

COMPUTER WORKSTATION ASSESSMENT TRAINING



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SASKATCHEWAN

Work to live.

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DEFINITIONS

APPENDIX:

OH & S Regulations: Chapter 81: Musculoskeletal Injuries

Interacting with the Worker

Recommended Tools

FORMS:

Chair Report Card

Chair Suitability Report

Workstation Report Card

Workstation Posture Assessment

EXAM

EVALUATION

COMPUTER WORKSTATION ASSESSMENT TRAINING COURSE

INTENDED AUDIENCE: Supervisors or their designates, 6 participants

OBJECTIVES: At the end of the course, participants will know how to:

- Apply ergonomic principles to set up a computer workstation
- Assess a computer workstation for ergonomic fit

LOCATION: Participants' place of employment

REQUIREMENTS: Room suitable for slide presentation

Access to five different computer workstations:

- Two to be used for instructional purposes
- Three to be used for evaluation purposes
- Preferably, each workstation should vary as relates to:
 - o The range of workers who may use it
 - o The tasks performed by the users
 - o The type of equipment/resources required
- Participants should wear comfortable pants, shirts and footwear suitable for moving around freely

TIME FRAME: Six hours

GETTING STARTED

MATERIALS:

Resource Manual

Assessment Forms

- Chair Report Card
- Chair Suitability Report
- Computer Workstation Report Card
- Computer Workstation Posture Assessment

Tool Kit

- Goniometer (beveled protractor)
- Tape measure
- Pen

PROCESS:

One and one-half hour slide presentation

Two hour interactive demonstration/practice

One-half hour group exam – open book

Two hour practical exam – computer workstation assessment

INTRODUCTION

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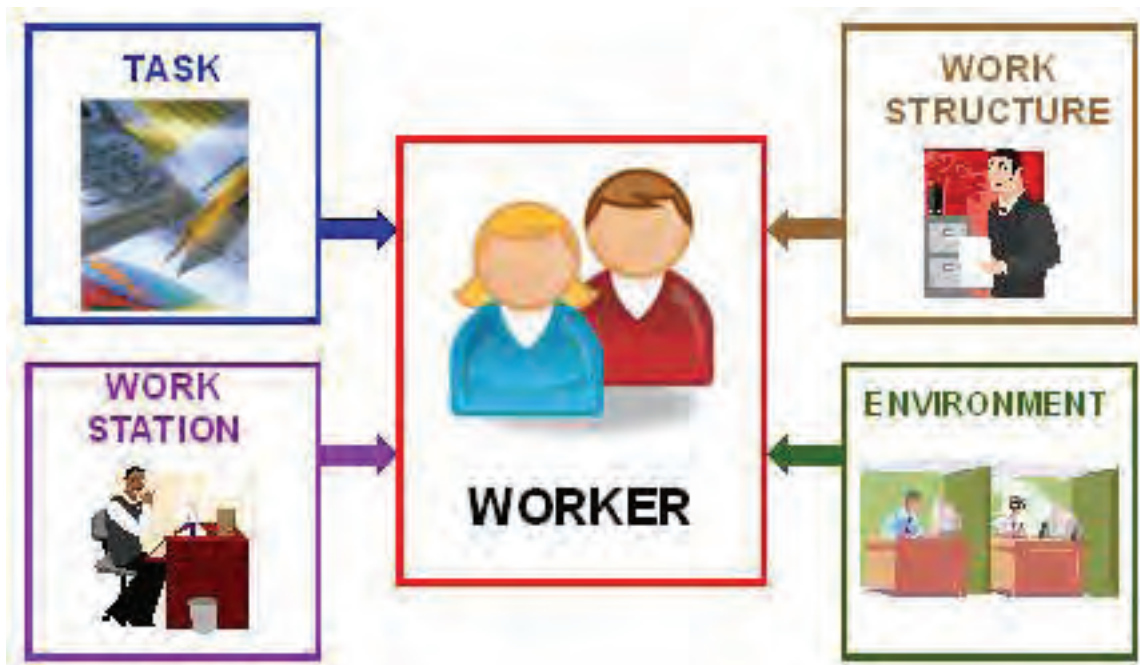
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1.1 What is ergonomics?

Ergonomics is the science of making the workplace safer, more productive, and more comfortable for the worker.

Ergonomics seeks to design or redesign work, so that it is compatible with what we know about the human body and how it works.

It is the principle of making the job fit the worker.



The postures the worker adopts while performing work tasks in his/her workstation are determined by the interaction of the worker with the **equipment/resources** he/she must use and the **design/layout** of the workstation.

The main tasks of office work are keyboarding/mousing, reading/writing, viewing documents and viewing the monitor screen. The standard components of a computer workstation include an adjustable chair, a work surface, and desktop computing equipment (keyboard, mouse, CPU, and monitor). The workstation may also include a footrest, document holder, telephone, and related furniture and equipment.

Setting up the workstation to allow for optimal working postures is the basis of workstation ergonomics.

1.2 Tissue Tolerance

Tissue tolerance is the amount of force that a body tissue can bear before it fails and injury occurs.

- Different body tissues (muscle, tendon, ligament, nerve, blood vessel, etc.) have different tissue tolerance levels.
 - Muscles are considered to have the lowest tissue tolerance in the musculoskeletal system.
- Tissue will adapt to the demands placed on it if its tolerance is not exceeded.

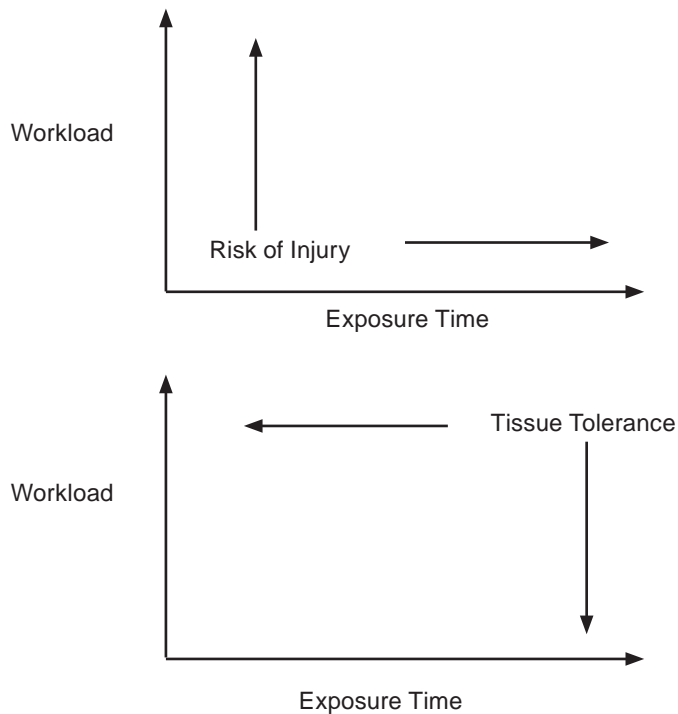
Workloads are forces that act on the body during work. During the course of the workday, workloads are placed on various body tissues.

The difference between the workload and the tissue tolerance is the **safety margin**.

- If the tissue tolerance far exceeds the workload, there is little risk of injury.
- As the difference between the workload and the tissue tolerance decreases, the risk of injury increases.
- If the workload exceeds the tissue tolerance, injury occurs.

Injury occurs when:

- The application of force during a task is so large that it exceeds the tissue tolerance. The result is an **acute** injury.
- Over time the application of lesser repetitive and/or sustained force lowers the tissue tolerance to the point where it is exceeded. The result is a **cumulative** injury.
 - When a workload is repeatedly applied to tissue, the tissue tolerance gradually decreases. If the workload is applied often enough, the tissue tolerance will eventually decrease to the point where it can no longer tolerate the low workload.
 - During a sustained event, the workload must be maintained for a period of time. This leads to a gradual decrease in tissue tolerance. If the tissue tolerance becomes less than the workload, injury occurs.



Tissue tolerance **recovery time** is exponentially related to activity time. Thus, tissue tolerance recovery time is much higher for repetitive/sustained load forces at low load levels than for high load forces applied over a short period of time. For example:

- If a high contraction force elicits fatigue for only one minute, muscle recovery is fast.
- A muscle fatigued for one hour may take hours to recover.
- If the fatiguing process lasts the whole 8 hour working day, the affected muscle(s) may not recover before the next morning.
- Depending on to what degree a tissue is stressed during work, no amount of rest may be able to fully repair the damage.

Basic ergonomic principles:

- The greater the workload, the greater the risk of the workload exceeding tissue tolerance.
- The more frequent the workload, the greater the risk of decrease in tissue tolerance.
- The more sustained the workload, the greater the risk of decrease in tissue tolerance.
- Work activity decreases tissue tolerance.
- Work breaks allow tissue tolerance time to rest, recover and increase.

1.3 Posture Force Relationship

Force is not simply determined by the weight of a load. The position of the load relative to the affected body joint(s) also influences the force imposed on the body.

When any segment of the body moves away from a joint, increased force is required because the segment is increasing the distance away from the joint or point of rotation.

When a muscle is close to its resting length, it has the greatest potential to generate force. The further the muscle is from its resting length, the less force production potential and the harder the muscle must work to manage the load.

Postures close to the end of the joint range of motion are considered to be extreme. High muscle activity is required to hold the position. Tissue tolerance decreases faster and there is increased risk of injury.

Blood flow can also be compromised leading to fatigue. Fatigue is the inability to maintain the needed development of force or power. In relation to work, fatigue is the point at which the worker can no longer perform a specific job with the same intensity. Fatigue lowers tissue tolerance.

An objective of ergonomic design is to reduce the amount of force required by the muscles to manipulate a load. The computer workstation should be set up to allow the worker to maintain neutral postures that are closest to the resting points of affected muscles. **Neutral postures allow for maximum efficiency using the least amount of energy.**

Any posture that takes body parts away from neutral is considered awkward as force requirements are increased in order to maintain the posture. In addition, awkward postures can cause pinching or impingement of tissues (nerves, arteries, veins, etc.).

Postures can be classified as either dynamic or static.

Dynamic postures are postures that involve movement. In dynamic postures, muscles are continuously tensed and relaxed. The muscles involved are not under constant load, as there is a rest interval in between each muscle tensing event.

Muscle contractions typically aid circulation. When muscles contract they squeeze down on the blood vessels within them, forcing blood out. When they relax, the blood vessels open up and fresh blood is drawn in.

Regularly changing positions keeps blood flowing, muscles well fed, and waste products removed. Different muscles share in the workload and tired muscles are given the opportunity to rest.

However, when dynamic postures are repetitive, the rest interval does not provide sufficient opportunity for tissue tolerance recovery and the risk of injury increases.

Static postures are postures that are held in a fixed position for a sustained period of time. The affected

Introduction

muscles are under continuous load. There is no rest interval.

Static posture decreases blood circulation. Blood flow to an affected muscle is restricted. The movement of waste products out of the muscle, and the delivery of oxygen and nutrients back into the muscle are reduced. The muscle can become oxygen deficient and thus more susceptible to injury.

The body and its joints are made for movement. Even neutral postures, if held for a long time are tiring. If the static posture is awkward, physical demands are even greater.

NEUTRAL UPPER BODY POSTURES AND JOINT ANGLES

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2.1 Neck

The neck is in neutral posture when the head is relatively upright, facing forward, balanced over the spine and in alignment with the upper body.

Neutral Posture



Neutral Posture



Awkward Posture – Rotation



Awkward Posture – Lateral Bend



Awkward Posture – Flexion



Awkward Posture – Extension



2.2 Back

The back is in neutral posture when the head, shoulders and hips are in alignment, facing forward and the upper (neck), middle and lower back form a gentle S curve.

Neutral Posture



Neutral Posture



Awkward Posture – Rotation



Awkward Posture – Lateral Bend



Awkward Posture – Flexion



Awkward Posture – Extension



2.3 Shoulder

The shoulders are in neutral posture when they are relaxed and the arms fall naturally to the body side. The shoulder allows the arm to move through space, to direct and support the hand. This supporting function imposes high forces on the shoulder. The further the arm is moved away from the body, the greater the load on the shoulder joint.

Neutral Posture



Awkward Posture – Raised



Awkward Posture – Abduction – lateral – dropped



Awkward Posture – Abduction – away from the midline



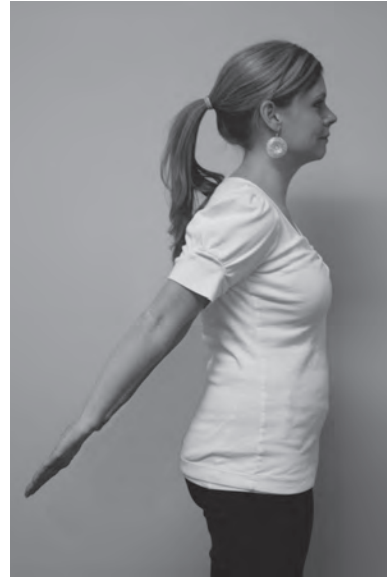
Awkward Posture – Adduction



Awkward Posture – Flexion



Awkward Posture – Extension



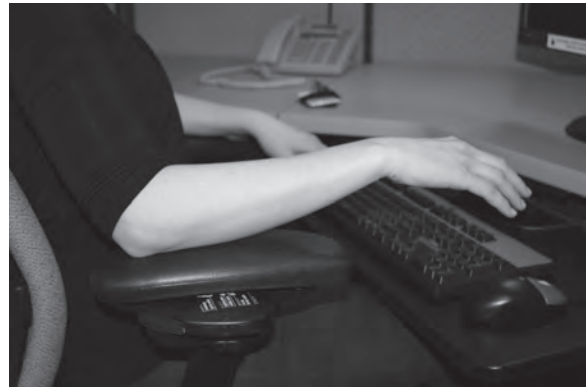
2.4 Elbow

When working, the elbow should generally be held at a right angle, or 90°. Thus, during keyboarding/mousing, the elbow is in neutral posture if it is approximately 90°.

Neutral Posture



Awkward Posture – Acute Flexion



Awkward Posture – Obtuse Flexion



2.5 Wrist

The wrist is in neutral posture when the hand, wrist and forearm are in alignment, hands straight out from the forearms, and fingers slightly flexed. The majority of the power producing muscles for the wrist, hand and fingers are located in the forearm and attach as high up as the lower aspects of the humerus (arm bone). The forearm muscles must transmit force over a long distance to the fingers. Deviated wrist postures increase tendon travel distance and friction.

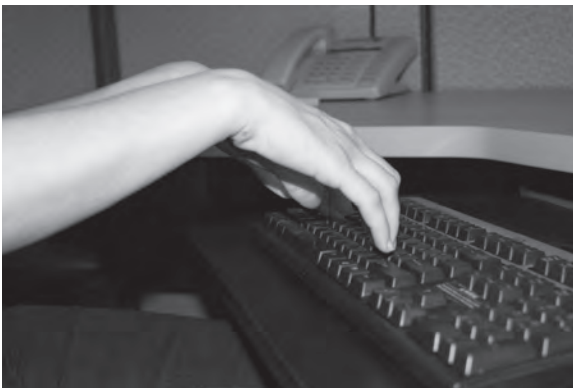
Neutral Posture



Neutral Posture



Awkward Posture – Flexion



Awkward Posture – Extension



Awkward Posture – Radial Deviation



Awkward Posture – Ulnar Deviation



2.6 NEUTRAL & EXTREME JOINT ANGLES

The following chart indicates neutral or desired working joint angles and extreme or dangerous working joint angles.

Body Part	Motion	Joint Angle (Degrees)	Joint Angle (Degrees)
		NEUTRAL	EXTREME
NECK	Rotation	0 - 8	40+
	Lateral Bend	0 - 5	24+
	Flexion	0 - 6	30+
	Extension	0 - 9	45+
BACK	Rotation	0 - 10	45+
	Lateral Bend	0 - 5	20+
	Flexion	0 - 10	45+
	Extension	0 - 5	20+
SHOULDER	Outward Rotation	0 - 3	17+
	Inward Rotation	0 - 10	49+
	Abduction	0 - 13	67+
	Adduction	0 - 5	24+
	Flexion	0 - 19	94+
	Extension	0 - 6	31+
ELBOW	Flexion	0 - 14	71+
FOREARM	Pronation	0 - 8	39+
	Supination	0 - 11	57+
WRIST	Flexion	0 - 9	45+
	Extension	0 - 10	50+
	Radial Deviation	0 - 3	14+
	Ulnar Deviation	0 - 5	24+

(Source: Drury, C. G. (1987), "A biomechanical evaluation of the repetitive motion injury potential of industrial jobs," V2, No. 1, March 1987.)

