

THE

# KEYS

TO HEALTHY COMPUTING

The diagram illustrates an ergonomic workstation setup. A person is shown sitting in a chair, working at a desk. The workstation includes a computer monitor, a keyboard, a mouse, and a document holder. The person's hands are resting on a wrist rest. The diagram is overlaid with the large text 'KEYS TO HEALTHY COMPUTING'. Various ergonomic guidelines are labeled with arrows pointing to the corresponding parts of the workstation:

- Viewing angle: 18 to 20
- Display angle: 5 to 20
- Document holder
- Lower back support
- Wrist rest
- Keyboard slope: 5 to 20
- Keyboard height: 23 to 28 inches
- Chair height: 16 to 20.5 inches
- Table adjustable height for terminal keyboard

## AN AFSCME HEALTH AND SAFETY HANDBOOK



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# INTRODUCTION

T

he Information Age has certainly arrived. Tremendous energy and creativity have been unleashed to find new applications for computers. Unfortunately, much less attention has been paid to the effects these machines are having on those who work with computers.

The expanded use of computers has been accompanied by a staggering increase in the number of health complaints and injuries among computer users.

**Ergonomics** is the practice of adapting the job to fit the person, rather than the person to the job. Adapting the job can be done by designing equipment, tasks, pace and other job factors in such a way as to enhance the health and comfort of the workers. In addition to health concerns, people work more efficiently and are more productive if they are not nursing aches and pains.

Injuries resulting from poor ergonomic working conditions affect workers in manufacturing, construction, health care, government and other sectors of the economy. These injuries are called musculoskeletal disorders (MSDs). According to the U.S. Bureau of Labor Statistics, in 2005 there were 375,540 work-related MSDs, which accounted for 30 percent of all workplace injuries and illnesses with days away from work. Carpal tunnel syndrome, one type of MSD that affects computer operators, caused a median of 27 days away from work and tied with fractures for the highest type of injuries.

The signs of pain and discomfort can be seen in most offices. Computer operators are popping pain killers, applying heat, using eye drops and taking other medications to get rid of their aches and pains. A growing number of workers have had restrictions placed on their duties for medical reasons. Computer-related injuries cause many employees to miss substantial periods of work.

Most of the health problems faced by those who work with computers fall into two categories:

- injuries to the hands, wrists, elbows, arms, shoulders and neck. These are called the “upper extremities” (UE).
- eye/vision problems and headaches.

Computer operators also feel aches and pains in their back and legs when they do not have chairs and other equipment that fit their shape and size.

This booklet describes musculoskeletal disorders that affect computer operators. These disorders are sometimes also known as cumulative trauma disorders (CTDs) or repetitive strain injuries (RSIs) or “wear and tear” injuries. These terms refer to injuries that are a result of continued wear and tear on muscles, ligaments, tendons and joints.

Are the aches, pains and injuries just the price workers have to pay for progress? Absolutely not! As with other occupational injuries and illnesses, the hazards of computer work are preventable. It is the employer’s responsibility to make the changes needed to prevent MSDs.

This booklet has been prepared to assist AFSCME members and staff in addressing the health problems that have accompanied the use of computers. If you need further information about ergonomics in your workplace, contact the Health and Safety Program in the AFSCME Department of Research and Collective Bargaining Services.

# HEALTH PROBLEMS CAUSED BY COMPUTER WORK

## PART A—RISK FACTORS

# A

A risk factor is a working condition that increases the chance of injuries. Each of the risk factors described here can cause health problems. However, workers who are exposed to more than one risk factor in their job tasks are more likely to suffer injuries. The risk factors that cause most of the injuries and discomfort to computer operators include:

- **Awkward posture:** includes computer keying with the wrists bent, reaching for the mouse, or doing other tasks while bending or twisting.
- **Repetition:** performing the same motion such as keying, using a mouse, or other task every few seconds or on a continuous basis for hours at a time or even the whole work shift.
- **Duration/lack of recovery time:** working long periods at a computer or other job without breaks and changing tasks.
- **Force:** the effort it takes to move an object or to remain in a sitting, standing or other position for a long time (prolonged static exertion).

Another type of force, known as contact stress comes from pressure against a part of a body, such as resting the wrists against a hard and/or sharp edge.

- **Uncomfortable environment:** includes poor air quality, improper lighting, glare, noise and other conditions.
- **Organization of work:** includes factors such as staffing levels, scheduling, workload and job pacing, electronic monitoring, performing monotonous tasks, and the amount of control workers have over how they perform their jobs. These are sometimes referred to as **psychosocial factors**.

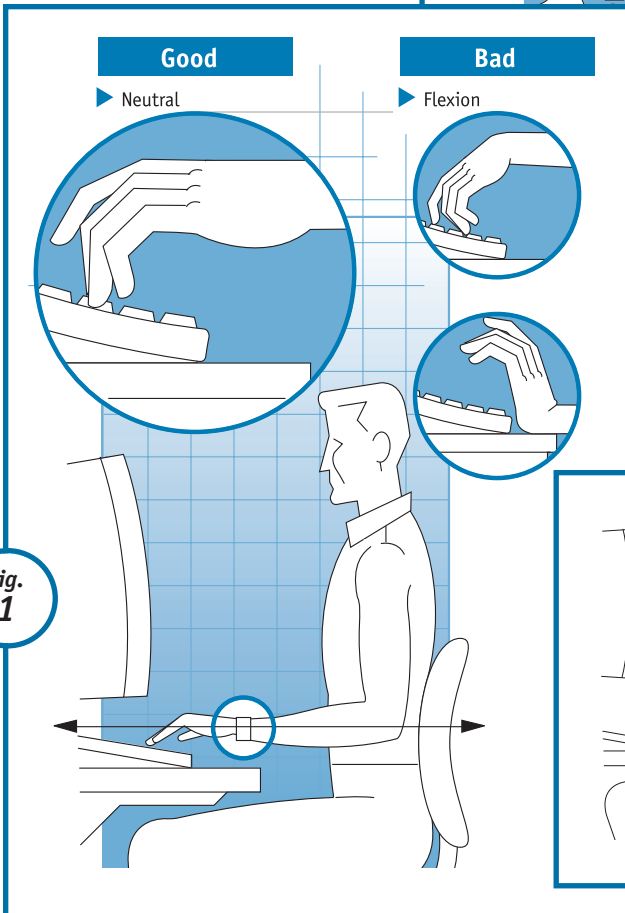
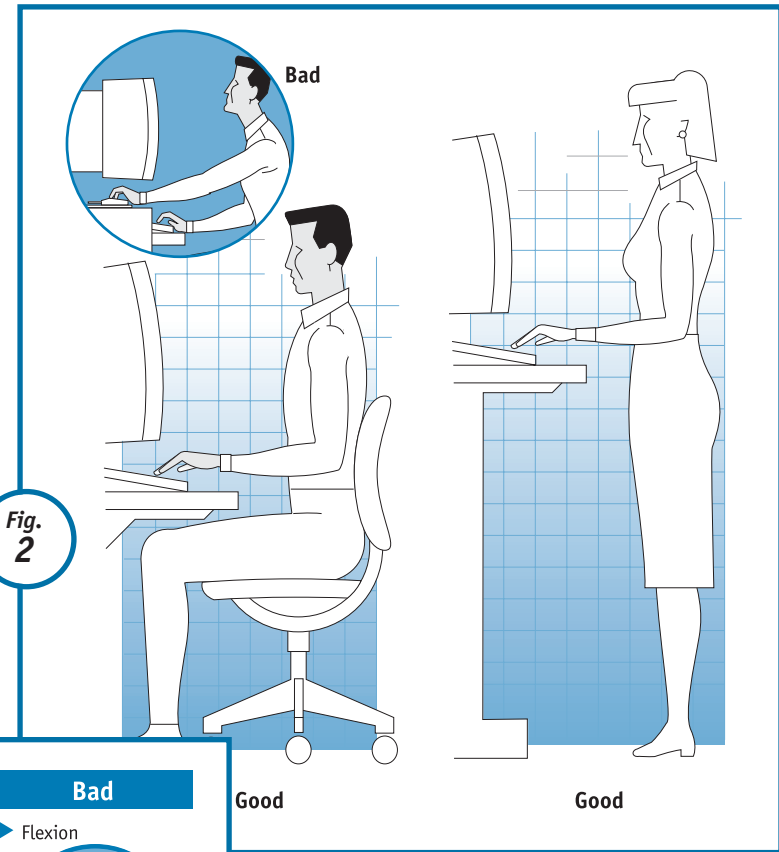
### POSTURE

