

Guidelines for Operators of Ultraviolet (UV) Tanning Lamps

Introduction

This guide has been written for the operators* of solarium (ultraviolet tanning lamps) to help them comply with the provisions of Australia/New Zealand Standard AS/NZS 2635:2008 *Solarium for cosmetic purposes*. The objective of the Standard (1.2)[†] is to “provide operators and users of artificial tanning equipment with procedures for reducing the risk associated with indoor tanning.” Surveys of commercial solarium operators have shown that most of them do not comply with key safety provisions of the Standard. If questions are ever raised about whether a solarium has been operated so as to minimise risks to clients, it is likely that this Standard would be used as a yardstick for comparison.

This guide is not a substitute for the Standard, which must be referred to as well. All commercial tanning operations should have a copy of the Standard available and staff must be familiar with its content.

Health authorities around the world strongly discourage the use of solarium for cosmetic purposes. In the short term, overexposure to sunlamps can cause severe burns. Long term exposure to ultraviolet radiation from any source (the sun or tanning lamps) is associated with an increased risk of skin cancer, premature aging of the skin (thickening, loss of elasticity, wrinkling etc) and eye damage.

The Standard does not permit claims for non-cosmetic health benefits to be made when promoting solarium, and operators should not claim that solarium use is risk-free (2.12).

Some tanning equipment currently in use may not permit complete compliance with all the provisions of the Standard. However, all operators should be able to comply with the Standard’s administrative and procedural requirements, such as staff training, the lower age limit for users, exclusion of people with especially sensitive skin and the requirement for warning signs and signed consent forms. Replacement of equipment should be used as an opportunity to bring in new equipment which allows a solarium to comply fully with all provisions of the Standard.

Some skin diseases can be treated by applying photo-sensitising ointments or drugs then exposing the skin to controlled levels of ultraviolet rays. Do not attempt to treat these diseases yourself. Treatment requires controlled conditions and medical supervision.

The guide was prepared by the National Radiation Laboratory, a specialist unit of the Ministry of Health which promotes radiation protection in New Zealand. Ultraviolet is a form of non-ionising radiation.

* The operator is the person who controls the tanning equipment. These guidelines assume that the operator is not the same person as the solarium user or client who is exposed to the rays. Nevertheless, the same principles apply for do-it-yourself users.

[†] Throughout these guidelines, numbers in brackets refer to clauses in the Standard.

1 Choice of equipment

Each tanning unit must have

- An accurate graduated timer, accurate to within 5%, which turns off power to the lamps after a pre-set period. Only the operator (ie not the client) should determine and set the exposure time (2.2.3, 2.2.1).
- A means by which the client (from the tanning unit) and the operator (from a central control area) can easily stop the session at any time (2.2.2). A provision to continue the session (up to the original preset time) may also be installed (2.2.4).
- Grilles or guards or some other means which prevent the user from accidentally touching or coming too close to the lamps (2.3.1).
- If the user stands in the unit, it must have a handgrip or other means to provide support (2.7).
- Several lamps spaced to provide practically even distribution of UV rays over the body.
- The lamps must comply with the specification in IEC 61228 (2.9).
- There should be no detectable UV at wavelengths below 280 nm (2.1.2). Emissions in the UV-B range (280 – 320 nm) should be between 0.7% and 3% of the total UV output (2.1.3).

The tanning unit supplier should be able to provide written confirmation that a unit meets these requirements.

2 Installation

Choose a secluded area, or preferably individual rooms, to set up the tanning unit, so that no-one else is inadvertently exposed to UV from the unit (2.3.2). Only one person at a time should be able to be in the unit (2.4).

As many people prefer to tan without any clothing, ensure privacy and security is available for the client both when using the unit and dressing/undressing.

Each unit should be on its own circuit breaker (2.6).

Warning signs of the type specified in the Standard should be posted near the entrance or reception area of the solarium and by every tanning unit (3.6.1).

3 Staff training

All staff who are responsible for operating the equipment and working with clients must receive proper training. This should include all the material covered in this Guide and in the Standard (2.11). It is advisable to keep records of staff training.

A fully trained staff member should be on duty and supervising operation of the tanning equipment at all times (3.4).

