



WESTERN CONNECTICUT STATE UNIVERSITY

ERGONOMIC OFFICE FURNITURE STANDARD

&

INFORMATION / RESOURCE GUIDE

PROCEDURE [S-116](#)

Issued 08/01

Please direct any questions or comments about the applicability of this document to Luigi Marcone, WCSU Department of Public Safety

Introduction

Over the past twenty-five years computers have become the workhorses of the office. We have come to understand that using a computer for more than three hours a day may cause the user to suffer a debilitating ergonomic injury. Because ergonomic injuries develop over time, we have also come to realize that the efficiencies realized by using the computer might be more than offset by the inefficiencies resulting from the body's reactions to a poor working posture.

The Americans with Disabilities Act has opened up the workplace to people whose needs are entirely different than their co-workers without disabilities. Additionally, the differences in the physical characteristics of today's office worker are now an important consideration when choosing the correct office furniture. The use of the computer has moved us away from the concept of the generic office place. Today the most important elements in office design are what work is being performed in the office and what are the physical characteristics of the person utilizing the office.

The purpose of this booklet is to supplement your knowledge of the potential hazards associated with computer usage and to help guide you in implementing a safe, ergonomically designed workstation. While the primary focus of this booklet is and should be on computer usage, it will offer an overview of the many other factors that may contribute to the office worker suffering an ergonomic injury.

Proper ergonomics begins with the office worker sitting at the workstation in what is called the neutral posture or position. The following is a general description of that position. We will, in more specific terms, discuss elements of this position in the section dealing directly with the office and with office furniture.

The office worker should sit straight in the chair. The head should be as upright as possible and well centered over the spine (The head can weigh about 10 pounds and when it is not resting over the spine, muscles have to work constantly to support it). When working at the keyboard, the operator's forearms should be approximately parallel with the floor, with the wrists and hands extending out to the middle row of the keyboard in a flat position, again parallel to the floor. The angle of the arms at the elbow should be approximately 90 degrees, with the keyboard positioned directly in front of the operator. The upper arms should fall naturally close to the body in a relaxed position. The operator's feet should be flat to the floor and the thighs parallel to the floor. The back of the operator's thighs needs to be far enough away from the seat pan so as not to restrict the blood flow to the lower legs.

The monitor needs to be located directly in front of the operator. The top of the monitor is to be no higher than the operator's eyes when they have achieved the position described above. The monitor is to be located approximately 30 inches away from the seated operator and is to be free of all glare. **It is to how to attain this position that we address the remaining pages of this booklet.**

Desk (and Return)

The requirement / dependence to use the computer for three or more hours on any given workday forces us to change our mindset with respect to the desk. The selection of a proper desk begins with understanding what tasks are performed by the person sitting at the desk. An office worker who interfaces with the public, frequently responds to the telephone, and utilizes the computer, requires a

completely different set-up than would a data entry clerk or one extensively involved in using the computer for research.

The ideal set-up requires that the work surface be adjustable in height. This is particularly important when you expect more than one user to utilize the workstation or when the user is disabled or at the physical extremes of normalcy. When it is impractical or impossible to utilize a height adjustable work surface, the height of the desk must equal the height of the return. The top surface should be somewhat of a matte finish so that light is not reflected up into the user's eyes or onto the monitor. The standard height of 29 ½ inches is acceptable under most circumstances. If the monitor is to be located on the return, the return should be at least 48 inches in length, 24 inches in depth, of solid stock, and at least 1 ¼ inches thick. The thickness allows for the installation of under-the-desk keyboard and mouse platforms. The depth provides space for the computer monitor. The length will ensure that the user's arms, when using the keyboard, will not come into contact with the desk. The monitor should NOT sit on top of the computer if it raises the top of the monitor above the user's eyes. Locating the computer in the office area is a matter of preference, but access to the CD drive, heat dissipation, position of the computer cables, and the general safety of floor traffic must be considered. Mobile CPU stands allow easy mobility for accessing rear cables and cleaning behind the unit.

For the general office area, the HON "L" workstations are quite adequate and may be purchased from Boise Cascade. Workstations are referred to as being right or left-handed. Imagine yourself sitting at a desk. If the return needs to be on your left, you will order a left-hand return. The converse is true for a right hand return.

Some desks come with wire channels, access ports, and even power strips. In most cases these are excellent concepts and we encourage their use. However, when utilizing under-the-desk keyboard and mouse platforms you need to compensate for the slack in the cables required to pull out and push in the platforms. You need to be mindful of where you are going to position the computer and peripherals before selecting desks with these features.

There are both fixed and adjustable workstation tables available for data entry clerks and research orientated office workers. Such furniture, used in conjunction with standard desks, may also have a role in the general office area when no other alternatives are available. Many of the adjustable height tables allow the office worker to sit or stand.

HON and Marvel both manufacture very adequate tables that are distributed by Boise Cascade.

A single desk or a fixed height workstation table seldom, if ever, provides an adequate ergonomic working environment for the general multi-tasked office worker. Generally speaking, there is not enough surface area to accommodate the computer, peripherals, and other office implements. The center drawer prevents using that area under the desk for keyboard platforms, and all of this is compounded by its fixed height.

People taller than 6 foot 4 inches, shorter than 5 foot 2 inches, and / or obese are quite likely to require a nonstandard desk or workstation. Distributors such as Boise Cascade offer the services of their own furniture specialist to help configure the correct workstation.

There are desks specifically designed for people with disabilities. The VariTask series of electrically adjustable tables distributed by AliMed Ergonomics (800-225-2610) are excellent for people in wheelchairs. Some standard desks accommodate devices for people of limited mobility

and / or limited reach. When searching for such devices, require that they are ADA compliant. AliMed is an excellent source to begin your search. Distributors such as Boise Cascade offer the services of their own ADA Specialists to help configure the correct workstation.

The Office Chair

One of the most important components of a proper workstation is a properly designed chair. The type of work being performed in the office often dictates what kind of chair is required. The size of the person doing the work might also affect the proper choice. This guideline is intended for most users, but accommodating the extremes in a person's height, weight, physical disability, etc., is a fact of life and must be a part of the planning process.

