

**GUIDANCE NOTE
FOR THE PROTECTION OF
WORKERS FROM THE ULTRAVIOLET
RADIATION IN SUNLIGHT
[NOHSC: 3012 (1991)]**

OCTOBER 1991

The National Occupational Health and Safety Commission has adopted a *Guidance Note for the Protection of Workers from the Ultraviolet Radiation in Sunlight*.

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The expectation of the National Commission is that guidance notes will provide detailed information for use by unions, employers, management, health and safety committee representatives, safety officers, occupational health and safety professionals and others requiring guidance.

It should be noted that National Commission documents are instruments of an advisory character, except where a law, other than the National Occupational Health and Safety Commission Act, or an instrument made under such a law, makes them mandatory. The application of any National Commission document in any particular State or Territory is the prerogative of that State or Territory.

National Occupational Health and Safety Commission

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FOREWORD

The National Occupational Health and Safety Commission is a tripartite body established by the Commonwealth Government to develop, facilitate and implement a national occupational health and safety strategy.

This strategy includes standards development, the development of hazard-specific preventive strategies, research, training, information collection and dissemination and the development of common approaches to occupational health and safety legislation.

The National Commission comprises representatives of the peak employee and employer bodies--the Australian Council of Trade Unions and the Confederation of Australian Industry--as well as the Commonwealth, State and Territory governments.

Consistent with the National Commission's philosophy of consultation, tripartite standing committees have been established to deal with issues relating to standards development, research and the mining industry. Expert groups may be established to provide advice to the standing committees on those issues with which the National Commission is concerned.

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PREFACE

Australia has the highest incidence of skin cancer in the world and it is well established that exposure to ultraviolet radiation from the sun is the major cause of skin cancer in this country. Outdoor workers are a high risk group as their work may involve prolonged exposure to solar ultraviolet radiation, well above the exposure most people receive through outdoor leisure activities. This risk has been recognised in the National Occupational Health and Safety Commission's *National Strategy for the Prevention of Occupational Skin Disorders**.

In addition to skin cancer, solar ultraviolet radiation exposure is a major cause of short term and long term eye damage.

The issue of responsibility for the provision of appropriate clothing to minimise exposure to solar ultraviolet radiation is not addressed in this document as it is considered to be outside its scope.

This guidance note provides advice for use by unions, employers, management, health and safety committee representatives, safety officers, occupational health and safety professionals and others requiring guidance. In addition, the principles outlined in this publication can be applied equally to non-occupational exposures.

* National Occupational Health and Safety Commission, *National Strategy for the Prevention of Occupational Skin Disorders* [NOHSC:4002(1989)], Australian Government Publishing Service, Canberra, 1989.

1. INTRODUCTION

1.1 The prevention of skin cancer in Australia has been given a high priority because:

- Australia has the highest incidence of skin cancer in the world; and
- two out of every three Australians living to the age of 75 can expect to develop some type of skin cancer.

1.2 Prolonged exposure to sunlight is well established as the major cause of skin cancer in Australia. It is the ultraviolet (UV) radiation component of sunlight which is harmful; this can occur even on cloudy days. Sufficient exposure to be harmful can be a year-round problem in Australia. Appendix 1 provides more information on solar UV radiation.

1.3 Several factors contribute to an increased risk of developing skin cancer. For example:

- exposure received during childhood;
- participation in outdoor activities resulting in increased exposure to solar UV radiation, for example sunbathing, leisure and sporting activities;
- because of higher solar UV exposures, the closer people live to the equator, the more likely they are to develop skin cancer. Queensland has a higher rate of diagnosed skin cancers than Tasmania;
- solar UV radiation intensity increases with height above sea level;
- solar UV radiation is at its greatest intensity between the hours of 10.00 am and 2.00 pm. (Note: These times should be adjusted to 11.00 am and 3.00 pm when there is daylight saving.);
- the risk of skin cancer is greatest in people with a fair complexion, blue eyes and freckles, who tan poorly and burn easily, but others, for example, individuals who have Dysplastic Naevi Syndrome, are also at risk (see Chapter 2); and
- there is an increased risk in people who have already had a skin cancer or keratoses diagnosed.

1.4 While certain skin types are associated with an increased risk, it is important that everyone should protect their skin from prolonged exposure to solar UV radiation, regardless of skin type.

1.5 In addition to skin cancer, solar UV exposure is a major cause of eye damage including photoconjunctivitis and photokeratitis, cataracts and pterygia (see Chapter 2).

1.6 Even intermittent exposure to solar UV radiation can be harmful. Those who work outdoors part-time are still at risk.