4 Maintenance

4.1 Lamps

The operator should keep careful records of the care and maintenance of the tanning equipment in order to be sure of the output from the lamps. The effectiveness of the tanning lamps is expressed as their *effective UV irradiance* (UVR_{eff}) which is measured at places likely to be occupied by a user. This takes account of both the intensity of the lamps – effectively, how bright they are – and also the relative effectiveness of different UV wavelengths at producing both the desired effect (a tan) and also undesirable effects (burning, skin cancer and other skin damage).

Background information on UVR_{eff} is contained in Appendix A.

In order to determine exposure times in the manner set out in the Standard (see section 6 of these Guidelines), the operator must know the value of UVR_{eff} for each unit in the solarium. UVR_{eff} should not exceed 0.9 W/m^2 (2.1.1). (This is about three times the UVR_{eff} of midday sunlight in summer.) The supplier of tanning equipment should be able to supply information on UVR_{eff} ; if not, the value should be measured before starting operations.

If this information is not available for existing equipment, operators will have to rely on exposure times recommended by the equipment supplier or manufacturer. However, operators should use replacement or maintenance of equipment as an opportunity to obtain better information on the lamps' output and/or the basis for the exposure times recommended by the supplier or manufacturer, in order to increase the degree of compliance with the Standard.

UVR_{eff} should also be remeasured if any part of the equipment is replaced with a part which does not meet the original manufacturer's specification. (2.10)

Lamps have a limited lifetime which is normally specified by the manufacturer. The operator should keep records of use to ensure that lamps are changed out as necessary. Only replace lamps with the exact equivalent. Other lamps may have different emission characteristics which could produce a completely different value of UVR_{eff} (2.8), meaning that recommended exposure times would also be different.

4.2 Hygiene

The operator should ensure that parts of the tanning equipment which might come into contact with the user are either discarded (if disposable) or disinfected before being used again. This includes the protective goggles (3.3).

4.3 General maintenance and lamp check

It is advisable to have a tanning unit checked by a trained technician at least once per year. This should include a check of the lamp output. Results of such checks should be recorded and filed (2.1.4).

5 Client assessment

5.1 Interview

Interview each user before the first tanning session. Reject any client whom you have reason to believe is especially sensitive to UV rays. Notes from the interview should be recorded and filed for at least two years (3.5). An example interview form is shown in Appendix B.

During and after the interview consider the following aspects:

5.1.1 Skin type assessment (3.6.2)

Each client must be assessed before any tanning session is started. Tolerance to UV radiation varies widely from person to person, even within each racial group. Some persons may not gain a noticeable tan from UV exposure but their skin could be damaged easily. Other people's skin may be damaged less easily. Redheads, people with freckles, and blondes are likely to be especially sensitive.

Ask about the person's experience of reactions to the sun's rays, including how readily she or he tans or burns.

Ask whether the client has used sunlamps before (if not on the record). If the answer is yes, ask whether the sessions were successful at producing a tan and whether any problems arose.

Dermatologists have developed a "skin type" classification, based on physical characteristics and past experience of tanning, to assess the degree of risk. The skin type is given a number (normally shown in roman numerals) from I to VI. The scheme is shown in Appendix C. Each client's skin type should be assessed and recorded. If in doubt, use a lower value.

You should not allow people with skin type I to use the tanning lamps, and discourage people with skin type II (3.1.3).

5.1.2 Medications

Some medications, such as antibiotics and anti-inflammatories, may make people abnormally sensitive to UV. Any client taking medications (by mouth or applied to the skin) should be advised to consult their medical practitioner or pharmacist to check whether exposure to tanning lamps may cause undesirable side-effects.

5.1.3 Exclusions

As well as people with skin type I, do not provide tanning sessions to persons who

- tend to suffer allergic reactions (itching or inflammation) when exposed to rays from the sun or ultraviolet lamps, or
- have now or in the past suffered from any form of skin cancer or abnormal growths related to exposure from the sun's rays, or
- have been advised by a doctor to avoid the sun's rays or UV lamps.

5.1.4 Client consent form

A copy of the client consent form in Appendix A of the Standard must be read and signed by the client and operator before the first tanning session begins. This signed form should be filed for at least two years, and a copy of the signed form should be given to the client to keep (3.6.2). Note that the form specifies that the client is over the age of 18 years.