- The chair should have a seat back with lumbar support capable of both up-and-down and front-and-back adjustment. The seat back should provide support to both the lower back and the shoulders and enable the person to sit comfortably upright without slouching.
- To accommodate the height of the user, the chair height with respect to the floor should be adjustable.
- The seat pan should be capable of tilting and it should have a contoured or waterfall front. The front edge of the seat should curve away and down from the back of the person's legs to promote circulation in the lower legs. Tilting transfers weight from your hips to your legs, encouraging normal back curve and reducing the pressure on the discs in the lower spine.
- The seat pan and backrest should be upholstered and cloth covered with a fabric that is breathable. Seat padding should not compress more than one inch when an individual is seated.
- The height of the armrests needs to be adjustable with respect to the seat pan. Adjustable height arm rests relieve tension in the upper back, neck, and shoulders, by allowing the user's arms and wrists to be in a parallel position. They also provide resting planes.
- To accommodate the breadth of the user's lower torso, the office chair armrests should be capable of in and out adjustment and that adjustment needs to be independent of the seat pan.
- The chair should be capable of swiveling at least 360 degrees.
- To prevent the possibility of tipping, the chair should have five casters. The type of casters depends on the flooring material. Use hard casters for carpeted floors. Use soft casters for hard wood vinyl or when used on chair mats.
- Look for chairs with a built-in tilt tension mechanism that controls the rate and ease with which the chair reclines to different weights and strengths of the user. This allows the user freedom to rock / shift in the chair, while not disturbing the original ergonomic settings.

Uplift seat assistors are pneumatic devices that are installed on the seat pan and when activated, help lift the mobility limited office worker out of the chair. They are available through AliMed Ergonomics.

Refer to Appendix A for a more detailed treatment of specific ergonomic chairs. Appendix A also includes information concerning physical characteristics of the user.

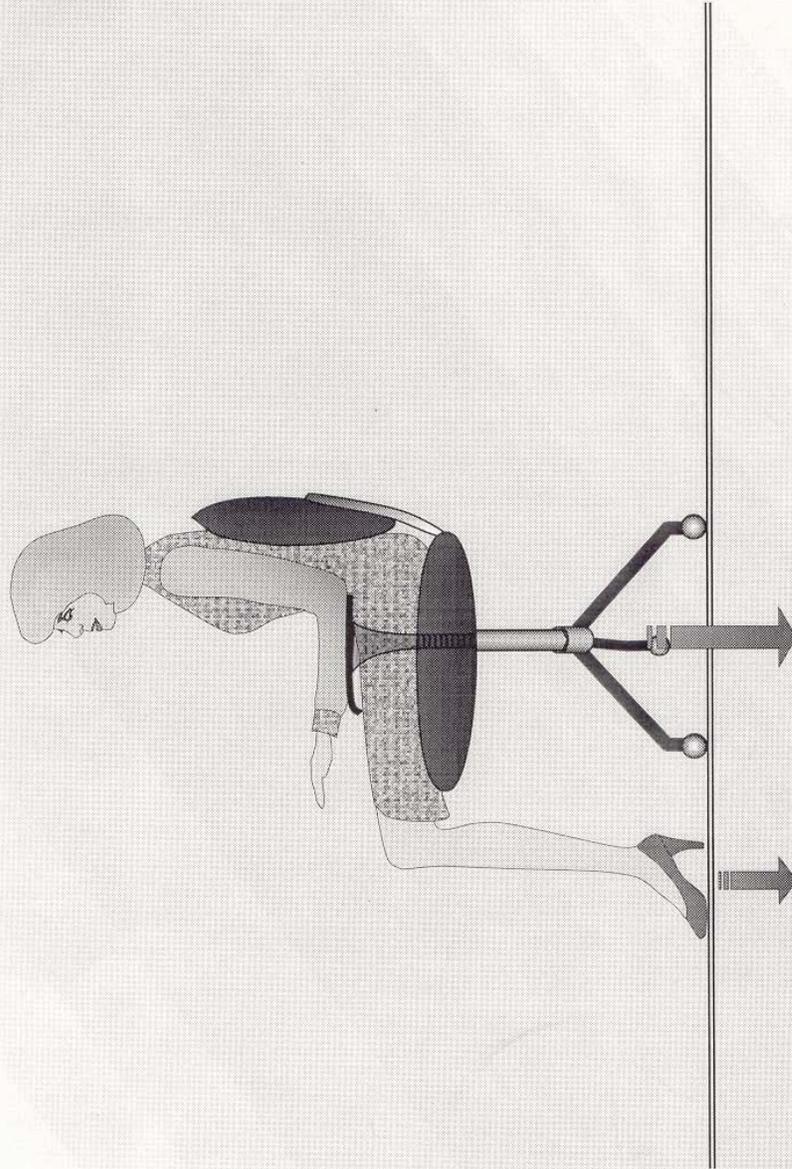
The Office of Public Safety has made the following recommendations to University personnel purchasing ergonomic multi-purpose office chairs:

Mystic SE – 3951-88D W TLC Foam
Ergonomic Chair
Fabric: Sherpa Heather – Grade A
Grey Heather 13949

