

I. CHAIRS AND STOOLS: OFFICE & LABORATORY

When ordering new chairs or assessing the suitability of existing chairs the following features are recommended:

- Stable base (5 legs)
- Adjustable seat height (pneumatic lift)
- Adjustable seat tilt
- Seat sloped at front to prevent thigh compression (waterfall edge)
- Adjustable backrest height
- Backrest padded to provide lumbar support (adjustable lumbar a plus)
- Adjustable backrest angle (tilt lock at any angle)
- Swivel/Rocking tilt
- Tension knob
- Sliding seat

Chair Specifications

This specification is intended to address employees of both sexes that fall into the 95th percentile range of height. Employees that fall outside this perimeter will be accommodated with the purchase of special ergonomic chairs. Special ergonomic chairs are not the subject of this specification. RM/EHOS should be consulted if special ergonomic chairs are required. This specification will address task chairs only.

General:

1. The chair base should have a five point base unit with casters that will roll across carpeted floors without pulling the carpet into the glide housing. The casters should be large enough to require a minimum of effort to move the chair. The five-point base will measure not less than twenty-three inches across.
2. The seat pan should be adjustable for forward and backward tilt angle independent of lumbar support adjustment.
3. The forward leading edge of the seat pan should cascade to a rounded edge that has a downward sloping angle, and shall have a concave contour for even weight distribution. The cushion deformation measured at the center of the seat pan shall be no more than one inch, as measured from a plane formed by a straight edge laid across the top of the seat of the pan.
4. The entire upper chair assembly will be capable of 360° rotation.
5. The backrest will be contoured to provide lumbar support and be adjustable for height and for angles ranging from behind the vertical to forward of the vertical position. The back support will have a vertical height adjustment span of at least three and one-half inches. The height adjustment may be achieved with one gross adjustment or with a combination of adjustment mechanisms.
6. Arm supports shall be adjustable for height and be removable. The height adjustment will be at least two and one half inches, as measured from the lowest position of the armrest to the full-extended position of the armrest. The armrest should be easily removed and adjustable without the use of tools. The arms should be adjustable for width without the use of special tools.
7. All adjustment mechanisms will be readily operable and within easy reach of the chair user. Adjustments will be capable of being accomplished without the use of tools. It is preferred that adjustment mechanisms be provided with labels as to their function.

Specific:

1. The roller casters should be removable and capable of being replaced.
2. The seat pan should measure at least 15" deep and 18" wide as measured from the front of the seat pan to the rear of the pan, and from one side of the pan to the other side of the pan.

3. The lumbar support and seat cushion is to be composed of high-density foam material.
4. The height adjustment should range from 14" to 19" as measured from the floor to the top edge of the seat pan. The height is measured when the chair is in an uncompressed state.
5. The backrest should measure at least 14" in height as measured from the bottom of the backrest to the top of the backrest.
6. The chair should provide a sliding seat. This action will move the seat pan forward away from the backrest for the prescribed distance and provide a longer seat pan reach.
7. Chairs shall meet or exceed ANSI/BIFMA (X5.1), 1993 Standards.

If chairs present a hazard by rolling too freely on linoleum for similar floors, chair glides are recommended. All suppliers should fit glides if requested when ordering a chair. Also, lockable castors may be used on linoleum floors. Lockable castors are free rolling when there is no weight on the chair, and lock in position when weight is applied.

Chairs shall comply with the requirements summarized in Table 1 on the following page.

Summary of chair requirements – Table 1

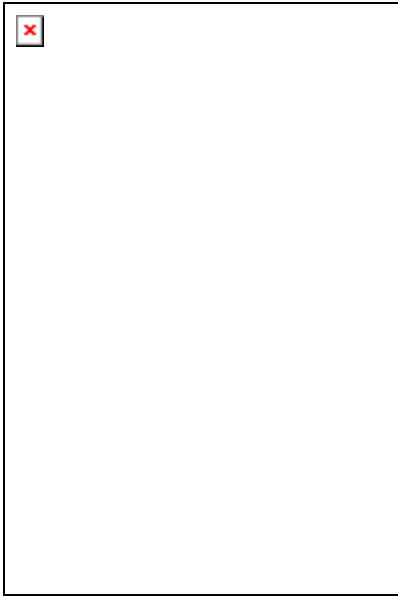
	Parameter	Requirement
1	SEAT	
	Height above floor-for keying tasks	14" – 19" (adjustable)
	Height for high counter work stations	21" - 29"
	Seat pan length	15" – 17" (adjustable)
	Seat pan width	18" – 20 "
	Seat pan angle/slope	0° to 10° (adjustable or fixed)
	Cushion thickness	2"
	*Seats should also provide a waterfall forward sloping front edge	
2	BACK SUPPORT	
	Seat back width	At least 13"