CHAIRS AND SITTING: SUPPORT FUNCTION

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3.1 Sitting



Why is the chair the most important piece of equipment in an office workstation?

All office workers sit at some point to perform work tasks (many sit for most of the working day).

- The chair puts the worker in contact with the workstation
- The chair is the worker's primary support system when sitting
- Sitting requires muscular force
- The right chair can reduce and/or eliminate muscular forces

Some facts about sitting:

- Sitting requires 15-20% less energy output than standing
 - This is why most people prefer to sit throughout the day
- Sitting places 20 - 40% more pressure on the lumbar discs than standing (depending on the type of sitting posture)
 - This is why most people cannot sit for too long
- The action of sitting down involves flexion of the knee and trunk and a backward rotation of the pelvis. These actions result in a flattening of the lumbar spine (nonneutral posture)
 - To overcome this non-neutral posture the pelvis needs to rotate forward to restore the lumbar lordosis (neutral spine posture). This requires muscular effort

Advantages of sitting in a chair adjusted to fit the worker include:

- Increased stability of the upper body
- Decreased energy consumption
- Decreased static muscular effort
- Reduced stress on the lower extremities
- Less demand on circulatory system due to lower hydrostatic pressure in lower extremities

Sitting must provide stability yet also allow for movement. The chair must provide structural support to stabilize the body while making space allowance for movement of body segments.

When a supportive ergonomic chair is adjusted to fit the worker, it reduces or even eliminates the muscular effort required to sit. A properly adjusted chair provides the supportive forces and less of the worker's body needs to be stabilized by muscles.



A good chair supports the mass of the upper body and the weight of the limbs through four key features: the seat, the backrest, the floor (or footrest) and the armrests. Most office chairs are supposedly designed to accommodate the middle 95% of the population, from the 5th percentile female to the 95th percentile male. However, there is no true 5th or 95th percentile person as nobody is average in all body dimensions. Someone at the 95th percentile for height is likely to be at a different percentile on distribution curves for other body dimensions such as lower leg length or sitting elbow height. So a chair designed to accommodate the middle 95th percent of each of a succession of important body dimensions could exclude a different 5% of users. The end result would be a chair that accommodates significantly less than 95% of potential users.

Stability balls should not be used as office chairs:

- The body must continuously work to maintain balance and seated posture on a stability ball. This active sitting increases the rate of fatigue.
- Stability balls do not have a stable balance and present a potential safety risk of falling.
- Stability balls do not have armrests or back supports, key features in supporting the body.
- A reclined sitting position produces the least amount of disc pressure and muscle activity – this cannot be achieved with a stability ball.

3.2 Features of a Good Ergonomic Chair



Evenly distributed 5 leg base, with its feet set in a circle at least as big as the chair's seat (minimum radius of 30 cm/12")

Castors

- To provide stability
- To minimize twisting
- To facilitate access to work materials
- To ease sitting down and standing up

Base with a pneumatic (air) cylinder

- For ease of adjustment

Non-slip breathable fabric seat

- To prevent worker from sliding off chair
- To allow for moisture to be wicked away from the body

Dense foam that compresses no more than 2.5 cm (1")

- To provide support
- To minimize contact stress
- To minimize fatigue resulting from the effects of prolonged compression of body tissues



Waterfall seat (seat curves downward at front edge)

- To prevent pressure on the back of the worker's legs
- To minimize fatigue resulting from the effects of prolonged compression of body tissues
- *A seat with too sharp an edge can cause pressure on the back of the thigh or knee, resulting in leg swelling, decreased circulation and nerve pressure*

360° swivel seat

- To facilitate access to work materials
- To ease sitting down and standing up
- To reduce twisting



Adjustable seat height

(38 cm to 51 cm or 15" – 20", CSA Section 7.4)

(42 cm to 51 cm or 16.5" – 20" is standard)

(38 cm to 45 cm or 15" – 18" is low height)

- Knee and hip angles impact spinal posture
- The height, depth and angle of the seat pan influence knee angle, hip angle and circulation
- The worker's feet should rest firmly on the floor
 - The floor, and not the front part of the thighs that rest on the seat pan, should bear the weight of the lower legs
 - Lower leg support while sitting distributes and reduces the forces on the buttocks and the back of the thighs
 - *When the legs are not supported, the worker will tend to slide forward to allow his/her feet to touch the floor, moving him/her away from the backrest and into an unsupported posture*
 - *A seat that is too high can cause pressure on the back of the thigh or knee, resulting in leg swelling, decreased circulation and nerve pressure*

- When sitting, the lengths of the leg muscles change and affect the position of the pelvis
 - *If the seat pan is too low, the worker's knees will be elevated, which will pull on the pelvis causing it to rotate further backwards, further flattening the lumbar curve*
- When sitting, part of the trunk weight is transferred to the supporting horizontal surface

Sufficient seat pan width

(> 45 cm or >18", CSA Section 7.4)

- To accommodate the worker's buttocks
- To support the weight of the worker

Adjustable seat pan depth

(38 cm - > 46 cm or 15" - > 18", CSA Section 7.4)

(Small: 38 - 42 cm or 15" – 16.5")

(Medium: 42 - 46 cm or 16.5" – 18")

(Large: > 46 cm or > 18")

- When sitting, part of the trunk weight is transferred to the supporting horizontal surface
 - The seat pan is the main part of the chair that supports the weight of the worker
- The height, depth and angle of the seat pan greatly influence knee angle, hip angle and blood circulation



- Seat pan depth should be adjustable to the length between the workers' buttock and the back of their knee
 - A free space between the back of the knees and the seat pan of about 5 cm (2") encourages leg movements
 - *A seat that is too deep can cause pressure on the back of the thigh or knee, resulting in leg swelling, decreased blood flow to the lower extremities and nerve pressure*
 - *A seat pan that is too short can irritate the sciatic nerve*

Adjustable seat pan tilt (3° forward to 4° back)

- Knee and hip angles impact spinal posture
- The height, depth and angle of the seat pan greatly influence knee angle, hip angle and blood circulation
- When the seat pan is angled forward, the lower extremities are positioned at a downward angle and the leg muscles are more relaxed
 - In a relaxed state, leg muscles do not pull on the pelvis, rotate it and affect the lumbar curve as much
- Research indicates that a back angle of 110° or greater places the least stress on the spine
 - *When the seat pan is horizontal and the backrest is angled back, the worker is further away from his/her work and tends to sit in an unsupported position*
 - By angling the seat pan down, the back angle of 110° can be maintained without moving the worker away from his/her work

Adjustable armrest height (19 cm to 24 cm or 7.5" – 9.5", CSA Section 7.4)

- Armrests are designed to allow the worker to support himself/herself when getting in or out of the chair
- Armrests are suitable for workers who perform a variety of tasks at a workstation, move frequently in and out of the chair, or sit back in the chair to talk to visitors
- Armrests are recommended when using the mouse for extended periods
- Armrests are less suitable for keying work
 - *Generally it is not recommended to rest the forearms on any support while typing because of the potential for restriction of circulation in the forearm and compression of the ulnar nerve at the elbow*



- Arm supports reduce force demands on the arm segment being supported because the support bears part of the load rather than the muscles
- Arm supports bear the weight of the arms and thus reduce forces placed on the lumbar spine
 - Studies have shown that using arm supports can decrease disc pressure

- Elbow supports provide a fulcrum at the elbow
 - When elbow supports are used, the axis of rotation becomes the elbow instead of the shoulder, making the external movement shorter
- *Armrests that are too high will force the worker to elevate his/her shoulders and abduct his/her arms, increasing the demands on the shoulder and upper back muscles*
- *Armrests that are too low will force the worker to slump forward or to the side to use them, redistributing and increasing pressures on the back*

Adjustable armrest width (at least 45 cm / 18")

- *Armrests that are too far apart will force the worker to elevate his/her shoulders and or abduct his/her arms, increasing the demands on the shoulders and the upper back muscles*

Adjustable armrest length (>18 CM / 7", CSA Section 7.4)
(set back at least 15 cm / 6" from front of seat)

- To provide forearm support when resting
- To allow worker to position self close to work surface

Concave backrest shape from side to side

- To support back

Backrest width (not less than 35 cm /14")

- To support back

Backrest height

(45 cm to 62.5 cm or 18" – 25", CSA Section 7.4)
(45 cm to 55 cm or 18" – 22" for standard back)
(high back: ≥7.5 cm or 3" higher than standard back)

- To support back

Convex shaped (from top to bottom) 50 mm thick lumbar support

- To support the lower back
 - A chair that maintains the normal alignment of the spine (s-curve) will relieve fatigue and discomfort

Adjustable lumbar support

(15 cm to 25 cm or 6" – 10" above seat, CSA Section 7.4)

- The lumbar support should be placed at the fourth or fifth lumbar vertebrae for the greatest benefit
- *Improperly positioned supports can be worse than no lumbar support*



Adjustable backrest tilt (between 90° to 130°)
(angle should be lockable at various positions within range)

- When sitting, the pelvis rotates backwards, causing the lumbar area to flatten and reducing lordosis (curved forward) and sometimes resulting in kyphosis (curved backwards)
- As the lumbar curve becomes less lordotic/more kyphotic, the forces placed on the tissues in the lower back change
- Research shows that disc pressure is greater during most sitting postures than when standing, but that sitting with the lumbar area supported and a large back rest angle actually reduces disc pressure
- A greater inclined backrest means a greater transfer of upper body weight to the backrest. Therefore, the backrest, not the discs and muscles, is supporting the weight
- The optimal condition for decreasing disc pressure and muscle activity is a backrest inclined 110° to 120° and a 50 mm thick lumbar support



Easy to operate adjustment controls

- To permit worker to self adjust chair
- To facilitate proper adjustment of chair to worker's body dimensions
- To allow for periodic adjustments to worker's seated posture



Adjustable from seated position

- To permit worker to remain in seated position while adjusting chair to body dimensions

Adjustability instructions

- To educate worker to adjust his/her own chair
- Adjustments and their purpose should be available to the worker
- To allow worker to adjust chair without requiring assistance
 - *Chair adjustments can be confusing without instructions*

3.3 NEUTRAL SITTING POSTURE

HEAD: Level or slight downward gaze, forward facing, and balanced over spine; in line with torso

NECK: Straight or in slight flexion and in line with rest of spine

SHOULDERS: Relaxed



UPPER ARMS: Hang naturally at side of body

ELBOWS: Close to body and form an angle slightly greater than 90 degrees

FOREARMS: Generally are parallel to the floor and in line with wrists

WRISTS: Straight and in line with hands

HANDS: In line with forearms and wrists

BACK: In line with head, neck, and hips; forms a gentle S curve; lower back in lordosis, fully supported; lumbar support fits into deepest part of lumbar curve

HIPS: Form an angle of 90 to 130 degrees, fully supported

THIGHS: Roughly parallel to the floor and fully supported

KNEES: Form an angle of 90 to 110 degrees; slightly lower than hips with a gap of 5 cm - 10 cm / 2 in - 4 in between front edge of seat pan and back of knees

LOWER LEGS: Slightly forward

ANKLES: Form an angle of 90 to 120 degrees

FEET: Slightly forward and fully supported by the floor or a footrest.

3.4 Neutral Sitting Posture Close Ups

Head

- Level or slight downward gaze
- Forward facing
- Balanced over spine
- In line with torso



Neck

- Straight or in slight flexion
- In line with rest of spine

Back

- In line with head, neck and hips
- Forms a gentle S curve
- Lower back in lordosis
- Fully supported
- Lumbar support fits into deepest part of lumbar curve



Hips

- Form an angle of 90° to 130°
- Fully supported



Thighs

- Roughly parallel to floor
- Fully supported



Knees

- Form an angle of 90° to 110°
- Slightly lower than hips
- Gap of 5 cm to 10 cm or 2" to 4" between front edge of seat pan and back of knees

Chairs and Sitting: Support Function

Lower legs

- Slightly forward

Ankles

- Form an angle of 90° to 120°



Feet

- Slightly forward
- Fully supported by floor or footrest

Shoulders

- Relaxed

Upper arms

- Hang naturally from shoulders
- Almost vertical

Elbows

- Close to body
- Form an angle slightly > than 90°

Forearms

- Generally parallel to floor
- In line with wrists and hands

Wrists

- Straight
- In line with hands and wrists

Hands (palm, fingers)

- In line with forearms and wrists
- Fingers slightly flexed



3.5 STEPS TO ADJUST CHAIR

1. LOCATE ALL ADJUSTMENTS.

2. SEAT HEIGHT:

Ask worker if current heel height is type of footwear usually worn.

If not, chair height should be adjusted to accommodate highest heel height typically worn and a footstool provided for use with lower heels.



Have worker stand in front of chair facing backrest.

Adjust seat pan height to just below worker's knee cap.

3. SEAT HEIGHT:

Have worker sit in chair, with back firmly against backrest to check seat pan height.

- Readjust seat pan height if needed so worker's:
- Feet are firmly on ground (ankles at 90° - 120°)
- Thighs are parallel to the ground (knee angle of 90° - 110°)
- Knees are slightly lower than hips

If work surface height is fixed, and:

- Taller than worker's seated elbow height by more than 5 cm (2"), raise the chair and add a footrest
- Lower than worker's seated elbow height, raise the work surface

If existing chair cannot be adjusted:

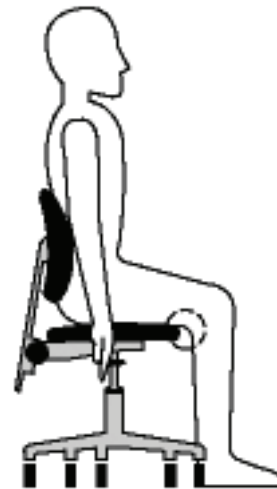
Low enough to fit worker, complete Chair Suitability Report to identify required chair characteristics.

- Alternatively, a footrest can be used

High enough to fit worker, complete Chair Suitability Report to identify required chair characteristics.

If a footrest is required/present, check that footrest is stable and large enough to accommodate both feet

- Fixed footrests are generally angled between 0° and 30°



4. SEAT DEPTH: Adjust seat so distance between back of worker's knees and edge of seat pan is 2 to 3 fingers (5 cm – 10 cm or 2" – 4") when worker sits firmly against backrest.

Worker's hip angle should be 90° to 130°, knee angle 90° to 120°, knee height slightly lower than hips.

If existing chair cannot be adjusted to fit worker, complete Chair Suitability Report to identify required chair characteristics.



5. SEAT TILT: Determine types of activities performed by worker while seated.

Adjust tilt accordingly: forward for close proximity tasks and horizontal for increased distance tasks.

The seat tilt should be somewhere between 90° and 130°.

6. LUMBAR SUPPORT:

Have worker stand up and place arm across small of back.

- Have worker sit down while keeping arm in small of back
- The lumbar support should be parallel to worker's arm
- Adjust lumbar support so it is positioned in middle of worker's lumbar curve
- If chair does not have lumbar support, a rolled towel, lumbar roll or cushion can be used to support the lower back. Be sure it fits properly and fits the size of worker's lumbar curve

7. BACKREST ANGLE: Check backrest angle. Adjust backrest angle so it is 110° to 130° with the seat pan.

8. ARMRESTS: Have worker hold arms at sides with elbows bent 90° (forearm parallel to floor, no shoulder elevation, flexion or abduction).

