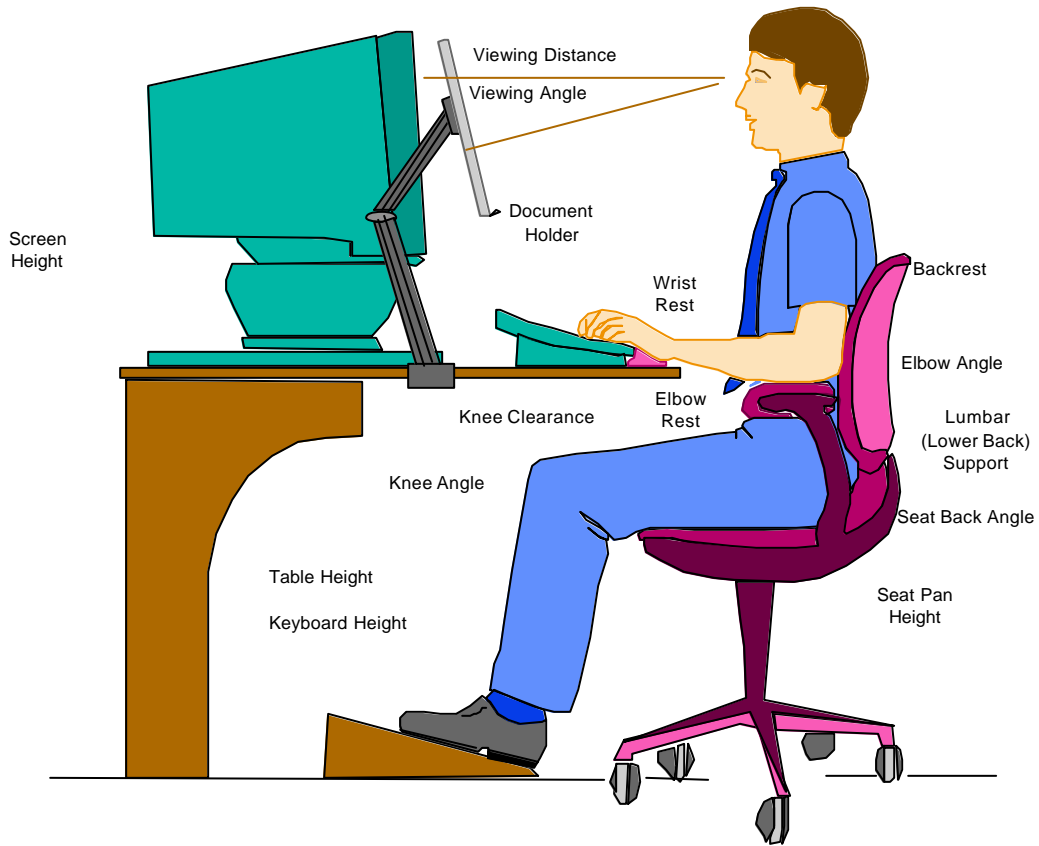


Introduction to

***Ergonomics in
the Office***



Presented by the Public Education Section
Department of Business and Consumer Business
Oregon OSHA



OR-OSHA Mission Statement

To advance and improve workplace safety and health for all workers in Oregon.

Consultative Services

- Offers no-cost on-site safety and health assistance to help Oregon employers recognize and correct safety and health problems in their workplaces.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, new-business assistance, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

Enforcement

- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.
- Inspects places of employment for occupational safety and health rule violations and investigates workplace safety and health complaints and accidents.

Appeals, Informal Conferences

- Provides the opportunity for employers to hold informal meetings with OR-OSHA on workplace safety and health concerns.
- Discusses OR-OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

Standards & Technical Resources

- Develops, interprets, and provides technical advice on safety and health standards.
- Provides copies of all OR-OSHA occupational safety and health standards.
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health standards and programs.
- Operates a Resource Center containing books, topical files, technical periodicals, a video and film lending library, and more than 200 databases.

Public Education & Conferences

- Conducts conferences, seminars, workshops, and rule forums.
- Presents many workshops that introduce managers, supervisors, safety committee members, and others to occupational safety and health requirements, technical programs, and safety and health management concepts.

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Welcome

Welcome to the “Introduction to Ergonomics in the Office” workshop. This workshop is designed to include you as much as possible in the learning experience. The more you contribute, the more you will get out of this training, so please don’t hold back. . .

Participate and have fun!

Purpose

This workshop has been designed as an introduction to the basic principles of Ergonomics in the Office. It targets the workers, supervisors, and managers that are exposed to ergonomic risks in the office environment.

Objectives:

Given the information and exercises in this workshop, you will learn the following:

Section 1. Identify “Health Considerations” that apply in the office environment

Section 2. Evaluate the “Work Station”

Section 3. Understand and consider computer monitor selection criteria

Section 4. Consider additional controls for “Cumulative Trauma”

Section 5. Use the computer monitor selection & set-up check list.

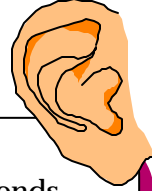


Hi, my name is Bob. I’ll be helping your instructor by demonstrating, in simple terms, what all this stuff means. So, just relax and we’ll get started.

Please Note: This material, or any other material used to inform employers of compliance requirements of Oregon OSHA standards through simplification of the regulations should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA.

