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AND STATE UNIVERSITY

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# Workplace Ergonomics Program



**Environmental, Health and Safety Services  
Occupational Health and Industrial Hygiene Division  
540-231-8751**

ENVIRONMENTAL, HEALTH AND SAFETY SERVICES

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# **Workplace Ergonomics Program**

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## **Revision Status**

Contact(s)	Implementation Date	Revision Number	Comments
Albert Moore	November, 1997	1	
Albert Moore	July, 2001	2	Codified workplace protocols for office, laboratory, industrial, ADA, Workers' Compensation, and expanded scope to incorporate new Return to Work policy. Posted on <a href="http://www.ehss.vt.edu">www.ehss.vt.edu</a> .

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## **Introduction**

### **Environmental, Health and Safety Services (EHSS) Mission Statement**

- To work toward providing a safe and healthful living, learning, and working environment for every member of the greater university community by assuring safe work practices through educating, training, and assisting individuals and departments;
- To help individuals and departments achieve compliance with all health and safety state and federal regulations and university policies as economically as possible; and
- To act as liaison with external regulatory agencies, and to monitor university compliance with mandatory health and safety standards where necessary.

### **Purpose**

1. To provide policies and procedures for the protection of Virginia Tech employees from ergonomic risk factors.
2. To establish a university ergonomics program which provides Virginia Tech employees with the following services:
  - Detection, correction, and prevention of musculoskeletal disorders by anticipating, identifying, and reducing ergonomic risk factors ,
  - Promotion of awareness of ergonomic risk factors and proper reporting of signs and symptoms of musculoskeletal disorders,
  - Coordination and promotion of ergonomics technology applications.

### **Applications**

The primary tools that Environmental, Health and Safety Services (EHSS) employs to administer the Workplace Ergonomics Program for Virginia Tech employees include:

- Training supervisors (including Deans, Directors, and Department heads) and employees in the awareness of and proper reporting of ergonomic risk factors and early reporting of signs and symptoms of musculoskeletal disorders.
- Review of Incident and Workers' Compensation records,
- Conducting workplace ergonomic risk assessments based on anticipated or reported ergonomics issues,
- Consulting on engineering and administrative ergonomic hazard reduction and control,
- Educating about the potential effects of ergonomic risk exposures,

- Communicating with supervisors and employees on ergonomics solution alternatives.

**Scope**

The Workplace Ergonomics Program involves all Virginia Tech employees whose job duties expose them to ergonomic risk factors. It is designed to systematically coordinate the efforts of Virginia Tech supervisors (including Deans, Directors, and Department heads), employees, and EHSS and other Virginia Tech entities to prevent occupational musculoskeletal disorders.

## Responsibilities

### Environmental, Health and Safety Services (EHSS)

The Industrial Hygienist for Physical Hazards from the Occupational Health and Industrial Hygiene Division of EHSS (231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu)) will be responsible for coordinating the Workplace Ergonomics Program (WEP) at Virginia Tech. This includes:

### Industrial

#### Hygienist:

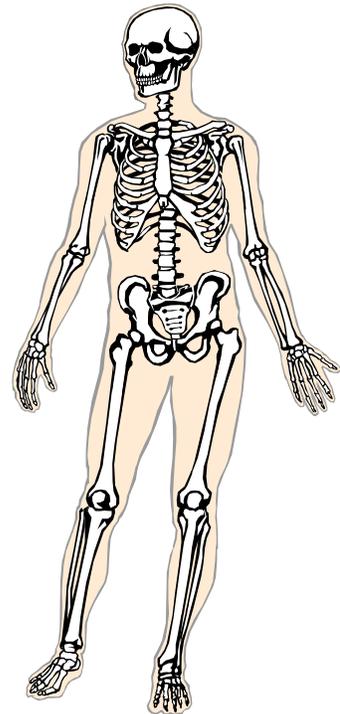
a person that anticipates, recognizes, and evaluates environmental hazards and can prescribe methods to eliminate, control, or reduce hazards.

- Educating supervisors and employees about ergonomic risk factors and the potential harm to their bodies,
- Recommending and coordinating the development of ergonomic risk factor reporting and case tracking mechanisms, and early sign and symptoms reporting.
- Training employees and supervisors in the need for, and the methods of early reporting of musculoskeletal disorder signs and symptoms.
- Prioritizing ergonomic evaluations based on available severity, prevalence and incident rate data (e.g. OSHA logs, First Report of Injury, Workers' Compensation, discomfort surveys).
- Performing ergonomic risk factor measurements and observations and communicating results to supervisors (including Deans, Directors, and Department heads) and employees,
- Establishing a job hazard analysis and control process that identifies, analyzes, and uses feasible engineering, work practice, controls to eliminate musculoskeletal disorders (MSD) hazards that reduce MSD hazards to the extent feasible, and
- Establishing ways to evaluate controls to assure that they are effective.

**Supervisors**

Supervisors (including Deans, Directors, and Department heads) are key personnel in promoting and maintaining a safe, local work environment. Supervisory responsibilities related to the Workplace Ergonomics Program are to:

- Provide funding to implement corrective measures to identified ergonomic risk factor exposures,
- Set a departmental climate which encourages active employee participation,
- Encourage early reporting of signs and symptoms of musculoskeletal disorders,
- Notify the Industrial Hygienist for Physical Hazards of EHSS (231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu)) of employee musculoskeletal signs and symptoms,
- Notify the Industrial Hygienist for Physical Hazards of EHSS (231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu)) of changes in workplace processes or equipment that may change (increase or decrease) ergonomic risk factors, and
- Ensure that the proper level of ergonomics training is provided to employees.

**Employees**

As the group most directly impacted by musculoskeletal disorders and their related discomfort and potentially disabling effects, employees are to:

- Report early signs and symptoms of musculoskeletal disorders,
- Follow work practice procedures related to their jobs that are intended to reduce ergonomic risks, and
- Actively participate in the recognition, analysis, and abatement of ergonomic risks.

**Other Virginia Tech Entities**

Within Virginia Tech, there are various entities that facilitate the implementation of solutions to ergonomic risk factors especially for those employees coping with musculoskeletal disorders. These are:

**Equal Opportunity and Affirmative Action****Americans with Disability Act (ADA) Office**

ADA Coordinator - Located in the Equal Opportunity/Affirmative Action (EOAA) office in 336 Burruss Hall, the ADA Coordinator is responsible for interpreting the impact of the ADA and the Rehabilitation Act of 1973 on University policies and practices. The ADA Coordinator consults with faculty,



staff, and departments about their related rights and responsibilities, provides training opportunities, and assists faculty and staff with specific accommodation needs. (540) 231-7500 (phone); (540) 231-9460 (TTY).

**Special Services Laboratory**

Special Services Lab, Newman Library - The ADA has provided a stimulus for industry to design and build remarkable adaptive equipment for use in both educational and professional environments. These devices provide a wide array of technological solutions for people with visual, hearing, learning, or physical disabilities. The Special Services Lab, located on the first floor of Newman Library, provides public access to and training on assistive technology devices for students and employees with disabilities. Referrals to the lab are made from the Dean of Students Office, Services for Students with Disabilities, Personnel Services or Environmental, Health and Safety Services (EHSS). (540) 231-3937 (phone); (540) 231-3035 (TTY); email: assist@vt.edu

**Personnel Services**

Personnel Services, located at Southgate Center, works with all departments to assist university employees with disabilities in identifying essential job functions and appropriate accommodations via Policy 4075. (540) 231-9331(phone); (540) 231-6258 (TTY); Their web site (<http://www.ps.vt.edu>) provides links for supervisors and employees on ergonomics issues.

**Return to Work (RTW)**

The Governor's Office has mandated that each agency establish a working Return to Work effort. This Executive Order 52(99) (<http://www.thedigitaldominion.com/press/eorder/eorder52.htm>) requires Virginia Tech to make every reasonable effort to return those employees to work who have sustained job related injuries or illnesses, and as a result are prevented from returning to their full former employment. Employees will be returned to work on a transitional or full time basis as soon as it is determined to be medically feasible to do so.

The Virginia Tech Return to Work Coordinator, (540) 231-3463, will be assigned to work closely with injured employees, treating physicians and departments to facilitate transitional duty assignments until the goal of full duty is obtained. Refer to Virginia Tech Policy 4420 posted on [www.ps.vt.edu](http://www.ps.vt.edu).

**Workers' Compensation**

The purpose of the Workers' Compensation Act is to provide compensation to an employee for the loss of his or her opportunity to engage in work, when the disability is occasioned by an injury suffered from an accident arising out of and during the course of their employment.

**Reporting Work-Related Injuries**

An injured employee needs to report the accident or illness to the direct supervisor. Upon the employee's notification of the injury to the departmental supervisor, the department must offer the employee a Workers' Compensation Panel of Physicians. The employee must select a physician from the panel of physicians for treatment by completing the Panel Physician Selection form. The

department will need to submit the signed Panel Physician Selection form with the Employer's Accident Report that is forwarded to the Benefit's Office.

Those employees needing immediate medical treatment for serious injuries may visit the Emergency Room and will need to report the injury as Workers' Compensation at the time treatment is received. All follow-up treatment must be provided by a Workers' Compensation panel physician.

Once an employee reports a job-related injury, the supervisor must immediately file the original Employer's Accident Report, Form VWC No. 3 (revised 09/01/99). This form requires an original authorized departmental signature for line #50 and may be obtained by calling Kathy Gibson at (540)231-7778 or Ella Mae Vaught at (540)231-7774. A claims adjuster from Managed Care Innovations, our Workers' Compensation carrier, will be assigned to handle the claim.

### **Information Systems**

Information Systems exists to serve the university community and the citizens of the Commonwealth by applying information resources to:



- enhance teaching and learning
- support research
- foster outreach and develop partnerships
- optimize administration

Information Systems and Computing (IS&C), a division of Virginia Tech Information Systems, provides the university community with information technology and support to complement its teaching, learning, research, and outreach.

IS&C supports Virginia Tech information technology users, through desktop set-up for students and staff, assistance in acquiring desktop computing hardware and software, and direct user assistance ([4HELP](#)).

### **Dean of Students**

The Dean of Students Office (<http://www.dos.vt.edu/>) creates a campus climate which promotes the personal and intellectual development of students by offering both support and challenge.



The office provides support for the transition to college life, for the creation of a campus community which is welcoming to all and which celebrates diversity, through coordination of access and accommodation for students with disabilities, through leading the response to student emergencies, and by serving as a voice for student concerns within the broader campus community.

The office provides challenge by assisting students in developing problem solving skills. The office serves as the primary link between students, parents, faculty, and the administration of the university. It offers a first line of response for parents and students in addressing issues in any area of student life.

**The Services for Students with Disabilities (SSD)**

The Services for Students with Disabilities (SSD), a function of the Dean of Students Office, is located in 152 Henderson Hall. The SSD is responsible for the identification and certification of students with disabilities and for determining appropriate academic accommodation. The Coordinator for Interpreting and Sensory Loss Services is also housed in the Dean of Student's Office. The SSD's web page, <http://www.rgs.vt.edu/gta/gta/StuWDisabilities.html>, has a link to College Students with Disabilities, a Faculty Handbook, with guidelines for accommodations, laws, and resources. (540) 231-3787 (phone); (540) 231-8717 (TTY).

Services for Students with Disabilities, a functional area in the Dean of Students Office, exists to assist the university with its mission of creating an inclusive and welcoming community for all students. Services for Students with Disabilities works to ensure that students with disabilities receive an equal access to education and opportunities in this academic community.

Accommodations are modifications or adjustments to programs, services, and facilities that enable a student with a disability to have an equal opportunity. Achieving reasonable accommodations for a student with a disability involves shared responsibility between students, faculty, and staff. Accommodations are provided on an individual basis.

Auxiliary aids are devices or services that compensate for a disability. These aids may include interpreters, readers, notetakers, and special equipment such as assistive listening devices and TDDs.

A variety of programs are offered each year. These include programs for faculty and staff.

To be eligible for disability-related services, students must have a documented disability condition as defined by the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. Students with disabilities must self-identify and provide relevant, comprehensive professional documentation to receive services.

**Virginia Tech College of Human Resources and Education**



*The Training & Technical Assistance Center*

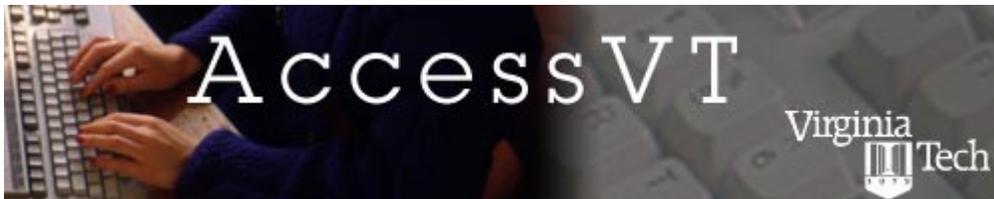
**Training and Technical Assistance Center (T-TAC)**

The mission of the Training and Technical Assistance Center (T-TAC), located in 222 Lane Hall, is to improve educational opportunities and contribute to the success of children and youth with disabilities (birth-22 years) and children who have disadvantages or are at-risk for school failure (birth-9 years). The Center provides quality training and technical assistance in response to local, regional, and state needs. T-TAC services increase the capacity of schools, school personnel, service providers, and families to meet the needs of children and youth. (540) 231-5167 or (800) 848-2714, FAX: (540) 231-5672, TDD: 231-3315.

<http://tac.elps.vt.edu/>

Services include:

- Library Loans including print material, videos, instructional and assistive technology, and augmentative communication devices.
- Technical assistance is available for transition between schools and from secondary school to work, community participation, and post-secondary education.
- Information searches on current practices, syndromes and disabilities, latest research, and other topics.
- Referral Services through linking and networking, T-TAC can connect Virginia Tech employees to other programs and professionals that will best meet needs.



