Health Administration, I would like to recognize the American Furniture Manufacturers Association (AFMA) for stepping forward to address work-related ergonomic issues in your industry. I congratulate you for your leadership in developing a tool that U.S. furniture manufacturers can use to reduce work-related musculoskeletal disorders.

Through your Alliance with the North Carolina Department of Labor, Occupational Safety and Health Division, you produced a document that effectively explains basic ergonomic principles and outlines a variety of best practices proven successful in protecting workers involved in furniture manufacturing. I commend your initiative for entering into this Alliance, which was the first to bring federal and state governments together with industry to develop voluntary ergonomic guidelines for a specific industry.

When Secretary of Labor Elaine L. Chao announced her comprehensive approach to ergonomics, she challenged industry to voluntarily develop ergonomic guidelines to meet their own specific needs. You have met this challenge by developing and publishing *Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry* in partnership with North Carolina and federal OSHA. Your industry serves as a model for other industries as they, too, tackle these difficult issues.

I believe there is no more important task than the one we have committed to pursue every day: reducing death, injuries and illnesses in America's workplaces. We appreciate the solid foundation you have laid for American furniture manufacturers and their workers to move forward together toward this critical goal.

Sincerely,

John L. Henshaw

Cherie K. Berry
Commissioner

(919) 733-0359
Fax: (919) 715-5629

Mr. Steve Kincaid
President
American Furniture Manufacturers Association
PO Box HP-7
High Point, NC 27261

Dear Mr. Kincaid:

Congratulations on a job well-done! The American Furniture Manufacturers Association has risen to the challenge to help create safer, more productive workplaces. We have enjoyed working with you and USDOL to assist with the drafting of the Voluntary Ergonomics Guideline. The Guideline demonstrates what industry and government can accomplish working together cooperatively. Your association has set a standard for other industries to follow.

In reviewing the guide, I see the association and its members have generated solutions to ergonomic hazards within furniture manufacturing that could not have come from an outside-in approach such as governmental rulemaking. The cooperative attitude of the many companies that participated contributed enormously to this guide.

I congratulate you and your members on your proactive approach. It will surely reduce injuries and illnesses in the furniture-manufacturing workforce. The North Carolina Department of Labor is proud to have participated in this endeavor.

Sincerely,

Cherie K. Berry

4 West Edenton Street • Raleigh, North Carolina 27601-1020

NCDOL and American Furniture Manufacturers Association Plan for Preparation of a Voluntary Guideline for Ergonomics in Furniture Manufacturing

08/13/2002

Objective

To develop an industry-specific voluntary guideline document to assist employers and employees in recognizing and controlling potential ergonomic hazards.

Description

The guideline document will address ergonomic issues and proactive approaches, including best practices, to control or reduce ergonomic hazards. The suggested format would include the following parts:

1. **Information Gathering & Research:** Scientific, practical, and industry data will be reviewed to determine trends, potential hazards, successes, and other data relevant to guideline development. Studies by NC State University and the Ergonomics Resource Center may be included.
2. **Program Management Recommendations:** Best management practices for identifying and addressing ergonomic hazards in furniture manufacturing.
3. **Worksite Analysis Recommendations:** Techniques to assist in analyzing specific activities or operations in furniture manufacturing that could represent potential ergonomic hazards.
4. **Hazard Control Recommendations:** Lessons learned, best practice, and other approaches to control hazards, including discussions of cost/benefit and effectiveness of each control approach.
5. **Sample Work Process or Control Documents:** Templates or sample documents that employers or employees can easily adapt to individual workplaces.

Roles and Responsibilities

The source of expertise for this voluntary guideline rests in the furniture manufacturing industry. As the industry representative, AFMA will establish an industry development team to lead the preparation and review of the guideline. The guideline is for voluntary use by furniture manufacturers and does not represent a standard or a document to be used for enforcement actions. The North Carolina Department of Labor will assist and participate in the development team with studies, editing, review, publicity, and/or publication of the guideline. The US Department of Labor, OSHA, is proposed as an alliance partner in the development of the guideline, and will assist, as requested, with promotion and publication of the completed voluntary furniture manufacturing ergonomic guideline. Other groups, such as NC State University or the Ergonomics Resource Center, may provide expertise as needed and specified by the development team.

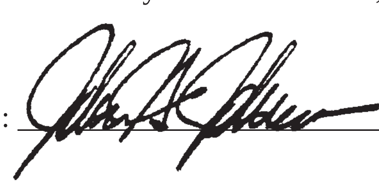
Schedule

The development, review, and publication of the guideline will be determined by the development team, with a proactive expectation of a finished product.

Comments: For questions or comments, please call John Johnson, NCDOL, at (919) 807-2861.

Agreement:

Voted and accepted by AFMA Safety Committee Board, July 30, 2002 (see meeting minutes).

Acceptance by NCDOL:  ______________________, John H. Johnson, Deputy Commissioner

Foreword

Many companies in the furniture manufacturing industry have made a substantial effort to reduce work-related injuries due to heavy lifting, repetitive motion, awkward and static work postures, vibration, and other recognized ergonomic stressors. The results achieved by these companies demonstrate that there are effective, affordable ways to protect furniture industry employees from injury while maintaining or, in many cases increasing productivity, quality and employee morale. The *Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry* is designed to guide furniture manufacturers through the process of developing an effective ergonomics program.

This guideline was developed in a unique partnership among the furniture industry, federal and state government, the academic community, and ergonomics specialists to create one of the first voluntary ergonomic guidelines in the nation for a specific industry. The developmental work group included talented and skilled professionals from the American Furniture Manufacturers Association; the N.C. Department of Labor, Occupational Safety and Health Division; North Carolina State University, Department of Industrial Engineering, Ergonomics Laboratory; and The Ergonomics Center of North Carolina.

To design this guideline, the *Voluntary Ergonomics Guideline* work group gathered and reviewed existing ergonomic practices and programs in the furniture industry and the latest research and information available on ergonomic stressors and control methods. The AFMA asked member companies for information on stressors present in their workplaces and for best practices, programs and processes that have successfully reduced exposure to these stressors.

This guideline provides practical suggestions for employers to reduce the number and severity of workplace injuries by identifying, evaluating and controlling hazards using methods that have been work-proven in the furniture manufacturing industry. This voluntary guideline is intended for furniture manufacturing facilities. Other employers with similar work environments may find the information provided useful. However, care should be taken to ensure that ergonomics solutions are developed to meet the specific hazards and requirements of different work environments.

The American Furniture Manufacturers Association recognizes that the Occupational Safety and Health Act of 1970 requires that, in addition to compliance with hazard-specific standards, all employers have a general duty to provide their employees with a workplace free from recognized hazards likely to cause death or serious injury. This guideline is designed to help employers meet this responsibility.

This guideline is advisory in nature and informational in content. This document does not represent a new regulatory standard and imposes no new legal requirements. An employer’s failure to implement this guideline is not a violation of the Occupational Safety and Health Act of 1970.

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Introduction

Furniture Manufacturing: A Challenging Work Environment

Lost-time work injuries caused by cumulative and acute trauma of the musculoskeletal system such as carpal tunnel syndrome and back injuries are some of the most costly workers' compensation claims in U.S. industry today.

In its 1998 national figures, Liberty Mutual Group estimates that these injuries totaled more than 41 percent of all reported injuries with an estimated $15.7 billion dollars in direct workers' compensation costs (Liberty, 2001).

Figures available from the N.C. Industrial Commission reveal that in 1996, the furniture industry in the state paid out an average of $33,000 in workers' compensation for each musculoskeletal disorder (MSD) claim (North, 1996). But workers' compensation is just the "tip of the iceberg" when costs for lost time injuries are added up. Each claim averaged almost 97 lost workdays (North, 1996) … lost production, lost income, employee replacement costs, training, community support of the worker's family and much more. Liberty Mutual Group estimates that the national average for indirect costs is between $2 and $5 for every workers' compensation dollar paid (Liberty, 2002).

Though the furniture industry has had an excellent lost work time accident record over the past several years, the U.S. Bureau of Labor Statistics reports that nationally, in 2001, the wood household furniture industry reported approximately 9,600 cases of musculoskeletal injuries and the upholstered furniture industry reported approximately 7,000 cases (U.S. Department, 2002).

Ergonomics is an effective approach to reducing the number and severity of these work-related injuries. Ergonomics is the practice of designing equipment, work tasks and work environments to conform to the capability of the worker … to create more efficient work places and prevent injuries to employees.

Ergonomics is a broad topic. This guideline deals only with the identification and control of ergonomic hazards that may cause **musculoskeletal disorders (MSDs)**. An MSD is an injury or disorder of the muscles, bones, nerves, tendons, ligaments, joints, cartilage and/or spinal disks that may be caused or contributed to by exposure to work activities and conditions involving certain risk factors.

Musculoskeletal Disorders

MSDs are disorders involving the muscles, bones, nerves, tendons, ligaments, joints, cartilage or spinal disks. The term "work-related musculoskeletal disorders" or WMSDs refers to (1) MSDs to which the work environment and the performance of work contribute significantly or (2) MSDs that are made worse or longer lasting by work conditions. In general, MSDs develop when physical stressors overcome the body's ability to heal and repair itself.

Physical risk factors in the workplace, or "ergonomic stressors," along with personal characteristics and social factors, are thought to contribute to the development of MSDs (Cohen, 1997). Some MSDs are caused by physical exposures in nonworking activities such as sports and hobbies. Genetics, age and other medical conditions such as arthritis, diabetes or degenerative disease can cause or contribute to the development of MSDs. MSDs can also result from certain psychosocial factors such as job dissatisfaction, monotonous work and limited job control (U.S. General, 1997). This guideline addresses only physical factors in the workplace.

Work-related MSDs may occur in the form of cumulative and acute trauma disorders.

Cumulative Trauma Disorders (CTDs)

CTDs can result from exposure to repetitive, forceful or awkward tasks over a period of time. Each stressful situation results in microtraumas to the specific region of the body, such as a muscle or tendon. Without adequate recovery, the accumulation of microtraumas results in pain, discomfort, numbness, reduced strength and/or inhibited dexterity. Symptoms of cumulative trauma typically cannot be associated with one specific event in time.

Examples of some of the more common cumulative trauma disorders that can occur in the workplace are shown in appendix A.

Acute Traumas

Acute traumas, such as lacerations, fractures, strains, sprains, contusions or bruises, can generally be attributed to a *one-time, specific, instantaneous event*. These traumas are often easier to diagnose and treat because the causative stressors and affected body regions are more readily identified. Acute traumas considered "ergonomics-related" include such injuries as muscle strains, low back pain, lumbar strains and other back concerns.

Ergonomic Stressors

Factors that increase risk for MSD development are called ergonomic stressors. The ergonomic stressors that furniture industry workers may face include:

Force—Physical effort required to lift, push, pull, grasp and pinch items in the work environment. Heavy lifting such as in warehousing, upholstering and cabinet room activities represent jobs that place high forces on the back, while upholstery, cushion stuffing and spring up are examples of jobs that require high force exertions from the hand, wrist and shoulder. Force is often required to handle and control equipment, tools, raw materials and finished products.

Ergonomic Stressors:

- Force
- Repetition
- Awkward Postures
- Static Postures
- Vibration
- Contact Stress
- Environmental Factors

Figure 1—An Example of the Use of Force in Furniture Manufacturing

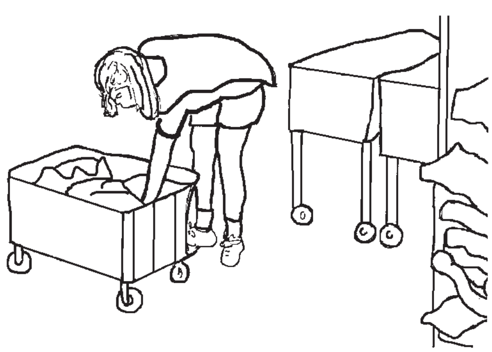


Figure 2—An Example of a Repetitive Task in Furniture Manufacturing

Repetition—Performing the same motion or series of motions continually or frequently. Most jobs on the furniture line require some level of repetitive movement.

Awkward Postures—Body postures that deviate from normal resting or neutral positions place unnecessary stress on muscles, tendons and bones. Examples of awkward postures include reaching above shoulder height, kneeling, leaning over an assembly or sanding table, bending the wrist during spray operations, and twisting the body while lifting. See appendix B for visual presentations of neutral and awkward postures.

Figure 3—An Example of an Awkward Posture in Furniture Manufacturing

Static Postures—Assuming and holding any posture for a long period of time can place stress on the body, particularly if the posture is non-neutral. Static postures can accelerate the development of fatigue and discomfort.

Vibration—Vibration is the physical exposure to rapidly oscillating tools or machinery. Powered hand tools or anywhere an operator comes in contact with a vibration source, such as a tow motor operator, are places to look for this stressor.

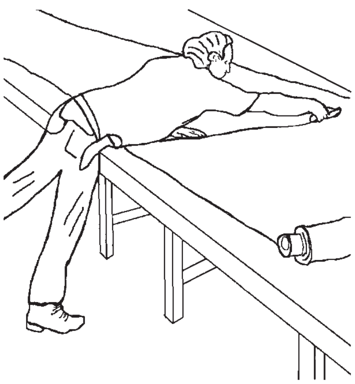


Figure 4—An Example of Contact Stress in Furniture Manufacturing

Contact Stress—Physical contact between the body and sharp edges of tools, equipment and products. Pressing the body against a hard, sharp edge, such as the edge of a worktable or using the hand as a hammer to drive parts together in assembly are examples of this stressor.

Environmental Factors—Cold, heat, lighting and noise are factors in the work environment that can directly influence worker comfort and can indirectly influence risk of injury through interaction with the above-mentioned physical stressors. Other environmental factors such as slick work surfaces that are found in many upholstery and shipping departments can directly increase the risk of injury.

Many jobs combine **multiple stressors** in a single job. For example, a single subassembly job might combine awkward shoulder and back postures in reaching across the worktable, force in lifting the finished sub-assemblies to the pallet, exposure to vibration when using a handsander, repetitive wrist motions when using a powered screwdriver, and contact stress with a sharp worktable edge and when using the hand to hammer parts together. The combination of multiple stressors within a job or work task can create an increased risk of injury.

Ergonomics Programs Work to Control Risk

A U.S. General Accounting Office study of five corporations that fully implemented ergonomics programs show a 50 percent to 80 percent reduction in average dollar cost per MSD claim, a marked reduction in workdays lost to injury and a reduction in the number of injuries and illnesses (between 2.4 and 6.1 fewer injuries per 100 full-time employees) each year (U.S. General, 1997).

Furniture companies that have implemented ergonomics-based injury prevention programs and have applied engineering and work practice controls to reduce exposure to stressors have also achieved success in reducing work-related injuries and workers' compensation costs. These companies have also noted other valuable benefits such as reduced absenteeism, increased productivity, improved product quality and higher morale.

Using This Voluntary Guideline

The information in this voluntary guideline is organized in five main sections: Ergonomics Program Management, Identifying Ergonomics Concerns, Ergonomic Control Strategies, Administrative Management and Ergonomics Program Evaluation, and a series of appendixes. This document is to be used as a reference document, and therefore, each of the five main sections can stand alone, resulting in some redundancy across sections. Each of these five sections is a concise summary of the important components of each of these areas. The bulk of this document is in the appendixes wherein the work group has assembled a group of work-proven approaches that others in the furniture manufacturing industry have found to be effective. There are examples of engineering solutions and work process solutions to a number of specific ergonomic challenges in the furniture manufacturing workplace. There are also examples of teamwork structures, ergonomics plans, reporting and analysis methods that are currently working for companies in the industry. The approach in developing this document is in keeping with the "best practices" style of the document.

The development of this guideline revealed more ideas than could be included in one publication. Therefore, the **American Furniture Manufacturing Association** has created a companion Web site for this guideline. This Web site, *http://www.afma4u.org/*, contains a wider selection of specific engineering and work process solutions to ergonomic stressors in the furniture manufacturing workplace. Most importantly, it is periodically updated with new ideas and submissions from companies in the furniture industry.

The AFMA trusts that the information found in this guideline and on the Web site will encourage furniture manufacturing companies to create and maintain successful ergonomics plans and workplace controls.

Furniture Manufacturing Ergonomics Program Management

Ergonomics Program Elements

The purpose of an ergonomics program is similar to that of any safety and health program—to help employers ensure that problems are identified and controlled, that any medical concerns are addressed and resolved as quickly as possible and that employees are protected. Many industries and companies have utilized the program elements described in the *Ergonomics Program Management Guidelines for Meatpacking Plants* (U.S. Department, 1993) issued in 1993 as the model for their programs. At the core of the program is management's commitment to implementing and managing the program and getting the employees involved in the process. Additionally, ergonomics programs typically contain these core elements:

Core Elements of an Ergonomics Program:

- **Identification of problem jobs/areas**
- **Development of control measures**
- **Training and education**
- **Appropriate healthcare management of ergonomics-related cases**

See appendix C for core elements of an ergonomics program as described in *Ergonomics Program Management Guidelines for Meatpacking Plants*.

There are many options for implementing an ergonomics program. The elements described above should serve as baseline or template, but the addition of other components is encouraged to make the program most successful. This guideline contains a standard approach for program implementation. It adds additional components and approaches that have been used effectively in furniture manufacturing facilities. All companies are encouraged to develop and maintain ergonomics programs that effectively address the ergonomics concerns and issues pertinent to their organizations.

To establish a program, it is important to outline a general approach that the company plans to take. Figure 5 illustrates the general steps normally taken to establish and maintain an effective ergonomics program. In all successful programs, companies must address ergonomics from both a reactive (after injury) and proactive (before injury) standpoint.

Documentation of the efforts put forth by a company to address ergonomics concerns is most often accomplished through a formal written ergonomics program. This written program documents the structure of the program, the individuals responsible for particular functions in the program, and specific solutions to problems that are addressed. This should be a living document that is appended any time ergonomics solutions are developed. This written program can be a very valuable tool to record efforts by a facility to address problems as they arise.

Ergonomics Program Management Flow Diagram

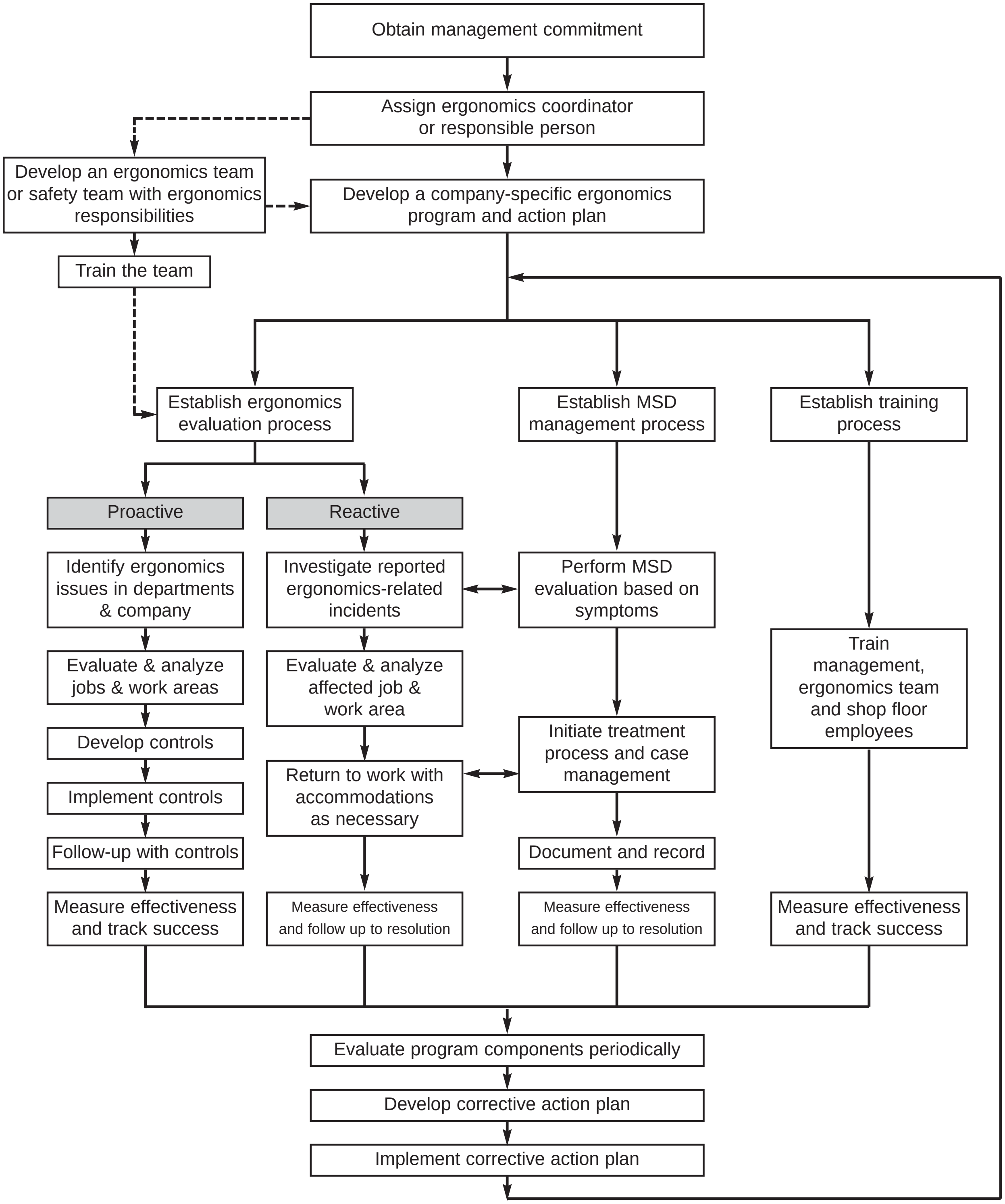


Figure 5—A Flow Diagram for Ergonomics Program Management

Throughout this document, the elements and components addressed in the flow diagram are outlined in further detail.