- Adjust armrest height so worker's elbows and forearms rest lightly (shoulders relaxed) on armrests when in use
- Adjust armrest width so worker's shoulders are neutral and upper arms remain close to body when in use
- When worker's arms are hanging at side, chair's armrests should be just below elbow
- Adjust armrest depth so worker's forearms are centered on armrests
- Check that armrests do not impede access to keyboard/mouse or restrict arm movement
- If armrests are in the way, remove them

9. WORKER KNOWLEDGE: Check that worker knows how to adjust assigned chair to fit.

WORKSTATION DESIGN

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4.1 Features of a Good Workstation Design

Adjustability

- People vary considerably in shape and size
 - There are gender related differences in bone structure and weight distribution, as well as infinite variations in limb lengths and body contours
- If the workstation will be used by more than one worker, an arrangement that accommodates the greatest range of body types is needed

Ease of adjustability

- Maintenance adjustability is usually acceptable if the workstation is assigned to one worker
- If the workstation is used by multiple workers, the workstation should be user adjustable



Workstation area sufficient for equipment/materials that make up the workstation

- To allow for full range of movement and to minimize awkward postures
 - *If the workstation is too small for the number of people, furnishings, equipment or other objects, the worker will not be able to move freely*
 - *If the workstation contains distortions, such as acute wall junctures and too many projections or surface changes, the worker will find it difficult to move around*

Semicircle (corner) design

- In a corner workstation the work surface extends along two sides of partitioning and forms a corner
 - *The corner section usually has a bridging section that is at 45° to the two sides*
 - *The bridging section may connect the two sides with a curve*
- The semicircle workstation design minimizes over-reaching and twisting
- An adjustable corner workstation design meets the needs of most computer workstations
- Corner workstations can be an efficient use of space
- Corner workstations often have built in cable housing

Stable work surface

- To minimize force requirements
 - *An unstable work surface results in awkward postures as muscles must work harder to keep the work surface in position*

Neutral coloured non reflective work surface

- To minimize glare

Flat smooth work surface

- For ease of writing

Rounded corners free of sharp edges

- To minimize contact stress
- To protect worker from injury

Height adjustable work surface

- The reading/writing work surface should be at least 5cm (2") higher than homerow on the keyboard
- A height adjustable work surface allows for adjustment of the reading/writing work surface to fit the worker
- Fixed height work surfaces rely on chair adjustments to allow the worker to maintain comfortable working postures
- The workstation height should be adjusted to allow the worker to maintain comfortable upright postures with elbows close to the body
- *If the work surface is too low, the worker will tend to lean forward when reading/writing, putting stress on the arms and back*
- *If the work surface is too high, the worker's arms and shoulders will be too high when reading/writing, resulting in static loading*
- A footrest is used to support the legs and feet in situations where chair and/or work surface cannot be lowered to fit the worker
- A good footrest has the following characteristics:
 - No sharp or hard edges
 - Sufficient surface area to allow for variations in leg posture
 - Stable enough to stay in place but mobile enough to be moved with the feet
 - Adjustable tilt





Sufficient work surface depth to accommodate keyboard and monitor in front of worker

(CSA recommends minimum of 76 cm or 30")

- To ensure monitor is positioned at least arm's length from the worker
- To ensure monitor screen and keyboard are in line with worker
- A freestanding workstation (desk) may have to be moved away from a wall to allow the monitor to be placed at the rear of the desk at an appropriate distance from the worker
- Some keyboard trays require a minimum work surface depth for installation

Sufficient work surface area to accommodate required equipment/resources

- The length and depth of the work surface depends on its use

Sufficient work surface area to accommodate tasks to be performed

- If drawer locations are fixed, the work surface and corresponding kick space need to be long enough to facilitate both keyboarding/mousing and reading/writing tasks
- Wider work surfaces may be required in reception areas for the placement of delivery items and to improve security

Reading/writing work surface and corresponding kick space on the worker's dominant side

- Right handed workstation – reading/writing work area is to the right of the monitor/keyboard/mouse
- Left handed workstation – reading/writing work area is to the left of the monitor/keyboard/mouse
- Left/right hand adjustable reading/writing work surface and corresponding kick space are recommended
- The natural inclination will be for the worker to perform reading/writing activities on his/her dominant hand side
- The worker will need to be able to get up close to the work surface and to have room underneath to accommodate movement of his/her legs and feet
- Any deep drawers should be located on the worker's non-dominant side
 - o Desks with deep drawers to the right are best for left-handed workers
 - o Desks with deep drawers to the left are best for right-handed workers

Work surface thickness provides for sufficient clearance between top of worker's thighs and bottom of work surface

- To allow legs to move freely
- To prevent awkward sitting postures such as twisting at the waist
- So worker does not bump legs



Sufficient under reading/writing area kick space (minimum 43 cm (17") knee space depth and 60 cm (24") toe depth, minimum 50 cm leg width (20"))

- The worker will need to be able to get up close to the work surface and to have room underneath to accommodate movement of his/her legs and feet
- To ensure room to change leg positions without getting up
- To allow for ease of movement of feet and legs
- The keyboard tray and/or its mounting mechanisms should not interfere with the worker's knees or posture



Sufficient under keyboard kick space for legs

(CSA recommends a minimum of 43 cm (17") of horizontal knee space depth and 60 cm (24") of toe space depth)

(CSA recommends a minimum of 50 cm (20") leg space width)

- To maintain neutral sitting posture
- To ensure room to change leg positions without getting up
- To allow for ease of movement of feet and legs
- The keyboard tray and/or its mounting mechanisms should not interfere with the worker's knees or posture
- If drawers are fitted to the work surface, the keyboard and monitor must be located over the leg-well space
 - o Mobile drawer units provide greater flexibility in the layout of a workstation to provide adequate kick space

Drawers located within comfortable reach

- The worker should not have to reach out or up, bend or twist to access frequently used items

Accessible storage space

- To minimize reaching and twisting

Sufficient storage space

- To keep workstation clutter free
- To ensure for a full range of movement



Stable keyboard/mouse tray

- To minimize force requirements
- *An unstable work surface results in awkward postures as muscles must work harder to keep the work surface from moving*



Height adjustable keyboard/mouse tray

- A height adjustable keyboard/mouse tray serves as the height adjustment mechanism for the keyboard/mouse when attached to a work surface set to the worker's reading/writing height
- *If the keyboarding height is too low, the back and neck experience greater work forces*
- *If the keyboarding height is too high, the shoulder and upper arm experience greater work forces*
- Maintenance adjustable or fixed height keyboard trays may be used if set to the worker's elbow height
- An alternative to a keyboard/mouse tray is to place both the keyboard and mouse on the work surface and adjust the work surface to the worker's keyboarding/mousing height



Distance adjustable keyboard/mouse tray

- To allow a better viewing arrangement by moving the worker back from the monitor screen or work surface
- To reposition the keyboard/mouse so the worker is approximately arm's length from the monitor screen
- The keyboard tray should not push the worker too far away from other frequently used items, such as the telephone

Tilt adjustable keyboard/mouse tray (horizontal to reverse)

- When typing/mousing, the keyboard/mouse should be level and the hand should not be pointed up or down
- Angle adjustability is desired to allow more precise matching of the keyboard angle to the worker's forearm angle
- Fixed angle keyboard trays may be used if horizontal or reverse tilted



Angle adjustable keyboard/mouse tray

- Allows worker to reposition keyboard/mouse quickly to keep worker, keyboard and monitor screen in line and centered

Sufficient keyboard/mouse tray surface area to accommodate both keyboard and mouse

- The worker should have enough space on the keyboard/mouse tray to move the cursor with the mouse in one sweeping movement rather than having to pick up and reposition the mouse
- A standard keyboard is 19" long, while fixed split keyboards are usually 21" or more long

Mouse tray (usually an extension on a keyboard tray, but can be a separate table or stand)

- The mouse should be placed:
 - o As close to the worker's side as possible
 - o At a height that allows the worker's upper arm to hang relaxed from the shoulder
 - o To allow neutral wrist posture, with the hand in line with the forearm
- If the keyboard tray is not long enough to accommodate both the keyboard and mouse, a mouse tray will:
 - o Reduce reaching by allowing the mouse to be positioned near the keyboard
 - o Allow for adjustment of the height and angle of the mouse so the mouse can be used with a straight wrist



Cable routing system

- To ensure computer cables do not present a trip and fall hazard
- To prevent interference with work tasks and equipment



KEYBOARDING AND MOUSING: INPUT INTERACTIONS

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5.1 NEUTRAL KEYBOARDING POSTURE

HEAD: Level or slight downward gaze, forward facing, and balanced over spine; in line with torso

NECK: Straight or in slight flexion and in line with rest of spine

SHOULDERS: Relaxed



UPPER ARMS: Hang naturally at side of body

ELBOWS: Close to body and form an angle slightly greater than 90 degrees; not resting on any surface

FOREARMS: Generally are parallel to the floor; in line with wrists; not resting on any surface

WRISTS: Straight and in line with forearms and hands; not resting on any surface

HANDS: In line with forearms and wrists; not resting on any surface; fingers slightly flexed

BACK: In line with head, neck, and hips; forms a gentle S curve; lower back in lordosis, fully supported; lumbar support fits into deepest part of lumbar curve

HIPS: Form an angle of 90 to 130 degrees, fully supported

THIGHS: Roughly parallel to the floor and fully supported

KNEES: Form an angle of 90 to 110 degrees; slightly lower than hips with a gap of 5 cm - 10 cm / 2 in - 4 in between front edge of seat pan and back of knees

LOWER LEGS: Slightly forward

ANKLES: Form an angle of 90 to 120 degrees

FEET: Slightly forward and fully supported by the floor or a footrest

5.2 NEUTRAL Mousing POSTURE

HEAD: Level or slight downward gaze, forward facing, and balanced over spine; in line with torso

NECK: Straight or in slight flexion and in line with rest of spine

SHOULDERS: Relaxed



UPPER ARMS: Hang naturally at side of body

ELBOWS: Close to body and form an angle slightly greater than 90 degrees; not resting on any surface

FOREARMS: Generally are parallel to the floor; in line with wrists

WRISTS: Straight and in line with forearms and hands

HANDS: In line with forearms and wrists; fingers fit comfortably over mouse

BACK: In line with head, neck, and hips; forms a gentle S curve; lower back in lordosis, fully supported; lumbar support fits into deepest part of lumbar curve

HIPS: Form an angle of 90 to 130 degrees, fully supported

THIGHS: Roughly parallel to the floor and fully supported

KNEES: Form an angle of 90 to 110 degrees; slightly lower than hips with a gap of 5 cm - 10 cm / 2 in - 4 in between front edge of seat pan and back of knees

LOWER LEGS: Slightly forward

ANKLES: Form an angle of 90 to 120 degrees

FEET: Slightly forward and fully supported by the floor or a footrest

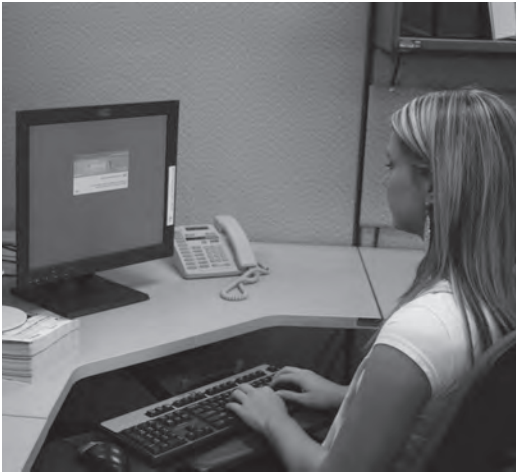
5.3 Keyboard/Mouse Setup

Keyboard

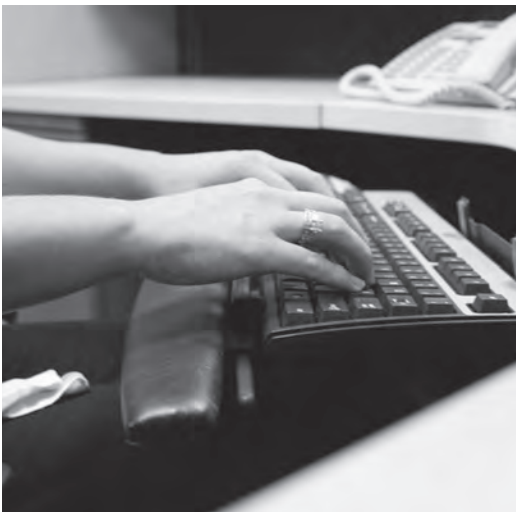
During keyboarding, the worker's upper arms should hang naturally from shoulders, upper arms almost vertical, elbows close to body, elbows form an angle slightly $> 90^\circ$, when fingers are in typing position on home row of keyboard, forearms, wrists and hands in line (CSA Sections 7.5.6,7.6.2,7.8.3)

- Placing the keyboard in the worker's immediate reach zone offers natural comfort and maximum hand-to-eye coordination
 - o This posture allows the shoulders to relax
 - o This posture puts the least stress on arms and wrists
 - o This posture allows the wrists to be held in a neutral posture
- *If the keyboard is positioned above the worker's elbow height:*
 - o *The worker will tend to elevate, abduct or flex shoulders*
 - o *The worker's elbows will be in sustained flexion*
 - o *The worker's wrists will have to be flexed to reach keys*
- *If the keyboard is positioned below the worker's elbow height:*
 - o *The worker will have to lean forward, putting stress on arms and back*
 - o *The worker must adopt awkward arm and back postures in order to "bend" to a closer position*
 - o *The worker's wrists will be in extension*
- *If the keyboard is positioned further in front of the worker than the length of his/her forearm and hand, the worker will tend to elevate, abduct or flex his/her shoulders*





- If used primarily for text entry, keyboard position should be directly in front of worker (center of alphanumeric keys (b key) centred on worker's midline) in line with worker and monitor screen
- If used primarily for data entry, keyboard position should be directly in front of worker's keying hand, in line with worker and monitor screen
- Most modern keyboards are asymmetrical in design (alphanumeric keyboard to the left and numeric keypad to the right)
 - If the outer edges of the keyboard are used as landmarks for centering the keyboard and monitor screen, the worker's hands will be deviated as the alphanumeric keys will be to the left of the worker's midline



During keyboarding, the worker's wrists should be straight

- If worker sits in a forward or upright position, the keyboard should be tilted away (negative angle) from the worker
- Keyboard angle must allow worker to keep wrists straight with no flexion/extension
- Deviated wrist postures increase tendon travel distance and friction

The keyboard/mouse should be positioned on same surface and beside each other

- The length of the keyboard determines the amount of arm extension required to reach the mouse

Mouse

During mousing, the worker's upper arms should hang naturally from shoulders, upper arms almost vertical, elbows close to body, elbows form an angle slightly $> 90^\circ$ when hand is resting comfortably on mouse, forearm, wrist and hand are in line (CSA Sections 7.5.6, 7.6.3, 7.8.4)



- Placing the mouse in the worker's immediate reach zone offers natural comfort and maximum hand-to-eye coordination
 - o This posture puts the least stress on arms and wrists
 - o This posture allows the wrists to be held in a neutral posture
- *If the mouse is positioned above the worker's elbow height:*
 - o *The worker will tend to elevate, abduct or flex shoulders*
 - o *The worker's elbows will be in sustained flexion*
 - o *The worker's wrists will have to be flexed to reach keys*
- *If the mouse is positioned below the worker's elbow height:*
 - o *The worker will have to lean forward, putting stress on arms and back*
 - o *The worker must adopt awkward arm and back postures in order to "bend" to a closer position*
 - o *The worker's wrists will be in extension*
- *Holding the arm in a fixed, raised, or outstretched position in order to use the mouse results in static loading of the shoulder*
- *If the mouse is positioned further in front of the worker than the length of his/her forearm and hand, the worker will tend to elevate, abduct or flex his/her shoulders*
- The wrist rest, if applicable, should be positioned immediately in front of keyboard/mouse
 - o Wrist rests are not recommended
 - o They are intended for use when the worker stops typing
 - o It is recommended that the worker remove his/her hands from the keyboard area during pauses in typing

5.4 STEPS TO ADJUST KEYBOARD

1. LOCATE ALL ADJUSTMENTS. HAVE WORKER SIT AT WORKSTATION.

2. KEYBOARDING / MOUSING AND READING / WRITING WORKSPACE LOCATION:

Determine whether workstation provides sufficient work surface area and corresponding kick space for separate keyboarding / mousing and reading / writing areas.

Each area will require (to CSA guidelines):

- Minimum of 43 cm (17") of horizontal knee room and 60 cm (24") of toe space
- Minimum of 50 cm (20") of horizontal leg space
- Minimum 5 cm to 7.5 cm (2"-3") of space between top of worker's thighs and underside of workstation

If there is not sufficient kick space, supply worker with an in line document holder sturdy enough for the worker to write on.

Determine whether workstation is adjustable for hand dominance:

- If workstation is not adjustable, position keyboarding and mousing area so that reading/writing area is located on the worker's dominant hand side
- If workstation is adjustable, position drawers so that shallow or pelican drawers are located on the worker's dominant hand side, deep drawers are located on the worker's non-dominant hand side and reading/writing area is located on worker's dominant hand side

3. WORK SURFACE HEIGHT: Determine whether there is a keyboard/mouse tray.

- If not, work surface height will be set to worker's seated elbow height (keyboarding/mousing height)
- If yes, reading/writing work surface height will be set to approximately 5 cm (2") above worker's seated elbow height

Determine whether work surface height is fixed.

If work surface height is fixed and too low, add extensions to raise work surface to appropriate height.

If work surface height is too high, adjust worker's chair and add a footstool so when seated work surface is appropriate height.