**Access VT**

Access VT is a tool that allows users to view any web page on the internet the way they would like to see them. It modifies web pages "on the fly", applying a personal formatting preferences chosen when users register to use the system.



Access VT users are not limited to text-only presentations of web-pages. The system allows users to remove/modify only what they want to change about EVERY web page viewed. This could be font sizes, colors, background removal, image removal, etc.

<http://access.vt.edu/>

## **Workplace Ergonomics Applications**

### **Definition of Ergonomics**

# **E**xpress **R**eview **G**uide **O**pen

Ergonomics is concerned with "the problem and processes involved in designing things for effective human use, and creating environments that are suitable for human living and work. It recognizes that work methods, equipment, facilities, and tool design all influence the worker's motivation, fatigue, likelihood of sustaining an occupational injury or illness, and productivity." (Occupational Ergonomics Handbook, 1999, p. 1594)

An ergonomic workplace can:

1. reduce occupational injury and illness
2. reduce workers' compensation and sickness and accident costs
3. reduce medical visits
4. reduce absenteeism
5. improve productivity
6. improve quality and reduce scrap
7. improve worker comfort on the job

Applications of Workplace Ergonomic principles require removal of two types of barriers: knowledge-based, and organizational.

Knowledge-based barriers stem from a lack of basic ergonomic principles and/or specific job-related ergonomic stressors. Organizational barriers stem from insufficient communication between those who design, purchase, install and use a workplace. They also can stem from competing interests for limited resources such as budgets, labor, and time. (Occupational Ergonomics Handbook, 1999, p. 1588).

Taken together, these barriers can slow the progress of implementing effective ergonomics to prevent and reduce occupational injuries and illnesses. The Virginia Tech Workplace Ergonomics Program addresses these potential barriers and provides a systematic approach to promote and sustain cost-effective, practical workplace ergonomic solutions that prevent injuries and illnesses for Virginia Tech employees.

### **Areas**

Application of Workplace Ergonomics principles can benefit employees engaged in a wide variety of pursuits. At Virginia Tech, these applications are arranged into five functional areas:

- Office
- Industrial

## **WORKPLACE ERGONOMICS PROGRAM**

- Laboratory
- Americans with Disabilities Act (ADA) Compliance
- Return-to-Work

Each functional area shares the common goal of systematically identifying ergonomic risks (such as musculoskeletal) and prioritizing solutions to reduce employee risk exposures.

However, there are some differences in the approaches which are described below.

### **Office**

Given the near universal use of computer systems, most Virginia Tech employees are exposed to office ergonomic risk factors for the upper extremities. Since office tasks are also visually intensive, special attention is paid to document and monitor placement. Office furniture, especially seating, is a key factor in reducing risks and improving safety, comfort, and productivity.

### **Industrial**

This area is more likely to expose employees to more acute injury risks from material handling activities to the upper extremities and back. Biomechanic analyses are appropriate tools to quantify stressors and demonstrate relative risks.

### **Laboratory**

Virginia Tech employees working in one of the more than 1000 laboratories generally have computer-related risk exposures to the upper extremities in addition to repetitive use of specialized equipment.

### **Americans with Disabilities Act (ADA)**

When complying with the ADA, confidentiality requirements significantly alter the reporting, case tracking, and follow-up procedures. See Policy 4075 enacted on February 18, 1999. EHSS assists in applying and implementing accommodations that reduce ergonomic risk factors.

(<http://www.vt.edu/admin/policies/4000/4075.html>)

### **Return-to-Work**

EHSS assists the Return to Work coordinator in assessing the physical demand of job tasks and proposing accommodations. As with ADA, additional confidentiality requirements are required.

## WORKPLACE ERGONOMICS PROGRAM

### ERGO Systems Model

ErgoFair99  
Workshops  
on  
Workplace Ergonomics

To help communicate and enhance understanding of the Workplace Ergonomics Program at Virginia Tech, the ERGO systems model was developed. It was first used in training workshops at ErgoFair99 in October, 1999 at Donaldson Brown Hotel and Conference Center for the university community.

This acronym provides another way to think about the process involved in understanding and solving ergonomics issues. The ERGO model has four elements:

- Express – tell others about perceived ergonomic risks and health effects
- Review – carefully look at tasks to discover the type and degree of ergonomic risks
- Guide – provide a range of solutions (training, medical management, equipment) to reduce ergonomic risks
- Open – be willing to implement and use new equipment and methods

The Workplace Ergonomics Program applies the ERGO model across these processes.

**Job Hazard Analysis:** a safety and health review that identifies jobs and workstations that may contain musculoskeletal hazards, the risk factors that pose the hazards, and the causes of the risk factors.

**Hazard prevention and control:** eliminating or minimizing the hazards identified in the worksite analysis by changing the jobs, workstations, tools or environment to fit the worker.

**Medical management:** the effective use of available health-care resources to prevent or manage work-related musculoskeletal disorders. –Relate to RTW

**Training and education:** a method to give both workers and managers an understanding of the potential risk of injuries, their causes, symptoms, prevention and treatment.

### Express

The “Express” element of the ERGO model focuses on communication between employees, supervisors, EHSS and other Virginia Tech entities.

#### Responsibilities

##### Employees

Employees are responsible to report signs and symptoms of musculoskeletal disorders to supervisors.

Express  
Review  
Guide  
Open

## WORKPLACE ERGONOMICS PROGRAM

### Supervisors

Supervisors (including Deans, Directors, and Department heads) are responsible for promoting a climate that fosters communication about ergonomic issues. This includes listening and responding to employee reports of signs and symptoms of musculoskeletal disorders and promptly forwarding concerns to EHSS.

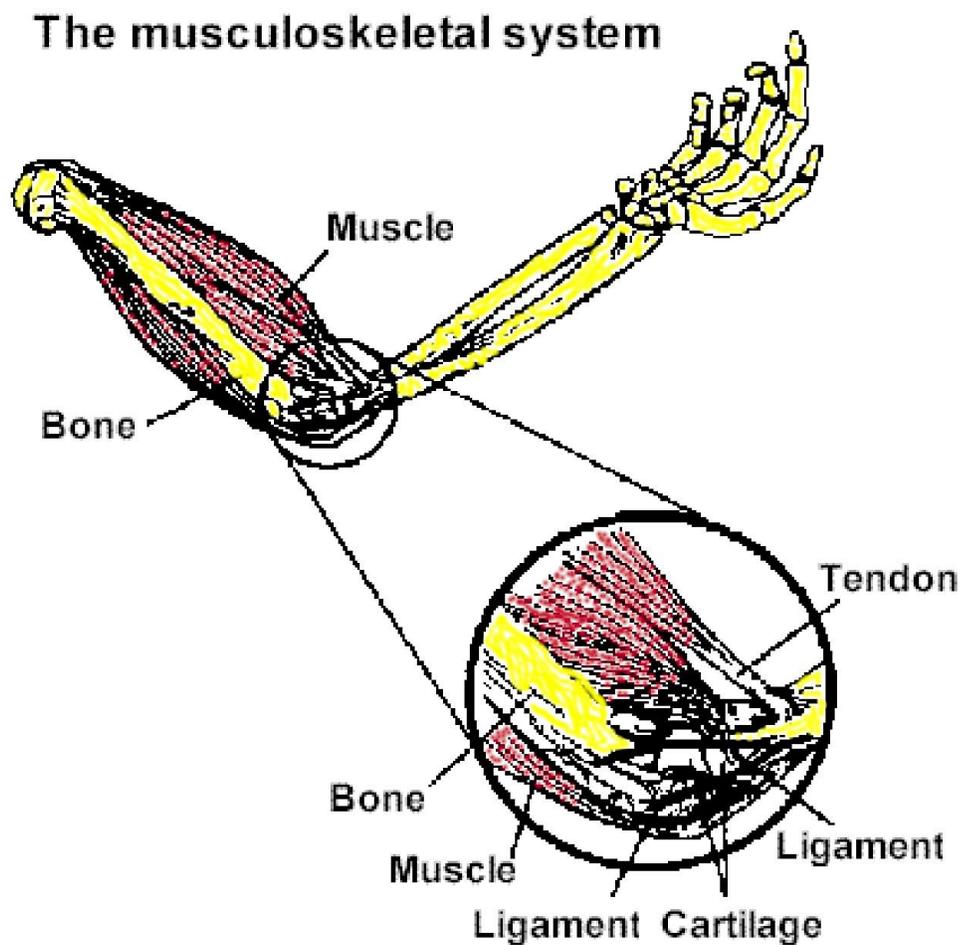
### EHSS

EHSS is responsible to prioritize and address reported ergonomic issues and coordinate distribution of awareness resources to supervisors and employees.

### Signs of musculoskeletal disorders

Some background information on the musculoskeletal system will provide employees and supervisors with a framework to “express” ergonomic concerns.

The musculoskeletal system is made up of the soft tissue and bones in the body. The arm is presented as an example below.



## WORKPLACE ERGONOMICS PROGRAM

These are the parts of the musculoskeletal system:

**Bones:** the load-bearing structure of the body.

**Muscles:** tissues that contract to create movement.

**Tendons:** tissue that connects muscles to bones.

**Ligaments:** tissue that connects bones to bones.

**Cartilage:** tissue that provides cushioning and reduces friction between bones.

**Nerves:** the communication system that links muscles, tendons and other tissue with the brain.

**Blood vessels:** tubes that circulate nutrients throughout the body.

### If you have signs or symptoms of MSDs...

If signs and symptoms of MSDs are not reported early, permanent disability may result. It is important to report MSD signs and symptoms right away to avoid long-lasting problems.

As previously stated, ergonomics is the science of fitting jobs to the people who work in them. The goal of the Virginia Tech Workplace Ergonomics Program is to reduce work-related musculoskeletal disorders (MSDs) employees may develop when a major part of their jobs involve ergonomic risk factors such as reaching, bending over, lifting heavy objects, using continuous force, working with vibrating equipment and doing repetitive motions.

### What are MSDs?

MSDs are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints or spinal discs. A healthcare provider might diagnose the following common MSDs.

- Carpal tunnel syndrome
- Rotator cuff syndrome
- Trigger finger
- Sciatica
- Tendinitis
- Raynaud's phenomenon
- Herniated spinal disc
- Low back pain
- Tension neck syndrome
- De Quervain's disease
- Epicondylitis
- Carpet layers' knee
- Hand-arm Vibration Syndrome



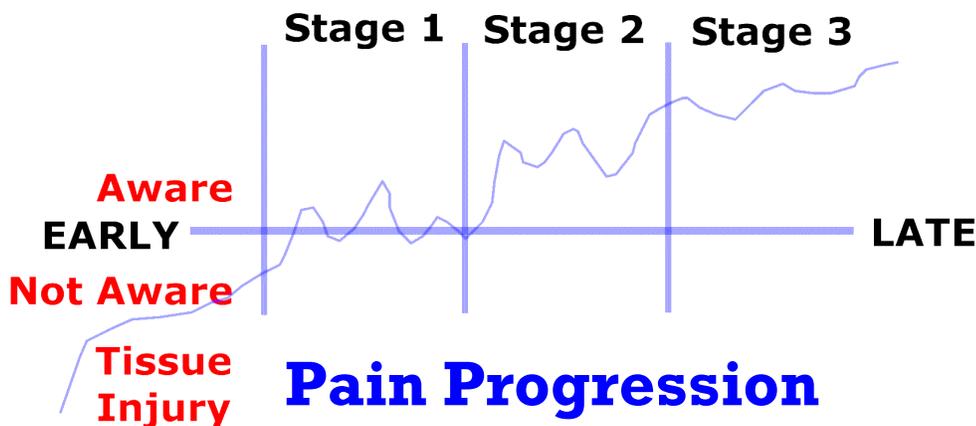
## WORKPLACE ERGONOMICS PROGRAM

### Signs and symptoms of MSDs

Employees suffering from MSDs may experience less strength for gripping, less range of motion, loss of muscle function and inability to do everyday tasks.

Common symptoms include:

- Painful joints
- Pain in wrists, shoulders, forearms, knees
- Pain, tingling or numbness in hands or feet
- Fingers or toes turning white
- Shooting or stabbing pains in arms or legs
- Back or neck pain
- Swelling or inflammation
- Stiffness
- Burning sensation



## WORKPLACE ERGONOMICS PROGRAM

### What causes MSDs?

Other terms for musculoskeletal disorders:  
Cumulative trauma disorders (CTDs)  
Repetitive trauma disorders  
Repetitive strain injuries (RSIs)  
Repeated motion disorders  
Overuse syndromes

According to the scientific literature, the following are recognized as important risk factors for musculoskeletal disorders, especially when occurring at high levels and in combination. Figure 1 provides illustrations of some of these risk factor conditions. In general, knowledge of the relationships between risk factors and the level of risk (dose-response) is still incomplete. Also, individuals vary in their capacity to adjust to the same job demands. Some may be more affected than others.

Workplace MSDs are caused by exposure to the following risk factors:

#### **Repetitive motions**

Doing the same motions over and over again places stress on the muscles and tendons. The severity of risk depends on how often the action is repeated, the speed of the movement, the number of muscles involved and the required force.

If motions are repeated frequently (e.g., every few seconds) and for prolonged periods such as an 8-hour shift, fatigue and muscle-tendon strain can accumulate. Tendons and muscles can often recover from the effects of stretching or forceful exertions if sufficient time is allotted between exertions. Effects of repetitive motions from performing the same work activities are increased when awkward postures and forceful exertions are involved. Repetitive actions as a risk factor can also depend on the body area and specific act being performed.

