Office Ergonomics Resource Guide

I N NOVA SCOTIA, musculoskeletal injuries (MSIs) account for 64 per cent of all time-loss claims. In a typical year they cost Nova Scotia employers $20 million in workers' compensation and direct medical costs. The real cost of musculoskeletal injuries to Nova Scotia industries is estimated to be between $100 million and $1 billion per year. This includes direct and indirect costs – things like lost productivity, replacing workers, overtime, training, and equipment design.

With advancements in technology, more and more workers are using computer workstations to complete their daily work tasks. This has lead to an increase of eye strain, neck, shoulder and back discomfort and more serious MSIs.

Most workplace injuries in Nova Scotia are MSIs and are caused by hazards associated with the way work is carried out and how work is organized. Preventing MSIs starts with understanding how they are caused and what risk factors lead to them. These factors usually include:

• Awkward body posture, such as bending, twisting, slouching

• High body force, such as lifting or carrying heavy loads

• High task repetition for long periods

• Duration, or working in the same body posture for long periods

This document will serve as a resource for organizing your computer workspace so that you can minimize the hazards that may exist.

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Definitions

1) **Ergonomics (human factors)**[1] is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

2) An **Ergonomist**[2] is an individual who contributes to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people.

3) A **Musculoskeletal Injury**[3,4] (MSI) is defined as "An injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue including sprain, strain and inflammation that may be caused or aggravated by work"

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[1] International Ergonomics Association
[2] International Ergonomics Association
[3] WorkSafe NB
[4] WorkSafe BC

A Systematic Approach

The following document is designed to outline a systematic approach for organizing your computer workspace. It covers everything from chair set-up to placement of accessories. Creating a workstation set-up that fits your unique requirements is very important for a healthy work environment. Systems are constantly changing; you should keep in mind that any changes or modification that you make will more than likely affect other aspects. Make sure that you continually apply the information provided in this guide to your workstation to ensure a healthy and productive working environment.
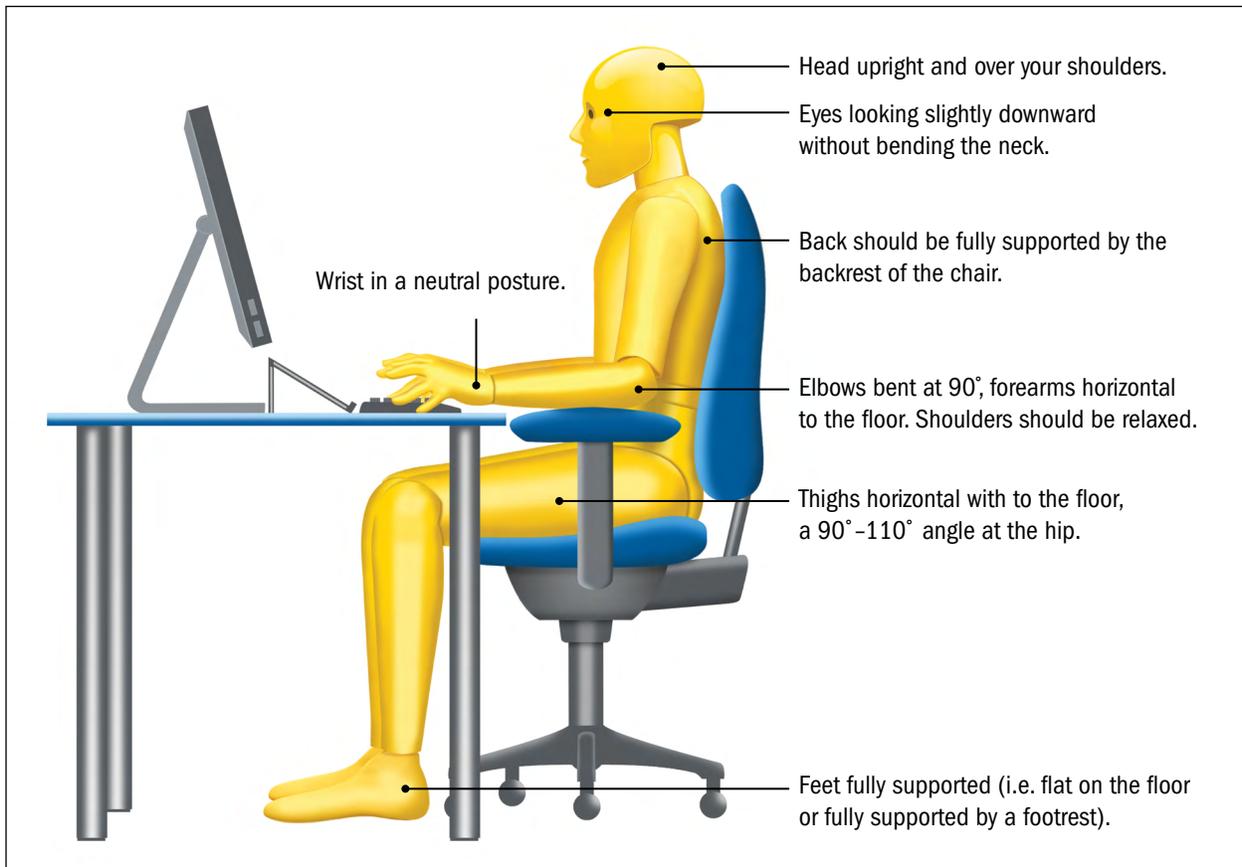

