

CASE STUDY - Computer Work

TASK TITLE: Computer Work

Task Description	<p>Computer work involves the use of a computer to perform a variety of tasks related to maintenance and inspection activities. Computer work typically involves the use of a keyboard and, sometimes, an additional input device (e.g. a mouse or trackball).</p> <p>Typical jobs in which computer work is performed include (not necessarily limited to):</p> <ul style="list-style-type: none">• computerized record keeping• tracking of preventative maintenance inspections (PMIs)• ordering parts• writing reports and memos <p>Computer work may be performed at a seated or standing work station or (via a laptop or a palmtop computer) in a variety of locations. In the maintenance inspection environment the issues or ergonomic concerns associated with computer work are generally less significant than for administrative areas since the duration of the task is lower. The key issues are discussed here for additional detail the user is directed to the computer work case study contained in the Level I Guide for Administrative Work Areas</p>
Job Performance Measures Most Often Impacted by Using a Computer:	<ul style="list-style-type: none">• Speed of completion of tasks.• Error free completion of tasks.
Typical Employee Comments about Using a Computer:	<p>For computer work, employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.</p> <p>The primary body regions affected are: head/eyes, hands/wrists/arms, and shoulder/neck. The secondary body regions affected are: back/torso and legs/feet.</p>
Suggested Level II Analysis:	Postural analysis, light level analysis.

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> Keyboard/mouse too high. (see Figure 1.1)  <p>Figure 1.1</p>	32. Lower the work surface <ul style="list-style-type: none"> set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard position the mouse at the same height as the keyboard 	✓		low	low	med
		123. Raise the person	✓		low	low	med
		120. Raise the chair <ul style="list-style-type: none"> set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse Note: in some cases, a footrest will be required in order to support the person's feet	✓		low	low	med
		38. Move closer to the work location <ul style="list-style-type: none"> move chair closer to keyboard/ edge of work surface 	✓		low	low	med
		<ul style="list-style-type: none"> Chair positioned too far away 					