	Seat back height	≥ 14"
	Reclining back angle	90° - 105°
	Cushioning/Fabric	Flexible, cellular polyurethane (polyester, cotton, rayon, olefin, nylon) Pass Calif. 117 flammability test Pass AATCC 8-1974 colorfastness test Pass ASTM 3597 & D4966 abrasion tests
3	BASE	
	Style	5-star
	Diameter (minimum)	23 in.
4	ARM RESTS	
	Arm rest height	6" – 7"
	Arm rest length	≥ 6"
	Arm rest width	≥ 2"
	Distance from front edge of seat	> 4" (Minimum)
	Arm rest separation	18" – 22"
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Stools

Most of the suppliers of ergonomic chairs also supply stools in the form of a drafting, technical or laboratory stools for work at laboratory or workshop benches. The main difference between ergonomic chairs and stools is that a longer gas strut is incorporated into the stools to give the required height range and a footrest of some kind is also added. This footrest is often in the form of an adjustable circular metal strip attached to the main stem of the chair.

For work areas where fabric chairs may be impractical, chairs can be manufactured in a range of vinyl.



II. FURNITURE/DESKS

Desks with these features are particularly recommended for use by keyboard operators:

- The desk height should be in the range of 24" – 31" (adjustable); 27" (non-adjustable)
- The desktop and supporting frame should be a maximum of 2". This feature is essential to allow the correct working height to be obtained for each operator.
- The underside of the desk should be free from obstruction to the knees and shins. There should be a minimum 15" of kneewell depth and a minimum of 20" kneewell width. There should also be a minimum of 7" thigh clearance which is measured from the seat pan to the desktop.
- The area of the desktop should be large enough to allow space for the keyboard equipment and for all other work aids. The area should not be smaller than 63 x 31 ½ in., and should be deeper if larger computers are used.
- The desktop should have matt finish to minimize reflections and be of a neutral color and all corners of the desktop should be well rounded.
- A partially adjustable desk top which allows adjustment of either keyboard or screen height is most favorable as this allows the operator to adjust the position of his or her head such that strain in neck and shoulders may be minimized.

Surface Area

The tabletop should be big enough to allow space not only for all computer-related necessary equipment, but also for paperwork, books, and other materials needed while working at the computer. Working with materials on chairs and at odd angles has the potential for neck and other body strain. Frequently used items should be kept close to avoid long reaches. A general recommendation is that the table top should be at least as big as the standard office desk - 30" x 60". A depth of at least 30" allows flexibility in use/reuse of the table. Usable space may be maximized by good wire/cable management.

Edges

Table edges should be smoothed or rounded to avoid discomfort on the part of the user as hands, arms, and wrists contact the table.

Construction

Sturdily built tables help avoid irritating vibrations. Furniture made of presswood material should be a minimum of 1" to a maximum of 2" thick. Furniture made of plastic (i.e. Rubbermaid) are not recommended due to a lack of durability.

Surfaces

Medium and light-colored surfaces may help avoid excessive contrast with printed materials. A non-shiny surface is recommended to help in reducing glare.

Finish

A matte finish in a neutral color is needed to keep glare to a minimum and reduce distraction.

Leg Room

Knee spaces should allow a worker to feel uncrowded and to allow some changes of position - even with the keyboard support lowered to the correct level for use. The knee space should be at least 30" wide by 19" deep by 27" high to comply with the requirements of the Americans with Disabilities Act. Leg clearance should be greater than the height of the thigh and knee of the largest person using the workstation; for those using a footrest, clearance must be calculated with the legs in place on the footrest. Likewise, depth of the "clearance envelope" for both knees and toes should be evaluated while the workstation user is in a normal working position at the table (determined by the design of the seating system and the way the user sits). Drawers and support legs (for furniture) should not go where human legs need to fit.

III. VIDEO DISPLAY TERMINAL (VDT)

Monitors

- "Refresh rate" refers to how often a screen image is "redrawn." Too slow a refresh rate produces noticeable screen flicker, contributing to eyestrain. The minimum refresh rate for the selected monitor should be 70 MHz. The monitor should be of the non-interlaced type.
- The monitor should be of a tilt-swivel type, to enable the user to adjust its positioning for optimum ergonomic benefit, i.e., to minimize neck twisting and craning.
- Monitor screens should be as flat as possible, to minimize potential focus problems.
- The selected monitor must comply with MPRII guidelines (guidelines of the Swedish National Board of Testing).
- When selecting an LCD (liquid crystal diode) monitor or screen, the active matrix type offers the clearest image for minimizing eyestrain.
- A monitor should have manual focus adjustments (Contrast, brightness, color, horizontal/vertical adjustments, etc).
- A monitor that utilizes dark letters on a light background, or that offers this setup option, is preferable to reduce eyestrain. In building your monitor's "desktop" or creating a document, avoid using red or blue for either the background-where they tend to be brighter than the work document-or for the regular font (text) color-where they are less distinct.