Whether standing or sitting, there is a neutral position for the back, neck, arms and hands. This is the position that puts the least amount of strain on a given part of the body. Postures that differ from the neutral position increase stress on the body. The illustrations below show positions that are good and bad for different parts of the body.

The wrists should be straight while keying. Operating the computer with the wrists bent backwards (*extension*) or forward (*flexion*) should be avoided. See Figure 1.

The computer operator should be able to reach the keyboard or mouse while keeping the shoulders and upper arms relaxed and bending the elbows at a 90 degree angle. See Figure 2.

The operator's back and neck should be straight while at the computer. The top of the monitor should be



slightly below eye level. The worker should not have to tilt their head backward or turn to the side to see the screen. See Figure 3.

Other awkward positions should be avoided while working at a computer, such as cradling a phone between the ear and shoulder.

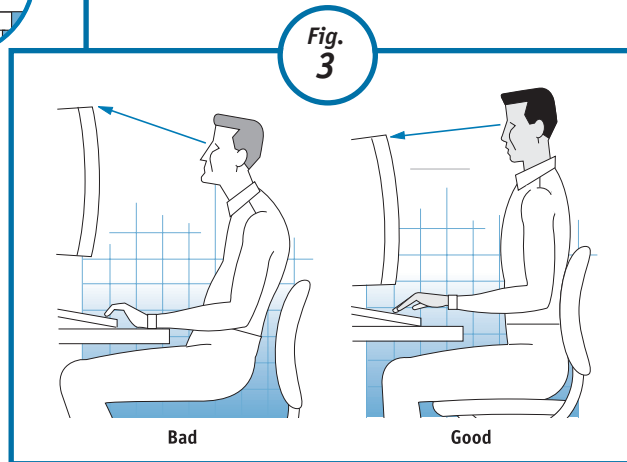


Fig. 1

Fig. 2

Fig. 3



## PART B – COMPUTER-RELATED INJURIES, ILLNESSES AND DISCOMFORT

The muscles, tendons, ligaments, joints, bones, cartilage and discs in the spine make up the **musculoskeletal system**. An injury or illness to these parts is called a **musculoskeletal disorder (MSD)**. Some MSDs, such as carpal tunnel syndrome, can affect nerves as well.

To understand these injuries, it is necessary to understand the structure and function of various parts of the body.

**Muscles** are tissues made up of very small fibers. Muscles contract and relax to make movement.

**Tendons** connect muscles to bones. Tendons are also made up of fibers, but these fibers do not stretch or shrink. The tendons transfer the force from the muscle to move the bone. Some tendons, like those in the wrist and hand, are covered with a **sheath** that contains a lubricating fluid. These tendons pass back and forth through the sheath as the muscles tighten or relax.

**Ligaments** connect bones to form a joint. Joints are covered by ligaments that form a joint capsule, which holds the ends of the bones together and allows movement. The joint also contains lubricating fluid. Some ligaments, such as those in the shoulder, elbow and knee are shielded from friction by a **bursa**, a small sac filled with fluid.

**Nerves** carry messages throughout the body — sending and receiving information to and from the brain. Nerves allow us to see and hear, and also feel pain.

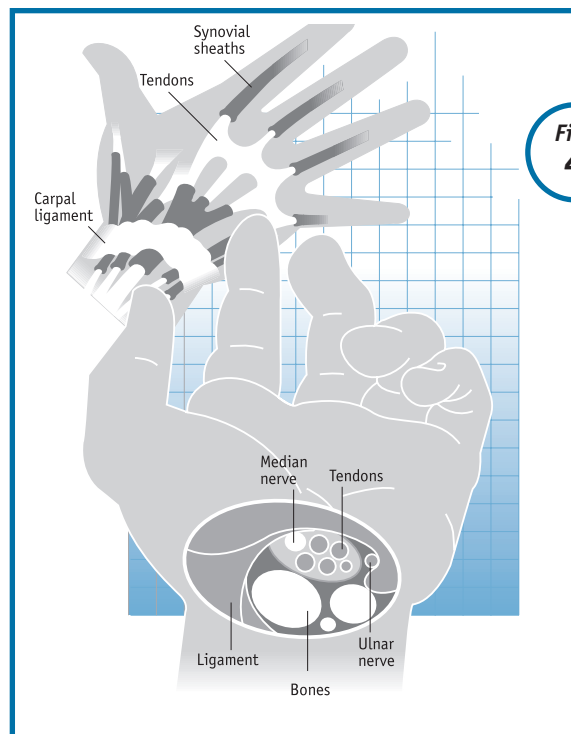
This chapter covers the most common injuries that computer operators experience because of poor ergonomics at work. The symptoms and major risk factors are described for each disorder. Generally, the more time a worker is exposed to these risk factors, the greater the chance of developing one of these injuries.

## CARPAL TUNNEL SYNDROME

Carpal tunnel syndrome (also known as median neuritis) is a painful condition of the hands and wrists. It is caused by pressure on the median nerve, which runs from the shoulder, down the arm, to the hand. In advanced cases, carpal tunnel syndrome can make the simplest chore or activity impossible, such as holding a frying pan, folding laundry or lifting an infant.

**Symptoms:** In addition to pain, the symptoms of carpal tunnel syndrome include numbness and tingling in the hands. These symptoms are usually felt in the first three fingers and the base of the thumb. Often the pain and other symptoms are worse at night or during sleep.

Figure 4 shows the parts of the hand and wrist that are involved. Tendons of the fingers, blood



vessels, and the median nerve all pass through what is called the carpal tunnel. The carpal tunnel is formed by the carpal ligament in the wrist. Swelling and steady irritation of the tendons that pass through the carpal tunnel create pressure on the median nerve.

**Risk factors:** The major causes of carpal tunnel syndrome are:

- working with bent wrists
- a high rate of repetition using the hands
- a lack of rest for the hands and wrists and
- forceful hand motions.