4. KEYBOARDING/MOUSING TRAY: If a keyboard/mouse tray is the keyboarding/mousing work surface, determine whether there is sufficient area to accommodate both the keyboard and mouse.

If not, arrange for either:

- Installation of a wider keyboard/mouse tray
- Installation of a separate mouse tray
- Replacement of keyboard with a shorter keyboard design
- Removal of keyboard/mouse tray and work surface height set to keyboarding/mousing height

5. KEYBOARD/MOUSE HEIGHT:

Method 1: Have worker sit in keyboarding position, and instruct worker to position hands just over keyboard homerow.

Position keyboard under worker's hands at a height obviously too low for worker.

Slowly raise keyboard, having worker lead with hands.

Raise keyboard to a position obviously too high for worker.

Lower keyboard until worker indicates where it feels most comfortable.

WORKER'S SHOULDERS SHOULD BE RELAXED, UPPER ARMS AT SIDE, ELBOWS AT APPROXIMATELY 90°, LOWER ARMS, WRISTS AND HANDS IN LINE.

This is the height that the keyboard's home row should be positioned.

Set keyboarding/mousing work surface height accordingly.

Method 2: Have worker sit in chair with arms hanging straight at sides.

Have worker rotate chair so one arm is perpendicular to keyboarding/mousing work surface.

Set keyboarding/mousing work surface height so work surface is slightly less than worker's elbow height.

6. KEYBOARD ALIGNMENT: Adjust location of keyboard, so keyboard is directly in line and between worker and monitor.

- If keyboard is used primarily for keyboarding, position it so center of alphanumeric keyboard (B key) is centred on worker's midline
- If keyboard is used primarily for one-handed data entry, position it directly in front of worker's keying hand

If worker regularly switches between using alphabetic keyboard and numeric keyboard, a flat keyboard tray should be used.

7. KEYBOARD DISTANCE: Position keyboard on keyboarding/mousing work surface so that keyboard is not further than the length of worker's forearm and hand.

8. KEYBOARD TILT: Adjust keyboard tilt to neutral or negative slope.

9. KEYBOARD SUITABILITY: If worker is still unable to achieve neutral upper extremity body posture when keyboarding, determine if an alternative keyboard design is required.

10. WRIST REST: If wrist rest is present, have worker demonstrate normal keyboarding and pausing postures.

Remove wrist rest if worker:

- Does not use wrist rest
- Rests any part of hand on wrist rest while keyboarding
- Adopts awkward postures while keyboarding
- The wrist rest may be left on if worker only uses wrist rest during pauses in typing

If wrist rest is not removed, ensure it is positioned parallel and adjacent to the keyboard.

Replace wrist rest if it:

- Is too soft or squishy
- Height is not approximately the same as front of keyboard
- Is narrower than 5 cm (2")
- Has sharp edges
- Is unclean or damaged

5.4 STEPS TO ADJUST MOUSE

1. MOUSE POSITION:

Position mouse at same height as keyboard.

Position mouse in front of worker's "mouse hand."

Position mouse close to side of keyboard.

WORKER'S SHOULDERS SHOULD BE RELAXED, UPPER ARMS AT SIDE, ELBOWS APPROXIMATELY 90°, LOWER ARMS, WRISTS AND HANDS IN LINE.

Ensure mouse cord does not limit movement of mouse.

2. MOUSE SUITABILITY:

Have worker hold mouse.

The worker's hand and fingers should fit comfortably around the mouse.

If worker is unable to achieve neutral upper extremity body posture when mousing, determine if an alternative mouse design is required.

The worker should find it easy to move the mouse.

If mouse does not move freely, arrange for a new mouse to be provided.

3. MOUSE WRIST REST:

If mouse wrist rest is present, have worker demonstrate normal mousing posture.

Replace mouse wrist rest if it:

- Does not move freely with mouse
- Is too soft or squishy
- Does not allow for neutral hand posture
- Has sharp edges
- Is unclean or damaged

5.5 Keyboard

The keyboard should allow the worker to work with:

- The wrist in neutral
- The hand in a gentle relaxed curve (knuckles higher than the finger joints)

Design Features

Conventional keyboard: For most workers, a conventional keyboard design works best if positioned correctly.



Alternative keyboards:

- Some alternative keyboards eliminate or reconfigure specialized keys and the numeric keypad
- Some alternative keyboards are extra wide, long or high and do not fit on standard keyboard trays
- Some alternative keyboards prevent a keyboard tray from retracting under the work surface
- Care should be taken in integrating an alternative keyboard into the workstation

Assessing body type is a primary element in selecting the right alternative keyboard

- Longer fixed-split keyboards typically fit tall, broad shouldered, wide-torso workers
- Shorter keyboards with embedded number keys that decrease reaching for the mouse may be better for smaller, narrow-shouldered workers



Split keyboards:



Fixed split: This design usually contains a 20° domed tilt with the high point up about 5 cm – 6 cm or 2” – 2.5”.

Flat-split: This design is a variation of the fixed split. The keys are angled to keep hands aligned with the forearms and the tilt attempts to place them in neutral.



Adjustable split: This design allows the worker to control the amount of lateral split by 7.5 cm to 10 cm or 3” – 4”. The keyboard can be flat or tented in the middle. Some can be split almost completely apart to shoulder width.

There is no consistent research evidence that split keyboard designs are better than conventional keyboards.

Split keyboards are designed to straighten the wrists. This can be accomplished by:

- Increasing the distance between the right and left sides of the keyboard, and/or
- Rotating each half of the keyboard so that each half aligns with the forearms

Split keyboards increase the keyboarding height as the peak or tilt increases, and this can create awkward postures such as flexing the elbows to less than 90°

Some of the more involved split keyboards have a very high profile when tilted in and short-waisted workers may have to angle elbows < 90° to type

Tented keyboard: The two keyboard halves can be tilted up like a tent. They can lie flat or have a 12.5 cm peak.



- Tented keyboards are designed to reduce rotation of the forearms.
- Tented keyboards increase the keyboarding height as the peak or tilt increases, and this can create awkward postures such as flexing the elbows to less than 90°.
- To achieve neutral keyboarding posture, tented keyboards must be placed on surfaces lower than those required for the conventional keyboard.
- A tented keyboard that adjusts from a closed position allows the worker to gradually adapt new positions.

Scooped/Bowl keyboard: The hand rests on a palm rest and the keys are arranged with the rows at different heights to match the variable length of the fingers. The key position is fixed, and the keys are stacked symmetrically, angled for the left and right hands.

- Scooped/bowl keyboards are designed to allow fingers to work in a more relaxed posture by curving the rows of keys or by placing keys in concave wells to “fit” the different lengths of the fingers

Negative slope keyboard: The front edge of the keyboard can be raised to slope the keyboard backward.

- Keyboards with adjustable negative (reverse) slope capabilities are designed to straighten the wrist.

Built in wrist rests:

- Wrist rests are incorporated into the design of some keyboards
- The use of a wrist rest places the keyboard further away from the worker, which can lead to awkward shoulder postures
- A wrist rest should not be required if the workstation has been set up to meet the worker's needs



Wrist rests:

- Wrist rests are intended for use when the worker stops typing
 - To prevent the wrist from dropping during keying pauses
 - To take weight off the shoulders and reduce shoulder muscle work
 - To soften the surface under the wrist
- The worker's wrists should not touch the wrist rest while typing
 - Using a wrist rest while typing can compress nerves and tendons
- Research has not demonstrated any substantial benefit for wrist rests



- The worker can become dependent on the wrist rest and develop the habit of bending his/her wrists to each side or bottom keys, rather than moving forearms
- The best wrist rest is broad, flat and firm
 - Soft and squishy wrist rests should be avoided as they will contour to the worker's wrist, restrict the movement of the worker's hands, and encourage more lateral deviation during typing
 - The wrist rest does not have to be soft if its shape and size distribute pressure well
- The height of the wrist rest should be about the same as the front of the keyboard
 - A wrist rest that is too high can cause flexion of the wrist
- The wrist rest should be wide enough to spread the load over a large area
 - Less than 5 cm (2") is too narrow
- The wrist rest should not have sharp edges that come in contact with the worker
 - Wrist rests with sharp edges, even foam ones, may be uncomfortable
- The wrist rest should be constructed of a cleanable material
- A wrist rest constructed with breathable material is recommended for warm or humid office environments
- The material used to construct the wrist rest should not have too much friction
- A mouse wrist rest should move (slide, roll) with the mouse

5.6 Mouse

Using a mouse requires the worker to make small, exact movements with the hand, fingers and thumb. The same small muscles are used over and over again.

Design Features

Traditional Mouse



- Mice come in a variety of shapes and sizes.
- The mouse should fit into the worker's hand and the worker should be able to comfortably curl his/her fingers around it.
- The worker should not need to place the heel of his/her hand on the desk.
- The mouse buttons should be located so as to avoid awkward finger and hand postures:
 - The worker's fingers should not feel cramped or have to be spread out to reach them
- A flat shaped mouse reduces wrist extension
- The mouse should be shaped the same on both sides
- The force needed to click a button should not be so great that it tires the worker's fingers
- The force needed to click a button should not be so little that the worker can inadvertently click a button, as the worker will then tend to hold his/her fingers up away from the buttons
- Mouse speed can be adjusted:
 - The faster the setting, the harder it is for the worker to control the mouse
- Mouse settings can also be set up for left handed workers

Cordless mouse

The advantage of a cordless mouse is that there is no cord to get in the way.

Newer mouse designs:

Trackball

- A trackball is like a mouse on its back
- A trackball minimizes arm movements
- *A trackball increases thumb and finger movements*



Rollerbar

- A rollerbar mouse is designed to sit just below the spacebar on a standard keyboard
- A rollerbar mouse allows the user to perform tasks – pointing, clicking and scrolling – while keeping arms in a relaxed position at the sides
- A rollerbar mouse can be manipulated with thumb or fingertip motion using either hand
 - To move the cursor, the user slides his/her fingers left to right, up and down, and diagonally



Mouse alternatives

- There is no ergonomic evidence to date that mouse alternatives are better or worse than traditional mice
- Pen like devices use pressure, light, electromagnetic disruption or radio frequencies to enter and manipulate information through contact with the computer screen or a horizontal pad.
- A pen pad requires as much room on the keyboard tray as a mouse.



- A touch pad allows the worker to move the cursor on the computer screen by simply gliding his/her finger across a small pad.
- A touch screen allows the worker to point directly at an object.
 - Awkward arm postures are required to operate a touch screen.
- Voice input allows the worker to talk to the computer.
 - Available programs can understand and respond to natural speech delivered at rates of up to 160 words per minute.

MONITOR, DOCUMENT HOLDER AND LIGHTING: VISUAL DEMANDS

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6.1 Monitors & Monitor Setup

Design Features

Liquid Crystal Display (LCD)



- A Liquid Crystal Display (LCD) monitor is lighter and thinner than a comparable Cathode Ray Tube (CRT) monitor and therefore easier to manipulate
- A 15" LCD provides the equivalent viewing area of a 17" CRT and a 17" LCD the equivalent of a 19" CRT
- LCDs are free from flicker
- LCDs have uniform screen brightness
- LCD screens are covered with a flexible surface that is less prone to glare than a glass covered CRT screen



Height adjustable monitor base

- An adjustable monitor base allows the worker to quickly adjust monitor height
- If the monitor does not have a height adjustable base, monitor risers, books, photocopier paper, etc. can be used to raise the monitor
- *Some monitor bases do not adjust low enough for the worker*



Tilt adjustable monitor screen: A tilt adjustable monitor screen allows the worker to adjust the monitor screen so that it is perpendicular to his/her line of vision

Swivel monitor base: A swivel design allows the worker to reposition the monitor screen without having to lift the monitor off the work surface

Monitor arm

- Monitor arms free up work surface under the monitor
- Monitor arms allow forward/back, up/down and tilt adjustments of the monitor to accompany posture changes or to fit multiple users
- Friction vs. crank vs. spring counterbalanced design affect ease of usability
 - Spring counterbalanced, if properly adjusted, is the easiest to use

Monitor Set Up

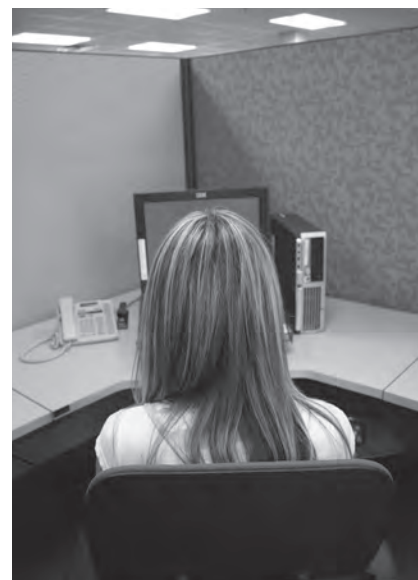
The ergonomics of vision is difficult to separate from the ergonomics of posture as one either directly or indirectly affects the other.

- The body will adjust posture so that the face is parallel with the viewing surface.
- Bending and twisting of the torso in order to keep the face aligned with the viewing surface compromises neutral posture of the forearms, wrists and hands at the keyboard.
- Seated posture is also affected as the worker must now lean forward in the chair.

Desired Conditions

Monitor screen in line with worker and keyboard:

- The lateral line of sight angle has an optimal range of 15° to the left or right of neutral
- *An angle greater than 35° requires rotation of the neck*
- Placing the monitor screen directly in front of the worker helps to eliminate neck twisting
- *If the monitor screen is off to the side, the muscles of the neck on the same side as the monitor will tend to tighten and the muscles on the opposite side of the neck will tend to elongate, eventually making it difficult to turn the head in the opposite direction*



Top of monitor screen positioned at worker's horizontal eye level when looking straight ahead or center of monitor screen 17.5 cm to 25 cm or 7" – 10" below horizontal eye level (CSA Sections 7.3.6, 7.6.1, 7.8.6):



- The appropriate monitor screen height is determined by the worker's vertical line of sight angle
 - In an upright seated posture, the normal vertical line of sight is 15° below the horizontal
 - In a more inclined position, the line of sight is approximately 35° below the horizontal (ISO 9241-5:1998(E))
 - The optimal line of sight angle is plus or minus 15° of the normal line of sight
- The cone of easy eye rotation varies from 5° above to 30° below the horizontal
- If the worker wears bifocals, the monitor screen should be positioned lower to prevent the worker from tilting his/her head back to view the monitor screen through the lower portion of his/her glasses
- Arm extension/finger pointing method:
 - Worker sits back in chair at an angle of 100° to 110° and holds arm out horizontally
 - Worker's middle finger should almost touch the center of the screen
- A downward gaze improves the eyes' ability to accommodate and converge:
 - Hold a business card at arm's length and at eye level
 - Slowly bring the card towards you until the letters start to blur
 - Without moving your head, slowly lower the card in an arc, keeping it the same distance from your eyes
 - You will see the letters come into focus
- *If the monitor screen is too low or too high, the muscles in the neck and shoulders need to work continuously to hold the head in a viewing position*
- *Vertical line of sight angles greater than 5° above the horizontal cause neck extension*
- *If the monitor screen is too low, the worker will bend the neck forward to keep eyes level*
- *The full weight of the head is being carried by the neck and shoulders*

- *The muscles elongate and can impinge nerves in the area*
- *Forward head posture decreases blood supply to neck muscles*
- *Rounded shoulders can compress the tendons in the front of the shoulder*

Vertical monitor screen angle

- Objects in the upper part of peripheral vision are generally farther away than the point being looked at, and objects in the lower part of peripheral vision are usually closer
- The human visual system is designed to perform best when the visual plane tilts away from the top
- *Tilting the monitor screen down works against the natural design of the human visual system*
- Humans actually see more of the visual field below the horizon than above
 - To test this fact, look down a hallway. You will see more of the floor than the ceiling



Monitor screen at least arm's length from worker when sitting in keyboarding position (monitor screen viewing distance of 60 cm – 90 cm or 24" to 36")

- When viewing close objects the eyes must both accommodate (change focus to look at something close) and converge (turn inward towards the nose to prevent double vision)
- The farther away the monitor screen, the less strain on both accommodation and convergence

Arm extension/finger pointing method:

- Worker sits back in chair at an angle of 100° to 110° and holds right arm out horizontally
- Worker's middle finger should almost touch the screen
- If the worker can read the monitor screen, it is not too far away
- If the worker cannot read the characters, it's usually better to make them larger than to bring the monitor screen closer



6.2 STEPS TO ADJUST MONITOR

1. LOCATE ALL ADJUSTMENTS.

2. HAVE WORKER SIT IN HIS OR HER CHAIR.

3. MONITOR SCREEN ALIGNMENT:

Adjust monitor position so monitor screen is in line with worker and keyboard.