6 Tanning plan (3.1.1, 3.1.2)

A tanning plan should be drawn up for each client, based on their assessed skin type. Initial exposures should be lower than for subsequent sessions. There should be at least 48 hours between sessions, and no more than three sessions per week.

The exposure time for the initial session should be no more than half of that required to produce reddening of the skin. Over subsequent sessions, the exposure time is gradually built up to be no more than 90% of that required to produce reddening of the skin.

As discussed in section 4 of these Guidelines, the Standard relies on knowledge of the *effective UV irradiance* (UVR_{eff})* of the lamps to determine exposure times for the initial and subsequent sessions. If UVR_{eff} is not known, operators will have to rely on exposure times recommended by the equipment supplier or manufacturer. However, operators should use replacement or maintenance of equipment as an opportunity to obtain better information on the lamps' output and/or the basis for the exposure times recommended by the supplier or manufacturer, in order to increase the degree of compliance with the Standard. It may be that exposure times recommended by the supplier or manufacturer have been determined in accordance with the Standard, but this would need to be confirmed by them.

If UVR_{eff} is known, the calculations outlined below can be used (by the operator or equipment supplier) to prepare a table of exposure times for each skin type (2.2.1). If there is more than one tanning unit, a table can be prepared for each unit. Preparing a table in this way means the calculations only have to be done once.

A worked example is presented in Appendix D, which also shows how to prepare a table of exposure times.

6.1 Determination of MED

Firstly, note down the value referred to in the Standard as the *MED*. This is the Minimum Erythema Dose (MED), taking into account the skin type. (Background information on the Minimum Erythema Dose – the minimum dose of UV required to cause reddening of the skin - is presented in Appendix A.)

MED for the different skin types is given in the table below (1.5.4 and 3.1.1).

* As discussed in section 4, the *effective UV irradiance* is a measure of the lamps' output which takes into account both their intensity, and the relative amounts of UVA and UVB.

Skin type	MED (J/m ²)
II	250
III	350
IV, V, VI	450

6.2 Find the maximum initial exposure time

The maximum initial exposure is 0.5 *MED* (3.1.1). The exposure time in minutes can be calculated from the formula:

$$\text{Maximum initial exposure time} = 0.5 \times \text{MED} / (\text{UVR}_{\text{eff}} \times 60)$$

Note: if there are several tanning units in an establishment, each with a different value of *UVR*_{eff}, the value of *UVR*_{eff} for the unit to be used must be put into the formula.

6.3 Find the maximum exposure time for subsequent exposures

The maximum exposure for subsequent exposures must be less than 0.9 *MED*. The exposure time in minutes for subsequent exposures can be found from the formula:

$$\text{Maximum exposure time} = 0.9 \times \text{MED} / (\text{UVR}_{\text{eff}} \times 60)$$

It is recommended that you build up to the maximum exposure time over several sessions, carefully monitoring the results and adjusting session times cautiously so as not to cause any reddening.

An inducement of unlimited sessions should not be used in promoting a solarium (3.1.2).

7 Client records (3.5)

Keep a record of

- the signed consent form (3.6.2)
- the answers the client gives during the initial interview (3.6.2)
- the tanning plan adopted, and
- dates, times of day, and durations of tanning sessions and, if there are several tanning units, the unit used
- any additional notes on the client's progress.

With the client's consent, make these records available to a doctor or other health authority if necessary. Remember that this information is personal.

If the user experiences difficulties during the course then the record can be reviewed and a decision made on whether to reduce or cease exposures. These records could be helpful in the early detection and diagnosis of some medical problems too.

Records should be filed in a way which makes them easy to retrieve if, say, the client comes back several months after the first course. Records should be kept for at least two years.

8 Operating the lamps

8.1 Preparations

Ask the client if she or he has been sunbathing or received any substantial ultraviolet exposure at any time during the last 48 hours. If they have, delay the intended tanning session until this time has elapsed.

Some cosmetics, creams, and lotions are photo-sensitisers and make the skin unusually sensitive to ultraviolet rays. Make the client aware of this and give them the option to come back later once they have removed any cosmetics etc. A few drugs sensitise the eyes as well.