Management Commitment

As in all safety and health initiatives, management commitment and leadership are critical in the overall success of any program or process. The ergonomics initiative is no different. Management commitment allows for effective allocation of time and resources to minimize the risk of MSDs throughout the organization and provides the necessary support and motivation to realize the many benefits of an effective ergonomics program. Management can demonstrate its commitment to ergonomics by:

- Understanding the elements involved in an effective ergonomics program
- Developing and instituting clear goals and objectives for the program
- Ensuring adequate education and training to accomplish goals and objectives
- Establishing a system of responsibility and accountability at all levels
- Encouraging participation and involvement at all levels
- Allocating resources to address ergonomics issues within the organization
- Striving to identify and eliminate ergonomics hazards in the work operations
- Maintaining a system to promptly and effectively address physical complaints
- Integrating safety and health as a value in the workplace while partnering with productivity and quality issues
- Defining a system for effective documentation and program evaluation
- Developing a procedure for equipment evaluation prior to purchase and installation (a sample checklist can be found in appendix F)
- Defining a system for effective documentation and program evaluation

Employee Participation and Involvement

A successful integration of ergonomics into the overall safety and health program keys not only on management commitment but employee participation as well. Just as management is actively involved in establishing and implementing the ergonomics process, employees can demonstrate their commitment by:

- Identifying ergonomics issues
- Participating in control measure development and implementation
- Contributing to ergonomics teams or committees
- Reporting early signs and symptoms of physical problems

A Team Approach

It has been demonstrated in many organizations that a team approach to implementing a multi-component ergonomics program can be very effective in reducing MSDs and addressing ergonomics concerns within the organization. Some facilities may find alternate approaches to accomplish these goals. But, despite the approach taken, ergonomics intervention is most successful when all levels and functions are involved in its implementation.

Ergonomics teams traditionally pull together representatives from all appropriate areas in a department or facility. Close communication and feedback between employees and supervisory, medical, engineering and management personnel are vital when trying to maintain and demonstrate ergonomics commitment. Teams bring to play the experience, talents and skills of the organization. Teams can be assembled to accomplish a variety of goals including, but not limited to:

- Establishing, documenting and managing the overall ergonomics program
- Tracking trend information for hazard identification
- Identifying, prioritizing, analyzing and correcting ergonomics hazards or workplace deficiencies
- Performing workplace assessments to address employee complaints or medical incidents
- Testing new processes, tools, equipment or work methods

Teams can be established in many different ways and evolve over time to accommodate the changing environment in a facility. Some ergonomics programs begin with a general approach—adding ergonomics components to safety or production teams. Others separate safety and ergonomics elements by having two or more distinct teams. In these cases, company teams may have common members. It is best to assemble a team that fits the structure and culture of the organization.

When pursuing a team approach, first establish the structure of the team, then define its purpose and goals to accomplish. Other activities may be established as the team is defined. Elements may include, but are not limited to, the following:

- Selecting team members and defining the size of the team appropriate for size and structure of the facility
- Establishing roles and responsibilities of the members
- Determining the frequency of team meetings and new member selection
- Training the team to accomplish the established goals
- Defining documentation tools including team meeting agenda format, ergonomics evaluation forms, project documentation, etc.

Examples of team structures proven successful in furniture and other organizations are included in appendix D. Additionally, this appendix includes guidance on training the team, forming subteams to achieve greater employee involvement and ideas for running an effective team meeting.

Identifying Ergonomics Concerns

Trends Analysis

There are many indications that ergonomics-related problems may exist in a facility or specific area. Looking for trends is an important step in identifying problem areas and ergonomics concerns. The objective of a trends analysis is to identify areas, or potential areas, of ergonomic concern within a specific job, department or operation. Use multiple sources of information to assess where the most significant problems, or potential problems, exist. Several areas where trends can be analyzed include, but are not limited to:

- OSHA injury and illness records (OSHA logs)
- First aid logs
- Workers' compensation records
- Lost-time and restricted duty records
- Production and quality records
- Turnover and absenteeism records
- Employee comments

Additionally, subtle signs within the workplace may also be indicative of ergonomics-related problems. These include, but are not limited to:

- Employees regularly complaining of discomfort and/or soreness
- Employees taking frequent rest breaks due to fatigue
- Employees shaking/rubbing arms, hands, shoulders or back due to discomfort
- Employees making modifications to the workstations or equipment to increase comfort
- Employees wearing personally purchased protective products

Trends analysis can be used to identify jobs or areas of priority ergonomics concern during a specific period of time, can focus the ergonomics coordinator or team working on key issues and can evaluate how the department or facility is progressing against program goals over a period of time.

OSHA Injury and Illness Recordkeeping Review

OSHA recordkeeping forms are often considered the best place to begin a trends analysis, a procedural examination of workplace incidents that can assist in determining where to focus safety and health resources. OSHA regulations require all furniture manufacturers with a staff larger than 10 people per year to complete special forms about the safety and health of their employees. These forms can contain significant information for determining problem areas and injuries or illnesses in a workplace.

Key information on OSHA Form 300, *Log of Work-Related Injuries and Illnesses*, to collect for the trends analysis would include:

- Case number or name for identification purposes
- Job title
- Date of injury or onset of illness
- Department or section where the event occurred
- Description of symptoms or diagnosis (if applicable) and what body parts were affected

- Determination of injury or illness*
- Days away from work
- Days of restricted work or job transfer

*Acute traumas, such as back injuries and muscle strains are noted in injury column (1); MSDs are noted in column (5)—all other illnesses.

Consider only cases that are ergonomics related. It is best to look at the description of injury/illness column and identify signs, symptoms and diagnoses pertinent to ergonomics-related MSDs. Appendix A identifies several common MSDs. Symptoms listed on the logs may include, but are not limited to: muscle or joint pain, soreness, swelling, redness, numbness, tingling, burning sensation, stiffness, weakness, pulled muscle, strain, and back pain. There may be other injuries/illnesses and symptoms that are noted in the records but are not on these lists. If questions arise, it is best to consult with a health care professional for clarification.

Another source of more detailed injury and illness data is OSHA Form 301, *Injury and Illness Incident Report*, or an equivalent form. This form provides more information about each recorded case and may be important to determine specific details on how an injury or illness occurred. Facilities that have small numbers of injuries and illnesses may prefer to start with form 301, or equivalent, analysis.

Sample spreadsheet formats for collecting analysis data from forms 300 and 301 are shown in appendix E. To analyze collected data, separate back injuries and other MSDs by location. Use the descriptions of the workplace locations, job titles, and types of injury or illness to determine the areas in which a more detailed analysis of the job may be needed.

It is best to review the 300 logs at least annually, depending on the size of the facility. Larger facilities may need to plan quarterly reviews.

First Aid Logs

In an effort to identify problem areas as early as possible, consider using first aid records, or daily logs, to assist in analysis of initial symptoms. Nonmedical treatment, such as use of nonprescription medications, hot and cold therapy, and nonrigid means of support (such as elastic bandages) may serve as a means of early identification of trouble spots.

Workers' Compensation Information

Workers' compensation claims may offer information related to expenses involved in various types of ergonomic injuries. These data can often be useful in helping to prioritize efforts based on the severity of the problems.

Lost-Time and Restricted Work Records

The OSHA logs show the number of lost and restricted workdays associated with each recorded incident. Lost and restricted workdays may indicate that employees are not reporting cumulative trauma-related MSDs early enough. Lost-time and restricted workdays escalate when symptoms progress untreated.

Production and Quality Records

Medical incidents and absenteeism may sometimes correlate to the amount of work performed during specific periods or scheduling intervals. Periods of heavy production, particularly in labor-intensive jobs, often result in an increased occurrence of MSDs. Other production issues such as seasonal or periodic work can also create short-term spikes in frequency.

Quality problems may indicate that employees are fatigued, that the job is too difficult (either physically or mentally), that the workstation/work method is poor, or that too much work is being completed too rapidly.

Turnover and Absenteeism Records

An operation that has high employee turnover and high absenteeism may indicate ergonomic problems with the job or work area.

Employee Comments

It is important to note employee comments or concerns regarding the job or workplace. These comments may be rendered during production, safety or other meeting settings; solicited during a walk-through or evaluation of the job or area; communicated through a "suggestion box" environment; or collected during a survey. This information is useful for determining areas of focus as well as for documentation of workplace improvement over time.

Workplace Analysis

The purpose of workplace analysis is to identify key ergonomic stressors associated with jobs, tasks and/or operations allowing the development of appropriate control measures that eliminate or significantly reduce risk of musculoskeletal disorder development. Workplace analysis can be both a reactive and a proactive process. Reactively, workplace analysis takes the form of an incident-specific evaluation. Proactively, workplace analysis is the next step after facility or department-wide trends analysis reveals problematic jobs, tasks and operations.

There are many different types of workplace analysis methods. Methods may range from simple observation of a job or work task to using a checklist format to collect multiple workplace components to conducting a more detailed analysis with measurement tools and quantification techniques. The method selected generally depends on the type of work activity performed, the complexity of the operation or problem and the level of ergonomics knowledge of the evaluator.

Checklists are the most widely used and provide a basic and structured means of collecting and recording information. Evaluators can develop specific checklists for their operations and facility or utilize an existing checklist format. Appendix F provides several checklist formats used successfully by several furniture manufacturers. Additionally, other tools available that take a more detailed approach to workplace analysis are also provided in appendix F. Whatever methodology is used for workplace analysis, ensure that all critical components of the work environment and operations are assessed and/or measured for all ergonomic stressors.

Conducting a Workplace Analysis

Utilizing results from the trends analysis and other pertinent information, jobs or work areas identified as causing or likely to cause MSDs within the facility should be prioritized based on the extent of the risk. MSD incident reviews should be conducted as needed. Evaluators should be knowledgeable on how to effectively identify ergonomic stressors to ensure that key concerns are addressed. Each analysis method employed may have specific needs in terms of information to collect or measure. In general, the following information is typically collected or observed during a worksite analysis:

- *Videotape of job, task, process or operation*
  Videotaping allows evaluators to observe all aspects of the job or task, slow down and playback key elements of the operation, review more obscure events at a closer glance, compare various operator methods, reduce potentially stressful over-the-shoulder task analysis, and capture work conditions for "before changes" documentation.
- *Tasks performed*
  Observation of job elements and tasks performed provides insight into potential problem areas. The breakdown of job tasks allows ergonomic stressors to be associated with each task, often revealing one or several key elements as the "root cause" of a problem. This information allows for targeted control measures to be developed and helps document the level of exposure to stressors.
- *Force measurements (as applicable)*
  Weights of objects lifted, pushed, pulled, or handled should be collected to determine the required force to perform the job or task. Note the way the load is handled, the frequency of handling and whether assist devices are used.
- *Postures*
  Each part of the body (hands/wrists, arms/elbows, shoulders, back and legs/feet) has the ability to maneuver in various ranges from neutral to extreme postures to perform work. Note tasks where awkward postures are observed per body part. A *Posture Identification Sheet* is shown in appendix B.
- *Exposure to ergonomic stressors*
  Exposure to the stressors involved in a job or task can be expressed as the percentage of a work shift that requires the same motions or activities to be performed. Ergonomic stress due to repetitions is a function of the duration and variety of the motions performed. Repetition is low when the task motion (regardless of its duration) is infrequent or performed with many built-in interruptions. The risk of injury and illness increases as the exposure to ergonomic stressors increases.
- *Job methods*
  When multiple employees are performing the same job, differences in job methods can reveal changes in ergonomic stressor exposure. Analyzing method variations can reveal opportunities for positive change.
- *Workstation layout and dimensions*
  Exposure to workplace stressors can often result from the design and layout of the workstation or area. As pertinent to the stressors identified, work area heights and reaches and dimensions of the worktable or surface can reveal problem areas.
- *Tool properties (if used)*
  Several attributes of tools used in an operation can contribute to stressor exposures. Weights of tools handled, size of the handle, length of the tool, postures assumed for use, power versus manual, vibration issues and maintenance of the tool are several factors to measure and observe.
- *Production information*
  Awareness of production rates, quality standards, break schedules, job rotation schedules and other production information can help to identify areas of key concern within a job or operation. Changes in this information over time compared to incidence information can reveal potential problems.
- *Work environment*
  Environmental issues within the workplace can contribute to the onset of fatigue and potential injury or illness. Exposure to temperature, noise, lighting and air contaminants can all be measured when applicable.
- *Employee comments*
  During the course of collecting information about the performance of the job and tasks, employees may comment on concerns within the job, favorable aspects of the process, suggestions for improvement, etc. Incorporating these comments into the workplace analysis process strengthens the analysis process and often provides insight for the best control measure to be developed.

Assessing Analysis Results

Once information is collected and reviewed, prioritize the concerns within each job analyzed so that the most significant risk is addressed first. Determine if additional detail or other analysis tools are needed to clarify or quantify stressor exposure. Please note that more detailed analysis and quantification of stressor exposure may be necessary to develop and justify control measures. For example, utilizing the NIOSH lifting equation to measure exposure to stressors associated with manual materials handling. The recommended weight limit derived from measuring and calculating certain variables provides a clearer path in control measure direction and assists with justification. The NIOSH lifting equation and other tools for workplace analysis are outlined in appendix F.

Analyzing MSD Incidents

An incident review should be triggered when an MSD or signs and symptoms of an MSD are reported. A workplace analysis can be performed to determine possible problem areas within the job, tasks, workstation, work methods, etc. The sooner analysis methods and control measures are employed, the sooner the case may be resolved. Incorporate the results of the incident reviews to make proactive change in the workplace. Several checklist formats that may be used for incident review or assessment of the workplace are shown in appendix F.

Refer to figure 5 for an illustration of how the MSD management and ergonomics evaluation processes work together.

Ergonomic Control Strategies

The most critical component to any ergonomics program is ergonomic control. Ergonomic controls are simply methods that are used to eliminate or reduce exposure of the employees to the ergonomic stressors associated with the development of MSDs. These control strategies can be divided into three categories: engineering controls, work practice controls and administrative controls. Techniques used to control exposure to the ergonomic stressors for the development of MSDs can vary considerably between facilities and within a facility. Most effective approaches involve a combination of engineering controls, work practice controls and administrative controls.

Engineering Controls

Engineering controls are those modifications to the workplace that fundamentally change the employee exposure by physically modifying the work or workplace. These changes include modifying workstations, changing the tools or equipment used to perform the work, or modifying the production techniques to eliminate or reduce the magnitude of one or more ergonomic stressors for MSDs.

The following list of engineering control ideas/concepts is not meant to be an exhaustive list but is presented to give examples of engineering control ideas (Cohen, 1997):

- Changing the way materials, parts and products can be transported—for example, using mechanical assist devices to relieve heavy load lifting and carrying tasks or using handles or slotted hand holes in packages requiring manual handling (such as using vacuum lifts to lift and move large panels and table tops, overhead hoists for moving large cases, conveyance systems for moving casegoods or upholstered pieces)
- Changing the process or product to reduce employee exposures to ergonomic stressors (reorienting parts on a cabinet line to allow for easy access with a screwgun)
- Modifying containers and parts presentation, such as height-adjustable material bins
- Changing workstation layout, which might include using height-adjustable workbenches or locating tools and materials within short reaching distances (height adjustable upholstery bucks, suspended hand tools)
- Changing the way parts, tools and materials are manipulated—for example, using fixtures (clamps, vise-grips, etc.) to hold work pieces to relieve the need for awkward hand and arm positions or suspending tools to reduce weight and allow easier access (suspended staple guns, screw guns)
- Changing tool designs—for example, pistol handle grips for knives to reduce wrist bending postures required by straight-handle knives or squeeze-grip-actuated screwdrivers to replace finger-trigger-actuated screwdrivers
- Changing materials and fasteners—for example, lighter-weight packaging materials to reduce lifting loads, changing from a slotted screw to a Phillips head screw for easier application
- Changing assembly access and sequence—for example, removing physical and visual obstructions when assembling components to reduce awkward postures or static exertions
- Adjusting the work pace to relieve repetitive motion risks and give the employee more control of the work process
- Providing anti-vibration and anti-fatigue materials—for example, gloves and floor mats

In general, these controls are preferred over work practice and administrative controls because they eliminate or significantly reduce the risk at the source. Further, engineering controls are often found to be the most cost-effective solutions in the long term, because they tend to fix the problem completely and do not require ongoing administrative effort by management. In many cases this may have an additional effect of decreasing employee training costs.

Illustrations in appendix G show a number of engineering controls that have been developed for various furniture manufacturing work tasks. It should be noted that the effectiveness of an engineering control is often task/facility specific and therefore these solutions should be carefully considered with regard to a specific application. In creating these pages the company who submitted the example briefly describes the problem that the control was built to address, describes the control (if possible, including a picture), discusses the impact of the control, cost of the control and any additional comments.

Work Practice Controls

Work practice controls are those modifications to the work methods used by the employee to reduce exposure to ergonomic stressors. Work practice controls can include both formal procedures and policies developed by management and handed down to employees and supervisors—for example, specific tasks that require a two-person lift—as well as more general informational policies such as employees are to always lift with their legs not their backs. These work practice controls should be understood and followed by managers, supervisors and employees. Often work practice control development requires formal and regular training and education. Employees need to be taught appropriate work techniques as well as basic body mechanics.

The following list of work practice control ideas/concepts is not meant to be an exhaustive list but is presented to give examples of work practice control ideas:

- Changing a lifting task from a one-person lift to a two-person lift (upholsterers and spring up operators)
- Encouraging employees to perform manual tasks with straight wrists where possible
- Encouraging employees to keep shoulders in a relaxed position while performing manual tasks where possible
- Encouraging employees to perform lifting tasks with the load as close to the body as possible and use the legs as much as possible to reduce the loading on the low back
- During brief pauses in the work cycle allowing the muscles to rest to reduce the accumulation of fatigue (micro breaks)
- Establishing policies and procedures for appropriate tool use (random orbital sander use policy)
- Requiring inspection of tools to verify that they are in good condition (sharpening of scissors and other tools to reduce force exertions)

The downside to the work practices control approach is that these controls require vigilance both on the part of the employees and management to make them effective. In comparison with the engineering controls, which fundamentally change the exposure of the employee to the stressor, work practice controls have been shown to be disregarded in times of peak stress (such as meeting a production deadline). Specific examples include disregarding the two-person lift policy, use of unorthodox and hazardous lifting techniques, and using the bare hand as a hammer because the necessary mallet is too far away from the employee's current location.

Administrative Controls

Administrative controls are those control measures designed to reduce exposure of the employees to ergonomic stressors through the development of specific policies/procedures. While engineering controls are the preferred method of addressing these ergonomic stressors, administrative controls can be helpful as temporary measures until engineering controls can be implemented or when engineering controls are not technically feasible. In some cases, the combination of administrative, engineering and work practice controls provide the best control option.

The following list of administrative control ideas/concepts is not an exhaustive list but is presented to give examples of administrative control ideas (Cohen, 1997):

- Rotating employees through several jobs with different physical demands to reduce the stress on limbs and body regions (job rotation)
- Broadening or varying the job content to offset certain ergonomic stressors (job enlargement)
- Implementing appropriate work-hardening procedures for new employees
- Scheduling more breaks to allow for rest and recovery
- Reducing shift length or amount of overtime allowed
- Training in the recognition of ergonomic stressors and instruction in work practices that can ease the task demands or burden
- Implementing mandatory warm-up and stretching exercises

Since administrative controls do not eliminate hazards, one of the ongoing costs of administrative controls is that management must ensure that the practices and policies are followed. This may involve weekly development of job rotation schedules, continuous training of employees to allow for job enlargement, and ongoing training and education. Further, job rotation (one of the often used administrative control approaches) requires that the person creating the job rotation is able to identify an appropriate sequence of jobs that allows body parts stressed under one task to rest during another, a challenging task in most workplaces. Challenges with regard to job rotation include establishing the acceptable duration of exposure to the hazardous task and the training and cross-training time and cost often required. Training the workforce on sound body mechanics and good work practices has been shown to be an effective tool to reduce risk of injury, especially in situations when work activities do not run “as scheduled” and the individual employee must work in an environment without the appropriate engineering control.

Documentation of Ergonomic Improvements

As companies take steps to control ergonomic stressors in the workplace, it is imperative to track and document improvements that affect employee morale, productivity and quality. Time, effort and money spent on these projects should be documented in a manner that allows the organization to continue its efforts to eliminate ergonomic stressors as new processes enter the workplace. Ergonomic projects and improvements should be documented regardless of size, impact, cost or scope. Even projects that failed to attain the goals of the project should be documented, as valuable lessons can be learned from failures as well as successes.

Although companies may choose different methods to document ergonomic improvements and no single method will satisfy every company’s needs, there are some elements that should be incorporated into most documentation processes. Appendix H provides a summary of documentation points to assist companies in developing their own ergonomic documentation process.

Additionally, a sample tool is provided. Appendix I provides a brief discussion to determine the return on investment (ROI) for an ergonomics project as well as a sample calculation.

Web-based Repository

Innovative people in the furniture manufacturing industry continue to develop new control measures; consequently, those control measures displayed here are only part of what will be available in the future. Therefore, this document should not be perceived as a static document, but instead as a living document that will continue to grow as new ergonomic solutions are created. This copy contains a subset of the ergonomics control strategies that have been created to date and have been generously shared by the companies who developed them. A more complete listing of control strategies can be found at *http://www.afma4u.org/*. It is hoped that as readers of this document and the Web site continue to develop ergonomic interventions for their facilities that they will share those ergonomic interventions with the rest of the industry in an effort to reduce the overall incidence of MSDs.

Contact the American Furniture Manufacturers Association through Bill Perdue at bperdue@afma4u.org or Gary Mirka, Ph.D., at mirka@eos.ncsu.edu in the Department of Industrial Engineering at North Carolina State University.

Administrative Management

Ergonomics Training Practices

Training and education are an integral part of a comprehensive strategy to reduce the incidence and severity of work-related injuries, particularly those that often have a pattern of gradual onset such as cumulative trauma disorders. Training is necessary to equip management, employees and the on-site ergonomics team with the knowledge and skills necessary to be a part of a system to recognize and control these disorders. The specifics of the training that are outlined below may vary depending on the specific group to be trained and their role in this effort. The benefits to be gained by an effective ergonomics training program are the reduction in both the numbers and severity of work-related MSD injuries/illnesses and, as a result, a reduction in costs.

Management Training

Training and education of management is specifically focused on basic education and the ways that management can most effectively facilitate the work of the employees in their facility. Typical content of management training sessions should include:

- Basic principles involved in ergonomics
- Basics of effective ergonomic task/workplace design
- Components of a sound ergonomics program
- Resources required to make the program work
- What to expect as the ergonomics program is developed
- Benefits of a sound ergonomics program (positive impact on quality, efficiency, productivity and injury cost control).

