Guidelines on the use of photocopiers
Occupational Health and Safety guidelines for the use of photocopiers

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1. Introduction

This booklet contains Occupational Health and Safety guidelines for the use of photocopiers.

Photocopier use comes under the NSW Occupational Health and Safety Act 2000 ('the Act') and the NSW Occupational Health and Safety Regulation 2001 ('the Regulation').

These regulations require employers to ensure that any photocopier (or 'plant') they provide for employees to use at work is safe and without risk to health (when properly used).

The manufacturer, supplier, hirer or lessor of plant must provide information to the supplier or the end user which is sufficient for the user to assess, manage and control any risks associated with operating the photocopier.

This information must then be passed on to the relevant employees under s.13-15 of the Act, so that the consultation in relation to the plant can be effective and meaningful, prior to the purchase/lease and installation or use of the plant.

See section on "Photocopiers and the law" (page 17) for detailed information on your employer's legal requirements regarding photocopiers.
2. What is photocopying?

Photocopying involves several technical processes. Light is reflected from the original document so that an image of the document is projected onto an electrically charged photoconductive drum. The photo conductor is generally the element selenium. The reflection of the document leaves a pattern of charges on the drum surface that is identical to the original document. These charges attract the toner, which is then transferred to the copy paper.

The process involves heat, or pressure, in conjunction with an electrical discharge from the drum.
3. OH&S issues and photocopiers

The photocopier

Relevant OH&S information regarding all models of photocopiers includes:

- **Noise levels during operation:** no photocopier should generate noise levels in excess of 70dB(A).
- **Automatic shut down mechanism:** copier should be capable of this when not in operation for 5-10 minutes.
- **Ozone filters:** all photocopiers should be fitted with them, plus information on cartridge replacement periods.
- **Normal operating temperature of the photocopying lamp**
- **Operator maintenance and repair:** particularly ease of maintenance and minor repairs, and scheduled maintenance intervals. The worker required to maintain the copier may need training for this purpose.
- **Maximum safe periods of continuous operation:** if relevant.
- **Exhaust ventilation ducting:** should be connected to all medium and high capacity copiers.
- **Material safety data sheets (MSDS) for toner:** are provided with the copier. Toner replacement for all models of photocopiers should be restricted to fitted toner cartridges. This may influence the choice of design and manufacturer of the photocopier when purchasing decisions are made.
- **Any operational restrictions relevant to the make and model of the photocopier**
- **Operational life of the photoccopying drum**

The models of photocopiers currently on the market can be identified under three broad descriptions of low, medium and high capacity copiers.
Low capacity copiers

A low capacity copier usually prints up to 10-15 sheets per minute. This type of copier would not be designed to operate over a long period or continuously, and is normally a ‘convenience’ copier. Low capacity copiers normally print standard A4 paper, and will not collate. This type of copier is for general office use, and can be located in an office environment provided it is not positioned less than 2 metres from workstations, and the work environment is well ventilated.

Ideally, the copier should be placed in close proximity to the air return ducts of the air conditioning system, or in a position where there is good cross ventilation where the office is air-conditioned.

If this is not possible, the photocopier should be located in a position where an exhaust fan can extract fumes from the exhaust area of the copier.

When operating, the noise levels should not be greater than 50-55dbA.

Paper capacity of low capacity copiers is generally less than 500 sheets.
Medium capacity copiers

A medium capacity copier is a photocopier capable of printing more than 10-20 sheets per minute. These copiers can operate for long periods, but not continuously. A medium capacity copier can print A4, A3 and other size paper, and may also collate. Paper capacity is generally in excess of 500 sheets of A4 and other sizes.

If the copier is required to be used for long periods of time it should be placed in a separate section of the office where paper for the copier is stored, and ideally where an exhaust extraction system can be installed. Medium capacity copiers should be chosen with design features enabling an exhaust extraction system to be fitted.

Noise levels during operation should not exceed 65dB(A).

Paper capacity is generally in excess of 500 sheets of A4 and other sizes.
High capacity copiers

High capacity copiers are capable of printing 20 plus sheets per minute. They can operate continuously for long periods of time depending on the paper capacity. A high capacity copier has a paper capacity of at least 2-4,000 A4 sheets.

These copiers must be installed in a separate office facility, and the machine fitted with an exhaust extraction system. It is also desirable (for reasons later explained) for the facility to have additional air conditioning capacity.