Remind the client of the importance of putting on the UV protective goggles before turning on the lamps. Some users are reluctant to protect their eyes because of untanned shadows. Eye protection is important and must be worn. Even if the eyes are closed, some UV can pass through the eyelid and the lens is particularly susceptible to long term damage. Protective goggles which meet the requirements of the Standard must be worn (3.2). Sunglasses are not adequate because rays can enter from the sides and some sunglass lens materials give little protection.

If the client prefers to wear any clothing during the first tanning session, recommend to the client that this should be worn during the remaining sessions of the series. If the client varies clothing then some areas of skin covered during first sessions will receive too high an initial dose on later occasions when exposure times are longer.

8.2 Lamps on

Ensure that the client knows how to position themselves so that exposure to the lamps is reasonably uniform.

Set the timer according to the length of the first session for the chosen tanning plan. On following occasions, increase the duration step by step up to the maximum determined previously.

8.3 Protection of the operator

If working on or near a unit while it is operating is unavoidable (eg to check whether lamps are working), minimise your own exposure by

- keeping as far away as possible
- avoiding direct or reflected rays from the lamps, whenever practicable
- wearing protective goggles.

Virtually all non-transparent materials will stop UV. Ordinary glass and clear plastics do not give protection from UVA wavelengths.

9 After tanning sessions

9.1 Advice to client

Once the lamps have turned off, advise the client to

- avoid sunbathing or spending long periods outdoors during daylight until at least 48 hours after the last tanning session of the series
- return for the next session no sooner than 48 hours later
- report any unwanted skin reaction, including reddening, at the next session.

10 Just before next tanning session

Immediately before the next tanning session

- check that at least 48 hours have elapsed since the previous session or any deliberate sun-bathing
- ask the client if their skin reacted after the previous session
- check for signs of ill-effects.

Reduce the duration of the next exposure if there is more than a slight reddening of skin.

If there is significant burning, discoloration, irritation, blistering, or swelling, give no further exposures until the client has sought advice from a doctor.

Record these results and any advice on the client's file, along with details of the day's session.

10 Further information

To obtain a copy of the Standard, contact Standards New Zealand on 0800 782 632, or email enquiries@standards.co.nz or consult their website www.standards.co.nz.

For further information consult a Health Protection Officer at your District Health Board or

National Radiation Laboratory
PO Box 25-099
Christchurch

Ph 03-366 5059
Fax 03-366 1156

Email enquiry@nrl.moh.govt.nz
www.nrl.moh.govt.nz

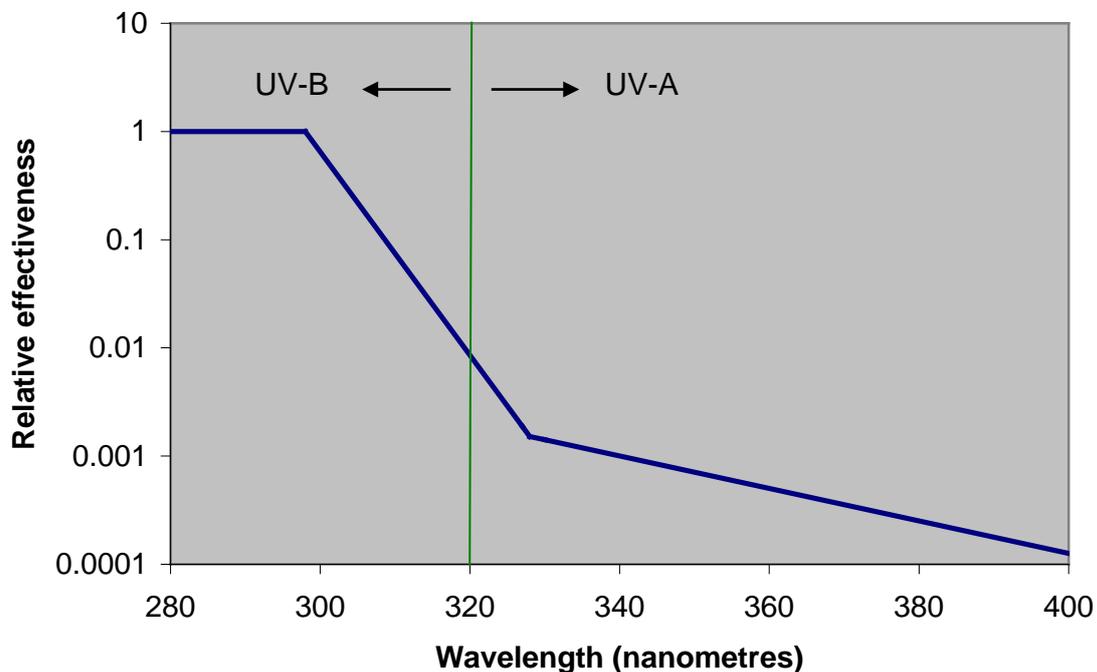
**National Radiation Laboratory
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Appendix A UVR_{eff} and MED