1.7 Measures to minimise exposure to solar UV radiation need to be incorporated into both work and leisure activities.

1.8 This guidance note is a practical guide on how to assess and minimise exposure to solar UV radiation at work.

2. ADVERSE HEALTH EFFECTS OF SOLAR ULTRAVIOLET RADIATION

SHORT TERM EXPOSURE

2.1 Short term exposure to the sun can result in sunburn and injuries to the eye.

Sunburn

2.2 The effects of sunburn include reddening of the skin, blistering, swelling and, later, peeling of the skin. Untanned skin, exposed to the summer sun between 10.00 am and 2.00 pm (11.00 am and 3.00 pm when there is daylight saving), will show:

- mild sunburn within 12 minutes;
- appreciable discomfort within 30 minutes;
- peeling and blistering in 60 minutes; and
- permanent damage after 120 minutes¹.

Effects on the Eye

2.3 Prolonged exposure to solar UV radiation can cause short term effects such as photoconjunctivitis and photokeratitis. Photoconjunctivitis is an inflammation of the conjunctiva (the mucous membrane covering the anterior portion of the eye). Photokeratitis is an inflammation of the cornea.

2.4 Symptoms of these complaints include a painful sensation in the eyes, excessive blinking and tears, the sensation of a foreign body in the eyes, difficulty in looking at strong lights, and swelling of the eyes. The effects are apparent within a few hours and usually disappear within two days. Permanent damage is rare.

2.5 Some industrial chemicals can cause photosensitisation of the eyes, for example, exposure to some coal tar derivatives can damage the outer surface of the eye.

LONG TERM EXPOSURE

2.6 In the longer term, repeated exposure to the sun can result in keratoses, skin cancers, premature skin aging and injuries to the eye.

Keratoses

2.7 Keratoses, sometimes called sunspots, are dry, rough, firm spots on the skin. Like premature ageing, they are indicators of prolonged exposure to solar UV radiation. Keratoses very occasionally develop into cancers.

Skin Cancers

2.8 There are three main types of skin cancers in Australia:

- Basal cell carcinoma (BCC) - This is the most common, but least dangerous type of skin cancer. They are usually found on the face and neck. BCCs first appear as small, round or flattened lumps which are red, pale or pearly in colour and may have blood vessels over the surface. If untreated, they will continue to spread into surrounding tissue, eventually breaking down to form ulcers.
- Squamous cell carcinoma (SCC) - This skin cancer is less common, but more dangerous than BCC. Caused by sunlight, this cancer can occur on the lips, particularly the lower lip. SCCs are characterised by scaling and red areas that may bleed easily and become ulcerated. Very occasionally, SCCs may spread to the lymph nodes.
- Melanoma - This is the least common, but most dangerous skin cancer. This cancer usually starts as a new spot, freckle or mole on the skin that changes in colour, thickness or shape over months. Melanomas occasionally occur in parts of the body other than the skin, such as the eye and mouth. Melanomas can be dark brown to black, red or blue-black or a combination of colours with an irregular outline or shape. Melanomas can also develop in pre-existing moles, particularly those which have irregular borders and variable shades of black and other colours. People who have many moles of this type, as well as individuals with Dysplastic Naevi Syndrome (a rare familial condition, presenting as numerous brown moles over the body), seem to have a higher risk of developing melanoma. Melanomas can spread to internal organs and cause death if not detected and removed promptly.

Effects on the Eye

2.9 Long term effects of prolonged exposure to solar UV radiation include damage to the cornea, formation of cataracts and pterygia. Cataracts are opacities of the lens of the eye. Pterygia are wing-shaped growths of the tissue on the outside of the eye. They can grow over the cornea of the eye and cause symptoms of mild conjunctivitis.

PHOTOSENSITISING SUBSTANCES

2.10 Exposure to photosensitising substances can worsen the effects of solar UV radiation. Some examples of photosensitisers are coal tar and several of its by-products, certain dyes, selected plants and fruits and a number of medications.

2.11 Appendix 2 is a list of substances which are known to cause photosensitisation. Although there are many substances listed, it is rare for an individual to develop photosensitisation.

3. PREVENTION

EMPLOYER AND EMPLOYEE RESPONSIBILITIES

3.1 Occupational health and safety legislation in Australia requires employers to provide and maintain, as far as is practicable, a working environment that is safe and without risks to health. This is the employer's general duty of care.

3.2 Employees are required to comply with all instructions given by their employer for reasons of health and safety and take reasonable precautions to protect themselves and others at work.

3.3 Employers should consult with employees and employee representatives in the assessment of exposure to solar UV radiation, the development and implementation of safe working procedures, and other control measures.

