

# Evaluating your computer workstation

*How to make it work for you*



## Contributors

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# **Evaluating your computer workstation**

*How to make it work for you*



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# Introduction

## How is your computer workstation treating you?

How do you feel after spending a day working in front of a computer? Do you have sore eyes or headaches? Do your wrists, arms, shoulders, back, legs, or neck feel stiff or uncomfortable? You probably suspect computer work as the culprit but don't know how to prevent the discomfort — or you just accept it as part of the job.

The aches and pains that can result from working at a computer take days, weeks, or months to develop. They may eventually fade away or they may develop into chronic conditions such as carpal tunnel syndrome (injury to nerves in the wrist); tendinitis (swelling of the tendons) in the wrist or elbow; or tenosynovitis (swelling of the sheath around a tendon).

Computer work that makes you feel sore, stiff, or uncomfortable has one or more of the following causes:

**Repetitive movements** – for example, you type for long periods without rest.

**Awkward postures** – for example, your neck is bent too far forward or your wrists are bent too far back.

**Static posture** – you sit for long periods without getting up or stretching.

Working at a computer may not always be exciting, but it doesn't have to be uncomfortable. This guide helps you set up and use a computer workstation so that you're comfortable and productive.

### Do you have some of the aches and pains described below? Proper workstation layout and correct posture can prevent them.

#### **Upper back and neck discomfort.**

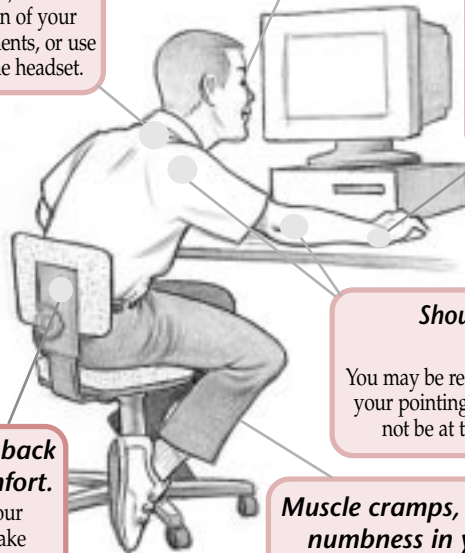
Adjust your chair, monitor, the position of your documents, or use a phone headset.

#### **Eyestrain, burning eyes, headache.**

Task lighting, viewing distance, monitor brightness, contrast level or font size may need adjusting.

#### **Wrist and hand discomfort.**

Straighten your wrists when you are typing or using a pointing device. Adjust keyboard slant or use a wrist rest.



#### **Shoulder or elbow discomfort.**

You may be reaching too far for your pointing device or it may not be at the proper height.

#### **Lower back discomfort.**

Adjust your chair or take more frequent rest breaks.

#### **Muscle cramps, aches, or numbness in your legs.**

Adjust your chair or seat back angle. You may need a footrest or more leg room.

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Part *One* tells you how to evaluate a computer workstation so you can set it up correctly. *Two* highlights solutions to common physical problems related to computer use and *Three* presents the health issues. You'll find checklists in *Four* to help you conduct a workstation evaluation and purchase appropriate workstation components.

## What is a computer workstation?

A computer workstation is the environment around your computer:

- **Furniture** – chair and desk or other work surface
- **Computer equipment** – computer, monitor or flat panel display, keyboard, mouse or pointing device
- **Accessories** – document holder, footrest, telephone, palm rest, mouse bridge
- **Ambient factors** – noise, illumination, glare, temperature, humidity, and static electricity

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### Examples of unfriendly computer workstations.

*Working at a computer may not always be exciting but it doesn't have to be uncomfortable.*



**How is your  
computer  
workstation  
treating you?**

# Evaluating your workstation

- Chair
- Work area
- Desk or work surface
- Keyboard
- Mice and other pointing devices
- Monitor
- Flat-panel displays
- Laptop computers
- Telephones
- Document holders
- Footrests
- Lighting and glare
- Temperature, humidity, and static electricity



## Chair

The chair is your foundation for comfortable computer work. It must fit you and be appropriate for your tasks. What to consider when selecting a chair:

**Stability.** Select a chair that has a five-point base.

**Seat pan.** The ideal seat pan allows two to three fingers' width (3-3.5 inches) from the front edge of the seat pan to the back of your lower leg at the knee when your back touches the backrest. The seat pan should allow your lower back to contact the backrest.



**Seat-pan padding and fabric.** Hard, unpadded seat pans are uncomfortable to sit on for more than an hour. Soft, deeply padded seat pans cause you to sink in too far, shifting pressure from the buttocks to surrounding tissues. The result is tension in the hip muscles.

The front edge of the seat pan should have a softly padded, rounded front edge (called a waterfall edge). Straight, unpadded edges compress thigh tissues and restrict blood circulation which can cause pain and numbness in the legs. Seat-cover fabric should be porous and breathable. A slippery seat pan will cause you to slide away from the backrest and provide little back support.

**Seat-pan angle.** The seat pan should adjust to reclining, flat, or forward angles – the three basic angles for seated work – so that you can achieve a comfortable posture.

**Backrest.** The backrest should be large enough to support your entire back, including the lumbar (lower back) region, but not so large that it interferes with your arms: 15 to 20 inches high and 13 inches wide is preferable. It should be adjustable for height and tilt and contour to the curve of your lower back. Most computer users tend to sit in an upright or slightly forward posture. Adjust the tilt angle so that the backrest touches your back.