Section 1: Health Considerations

Noise



On your own:

List as many sources of noise in your office as you can in the next 60 seconds.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

OR-OSHA staff has measured sound levels produced by computer workstations and associated equipment. The levels found were consistently below those that damage hearing. However, the equipment noise can still be disruptive, annoying, or distracting. As a result, ambient sound levels should be kept below 55 decibels on the A-scale (dBA). Also, narrow band tones above ambient sound levels should be reduced. It is good practice to isolate main CPUs and disk drives and provide noise-control covers on high-speed printers.

Fatigue



As a group:

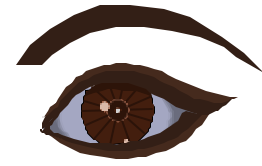
There are at least six steps you can take to reduce operator fatigue. Name as many as you can in the next couple of minutes.

Your list

Instructor's list

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

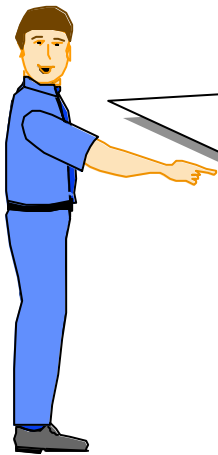
Section 1: Health Considerations (cont.)



Vision Care

Eye exams should be conducted to assure early detection and correction of poor vision. Ongoing complaints indicate the need for prompt and complete eye examinations. To ensure that prescribed corrective lenses provide a sufficient range of focus for computer monitor work, tell the examining ophthalmologist or optometrist that the employee's work involves using a computer monitor.

Also, it's important to note that when a computer user visits an ophthalmologist or optometrist who is prescribing eyewear for reading, the operator needs to inform the eye care specialist of the distance between the eyes and computer monitor. Eyewear prescribed for reading a book versus viewing a computer monitor may vary due to different focal distances. This distance can be easily measured by taking a piece of string and measuring from the bridge of the nose to the screen.



I found that using my graduated bifocals didn't work because the focal point for the correct distance to the monitor caused me to tilt my head back.

Psychosocial Issues



"User-friendly" software and adequate operator training are critical to a successful introduction. Training and orientation may be helpful.

A person's response to change depends on whether the change is perceived as positive or negative. If the perception is negative, the potential for health problems may increase if computers and/or monitors are introduced in a way that fails to meet the needs of both the job and the users. To prevent elevated levels of stress and anxiety, you must ensure effective communication between workers and supervisors. Involve workers in the equipment selection process and in the proper use and adjustment of the equipment.

Section 1: Health Considerations (cont.)

Radiation



Different types of radiation are distinguished by their frequencies. High frequency radiation such as X-ray is called *ionizing radiation*. It can disrupt the normal chemical structure and function of cells in the body. Published studies show that ionizing radiation emissions from computer monitor are negligible and do not constitute a health hazard.

VDT Use and Pregnancy



Although concern about on-the-job hazards related to computer monitor use during pregnancy has increased as more women of childbearing age are in the workforce, there is insufficient evidence available today to support the assumption that exposure to electromagnetic fields may cause birth defects and miscarriages. A recent study conducted by the National Institute for Occupational Safety and Health (NIOSH) and the American Cancer Society. . . “found no increase in the risk of spontaneous abortion (miscarriage) associated with the occupational use of VDTs.”

The workstation may have to be modified during pregnancy because of changing body proportion.

The following references are provided so that women of childbearing age who use computer monitors routinely at work, and their employers, can study the research. (Some of these articles are available from OR-OSHA’s Resource Center)

1. “computer monitors and the Risk of Spontaneous Abortion” (NIOSH) The New England Journal of Medicine, pp. 727-733, Volume 324, Number 11, March 1991.
2. “computer monitors and Health: Adverse Pregnancy Outcome” Scandinavian Journal of Work, Environment and Health, pp. 62-67, Volume 10, Supplement Number 2, 1984.
3. “Office Employment, Work with computer monitors, and Course of Pregnancy: Reference Mothers’ Experience from a Finnish Case-referent Study of Birth Defects” Scandinavian Journal of Work, Environment and Health, Volume 14, Number 5, October 1988.
4. “Work with Visual Display Units in Pregnancy” British Journal of Industrial Medicine, Volume 45, Number 8, August 1988.
5. “The Risk of Miscarriage and Birth Defects Among Women Who Use Visual Display Terminals During Pregnancy” Division of Research, Northern California Kaiser Permanente Medical Care Program, Oakland, CA American Journal of Industrial Medicine, Volume 13, June 1988.
6. “Reproductive Hazards in the Work Environment” Professional Safety, American Society of Safety Engineers, May 1990.

Section 2: Work Station Evaluation

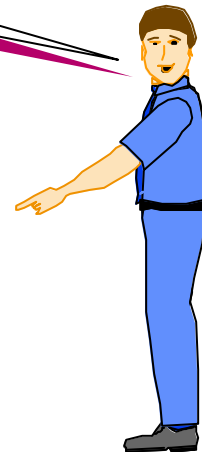
Work Area

On your own:

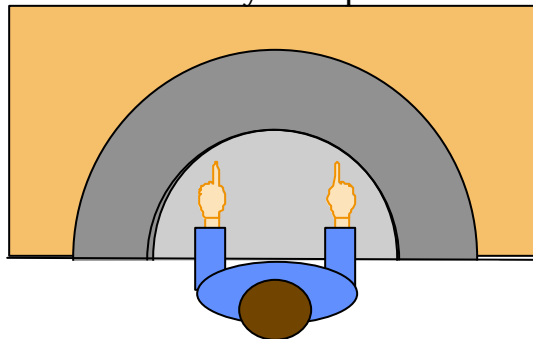
In your own words define “Work Area”.