3.4 Employees should report any problems in achieving compliance to their employers.

EXPOSURE ASSESSMENT

3.5 As solar UV radiation exposure in outdoor environments may vary depending on where the work is performed, an exposure assessment should identify:

- jobs/tasks, including breaks, which involve solar UV radiation exposure;
- the time of day when the tasks are carried out and the frequency with which the tasks are performed;
- the shade provided by the physical environment in which the work is carried out;
- reflective surfaces, for example, water, reflective building glass, white surfaces such as sand, rock, cement or snow, and unpainted corrugated steel or aluminium roofing, that are part of the environment in which the work is carried out; and
- any photosensitising substances associated with the work.

3.6 In most cases, a once-only exposure assessment will be sufficient. However, an assessment should also be conducted whenever there are changes in a work procedure which may lead to greater solar UV radiation exposure. A sample exposure checklist is given in Appendix 3.

3.7 Examples of exposure assessment and control reports are given in Appendix 4.

CONTROL STRATEGY

3.8 Employers should ensure that exposures to solar UV radiation in the workplace are minimised by implementing a control strategy, where practicable, that includes:

- the use of natural and/or artificial shade;
- administrative and procedural measures; and
- personal protection.

3.9 These measures should be implemented together to minimise exposure to solar UV radiation.

3.10 Where employees may be exposed to solar UV radiation and photosensitisers, exposures to both need to be minimised.

3.11 In many instances, employers can reduce exposure to solar UV radiation by making some simple changes to the way that outdoor work is done. Examples of these changes are outlined below.

Use of Natural and/or Artificial Shade

3.12 Where practicable, shade created by permanent objects such as trees, buildings and other structures should be used. In the absence of such objects, shade can be created by the use of canopies, tents, screens and other portable structures which are easy to erect and dismantle.

3.13 It is important to remember that shade will only lessen exposure to solar UV radiation. Sunburn can still occur in shaded areas, due to the scattering of solar UV radiation by clouds and reflection from brightly coloured or shiny surfaces.

3.14 In addition to shade, it is important to note that a high degree of attenuation of solar UV radiation can be achieved with ordinary window glass, hence there is value in keeping vehicle windows up when driving for long periods.

Administrative and Procedural Measures

3.15 Consideration may be given to simple reorganisation of outdoor work programs, and to the opportunity to undertake alternative tasks when the sun is most intense, that is, between 10.00 am and 2.00 pm (11.00 am and 3.00 pm when there is daylight saving).

Personal Protection

3.16 The use of personal protection is an important component in the solar UV radiation control strategy.

3.17 It is also important to ensure that the use of personal protection itself does not create a secondary hazard to the worker. For example, loose clothing worn near outdoor machinery, such as a post hole digger/auger, may constitute a secondary hazard. Heat stress may also be a secondary hazard when wearing some types of protective clothing and performing heavy manual labour.

3.18 Over-reliance on only one form of personal protection should not be encouraged, for example, the use of a hat and a sunscreen together is preferable to the use of a sunscreen alone.

Clothing

3.19 Most clothing provides personal protection for screening out solar UV radiation. The selection of appropriate clothing must take into account both the need to screen out solar

UV radiation and the need for coolness in hot conditions. The key features to look for when selecting clothing are:

- tightness of weave or knit;
- permeability of the material to assist the evaporation of sweat; and
- design.

3.20 Loose-fitting clothing allows air to circulate. Cuffs, ankles and waist bands should be loose. Long-sleeved shirts with collars worn with long trousers are preferred, if comfortable to wear. Shirts are best worn outside trousers to increase ventilation, providing care is taken to ensure that this does not place the worker at greater risk of injury (see the reference to secondary hazards in Section 3.17).

3.21 The tighter the fabric weave or knit, the less solar UV radiation reaches the skin. However, tightly woven fabrics provide more protection at the cost of being warmer. Impermeable materials, such as some disposable overalls with plastic linings, do not allow sweat to evaporate and will increase the risk of heat stress in certain circumstances. Cotton fabrics, which tend to be tightly woven, usually offer better protection than synthetics. In addition, cotton, because it assists sweat evaporation, is more comfortable to wear than fully synthetic fabrics. Light coloured fabrics are cooler to wear because they reflect the heat.

Hats

3.22 Hats provide shade and the bigger the brim, the greater the amount of shade that is provided. For adequate head and face protection, hats with brims of at least 8 centimetres should be worn. Foreign Legion-style caps, with loose flaps to protect the neck and ears, are also effective.

3.23 Where practicable, hard hats and other protective hats, for example, bicycle helmets, should be fitted with broad brims. Attachable brims and neck flaps are available for this purpose. Due to their size, the wearing of wide brimmed hats may cause difficulties in some circumstances. In such cases, the safety function of the hat should take precedence over protection from the sun. Sunscreens and other protective measures should be used instead.