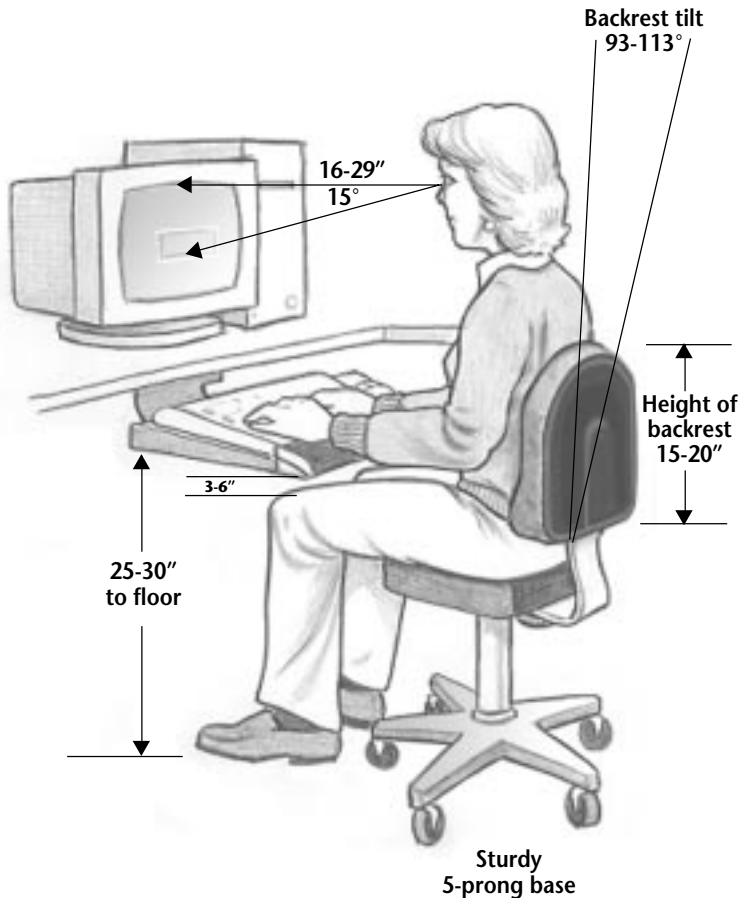


*The lower part of the backrest should support the curve of your lower back.*

## Chair (continued)

**Armrests.** Armrests should be adjustable and should not interfere with the work surface. You should be able to move in close to your work without losing support from the backrest. Your forearms should rest comfortably on the armrests, with your shoulders relaxed. If the armrests are too high they will elevate your shoulders and cause stiffness or pain in the shoulders and neck; if they're too low they promote slumping and leaning to one side. Remove armrests if you don't use them, if they interfere with your tasks, or if they can't be properly adjusted.

**Chair height.** You should be able to adjust the height of the seat pan so that your legs are at right angles and your feet rest flat on the floor. Your forearms should be horizontal and at right angles to your upper arms and your elbows should just clear the top of the work surface.

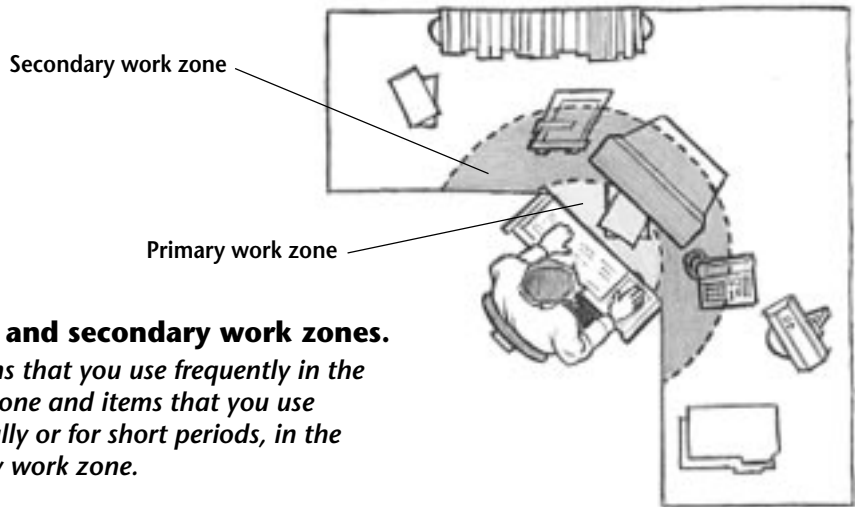


*Courtesy of the Workers' Compensation Board of British Columbia. Illustration used with permission.*

## Work area

How you organize the materials that you use to do computer work can affect your productivity and comfort. Your work area should be large enough to accommodate materials that you use often and to permit a full range of motions for tasks — *about 16 inches* in front of you or to your side. Place materials that you use occasionally farther away. Use storage areas such as overhead shelves, filing cabinets, and desk drawers for items that you use infrequently. Avoid storing items under your desk, which can take up leg space or strain your back when you retrieve them.

Take the time to organize materials that you use to do computer work. You'll be more efficient and reduce the number of times that you have to reach for them.



### **Primary and secondary work zones.**

*Place items that you use frequently in the primary zone and items that you use occasionally or for short periods, in the secondary work zone.*



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***Use overhead shelves, filing cabinets, and desk drawers for items that you use infrequently.***

## **Desk or work surface**

Select a stable, adjustable-height work surface that has a separate, adjustable keyboard platform or keyboard and mouse platform. Adjustable-height work surfaces and keyboard platforms accommodate different users and tasks.