If monitor screen is very large and most of worker's tasks involve software that defaults to creating left-aligned pages, align worker to a point about 1/3 of the distance across monitor screen from left side.

4. MONITOR SCREEN HEIGHT:

Adjust monitor screen height so top of monitor screen is at or just slightly below worker's eye level.

Arm extension/finger pointing method:

- Instruct worker to sit back in chair and hold out right arm horizontally
- Worker's middle finger should be pointing at the center of monitor screen
- While in correct sitting posture, worker should be looking straight at top of monitor screen and be able to drop eyes, not his or her head, to look at bottom of screen

If monitor does not have an adjustable stand or arm, and screen is:

- Too low - monitor risers, unused binders or books, etc. can be used to elevate
- Too high - arrange for an alternate monitor

5. MONITOR SCREEN ANGLE:

Adjust angle of monitor screen so screen is vertical or slightly tilted back.

6. MONITOR SCREEN DISTANCE:

Position monitor so screen is 60 cm to 90 cm (24" – 36") from worker when sitting back in chair.

Arm extension/finger pointing method:

- Instruct worker to sit back in chair and hold right arm out horizontally
- Worker's middle finger should almost touch center of monitor screen

At this distance, worker should be able to see monitor screen without making head movements.

If worker can read text on monitor screen, it is not too far away.

If worker cannot read text, magnify screen image.

7. MONITOR SCREEN BRIGHTNESS:

Adjust the screen's brightness so that it matches the general brightness of the room.

8. MONITOR SCREEN RESOLUTION:

Adjust the screen so that characters are dark against a light background.

9. MONITOR SCREEN TEXT SIZE:

Adjust the text so that it is easy for the worker to read.

- The size of the text should be three times the size of the smallest text the worker can comfortably read
- The worker should easily be able to read the text on his/her monitor screen from three times his or her normal working distance

10. MONITOR SCREEN CLEANLINESS:

Clean the monitor screen.

6.3 Lighting Setup

Luminance refers to the amount of light emitted or reflected from a surface.

Glare occurs when the luminance in some part of the worker's visual field is significantly greater than other parts. An object appears brighter than other objects to which the worker's eyes have adapted.

Glare causes the iris to contract and the eyes to squint. This reduces the amount of light entering the eye and results in eye strain. To see, the worker may adopt an awkward posture.

Common sources of glare include direct sunlight, overhead lighting and shiny surfaces.

Direct glare occurs when light shines directly into the worker's eyes. Indirect glare occurs when light is reflected from a surface, such as the monitor screen, into the worker's eyes.

Glare often appears as mirror images and/or white spots on the monitor screen. To reduce glare:

- Eliminate light sources that **shine** directly into the worker's eyes.
- Eliminate light sources that **reflect** into the worker's eyes.
- Adjust lighting to avoid glare on screen.
- Avoid intense or uneven lighting in the worker's field of vision.



Desired Condition

Control of natural light:

- Sunlight can be the source of direct or indirect glare
- Blinds, shades or curtains should be used on windows located less than 6 meters from a computer workstation
- Solutions to deal with natural light glare issues include:
 - o Installation of adjustable drapes/blinds
 - o Installation of partitions
 - o Installation of awnings
 - o Installation of tinted glass
 - o Reposition shiny objects
 - o Remove or cover shiny surfaces/objects
 - o Turn, adjust height, adjust angle or reposition reflective surfaces
 - o Paint walls a neutral and not too bright wall colour

**Adequate, evenly distributed ambient lighting
(general illumination of room)**

- So lighting does not interfere with reading the screen or source documents
- Light levels must be high enough for paper work, but not too bright for computer work
 - o When light levels are too high for computer work, the worker may adopt an awkward posture in order to see the screen



Workstation located parallel to (next to rather than directly underneath) overhead lighting

- So lighting does not produce glare or reflections on the screen
- Solutions to deal with overhead lighting positioned directly over workstation:
 - o Install a diffuser over light source
 - o Install a parabolic filter over light source – Parabolic filters allow light to travel only straight down, providing sufficient light while minimizing reflection on monitor screens
 - o Installation of partitions that block light
 - o Reposition of workstation parallel to light source
 - o Removal of overhead light source
 - o Redirection of light source
 - o Installation of an indirect lighting system that does not shine directly into the work area but only after being reflected off ceilings and walls

Task lighting (illumination focused on a specific work area or task) brighter than ambient lighting

- Most office work involves using the monitor and paper documents at the same time
- Paper documents require a higher light level than the monitor screen
- A desk lamp (any type of soft task light) can be used to illuminate documents while avoiding excessive light near the monitor screen
- If light levels are too low for paper work, eye muscles are strained and the worker is more likely to adopt an awkward posture to see the paper

Task lighting focused on source documents, controls and other visual needs

- To reduce eyestrain and awkward postures by illuminating paperwork and reducing the need for bright ambient light that may cause screen glare or increase contrast between the screen and its surroundings
- Task lighting should evenly diffuse light over an appropriate area
- Task lighting should not be pointed at the monitor screen or the worker's eyes
- Lights on movable arms provide more flexibility in the location and quantity of task lighting
- The task light bulb should not be visible to the worker when in his/her normal working position
 - o If it is, the bulb should be shielded or the fixture moved
- Task lights with dimmers or multi switches allow for individual adjustment



Matte finishes on walls, floors and furniture

- To prevent indirect glare
- Solutions to deal with indirect glare caused by reflective surfaces:
 - o Remove or cover shiny surfaces/objects
 - o Turn, adjust height, adjust angle or reposition the reflective surface
 - o Paint walls a neutral and not too bright wall colour

Monitor screen perpendicular (90° angle) to any windows (worker does not face window or have back to window)

- To prevent indirect glare from sunlight reflecting off the monitor screen
- To prevent direct glare from sunlight shining directly into worker's eyes

Flat monitor screen – Flat screens reduce glare

Negative contrast screen setting

- Negative contrast screens, dark letters on a light background, significantly reduce the effect of reflections

Sharp, easy to read, non-flickering monitor screen

- To ensure screen contents are readable
- To prevent forward leaning in an attempt to read screen contents

Anti-glare screen in place (only if workstation cannot be rearranged to eliminate glare)

- To improve screen visibility by reducing bright spots or washout caused by ambient light on monitor screens
- In general, anything between the worker and the monitor screen compromises the quality of the image
 - o It is preferable to control glare through proper lighting design and placement of the monitor
- *Mesh anti-glare screens reduce reflections but also the quality of the print on the screen*
- *Mesh screens can collect dust and obscure the image*
- Polarized anti-glare screens reduce reflections without degrading the image
 - o In general, an optical coating that creates a purplish, rather than green or blue, reflection is best
- Screens that are both polarized and optically coated cause much less distortion than mesh screens
- Grounded screens can reduce static electricity and thus dust buildup
- Once the anti-glare screen is installed, the monitor screen brightness will need to be increased to compensate for any darkening caused by the screen



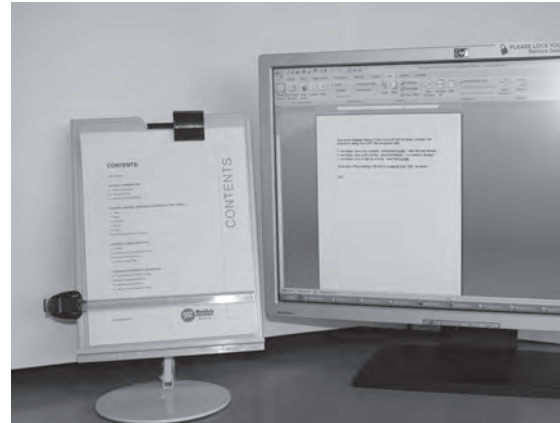
Clean screen

- Dust buildup can make distinguishing characters difficult and may also contribute to glare and reflection problems
- *Anti-glare coated screens can be difficult to keep clean*

6.4 Document Holder Setup

A document holder should be used if documents are referred to during typing. The document holder should be:

- Adjustable for height, position, distance, and angle of view
- Wide enough to accommodate worker's typical source documents
- Sturdy enough to accommodate worker's typical source documents
- Sturdy enough to support weight of worker's arm if being used as a writing surface
- Designed to meet the visual needs of the task
 - o For example, a line guide, preferably one that moves by action of a foot pedal, is recommended for workers working from columns of numbers



Desired Conditions

Option 1:

Document holder (freestanding or attached) positioned on same side as worker's dominant eye

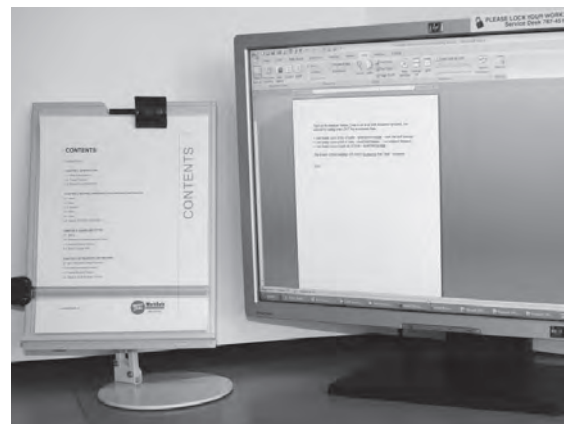
- The center of the visual field is shifted slightly toward the dominant eye
- In general, when a visual target must be placed outside the central visual field, it should be positioned to the side of the dominant eye to minimize eye movement and head, neck or upper body twisting

Document holder positioned directly next to monitor screen

- The worker can look between source document and monitor screen by just moving eyes
- It is easier for the eyes to refocus between the source document and the monitor screen when the source document is close to the monitor

Document holder positioned at same height as monitor screen

- To avoid repetitive motion of head looking back and forth between source document and monitor screen
- When the source document is positioned at the same height and distance to eyes as the monitor screen changes in eye focus are minimized

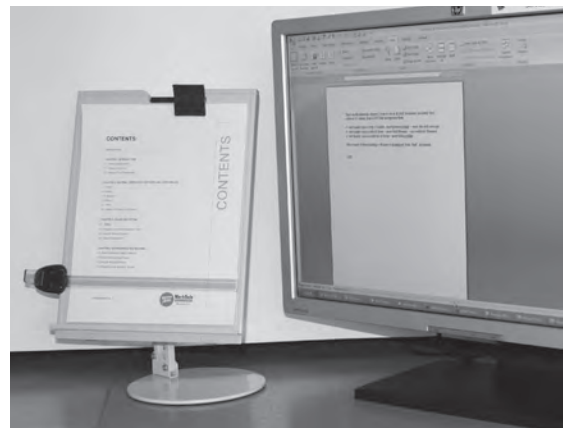


Document holder positioned at same distance as monitor screen

- To reduce eye strain by keeping the source document at approximately the same distance as the monitor screen
- In general, if the worker must frequently look from one object to another, the viewed objects should be approximately the same distance from the worker
- While the document holder should be close to the monitor screen, it does not have to be exactly the same distance from the eyes as the monitor screen
 - If two objects are only a few centimeters difference in their distance from the eyes, the eyes do not have to refocus to look from one to the other

Document holder angled to aim source document straight at worker's eyes (perpendicular to worker's line of vision)

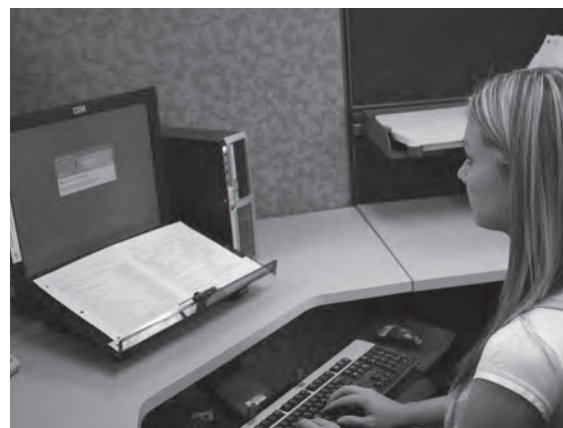
- To reduce eye strain by keeping the source document at approximately the same angle as the monitor screen
- *Studies indicate that the worst situation is placement of source documents flat on the work surface*
- To reduce distortion of print that occurs when a document is slanted away from the eyes
- *Keyboarding accuracy decreases when angular differences exist between the source documents and the monitor screen*



Option 2:

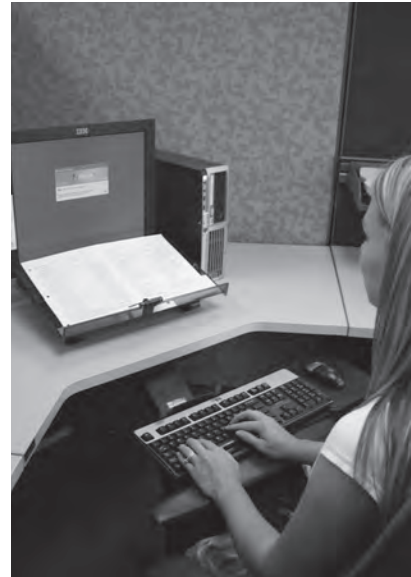
Document holder positioned between keyboard and monitor in line with worker, keyboard and monitor screen

- To eliminate/minimize awkward neck postures
- Studies indicate the preferred working posture is alignment of the worker's body and head, the keyboard and the source document
- In line document holders can convert empty space in front of the monitor screen to usable space



Document holder in line with worker, keyboard and monitor screen

- To avoid repetitive motion of head looking back and forth between source document and monitor screen
- Worker can look between source document and monitor screen by just moving eyes
- Easier for eyes to refocus between source document and monitor screen when source document is close to monitor screen
- While the document holder should be close to the monitor screen, it does not have to be *exactly* the same distance from the eyes as the monitor screen
 - o If two objects are only a couple of inches difference in their distance from the eyes, the eyes do not have to refocus to look from one object to the other



Document holder angled to aim source document straight at worker's eyes (perpendicular to the worker's line of vision)

- To avoid repetitive motion of head looking back and forth between source document and monitor screen
- To reduce eye strain by keeping the document at approximately the same distance and angle as the screen
- To reduce the distortion of print that occurs when a source document is slanted away from the eyes
- *Keyboarding accuracy decreases when angular differences exist between the source documents and the monitor screen*

6.5 STEPS TO ADJUST DOCUMENT HOLDER

1. **NEED FOR DOCUMENT HOLDER:** Ask worker about the nature of his/her work and the use of source documents.

- Determine if the frequency of use of source documents or the nature of use of source documents indicates the need for a document holder
- Determine whether a screen mounted/freestanding or in-line document holder is preferable

If any of the following apply, an in-line document holder is indicated:

- Limited reading/writing work surface
- Larger source documents (legal size paper or larger, ledgers, etc.)
- Multiple source documents (worker must refer back and forth to)
- Heavier source documents (books, binders, etc.)
- Worker writes on source documents
- Large computer monitor screen

If there is a document holder present, but it does not meet the identified needs of the worker, arrange for a replacement document holder to be provided.

If there is a document holder present, but it is damaged, arrange for a replacement document holder to be provided.

If there is no document holder present, arrange for a document holder to be provided.

2. **HAVE WORKER SIT IN CHAIR FACING MONITOR SCREEN.**

3. **OPTION 1: SCREEN MOUNTED OR FREESTANDING**

Position document holder directly next to monitor screen on same side as worker's dominant eye.

To determine worker's dominant eye, instruct worker to:

- Make a triangle with fingers
- Focus on an object in the distance
- Close right eye
- Open right eye and close left eye
- The eye that keeps the object centered is dominant.

Position top of document holder at same height as top of monitor screen.

Position document holder same distance away from worker as monitor screen.

Angle document holder to aim source document straight at worker's eyes.

Source document should be adjacent to monitor screen and perpendicular to worker's line of sight.

4. **OPTION 2: IN-LINE DOCUMENT HOLDER**

Position document holder between keyboard and monitor screen so it aligns with worker's body midline.

Angle document holder so source document is perpendicular to worker's line of sight.

Worker should only need to use eyes to look between source document and monitor screen.

WORK FLOW

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7.2 Steps to Adjust Work Flow Organization Fact Sheet	83
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7.1 Work Organization Setup

The positioning of items in the workstation is important in minimizing awkward postures. The location of items within the workstation should be designed:

- To minimize twisting of the body trunk in excess of 15°
- To minimize reaching

High priority tasks and items should be placed in the worker's primary work zone. This is the area closest to the worker, within hands reach without the worker's elbows leaving his/her sides.