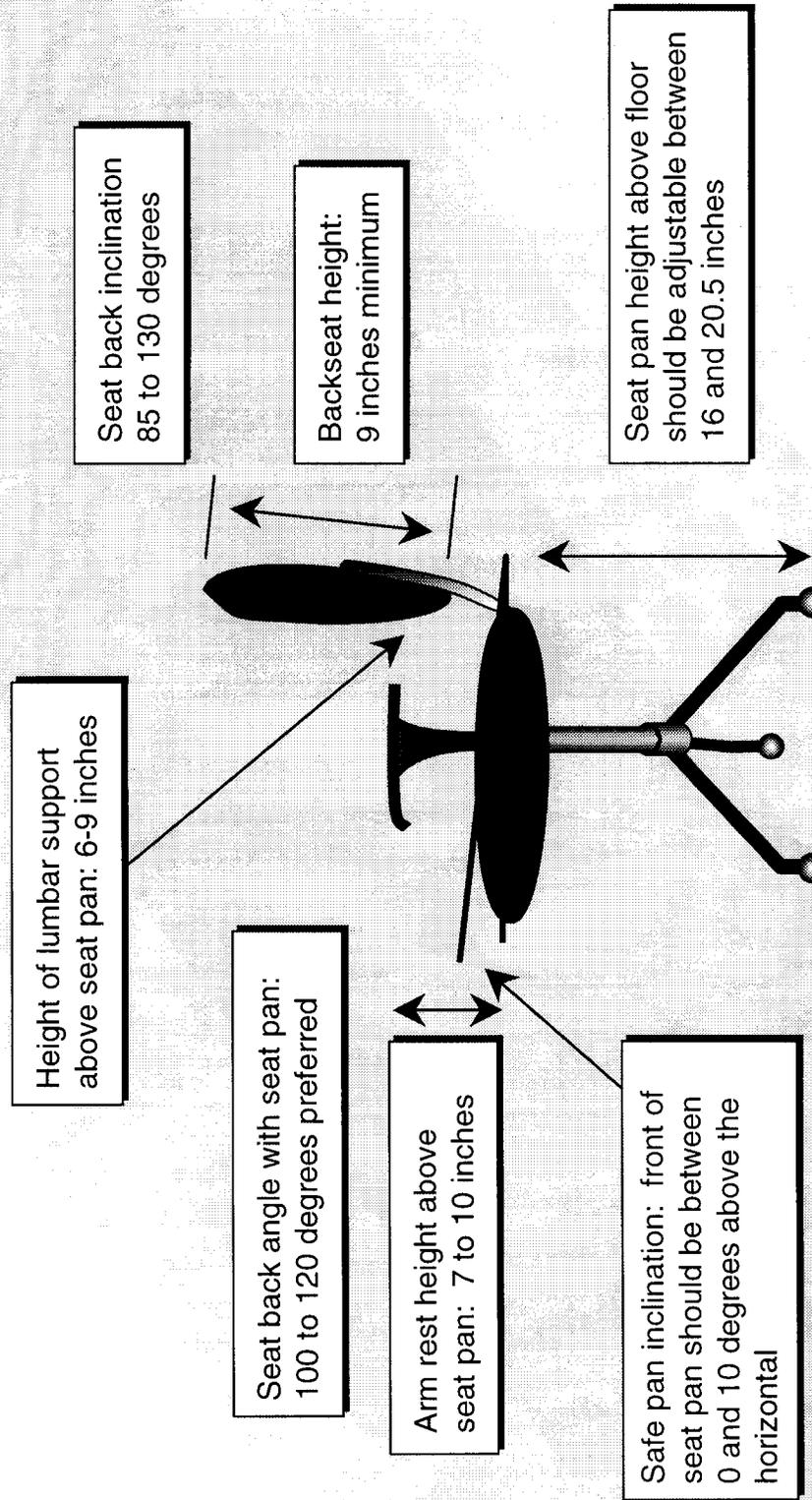
From: Insalco Corporation

Hon High Performance Task Chair – E47707BB12T
With
Hon Gel Top All-adjustable Armrests – E4GL103
From: Boise Cascade Office Products

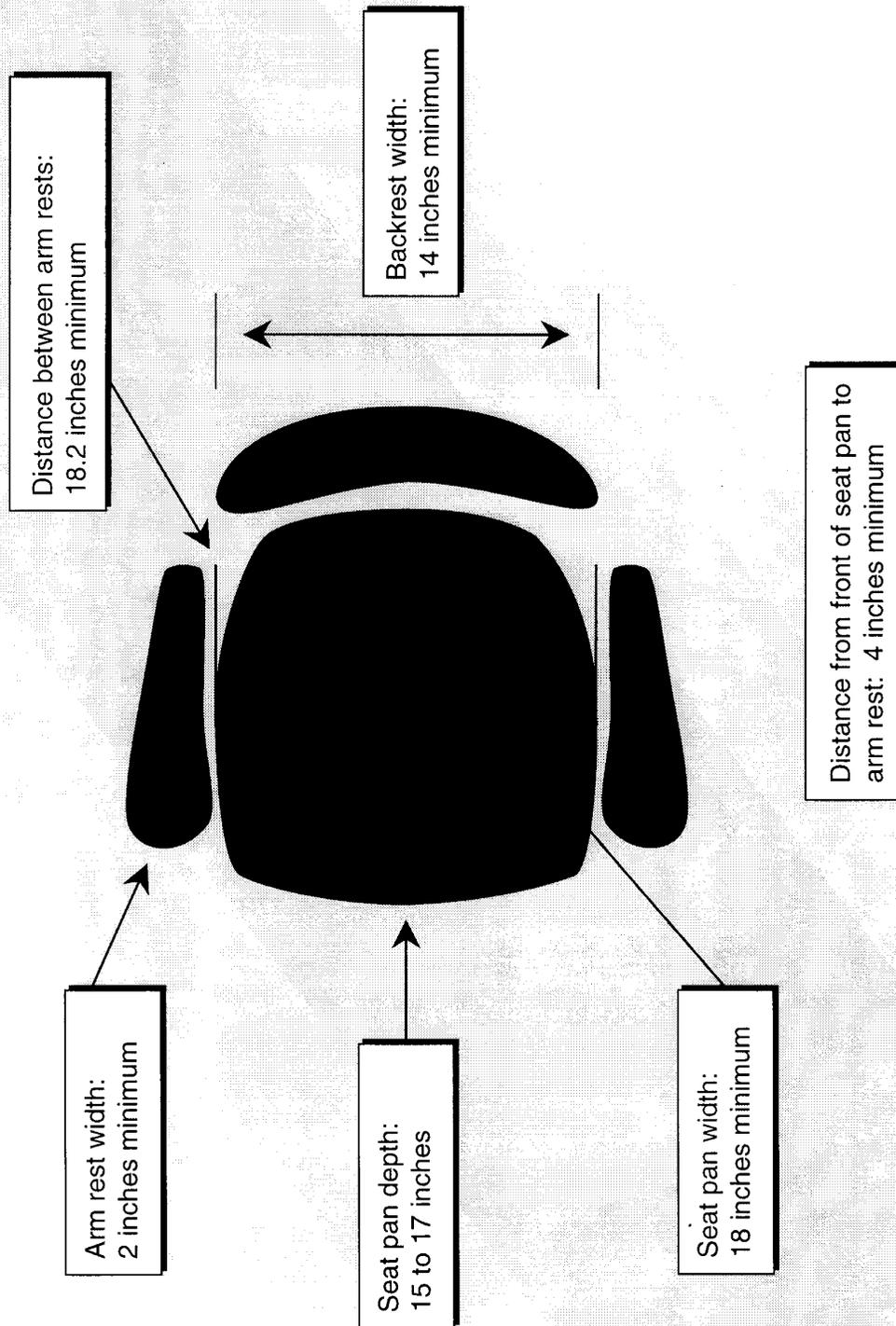
Guidelines for Office Seating



Dimension Guidelines for VDT Chairs



Dimension Guidelines for VDT Chairs



To Adjust an Ergonomic Chair:

1. Stand in front of the chair.
2. Adjust the height so that the highest point of the seat is just below the kneecap.
 - Your thighs should be parallel to the floor when you sit.
 - This allows you to place your feet on the floor, ensuring good circulation in the legs.
3. Sit so that the clearance between the front edge of the seat and the upper part of the legs behind the knee is at least one finger width.
4. Adjust the back height to provide support to the lumbar or lower back area.
 - This will help you to maintain correct posture and reduce back pain.
5. Adjust the seat angle by unlocking the mechanism to tilt the seat forward or rearward.
 - This minimizes pressure on the underside of the thighs and reduces tension on back muscles.
6. Adjust the angle of the seat back so that it provides firm support to your back.
 - This helps to reduce back fatigue.
7. Adjust the armrest width and height so that your arms rest lightly on them when your arms are comfortably close to your body and your forearms are parallel to the floor.
8. Adjust the chair height **upward** so that your forearms and hands extend out to the middle row of the keyboard, while remaining parallel to the floor.
 - Be sure that there is enough space between the top of your thighs and the underside of the work station.