If you can't adjust the height of your work surface, you should have a keyboard platform with adjustable height and angle; one that isn't adjustable may position you too far from the work surface. The platform must be wide enough for the keyboard and for a mouse or other pointing device; the height adjustment control should not interfere with your legs.

The work surface should have a matte finish to reduce glare. Beneath the surface there should be ample room for your legs — nothing to obstruct knees, legs, shins, or thighs.

### **Minimum work-surface depth, including space for a keyboard if it is not on a platform:**

- *24 inches*, flat-panel display
- *30 inches*, 13-inch monitor
- *40 inches*, 17-inch monitor

## Keyboard

The keyboard should be thin to help keep your wrists straight while you're typing. If you use a keyboard platform, choose one with adjustable height and angle.

Wrists and forearms should be relatively straight, slightly above the keyboard: your hands should be at or just below elbow height. Shoulders should be relaxed, elbows close to your body.

Matte-finished keyboard surfaces reduce reflection and eyestrain.

Keyboards can be fitted with palm rests that support your hands, minimize contact with table edges, and help keep your wrists straight. Make sure the palm rest supports your palms, not your wrists. The top of the palm rest should not be higher than the first row of keys on the keyboard.

Alternative keyboard designs are also available, including split and angled keyboards and keyboards with different key arrangements. Some computer users feel that these alternative keyboards reduce typing fatigue; they're not successful for all users, however. Proper chair height and work surface adjustments are more important than an alternative keyboard.



### Alternative keyboards:

*Split and left-hand numeric keypad.*

### **X** incorrect position



Don't bend your wrists up (shown) or down while keyboarding

### **✓** correct position



Your wrists should be straight while keyboarding.

### **✓** correct position



If your wrists are straight while keyboarding, you decrease the risk of injury.

### **✓** correct position



A palm rest – like the one shown here – can support your palms and wrists during rest periods from keying. Make sure you place the palm rest under your palms, not your wrists.

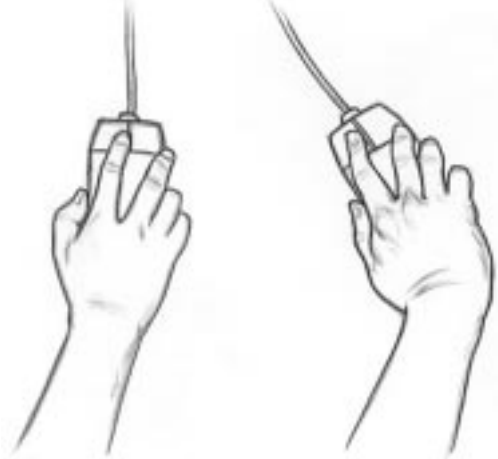
*Courtesy of the Workers' Compensation Board of British Columbia. Illustrations used with permission.*

## Mice and other pointing devices

Your mouse or pointing device should be at the same height as the keyboard, to either side of it. Your arm should be close to your body for support. Your hand, wrist, and forearm should be reasonably straight and slightly above the mouse. (A palm rest can help support your hands and keep your wrists straight.)

Other types of pointing devices include touch pads, mouse pens, glide points, mice that reorient the hand and wrist, and mice designed for either hand.

✓ correct position      ✗ incorrect position



*Keep your wrist straight during mouse work. Don't bend your wrist from side to side. Try to move your whole arm, instead.*



*"Palming" the mouse helps keep the wrist straight and reduces the small-wrist motions.*

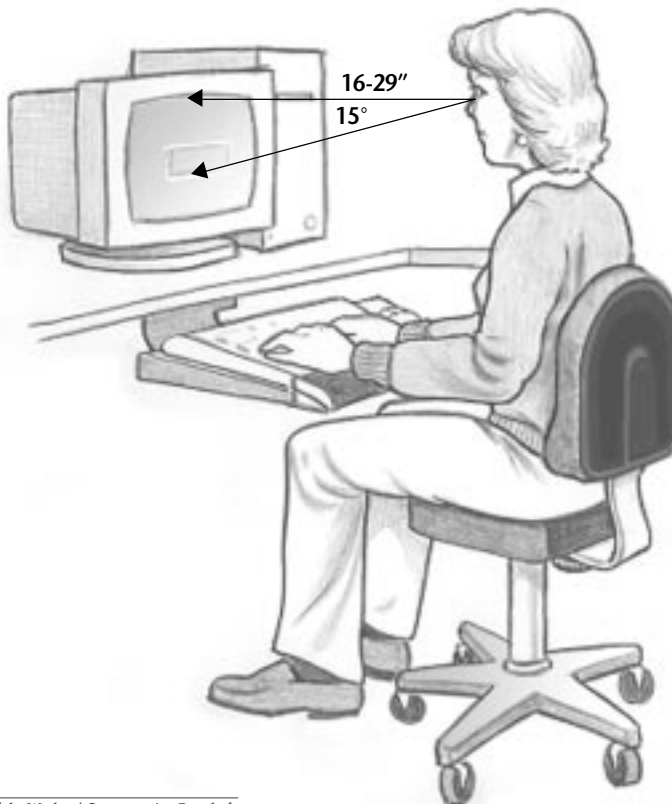
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## Monitor

The topmost active line of the monitor screen should be at or slightly below eye level. The topmost active line is the first line that you typically look at, not the top line of the status bar. The area of the screen that you look at most often should be about *15 degrees* below eye level. The distance between your eyes and the screen should be about an arm's length (*16-29 inches*) when your neck is straight.