High priority tasks and items include those:

- Used/performed the most frequently,
- Used/performed for longer durations,
- With larger force requirements,
- Requiring the highest speed, and/or
- Requiring the most accuracy.



Lower priority tasks and items should be placed in the worker's secondary work zone. This area is further away from the worker, within hands reach of the worker when he/she extends his/her arm, but without bending forward at the trunk.

Infrequently performed tasks or used items can be placed in the worker's tertiary zone.

Desired Condition

Work organized so it flows towards worker's dominant hand side – Generally, this will be the worker's preferred working side.

Work surface

High priority tasks/items located in worker's primary zone (hands reach with elbows at side)

Lower priority tasks/items located in worker's secondary zone (hands reach with arm extended)

Occasionally performed tasks/used items located in tertiary zone (just past hands reach with arm extended, some trunk flexion)

- Frequently used items should be located close to and in front of worker to minimize reaching and twisting
- In/out trays should be located in maximum reach zone either
 - o Stacked on top of one another, or
 - o Placed side by side

Storage

High priority items stored in worker's primary zone

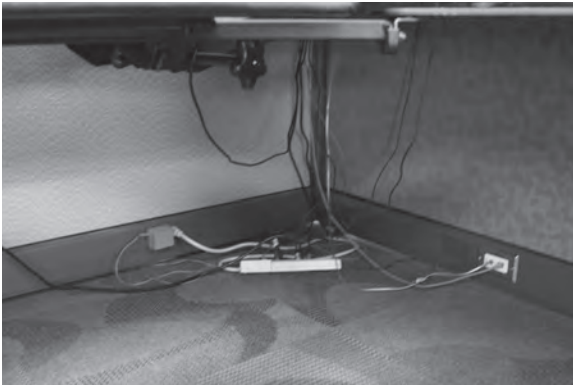
Lower priority items stored in worker's secondary zone

Occasionally used items stored in worker's tertiary zone or further

High priority items stored in worker's "safety zone" – between knuckles and shoulders

- To reduce the amount of bending and reaching required
- Most commonly used items located in a top desk drawer
- Files should be arranged in filing cabinets such that frequently used files are in the middle drawer or closest to elbow level

No items stored in the kick space



- To minimize interference with required leg space

Clutter free workstation



- To avoid tripping and falling hazards

Telephone located either within or at limit of worker's primary reach zone (within 30 cm (12") of worker, CSA Section 7.7.2)

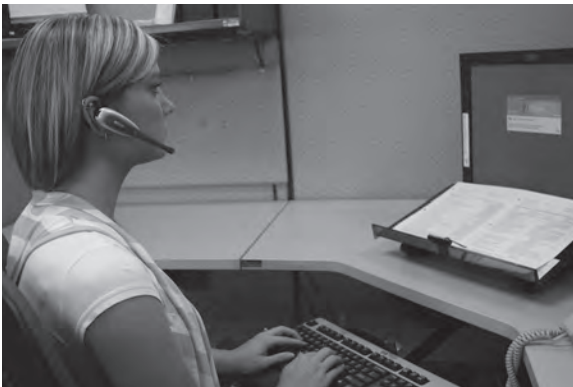


- The location of the telephone should allow the worker to operate the telephone without twisting

If no headset, telephone located on worker's dominant ear side (ear worker uses to listen when on the telephone) or directly in front of worker.

- So cords do not interfere with work objects/tasks

Headset provided if telephone use is a major component of job, especially in combination with computer work



- To minimize "cradling" the headset between the ear and shoulder

If headset, telephone positioned on dominant side or directly in front of worker



- To minimize twisting
- To minimize shoulder adduction

If transcription system, foot pedal positioned at same height as worker's feet and close to worker's operating foot

- To minimize awkward foot, ankle, leg and knee postures
- If the worker requires a footrest, it is recommended that a separate footrest be used to raise transcription foot pedal to correct height

7.2 STEPS TO ADJUST WORK FLOW ORGANIZATION

1. HAVE WORKER SIT IN CHAIR AND POSITION HIM OR HER FOR KEYBOARDING AND MOUSING.

2. **WORK FLOW:** Determine worker's dominant hand.

- Position in/out trays and other items on work surface so work flows from dominant to non-dominant hand side

3. **WORK SURFACE ORGANIZATION:**

Ask worker about items located on work surface as to frequency of use and duration of use.

- Have worker demonstrate reaching for items frequently accessed while in keyboarding and mousing position

Position items so that:

- High priority tasks/items are located in worker's primary zone (hands reach with elbows at side)
- Lower priority tasks/items are located in worker's secondary zone (hands reach with arm extended)
- Occasionally performed tasks/used items are located in tertiary zone (just past hands reach with arm extended, and some trunk flexion).

If separate keyboarding/mousing and reading/writing work surface, have worker reposition chair as for reading/writing and demonstrate reaching for items frequently accessed while in this position.

Position items so that:

- High priority tasks/items are located in worker's primary zone
- Lower priority tasks/items are located in worker's secondary zone
- Occasionally performed tasks/used items are located in tertiary zone

4. **STORAGE:** Ask worker about contents of drawers and other storage units.

Have worker demonstrate reaching for items.

Position items so that:

- High priority items are stored in drawers and other storage units within worker's primary zone (hands reach with elbows at side)
- Lower priority items are stored in drawers and other storage units within worker's secondary zone (hands reach with arm extended)
- Occasionally used items are stored in worker's tertiary zone or further (just past hands reach with arm extended, some trunk flexion)

Have worker demonstrate reaching for items on shelves.

Position items so that high priority items are stored in worker's "safety zone" – between knuckles and shoulders.

Arrange files and other items in filing cabinets so that high priority items are in middle drawers.

5. **KICK SPACE:** Check both the reading/writing and keyboarding/mousing kick space.

- Remove any items stored in the kick space
- Position garbage can so that it does not interfere with movement of worker's feet and legs but is within arm's reach
- Position recycling box so that it does not interfere with movement of worker's feet and legs but is within arm's reach

6. **CLUTTER:** Remove unnecessary items from workstation.

If space is limited, remove infrequently used items from workstation.

Position any personal items such that they do not interfere with work task demands.

7. **TELEPHONE LOCATION:** Have worker reach for telephone.

Position telephone so that it is within or at limit of worker's primary reach zone.

- If there is no headset, position telephone on worker's dominant ear side (ear worker uses to listen when on telephone) or directly in front of worker.
- If worker frequently uses phone, especially when keyboarding/mousing or writing, a headset should be requested
- If there is a headset, position the telephone on worker's dominant hand side or directly in front of worker

8. **FOOT PEDALS:** If transcription system, position foot pedal close to operating foot.

- If worker requires a footstool, position foot pedal at the same height

7.3 Laptop

Laptop design presents ergonomic problems because the keyboard and screen are attached. It is not possible for the worker to maintain both optimal keyboarding/mousing postures and optimal monitor viewing posture.

Laptop computers are not recommended as primary computers.

If a laptop is used in the office as the primary computer, the following are required.



Design Features

External keyboard

- Using a laptop without either an external keyboard or an external monitor is a tradeoff between poor neck/head posture and poor hand/wrist posture
- Laptop computers are not designed for prolonged use

External mouse

- The touch pad and scroll ball promote awkward hand posture
- Laptop computers are not designed for prolonged use

External monitor or an adjustable height and tilt laptop stand, laptop drawer or docking station

- Using a laptop without either an external keyboard or an external monitor is a tradeoff between poor neck/head posture and poor hand/wrist posture
- Laptop computers are not designed for prolonged use

Caution

Currently there are no regulatory requirements manufacturers must meet in order to claim a product is ergonomically correct. Therefore, it is important to research products carefully before making purchases. Consider having the salesperson(s) come to the workplace to demonstrate products. Demo potential purchases for a reasonable time period before making a final decision.

The following questions will assist in making “ergonomic product” purchasing decisions:

1. Does the product design make sense?
2. What research evidence can the manufacturer provide to support their claims?
3. What do ergonomic experts have to say about the product?
4. Given a reasonable trial period, is the product comfortable to use?

DEFINITIONS

ABDUCTION: Movement of the arm out from the body

ADDUCTION: Movement of the arm across the front of the body

ANTHROPOMETRY: The study of the physical dimensions of people, including size, breadth, girth, distance between anatomical joints and joint of range motions

AWKWARD POSTURE: A deviation from the neutral position of any particular joint

CONCAVE: Curving inwards, like the inside surface of a sphere

CONVEX: Curving out, like the outside surface of a sphere

DYNAMIC POSTURES: Postures that involve movement

ERGONOMICS: The science of making the workplace safer, more productive and more comfortable for workers

EXTENSION: Movement from a bent position to a straight position

FLEXION: Opposite of extension and in general movement toward a bent position

HOME ROW: The middle row of the keyboard when the typist is at rest and lightly touches the “A-S-D-F” keys with her hand, and the “J-K-L-;” keys with her right hand.

INTENSIVE COMPUTER USE: The worker regularly uses a computer for more than five hours per day

LATERAL: Toward the side of the body away from the midline

LATERAL LINE OF SIGHT ANGLE: The angle created between the line of sight and a line bisecting the eyes

- Optimal range is 15° to the left or right of neutral

LINE OF SIGHT: The line connecting the eyes to the point the eyes are fixed on

MODERATE COMPUTER USE: The worker regularly uses a computer between three to five hours per day

MUSCULOSKELETAL INJURY: Injury or disorder of the muscles, tendons, ligaments, nerves, joints, bones or supporting musculature

NEUTRAL POSTURE: Posture closest to resting point of affected muscles; posture of greatest comfort and efficiency

NEUTRAL HAND POSTURE: Hand straight out from the forearm, palms facing inward, fingers slightly flexed

DEFINITIONS

POSTURE: The relative arrangement of body parts, specifically the orientation of the limbs, trunk and head

PRONATION: Rotation of the hand and arm toward palm down from the neutral position and rotation of the hand in the same manner from any other position

RADIAL DEVIATION: Movement of the wrist to rotate the hand toward the wrist

SAFETY MARGIN: The difference between workload and tissue tolerance

STATIC POSTURES: Postures that are held in a fixed position for a sustained period of time

SUPINATION: Rotation of the hand and arm toward palm up from the neutral position and rotation of the hand in the same manner from any other position

TISSUE TOLERANCE: The amount of force that a body tissue can bear before it fails and injury occurs

ULNAR DEVIATION: Movement of the wrist to rotate the hand toward the little finger

VERTICAL LINE OF SIGHT ANGLE: The angle created between the line of sight and a horizontal line from the eyes

WORKLOADS: The forces that act on the body during work

APPENDIX

CONTENTS

OHS Regulations: Chapter 81: MUSCULOSKELETAL INJURIES

Interacting with the Worker

Recommended Tools

OCCUPATIONAL HEALTH AND SAFETY REGULATIONS - SECTION 81: MUSCULOSKELETAL INJURIES

(1) In this section, “**Musculoskeletal Injuries**” means an injury or disorder of the muscles, tendons, ligaments, nerves, joints, bones or supporting vasculature that may be caused or aggravated by any of the following:

- a) repetitive motions
- b) forceful exertions
- c) vibration
- d) mechanical compression
- e) sustained or awkward postures
- f) limitations on motion or action
- g) other ergonomic stressors

(2) An employer or contractor, in consultation with the Committee, shall regularly review the activities at the place of employment that may cause or aggravate musculoskeletal injuries.

(3) Where a risk of musculoskeletal injury is identified, an employer or contractor shall:

- (a) inform each worker who may be at risk of developing musculoskeletal injury of that risk and of the signs and common symptoms of any musculoskeletal injury associated with that worker’s work; and
- (b) provide effective protection for each worker who may be at risk, which may include any of the following:
 - (i) providing equipment that is designed, constructed, positioned and maintained to reduce the harmful effects of an activity;
 - (ii) implementing appropriate work practices and procedures to reduce the harmful effects of an activity;
 - (iii) implementing work schedules that incorporate rest and recovery periods, changes in workload or other arrangements for alternating work to reduce the harmful effects of an activity.

(4) An employer or contractor shall ensure that workers who may be at risk of developing musculoskeletal injury are instructed in the safe performance of the worker’s work, including the use of appropriate work practices and procedures, equipment and personal protective equipment.

(5) Where a worker has symptoms of musculoskeletal injury, an employer or contractor shall:

- (a) advise the worker to consult a physician or a health care professional who is registered or licensed pursuant to an Act to practice any of the healing arts; and
- (b) promptly review the activities of that worker and of other workers doing similar tasks to identify any cause of the symptoms and to take corrective measures to avoid further injuries.

INTERACTING WITH THE WORKER

How you interact with the worker will impact the success of the assessment.

Pre-assessment:

- Contact the worker to arrange for a mutually convenient assessment time and date
- Ready tools required for assessment (equipment, forms, fact sheets, etc.)
- Introduce self and provide background as to your training/qualifications
- Explain the purpose of the assessment
- Find out if any medical accommodations have been requested/implemented

During assessment:

- Treat the worker with respect
- Involve the worker in the assessment
- Ask permission before each instance where you may need to touch the worker
- Explain to the worker what you are doing
- Use the assessment as a teaching opportunity
- Keep the assessment climate positive
- Ask the worker questions to find out more about the nature of the work
- If the worker reports symptoms, advise the worker:
 - To seek medical advice
 - To complete an Incident Report
- If workstation design allows, make required adjustments during the assessment
- If required adjustments cannot be made during the assessment, implement temporary fixes if possible
- In situations where more than one solution is appropriate, involve the worker in making the final decision
- Indicate on the Computer Workstation Posture Assessment form required actions that could not be corrected during the assessment
- If the worker appears resistant to changes made to his/her workstation, encourage the worker to trial the adjusted workstation

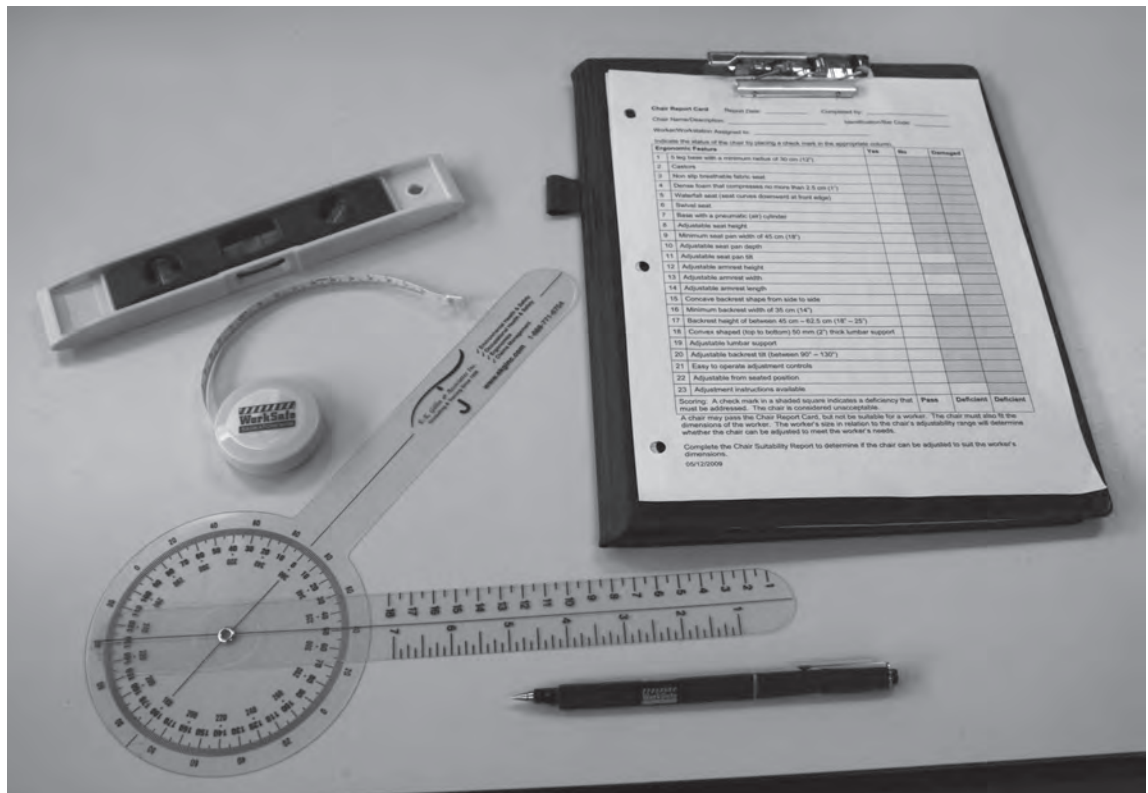
Post assessment:

- Keep a copy of all documents related to the assessment in a secure location
- Provide the worker with a copy of any report
- Send a copy of each report to applicable personnel for follow up
- Follow up with worker in a reasonable time period re status of follow up actions
- If worker experiences problems:
 - Check adjustments made during the assessment
 - Check that adjustments made post assessment were properly implemented
 - Check to see if the worker has readjusted his/her workstation
 - If needed, request input from an ergonomic specialist

RECOMMENDED TOOLS

The following tools will assist in assessing a computer workstation:

- **GONIOMETER OR BEVELED PROTRACTOR:** A graduated circular protractor having a pivoted arm; used for measuring or marking off angles or rotating an object to a precise angular position
- **LEVEL:** A tool for determining whether a surface is horizontal, vertical or at a 45° angle, consisting essentially of an encased, liquid-filled tube containing an air bubble that moves to a center window when the tool is set on an even plane
- **TAPE MEASURE:** a tape of cloth, paper or steel marked off in a linear scale, as of inches or centimeters, for taking measurements
- Clipboard
- Pen
- Pliers (optional)
- Screwdriver (optional)
- Wrenches (optional)



FORMS

CONTENTS

Chair Report Card

Chair Suitability Report

Workstation Report Card

Workstation Posture Assessment

FORMS

Chair Report Card Report Date: _____ Completed by: _____

Chair Name/Description: _____ Identification/Bar Code: _____

Worker/Workstation Assigned to: _____

Indicate the status of the chair by placing a check mark in the appropriate column.

