

CHAPTER 1

INFocus

# HEALTHY COMPUTING

Working with computers involves more than just using software and hardware. This chapter focuses on aspects that must be considered to ensure that employees' working conditions are both safe and healthy.

## In this session you will:

- ✓ gain an understanding of **Work Health and Safety** in **Australia**
- ✓ gain an understanding of performing a computer risk assessment
- ✓ gain an understanding of how to set up a workstation ergonomically
- ✓ gain an understanding of exercises you can do while working at a computer
- ✓ gain an understanding of factors that contribute to a healthy office work environment
- ✓ gain an understanding of the standards and specifications associated with ergonomics.

# WORK HEALTH AND SAFETY

A safe and healthy workplace is essential for successfully running a business of any size. Business owners have rights and responsibilities regarding the health and safety of their

employees, their customers and also the general public. In Australia the states and territories have each enacted their own **Work Health & Safety** (WHS) laws.

## Employer Obligations

Even though each state and territory in Australia has its own WHS legislation, the laws are similar enough to ensure that all employers are obliged to provide:

- Safe premises
- Safe machinery and substances
- Safe systems of work
- Information, instruction, training and supervision
- A suitable working environment and facilities

It doesn't matter whether you sit on a chair in front of a computer in an office or descend two kilometres underground to dig coal, as an employee your health and safety is covered by WHS legislation, and heavy penalties exist for employers who fail to meet their obligations.

## Acts, Regulations and Codes of Practice

Each state and territory in Australia has its own **WHS Act** which sets out the requirements for ensuring safe and healthy workplaces. These acts are general in nature and explain the responsibilities and duties of various people who play a role in workplace health and safety.

Some hazards in the workplace require more specific regulations or codes of practice. The various states and territories have created their own codes of practice to regulate these hazards. For example in New South Wales there is a code of practice dealing with *The Safe Removal of Asbestos*, another for *Working in Confined Spaces*, and yet another for the *Collection of Domestic Waste*. These codes spell out more detailed regulations, procedures and responsibilities for dealing with specific hazards to employees, customers and the general public.

## WHS Authorities

Each state and territory has its own authority that is responsible for enforcing the WHS laws, codes and regulations. These authorities also work with a national **Safe Work Australia** authority. Each of these authorities has its own website where you can obtain WHS information specific to the state in which you work. The authorities are listed below.

State/Territory	Authority	Website
ACT	WorkSafe ACT	<a href="http://www.worksafe.act.gov.au">www.worksafe.act.gov.au</a>
New South Wales	WorkCover NSW	<a href="http://www.workcover.nsw.gov.au">www.workcover.nsw.gov.au</a>
Northern Territory	NT WorkSafe	<a href="http://www.worksafe.nt.gov.au">www.worksafe.nt.gov.au</a>
Queensland	Workplace Health and Safety Queensland	<a href="http://www.worksafe.qld.gov.au">www.worksafe.qld.gov.au</a>
South Australia	SafeWork SA	<a href="http://www.safework.sa.gov.au">www.safework.sa.gov.au</a>
Tasmania	Workplace Standards Tasmania	<a href="http://www.wst.tas.gov.au">www.wst.tas.gov.au</a>
Victoria	WorkSafe Victoria	<a href="http://www.worksafe.vic.gov.au">www.worksafe.vic.gov.au</a>
Western Australia	WorkSafe WA	<a href="http://www.commerce.wa.gov.au/WorkSafe/">www.commerce.wa.gov.au/WorkSafe/</a>

These authority names and website addresses were correct at the time of writing but may vary and change over time. You can use an internet search engine (such as **Google**) to find the relevant WHS authority for the state in which you work.

# PERFORMING A COMPUTER RISK ASSESSMENT

To ensure that you are working safely and in a healthy manner with your computer and at your workstation you can perform a **risk assessment** to ascertain where any potential problems lie. A

risk assessment tool can simply be a checklist with questions like the ones shown below. This checklist can then be used to rectify potential problems.