NOTE: If in step 8 you would need to adjust your chair downward to have enough space between the top of your thighs and the underside of the workstation, you must raise the workstation to achieve the required end result.

9. If, after step 8, your feet cannot rest flat on the floor or if there is pressure underneath the thighs, you will need to use a footrest to make the chair adjustment complete.

Foot Rest

If one's knees are positioned much higher or lower than the hips and they are not evenly supported, uncomfortable pressure will be exerted against the legs and the buttocks. Therefore, in a large number of cases a foot rest is required to keep the back of the person's thighs parallel to the floor, while, at the same time, providing foot support. A proper position promotes blood flow to the lower legs, which in turn helps prevent fatigue.

Keep in mind that you do not want the furniture, however accurately positioned, to restrict free and reactive movement. The footrest should help promote exercise. A good footrest will tilt, rock, and adjust in height. It should have a textured surface to prevent slipping.

The Office of Public Safety has made the following recommendation to University personnel who require a footrest:

Comfort Tread Plus Footrest
Height-Adjustable Tilting Footrest – E604653
From: Boise Cascade Office Products

Several manufacturers are marketing special needs footrests. There are footrests that feature variable heat settings to counter cold winter drafts, and allow for fan-only settings to cool the feet during the hot summer months. Footrests are available that massage the feet as well as those that promote stretching. Most of these footrests come with some disadvantages, so a balanced approach to a proper choice is required. The Office of Public Safety can help you to make the right choice.

Chair Mat

In some cases a chair mat is required to eliminate static build-up / discharge. Additionally, and perhaps more importantly, they support easy chair movement over pile carpets. They are extremely beneficial to people confined to wheelchairs, as they promote increased maneuverability. From an ergonomic standpoint, the chair mat should be “gripper” backed to prevent them from sliding across the surface and have beveled edges on its entire perimeter for easy roll on / roll off. Keep in mind that the thickness of the carpeting will influence your selection of the best chair mat.

Usually a standard weight mat is used with carpets and padding whose thickness is 5/8 inch or less. An intermediate weight mat is used with carpeting and padding 3/8 inch or less. A deluxe weight mat is used for carpeting and padding greater than 5/8 inch.

Boise Cascade has a fine selection of chair mats.

Antifatigue Mat

In those cases where extended periods of standing is a factor, floor mats are available to relieve those stresses exerted on the spine and back muscles as they are translated through the heels and knees. Antifatigue matting may very well be the simplest and most effective way to reduce “standing worker fatigue.” Once thought of exclusively in terms of their advantages in the factory, we now find them in the office environment at copier machines, service counters, lecterns, and at archival stations.

The logic used to select the proper antifatigue mat is the same as that applied to the chair mat, with the exception of considering the mat’s basic structure. The concept behind the antifatigue mat is that it reduces the hardness of the already carpeted floor. They will be at least 3/8 inches thick. They may be made of closed vinyl foam, molded rubber, or rubber sponge. The top surface can vary from a non-skid abrasive to an attractive fabric. As a general rule, when a mat can be easily rolled up or flexed, it should offer a high comfort level.

End item use, the physical limitations of the office worker, location in the office area, and décor make the choice of the proper antifatigue mat somewhat difficult. Lab Safety Supply, Ranco Industries, and Mat Depot all offer an excellent selection. The Office of Public Safety is always available to help you make the right choice.

Ranco Industries Inc.
3421 Rusk, Houston, Texas 77003
800-228-5543

Mat Depot – 800-211-1703
Lab Safety Inc – 800-356-0783

Monitor

The correct placement and adjustment of the monitor can reduce eye, shoulder, neck and back fatigue. There are many types and configurations of monitor risers.

- Adjust the monitor height so that the top of the screen is at or slightly below eye level.
- Tilt the monitor back so that the top is slightly farther away from the eyes than at the bottom, but not so tilted that the monitor picks up unwanted glare from the overhead lights. Notice how you hold a magazine. Most likely you will tilt it away at the top. When we look at the world, objects in the upper part of our peripheral vision are generally farther away than the point we are looking at, and objects in the lower part of our peripheral vision are usually closer. As a result, our visual system has developed to perform best when the visual plane tilts away from us at the top.
- The monitor should be approximately an arm's length away. One of the main reasons for computer-related eyestrain is the closeness of the monitor. Perform this exercise: Hold your finger at arm's length and bring it slowly toward your nose. Notice that the closer your finger comes, the more eyestrain you feel. When viewing close objects your eyes must both accommodate and converge. Accommodation is when your eyes change to look at something close. Convergence is when your eyes turn inward toward the nose to prevent double vision. If having a monitor that is too close contributes to eyestrain, one of the solutions is to place it further away. The farther away the object of view, the less the strain there is on both accommodation and convergence. Reducing those stresses will reduce the likelihood of eyestrain.
- Place the monitor at right angles to windows or other bright light sources to minimize glare and reflections. Installing an anti-glare filter may eliminate glare. In some situations, general illumination may need to be reduced and a task light used, as required.
- Adjust the monitor's brightness and contrast controls to enhance readability and optimal viewing comfort. Check the program specifications to determine if color combinations can be altered. These adjustments can have a profound impact on viewer comfort and productivity. Our University Computing Department is ready to help you.
- Display images on the screen should appear stable and free of any distortion, flicker or jitter. Blinking screen characters or the cursor may contribute to eye fatigue. If adjustable, blinking characters should not vary at more than 2 hertz (2 cycles per second).
- Clean your monitor regularly. Use a lint-free, non-abrasive cloth and a non-alcohol, non-abrasive cleaning solution or glass cleaner to minimize dust. If you wear bifocal, trifocal, or progressive lens glasses, it's especially important to properly adjust your monitor height. Avoid tilting your head back to view the screen through the lower portion of your glasses; this could lead to muscle fatigue in your neck and back. Instead, try lowering your monitor to bring the screen into focus without tipping your head. You may want to consider using monofocal glasses (also called single-vision or focal length lenses) that are specially made for computer use. Your eye doctor will need to know the height, distance, screen size, and general use of your computer to help prescribe the correct glasses.