If you wear bifocal, trifocal, or progressive lenses, you may want to position the monitor lower to avoid tilting your head back to read through the bottom portion of the lens. Monitors that swivel horizontally and tilt vertically enable you to achieve the best viewing angle. If you need more workstation space or if others will use the workstation, consider mounting the monitor on an adjustable arm.

The monitor should have brightness and contrast controls that are easy to adjust. Text characters should be easy to see, distinct, and not have a perceptible flicker or waiver. Regular screen cleaning also helps keep text and images clear.



*Courtesy of the Workers' Compensation Board of British Columbia. Illustration used with permission.*

## Flat-panel displays

Flat-panel displays are becoming increasingly common. Most practices that apply to traditional monitors also apply to flat panel displays; however, there are significant differences:

Flat panels free up work surface space and tend to offer more screen area, consume less power, and generate less heat than traditional monitors. Flat-panel displays also have a sharper image but are slower to respond to quickly moving images than traditional monitors. Flat-panel displays generally have lower screen contrast ratios than traditional monitors so they may be more prone to glare. Colors also may appear somewhat differently on flat panels; choose displays that offer the widest contrast ranges and color adjustments.



**Flat-panel display**



## Laptop computers

Laptop computers are not designed for prolonged use. The display, keyboard, and pointing device are close together which creates awkward wrist, arm, shoulder, and neck postures. If you use a laptop for prolonged periods, make yourself comfortable by doing the following:

- Plug a standard-size keyboard and mouse into the laptop.
- Place the keyboard and mouse at a comfortable height on a desk or work surface. (Your hands should be at or just below elbow height; wrists and forearms relatively straight, slightly above the keyboard.)
- Place the laptop on a platform or riser so that the display is at a comfortable height (the area of the screen that you look at most often should be about *15 degrees* below eye level).



### **Laptop monitor riser**

*A laptop riser makes screen viewing more comfortable and allows room for a standard-sized keyboard.*

## Telephones

If you use a phone frequently, place it close to you so you don't have to reach across the work surface for it. Try using a headset or a speaker phone if you have a tendency to cradle the phone between your ear and shoulder. Headsets also make it easier to refer to files or to use the computer while you're on the phone.

✓ correct position



✗ incorrect position



*If you use your phone frequently, use a headset to reduce awkward neck postures.*

## Document holders

A document holder should be stable and adjustable for height and angle of view. Place the document holder close to your screen and at the same height and viewing distance to reduce head, neck, or back strain as you look from screen to document. If a document is too heavy or won't fit a document holder, you can prop it up at an angle between the keyboard and screen if space is available.



*When entering data from a large document, prop the document up in front of you.*



*If you need to look back and forth between your monitor and a document, place your document on a document holder, close to and at the same height and viewing distance as your screen.*

*Typing from documents placed to your side can cause awkward trunk or neck postures.*

**X incorrect position**



## Footrests

When you sit in a properly adjusted chair your feet should be flat on the floor. If not, support them with an angled (no more than *30 degrees*) footrest that doesn't restrict leg movement. Don't use your chair base as a footrest.

### What to look for when selecting a footrest:

- Stable, portable, incline-adjustable.
- Large enough to support the soles of both feet.
- Covered with nonslip material.



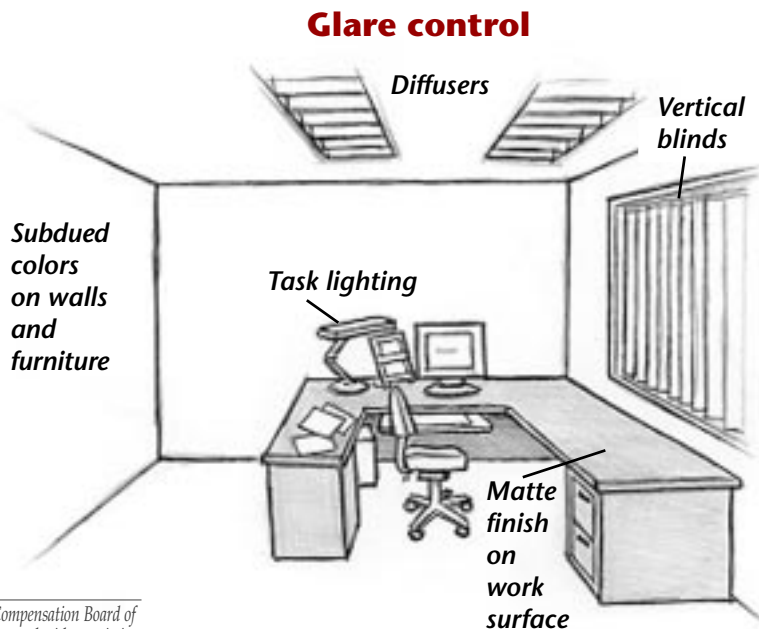
## Lighting and glare

A brightly-illuminated work area will wash out the images on a computer screen because the monitor produces its own illumination and contrast. Computer workstations should have lower light levels than typical office areas. Illumination should be 20-50 foot-candles for screen viewing and 50-70 foot-candles for reading printed documents. Foot-candle? Lighting intensity is commonly measured in foot candles. A foot candle is the illumination produced by one candle at a distance of one foot. The most practical way to measure illumination is with a light meter.