The work area should be large enough to accommodate the operator, allow the full range of motions involved in performing the task, and have room for the equipment and materials that make up the workstation. An effective work area should be limited to the convenient reach of the operator.

I found a good rule of thumb regarding the layout of my desktop. Take a look at the drawing below.



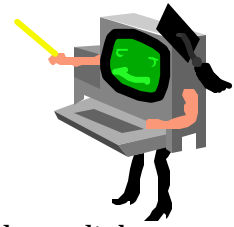
Desk Layout Top View



Equipment and/or materials found inside the small arch (light gray) are tilted toward me at roughly 8 degrees. These are high use items. Medium use items are located inside the second arch (dark gray) and are tilted towards me at roughly 18 degrees. All other items such as reference materials or charts are located outside the second arch and are slightly less than vertical.

Section 2: Work Station Evaluation (cont.)

Lighting and Glare



An environment with high illumination washes out images on a computer monitor because it produces its own illumination and contrast. For this reason, computer monitor work areas should have lower light levels than standard office areas. For these areas, illumination ranges should be 30-50 foot-candles for screen viewing and 50-70 foot-candles when reading printed documents.

Adjustable lamps may be needed to provide supplemental light for reading printed documents. To control direct-glare and reflected-glare sources, the walls, furniture, and other equipment located near a VDT should not have highly-reflective finishes. Walls can be painted with non-reflective, subdued color paint to reduce glare.

Windows should have adjustable drapes and the computer monitor work area should be located away from and at right angles to windows. Light fixtures should be equipped with diffusers, cube louvers or parabolic louvers when located near computer monitors. Recessed or indirect lighting systems can eliminate glare and reflections but are not suitable for all workplaces. To reduce glare and reflection from overhead lights, place the computer monitor work area between rows of overhead lights.

Screen glare filters should be used as a last resort, since they can contribute to blurring and poor contrast of screen characters. Operator response to these is mixed; nylon mesh filters are preferred over glass or plexifilters. *Using screen filters is a supplementary solution and not a substitute for proper lighting.*



I am amazed at how much more relaxed I am now that the lighting problems have been taken care of. I don't make near as many errors and my neck and shoulders don't hurt as they used to from all the tension.

On your own:

Make a list of lighting issues you want to address when you get back to work.

Section 2: Work Station Evaluation (cont.)

Temperature and Humidity

Set room temperature controls to maintain thermal comfort (sufficient cooling and ventilation). Avoid overcrowding VDT work areas. Provide a fairly constant relative humidity level (30-60 percent is recommended). Do not direct warm air units from central processing units (CPUs) and disk drives toward operators.



As a group:

Make a list of all the negative experiences you have endured because of temperature and/or humidity problems in the workplace.

Static Electricity

Provide anti-static floor mats or other static-grounding in low-humidity workplaces.

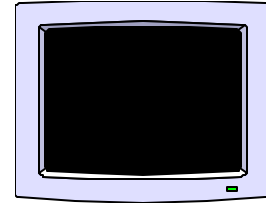


You know, I laughed right along with everyone else the first few times I got shocked, but after awhile it really got to me. I became more worried about being shocked than I was about anything else. I really like this anti-static carpeting.



Section 3: Planning & Problem Solving

Monitors

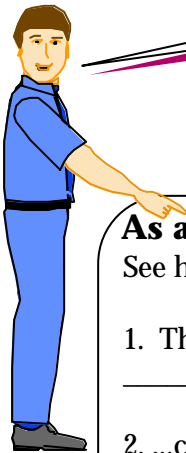


When selecting a display screen, characters should not have perceptible flicker or waiver. Geometric designs of letters and symbols should not be distorted or appear to melt together.

Character size should be sufficient for the viewing distance (i.e. based on a 20-inch viewing distance the minimum character height should be 1/9 of an inch). The screen should have user controls for character brightness and contrast. Screens which swivel horizontally and tilt or elevate vertically enable the operator to adjust for the best viewing angle. Mounting a video display monitor on an adjustable arm, which allows movement in all directions, is the most efficient way to build in adjustability and free up workstation space.

The light-adapted eye is most sensitive to light in the green part of the color spectrum. For this reason, it is often recommended that the color of the characters fall within the green-yellow part of the spectrum. In practice, however, the character color is secondary to the need for adequate contrast and clarity of the display. Regular screen cleaning is necessary to maintain clarity of characters.

Eyes in relation to the keys: When adjusting the screen height, the top most line of the display should be at or slightly below the users line of vision. The viewing distance between the user's eyes and the screen should be between 16-29 inches when the neck is in the neutral position. Bifocal users usually position the monitor at the lowest point on the work surface.



That was sure a mouthful. Let's try to simplify this one with the following exercise.

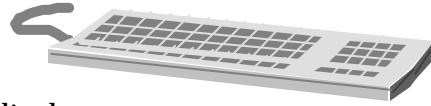
As a group:

See how quickly you can fill in the answers.