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### Awkward postures

Body postures determine which joints and muscles are used in an activity and the amount of force or stresses that are generated or tolerated. Awkward postures include repeated or prolonged reaching, twisting, bending, kneeling, squatting, working overhead with your hands or arms, or holding fixed positions. For example, more stress is placed on the spinal discs when lifting,



Figure 1. Selected risk factor conditions. (Illustrations adapted from UAW-GM Center for Health & Safety [1990]; Putz-Anderson V [1988]; Grant et al. [1995]; Canadian Center of Occupational Safety and Health [1988]; American Meat Institute and Ergo Tech, Inc. [1990].)

lowering, or handling objects with the back bent or twisted, compared with when the back is straight. Manipulative or other tasks requiring repeated or sustained bending or twisting of the wrists, knees, hips, or shoulders also impose increased stresses on these joints. Activities requiring frequent or prolonged work over shoulder height can be particularly stressful.

## **WORKPLACE ERGONOMICS PROGRAM**

### **Contact stresses**

Pressing the body against a hard or sharp edge can result in placing too much pressure on nerves, tendons and blood vessels. For example, using the palm of your hand as a hammer can increase your risk of suffering an MSD.

Repeated or continuous contact with hard or sharp objects such as non-rounded desk edges or unpadded, narrow tool handles may create pressure over one area of the body (e.g., the forearm or sides of the fingers) that can inhibit nerve function and blood flow.

### **Vibration**

Exposure to local vibration occurs when a specific part of the body comes in contact with a vibrating object, such as a power handtool. Exposure to whole-body vibration can occur while standing or sitting in vibrating environments or objects, such as when operating heavy-duty vehicles or large machinery.

### **Forceful exertions (including lifting, pushing, and pulling)**

Force is the amount of physical effort required to perform a task (such as heavy lifting) or to maintain control of equipment or tools. The amount of force depends on the type of grip, the weight of an object, body posture, the type of activity and the duration of the task.

Tasks that require forceful exertions place higher loads on the muscles, tendons, ligaments, and joints. Increasing force means increasing body demands such as greater muscle exertion along with other physiological changes necessary to sustain an increased effort. Prolonged or recurrent experiences of this type can give rise to not only feelings of fatigue but may also lead to musculoskeletal problems when there is inadequate time for rest or recovery. Force requirements may increase with:

- increased weight of a load handled or lifted,
- increased bulkiness of the load handled or lifted,
- use of an awkward posture,
- the speeding up of movements, increased slipperiness of the objects handled (requiring increased grip force),
- the presence of vibration (e.g., localized vibration from power handtools leads to use of an increased grip force),
- use of the index finger and thumb to forcefully grip an object (i.e., a pinch grip compared with gripping the object with your whole hand), and
- use of small or narrow tool handles that lessen grip capacity.

### **Duration**

Duration refers to the amount of time a person is continually exposed to a risk factor. Job tasks that require use of the same muscles or motions for long durations increase the likelihood of both localized and general fatigue. In general, the longer the period of continuous work (e.g., tasks requiring sustained

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muscle contraction), the longer the recovery or rest time required. In cases of high force requirements, sufficient recovery time may be longer than the task itself.

### **Other conditions**

Workplace conditions that can influence the presence and magnitude of the risk factors for MSDs can include:

- cold temperatures,
- insufficient pauses and rest breaks for recovery,
- machine paced work, and
- unfamiliar or unaccustomed work.

### **Workplace Ergonomics Program History at Virginia Tech**

Activity and outcome measures are both important to adequately determine whether an ergonomics program is effective. Activity measures help identify whether the program elements are functioning as a systematic process. This type of measure indicates whether "mid-course" corrections are needed to achieve targeted long-term goals and whether the program is set to respond quickly to problems that arise in the future. Activity measures also provide ways to measure interim or "in-process" accomplishments achieved along the path to building a program that is effective in eliminating or reducing MSDs and MSD hazards. This particularly important if it takes time before quantitative successes can be measured.

Outcomes measures, on the other hand, are the most telling in terms of defining a successful program because they measure quantitative "bottom-line" results. They identify whether the program eliminates or reduces MSDs, MSD hazards and related costs.

### **University Community Outreach**

EHSS has hosted three university community outreach events on ergonomics called ErgoFairs. These events were held in March and September of 1998 and again in October, 1999, and drew representatives from 52 departments with over 250 registered attendees. Each all-day event provided a variety of training experiences and speakers on ergonomics along with demonstrations of the latest in office furniture, seating, and assistive technologies.

In the Spring of 1998, a machine readable Musculoskeletal Disorder Symptom Survey was developed with input from the Virginia Tech Center for Survey Research. CommonHealth distributed this survey to 948 employees in conjunction with wellness events. The data collected illustrated the prevalence of self-reported ergonomics signs and symptoms across Virginia Tech. It suggested those with longer job tenure experienced greater self-reported discomfort. There was also a concentration of symptoms in the upper extremities with correlation to the degree of computer usage.

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### **Training**

In addition to the training offered at ErgoFair Workshops, training has been provided for the staff of Virginia Tech Extension Services and the College of Human Resources during off-site retreats. Other departments and groups (e.g., Fisheries and Wildlife, Residential and Dining Programs, Administrative Information Systems, Controllers Office, Fiscal Lunch Bunch) have benefited from group training in ergonomic awareness as they seek to implement ergonomic solutions.

### **Consultations**

While group interactions and education enhance understanding of ergonomics, individual consultations have historically been the main tool to evaluate risk factors and fashion solutions. EHSS has served over 100 individuals with customized ergonomics evaluations, reports, and follow-up spanning 40 different departments.

To arrange training or consultations in a department, contact the Industrial Hygienist for Physical Agents at 231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu).

### Review

The “review” component of the ERGO model focuses on developing a perspective on the extent and type of ergonomic issues reported at Virginia Tech.

#### Responsibilities

##### Employees

In addition to signs and symptoms for musculoskeletal disorders, Virginia Tech employees should report all occupational injuries and illnesses to their supervisors.

##### Supervisors

Supervisors should document employee reports of occupational injuries and illnesses using the appropriate forms. Accurate and timely reporting is critical to appropriate interventions.

##### EHSS

EHSS will collect lost-time work injuries data along with ergonomics information from sources inside and outside Virginia Tech. This will be used in educational materials, training, and to prioritize ergonomics activities with the goal to reduce incidence and severity rates.

#### Lost-time work injuries Statistics

##### National Incidence and Severity Rates

On March 28, 2001, the Bureau of Labor Statistics released “Lost-worktime injuries and illnesses: Characteristics and resulting time away from work, 1999.” The following excerpt provides a national perspective on the prevalence of musculoskeletal disorders in the workplace. The Workplace Ergonomics Program prepares and equips Virginia Tech to address these issues and reduce employee pain and suffering with associated losses in productivity, morale and money.

A total of 1.7 million injuries and illnesses that required recuperation away from work beyond the day of the incident were reported in private industry workplaces during 1999.

The number of injuries and illnesses reported with only restricted work activity rather than days away recuperating remained at over 1,000,000 cases in 1999, after increasing by nearly 70 percent during the previous seven year period.

As in the preceding six years, more than 4 out of 10 injuries and illnesses resulting in time away from work in 1999 were sprains or strains, most often involving the back...and cases of carpal tunnel syndrome increased 6 percent.

Almost 6 out of 10 workers had at least a year of service with their employer when they sustained their injury or illness. Indeed, almost a fourth had over 5 years of service, suggesting that many experienced workers incur lost worktime

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**G**uide  
**O**pen



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**injuries** [emphasis added]. This implies that training and experience alone are not sufficient to prevent injuries and illnesses. Recurring application of the ERGO model is necessary to reduce inherent system-wide workplace ergonomic risks. The Virginia Tech Workplace Ergonomics Program provides the tools to address and reduce systematic workplace risks with appropriate engineering and workplace controls and facilitate employee and supervisor acceptance of these ergonomics technologies.

YEAR	Total	MSDs	Percent
1992	2,331,100	784,100	33.6%
1993	2,252,600	762,700	33.9%
1994	2,236,600	755,600	33.8%
1995	2,040,900	695,800	34.1%
1996	1,880,500	647,400	34.4%
1997	1,833,400	626,400	34.2%
1998	1,730,500	592,500	34.2%
1999	1,702,500	582,300	34.2%

**Table 1.: National MSD Trends**

**"many experienced workers incur lost worktime injuries.** This implies that training and experience alone are not sufficient to prevent injuries and illnesses."

Case characteristics help identify the disabling condition leading to the lost worktime and how the event or exposure occurred. Following are highlights of the 1999 findings for these characteristics:

- Sprain and strain was, by far, the leading nature of injury and illness in every major industry
- The trunk, including the back, was the body part most affected by disabling work incidents in every major industry. Most other injuries and illnesses were to upper or lower extremities.
- Overexertion while maneuvering objects and contact with objects and equipment led all other disabling events or exposures

No one source of injury or illness stood out, although the following three had roughly 14 to 16 percent each of the case total: floors and other surfaces, worker motion or position, and containers.

The U.S. Department of Labor defines a musculoskeletal disorder (MSD) as an injury or disorder of the muscles, nerves, tendons, joints, cartilage, and spinal discs. MSDs do not include disorders caused by slips, trips, falls, motor vehicle accidents, or similar accidents.

Work-related musculoskeletal disorders (MSDs) include cases where the nature of the injury or illness is:

- sprains, strains, tears;
- back pain, hurt back;
- soreness, pain hurt, except the back;

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- carpal tunnel syndrome;
- hernia;
- or musculoskeletal system and connective tissue diseases and disorders and
- when the event or exposure leading to the injury or illness is bodily reaction/bending, climbing, crawling, reaching, twisting;
- overexertion;
- or repetition.

Cases of Raynaud's phenomenon, tarsal tunnel syndrome, and herniated spinal discs are not included. Although these cases may be considered MSDs, the survey classifies these cases in categories that also include non-MSD cases.

Over 582,000 musculoskeletal disorders were reported, accounting for more than one out of three of the injuries and illness involving recuperation away from work. Although both total injuries and illnesses with days away from work and MSDs have decreased since 1992, MSDs continue to account for more than one in three of the total lost worktime cases.

Median days away from work--the key survey measure of severity--designates the point at which half the cases involved more days and half involved fewer days. The median number of lost workdays for all cases was 6 days in 1999, with a fourth of the cases resulting in 21 days or more away from work.

- Among major disabling injuries and illnesses, median days away from work were highest for
  - (a) carpal tunnel syndrome (27 days),
  - (b) fractures (20 days), and
  - (c) amputations (18 days).
- Repetitive motion, such as grasping tools and typing resulted in the longest absences from work among the leading events and exposures--a median of 17 days.
- Injuries to the wrist resulted in the longest absences from work--a median of 12 days. Injuries to the knee and shoulder had the next longest absences from work--a median of 10 days each.



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### Virginia Tech Data

From recent Return to Work (RTW) and Workers' Compensation (WC) data, these are Virginia Tech 2000 injury data.

2000 Injury Data by Type		2000 Injury Data by location	
Strain	48%	Hand/Finger	26%
Laceration	24%	Back	20%
Contusion	14%	Arm/Shoulder	13%
Burn	4%	Knee/Leg	13%
Foreign Object	3%	Head/Face	10%
Other	3%	Elbow/Wrist	7%
Fracture	2%	Ankle/Foot	7%
Illness	1%	Other	2%
		Abdomen	2%

**Table 2.: Recent Virginia Tech MSD Data**

The OSHA 200 log indicates 231 injuries filed without lost workdays in 1999. There were also 168 injuries that occurred involving days away from work with a total of 1528 days for the year of days away from work.

Numbers indicating musculoskeletal injuries vs. non-musculoskeletal injuries were not available. There were 2 injuries in 1999 with repeated trauma that were OSHA reportable involving carpal tunnel syndrome recorded as illnesses leading to 12 additional days of lost work and 1 injury being without any lost time.

## **Guide (Job Hazard Analysis)**

The “guide” component of the ERGO model focuses on applying appropriate ergonomic tools to analysis specific jobs to identify the types and causes of musculoskeletal disorders.

### **Responsibilities**

#### **Employees**

Employees should cooperate with supervisors and EHSS in the assessment of job tasks and demands.

#### **Supervisors**

Supervisors should cooperate with employees and EHSS in the assessment of job tasks and demands.

#### **EHSS**

EHSS will conduct a safety and health review (Job Hazard Analysis) that identifies jobs and workstations that may contain musculoskeletal hazards, the risk factors that pose the hazards, and the causes of the risk factors. This review will involve input from both supervisors and employees.

### **Job Hazard Analysis**

These are the primary steps used to conduct a job hazard analysis:

- Records review.
- Signs of musculoskeletal disorders.
- Incidence and severity rates.
- Selecting projects.
- Identifying risk factors.
- Worksite analysis tools.
- Identifying risk-factor causes.

Each of the four parts of the ERGO model (Express, Review, Guide, and Open) apply throughout these activities.

**E**xpress  
**R**evue  
**G**uide  
**O**pen

## **WORKPLACE ERGONOMICS PROGRAM**

### **Records Review**

There are many different ways to prioritize the control of MSD hazards. While addressing the worst problems first, other factors should be considered in setting priorities:

- The number of employees affected;
- The severity of the MSDs reported or identified;
- The availability of controls; and
- The ability of interim measures, such as employee rotation, to protect employees while permanent solutions are developed and implemented.

### Potential Sources of Ergonomics Information

- Records review.
- Signs of musculoskeletal disorders.
- Incidence and severity rates.
- Worksite analysis tools.
- OSHA 200 log of injuries and illnesses
- Workers' compensation claims.
- First-aid room logs.
- Accident reports or incident reports.
- Safety meeting reports or minutes (required of all employers).
- Safety and/or workplace audits.
- Job titles and descriptions.
- Employee complaints.
- Symptom surveys
- Equipment and tool evaluations.

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Table 3 summarizes the priority considerations in deciding about the need for job analyses and consequent control interventions for addressing MSDs.