Effective UV irradiance UVR_{eff}

UV radiation is one component of the radiation emitted by the sun. It can also be produced by artificial sources, such as tanning lamps. Other components of radiation from the sun include visible light and infra-red radiation. Unlike visible light, which we detect with our eyes, and infra-red, which we feel as warmth, UV radiation can neither be seen nor felt. The effect of UV radiation on the body depends on a property called its wavelength. (Visible light also has a wavelength – the colour we perceive depends on the wavelength of the light.) UV wavelengths are divided into three regions: UV-A, UV-B and UV-C. UV-C from the sun is all absorbed in the atmosphere.

UV-A and UV-B both produce harmful effects on the skin, including sunburn, loss of elasticity and skin cancer. UV-B is much more effective than UV-A at causing these harmful effects. The relative effectiveness of different wavelengths of UV at producing sunburn is shown in the graph below.



This graph shows that UV-B is much more harmful than UV-A of the same intensity. UV-B with a wavelength of 300 nanometres is about 500 times more harmful than UV-A with a wavelength of 325 nanometres, and about 1,000 times more harmful than UV-A with a wavelength of 350 nanometres.

UV lamps produce a wide range (or “spectrum”) of wavelengths. In order to compare the effects of different lamps, which might produce different amounts of UV at different wavelengths, the output at each wavelength is weighted according to the relative effectiveness at that wavelength to give a measure called the *effective UV irradiance* (UVR_{eff}). UVR_{eff} is measured in watts per square metre (W/m^2).

For example, a UV lamp which only produces output at a wavelength of 350 nanometres would need to be about 1,000 times more intense (“brighter”) than a lamp which only produces an output at a wavelength of 300 nanometres to produce the same effects.

The maximum level of UVR_{eff} permitted in the Standard is 0.9 W/m^2 . This is about three times more intense than midday summer sunshine.

Minimum erythema dose - MED

The *minimum erythema dose* (MED) is the amount of UV required to just produce slight reddening on previously unexposed skin. (“Erythema” comes from the Greek word for “red”.) In other words, the MED is the amount of UV required to just start sunburn.

Different skin types have different sensitivities, so in the Standard a range of values for MED is used, ranging from 250 joules per square metre (J/m^2) for skin type II (fair) to 450 J/m^2 for skin type IV and above (dark).

Dose calculation

The actual dose of UV (in J/m^2) is calculated from the following formula:

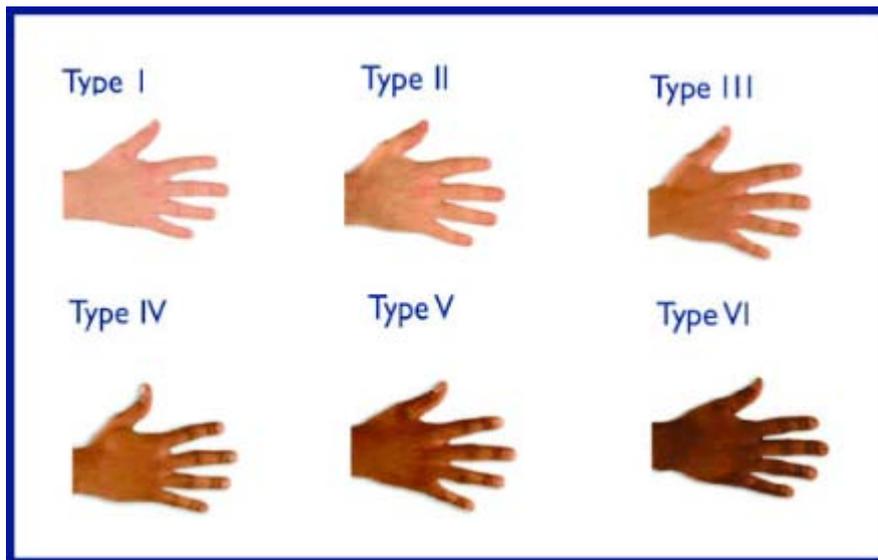
$$\text{Dose} = UVR_{\text{eff}} \times \text{Exposure time (in minutes)} \times 60.$$