Your workstation should be located away from and at right angles to windows; windows should have adjustable blinds or drapes to reduce glare and eye fatigue. (Vertical blinds reduce glare more effectively than horizontal blinds.) Walls, furniture, and equipment near a monitor or display screen should have nonreflective, subdued colors to minimize glare.

Light fixtures near computers should have diffusers, cube louvers, or parabolic louvers. Recessed or indirect lighting systems can eliminate glare and reflections but are not suitable for all computer work areas. Workstations should be spaced between rows of overhead lights to reduce glare and reflection.

If glare is still a problem, attach a visor hood to the monitor. Use anti-glare screens as a last resort because they can blur screen images and reduce contrast. Most newer monitors have tinted screens to control glare.



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## **Temperature, humidity, and static electricity**

Avoid overcrowding computer work areas. Set thermostats to maintain temperature levels between *68 and 72 degrees*. Relative humidity should be *40-60 percent*. Use antistatic floor mats or other static dissipaters in low-humidity workplaces.

# Problems and solutions

- Back
- Neck
- Shoulder
- Mouse use
- Forearm and hand
- Leg
- Vision

## Back

Back pain is a common complaint among computer users. Common causes:

### Chair lacks lower-back support

A chair that fails to support the lumbar (lower) region of the spine is a common cause of back discomfort; 35 percent more pressure can be placed on an unsupported lower back. The normal alignment of the spine is an S-shaped curve: an inward curve at the neck, an outward curve in 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. As a person sits, the bottom of the hipbone contacts the chair first. The hip rotates, flattening the curve in the lower part of the back; the spinal discs stretch from the vertebrae causing back pain.

**Solution:** Select a chair that provides good low-back support. A chair that maintains the normal alignment of the lower spine will relieve fatigue and discomfort. Adjusting seat pan tilt also helps align the lumbar spine.

A straight-back chair provides little or no support. Sitting in such a chair causes back fatigue from the effort required to maintain a comfortable posture.

**Solution:** Select a chair that has a tiltable backrest; a tiltable backrest permits you to change postures and reduces muscular fatigue. A slight backward tilt helps reduce the flattening of the lower spine.



*A back rest should provide good low-back support.*



## **Back (continued)**

### **Chair is too soft or too hard**

If you're like most computer users, you spend most of your work time sitting. If your chair is too soft, you sink into the seat pan which restricts your movement and causes thigh, buttocks, and lower back fatigue. When your chair is too hard, you may need to change postures frequently to relieve thigh and buttock discomfort.

**Solution:** If possible, try out different chairs with similar features and select the one that feels most comfortable.

### **Monitor is too low**

When your monitor is too low, you tend to bend your head forward, slouch, or lower your chair to improve viewing. Tilting the monitor up too much can increase glare from overhead lighting.

**Solution:** Raise the monitor to the correct viewing height; the topmost active line of text displayed on the screen should be at or just below your eye level.

## Neck

Neck strain is often related to improper monitor height, poor placement of documents, or improper positioning a document holder.

### **Improper monitor height**

A monitor that is too high or too low will cause you to bend your neck backward or forward to read text on screen. If you wear bifocals, trifocals, or progressive lenses, you may also tilt your head back to read through the bottom portion of the lenses.

**Solution:** Lower or raise the monitor so that you don't have to bend your neck or tilt your head to read text.

### **Poor placement of documents**

Documents placed flat and off to the side of the work surface cause forward bending and twisting of the neck and trunk.

**Solution:** Use an adjustable document holder. Position it close to and at the same height and viewing distance as the monitor screen — or between the keyboard and monitor if space is available.

### **Improperly positioned document holder**

The document holder is too far away from the monitor screen.

**Solution:** The monitor screen and document holder should be close together and the same distance from your eyes so that you can look from screen to document without excessive neck or back movement.

## Shoulder

Working with your arms too high or low can cause shoulder pain. When your arms are too high, they pull your shoulders up, straining shoulder and back muscles. When your arms are too low, they pull your shoulders down, putting pressure on the shoulder and back muscles and compressing nerves in the neck and arms.

### **Keyboard is too high or too low**

**Solution:** Adjust the keyboard or chair so that your hands are at or just below elbow height; wrists and forearms should be in a reasonably straight line, slightly above the keyboard. Your shoulders should be relaxed, your elbows next to your body.

### **Chair armrests are too high or too low**

**Solution:** Remove the armrests if you can't adjust them to a comfortable height; if they're permanently attached to the chair, replace the chair with one that has adjustable armrests.

## Mouse use

### Shoulder or arm discomfort

You could develop a sore shoulder from prolonged reaching if the mouse is too far away from your keyboard.

**Solution:** Place the mouse next to the keyboard so that your shoulders are relaxed, your wrists are straight, and your elbows are by your side.

If you don't use the ten-key portion of your keyboard consider a mouse bridge, a simple platform that rests over the keypad. Using the mouse on the bridge reduces the need to reach for the mouse.

### Hand and finger discomfort

How do you move your mouse? Holding the mouse too tightly or resting your wrist on the edge of the work surface can cause pain in your hand or fingers.

#### Solutions:

- Your elbow, rather than your wrist, should pivot when you move the mouse.
- Use a palm rest to support your hand and to keep your hand and wrist straight.
- Use less force to hold and operate the mouse.
- Alternate mouse commands with key commands.
- Position the mouse on the opposite end of the keyboard and operate it with your other hand. (Some mice are designed to be used with either hand.)
- Try a different input device — one that positions shoulder, arm, hand, and wrist more comfortably than a mouse.

