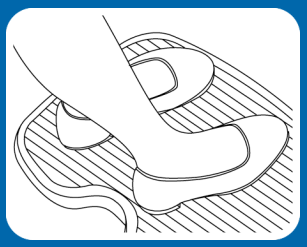

Workplace Ergonomics Reference Guide 2nd Edition

A Publication of the Computer/Electronic Accommodations Program

Real Solutions for Real Needs

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The Workplace Ergonomics Reference Guide is based on literature by and experiences of professionals in the field of design, ergonomics, and clinical medicine. No guarantee of the accuracy or completeness of the information in this Workbook or its acceptability or compliance with any mandatory requirement of any code, law, or regulation is either intended or implied. Products described in this Workbook are included only as examples, and no endorsement, recommendation, or evaluation of these products or their use is intended or implied.

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Introduction

Welcome to *The Workplace Ergonomics Reference Guide*. This is a publication of the Computer/Electronic Accommodations Program (CAP) Work Life Wellness Program. This guide provides illustrations of proper workstation ergonomics and a checklist for implementation of these strategies as well as tips for prevention of repetitive stress injuries. Ensuring proper ergonomics in the workplace is a smart business decision because it increases employee productivity and satisfaction.

CAP works to ensure that people with disabilities have equal access to the information environment and opportunities in the Department of Defense and throughout the Federal government. While CAP's focus is to provide assistive technology to accommodate people with a disabling condition, such as carpal tunnel syndrome (or other repetitive stress injuries), we prefer to take a proactive approach to these issues by educating our customers on prevention of the repetitive stress injuries that can result from workstations that lack proper ergonomic configuration. This strategy can diminish the severity of ergonomic-related injuries or eliminate the need for accommodation altogether.

After reviewing *The Workplace Ergonomics Reference Guide*, please consult the list of related organizations for additional information on workplace ergonomics. If you would like to speak to someone regarding an ergonomic needs assessment, please contact CAPTEC at 703-693-5160 (Voice), 703-693-6189 (TTY), or CAPTEC@tma.osd.mil.

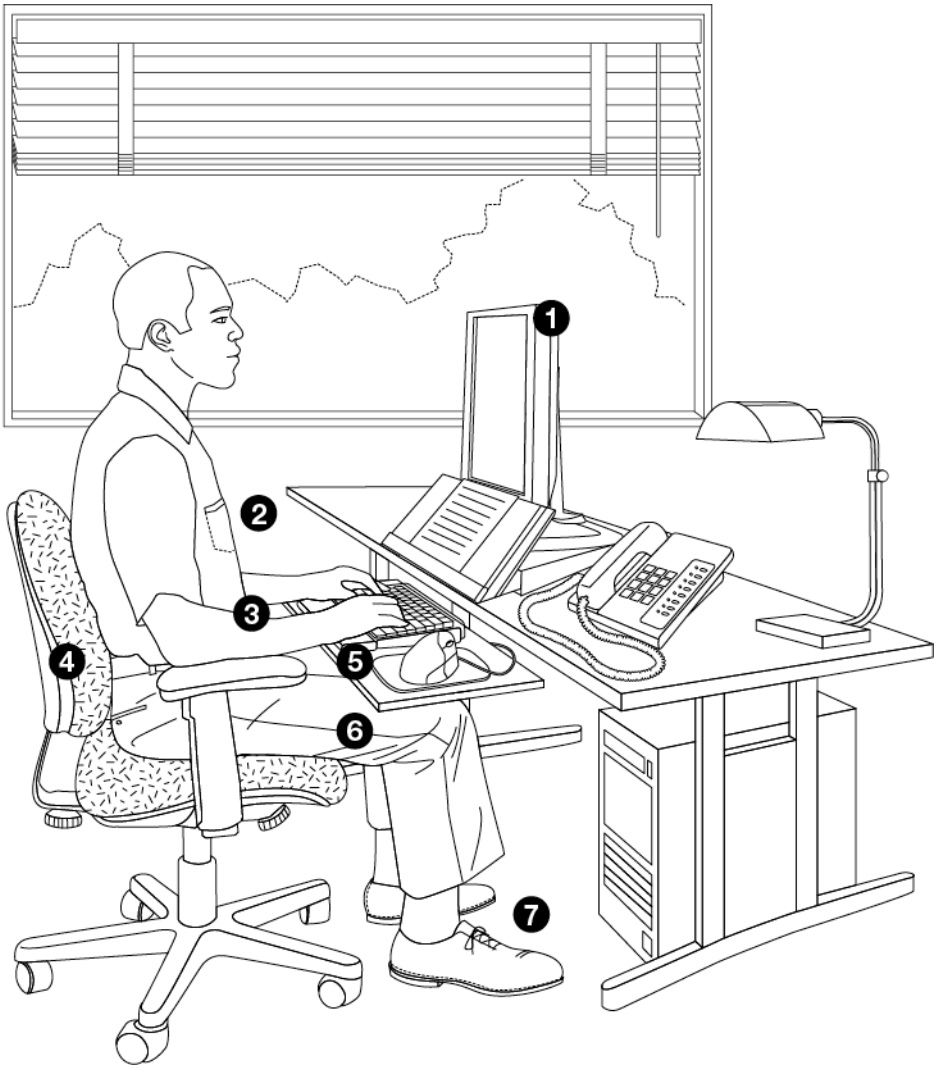
What is Ergonomics?