For the sight impaired, there are several types of magnifying glare filters. Generally, these devices remove glare and also magnify the object plane by a factor of two, without distortion.

For users who enter data, a document holder, located near and at the same height as the monitor, should be integrated into the workstation. If the visual targets are spaced apart in direction or distance, the eye must be continuously redirected and refocused, while sweeping from one target to another. This may contribute to eye fatigue.

All things being equal, the flat screen monitor is ergonomically superior to the standard monitor. There is more flexibility in locating the monitor because they do not take up as much room. The flat screen does not reflect as much of the ambient light as the standard monitor, and the eyes do not have to refocus as much when moving across the screen.

Font Size

The sizes of characters are an often overlooked consideration when determining how far/close the monitor and hard copy should be placed from the viewer.

Various organizations specify various character sizes such as minimum character height of 9 pt for legibility, with a preferred height of 11 or 12 pt for readability and legibility. One of the problems that you may run into is that often hard-copy documents normally have smaller type sizes - 8 pt to 10 pt. When placed in close proximity to the screen at such distances, visual discomfort may result. Many people will have difficulty reading and hunch forward to better see the hard-copy text, which may result in eyestrain.

The important point is that in many cases you may need to compromise on the placement of the monitor and the reference material, taking into account the type size and the image quality found on the visual targets and of course, your visual acuity. For those of you who perform multiple tasks involving different software, re-adjustments of your monitor and your documents may be needed throughout the day.

Here are some type sizes for comparison:

This is 8-pt. type

This is 10-pt. type

This is 12-pt. type

This is 14-pt. type

This is 16 pt. type

This is 20-pt. type

Keyboard / Mouse Platform(s)

The goal is to have the hands and wrists remain in a neutral position during typing and prevent over-reaching when using the mouse. An under-the-desk articulating keyboard / mouse platform is an essential component of the concept of total adjustability.

The platform should rotate 360 degrees. It should be adjustable up to 6 inches in height, tilt from – 10 degrees to + 15 degrees, and extend 2 inches out from the desk or return. The platform should have a non-skid surface or capability to clamp the keyboard in place. The platform should have an adjustable wrist rest.

Having the mouse in close proximity to the keyboard is very important. Repeated or prolonged over-reaching or hyperextending for a mouse can place a stress on the shoulder and ultimately result in tendonitis, inflammation, etc. This frequently happens when a conventional keyboard tray is used without a mouse tray. The keyboard tray requires that one sit farther back from the work surface; this requires one to lift their arm up and out to use the mouse. Ideally, the mouse platform should

be an integral part of the keyboard platform. In those cases where this is not possible, an independent mouse platform is desirable.

The Office of Public Safety has installed the following under-the-desk platforms for several University personnel:

Adjustable Keyboard Platform – Boise Cascade – Model Number E676511RK

Adjustable Mouse Cradle – Boise Cascade – Model Number E676545

Please note that in order to install these units the desk must be solid core 1¼ inches thick and the platforms require 32 inches of lateral and 19 inches in depth of under-the-desk space. Knowing the office worker's dominant hand is essential.

In those extreme cases where the mouse platform and keyboard must sit on the desk or slide out drawer, it is important to utilize a wrist rest. Gel, closed-cell foam, open-cell foam, vinyl, or fabric wrist rests all offer adequate protection. The ultimate choice generally resides with the user. When not an integral part of a keyboard platform, the height of the wrist rest is equal to, or somewhat less than, the distance from the table top to the top of the space bar.

The Office of Public Safety recommends the following products if, and only if, under-the-desk adjustable platforms cannot be utilized:

Wrist Rest for Keyboard – Boise Cascade – Model Number – E6WR510

Wrist Rest for Mouse – Boise Cascade – Model Number – E6WR511

Wrist Rest for Keyboard and Mouse – Boise Cascade – E6WR512

Keyboard and Mouse Placement

- Place the keyboard and mouse directly in front of and close to you.
- Adjust the keyboard as low as possible, but with adequate leg room. Adjust the slope of the keyboard so that your wrists are straight. They should not extend downward or upward while typing.
- Type with your hands and wrists floating above the keyboard, using the wrist pads only to rest your wrists while typing. Studies have shown that office workers tend to relax their arms against the wrist rest while using the computer. It is important to avoid doing so, as using the wrist rests to support the arms often isolates movements from your wrist down to your fingers, which can cause problems.
- Avoid resting your wrist on sharp objects (e.g., desk edge).

Mouse technology, specifically trackball and active touch pad mice, require different platforms. The so-called ergonomic keyboards discussed in Appendix A also require their own keyboard platforms. At this time, demand for these products is not sufficient enough to induce manufacturers to produce complementary products. Further, there is not enough published information on these products to cause one to champion their use over the standard keyboard configuration. It is also important to understand that there are many devices on the market for people with disabilities (see Appendix A). If required, contact the Office of Public Safety for help in understanding the latest equipment available.

Lighting

In any office it is important to ensure that lighting is adjusted to a comfortable level. Lighting preferences vary among individuals and are affected by age and work tasks. Because of the computer, we no longer need, nor is it advisable, to brightly illuminate the office. Too much light can be as visually fatiguing as too little. The best level of illuminance for video display terminal work that also uses paper documents is 300 to 400 lux (30 to 40 foot-candles). If paper documents are not used, the level of illuminance should be 200 lux (20 foot-candles) or lower. Reflective light on the monitor screen from office lighting, as well as that energy reflected from desktops and other pieces of office furniture, passes directly to the user's eyes. New lighting technology utilizes highly efficient reflective surfaces within the light structure to maximize the lamp output. It is extremely important to ensure that these overhead lights are not positioned so as to directly reflect the "lamp image" onto the work area. (You are viewing the maximum lamp output if, when looking at the light structure, you can see the lamp configuration reflected directly back onto you.) Years ago light was used to illuminate the work surface. In today's office, the computer gives off its own light. In addition to the "light" output of the computer monitor, the office worker, because his or her head is in a more upright position, will be processing much more energy from the windows as well as the overhead lighting. The contrast between the light output and the ceiling need to be minimized. Overhead lighting can be reduced by switching to lower wattage bulbs or by the installation of diffusers. In some cases, vertical blinds are superior to horizontal blinds in that they allow the office worker to redirect the light away from them without affecting the amount of light entering the office. As a general ergonomic rule, the more time a person spends on the computer, the more "muted" should be the office lighting.

Task light

Every workstation should have a task light. Because harsh light spots increase eye strain and fatigue, the lamp needs to have an antiglare screen that does not impede the lamp's ability to deliver a broad area of uniform low glare light across the immediate work surface. The lamp should have an adjustable arm that permits both height and angle adjustments. The lamp base needs to be weighted to maintain stability when the lamp is positioned at its extremes.