The room, walls and ceiling should be insulated with noise absorbing material or tiles, and the floor should be rubber matting. Suitable paper storage shelving should also be installed in the facility.

Noise levels should not exceed 70dB(A). (All noise level measurements should be recorded directly adjacent to the noisiest part of the photocopier).
Toner

Modern photocopiers rely on dry toner. This is a fine powder; the main constituent being carbon black which is set in a plastic resin and mixed with a carrier material (small steel, glass, or silica beads) in powder form. The carrier is recycled when the toner clings to the pattern on the drum.

Some toners contain compounds such as nitropyrenes and trinitrofluorenone. These compounds have carcinogenic properties, therefore skin contact and inhalation is to be avoided. The provision of toner in cartridges that can be fitted directly to the copier is a successful means of preventing skin contact and inhalation.

However, where a risk of skin contact or inhalation exists, workers handling cartridges must be provided with disposable gloves and facemasks.

The MSDS provided with the toner will advise of hazards and precautions to be used in relation to the compound.
Selenium

Selenium is a photoconductive coating applied to the photocopying drum. Exposure to selenium is only likely to occur if the coating degenerates during the copying process. This will occur if the photocopier overheats during operation (small and medium capacity machines particularly). This generally occurs when the machine is used outside of design parameters, or is operated when a fault is evident. In addition, if the copier is not maintained or serviced in accordance with the manufacturer’s specifications, overheating is also likely to occur.

Selenium exposure is generally accompanied by a metallic taste in the mouth, and a garlic smelling breath. Long periods of exposure can cause fatigue, insomnia, poor concentration, as well as upper respiratory tract disorders, and irritation of the eyes and lips.

Instances of selenium exposure are generally very rare, and the symptoms described above are readily detectable, and can be successfully treated.

The risk of particles of selenium becoming dislodged from the photocopying drum could also be associated with the age of the copier, maintenance levels, and general usage over a number of years. Copiers that have not been used for several months should also be inspected by a technician to determine the condition of the photocopying drum.

Under no circumstances should a photocopier with a damaged drum be operated.
Ozone

Ozone is an acrid smelling gas produced when air is exposed to an electrical field. The oxygen content in air picks up an electrical charge and undergoes a chemical transformation from $\text{O}_2$ to $\text{O}_3$. In most cases, people operating hair dryers or electric shavers will smell ozone as the dryer or shaver is in close proximity to their nose.

Photocopiers that utilise a negative DC process with an electrostatic drum carrying a negative charge produce the most ozone. Some ozone is also created by UV emission from the photocopier lamp.

Fortunately, ozone is also a very unstable and as soon as it forms it very quickly breaks down to form oxygen again. The gas is very poisonous, however, and it can build up in environments that are poorly ventilated, or lacking in circulation. In these circumstances ozone may not immediately break down.

As a result, people working with electrical equipment in confined spaces, or where the atmosphere is air depleted, often require breathing equipment due to the risk of ozone exposure.

All well designed photocopiers will have an activated carbon ozone filter fitted to the equipment. This type of filter removes and immediately neutralises all ozone generated during photocopying.

Copiers without ozone filters may produce minimal quantities of ozone. In some cases exposure to small amounts of ozone may affect some workers, usually causing headaches, when they are working in close proximity to the copier. These symptoms are more likely to occur in cold weather rather than hot weather, as the breakdown of ozone is slower in cold conditions.

The risk of ozone exposure is another good reason for natural or mechanical ventilation.
Electro magnetic radiation (EMR)

The manufacturer or supplier should be able to provide information on the level of EMR generated by their photocopiers. Generally photocopiers generate an EMR field. As a precaution, the person using a photocopier should stand at least half a metre away from the copier during copying. This distance is sufficient to prevent exposure, as the radius of the EMR field is generally quite small.

The controversy of EMR exposure and health is generally associated with mobile telephones. However, a range of electrical equipment can emit EMR, including photocopiers.

While the health effects associated with EMR are still a matter of controversy, the previous recommendation is considered a safe work practice. The level of EMR generated by a photocopier can be measured, and the radius of the EMR field can be estimated.

