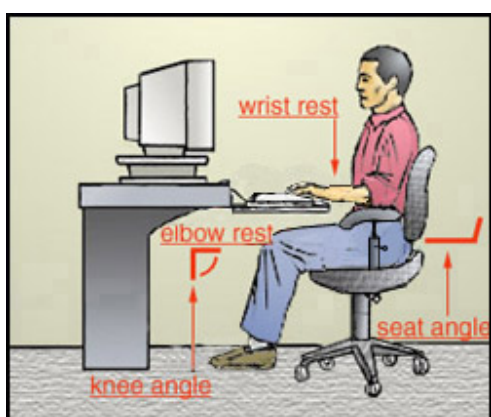


WORKSTATION ERGONOMICS

Workstation – Chair

A properly designed and adjusted chair will provide appropriate support to the back, legs, buttocks and arms. This support can reduce contact stress, over exertion and fatigue. It will also promote proper circulation to the extremities. The following items are critical to an employee who spends extended hours at the workstation:



The proper adjustment of the chair is related to the proper placement of the monitor, keyboard, mouse and work surface.

Seat Position

*Potential **Hazard**:*

Improper size, shape, or choice of materials for the seat pan and backrest may result in uneven weight distribution, contact stress, decreased circulation to the extremities and awkward posture.

*Possible **Solutions**:*

- The seat and backrest of the chair should support a comfortable posture that allows frequent changing of the seating position
- The seat pan should accommodate the specific employee (not too big/small). It should be padded and have a rounded, "waterfall" edge (Fig. 1). This will reduce contact stress to the back of the legs.
- The angle of the seat pan is also important. A seat pan with an adjustable tilt ensures the worker is able to maintain proper support in different positions.

Chair Height

Potential Hazard:

Improper chair height

Possible Solutions:

- Chairs should be height adjustable, especially in work areas where they are shared by a number of employees.
- The chair height is correct when the entire sole of the foot can rest on the floor or a footrest (Fig. 1)
- The back of the knee is slightly higher than the seat of the chair (Fig. 2). This position allows blood to circulate freely in the legs and feet.



Fig.1 Footrest



Fig. 2 Knee slightly higher than the seat of the chair.

Armrest

Potential Hazard:

Armrests that are too high or too low can produce awkward postures, create contact stress to the elbow, provide inadequate support, and may prevent the operator from moving close enough to the workstation.

Possible Solutions:

- Adjustable armrests (Fig. 3) can be lowered to fit under work surfaces. This allows the user to work from a comfortable distance.
- The armrests should support both forearms while the employee performs tasks and should not interfere with movement.



Fig. 3 Office chair with adjustable armrests.

Workstation - Monitor and Document

Monitor and document placement is important in creating a comfortable workstation. Consider the following items in order to reduce awkward head and neck postures, fatigue and/or headaches:



The monitor and document are related to the placement of the keyboard, mouse, and properly adjusted chair.

Display

Potential Hazard:

A display screen that is too high, too low, or placed to the side of the user (Fig. 1), may, over time, cause awkward postures and increased stress on the muscles of the neck, shoulders, and upper back.

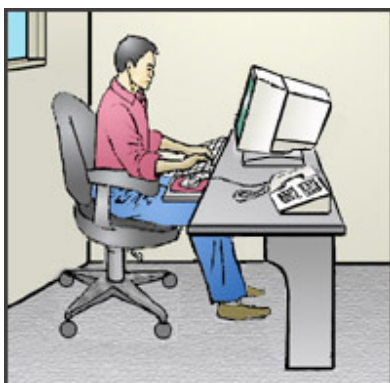


Fig. 1
Display screen too low.

Possible Solutions:

- Keep monitor directly in front of the user.
- The topmost line of the screen should not be higher than the user's eyes.
- Screens that swivel horizontally and tilt or elevate vertically enable the operator to select a comfortable viewing angle.
- Generally, placing the monitor on top of the computer will raise it too high.



Fig. 2
Comfortable viewing angle.

Potential Hazard:

Tilting the head back to read through the bottom portion of bifocal lenses can stress the neck, back and shoulders.

Possible Solutions:

- Tilting of the head can be avoided by lowering the display or using single-lens glasses with a shorter focal length while viewing the monitor.

Potential Hazard:

Viewing distances that are too long or too short can cause stress and eye strain.

Possible Solutions:

- The preferred viewing distance is 18 to 24 inches. If there is not enough table depth to accommodate this distance, install a keyboard extender or tray underneath the desk
- The table depth should generally be at least 30 inches from the wall to properly accommodate monitors.
- Pull tables and desks away from the wall and dividers to provide more space for monitors.

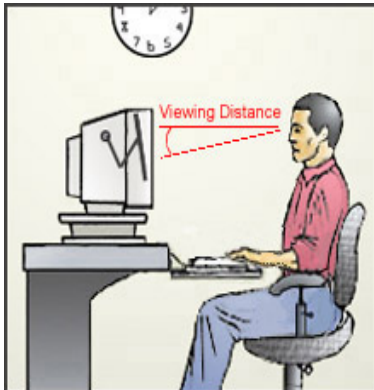


Fig. 3
Preferred viewing distance.

