



## UW OFFICE AND ADMINISTRATIVE ERGONOMIC FURNITURE AND EQUIPMENT DESIGN GUIDELINES

### GENERAL REQUIREMENTS

All materials must adhere to the following requirements:

- **Meet the Greenguard certification standards** for Low Emitting Products for the Indoor Air Environment (Greenguard Environmental Institute) or equivalent standard.
- **Fire retardant:** Flame spread index less than 25 and smoke developed rating less than 50. Flammability testing must be in accordance with ASTM and UL Standard Vertical Test Methods for Flame Resistance in the office.
- **Workstation furniture and equipment** shall meet the guidelines specified below.
- **Furniture layout** shall not impede code-required egress from within the space.
- **General contractor** to maintain a safe and secure project site.
- **Note:** The following guidelines are intended for office and administration settings only, and do not include medical, healthcare and industrial environments.

### OFFICE

Workplace Safety in the office can be addressed by adhering to the ergonomic workstation design and furniture specifications in this document. Additionally, workstation accessories must meet local ergonomic regulations or requirements.

The following ergonomic design guidelines are based on published standards (ANSI-BIFMA, ANSI-HFES), current literature, best practices within the ergonomics field, and historical data on the causes of musculoskeletal injuries and illnesses.

Furniture Design Guidelines should accommodate the 5th percentile of the female population to the 95th percentile of the male population (90% of the overall population) across different demographics to reflect the UW's employee diversity. Recommended and minimum guidelines are outlined in this document to accommodate the target population. The 10% population outside of the guidelines range (large-frame, tall or petite individuals etc.), may require furniture and equipment sizing and adjustments outside of the



parameters in this document. Adjustability of workstation furniture is essential for supporting postural changes during a work session, as well as for supporting different users of the same workstation.

When possible, an electric adjustable sit-stand worksurface is strongly recommended to accommodate the target population outlined in these guidelines. However, in the event this is not feasible, the following general office equipment should be considered as minimal:

- o Articulating Keyboard Platform (AKP)
- o Adjustable Monitor stems or Monitor Arm(s)
- o Adjustable Chair

**Note:** Fixed worksurfaces are not recommended but have been included in these design guidelines.

## **Worksurfaces**

### **(Administrative & Mixed-use- computer, phone and paperwork)**

#### **After-market Sit-Stand surfaces:**

Although adjustable sit-stand desks are the recommended solution for new construction and major renovations, after-market sit-stand surfaces can be used as an alternative if sit-stand desks are not feasible when modifying existing workstations. All new projects should include sit-stand desks as recommended in this document.

These after-market units typically either sit on top of or clamp onto an existing work surface. Most units do not have the capacity for the keyboard and mouse to be positioned below the work surface height which can be problematic for shorter users. Some units are very wide and heavy to lift, which can be problematic for users with shorter arm reach and smaller diameter wrists (e.g. females). As a result, choose only units that have the ability to position the keyboard and mouse surface below the work surface height.

**Table 1- Worksurface Guidelines:**

| Item               | Guidelines                                                                                                                                                                                         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Worksurface Height | <b>Strongly Recommended: (Height Adjustable Sit-Stand):</b> Electric controlled worksurface that is user height adjustable; recommended adjustability range is from 22-50 inches. (BIFMA- G1-2013) |