**Table 3. Determining priorities for job analyses and control actions**

<b>Priority and action</b>	<b>Current cases of MSDs for persons in selected jobs</b>	<b>No current cases, but past plant records indicate MSDs in select jobs or departments that have not changed</b>	<b>No current or past cases, but worker complaints and symptom surveys suggest MSDs in select jobs or departments</b>	<b>No cases, reports of MSDs, or complaints, but job screening and checklists suggest high risk factor potential in select jobs</b>
Priority for follow-up analyses and control actions	Immediate need	Priority is second only to the need to address more current cases	Third in priority; resolving problems at an early stage is commendable	While last in priority, this effort is preventive; most positive of all actions
Type of job analyses needed	Perform job analyses to sort out and rate risk factors for observed cases	Perform job analyses to sort out and rate risk factors for jobs with highest number or severity of past MSDs and largest work group at risk	Perform job analyses to sort out and rate risk factors for jobs having frequent MSD complaints and symptoms	Perform job analyses to sort out and rate risk factors for jobs with the highest problem potential (based on screening observations)
Focus needed for control actions	Control actions should be focused on reducing the highest rated risk factors in current jobs linked with the greatest number of cases	Control actions should be focused on reducing the highest rated risk factors in jobs with the highest number or greatest severity of past MSDs for the largest work group at risk	Control actions should be focused on reducing the highest rated risk factors in jobs having frequent MSD complaints and symptoms	Control actions should be focused on reducing the highest rated risk factors for MSDs before any are reported

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### Prioritizing–Selecting projects.



Screening jobs for these risk factors may involve the following:

- Walk-through observational surveys of the work facilities to detect obvious risk factors
- Interviews with employees and supervisors to obtain the above information and other data not apparent in walk-through observations, such as time and workload pressures, length of rest breaks, etc.
- Use of checklists for scoring job features against a list of risk factors

Of the above three methods, the checklist procedure provides the most formal and orderly procedure for screening jobs. Numerous versions of checklists exist in ergonomics manuals. When persons familiar with the job, task, or processes involved gather the checklist data, the quality of the data is generally better. Checklist procedures are also typically used in more complete job analyses (described below).

While screening tools such as checklists have been widely and successfully used, these are no substitutes for professional judgement and skill. Combining checklist observations with symptoms data offers a means of overcoming uncertainty.

Integrating efforts to identify risk factors for musculoskeletal disorders with efforts to identify common safety hazards such as slips and trips should be considered. Jobs with risk factors for musculoskeletal disorders also may have safety hazards.

Scenarios for more intensive job analysis to verify the existence of risk factors for musculoskeletal disorders include.

- finding cases of musculoskeletal disorders prompted the follow-up analysis.
- Complaints of musculoskeletal discomfort, established through questionnaires, were the basis for sorting out possible work-related causes.
- The physical demands or risk factors of the job, even without medical or symptom data, presented strong risk implications for potential MSDs, thus triggering the analysis.

These three scenarios offer a basis for setting priorities for undertaking risk factor analyses and implementing control measures. Specifically, jobs associated with cases of musculoskeletal problems deserve the highest consideration in follow-up efforts to identify risk factors and implement control actions. Jobs in which current cases have been identified should receive immediate attention, followed by those in which past records have noted a high incidence or severity of MSDs despite the lack of current cases. Priority for job analysis and

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intervention should be given to those jobs in which most people are affected or in which work method changes are going to be taking place anyway.

Jobs associated with worker complaints of fatigue and discomfort should be ranked next in deciding needs for follow-up job analysis and possible interventions.

Finally, where screening efforts suggest the presence of significant risk factors for musculoskeletal disorders, more detailed job analyses should be done to assess the problem potential. Ratings of high or extreme levels of risk factors, especially occurring in combination, may indicate a need for control actions. While appearing last in the priority order, taking steps to reduce apparent risk factors for musculoskeletal disorders is a preventative approach.

### **A JOB HAZARD ANALYSIS IS ADEQUATE IF IT COVERS FIVE JOB FACTORS AND COMPONENTS:**

#### **I. Physical demands of the work tasks or job**

- Force
- Repetition
- Work postures
- Duration
- Local contact stress

#### **II. Workstation layout and space**

- Work reaches
- Work heights
- Seating
- Floor surfaces
- Contact stress

#### **III. Equipment used and objects handled**

- Size and shape
- Weight and weight distribution
- Handles and grasp surfaces
- Vibration

#### **IV. Environmental conditions**

- Cold and heat
- Glare (as related to awkward postures)

#### **V. Work organization**

- Work-recovery cycles
- Work rate
- Task variability

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### Identifying Risk Factors

Job analysis breaks a job into its various elements or actions, describes them, measures and quantifies risk factors inherent in the elements, and identifies conditions contributing to the risk factors [Putz-Anderson 1988; Keyserling et al. 1993; Grant et al. 1995; ANSI 1996].

**FORCE**

**REPETITION**

REPETITION REPETITION REPETITION  
REPETITION REPETITION

**POSTURE**

**DURATION**

Persons with considerable experience and training in these areas usually perform job analyses. While most job analyses have common approaches, such as a focus on the same set of risk factors described above, no "standard" protocol exists for conducting a job analysis to assess ergonomic hazards.

Most job analyses have several common steps. A complete description of the job is obtained. Employees are often interviewed in order to determine if the way the job is done changes over time. During the job analysis, the job is divided into a number of discrete tasks. Each task is then studied to determine the specific risk factors that occur during the task. Sometimes each risk factor is evaluated in terms of its magnitude, the number of times it occurs during the task, and how long the risk factor lasts each time it occurs.

The tasks of most jobs can be described in terms of (1) the tools, equipment, and materials used to perform the job, (2) the workstation layout and physical environment, and (3) the task demands and organizational climate in which the work is performed. Job screening, as described above, provides some of these data. More definitive procedures for collecting information on these components can include the following:

- Observing the workers performing the tasks in order to furnish time-activity analysis and job or task cycle data; videotaping the workers is typically done for this purpose
- Still photos of work postures, workstation layouts, tools, etc., to illustrate the job
- Workstation measurements (e.g., work surface heights, reach distances)
- Measuring tool handle sizes, weighing tools and parts, and measuring tool vibration and part dimensions
- Determining characteristics of work surfaces such as slip resistance, hardness, and surface edges
- Measuring exposures to heat, cold, and whole body vibration
- Biomechanical calculations (e.g., muscle force required to accomplish a task or the pressure put on a spinal disc based on the weight of a load lifted, pulled, or pushed)
- Physiological measures (e.g., oxygen consumption, heart rate)

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- Special questionnaires, interviews, and subjective rating procedures to determine the amount of perceived exertion and the psychological factors influencing work performance

### **Worksite analysis tools**

One approach calculates the muscle strength required to perform a certain job task and estimates the fraction of the working population that possesses the required strength. A second approach asks workers in the laboratory to judge acceptable work conditions by engaging them in tasks that impose different physical demands. A third method compares the forces generated in a part of the body when performing specific work tasks and compares it with a level believed to be harmful.

NIOSH recommends the use of the NIOSH lifting equation as one useful approach in both the design of new lifting tasks and in the evaluation of existing lifting tasks [Waters et al. 1993; Waters et al. 1994]. Other assessment tools are also available for evaluating such tasks [Chaffin and Andersson 1991; Marras et al. 1993, 1995; Hidalgo et al. 1995]. Population data depicting human strength capacities can be helpful in designing and evaluating jobs [Snook and Ciriello 1991]. Tables indicating standing and seated height and reach distances that can accommodate various proportions of the worker population [Kroemer and Kroemer-Elbert 1994] can also be helpful. Comparing job analysis results with such references can yield estimates of the percentage of the population that may be especially affected by these job conditions. Westgaard and Winkel [1996, p. 87] recently summarized the strengths and weaknesses of current guidelines by concluding that "at present, guidelines to prevent musculoskeletal disorders can only give directions, not absolute limits." These authors believe the best guidelines must consider the level, duration, and frequency of exposure.

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Reference levels used in rating job risk factors for musculoskeletal disorders

### **Risk factor**

**or  
risk  
condition**

### **Reference levels used in NIOSH evaluations**

**Excessive reach** Based on body measurement data indicating comfortable or normal seated and standing arm reach distances for the majority of the male and female population

**Lifting loads** NIOSH Work Practices Guide first used in defining acceptable loads to be lifted [NIOSH 1981]. Revised NIOSH lifting equation for recommended weight limits proposed in 1993 [Waters et al. 1993; Waters et al. 1994]. Applies to standing, two-handed, smooth lifting and lowering of stable objects in unrestricted spaces. Calculations take account of the horizontal distance of load from the body, vertical locations of hands at the beginning and end of lift, vertical distance of the load moved, frequency rate of lifting, balance, and coupling factors

Michigan 2- and 3-Dimensional Static Strength Prediction Program which estimates, for lifting tasks, the amount of compressive force at the lumbo-sacral disc [Chaffin and Andersson 1991]

Model of risk of low back disorders as a function of workplace characteristics and trunk motion characteristics (e.g., lift rate, trunk bending, twisting motion) [Marras et al. 1993, 1995]

**Pushing or Pulling loads** Initial and sustained forces of loads pushed or pulled at variable rates that are judged acceptable for 90% of the female work population [Snook and Ciriello 1991]

**Whole-body vibration** International Standards Organization (ISO) Dose System for Whole Body Vibration indicating vibration levels in three dimensions with limiting times for fatigue decreased proficiency [ISO 2631/1, 1985]

**Hand/arm vibration** American National Standards Institute (ANSI) daily exposure limits [ANSI S3.34, 1986] and American Conference of Governmental Industrial Hygienists (ACGIH) [ACGIH 1996] values for judging whether estimated worker task exposure levels are excessive

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**Repetition rate** Both the number of hand manipulations per 8-hour work shift and the task cycle time have been used to rate this factor. Task cycle times of 30 sec or less were defined as high repetition; cycle times greater than 30 sec as low repetition. For hand manipulations, high repetitiveness was described as more than 20,000 manipulations per 8-hour work shift; medium repetitiveness as between 10,000 and 20,000 manipulations per 8-hour work shift, and low repetitiveness as less than 10,000 manipulations per 8-hour work shift [HETA 88 361 2091; HETA 88 180 1958]. A recent proposed repetition guideline believed to be more protective is cited by Kilbom [1994] This guideline also considers other areas of the upper extremity. Each area may have a different ability to tolerate repetitious activity. At the same rate of repetitions some specific acts such as pinching may be less well tolerated than others. This is an example of complexities that current guidelines may not address adequately.

**Force and energy demands of work tasks** Relative ratings on a 5-point scale used to classify task performance as requiring high, medium, and low levels of force [HETA 88 180 1958; HETA 88 361 2091]. Criterion of 5.0 kcal/min as measured by oxygen consumption used as a limit for energy expenditure [Astrand and Rodahl 1986]

The tools listed are offered as illustrative examples of reference levels or guidelines. The actual risk to each worker depends not only on the current level of exposure to risk factors, but also on their physical capability, their past medical history, concurrent nonwork exposures, and many other factors. These reference levels have varying degrees of scientific justification. Each was useful in a specific NIOSH workplace investigation aimed at reducing MSDs.

## **Open (Hazard Reduction and Control)**

The “open” component of the ERGO model focuses on the acceptance of controls that reduce identified ergonomic risks.

### **Responsibilities**

#### **Employees**

Employees should adopt the provided controls to reduce identified ergonomic risks.

#### **Supervisors**

Supervisors should provide the resources to institute the controls to reduce identified ergonomics risks and establish a climate for their continued use.

#### **EHSS**

Based on job hazard analyses, EHSS will provide feedback on the recommended controls to reduce identified ergonomics risks to supervisors and employees including:

- Explaining job stress findings (methods, appropriate tools, etc),
- Developing solution options,
- Facilitating meetings between employee and supervisors
- Providing follow-up after controls are implemented

### **Identifying contributing risk-factor**

After the completion of the job hazard analyses, the ergonomist, supervisor(s), and employee(s) will have documentation on the nature and degree of observed workplace ergonomic hazards. The next steps involve each stakeholder in cooperatively identifying contributing ergonomics risk factors and cost-effectively applying ergonomics technology to change the workplace to reduce and/or eliminate the hazards.

Personal characteristics of the workers, such as size, physical condition or medical history, may need to be accommodated to make the best application of ergonomics technology. This is required for ADA cases. (See Virginia Tech Policy 4075 for details.)

There are three types of ergonomics technology controls:

- Engineering controls,
- Work practice controls, and
- Personal protective equipment (PPE).

The following are examples of each type of published ergonomics technology applications, but are by no means exhaustive. These guidelines are intended to

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be representative starting places. Potential solutions should be tailored to the individual(s), task requirements, and environment. Also, after application of controls, the workplace should be periodically re-evaluated to verify solution effectiveness and that MSD hazards have been eliminated or reduced.

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### **ENGINEERING CONTROLS**

Engineering controls involve making changes to workstations, tools or equipment used on the job, or changing the way a job is done to avoid work-related musculoskeletal hazards. These controls are preferred over all others because they make permanent changes that eliminate hazards at the identified source(s). By eliminating the source(s) of ergonomic hazards in the workplace and preventing MSDs, engineering controls can be the most cost-effective solutions for the university to implement.

Engineering controls include workstation design, work methods design, tool and equipment design, controls and displays, connectors, fasteners and valves, and product design. Following are descriptions and examples of each.

#### **Computer workstations**

Computer workstations are a common source of ergonomic hazards at Virginia Tech. The monitor and keyboard positions, lighting and seating are especially important in preventing work-related musculoskeletal disorders and eye discomfort. Shared workstations should be easily adjustable so the screen and keyboard can be at the proper level. These aspects should be taken into account to prevent discomfort and/or injury:

- Neutral posture at the keyboard and mouse - arms comfortably at the sides, elbows bent at approximately 90 degrees, forearms parallel to the floor, knees slightly below hips, and wrists straight.
- Chairs should meet the recommendations under "Seating" below.
- The work surface should be large enough to support the keyboard, mouse, monitor and documents. Not having enough space for the mouse to be adjacent to the keyboard is, unfortunately, one of the most commonly observed ergonomic hazard especially.
- The top line of the screen should be just below eye level to keep the neck straight. (Adjustable arms, tables or platforms can help bring the screen to the proper height.) Screens that tilt vertically and swivel horizontally help the worker adjust the best viewing angle.
- Monitors should be placed 18-30 inches away from worker for viewing. The distance depends on the size of the monitor, the use of corrective lenses and visual acuity among other factors.
- Keyboards and monitors should be detachable so the angle and position can be adjusted.
- Keyboard and work-surface edges should be rounded to prevent contact stress.
- Documents should be at the same height and distance as the screen.
- The screen and document should be easily viewed so that the worker's head does not have to turn to the side or tilt up or down regularly.