1. The screen should have user controls for character _____ & _____.
2. ...character color is secondary to the need for adequate _____ & _____.
3. When adjusting the screen height, the topmost line of the display should be _____.
4. The viewing distance between the user's eyes and the screen should be between ____ & ____ inches when the neck is in the neutral position.

Section 3: Planning & Problem Solving (cont.)

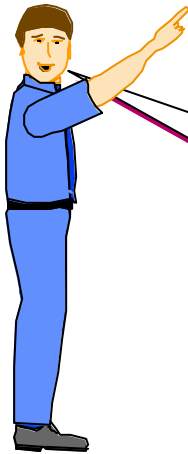
Keyboards



Choose a keyboard which is detached from the display screen and allows independent angle adjustment and positioning. The keyboard should have a thin profile to minimize wrist deviation. Keys should provide tactile and audible feedback.

A movable keyboard with tilt-angle adjustment from 0-25 degrees will allow for arranging the keyboard to suit the task and the physical needs of the operator. A matte-finished keyboard surface reduces reflections, easing operator eye strain. A keyboard fitted with a wrist rest supports the heel of the operator's hand, minimizing both hand contact with sharp table edges and wrist deviation. The wrist pads thickness should not exceed the height of the first row of keys on the keyboard.

Arms in relation to the keyboard: When the operator's hands are resting on the keyboard, the upper arm and forearm should form a right angle (90 degrees). The hands should be in a reasonably straight line with the forearms.



Take a minute and underline the following key points in the text above:

- * The keyboard should have a thin profile to minimize wrist deviation.
- * A movable keyboard with tilt-adjustment from 0-25 degrees will allow for arranging the keyboard to suit the task and the physical needs of the operator.
- * A keyboard fitted with a wrist rest supports the heel of the operator's hand. . .

Arms in Relation to the "Mouse" or Digitizer



The mouse or digitizer should be positioned to the user's side, with his or her arm close to the body for support, while maintaining a straight line between the hand and forearm.

Section 3: Planning & Problem Solving (cont.)

Document Holders



The document holder should be stable and adjustable for height, distance, and angle of view. Here are the key features:

1. The holder fully supports the document and can be used on either side of the monitor.
2. The document holder should be the same distance from the eyes as the computer monitor to avoid frequent changes of focus.
3. The holder is next to and at the same height as the display screen so that the operator can look from one to the other without moving the neck or back.



I've heard that they make a desk setup that includes a place to hold documents between the keyboard and the monitor. I haven't seen one yet. Have you? It sounds pretty neat.

As a group:

Describe the negative effects the document holder could have on the operator if the following rules are not applied.

1. It can be used on either side of the monitor.

2. It should be the same distance from the eyes as the display screen.

3. It is at the same height as the display screen.

Section 3: Planning & Problem Solving (cont.)

Chairs



It is essential for the chair to be properly designed for comfort, efficiency, and the task being performed. A chair must not only fit the person, but also the requirements of the task and the environment in which it is being used. When this is determined, consider individual dimensions before selecting a chair. Here are the key factors in selecting a chair.

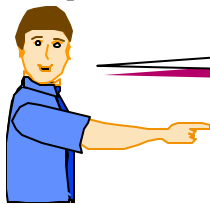
- * **Stability** -- Choose a chair that has good stability (five-point base)
- * **Seat** -- An ideal seat pan length allows 3 to 3-1/2 inches from the front edge of the seat to the back of the lower leg at the knee, when the back contacts the backrest. The seat pan should not exceed 17 inches, or the front edge of the seat will press against the back of the legs and cause discomfort. This will force the operator to sit forward in the seat, out of contact with the backrest. For most people, a seat pan with a length of less than 13 inches will not give adequate support under the thighs causing the weight load to shifted to other tissues, which will lead to discomfort during long periods of sitting.

Ideally, the chair height should be adjusted first and then the workstation adjusted. In reality, however, the work surface height often cannot be adjusted. In the event that the work surface is too high, the chair height needs to be adjusted upward until the upper arm and forearm are at a 90 degree angle with work surface. A footrest can then be added as needed to compensate for the increased chair seat height.

Seat Pan Padding

Hard, unpadded, flat seat pans are uncomfortable for periods over an hour. Soft, deeply padded seat pans cause a person to sink too far, transferring the weight load from the buttocks to the surrounding tissues. This causes tension in the hip muscles and becomes uncomfortable. The seat pan contour should promote lower back contact with the backrest.

The front edge of the seat pan should have a softly-padded, rounded front edge (waterfall edge). Straight, unpadded seat pan front edges compress thigh tissues, restricting blood circulation. This causes pain and legs may fall to sleep. Seat covering materials should be porous and breathable, but not slippery, as this may cause the operator to slide away from the backrest, thus providing little back support.



The key here is that the padded seat contour should promote lower back contact with the backrest and have a rounded front edge.

Section 3: Planning & Problem Solving (cont.)

Backrests

Backrests should have a 15 to 20 inch high support surface, be about 13 inches wide, and contour to the curve of the lower back. The backrest should be large enough to support the entire back, including the lumbar region. However, it shouldn't be so large that it interferes with the use of the arms during the performance of the assigned task.



Armrests

It is preferable to have a chair with armrests that can be adjusted to the height of the individual for the task being performed. Armrests should be low and short enough to fit the chair under the work surface and allow the user to get close enough to the work surface to use the chair backrest. Armrests that are too high elevate the shoulders, causing stiffness or pain in the shoulder and neck muscles. Armrests that are too low tend to promote slumping and leaning to one side. The most comfortable armrests are long enough to support the full arm at the base of the hand while maintaining the upper arm and forearm at a right angle (90 degrees).