*If you don't use the ten-key pad on your keyboard, consider a mouse bridge to reduce reaching for the mouse.*





## **Forearm and hand**

Discomfort can occur if your hands aren't in line with your forearms or if sharp work surface edges press against your palms, wrists, or forearms.

### **Keyboard is too thick, too low, or too high**

**Solution:** Use a thin keyboard to keep your hands in line with your forearms. Adjustable-height and sloped keyboard platforms make correct hand and wrist posture easier to achieve.

### **Wrists rest on the work surface**

Some keyboard users support their wrists on the work surface as they type. This can cause backward bending of the wrist and pressure on the wrists and palms.

**Solution:** Choose work surfaces that have round edges or use a palm rest. A palm rest will support the heel of your hand and minimize wrist bending. The top of the palm rest should not be higher than the first row of keys.

## Leg

### Edge of the seat pan presses against the thighs

**Solution:** Adjust the seat-pan height so that your feet are flat on the floor; use a footrest if your feet aren't flat on the floor. (The ideal seat-pan length allows two to three finger widths from the front edge to the back of your knee.)

### Excessive knee bending

Avoid using the base of your chair as a footrest. Doing so can cause your knees to bend too much.

**Solution:** Adjust the height of the chair so that your feet rest flat on the floor. Use a footrest, if necessary.



## Vision

### **Burning eyes, blurred vision, irritated eyes, headaches**

**Solution:** The minimum distance from your eyes to the screen should be *16 inches*. Take a short rest break (3-5 minutes) for each hour of continuous computer work; get up and stretch, move about, or do other work. Periodically focusing on distant objects also relaxes eye muscles.

### **Uncorrected or improperly corrected vision**

Uncorrected or improperly corrected vision can cause or contribute to vision problems.

**Solution:** When getting fitted for glasses, tell your eye-care specialist that you do computer work. The following information will be helpful to your specialist: the size of your monitor screen, the distance from your eyes to the screen, average hours per day that you spend using a computer, and the tasks that you do on the computer.

### **Wearing bifocals or trifocals**

If you wear bifocals or trifocals do you tilt your head back to read text on the monitor screen through the bottom of the lenses? This can strain your neck muscles.

**Solution:** Adjust the height of the monitor so that you don't have to tilt your head back or wear lenses made specifically for computer use.

### **Poor lighting**

Too much light and too little light contribute to vision problems.

**Solution:** The ideal illumination for computer work should be *20-50 foot-candles* for screen viewing; *50-70 foot-candles* for reading printed documents. The most practical way to measure illumination is with a light meter.

## Vision (continued)

### Glare

Harsh bright light that reflects off the computer screen can cause eyestrain, headache, and loss of concentration. Typical sources of glare are ceiling lighting, windows, and other bright lights. Glare reflected from flat panel displays may be harder to control than glare from traditional monitor screens.

#### Solutions:

- Dim or turn off overhead lights and use a task light.
- Face matte-finished, dark-colored walls when you do computer work.
- Adjust the monitor screen slightly — upward, downward, to the left, or right. Too much screen deviation, however, can cause neck problems.
- Position computer workstations at right angles to windows, between rows of overhead lights.
- Attach a visor hood to the monitor.
- Use draperies or blinds over windows.



# Health concerns

- Fatigue
- Vision
- Noise
- Radiation
- Pregnancy

## Fatigue

If you work all day at a computer, get up and move frequently to reduce fatigue. A three- to five-minute break after each hour of intense computer work and a 10-15-minute break after two hours of moderate computer work should be sufficient.

Daily stretching exercises can help reduce muscle tension and eyestrain, but stretching doesn't take the place of a properly set up workstation or cure existing discomfort. The stretches below take about five minutes. Repeat each stretch three to five times. Do all of the exercises or just those that relieve tension in a particular area.

If you have concerns about an existing medical condition or injury, see your physician before you do any of these exercises.



### Neck

- *Move your head back as far as it will go, keeping your head and ears level. Next, move your head forward. Repeat three times.*
- *Shrug your shoulders, raising them for a count of three, then lowering them. Rotate your shoulders backwards, arms relaxed at your sides. Repeat three times.*



### Shoulders

- *Squeeze your shoulder blades together with your elbows lifted away from your body. Imagine you have a pencil between your shoulder blades and you are trying to trap it and then release it.*



### **Back**

- *Hold your arms straight in front of you and stretch them forward. Raise your arms above your shoulders and stretch them upward.*
- *Sit relaxed, feet flat on the floor. Imagine a cable attached to the top of your head pulling you up. Hold for a count of three, then relax. Repeat three times.*



### **Wrist and hands**

- *Clench your fists, then release them, spreading out your fingers. Hold each position for a count of three.*
- *In a sitting or standing posture, drop your arms to your side. Gently shake out your arms and hands.*



### **Lower back**

- *From a seated posture, lift your leg, leaving your knee bent slightly. Rotate your ankle slowly. Point your toes and then pull them toward your shin.*
- *Stand up and take a short walk.*



## **Vision**

You should have regular eye exams. Be sure to tell the examining ophthalmologist or optometrist that you do computer work. Other useful information to have for the examination: the size of your monitor screen, the distance from your eyes to the screen, average hours per day you use a computer, and the tasks that you do on the computer. Book reading and computer viewing may require different prescriptions.

## Noise

Annoying noise from computers and other workstation equipment – even at low levels – creates stress and lowers productivity. Sources of noise include keyboard typing, computer fans and CD drives, copy machines, and printers. Generally, sound levels in an office environment should be below 70 decibels (dBA) measured at the workstation.