3.24 Hats with wide brims will not protect against solar UV radiation reflecting from shiny surfaces.

Sunscreens

3.25 Sunscreens should be selected in accordance with the skin type and working conditions of the user. Broad-spectrum sunscreens provide protection against UV-B rays and some UV-A rays. A water-resistant sunscreen may be suitable for some types of work. Sun protection factors (SPFs) are based on Australian Standard AS 2604 *Sunscreen Products-Evaluation and Classification*. The higher the SPF, up to a value of 15+, the greater the protection. However, the SPF value only relates to the reddening of the skin caused by one part of the UV spectrum (UV-B). Therefore, it is a wise precaution to use a high SPF broad-spectrum sunscreen that will block a greater range of the UV spectrum, not just the part that causes this effect.

3.26 No sunscreen provides complete protection. For example, an SPF of 15+ filters out 94 per cent of solar UV radiation. Therefore, hats, clothing and other protective measures should always be used in addition to a sunscreen.

3.27 Sunscreens are best applied to dry skin at least 15 minutes before the start of any outdoor work. Sunscreens are more effective if they are wiped on, rather than being rubbed into the skin. Reapply sunscreens every two hours. In hot conditions, when sweating is profuse, reapply the sunscreen more frequently as the sweat will wash off the previous application. The effectiveness of any sunscreen depends on its correct use. Too much sunscreen can reduce sweating and cause heat stress, and too little may not provide protection. Always read the instructions on the label to ensure correct use.

3.28 Sunscreen selection should take into account whether the user is working in dusty conditions. Use of an oilbased sunscreen will increase the risk of dust adhering to the skin, thereby giving rise to a secondary hazard if the dust is of a hazardous nature. In such situations, a sunscreen with an alcohol or vanishing cream base can be used. Manufactured dusts, such as cement powders, may present problems on skin contact. Consult the Material Safety Data Sheet for the relevant dust to see if there is a health risk.

3.29 The possibility of hypersensitivity and allergies to sunscreens cannot be excluded, and any history of individual reaction or preference for a particular type of sunscreen should be taken into account. Rather than not wearing a sunscreen under such circumstances, another sunscreen type should be used.

3.30 Adequate supplies of sunscreen should be maintained at any outdoor work location. Bracket-mounted pump-packs of sunscreen are available from some suppliers, and can be mounted in changerooms, near time clocks or in vehicles. Simple preparations, such as zinc cream (SPF 15+), will provide economical protection to essential areas such as the nose, lips and top of the ears. Zinc cream must be applied thickly but cannot be used on large areas of the body because it prevents sweat evaporation in hot conditions.

Lip Protection

3.31 Lip protection is very important as lips do not contain melanin which provides natural protection. Lip cancer from prolonged exposure to sunlight is common in outdoor workers. To avoid damage by solar UV radiation, lips should be protected with an SPF 15+ sunscreen or a lipstick which has an SPF 15+ rating. For women, this can be used as a base for any coloured cosmetic lipstick they may use. Opaque, coloured lipsticks may provide some lip protection. In the case of men, a moustache can add to the protection that a sunscreen provides. Shading from broad-brimmed hats will also contribute to lip protection.

Eye Protection

3.32 Eye protection from solar UV radiation is recommended, particularly in highly reflective environments (see Section 3.5). Where eye protection is required, two issues should be considered - safety and health.

3.33 Where safety is the over-riding concern, glasses which comply with Australian Standard AS 1337 *Eye Protectors for Industrial Applications* are recommended. This standard includes tinted and untinted protectors which afford UV protection.

3.34 Where health, for example, protection from cataract formation, is the over-riding concern, sunglasses designated as specific purpose type (b) in Australian Standard AS 1067.1 *Sunglasses and Fashion Spectacles - Part 1: Safety Requirements* may be worn.

4. HEALTH SURVEILLANCE

4.1 In most cases, health surveillance for skin cancer involves self-screening, that is, people examining their bodies themselves.

4.2 Employers should ensure that workers are provided with information on self-screening for skin cancers. Pamphlets which describe what to look for are available from the State or Territory Anti-Cancer Councils. These Anti-Cancer Councils are listed in Appendix 4.

4.3 It is important for people to regularly check all parts of the body, in particular, the areas most often exposed to the sun, that is, the ears, face, neck, shoulders, arms and hands.

4.4 If any abnormalities are detected that may indicate the presence of a skin cancer or sunspots (keratoses), a medical practitioner should be consulted promptly.

4.5 Early detection of skin cancer is important in ensuring effective treatment of the condition.

4.6 Employers should ensure that workers are provided with information on the hazards of solar UV radiation and its effects on health, for example, by making this guidance note available.