Terminal Tables & Surfaces

Select a stable terminal table. A work table with an adjustable surface and a separate, adjustable keyboard shelf is recommended. If a mouse is used, the adjustable shelf should accommodate the mouse and keyboard. The table surface height should be adjustable from 23 to 28 inches. The keyboard height should range from 22 to 28 inches. Adjustable work tables and keyboards allow for different operators and a variety of tasks to be performed.

If a fixed-height work table is used, the table surface and keyboard surface should be separate, with the table surface about 29 inches high and the keyboard surface about 27 inches high.

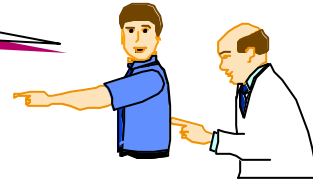
All work table surfaces should have a matte finish to minimize glare and reflection. The terminal table should also have sufficient leg room (depth and width) so there are no obstructions for knees, legs, shins or thighs. The minimum depth for knee space is 15 inches at knee level and 23-1/2 inches at toe level. The minimum width for knee space is 20 inches.

Footrests

If an operator's feet do not rest completely on the floor once the chair height has been properly adjusted, a footrest should be provided. Footrests should be adjustable in inclination, not restrict leg movement, and be easy to remove. A footrest should be large enough to support the soles of both feet and have no more than 30 degrees inclination. The top of the footrest should be covered with a nonskid material to reduce slippage.

Section 4: Additional Controls For Cumulative Trauma

This section introduces common *computer-related* health problems and I'll provide some effective solutions.



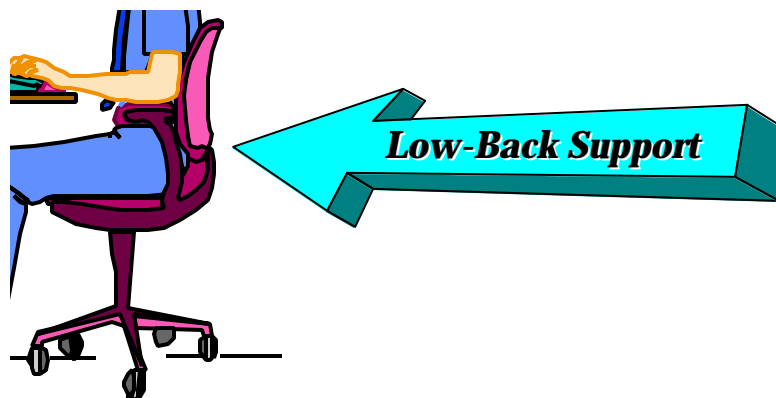
Back Problems

Back pain is one of the more common VDT user complaints. The back is a very complex structure. Back problems can result from several sources.

Problem: A chair that **fails to support** the lumbar (lower) region of the spine is a common cause of back discomfort because up to 35 percent more pressure can be placed on the lower back when sitting. The normal alignment of the spine, if viewed from the side, is an S-shaped curve with an inward curve at the neck, an outward curve at the middle of the back, and an inward curve at the lower back. When a chair does not provide adequate lumbar support, the lower curve of the back flattens (called lumbar lordosis). When sitting down, the bottom of the hip bone contacts the chair first. As the sitting process is completed, the hip actually rotates backward, flattening the curve in the lower part of the back. This causes the spinal discs to stretch from the vertebrae, causing back discomfort.

Solution

A chair that provides good low-back support can maintain the normal alignment of the lower spine, relieving fatigue and discomfort.



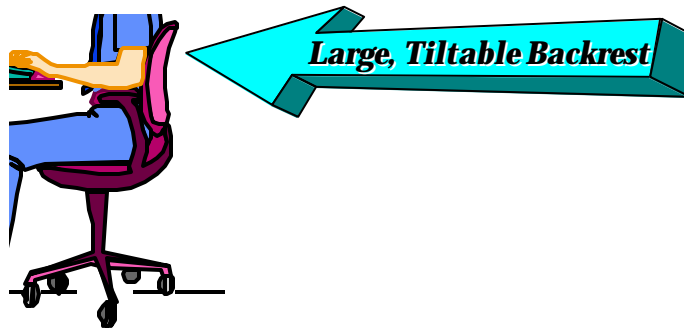
Section 4: Additional Controls For Cumulative Trauma Back Problems (cont.)

Problem: A straight-back chair provides little or no support to the lower and upper back. Sitting in this type of chair causes back muscle fatigue as a result of muscular efforts to maintain back posture for a long time.



Solution

A large, tiltable backrest allows the user to change positions, reducing muscular effort and fatigue from sitting. A slight backward recline also helps to reduce the flattening of the lower spine when sitting.



Problem: When chairs are too soft, the users sink into the seat pan. This restricts movement and causes thigh, buttock, and lower back fatigue. Conversely, when chairs are too hard, users may need to change postures frequently to relieve thigh and buttock discomfort.



Solution

People spend much of their time at work sitting. This is especially true of *computer* operators. A user's chair should be designed to allow free movement while sitting. The chair must be properly designed for comfort, efficiency, and the task being performed. You need to involve users in the selection and purchase of chairs to ensure that users are satisfied with their chairs.