All of these risk factors are not necessary to get carpal tunnel syndrome. For example, computer operators get carpal tunnel syndrome even though modern computers only require a very light force to press the keys. The awkward posture, intense keying and lack of rest periods are more than enough to cause problems.

Carpal tunnel syndrome is a very serious injury. It can occur in one wrist, or both (**bilateral carpal tunnel**). Carpal tunnel syndrome affects workers in many industries such as meatpacking, grocery checkout and assembly work. AFSCME members, especially among those who work with computers, are also victims of carpal tunnel syndrome.

Early and proper treatment is important for this condition. Treatment should start out conservatively with rest and physical therapy. Surgery should *not* be the first choice. The person's job may have to be redesigned to remove or reduce risk factors at work. Otherwise, the symptoms are likely to get worse and require surgery to relieve the pain.

## TENDON DISORDERS

### Tendinitis

Tendinitis is a very common ailment. Pain and inflammation in the arms or elsewhere result from overuse and awkward posture. Tendons can eventually fray and tear. Remember, tendons are like chords that connect muscles and bones. Tendons twist and bend, but do not stretch or shrink.

### Epicondylitis

This is also known as "tennis elbow." Pain begins in the elbow and then spreads to the forearm. The main conditions that cause this problem are repetition, rotating the forearm or force.

### Tenosynovitis

Unlike the tendons in the elbows, some are covered with a sheath. The tendons of the fingers, for example, are covered with a **synovial sheath**. The sheath is filled with a fluid that lubricates the tendon as it slides back and forth through the sheath. This fluid is called **synovial fluid**.

When workers perform highly repetitive motions, too much fluid is produced in the sheath. The extra fluid builds up and the sheath becomes swollen and causes pain. Awkward posture, such as doing intensive keyboard work with the wrists bent backward, is also an important risk factor.

### Stenosing tenosynovitis

Stenosing means constriction. The passageway through the sheath becomes smaller. This occurs when tendons become rough or irritated and the tendon sheaths are inflamed. The swollen sheaths then press on the tendons.

### DeQuervain's disease

This is a specific example of a stenosing tenosynovitis. In DeQuervain's disease, the tendons at the side of the wrist and the base of the thumb are affected, causing pain and inflammation. These tendons are connected to the muscles on the back of the forearm. When these muscles tighten, the thumb is pulled back away from the hand.

DeQuervain's disease develops with too much friction of the tendons in the thumb and the sheath. The sheath gets thicker because of the friction, which in turn constricts the tendons. The risk factors for this disorder include tight gripping and a clothes-wringing motion.

### Ganglionic cysts

Ganglionic cysts are also known as "Bible bumps." This ailment involves a tendon sheath on the back side of the wrist. In this instance, the fluid inside the sheath builds up so much that it actually forms a bump

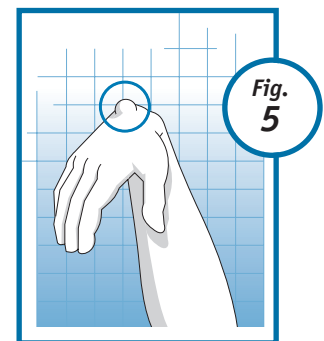
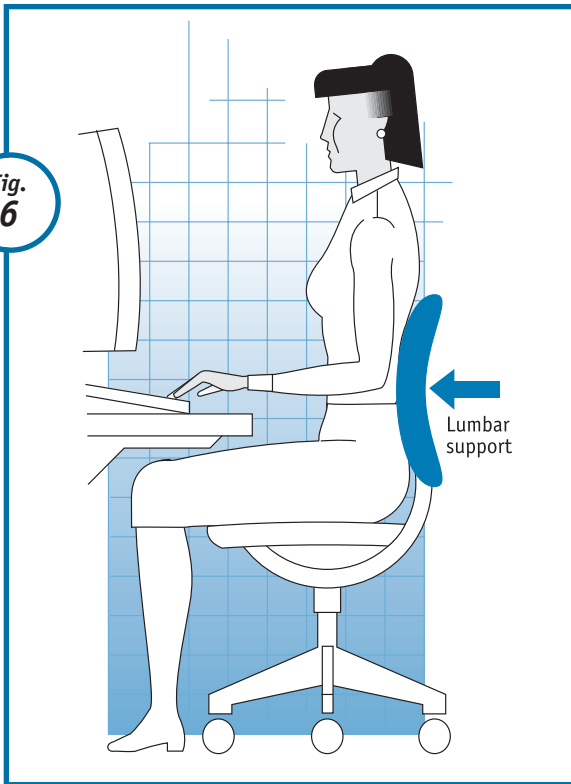


Fig. 6



under the skin (Figure 5). Once again, repetitive work with bent wrists is the main risk factor.

### BACK, NECK AND SHOULDER PROBLEMS

Computer operators commonly feel pain in the lower back. This is often the result of sitting for long periods in a chair that does not provide support to the lower back (lumbar) region (Figure 6). If the chair is not helping to maintain the back in an upright position, the back muscles must do more work, causing fatigue. Inappropriate chairs also contribute to slouching and other postures that put pressure on the spine.

Tilting the head backward causes a pain in the neck and shoulders. This commonly happens when the monitor is too high. When seated at the computer, the top of the monitor should be at or below eye level.

Improper placement of work materials is also a common cause of neck problems. Repeatedly bending the head downward to look at a paper flat on a desk and then tilting the neck backwards to see the computer screen can cause pain and stiffness

in the neck. A document holder at the same height, distance, and angle as the computer screen eliminates the need for this motion. Shoulder strain and soreness can also occur if the computer operator must reach too far to use the mouse. The mouse should be next to the keyboard, and appropriately placed for either right- or left-handed users.

### EYE AND VISION PROBLEMS

Eye and vision problems are the most common health complaints of computer operators. This comes as no surprise to anyone who has worked for long periods of time in front of a computer. The usual symptoms include:

- eye fatigue or eye strain (asthenopia)
- blurred vision
- burning, itching or tearing eyes
- temporary change in ability to see colors and
- headaches.

Many operators have reported that they feel their vision has worsened after working with computers. Some started wearing corrective lenses and others have required frequent prescription changes since beginning work on the equipment. Most investigators have not found any connection between computer use and long-term damage to the eyes.

The most common risk factors for headaches, eye and vision problems are:

- unclear, flickering or characters that are too small
- reflections and glare on the screen
- light that is too bright
- being too close or too far from the screen
- too much time looking at the screen and
- stressful working conditions.

Computer operators should have yearly vision examinations. Make sure your eye care professional knows that you work with a computer. The fact that you work with a computer may affect the type of prescription lenses that you need.

### STRESS

Just about every working person knows the feeling of being under pressure to meet the demands of the job. In workplaces across the

country, employers and workers are striving for greater efficiency. In offices, management has looked to computer technology as a way to get more work done in less time and with fewer people.

Stress is not only a feeling; it causes changes in body functions (physiology) such as the release of a variety of hormones, increased breathing, quickened pulse and the production of more stomach acid. Workers suffering from repeated, prolonged or continuous job stress may experience:

- frequent headaches
- sleeplessness
- loss of appetite
- depression
- short temper
- backache and stomach problems
- ulcers
- high blood pressure and/or
- heart disease.