Figure 1: Ideal Sitting Posture, Computer Workstation

Chair

It is very important to adjust your chair to suit the dimensions of your body. Each worker is unique and requires a different set-up of their workstation.

- Lumbar (lower back region) support that is inadequate will lead to awkward postures and fatigue of the lumbar region and its supporting muscles;

- Seating that is either too high or too low can lead to awkward neck, shoulder and leg postures. This will increase the demand on the back or cause pressure in the thighs;

- Long periods of sitting without altering posture will decrease blood flow and circulation to the legs.

Note: Refer to Figure 1 for an illustration of an optimal chair set-up.

Chair Height

To begin your office set-up, you need to first set-up your chair to fit your body dimensions and then organize your workstation around you.

First, determine a suitable seating height, position your seat pan at a height that is no higher than your knee cap while you are standing. Adjust your chair so that it is just below your knee cap while sitting in your chair. Your feet should be planted firmly on the ground and your lower leg and thighs should be at a 90° angle. *Please note: your chair height may be variable day-to-day based on your choice of footwear and may require alterations.* If you are sitting in your chair and your knees are not at a 90° angle, make adjustments to your chair height so that you are.

TIP

If your chair is too high or too low you will feel pressure on the underside of your thighs; adjust the height until you feel a reduction in pressure.

Now that your chair is at the appropriate height, you need to ensure that the seat pan is optimally positioned, according to your thigh length. To do this, sit with your back supported against the back rest, there should be a minimum of two to three fingers width between your knee and the front of the seat pan, and at least two-thirds of your leg should be supported by the seat pan. If this is not the case, adjust the seat pan to meet these requirements.

Backrest

The backrest should support the natural curve of your spine. Most backrests have some form of lumbar support built into them; adjust this by raising or lowering the backrest to match your lumbar curve and to improve comfort.

Some models of chairs have additional features, like inflatable lumbar support, which the user can increase or decrease the amount of inflation to best suit their lumbar curve. If your chair does not have a natural lumbar curve built in or the ability to inflate the lumbar support, you can replicate this by using a rolled up towel.

Armrests

Armrests are effective in reducing the stress on the upper limbs. Armrests should be located 1-2 cms below the elbows when your shoulders are relaxed. If you have soft armrests, this will also assist in reducing contact stress on the elbows.

Note: Your armrests should not hinder your ability to move freely or turn your chair. Remove armrests if they limit your ability to work at comfortable typing height, or getting your chair close enough to your workstation.

General features to look for when purchasing a chair:

• Breathable fabric materials increase user comfort and are less likely have user slide while in their chair;

• Seat pans should have a waterfall design in the front of the chair. This promotes blood flow and circulation and limits the chances of the legs tingling;

• Adjustability in a chair is the key to a good fit. Each person is unique so the ability to raise and lower armrests, backrests, the ability to tilt forward and back and slide the seat pan in and out will increase the likelihood of achieving a good fit;