Management training is generally the first training performed to ensure management's commitment to the process. This training is usually completed in a 1–1.5 hour time frame. The benefits gained through management training are:

- Management's understanding of how these disorders develop
- Management's understanding the importance of the application of ergonomics to their prevention
- Solidification of management's commitment to the ergonomics process

Ergonomics Team Training

The training of the ergonomics team is, by necessity, much more in-depth and hands-on than the management training. The ergonomics team is the group of individuals responsible for the development and maintenance of the ergonomics effort within the facility. As such, they should be trained to use the various ergonomics tools that are employed during the identification of ergonomics concerns and control process. Toward this end, the content of this training should include the following:

- Basic principles involved in ergonomics
- Methods of identifying high-risk jobs
- Methods of evaluating jobs to identify potential problem areas
- Methods of effective ergonomic task/workplace design
- Components of a sound ergonomics program
- Hands-on work addressing the ergonomic issues in a specific set of jobs

Training time for the team can vary in length, but it is typically accomplished in a two-day format that includes a considerable amount of hands-on learning where the participants perform an evaluation of a specific job in their own facility. The benefits gained through ergonomics team training are:

- Development of in-house expertise in the identification and control of problem jobs
- Reduced reliance on external consultants
- Ability of a facility to have a "rapid response" to a concern raised by shop floor employees

Shop Floor Employee Training

The training for shop floor employees should be very focused training that presents the information necessary for these individuals to be a functional part of this ergonomics process. Topics generally covered in such training include:

- Basic principles involved in ergonomics
- Workplace ergonomic stressors
- Non-work-related risk factors for the development of MSDs
- Early warning signs and symptoms for MSD development
- How to interact and express concern to individuals responsible for ergonomics in the facility
- Benefits to the business and to the individual that accrue from learning and applying sound ergonomic principles.

This should be very focused training that can be completed in 30–45 minutes and conducted in groups of 20–40 employees. Industry experience indicates that hands-on training is very effective. Training with examples is also recommended. The benefits gained through shop floor employee training are:

- Early reporting of discomfort potentially leading to a solution before a problem becomes chronic and costly
- Employee awareness of non-work activities that can contribute to musculoskeletal disorders
- Having the employees equipped with the tools necessary to participate actively in the ergonomics program including solution development

Appendix J provides training and education approaches that have been successful in furniture manufacturing companies.

Employee Placement Strategies

Many jobs in the furniture manufacturing industry, by their nature, require robust physical attributes (strength and endurance) on the part of the operator due to the basic physical dimensions of the product being produced. While job placement strategies are not regarded as the "ultimate solution" to ergonomic concerns, for jobs that do not present feasible engineering controls or administrative controls, they represent measures that can be used to improve the fit between specific, high-challenge jobs and the capabilities of job candidates. All efforts should be made to use engineering controls to reduce stresses to levels that present little or no risk to the widest possible segment of the working population. In the furniture manufacturing industry, job placement procedures can augment these engineering controls and can be a valuable tool in reducing the incidence and severity of work-related MSDs.

Evaluation Process Characteristics

One of the major considerations in devising and implementing a structured job placement procedure is the duty of employers to comply with federal, state and local equal opportunity laws and regulations including the Americans with Disabilities Act (ADA). In these cases it is best for the company to consult with its human resources manager and/or general counsel. This document does not purport to provide legal advice; however, research relative to this issue shows that a number of considerations are important to this matter.

Placement evaluation measures must be:

- *Job-related.* The evaluation process must rest on a foundation that addresses the essential functions of the work activity performed, on a job-by-job basis.
- *Objective.* In other words, physical capabilities are quantified and based on sound medicine/science. An example is a measurement such as the ability to exert force of a certain magnitude, in a specific direction, for a defined time interval.
- *Capable of being validated, in comparison with characteristics of the population engaged in the specified work activity.* This means that the performance characteristic is one that is exhibited by members of the group actually doing the work activity.
- *Administered to all applicants for the open position.* An employer cannot “pick and choose” those to be evaluated, based upon their physical characteristics, work history or other criteria.
- *Safe to perform.* Based upon the review of a healthcare professional, there is a low level of risk of injury to the person participating in the evaluation. This assumes the candidates follow the protocols and that they disclose any pre-existing conditions that may affect their risk of injury.
- *Standardized.* Each candidate is given the same instructions, and tests are administered and results recorded the same way. This means that the process must be well documented and that adequate training is provided to those performing the evaluations.
- *Designed and administered in a manner that protects the confidentiality of the information gathered.* The evaluation process and the information generated from it must be handled in a manner that complies with applicable laws and standards.
- *Economical to perform.* Variables include the current employment turnover rate, time and cost involved in performing the evaluations, and effects on recruitment efforts in the local labor market. Note that using an evaluation process such as the one described may result in lower employment turnover because of improved candidate/job fit.
- *Consistent with any labor agreements that may exist.*
- *Designed in a manner that prevents discrimination against qualified candidates with disabilities.* Review of the evaluation process by an attorney knowledgeable of the subject is advised.

Evaluation Process Models

Neither the American Association of Occupational Health Nurses, the American Physical Therapy Association, nor the American College of Occupational and Environmental Medicine have a practice guideline or standard protocol for performing physical capacity evaluations of candidates for employment. Therefore, the models available consist of proprietary methods developed by individual companies serving as consultants to management. The following key points summarize several of the approaches commonly used. An expanded view of this information is included in appendix K.

In general, the following elements are included in the evaluation process:

- Job analysis—measuring the forces, postures and other characteristics of the job. This should be performed by a knowledgeable and qualified individual and be documented. The results of the analysis should be used to construct the test elements.
- Conditional offer of employment—subject to the candidate's demonstration that he or she can meet the job requirements.
- Review of a written summary of job requirements by the candidate and a response as to whether or not the candidate thinks he or she can meet the requirements—with or without accommodation.
- Prior to test administration, the candidate is presented with information on the test and is asked to disclose information that may affect the safe administration of the test—for example, any restrictions on exertion that have been set by the candidate's physician. A consent form that discloses foreseeable risks (of performing the test) is signed and dated by the candidate.
- A basic physical assessment should be conducted by a knowledgeable and qualified individual to rule out any obvious contra-indications to the test—such as elevated heart rate, blood pressure and medical history.
- The test is performed using a standard protocol, and the results are documented and discussed with the candidate.
- Based upon the protocol, a decision is made, whether or not to place the candidate in the position applied for, offer a different position or withdraw the offer.

Costs of Neglecting Appropriate Evaluation of Job Candidates

Although there is no evaluation process model that carries zero risk, structured job placement procedures are intended to help prevent a situation in which someone who is unsuited to a particular job is placed into it and is then injured because of a mismatch between job demands and his or her physical capabilities. In this scenario neither the employer nor the employee wins. The costs associated with placing an applicant in a job that exceeds that individual's physical capabilities are the same as those that result from poor workplace design—workers' compensation costs, medical costs and the less prominent indirect costs.

Management of MSDs

For an ergonomics program to be effective, organizations must address the reactive (after injury) as well as the proactive (before injury) aspects of ergonomics. A health care delivery system, or MSD management program, should be established to provide injured employees with prompt care for evaluation, treatment and follow-up of workplace MSD problems. An effective MSD management system can benefit both employers and employees by minimizing injuries, reducing time away from work, reducing the severity of an injury and reducing medical costs. All MSD management programs should be established in cooperation with a physician or occupational health nurse (OHN) with training in the prevention and treatment of MSDs.

Goals of MSD management are to:

- **Identify signs and symptoms as soon as they occur**
- **Ensure proper evaluation and treatment of injured workers**
- **Ensure safe and timely return to work for injured workers**

A general process can be used to effectively manage musculoskeletal disorder cases (see figure 6). This process includes health care management, such as evaluation of the injured employee and treatment of symptoms, as well as ergonomics evaluation of the work area and job tasks to determine possible work accommodations. The coordination of health care and ergonomics initiatives allows an organization to optimize its ability to get employees back to work quickly, minimize risk of reinjury and minimize the need for lost work time. To be successful, regular communication and cooperation among managers, employees, health care providers and claim representatives are necessary.

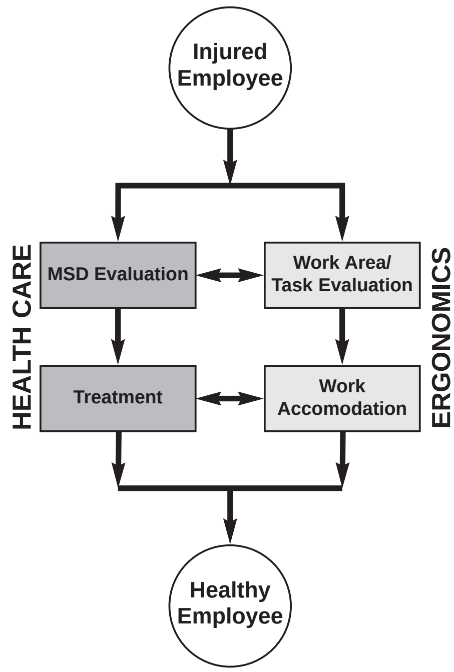


Figure 6: General Process for Managing MSD Cases

Identifying Signs and Symptoms of MSDs

Signs and symptoms of MSDs including cumulative and acute trauma, vary depending on the severity and complexity of the problem. MSD signs and symptoms may include both subjective symptoms, which are reported by the injured employee, and objective signs, which are noted by an examiner. These signs and symptoms help a health care provider establish treatment options.

The most common signs and symptoms include, but are not limited to:

- **Subjective symptoms**
  - **Discomfort or pain**
  - **Numbness**
  - **Burning or tingling**
  - **Tightness**
  - **Weakness or stiffness**
- **Objective signs**
  - **Swelling**
  - **Redness**
  - **Loss of range of motion**
  - **Muscle wasting**

Reporting an MSD

Early reporting of signs and symptoms of MSDs is the first step in reducing the severity and associated costs of MSDs. Well-defined procedures should be developed for injured employees to report symptoms and MSD complaints. Through education and training, all employees should be aware of the signs and symptoms of MSDs and the proper reporting mechanisms to ensure timely and appropriate evaluation and treatment. If symptoms of an MSD are addressed promptly and the underlying ergonomic stressor eliminated, the symptoms of the MSD often resolve within a short time frame and require little to no involvement from an off-site health care professional. Treating MSD symptoms early typically reduces lost work time and medical costs. If symptoms are allowed to progress to more severe stages, treatment may be more advanced and expensive.

MSD Evaluation and Treatment

Employees reporting signs and symptoms of MSDs should be assessed to determine, at a minimum, the nature of the complaint, location of symptoms, extent of problem and possible contributing factors. This information should be documented and maintained with the employee's medical files. MSD evaluation can involve several assessment methods including health assessment and physical assessment. A health assessment can provide occupational, social and medical histories of the injured employee. A physical assessment classifies the symptoms of the reported MSD as subjective or objective and provides a more definitive picture of the reported concern. The health assessment or history, physical assessment and knowledge of the job factors are all important in determining work-relatedness. Additional information and several formats for conducting these assessments are provided in appendix L.

A process for treatment of MSDs is best initiated in the early stages of subjective symptom development. An in-house conservative care process should be developed to promote early reporting and intervention so problems can be resolved in a timely manner and more serious conditions can be prevented. Conservative care may involve both medical treatment and ergonomics intervention. Suggested treatment processes based on commonly used protocols and conservative care decision processes and guidance for medical referrals are provided in appendix M.

Conservative medical treatment may involve the administration of an anti-inflammatory medication, ice and/or heat, rest, stretching exercise, and work accommodations. These first aid treatment procedures can often be administered by an in-house health care provider (HCP). For more severe symptoms, advanced treatment and referral to an off-site HCP may be necessary. Advanced treatment may include prescription drugs, therapy, splints, surgery and/or rehabilitation.

Concurrent to conservative medical treatment, an ergonomics evaluation of the injured employee's work area, job tasks and work methods should be performed. The evaluation should address all aspects of the employee's job that may contribute to problem development. Accommodations, or control measures, should be prioritized and implemented to minimize risk of reinjury.

Return-to-Work Programs

Return-to-work programs are essential to the success of an injured employee achieving his or her optimal level of functioning. Careful management and coordination of the injured employee's health care, ergonomics evaluation of the work area and job tasks, and good communication among all individuals involved in the process is key to a successful return-to-work program.

Several points to consider when establishing an effective return-to-work program:

- Return-to-work should be determined on an individual basis.
- The HCP should indicate specific restrictions (e.g., use of extremity, sitting or standing, length of duty, length of work week, and estimated time of limited duties).
- The HCP along with the injured employee and the case manager should determine both short-term and permanent restrictions in work activities for the injured employee.

"Modified duty" or "light duty" assignments, hereafter called *alternate duty*, are jobs that provide work accommodations for employees who require special physical work considerations specific to the MSD injury or illness. They are used to promote recovery and prevent physical harm to specific body parts that are affected. Each case is evaluated as an individual and unique situation based on physical assessment findings or assigned diagnosis and on physical capabilities revealed by an examination. Alternate duty assignments may involve performing: a different than usual job activity with few ergonomic stressors, a reduced number of usual job tasks or all usual job tasks at a reduced pace, to name a few.

Each individual assigned an alternate duty task should have, as a goal, the return to his or her usual job without restrictions and risk of reinjury. It is important to evaluate all jobs performed by the employee to determine potential stressors and identify primary areas of change prior to complete return to work. Additionally, the following points should be considered for alternate duty assignments:

- The modified duty positions should be medically appropriate for each individual enrolled in the program and should be consistent with previous work experience, skills and work rule situations.
- The employee should be gradually acclimated to the alternate duty task to ensure proper development of skills and to reduce the risk of injury to other body parts.
- All employees in the alternate duty program should have a defined duration of modified duty, varying with the type and extent of the particular medical situation.
- Each employee in the modified duty program should be monitored to ensure that he or she is progressing appropriately. If adequate progress is not seen or if an individual has an exacerbation of symptoms, the individual should to be re-evaluated to assess suitability for continuing in the program.

Ergonomics Program Evaluation

Every company wants its ergonomics efforts to be successful and effective. Therefore, a process for evaluating the success of the overall ergonomics program should be developed. This process allows a facility to track and measure the effectiveness of each program element and to make periodic adjustments as appropriate or necessary.

Typical evaluation techniques include qualitative methods (question/answer type responses) as well as quantitative ones (compiling numbers and measures from various sources). The frequency of evaluation varies per program element and component, but it is generally recognized that overall program evaluation should occur on a semiannual basis. The evaluation results should be documented and shared with management and the ergonomics team.

The most successful ergonomics programs show reductions in ergonomics-related incidence, reductions in severity of cases and reductions in costs associated with the incidents over a period of time. Concurrently increases in productivity, operation and worker efficiency, quality standards and employee morale are viewed as success measures especially when experienced in conjunction with reductions in employee complaints and discomfort.

It should be noted that in the early stages of program implementation, it is natural to experience an increase in reported discomfort and MSD incidence. This is often due to a heightened awareness for early reporting of discomfort and concerns. Over time, as cases are evaluated, treated and resolved, and changes are made to the work areas, the number of incidents and severity of cases should decrease. It is important to recognize that with an effective and successful early reporting program for MSDs, there may be a number of incidents on the injury/illness logs, but the severity of the cases should be reduced. Decreased severity typically yields decreased costs. A comparison of costs to benefits can be performed for a complete ergonomics program using the return on investment strategy as outlined in appendix I.

General questions for evaluating an ergonomics program are included in appendix N. It is important to establish measurements and evaluation criteria pertinent to the programmatic elements and components of each facility.

Appendixes

Appendix A: Common MSDs in the Workplace

Common Cumulative Trauma Disorders in the Workplace

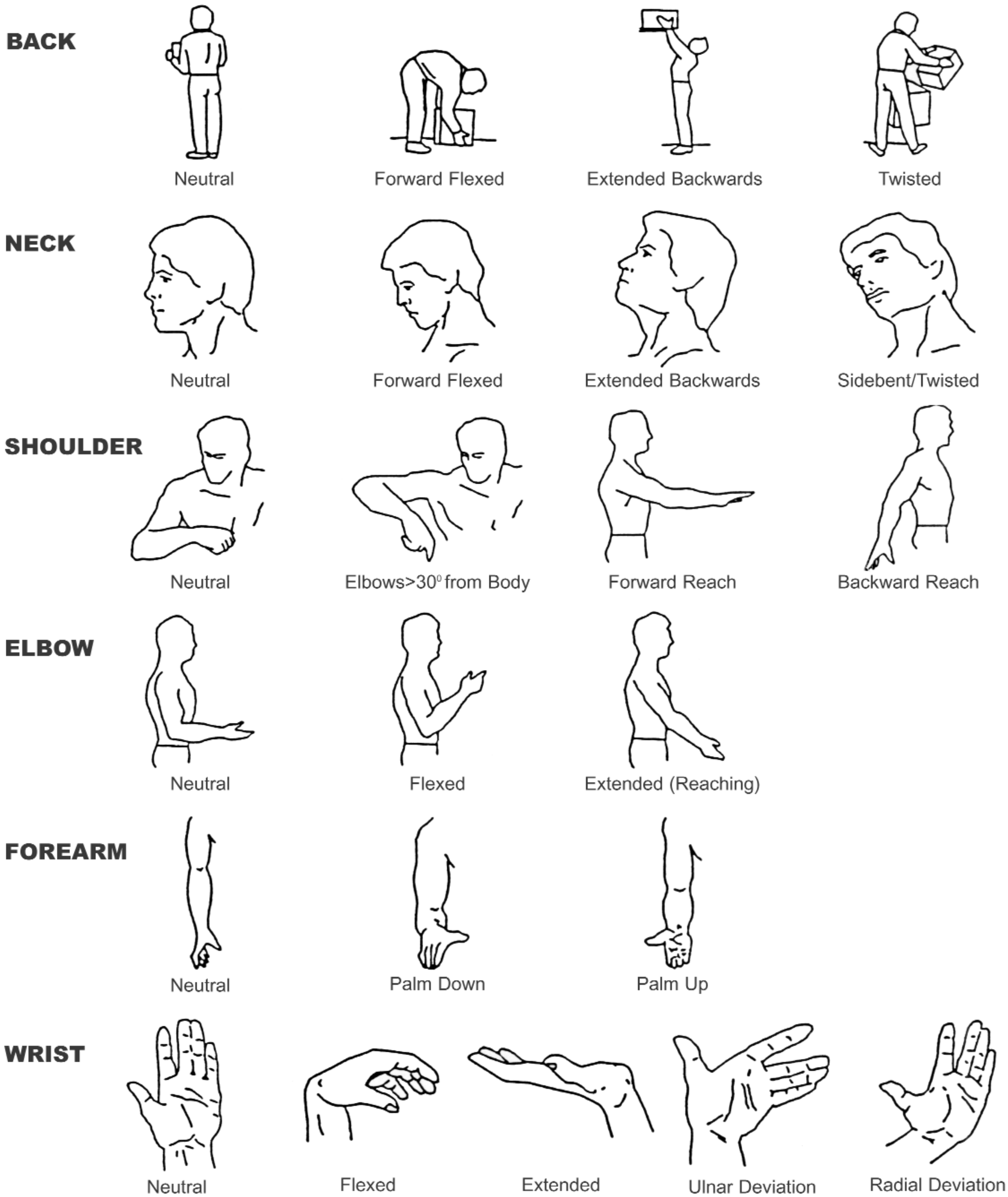
- **Tendinitis** is an inflammation of a tendon usually associated with overuse of that tendon or rubbing of the tendon against bone.
- **Epicondylitis** is an inflammation of the tendon attachments on the inside of the elbow. Medial epicondylitis (often called golfer's elbow) is associated with repetitive flexion of the wrist while exerting a grip force (manual screwdriver action). Lateral epicondylitis (often called tennis elbow) is associated with repetitive gripping exertions with an extended wrist.
- **Carpal Tunnel Syndrome** is a group of signs and symptoms associated with swelling within the carpal tunnel. The carpal region stretches from the lower palm to the tender portion of the wrist. A bundle of tendons and the median nerve are located within the carpal tunnel, which is about the size of a dime. Exposure to stressors can cause swelling within the tunnel. This can also cause the tendons to enlarge and impinge the median nerve resulting in pain and numbness.

- **Tenosynovitis** is an inflammation of the synovial sheath that covers the tendon. **De Quervain's Syndrome** is a common tenosynovitis of the thumb tendons resulting from the repetitive motions of the thumb.
- **Trigger Finger** is a common term for tendinitis or tenosynovitis that causes locking of the finger(s) while bending or flexing.
- **Raynaud's or Vibration Syndrome** is a circulatory disorder that is also called the "white finger syndrome." Symptoms such as pain and whitening of hands and fingers are exacerbated by cold and vibration.
- **Thoracic Outlet Syndrome** can be caused by several different problems. The thoracic outlet is the route utilized by nerves and blood vessels to pass from the upper body into the arms. Nerves and blood supply passing through the thoracic outlet may be pinched, which then causes pain and/or numbness down the arm and to the fingers. Repetitive reaching above the head or behind the body are thought to stress this region.
- **Low back pain** of cumulative origin is thought to be a result of natural, gradual changes in the passive tissues of the spine (disks, ligaments and vertebrae) with age, but it is thought to be accelerated due to work activities involving repetitive lifting, awkward postures and forceful exertions.

Ergonomic-related Acute Trauma

- **Strained muscles** can occur when a muscle is overloaded resulting in the partial tearing of fibers. Scar tissue may form, which can cause chronic tension and make the muscle susceptible to reinjury. Common muscle strains occur in the shoulders, upper arms, forearms and low back.
- **Low back pain** of acute origin is generally attributed to muscle strains of the lumbar region. Poor lifting postures, heavy loads and/or repetitive exertions are often cited as activities that preceded the acute injury. In many cases the specific cause of acute low back pain is unknown.

Appendix B: Posture Identification Sheet



Appendix C:
Core Elements of an Ergonomics Program

From: *Ergonomics Program Management Guidelines for Meatpacking Plants*

An effective occupational safety and health program to address ergonomic hazards in the meat-packing industry includes the following four major program elements: worksite analysis, hazard prevention and control, medical management, and training and education.

1. Worksite Analysis

Worksite analysis identifies existing hazards and conditions, operations that create hazards and areas where hazards may develop. This also includes close scrutiny and tracking of injury and illness records to identify patterns of traumas or strains that may indicate the development of cumulative trauma disorders (CTDs).

2. Hazard Prevention and Control

Once ergonomic hazards are identified through the systematic worksite analysis discussed above, the next step is to design measures to prevent or control these hazards. Thus, a system for hazard prevention and control is the second major program element for an effective ergonomics program.