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|                   | <p><b>Recommended Alternative Sit-Stand (Desktop Converter):</b><br/>If a height adjustable worksurface is not feasible, a desktop sit-stand converter is the next best sit-stand option. Recommended adjustability range of desktop converter is 16-20 inches above worksurface height and 2-4 inches of adjustability below worksurface height.</p> <p><b>Note:</b> Sit-stand worksurfaces are HIGHLY recommended to accommodate the greatest number of users and to allow for user adjustability within one shift as well as in a shared workspace.</p> <p><b>Minimum (if seated height):</b> Worksurface must be installer or user height adjustable by bracket system, hand crank, or articulating keyboard tray; recommended adjustability range is 22-30 inches. (ANSI/HFES 100-2007; pg. 79)</p> <p><b>Minimum (if workstation is fixed):</b> 28.5 inches.<br/>(ANSI/HFES 100-2007, p. 79)</p> |
| Worksurface Width | <p><b>Recommended:</b> 60 inches or more of usable desktop width. (ANSI/HFES 100-2007, p. 17)</p> <p><b>Minimum:</b> At least 46 inches desktop width if workstation is primarily used for computer work. (ANSI/HFES 100-2007, p. 17)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Worksurface Depth | <p><b>Recommended:</b> At least 30 inches depth to allow for adequate placement of computer equipment, resting forearms, paperwork and peripherals on the worksurface. (BIFMA G1- 2013, p. 64)<br/>For larger monitors (e.g. 27-36 inch screen size), the recommended worksurface depth is 36 inches to achieve a safe and comfortable viewing distance.</p> <p><b>Minimum:</b> 24 inches depth for non-computer work surfaces (e.g. side credenza for paperwork, phone tasks). (ANSI/HFES 100-2007, p. 80)</p> <p><b>Note:</b> Recommended worksurface depth of 30 inches for average size monitors (e.g. 19-24 inch), and 36 inch depth for larger monitors (e.g. 27-36 inch) will allow for minimum screen viewing distance (18-24 inches for average size screens or more for larger monitors).</p>                                                                                                |



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| Undersurface Width | <p><b>Recommended:</b> 41 inches or more of unobstructed leg room width underneath work surface to allow for movement in and out of workspace. (ANSI/HFES 100-2007)</p> <p><b>Minimum for ADA compliance:</b> Undersurface width of 30 inches to allow for accessibility of a single stationary wheelchair. (ADA Accessibility Guidelines for Building and Facilities, sec. 4.2.4.1)</p>                                                                                                                                                                                                 |
| Undersurface Depth | <p><b>Recommended:</b> 22 inches or greater at the level of the knee; 26 inches or greater at level of feet on floor. (ANSI/HFES 100-2007, p. 80)</p> <p><b>Minimum:</b> 17.3 inches at the level of the knee and 23.6 inches at level of the feet. (ANSI/HFES 100-2007, p. 80)</p> <p><b>Note:</b> Users should be able to fit their legs in the space provided under the work surface without obstruction. There should be adequate space to permit users to get close to their work surface while allowing freedom of foot movement and postural changes. (BIFMA G1- 2013, p. 63)</p> |
| Thickness          | <p><b>Recommended:</b> Worksurface thickness no greater than 1.5 inches. (ANSI/HFES 100-2007, p. 76)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Finish             | <p>Matte finish is recommended to reduce reflection on worksurface from internal or external light sources.</p> <p><b>Note:</b> Per ANSI/HFES guidelines, specular reflectance of no more than 45 gloss units at an angle of 60 degrees is recommended. (ANSI/HFES 100-2007, p. 78)</p>                                                                                                                                                                                                                                                                                                  |
| Edges              | <p><b>Recommended:</b> Rounded front edges with 3mm radii or greater; no sharp corners, cut-outs, or edges. (ANSI/HFES 100-2007, p. 78)</p> <p><b>Note:</b> Discomfort and postural risks can be avoided when worksurface edges and corners have at least 3mm radius.</p>                                                                                                                                                                                                                                                                                                                |
| Stability          | <p><b>Recommended:</b> Freestanding work surfaces should have a functional load capacity of at least 200 pounds. Work surfaces and bases should meet ANSI/BIFMA requirements. (ANSI-BIFMA G1- 2013)</p> <p>Worksurfaces must be structurally rigid and stable under typical office usage. (ANSI/HFES 100-2007, p. 77)</p>                                                                                                                                                                                                                                                                |