5. TRAINING AND EDUCATION

OBJECTIVES

5.1 Employers should provide training where the need is identified in an exposure assessment of the type mentioned in Section 3.5. Having identified this need, the training program should be on-going, as necessary, and be included in the induction of new employees. The target groups requiring training are those people responsible for organising outdoor work and those people receiving prolonged exposure to solar UV radiation.

5.2 The objectives of training and education should include:

- increasing recognition of the harmful health effects of solar UV radiation;
- the promotion of safe working procedures consistent with the control strategy outlined in this guidance note; and
- the provision of information on self-screening for skin cancer.

CONTENT

5.3 The content of any training program should be tailored to the specific needs of the employees being trained, in the language(s) appropriate to the workplace, and to the environmental conditions identified.

5.4 The Anti-Cancer Councils in each State or Territory are an excellent source of simple but effective education and training packages on this issue.

5.5 Topics to be dealt with in such a training program should include:

- the nature of solar UV radiation, including seasonal changes, and the daily pattern of intensity (see Appendix 1);
- the effects of solar UV radiation, with particular reference to the risk factors associated with the development of skin cancer;
- the control strategy to be utilised in the work activity;
- self-screening for skin cancer; and
- protection from photosensitising substances, where applicable (see Appendix 2).

CHARACTERISTICS OF SOLAR ULTRAVIOLET RADIATION

A1.1 Ultraviolet radiation is a component of the electromagnetic radiation (EMR) spectrum emitted by the sun.

A1.2 All forms of EMR are characterised by wavelength. The unit of measurement of wavelength for UV radiation is the nanometer (nm) which is a 1,000,000,000th of a metre.

A1.3 The UV radiation range is traditionally divided into four sub-divisions:

- UV-A 315-400 nm;
- UV-B 280-315 nm;
- UV-C 200-280 nm; and
- Vacuum UV 100-200 nm.

A1.4 Wavelengths in the vacuum UV and UV-C ranges do not reach the Earth through the atmosphere from the Sun. Sunlight contains more UV-A than UV-B, but UV-B is much more active in causing skin damage. Broad-spectrum sunscreens are effective against UV-B rays and at least part of the UV-A spectrum.

A1.5 The factors which affect the intensity of solar UV radiation (particularly of UV-B and, to a lesser extent, UV-A) are:

- time of day;
- cloud cover;
- season of the year;
- proximity to the equator;
- stratospheric ozone concentration;
- altitude;
- extent of reflection; and
- extent of shade.

A1.6 Stratospheric ozone depletion is now recognised as a major future determinant of solar UV radiation at ground level. The World Health Organization has stated that a decrease in stratospheric ozone by 1 per cent would lead to an increase in the incidence of non-melanoma skin cancers by 3 per cent. An ozone depletion of 5 per cent would lead to an increase of incidence by 16 per cent. Such depletion, if it occurs, is most likely to particularly affect Tasmania and southern parts of the Australian continent.

A1.7 Solar UV radiation is likely to be at its greatest intensity between the hours of 10.00 am and 2.00 pm (adjusted to 11.00 am and 3.00 pm for daylight saving) because the sun is highest in the sky between these times. On sunny days, a useful rule of thumb is to avoid direct (unprotected) exposure when your shadow is shorter than yourself. Cloud cover will reduce the intensity of solar UV radiation, however, more solar UV radiation may be transmitted than is expected from the apparent density of the cloud, and sunburn can still occur on a cloudy day.

A1.8 On average, over summer the peak intensity of solar UV radiation is at 12.00 noon. Between the hours of 10.00 am and 2.00 pm, two hours before and two hours after the peak intensity, approximately 65 per cent of the total solar UV radiation responsible for skin cancer is received.

A1.9 This is why it is recommended that people should particularly avoid direct exposure to sunlight between the hours of 10.00 am and 2.00 pm. This general approach should apply throughout Australia, allowing for time variation due to daylight saving time.

A1.10 During the winter months, the sun is lower in the sky and the amount of solar UV radiation received in Australia is less than that received during summer. However, the preventive strategies given in Chapter 3 still need to be applied during this time, particularly in the tropical north of Australia.

A1.11 The intensity of solar UV radiation increases with height above sea level. For example, workers in the Australian Capital Territory and Southern Highlands of New South Wales may be exposed to higher solar UV radiation levels than those received by workers in some parts of Queensland. Some natural surfaces, such as fresh snow, are highly reflective of solar UV radiation. Exposures of Australian ski-field workers to solar UV radiation in winter can be just as intense as summer exposures at sea level. Other natural surfaces which are reflective include sand, rock and water. There is also major reflection from some metallic surfaces, particularly aluminium.

A1.12 While most of the heat radiation of the Sun comes directly from the Sun, half to two-thirds of solar UV radiation is scattered from the sky. Substantial solar UV radiation exposure is therefore possible even when direct sun rays are shaded.