Lamps can be purchased using halogen, fluorescent, or incandescent bulbs. Lamps are available that utilize a combination of fluorescent and incandescent. In general, the halogen lamps allow the user to better focus the light's energy on the work, but the light is harsh and generates more heat. The fluorescent lamp offers the greatest potential for providing the necessary light. See Appendix A for different types of task lamps.

Document holder

As with monitor positioning, distance and viewing angle are critical for comfort when viewing source documents during computer work. Many computer users find a document holder useful, particularly if they work primarily from source documents. If the source documents are placed laying down on top of your desk, the head will continuously "bob" up and down as one reads the source document and views the monitor screen. Over an extended period of time, this can lead to neck and shoulder muscle fatigue (pain).

There are three ways to place a document:

- Place the document to the side of the monitor;
- Place the document in-line with the monitor;
- Place the document standing up on the table top.

When a document holder is properly positioned, as described below, this muscle fatiguing motion is not required.

If you use a document holder stand, position it at a height that is comfortable for you, close to the screen so that it will be the same distance from your eyes.

Position the desk lamp or task light (if you use one) so that it illuminates the source documents without causing glare on the monitor screen or your document. Add just enough light so that you can see the document clearly; the illumination on the source document should be kept to a minimum so that the lighting contrast between the screen and the document is minimized.

Telephone

People who are likely to use the phone and the keyboard at the same time should either use a headset or their workstation should be isolated from coworkers so that the speakerphone may be utilized. Under no circumstances should the office worker cradle the telephone between the shoulder and neck. Doing so might lead to tension and nerve pinching. This is because the nerves that control the arms and hands originate in the neck area of the spine. While the telephone shoulder rests offer some relief, they too should not be used as a substitute for the headset or the speakerphone.

There are several telephones designed specifically for the hearing and / or sight impaired.

Office Storage Furniture

There are many classes and configurations of storage furniture. Whether you select a wood veneer bookcase, a four-drawer filing cabinet or one of the new multi-media storage units, the basic essentials and concerns remain the same.

A storage device with doors tends to reflect much more light than one without. Therefore, if you chose to use such furniture, it is important that you locate the furniture so it does not reflect the light back onto the workstation. This problem increases with the height of the device, as it not only picks up more light, but also tends to pick up light from multiple light sources.

Frequently used objects need to be stored close to the workstation and should be easily accessible. Imagine an area defined by the intersection of the radius of each arm extending outward side to side from the upright shoulder position and rotating until they touch somewhere in front of you. It is within this “zone” that the objects, equipment, and files most often used should be stored. Heavy objects should be stored at or below waist level regardless of the frequency of use. This is not only true because it ensures that the office worker will not reach up for heavy objects, but also because it tends not to affect the balance of the particular storage device. This is particularly true with filing cabinets. Storing the heavier files in the lower drawers not only ensures that the cabinet will not “tip” over, but the drawer slide mechanisms work better. Under no circumstances should the office worker open two drawers at the same time.

General Work Environment

Background Noise

Ambient sound levels should not be higher than 55 decibels (dBA).

Temperature and Humidity

Temperature and humidity should be within comfortable ranges. A relative humidity level between 40% and 60% is generally desirable for most workers in office environments. Under no circumstances should the temperature and humidity be allowed to vary by an amount greater than 20% over a one hour time period.

Personal

The office environment should be comfortable to the person utilizing the office. By comfortable, we mean mentally as well as physically. Pictures, plants, knick-knacks, etc., all have an important role to play in a proper work environment. **An office worker's potential to obtain an ergonomic injury IS affected by their attitude toward their job and their surroundings.** While this is very important, it is also important to understand that many of these personal "touches" bring on their own set of problems. Pictures reflect light. Watering plants near electrical outlets or devices is unsafe. Knick-knacks attract dust. Encouraging the office worker to bring a little of their home to the work place is a good thing. However, it is a good thing that needs to be managed with both individual and group safety as the ultimate arbitrator

Office workers should be encouraged to take rest / exercise / change of task breaks. A common recommendation is 2 to 3 minutes off every 30 minutes. Keep in mind that sitting in a chair is a repetitive task.

Health

There is an abundance of data that suggests that a person's health (mental as well as physical) is a major contributor to the potential of suffering an ergonomic injury. All supervisory personal need to create an environment whereby all workers understand the impact their health plays on potential ergonomic injuries, and one that encourages the office worker to seek help. The most important health fact to keep in mind is that there is a long period of time between the symptoms of an ergonomic injury and the actual injury. Everybody involved has time to carefully and intelligently prevent these types of injuries. An overview of health issues is given in Appendix B.

Foot Note

Evolving technology has and will continue to alter the concepts to be considered when designing the proper ergonomic office. Flat screen technology, the laptop, local LAN's, etc., individually or combined, will someday make much of this document obsolete. However they alleviate some of our current issues, they will most certainly present new issues. The Office of Public Safety is committed to keeping up with the technology and making itself available to support your needs.

The Office of Public Safety is available to perform Office Assessments to existing office workstations. We utilize the "Performance Oriented Ergonomic Checklist for Computer (VDT) Workstations" as designed by the Human Factors Group of Cornell University. A copy of that document is included in Appendix C

Reference Sources:

The Division of Public Safety makes available a series of brochures. They are:

- Office Ergonomics
- Computer Monitors
- Lifting and Back Safety
- Stretches and Exercises for the Office

The Division of Public Safety makes available a Training Lecture on Office Ergonomics. Call Peter Cronin, extension 79322 for information.

Appendix A

ADDITIONAL FURNITURE And OFFICE SUPPLY INFORMATION

Office Chairs

Some manufactures / distributors classify office chairs in terms of the tasks that the user is most likely to perform.

- Occasional Task Chairs are used for those applications where light task work is performed such as training, conferences, etc. These are ideal chairs for multiple temporary users.
- Multiple Task Chairs are used for those office workers who do not stay at any one given task for long periods of time. You would consider using these chairs for management level, and secretary/receptionist workers.
- Continuous Task Chairs are used when a full day's work involves a single range of motions. They would be ideal for people involved with data entry, telemarketing, or customer service.

Some manufacturers classify office chairs in terms of the job title of the user, i.e., executive, manager, secretary, etc. It is easy to sacrifice ergonomic requirements when you let the title dictate your reasoning process. You may purchase good ergonomic chairs in any of these "status orientated" chair groups. You need to focus on the basic ergonomic principles.