Stress can also increase the risk of being injured on the job, weaken the body's resistance to disease, lead to substance abuse, and contribute to marital and other social problems.

Conditions that cause stress (stressors) can be divided into two general categories, the work environment and the organization of work.

**Environmental factors** that lead to stress include:

- uncomfortable temperatures, humidity and poor air quality
- improper lighting
- noise and
- equipment and furniture that are not the right shape or size.

When the physical working conditions are uncomfortable or inappropriate, the computer operator must do something to adapt to the unsuitable conditions. The effort to cope with the environment is added to the already existing demands of the job, thereby increasing the level of stress.

The **organization of work** involves the manner in which work is done. Numerous organizational factors can make computer work more stressful, such as:

- repetitive tasks
- a lack of participation in decision-making and control over how to do your job
- lack of breaks or work not requiring a keyboard
- excessive overtime
- unreasonable pace of work and
- computer monitoring.

In addition to the actual design of computer work, other job conditions can contribute to the stress of operators. These include low wages, absence of career advancement opportunities and inadequate child care.

# 2

## SOLVING COMPUTER-RELATED HEALTH PROBLEMS

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nion activists are problem solvers. As with any other problem, the first step is to get the facts. The questions you need to answer for computer-related health problems are:

**Who** has pain or other symptoms?

**Where** in the workplace do employees feel aches and pains?

**When** do workers feel these symptoms?

**Why** are workers hurting? In other words, what equipment are they using and under what working conditions?

**What** needs to be done to correct the problems?

There are three basic steps to answering these questions.

**Step 1:** Find out which workers have been injured or are having pain. Figure out where and when these problems are happening.

**Step 2:** Identify the working conditions that are causing the injuries.

**Step 3:** Determine ways to correct the conditions that are causing problems.

Whether working in cooperation with management or not, your local should establish a health and safety or ergonomics committee. The committee is the vehicle for identifying problems and recommending solutions. In addition, the ergonomics committee should monitor the effectiveness of the ergonomics program.

### STEP 1: COLLECTING INFORMATION ON INJURIES

There are different ways to discover who has been injured. Begin by reviewing records the employer collects. These include workers' compensation, medical insurance data, and injury and illness data. **WARNING!** These sources are often incomplete and inaccurate.

#### THE OSHA 300 LOG

If you work in a state where public employees are covered by the Occupational Safety and Health Administration (OSHA) or you are in the private

# Log of Work-Related Injuries and Illnesses

**Attention:** This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Identify the person			Describe the case			Classify the case				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
(A) Case no.	(B) Employee's name	(C) Job title <i>(e.g., Welder)</i>	(D) Date of injury or onset of illness	(E) Where the event occurred <i>(e.g., Loading dock north end)</i>	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill <i>(e.g., Second degree burns on right forearm from acetylene torch)</i>	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Away from work	On job transfer or restriction	(M) Check the "Injury" column or choose one type of illness:					
						Death	Days away from work	Job transfer or restriction	Other recordable cases	(K)	(L)	Injury	Skin disorder	Respiratory condition	Poisoning	Hearing loss	All other illnesses
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Page totals **▶** \_\_\_\_\_

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Injury	Skin disorder	Respiratory condition	Poisoning	Hearing loss	All other illnesses
(1)	(2)	(3)	(4)	(5)	(6)

sector, your employer is required to keep a record of all job-related injuries, illnesses and deaths. The Federal **OSHA Form 300** (state OSHA plans may have a different form number) is a yearly summary of injuries, illnesses and deaths. Union representatives have a right to review the log. A sample form is on page 12 and 13.

An accurate 300 log can tell you:

- who has had a musculoskeletal disorder
- the occupation of an injured worker
- the department of an injured worker and
- how much work time has been lost due to MSDs.

These facts can be used to find patterns of injuries. This helps to identify if many or most of the MSDs are occurring in certain departments or occupations. The log can also show if the number of injuries has been rising, falling or staying about the same.

One way to assess the seriousness of the problem is to figure how much time workers are off work due to MSDs. This can be done by keeping track of lost workdays due to MSDs on injury reports, workers' compensation records, the 300 log or other records. This method will be accurate enough if the number of workers does not change much from year to year.

## SURVEYS

The union can conduct its own survey. Surveys are useful for a number of reasons:

- A survey can provide a more complete picture of who is having symptoms.
- The records your employer keeps may not be very accurate.
- Many workers with a musculoskeletal disorder do not report them to their employer or file for workers' compensation.
- A survey increases worker awareness about ergonomic issues.

Surveys can be done with or without using workers' names. People will not give you accurate answers if they feel the information may be used against them. The decision to include employees' names depends on the situation.

Keep the following tips in mind when doing a survey:

- Use words that everyone will understand.
- It is usually better for surveys to be shorter rather than longer.
- As much as possible the answers should be yes or no, true or false, or multiple choice.

A sample health survey for computer operators follows.

# COMPUTER OPERATOR SYMPTOMS SURVEY

Name: \_\_\_\_\_

Employer: \_\_\_\_\_

Department: \_\_\_\_\_

Work Location: \_\_\_\_\_ Work Phone #: \_\_\_\_\_

E-Mail: \_\_\_\_\_

Current Job: \_\_\_\_\_ How Long: \_\_\_\_\_

If less than 2 years in this position, previous job: \_\_\_\_\_ How Long: \_\_\_\_\_

1) On average, how many hours a day do you work with a computer?

- less than 2       2-4 hours       more than 4 hours

2) During the past two years, have you had any of the following symptoms that lasted for at least a week

	YES	NO
a) Pain, aches, stiffness, burning, numbness or tingling in your <b>fingers, hands or wrists?</b>	<input type="checkbox"/>	<input type="checkbox"/>
b) Pain, aches, stiffness, burning, numbness or tingling in the <b>elbows or forearms?</b>	<input type="checkbox"/>	<input type="checkbox"/>
c) Pain, aches, stiffness, burning, numbness or tingling in the <b>shoulders?</b>	<input type="checkbox"/>	<input type="checkbox"/>
d) Pain, aches, stiffness, burning, numbness or tingling in your <b>neck?</b>	<input type="checkbox"/>	<input type="checkbox"/>
e) Pain, aches, stiffness, burning, numbness or tingling in your <b>back?</b>	<input type="checkbox"/>	<input type="checkbox"/>
3) Are you <i>currently</i> feeling pain, aches, stiffness, burning, numbness or tingling in your:	<input type="checkbox"/>	<input type="checkbox"/>
a) <b>fingers, hands or wrists?</b>	<input type="checkbox"/>	<input type="checkbox"/>
b) <b>elbows or forearms?</b>	<input type="checkbox"/>	<input type="checkbox"/>
c) <b>shoulders?</b>	<input type="checkbox"/>	<input type="checkbox"/>
d) <b>neck?</b>	<input type="checkbox"/>	<input type="checkbox"/>
e) <b>back?</b>	<input type="checkbox"/>	<input type="checkbox"/>

4) In the past *two years*, has a physician told you that you have any of the following conditions?