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| Adjustment controls       | <b>Recommended:</b> User height-adjustable worksurfaces must have easy to reach and operate controls that can be accessed from sitting or standing working postures. Location of controls should not interfere with users' work equipment or work positions. (ANSI/HFES 100-2007, p. 14)                                                                                                                                                                        |
| Storage below worksurface | <b>Recommended:</b> Storage should be mobile (on casters) or removable, and dimensions must fit under lowest height of standard worksurfaces (22 inches for sit-stand and 22 inches for fixed seated height worksurfaces. (BIFMA G1-2013)                                                                                                                                                                                                                       |
| Storage above worksurface | <b>Recommended:</b> Storage above worksurface should be adjustable and easily removable to accommodate monitor heights while sitting or standing. At least 30 inches of height clearance from the worksurface to the bottom of the storage unit is recommended for fixed seated height worksurfaces. Above storage cabinets are not recommended for sit-stand workstations. (BIFMA G1-2013)                                                                     |
| General Notes             | <p>Adjustable surfaces that hold heavy objects, such as CPU's and monitors can present a risk to users. To reduce user risk of injury, use a control locking mechanism to prevent accidental operation of adjustment controls.</p> <p>If it is a fairly common practice or desirable to move desks throughout a facility or floor, it is strongly recommended that you include low profile casters on the rear part of the foot for easier maneuverability.</p> |

## Office Chairs:

A chair is one of the most important components in an office workspace. Approximately 80% of a user's physical contact with equipment in an office occurs while seated. Employees need chairs that provide stable support and allow them to maintain neutral, non-stressful, comfortable seated postures throughout the day. Chairs must be adjustable to accommodate changes in posture and movement during the day, and to accommodate changing work habits. Office chairs must be able to accommodate a variety of body sizes, weight capacities and preferred seated postures.

The following chair guidelines cover the 5th percentile of the female population to the 95th percentile of the male population (90% of the overall population). Petite, tall or large-framed individuals, individuals weighing more than 250 pounds, and people with specific



ergonomics needs may require equipment with size or range adjustments that are outside the parameters provided in these guidelines.

Chairs must have adjustable lumbar support (height at minimum, depth ideally), angle-adjustable backrest with locking mechanism, seat pan depth adjustment, waterfall front edge, an option for height and pivot adjustable padded armrests, a stable five-leg swivel base, and easy rolling casters. The chair must support the user's back and at least 2/3 of the thighs while seated in their preferred sitting posture (upright, reclined or declined).

Manufacturers should locate adjustment control paddles, levers, or knobs in conveniently accessible locations. Control mechanisms must operate in an intuitively logical manner, with low to moderate hand force. Controls should require only one hand to adjust.

Chairs considered for purchase should meet the design guidelines in Table 2.

**Table 2- Chair Guidelines:**

| Item            | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| Backrest Height | <p><b>Recommended:</b> Height of backrest should be 17.7 inches or more from the top of the seat to the top of the backrest. Backrest support should be height adjustable from 5.9 - 9.8 inches above the seat. (ANSI/HFES-100-2007 p.88, BIFMA G1-2013, p. 36)</p> <p><b>Minimum:</b> At least 13.9 inches from the seat to the top of the backrest. (BIFMA G1-2013, p.32)</p> <p><b>Note:</b> Backrest should lock at desired height and should not impede the shoulders from being held in a neutral upright position. Backrest should be firm and supportive. Higher backrests help support the midback in reclined postures and should be available for longer torso individuals. (BIFMA G1-2013, p. 31)</p> |
| Backrest Width  | <p><b>Recommended:</b> At least 14.2 inches is the recommended backrest width in the lumbar region. The backrest should be wide enough to provide adequate support for the users' back without causing pressure points. (BIFMA G1-2013, p. 34)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Backrest Angle  | <p><b>Recommended:</b> Adjustment of 15 degrees or more within the range of upright (90°) to reclined position not greater than 115°. (BIFMA G1-2013, p. 37)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