## Workstation

Is the desk between 68cm and 72cm high and have a top dimension larger than 115cm x 90cm?	Yes	No
Is the workstation designed to prevent undue twisting of the neck or trunk?	Yes	No
Can all frequently used items such as telephones and documents be placed within easy reach?	Yes	No
Does the chair have height adjustment, backrest adjustment, lumbar support, and a 5 star castor base?	Yes	No
Are your thighs fully supported with 2-3 finger space behind the knees when seated and with the back fully supported by the chair?	Yes	No
Is a footstool required?	Yes	No
Can the keyboard be placed at a height where your forearms are parallel with the floor?	Yes	No
Can the mouse be positioned next to and at the same height as the keyboard?	Yes	No
When sitting tall and looking straight ahead can you look at the top edge of the screen?	Yes	No
Is a document holder available?	Yes	No
Is the screen at approximately one arm's length away and at a comfortable reading distance?	Yes	No
Is the image on the screen steady and free from flicker?	Yes	No
Is the screen free from glare and reflection?	Yes	No

## Work Environment

Can the level of lighting be adjusted, perhaps through the use of window blinds?	Yes	No
Is access and egress to the workstation and work area free from obstacles?	Yes	No
Is the area free of tripping and slipping hazards?	Yes	No
Are adequate storage facilities available?	Yes	No
Is ventilation, heating and cooling adequate?	Yes	No
Is the level of noise conducive to concentration?	Yes	No

## Work Practices

Can your posture be changed at least every hour, perhaps by changing the variety of tasks?	Yes	No
Do you have control over your workload and the ability to take breaks?	Yes	No

## Safety Equipment

Is a first aid kit available?	Yes	No
Are electrical cords and connections safe (undamaged and not caught around or under equipment)?	Yes	No
Have appropriate circuit breakers been installed in electrical circuits?	Yes	No

There are many checklists available on the internet that can be used a source of inspiration for your own. Some of the questions on the checklist above have been adapted from a checklist published on the internet by the University of Western Australia and other organisations.

# SETTING UP AN ERGONOMIC WORKSTATION

Many of the office-based injuries to the neck, arm and wrist can be prevented by having a properly set up workstation. This section presents some guidelines for you to work with in setting up a

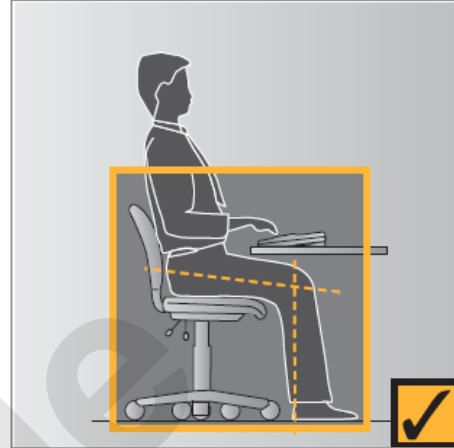
safe computer workstation. However, common sense must always prevail and if you feel any pain or discomfort as a result of using a computer you should stop immediately.

1

## Chair

The chair should be a gas-adjustable type chair. Adjust the height of the chair so that feet are comfortably flat on the floor, the thighs are approximately horizontal and the lower legs approximately vertical. Position the backrest to the curve of the back – if not comfortable, lower the height several centimetres and try this position.

1



2

## Arm Rests

Arm rests are usually not recommended unless they are well out of the way.

3

## Desk

Having adjusted the chair as above, adjust the height of the desk (where available) so that the top surface is just below elbow height. Ensure that there is ample clearance under the desk and that the desk is not too cluttered.

3



4

## Keyboard

The common and preferred setting for the keyboard is where the feet (under the keyboard) are lowered so that the keyboard sits flat on the desk. Place the keyboard as close to the front of the desk as is comfortable so that the top half of the arms are approximately vertical.