Some manufacturers / distributors classify chairs in terms of the size of the user. It is generally a good idea to focus on these types of chairs for users who find themselves in the extremes of the different size groups.

- Small: Less than 5' 6" in height and weighing less than 250 pounds
- Medium: 5'6" to 5'11" in height and weighing less than 250 pounds
- Large: Taller than 6" and weighing between 200 and 350 pounds

Ergonomic Keyboards – As technology develops, the following devices will offer the potential to reduce ergonomic injuries and / or help the ADA worker:

- Contoured keyboard
- Fixed split keyboard
- Adjustable split keyboard
- Programmable keyboard ADA functions
- Cordless
- Stand alone keypad

Ergonomic Platforms – AliMed, Inc., distribute platforms that are designed to be used in the lap. They also distribute CPM (Continuous Passive Motion) platforms. These platforms raise and lower the keyboard over a 3-inch range on 3-minute intervals. The intent is to improve circulation and reduce tension and muscle fatigue.

Ergonomic Mouses – As technology develops, the following devices will offer potential to reduce ergonomic injuries and / or help the ADA worker:

- Foot mouse
- Adjustable
- Cordless

- Touch Pad

Task Lighting

- Computer Mounted Lamp – Reduces glare on monitor screen and lights the area immediately in front of the monitor
- Polarizing Task Lamps - Comes with an antiglare screen
- Panel System Long Arm Lamps – Mounts directly to “Hayward” panels that utilize slotted standards
- Panel System Lamps – Mounts directly to the top of the “Hayward” panels
- Document Holder Task Lamp – Mounts directly onto the document holder and illuminates the document

Telephone Head Set

Headsets come with either one or two “ear muffs” (speakers). The adjustable headband can go over the head or under the chin. A clothing clip keeps the headset wire out of the way.

The unit comes with an amplifier that remains next to the standard telephone. In most cases, the headset can be easily disconnected from the amplifier to allow freedom of motion. Many monaural head sets come with a noise cancellation feature.

APPENDIX B

HEALTH ISSUES

Health Issues

Computer-intensive tasks can cause muscle strain in the neck, shoulders, back, elbows and wrist, as well as eyestrain, headaches and fatigue. The good news is that it is possible to prevent or greatly reduce the aforementioned problems.

The most frequently reported visual problems include eye fatigue, eyestrain, difficulty in focusing, burning or irritated eyes, watery and red eyes, and blurred vision. These problems can be attributed to:

- Focusing the eyes on a close object for a long period of time;
- The constant refocusing of the eye when the source document and the screen are placed at different focal locations;
- Improper lighting.

Ergonomic disorders are disorders of the musculoskeletal and nervous system occurring in either the upper or lower extremities, including the lower back. These disorders, also known as Cumulative Trauma Disorders (CTDs) may be caused by repetitive motions, forceful exertions, sustained or awkward positioning of the body or mechanical compression of the hand, wrist, arm, back, neck, shoulder and leg over extended periods of time. Activities associated with the onset of CTDs arise from ordinary movements that may include repetitive bending, twisting, gripping, reaching and pushing, etc. These activities, by themselves, are no more hazardous at work than at home. What makes them hazardous is the chronic repetition and the awkward manner in which the tasks are performed without rest or sufficient recovery time. **Cumulative** indicates that these injuries develop gradually over periods of weeks, months, or even years as a result of repeated stresses on a particular body part.

Each repetition of an activity produces some trauma or wear and tear on the tissue and joints. The word **trauma** signifies bodily injury from mechanical stresses. The term **disorders** refer to physical ailments or abnormal conditions.

The majority of health issues arise from improperly designed workstations, the lack of sufficient recovery time between tasks, and the lack of employee awareness of the hazards associated with computer usage. By following guidelines that are discussed in this booklet, you can reduce the chance of injury or illness. When workstations are well designed, posture is improved, strain is not placed on a particular group of muscles, and comfort is increased.

APPENDIX C

PERFORMANCE ORIENTATED ERGONOMIC CHECKLIST

Performance Oriented Ergonomic Checklist For Computer (VDT) Workstations

Cornell University Human Factors Group

Introduction

Among ergonomists there is a general agreement with regard to proper computer workstation set-up and the optimal body postures assumed by people performing tasks at the workstations.

Unfortunately, quick and easy solutions to ergonomic problems, such as wrist rests, seldom help and sometimes they actually make matters worse. Likewise, recommending specific dimensions for workstations without knowledge of the anthropometrics of each user, the dimensions of equipment, and the nature of the work to be done can result in suboptimal workstation arrangements.

This performance-oriented checklist is designed to help you to evaluate what is needed for a good ergonomic workstation arrangement. Specific dimensional constraints were intentionally omitted and replaced by a principles oriented approach for this checklist. A checklist is a guide to good decision-making, not an end point in itself. No checklist alone is able to capture the interactions and complexities of all possible combinations of people, task, equipment, and work environment. However, use of this checklist, along with an understanding of the principles of Ergonomics, will allow you to identify workstations which need redesign work, and it will give you guidance on the goals of any workstation redesign that is required.

At a minimum, while using this checklist, remember that designing for ergonomics requires understanding and consideration of:

- The physical and psychological attributes of the person or population of people that will perform the job.
- The design and arrangement of the workstation furniture, computer hardware, computer software, and other workstation accessories.
- The tasks required to perform the job.
- The work environment, including such things as noise and temperature, but also management and organizational methods and constraints.

The interaction between these general topics is critical, and will define the postures, forces, and repetitions assumed by the person(s). Remember that all parts of the body are linked together, and consequently, a modification in one area may have significant effects in another. No single change can be performed without considering the effects on the other areas. For example, lowering seat height so that someone may comfortably rest his/her feet on the floor may force a stressful upper body posture if the monitor position and table or keyboard height are not adjusted in concert (this is often a good reason to provide a footrest).

When using this checklist:

- Ask not whether the person can merely achieve these general goals, but whether the design of the workstation, task, and environment interfere with, obstruct, or outright inhibit a person from achieving them.
- Remember that it is worded for use when reviewing one person and that person's VDT workstation, tasks, and working environment. If more than one person must use that same workstation, the checklist should be applied to each individual, and an easily adjustable workstation becomes even more important.
- Remember that there is no "perfect posture for all time" and that a dynamic posture (frequent changes in posture) is a good way to reduce stress and redistribute pressure related to long duration static postures. However, work can be sustained for longer times without causing harm if the person is working in a neutral posture.
- Remember that the checklist is not all-inclusive and may not cover all of the topics important to your specific situation.
- Remember that a good ergonomics approach will improve comfort, productivity and quality, as well as health and safety.