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|                                 | <p><b>Minimum:</b> Backrest angle should allow the user to achieve a torso-to-thigh angle of approximately 90° - 110°. (BIFMA G1-2013, p.37/ ANSI/HFES 2007, p. 88).</p> <p><b>Note:</b> User-adjustable headrests are necessary for chairs reclining greater than 115° - 120°. (ANSI/HFES 2007, p. 88)</p>                                                                                                                                                                                                                                                                                                                                                                     |
| Lumbar Support height/depth)    | <p>Height adjustable lumbar support is recommended so that it supports the back when sitting with different backrest positions (reclined, upright, and declined sitting postures). Recommended lumbar support or backrest height is 5.9 – 9.8 inches above the seat pan. (BIFMA G1-2013, p. 36)</p> <p>Backrest lumbar depth should adjust from 0.6- 2.0 inches to accommodate lumbar support preferences and different spine curvatures. (Sitting and Chair Design, CU Ergo)</p>                                                                                                                                                                                               |
| Seat Height                     | <p><b>Recommended:</b> Seat height must be adjustable with a minimum range of 15-22 inches from the floor to the top of the seat, and at least 4.5 inches of height range. (ANSI/HFES 100-2007- p. 87)</p> <p>Users must be able to sit with feet comfortably on the floor or resting on a footrest without pressure on the underside of the thighs. The torso to thigh angle should not be less than 90 degrees.</p> <p><b>Note:</b> To accommodate outside of these guidelines, longer or shorter pneumatic chair cylinders may be required. Alternative chair size options may also be necessary to accommodate petite or tall users outside of the standard guidelines.</p> |
| Seat depth and depth adjustment | <p><b>Recommended seat length:</b><br/><b>14–16 inches</b> for small stature user; <b>16 inches</b> – Average size user, <b>17–19 inches</b> for taller user (BIFMA G1- 2013)</p> <p><b>Recommended Seat depth Adjustment:</b> Seat depth should be adjustable and provide a minimum of 2.5- 3 inches of forward and backward seat pan movement (ANSI/HFES 100-2007, p. 87). Ideal depth adjustment would be 14 – 19 inches.</p>                                                                                                                                                                                                                                                |



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|                  | <p><b>Minimum:</b> If seat pan is non-adjustable, seat should be no greater than 16.9" deep. (ANSI/HFES 100-2007, pg. 87)</p> <p><b>Note:</b> For proper back support, users should not experience a seat depth that causes pressure on the back of knees, and the seat pan should provide adequate buttock and thigh support. (BIFMA G1- 2013, p.24)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Seat width       | <p><b>Recommended:</b> A selection of seat sizes to accommodate different user hip widths, from a small seat to a large seat. The seat must be wide enough such that no hip area tissues are beyond the side edges of the seat and those tissues are not pressing into arm rests.</p> <p><b>Minimum:</b> 17.7 inches wide. (ANSI/HFES 100-2007, pg. 87)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Seat angle/tilt  | <p><b>Recommended:</b> Range of at least 4 degrees of user-controlled adjustability forward, and 3 degrees of adjustability backward. (ANSI/HFES 100-2007, pg. 87/ BIFMA G1- 2013, p. 29)</p> <p><b>Minimum:</b> If seat pan angle does not adjust, seat should be designed with slight sloping angle forward or backward. (ANSI/HFES 100-2007)</p> <p><b>Note:</b> Industry practice suggests that the seat pan angle, if fixed, should fall within a range from 0° (horizontal) to 4° rearward (BIFMA G1- 2013, p. 29). This may require after-market seat wedge cushions be available to those users preferring a slightly forward seat.</p> <p>Avoid excessive forward seat angles (&gt;6°) which can cause users to shift too much torso weight to their feet or experience the sensation of sliding out of the chair.</p> |
| Seat material    | <p><b>Recommended:</b> For non-clean room, non-medical, and non-laboratory settings, porous/breathable, with moderate friction, zero VOCs, and flame retardant.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Seat pan cushion | <p><b>Recommended:</b> Firm with approximately 2-inch depth. Softly contoured to permit lower back/backrest contact. Waterfall front edge of seat to reduce pressure on back of legs/knees.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