Potential Hazard:

Viewing the monitor for long periods of time can cause eye fatigue and dryness.

Possible Solutions:

- Rest eyes periodically by focusing on an object at least 20 feet away.
- Stop, look away, blink and/or stretch at regular intervals.
- Expand the employee's duties with other non-computer tasks such as filing, phone work, or customer interaction to provide periods of rest for the eyes.

Source Document Position

Potential Hazard:

Awkward posture or frequent movement of the head and neck to look from the monitor to a document.

Possible Solutions:

- The screen and document holder should be close enough together so the operator can look from one to the other without excessive movement of the head, neck or back.
- If writing needs to be performed, a document holder can be positioned directly beneath the monitor.

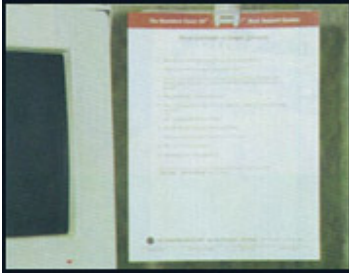


Fig. 4
Screen and document holder are close together and same distance from the eye.

(Fig. 5). This provides a sturdy writing surface and prevents frequent movement of the head, neck or back.



Fig. 5
In-line document holder that allows for writing

Workstation - Keyboard and Mouse

The proper position of the keyboard and mouse is essential in creating a comfortable workstation. Consideration of the following factors can help prevent musculoskeletal disorders such as carpal tunnel syndrome and tendonitis:

Height and Orientation

Potential Hazard:

Improper height and angle of the keyboard, mouse, or working surface can cause employees to bend their wrists or lift their arms for extended periods.

Possible Solutions:

- The work surface may need to be raised or lowered to keep the operator's arms in a comfortable position. This can be achieved by installing an adjustable keyboard extender or tray (Fig. 1), by providing an adjustable table/working surface, or by raising the chair and providing a footrest if needed.
- Adjust the keyboard and/or chair height so the employee's elbows can hang comfortably at the side of the body, the shoulders are relaxed and the wrist is not bent up or down or to either side during keyboard use (Fig. 1).
- The angle of the keyboard should also be considered when determining the preferred height. The preferred working position for most keyboard operators is with the forearms parallel to the floor and elbows at the sides; this allows the hands to move easily over the keyboard.



Fig.1 Keyboard tray.

Placement

Potential Hazard:

A keyboard or mouse that is not directly in front of or close to the body (Fig. 2) forces the employee to repeatedly reach during use.

Possible Solutions:

- Make sure the keyboard is placed directly in front of the user.
- The mouse should be positioned at the operator's side with his or her arm close to the body (Fig. 3). A straight line should be maintained between the hand and the forearm. The upper arm should not be elevated or extended while using the mouse. The employee should not have to reach to use the mouse.
- Consider using a mouse platform that rotates above the keyboard while maintaining about the same plane. This design (Fig. 4) allows the mouse to be used above the 10-key pad, which gives the user a better wrist angle and reduces reach.



Fig. 2 Mouse placed too far from the body.



Fig. 3 Mouse placed close to the body.

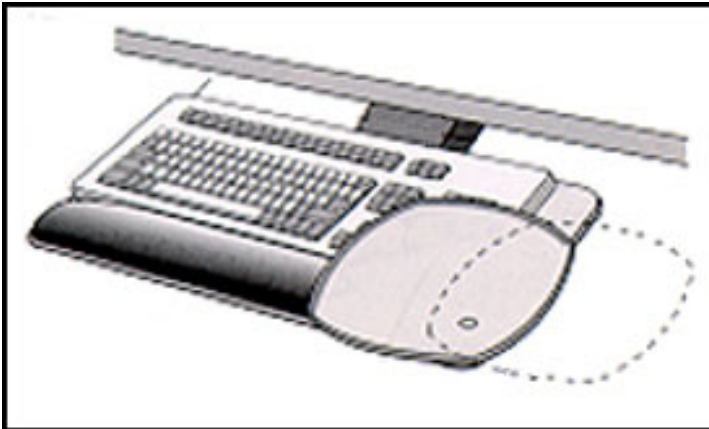


Fig. 4 Rotating mouse pad

Design and Use

Potential Hazard:

Bending wrists sideways (Fig. 1) or up and down (Fig. 2) while keying.



Fig. 1 Hazardous side bending of the wrist.

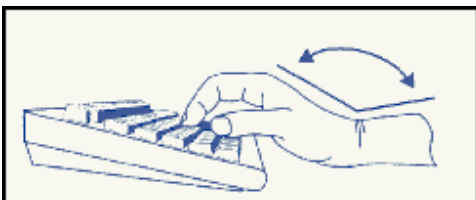


Fig. 2 Bending the wrist upward.

Possible Solutions:

- Reduce bending of the wrists by moving the entire arm.