"NO" responses indicate conditions that may be associated with higher risk of illness/injury and steps should be taken to address the source of the problem.

VDT Posture Checklist

1. POSTURE

"NO" answers to ANY posture question identify the item that may be contributing to ergonomic risk and this should be addressed immediately. For a more detailed and systematic analysis of postural risks, this checklist should be followed up by undertaking a Rapid Upper Limb Assessment (RULA) analysis of the worker's posture.

Lower Extremities

- Is the person able to rest the feet comfortably?
- Is the person able to sit with the knees in a comfortable position?
- Is the person free of uncomfortable pressure points, obstructions, or other interferences in the lower extremities?

Upper Extremities

- Is the person able to work with the head in vertical orientation, such that the neck is not stressed by holding the head off balance from the neck and shoulders?
- Is the person able to work with the head-facing forward of the plane of the upper body the majority of the time, such that repetitive or long duration head rotation is minimized?
- Is the person able to reach the objects on the workstation without extended reaching, especially where the reaching is held for long durations, is repetitive, or requires trunk/torso deviations?

Is the person able to work with comfortable arm positions, or approximately:

- Neutral shoulder positions (upper arms tucked close to the body and hanging relaxed, not abducted out to the side, extended forwards or backwards, raised up or hunched)?
- Comfortable elbow positions (hands in a straight line with the lower arms, hands not flexed down towards the palm, not extended up nor bent towards the little finger, nor bent towards the thumb)?

Force Static Body Posture

- Do the workstation and job requirements cause non-neutral body positions to be held constant for extended periods of time?

2. WORKSTATION AND ENVIRONMENT DESIGN FEATURES

Seat Surface

- Is the seat surface height adjustable, such that the person is able to set it at an individually comfortable height in relation to the required work activities?
- Is the seat surface of appropriate size, such that it is deep and wide enough to comfortably accommodate the specific person?
- Is the seat slope adjustable, such that the person is able to achieve a comfortable angle, either forward or rearward sloping?
- Is it comfortable and is the front well rounded (“waterfall” front edge), such that the person does not experience excess pressure on the underside of the leg due to the forward edge?
- Overall, is the seat comfortable for the person who is required to use it?

Seat Backrest

- Can the person easily adjust its height to provide mid lumbar support (lower back region)?
- Can the person easily adjust its angle relative to the seat surface?
- Can the person easily adjust it to alter the depth of the seat?
- Overall, is it comfortable to the person required to use it?

Work Surface

- With the lower limbs in comfortable positions and feet on the floor, can the person achieve a comfortable work surface height?
- Is the width of the work surface appropriate, such that all required task accessories and duties can be located within comfortable reach and viewing distance?
- Is the depth of the work surface appropriate, such that the computer, and keyboard if necessary, can be placed directly forward of the person with the work orientation parallel to the plane of the upper body?
- Is the area under the desk large enough to accommodate the legs and any accessories, such as footrests and arm rests?

Computer Monitor (VDT)

- Is the person able to easily adjust the height of the monitor?
- Is the person able to easily adjust the fore-aft distance of the monitor?
- Is the person able to easily adjust the tilt (up/down) angle of the monitor?
- Is the person able to easily adjust the yaw angle (left/right rotation) of the monitor?

Keyboard

- Is the keyboard detachable from the VDT/computer monitor?
- Is the person able to easily adjust keyboard height?
- Is keystroke pressure comfortable to the person?
- Has the person correctly adjusted the angle of the keyboard so that their hands/wrists are in a neutral posture when they are typing? Placing the keyboard in a preset angle negative tilt keyboard tray that is height adjustable allows users to access the keyboard in a wrist neutral posture.

Mouse

- Is the shape and button activation comfortable and easy to operate for the person?
- Is the person able to reach and operate the mouse without extended long duration or repetitive reaching and with the shoulders, arms and wrists in a neutral posture?
- Is the mouse on a position adjustable surface so that this can be used within the person's immediate reach zone?

Document Holder for Data Entry Tasks

- Is there a special holder or support for the source document?
- Is the person able to easily adjust the document holder height, distance and angle?
- Does the device prevent the document from vibrating?
- Is the device located such that the person is not required to twist the head/neck back and forth between the document and screen extensively or for long durations?

Support for the Hands and Arms

- Are seat or other padded armrests available?
- Are armrests adjustable (height, lateral position)?
- Is a broad, flat keyboard palm support available to support the hands in a neutral posture in between bursts of typing movements?
- Is the palm supported for mouse use?

Office Lighting

- Are lighting levels in the VDT/computer monitor area comfortable to the person?
- Is the monitor screen placed such that light from the windows and overhead lighting do not cause glare? If not, are glare screens or other glare reducing materials used?
- Are diffusers, cube louvers or parabolic louvers used on overhead lights where screen glare from that source is a problem, or is indirect lighting used?
- Are movable task or desk lights available?
- Do work surfaces have a matte finish to reduce light reflections?
- Do windows have curtains, drapes or blinds to block light where glare from that source is a problem?

Temperature

- Is the person comfortable with ambient temperatures?
- Is the person comfortable with the temperatures of any equipment or surfaces he/she must contact?

Vibration

- Does the person experience any uncomfortable building vibration (e.g., from mechanical systems, outside traffic)?
- Does the person experience any uncomfortable equipment vibration (e.g., from internal fans)?
- Does the person experience any uncomfortable keyboard vibration (e.g., wobble from an unstable keyboard tray)?

Noise

- Are the sound levels at comfortable levels, allowing conversation and other communications without significant effort?

- Does the person experience any uncomfortable equipment noise sources (e.g., printer noise)?

Ventilation

- Is air circulation sufficient?
- Is air quality satisfactory?
- Is the air dry or too humid?

Electrostatic Electricity

- Does the person frequently experience static electricity shocks?

3. THE WORKER

Fatigue Control

- Is the person allowed to take rest pauses or breaks from tasks that require long duration or repetitive postures, forces, keying or mousing activities?
- Is there job rotation or substitution of tasks which require a different type of activity where posture, force, and repetition hazards have not been addressed by design?

Vision

- Does the person wear bifocal glasses, causing him/her to tilt the head to see through the appropriate lens area?
- Are workers with symptoms of eyestrain, burning sensation in the eyes, blurred vision, irritated eyes, or headache examined for vision problems?

Psycho-Social Issues

- Does the person have some involvement and control over the work process?
- Is there good communication between the person and supervisors?
- Has the person been adequately trained?
- Is the software “user-friendly”?

If you answered “NO” to any of the questions in the worker section, administrative issues may be contributing to ergonomic risk. A review of training and other administrative policies is recommended.