5

## Mouse

Place the mouse directly beside the end of the keyboard. When your hand is on the mouse, place your forearm on the desk or on a wrist rest if you find the edge of the desk painful. Try to use the mouse both left-handed and right-handed and change hands regularly.

6



6

## Screen

Position the screen after you have positioned the chair and desk. The top of the screen should be level with or slightly lower than your eyes. It should be at an arm's length away from the user. Position the screen to avoid reflective glare from windows and lights.

7

## Document Holder

Try to place documents so that they are at eye level and just to the side of the screen.

8

## Laptop Computer

If you use a laptop for more than 2 hours per day connect a separate mouse and LCD screen and position both as directed above.



# ACTIVITY – ERGONOMIC WORKSTATIONS



Individual  
Activity



Group  
Activity

## Setting Up An Ergonomic Workstation

Have a think about the workstation components listed below and circle whether you think they're ergonomic or no.

Workstation Component	Ergonomic?
If you use a document holder, it should be placed just to the side of the monitor at eye level	Yes – No
The mouse should be placed on the desk approximately above your knee	Yes – No
Position the keyboard as close to the front of your desk as possible	Yes – No
When you look at the centre of your monitor, your eyes should be looking down at an angle of approximately 30°	Yes – No
The best office chairs are gas-adjustable and include arm rests	Yes – No
If you're using a laptop for more than 2 hours per day, connect a separate mouse, LCD monitor and keyboard	Yes – No
It doesn't matter which side you position a document holder as long as it is positioned just to the side of your monitor	Yes – No
Get the position of your monitor correct and then position the chair and desk	Yes – No
It is good to use the mouse both left-handed and right-handed even if you are right-handed	Yes – No
Adjust the height of your chair until your thighs are angled at approximately 30° below horizontal	Yes – No
Position the monitor so that it avoids reflective glare from windows and overhead lights	Yes – No
Adjust the backrest of your chair so that it is positioned in the curve of your back	Yes – No
The correct height of your desk places its top surface just above elbow height	Yes – No
When you sit at your desk, your top half of your arms and lower legs should be approximately vertical	Yes – No

# BREAKS AND EXERCISES

Prevention is definitely better than cure when it comes to any form of illness or injury. Here are a number of suggestions for rest breaks and stretching exercises for you to try while working

at the computer. Make sure that you relax and perform the exercises gently. You should stop immediately if you feel any discomfort.

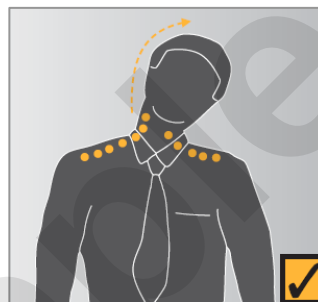
## Rests and Breaks

- Take a rest break away from the computer for 5 to 10 minutes every hour.
- Active rest during a break with some other type of activity, such as walking or stretching, is more beneficial than passive rest – get up off your chair and walk to the printer to collect those print jobs!
- Vary activities where possible interspersing computer tasks with non-computer tasks.
- Try to limit computer time to 5 hours per day – break this time up into segments.

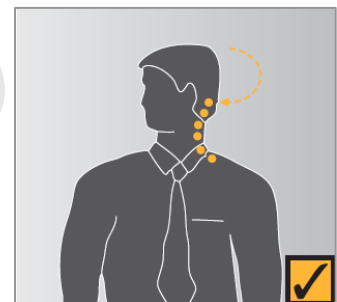
## Exercises

### Head Rolls

Gently lower ear to shoulder and hold for 10 seconds. Slowly roll chin to chest and up to other shoulder and hold chin for 10 seconds. Repeat several times and be careful not to extend your neck back too far.