• The chair base should contain five-prongs to limit the chances of tipping, and the casters should be suited for the type of flooring.
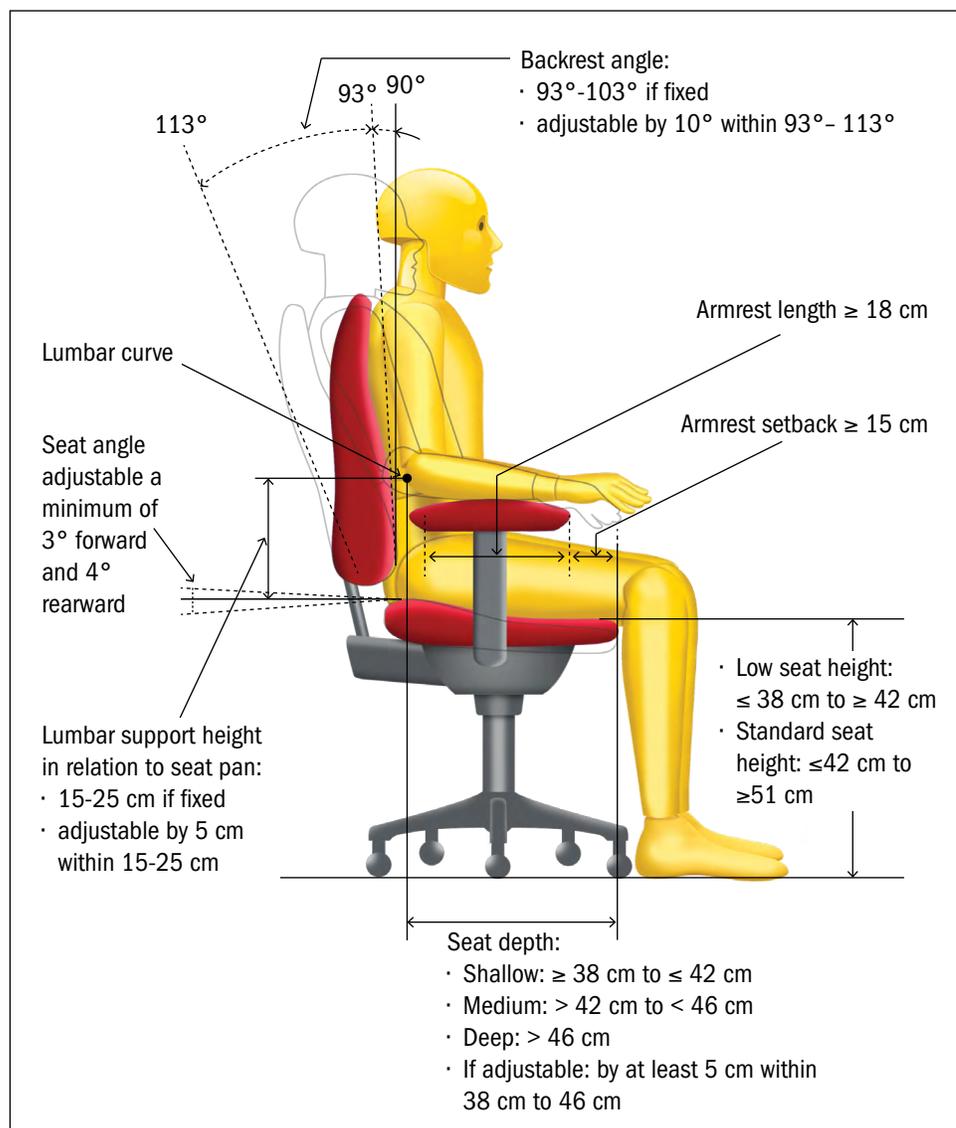
93° 90°

113°

Backrest angle:
· 93°-103° if fixed
· adjustable by 10° within 93°– 113°

Lumbar curve

Seat angle adjustable a minimum of 3° forward and 4° rearward

Armrest length ≥ 18 cm

Armrest setback ≥ 15 cm

Lumbar support height in relation to seat pan:
· 15-25 cm if fixed
· adjustable by 5 cm within 15-25 cm

· Low seat height: ≤ 38 cm to ≥ 42 cm
· Standard seat height: ≤42 cm to ≥51 cm

Seat depth:
· Shallow: ≥ 38 cm to ≤ 42 cm
· Medium: > 42 cm to < 46 cm
· Deep: > 46 cm
· If adjustable: by at least 5 cm within 38 cm to 46 cm

Figure 2: Chair Dimensions – Side View

Work surface

A work surface that is customized to fit your needs is an essential aspect in ensuring good posture and overall comfort throughout the work day. You can do this by modifying your work surface height, adding adjustability to the work surface and re-organizing your work surface layout.

The work surface height should be at the same level as your elbow height when you are sitting in your chair. If your work surface is too low, raise the height of the work surface using a stable support until it or the keyboard is at elbow height. If your work surface is too high, raise your chair until you are at a neutral elbow posture (this may require using a footrest to do so).