Ergonomics is the field of study that seeks to fit the job to the person, rather than the person to the job. This is achieved through the evaluation and design of workplaces, environments, job tasks, equipment, and processes in relationship to human capabilities and interactions in the workplace. Anytime there is a change in the workplace (new employee, new chair, new desk), new ergonomic solutions are required. It is important that all furniture (chairs, desks) and other accessories are adjustable in order to meet individual worker's needs, for no two people are alike. Ergonomics covers the entire work area, including issues regarding the chair, workstation, and lighting.

Effective use of ergonomic practices will assist in maintaining high levels of productivity, avoiding painful and costly employee injuries, and increasing worker satisfaction. By designing the job around the person, employees will have a decreased risk of injury and an improved perception of their "employee-centered" role at work.

Workstation Review

1. **Monitor Screen Top**
   Slightly below eye level
2. **Body**
   Centered in front of the monitor and keyboard
3. **Forearms**
   Level or tilted-up slightly
4. **Lower Back**
   Supported by chair
5. **Wrists**
   Should not rest while typing
6. **Legs**
   Horizontal
7. **Feet**
   Resting flat on the floor or footrest



Ergonomic Checklist

This checklist is designed as a quick overview to assist you in assessing your workstation. If you answer “no” to any of these questions you should refer to *The Workplace Ergonomics Reference Guide* and make adjustments to that area of your workstation. Please use this checklist to evaluate how to use any ergonomic equipment you may have received.

		Yes	No
1.	Is the workstation adjusted so that your wrist is in a neutral position, i.e., not bent up or down?		
2.	If documents are referred to, is there an adequate document holder?		
3.	If telephone duties are performed, is a headset, phone rest, or speakerphone used?		
4.	Are your most frequently used items within easy reach?		
5.	Is the top of your monitor parallel to your eyes?		
6.	Is your monitor screen placed in such a way that light from windows and overhead lighting does not cause glare? If not, are glare screens used?		
7.	Are you able to operate the pointing device without extended, long duration, or repetitive reaching?		
8.	Is your pointing device (e.g. mouse) on the same plane as the keyboard and in a comfortable position?		
9.	Is the seat height adjustable so that the entire sole of your foot rests on the floor or footrest, and the back of the knee is slightly higher than the seat of the chair?		
10.	Does your chair have five or more legs?		
11.	Are the lighting levels in your workspace comfortable?		
12.	Is your workspace free from excessive heat, cold, vibration, and noise?		
13.	Do you take short breaks while key-stroking?		

Ergonomic Needs Assessment

Chair

Experts agree that your chair is perhaps the single most important component of a healthy working environment. In fact, it is what most people should adjust first - before modifying their keyboard or monitor position.

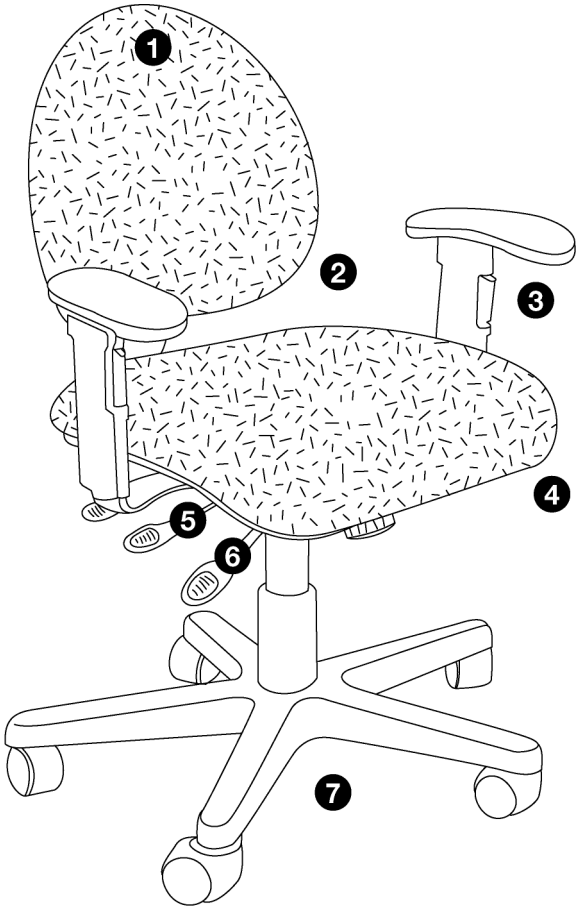
If you do not have an adjustable chair, you may need to think creatively to obtain an ideal sitting posture. Lumbar support cushions and footrests are ideal solutions.