Ergonomic hazards are prevented primarily by effective design of the workstation, tools and job. To be effective, an employer's program needs to use controls to correct or control ergonomic hazards including the following:

- **Engineering controls**
- **Work practice controls**
- **Personal protective equipment (PPE)**
- **Administrative controls**

3. Medical Management

Implementation of a medical management system is the third major element in the employer's ergonomics program. Proper medical management is necessary both to eliminate or materially reduce the risk of development of CTDs through early identification and treatment of signs and symptoms and to prevent future problems through development of information sources.

4. Training and Education

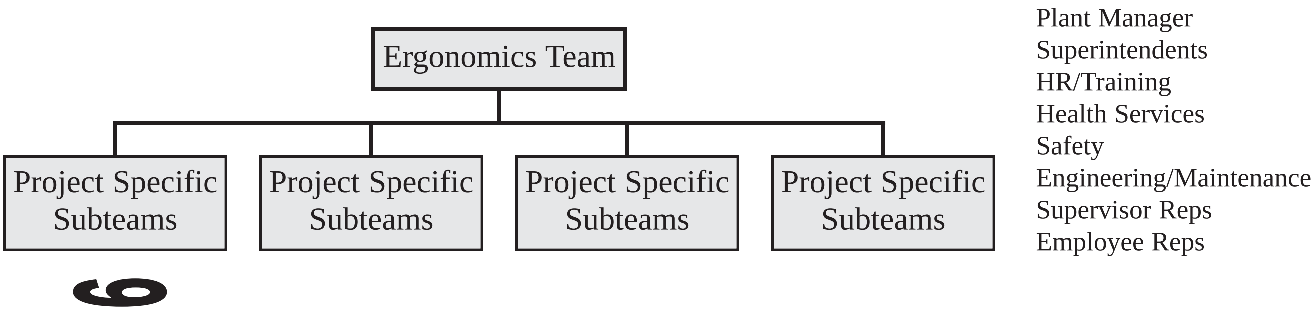
The fourth major program element for an effective ergonomics program is training and education. The purpose of training and education is to ensure that employees are sufficiently informed about the ergonomic hazards to which they may be exposed, so that they are able to participate actively in their own protection. Employees must be adequately trained about the employer's entire ergonomics program.

The full guidelines can be found at *http://www.osha.gov/Publications/osha3123.pdf*.

Appendix D: Team Structures and Activities

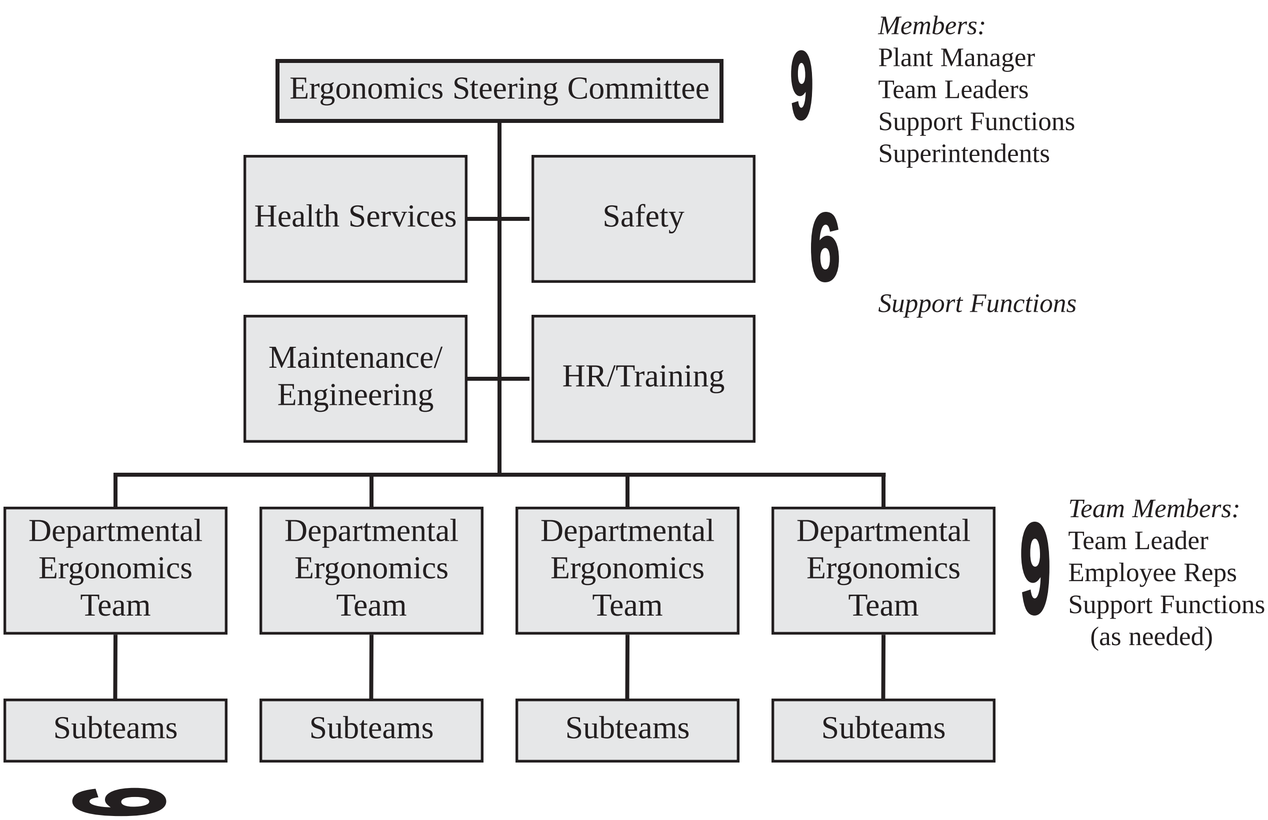
Ergonomics Team Structures

Example 1:



Subteams: Selected operators depending on project
Projects: Issue specific and determined by departmental teams

Example 2:



Subteams: Selected operators depending on project
Projects: Issue specific and determined by departmental teams

Training for the Team

To be effective, the team should be appropriately trained to identify, prioritize, analyze and correct ergonomic hazards or deficiencies in the workplace.

- Suggested training topics include:
- Basic ergonomic principles
- Cumulative trauma disorders and other ergonomic-related problems
- Trends analysis
- Identification and prioritization of ergonomic stressors
- Developing appropriate control measures
- Troubleshooting problematic jobs
- Workplace design criteria

Establishing Subteams

To assist the ergonomics team, subteams can be effective in identifying ergonomic problems, implementing corrective measures, pilot testing control measures, evaluating job methods, etc. It is best to engage employees that work on the job or have some association to the identified problem. Each subteam developed should have a leader or coordinator. It is usually best to appoint a member of the main ergonomics team. Additional staff can be added as appropriate to assist in the efforts (e.g., maintenance, engineering, safety and health, supervisors, etc.).

Emphasize the strengths of these subteams and keep their goals in perspective. Consider the following key points:

- Keep the subteam size manageable.
- Narrow the focus of the team as much as possible.
- Encourage them to pinpoint key areas of concern.
- Work efficiently to achieve established goals.

The subteam leaders should encourage as many ideas as possible in an effort to eliminate or reduce identified concerns. Normally, if the concerned employees have a part in the decision-making process, they are more receptive to any changes made.

Running an Effective Team Meeting

To run an effective team meeting, team leaders should be prepared. Some suggestions for conducting an efficient meeting are shown below:

- Establish an agenda for the meeting ahead of time. Distribute it before the meeting (if possible) to ensure all members come prepared to give an update on their assignments or projects, or to discuss new items.

Suggested agenda topics:

- Prioritized issues:
  - Description of project
  - Project discussion—identified stressors, problems, complaints, etc.
  - Responsible individual(s)
  - Project time table
  - Project status (follow through to completion)

- New items:
  - Discussion of concerns
  - Establish priority and communication of follow-up discussion
  - Make assignments as necessary
- Begin meetings promptly and stick to the agenda.
- Even with an agenda, allow the group to freely exchange ideas when discussing all issues. No ideas are bad ideas. Work together to determine the best solution. Keep in mind that interim solutions may be necessary.
- Document all meetings with minutes. Be sure to keep documentation of all projects, priorities, status and designated project leader.
- Establish timetables and deadlines for all projects.
- Establish time and goals for the next meeting.

Appendix E: Spreadsheets for OSHA 300 Log Trends Analysis

Form 300 Summaries for Back Injuries and MSDs

Number	Case No.	Job Title	Injury Date	Location	Body Part	M-Code 1	M-Code 5	Death	# Days Away	# Transfer/ # Restricted	Other
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
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25											
26											
27											
28											
29											
30											
31											
32											
33											
34											

Form 301 Summaries for Back Injuries and MSDs

Number	Case No.	Age	M/F	Hired	Prior Activity	Description of Incident	Body Part and How Affected	Object/Substance Causing Harm
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
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39								

Appendix F:
Tools for Identifying Ergonomics Concerns

Equipment/Process Safety Assessment Checklist

All new standard, modified and specialized equipment must be evaluated by safety/environmental and approved prior to being placed into production. Modifications to existing machinery also require a safety assessment. The following checklist is to be utilized to evaluate and eliminate hazards. The checklist is generic and may not cover every possible situation. The individual ordering equipment, the supervisor and the safety coordinator are responsible for ensuring that safety and health concerns are addressed before the machine is placed into production in order to prevent employee injury and reduce costs associated with retrofitting machinery with safeguards and controls. The checklist is not considered completed until the pre-start-up review is completed, signed by the supervisor and a member of the safety department, and returned to engineering for filing.

Safety Is a Core Value!

Whenever an item on the machine review document is answered with a response of "no," the safety director/coordinator must document the item/issue in question and note what action will be taken to correct the hazard(s) and by whom such action will be taken before the machinery is placed into production. The information is to be documented in the table found at the end of each section. A member of the safety department and supervisor must sign off on the assessment before the equipment/process is allowed to be placed into production.

______________________	______________________
Date	Individual Initiating Action
______________________	______________________
Plant/Department	RFE Number

Project Description: ____

____

____

1. **Initial Safety Review (initial RFE)** **Date:** ______________________

______________________	______________________
Engineer	Other
______________________	______________________
Safety Department	Environmental

****

2. **Build Review (before leaving shop)** **Date:** ______________________

______________________	______________________
Engineer	Other
______________________	______________________
Safety Department	Environmental

****

3. **Pre-Start-up Review (installation)** **Date:** ______________________

______________________	______________________
Engineer	Other
______________________	______________________
Safety Department	Environmental

****

Upon completion, forward a copy of the completed checklist to facility engineering.

1. ENVIRONMENTAL

YES	NO	
❑	❑	a. Does this project involve the addition or modification of any air emission source or control devices? If yes, have permit applications been filed?
❑	❑	b. Does this permit affect the "potential" to emit regarding air, dust, boiler or waste processes? If yes, has a permit application or review been initiated?
❑	❑	c. Does project generate a new waste stream? If yes, have arrangements been made to handle the new waste?

____

____

____

2. LIFTING DEVICES AND MATERIAL HANDLING

NOTE: This section does not need to be completed if material-handling equipment (cranes, hoists, etc.) are not involved in the installation of new machinery or changes to existing machinery.

YES	NO	N/A	
❑	❑	❑	a. Have crane and hoist systems been approved by a structural engineer?
❑	❑	❑	b. Is the rail/beam labeled with the rated load?
❑	❑	❑	c. Is the hoist labeled with the rated load?
❑	❑	❑	d. Are safety latches provided on all hoist hooks, including the hooks used to attached the hoist to the rail, trolley or structure?
❑	❑	❑	e. Have proof testing inspection tags been assigned?
❑	❑	❑	f. Has the installation of lifting devices been communicated to maintenance and recorded and logged for routine inspections?
❑	❑	❑	g. Have all material handling concerns been addressed (this may include items other than those outlined above)?

Number	Action to be Taken	Assigned to:
________	______________________________	____________
________	______________________________	____________
________	______________________________	____________
________	______________________________	____________

3. FIRE SAFETY

YES	NO	N/A	
❑	❑	❑	a. Is the machinery being placed so that it does not block an egress path, fire extinguisher or fire alarm?
❑	❑	❑	b. If the new machinery requires shutting down a sprinkler system, has this effort been communicated to Factory Mutual and ADT well in advance of the date required?
❑	❑	❑	c. Is the new machinery installed so that it will not interfere with the operation of sprinkler systems?
❑	❑	❑	d. Have process/equipment which create a fire hazard from new materials been eliminated?

Number	Action to be Taken	Assigned to:
________	______________________________	____________
________	______________________________	____________
________	______________________________	____________
________	______________________________	____________

4. INDUSTRIAL HYGIENE

YES	NO	N/A	
❑	❑	❑	a. Has noise exposure been measured? The time-weighted average (TWA) decibel level is _________ decibels. If noise levels are unknown, the safety department must be contacted to perform noise monitoring.
❑	❑	❑	b. If noise monitoring indicated TWA noise levels equal to or greater than 85 decibels, have signs been posted indicating that hearing protection is required?
❑	❑	❑	c. Has a chemical review/approval been completed and MSDS sheets been supplied for any new chemicals used in the process?

YES	NO	N/A	
❑	❑	❑	d. Has air sampling been performed to ensure that dusts, fumes, vapors, gases and mists that result from use of the equipment are below OSHA permissible exposure levels? Has adequate local exhaust ventilation been provided for the control of contaminants?
❑	❑	❑	e. Are bonding and grounding devices available to use during transfer of flammable liquids?
❑	❑	❑	f. Are eye wash stations available and easily accessible where corrosives and other materials that are hazardous to the eyes and skin are used?
❑	❑	❑	g. Have all confined space hazards in the project been addressed and entrance procedures written?
❑	❑	❑	h. Have hazards posed by extremes in temperature (heat/cold) been controlled/eliminated?
❑	❑	❑	i. Have potential hazards posed by lasers/radiation been controlled/eliminated?
❑	❑	❑	j. If necessary, have employees been informed of personal protective equipment requirements (respiratory protection, gloves, face shields, goggles, etc.)?
❑	❑	❑	k. Have all industrial hygiene issues been addressed (this may include items other than those outlined above)?

Number	Action to be Taken	Assigned to:

5. LOCKOUT/TAGOUT

YES	NO	N/A	
❑	❑	❑	a. Is the main power disconnect capable of being padlocked in the off position (or unplugged when not 3-phase) and located within 50 feet of the equipment?
❑	❑	❑	b. Are all supply valves (air, hydraulic, steam, etc.) capable of being locked out and handles provided with a means for locking out? Are valves that automatically bleed downstream air installed?
❑	❑	❑	c. Has a machine-specific lockout/tagout procedure been developed, documented and posted at the machine that outlines the specific steps for the isolation of the machinery from its energy sources, the release of any stored energies, and the steps necessary to verify that the machinery is effectively locked out?
❑	❑	❑	d. Have electrical disconnects and shut-off valves used in lockout/tagout procedures been identified by tags and referenced in machine-specific procedures when their location is not immediately obvious?
❑	❑	❑	e. Have all lockout issues been addressed (this may include training and written operating procedures)

Number	Action to be Taken	Assigned to:

6. ERGONOMICS

YES	NO	N/A	
❑	❑	❑	a. Have material handling equipment and mechanical lifting equipment been provided to eliminate or reduce: highly repetitive tasks, heavy lifting greater than 40 pounds, excessive reaching, bending, twisting, etc.?
❑	❑	❑	b. Is proper working height achieved by adjustability of standing platforms, use of lift tables, adjustable chairs, etc., where possible?
❑	❑	❑	c. Are twisting motions minimized by the use of conveyors or turntables, or by providing enough room for the employee to turn his or her whole body?
❑	❑	❑	d. Is the work station designed so tools and machine controls are close to the station and designed to allow the worker to handle material close to the body?

❑ ❑ ❑ e. Has work with the hands or elbows at or above shoulder level been minimized? Is the job designed to allow work to be performed near the elbow height range of most workers (40-43.5 inches, precision work requires elbow heights slightly above this range, while heavy lifting is 4-8 inches below this range)?

❑ ❑ ❑ f. Have repetitive and forceful hand and wrist movements been minimized?

❑ ❑ ❑ g. Have static postures been minimized and are anti-fatigue mats provided for employees standing for extended periods of time?

❑ ❑ ❑ h. Have the tasks been designed so the hand is not used as a tool (using the hand as a hammer or vise)?

❑ ❑ ❑ i. Are tasks and hand tools designed to allow the use of a power grip as opposed to a pinch grip?

Number	Action to be Taken	Assigned to:
________	________________________________	______________
________	________________________________	______________
________	________________________________	______________
________	________________________________	______________

7. MACHINE GUARDING

YES NO N/A

❑ ❑ ❑ a. Are in-running nip joints, pinch points, rotating shafts, flywheels, chains, chain dives, sprockets, gears, belts, ropes and pulleys guarded?

❑ ❑ ❑ b. Are point of operation guards (cutting, milling, shearing, bending, shaping, boring, pressing operations, etc.) guarded?

❑ ❑ ❑ c. Have sharp corners on equipment been eliminated or guarded?

❑ ❑ ❑ d. Are signs posted warning of identified hazards (see hazards noted in 1)?

❑ ❑ ❑ e. Are interlocked guards installed so that machinery does not automatically restart when the guards are replaced?

❑ ❑ ❑ f. Is machinery designed for a fixed location securely anchored?

❑ ❑ ❑ g. Are controls provided on each machine for the operator to cut the power from each machine without leaving his or her position at the point of operation emergency-stops, safety cables, etc.)?

❑ ❑ ❑ h. Have provisions been made to prevent machines from automatically restarting upon restoration of power?

❑ ❑ ❑ i. Are two-hand controls and two-hand trips protected (ring guards) against unintended operation and are they arranged to require the use of both hands concurrently?

❑ ❑ ❑ j. Where two-hand controls/two-hand trips are used on machinery with more than one operator, is such machinery provided with a separate set of controls for each operator?

Number	Action to be Taken	Assigned to:
________	________________________________	______________
________	________________________________	______________
________	________________________________	______________
________	________________________________	______________

8. GENERAL SAFETY COMPLIANCE

YES NO

❑ ❑ a. Has compliance with all OSHA, NIOSH and ANSI regulations that would affect this process been considered?

Job Safety Analysis Checklist

This checklist is designed for use during the surveillance of the job task or workstation being analyzed.

Job:	**Department:**	
Job Description:	**Analyzed by:**	
	Date:	**Number of Employees Affected:**
Line Speed (pieces/min):	**Rotation Schedule:**	

Workstation:

___ 1. Are employees resting body parts against sharp edges (tables/benches/etc.)?
___ 2. Is workstation correct height for employee?
___ 3. Can tools be moved around in workplace?
___ 4. Can the work surface height be adjusted vertically?
___ 5. Can fixtures be tilted or rotated?
___ 6. What is the employee standing on? ________________ (grate/mat/concrete floor)
___ 7. Is the floor or platform slippery?
___ 8. Level of lighting/glare

Postural:

___ 1. Can the worker change postures? (sit-to-stand or stand-to-sit)
___ 2. What are the maximum reach distances in inches? Vertical _____ Horizontal ______

Power Tools:

___ 1. What tools does the employee use? ______________________________________
___ 2. Type: Reciprocating or vibrating ____________ Torque _____ Other ____________________
___ 3. What is the weight of the tool?__________ lbs Is the weight appropriate for the employee?
___ 4. Size of the handle: Span ______ inches, length ______ inches, material _____________ Is the size appropriate for the employee?
___ 5. What is the source of power? _____________ (air, electric)
___ 6. If air, is the exhaust away from the hand?
___ 7. Is the tool counterbalanced?
___ 8. Type of grip (pistol/in-line)________________

Manual or Hand Tools:

___ 1. What hand tool(s) does the employee use? ______________________________________
___ 2. What is the weight of the tool? _________ lbs Is the weight appropriate for the employee?
___ 3. Size of the handle: span ______inches, length ______inches, material _____________ Is the size appropriate for the employee?
___ 4. Is there a place for the tool in the workplace? (holster/fixture/etc.)
___ 5. Is it placed a safe distance from worker?
___ 6. Is the tool evenly balanced?

Miscellaneous

___ 1. Are other objects or materials handled?
___ 2. What are they and what do they weigh? Item(s) _____________________________ Weight ________ lbs.
___ 3. What is the temperature of the work environment? _________ degrees (C/F)
___ 4. What personal protective equipment is used? _______________ (e.g., gloves/hard hat/apron)
___ 5. Can worker stop or control the line speed?
___ 6. Are there opportunities for micro pauses? If so, how many seconds? _________________
___ 7. Estimate exertion or effort required to do the job. 1=low, 5=high

Other:

___ 1. Are there other safety concerns in work area? ______________________________________
___ 2. Has responsibility for this concern been assigned? If so, to whom? ________________
___ 3. Accessibility of emergency stops

Job Task Analysis Worksheet

Job: ______________________ **Department:** ______________________

Analysis performed by: ____

Start Date: ______________________ **Completion Date:** ______________________

Sequence of Steps:

1. ______________________
____
2. ______________________
____
3. ______________________
____
4. ______________________
____
5. ______________________
____
6. ______________________
____
7. ______________________
____
8. ______________________
____
9. ______________________
____
10. ______________________
____

Potential Accidents, Hazards or Ergonomic Stressors	Preventive Measures

Add additional pages as needed.

Task Analysis Checklist

Negative responses indicate potential problem areas that should receive further investigation.