Note: An adjustable chair and footrest are key elements for a multi-user work surface.

Work Surface Adjustability

Height adjustability is a critical feature in most cases, as an adjustable work surface allows you to easily change your posture throughout the work day. That's why adjustability is usually recommended for work surfaces that are used by multiple people. If you are purchasing a new work surface, you may want one with adjustability already built in. Below are some ideas on how to add adjustability to your work surface:

• Add attachments to your work surface such as a keyboard tray or monitor arm;

• Use a smaller, separate computer workstation and continue to use the work surface for regular work;

• Purchase an L-shaped work surface that allows for a separate writing and typing area.

Organizing Your Work Area

Imagine the awkward body postures and discomfort caused when constantly reaching for items placed too far from where you are sitting: the arrangement of items on your work surface can affect your comfort, if not done appropriately. A way to reduce the chances of this occurring to you is to organize your work area based on one simple design principle: frequency of use. That is, the more you use an item, the closer it should be to you. Organizing your work area this way improves efficiency, creates more working space and reduces the distance and frequency of reaches.

Divide your work surface into two main areas based on item usage: primary and secondary work areas. The primary work area includes the semi-circle area directly (up to 36 cm) in front of you. Place items that you frequently use, or use for long durations of time, in this area, like your keyboard or mouse. The secondary work area (36 to 50 cm semicircle in front of you) would contain items that you occasionally use or that you use for only a short duration, such as a calculator or reference material. Lastly, items that are very infrequently used should be placed beyond the secondary work area.
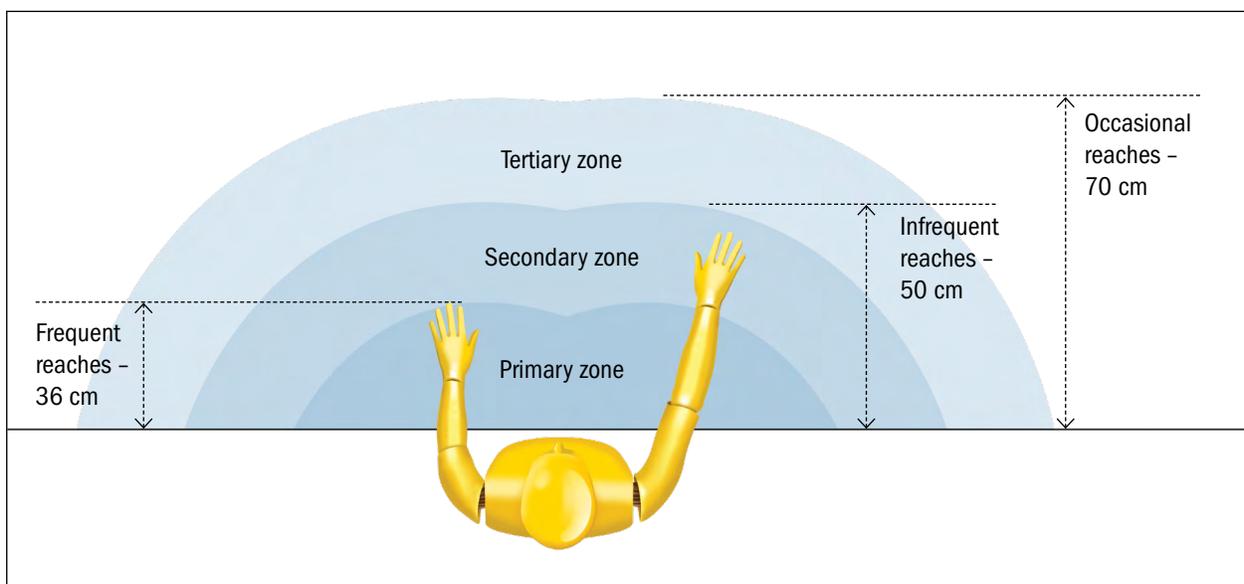

Figure 3: General Guidelines for Work Reaches

Input devices – i.e. keyboard & mouse

A comfortable interface with your keyboard and mouse is essential in creating a workstation that fits you. The following points describe the ideal posture you should have while using your keyboard and mouse.

- Upper arms should be relaxed by your sides;

- Elbows bent at right angle and forearms parallel to the floor;

- Straight wrists.