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| Armrest height       | <p><b>Recommended:</b> Provide chairs that have the option to remove arm rests or order chairs without arm rests and add them later if necessary. If armrests are needed, height must be adjustable from at least 6.7 - 10.6 inches above top of seat. (ANSI/HFES 100-2007, p. 89)</p> <p><b>Minimum:</b> Armrest height is adjustable and adjusts within the range of 6.7 - 10.6 inches above the seat. (ANSI/HFES 100-2007, p. 89)</p> <p><b>Note:</b> Armrests must not interfere or obstruct chair from sliding under the desktop or work surface. (BIFMA- G1-2013)</p> |
| Armrest Width        | <p><b>Recommended:</b> At least 18.1 inches of clearance between armrests. (ANSI/HFES 100-2007, p. 89)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Armrest angle        | <p><b>Recommended:</b> Armrests should adjust in and out or pivot relative to the seat pan. (ANSI/HFES 100-2007, p. 89)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Armrest cushion      | <p><b>Recommended:</b> Armrest cushion should be smooth, flat, padded with no hard edges or materials. (ANSI/HFES 100-2007, p. 89)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Armrest dimensions   | <p><b>Recommended:</b> Armrest dimensions should be at least 2-inch wide by 6-inch long.</p> <p><b>Note:</b> Armrests should support both forearms and should not interfere with movement of arms while performing tasks.</p>                                                                                                                                                                                                                                                                                                                                               |
| Armrest installation | <p><b>Recommended:</b> Armrests should be attachable or removable by the user. (ANSI/HFES 100-2007, p. 89)</p> <p><b>Minimum:</b> Armrests should be attachable or removable by the installer. (ANSI/HFES 100-2007, p. 89)</p>                                                                                                                                                                                                                                                                                                                                              |
| Base                 | <p><b>Recommended:</b> Five-point base is recommended to provide stability. Chair seat must swivel easily on base with casters.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Casters              | <p><b>Recommended:</b> Casters should be appropriate material and size for the floor type (carpet, linoleum, hardwood, concrete) so they slide easily.</p> <p><b>Note:</b> Chair should not glide by itself on smooth floors. If the chair is used on a smooth or sloped surface, ensure the chair has a wheel locking mechanism.</p>                                                                                                                                                                                                                                       |



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| Chair Adjustment Controls                  | <b>Recommended:</b> Controls should be easy to adjust from a sitting position and clearly marked to indicate function.<br><br><b>Note:</b> There should be no sharp or hard edges on the chair or controls.                                                                                                                                                 |
| Weight capacity                            | <b>Recommended:</b> At least 275 pounds weight capacity is strongly advised. (BIFMA best practice for standard chairs).<br><br><b>Minimum:</b> At least 250 pounds weight capacity. (BIFMA- Manufacturing industry standard).                                                                                                                               |
| Workspace Clearance for an ergonomic chair | <b>Recommended:</b> At least 48 inches of clearance (floor space) is recommended behind the front edge of the desk so that the user can freely push back to stand up, move and then get back in the workspace easily.<br><br><b>Minimum:</b> 36 inches is the minimum to allow a user to push back from the worksurface to stand up and then sit back down. |
| General Guidelines                         | Minimum 5-year warranty on cylinder and mechanisms.<br>Chair instructions included or available for end user.                                                                                                                                                                                                                                               |

## **Articulating Keyboard Platforms (AKP's) - 'Keyboard Trays':**

Although adjustable sit-stand desks are the recommended solution for new construction and major renovations, keyboard trays can be used as an alternative if sit-stand desks are not feasible when modifying existing workstations. All new projects should include sit-stand desks as recommended in this document.