	YES	NO
a) Carpal tunnel syndrome	<input type="checkbox"/>	<input type="checkbox"/>
b) Tendinitis	<input type="checkbox"/>	<input type="checkbox"/>
c) Tenosynovitis	<input type="checkbox"/>	<input type="checkbox"/>
d) Ganglionic cyst	<input type="checkbox"/>	<input type="checkbox"/>
e) Bursitis	<input type="checkbox"/>	<input type="checkbox"/>



- |   | YES                      | NO                       |
|---|--------------------------|--------------------------|
| f) Rotator cuff injury  | <input type="checkbox"/> | <input type="checkbox"/> |
| g) DeQuervain's disease   | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Epicondylitis  | <input type="checkbox"/> | <input type="checkbox"/> |
| 5) If you answered "Yes" to any of the conditions in the previous question, for , if any, which did you file a workers' compensation claim? a) ___ b) ___ c) ___ d) ___ e) ___ f) ___ g) ___ h) ___                           |                          |                          |
| 6) In the past two years, have you ever been on restricted duty because you were injured or felt pains as the result of working with a computer?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 7) How many days of work have you missed in the last 12 months because of pain or injuries caused by working on a computer?<br>1 - 5 days____                      6 - 15 days____                      more than 15 days____ |                          |                          |
| 8) Do you regularly get headaches while you work with a computer?   | <input type="checkbox"/> | <input type="checkbox"/> |
| If you answered "Yes" to Question 8, how often do they occur?   |                          |                          |
| Once every 2 weeks?   | <input type="checkbox"/> | <input type="checkbox"/> |
| Once a week?  | <input type="checkbox"/> | <input type="checkbox"/> |
| More than once a week?  | <input type="checkbox"/> | <input type="checkbox"/> |
| Almost daily?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 9) Do your eyes usually itch, burn or feel tired after a day of working with your computer?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 10) Does your vision get blurred while you are working on your computer?  | <input type="checkbox"/> | <input type="checkbox"/> |

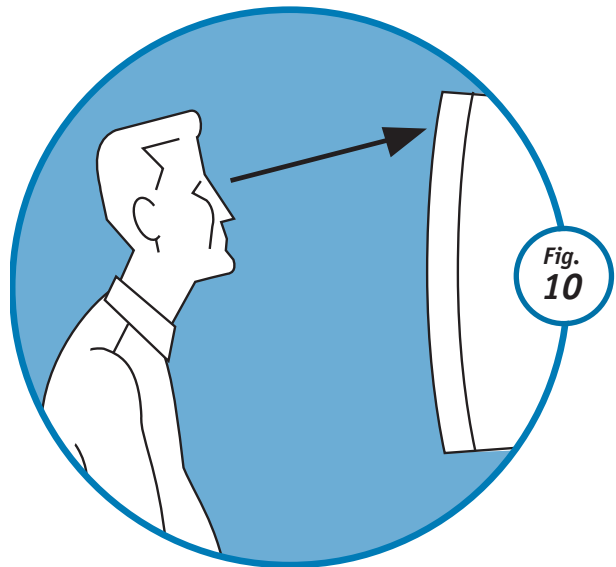
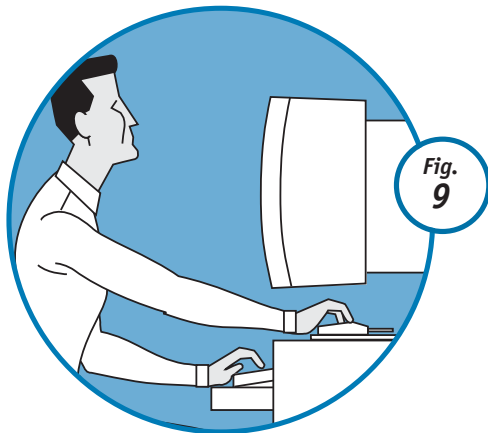
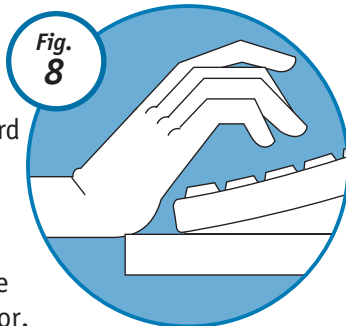
## STEP 2: JOB ANALYSIS

Once you know which workers are affected, the next step is to figure out why the work is causing pain and injuries. You need to find the “risk factors” for the jobs. **REMEMBER: Look at all the duties in a person’s job, not just the computer tasks!**

### WARNING!!!

If you see any of the following conditions in your workplace, it is very likely that workers are already being injured or will soon develop problems. Your employer should take prompt action to correct these situations.

- Wrists bent backward while keying. See Figure 8.
- Shoulder and arm reaching for the keyboard or mouse. See Figure 9.
- Neck tilted backward while viewing monitor. See Figure 10.
- Continuous or frequent keystrokes, mousing and other movements that put a strain on the hands, wrists or other parts of the body (repetition rate).



- Spending a majority of the workday keying, typing or doing other work that requires repetitive movements or forceful exertions of the arms and hands (duration).
- A lack of breaks and other periods of work when an employee is not using the computer or doing similar work such as typing (recovery time).
- Jobs in which workers must cope with unreasonable workloads, rotating shifts, electronic monitoring and a lack of control over the way they do their work (psychosocial factors).
- A keyboard that requires a “heavy touch” to depress the keys or pressure on a worker’s wrists from pressing against the surface or edge of a desk or other piece of equipment (force).
- Workers wearing wrist braces at work, regularly taking pain medication or being treated by a doctor for a musculoskeletal disorder.
- Wrists pressing against a desk or other surface that has hard and/or sharp edges (contact stress).

The checklist on the next page can be used to conduct a more thorough job analysis to help you figure out what is causing problems.

# COMPUTER WORKSTATION CHECKLIST

## Yes No Your Chair

- Can you adjust the height of your seat so that it is between 16 and 20 inches from the floor?
- Is your chair about 18 inches wide?
- Is your chair cushioned with a rounded front edge?
- Is the distance from the front to the back of the seat between 15 and 17 inches?
- Does your chair have a backrest that you can adjust so that it supports your lower back (lumbar support)?
- Does your chair have a five-star base?
- Can you adjust the height and/or width of the armrests to allow your shoulders to be relaxed, the upper half of your arms to be at your sides, and to reach the keyboard with your elbows bent at about a 90 degree angle?
- Can you adjust your chair so your feet are flat on the floor or on a foot rest?

## Your Keyboard and Mouse

- Is your keyboard separate from the monitor?
- Is the slope of the keyboard between 0 and 25 degrees?
- Is your mouse at the same height as your keyboard?
- Can you adjust the height of the keyboard so that it is between 23 and 28 inches from the floor?
- Do you have a padded rest for your wrists when you are not keying?

## Your Monitor

- Can you adjust the contrast and brightness of the screen?
- Does your screen tilt up and down and swivel from side to side?
- Are screen characters in focus and free of flicker?

## Yes No

- Are your eyes between 18 and 30 inches from the screen?

## Your Posture While Seated at Your Computer

- While looking at the screen, is the top of the screen slightly below eye level?
- Are your shoulders relaxed with the upper half of your arms at your sides?
- Are your forearms parallel with the floor?
- Are your wrists straight while you key?
- Do your legs fit easily underneath the keyboard surface?
- Are your feet squarely on the ground or a foot rest?
- Do you have a document holder?