Job: ______________________________ **Department:** ______________________

Analysis performed by: ____

Start Date: ___________________________ **Completion Date:** ____________________

1. Does the design of the primary task reduce or eliminate:		
bending or twisting of the back or trunk?	❑ Yes	❑ No
crouching?	❑ Yes	❑ No
bending or twisting the wrist?	❑ Yes	❑ No
extending the arms?	❑ Yes	❑ No
raised elbows?	❑ Yes	❑ No
static muscle loading?	❑ Yes	❑ No
clothes wringing motions?	❑ Yes	❑ No
finger pinch grip?	❑ Yes	❑ No
2. Are mechanical devices used when necessary?	❑ Yes	❑ No
3. Can the task be done with either hand?	❑ Yes	❑ No
4. Can the task be done with two hands?	❑ Yes	❑ No
5. Are pushing or pulling forces kept minimal?	❑ Yes	❑ No
6. Are required forces judged acceptable by the workers?	❑ Yes	❑ No
7. Are the materials:		
able to be held without slipping?	❑ Yes	❑ No
easy to grasp?	❑ Yes	❑ No
free from sharp edges and corners?	❑ Yes	❑ No
8. Do containers have good handholds?	❑ Yes	❑ No
9. Are jigs, fixtures and vises used where needed?	❑ Yes	❑ No
10. As needed, do gloves fit properly and are they made of the proper fabric?	❑ Yes	❑ No
11. Does the worker avoid contact with sharp edges when performing the task?	❑ Yes	❑ No
12. When needed, are push buttons designed properly?	❑ Yes	❑ No
13. Do the job tasks allow for ready use of personal equipment that may be required?	❑ Yes	❑ No
14. Are high rates of repetitive motion avoided by:		
job rotation?	❑ Yes	❑ No
self-pacing?	❑ Yes	❑ No
sufficient pauses?	❑ Yes	❑ No
adjusting the job skill level of the worker?	❑ Yes	❑ No
15. Is the employee trained in:		
proper work practices?	❑ Yes	❑ No
when and how to make adjustments?	❑ Yes	❑ No
recognizing signs and symptoms of potential problems?	❑ Yes	❑ No

Workstation Checklist

Negative responses indicate potential problem areas that should receive further investigation.

Job: ________________________________ **Department:** __________________________

Analysis performed by: ____

Start Date: ______________________________ **Completion Date:** ______________________

1. Does the workspace allow for full range of movement? ❑ Yes ❑ No
2. Are mechanical aids and equipment available? ❑ Yes ❑ No
3. Is the height of the work surface adjustable? ❑ Yes ❑ No
4. Can the work surface be tilted or angled? ❑ Yes ❑ No
5. Is the workstation designed to reduce or eliminate:
   - bending or twisting at the wrist? ❑ Yes ❑ No
   - reaching above the shoulder? ❑ Yes ❑ No
   - static muscle loading? ❑ Yes ❑ No
   - full extension of the arms? ❑ Yes ❑ No
   - raised elbows? ❑ Yes ❑ No
6. Are the workers able to vary posture? ❑ Yes ❑ No
7. Are the hands and arms free from sharp edges on work surfaces? ❑ Yes ❑ No
8. Is an armrest provided where needed? ❑ Yes ❑ No
9. Is a footrest provided where needed? ❑ Yes ❑ No
10. Is the floor surface flat and free of obstacles? ❑ Yes ❑ No
11. Are cushioned floor mats provided for employees required to stand for long periods? ❑ Yes ❑ No
12. Are chairs or stools easily adjustable and suited to the task? ❑ Yes ❑ No
13. Are all task elements visible from comfortable positions? ❑ Yes ❑ No
14. Is there a preventive maintenance program for mechanical aids, tools and other equipment? ❑ Yes ❑ No

Materials Handling Checklist

Negative responses indicate potential problem areas that should receive further investigation.

Job: ______________________ **Department:** ______________________

Analysis performed by: ____

Start Date: ______________________ **Completion Date:** ______________________

1. Are the weights of loads to be lifted judged acceptable by the workforce? ❑ Yes ❑ No
2. Are materials moved over minimum distances? ❑ Yes ❑ No
3. Is the distance between the object load and the body minimized? ❑ Yes ❑ No
4. Are the walking surfaces:
   - level? ❑ Yes ❑ No
   - wide enough? ❑ Yes ❑ No
   - clean and dry? ❑ Yes ❑ No
5. Are objects:
   - easy to grasp? ❑ Yes ❑ No
   - stable? ❑ Yes ❑ No
   - able to be held without slipping? ❑ Yes ❑ No
6. Are there handholds on these objects? ❑ Yes ❑ No
7. When required, do gloves fit properly? ❑ Yes ❑ No
8. Is the proper footwear worn? ❑ Yes ❑ No
9. Is there enough room to maneuver? ❑ Yes ❑ No
10. Are mechanical aids used whenever possible? ❑ Yes ❑ No
11. Are working surfaces adjustable to the best handling heights? ❑ Yes ❑ No
12. Does material handling avoid:
    - movements below the knuckle height and above shoulder height? ❑ Yes ❑ No
    - static muscle loading? ❑ Yes ❑ No
    - sudden movements during handling? ❑ Yes ❑ No
    - twisting at the waist? ❑ Yes ❑ No
    - extended reaching? ❑ Yes ❑ No
13. Is help available for heavy or awkward lifts? ❑ Yes ❑ No
14. Are high rates of repetition avoided by:
    - job rotation? ❑ Yes ❑ No
    - self-pacing? ❑ Yes ❑ No
    - sufficient pauses? ❑ Yes ❑ No
15. Are pushing or pulling forces reduced or eliminated? ❑ Yes ❑ No
16. Does the employee have an unobstructed view of handling the task? ❑ Yes ❑ No
17. Is there a preventive maintenance program for equipment? ❑ Yes ❑ No
18. Are workers trained in correct handling and lifting procedures? ❑ Yes ❑ No

Hand Tool Analysis Checklist

Negative responses indicate potential problem areas that should receive further investigation.

Job: ______________________ **Department:** ______________________

Analysis performed by: ______________________________________

Start Date: ______________________ **Completion Date:** ______________________

1. Are tools selected to limit or minimize:
   - exposure to excessive vibration? ❑ Yes ❑ No
   - use of excessive force? ❑ Yes ❑ No
   - bending or twisting the wrist? ❑ Yes ❑ No
   - finger pinch grip? ❑ Yes ❑ No
   - problems associated with trigger finger? ❑ Yes ❑ No
2. Are tools powered where necessary and feasible? ❑ Yes ❑ No
3. Are tools evenly balanced? ❑ Yes ❑ No
4. Are heavy tools suspended or counterbalanced in ways to facilitate use? ❑ Yes ❑ No
5. Does the tool allow adequate visibility of work? ❑ Yes ❑ No
6. Does the tool grip/handle prevent slipping during use? ❑ Yes ❑ No
7. Are tools equipped with handles of textured, nonconductive material? ❑ Yes ❑ No
8. Are different handle sizes available to fit a wide range of hand sizes? ❑ Yes ❑ No
9. Is the tool handle designed not to dig into the palm of hand? ❑ Yes ❑ No
10. Can the tool be used safely with gloves? ❑ Yes ❑ No
11. Can the tool be used in either hand? ❑ Yes ❑ No
12. Is there a preventive maintenance program to keep tools operating as designed? ❑ Yes ❑ No
13. Have employees been trained:
    - in the proper use of tools? ❑ Yes ❑ No
    - when and how to report problems with tools? ❑ Yes ❑ No
    - in proper tool maintenance? ❑ Yes ❑ No

Ergonomic Assessment/Intervention Report

Office/Plant Environment

Name:	**Plant:**
Dept.:	**Job Title:**
Shift:	**Date:**

Location: ❑ Office ❑ Plant ❑ Vehicle

Reason(s) for Assessment (Check all that apply.)

❑ Fingers/Hand ❑ Shoulder/Neck ❑ Hips ❑ Wrist

❑ Upper Back ❑ Leg/Knee ❑ Elbow/Arm ❑ Lower Back

Fully Describe Employee's Concern

Assessment of Work Area

C = Correct, I = Improvement Needed, NA = Not Applicable

Office

Chair:	Height	Lumbar	Arm Support	
Desk:	Height	Storage		
Keyboard:	Height	Mouse Support	Wrist Support	
Monitor:	Height	Distance	Glare	Document Holder
Telephone:	Location	Headset		
Leg/Feet:	Foot Support	Obstacles		
Posture:	Bending	Reaching	Repetitive	
	Static	Gripping/Pinching	Lifting	
	Neutral	Stretch Breaks	Alter Tasks	

<table>
<tr><th colspan="31">Plant</th></tr>
<tr><td>Position:</td><td colspan="15">Sitting</td><td colspan="15">Standing</td></tr>
<tr><td>Chair:</td><td colspan="10">Height</td><td colspan="10">Lumbar</td><td colspan="10">Arm Support</td></tr>
<tr><td>Desk:</td><td colspan="15">Height</td><td colspan="15">Storage</td></tr>
<tr><td>Table:</td><td colspan="10">Height</td><td colspan="10">Storage</td><td colspan="10">Tilt</td></tr>
<tr><td>Telephone:</td><td colspan="15">Height</td><td colspan="15">Reaching</td></tr>
<tr><td>Material Handling:</td><td colspan="10">Height</td><td colspan="10">Adjustment</td><td colspan="10">Weight</td></tr>
<tr><td>Hand Tool:</td><td colspan="6">Size</td><td colspan="6">Weight</td><td colspan="6">Vibration</td><td colspan="6">Temperature</td><td colspan="6">Storage</td></tr>
<tr><td>Machine:</td><td colspan="10">Height</td><td colspan="10">Speed</td><td colspan="10">Control Position</td></tr>
<tr><td rowspan="4">Posture:</td><td colspan="10">Bending</td><td colspan="10">Reaching</td><td colspan="10">Repetitive</td></tr>
<tr><td colspan="10">Static</td><td colspan="10">Gripping/Pinching</td><td colspan="10">Pulling</td></tr>
<tr><td colspan="10">Lifting</td><td colspan="10">Sliding</td><td colspan="10">Neutral</td></tr>
<tr><td colspan="15">Stretch Breaks</td><td colspan="15">Job Rotation</td></tr>
<tr><th colspan="31">Describe Specific Recommendations for Improvement:</th></tr>
<tr><td colspan="31"></td></tr>
<tr><th colspan="31">State Actions Taken With Date Completed:</th></tr>
<tr><td colspan="31"></td></tr>
<tr><th colspan="31">Assessment Completed by:</th></tr>
<tr><td colspan="16">Name:</td><td colspan="15">Date:</td></tr>
</table>

Additional Tools for Workplace Analysis

Tool:	**Job Strain Index** Moore, J.S., and A. Garg. 1995. The Strain Index? A proposed method to analyze jobs for risk of distal upper extremity disorders. *AIHA Journal* 56(5): 443–458.	**Source:**	Obtain a copy from: American Industrial Hygienists Association 2700 Prosperity Avenue Suite 250 Fairfax, VA 22031 Phone: (703) 849-8888 Web site: http://www.aiha.org/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Hands • Wrists

Examples of Jobs Where Tool Applies:

- Data processing
- Hand rubbing
- Inspecting
- Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly
- Keyboarding
- Machine rubbing
- Manual cushion stuffing
- Marking and cutting fabric and leather
- Packaging
- Sewing
- Small parts assembly
- Spray operators
- Spring-up
- Upholsterers
- Veneering

Tool:	**ACGIH® Hand Activity Level (HAL)** American Conference of Governmental Industrial Hygienists (ACGIH). 2001 Threshold Limit Values for Physical Agents in the Work Environment, *2001 TLVs® and BEIs® Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*	**Source:**	Obtain a copy from: American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Drive Cincinnati, OH 45240 Phone: (513) 742-2020 Web site: http://www.acgih.org/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Hands • Wrists • Forearm

Examples of Jobs Where Tool Applies:

- Data processing
- Hand rubbing
- Inspecting
- Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly
- Keyboarding
- Machine rubbing
- Manual cushion stuffing
- Marking and cutting fabric and leather
- Packaging
- Sewing
- Small parts assembly
- Spray operators
- Spring-up
- Upholsterers
- Veneering

Tool:	**Revised NIOSH Lifting Equation** Waters, T.R., V. Putz-Anderson, and A. Garg. 1994. *Applications Manual for the Revised NIOSH Lifting Equation*, National Institute for Occupational Safety and Health (DHHS, NIOSH Publication No. 94-110).	**Source:**	Obtain a copy from: U.S. Department of Commerce Technology Administration National Technical Information Service (NTIS) 5285 Port Royal Road Springfield, VA 22161 (NTIS Publication No. PB94-176930) Phone: (703) 605-6040 Web site: http://www.cdc.gov/niosh/topics/ergonomics/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Lower back

Examples of Jobs Where Tool Applies:

- Assembly work
- Hand trucks
- Manual assembly rotation
- Manual handling—lifting weights greater than 10 lbs.
- Package delivery
- Production jobs involving forceful exertions
- Repetitive parts handling in machine, cabinet and sanding rooms
- Stationary lifting
- Warehouse and shipping

Tool:	**Snook Push/Pull Hazard Tables** Snook, S.H. and V.M. Cirello. 1991. The design of manual handling tasks: Revised tables of maximum acceptable weights and forces. *Ergonomics*, 34(9):1197-1213.	**Source:**	Obtain a copy from: Taylor & Francis Group—Journals 325 Chestnut St. Suite 800 Philadelphia, PA 19106 Phone: (800) 354-1420/(215) 625-8914 Web Site: http://www.tandf.co.uk/journals/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Back • Trunk • Shoulders • Legs

Examples of Jobs Where Tool Applies:

- Housekeeping
- Jobs involving pushing/pulling; e.g., factory trucks and tow boys
- Package delivery
- Pushing frames and sub-assembly

Tool:	**Rapid Upper Limb Assessment (RULA)** McAtamney, L., and E.N. Corlet. 1993. RULA: A survey method for the investigation of work-welated upper limb disorders. *Applied Ergonomics*. 24(2):91–99.	**Source:**	Obtain a copy from: Elsevier Science Regional Sales Office Customer Support Department P.O. Box 945 New York, NY 10159 Phone: (212) 633-3980 Web site: http://www.elsevier.com/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Wrists • Forearms • Elbows • Shoulders • Neck • Trunk

Examples of Jobs Where Tool Applies:

• Data processing • Distressing • Hand rubbing • Inspecting • Janitorial services	• Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly • Keyboarding • Machine room off-bearer • Machine rubbing	• Maintenance • Manual cushion stuffing • Marking and cutting fabric and leather • Packaging • Sewing	• Small parts assembly • Spray operators • Spring-up • Upholsterers • Veneering • Warehousing

Tool:	**Rapid Entire Body Assessment (REBA)** Hignett, S., and L. McAtamney. 2000. Rapid Entire Body Assessment (REBA). *Applied Ergonomics*. 31:201–205.	**Source:**	Obtain a copy from: Elsevier Science Regional Sales Office Customer Support Department P.O. Box 945 New York, NY 10159 Phone: (212) 633-3980 Web site: http://www.elsevier.com/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures	**Areas of Body Addressed:**	• Wrists • Forearms • Elbows • Shoulders • Neck • Trunk

Examples of Jobs Where Tool Applies:

• Data processing • Distressing • Hand rubbing • Housekeeping • Inspecting • Janitorial services	• Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly • Keyboarding • Machine room off-bearer • Machine rubbing • Maintenance	• Manual cushion stuffing • Marking and cutting fabric and leather • Packaging • Quality contro inspectors • Sewing	• Small parts assembly • Spray operators • Spring-up • Upholsterers • Veneering • Warehousing

<table>
<tr><td>Tool:</td><td>ACGIH® Hand/Arm (Segmental) Vibration TLV

American Conference of Governmental Industrial Hygienists (ACGIH). 2001 Threshold Limit Values for Physical Agents in the Work Environment. 2001 TLVs® and BEIs® Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.</td><td>Source:</td><td>Obtain a copy from:
American Conference of Governmental Industrial Hygienists
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Phone: (513) 742-2020
Web site: http://www.acgih.org/</td></tr>
<tr><td>Risk Factors Evaluated:</td><td>• Vibration</td><td>Areas of Body Addressed:</td><td>• Hands
• Arms
• Shoulders</td></tr>
<tr><td colspan="4">Examples of Jobs Where Tool Applies:</td></tr>
<tr><td>• Chain sawing
• Distressing
• Drilling
• Grinding</td><td>• Hand carving
• Jigsawing
• Machine rubbing</td><td>• Production work using vibrating or power hand tools</td><td>• Regular use of vibrating hand tools
• Sanding
• Sawing</td></tr>
</table>

<table>
<tr><td>Tool:</td><td>GM-UAW Risk Factor Checklist

United Auto Workers-General Motors Center for Human Resources, Health and Safety Center. 1998. UAW-GM Ergonomics Risk Factor Checklist RFC2.</td><td>Source:</td><td>Obtain a copy from:
UAW-GM Center for Human Resources Health and Safety Center
1030 Doris Road
Auburn Hills, MI 48326</td></tr>
<tr><td>Risk Factors Evaluated:</td><td>• Repetition
• Force
• Awkward postures
• Contact stress
• Vibration</td><td>Areas of Body Addressed:</td><td>• Hands
• Wrists
• Forearms
• Elbows
• Shoulders
• Neck
• Trunk
• Back
• Legs
• Knees</td></tr>
<tr><td colspan="4">Examples of Jobs Where Tool Applies:</td></tr>
<tr><td>• Assembly work
• Data processing
• Distressing
• Hand rubbing
• Housekeeping
• Inspecting
• Janitorial services</td><td>• Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly
• Keyboarding
• Machine room off-bearer
• Machine rubbing
• Maintenance
• Manual cushion stuffing</td><td>• Marking and cutting fabric and leather
• Packaging
• Production work
• Quality control inspectors
• Sewing
• Small parts assembly</td><td>• Spray operators
• Spring-up
• Upholsterers
• Veneering
• Vibrating hand tools
• Warehousing</td></tr>
</table>

Tool:	**Washington State Appendix B** Washington State Department of Labor and Industries. 2000. *Appendix B: Criteria for Analyzing and Reducing WMSD Hazards for Employers Who Choose the Specific Performance Approach*. WAC 296-62-05174.	**Source:**	Obtain a copy from: Washington Department of Labor and Industries P.O. Box 44851 Olympia, WA 98504-4851 Phone: (360) 902-5799 Web site: http://www.lni.wa.gov/wisha/ergo/
Risk Factors Evaluated:	• Repetition • Force • Awkward postures • Contact stress • Vibration	**Areas of Body Addressed:**	• Hands • Wrists • Forearms • Elbows • Shoulders • Neck • Trunk • Back • Legs • Knees
Examples of Jobs Where Tool Applies:			
• Assembly work • Data processing • Distressing • Hand rubbing • Housekeeping • Inspecting • Janitorial services	• Jobs involving highly repetitive motions; e.g., knock-up, sub-assembly • Keyboarding • Machine room off-bearer • Machine rubbing • Maintenance • Manual cushion stuffing	• Marking and cutting fabric and leather • Packaging • Production work • Quality control inspectors • Regular use of vibrating hand tools	• Sewing • Small parts assembly • Spray operators • Spring-up • Upholsterers • Veneering • Warehousing

NIOSH Lifting Equation

The NIOSH lifting equation was developed to help industry combat back injury problems by providing a quantitative model that can identify problem jobs before they cause an injury and also show areas for potential improvements. This is a brief summary of the technique. If planning to use the equation, it is recommended that the evaluator refer to the NIOSH publication *Application Manual for the Revised NIOSH Lifting Equation* (Publication No. 94-110).

Basic Concept

1. Start with the maximum weight that can be lifted under ideal conditions (51 pounds) and reduce that ideal weight as the working environment moves away from these ideal conditions.
2. The recommended weight limit (RWL) is calculated based on the characteristics of the lifting task.
3. An RWL is calculated at the beginning of the lift (where the person picks up the load) and at the end of the lift (where the person sets down the load). The lesser of these two values is the overall RWL for the task.
4. The technique requires that the analyst gather some basic dimensional information about the lifting task. This includes a measurement of the:
   a. horizontal distance from the center of the load to the midpoint between the ankles (for example, if the person must reach out 18 inches to grasp the item)
   b. vertical distance from the ground to the center of the hand (for example, if the person must bend down to a position so the hands are 4 inches above the ground)
   c. amount of “twist” required in the lifting/lowering position (for example, if the person must twist 45 degrees to pick up the box)
   d. vertical distance that the load travels (for example, if the person lifts the box 12 inches)
   e. frequency of lifting (for example, if the person lifts the item once every two minutes)
   f. the quality of handles/hand holds (for example, if the box has well-designed cut-outs for easy lifting).

1991 Revised Lifting Guide Equation (1993)

$RWL(lbs) = 51 \times HM \times VM \times DM \times FM \times AM \times CM$

$HM = (10/H)$

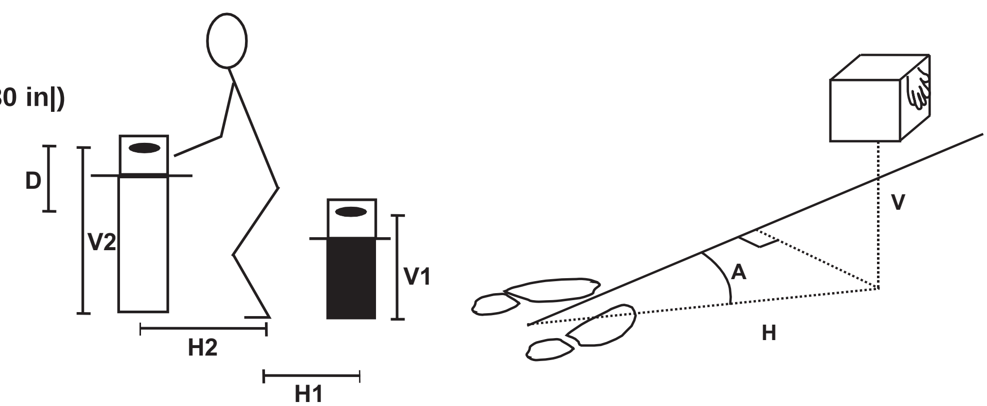
$VM = 1 - (.0075 \times |V - 30\text{ in}|)$

$DM = (.82 + 1.8/D)$

FM = (From Table)

$AM = (1 - .0032A)$

CM = (From Table)



5. One of the strengths of this approach is that it gives some guidance as to how the workplace can be reconfigured to improve the lifting tasks. Simply look for the smallest factors and see if these factors can be increased by improving the arrangement of the lifting task (location of the load, reduce frequency of lift, etc.).