Section 4: Additional Controls For Cumulative Trauma

Back Problems (cont.)

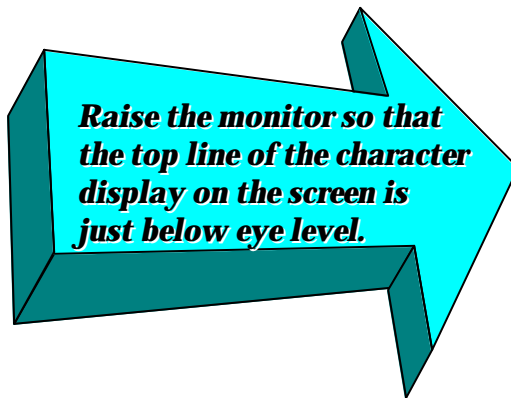
Problem: When a display monitor is too low it causes operators to lean forward, slouch down or lower their chair to improve their viewing of the display monitor. This causes the lower curve of the back to flatten because of a lack of lumbar support.



Solution

Mount the monitor on an adjustable arm that allows movement in all directions (vertically and horizontally). This will permit the operator to make individual adjustments for comfortable head and neck placement. The top line of the character display on the screen should be at or just below the operator's eye level.

If you can't afford an adjustable arm what do you do?

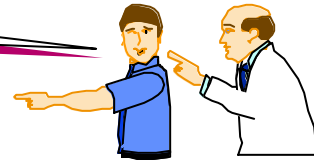


On your own:

If this is a problem where you work, list some ways that you can adjust the monitor using everyday things you can find around the office.

Section 4: Additional Controls For Cumulative Trauma

What about Neck and Shoulder problems?



Neck Problems

Neck strain is also a common complaint. The causes are often related to the monitor height, the absence of a document holder, or improper positioning of the holder.

Problem: *The monitor is too high or too low causing hyperextension or forward flexion of the neck.*



Solution

Screens which swivel horizontally and tilt or elevate vertically allow the operator to select the optimum viewing angle. Mounting a video display monitor on an adjustable arm allows movement in all directions, and is the most efficient way to create adjustability, along with freeing up workstation space.

Problem: *Documents placed flat and off the side of the work surface causes a forward flexion/rotation of the neck.*



Solution

An articulated document holder or a document holder mounted on the video display monitor positioned at the same elevation as the screen, should relieve this problem. A document holder should be capable of being used on either side of the monitor.

Section 4: Additional Controls For Cumulative Trauma Neck Problems (cont.)

Problem: *The document holder is too far off to the side, causing repetitive neck rotation.*



Solution

The screen and document holder should be the same distance from the eye (to avoid constant changes of focus) and close enough together so that the operator can look from one to the other without excessive neck or back movement.

Shoulder Problems

Shoulder strain can occur when the user's arms are positioned too high or too low.

Problem: *The arms are too high when using the keyboard.*



Solution

Lower the keyboard or raise the chair, reinforcing the principle of keeping the operator's arms and forearms at 90 degree angles. The hands should be in a reasonably straight line with the forearm. The user's upper arms should rest comfortably at his/her side.



Adjust the keyboard or chair to the correct height for comfort.

Section 4: Additional Controls For Cumulative Trauma Shoulder Problems (cont.)

Problem: The user's arms are too high or too low when using the chair armrests.



Solution

Remove the armrests and/or replace with adjustable armrests. High armrests elevate the shoulders, causing stiffness or pain in the shoulders or neck muscles. Lower armrests tend to promote excessive body slump and leaning to one side. The armrests should be low enough to fit under workstations or short enough so that the chair can be moved close to the work station.

On your own:

Here is a list of the problems covered so far. Write down the things you are going to look for when you get back to your workplace.

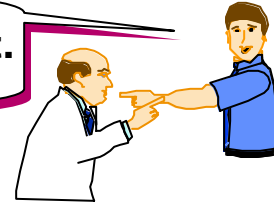
Back Problems: _____

Neck Problems: _____

Shoulder Problems: _____

Section 4: Additional Controls For Cumulative Trauma

Forearm & Hand Problems are next.



Forearm & Hand Problems

If the user's hands don't form a straight line with the forearms or if the sharp edge of the work surface presses against the palms, wrists, or forearms, hand and forearm problems can occur.

Problem: *The keyboard is too thick, causing wrist deviation.*



Solution

Purchase thin keyboards to minimize wrist deviation. A keyboard fitted with a palm rest will support the heel of the operator's hand and minimize wrist deviation. Please note that the palm rest thickness should not exceed the height of the first rows of keys on the keyboard.

Problem: *Hands deviate from a straight line with the wrist because the work surface is too high or too low or chair armrests are too high or too low.*



Solution

See the solutions discussed under shoulder strain.

Problem: *The users supports the wrists on the front edge of the work surface. This can cause compression of the wrist's median nerve, producing hand and finger numbness.*

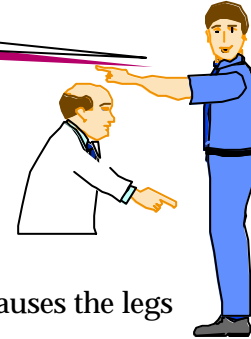


Solution

All table surface edges should be rounded and keyboards should be retrofitted with a palm rest.