For example, for a tanning unit with $UVR_{\text{eff}} = 0.5 \text{ W/m}^2$, an exposure time of 5 minutes would give a total dose of:

$$\text{Dose} = 0.5 \times 5 \times 60 = 150 \text{ J/m}^2.$$

Appendix B Example interview and client record form

Appendix C Skin type classification



Type I

Often burns, rarely tans. Tends to have freckles, red or fair hair, blue or green eyes.

Type II

Usually burns, sometimes tans. Tends to have light hair, blue or brown eyes.

Type III

Sometimes burns, usually tans. Tends to have brown hair and eyes.

Type IV

Rarely burns, often tans. Tends to have dark brown eyes and hair.

Type V

Naturally black-brown skin. Often has dark brown eyes and hair.

Type VI

Naturally black-brown skin. Usually has black-brown eyes and hair.

Appendix D Example tanning plan

Note: This is an example only.

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UVR_{eff} of the tanning unit to be used = 0.5 W/m^2 .

Client has skin type III.

For skin type III, the Minimum Erythema Dose MED is 350 J/m^2 .

Maximum initial exposure (first visit)

The maximum exposure time (in minutes) for the first visit can be calculated from the formula:

$$0.5 \times MED / (UVR_{\text{eff}} \times 60)$$

As $MED = 350 \text{ J/m}^2$ and $UVR_{\text{eff}} = 0.5 \text{ W/m}^2$, this gives us:

$$0.5 \times 350 / (0.5 \times 60)$$

$$= 175/30$$

$$= 5.8 \text{ minutes (ie 5 minutes 50 seconds)}$$

Maximum exposure time for subsequent sessions

The maximum exposure time (in minutes) for subsequent sessions can be calculated from the formula:

$$0.9 \times MED / (UVR_{\text{eff}} \times 60)$$

As $MED = 350 \text{ J/m}^2$ and $UVR_{\text{eff}} = 0.5 \text{ W/m}^2$, this gives us:

$$0.9 \times 350 / (0.5 \times 60)$$

$$= 315/30$$

$$= 10.5 \text{ minutes (ie 10 minutes 30 seconds)}$$

The operator would normally build up to this maximum time over several sessions.

Developing a table of exposure times

The operator or equipment supplier/manufacturer can develop a table of exposure times for the different skin types. This is readily done using a spreadsheet. Suppose UVR_{eff} is 0.5 W/m^2 , and the exposure time is built up to the maximum over five sessions. For simplicity, exposure times have been rounded to the nearest half minute.

Exposure times for tanning unit with $UVR_{\text{eff}} = 0.5 \text{ W/m}^2$			
	<i>Skin Type</i>		
	<i>II</i>	<i>III</i>	<i>IV, V, VI</i>
MED	250 J/m²	350 J/m²	450 J/m²
<i>Session no.</i>	<i>Exposure time (minutes)</i>		
<i>1</i>	4	6	7.5
<i>2</i>	5	7	9
<i>3</i>	6	8	10.5
<i>4</i>	6.5	9.5	12
<i>5</i>	7.5	10.5	13.5
<i>6 and above</i>	7.5	10.5	13.5

For example, a client with skin type III should start off with an exposure time of 6 minutes, increasing to 7, 8 and 9.5 minutes on the second, third and fourth sessions. On the fifth and subsequent sessions, the session time would be 10.5 minutes.

Note that this table is only valid for units confirmed to have UVR_{eff} of 0.5 W/m^2 .