## Lighting

- Is the brightness in the room between 200 and 500 lux?
- Are windows in the room covered with blinds or shades?
- Are screens positioned at a 90 degree angle to windows?
- Is your screen free from reflection from overhead lighting and other sources of light?

## Breaks and Job Content

- Do you normally use a computer less than 4 hours per day?
- After each hour of intensive computer work, do you get at least a 15-minute period of rest from keying, typing or similar activity?
- After every two hours of computer work, do you get a 15-minute break or period away from keying?
- Can you take short periods to stretch or briefly do non-computer work during your shift?

This checklist is based on the needs of most people. Some computer operators require customized equipment. Ideally, the workers who complete this survey will answer “Yes” to all of these questions. However, if they are feeling aches and pains in their arms, neck or back while they work, look at the items that are checked “No.” Even if workers are feeling well, it is a good idea to correct these conditions before problems arise.

## STEP 3: SOLUTIONS TO COMPUTER-RELATED HEALTH PROBLEMS

There are five areas in which actions need to be taken to make computer work safe and comfortable.

- **EQUIPMENT:** Replacing or modifying equipment and furniture, and creating a comfortable environment (engineering controls).
- **JOB TASKS:** Changing the way work is organized (administrative controls).
- **MEDICAL CARE:** Ensuring that injured workers get proper care and that symptoms are reported at an early stage (medical management).
- **TRAINING:** Training workers and supervisors about proper ergonomics.
- **PROGRAM EVALUATION:** Assessing the effectiveness of the ergonomics program.

## GETTING THE RIGHT FIT:

### EQUIPMENT, FURNITURE AND ENVIRONMENT

A key to healthy and comfortable computer work is a workstation that fits the worker who uses it. Since people are not all the same shape or size, the workstation needs to be adjustable. See Figure 11 on page 20.

Ergonomics should be considered **BEFORE** new computers or furniture are purchased or older

equipment is replaced. There are also many computer accessories available that allow workers to make existing workstations more comfortable. Whether buying new or fixing old equipment, the ergonomics committee along with other employees should evaluate the products. The following recommendations should make computer work safer and more comfortable for the vast majority of computer operators.

### Monitor

- viewing distance 18–30 inches
- eyes level with top of monitor — able to see top
- monitor tilt is adjustable
- contrast/brightness controls
- document holder
- should be placed directly in front of user to eliminate twisting the neck to view

### Keyboard

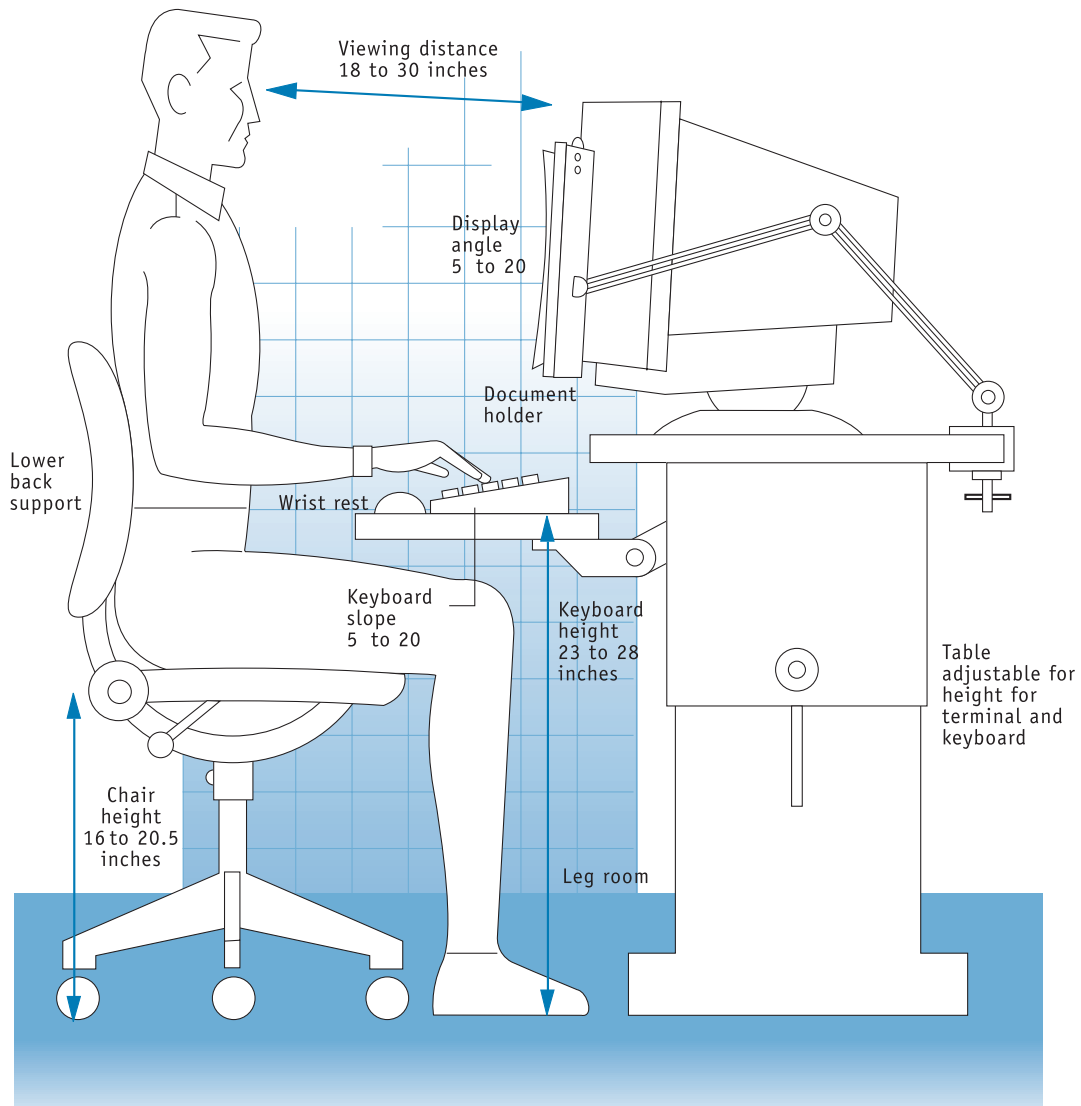
- adjustable surface to hold the keyboard
- keyboard slope 0°–25°
- keyboard surface adjustable 23–28 inches above floor
- mouse or tracking ball at same height as the keyboard
- padded wrist rests

### Chair

- seat height adjustment 16–20.5 inches
- seat depth between 15 and 17 inches
- seat width a minimum of 18 inches
- contoured, cushioned seat pan
- space between the back of the knees and the front edge of the seat
- angle between seat pan and seat back 90°–105°
- backrest contoured in shape and supports lumbar region
- foot rests

## Recommendations for workstation design

Fig. 11



- armrests at least as wide as seat width
- armrests adjustable for height and width
- a five-point base

### Accessories

Having a properly designed workstation does not mean your employer has to buy all new equipment. There are many accessories on the market that will allow workers to adjust their existing workstations. See Figure 12 on page 21.

### The Office Environment

Many offices that were originally designed for tasks such as reading printed document and typing need to be modified to address the special lighting requirements of computer work, excess noise and proper indoor air quality.