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- To prevent glare, the monitor and keyboard should be perpendicular to windows and between (not directly under) overhead lights. If this is not possible, then adjustable window coverings should be installed to reduce backlighting and/or glare.
- Screen contrast and brightness should be easily adjustable.
- Screen should be frequently cleaned per manufacturer's suggestions.
- Screen characters should be clearly displayed, neither wavy nor flickering. The refresh rate on the monitor should be set no lower than 72 Hz or higher if possible.
- Wrist/palm rests may be used to protect wrists and palms from hard or sharp edges and to help keep the wrists in a neutral position. However, continually resting wrists on a wrist/palm rest during keying can put pressure on nerves or in other words be a source of contact stress. Wrist/palm rests should be made of soft but supporting material and be the same height as the front edge of the keyboard.

### **Workstation design**

Changeable aspects of workstations include workspace layout, work surfaces, standing and walking surfaces, seating, storage, work fixtures, materials handling/movement and work environment.

**ADJUSTABLE**

### **Workspace layout**

Workspace layout and arrangement should allow:

- Adjustability to fit each worker's size within an appropriate population percentile.
- Worker to maintain neutral posture and avoid awkward or extended reaches and jerky movements while performing the tasks.
- A variety of working positions to avoid static postures.
- Full range of motion and adequate leg room under desks or work benches.
- Adequate space for and access to all necessary tools and equipment.
- Frequently used work items within easy arm's reach.
- Unobscured line of sight.

### **Work surfaces**

Work surfaces should be at the proper height and angle for the individual worker's size and tools, equipment used and tasks performed. They should permit neutral postures and be adjustable, especially where different kinds of

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tasks are performed or the workstation is shared. For example, where workers perform other visually intensive tasks, work surfaces could be tilted to reduce neck, shoulder and arm strain.

### **Walking and standing surfaces**

Surfaces on which people stand for long periods should be designed to prevent slipping and provide adequate traction and comfort. Anti-fatigue floor mats, sit-stand stools, and footrests can help make workers more comfortable.

### **Seating**

Seat-height adjustability and lower back support are important for work done for a long time while seated. Some workers may choose to sit part of the time and stand other times to reduce stress on the body from working in one position too long. Chairs or seating should:

- Adequately support the back and legs.
- Have padded seats.
- Have separately adjustable back and seat cushions.
- Have five (5) legs.
- Have a waterfall front edge.
- Permit feet to be supported either on the floor or with a footrest.
- Be easily adjustable while seated.
- Have swivel seats for most tasks.
- Isolate workers from whole-body vibration.
- Have adjustable arm support when appropriate.

### **Storage**

Storage areas should be organized so that workers maintain good body positions, reduce muscular forces and avoid excessive reach. Store heavy items between knee and shoulder height and frequently used items closest to the worker.

### **Work fixtures**

Workers should not have to use their hands or bodies as a vise to hold objects; mechanical devices do this much better. Tooling fixtures and jigs should be set up to avoid awkward postures and excessive forces.

## **WORKPLACE ERGONOMICS PROGRAM**

### **Materials handling movement**

Lifting, carrying, pushing or pulling objects can strain the back, arms and shoulders. Strength and lifting limits should not be exceeded; extreme muscular exertion can cause injury. The following steps will make materials handling/movement easier:

- Do not exceed the physical ability of the worker doing the lifting
- Provide adequate recovery time for tasks that require frequent lifting.
- Provide easy access so the load is in front of the person lifting.
- Eliminate twisting by changing the start or end point of the lift.
- Put items to be lifted between knee and shoulder height.
- Provide handles or cutouts to make grasping easier, permit a closer lift, and allow items to be carried near the body.
- Change an object's shape to make it easier to grasp.
- Decrease the weight of objects.
- Decrease the distance or height over which the object must be moved.
- Distribute a load evenly within a container.
- Use hand carts or hand trucks.
- Use a vacuum-assisted hoist or integrated conveyors.
- Use loaders, cranes and motorized material pallets to help move loads that are larger or heavier than one or two people can safely handle.

### **Work environment**

Here are some ways to minimize work-environment hazards:

- Isolate equipment or operations that produce loud or distracting noise.
- Make lighting bright enough without causing glare so workers can see clearly.
- Isolate hands and feet from cold.
- Reduce whole-body vibration while riding in a vehicle or standing near equipment.
- Isolate workers from excessive heat; provide adequate cooling and ventilation.

### **Work methods design**

Work methods should be designed so work can be completed safely and comfortably, and factors contributing to work-related musculoskeletal disorders

## **WORKPLACE ERGONOMICS PROGRAM**

are minimized. Here are several risk factors and examples of how to change work methods to reduce them:

### **Static or awkward postures**

Prolonged static or awkward postures can rapidly cause fatigue. Work should be done so neutral postures are maintained, stoops and reaches are avoided, and time working overhead is minimized. For example, tasks should be organized so that workers at a conveyor belt do not have to lean over the belt.

### **Mechanical stress**

Nerves, tendons and blood vessels can be damaged by exposure to hard or sharp edges, such as a table edge. Equipment should be moved so a worker does not touch the edge, or edges should be padded to minimize contact. For example, in packing boxes, the position of the box could be changed so a worker does not have to contact a sharp table edge to place the contents.

### **Repetitive-motion tasks**

Tasks involving repetitive motion are major contributors to cumulative-trauma disorders. Minimize repetition by:

- Using automation, such as in stapling, sorting, labeling or filling operations.
- Changing the job to include tasks that do not use the same muscle groups.

### **Excessive force**

Workers must use excessive force when objects are difficult to grasp or control, equipment and tools are poorly maintained, or tasks require awkward postures. Eliminate the use of excessive force by:

- Improve friction on slippery objects.
- Use mechanically assisted devices for awkward lifts.
- Choose tools that fit the dominant hand. Be mindful that approximately 10% of the population is left-handed.
- Keep equipment properly maintained to prevent jamming and sticking.
- Provide adequate work room to perform tasks.
- Work rates

The capacity of workers should be considered in establishing production goals. Increased work rates, excessive overtime and incentive programs for piece work can cause fatigue, increasing the chance for injury.

## **WORKPLACE ERGONOMICS PROGRAM**

### **Tool and Equipment Design**

Tools and equipment should fit the individual user and be chosen for the specific demands of the task. Tools should be designed to maintain neutral body positions. Take extra care to avoid twisting, vibration, static muscle loading, and pressure on tissues and joints. Factors that can be modified to prevent risks include tool size, weight, and balance; handle size and position; and power control design.

### **Tool size, weight and balance**

Select tools just heavy enough to accomplish the task to minimize risks:

- Use counterweights or supports to minimize the weight of a tool; extra force should not be required to counteract the balancer.
- Select tools that can bend or are shaped to prevent awkward wrist or shoulder postures.
- Select balanced tools that can be held at the center of gravity.
- Handle size and position

The size of the handle influences the amount of force that can be exerted without straining the muscles and tendons. A handle that is too large or too small requires more force to accomplish the same amount of work as a tool with a correctly-sized handle.

Handles should:

- Fit the individual user's hand and be long enough so they don't press into the palm or wrist.
- Have rounded (not sharp) edges, a positive stop or flanged end, and no fluting.
- Be made of material that is non-conductive, compressible, and doesn't feel slippery.
- Minimize vibration transferred to the hand. For example, some screwdrivers prevent repeated motion in an awkward position by means of a pistol grip, and a "yankee drill" mechanism rotates the bit when the tool is pushed forward.

### **Power control**

Workers should be able to turn a tool off and on or keep it running without using extra force. Auto-start/ stop tools are preferred. Steps to reduce hazards:

- Minimize rotational forces with variable torque settings.
- Avoid high-tension and one-finger triggers.

## **WORKPLACE ERGONOMICS PROGRAM**

### **Controls and displays**

The location of equipment/machinery controls and indicators should take into account their importance, frequency and sequence of use, and height of workers. Controls and displays need to be visible and accessible while in use, and easy to operate in relation to equipment functions. Spacing should be adequate to accommodate gloves or other protective equipment.

### **Connectors, fasteners and valves**

Components, connectors, valves and fasteners should be located to allow neutral postures during work. The following can help reduce risks:

- Quick-release connectors and fasteners that require few turns with little force can reduce strain.
- Connectors should be positioned to allow easy access.
- Connectors should be labeled and set up to make connection easy and prevent cross-connection.

### **Product design**

Product designers should take into account ergonomic considerations, not only for the people who use products, but also for those who fabricate, assemble and perform maintenance on them. Form, materials, means of assembly, packaging, disassembly and disposal should be considered. Designers should ask these questions to reduce hazards in product design:

- Does material handling or assembly require awkward postures, excessive repetitive movements or extreme force during assembly or manufacturing?
- If sharp edges are a hazard, can they be removed?
- Can materials be changed to help fabrication or assembly?
- Could assembling parts in a different order eliminate musculoskeletal hazards?
- Could the product's size or shape be changed to make manufacturing easier and make the product more acceptable to the user?

## **WORKPLACE ERGONOMICS PROGRAM**

### **WORK PRACTICE CONTROLS**

Work practice controls are procedures for safe and proper work that are used to reduce the duration, frequency or severity of exposure to a hazard. Standard operating procedures should allow for enough workers to complete the tasks and should be a regular part of the way doing business at the university. When defining safe work practice controls, it is a good idea to ask workers for their ideas, since they have firsthand experience with the tasks. All supervisors and employees should understand and follow these controls.

#### **Work methods training**

Employees should be taught how to perform their jobs with the lowest physical stress and best posture, as well as how to handle materials, tools and equipment safely.

#### **Gradual introduction to or Return to Work**

New and returning employees in jobs involving risks, such as prolonged repetitive motion, should be introduced gradually to a full workload to improve work capacity and prevent injury.

#### **Monitoring**

Review all jobs regularly to see if specified safe work practices are being used. Work techniques should be reviewed periodically to ensure that they reduce risks.

#### **Recovery pauses**

Regular recovery pauses can help prevent eye strain, headache, neck, back, shoulder, arm or hand pain. Employees can perform activities that involve different muscle groups during these pauses.

#### **Job rotation**

If possible, job rotation should be used to prevent injury, not as a response to it. Also, job rotation should generally be used as an intermediate solution while working on other solutions. Workers should be rotated into jobs using different muscle-tendon groups to prevent fatigue; otherwise, the change increases MSDs risks from repetition and duration.

#### **Job design**

EHSS working with Supervisors and Employees can look for ways that jobs can be (re)designed to incorporate good ergonomic practices. These include providing relief from frequent repetitive motions, static or awkward postures, excessive forceful exertions, and mental and muscular fatigue.

#### **Maintenance and housekeeping**

Regular maintenance is critical to ensure that employees have tools and equipment that are in proper working order and perform to expectations. Equipment that is not maintained and cleaned can make regular operations more difficult. Worn-out tools should be replaced; dull tools should be sharpened. Housekeeping should be done as often as necessary to reduce musculoskeletal hazards.

## WORKPLACE ERGONOMICS PROGRAM

### PERSONAL PROTECTIVE EQUIPMENT

**NOTE:**  
OSHA does not consider backbelts to be PPE.

Personal protective equipment (PPE) includes such things as gloves and knee pads that may help reduce hazards until other controls can be put into place, or to supplement existing controls. Be sure to choose PPE that fits the individual worker, is appropriate for the task being done, and does not contribute to extreme postures or excessive force. Remember, however, that eliminating a hazard is preferable to using PPE.

#### Gloves

Gloves can protect the hands from injury or cold, but they also may reduce dexterity and increase grip force. When choosing gloves, consider these factors:

- Gloves should be small enough to minimize wrinkling or slipping but large enough so they do not reduce circulation.
- Padding or insulation can add protection.
- Texturing improves friction.
- If chemical resistance is not a concern, material should be breathable so perspiration is not trapped.

#### Footwear/anti-fatigue insoles

Anti-fatigue insoles can give relief from musculoskeletal fatigue that develops from prolonged standing and walking on hard floor surfaces. They are especially appropriate when anti-fatigue floor mats cannot be used because of housekeeping needs, the size of the area to be covered, or tripping hazards.

#### Knee pads

Knee pads can be used to avoid prolonged contact with hard or sharp surfaces. They should be comfortable, large enough to cover the entire knee, padded, and snug enough to fit well but not so tight that they impede circulation.

NOTE: OSHA does not consider devices such as wrist splints and back belts PPE and should only be used as part of an injured worker's treatment on the advice of a qualified health-care practitioner.

## **Medical management**

### **Responsibilities**

#### **Employees**

Employees should immediately report any signs or symptoms of musculoskeletal disorders (MSDs) to their supervisors.

#### **Supervisors**

Supervisors should:

- Assist EHSS in promoting MSDs prevention efforts,
- Provide resources to correct identified ergonomic risks,
- Assist EHSS in investigating the root causes of MSDs injuries in their workplaces,
- If MSDs occur then provide a supportive climate during employees' healing periods,
- Cooperate with EHSS and other Virginia Tech entities in returning injured employees to work.

#### **EHSS**

EHSS will

- Provide MSDs prevention efforts through ergonomics training,
- Conduct job analyses to identify MSD risk factors,
- Recommend solutions to identified MSD risk factors,
- Provide recommendations and follow-up for employee accommodations,
- Cooperate with Supervisors, Employees, and other Virginia Tech entities in returning injured employees to work.