Keyboard trays added to existing workstations increase the distance between the user and the monitor screen and their desktop equipment, yet may allow for more neutral upper body postures (arms, wrists and hands) while keying and mousing. When worksurfaces are not height adjustable or do not meet the specifications needed for certain users (e.g. petite or tall employees), keyboard trays may be needed to achieve appropriate computing heights as outline in this guidelines document.

Keyboard tray dimensions must provide enough space for a left or right-sided mouse, mouse pad, and a padded palm rest for a keyboard. A slim mounting keyboard tray



mechanism and track helps to avoid contact on the user's knees and legs while computing. Keyboard trays must be able to meet the following specifications in Table 3 (below).

**Table 3– Keyboard Tray Specifications:**

| Item                                  | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| Keyboard tray height                  | <p><b>Recommended:</b></p> <p><b>Seated keyboard tray adjustability:</b> 22.6 – 29.4 inches, measured from the floor to the top of the keyboard tray. (BIFMA G1-2013, p. 75)</p> <p><b>Standing keyboard tray adjustability:</b> 38.3 – 48.7 inches, measured from the floor to the top of the keyboard tray. (BIFMA G1-2-13, p. 78)</p> <p><b>Note:</b> With above guidelines, users should be able to sit in a variety of positions while computing on a keyboard tray with adequate clearance for legs and feet supported on the floor or a footrest. Shoulders, elbows, and wrists should be in neutral postures while computing.</p> |
| Keyboard tray storage                 | <p><b>Recommended:</b> The keyboard tray should be fully retractable under the work surface which requires a track length under the desk of at least 22 inches.</p> <p><b>Note:</b> If worksurface depth is less than 22 inches, a shorter track option can be used. The keyboard tray will not fully retract under the worksurface with a shorter track, so ensure the user is aware of this limitation before installation.</p>                                                                                                                                                                                                         |
| Keyboard tray clearance (floor space) | <p><b>Recommended:</b> Minimum of 48 inches of clearance is needed behind the front edge of the desk to fully extend a keyboard tray while the user is seated or standing.</p> <p><b>Note:</b> Extended keyboard tray will push the user further back from the desk, so recommended clearance is needed to move chair back without obstruction.</p>                                                                                                                                                                                                                                                                                       |
| Keyboard tray depth                   | <p><b>Recommended:</b> 11-inch minimum or enough to fit a standard or shaped keyboard in addition to a keyboard palm rest pad.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



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| Keyboard tray width     | <p><b>Recommended:</b> At least 27 inches wide and wide enough to accommodate a standard or shaped keyboard plus a mouse to the right or left.</p> <p><b>Minimum:</b> 19 inches wide with 8-inch dual right and left sliding mouse platforms.</p> <p><b>Note:</b> One-piece keyboard trays are recommended to ensure keyboard and mouse are positioned at the same height.</p> |
| Keyboard tray tilt      | <p><b>Recommended:</b> 0° (neutral) to 20° negative tilt.</p> <p><b>Note:</b> If feasible, positive tilt lock-out is advised to maintain neutral tray position and 0-20° negative tilt angle only.</p>                                                                                                                                                                         |
| Keyboard tray height    | <p><b>Recommended:</b> At least 8 inches adjustable height range to allow for recommended 22–30 inch high seated computing height, and at least 13 inches adjustable height range to allow for recommended 37-50 inch high standing computing height. (BIFMA- G1-2013)</p>                                                                                                     |
| Palm rest (optional):   | <p><b>Recommended:</b></p> <p><b>Height:</b> 1-inch maximum height to match keyboard keys height.</p> <p><b>Depth:</b> 1.5-inch depth minimum and 3-inch depth maximum. Keyboard tray palm rest pad should be removable with a separate removable mouse palm rest pad.</p> <p><b>Note:</b> Palm rest should be soft and rounded to minimize pressure on the wrists. (OSHA)</p> |
| Keyboard tray mounts    | <p><b>Recommended:</b> Hardware should allow for 27 inches of vertical knee clearance from the floor to bottom of the keyboard tray's track, and for a depth of 22 inches while seated. (BIFMA-G1 2013, p. 64)</p> <p><b>Note:</b> Hardware, tray, and track should have no accessible sharp edges.</p>                                                                        |
| Keyboard tray operation | <p><b>Recommended:</b> Easily manually adjustable vertically and horizontally without tools.</p>                                                                                                                                                                                                                                                                               |