Features of an Ergonomic Chair

The mechanisms for adjusting the chair should be easy to locate and adjust with one hand while seated. One should understand the functions of the mechanisms, and know how to operate them.

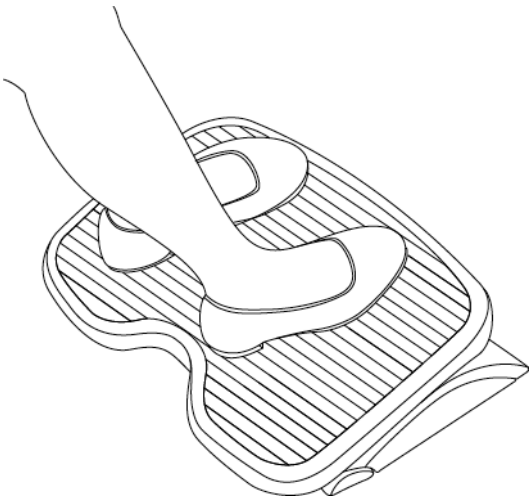
> **!** Ergo Tip: Fully adjustable chairs are essential to an ergonomic environment.

1. Breathable, medium texture upholstery
2. Adjustable lumbar support that moves up/down and forward/backward
3. Adjustable armrests that move up/down and inward/outward
4. Seat pan with a rounded front edge (waterfall design)
5. Adjustable seat pan that moves up and down and tilts forward and backward
6. A tilt mechanism that tilts backward and forward
7. Five-caster base and full 360-degree swivel



Proper Seating Adjustments

- First adjust the chair height for the user and then adjust the work surface to accommodate the chair.
- When working at the keyboard, adjust the seat pan height so that your elbows are the same height as the home row of the keyboard and so the wrists are neutral while typing.
- Adjust the height of the seat pan so that the highest point of the seat is just below the kneecap.
- For adequate thigh support, adjust the depth of the seat by moving the backrest forward and backward so that the clearance between the front edge of the seat and the lower part of the legs fits comfortably.
- Adjust the armrest height so that your elbows rest lightly on the armrests with your upper arms straight up and down and your forearms horizontal or slightly downward.
- Adjust the height of the backrest so that it supports the small of the lower back. Note: back of chair should not “give” when the user leans back in the chair.



- Feet should rest flat on the floor. If your feet do not rest flat on the floor after properly adjusting your chair, a footrest should be used.