Photocopi er lights

Fluorescent, metal halide or quartz exposure lamps are the most common light sources used in photocopiers. While the light that operates during the copying process does not cause eye damage, it will cause visual discomfort, and exposure to the light flash should be avoided. Prolonged exposure can cause headaches. The lights also generate radiant heat. The amount of heat generated is proportional to the use of the copier.

Good ventilation, either by natural or mechanical means will control the heat radiated by these lamps.
4. Other OH&S issues

Chemical residues

Toner residues remaining after the photocopying process are exhausted from the back of most copiers. If the copier is faulty, or overdue for maintenance or service, the amount of residue discharged can also increase, as some of the toner may not be used.

This can usually be detected on printed copies, or if the print on the photocopy is easily smudged.

Inhaled residues will often cause persons working with photocopiers to suffer respiratory disorders, and skin disorders where skin contact occurs.

With some workers these health effects can be severe. There have also been reported cases of a complaint described as multiple chemical sensitivity disorder alleged to be associated with contact with the chemical residue by-product of photocopier operation.

The most common symptoms workers report are sinusitis, rhinitis, bronchitis, and in rare cases asthma and more serious respiratory disorders. Even after successful treatment of these conditions, the worker may have an adverse reaction when re-exposure occurs. It is not uncommon for workers in this situation to be unable to carry out any photocopying.
The only way to reduce exposure from these chemicals is to ensure that the location or facility where the copier is located is a **good size**, and the workplace is **well ventilated** by conventional means, or preferably by an effective mechanical ventilation system.

**The most effective form of mechanical ventilation is when the exhaust system is directly fitted to the exhaust of the copier.** This system prevents any residue circulating in the work environment. However, other systems with exhaust inlets installed in close proximity to the photocopier exhaust outlet are also effective.
Fire retardants

Most photocopiers' internal electrical circuit boards and in many cases plastic components are coated with fire retardant chemicals. These compounds are released in small quantities when a photocopier becomes hot. The compounds will vaporise to some degree releasing the chemical into the immediate working environment.

Some of these compounds (particularly brominated fire retardant compounds) may irritate the nasal passages and respiratory system, or cause eye and skin irritations.

The smell from these chemicals is particularly noticeable, and may resemble burning plastic, when a photocopier is new. The smell will gradually disappear (but not always) over several weeks of operating the machine. Cathode ray tube-operated visual display terminals (VDTs) used with computers will do the same thing when new.

When these compounds continue to vaporise over long periods there will be an increased risk of workers developing the above health problems. In extreme cases long-term exposure may also affect a worker's immune system.

The CSIRO have issued warnings over the use of using toxic chemicals, such as bromine compounds, in plastics. They also recommended testing and labelling of plastic products arriving in Australia.

It has also been alleged that equipment containing plastic parts or components manufactured in China and other parts of Asia is more likely to contain these chemicals.

The manufacturer and supplier of the photocopier must provide relevant OH&S information on request to an employer, and workers, to make their own judgement concerning the photocopier intended for operation.
Heat

Photocopiers can often get very hot during normal operation. The heat is also 'dry' heat, and will quickly reduce workplace humidity.

Medium and large capacity machines (due to the volume of paper they can process, the speed of operation, and the sheer size of the machine) are particularly problematic when operated in poorly designed or enclosed areas in the workplace.

The lamp radiates most of the heat during normal operation. The electric motor that operates the photocopier is another normal source of radiated heat.

It is therefore important to ensure that comfortable working temperatures are maintained in the working environment, particularly when workers are going to operate the copier continuously.

While exhaust ventilation will remove hot gases from the photocopier exhaust, either an additional or separate air conditioning unit should be installed in the facility where the copier is installed to deal with radiated heat from the lamp and motor.

Excessive 'dry' heat will cause skin, respiratory and eye problems that over time can become serious.

Modern photocopiers are generally fitted with a thermostat that will automatically shut down the operation of a copier if an unsafe temperature is reached. This information should be provided with the technical and operating data.

Any copier that shuts down in these circumstances should not be operated again until it is examined by a qualified technician.
Overuse injury and other strain injuries

Care should be exercised by employers when organising work involving large machines continuously operating. These photocopiers are usually operated by at least one full time worker. The risk of overuse injury arises when loading or unloading paper, and lifting and carrying quantities of paper. The risk of injury generally increases in proportion with the frequency of the activity, and the weight and dimensions of the load. The physical attributes of the worker are also important.