Section 4: Additional Controls For Cumulative Trauma

Now let's talk about leg and vision problems.



Leg Problems

Leg problems can result from decreased blood circulation. This causes the legs to fall asleep.

Problem: *The edge of the seat pan presses against the thighs.*



Solution

A proper seat pan length allows for a three-finger clearance from the front edge of the chair to the back of the thighs upon properly adjusting the chair height to the workstation.

Problem: *Feet swell up during VDT work.*



Solution

Take rest breaks more often. Get up from the chair and move around.

Problem: *Using the foot rungs on the chair as footrests can produce excessive knee flexing. Operators usually put their feet on the rungs because their feet cannot rest squarely on the floor.*



Solution

Provide a footrest.

Section 4: Additional Controls For Cumulative Trauma Vision Problems

There are no permanent vision or eye problems associated with computer monitor use. However, these are the most common complaints:

- * Eye Strain
- * Burning Eyes
- * Blurred vision
- * Irritated eyes
- * Headache

Solution:

- * Because these complaints are associated with focusing at close range, the minimum eye distance should be 16 inches from the monitor.
- * Recommend a short rest break following each hour of continuous computer usage.
- * Periodically focus on distant objects. This serves to relax eye muscles.
- * Uncorrected or improperly-corrected vision can aggravate any of these complaints. When getting fitted for glasses, Computer users need to tell their eye care specialist that they work with computers regularly on the job. *The focal distance for reading (10 - 12 inches) is less than it is for computer monitor work (16 - 29 inches).*
- * People wearing bifocals or trifocals have to tilt their heads back to read through the bottom portion of the lenses. *This can cause neck strain.* Correct the problem by lowering the height of the computer monitor or using single-focal-length glasses specifically for computer use.
- * Poor or excessive lighting contributes to vision problems. The illumination level for computer monitor work should be 30 - 50 foot-candles for screen viewing only, and 50 - 70 foot-candles for reading printed documents.
- * **Room glare** can be reduced or eliminated by lowering the lighting, having the operator sit facing a matte-finished, dark-colored wall, or adjusting the screen upward, downward, or slightly to the left or right. However, too much screen deviation can cause neck problems.
 - Position the computer workstation at right angles to the window.
 - Install the computer workstation between rows of overhead lighting.
 - Install screen-glare filters over the monitor screen. This should be your last resort, because it may reduce image quality.
- * **Window glare** can be reduced or eliminated by covering the windows with draperies or blinds. Blinds are preferred over drapes, and vertical blinds are preferred over horizontal blinds.
 - Install natural density filter shades over the windows.
 - Add outdoor window awnings.

Section 4: Additional Controls For Cumulative Trauma Muscle Fatigue Problems

Computer work, consisting of a combination of static posture coupled with repetitive motions, results in local muscle fatigue. If muscles are not given adequate rest, injury and/or illness is likely to occur. To reduce the frequency and duration of computer operation, the following ideas are recommended:

- * Take frequent breaks of shorter duration, every hour on the hour.
- * Change job tasks. This reduces fatigue and monotony from a stressful task. Reducing the duration of continuous exposure means increasing the rest time by allowing different sets of muscles to be used with a different posture.
- * Exercise to help relax tight muscles, reduce stress, and lessen the sense of general fatigue.

On your own:

Here is a list of the last problems. Take some notes as we review.