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Lack of leg clearance under desk. Arms of chair or other obstructions interfere with moving chair closer (see Figure 1.2) 	80. Provide adequate leg clearance <ul style="list-style-type: none"> remove clutter from under work surface. remove cross beams if possible to increase clearance 132. Remove obstructions <ul style="list-style-type: none"> remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the work station 	✓	✓	low med	low low	low low
	 <p>Figure 1.2</p> <ul style="list-style-type: none"> Mouse/input device is too far away from the body Mouse not positioned next to keyboard. 	44. Place the mouse/input device next to the keyboard <ul style="list-style-type: none"> position mouse next to keyboard position mouse and keyboard so the forearm can be rested on the work surface while keying and mousing 	✓ ✓		low low	low low	med med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Keyboard tray is too small 	44. Place the mouse/input device next to the keyboard <ul style="list-style-type: none"> Replace the current keyboard tray with a tray which accommodates a mouse/input device and a keyboard add an attachment or extension to the side of the current tray 		✓	med to high	med	med
	<ul style="list-style-type: none"> Items used frequently not positioned close to the body. 	41. Move work piece closer to body <ul style="list-style-type: none"> Items which are used every few minutes or more should be placed close to the body 	✓		low	med	med
	<ul style="list-style-type: none"> Employee is not conscious of poor work habits. 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> encourage person to minimize reaching by arranging materials and documents according to frequency of use help person understand how to adjust the chair properly encourage person to take frequent rest pauses 	✓		low	low	med
			✓		low	low	med
			✓		low	low	med
			✓		low	low	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carrying materials	<ul style="list-style-type: none"> Rarely occurs 	N/A					
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> Rarely occurs 	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> Cradling of phone between the head and shoulder 	73. Provide a telephone headset		✓	med to high	med	high
		<ul style="list-style-type: none"> provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear) for employees who must key and talk on the phone for prolonged periods 	✓		low	med	med
		<ul style="list-style-type: none"> encourage employee to hold the phone with their hand discourage employee from talking on the phone while keying 	✓		low	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Document positioned flat on work surface 	111. Provide support for reference documents <ul style="list-style-type: none"> provide a document holder position document at the same height and angle as the monitor. if document is handled, flipped or written on, an inclined work surface is preferred. place document on side of dominant eye. 	✓	✓	med low	low low	med med
	<ul style="list-style-type: none"> Monitor positioned too low 	122. Raise the monitor/screen - monitor should be positioned such that the top of the screen is between 0-4" (0-10 cm) below eye height: <ul style="list-style-type: none"> use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height 	✓		low	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Monitor positioned too high (head tipped backwards) (see Figure 1.3)  <p>Figure 1.3</p> <ul style="list-style-type: none"> • Monitor and keyboard not aligned due to inadequate work station depth 	<p>30. Lower the monitor/screen</p> <ul style="list-style-type: none"> • monitor should be positioned such that the top of the screen is between 0-4" (0-10 cm) below eye height: • remove the hard drive from under the monitor • use a monitor riser, or other stable surface to position monitor at the correct height <p>45. Position the monitor/screen in front of the body</p> <ul style="list-style-type: none"> • position monitor so that it is directly behind the keyboard - this allows the body to be in alignment and prevents twisting of the neck • provide a work surface that is deep enough to support the keyboard and the monitor screen. For large monitors, this indicates a work surface which is at least 30" (76.2 cm) deep. • provide a work surface that is large enough for computer and paper tasks. 	✓		low	med	med
			✓		low	med	med
			✓		low	med	med
			✓		low	med	med
				✓	low	med	med
				✓	med	med	med
				✓	med to high	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Monitor is too high for bifocal user. 	100. Provide computer glasses <ul style="list-style-type: none"> provide monofocal computer glasses 		✓	med	med	med
		30. Lower the monitor/screen for bifocal users, place monitor directly on the work surface so that the head is upright not tilted back	✓		low	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> Keyboard/mouse too high. 	32. Lower the work piece/work surface <ul style="list-style-type: none"> if the work surface/keyboard tray is adjustable in height, lower/set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse 	✓		low	low	med
		120. Raise the chair <ul style="list-style-type: none"> set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse Note: in some cases, a footrest will be required in order to support the person's feet	✓		low	low	med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Keyboard is sloped towards the person 	49. Provide a flat/level keyboard (note: “flattening” the keyboard can help flatten the wrist) <ul style="list-style-type: none"> lower the feet on the back of the keyboard adjust the keyboard support surface so the keyboard is flat and level 	✓		low	low	med
	<ul style="list-style-type: none"> Resting wrists inappropriately on front edge of keyboard or on wrist rest 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> maintain straight wrists while keying and while resting the hands rest hands on arm rests of work surface in between data entry tasks 	✓		low	low	med
		65. Provide a palm rest <ul style="list-style-type: none"> palm rests provide a place to rest hands in between sets of key strokes. Encourage the person to avoid resting the hands on the palm rest while keying 	✓		low	low	low

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Using wrist movement to move mouse rather than arm movement 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> encourage person to use a forearm movement to move the mouse rather than a wrist movement 	✓		low	med	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> Rarely occurs 	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> Keying or mousing habits (e.g., repetitive stretching of thumb to use space bar) 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> encourage person to practice keeping the hands and fingers in a relaxed position keep the wrists straight and flat keep the fingers together and slight curved use the forearms to move around on the keyboard instead of “reaching” with fingers 	✓		low	med	med
			✓		low	med	med
			✓		low	med	med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> Keying/typing speed and length of task. Length of task without a work break. 	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> program macro keys to reduce keying. 	✓		low	low	med
		28. Incorporate rest pauses	✓		low	med	med
		33. Increase task variety	✓		low	med	high
	<ul style="list-style-type: none"> Person has tendency to grasp mouse too hard Keys feel stiff; require excessive force to activate Keys lack appropriate tactile and auditory feedback (“click”). 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> encourage person to practice keeping a light grip on the mouse 	✓		low	med	med
		56. Provide a keyboard which does not require excessive keying forces <ul style="list-style-type: none"> maintain or replace keyboard 		✓	high	med	med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact, or torque to the hand	<ul style="list-style-type: none"> Rarely occurs 	N/A					
10. Exposure to hard edges	<ul style="list-style-type: none"> Individual rests wrists on edge of work surface. Not enough room on work surface to support forearm for mousing. 	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> move keyboard forward so forearms rest evenly on surface for keyboard use, provide a palm rest eliminate the hard edge by replacing the hard edge with a "bull-nose"/rounded edge 	✓		low	med	med
		24. Increase size of work surface <ul style="list-style-type: none"> install keyboard tray that accommodates mouse, keyboard 		✓	low to med	med	med
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> Work area is too cold 	105. Provide portable heaters		✓	med	med	med
		23. Increase room temperature		✓	med	med	med

