

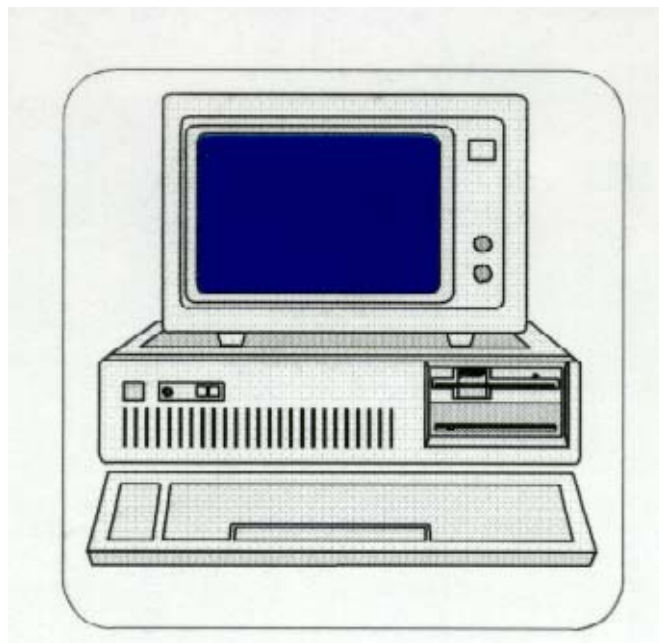
**INFORMATION PROVIDED
BY PROVIDUS
ERGONOMICS**

TO HELP PREVENT

***Cumulative Trauma
Disorders***

INCLUDES

Introduction
Workstation Design
Chair Adjustments
Displays
Keyboards
Lighting
Lifestyle Changes and Exercises
VDT Selection



INTRODUCTION

Video Display Terminals have become an exciting development for employees in all types of industries. They are used in word processing, programming, financial data collecting, proposal and bid specifications, design, engineering, blueprinting, typesetting and a host of other areas. While they have significantly increased the productivity of employees, in some cases they have been associated with health problems, principally cumulative trauma disorders. Managers and supervisors can and should create a positive work environment for employees who use VDTs, one which will maximize comfort and efficiency.

Cumulative Trauma Disorder (CTD) is the wear and tear on tendons, muscles and nerve tissue caused by continuous use over an extended period of time. Five risk factors that have been associated with CTDs are:

Repetition or doing the same movement continuously such as keying.

Sustained exertions and constrained postures. Examples include holding fingers poised over keys, holding a telephone handset to the ear, using a computer mouse, extended sitting, long periods of looking at documents or a computer screen, holding the head in one position because of computer glare, and posture constrained by a single-position chair. A chair that's too small or a chair with confining form can also result in constrained postures.

Awkward postures. Holding a telephone handset to the ear, reaching overhead for files, craning the neck to see a computer screen through bifocals, keying with the wrist extended or deviated, raised shoulders due to work surfaces or armrests that are too high, or due to a seat that is too low, are a few examples. Also, an oblique thigh-torso angle due to a chair that is too low, a chair with a tight backrest/seat angle, or a chair with uncomfortable contours can cause awkward postures.

Localized mechanical stress or contact stress. Resting arms or hands on sharp work surface edges, chair armrests, chair cushion edges, keyboard edges, or keyboard tray edges can cause this problem. Pressure on backs and thighs due to too-high or too-deep chair seats can cause similar problems.

Forceful exertions may result from forceful keying, "scooting" around on a chair or spinal loads due to unsupported spine. Excessive loads may be placed on feet or thighs due to misadjusted chair or to low-friction upholstery (which may cause sliding out of chair).

Ergonomics is the science of arranging and adjusting the work environment to fit the employee and their body. There are several steps to good ergonomics in using video display terminals. Some of these steps, along with helpful checklists, are included in the following pages.

Employee training on this VDT program should be completed at least annually. If a particular department is having a problem then an ergonomic survey should be made of the workstation.

WORKSTATION DESIGN

As part of all new employee orientation, employees should be given an understanding of VDTs and their risk factors, so they can use this tool efficiently. The supervisor should conduct an ergonomic survey of the employee's workstation so that adjustments can be made to provide a good fit between the workstation and the worker. This would include:

- Adjusting Workstation Height
- Adjusting Chair Height
- Providing Leg Clearance Under Workstation Top
- Adjusting Keyboard Height To Maintain A Neutral Wrist Position
- Adjusting Monitor Height And Position
- Reducing Glare
- Providing Rest Breaks And Exercise Programs To Reduce Fatigue And Potential Cumulative Trauma Disorders

The workstation design should provide the employee with a working surface top at least 3 " above the lap and at approximately elbow height. The forearm position should be parallel to the floor (when the employee is seated in the normal position for keyboard entry). The keyboard should be placed between 26 to 30 inches above the floor, allowing the employee ample leg room between the top of their chair and desk. While using the keyboard, the employee should maintain a neutral arm position. The neutral position consist of the employee's arms close to the body, wrist kept straight and is usually just below elbow height.