### **Ways to control noise at computer workstations:**

- Install acoustic pads under keyboards.
- Cover impact and ink-jet printers with acoustic covers or install acoustic pads under them.
- Use partitions to help isolate or attenuate noise. Carpeting, drapery, and upholstery also help control noise.



## **Radiation**

Radiation is distinguished by its frequency. High-frequency radiation (such as X-rays) is called ionizing radiation. It can disrupt the normal chemical structure and function of cells in the body. Studies show that ionizing radiation emissions from computers are negligible and not a health hazard.

Lower-frequency radiation is called non-ionizing radiation and includes ultraviolet radiation, visible light, infrared radiation, microwaves, radio frequency, and sub-radio frequency radiation. All electrical equipment can produce non-ionizing radiation. Computer monitors have internal shielding that reduces non-ionizing radiation to safe levels. Computer users who sit at typical distances from their monitors receive extremely low exposures. Current research suggests there are few, if any, health effects caused by non-ionizing radiation among computer users.

## **Pregnancy**

Although concerns about on-the-job hazards related to computer work during pregnancy have increased, there is insufficient evidence that exposure to computer electromagnetic fields (non-ionizing radiation) may cause birth defects and miscarriages.

A 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 using computers in the workplace. The conventional scientific opinion is that computer use is not a radiation hazard for the pregnant worker. However, computer workstations and work tasks may have to be modified to accommodate pregnant workers. Poor work postures and job stress associated with prolonged or intense computer work should be of more concern for those who do computer work.

# Evaluation checklist

## Work posture

- Head and neck are upright or in line with the torso (not bent down or back).
- Head, neck, and trunk face forward (not twisted).
- Trunk is perpendicular to the floor (may lean back into backrest but not forward).
- Shoulders and upper arms are in line with the torso, perpendicular to the floor, and relaxed.
- Upper arms and elbows are close to the body (not extended outward).
- Forearms, wrists, and hands are straight and in line.
- Wrists and hands are straight (not bent up, down, or sideways).
- Thighs are parallel to the floor and the lower legs are roughly perpendicular to floor.
- Feet rest flat on the floor or are supported by a stable footrest.
- Alternate computer tasks and other activities or take short breaks to reduce fatigue.

## Chair

- Backrest supports the lower back (lumbar area).
- Seat pan width and depth accommodate the user (seat pan not too big or small).
- Seat pan does not press against the back of the knees and lower legs (seat pan not too long).
- Seat pan is cushioned and rounded with a “waterfall” front (no sharp edge).
- Armrests, if used, support the forearms and do not restrict movement.



## Evaluation checklist (continued)

### Keyboard and pointing device

- The keyboard platform is stable and large enough to hold a keyboard and a pointing device.
- The pointing device is next to the keyboard so it can be operated without reaching.
- The pointing device is easy to activate and fits the hand comfortably.
- Wrists and hands do not rest on sharp or hard edges.

### Monitor

- The top of the screen is at or below eye level so that it can be read without bending the neck.
- Those who wear bifocal or trifocal lenses can read the screen without bending the neck.
- The monitor distance allows one to read the screen without leaning forward or backward.
- The monitor is directly in front of the user.
- Glare from windows or other light sources does not interfere with text or images on the screen.

### Desk or other work surface

- There is enough space between the top of the user's thighs and the work surface or keyboard platform so that the thighs aren't trapped.
- There is enough space under the work surface for the legs and feet so that the user can get close enough to the keyboard to type comfortably.

### Accessories

- The document holder is stable and large enough to hold documents.
- The document holder is about the same height and distance from the user as the monitor screen.
- Palm rests are padded and free of sharp or square edges.
- Palm rests allow the forearms, wrists, and hands to remain in a straight line.
- A telephone can be used with the head upright (not bent) and the shoulders relaxed.

# Purchasing checklist

## Monitor

- The screen should be large enough to read text easily; generally, a 15-inch to 20-inch monitor is sufficient.
- The angle and tilt should be easy to adjust.
- Flat-panel displays take less space on desks or other work surfaces with limited space.

## Keyboard

- A split keyboard design may help users maintain neutral wrist postures.
- The electrical cord that plugs into the computer should be long enough to allow the user to place the keyboard and the computer in a variety of comfortable positions. At least six feet of cord is desirable.
- Consider a keyboard without a numeric keypad if the task does not require one. If the task requires one occasionally, a keyboard with a separate numeric keypad may be appropriate. Keyboards without keypads allow the user to place a mouse closer to the keyboard.
- Consider keyboards without built-in palm rests; separate palm rests are usually better.

## Keyboard platform

- Consider the shape and size of the keyboard if a keyboard platform is used. The keyboard should fit comfortably on the platform.
- Keyboard platforms should be wide enough and deep enough to accommodate the keyboard and a mouse or other pointing device.
- The minimum vertical adjustment range for a keyboard platform should be 22 inches to 28 inches from the floor.
- Keyboard platforms should have adjustment mechanisms that lock into position without turning knobs. Knobs are frequently overtightened, which can strip the threads and may be difficult for users to loosen.