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| Keyboard tray stability | Keyboard tray mechanism must lock and remain stable without bouncing during routine keyboard and mouse use. |
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## **Monitors:**

Monitors should have easily accessed controls for brightness, contrast, and other settings. Most LCD monitors now have an anti-reflective screen surface, which is essential to reduce reflective glare from external or internal light sources. Monitor bezels should be able to accommodate external webcams and any additional accessories such as document holders.

The following specifications are outlined to provide guidelines for monitor display screens in an office environment.

**Table 4- Monitor Specifications (when monitor is on a worksurface):**

| Item             | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| Monitor distance | <p><b>Recommended:</b> Viewing distance of 18-24 inches between the user and monitor screen for average size monitors (19-24 inch). (BIFMA G1-2013, p.80)</p> <p><b>Minimum:</b> Viewing distance of 15.7 inches between the user and display screen. (BIFMA G1- 2013, p. 80)</p> <p><b>Note:</b> User viewing distances vary depending on the size of monitors and user visual acuity. Worksurfaces must have sufficient depth as outlined in the worksurface guidelines in this document to allow for monitor distance variability.</p> |
| Monitor height   | <p><b>Recommended (for average size monitors- 19-24 inches):</b><br/>For upright <b>seated posture</b>, the top edge of the monitor screen should be adjustable by a minimum of 11 inches from 43 inches to 54 inches above the floor. (BIFMA G1-2013, p.86)</p> <p>For <b>standing posture</b>, the top edge of the monitor screen should be adjustable by a minimum of 14.6 inches from 56.8 inches to 71.4 inches. (BIFMA G1-2013, p. 86)</p>                                                                                          |



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|                   | <p><b>Recommended (for large monitors &gt;24 inches):</b><br/>Larger monitor screens should be positioned at a height that permits the user when seated or standing in an upright posture to comfortably view the top of the monitor to the upper 1/3 of the screen when looking straight ahead. (BIFMA G1-2013, p. 85)</p> <p><b>Note:</b> User monitor viewing heights will vary depending on the size of monitors and user visual acuity. It's important to keep the space above monitors clear for effortless monitor height adjustability. Avoiding overhead storage bins or cabinets is recommended as indicated in the worksurface design specifications in this guidelines document.</p> <p><b>Note:</b> Ideally, monitor stems have built-in height and angle adjustability to avoid unnecessary installation of monitor arms or monitor risers.</p> |
| Monitor placement | <p><b>Recommended:</b><br/>Monitor(s) should be positioned in the center of the primary work surface, so they do not interfere with the user's ability to adjust the height, tilt, and rotation of the monitor. (ANSI/HFES 100-2007, p. 83)</p> <p>Screen viewing area should allow for monitor positioning between 0° (eye level) and 60° below the user's horizontal eye height. The center of the visual display should be located approximately 15° to 20° below eye level. (ANSI/HFES 100-2007, p. 58)</p> <p><b>Note:</b> Worksurface design specifications outlined in this document will allow for placement of the monitor(s) in the center of the primary worksurface and for the vertical height and angle guidelines above.</p>                                                                                                                   |
| Monitor Swivel    | <p><b>Recommended:</b> Monitor(s) should be able to swivel a minimum of <math>\pm 45^\circ</math> in either direction (left-right), so that monitor(s) can be aligned, and adjusted to user's preferred position (e.g. primary monitor more centered to user and secondary monitor angled inward).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Monitor Tilt      | <p><b>Recommended:</b> Monitors should be able to tilt <math>\pm 10^\circ</math> in either direction (up-down), so that monitors can be adjusted to user's preferred viewing angle.</p> <p><b>Note:</b> As a general rule, the monitor screen angle should be between 0° to -10°, so the monitor screen is flat or the top is tilted slightly back.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