A NIOSH Lifting Equation Example

Workplace Measurements

Horizontal distance	H_{BEG}	= 18"	H_{END}	= 15"
Vertical distance	V_{BEG}	= 18"	V_{END}	= 40"
Distance (vertical) traveled	D_{BEG}	= 22"	D_{END}	= 22"
Asymmetry	A_{BEG}	= 0°	A_{END}	= 45°
Frequency of lift (lifts/min)	F	= 2/minute		
Coupling quality	C	= poor		
Box weight		= 25 lbs		

Solution

Starting Position

RWL_{BEG} = LC x HM x VM x DM x AM x FM x CM

HM = 10/H	**HM**= 10/18	**HM** = .5556
VM = 1 – (.0075 x |V – 30|)	**VM** = 1 – (.0075 x |18 – 30|)	**VM** = .9100
DM = .82 + (1.8/D)	**DM** = .82 + (1.8/22)	**DM** = .9018
AM = 1 – (.0032 x A)	**AM** = 1 – (.0032 x 0)	**AM** = 1.0
FM = .6500 (From Table)		
CM = .9000 (From Table)		

RWL_{BEG} = 51 x .5556 x .9100 x .9018 x 1.0 x .6500 x .9000
RWL_{BEG} = 13.61 lbs

Ending Position

RWL_{END} = LC x HM x VM x DM x AM x FM x CM

HM = 10/H	**HM** = 10/15	**HM** = .6667
VM = 1 – (.0075 x |V – 30|)	**VM** = 1 – (.0075 x |40 – 30|)	**VM** = .925
DM = .82 + (1.8/D)	**DM** = .82 + (1.8/22)	**DM** = .9018
AM = 1 – (.0032 x A)	**AM** = 1 – (.0032 x 45)	**AM** = .8560
FM = .6500 (From Table)		
CM = .9000 (From Table)		

RWL_{END} = 51 x .6667 x .925 x .9018 x .8560 x .6500 x .9000
RWL_{END} = 14.20 lbs

$RWL_{BEG} < RWL_{END}$ therefore the RWL for the task is 13.6 pounds

Since the person is asked to lift 25 pounds the ratio of the actual to the recommended is 25/13.6 = 1.84 and this is called the lifting index.

Interpretation

In this particular task it looks like the HM in at the beginning of the lift is the smallest value therefore is having the greatest impact on the challenge posed by this task. The analyst should look to see if the task could be redesigned to move the load closer to the person to reduce this stress at the beginning of the lift. Similar kinds of analyses can be performed on the other factors to further reduce the risks.

Appendix G:
Engineering Controls for the Furniture Manufacturing Industry

Ergonomic Intervention

Name: **Fabric Picking Tongs**

Primary Task: Fabric cutting

Description: These tongs are designed to extend the reach of the operator, thereby reducing the awkwardness of the posture of the shoulder and low back. These tongs were originally designed to work on a automated fabric cutter but could have applications in a number of areas where people are reaching for fabric.

Task Description

BEFORE

In order the get the pieces of fabric in the middle of the cutting bed, the operators often had to achieve extremely awkward postures of the shoulder and low back.

AFTER

The tongs extended the reach of the operator by up to 8 inches, which had the effect of significantly improving shoulder and back postures during this activity.

Ergonomic Impact: This control reduced the stresses on shoulders, back and arms from over-reaching. “In a year and a half OSHA Strains/Sprains in the Cutting Department were reduced 59 percent and workers’ compensation costs were reduced 67 percent.”

Special Points of Interest: The tongs should be lightweight and the ends should hold the material well.

Estimated Cost to Purchase or Manufacture: Purchase for $3.

Ergonomic Intervention

Name: **Random Orbital Sander Interface**

Primary Task: Hand sanding

Description: The operator wears a glove that has vibration-absorbing material in the palm. This glove is secured to the sander by means of a harness system that wraps around the circumference of the sander motor.

Task Description

BEFORE

Using the random orbital sander required a static gripping force on a vibrating hand tool.

AFTER

The glove reduces the amount of vibration reaching the operator, and the harness system eliminates the need for the continuous gripping force.

Ergonomic Impact: Relieves stress and fatigue on the wrist and forearm.

Special Points of Interest: The nature of the harness system requires that an additional valve be placed in the hose for speed control. The harness system is also a bit cumbersome to take off and put on. Best results have been found for those individuals who spend more than 90 percent of their time hand sanding.

Estimated Cost to Purchase or Manufacture: Manufacture for $40.

Ergonomic Intervention

Name: **Spring-Loaded Material Handling Cart**

Primary Task: Movement and holding of components for processing

Description: Weight-calibrated springs are integrated into the cart mechanism that raises the components on the cart surface to a better position.

Task Description

BEFORE

Employees reached down to lift components to their workstation/machine.

AFTER

Spring-loaded mechanism keeps the parts in a more accessible position for retrieval.

Ergonomic Impact: Reduces the opportunity for back injury due to excessive bending and lifting parts off of the cart.

Special Points of Interest: These spring-loaded tables can be custom built and placed in virtually any cart system.

Estimated Cost to Purchase or Manufacture: Purchase for $100.

Ergonomic Intervention

Name: **Fabric Tub Cart Extension**

Primary Task: Various areas in upholstery operations

Description: Legs on fabric tub carts are lengthened to raise height of fabric tub to reduce repetitive bending of the trunk.

	
Task Description **BEFORE** Employees reached down into fabric tubs to retrieve fabric.	**AFTER** Employees have fabric at a comfortable working height.

Ergonomic Impact: Reduction of risk from back and shoulder injuries by removing need to reach down into fabric tub.

Special Points of Interest: Maintenance employees or welding shop can add extensions to cart legs.

Estimated Cost to Purchase or Manufacture: $100 materials and labor.

Ergonomic Intervention

Name: **Sewing Machine Table Tilt Legs**

Primary Task: Sewing

Description: Legs adjust to allow surface of table to tilt towards operator to improve operator posture.

<table>
<tr><td></td><td></td></tr>
<tr><td>Task Description

BEFORE
Operators spent a great deal of their time bent over the sewing workstation looking down at the work pieces.</td><td>AFTER
The new adjustable workstation allows the worker to maintain a more upright and neutral posture of the whole spine, but particularly the upper back and neck.</td></tr>
</table>

Ergonomic Impact: This adjustability reduces stresses and poor postures on the operator's back and shoulder.

Special Points of Interest: It very is important to train operators how to adjust the tables.

Estimated Cost to Purchase or Manufacture: Purchase for $100.

Ergonomic Intervention

Name: **Wood Parts Containers**

Primary Task: Parts storage for upholstery frame building

Description: The wood parts container has drop down sides to reduce bending and reaching to obtain components.

	
Task Description **BEFORE** Frame builders reached down into the cardboard boxes to retrieve the components needed for building the frames.	**AFTER** Frame builders can remove the sides of the containers to reduce the awkward postures of the low back when retrieving the components.

Ergonomic Impact: This adjustability reduces stresses and poor postures on the frame builders' backs.

Special Points of Interest: These containers stack together making an organized and safe storage of parts. The containers are moved by forklift instead of by employees.

Estimated Cost to Purchase or Manufacture: Purchase for $126.

Ergonomic Intervention

Name: **Spring-Loaded Fabric Buggy**

Primary Task: Transport and acquisition of rolls of fabric

Description: Weight-calibrated springs are integrated into the cart mechanism that raises the rolls of fabric for easy lifting.

Task Description

BEFORE

The operator bent down into the fabric buggy (often to 6-8 inches from the ground) and lifted the roll of fabric to the shoulder level.

AFTER

The spring-loaded system raises the fabric to near waist level to reduce the awkward posture of the low back.

Ergonomic Impact: Reduces the opportunity for back injury due to excessive bending and lift heavy fabric rolls off of the buggy. Also reduces shoulder stress.

Special Points of Interest: These spring-loaded systems can be custom built and placed in virtually any cart system.

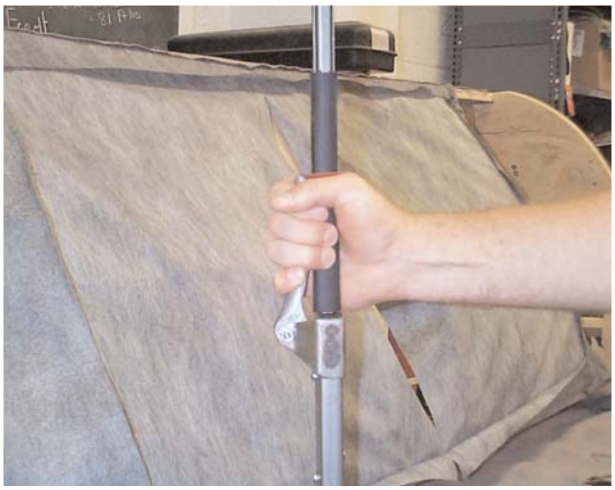
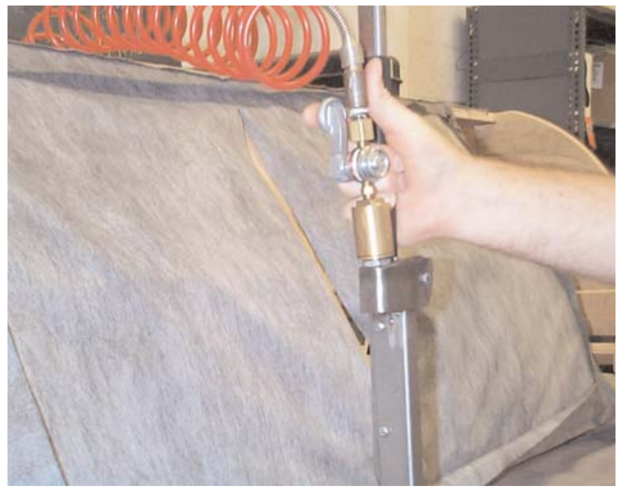
Estimated Cost to Purchase or Manufacture: Purchase for $135.

Ergonomic Intervention

Name: **Pneumatic Coiled Spring Stapling Tool**

Primary Task: Securing coiled springs to webbing

Description: The grip force required to activate the manual stapling tool is replaced by pneumatic power.

	
Task Description **BEFORE** The operator repetitively (three to four staples per spring) activated the stapling tool using a power grip.	**AFTER** The operator pushes a single button to activate the pneumatic mechanism that performs the stapling activity.

Ergonomic Impact: Relieves stress and fatigue on the wrist and forearm.

Special Points of Interest: The pneumatic tool requires an additional air line.

Estimated Cost to Purchase or Manufacture: Purchase for $135 more than the manual system.

Ergonomic Intervention

Name: **Air Hose Coil System**

Primary Task: Various activities that require air-powered tools

Description: An overhead coiling mechanism can used to keep the floor clear of the trip hazard associated with loose air hoses. Also the coiling mechanism can be set so that the weight of the hose is not experienced by the operator using the tool.

Task Description

BEFORE

Operators often had to struggle with hose management and the weight of the hose on the shoulder and elbow muscles led to fatigue and pain.

AFTER

When the coiling mechanism is set correctly, the hoses/tools are always in a position for easy access and the weight of the hose no longer stresses the operator's shoulder.

Ergonomic Impact: This intervention can reduce the risk of back injury from trip and fall incidents as well as reduce the loading on the shoulder because the operator is no longer supporting the weight of the hose.

Special Points of Interest: The housekeeping effects of this intervention can be substantial if there are a number of air-powered tools being used.

Estimated Cost to Purchase or Manufacture: Purchase for $150.

Ergonomic Intervention

Name: **Ottoman Workstation**

Primary Task: Upholstery of ottomans

Description: Ottoman workbench has pneumatic height adjustability using a foot pedal and has a swivel top.

Task Description

BEFORE	AFTER
Operator had to bend his or her back and slide pieces to perform the various upholstery activities on the ottoman.	The new system raises and lowers the piece to the optimal height and allows the operator to spin the work surface instead of pushing and pulling piece.

Ergonomic Impact: This adjustability reduces stresses and poor postures on the upholsterer's back, shoulders and wrists.

Special Points of Interest: The ease of adjustability was an issue with piecework employees. Productivity of the operator was of great importance in this design.

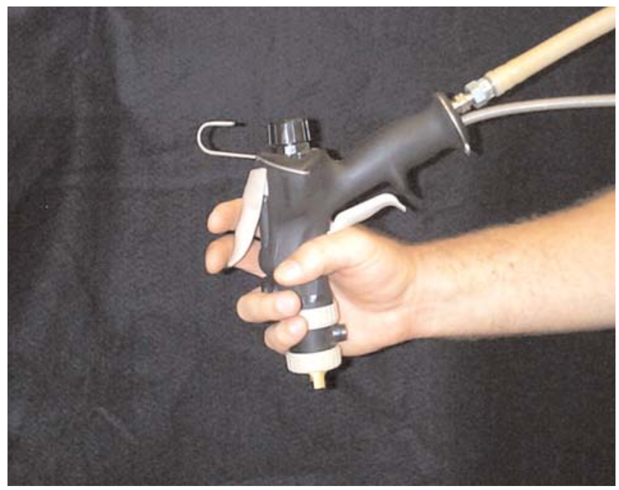
Estimated Cost to Purchase or Manufacture: Manufacture for $250 per station.

Ergonomic Intervention

Name: **Dual Trigger Spray Gun**

Primary Task: HVLP operations in finishing

Description: The spray gun has two triggers that allow the operator to maintain a straight wrist posture while spraying horizontal surfaces.



Task Description

BEFORE

The employee bent the wrist to keep the spray perpendicular to the surface being sprayed.

AFTER

The employee maintains a straight wrist posture while spraying the horizontal surface by using the second trigger.

Ergonomic Impact: Relieves stress on the hands, wrists, elbows and shoulders.

Special Points of Interest: The gun is made of a lightweight composite material and if an appropriate swiveling joint is used can reduce the forces created by the hose.

Estimated Cost to Purchase or Manufacture: Manufacture for approximately $300 each.

Ergonomic Intervention

Name: **Adjustable Height Arm Jig**

Primary Task: Upholstery of arm

Description: The original arm jig allows rotation in the vertical plane 360 degrees but does not adjust for height during the operation. The new arm jig allows adjustment for height by using an air ram that is actuated by a foot pedal.

	
Task Description **BEFORE** There were bent postures and stapling above shoulder height, while upholstering the arm.	**AFTER** Jig height can be adjusted to place the piece in the best position for easy upholstery.

Ergonomic Impact: The control reduces stress to the back and shoulder.

Special Points of Interest: Cycle time is not affected by the change, upholsterers can move the jig vertically at the touch of a pedal. The upholsterer must be trained on how to use it during upholstering an arm and how it can help him or her to be injury free. If just given the new jig assembly with out the training, the upholsterer just adjusted it at the beginning of the shift and did not get much of an advantage from it.

Estimated Cost to Purchase or Manufacture: $350.

Ergonomic Intervention

Name: **Height-Adjustable Upholstery Bucks**

Primary Task: Upholstery

Description: The height-adjustable worktable can be adjusted using a foot pedal to present the furniture in the optimal position for the upholstery process.

Task Description

BEFORE

The operator maintained static awkward postures of the back (forward bending, side bending and twisting) while securing the fabric/leather to the frame. Operator also assumed a deep knee bend position.

AFTER

When upholstering the piece using the adjustable workstation, the operator can raise the piece to the optimal position, thereby reducing the awkward postures of the back and knees.

Ergonomic Impact: Reduces stress on the low back and knees.

Special Points of Interest: A model currently in development also lowers the work surface to a position 4 inches from the ground, thereby eliminating the heavy lifting that often accompanies this task.

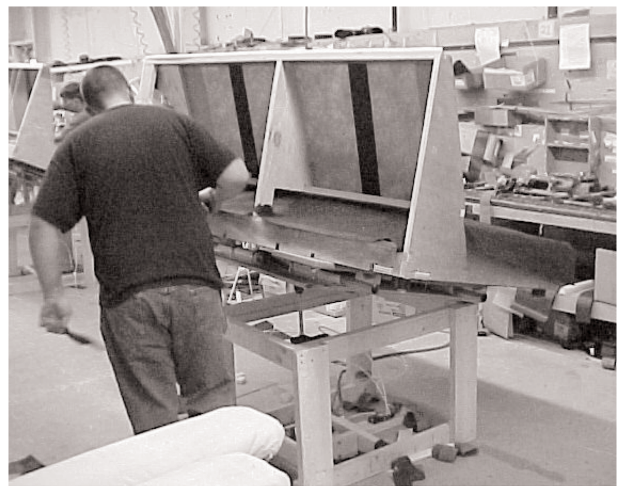
Estimated Cost to Purchase or Manufacture: Purchase for $600 to $800.

Ergonomic Intervention

Name: **Angle-Adjustable 8-Way Hand Tie Station**

Primary Task: Securing coiled springs to the webbing

Description: The angle-adjustable workstation can be adjusted using a foot pedal to present the furniture in the optimal position for the 8-way hand tie process.



Task Description

BEFORE

With the piece horizontal, the employee maintained a static forward bent posture for extended periods of time while tying the springs together.

AFTER

When tying the springs together using the adjustable workstation, the operator can raise the piece, thereby reducing the degree of forward bend required.

Ergonomic Impact: Relieves stress on the low back and shoulder.

Special Points of Interest: A model currently in development also lowers the work surface to a position 4 inches from the ground, thereby eliminating the heavy lifting that often accompanies this task.

Estimated Cost to Purchase or Manufacture: Purchase for $600 to $800.

Ergonomic Intervention

Name: **Automatic Frame Spring Puller**

Primary Task: Attaching seat springs to frames

Description: The puller automatically stretches the springs and attaches them to the clips in the seat frame.

Task Description

BEFORE

The employee had to grab each spring and pull against significant tension to the clip on the opposite end of the frame.

AFTER

Employee attaches the spring to the mechanism and it pulls all springs simultaneously to the clip on the other end of the frame.

Ergonomic Impact: Relieves stress on the hands, wrists, elbows, shoulders and back because the employee does not have to stretch the springs by hand.

Special Points of Interest: The machine does not hinder the operation of the employee because the times between the hand springing and the machine springing are almost identical.

Estimated Cost to Purchase or Manufacture: Manufacture for approximately $750 each.

Ergonomic Intervention

Name: **Standup/Perched Sewing Workstation**

Primary Task: Sewing

Description: The standup/perched sewing workstation reduces the static stress from being bent over the work while sewing. This arrangement allows more mobility and in some cases improves the posture for lifting tasks.

Task Description

BEFORE

Operators spent a great deal of their time bent over the sewing workstation. Lifting was often done from a seated posture, which was a concern for low back injury risk.

AFTER

The new adjustable workstation allows the worker to maintain a more upright and neutral posture of the whole spine, but particularly the upper back and neck. It makes it easier for the operator to be more mobile and therefore makes it more likely for the operator to use good lifting mechanics when lifting. Work can be performed in either a standing posture or “perched.”

Ergonomic Impact: This adjustability reduces stresses on the operator’s back and shoulder and improves poor postures and lifting mechanics.

Special Points of Interest: It is important to train operators how to adjust the tables.

Estimated Cost to Purchase or Manufacture: Purchase for $890.

Ergonomic Intervention

Name: **Pneumatic Lift for Spray Booth**

Primary Task: Spraying operations

Description: Lift positions the piece to be sprayed in raised position to reduce awkward shoulder and back postures.

	
Task Description **BEFORE** Spray operator assumed awkward postures to reach all necessary locations on the piece.	**AFTER** The operator can raise the piece to a position that significantly reduces the extreme back and shoulder postures.

Ergonomic Impact: Reduction of awkward and fatiguing postures of the back and shoulders.

Special Points of Interest: Requires some facility modification to implement.

Estimated Cost to Purchase or Manufacture: Manufacture for $1,000.

Ergonomic Intervention

Name: **Material Lift**

Primary Task: Various machining operations

Description: This is a generic solution for many manual materials handling tasks. This air powered stock lift is used to raise pallets or shop trucks loaded with stock to the height the operator needs.

Task Description

BEFORE

In order to get the components from the pallet, the operator performed repetitive, awkward trunk motions, especially when the pallet was almost empty. This was an inefficient and awkward process.

AFTER

The operator is able to adjust the height of the pallet of components to the appropriate height, thereby decreasing loading on the back and increasing productivity.

Ergonomic Impact: This control reduced the stresses on shoulders and low back.

Special Points of Interest: A significant improvement in productivity can be realized through the basic increase in the efficiency of operator movements.

Estimated Cost to Purchase or Manufacture: Purchase for $1,500 per workstation.

Ergonomic Intervention

Name: **Sofa Tray Installation Conveyor**

Primary Task: Preparing upholstered furniture for shipping

Description: The sofa tray installation conveyor is used to replace the process of two men picking up a sofa and placing it in the cardboard tray. The conveyor transports the sofa above another conveyor transporting the tray. The sofa simply drops into the tray.

Task Description

BEFORE

Two operators picked up a sofa and set it down into the tray.

AFTER

The top conveyor transports the sofa at the same speed as the lower conveyor moves the tray. The sofa drops into the tray, and the employee simply guides it.

Ergonomic Impact: Eliminates the heavy lift from ground level to put the sofa into the tray. Reduces back and shoulder stress.

Special Points of Interest: Maintenance employees or welding shop can add additional conveyor over existing shipping conveyor. Also reduces the man- power to put the sofa into the tray.

Estimated Cost to Purchase or Manufacture: Manufacture for $1,500 materials and labor.

Ergonomic Intervention

Name: **Electric Inspection Lift**

Primary Task: Final inspection of upholstered pieces

Description: The lift can be used to raise the fully upholstered piece to a more advantageous position for final cleaning and inspection.

<table>
<tr><td></td><td></td></tr>
<tr><td>Task Description

BEFORE
The employee was required to maintain an awkward back posture (and sometimes sit down) in order to inspect and clean the upholstered piece before packing/shipping.</td><td>AFTER
The lift is controlled by the employee and can position the upholstered piece in an improved location for easy cleaning and inspection.</td></tr>
</table>

Ergonomic Impact: Relieves stress on the low back, shoulders and knees.

Special Points of Interest: This piece of equipment can be a trip hazard when not in use.

Estimated Cost to Purchase or Manufacture: Purchase for $2,400 per lift.

Ergonomic Intervention

Name: **Air-Assisted Table Flipping Device**

Primary Task: Table top assembly/finishing

Description: The air-assisted device lifts and flips the table over without any lifting, pushing or pulling. The table can also be transporting using the lift to the shop truck without lifting.

	
Task Description	
BEFORE	**AFTER**
Two operators lifted the table top and flipped it 180 degrees for the installation of hardware. Sometimes the table top was flipped again for finishing activities.	The new system uses a vacuum-based suction system to grab the table top. The table top is flipped using a bar suspended from an overhead hoist system.

Ergonomic Impact: Loads on the low back, shoulder, elbow and hand/wrist are greatly reduced.

Special Points of Interest: The lift is somewhat slower than manual lifting, but the benefits far outweigh the small amount of time needed to operate the lifts.