Most high capacity copiers are capable of being loaded with several thousand sheets of paper at a time. In the case of A4 and A3 sheets, these are usually packed in sealed cartons of 500 sheets, with 10 cartons to a box.

The risk of overuse injury can also occur from repetitive opening and 'fanning' of the cartons of paper prior to loading the copier. The sheets have to be gripped firmly in one hand and moved back and forth while the other hands separates the paper prior to loading. This exercise is primarily to stop paper jams that occur when several sheets of paper stick together.

When a worker repeats this task many times a day, the action places strain on the fingers, wrist, tendons of the lower arm and the elbow of the hand holding the paper.
In addition, as bulk paper is usually stored in close proximity to the photocopier, handling and lifting boxes of paper cartons may cause back, shoulder and arm muscle strain. The risk of injury can also be dependent on the design of the workroom, particularly the height of storage shelves, weight and size of the bulk paper storage boxes, and the number of lifting, carrying, pushing or pulling operations carried out.

These OH&S issues need to be addressed in accordance with Chapter 2 of the Regulation, and the relevant parts of the Regulation specific to the hazard (e.g. Manual Handling/Occupational Overuse Injury prevention).
5. Photocopiers and the law

All photocopiers fall within the definition of 'plant' described in the 
NSW Occupational Health and Safety Act 2000 ('the Act') and the 
NSW Occupational Health and Safety Regulation 2001 ('the 
Regulation').

Section 8 (1) (b) of the Act requires employers to ensure that 
any 'plant' provided by the employer for employees to use at 
work is safe and without risk to health when properly used. 
Section 11(1) and (2) of the Act places specific duties on the 
designers, manufacturers and suppliers of 'plant' to:

- Ensure the plant is safe and without risks to health when 
  properly used, and
- Provide adequate information on the plant to whom it is 
  supplied, to ensure the plant's safe use.

These provisions apply:

- whether or not the plant is exclusively designed, manufactured, 
  or supplied for use by people at work.
- to the design, manufacture or supply of components or 
  accessories of the plant.
- whether the plant is purchased, leased or hired from a principal 
  supplier, agent, wholesaler or re-seller.

The provisions do not apply to a person who provides finance to the 
purchaser for the purpose of acquiring the plant.

Chapter 5 of the Regulation requires designers of the plant to identify 
any foreseeable hazard arising from its design. The following risk 
assessment criteria is relevant to photocopiers:
• the impact of the plant on the work environment in which it is designed to operate.
• the range of environmental and operational conditions in which the plant is to be installed and used.
• the ergonomic needs of the person who uses the plant.

In controlling risks the designer must ensure the design of the plant has:

• regard for ergonomic principles
• safe access for maintenance, adjustment, repair and cleaning
• minimal build up of substances or materials that create a risk
• safe insulation, earthing and appropriate access to controls.

The designer is also required to provide information related specifically to the following:

• testing and inspections on the plant.
• Installation, operation, maintenance, and cleaning of the plant
• systems of work necessary for the safe use of the plant

Similar obligations are placed on the manufacturer, supplier, hirer or lessor of plant.

These persons must also provide information to a supplier or the end user that is sufficient for the user to assess and manage or control any risks associated with the operation, and systems of work, involving the plant's use.

This information must then be passed on to the relevant employees under s.13-15 of the Act, in order that the consultation in relation to the plant can be effective and meaningful, prior to the purchase/lease and installation or use of the plant.
6. Contacts, further information

The PSA, WorkCover, the Workers Health Centre and the National Occupational Health and Safety Commission can provide further information on photocopiers, and office copying machines.

**Public Service Association of New South Wales**
160 Clarence St  
Sydney NSW 2000  
Telephone: 02 9290 1555  
Fax: 02 9262 1623  
Email: psa@psa.asn.au  
Website: www.psa.labor.net.au

**WorkCover New South Wales**
400 Kent Street  
Sydney NSW 2000  
Telephone: 02 9370 5000  
Fax: 02 9370 5999  
Email: contact@workcover.nsw.gov.au  
Website: www.workcover.nsw.gov.au

**Workers Health Centre**
Second floor, 12 Railway St  
Lidcombe NSW 2141  
Telephone: (02) 9749 7666  
Fax: (02) 9897 7566  
Email: admin@workershealth.com.au  
Website: www.workershealth.com.au