## WORKPLACE ERGONOMICS PROGRAM

### Goals

It is useful to think of Medical Management in three parts or stages.

Stage I- injury prevention

Stage II- injury management/early intervention

Stage III- chronic injury

#### Stage I – Injury Prevention

This is the most pro-active stage of medical management. The Workplace Ergonomics Program aims to apply ergonomics technologies across the university to prevent MSDs.

#### Stage II – Injury Management/early intervention

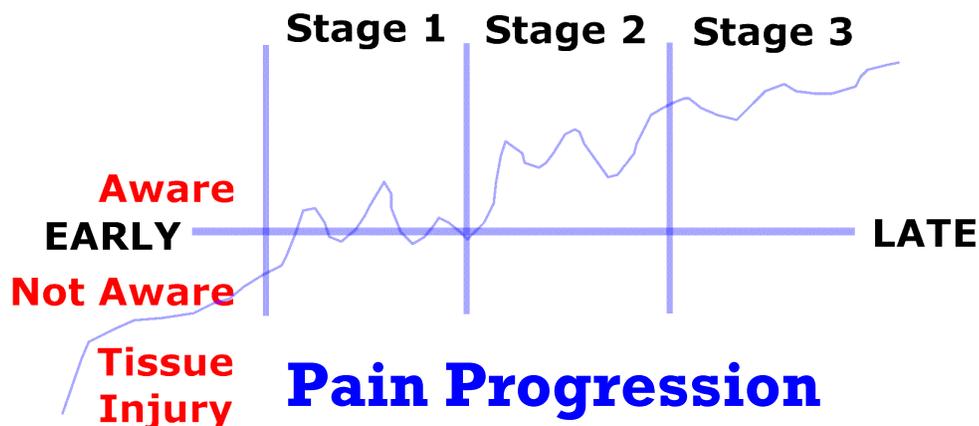
If an MSD does occur, then intervention in the earliest stages can reduce the severity of the MSD. This requires close cooperation between Employees in reporting, Supervisors responding, and EHSS investigating (and other Virginia Tech entities as required).

#### Stage III – Chronic Injury

This last stage involves the development of accommodation plans with input from the ADA office, Return to Work, EHSS, Supervisors, and Employees.

The goals of medical management are to:

- Promote prevention of injury and illness.
- Identify signs and symptoms as soon as they occur.
- Ensure proper evaluation and treatment of injured workers.
- Prevent further work-related injury.
- Ensure safe and timely return to work for injured workers.
- Reduce the direct costs of injury and illness by decreasing time-loss and disability payments.
- Reduce the indirect costs of injury and illness by retaining workers and maintaining productivity.



## **WORKPLACE ERGONOMICS PROGRAM**

# **Training**

### **Responsibilities**

#### **Employees**

Employees should attend all necessary Workplace Ergonomics training and apply the material learned in their workplaces and work practices.

#### **Supervisors**

Supervisors should provide time to attend all necessary training and promote a climate that encourages and reinforces new equipment usage and methods.

#### **EHSS**

EHSS will provide:

- Ergonomics training tailored to the workplace environment and client needs,
- Ergonomics training for entire departments, units, or individuals as needed,
- Training supervisors and employees in Workplace Ergonomics program and their role in it,
- Tools for the recognition of MSD signs and symptoms,
- Emphasize the importance of early reporting and the consequences of failing to report them early,
- Tools for the identification of MSD hazards in the workplace, and
- Overview of the methods used to control MSD.

### **WHEN AND WHOM TO TRAIN**

Training and educating members of the university community on work-related musculoskeletal disorders is critical to the success of the Workplace Ergonomics Program at Virginia Tech. Training and education should give both supervisors and workers an understanding of the potential risk of injuries, their causes, symptoms, prevention and treatment. The more aware workers are of the musculoskeletal hazards in their workplace, the more likely they are to work toward reducing injuries.

#### **When is ergonomics training offered?**

Ergonomics training (at no cost to supervisors or employees) is offered and scheduled based on client needs. Training can be provided on-site or at the Environmental, Health and Safety Services Classroom.

#### **How is training requested?**

Contact the Industrial Hygienist for Physical Hazards at 231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu) to schedule a needs assessment and training.

## **WORKPLACE ERGONOMICS PROGRAM**

### **Who should be trained?**

Training should involve all employees, including support personnel. These people should all receive training on musculoskeletal risk factors:

- Supervisors and Employees.
- Engineers.
- Maintenance personnel.
- Purchasing personnel.
- Safety and risk control managers.
- Health-care providers.
- Insurance administrators.

### **CONTENTS OF TRAINING**

EHSS provides training can either be for general awareness or specific to the particular job or task. Needs analyses determine what type of ergonomics training is provided based on:

- The nature of the task performed.
- The type of tools, equipment or processes involved.
- The length of time the task is to be performed.

#### **General**

General training involves providing instructions to supervisors and employees about the hazards involved with their jobs and includes:

- Types of musculoskeletal disorders often associated with the job.
- Risk factors that may contribute to or cause these disorders.
- How to prevent these disorders from occurring.
- Recognition and reporting of symptoms associated with these disorders.

#### **Job-specific**

Job-specific training involves the following:

- Hands-on training before beginning a regular production job.
- Care and proper use of all tools and equipment.
- Proper lifting techniques and devices.
- The correct way to stand, sit, bend, turn, reach, grasp, push/pull, and climb.

## **WORKPLACE ERGONOMICS PROGRAM**

- Identification of hazards in the area, such as slippery surfaces, sharp edges, moving machinery or vehicles.
- Use of proper personal protective equipment, if any.

### **Supervisors**

It is important for supervisors to get training similar to that of their employees, as they are responsible for ensuring that their employees use work practices that are ergonomically correct and safe. Supervisors should get additional training that will allow them to:

- Recognize early signs and symptoms of work-related musculoskeletal disorders and inform health-care providers about them.
- Recognize and correct hazardous work practices.
- Understand and emphasize the importance of the ergonomics program.

### **Engineers, Architects, and Maintenance Staff**

Training for engineers and maintenance personnel should include how to correct musculoskeletal hazards through job and workstation design and maintenance. These personnel should be able to recognize hazards and modify workstations to eliminate or reduce hazards.

### **Purchasing Personnel**

Purchasing personnel should be trained to understand basic ergonomic concepts of tool, equipment and furniture design. This will help them make more informed choices in their purchasing decisions.

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**People to Contact**

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**On-line Information**

Visit EHSS on the web at <http://www.ehss.vt.edu/>.

## **WORKPLACE ERGONOMICS PROGRAM REGULATIONS AND GUIDELINES**

### **Regulations, Policies, and Guidelines**

OSHA General Duty Clause

Ergonomics Program Management Guidelines for Meatpacking Plants  
(<http://www.osha-slc.gov/Publications/Osha3123.pdf>)

OSHA Interpretations: See [www.osha.gov](http://www.osha.gov) for the most up-to-date interpretations.

OSHA 300 LOG (starting January, 2002).

Executive order 52 – Return-to-Work

VT Health & Safety Policy

VT Policy 4075

VT Policy 4420

HFES 100

ANSI 365 Z

## **WORKPLACE ERGONOMICS PROGRAM FREQUENTLY ASKED QUESTIONS**

# **Frequently Asked Questions**

### **What is ergonomics?**

Ergonomics can be defined as the study of work to match human capabilities with job requirements. The human is fixed, but the job, tools, equipment, environment, and facilities can be changed. If the job requirements exceed the capabilities of the worker then productivity is reduced and/or injuries can result.

### **How do I get help in MY workplace?**

The Ergonomics Program provides workplace consultations to evaluate risk factors and offers solutions to improve productivity, reduce injury rates, and accommodate a greater percentage of the population at work.

If you have any ergonomics concerns or questions, please contact:

The Industrial Hygienist for Physical Hazards at 231-3080 or [ergo@vt.edu](mailto:ergo@vt.edu)

### **What is the cost of an ergonomics consultation?**

Environmental, Health and Safety Services provides ergonomics consultations at no cost to the faculty and staff of Virginia Tech. However, as with other Health and Safety Programs the requesting department is responsible for costs associated with implementation (i.e., purchasing, installing, and maintaining).

### **What are some common ergonomic risk factors?**

Some common ergonomic risk factors include:

- Forceful exertions--heavy or dull tools, loose gloves
- Repetition--short cycle times, repeated motions
- Awkward postures--back, hands, arms, or legs,
- Mechanical stress--sharp edges on desks, tools, or seating
- Environmental stress--cold, vibration

### **What type of ergonomics training is offered?**

Ergonomics training is tailored to the workplace environment and client needs. Training is provided for entire departments, units, or individuals.

### **When is ergonomics training offered?**

Ergonomics training is offered and scheduled based on client needs. Training can be provided on-site or at the Environmental, Health and Safety Services Classroom.

### **What happened to the federal ergonomics standard?**

"The safety and health of our Nation's workforce is a priority for my administration. Together we will pursue a comprehensive approach to ergonomics that addresses the concerns surrounding the ergonomics rule repealed today. We will work with the Congress, the business community, and our Nation's workers to address this important issue."

## **WORKPLACE ERGONOMICS PROGRAM FREQUENTLY ASKED QUESTIONS**

President George W. Bush

March 20, 2001

With these words, President Bush signed a joint resolution of Congress disapproving OSHA's ergonomics standard and, at the same time, pledging to find a solution to ergonomic-related problems affecting the nation's workforce. OSHA's ergonomics program standard was issued November 14, 2000, and took effect January 16, 2001. Congress acted under authority of the Congressional Review Act of 1996.

In July, 2001, Secretary of Labor, Elaine Chao held a series of forums on ergonomics. EHSS closely follows ergonomics issues and will update the Workplace Ergonomics Program to reflect current regulations and guidelines.

## Glossary

**Administrative controls:** Changes in the way that work in a job is assigned or scheduled that reduce the magnitude, frequency or duration of exposure to ergonomic risk factors. Examples of administrative controls for musculoskeletal disorder (MSD) hazards include:

- (1) Employee rotation;
- (2) Job task enlargement;
- (3) Alternative tasks;
- (4) Employer-authorized changes in work pace.

**Awkward posture:** Deviation from the ideal working posture. Awkward postures typically include reaching behind, twisting forward or backward bending, pinching, and squatting.

**Arthritis:** inflammation of a joint or joints.

**Carpal tunnel syndrome:** a compression of the median nerve as it passes through the carpal tunnel in the heel of the hand.

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

**Constriction:** binding, squeezing, or shrinking blood vessels so that circulation is reduced.

**Control MSD Hazards:** To reduce MSD hazards to the extent that they are no longer reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid.

**Cubital tunnel syndrome:** compression of the ulnar nerve as it passes through the notch of the elbow.

**Cumulative trauma disorder:** damage to body tissue by outside forces that has built up over time.

**Degenerative disc disease:** a breakdown of the discs that separate the vertebrae of the spine.

**DeQuervain's Disease:** an inflammation of the tendon and/or its sheath at the base of the thumb.

**Digital neuritis:** compression of the nerves along the sides of the fingers or thumbs.

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

**Ergonomics:** The scientific study of human work. The term comes from the Greek words "ergos" meaning work, and "nomos," meaning natural laws of.

Ergonomics considers the physical and mental capabilities and limits of the worker during interaction with tools, equipment, work methods, tasks, and the working environment.

**Engineering controls:** are physical changes to a job that reduce MSD hazards. Examples of engineering controls include changing or redesigning workstations, tools, facilities, equipment, materials, or processes.

**Epicondylitis:** an inflammation of the tendons at the elbow. Also called tennis elbow (lateral or outside part of the elbow), or golfer's elbow (medial or inside part of the elbow).

**Follow-up:** means the process or protocol an employer or HCP uses to check on the condition of an employee after a work restriction is imposed on that employee.

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

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

**Ganglionic cyst:** swelling of the tendon and sheath due to the build-up of synovial fluid inside the sheath. The cyst usually causes a bump under the skin.

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

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

**Health care professionals (HCPs):** are physicians or other licensed health care professionals whose legally permitted scope of practice (e.g., license, registration or certification) allows them to provide independently or to be delegated the responsibility to carry out some or all of the MSD management or Return to Work requirements of Executive Order 52.

**Job:** means the physical work activities or tasks that an employee performs. This program considers jobs to be the same if they involve the same physical work activities or tasks, even if the jobs have different titles or classifications.

**Incidence rate:** the rate at which new injuries and illnesses occur for a given job, production line, work area, department or the College. Incidence rates express the number of new work-related musculoskeletal disorders occurring per year or other specified time period. They allow comparison of the numbers of injuries or illnesses between and within jobs, production lines, work areas, departments and the company from year to year.

Often, a university-wide incidence rate for musculoskeletal disorders is used as a baseline to evaluate specific jobs or departments. A baseline would be an incidence of work-related musculoskeletal disorders that may

be expected to occur without a significant contribution from work-related causes. In some cases, a baseline incidence rate is determined from research published in the scientific literature.

The incidence rate is usually expressed as the number of cases per 100 workers per year. The incidence rate assumes each worker works 2,000 hours per year (8 hours a day, 5 days a week, 50 weeks a year).

The incidence rate is calculated as:

Incidence rate = Number of new cases/yr. x 200,000 work hours / Number of workers in job (or department) x 2,000 hours

Note: 200,000 work hours is used to express the incidence rate on the basis of 100 workers per year (2,000 hours per worker per year x 100 workers).

If the actual number of hours worked by job or department is known, the formula below may be used:

Incidence Rate = Number of new cases/yr. x 200,000 work hours / Total hours worked (per job or department)

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

**Medical management:** The effective use of available health-care resources to prevent or manage work-related musculoskeletal disorders. Medical management is an element of the Workplace Ergonomics Program that interacts with Workers' Compensation, Return to Work, and the ADA office.