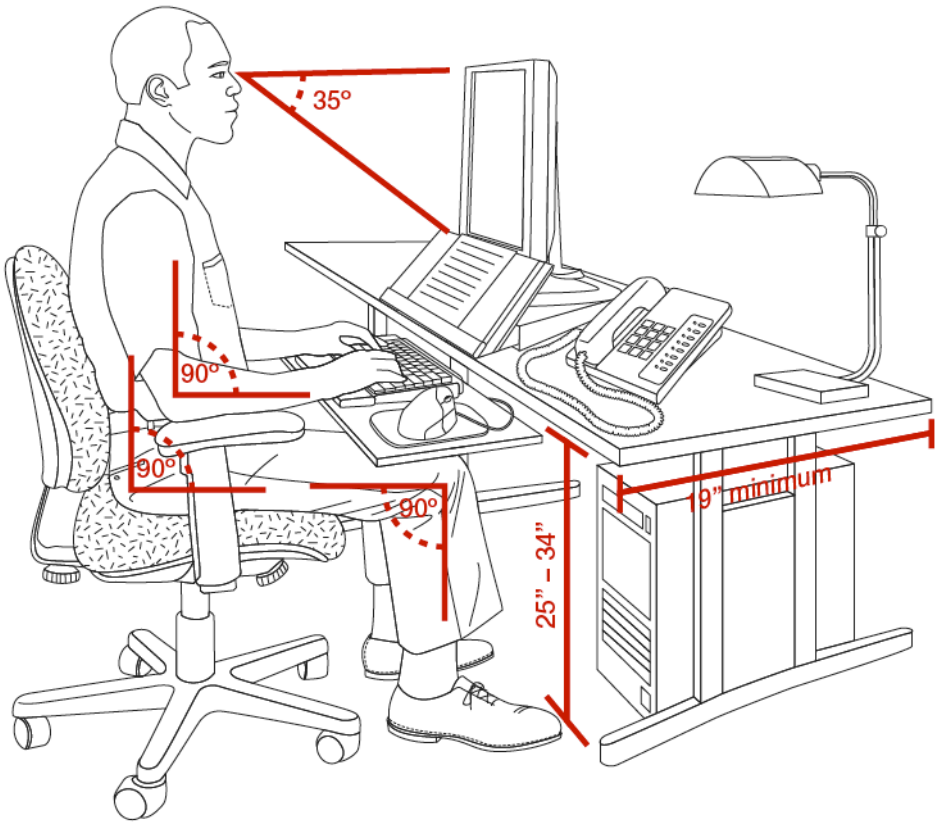
Preventing Posture Problems

- Ensure that your chair and workstation are adjusted properly.
- Place frequently used items within an easy arm’s reach and items that are used less often further away.
- Avoid long periods of working in one position and repeating the same motions.
- Vary tasks to change body position.
- Eliminate monitor glare by properly positioning your desk (perpendicular to window) and adjusting your lighting for specific tasks.

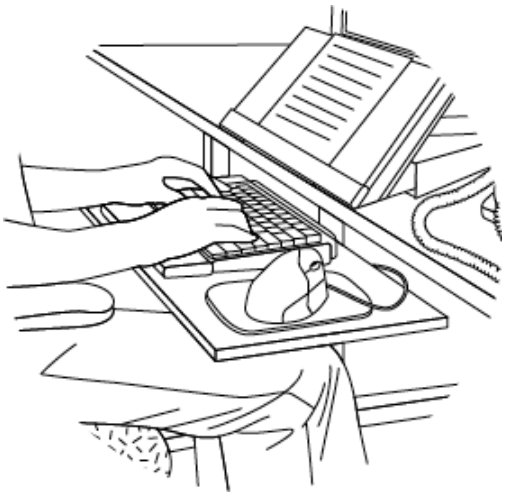
Workstation

Proper Work Surface Setup

- The work surface should be installed/adjusted to be approximately 25” - 34” high for seated work and to fit a range of operator sizes (ensure that adjustments can be made easily).
- The space beneath the work surface should have sufficient room above your legs to allow for a range of body postures. The knee well should be 30” by 19” deep.
- The work surface should have adequate space for equipment (monitor, telephone, stapler, tape dispenser) to be located close to the user to minimize bending, flexing, or twisting of arms, wrists, or hands.
- A matte finish on the work surface is ideal to reduce light reflection.
- The keyboard and mouse should be placed together on a platform that is at least 28” wide, directly in front of you and directly beneath the monitor.
- The keyboard and mouse platform should easily move side to side, up and down, in and out, and lock securely in place.
- The height of the keyboard/mouse platform should allow your hands to rest lightly on keyboard or mouse with your forearms using the chair armrests for support.



Keyboard & Mouse Adjustments



- The keyboard height should allow straight wrists and a 90-degree angle between the upper arm and the forearm (angle should adjust by 20-degrees up or down for individual preference and periodic adjustment).
- The keyboard height and angle should be adjustable (reverse slope).
- The keyboard and mouse should have a wrist rest and/or mouse rest available for support when taking mini-breaks.
- The standard keyboard should be replaced with an alternative keyboard (split-key) and alternative mouse (trackball or touchpad) if a musculoskeletal disorder develops.
- The keyboard should be able to support "short-cut software" (macros).

Ergo Tip: "Wrist rests" are misleading. One should only use a wrist rest while taking a break from typing!

Peripheral Items

- Ensure peripheral items that are used most frequently are placed closest to the user so that they can be conveniently and comfortably reached.
- Use an in-line document holder that sits between the keyboard/keyboard tray and screen and is aligned with your body midline so that all you have to do is look down to see the documents and raise your eyes to see the screen.
- Use a screen-mounted document holder and position this to the same side of your screen as your dominant eye.
- Use a freestanding document holder and position this next to the side of the screen and slightly angle it so that it follows a curve from the side of the screen.
- To reduce the stress in your neck, a headset may be beneficial to reduce stretching and improperly holding the phone.