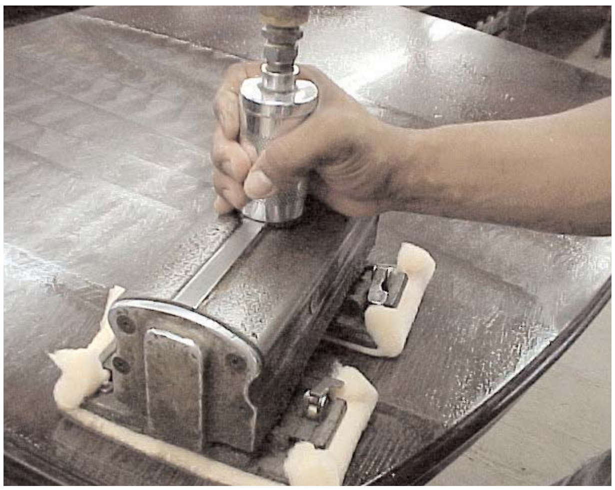
Estimated Cost to Purchase or Manufacture: Manufacture for $5,500 per station.

Ergonomic Intervention

Name: **Suspended Table Rubbing Machine**

Primary Task: Rubbing dining table tops

Description: The suspended rub machine allows the operators to achieve a much higher quality and more consistent rub on dining table tops. It virtually eliminates the constant vibration associated with the 40-pound machines. Also operators do not have to lift the machines to and from the tables.

	
Task Description **BEFORE** Operator manually moved the heavy, vibrating rub machine across the work surface and lifted the machine off of the finished piece.	**AFTER** The new system supports the mass of the rub machine and the framework structure isolates the rub machine vibration from the operator.

Ergonomic Impact: Loads on the low back, shoulder, elbow and hand/wrist are reduced. Exposure to vibration is virtually eliminated.

Special Points of Interest: After installing the new machines, cycle time was reduced.

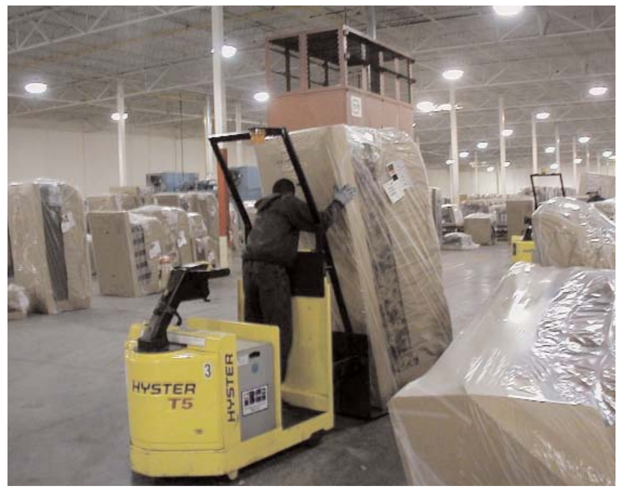
Estimated Cost to Purchase or Manufacture: Manufacture for $6,000 per station.

Ergonomic Intervention

Name: **Powered Industrial Truck**

Primary Task: Shipping/material handling

Description: A generic tool that can be used anywhere to move large items long distances. Significantly reduces the stress and fatigue of transporting large, heavy or bulky items.



Task Description

BEFORE

Operators manually moved the large, bulky items by either sliding them along the floor or using a two-wheel hand truck. Significant push-pull forces were required, and the instability of the load led to the item falling, and the operator trying to catch the falling item.

AFTER

Load is completely supported by the truck and is much more stable. Productivity may increase for long travel distances.

Ergonomic Impact: This control reduced the stresses on shoulders and low back.

Special Points of Interest: Safety concerns similar to those of fork lifts need to be addressed here. Powered industrial trucks are battery operated and reduce noise and problems with exhausts.

Estimated Cost to Purchase or Manufacture: Purchase for $6,500.

Ergonomic Intervention

Name: **Vacuum Lift for Panel Stock**

Primary Task: Lifting panel stock to conveyor from pallet

Description: Vacuum lift is positioned over panel and vacuum activated to lift panel. Panel is moved to conveyor.

	
Task Description **BEFORE** Employees manually lifted the panels and placed them on the conveyor to the sander. This required two employees.	**AFTER** One employee lifts the panel with the vacuum lift and places it on the conveyor.

Ergonomic Impact: Reduction of physical force and strain to back, shoulders and arms needed to lift the heavy panels; also, a reduction in twisting of body to place panel after lifting.

Special Points of Interest: The vacuum lift reduced the number of employees needed to lift the panels.

Estimated Cost to Purchase or Manufacture: Purchase for $7,000.

Ergonomic Intervention

Name: **Cushion Fill Machine**

Primary Task: Compresses and inserts the foam filling in upholstery cushions.

Description: Cushion fill machine reduces fatigue on hands and arms by inserting the foam filling into the cushion.

Task Description

BEFORE

Operator pushed and pulled the foam filling into place within the cushion cover.

AFTER

The cushion is inserted into the cushion fill machine and compressed. The open-end cushion is placed over the compressed part of the machine and cushion is hydraulically inserted into the cushion cover.

Ergonomic Impact: Reduction of force exerted on hands and arms to force cushion into the cushion cover.

Special Points of Interest: Reduces abrasion to arms and hands from inside cushion and against zipper.

Estimated Cost to Purchase or Manufacture: Purchase for $9,200.

Ergonomic Intervention

Name: **Box Up-Ender**

Primary Task: Packing/shipping

Description: The box up-ender is a mechanical aid that tilts on an axis from the vertical to a horizontal position when packaging furniture. The box up-ender is designed for handling large runs of product of similar size.

Task Description

BEFORE

Operators manually tilted the box over to the horizontal position expending a great deal of force and stressing the low back.

AFTER

A carton is placed over the top of the unit and the unit is placed on the bottom plate of the box up-ender. The box up-ender then rotates on its axis to lift the unit to a position slightly above horizontal and the product is forced completely into the carton. Padding is then placed around the bottom of the product and the bottom skid is attached and the carton is closed and the product is ready to be warehoused until shipped.

Ergonomic Impact: Reduces manual material handling including heavy lifting and minimizes low back, arm and shoulder injury.

Special Points of Interest: Padding is placed around the product edges to minimize damage in shipping.

Estimated Cost to Purchase or Manufacture: Purchase for $10,000.

Ergonomic Intervention

Name: **Automated Spraying System**

Primary Task: Spraying table tops

Description: The overhead automatic spray machine is used to spray dining table tops to reduce inconsistencies in spraying techniques and reduce repetitive motions associated with constant spraying.

Task Description

BEFORE	AFTER
Operator tried to maintain a consistent spray pattern across the surface by leaning out as far possible and extending his or her shoulder.	The new system is completely automated and, due to the reduction in reach limitations, reduces the inconsistencies in the finish.

Ergonomic Impact: Awkward postures and repetitive motions of the shoulder, elbow and wrist were eliminated for this process.

Special Points of Interest: There were concerns with regard to the quality of the product (inconsistencies in the finish) when manually sprayed. The automated system reduced these inconsistencies.

Estimated Cost to Purchase or Manufacture: Manufacture for $30,000.

Appendix H: Documentation of Ergonomics Projects

Guidelines for Documentation Elements

In addition to site-specific information that varies from company to company, there are nine key elements that should be included in any ergonomic improvement documentation process. These are:

1. Date the process or improvement was implemented and who submitted the improvement.
2. Name or brief description of the control/improvement.
3. Primary activity or task the improvement affected.
4. Secondary activities the improvement may have affected.
5. Detailed description of the ergonomic control/improvement.
6. Illustrations, video or photos of the ergonomic control (before the control was put into place and after the control was put into place).
7. Ergonomic impact of the control.
8. Special points of interest not listed in the detailed description.
9. Estimated cost to purchase or implement the control.

Description of Documentation Elements

1. **Date the process or improvement was implemented and who submitted the improvement:** It is important to date the improvement so the progress of ergonomic improvements can be tracked and revisited to ensure the improvement is being sustained to its fullest potential. Having a record of who submitted or who was responsible for the improvement is important. Knowing who was responsible for the improvement can identify that person as a valuable resource for future projects.

2. **Name or brief description of the control/improvement:** Giving the improvement a name adds identity to the project and may avoid confusion when discussing various projects.

3. **Primary activity or task the improvement affected:** List the primary task, job or process the ergonomic control/improvement affected. There are many different elements to each job and discerning which activity the control affected is important.

4. **Secondary activities the improvement may have affected:** The improvement implemented may impact job activities or tasks other than the task or activity targeted. List any positive affects the improvement may have had on secondary tasks. Having this information may spawn new ideas to further control ergonomic stressors for secondary job tasks or activities.

5. **Detailed description of the ergonomic control/improvement:** List a description of what the ergonomic control/improvement is, when it is used, and how it is used to perform the task. Include how the control is integrated into the process and any changes made to the process in order to implement the control.

6. **Illustrations, video or photos of the ergonomic control/improvement:** The adage “a picture is worth a thousand words” is never more appropriate than when documenting ergonomic controls/improvements. Be sure to take photos or video of the process or task before the control is put into place and include photos after the control is put into place. The photos/video should include the interaction of the employee with the process and show any apparent stressors (if they are evident). Visually documenting the process control is an invaluable tool for implementing future or similar improvements.
7. **Ergonomic impact of the control/improvement:** List the ergonomic stressors the control/improvement reduced or eliminated. Ergonomic stressors include, but are not limited to, force reduction, posture improvements, cycle time change and others. By listing the stressors affected, the process of elimination method can be used to address all stressors within a set task or activity.
8. **Special points of interest not listed in the detail description:** Include any special notes concerning the project that were not listed in the detailed description segment. This could include any special instructions for the user, special equipment needs, instances when the control is more or less effective, things to avoid when using the control, special personal protective equipment (PPE), or special instructions for searching for vendors or suppliers.
9. **Estimated cost to purchase or implement the control:** Tracking the cost of an ergonomic improvement is vital to the continuation of ergonomic improvements. Cost justification plays a vital role in securing funds from upper management for future ergonomic projects. Cost estimates may include labor, materials, downtime and overhead costs for the project.

Ergonomics Project Documentation

Name of Ergonomic Control:		
Primary Activity: *(What task/activity is the control used to perform?)*		
Secondary Activity: *(if applicable)* *(What additional tasks/activities/areas could the control be used to perform?)*		
Description of Ergonomic Control: *(A brief description of what the control is, when it is used, and how it is used to perform the task.)*		
Illustrations: *(Include before picture, if applicable, showing methods used or conditions before the ergonomic control and after the control was introduced.)*	*Insert "Before" picture*	*Insert "After" or ergonomic control picture*
	Description: *(Add a description of how the task/activity was performed before the control was introduced.)*	
Ergonomic Impact: *(What ergonomic stressors did the control reduce or eliminate-including, but not limited to, force reduction, posture improvement, cycle time change, etc.)*		
Special Points of Interest: *(Include any special instructions for user, special equipment needs, instances when control is more or less effective, things to avoid when using control, special instructions for vendor searching, etc.)*		
Economic Impact: *(Estimated cost to purchase or manufacture, increases in production, efficiency, etc.)*		
Documented by:	**Date:**	
Ergonomics Team/Employee Comments:		

Appendix I: Return on Investment (ROI) for an Ergonomics Project

In many cases a company will only make an investment into new idea if it can be shown to have a net positive effect on the bottom line. Fortunately, most ergonomic solutions will show a positive return on investment (ROI) if all of the associated benefits of an ergonomic intervention are accurately tabulated.

When calculating the ROI for a project, it is generally straightforward as to how the costs of the project are to be tabulated. These costs include the purchase cost, potential maintenance costs, possibly some training costs, etc. These costs are more straightforward because they are either represented in dollars or time (which can be easily translated into dollars). When attempting to tabulate the benefits of an ergonomics project, the process can be a little less clear. The main benefits of an ergonomics project are the expected reduction in the costs associated with an injury that has yet to take place. The cost reductions come in two forms: direct and indirect costs. Direct costs generally refer to the costs of medical treatment and indemnity costs, while the indirect costs are a more nebulous concept that includes the costs of absenteeism, training new workers to fill in for injured workers, paperwork costs, decreased quality and decreased productivity. A conservative estimate of the relationship between direct and indirect costs places the value of indirect costs at two times the direct costs. These are the benefits that are directly related to the avoidance of the injury. Other benefits of ergonomic intervention that can be challenging to quantify are increases in productivity and increases in quality (reduced rework) that can result from improved workplace design.

Once the annual costs and the benefits of an ergonomics project are tabulated, the return on investment can be calculated simply by summing the annual benefits and dividing this sum by the total cost of the project. A similar approach can be taken to calculate the payback period of an investment. This is simply the reciprocal of the ROI measure and describes the number of months required to payback the original investment. Most often management will have its own measures of what acceptable payback periods and ROIs they will find as an acceptable investment.

Example:

Some employees in an upholstery department with 30 upholsterers are experiencing a low back pain problem. On average the direct costs associated with low back pain are $8,000 per year. A potential investment ($600/upholsterer) for reducing exposure to the risk factors for low back pain is now available. By estimation, this should reduce the direct costs by 50 percent annually. Here is how to calculate the payback period for this investment:

Initial Investment: $600/upholsterer x 30 upholsterers = $18,000
Annual Savings in Direct Costs: $4,000
Annual Savings in Indirect Costs: 2 x $4,000 = $8,000 (conservative estimate)
Annual Savings Total = $12,000

Payback Period = Initial Investment/Annual Savings Total

$$\frac{\$18{,}000}{\$12{,}000/\text{year}} \qquad \text{Payback Period} = 1.5 \text{ years}$$

Appendix J: Training and Education

Ergonomics Training—One Company's Approach

This training structure can provide insight into how a large, geographically dispersed furniture manufacturing organization has structured its approach to training employees on the subject of ergonomics.

Strategy

The philosophy of the company was shaped by various training experiences over time and by using the services of consulting organizations, purchasing mass-market produced training materials and developing in-house produced materials. What the company found to be productive is to leverage best practices that apply to multiple plant sites and to use a combination of training media prepared by national training vendors, blended with video, still pictures and other materials developed on-site.

Structure/Elements

The training programs in ergonomics are comprised of the following elements:

1. Management communications: The safety function leader makes periodic presentations to plant managers that provide an overview of progress being made in reduction of ergonomics-related injuries. This provides a continuing opportunity to build support for ergonomics projects and helps to sustain support for ongoing training.
2. Safety function infrastructure: Annual safety manager conferences are held, at which best practices are exchanged: this provides an opportunity for safety managers to learn/refresh skills related to anticipation, identification, evaluation and control of ergonomics hazards. Further, an electronic record of ergonomics projects (with vendor information and descriptions) is maintained on the company server and is indexed by plant and department to facilitate best practices transfer.
3. Product development function: The company's largest division has a product development center that serves eight plants. On several occasions, training in ergonomics (building ergonomics into the production process) has been provided to designers. Also, product development is represented in the monthly ergonomics conference call (see entry below).
4. Ergonomics and safety manager conference calls: Monthly conference calls are held with two groups of management-level staff. The ergonomics call participants are a blend of time study analysts, safety managers and ergonomics coordinators, and their activities revolve around early identification of emerging ergonomics issues, special projects (such as developing a guide to fastener driver selection) and transfer of best practices.

   The safety manager conference call has some crossover with ergonomics, but is more broadly focused on OSHA compliance and best practice discussion, in the safety realm. Periodically, in both conference calls, discussions are held relative to new training materials or approaches developed or surfaced by call participants.

5. Centralized library of ergonomics training materials: The company maintains a library of video-based ergonomics training materials, available from the corporate office. Also, a list of training materials held in individual plant safety office locations is published on the company server for intra-company loan.
6. Manager/supervisor safety training program: The corporate safety department developed a 10-module safety awareness and skills-building course, which each manager and supervisor is required to complete. One of the modules provides an overview of ergonomics as well as the manager's/supervisor's roles and responsibilities in relation to ergonomics.
7. Plant-level ergonomics training: Training for plant management and supervision typically involves (in addition to the training referenced in 6 above), a one- or two-hour presentation, repeated on a periodic basis. Ergonomics Teams at each plant typically receive a one- or two-day training session provided by a consultant, and hourly employees receive both generalized ergonomics training (how to lift properly, early warning signs of ergonomics-related injury, etc.) upon joining the company and job-specific training. In addition, most plants require supervisors to present monthly training topics to all employees in their department: in most cases, ergonomics is one of the topics selected. Other groups, such as plant engineers, may participate in professional development conferences at which ergonomics is discussed.

Conclusion

There are many approaches to ergonomics training, and each organization needs to find a method that fits its culture, operations and budget. By involving diverse groups, in a variety of settings, this company is able to keep awareness and motivation for improvement at a high level.

Training and education for the workforce does not always have be accomplished the same way. Some companies communicate basic ergonomics principles on a regular basis during production, safety and other employee-based meetings. Below are two examples of this approach that were implemented by a furniture manufacturer:

Ergo Chats

Example 1:

Ergonomics

Keynote: *Ergonomics* is a word that most of us don't use on a daily basis. Do you know what ergonomics are (is)?

Ergonomics is the study of how you and your body relate to your workplace, tools and the environment you work in. Ergonomics looks at issues such as lifting, sitting, repetitive acts and how they affect your body. Performing tasks in the correct way and designing workplaces and tools in an "ergonomic way" can greatly reduce injuries and can also help you feel much better when you leave your job at the end of the day.

Below are some basics to familiarize you with ergonomics:

- Working in an awkward position or using poor lifting techniques can put unnecessary strain on your body. Body stresses accumulated over time can actually cause more shoulder, neck and back pain than one traumatic event. Be aware of the postures you work in. If you are working in an awkward position, try to improve the position before continuing your task. If you can't improve your position, ask your supervisor to contact the ergonomics team for help!
- Look at you work area! Is the table or machine you are working at the right height for you? Do you have to bend over or reach awkwardly to perform your task? If so, adjustments need to be made to the table or machine.
- Do the hand tools you work with fit your hands? Are they too big or too small? Do they hurt your hands when you use them? If so, there are several alternatives. Most tools are available in various sizes, and specialized gloves are available for certain tasks. Let your supervisor know if this is the case.
- This is just the "tip of the iceberg" as far as understanding ergonomics. You will be learning more about ergonomics!

Example 2:

Tackling Ergo Problems at the Source

Ergonomic hazards can be a difficult problem for production managers and safety managers. Sometimes the problems are not easily fixed with engineering controls, which may be too costly. There are things that shop floor employees can do to reduce ergonomics problems too.

Here are some low or no-cost tips:

1. **Shake things up:** Job rotation can be a great way to keep people from overworking one muscle group during the workday. The key is to make sure employees rotate through job tasks that require the use of different muscles. Look for duties that involve different postures, pace of work and amounts of physical exertion. It is important to realize that giving workers a variety of duties may decrease boredom and boost productivity.
2. **Stick to the middle:** Observe people's posture as they do their work. Any motion that requires them to bend or reach in extreme positions could eventually cause an ergonomic injury. Look for ways to make it easier for people to stick to the mid-range postures—which means elbows are close to the sides and hands are extended straight out from wrists. Simple modifications such as providing adjustable stools or raising or lowering the height of worktables can make all the difference.
3. **Keep it clean:** Regular housekeeping can keep people from having to reach, bend or twist in awkward positions. Try rearranging workstations so that frequently used items are kept within easy reach and others are stored elsewhere. Also by keeping work areas neat and organized, non-value-added steps can be shaved from the process and productivity may increase.

Training Schedules

As noted in the body of this document ergonomics training of the shop floor employees can be a valuable tool to reduce incidence and severity of work-related MSDs by increasing knowledge with regard to how the disorders develop and what can be done to reduce risk. There are two general models that have been employed by furniture manufacturers—a performance-based approach and a periodic training approach.

Performance-Based Approach

The performance-based approach provides training on an as-needed basis. The employees would receive ergonomics training, as well as other safety training, at the time of hire. Additionally that training would be initiated when a significant change was made to the operation, process, product and/or equipment. It would be wise to supplement this formal training with periodic refresher tips, particularly for those jobs that do not change significantly over time.

Periodic Approach

Alternatively, some companies use a periodic approach to training. As in the performance-based approach, the employees would receive ergonomics training as well as other safety training at the time of hire. Periodic training is often provided on an annual basis to refamiliarize the employees with the basic principles of ergonomics and their relevance to the work environment. Although this training is not dependent upon changes in the workplace, it would be wise to consider supplemental training when changes do occur.

Appendix K: Placement Evaluation Process Model

A general approach typically recommended by organizations specializing in the design and implementation of selection programs includes the following:

1. Job analysis—based on observations of current employees actually performing the work and utilizing measurements of force, task element duration, required postures, ambulation, balance and agility factors and other physical and sensory aspects. Typically a professional who has education and work experience in fields such as ergonomics, physical therapy or occupational therapy performs this analysis. It is important that safe work practices be established prior to job analysis. The results of the job analysis should be checked with incumbents, supervisors and management representatives and an appropriate proportion of incumbents run through the evaluation process (once complete) to verify that an accurate "pass/fail" score has been established.
2. Prior to testing applicants, several actions should be taken:
    a. An offer of employment (conditional upon successful completion of the physical capacities test) should have been extended to the candidate.
    b. The candidate should be provided with a task description that outlines the essential functions of the job, complete with information on weights, force demands and other relevant data and asked if he or she can perform the listed requirements. If their response reveals a disability, ask if he or she could perform the essential functions with some form of accommodation or job modification. If so, this and other relevant information should be taken into consideration and the organization's ADA compliance program applied. A detailed discussion of ADA and other equal opportunity issues is beyond the scope of this document. Such matters are of sufficient complexity that competent legal advice is warranted.
    c. Prior to administration of any physical capacities test, the test process, its intent and other information (including potential risks) should be discussed with the job candidate and an acknowledgment form read and signed. The discussion and form should specifically reference the existence of any directives by the candidate's physician that pertain to the activities included in the test.
    d. Again, prior to the administration of the test, a medical history and musculoskeletal physical assessment (including range of motion, strength, flexibility, blood pressure and heart rate) should be performed to prevent testing when it is medically contraindicated. In some jurisdictions a referral from a physician may be required prior to test administration.
3. Testing—by a trained individual who follows a standardized protocol—which deals with all aspects of the test including directions to the candidate, proper adjustment of test fixtures, calibration of test instruments and other factors that, if not performed uniformly would result in inaccurate results. Documentation of results and any issues that arose during testing are also important. One such issue might be suspension of testing due to safety concerns (in accordance with test protocols).
4. Discussion of results with the candidate and observance of procedures designed to maintain confidentiality of test records.
5. Periodic refresher training of those administering tests and scheduled review of test protocols and results by qualified professionals to verify that they are keeping pace with changes in medical practice, technology and the legal environment.