Height

An easy way to determine the proper height for your keyboard and mouse is to let your upper arms relax by your sides and then position the keyboard and mouse at approximately the same height as your elbows. This is most easily accomplished with the use of an adjustable keyboard tray mounted to the underside of your desk. However, this can also be accomplished by adjusting the height of your chair (refer to **Chair** section for more detail concerning this). Special precaution should be taken when installing a keyboard tray to ensure it doesn't compromise leg room.

Positioning

The keyboard and mouse should be positioned at the same level/height and as close together as possible. Remember, to prevent MSIs, it is important to keep your wrists straight, so the keyboard should lie flat, as opposed to being propped up on its legs, to prevent awkward wrist postures. A palm rest, placed in front of your keyboard, is often useful to rest the heel of your palm on when you are not typing. Palm rests should run the full length of the keyboard, be made of soft, compressible material and be about the same height as the keys.

Monitor

The height and depth at which you position your monitor on the work surface is determined relative to the position of your eyes when you are seated comfortably in your chair. The monitor should always be positioned directly in front of your body, as having it off to the side promotes awkward neck and lumbar postures. Another factor to consider when positioning your monitor is glare. If possible, your screen should be facing away from any windows letting in bright sunlight. Refer to the **Lighting** section for more detail concerning this.

Distance

Every person-workstation system is unique and, as a result, the ideal monitor distance will be as well. The general range is between 60cm and 90cm in front of your eyes, or about one arm's length away. Large monitors should be positioned farther away than smaller monitors. Users with eyesight limitations will need to move their monitors closer. A common best practice is to position the monitor as far away as possible while still being able to easily read the smallest font on the monitor.

Height

A good rule of thumb for determining the proper height for your monitor is to align your eyes with the top of the screen as you are seated comfortably in your chair. Tilting the top of the screen away from you slightly will allow your gaze to fall comfortably on the screen in a more natural way than if it was completely vertical, illustrated in the figure below.
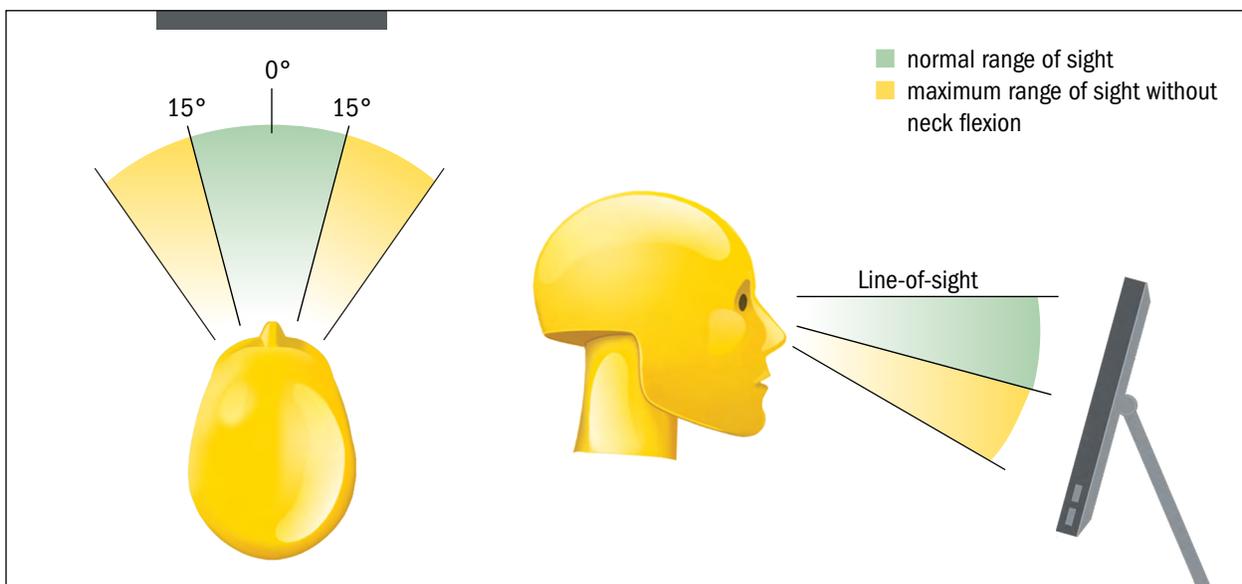

Figure 4: Line of Sight Angles

Laptops & tablets

Portability has taken precedence over usability when it comes to laptops and tablets. Convenience in taking work between the office, home, and a multitude of other locations has become a requirement for many. Unfortunately, ever more compact designs, with attached screens and keyboards or touchscreens, require the user to adopt awkward postures. Using the best practices guidelines described earlier, portable devices pose a never ending trade-off between the proper viewing height and the proper keying height.