Storage Location

- Materials should be stored in an accessible area (between 15" - 48" above floor).
- Storage areas should allow 30" x 48" clear maneuvering space and accommodate right or left-hand access.
- Deep storage should have "lazy susan" carousels, pull-out shelves or drawers with full-extension ball bearing slides.
- Stored materials should have labels facing out with instructions, symbols, or color-coding.

Lighting

Be aware of florescent lights as well as window lighting. Use a glare screen to reduce glare on the monitor screen. Use task lighting.

Proper Lighting

- Overhead light may cause glare and can be reduced by the use of a panel diffuser (diffuser should direct the light straight down rather than out across the room).
- Lighting with a dimmer control should be used with supplemental task lighting.
- Task lighting is designed to boost lighting levels in a highly localized area, so that overall lighting can be reduced to cut glare.
- Reduce direct sunlight by placing blinds or curtains on all windows.
- Cover polished work surfaces with pads or blotters to reduce glare.
- Reposition the angle and/or slope of the computer screen to reduce glare.
- A non-glare screen overlay should be considered to reduce unwanted glare.

> **!** Ergo Tip: Too much illumination can cause glare, either directly from the light source, or indirectly from reflective surfaces.

Proper Monitor Placement

- The monitor should be placed perpendicular to the windows or in such a location that the windows are not directly in front of or behind the monitor.
- The monitor should be placed on a solid, stable surface directly in front of your chair and directly over the center of the workstation knee well.
- The monitor's contrast and brightness controls should be adjusted to improve the screen image.
- The monitor should be placed so that your eyes are at least an arm's length from the screen (approximately 18" – 28" away from eyes).
- The monitor should be supported so that the top edge of the screen is at your eye level (lower if you wear bifocals).

Visual Clarity

- To reduce stress to your eye muscles, occasionally look away from your monitor (look out a window) and refocus your eyes on an object at least 25 feet away.
- To keep your eyes well lubricated, one should blink often.
- For ultimate clarity, a monitor with at least 1024 x 768 resolution and a dot pitch of .28 or less should be used.
- For better visual clarity, your monitor screen should be cleaned at least once a week.

Healthy Work Practices

- Adjust your chair, work surface, keyboard platform and keyboard/mouse to maintain a neutral position.
- Sit in a comfortable upright position with your feet flat on the floor (or on a footrest), thighs fully supported by the chair seat, with no pressure on back of the knees.
- Alternate tasks throughout the work shift (stop using keyboard, lean back and proofread your work, retrieve work from printer, file documents, make phone calls).
- Wherever possible, distribute or alternate tasks between right and left hands and alternate between use of keyboard and mouse (use keystroke equivalents to mouse).
- Change your posture frequently throughout the day.
- Use minimal force when typing on your keyboard.
- Place a document holder next to your computer screen at approximately the same angle and height of the screen.
- Work to minimize vibration from keyboard and other office equipment.
- Monitor sound levels to ensure that communication can occur without a great deal of interference from external noise.

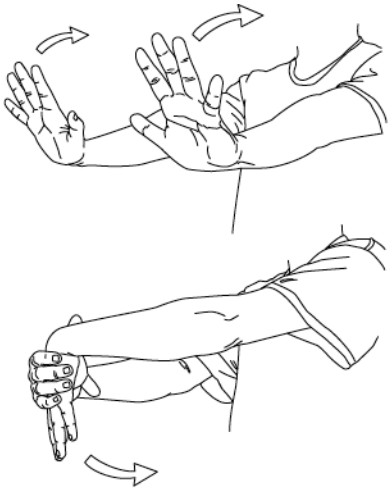
Health Factors

- Maintain a comfortable temperature, good air quality and adequate circulation in your workstation at all times.
- Move often throughout the day to help circulation.
- You should have regular general medical and eye examinations as recommended by a physician.
- Get adequate rest, regular exercise and maintain a healthy diet.

Ergo Tip: Your blood carries more nutrients to your muscles, tendons, and nerves, when you are physically fit.

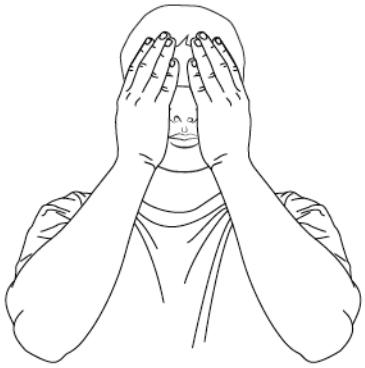
Workspace Exercises

- Take regular breaks for simple, brief exercises (shoulder shrugs, neck rolls, ankle rotations, leg extensions, overhead stretches, hand shakes, finger spreads).
- Stand up every 45 minutes to give your muscles a good stretch.
- Every 20 minutes, refocus your eyes away from the computer screen to an outside window or other object at least 25 feet away.