Glare Screens / Visors

If glare can be reduced only through the use of an optional anti-glare attachment, make sure it has an AOA (American Optometric Association) Seal of Acceptance. Glare screens should have a 99.9% protection from ELF/VLF E-field radiation and at least 95% antiglare. Visors help relieve eyestrain and fatigue by blocking reflection from overhead lighting to effectively reduce screen glare.

Monitor Risers

Allow the computer user to incrementally adjust the height of the monitor. VuRysers provide 1" of additional height.

IV. ACCESSORIES/AIDS

Keyboards

Keys should be slightly concave on top to conform to the shape of the fingers and to keep them from sliding off keys. Keys should be large enough and should be spaced comfortably.

Split keyboard

Split keyboards with a raised middle may facilitate a more natural position for the wrists while typing. Many alternative keyboard designs are available: Microsoft Natural Elite; Microsoft Natural Pro; etc.

Keyboard Tray

User comfort (and strain avoidance) dictate that the keyboard should be at a lower level than the screen so that the screen can be viewed comfortably and the keyboard used comfortably. The familiar arrangement of stacking the monitor on the computer while keeping the keyboard on the tabletop can be successful. Another possibility is to use a special lower shelf for the keyboard. This may be especially useful when the tabletop is also needed as a writing surface. The writing height for an individual is usually higher than a person's keyboard height. RM/EHOS recommends the Workrite and Humanscale/Softview keyboard trays because they let you adjust the keyboard tray and mouse pad to optimum comfort level, without levers, knobs or handles. They also provide knee clearance and adjust from 10° positive to 15° negative tilt. In addition, a mouse area is supported by these trays and are at the same level as the keyboard. The height of an adjustable keyboard tray should adjust between 23" and 28" to accommodate most users. 26" is a recommended compromise position, while leg clearance must still be considered.

Wrist rests

Wrist rests should have rounded, not sharp, edges and should provide a firm but soft cushion. For the Microsoft Natural keyboards, a Softspot Contour support is recommended to reduce the sharp angle and hard pressure points caused by the built-in palm support.

Mice

Setting the mouse on a platform, slightly above the keyboard, offers natural comfort and maximum hand-eye coordination. If possible, switch the mouse to your other hand occasionally to avoid too much stress on one shoulder and arm.

Headsets

Plantronics headsets (cordless and amplifiers) provide a solution to preventing neck, shoulder and arm pain from holding the receiver while talking on the phone. Wedging the receiver between the neck and shoulder causes pain and neck stiffness. Headsets free arms and shoulders for increased efficiency and comfort.

Footrests

Situations will arise in which a user is perfectly adjusted for keyboard use and with the monitor at a correct angle, but her/his feet do not rest flat on the floor. A footrest may be used to correct this problem. The footrest should be adjustable between 11" and 18" at an angle from 10° to 25°.

Copy Stands

Use of a copyholder, instead of resting a copy on the tabletop, helps eliminate strain and discomfort by keeping the copy close to the monitor and at the same height and distance from the user's face as the screen. An in-line document holder is recommended because this positions a copy at the same distance as the monitor and directly in line with the monitor and operator. This reduces neck, shoulder and eye motion, lessening muscle stress and fatigue. For thick, heavy books a Read/Write stand helps improve reading and writing comfort. Read/Write stands reduces fatigue by eliminating head tilt and reduce glare on paper documents with two angles of adjustment (25° and 30°).

Alternative Input Devices

There are many alternative input devices available to help reduce keystrokes. Some of these devices may be preferable, but some (notably the trackball) may not be any better than the keyboard or mouse.

Whether they are really any better depends on the person's size, personal preferences, state of technology, availability, space, etc.

- Tablets and pens designed primarily to manipulate on-screen graphic objects.
- Footpedals can be used to perform all mousing tasks. One footpedal allows for 360° cursor control and the other for clicks.
- Trackball: a ball mounted directly into the keyboard or in its own case that is rolled to move the cursor. A Logitech Marble FX is recommended because it eliminates static hand/finger positioning by combining a large trackball with a hand support that keeps your wrist in a neutral position.
- Touchpad: finger-operated, pressure sensitive pad-such as a SmartCat that moves the cursor corresponding to the direction the finger moves.
- Touchscreen: a screen that is touched directly to place the cursor or make a choice.
- Voice activated system (or speech recognition software) that responds to the user's voice. Dragon Naturally Speaking Professional is the software recommended for speech recognition.
- Dr. Grip pens reduce required gripping effort, a wide cushion grip relieves stress and alleviates writing fatigue.
- Electric Staplers eliminate hand strain caused by traditional staplers. Reduces the chance of repetitive strain injury.
- Staple Removers easily extract staples without the hazardous pinch grip most removers require. Larger muscles of the forearm and upper arm are used to smoothly remove staples without tearing paper.
- Desk risers adjust the height of any workstation or desk. 1" thick disks placed under desk legs can provide proper desk height reducing fatigue, back pain and neck strain.
- Calculator wrist rests support palms and angles your keyboard for faster and more accurate entries.