Neck Stretch



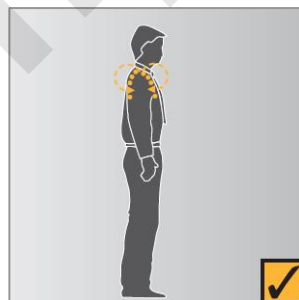
Head Turns

### Head Turns

Turn head to look over left shoulder and hold for 10 seconds. Turn head the other way and hold for 10 seconds. Repeat several times.

### Shoulder Rolls

Circle shoulders forward several times, then backwards. Repeat 3 to 5 times.



Shoulder Rolls



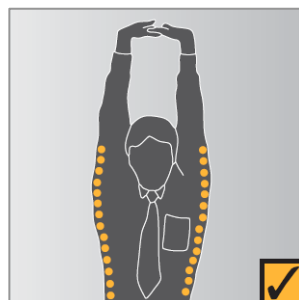
Wrist Stretch

### Wrist Stretch

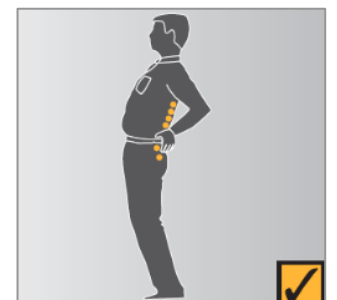
Interlace fingers, palms outwards, and straighten arms in front. Hold for 10 seconds and repeat several times.

### Upper and Lower Back Stretch

Interlace fingers and turn palms upward above head, straighten arms then slowly lean slightly from side to side. Repeat movement several times.



Upper and Lower Back Stretch



Back Arching

### Back Arching

Stand up and support your lower back with your hands then gently arch for five to ten seconds.

For a comprehensive range of exercises for office workers refer to **Appendix B** in *Officewise: A Guide to Health and Safety in the Office* published by **WorkSafe Victoria**. You can download a copy from the download link on the home page of **WorkSafe Victoria** (<http://www.worksafe.vic.gov.au>).

# RESEARCH – BREAKS AND EXERCISES



Individual  
Activity



Group  
Activity

## Research Task

<b>At Work</b>	If you are currently employed and sit for long periods at a desk, describe 3 types of exercises or breaks that you do during the day. If you don't sit for long periods, speak to someone who does so that you can complete this exercise.
<b>At School</b>	If you are still at school, ask an adult who is currently employed and who sits for long periods at a desk to describe 3 types of exercises or breaks that they do during the day.

## Exercise or Break

1.

2.

3.

# ENSURING A HEALTHY WORK ENVIRONMENT

General office environmental factors play a role in determining a safe and healthy office workplace. These factors include, but are not limited to, air quality and ventilation, furniture and

storage, lighting, noise levels, and temperature. These factors should be established according to published guidelines to ensure a comfortable office workplace setting.

## Air Quality

No-one likes to work in an environment where air is contaminated. In an office, air may be contaminated by the air conditioning system drawing in fumes, odours, or even micro-biological and chemical contaminants. A couple of the more documented contaminants that have resulted in injury or illness include Legionnaire's disease caused by exposure to legionella bacteria, and ozone gas produced by some photocopiers and laser printers.

Guidelines on air quality standards are contained in Australian Standards AS 1668:2 *The Use of Ventilation and Air Conditioning in Buildings: Ventilation Design* (2002).

## Furniture and Storage

The type of furniture found in an office, and where it is placed (office layout), can play a key role in preventing injury. It is recommended that each employee have at least 6 square metres for their desk, chair, filing cabinet, and other necessary equipment.

There should also be adequate walkways and pathways through an office to provide safe access at all times. Emergency exits should be clearly labelled and should never be blocked or have access hindered in any way.

Office storage should be sturdy in construction. Where reaching is required there should be adequate facilities, such as steps or purpose-built ladders to reduce unnecessary stretching. Above-desk storage such as shelving should be designed in such a way as to not hinder lighting or ventilation.