#### Lighting

Inappropriate office lighting is probably the most widespread environmental problem for computer workers. The light comes primarily from sunlight

## Accessories

Having a properly designed workstation does not mean your employer has to buy all new equipment. There are many accessories on the market that will allow workers to adjust their existing workstations.

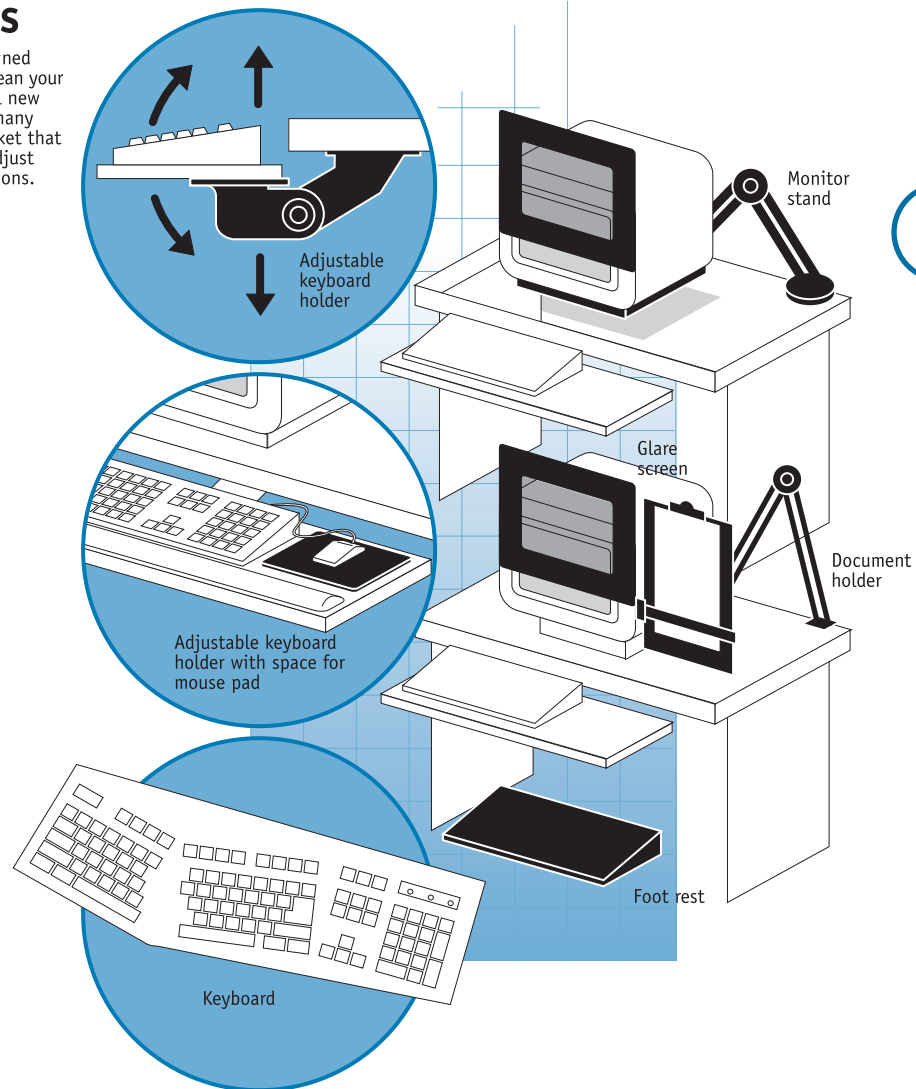


Fig. 12

or bright, unshielded overhead light. There are a number of ways to correct lighting problems.

- Lower lighting levels where computers are used to a range of 200 to 500 lux. Illumination is measured in units called lux or footcandles.
- Eliminate glare and bright sunlight from windows by using curtains or shades and positioning the screen at a 90 degree angle to windows. Screens should never be placed with a window directly in front or behind the terminal.
- Reduce glare from overhead lighting by using indirect lighting or by shielding overhead tubes with shields or parabolic louvers.
- Try glare screens, if needed, after attempting to eliminate bright light and glare.
- Use a desk lamp (task lighting) when more light is needed for working with printed material.
- Furnish offices with colors and materials that absorb rather than reflect light.

### *Indoor air quality*

A comfortable temperature, somewhere around 70 degrees, should be maintained, with humidity around 50 percent. The ventilation should be properly maintained, filters regularly changed, and enough air exchanges provided to prevent the buildup of air contaminants.

### **JOB TASKS — WORK ORGANIZATION**

Work organization refers to breaks, periods of non-computer work, job enlargement, light-duty for injured workers and other working conditions. Administrative controls means adjusting these factors to make work safer.

Although there is no OSHA standard, research into this area supports a number of common sense recommendations. At a minimum, computer operators should have a 15-minute break for every two hours of computer work, and a break from the computer every hour if they perform intensive keyboard work. In addition to rest breaks, employees should be allowed and encouraged to regularly take brief periods to stretch and do non-computer work tasks.

It is important that workers are not making problems worse when they are performing non-computer tasks. For example, typing, writing or book handling pose some of the same risk factors for MSDs as computer work.

Piece work or other types of incentive programs can be harmful. Workers need to give their bodies time to rest during their shift or when they are feeling pain.

### **MEDICAL MANAGEMENT**

An effective medical management program will prevent and treat musculoskeletal disorders. The proper medical management of MSDs requires:

- Ensuring the early identification and evaluation of signs and symptoms of MSDs.
- Making a correct diagnosis. The medical assessment includes an occupational and medical history, physical exam and may involve laboratory tests.

- Providing appropriate medical treatment. The treatment depends on the type and severity of the illness. Treatment of upper extremity MSDs may involve rest, immobilizing the affected area, drugs, exercise, heat and cold, and local injections of anti-inflammatory agents. More aggressive treatment, such as surgery, may be necessary in cases of carpal tunnel syndrome or other disorders involving nerve entrapment.

- Changing the workstation and work process to eliminate or reduce exposure to risk factors as much as possible. Without such changes, the worker will again be subjected to the same conditions that caused the problem in the first place. It is likely that the injury will occur again.

A qualified occupational health professional with training in the prevention and treatment of MSDs should be selected to supervise the program. The union should participate in the choice of this person. The health care provider should be part of the ergonomics team which, consists of union and management representatives and others with knowledge about ergonomics.

A medical management program includes the following elements:

#### **1) Trained and Available Health Care Providers**

Employees need access to health care providers with knowledge in the prevention, early recognition, evaluation, treatment and rehabilitation of MSDs.

#### **2) Periodic Workplace Walkthrough**

The purpose is to spot risk factors, identify light-duty jobs and ensure that hazards have been corrected.

#### **3) Symptoms Survey**

A symptoms survey of employees should be conducted at least annually.

#### **4) A List of Light-Duty Jobs**

Light-duty means jobs with the least exposure to the risk factors that cause MSDs.

## 5) Health Surveillance

Health surveillance can establish a base against which changes in a person's health can be compared. Exams should not be used to deny people a job. A baseline evaluation should include a medical and job history, and physical exam. Additional evaluations should be conducted every couple of years.

## 6) Training and Education

Training should include employees and supervisors. The subjects should include different types of injuries, their causes, prevention, and early signs and symptoms.