All cords and cables should be concealed so that they do not present a tripping hazard. Cords should not be placed in traffic lanes. The top of the monitor should be at or slightly below eye level and located 16 to 30 inches from the employee's eyes. Lighting should not produce excessive glare. VDTs located near windows may have a glare problem due to the natural lighting. This can be corrected by the use of shades or blinds or blind type coverings. The monitor can also be positioned at a 90 degree angle from windows. Never have a window at the VDT operators back. Employee training on the company rules for rest breaks and exercises should be completed.

CHAIR/SEAT ADJUSTMENTS

For employees who will spend most of their day sitting, the chair is the main support for their body. A well adjusted chair improves circulation and helps prevent backaches and fatigue. The right chair height helps to relieve cramping and stiffness in the legs. It also helps to prevent stress and tension in the neck and shoulders. The employee can be made comfortable by adjusting their chair height and backrest to fit their body as follows:

Seat height is the first adjustment to be made. The feet should rest flat on the floor. Raise or lower the seat until a 90 degree angle is obtained at the hip and knees. Angles less than 90 degrees result in unnatural pressure in the abdominal area and on the base of the spine and upper legs. Angles slightly greater than 90 degrees are okay if the back rest is used and the soles of the feet reach the floor or foot rest. Provisions have to be made if the chair height cannot be adjusted. For example, if a chair is too high a footrest can be provided and a seat cushion might be required for a chair of insufficient height.

The chair height is correct when the entire sole of the foot can rest on the floor or footrest and the back of the knee is slightly higher than the seat of the chair. This allows blood to circulate freely in the legs and feet.

A proper backrest reduces pressure on the spine and supports the lower back. The backrest should fit snugly against the lower back, with the lumbar support at approximately belt level. If it doesn't, it should be adjusted. If it cannot be adjusted, use a small firm pillow or rolled up towel as a lumbar support.

DISPLAYS

Correctly adjusting the height and viewing distance of the display can reduce eyestrain and muscle tension in the neck, shoulders and upper back. The height of the display screen surface must be determined in relation to the task and the operator's height. In addition, screens that swivel horizontally and tilt or elevate vertically enable the operator to select the optimum viewing angle. The display should be set up as follows:

- The topmost line of the display should not be higher than the user's eyes. A height adjustable monitor holder is preferred; however, in its absence, a ream of paper or a phone directory may be used (to raise a monitor that is too low), or the computer may be removed from under the monitor (to lower a monitor that is too high). Make sure that after these adjustments the monitor is sitting on a stable, sturdy surface and all the ventilation openings on the monitor are unrestricted.
- The work surface layout will depend on the nature of the work. For jobs that require looking back and forth between documents and the monitor, place the monitor and the document holder side by side at the same level and distance from the eye (to avoid constant change in focus and excessive movement of the neck or back). For jobs that require constant looking at the document, place the document holder directly in front of the employee with the monitor off to the side. For jobs that require constant looking at the monitor, place the monitor directly in front of the employee.
- The preferred viewing distance for VDTs ranges between 16 and 30 inches.

KEYBOARDS

The proper keyboard height can help keep the wrists from bending while typing. This improves the comfort of the hands, wrists and forearms and helps avoid injuries. The preferred working position is as follows:

- With the fingers on the middle row of the keyboard and the arms parallel to the floor and the elbows at the sides, the wrist should be in line with the forearm.
- If not, the keyboard should be adjusted up or down until the wrists are straight.
- To keep the wrists relaxed, try a wrist rest or padded support. One might be cautioned however, that wrist rests can put additional pressures on nerves, especially if a person has symptoms of Cumulative Trauma Disorders.

LIGHTING

Lighting should be directed so that it does not shine (either directly or via reflection) into the operator's eyes when the operator is looking at the screen. Further, lighting should be adequate for the operator to see the text and the screen, but not so bright as to cause glare and discomfort.

There are four basic lighting factors that must be controlled to provide suitable office illumination and avoid eyestrain: quantity, contrast, and direct and reflected glare.