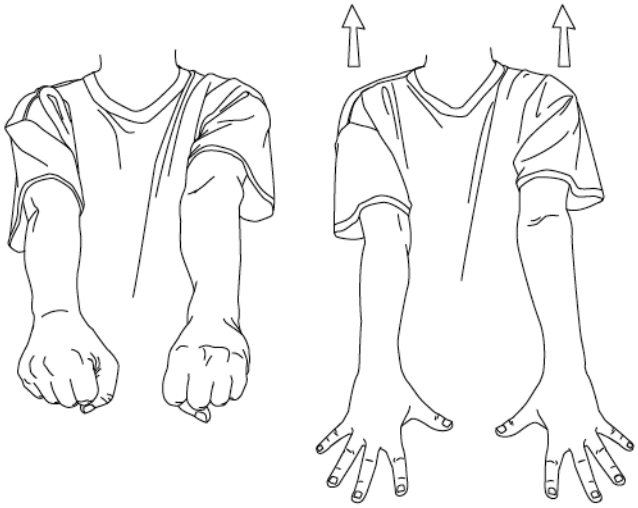


Exercise 1: With arms extended in front of you, gently flex both wrists, pressing the tops of your hands towards your body (hold for 5 seconds). Release wrists to a neutral position. Then, placing the palm of your right hand across the top of your left hand, gently press the palm of your hand towards your body (hold for 5 seconds). Repeat with the other hand.

Exercise 2: With your right arm extended to your side, place your left hand on the top of your head and gently press your left ear towards your left shoulder (hold for 5 seconds). Repeat with the other side of your body.



Exercise 3: Cup your hands gently over your closed eyes (hold for 1 minute).



Exercise 4: With arms extended in front of you, first clench both fists (hold for 5 seconds). Then spread fingers as far as you can (hold for 5 seconds). Repeat 5 times.

Accessible Work Environment

The Americans with Disabilities Act (ADA) is a landmark law that protects the civil rights of persons with disabilities. It prohibits discrimination on the basis of disability in employment, State and local government services, transportation, public accommodations, commercial facilities, and telecommunications. To ensure access to the built environment, the ADA requires the establishment of design criteria for the construction and alteration of facilities covered by the law. These requirements, which were developed by the United States Access Board, are known as the ADA and ABA Accessibility Guidelines for Buildings and Facilities (ADAAG) (http://www.access-board.gov/ada-aba/final.cfm). The Board's guidelines serve as the baseline for standards used to enforce the ADA and the Federal buildings legislation, entitled the Architectural Barriers Act of 1968. Below are some basic guidelines that you can follow to ensure that your work environment is safe and accessible.