## 7) Early Reporting of Symptoms

It is crucial that employees are encouraged to report symptoms and signs of problems. Early identification and treatment saves suffering, days off work or restricted duty, and recovery time.

## 8) Standardized Procedures for Health Care Providers

Different health care providers should use similar methods to diagnose and treat MSDs. These written standardized procedures are called protocols.

## 9) Evaluation, Treatment and Follow-up of MSDs

The medical management program should provide follow-up to the initial evaluation and treatment. Employees returning to work

after time off may need a period of adjustment and re-conditioning.

## 10) Keeping Accurate and Complete Records

Records are important to monitor progress as well as problems.

### TRAINING

All computer operators and their supervisors should receive training about MSDs and how to prevent them. Workers should be trained to:

- Recognize the signs and symptoms of MSDs.
- Adjust equipment and furniture.
- Take breaks from computer work.
- Do stretching and other exercises at their desks.
- Report symptoms to the appropriate person.

### PROGRAM EVALUATION

How can you tell if the ergonomics program is working? The measure of the ergonomics program is whether there is a reduction of MSDs, symptoms and lost time or restricted duty. This requires accurate and complete records.

If management will not cooperate in implementing an effective ergonomics program, the local union should collect information on the extent of MSDs and symptoms, identify risk factors in the workplace and make recommendations to implement an ergonomics program.



## PREVENTING INJURIES FROM PORTABLE COMPUTERS

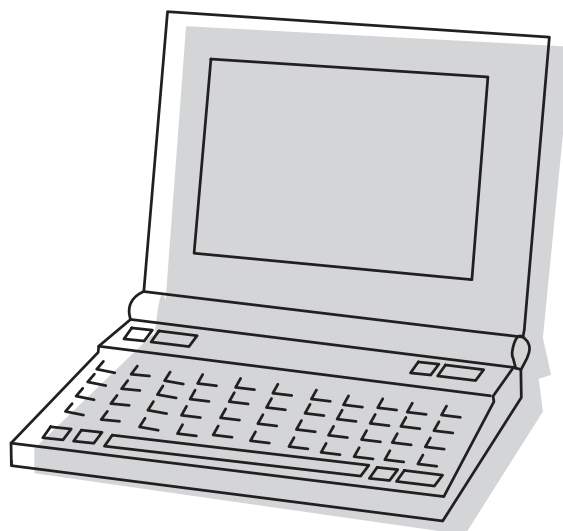
Computers are not used just in offices or other fixed areas. Carrying and using laptop computers can also cause injuries. The potential problems for users include:

- difficulty maintaining a neutral position of the arms, wrists and hands
- flexion of the neck or back
- eye strain and headaches due to smaller screens, and that are also difficult to adjust for glare and resolution
- smaller keys
- back and shoulder injuries from carrying the laptop and other objects
- the base of the laptop can get hot.

A docking station can reduce these problems if the laptop is used in an office, home, or other fixed location. Docking stations have connections for all standard sized items such as keyboards, monitors and mice, and allows the user to create a comfortable workstation. In addition, there are many accessories to help make laptop use more comfortable, including laptop stands, document holders, lights, glare filters and detachable keyboards.

The following recommendations can help to prevent aches and pains from laptop use:

- Take frequent mini-breaks to avoid repetition and static positions.
- Maintain a comfortable viewing distance to the laptop (18–30 inches).
- Keep the screen clean.
- Position the keyboard at elbow height, and keep wrists straight.
- If the computer is on your lap, use a cushion to raise the height. Avoid excessive curving of the neck.
- Use a chair with back support rather than sitting on a stool.
- Use an external mouse instead of the small touchpad or trackball on the laptop.
- Use a laptop case with smooth-moving wheels.
- When carrying the computer, try to lighten the load by removing any unnecessary drives, papers or other items.
- Use a lightweight bag with a well-padded shoulder strap and handle.



# 3

## SECURING WORKPLACE PROTECTIONS

A

t this time, there are no adequate federal or state health and safety laws or regulations concerning ergonomics. That does not mean, however, that workers have to put up with pain and unhealthy working conditions. Workers acting together through their union can use a variety of strategies to make their workplaces safe.

### HEALTH AND SAFETY OR ERGONOMICS COMMITTEES

As a first step, establish a health and safety or ergonomics committee. A committee of labor and management working together can get problems corrected more quickly. However, the union can still push for changes even if the employer does not choose to cooperate in a committee.

The purpose of the committee is to develop, implement and monitor the effectiveness of the ergonomics program. This requires taking the actions outlined in the previous chapter:

- Find out which and how many workers are affected.
- Identify the conditions that are causing problems.
- Develop recommendations concerning equipment design, work organization and training.
- Establish a medical surveillance program.
- Determine whether the ergonomics program is reducing injuries.

The entire committee should be involved with the evaluation and purchasing of equipment. The workers who will use the equipment should be given the chance to try it before it is purchased.

### COLLECTIVE BARGAINING

There are different ways to obtain better computer working conditions through negotiations. One approach is simply to establish an ergonomics committee that is responsible to make recommendations to the employer.

**Ergonomics Committee:** The employer and union agree to establish a joint committee on ergonomics. The committee shall consist of an equal number of representatives from both parties. The committee's purpose is to develop, implement and monitor the effectiveness of the ergonomics program.

Another strategy is to negotiate detailed contract language concerning computer working conditions. Some AFSCME locals have negotiated specifications similar to the guidelines in the previous chapter for lighting levels, chairs, keyboards, tables and other workstation components.

There are other computer issues that can be negotiated:

**Eye and Vision:** Any employee who regularly operates a computer may obtain an annual eye examination paid by the employer. The Employer will also pay for corrective lenses that have been prescribed for computer use.

**Breaks:** At a minimum, employees will be provided with a 15-minute break after every two hours of work that involves a computer. In addition to rest breaks, employees will be allowed and encouraged to take brief periods to stretch and do non-computer work tasks.

**Light-Duty and Other Job Accommodations:** The Employer will make job accommodations to employees who have been injured from working with a computer or are experiencing symptoms. The accommodations will include but not be limited to modified job duties, scheduling, equipment, and accessories.

## USING OSHA

OSHA has not issued regulations concerning ergonomics. However, if you work in a state where public employees are covered by OSHA or you are in the private sector, it is still possible to use OSHA to make your workplace safer.

### OSHA Consultation

In situations where management is cooperating with the union to solve computer problems, OSHA can be a valuable resource. OSHA has a branch that provides free consultations.

The consultation service can be used in a different way if the union does not have the employer's cooperation. On its own, the union can collect some basic information that shows there are problems. The union can then go to the employer and request that the employer ask for a consultation. If the employer refuses, the union can publicize the employer's refusal to accept free advice on how to improve the comfort of its employees. This should help to mobilize the membership for further action.

### OSHA Enforcement

Section 5 of the Occupational Safety and Health Act is known as the "General Duty" clause and requires that each employer:

*Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employee.*

OSHA has the authority to issue general duty citations to employers that have higher rates of injuries and who expose their employees to ergonomic hazards. It is best to do your own investigation before calling OSHA. Review injury records or conduct a survey to document the problem and consider possible solutions. Make the OSHA inspector's job easier by collecting this information.



NOTES

Ruled lines for writing notes.





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