Ergonomic Feature		Yes	No	Damaged
1	5 leg base with a minimum radius of 30 cm (12")			
2	Castors			
3	Non slip breathable fabric seat			
4	Dense foam that compresses no more than 2.5 cm (1")			
5	Waterfall seat (seat curves downward at front edge)			
6	Swivel seat			
7	Base with a pneumatic (air) cylinder			
8	Adjustable seat height			
9	Minimum seat pan width of 45 cm (18")			
10	Adjustable seat pan depth			
11	Adjustable seat pan tilt			
12	Adjustable armrest height			
13	Adjustable armrest width			
14	Adjustable armrest length			
15	Concave backrest shape from side to side			
16	Minimum backrest width of 35 cm (14")			
17	Backrest height of between 45 cm – 62.5 cm (18" – 25")			
18	Convex shaped (top to bottom) 50 mm (2") thick lumbar support			
19	Adjustable lumbar support height			
20	Adjustable backrest tilt (between 90° – 130°)			
21	Easy to operate adjustment controls			
22	Adjustable from seated position			
23	Adjustment instructions available			
Scoring: A check mark in a shaded square indicates a deficiency. The chair is considered unacceptable.		Pass	Deficient	Deficient

A chair may pass the Chair Report Card, but not be suitable for a worker. The chair must also fit the dimensions of the worker. The worker's size in relation to the chair's adjustability range will determine whether the chair can be adjusted to meet the worker's needs.

Complete the Chair Suitability Report to determine if the chair can be adjusted to suit the worker's dimensions.

Chair Suitability Report Report Date: _____ Completed by: _____

Chair Name/Description: _____ Identification/Bar Code: _____

Worker/Workstation Assigned to: _____

Worker Characteristics – Circle the descriptor that best describes the worker			
Height	Less than 5'	5' – 6'	More than 6'
Size	Svelte (very slender)	Average	Large
Upper to lower body ratio	Short waisted	Average	Long waisted

Indicate the status of the chair by placing a check mark in the appropriate yes/no column. If no, circle the desired chair characteristic.

Chair Suitability		Yes	No	Desired Chair Characteristic
1	Seat height can be adjusted so worker's feet sit firmly on floor			Lower seat height adjustability Higher seat height adjustability
2	Seat width is sufficient to accommodate worker's buttocks			Smaller seat Larger seat
3	Seat pan depth can be adjusted to allow for 2 - 3 fingers clearance between seat and back of worker's knees (5 cm (2"))			Shorter seat pan depth adjustability Greater seat pan depth adjustability
4	Armrests can be adjusted to allow worker to sit with shoulders level			Lower armrest height adjustability Higher armrest height adjustability
5	Armrests can be adjusted to allow worker to sit with upper arms in neutral			Narrower armrest width adjustability Wider armrest width adjustability
6	Armrests can be adjusted to sit under worker's forearms			Shorter armrests Longer armrests Armrests that can be adjusted forwards and backwards
7	Backrest is wide enough to support worker without restricting movement			Narrower backrest Wider backrest
8	Backrest height is sufficient to support worker			Lower backrest Higher backrest
9	Lumbar support can be adjusted to support worker's lower back			Lower lumbar support adjustability Higher lumbar support adjustability
10	Chair is designed to support weight of worker Chair weight capacity: _____			Chair designed for smaller/lighter worker Chair designed for large/heavier worker
11	Chair fabric is clean and in good repair			Clean chair Replace chair
Scoring: A check mark in any shaded square indicates the chair is unsuitable for the worker.		Suitable	Not Suitable	

Chair recommendation (make and model): _____

Computer Workstation Report Card Report Date: _____ Completed by: _____

Workstation Location: _____ Identification Code: _____

Worker Assigned to: _____ Office Setup Cubicle Setup

To assess the chair assigned to the workstation, complete the Chair Report Card.

Indicate the status of the workstation by placing a check mark in the appropriate column.

Ergonomic Feature		Yes	No	N/A	Damaged
1	Workstation area sufficient for equipment/materials that make up the workstation - allows for full range of movement				
2	Semicircle design				
3	Stable work surface				
4	Neutral coloured non reflective work surface				
5	Flat smooth work surface				
6	Rounded corners free of sharp edges				
7	Height adjustable work surface				
8	Sufficient work surface depth to accommodate keyboard and monitor in front of worker (minimum 75 cm (30"))				
9	Sufficient work surface area to accommodate required equipment/resources				
10	Sufficient work surface area to accommodate tasks to be performed				
11	Left/right hand adjustable reading/writing work surface and corresponding kick space				
12	Work surface thickness allows for 5 cm - 10 cm (2" - 4") clearance between top of worker's thighs and bottom of work surface				
13	Sufficient under reading/writing area kick space (minimum 43 cm (17") knee space depth and 60 cm (24") toe depth, minimum 50 cm (20") leg width)				
14	Sufficient under keyboard kick space (minimum 43 cm (17") knee space depth and 60 cm (24") toe depth, minimum 50 cm (20") leg width)				
15	Drawers located within comfortable reach				
16	Accessible storage space				
17	Sufficient storage space				
18	Stable keyboard/mouse tray				
19	Height adjustable keyboard/mouse tray				
20	Distance adjustable keyboard/mouse tray				

	Ergonomic Feature	Yes	No	N/A	Damaged
21	Tilt adjustable keyboard/mouse tray (horizontal to reverse tilt)				
22	Angle adjustable double pivot keyboard/mouse tray				
23	Sufficient keyboard/mouse tray surface area to accommodate keyboard and mouse				
24	Separate mouse tray if keyboard tray not large enough to accommodate both keyboard and mouse				
25	Cable routing system				
26	<input type="checkbox"/> CPU or <input type="checkbox"/> Laptop				
27	External keyboard				
28	External mouse or equivalent				
29	<input type="checkbox"/> Monitor or <input type="checkbox"/> Height adjustable laptop docking station				
30	Height adjustable: <input type="checkbox"/> monitor <input type="checkbox"/> monitor stand <input type="checkbox"/> monitor arm				
31	Flat monitor screen				
32	Sharp, easy to read, non flickering monitor screen				
33	Monitor screen perpendicular to any windows				
34	Natural light controlled by drapes/blinds, awnings, tinted glass, partitions, positioning of reflective objects				
34	Anti glare screen in place (only if workstation cannot be rearranged to eliminate glare)				
36	Adequate, evenly distributed ambient lighting				
37	Workstation located parallel to overhead lighting				
38	Task lighting brighter than ambient lighting				
39	Task lighting focused on source documents, controls and other visual needs				
40	Matte finishes on walls, floors and furniture				
Scoring: A check mark in any shaded square indicates a deficiency that must be addressed.		Pass	Deficient		Deficient

Comments/recommendations:

Computer Workstation Posture Assessment

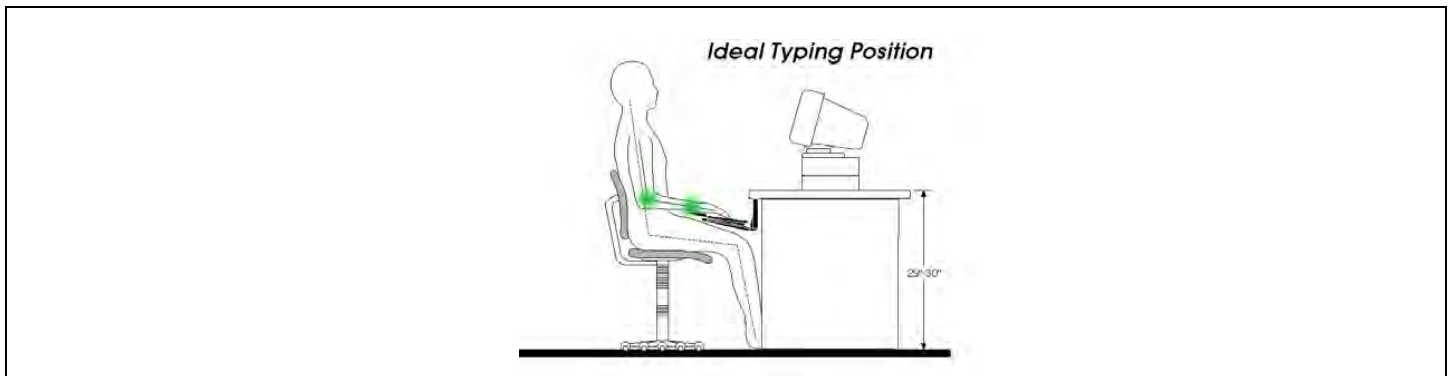
Report Date: _____ Completed by: _____

Worker: _____ Job Title: _____ Department: _____

Supervisor: _____ Workstation Location: _____

Reason for Assessment: new hire new workstation symptoms supervisor request worker request

1. Under Desired Posture/Condition:
 - a. Check yes or no to indicate the current status of the desired posture/condition
 - b. Fill in any blanks
 - c. Where asked for, circle the applicable worker characteristic
2. Under Required Actions, for any working posture/condition that departs from the recommended:
 - a. Check the action(s) required to correct the posture/condition
 - i. Fill in any related blanks
 - ii. Circle the appropriate conditions
3. Under Status, for any checked required action identify whether:
 - a. The action was completed at the time of the assessment (✓ or your initials)
 - b. A temporary control has been put in place (T)
 - c. The required action requires follow up action (X)
 - i. **H** can be used to identify high priority actions, **A** for medium priority and **L** for low priority
 - ii. If you know who will be responsible for follow up, you can indicate using an acronym system



CHAIR (SUPPORT FUNCTION)		
Desired Posture/Condition	Required Actions	Status
Seat height (feet on floor, ankle angle of 90° to 120°, knee angle of 90° to 110°, knee height equal to or slightly lower than hips) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Raise / lower seat height to _____	
	<input type="checkbox"/> Provide footrest: model _____	
	<input type="checkbox"/> Other _____	
Seat depth (thighs and hips supported, 2 to 3 finger space between edge of seat and back of knees, back against back rest) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Increase / decrease seat depth to _____	
	<input type="checkbox"/> Other _____	
Seat tilt (hip angle of 90° to 130°, knee angle of 90° to 110°, knee height slightly lower than hips) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Increase / decrease seat tilt to _____	
	<input type="checkbox"/> Other _____	

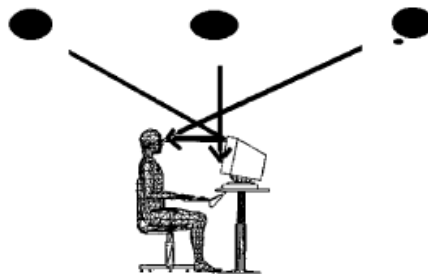
Lumbar support height (support fits deepest part of lumbar curve) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Raise / lower lumbar height to _____	
	<input type="checkbox"/> Increase / decrease lower back tension	
	<input type="checkbox"/> Other _____	
Backrest tilt (hip angle of 90° to 130°) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Increase / decrease backrest tilt to _____	
	<input type="checkbox"/> Increase / decrease upper back tension	
	<input type="checkbox"/> Other _____	
Armrest height (relaxed shoulder, elbow angle slightly > 90°, elbow just above armrest, forearm supported) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Raise / lower armrest height to _____	
	<input type="checkbox"/> Other _____	
Armrest width (upper arm close to body) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Increase / decrease distance between armrests to _____	
	<input type="checkbox"/> Other _____	
Armrest length and depth (forearm supported, elbow just above) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CRC <input type="checkbox"/> CSR	<input type="checkbox"/> Increase / decrease armrest depth	
	<input type="checkbox"/> Other _____	
WORK SURFACE, KEYBOARD, MOUSE (INPUT INTERACTIONS)		
Space for separate reading/writing workspace and keyboarding/mousing workspace (each requires minimum of 43 cm (17") horizontal knee space, 60 cm (24") horizontal toe space, 50 cm (20") leg space and 5 cm to 10 cm (2" – 4") clearance between top of worker's thighs and underside of work surface) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC <input type="checkbox"/> N/A	<input type="checkbox"/> Provide inline document holder: model _____	
	<input type="checkbox"/> Other _____	
Reading/writing work surface location (dominant hand side) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC <input type="checkbox"/> N/A Right / left hand dominant	<input type="checkbox"/> Position keyboard/mouse to left / right of reading/writing area	
	<input type="checkbox"/> Position deep drawers to left / right of keyboarding/mousing area	
	<input type="checkbox"/> Other _____	
Reading/writing work surface height (at least 5 cm (2") above elbow height if separate keyboard/mouse tray or separate keyboarding/mousing surface) (at keyboarding/elbow height if no separate keyboarding/mousing surface) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC Recommended work surface height: _____	<input type="checkbox"/> Raise / lower work surface height to _____	
	<input type="checkbox"/> Add / remove footrest	
	<input type="checkbox"/> Install keyboard/mouse tray: model _____	
	<input type="checkbox"/> Lower / raise right / left hand work surface to _____	
	<input type="checkbox"/> Other _____	

<p>Keyboarding/mousing tray surface area (large enough to accommodate both)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Install keyboard/mouse tray: model _____	
	<input type="checkbox"/> Install separate mouse tray: model _____	
	<input type="checkbox"/> Replace keyboard/mouse tray with longer keyboard/mouse tray: model _____	
	<input type="checkbox"/> Replace keyboard with shorter model _____	
	<input type="checkbox"/> Replace keyboard with alphanumeric keyboard	
	<input type="checkbox"/> Remove keyboard/mouse tray and set work surface height to keyboarding/mousing height	
	<input type="checkbox"/> Other _____	
<p>Mouse location in relation to keyboard (immediately adjacent, same height, same distance)</p> <p>(shoulder relaxed, upper arm hangs naturally from shoulder, upper arm almost vertical, elbow close to body, elbow forms an angle of slightly > than 90°, forearm, wrist and hand in alignment and parallel to floor)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Reposition mouse closer to keyboard	
	<input type="checkbox"/> Reposition and reconfigure mouse for left / right hand use	
	<input type="checkbox"/> Raise / lower mouse to _____	
	<input type="checkbox"/> Replace keyboard with one without number pad	
	<input type="checkbox"/> Replace keyboard/mouse tray with longer keyboard/mouse tray	
	<input type="checkbox"/> Provide mouse platform to sit over numeric keypad	
	<input type="checkbox"/> Reposition mouse on dominant hand side (left / right)	
<input type="checkbox"/> Other _____		
<p>Keyboard/mouse height (shoulders relaxed, upper arms hang naturally from shoulders, upper arms almost vertical, elbows close to body, elbows form an angle of slightly > than 90°, forearms, wrists and hands in alignment and parallel to floor, clearance between top of thighs and underside of keyboard/mouse tray)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Raise / lower keyboard/mouse tray so keyboard homerow height is _____	
	<input type="checkbox"/> Replace keyboard/mouse tray with one with less obtrusive mounting mechanism: model _____	
	<input type="checkbox"/> If no keyboard/mouse tray, raise / lower work surface so keyboard homerow height is _____	
	<input type="checkbox"/> Replace / repair damaged keyboard/mouse tray	
	<input type="checkbox"/> Install height adjustable keyboard/mouse tray: model _____	
	<input type="checkbox"/> Add footrest	
	<input type="checkbox"/> Other _____	