- **Quantity:** In most offices, light fixtures and daylight provide illumination for work surfaces (e.g., 50-100 foot-candles). High illumination “washes out” images on the display screen; therefore, if possible, where VDTs are used, illumination levels should be somewhat lower (28-50 foot-candles are often satisfactory).
- **Contrast:** Contrast is the difference in luminance or brightness between two areas. To prevent the visual load caused by alternate light and dark areas, the difference in illumination between the VDT display screen, horizontal work surface and surrounding areas should be minimized.
- **Glare:** Glare is the result of direct light sources in the visual field (e.g., windows), or reflected light from polished surfaces (e.g., keyboard) or from more diffuse reflections which may reduce contrast (e.g., improper task lighting). Glare may cause annoyance, discomfort, or loss in visual performance and visibility. Simple lighting adjustments can help minimize glare and reduce strain on the eyes. Adjusting the screen’s contrast and brightness can also help improve comfort. Some adjustments that can be made include:
 - Controlling light from uncovered windows by installing window blinds or shades.
 - Adjust the angle of the display monitor to eliminate glare.
 - Set up the display monitor at right angles to windows or the light sources.
 - Install antiglare filters over the screen.
 - Adjust task light or lamps being used.
 - See an eye doctor for an exam on a regular basis.

LIFESTYLE CHANGES AND EXERCISE

The way you live has a lot to do with how you feel. Lifestyle changes such as eating right, exercising regularly, and getting enough rest will complement the changes you can make. Lifestyle changes can improve your health and comfort on and off the job.

Eating right and staying in shape to feel better will give you more energy at work and play. Cut down on fatty foods and eat foods with more fiber such as fresh fruits and vegetables as well as whole grains. Join an exercise class or take a walk to improve your circulation. To reduce stress, do something you enjoy doing. Try to get 8 hours of sleep a night. Use good ergonomics at home. Pay attention to your posture and make correction in bad habits you may have developed.

At work, take micro- breaks! Throughout the day, re-adjust your sitting posture and take a thirty second micro- break right at the workstation. These exercises can help energize your body and relieve muscle tension. Typical exercises include:

1. **PALM YOUR EYES** - Lean your elbows on your desk. Cup your hands and place them lightly over your closed eyes. Hold for a minute, while breathing deeply in and out. Slowly uncover your eyes.

2. **SQUEEZE YOUR SHOULDERS** - Put your hands up, with forearms raised. Push your arms back, squeezing your shoulder blades. Hold for a few seconds. Relax and repeat 3 times.
3. **STRETCH YOUR BACK** - Sit up straight and imagine you have a cable attached to the top of your head. Feel the cable slowly pull you up higher and higher. Hold for a few seconds. Relax and repeat 3 times.
4. **SHAKE YOUR ARMS** - Drop your arms and hands to your sides. Shake them out gently for a few seconds. Relax and repeat 3 times.

VDT SELECTION AND SET-UP CHECKLIST

1. Height of work surface: Adjust 23 to 28 inches
2. Width of work surface: At least 30 inches
3. Viewing distance: 16 to 24 inches for focusing at close range.
4. Thickness of work surface: 1 inch
5. Eyes in relation to screen: Topmost line of display should not be higher than user's eyes
6. Knee room height: Minimum of 26.2 inches non-adjustable surface and 24 inches adjustable surface
7. Knee room width: Minimum of 20 inches
8. Knee room depth: Minimum of 15 inches knee level; 23.5 inches toe level
9. Seat height: Adjustable 16 to 20.5 inches
10. Seat size: 13 to 17 inches depth; 17.7 to 20 inches width; "waterfall" front edge
11. Seat slope: Adjustable 0 degrees to 10 degrees backward slope
12. Backrest size: 15 to 20 inches high; 13 inches wide
13. Backrest height: Adjustable 3 to 6 inches above seat
14. Backrest tilt: Adjustable 15 degrees
15. Angle between backrest and seat: 90 degrees to 110 degrees
16. Angle between seat and lower leg: 60 degrees to 110 degrees
17. Angle between upper arm and forearm in relation to keyboard: Upper arm should be at an 80 degree angle; hands should be in a reasonably straight line with forearm

REFERENCES

1. **Texas Workers' Compensation Commission:** Health and Safety Guidelines for Video Display Terminals in the Workplace.
2. **ANSI/HFS Standard No. 100-1988:** American National Standard for Human Factors Engineering of Visual Display Terminal Workstations.
3. **OSHA 3092 (1992):** Working Safely With Video Display Terminals