- Do not use the feet provided on the back of most keyboards if this causes wrists to bend upward (Fig. 2). If the operator sits lower in relation to the keyboard, the keyboard feet may be used to maintain a neutral wrist (Fig. 3).
- Wrists should be extended straight, not bent up or down. A mouse pad or wrist rest can be used to help maintain straight wrists. Wrist/palm rests (Fig. 3) should not be used while keying, but to rest the wrists between periods of keying.



Fig. 3 Straight wrists with a rest.

- Consider using alternative pointing devices such as trackballs (Fig. 4), or touch pads. Alternative keyboards (Fig. 5) may also be helpful in allowing the worker to maintain a neutral wrist position.



Fig. 4 Trackball.

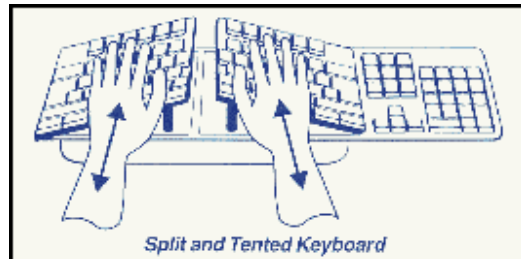
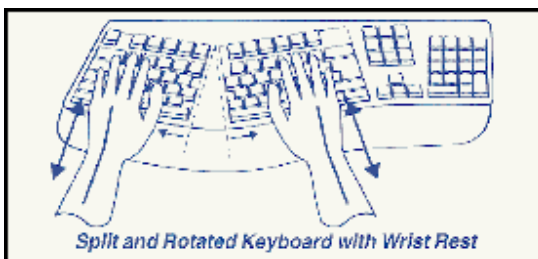


Fig. 5 Alternative Keyboards

Environment – Lighting

Lighting that is not appropriate for computer work is a major factor in visual discomforts such as eyestrain, burning or itchy eyes, headaches and blurred or double vision.

Lighting should be adequate for the operator to see the text and the screen, but not so bright as to cause glare or discomfort. For optimal comfort and performance, the following factors should be considered:

Amount of Light

*Potential **Hazard**:*

Bright light on the display screen "washes out" images making it difficult for operators to clearly see the work.

*Possible **Solutions**:*

- Use light diffusers so that desk tasks (writing, reading papers) can be performed without direct brightness on the computer screen. Place rows of lights parallel to the operators line of sight.
- Use operator adjustable task/desk lighting.
- If diffusers or alternative lights are not available, removing the middle bulbs of 4-bulb fluorescent light fixtures can also reduce the brightness of the light.

*Potential **Hazard**:*

Bright light in the operator's field of view (Fig. 1).



Fig. 1
Bright light entering from a window

*Possible **Solutions:***

- Use blinds or drapes on windows to eliminate bright light. Blinds should be adjusted during the day to allow light into the room, but not directly into the operator's field of view (Fig. 2).
- Lamps should have glare shields or shades and the line of sight from the eye to the light should be at an angle greater than 30 degrees.
- Reorient the workstation so that bright lights from open windows are not in the field of view. (Fig. 2).
- Use indirect or shielded lighting where possible and avoid intense or uneven lighting in the field of vision (Fig. 2).



Fig. 2 Blinds on the windows and the monitor placed at different angle.

Contrast of Light with Environment

*Potential **Hazard:***

High contrast between light and dark areas of the computer screen, horizontal work surface, and surrounding areas.

*Possible **Solutions:***

- For computer work, well-distributed diffuse light is best. The advantages of diffuse lighting are two-fold: There tend to be fewer hot spots, or glare surfaces, in the visual field, and the contrasts created by the shape of objects tend to be softer.

- Use light, matte colors and finishes on walls and ceilings in order to better reflect indirect lighting and reduce dark shadows and contrast.

Environment - Glare

Glare on the viewing screen may cause eyestrain, headaches and/or fatigue. The worker may not be conscious of the irritation; however, over the course of a long day, it can cause problems. The following sources of light may cause glare:



Direct Light

*Potential **Hazard**:*

Direct light sources (e.g., windows, overhead lights) that cause a reflected light to show up on the monitor.

*Possible **Solutions**:*

- Orient workstations so that light sources do not reflect on the screen. Position task lighting (e.g. desk lamp) such that the light does not reflect on the screen.
- Use blinds or drapes on windows to help reduce glare.
- Clean the monitor frequently. A layer of dust can contribute to glare.
- Screen glare filters that attach directly to the surface of the monitor can reduce glare (Fig. 1).
- Use barriers or light diffusers on fixtures to reduce glare from overhead lighting.
- Generally, a large number of low powered lamps rather than a small number of high powered lamps will result in less glare.

Reflected Light

*Potential **Hazard**:*

Reflected light from polished surfaces (e.g., keyboards) that may cause annoyance, discomfort, or loss in visual performance and visibility.

*Possible **Solutions**:*

- To limit reflection from walls and work surfaces around the screen, these areas should be painted a medium color and have a non-reflective finish. Workstations and lighting should be arranged to avoid reflected glare on the display screen or surrounding surfaces.
- Tilt the monitor down slightly; this will prevent it from reflecting overhead light.
- Use dark characters on a light background; they are less affected by reflections than are light characters on a dark background.