**Musculoskeletal disorder (MSD):** is a disorder of the muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels, or spinal discs. This includes MSDs in the following areas of the body that have been associated with exposure to risk factors: neck, shoulder, elbow, forearm, wrist, hand, abdomen (hernia only), back, knee, ankle, and foot. MSDs may include muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves, and spinal disc degeneration. MSDs include such medical conditions as: low back pain, tension neck syndrome, carpal tunnel syndrome, rotator cuff syndrome, DeQuervain's syndrome, trigger finger, tarsal tunnel syndrome, sciatica, epicondylitis, tendinitis, Raynaud's phenomenon, hand-arm vibration syndrome (HAVS), carpet layer's knee, and herniated spinal disc. Injuries arising from slips, trips, falls, motor vehicle accidents, or similar accidents are not considered MSDs for the purposes of this program. However, ergonomic deficiencies may have contributed to such acute trauma.

**MSD hazard:** the presence of risk factors in the job that occur at a magnitude, duration, or frequency that is reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid.

**MSD signs:** are objective physical findings that an employee may be developing an MSD. Examples of MSD signs are:

- (1) Decreased range of motion;
- (2) Deformity;
- (3) Decreased grip strength; and
- (4) Loss of muscle function.

**MSD symptoms:** are physical indications that an employee may be developing an MSD. For purposes of this standard, MSD symptoms do not include discomfort. Examples of MSD symptoms are:

- (1) Pain;
- (2) Numbness;
- (3) Tingling;
- (4) Burning;
- (5) Cramping; and
- (6) Stiffness.

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

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

**Non-specific backache:** general soreness and fatigue of the low back.

**Personal Protective Equipment:** Gloves, kneepads and other equipment that may help reduce hazards until other controls can be implemented, or to supplement existing controls. Examples of PPE are vibration-reduction gloves and carpet layer's knee pads. **NOTE: backbelts are NOT considered PPE.**

**Raynaud's Phenomenon:** a constriction of the blood vessels in the hands and fingers. Also called "white finger."

**Records review:** Reviewing university records to identify patterns of injuries (or potential injuries) to help find the jobs and workstations that may contain musculoskeletal hazards.

**Repetitiveness:** Performing the same motions repeatedly. The severity of risk depends on the frequency of repetition, speed of the movement or action, the number of muscle groups involved, and the required force.

**Risk factors:** An aspect of a job that increases the worker's chance of getting a work-related musculoskeletal disorder from force, awkward posture, repetition, vibration, and contact stress.

**Rotator cuff tendinitis:** inflammation of one or more tendons at the shoulder. Also called "Pitcher's Shoulder."

**Severity rate:** the cost (in terms of lost workdays) of new injuries and illnesses occurring in a given job, production line, work area, department or College.

The severity rate gives indications of the associated cost to the employer. The severity rate calculation used in this guideline is similar to the one for incidence rates. The main difference is that total lost work days per year is substituted for the number of new cases per year.

The severity rate is calculated using the following formula:

$$\text{Severity Rate} = \frac{\text{Total lost workdays/year} \times 200,000 \text{ work hours}}{\text{Number of workers in job (or dept.)} \times 2,000 \text{ hours}}$$

or

$$\text{Severity Rate} = \frac{\text{Total lost workdays/year} \times 200,000 \text{ work hours}}{\text{Total hours worked (per job or department)}}$$

Calculating the incidence rate and severity rate for each job where work-related musculoskeletal disorders occur allows targeting of specific jobs for worksite analysis. If information is not available on a specific job basis, then incidence rates should be calculated on a department-by-department basis, if possible.

The incidence rate and severity rate can also be used to identify long-term trends (3+ years). Looking at trends can help measure the effect of changes to equipment, process, methods, training, workstations, and production rates. This information can also be used to measure the success of a company's ergonomic program and help determine the cost effectiveness of the program.

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

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

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

**Tendinitis:** inflammation of the tendon inside the sheath.

**Tenosynovitis:** inflammation of the sheath around the tendon.

**Thoracic outlet syndrome:** compression of the nerves and blood vessels between the neck and shoulder often associated with prolonged overhead work.

**Trigger finger:** a common term for tendinitis or tenosynovitis that causes painful locking of the finger(s) while flexing.

**Ulnar nerve entrapment:** compression of the ulnar nerve as it passes through the wrist, often associated with prolonged flexion and extension of the wrist and pressure on the palm.

**Workplace Ergonomics Program:** A systematic method (similar to an accident prevention or quality improvement program) used to evaluate, prevent and manage work-related musculoskeletal disorders. The main elements of ergonomics program are worksite analysis, hazard prevention and control, medical management, and training and education.

**Work practice controls** are changes in the way an employee performs the physical work activities of a job that reduce or control exposure to MSD hazards. Work practice controls involve procedures and methods for safe work. Examples of work practice controls for MSD hazards include:

- (1) Use of neutral postures to perform tasks (straight wrists, lifting close to the body);
- (2) Use of two-person lift teams;
- (3) Observance of micro-breaks.

**Work-related** means that an exposure in the workplace caused or contributed to an MSD or significantly aggravated a pre-existing MSD.

**Work restrictions** are limitations, during the recovery period, on an employee's exposure to MSD hazards. Work restrictions based on the Virginia Tech Return-to-Work policy may involve limitations on the work activities of the employee's current job (light duty), transfer to temporary alternative duty jobs, or temporary removal from the workplace to recover.

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

**Worksite analysis:** A safety and health review that addresses work-related musculoskeletal disorders. It is a structured way of identifying jobs and workstations that may contain musculoskeletal hazards, the risk factors that pose the hazards, and the causes of the risk factors. Worksite analysis is an element of the ergonomics program.

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(i) Management leadership, as demonstrated by an effective MSD reporting system and prompt responses to reports, clear program responsibilities, and regular communication with employees about the program;

(ii) Employee participation, as demonstrated by the early reporting of MSDs and active involvement by employees and their representatives in the implementation, evaluation, and future development of your program;

(iii) Job hazard analysis and control, as demonstrated by a process that identifies, analyzes, and uses feasible engineering, work practice, and administrative controls to control MSD hazards or to reduce MSD hazards to the levels below those in the hazard identification tools in Appendix D to this section or to the extent feasible, and evaluates controls to assure that they are effective;

Note to Paragraph (c)(1)(iii): Personal protective equipment (PPE) may be used to supplement engineering, work practice, and administrative controls, but you may only use PPE alone where other controls are not feasible. Where PPE is used, you must provide it at no cost to employees.

(iv) Training of managers, supervisors, and employees (at no cost to these employees) in your ergonomics program and their role in it; the recognition of MSD signs and symptoms; the importance of early reporting; the identification of MSD hazards in jobs in your workplace; and the methods you are taking to control them; and

(v) Program evaluation, as demonstrated by regular reviews of the elements of the program and of the effectiveness of the program as a whole, using such measures as reductions in the number and severity of MSDs, increases in the number of jobs in which MSD hazards have been controlled, or reductions in the number of jobs posing MSD hazards to employees; and the correction of identified deficiencies in the program. At least one review of the elements and effectiveness of the program must have taken place prior to [insert date 60 days after the publication date of this standard.]

(2) By [Insert date one year after the effective date of this standard], you must have implemented a policy that provides MSD management as specified in paragraphs (p), (q), (r), and (s) of this section.

(3) An employer who has policies or procedures that discourage employees from participating in the program or reporting the signs or symptoms of MSDs or the presence of MSD hazards in the workplace does not qualify for grandfather status under paragraph (c) of this section.

(d) If the standard applies to me, what initial action must I take?

(1) You must provide each current and each new employee basic information about:

(i) Common musculoskeletal disorders (MSDs) and their signs and symptoms;

(ii) The importance of reporting MSDs and their signs and symptoms early and the consequences of failing to report them early;

(iii) How to report MSDs and their signs and symptoms in your workplace;

(iv) The kinds of risk factors, jobs and work activities associated with MSD hazards; and

(v) A short description of the requirements of OSHA's ergonomics program standard.

(2) You must make available to the employee a summary of the requirements of this standard.

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(3) You must provide the information in written form or, if all employees have access, in electronic form. You must provide the information to new employees within 14 days of hiring. You must post the information in a conspicuous place in the workplace (e.g., employee bulletin board or, if all employees have access, electronic posting).

Note to paragraph (d): You may use the information sheet in non-mandatory Appendix A to this section to comply with paragraphs (d)(1) of this section and the summary sheet in non-mandatory Appendix B to this section to comply with paragraph (d)(2) of this section.

(e) What must I do when an employee reports an MSD or the signs or symptoms of an MSD?

(1) You must promptly determine whether the reported MSD or MSD signs or symptoms qualify as an MSD incident. You may request the assistance of a Health Care Professional (HCP) in making this determination. A report is considered to be an MSD incident in the following two cases:

- (i) The MSD is work-related and requires days away from work, restricted work, or medical treatment beyond first aid; or
- (ii) The MSD signs or symptoms are work-related and last for 7 consecutive days after the employee reports them to you.

(2) If the employee has experienced an MSD incident, you must determine whether the job meets the standard's Action Trigger. See paragraph (f) of this section.

(3) If the employee has not experienced an MSD incident, you do not need to take further action.

(f) How do I determine whether the employee's job meets the Action Trigger?

(1) A job meets the Action Trigger if:

- (i) An MSD incident has occurred in that job; and
- (ii) The employee's job routinely involves, on one or more days a week, exposure to one or more relevant risk factors at the levels described in the Basic Screening Tool in Table W-1.

(2) If the employee's job does not meet the Action Trigger, you do not need to take further action.

(g) What actions must I take if the employee's job meets the Action Trigger?

For the employee's job and all jobs in the establishment that are the same as that job, you must either:

(1) Comply with the Quick Fix option in paragraph (o) of this section, or

(2) Develop and implement an ergonomics program that includes the following elements:

- (i) Management leadership as specified in paragraph (h) of this section;
- (ii) Employee participation as specified in paragraph (i) of this section;
- (iii) MSD management as specified by paragraphs (p), (q), (r), and (s) of this section;
- (iv) Job hazard analysis as specified by paragraph (j) of this section;
- (v) Hazard reduction and control measures as specified in paragraphs (k), (l), and (m) of this section, and evaluations as specified in paragraph (u) of this section, if the job hazard analysis determines that the job presents an MSD hazard;
- (vi) Training as specified in paragraph (t) of this section.

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(h) What must I do to demonstrate management leadership?  
You must:

(1) Assign and communicate responsibilities for setting up and managing the ergonomics program;

(2) Provide designated persons with the authority, resources, and information necessary to meet their responsibilities;

(3) Ensure that your policies and practices encourage and do not discourage:

(i) The early reporting of MSDs, their signs and symptoms, and MSD hazards; and

(ii) Employee participation in the ergonomics program;

(4) Communicate periodically with employees about the ergonomics program and their concerns about MSDs.

(i) What must I do to ensure employee participation in my program?  
You must ensure that employees and their representatives:

(1) Have ways to promptly report MSDs, MSD signs and symptoms, and MSD hazards in your workplace;

(2) Receive prompt responses to their reports of MSDs, MSD signs and symptoms, and MSD hazards;

(3) Are provided with a summary of the requirements of this standard, as specified in paragraph (d) (2) of this section, and have ready access to a copy of this standard and to information about MSDs, MSD signs and symptoms, MSD hazards, and your ergonomics program; and

(4) Have ways to be involved in the development, implementation, and evaluation of your ergonomics program.

(j) What must I do to determine whether a job that meets the Action Trigger poses an MSD hazard to employees in that job?

(1) You must conduct a job hazard analysis for that job. You may rely on an analysis previously conducted in accordance with this section to the extent it is still relevant.

(2) Your job hazard analysis must include all employees who perform the same job, or a sample of employees in that job who have the greatest exposure to the relevant risk factors, and include the following steps:

(i) Talk with those employees and their representatives about the tasks the employees perform that may relate to MSDs; and

(ii) Observe the employees performing the job to identify the risk factors in the job and to evaluate the magnitude, frequency, and duration of exposure to those risk factors.

(3) You must use one or more of the following methods or tools to conduct this analysis:

(i) One or more of the hazard identification tools listed in Appendix D-1 to this section, if the tools are relevant to the risk factors being addressed;

(ii) The occupation-specific hazard identification tool in Appendix D-2 to this section;

(iii) A job hazard analysis conducted by a professional trained in ergonomics; or

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(iv) Any other reasonable method that is appropriate to the job and relevant to the risk factors being addressed.

(4) If you determine that there is an MSD hazard in the job, the job will be termed a "problem job."

Note to paragraph (j): If you determine that the MSD hazards pose a risk only to the employee who reported the MSD, you may limit your job controls, training and evaluation to that individual employee's job.

(k) What is my obligation to reduce MSD hazards in a problem job?

(1) You must:

(i) Control MSD hazards; or

(ii) Reduce MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D to this section; or

(iii) If you cannot reduce MSD hazards in accordance with paragraphs

(k)(1)(i) or (k)(1)(ii) of this section, you must do the following:

(A) Reduce MSD hazards to the extent feasible;

(B) At least every 3 years, assess the job and determine whether there are additional feasible controls that would control or reduce MSD hazards; and

(C) If such controls exist, implement them until you have reduced the MSD hazards in accordance with paragraphs (k)(1)(i) or (k)(1)(ii) of this section.

(2) If a work-related MSD occurs in a job whose hazard(s) you have reduced to the levels specified in paragraph (k)(1) of this section, you must:

(i) Ensure that appropriate controls are still in place, are functioning, and are being used properly, and

(ii) Determine whether new MSD hazards exist and, if so, take steps to reduce the hazards as specified in paragraph (m) of this section.

Note to paragraph (k): The occurrence of an MSD in a problem job is not in itself a violation of this standard.

(1) What kinds of controls must I use to reduce MSD hazards?