Forearm & Hand Problems: _____

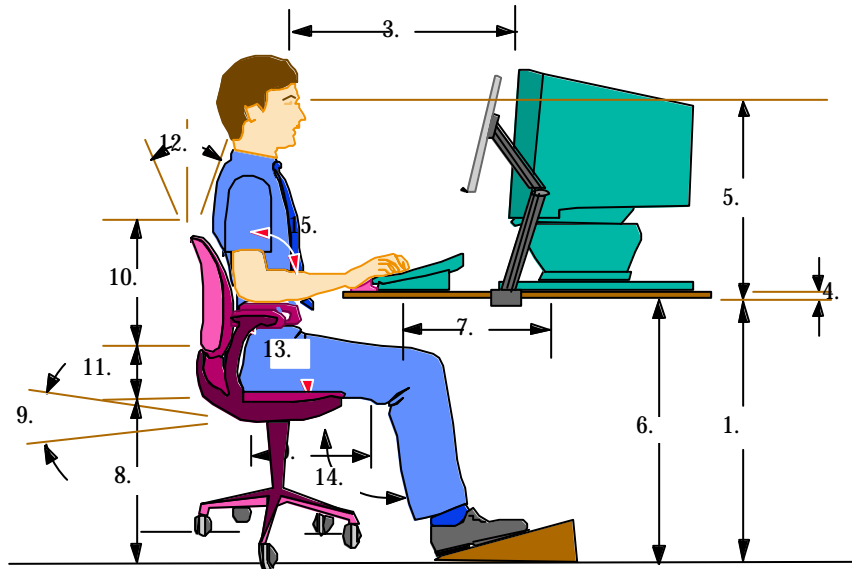
Leg Problems: _____

Vision Problems: _____

Muscle Fatigue Problems: _____

Section 5: Computer Monitor Selection and Set-up Checklist

Recommended Workstation Criteria

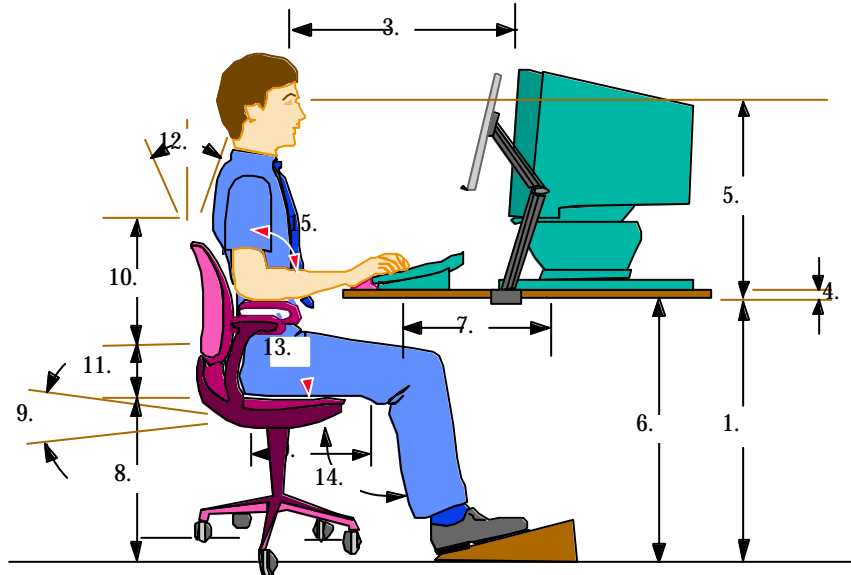


Recommended Selection & Set-up

- Height of work surface:**
Adjustable 23 - 28 inches
- Width of work surface:**
30 inches
- Viewing distance:**
16 - 29 inches for focusing at close range
- Thickness of work surface:**
1 inch
- Eyes in relation to screen:**
Topmost line of display should not be higher than user's eyes.
- Knee room height:**
Minimum of 26.2 inches non-adjustable surface and 24 inches adjustable surface.
- Knee room depth:**
Minimum of 15 inches knee level; 23.5 inches toe level.

Section 5: computer monitor Selection/Set-up Checklist (cont.)

Recommended Workstation Criteria (cont.)



Recommended Selection & Set-up

- Seat height:**
Adjustable 16 - 20.5 inches.
- Seat slope:**
Adjustable 0 - 10 degrees backward slope.
- Backrest size:**
15 - 20 inches high; 13 inches wide.
- 11. Backrest height:**
Adjustable 3 - 6 inches above seat.
- 12. Backrest tilt:**
Adjustable 15 degrees.
- 13. Angle between backrest and seat:**
90 - 105 degrees.
- 14. Angle between seat and lower leg:**
60 - 100 degrees.
- 15. Angle between upper arm and forearm in relation to keyboard:**
Upper arm and forearm should form a right angle (90 degrees).
Hands should be in a reasonably straight line with the forearm.

Section 5: computer monitor Selection & Set-up Checklist (cont.)

Recommended Selection & Set-up

Additional VDT Workstation Criteria

- Seat pan depth:**
13 - 17 inches depth; 17.7 inches to 20 inches width; “waterfall” front edge.
- Knee room width:**
20 inches minimum.
- Non-adjustable work surfaces:**
The table surface should be about 29 inches high, with a keyboard surface height of 27 inches.
- VDT Stands:**
Use height-adjustable stands for all new installations.
- Seats:**
Use easily adjustable swivel chairs on five-point base.
- Footrests:**
Use if an operator cannot keep both feet flat on floor when chair is too high.
- Keyboards:**
Use thin boards, detached from console, and a palm rest.
- Wrist rest:**
The palm rest thickness should not exceed the height of the first row of keys on the keyboard.
- Non-Keyboard Entry Devices:**
Position devices following the same guidelines as for keyboards.
- Screens:**
Must be readable with no perceptible flicker; brightness control necessary.
- Blink Rate:**
No more than two different blink rates, at least 2 Hertz apart (slow blink rate not less than 0.8 Hz; fast blink rate not more than 5 Hz).
- Cables and Cords:**
Keep concealed, covered, or out of the way.

Section 5: Computer monitor Selection / Set-up Checklist (cont.)

Recommended Selection & Set-up (cont.)

Additional Workstation Criteria (cont.)

- Glare Control:**
Ensure the computer monitor is placed at right angles to windows and have tilt and swivel adjustments.
- Use windows with curtains, drapes or blinds to reduce bright outside light.
- Use lighting levels at 30 - 50 foot-candles when using a monitor; 50 - 70 foot-candles where documents are read, compared to normal office levels of 75 - 160 foot-candles.
- Use cube louvers or parabolic louvers to reduce overhead-lighting glare.
- Ensure that work surfaces have anti-glare (matte) finish.
- Use movable task or desk light's; locate monitors between rows of overhead lighting. Use screen filters and/or hoods if above are not successful.
- Temperature and Humidity:**
Maintain thermal comfort and 30 - 60 percent relative humidity.
- Training:**
Train operators to adjust their workstation components, such as their chair, monitor, and document holder.
- Fatigue Control:**
Encourage good operator posture, body and eye exercises, rest pauses, job rotation or substitution of less demanding tasks.
- Vision Problems:**
Evaluate operators who may need glasses or wear bifocals.
- Psychosocial Issues:**
Include operator in the selection process; encourage communication between operators and supervisors; install user-friendly software; and provide adequate operator training.

Referrals & References

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