A1.13 Solar UV radiation levels are generally low indoors. People who work near windows will be exposed to solar UV radiation, the level of which will depend on the direction the window is facing, the type of glass in it, shading from nearby objects and whether the window is open or shut. Ordinary window glass effectively blocks out all UV-B and should therefore protect against skin cancers.

A1.14 Clear car glass has a protection factor of about 13, which is equivalent to a good sunscreen, while some window tints, for example, film tinting for car windows, have protection factors of 500.

SOME SUBSTANCES WHICH CAUSE PHOTSENSITIVITY

A2.1 Photosensitivity is an abnormally high reactivity in the skin or eyes to UV radiation or natural sunlight. It *may* be induced by ingestion, inhalation or skin contact with certain substances known as photosensitisers. Symptoms will vary with the amount of UV radiation, type and amount of photosensitiser, skin type, and age and sex of the person exposed.

INDUSTRIAL CHEMICALS

A2.2 Photosensitisation of the skin and eyes can be caused by exposure to specific industrial chemicals. The skin can be affected by dermal exposure or inhalation. The eyes can be affected by volatile fumes. In certain occupations, the risk from exposure to particular photosensitising chemicals and solar UV radiation is severe. For example, exposure to tar and sunlight can cause precancerous and cancerous skin lesions. Exposure to coal tar fumes can cause simultaneous inflammation of the conjunctiva and cornea.

A2.3 The industrial chemicals listed below have been identified as photosensitisers following dermal exposure²:

Dyes

acridine

bromofluorescein

eosin

erythrocin

fluorescein

methylene blue

rhodamine

rose bengal

Coal Tar and Derivatives

anthracene

phenanthrene

pitch

creosote

Chlorinated Hydrocarbons

chlorobenzols

diphenyls

triphenyls

DRUGS

A2.4 Ingestion or topical application of particular medications may cause photosensitivity in some individuals. Photosensitivity may occur in every person, is usually dose related and may not happen the first time the drug is taken. It should be stressed that administration of the medication should not stop until medical advice has been sought. Avoiding exposure to direct sunlight will control the photosensitivity in the meantime. Consult a doctor or pharmacist about the availability of alternative medications.

A2.5 The following drugs have been identified as photosensitisers from either occupational exposure and/or therapeutic administration^{2,3}:

Drug	Exposure Route	Drug	Exposure Route
sulphonamides	oral	diethylstilbestrol	oral
p_aminobenzoic acid and esters	oral	estrogens	oral
sulfonlureas	oral	triethylenemelamine	oral
chlorothiazides	oral	quinine	oral
chlorosalicylanildes	oral	riboflavin	oral
griseofulvin	oral	estrone	dermal
phenothiazines	oral	nalidixic acid	dermal
demethylchlor-tetracycline	oral	naproxen	dermal
diphenhydramine hydrochloride (Benadryl)	oral	fluorouracil	dermal
promethazine (Phenergan)	oral	furocoumarins	oral
		tetracyclines	oral
		thiazides and related sulphonamide diuretics	oral

PLANTS

A2.6 The following plants found in Australia are known to cause photosensitivity through skin contact with the plant or its juices^{2,3}:

Common Name	Botanical Name	Common Name	Botanical Name
agrimony	<i>Agrimonia eupatoria</i>	giant hogweed varieties	<i>Heracleum</i> species
bergamot	<i>Citrus bergamia</i>	goosefoot	<i>Chenopodium</i> species
bind weed	<i>Convolvulus arvensis</i>	Indian mustard	<i>Brassica juncea</i>
bishop's weed	<i>Ammi majus</i>	lichen species	---
buttercup	<i>Ranunculus</i> species	lemon	<i>Citrus limon</i>
carrot	<i>Daucus carota</i>	lime	<i>Citrus aurantifolia</i>
celery	<i>Apium graveolens</i>	milfoil, yarrow	<i>Achillea millefolium</i>
citron	<i>Citrus medica</i>	parsnip	<i>Pastinaca sativa</i>
chrysanthemum	chrysanthemum species	St. John's wort	<i>Hypericum perforatum</i>
dill	<i>Anethum graveolens</i>	Scurfy-pea, bavchi	<i>Psoralea corylifolia</i>
fat hen	<i>Chenopodium album</i>	seville orange	<i>Citrus aurantium</i>
fennel	<i>Foeniculum vulgare</i>	stinking mayweed, corn chamomile	<i>Anthemis cotula</i>
fig	<i>Ficus carica</i>		

A2.7 Gardeners, people in the food processing industry, surveyors, construction workers, horticulturalists, florists, and agricultural and forestry workers are among the occupational groups that may be exposed to these plants. Oil-based sunscreens provide greater protection against plant-related photosensitivity than water-based sunscreens as the oil-based sunscreens will assist in providing a barrier to plant juices.