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> Reaching for items too far from body. Chair arms interfere with moving chair closer. 	41. Move work piece closer to body <ul style="list-style-type: none"> move documents and other reference materials into work zone. 	✓		low	med	med
		132. Remove obstructions <ul style="list-style-type: none"> remove or lower armrests. 	✓		low to med	med	med
13. Twisting of the lower back	<ul style="list-style-type: none"> Leg obstructions Restricted leg clearance Monitor and keyboard not aligned Monitor in the corner of desk Inadequate work station depth Inadequate work space 	80. Provide adequate leg clearance <ul style="list-style-type: none"> eliminate leg obstructions 	✓		low	med	med
		45. Position the monitor/screen in front of body <ul style="list-style-type: none"> position monitor so that it is directly behind the keyboard this allows the body to be in alignment and prevents twisting of the neck 	✓		low	med	med
		<ul style="list-style-type: none"> provide a work surface which is deep enough for a monitor and a keyboard. (at least 30" (76.2 cm) in depth is preferred, 36" (91.5 cm) for larger monitors) 		✓	low to high	med	high
		If paper and computer tasks are performed at the same work station, provide a work surface which is large enough for both tasks		✓	low to high	med	high

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements	<ul style="list-style-type: none"> Rarely occurs 	<ul style="list-style-type: none"> N/A 					
15. Static, awkward back postures	<ul style="list-style-type: none"> Monitor greater than 30" (76 cm) from eye causes the person to lean forward to read monitor 	41. Move work piece closer to body position monitor between 18 and 30" (46-76 cm) from eyes <ul style="list-style-type: none"> 22"-24" (56-61 cm) is a good distance for many people 	✓		low	med	med
		18. Improve visual access to work <ul style="list-style-type: none"> increase font size of text - font size of at least 12 point is recommended for screen distances of 18"-30" (46-76 cm). - font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76 cm) 	✓		low	low	low

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Inadequate lower back support Inappropriate chair adjustment. Inappropriate chair design 	115. Provide support for the lower back <ul style="list-style-type: none"> adjust back rest to support lower back pull chair forward and lean back while working attach a small pillow to back rest to support lower back provide a chair with adequate lower back support 	✓		low	med	med
	<ul style="list-style-type: none"> Keyboard is too low Mouse/input device is too low Documents are too low Chair too high 	124. Raise the work piece/work surface <ul style="list-style-type: none"> raise the fixed table with risers provide an adjustable table 	✓		low high	med med	med high
		31. Lower the person <ul style="list-style-type: none"> provide a chair/stool to sit on 	✓		low to med	med	med
		28. Lower the chair <ul style="list-style-type: none"> adjust the chair height lower to reduce the need to lean forward 	✓		low	med	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Person tends to lean forward while working 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> Encourage person to sit back and relax while working Encourage person to push his or her chair toward the work station in order to reduce the tendency to bend 	✓		low	med	med
	<ul style="list-style-type: none"> Keyboard or paperwork is too far away 	38. Move closer to the work location <ul style="list-style-type: none"> pull the chair closer to the work station stand closer to the work station 41. Move the work piece closer to the body <ul style="list-style-type: none"> move the keyboard closer to the body 	✓		low	med	med
	<ul style="list-style-type: none"> Seat pan on chair is too deep 	115. Provide support for the lower back <ul style="list-style-type: none"> attach a pillow to back rest to decrease the seat pan depth and support the lower back provide a chair with an adequate/adjustable seat pan depth and adequate lower back support 	✓	✓	low high	med med	med med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Inadequate foot support prevents person from obtaining proper back support Chair too high causes person not lean against back rest 	52. Provide a footrail/footrest <ul style="list-style-type: none"> provide a footrest which allows both the heels and toes to be supported - a box or several ring binders taped securely together can also be used (for additional information on footrest design refer to Level I Guide for Administrative Work Areas) 	✓		low	low	low
16. Lifting forces	<ul style="list-style-type: none"> Rarely occurs (if it occurs, see Lifting case study) 	N/A					
17. Pushing or pulling	<ul style="list-style-type: none"> Rarely occurs 	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> Standing on hard surfaces 	86. Provide an appropriate anti-fatigue mat		✓	med	med	med
		96. Provide appropriate shoe inserts <ul style="list-style-type: none"> inserts should be made of a high performance material such as a gel filled or viscous-damping media that is durable (open-cell foam inserts tend to break-down quickly and lose ability to distribute forces) 	✓		low	low	low
	<ul style="list-style-type: none"> Inadequate foot support 	52. Provide a footrail/footrest <ul style="list-style-type: none"> provide a footrail which allows the person to rest one foot at a time 		✓	low	low	low
	<ul style="list-style-type: none"> Seat pan which is too deep causes pressure on back of legs 	115. Provide support for the lower back	✓		low	med	med
		<ul style="list-style-type: none"> attach a pillow to back rest to decrease the seat pan depth and support the lower back provide a chair with an adequate/adjustable seat pan depth and adequate lower back support 		✓	high	med	med

Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> • Hard edge on front of seat pan 	64. Provide a compressible, padded surface to sit on <ul style="list-style-type: none"> • provide a cushion for the seat pan to prevent contact with hard edge • provide a chair with a rounded front edge on the seat pan 	✓		low	med	med
				✓	high	med	med
	<ul style="list-style-type: none"> • Seat pan which is too deep causes pressure on back of legs 	115. Provide support for the lower back <ul style="list-style-type: none"> • attach a pillow to back rest to decrease the seat pan depth and support the lower back • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support 	✓		low	med	med
				✓	high	med	med
21. Awkward leg postures	<ul style="list-style-type: none"> • Inadequate foot support causes legs to be tucked back or causes person to cross legs 	52. Provide a footrail/footrest <ul style="list-style-type: none"> - provide a footrest which allows both the heels and toes to be supported - a box or several ring binders taped securely together can also be used 	✓		low	low	low
22. Standing foot pedal	<ul style="list-style-type: none"> • Rarely occurs 	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> • Glare directly from a light source: looking towards an overhead light • Glare from an overhead light reflected off monitor or other shiny surfaces. 	109. Provide protection from glare from overhead lights/task lights <ul style="list-style-type: none"> • provide screen hood/visor. • position monitor between rows of overhead lights. • tilt monitor down so that it is parallel to the floor. • remove glossy or shiny surfaces from work area • place the work station so that it faces a wall or partition. • install parabolic louvers to direct light down on the surface. 	✓		low	med	med
			✓		low	med	med
			✓		low	med	med
			✓		low	med	med
			✓	✓	med	med	med
				✓	high	med	med
	<ul style="list-style-type: none"> • Glare directly from a light source: looking towards a task light • Glare from a task light reflected off monitor or other shiny surfaces. 	109. Provide protection from glare from overhead lights/task lights <ul style="list-style-type: none"> • direct task light away from screen and eyes. • turn off the task light • move monitor screen out from underneath fixed task lights • shield task light to prevent it from shining into eyes. 	✓		low	med	med
			✓		low	med	med
			✓		low	med	med
				✓	low	med	med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Glare directly from a light source: looking towards an uncovered window Glare from an uncovered window reflected off monitor or other shiny surfaces. 	108. Provide protection from glare from natural light <ul style="list-style-type: none"> orient work station so that the monitor screen is perpendicular to the window. adjust window coverings provide window coverings 	✓		low	med	med
	Light levels too high: in particular, for computer tasks (for more detail on the impact of lighting, refer to Level I Guide for Administrative Work Areas)	27. Lower the light levels <ul style="list-style-type: none"> 20-50 fc (200-500 lux) is an appropriate range of light levels for computer tasks. remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the appropriate technical assistance and the agreement of co-workers in the area. 	✓	✓	low med to high	med med	med med
	<ul style="list-style-type: none"> Light levels are too low: in particular, for reading tasks 	22. Increase light levels <ul style="list-style-type: none"> provide task light (50-100 fc is an appropriate range of light levels for reading tasks) increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed) 		✓	med	med	med
				✓	med	med	med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Uncorrected visual disorders cause the person to lean forward to read monitor or documents Font/character size too small to read on computer screen. VDT screen dirty. 	14. Encourage person to have visual disorders corrected 18. Improve visual access to work <ul style="list-style-type: none"> increase font size of text font size of at least 12 point are recommended for screen distances of 18"-30" (46-76 cm). font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76 cm) 18. Improve visual access to work <ul style="list-style-type: none"> clean screen regularly. 	✓		low	med	med
			✓		low	med	med
			✓		low	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> Length of work task without a change of position for the eyes. 	8. Distribute intensive activities throughout the process <ul style="list-style-type: none"> perform intensive visual tasks for short periods throughout the day (as opposed to in one continuous session). 	✓		low	med	med
		20. Incorporate rest pauses <ul style="list-style-type: none"> periodically look away from screen. 	✓		low	med	med

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