Accessories

There are numerous accessories that can help improve the physical interaction between the user and their laptop or tablet:

• **Docking Station:** If frequent use of a laptop or tablet is conducted in a consistent environment, i.e. home or office, a docking station can help alleviate some of the postural mismatches. These allow you to connect a keyboard and mouse and essentially converting your laptop or tablet into a desktop computer (please reference previous guidelines for set-up).

• **External Input Devices:** Compact wireless options are easily available, however even wired in devices will allow the user to assume more neutral working postures. These may include keyboard, mouse, stylus pen, etc.

• **Laptop/Tablet Stand:** Keyboard stands should be used with an external keyboard and mouse, and will allow the user to raise the monitor height to a more neutral viewing position.

> **Note:** If you are on the go and do not have the option of using any external devices, more frequent breaks should be taken since awkward postures are more likely.

Lighting

When considering the lighting in your working environment, there are various issues that you should keep in mind. In setting up your work area, you want to find an appropriate level of brightness that will both reduce eye strain and muscle soreness that can develop from leaning forward or to the side to view your monitor. Below you will find some easy fixes that you can use to improve the glare and lighting in your work environment.
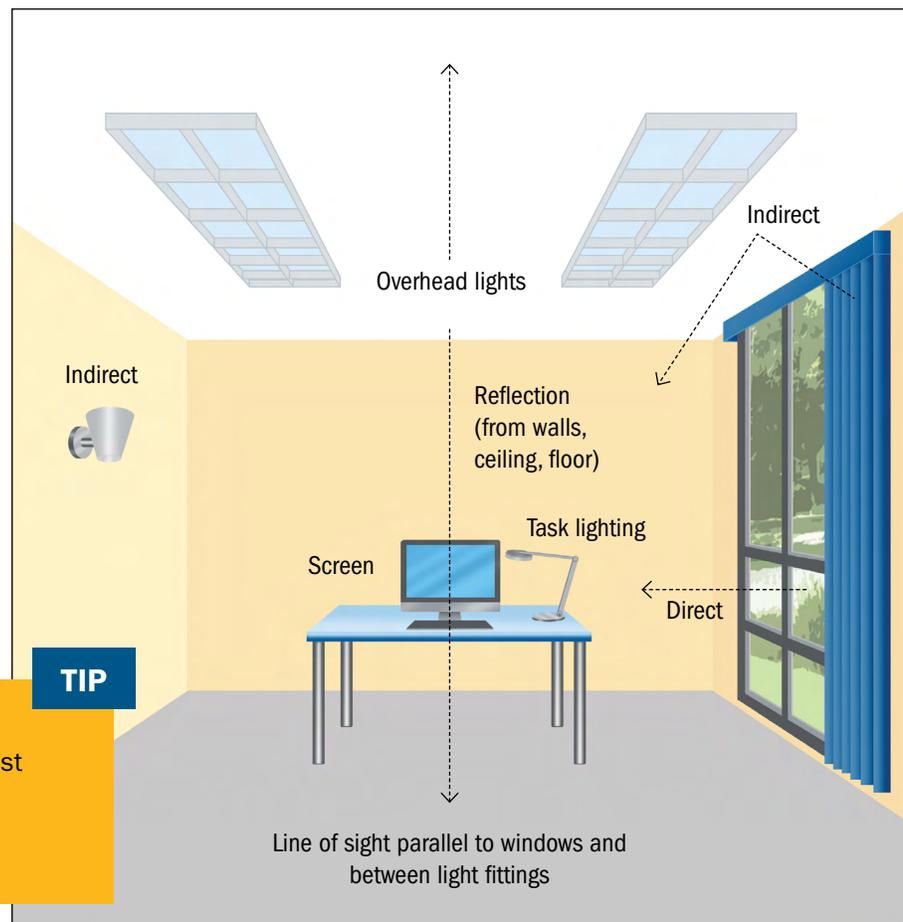
TIP

Windows:
- vertical blinds (east/west exposure of a building);
- horizontal blinds (south exposures of building)

Overhead lights

Indirect

Indirect

Reflection (from walls, ceiling, floor)

Task lighting

Screen

Direct

Line of sight parallel to windows and between light fittings

Figure 5: Light Sources

Glare

Glare is an ergonomics issue, as it can result in eye strain, visual fatigue or similar visual discomfort during your work day. Windows and bright lights are often sources of glare on your monitor. To check for environmental glare, turn off your monitor and look for reflections. If reflections are present, move or tilt your monitor downward or lower the light level. You can also position your computer workstation between rows of overhead lights rather than directly below them. Anti-glare screens or filters that fit on your computer monitor are another option in reducing glare from your environment, however these must be cleaned regularly as to not create further viewing obstruction.