Ideally, floor surfaces should be carpeted with a wool-mix blend that reduces the build-up of static electricity. The carpet should be properly laid and maintained. Low pile carpet is preferred in offices where pushing or pulling of equipment is required.

## Lighting

Huge tomes have been written on office lighting. Lighting is measured by how much light falls on a surface – this is known as illuminance and its unit of measure is known as lux. The amount of lux in an area can be measured using a lux meter.

The optimum amount of lux in an office varies depending upon the activities being carried out. For example, a staff change room has a recommended lux of 80, waiting rooms have 160, areas of computer usage have 240, while routine office work areas have 400 lux. Areas where more difficult tasks are carried out, such as drawing offices or where proof-reading occurs, have a recommended lux of 600.

It is also desirable to minimise reflections of light from work surfaces. Highly polished floors and large glass-covered posters and paintings can be a nuisance. A constant source of annoyance to office workers is flickering lights which should be fixed immediately.

## Noise

Many non-office workplaces have strict guidelines for controlling the amount of noise – excessive noise can damage hearing. In an office it is unlikely that noise will damage hearing. It can however be distracting and annoying.

Office noise is much more subjective than industrial noise. It can include things such as a radio, music on-hold which may be heard by colleagues when you've placed your on-hold call on speaker phone, background music while working on the computer, even people talking.

Generally some consensus should be obtained from work colleagues as to what is appropriate to your office.

## Temperature

Temperature, or thermal comfort, in the office is another of those very subjective areas. What may be too hot for some will be just right for others and vice versa. General thermal comfort issues need to be addressed where problems are raised by many staff members. As far as individuals are concerned thermal comfort issues may be addressed by moving staff away from air-conditioning vents or doorways, providing personal heaters and possibly even clothing.

# RESEARCH – HEALTHY WORK ENVIRONMENT



Individual  
Activity



Group  
Activity

## Research Task

<b>At Work</b>	If you are currently employed, describe examples of how your employer has set up your workplace so that it is as healthy as possible. Group the examples under the headings shown below. If there are problem areas in your workplace, describe these as well.
<b>At School</b>	If you are still at school, ask an adult who is currently employed to describe examples of how their employer has set up their workplace so that it is as healthy as possible. Ask the person enough questions so that you can group the examples under the headings shown below. If there are problem areas in their workplace, describe these as well.

## Examples

1. Furniture and  
Storage

2. Lighting

3. Noise

# SPECIFICATIONS AND STANDARDS

WHS is a huge subject and is constantly evolving. There are many WHS sources of information related to computing especially in regard to ergonomics. Most countries around the

world recognise the importance of WHS and there are now a number of national and international standards that can help you determine how to correctly setup a workstation.

## Common Specifications and Dimensions

### Height of work surface (from floor)

Fixed desk: 680mm to 720 mm

Adjustable: 580 mm to 730 mm

### Work surface area

Width: 1,500mm minimum

Depth: 900 mm minimum

### Leg space volume

Width: 800 mm minimum

Depth: 550 mm minimum

Height: 580 mm minimum

### Viewing distance to work

350 mm to minimum

750 mm to maximum

### Height of display

30 mm to 40 mm below eye level

### Seat pan height

Surface of seat to floor: 380 – 510 mm

Seat pan depth: 330 – 430 mm

Footrest area: 300 – 375 mm

## National Standards Pertaining to Computer Ergonomics

**AS3590.1-1990 Screen-based Workstations – Visual Display Units**

**AS3590.2-1990 Screen-based Workstations – Workstation Furniture**

**AS3590.3-1990 Screen-based Workstations – Input Devices**

## National/International Standards Pertaining to Computer Ergonomics

**AS/NZS 4438:1997 Height Adjustable Swivel Chairs**

**AS/NZS 4442:1997 Office desks**

**AS/NZS 4443:1997 Office panel systems**

## International Standards Pertaining to Computer Ergonomics

**ISO 9241-1:1997(E) Ergonomic requirements for office work with visual display terminals**

**Part 1: General introduction**

**Part 3: Visual display requirements**

**Part 4: Keyboard requirements**

**Part 5: Workstation layout and postural requirements**

**Part 6: Environmental requirements**

**Part 7: Requirements for display with reflection**

These standards are all very comprehensive and are supplied in quite large books. If you perform a search on the internet (using Google or something similar) you will easily be able to locate retailers who can provide these standards to you should you require them.