Accessible Doorways

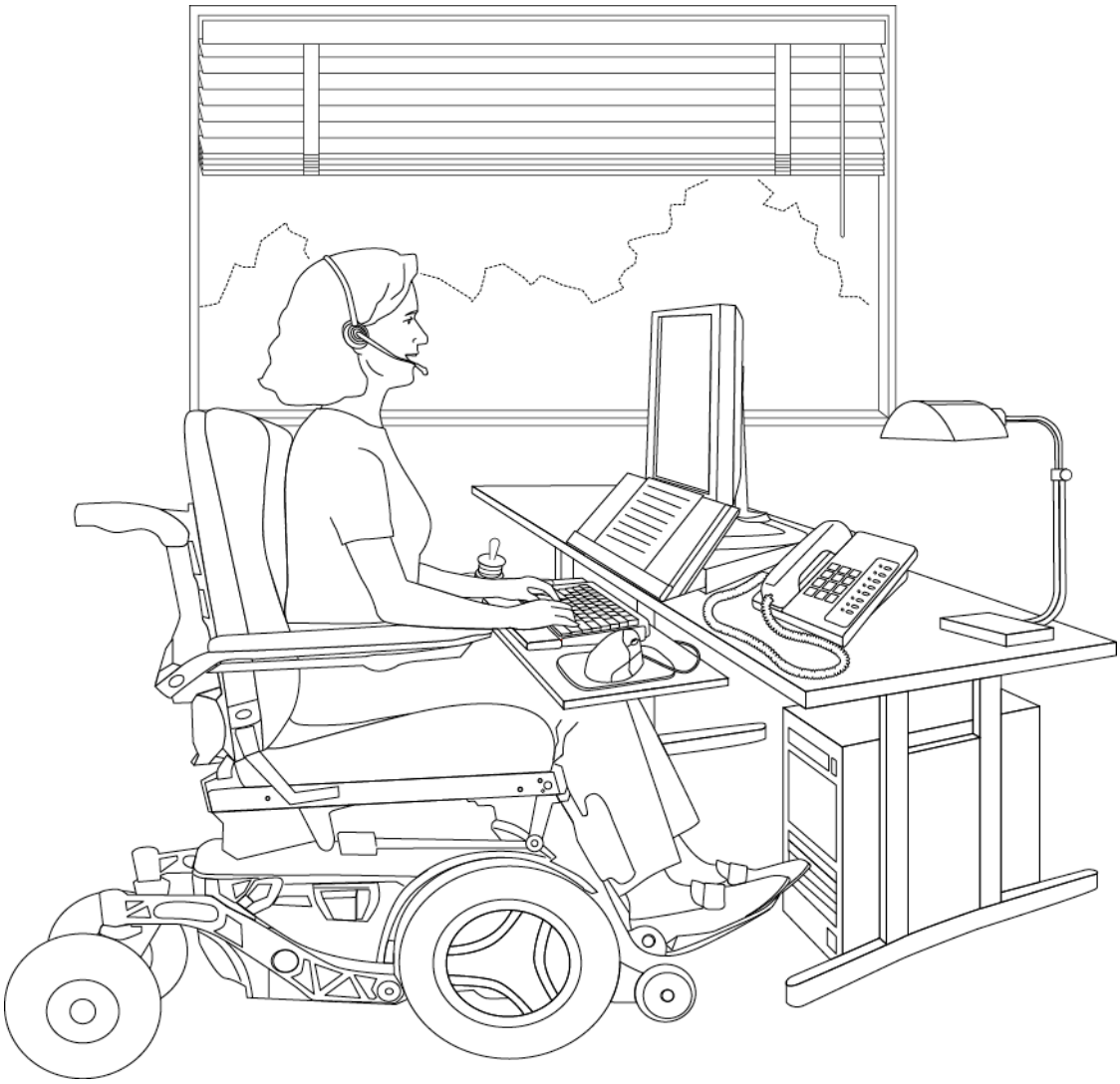
- The doorways should provide at least 32" clearance; level or add a ramp to any threshold greater than 3/4" high.
- There should be kick-plates installed 12-18" above floor.
- The inside and outside of doors should provide 60" clear floor space and 18" to the latch side; between sets of doors, allow at least 48", plus the width of the doors.
- The doorknobs should be replaced with levers, push-bars, or U-shaped pull handles 36-48" above the floor.
- The door closer resistance should be minimized or powered door openers should be installed.

Accessible Work Areas

- The workspace should be large enough to accommodate wheelchair users (48" aisle width between workstations).
- Distances between entrances, work areas, restrooms, office equipment, and other common facilities should be minimized.
- The work area should be at least 36" wide for a clear path of travel.
- Objects hanging lower than 80" above the floor or protruding more than 4" from the walls should be removed.
- The carpeting should be non-absorbent in warm, dark colors without padding or sculptured textures.
- The walls and floors should maintain both color and brightness contrasts.

Ergonomics and Assistive Technology

When setting up a workstation for a person with a disability, ergonomic principals remain the same. Please refer to this ergonomic reference guide for proper work surface setup and good placement tips. It is advisable to adhere to good ergonomic positioning while utilizing the appropriate assistive technology.



Ergo Tip: Using assistive technology, employees may be able to perform additional assignments or perform current tasks more efficiently.

Available Assistive Technology

- Screen reading software operates a speech synthesizer, which voices the contents of a computer screen, allowing people who are Blind or have low-vision to access the computer environment.
- People who are Blind may use a Braille Embosser which provides hard copy Braille output from a computer.
- Individuals with low-vision may need a larger monitor (21”) or a closed-circuit television (CCTV) to magnify the print. The monitor should be placed perpendicular to the windows or in such a location that the windows are not directly in front of or behind the monitor.
- Deaf or hard of hearing users can use a videophone or teletypewriter (TTY) to provide telephone accessibility.
- Assistive listening devices make conference rooms and auditoriums accessible for hard of hearing individuals.
- Persons with dexterity impairments may use voice recognition software allowing them to input data by using their voice alone or in conjunction with the mouse or keyboard.
- Alternative keyboards/pointing devices can facilitate the use of personal computers.

Beyond the Office: The Ergonomics of Telework

In this information age, more and more professionals with disabilities are seeking telework as their most appropriate form of reasonable accommodation. Per Public Law 106-346, Section 359, the Office of Personnel Management outlines the specifications for implementation of this guideline.