Ensure that you are not positioned directly in front of a window; if possible, you should re-locate your workstation perpendicularly to that window, as it can reduce light shining directly onto your monitor. If re-positioning your workstation is not possible, install moveable devices such as curtains or roller blinds on windows to allow you to adjust the incoming light.
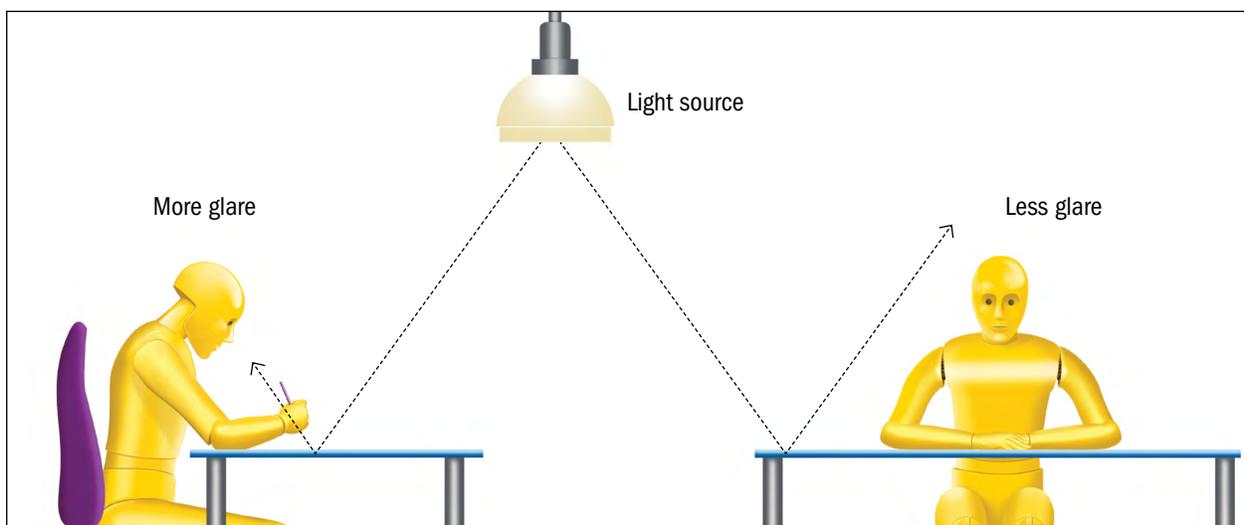
Light source

More glare

Less glare

Figure 6: Reflected Glare

Task Lighting

When lights are mounted overhead of your workstation, sometimes this can result in insufficient light levels reaching your work surface. Flexible task lighting (or desk lamps) over your main work area can minimize awkward head/neck postures, reduce the potential for eye strain and improve the quality of your day. This also allows you to customize your working environment to light levels that are comfortable for you to work in.

> **Note:** When using task lighting it is a good idea to place it to your left if you are a right-handed person. This eliminates shadows that would be cast across your work surface, caused by your writing arm. Vise versa for left-handed people.

Additional accessories

Footrests

A footrest is recommended when, as described earlier (refer to the **Chair** section), your chair set-up does not suit your workstation set-up and your feet do not rest on the ground. A footrest will act as a support and alleviate contact pressure between the thighs and the seat pan. A footrest should be adjusted to be the same height as the distance between your feet and the ground. Foot rests should be stable and secure so they do not slide when your feet are in contact, have a non-slip surface and should be adjustable between 10-20°.

Document Holders

Document holders are best utilized when they are located below the monitor and above the keyboard. These items should fall in a straight line directly in front of the user, which will limit the need to refocus the eyes and the amount of lateral flexion and rotation of the neck. Vertical monitor holders should follow the same principles, however if the majority of time is spent typing from the a vertical holder you may want to reposition the document holder in front of your and slightly offset the monitor.