Modified Evaluation Process

The process described in the previous section represents a more robust approach to evaluation. It is the most accurate and legally defensible method of matching candidates with specific jobs; however, it is not the only approach in common use. The following section outlines a method that has been used as a "bridge" between the more scientific and exacting system outlined above and no system at all—which means no evaluation, other than showing the candidate the job and taking on faith the response that he or she can perform it safely. This method includes the following elements:

1. A written position description, which specifies the essential job functions and corresponding physical demands
2. A medical history questionnaire that contains job-related questions that serve to identify issues for discussion and concerns that may be addressed during a physical examination by a licensed healthcare professional. The candidate completes the questionnaire only after a conditional offer of employment has been made.
3. A physical exam that is performed by a licensed healthcare professional and which incorporates range of motion, flexibility and other components designed to mirror job requirements.

Based upon the results of the medical questionnaire, exam and interview, if the healthcare professional determines that there is not a good fit between the job demands and the candidate's capacity, the candidate is asked to consider another job, if available, that represents a better "fit." If no such job is available, the employment offer is withdrawn. The employer needs to recognize that the second, more abbreviated approach outlined above, carries with it more risk of equal opportunity-related litigation. However, if done with sensitivity and proper regard for legitimate concerns about fairness, it is workable (*CTD*, 2000; Fearon, 1992; Gassoway, 2000; Isernhagen, 1992; Isernhagen, 1990; McGlothen, 2000; Miller, 2001; Nassau, 1999; Sarkis, 2000).

Appendix L:
Forms for MSD Evaluation and Assessment Methods

The MSD questionnaire that follows can be used in-house to document the symptoms reported and provides details of the injured employee's case. This form can be used every 48 hours during a conservative care process to track any changes in the employee's condition.

MSD Questionnaire

Name: ______________________ Date: ______________________

Date of Employment: ______________ How long at present job? ____________

Department: ______________________ Duration of symptoms? ____________

Rank the discomfort you are experiencing using the following scale:

	Right	Left
Fingers		
Thumb		
Hand		
Wrist		
Forearm		
Upper Arm		
Elbow		
Shoulder		
Neck		
Low Back		
Hip		
Knee		
Ankle		

1 = Pain at Rest
2 = Pain during Movement
3 = Swelling
4 = Tenderness
5 = 'Grating' Feeling
6 = Numbness
7 = Weakness
8 = Stiffness

When do the above symptoms bother you most?

❑ When in bed ❑ When at work
❑ Awake but not working ❑ Other ______________________

What do you do most when not at work? ______________________

Have you had treatment for your current condition? ❑ Yes ❑ No

If yes, when? ______________________

Have you ever been treated for an injury to the affected area? ❑ Yes ❑ No

If yes, when? ______________________

Are you currently taking any medications? ❑ Yes ❑ No

Are you allergic to any medications? ❑ Yes ❑ No

Are you right- or left-handed? ❑ Right ❑ Left

______________________ ______________________
Interviewer **Date** **Employee** **Date**

Assessment Methods

Health Assessment

A general health assessment addresses occupational, social and medical histories. This information provides a complete assessment of the injured employee. Utilization of a standard form allows information to be collected consistently and accurately. A complete history is taken by a HCP and may include:

1. *Occupational history (past and present)*
   - Job tasks/risk factors
   - Length of time on the job
   - Job history (past/present)
   - Hours of work/overtime
2. *Social*
   - Family health history
   - Other jobs/responsibilities
   - Tobacco, alcohol use
3. *Medical history*
   - Chronic conditions
   - Medications
   - Previous disorders/injuries
4. *Current complaint*
   - Onset
   - Severity of problem
   - Increases/decreases complaint

Physical Assessment

Physical assessment classifies symptoms of MSDs as subjective or objective and provides a more definitive picture of the reported concern.

Subjective symptoms or findings are described or experienced by the injured individual. They are not detected by the senses of the examiner and may include:

- Pain
- Numbness
- Tingling
- Tightness
- Stiffness

Objective signs are detected findings on examination or testing. Objective signs may include:

- Positive responses to physical examination maneuvers
- Swelling, observable and indicating accumulated fluid in the tissues
- Abnormal nerve conduction studies may occur when the swelling exerts pressure on nerves and blood supply causing constriction, slowing the speed of the electrical impulse and resulting in the symptoms of pain, numbness and tingling
- Redness, resulting from the inflammatory process
- Crepitus, feeling like a grating sensation or the popping of little air bubbles
- Loss of range of motion
- Muscle wasting

Ergonomic Assessment/Intervention Report

Office/Plant Environment

Name:	**Plant:**
Dept.:	**Job Title:**
Shift:	**Date:**

Location: ❑ **Office** ❑ **Plant** ❑ **Vehicle**

Reason(s) for Assessment (Check all that apply.)

❑ **Fingers/Hand**	❑ **Shoulder/Neck**	❑ **Hips**	❑ **Wrist**
❑ **Upper Back**	❑ **Leg/Knee**	❑ **Elbow/Arm**	❑ **Lower Back**

Fully Describe Employee's Concern

Assessment of Work Area

C = Correct, I = Improvement Needed, NA = Not Applicable

Office

Chair:	Height	Lumbar	Arm Support	
Desk:	Height	Storage		
Keyboard:	Height	Mouse Support	Wrist Support	
Monitor:	Height	Distance	Glare	Document Holder
Telephone:	Location	Headset		
Leg/Feet:	Foot Support	Obstacles		
Posture:	Bending	Reaching	Repetitive	
	Static	Gripping/Pinching	Lifting	
	Neutral	Stretch Breaks	Alter Tasks	

Plant

Position:	Sitting		Standing		
Chair:	Height	Lumbar	Arm Support		
Desk:	Height		Storage		
Table:	Height	Storage	Tilt		
Telephone:	Height		Reaching		
Material Handling:	Height	Adjustment	Weight		
Hand Tool:	Size	Weight	Vibration	Temperature	Storage
Machine:	Height	Speed	Control Position		
Posture:	Bending	Reaching	Repetitive		
	Static	Gripping/Pinching	Pulling		
	Lifting	Sliding	Neutral		
	Stretch Breaks		Job Rotation		

Describe Specific Recommendations for Improvement:

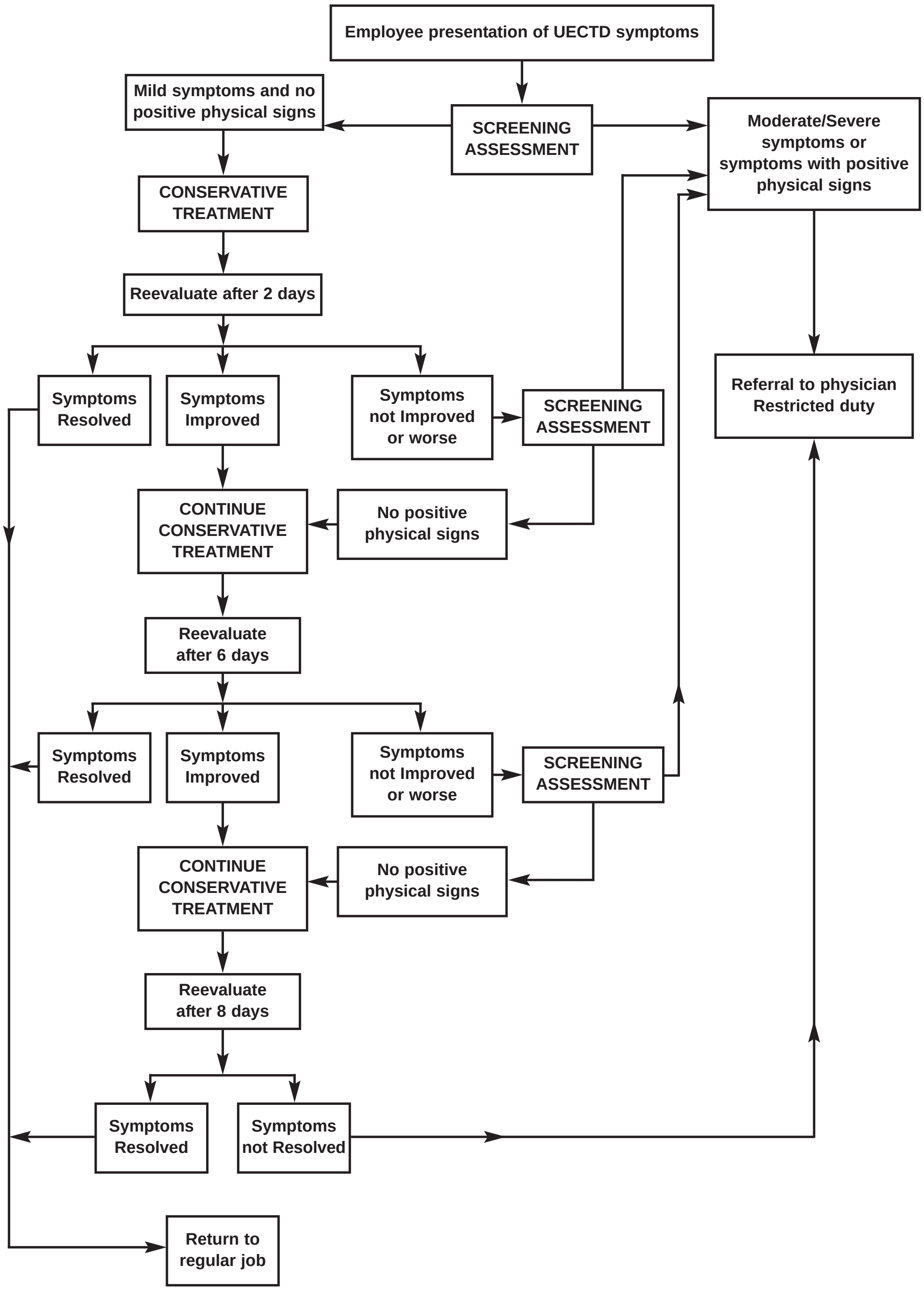
State Actions Taken With Date Completed:

Assessment Completed by:

Name: **Date:**

Appendix M: Suggested Treatments for MSDs

Upper Extremity (UE) Cumulative Trauma Disorders (CTDs) Treatment Algorithm*



**Ergonomics Program Management Guidelines for Meatpacking Plants.* OSHA Pub. 3123. Washington, DC: U.S. Department of Labor, 1993.

Common First Aid Treatment for MSDs

The primary goal for an in-house conservative care program is to promote early reporting and intervention so problems can be resolved in a timely manner and more serious conditions can be prevented.

The following are suggested treatments based on commonly used protocols. Always review any treatment procedures with a HCP prior to implementation.

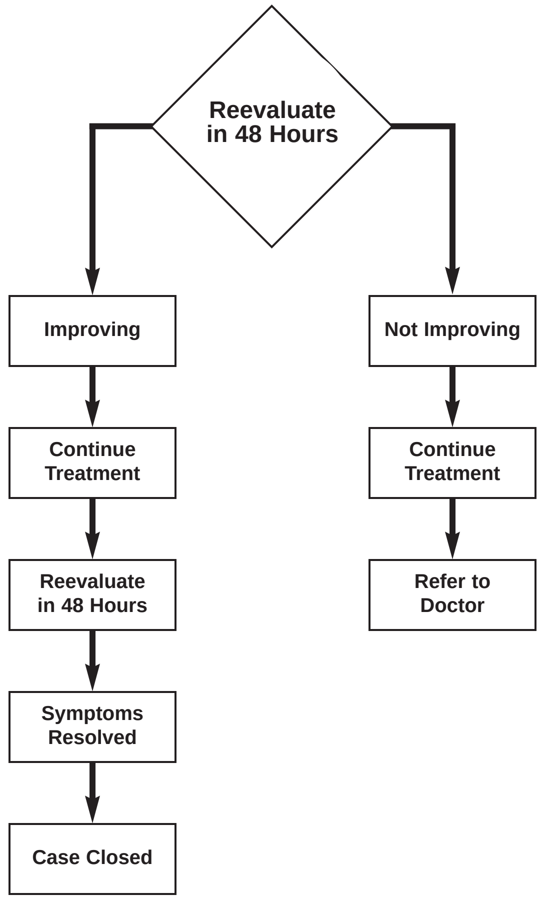
Complaint	Treatment
Pain	• Nonsteroidal anti-inflammatory drugs (NSAIDs) • Ice • Exercises • Job evaluation
Pain and any combination of the following: numbness, loss of function, redness and/or swelling	• NSAIDs • Ice • Exercises • Job evaluation • Job modification • Refer to physician
Back pain—muscular	• Ice for the first 48 hours • Follow with heat • NSAIDs • Re-evaluate if the condition is not resolving, refer to physician for evaluation

First Aid Treatment Procedure for MSDs

NSAIDs:	(Nonsteroidal anti-inflammatory drugs) Ibuprofen (200 mg) or aspirin (325 mg)—two tablets four times daily. Note: If allergic to aspirin or if has a bleeding disorder, do not give aspirin or any NSAID. May give acetaminophen (250 mg)—two tablets, three to four times daily.
Ice:	Ice pack to affected area four times daily for 15 to 20 minutes. Can change to heat or alternate with heat after 48 hours.
Exercise:	Gentle flexion and extension movement to stretch muscles in the affected area. Should not cause pain.
Job evaluation:	Ergonomic evaluation of the job to determine if complaint is work-related and what controls can be implemented.

First Aid Treatment Decision Tree

If an MSD is going to respond favorably to conservative care, some indication of improvement should be evident within 48 hours. The following decision tree can be used as a process guide for MSD in-house conservative treatment.



Conservative Care Decision Tree

This decision tree is based on a commonly recognized treatment algorithm. Always review treatment procedures with a licensed health care provider prior to implementation.

Medical Referrals

When treatment procedures go beyond the scope of practice for the in-house HCP, MSD cases may require the medical expertise of an off-site HCP or physician. Some facilities, without an in-house HCP, may opt to refer all cases to an off-site HCP for evaluation and treatment.

When symptoms progress to more severe stages, treatment may be more advanced and expensive. More progressed symptoms reduce the chances for a complete and timely recovery for the employee. Lost work time, restricted duty and/or work accommodations may accompany these cases in the more severe stages. For more severe symptoms, advanced treatment may include prescriptive drugs, splints, physical therapy, occupational therapy, surgery and/or rehabilitation.

For MSD cases involving the back, if pain is present directly down the spine or the employee has difficulty standing erect, refer to the physician on the first examination. This condition needs more intense treatment than can be provided by an in-house HCP. This condition usually requires muscle relaxants, prescription anti-inflammatory medications and/or physical therapy.

Physician Selection

In the process of obtaining referral medical care, the following steps may be helpful:

- **Meet with several health care providers.** Inviting them for a meeting and plant tour as a group may be most convenient and allows them to see firsthand jobs and work environment. Individual meetings may be preferred. Visiting the office is an option. Face to face is always preferable.
- **Share the mission, goals and objectives** for the organization.
- **Educate the audience** on workers' compensation issues, OSHA recordability and options for alternate duty/work accommodation programs to reduce absenteeism. Provide information packets to take back to the office.
- **Discuss standing orders for treatment.** Request physician signature. The "Upper Extremity Cumulative Trauma Disorders Algorithm" is provided by the U.S. Department of Labor in the Ergonomics Program Management Guidelines for Meatpacking Plants.
- **Outline a process for referrals.** Provide names and phone/fax numbers of contact persons on all shifts. Have the contact persons introduced if possible.
- **Establish system of communication** between the off-site health care providers and plant. Identify forms to facilitate the exchange of information. Understand and agree upon timeframe expectations of exchanging information.
- **If either party is not satisfied** with the relationship and the differences are not resolved, a new health care provider should be identified as the referral.

The company should be committed to providing optimum medical care to its employees. The employees are responsible for obtaining providers for their own personal medical needs, but the company assumes responsibility for providing access to competent, compassionate health care providers whenever medical needs arise as a result of work.

Appendix N: Ergonomics Program Evaluation

Questions for an Ergonomics Program Evaluation

Management Commitment

1. Do you have a written plan or policy relating to ergonomics?
2. Is management aware of the costs associated with poor ergonomics (e.g., workers' compensation, medical costs, absenteeism, turnover, production losses)?
3. Is management aware of the benefits of ergonomics (e.g., healthy workforce, productivity increases, improved quality, reduction in costs)?
4. Is management represented on any ergonomics teams/committees?
5. Does management (including supervisors) understand and act on the policies and goals of the program?
6. Are resources provided were necessary?

Employee Involvement

1. Do employees understand ergonomics and MSDs including cumulative trauma disorders (CTDs)?
2. Are employees encouraged to report MSD problems early?
3. Do employees report MSD problems early?
4. Do employees have representation on ergonomic team(s)?
5. Do employees provide suggestions for ergonomic improvement?

Workplace Analysis and Control Development

1. Is the ergonomics risk in all departments and jobs known?
2. Are highest risk jobs prioritized for change?
3. How successful has the team been in solving ergonomic issues?
4. Does the ergonomics team determine appropriate and effective solutions?
5. Are employees involved?
6. Are engineering controls pursued prior to administrative controls?
7. Are administrative controls managed properly and working effectively?

Ergonomics-Related Trends

1. How many MSDs were reported over the last year? ________

   Number of CTDs (tendinitis, carpal tunnel syndrome, tennis elbow, etc.) ________
   Number of back problems and muscle strains ________

2. Number of lost work days associated with MSDs: ______
3. Number of restricted work days associated with MSDs: ________
4. What percentage of total injury/illness incidents are MSDs? ________
5. What area(s) of the facility has the highest incidence of MSDs:

   Dept: ____________________________ Job: _________________________
   Dept: ____________________________ Job: _________________________
   Dept: ____________________________ Job: _________________________

Training and Education

1. Has ergonomics training been conducted for all personnel (management, supervisors, hourly employees, maintenance, engineering, etc.)?
2. If so, is refresher training offered on a periodic basis?
3. Is ergonomics discussed during employee orientation?
4. Are efforts made to promote ergonomics awareness on a regular basis?

MSD Management

1. Is an effective health care delivery system for MSDs established?
2. Are employees who report signs or symptoms of MSDs provided with conservative treatment?
3. Are employees, whose signs or symptoms of MSDs are not improving, provided with effective medical referrals?
4. Is case management provided for employees with MSDs until resolution or optimum health status is achieved?
5. Are alternate duty jobs or job modifications identified to return employees to work?
6. Has a safe and efficient return-to-work program been developed and operating effectively?

Documentation

1. Are all projects well documented?
2. For projects completed, what impact do the changes have on the operation? (e.g., employee comfort, performance, operation productivity and/or efficiency)?
3. Have the direct and indirect costs associated with the projects been determined?
4. Are medical, productivity, efficiency, comfort and quality issues used in the justification of control measure expenditures? Which have the most impact?
5. Is ergonomics considered in all new projects, purchases, repairs, equipment, layout changes, etc.?

Glossary of Terms

Alternate duty—jobs that provide work accommodations for employees requiring special physical work considerations specific to the MSD injury or illness; used to promote recovery or prevent physical harm to specific body parts that are affected; also called "modified duty" or "light duty" assignments.

Acute trauma—generally attributed to a one-time, specific, instantaneous event.

Administrative controls—control measures designed to reduce employee exposure to risk factors for MSDs through the development of specific policies/procedures.

Awkward postures—body positions that place unnecessary stress on muscles, tendons or bones.

Contact stress—pressing the body against a hard, sharp edge, such as the edge of a worktable, or using the hand as a hammer to drive parts together in assembly.

Cumulative trauma disorder (CTD)—disorder resulting from exposure to repetitive, forceful or awkward tasks over a period of time.

Direct costs—costs of medical treatment and indemnity costs.

Engineering controls—modifications that fundamentally change the employee exposure by physically modifying the work or workplace.

Ergonomic controls—methods used to eliminate or reduce employee exposure to the risk factors for developing work-related musculoskeletal disorders.

Ergonomic stressors—physical risk factors that increase risk for MSD development.

Ergonomics—the practice of designing equipment, work tasks and work environments to conform to the capability of the worker.

Force—stress of heavy lifting or using physical effort to control equipment or tools.

Indirect costs—costs of absenteeism, training new workers to fill in for injured workers, paperwork costs, decreased quality and decreased productivity.

Musculoskeletal disorder (MSD)—disorder of the bones, muscles, nerves, tendons, ligaments, joints, cartilage or spinal disks.

Repetition—performing the same motion or series of motions continually or frequently.

Static postures—assuming and holding any posture for a long period of time, placing stress on the body.

Trends analysis—the process of identifying problem areas and concerns within a specific job, department or operation using multiple sources of information including injury/illness records, insurance records, production information, employee feedback.

Vibration—physical exposure to rapidly oscillating tools or machinery such as powered hand tools.

Work practice controls—modifications to the work method used by the employee to reduce exposure to the risk factors for musculoskeletal disorders.

Workplace analysis—the process used to determine the jobs and employees affected by ergonomic stressors.

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Web Site Resources

American Conference of Governmental Industrial Hygienists: *http://www.acgih.org/*

American Furniture Manufacturers Association: *http://www.afma4u.org/*

American Industrial Hygiene Association: *http://www.aiha.org/*

National Institute for Occupational Safety and Health: *http://www.cdc.gov/niosh/*

Elements of Ergonomics Programs: A Primer Based on Workplace Evaluations of Musculoskeletal Disorders: *http://www.cdc.gov/niosh/ephome2.html*

Elsevier (publisher of scientific, technical and health information): *http://www.elsevier.com/*

North Carolina State University—Department of Industrial Engineering: *http://www.ie.ncsu.edu/*

Washington State Department of Labor and Industry, Ergonomics: *http://www.lni.wa.gov/wisha/ergo/*

Federal OSHA index page for the Meatpacking Industry: *http://www.osha.gov/SLTC/meatpacking/index.html*

Federal OSHA Ergonomics Guidelines for the Meatpacking Industry: *http://www.osha.gov/Publications/osha3123.pdf*

Taylor and Francis Publishing (academic journals): *http://www.tandf.co.uk/journals/*

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