## Monitor Arms:

Monitor arms should provide vertical, horizontal, tilt, and swivel adjustability, allowing the user to easily adjust screens for optimal forward gaze viewing and to reduce disturbing reflections or glare. The user should be able to easily make adjustments to maintain a relaxed working posture regardless of the user's eye height. (BIFMA-G1 2013, p. 78)

Monitor arms should allow the user to meet all the requirements in the "Monitor" section above.

Recommended monitor arm specifications are outlined below in Table 5.

**Table 5- Monitor Arm Specifications:**

| Item                                      | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitor Arm-<br>Worksurface<br>Attachment | <p><b>Recommended:</b> A clamp attachment is recommended since it allows the installer or user to adjust the position of the monitor arm(s) on the work surface. This is important to achieve preferred monitor viewing positions and to work around other desktop items. Worksurface clamps must accommodate a desk thickness of up to 1.5 inches as outlined in the worksurface guidelines.</p> <p><b>Note:</b> A grommet clamp is an alternative attachment but requires drilling a hole into the worksurface to install the grommet attachment. This is not recommended since it's more difficult to relocate monitor arms.</p> |
| Monitor arm -<br>Display attachment       | <p><b>Recommended:</b> Monitor arm attachments must be VESA compliant. VESA compliant monitor arms will include (75 mm and 100 mm) plates for standard monitors.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Monitor arm -<br>Horizontal Distance      | <p><b>Recommended:</b> For desk depths of 30 or 36 inches, an 8–24 inch horizontal arm reach is recommended. This will provide the distance needed to position monitors adjacent to each other, or angled slightly in, and allow for desktop forearm support.</p> <p><b>Note:</b> 2-3 articulating monitor arm links are recommended for maximum adjustability when positioning multiple monitors together. Length of arms needed will depend on desk depth per worksurface guidelines.</p>                                                                                                                                         |



|                                  |                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitor arm -<br>Vertical Height | <b>Recommended:</b> At least 12-14 inches of vertical travel is recommended so monitors can be adjusted up or down easily to achieve optimal user viewing heights.<br><br><b>Minimum:</b> At least 10 inches of vertical travel.                                                                                                 |
| Monitor arm-<br>Weight capacity  | <b>Recommended:</b> A 15-30 pound weight capacity range is recommended. Monitor arms must support the weight of current UW standard monitors (24- 27 inch).<br><br><b>Note:</b> Current 24- 27 inch LED/LCD monitors weigh approximately 8-20 lbs. Monitor arm capacity must meet any changes to UW's IT monitor size standards. |
| Monitor arm-<br>adjustability    | <b>Recommended:</b> Monitor arms should be articulating at multiple joints and easily adjustable by the user simply using their hands. Monitor arms must be stable and hold the monitors in place once adjusted to the user's preferred position.                                                                                |
| Laptops                          | Laptops are not recommended for routine computer work at a traditional desk, cubicle, or office workstation without a suitable external monitor, keyboard, and mouse.                                                                                                                                                            |

## Installation

Furniture shall be installed following final application of interior finishes (paints/lacquers) so as not to provide "sink" for volatile organic compounds generated from the construction activities. Install per manufacturer's instructions and coordinate location with furniture installer.

## Testing and inspection requirements

Refer to IT standards and specifications for computer hardware requirements (e.g., monitor, keyboard, mouse, headset).

## REFERENCES

- Business and Institutional Furniture Manufacturer's Association (BIFMA)- BIFMA G1- 2013
- ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations © 2007
- European Economic Community (EEC)



- 89/391 EEC
  - 90/270/EEC
- GreenGuard Environmental Institute
- Occupational Safety and Health Association (OSHA)