Phone

Depending on your phone usage, you want to keep your phone close to your working area. If you are using your phone in combination with keying or writing tasks, locating files, and/or your phone usage is greater than two hours per day, you may want to consider a headset.

Available resources

- WorkSafe BC. How to make your computer workstation fit you.
  http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/comptr_wrkstn.pdf

- WorkSafeNB. Ergonomic guidelines for the office.
  http://www.worksafenb.ca/docs/officeedist.pdf

- Occupational Health Clinics for Ontario Workers Inc. Office Ergonomics Handbook, 5th Ed.
  www.ohcow.on.ca

- Canadian Standards Association. CSA Z412 – Guide on Office Ergonomics.
  www.csa.ca

- CCOHS.
  http://www.ccohs.ca/products/publications/office.html

References

- International Ergonomics Association. 2015.
  http://www.iea.cc/whats/index.html

- WorkSafeNB, 2010. Office Ergonomics, Guidelines for Preventing Musculoskeletal Injuries.
  http://www.worksafenb.ca

- WorkSafe BC, 2009. How to make your computer workstation fit you.
  http://www.worksafebc.com

- Canadian Standards Association Reaffirmed 2011. CSA Z412 – Guide on Office Ergonomics.
  www.csa.ca

Appendix A

OFFICE ERGONOMICS CHECKLIST	
Date:	Evaluator:

Task Information	
Name:	Years on Job:
Position:	
Task Information (including any recent changes):	

Discomfort Survey

Body Part	Right	Left	Task(s) that usually causes discomfort
Hand/wrist			
Elbow			
Shoulder			
Neck			
Back			
Legs			
Headache/eyestrain			
Other			

X – Moderate to Severe Discomfort and/or Frequent or Constant Symptoms

Workstation Evaluation			
	Yes	**No**	**If No, Suggested actions**
Chair			
Does the chair have the ability to be adjusted (seat pan, back support)?			• Obtain a properly functioning chair
Do your armrests allow you to get close to the workstation?			• Adjust armrests • Remove armrests (caution – this could create other issues)
Are your feet supported on the floor or a footrest?			• Lower the chair • Add a footrest • Readjust for footwear height
Is your lower back supported by the backrest?			• Adjust chair back • Obtain a properly functioning chair • Obtain a lumbar role
Do you feel pressure on the back of your knees or thighs?			• Adjust seat pan • Add a back support
Does your chair have a 5-pronged base?			• Obtain a properly functioning chair
Work surface			
Is the working level at your elbow height (keying, mousing, writing, etc.)?			• Adjust chair or desk height
Are commonly used items located within arm's reach?			• Rearrange workstation • Remove clutter or unnecessary objects from primary and secondary reach area
Is there room for your legs underneath your workstation?			• Adjust chair or desk height • Remove clutter or unnecessary objects
Input Devices			
Are your keyboard and mouse located at the same working level?			• Raise or lower your workstation • Raise or lower keyboard • Raise or lower chair
Are you able to keep your wrists neutral while keying or mousing?			• Adjust chair • Check posture • Check keyboard and mouse height
Does your mouse feel comfortable in your hand?			• Evaluate size and shape of mouse • Move mouse closer to keyboard • Obtain a larger keyboard tray if necessary
Wireless devices, and mice/keyboard options may offer additional flexibility for the worker.			

	Yes	No	If No, Suggested actions
Monitor			
Is your monitor positioned in front of you?			• Reposition monitor
Is the monitor approx. an arm's length away from you?			• Reposition monitor; if space is limited a wider desk may be required
Is the top of your monitor casing located below your eye level?			• Adjust monitor height (may require a monitor stand)
Lighting & Accessories			
Is your work surface and monitor free from glare and reflections?			• If possible, adjust light source or adjust work surface configuration • Place your monitor perpendicular to glare source
Is lighting sufficient for reading and writing tasks?			• Obtain a stronger desk lamp
Do you have task lighting?			• Obtain desk lamp or equivalent • Place on opposite side of your dominant hand
Are you using a headset or speakerphone if you are writing or keying while talking on the phone?			• Obtain a headset (wireless options may be preferred)
Do you have a document holder? If yes, is it placed directly in front of you?			• If necessary, obtain one and position it directly in front of you (between keyboard and monitor)
Breaks			
Do you take stretch breaks every 30 minutes?			• Set reminders to take breaks
Do you take regular eye breaks from looking at your monitor?			• Refocus on something distant every few minutes

What do you think could improve your job?

Additional Notes:

Notes