## CHAPTER 2

## InFocus

# COMPUTER HARDWARE

The most obvious part of a computer is its physical being – its existence. A computer is simply a box of wires, nuts, bolts and other sundry bits and pieces that you can touch, hold and pull apart. The physical items that make up a computer are known as the computer's **hardware**.

**In this session you will:**

- ✓ gain an overview of the main parts of a personal computer
- ✓ gain an understanding of the internal hardware devices found in a computer
- ✓ learn how to identify the **CPU** and its main functions
- ✓ gain an overview of computer speed
- ✓ gain an overview of **RAM** and its role in the computer
- ✓ gain an overview of **ROM** and its role in the computer
- ✓ gain an understanding of the external hardware components of a computer
- ✓ gain an understanding of computer peripherals
- ✓ gain an overview of keyboards and keyboard layouts
- ✓ gain an understanding of a range of input devices
- ✓ learn how to identify output devices used on the computer
- ✓ gain an overview of devices used for both input and output
- ✓ learn how to identify the main storage devices
- ✓ gain an understanding of how external devices are connected.



# THE MAIN PARTS OF A PERSONAL COMPUTER

A personal computer is normally made up of three main components: the **monitor**, the **keyboard** and the **system unit**. The keyboard is used to input data (it is known as an **input**

device). The monitor is used to display information that has been processed (it is known as an **output** device). Most computers also have another input device known as a **mouse**.



## The System Unit

The **system unit** is the brain of the computer. Here data and instructions received from input devices are processed and then sent to output devices for display. The system unit has a number of core and critical components under the hood as described in the following table.

Component	Category	Function
<b>CPU</b>	Processing	The <b>Central Processing Unit</b> (CPU) is an integrated circuit that is plugged into the main electronic board inside the system unit. Its job is to direct all of the activities within the computer and is where the processing of data takes place. The CPU acts as the 'brain' of your computer. Personal computers are often classified according to the type and speed of the processor they have fitted.
<b>Hard disk</b>	Storage	The hard disk is used to store data and information so that it can be used again at a later time.
<b>RAM</b>	Storage	<b>Random Access Memory</b> (RAM) is a temporary storage area for data awaiting processing by the CPU while the computer is switched on. The data stored in the RAM is erased when the computer is turned off.
<b>DVD drive</b>	Storage	The <b>DVD drive</b> on the computer is much the same as the DVD you use at home for playing movies. Large programs (especially games) are available on DVD and the DVD drive is normally used to load those programs onto the computer. The DVD drive can also be used to play your audio CDs on the computer and to play movies – providing you have the right software and sound card. Most of the DVD drives can also create (or <i>write</i> as it is known) DVD disks – this is known as <i>burning</i> a disk.
<b>USB port</b>	Storage or device connection	Another important part of a computer is the <b>USB</b> (Universal Serial Bus) <b>ports</b> . A port means a connecting socket. Most computers will have several of these ports because they can be used to do a number of different jobs, sometimes simultaneously. USB ports, for example, can be used to connect a mouse to your computer. They can also be used to connect a temporary storage device known as a <i>USB Stick</i> or <i>Memory Stick</i> to the computer so that you can copy data from the computer to the device for safe keeping.

## Peripheral Devices

There are a number of other devices that can be attached to a personal computer. These include devices such as printers, scanners for scanning in pictures, digital cameras, joysticks for playing games, and more. These devices are normally attached to special plugs at the back of the computer. Since they are peripheral to the main operation of the computer, they are sometimes known as **peripheral** devices.