MISCELLANEOUS

A2.8 Some oils and fragrances used in cosmetics and other products, and, very occasionally, sunscreen additives, have been identified as possible photosensitisers following dermal exposure²:

Oils and Fragrances

angelica root oil

bergamot oil

cumin oil

lemon oil

lime oil

orange oil bitter

rue oil

cedarwood oil

lavender oil

neroli oil

orange peel oil

sandalwood oil

musk ambrette

Sunscreen Additives

digalloyl trioleate

6-methylcoumarin

p-aminobenzoic acid (PABA)

PABA derivatives

SOLAR ULTRAVIOLET RADIATION EXPOSURE CHECKLIST

Please print details of the location, task performed, and the length of time in hours, in the boxes below.

Date

Site location

Task description

Hours per day outdoors

Time of Day

Indicate the time of day during which exposure occurs by placing a tick in the corresponding box. If the exposure varies throughout the day, please write further details in the box provided.

Before 10.00 am YES NO 12.00 noon - 2.00 pm YES NO

10.00 am - 12.00 noon YES NO After 2.00 pm YES NO

Variable

Shade

In the boxes provided below, please indicate the type (such as buildings or trees) and extent (such as sparse or plentiful) of available shade.

Type

Extent

Reflective Surfaces

If reflective surfaces are present in your work environment, please identify them from the selection given below. 'Other' includes surfaces such as snow.

Concrete YES NO Sand YES NO

Glass YES NO Other YES NO

If OTHER, specify

Photosensitising Substances

Are photosensitising substances present? YES NO

If YES, specify

EXAMPLES OF EXPOSURE ASSESSMENTS

A4.1 The following examples identify the main features of a written exposure assessment made in accordance with Chapter 3 of this guidance note. It is important to note that these examples are not intended as model formats for exposure assessments and lists of control options, since each assessment and related control options will be unique to the particular outdoor workplace. Instead, these examples are merely intended to illustrate the key features of a written exposure assessment.

A4.2 Control options discussed are therefore specific to the example in question, and should not be seen as setting a precedent for other outdoor workplaces.

EXAMPLE 1: DOCKSIDE PETROLEUM DEPOT - OIL INDUSTRY

Exposure Assessment

Pump maintenance workers and fork-lift drivers are the only workers with outdoor work tasks. Hours of work are between 8.00 am and 4.00 pm. Both groups of workers work outdoors and indoors as the work requires.

Control Options

Use of Natural and Artificial Shade

Adequate natural shade is provided for fork-lift drivers by two warehouse sheds on the eastern side between 2.00 pm and 3.00 pm. No adequate natural shade is available for pump maintenance workers. However, portable sunshades could be erected to shade pump connections when ships are being unloaded.

Administrative and Procedural Measures

Some outdoor fork-lift work could be rescheduled to before 10.00 am and after 2.00 pm (11.00 am and 3.00 pm when there is daylight saving). Fork-lift transit routes for the warehouses may be rerouted to take advantage of natural shade, provided this does not interfere with good traffic practice, although drum storage along the west side of the warehouses would have to be relocated to provide a clear path for forklifts. Forklifts could be fitted with shade cloth canopies to provide shade. The problem with using shade cloth on fork-lifts is that it obscures the driver's vision. Tinted perspex screens over the top and beside forklift drivers are an alternative. When trucks arrive for loading/unloading between 11.00 am and 3.00 pm, forklift driver rosters could be reorganised with consideration given to breaking the shift down into one hour loading/unloading per driver between 11.00 am and 3.00 pm.

The work of pump maintenance workers cannot be rescheduled as it depends on the times at which ships arrive and depart.

Personal Protection

The use of sunscreens, sunglasses which provide solar UV radiation protection and broad-brimmed hats should be considered for both groups of workers.

Clean-up procedures in the event of leaks/spills must be improved to ensure that wash-ups are carried out immediately after skin contamination. Re-application of sunscreens will be required after wash-ups.

EXAMPLE 2: SPORTS GROUND WORKERS

Workplace Situation

The workplace is a sports ground at which major football and cricket matches are played. The workforce is comprised of 10 permanent staff and up to 40 casual staff employed cyclically from among a relatively stable pool of 100 people.

The schedule, that is, the dates and times of events, is pre-determined each season and strictly adhered to. Workers are engaged in a range of jobs including:

- permanent staff responsible for ground and pitch maintenance, facilities and equipment maintenance, and administration; and
- casual staff responsible for parking and ground admission, and refreshment and program sales around the ground.