(1) For each problem job, you must use feasible engineering, work practice or administrative controls, or any combination of them, to reduce MSD hazards in the job. Where feasible, engineering controls are the preferred method of control.

(2) You may use personal protective equipment (PPE) to supplement engineering, work practice or administrative controls, but you may use PPE alone only where other controls are not feasible. Where you use PPE, you must provide it at no cost to employees.

(m) What steps must I take to reduce MSD hazards?

You must:

(1) Ask employees in the problem job and their representatives to recommend measures to reduce MSD hazards;

(2) Identify and implement initial controls within 90 days after you determine that the job meets the Action Trigger. Initial controls mean controls that substantially reduce the exposures even if they do not reach the levels specified in paragraph (k)(1) of this section.

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(3) Identify and implement permanent controls that meet the levels specified in paragraph (k)(1) of this section within 2 years after you determine that a job meets the Action Trigger, except that initial compliance can take up to [insert four years after the effective date of this standard] whichever is later.

(4) Track your progress and ensure that your controls are working as intended and have not created new MSD hazards. This includes consulting with employees in problem jobs and their representatives. If the controls are not effective or have created new MSD hazards, you must use the process in paragraphs (m)(1) and (m)(2) of this section to identify additional control measures that are appropriate and implement any such measures identified.

(n) [Reserved]

(o) May I use a Quick Fix instead of setting up a full ergonomics program?

(1) You may use a Quick Fix for a job if your employees have experienced no more than one MSD incident in that job, and there have been no more than two MSD incidents in your establishment, in the preceding 18 months.

(2) To use a Quick Fix, you must:

(i) Provide the MSD management required by paragraphs (p), (q), (r), and (s) of this section, as appropriate, to the employee promptly after you determine that the employee's job meets the Action Trigger;

(ii) Talk with employees in the job and their representatives about the tasks the employees perform that may relate to the MSD incident; and

(iii) Observe employees performing the job to identify which risk factors are likely to have caused the MSD incident;

(iv) Ask the employee(s) performing the job and their representatives to recommend measures to reduce exposure to the MSD hazards identified;

(v) Within 90 days of your determination that the job meets the Action Trigger in paragraph (e) of this section, implement controls in the job in accordance with paragraph (1) of this section that control the MSD hazards or reduce MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D to this section, and train the employee(s) in the use of these controls;

(vi) Within 30 days after you implement the controls, review the job to determine whether you have reduced the MSD hazards to the levels specified in paragraph (o)(2)(v) of this section; and

(vii) Keep a record of the Quick Fix process for each job to which it is applied. You must keep the record for 3 years.

(3) If you determine that you have reduced the MSD hazards to the levels specified in paragraph (o)(2)(v) of this section, you need take no further action except to maintain controls, the training related to those controls, and recordkeeping.

(4) If you have not reduced MSD hazards to the levels specified in paragraph (o)(2)(v) of this section, you must implement an ergonomics program, as specified in paragraph (g) of this section.

(p) What MSD management process must I implement for an employee who experiences an MSD incident in a job that meets the Action Trigger?

(1) You must provide the employee with prompt and effective MSD management at no cost to the employee. MSD management must include:

(i) Access to a Health Care Professional (HCP);

(ii) Any necessary work restrictions, including time off work to recover;

(iii) Work restriction protection; and

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(iv) Evaluation and follow-up of the MSD incident.

(2) You must obtain a written opinion from the HCP for each evaluation conducted under this standard, and provide a copy to the employee. You must instruct the HCP that the opinion may not include any findings or information that is not related to workplace exposure to risk factors, and that the HCP may not communicate such information to the employer, except when authorized to do so by State or Federal law.

(3) Whenever an employee consults an HCP for MSD management, you must provide the HCP with the following:

- (i) A description of the employee's job and information about the physical work activities, risk factors and MSD hazards in the job;
- (ii) A copy of this standard; and
- (iii) A list of information that the HCP's opinion must contain.

Note to paragraph (p): MSD management under this standard does not include medical treatment, emergency or post-treatment procedures.

(q) What information must the HCP's opinion contain?  
The HCP's opinion must contain:

(1) The HCP's assessment of the employee's medical condition as related to the physical work activities, risk factors and MSD hazards in the employee's job;

(2) Any recommended work restrictions, including, if necessary, time off work to recover, and any follow-up needed;

(3) A statement that the HCP has informed the employee of the results of the evaluation, the process to be followed to effect recovery, and any medical conditions associated with exposure to physical work activities, risk factors and MSD hazards in the employee's job; and

(4) A statement that the HCP has informed the employee about work-related or other activities that could impede recovery from the injury.

(r) What must I do if temporary work restrictions are needed?

(1) If an employee experiences an MSD incident in a job that meets the Action Trigger, you must provide the employee with any temporary work restrictions or time off work that the HCP determines to be necessary, or if no HCP was consulted, that you determine to be necessary.

(2) Whenever you place limitations on the work activities of the employee in his or her current job or transfer the employee to a temporary alternative duty job in accordance with paragraph (r)(1) of this section, you must provide that employee with Work Restriction Protection, which maintains the employee's employment rights and benefits, and 100% of his or her earnings, until the earliest of the following three events occurs:

- (i) The employee is able to resume the former work activities without endangering his or her recovery; or
- (ii) An HCP determines, subject to the determination review provisions in paragraph (s) of this section, that the employee can never resume his or her former work activities; or
- (iii) 90 calendar days have passed.

(3) Whenever an employee must take time off from work in accordance with paragraph (r)(1) of this section, you must provide that employee with Work Restriction Protection, which maintains the employee's employment rights

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and benefits and at least 90% of his or her earnings until the earliest of the following three events occurs:

- (i) The employee is able to return to the former job without endangering his or her recovery;
- (ii) An HCP determines, subject to the determination review provisions in paragraph (s) of this section, that the employee can never return to the former job; or
- (iii) 90 calendar days have passed.

(4) You may condition the provision of WRP on the employee's participation in the MSD management that this standard requires.

(5) Your obligation to provide WRP benefits to a temporarily restricted or removed employee is reduced to the extent that the employee receives compensation for earnings lost during the work restriction period from either a publicly or an employer-funded compensation or insurance program, or receives income from employment made possible by virtue of the employee's work restriction.

Note to paragraph (r): The employer may fulfill the obligation to provide work restriction protection benefits for employees temporarily removed from work by allowing the employees to take sick leave or other similar paid leave (e.g., short-term disability leave), provided that such leave maintains the worker's benefits and employment rights and provides at least 90% of the employee's earnings.

(s) What must I do if the employee consults his or her own HCP?

(1) If you select an HCP to make a determination about temporary work restrictions or work removal, the employee may select a second HCP to review the first HCP's finding at no cost to the employee. If the employee has previously seen an HCP on his or her own, at his or her own expense, and received a different recommendation, he or she may rely upon that as the second opinion;

(2) If your HCP and the employee's HCP disagree, you must, within 5 business days after receipt of the second HCP's opinion, take reasonable steps to arrange for the two HCPs to discuss and resolve their disagreement;

(3) If the two HCPs are unable to resolve their disagreement quickly, you and the employee, through your respective HCPs, must, within 5 business days after receipt of the second HCP's opinion, designate a third HCP to review the determinations of the two HCPs, at no cost to the employee;

(4) You must act consistently with the determination of the third HCP, unless you and the employee reach an agreement that is consistent with the determination of at least one of the HCPs;

(5) You and the employee or the employee's representative may agree on the use of any expeditious alternative dispute resolution mechanism that is at least as protective of the employee as the review procedures in paragraph (s) of this section.

(t) What training must I provide to employees in my establishment?

(1) You must provide initial training, and follow-up training every 3 years, for:

- (i) Each employee in a job that meets the Action Trigger;
- (ii) Each of their supervisors or team leaders; and

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(iii) Other employees involved in setting up and managing your ergonomics program.

(2) The training required for each employee and each of their supervisors or team leaders must address the following topics, as appropriate:

- (i) The requirements of the standard;
- (ii) Your ergonomics program and the employee's role in it;
- (iii) The signs and symptoms of MSDs and ways of reporting them;
- (iv) The risk factors and any MSD hazards in the employee's job, as identified by the Basic Screening Tool in Table W-1 and the job hazard analysis;
- (v) Your plan and timetable for addressing the MSD hazards identified;
- (vi) The controls used to address MSD hazards; and
- (vii) Their role in evaluating the effectiveness of controls .

(3) The training for each employee involved in setting up and managing the ergonomics program must address the following:

- (i) Relevant topics in paragraph (t)(2) of this section;
- (ii) How to set up, manage, and evaluate an ergonomics program;
- (iii) How to identify and analyze MSD hazards and select and evaluate measures to reduce the hazards.

(4) You must provide initial training to:

- (i) Each employee involved in setting up and managing your ergonomics program within 45 days after you have determined that the employee's job meets the Action Trigger;
- (ii) Each current employee, supervisor and team leader within 90 days after you determine that the employee's job meets the Action Trigger;
- (iii) Each new employee or current employee prior to starting a job that you have already determined meets the Action Trigger;

(5) You do not have to provide initial training in a topic that this standard requires to an employee who has received training in that topic within the previous 3 years.

(6) You must provide the training required by paragraph (t) of this section in language that the employee understands. You must also give the employee an opportunity to ask questions about your ergonomics program and the content of the training and receive answers to those questions.

(u) What must I do to make sure my ergonomics program is effective?

(1) You must evaluate your ergonomics program at least every 3 years as follows:

- (i) Consult with your employees in the program, or a sample of those employees, and their representatives about the effectiveness of the program and any problems with the program;
- (ii) Review the elements of the program to ensure they are functioning effectively;
- (iii) Determine whether MSD hazards are being identified and addressed; and
- (iv) Determine whether the program is achieving positive results, as demonstrated by such indicators as reductions in the number and severity of MSDs, increases in the number of problem jobs in which MSD hazards have been controlled, reductions in the number of jobs posing MSD hazards to employees, or any other measure that demonstrates program effectiveness.

(2) You must also evaluate your program, or a relevant part of it, when you have reason to believe that the program is not functioning properly.

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(3) If your evaluation reveals deficiencies in your program, you must promptly correct the deficiencies.

Note to paragraph (u): The occurrence of an MSD incident in a problem job does not in itself mean that the program is ineffective.

(v) What is my recordkeeping obligation?

(1) If you have 11 or more employees, including part-time or temporary employees, you must keep written or electronic records of the following:

- (i) Employee reports of MSDs, MSD signs and symptoms, and MSD hazards,
- (ii) Your response to such reports,
- (iii) Job hazard analyses,
- (iv) Hazard control measures,
- (v) Quick fix process,
- (vi) Ergonomics program evaluations, and
- (vii) Work restrictions, time off of work, and HCP opinions.

(2) You must provide all records required by this standard, other than the HCP opinions, upon request, for examination and copying, to employees, their representatives, the Assistant Secretary and the Director in accordance with the procedures and time periods provided in §1910.1020(e)(1), (e)(2)(i), (e)(3), and (f).

(3) You must provide the HCP opinion required by this standard, upon request, for examination and copying, to the employee who is the subject of the opinion, to anyone having the specific written consent of the employee, and to the Assistant Secretary and the Director in accordance with the procedures and time periods provided in §1910.1020(e)(1), (e)(2)(ii), (e)(3), and (f).

(4) You must keep all records for 3 years or until replaced by updated records, whichever comes first, except the HCP's opinion, which you must keep for the duration of the employee's employment plus 3 years.

(5) You do not have to retain the HCP opinion beyond the term of an employee's employment if the employee has worked for less than one year and if you provide the employee with the records at the end of his or her employment.

(w) When does this standard become effective?

This standard becomes effective [insert date 60 days after the publication date of final rule].

(x) When must I comply with the provisions of the standard?

(1) You must provide the information in paragraph (d) of this section to your employees by [insert date 11 months after the date of publication]. After that date you must respond to employee reports of MSDs and signs and symptoms of MSDs.

(2) You must meet the time frames shown in Table W-2 for the other requirements of this section, when you have determined that an employee has experienced an MSD incident, in accordance with paragraph (e) of this section.

### TABLE W-2

#### COMPLIANCE TIME FRAMES

#### REQUIREMENTS AND RELATED RECORDKEEPING TIME FRAMES

Paragraph (e), (f): Determination of Action Trigger Within 7 calendar days after you determine that the employee has experienced an MSD incident.

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Paragraphs (p), (q), (r), (s): MSD Management Initiate within 7 calendar days after you determine that a job meets the Action Trigger.

Paragraph (h) & (i): Management Leadership and Employee Participation Initiate within 30 calendar days after you determine that a job meets the Action Trigger.

Paragraph (t)(4)(i): Train Employees involved in setting up and managing your ergonomics program Within 45 calendar days after you determine that a job meets the Action Trigger.

Paragraph (j): Job Hazard Analysis Initiate within 60 calendar days after you determine that a job meets the Action Trigger.

Paragraph (m)(2): Implement Initial Controls Within 90 calendar days after you determine that a job meets the Action Trigger

Paragraph (t)(5)(ii): Train current employees, supervisors or team leaders Within 90 calendar days after you determine that the employee's job meets the Action Trigger.

Paragraph (m)(3): Implement Permanent Controls Within 2 years after you determine that a job meets the Action Trigger, except that initial compliance can take up to [insert date 4 years and 60 days after the date of publication] whichever is later.

Paragraph (u): Program Evaluation Within 3 years after you determine that a job meets the Action Trigger

Note to paragraph (x): Refer to paragraph (o) of this section for Quick Fix timeframes.

(y) When may I discontinue my ergonomics program for a job?

You may discontinue your ergonomics program for a job, except for maintaining controls and training related to those controls, if you have reduced exposure to the risk factors in that job to levels below those described in the Basic Screening Tool in Table W-1.

You means the employer as defined by the Occupational Safety and Health Act of 1970 (29 U.S.C. 651 et seq.)

# **WORKPLACE ERGONOMICS PROGRAM**