<p>Keyboard/mouse distance (shoulders relaxed, upper arms hang naturally from shoulders, upper arms almost vertical, elbows close to body, elbows form an angle of slightly > than 90°, forearms, wrists and hands in alignment and parallel to floor)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Move keyboard closer to / further from worker	
	<input type="checkbox"/> Move keyboard/mouse tray closer to / further from worker	
	<input type="checkbox"/> Replace / repair damaged keyboard/mouse tray	
	<input type="checkbox"/> Install distance adjustable keyboard/mouse tray: model _____	
	<input type="checkbox"/> Lower armrests	
	<input type="checkbox"/> Reposition armrest closer to seat back	
	<input type="checkbox"/> Other _____	
<p>Keyboard/mouse tilt (straight wrists)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Decrease keyboard/mouse tray tilt to 0°	
	<input type="checkbox"/> Adjust keyboard/mouse tray tilt to negative slope of _____	
	<input type="checkbox"/> Adjust keyboard feet so keyboard has zero tilt	
	<input type="checkbox"/> Replace / repair damaged keyboard/mouse tray	
	<input type="checkbox"/> Install tilt adjustable keyboard/mouse tray: model _____	
	<input type="checkbox"/> Other _____	
<p>Keyboard alignment (in line with worker, monitor screen)</p> <p>Alphanumeric keyboarding – b key centred on worker's midline</p> <p>Data entry – numeric keyboard positioned directly in front of worker's keying hand</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<input type="checkbox"/> Move keyboard to left / right	
	<input type="checkbox"/> Move keyboard/mouse tray to left / right	
	<input type="checkbox"/> Replace keyboard/mouse tray with fixed / flat keyboard/mouse tray: model _____	
	<input type="checkbox"/> Replace keyboard/mouse tray with shorter/ longer keyboard/mouse tray: model _____	
	<input type="checkbox"/> Other _____	
<p>Keyboard suitability (wrist in neutral, hand in a gentle relaxed curve, knuckles higher than finger joints, forearms rotated slightly so thumbs are on top and not in full palm down position)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No</p>	<input type="checkbox"/> Replace / repair damaged keyboard	
	<input type="checkbox"/> Replace keyboard with conventional / alternative keyboard with the following features: fixed split / flat split / adjustable split / tented / scooped-bowl / negative slope	
	<input type="checkbox"/> Other _____	

Mouse suitability (fits worker's hand, fingers comfortably curl around, heel of hand above work surface) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Replace / repair damaged mouse	
	<input type="checkbox"/> Replace mouse with smaller / larger mouse design: model _____	
	<input type="checkbox"/> Replace mouse with optical mouse / cordless mouse	
	<input type="checkbox"/> Replace mouse with roller bar / trackball / pen pad / touch pad / touch screen / voice input program: model _____	
	<input type="checkbox"/> Other _____	
Wrist rest usage (forearm, wrist, and palm do not come in contact with while typing, forearms, wrists and hands parallel to floor) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Remove wrist rest	
	<input type="checkbox"/> Reposition wrist rest	
	<input type="checkbox"/> Replace wrist rest with wrist rest with following features: flat / firm / at least 2" wide / same height as front of keyboard / cleanable / breathable material	
	<input type="checkbox"/> Replace damaged wrist rest	
	<input type="checkbox"/> Remove mouse wrist rest	
	<input type="checkbox"/> Reposition mouse wrist rest	
	<input type="checkbox"/> Replace mouse wrist rest	
	<input type="checkbox"/> Other _____	

MONITOR, DOCUMENT HOLDER, LIGHTING (VISUAL DEMANDS)



Monitor screen alignment (directly in line with keyboard and worker) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC	<input type="checkbox"/> Move monitor to the right / left	
	<input type="checkbox"/> Reposition monitor screen directly in line with keyboard and worker	
	<input type="checkbox"/> Reposition keyboard directly in line with monitor screen and worker	
	<input type="checkbox"/> Other _____	
Monitor screen angle (visual plane is vertical or tilts away from the top) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Reduce screen backward tilt to 0° to 5°	
	<input type="checkbox"/> Change forward tilt to 0° to 5° backward tilt	
	<input type="checkbox"/> Other _____	

Monitor screen height (top of monitor screen horizontal with worker eye height with head in a neutral vertical position, center of monitor screen 17.5 cm to 25 cm (7" – 10") below horizontal, most important visual display $\pm 15^\circ$ vertical line of sight) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Raise / lower monitor screen to _____	
	<input type="checkbox"/> Remove CPU from under monitor	
	<input type="checkbox"/> Add monitor riser	
	<input type="checkbox"/> Replace monitor with height adjustable monitor	
	<input type="checkbox"/> Install monitor arm	
	<input type="checkbox"/> Other _____	
Monitor screen viewing distance (45 cm to 75 cm (18" – 30") from eyes (approximately an arm's length)) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC	<input type="checkbox"/> Move monitor forward / backward to _____	
	<input type="checkbox"/> Other _____	
Monitor screen brightness (no glare, easy to read) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Increase / decrease screen brightness	
Monitor resolution (negative contrast) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Change screen setting to dark text on a light background	
	<input type="checkbox"/> Increase text size to _____	
Monitor screen cleanliness (free of dirt and obstructions) <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Clean monitor screen	
	<input type="checkbox"/> Other _____	
Suitable document holder provided if worker frequently refers to source documents (sufficient room for required source documents) (sturdy enough to maintain source documents) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Provide standard document holder: model _____	
	<input type="checkbox"/> Provide inline document holder: model _____	
	<input type="checkbox"/> Provide document holder with manual / foot operated line guide: model _____	
	<input type="checkbox"/> Replace document holder with larger / smaller document holder: model _____	
	<input type="checkbox"/> Replace document holder with more stable document holder: model _____	
	<input type="checkbox"/> Replace document holder with document holder capable of holding heavier source documents: model _____	
	<input type="checkbox"/> Replace document holder with document holder that can be used as a writing surface: model _____	
	<input type="checkbox"/> Other _____	

<p>Document holder position (minimal neck twisting, minimal neck flexion/extension, source document aimed straight at eyes)</p> <p><input type="checkbox"/> N/A</p> <p><input type="checkbox"/> Standard document holder (immediately adjacent to monitor, same height as monitor, same distance as monitor, on worker's dominant eye side)</p> <p><input type="checkbox"/> Inline document holder (between keyboard and monitor in line with worker, keyboard, and monitor, angled so perpendicular to worker's line of sight)</p>	<input type="checkbox"/> Move document holder closer to monitor	
	<input type="checkbox"/> Move document holder to worker's dominant eye side (left / right)	
	<input type="checkbox"/> Reposition document holder between and inline with keyboard and monitor	
	<input type="checkbox"/> Increase / decrease document holder viewing distance to monitor viewing distance of _____	
	<input type="checkbox"/> Raise / lower document holder height to monitor screen height of _____	
	<input type="checkbox"/> Increase / decrease document holder angle to _____	
	<input type="checkbox"/> Other _____	
<p>Overhead lighting (workstation located parallel to, not directly underneath)</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC</p>	<input type="checkbox"/> Move workstation parallel to overhead lighting	
	<input type="checkbox"/> Install diffuser over overhead light source	
	<input type="checkbox"/> Install parabolic filter over overhead light source	
	<input type="checkbox"/> Remove / shut off overhead light source	
	<input type="checkbox"/> Redirect overhead light source down / up	
	<input type="checkbox"/> Provide an anti glare screen	
	<input type="checkbox"/> Other _____	
<p>Task lighting (brighter than ambient, focused on source documents, controls and other visual needs)</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC <input type="checkbox"/> N/A</p>	<input type="checkbox"/> Provide adjustable task lighting: model _____	
	<input type="checkbox"/> Reposition task lighting to worker's dominant hand side (left / right)	
	<input type="checkbox"/> Increase / decrease task lighting intensity	
	<input type="checkbox"/> Reposition task lighting to focus on source documents, controls and other visual needs	
	<input type="checkbox"/> Other _____	
<p>No reflective surfaces - walls, floors and furniture</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC</p>	<input type="checkbox"/> Remove following shiny objects _____	
	<input type="checkbox"/> Reposition following shiny objects _____	
	<input type="checkbox"/> Cover following shiny surfaces and objects _____ _____	
	<input type="checkbox"/> Other _____	

Natural light - control of (Monitor positioned at 90° angle to window) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC <input type="checkbox"/> N/A	<input type="checkbox"/> Adjust window coverings	
	<input type="checkbox"/> Reposition following shiny objects _____	
	<input type="checkbox"/> Remove following shiny objects _____	
	<input type="checkbox"/> Cover following shiny objects and surfaces _____	
	<input type="checkbox"/> Reposition monitor screen so at 90° angle to window	
	<input type="checkbox"/> Add protective film to windows	
	<input type="checkbox"/> Provide anti glare screen: model _____	

WORK ORGANIZATION (INPUT INTERACTIONS)



Work surface: <ul style="list-style-type: none"> • High priority tasks/items in primary zone (hands reach with elbows at side) • Lower priority tasks/items in secondary zone (hands reach with arm extended) • Occasionally performed tasks/used items in tertiary zone (just past hands reach with arm extended, some trunk flexion) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC	<input type="checkbox"/> Reposition following items in primary zone _____	
	<input type="checkbox"/> Reposition following items in secondary zone _____	
	<input type="checkbox"/> Reposition following items in tertiary zone _____	
Work organized so it flows towards dominant hand <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> CWRC	<input type="checkbox"/> Relocate in/out trays to within maximum reach zone either: stacked on top of one another / placed side by side	
	<input type="checkbox"/> Other _____	
	<input type="checkbox"/> Reconfigure workstation to left / right hand setup	
	<input type="checkbox"/> Move in/out trays to non dominant hand side (left / right)	
	<input type="checkbox"/> Other _____	

<p>Storage (drawers, shelves, filing cabinets, etc.):</p> <ul style="list-style-type: none"> • High priority items stored in primary zone (hands reach with elbows at side) • Lower priority items stored in secondary zone (hands reach with arm extended) • Occasionally used items stored in tertiary zone or further • High priority items stored in worker's "safety zone" (between knuckles and shoulders) <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>CWRC</p>	<p><input type="checkbox"/>Relocate commonly used items to a top desk drawer</p> <p><input type="checkbox"/>Arrange files in filing cabinet so frequently used files are closer to elbow level</p> <p><input type="checkbox"/>Relocate items on shelves so frequently used items are closer to elbow level</p> <p><input type="checkbox"/>Replace shelving with shelves a maximum depth of _____</p> <p><input type="checkbox"/>Reposition following items in primary storage zone _____</p> <p><input type="checkbox"/>Reposition following items in secondary storage zone _____</p> <p><input type="checkbox"/>Reposition following items in tertiary storage zone _____</p> <p><input type="checkbox"/>Other _____</p>	
<p>No items stored in kick space (leg room) (worker able to perform keyboarding/mousing and reading/writing activities in neutral sitting posture)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No</p>	<p><input type="checkbox"/>Remove following items from keyboarding/mousing kick space _____</p> <p><input type="checkbox"/>Remove following items from reading/writing kick space _____</p> <p><input type="checkbox"/>Reposition following items to under work surface on worker's non dominant hand side (left / right) _____</p> <p><input type="checkbox"/>Other _____</p>	
<p>Clutter free workstation (room to move freely)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No</p>	<p><input type="checkbox"/>Remove following items from workstation _____</p>	
<p>Telephone located in primary zone (within 30 cm (12") of worker, CSA Section 7.7.2)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>N/A</p>	<p><input type="checkbox"/>Relocate telephone to primary zone</p> <p><input type="checkbox"/>Other _____</p>	
<p>Telephone headset provided (if frequent telephone use and/or used in combination with keyboarding/mousing or writing)</p> <p><input type="checkbox"/>Yes <input type="checkbox"/>No <input type="checkbox"/>N/A</p>	<p><input type="checkbox"/>Provide worker with telephone headset: model _____</p> <p><input type="checkbox"/>Replace telephone headset with a corded / cordless model: _____</p> <p><input type="checkbox"/>Replace / repair damaged telephone headset</p> <p><input type="checkbox"/>Replace telephone headset style with a headband / ear plug / ear hook (small / medium / large) / neckband style</p> <p><input type="checkbox"/>Other _____</p>	

EXAM

EXAM

Computer Workstation Assessment Training Exam (1/2 hour)

For each image identify:

1. What is wrong?
2. Why it is wrong? Or what is the correct posture?
3. What you would do to fix the problem?

IMAGE 1



IMAGE 2



IMAGE 3



IMAGE 4



IMAGE 5



IMAGE 6



IMAGE 7



IMAGE 8



IMAGE 9

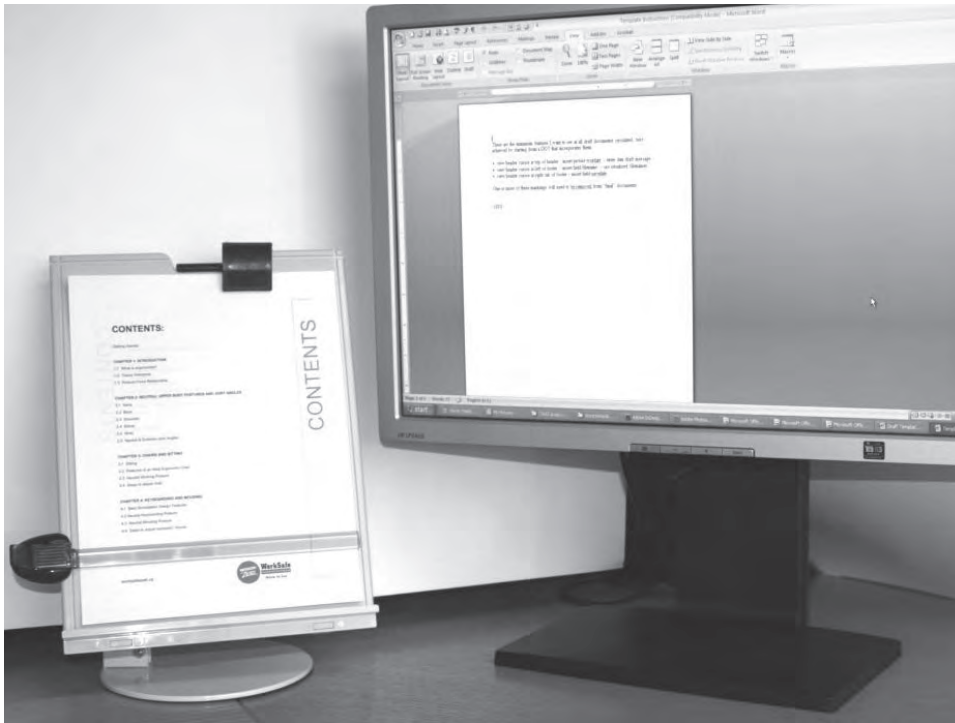


IMAGE 10



IMAGE 11



COMPUTER WORKSTATION ASSESSMENT TRAINING

Participant Evaluation

Date: _____ Instructor: _____

Location: _____

We want to know what you think. Your answers help us improve our courses.

“A” STRONGLY AGREE; “B” AGREE; “C” NO OPINION; “D” DISAGREE; “E” STRONGLY DISAGREE

A. GENERAL:

- A B C D E 1. The course was informative.
- A B C D E 2. I will be able to apply what I learned today to my workplace.
- A B C D E 3. I would recommend this course to others.

B. INSTRUCTOR:

- A B C D E 1. The instructor was prepared and organized.
- A B C D E 2. The instructor knew the course content.
- A B C D E 3. The instructor provided adequate opportunities for discussion.
- A B C D E 4. I felt free to ask the instructor questions.

C. COURSE:

- A B C D E 1. The activities helped me learn how to assess computer workstations.
- A B C D E 2. There was enough time provided for:
- A B C D E a) questions
- A B C D E b) practical application
- A B C D E 3. The course materials were well organized, easy to read/understand.
- A B C D E 4. The slides were easy to read and understand.
- A B C D E 5. The room was comfortable and appropriate for this course.
- A B C D E 6. The location of the course was convenient for me.

D. COMMENTS AND SUGGESTIONS:

THANK YOU. PLEASE RETURN THIS FORM TO YOUR INSTRUCTOR BEFORE YOU LEAVE.