Assessment Procedure

This assessment has been prepared by the Grounds and Maintenance Supervisor in conjunction with the maintenance staff's health and safety representative and the casual staff's shop steward.

Exposure Assessment

Tasks

Except for administration and machinery maintenance work (2 staff), all tasks involve some periods of outside work.

Car park attendants, grounds maintenance staff and refreshment vendors spend the bulk of their work time outdoors. Pitch maintenance staff are less exposed, but are generally outdoors for some part of each day.

Hours of Work Outdoors

Car park attendants and refreshment vendors are outdoors all day (between 8.00 am and 6.00 pm). Grounds maintenance staff are outdoors for approximately four hours each day (currently between 8.00 am and 8.00 pm). Pitch maintenance staff are outdoors for approximately three hours each day (currently between 8.00 am and 10.00 am and 3.00 pm and 5.00 pm).

Control Options

Use of Natural and Artificial Shade

Car park gate attendants have booths which provide shade. However, their work involves being outside the booth to collect monies. Other car park attendants have no artificial shade. However, there are trees scattered around the car park which afford natural shade.

Tractor mowers are fitted with canopies. Grounds work, other than mowing, involves no shade except when the shadow of grandstands and adjacent buildings covers the playing areas.

Administrative and Procedural Measures

Work carried out by outdoor staff falls into two main categories. These are:

- Event-related work, that is, car parking and refreshment selling. Event-related work is necessarily scheduled to fit in with fixed times such as gate/car park opening. This work cannot be rescheduled.
- Grounds maintenance work, which follows a set pattern. Reseeding, mowing and watering are carried out at set times of the day to take account of plant growth cycles, ideal watering times and other horticultural requirements. This work cannot be rescheduled.

Personal Protection and Photosensitising Chemicals

There is a need to consider the use of sunscreens, long-sleeved shirts and other protective clothing, hats and sunglasses.

Grounds maintenance staff could possibly experience some effect from the use of herbicides and plant foods, but a review of the Material Safety Data Sheets provided by the supplier reveals that none contain photosensitisers. There are no known photosensitising plants in or around the grounds.

SUMMARY

The work of most employees involves significant time spent outdoors. There is little flexibility in the way that work can be scheduled and carried out and few areas in which additional artificial or natural shading could be installed.

Additional artificial shading could be provided for car park/gate attendants and a rotating roster established between gate and car park areas.

Other solutions could involve some limited amount of job rotation among grounds and maintenance staff.

The use of personal protection has been discussed. Individuals at particular risk should be warned of the risk(s).

STATE AND TERRITORY ANTI-CANCER COUNCILS

A5.1 Information on the identification of skin cancer by self-screening is available from:

Anti-Cancer Council of Victoria

Keogh House
1 Rathdowne Street
CARLTON SOUTH VIC 3053
Tel: (03) 662 3300

New South Wales Cancer Council

Level 2
Angus and Coote Building
500 George Street
SYDNEY NSW 2000
Tel: (02) 264 8888

Queensland Cancer Fund

William Rudder House
553 Gregory Terrace
FORTITUDE VALLEY QLD 4006
Tel: (07) 257 1155

**Anti-Cancer Foundation of the
Universities of South Australia**

24 Brougham Place
NORTH ADELAIDE SA 5006
Tel: (08) 267 5222

**Cancer Foundation of Western
Australia**

42 Ord Street
WEST PERTH WA 6005
Tel: (09) 321 6224

Tasmanian Cancer Committee

43 Collins Street
HOBART TAS 7000
Tel: (002) 354 895

**Northern Territory Anti-Cancer
Foundation**

Shop 24 Casuarina Plaza
CASUARINA NT 0810
Tel: (089) 274 4888

**Australian Capital Territory Cancer
Society**

15 Theodore Street
CURTIN ACT 2605
Tel: (06) 285 3070

ACKNOWLEDGEMENT AND REFERENCED DOCUMENTS

The National Commission acknowledges the Australian Council of Trade Unions/Victorian Trades Hall Council publication 'ACTU Occupational Health and Safety Standard - Prevention of Occupational Skin Cancer and Other Ultraviolet Radiation Hazards, Outdoor Workers', *Health and Safety Bulletin, no. 61* as a source document in the preparation of this guidance note.

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Individual members were nominated to the Ultraviolet Radiation and Outdoor Workers Expert Review Group on the basis of their expertise in specific occupational health and safety areas. The recommendations of the Ultraviolet Radiation and Outdoor Workers Expert Review Group were subject to review by the tripartite Standards Development Committee and the National Commission, where the social, economic and technological implications of these recommendations are considered.

The provisions of this guidance note may not necessarily reflect the views of individual members of the Ultraviolet Radiation and Outdoor Workers Expert Review Group.