Each executive agency shall establish a policy under which eligible employees of the agency may participate in telecommuting to the maximum extent possible without diminished employee performance. The requirements of this Section are to be applied to 25 percent of the Federal workforce, and to an additional 25 percent of such workforce each year thereafter (Public Law 106-346, Section 359: 10/23/2000).

The mere establishment of a telework policy does not automatically infer compliance with the law. Agencies must consistently review their telework policies to ensure that the practical enforcement of this regulation readily facilitates telework in all circumstances where it is deemed appropriate based on the essential functions of the job. If a telework policy is in place at an agency and assigned duties allow for this accommodation, employees who exhibit satisfactory performance and wish to participate must be allowed to do so.

Once telework has been arranged, it is vital to execute the same ergonomic principals discussed in this reference guide when arranging a home office environment. Please refer back to the guide for specific recommendations. To learn more about telework, please visit http://www.telework.gov.

Ergonomic Statistics: Do You Know the Numbers?

1. Workplace Musculoskeletal Disorders (WMSD) account for _____% of all lost workday injuries & illnesses.
   a) 5% b) 34% c) 20%

2. The average Federal government cost (medical & Worker's Compensation costs) for a carpal tunnel syndrome case is $_____.
   a) $3,476 b) $1,280 c) $8,799

3. _____% of carpal tunnel cases result in more than 30 days away from work.
   a) 42% b) 29% c) 12%

4. On average, an amount of $_____ in direct costs will be saved for each WMSD that is prevented.
   a) $22,500 b) $73,250 c) $8,932

5. An ergonomic work environment can increase productivity on average by _____%
   a) 7% b) 11% c) 34%

6. $_____ is the average annual cost to an employer for altering a workstation.
   a) $1,200 b) $650 c) $150

7. Ergonomic related injuries account for $_____ in worker's compensation costs each year.
   a) $20 Thousand b) $20 Million c) $20 Billion

8. _____ WMSD's must occur before the Occupational Safety & Health Administration's (OSHA) ergonomic standard is triggered to be implemented.
   a) 1 b) 5 c) 10

9. OSHA has been developing an ergonomic standard over the past _____ years.
   a) 2 b) 7 c) 18

10. _____ injuries per year involve lost work days due to WMSD's.
    a) 89,000 b) 309,472 c) 600,000

Answers

1.) 34%, **2.)** $8,799, **3.)** 42%, **4.)** $22,500, **5.)** 11%, **6.)** $150, **7.)** $20 Billion, **8.)** 1, **9.)** 7, **10.)** 600,000

Ergonomic Resources

Computer/Electronic Accommodations Program (CAP)

Computer/Electronic Accommodations Program

Phone: 703-681-8813 (Voice), 703-681-0881 (TTY)
DSN: 761-8813 (Voice)
FAX: 703-681-9075
Email: cap@tma.osd.mil
Web: www.cap.mil

To schedule an appointment or visit CAPTEC:
Address: Pentagon
Room 2D1049 (for directions please visit: www.cap.mil)
Phone: 703-693-5160 (CAPTEC Voice), 703-693-6189 (CAPTEC TTY)
Email: CAPTEC@tma.osd.mil

Additional Resources

Air Force Institute for Operational Health (AFIOH)

DSN: 240-5454
Voice: (888) 232-3764
Web: www.brooks.af.mil/search/generalsearch.asp?q=Ergonomics&btnG.x=0&btnG.y=0&site=Brooks

Army

US Army Public Health Command
AIPH Ergonomics Program
DSN: 584-2439
Voice: (410) 436-5493
Web: http://phc.amedd.army.mil/topics/workplacehealth/ergo/

General Services Administration (GSA)

Web: www.gsa.gov
IT Accommodation: www.section508.gov

Ergo In Demand, Inc.

Voice: (800) 888-6024
Web: www.ergoindemand.com

The Ergonomics Center of North Carolina

Voice: 1-800-664-3746
Web: www.theergonomicscenter.com

Ergonomics.org

Web: www.ergonomics.org

National Institute for Occupational Safety and Health (NIOSH)

Division of Surveillance, Hazard Evaluations and Field Studies
Voice: (513) 841-4428
Web: www.cdc.gov/niosh/topics/ergonomics

Navy

Chief of Naval Operations (N45)
Safety and Health Branch
Web: www.navfac.navy.mil/Safety

Occupational Safety & Health Administration (OSHA)

Director, Office of Ergonomic Support
Voice: (202) 693-2300
Web: www.osha.gov

Office-Ergo

Web: www.office-ergo.com

Notes

Real Solutions for Real Needs

Computer/Electronic Accommodations Program
www.cap.mil