## Purchasing checklist (continued)

### Desk or other work surface

- The work surface should accommodate a monitor 16-29 inches in front of the user's eyes.
- The work surface should be deep enough to accommodate a monitor and a keyboard; about 24 inches for flat panel displays; 30 inches for traditional monitors.
- Work-surface height should be adjustable between 20 inches and 30 inches. The surface should be at about elbow height when the user is seated with feet flat on the floor. A fixed-height work surface used by more than one person should have a height-adjustable keyboard platform.
- There should be sufficient space under the work surface for the user's legs. The minimum depth should be 15 inches for knees and 24 inches for feet. Minimum width should be 20 inches.
- Work surfaces should have a matte finish to minimize glare. Avoid glass tops.
- Avoid sharp leading edges where arms contact work surfaces. Choose rounded or sloping surfaces.

### Chair

- The chair should be easy to adjust.
- The chair should have a sturdy five-legged base and casters that roll easily over the floor or carpet.
- The chair should swivel 360 degrees so it is easier to reach items around the workstation without twisting.
- Minimum seat height is about 16 inches.
- Seat pan length is 15 inches to 17 inches.
- Minimum seat-pan width is about 18 inches, or at least as wide as the user's thighs.
- Chair edges should be padded and contoured for support.
- Seat-pan tilt should have a minimum adjustable range of 5 degrees forward and backward.
- Avoid severely contoured seat pans; they restrict seated postures and are uncomfortable for many users.
- The front edge of the seat pan should be rounded.

## Purchasing checklist (continued)

### Chair (continued)

- The seat pan and seat back material should be firm, breathable, and resilient.
- Seat-pan depth should be adjustable. Some chairs have seat pans that slide forward and backward and a fixed-position back. On other chairs, the seat-pan position is fixed and the backrest moves forward and backward to adjust the seat-pan depth. Avoid chairs with backs that only tilt forward and backward; these do not accommodate a wide range of users.
- The backrest should be at least 15 inches high and 12 inches wide and should provide lumbar support that matches the curve of the user's lower back.
- The backrest should widen at its base and curve in from the sides to conform to the user's body and minimize interference with the arms.
- The backrest should allow the user to recline at least 15 degrees and should lock in place.
- The backrest should extend high enough to support the upper trunk, shoulders, and neck. Backrests that recline more than 30 degrees from vertical should have headrests.
- Armrests should be removable and at least 16 inches apart; the distance between them should be adjustable.
- Armrest height should adjust between 7 and 10.5 inches from the seat pan. Avoid fixed-height armrests on chairs intended for more than one user.
- Armrests should have sufficient length and width to support the user's forearms but not interfere with the work surface.
- Armrests should be padded and soft.
- Users who weigh more than 275 pounds may need chairs designed to support the weight; most chairs are designed for users who weigh less than 275 pounds.

### Document holder

- The document holder should have adjustable heights, positions, distances, and viewing angles.

## Purchasing checklist (continued)

### Palm rest

- The palm rest should match the front edge of the keyboard in width, height, slope, and contour.
- The pad should be soft but firm.
- The palm rest should be at least 1.5 inches back from the keyboard to minimize pressure on the wrists and forearms.

### Mouse

- A mouse should match the contour of the user's hand and have sufficient cord length to be placed next to the keyboard. A mouse with sensitivity adjustment that can be used with either hand is desirable.

### Telephone

- Consider hands-free headsets for those who use telephones and computers simultaneously. Hands-free headsets should have volume adjustments and volume limits.
- The telephone should have a speaker feature for hands-free use.

### Desk lighting

- The location, angle, and intensity of the light should be adjustable. The base should be large enough to allow a range of positions or extensions.
- The light should have a hood or filter to direct or diffuse the light.

## Resources

### **Center for Research on Occupational and Environmental Toxicology (CROET)**

- Office ergonomics: [www.croetweb.com](http://www.croetweb.com)

### **Ergoweb**

- [ergoweb.com](http://ergoweb.com)

### **Occupational safety and health administration (OSHA)**

- [www.osha.gov](http://www.osha.gov)

### **Office ergonomics training**

- [www.office-ergo.com](http://www.office-ergo.com)

### **The National Institute for Occupational Safety and Health**

- Ergonomics and musculoskeletal disorders: [www.cdc.gov/niosh](http://www.cdc.gov/niosh)

### **Typing Injury FAQ**

- [www.tifaq.com](http://www.tifaq.com)

## OR-OSHA Services

### **OR-OSHA offers a wide variety of safety and health services to employers and employees:**

#### **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.
- Coordinates and provides technical training on topics like confined space, ergonomics, lockout/tagout, and excavations.
- Provides workshops covering basic safety-and-health-program management, safety committees, accident investigation, and job-safety analysis.
- Manages the Safety and Health Education and Training Grant Program, which awards grants to industrial and labor groups to develop occupational-safety-and-health training materials for Oregon workers.

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### For more information, call the OR-OSHA office nearest you.

(All phone numbers are voice and TTY.)

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Salem, OR 97301-3882

**Phone:** (503) 378-3272

**Toll-free:** (800) 922-2689

**Fax:** (503) 947-7461

**en Español:** (800) 843-8086

**Web site:** [www.orosha.org](http://www.orosha.org)

#### **Portland**

1750 NW Naito Parkway, Ste. 112  
Portland, OR 97209-2533

(503) 229-5910

*Consultation:* (503) 229-6193

#### **Salem**

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Salem, OR 97310-1330

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#### **Eugene**

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(541) 686-7562

*Consultation:* (541) 686-7913

#### **Bend**

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Bend, OR 97701-4374

(541) 388-6066

*Consultation:* (541) 388-6068

#### **Medford**

1840 Barnett Rd., Ste. D  
Medford, OR 97504-8250

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