THE SHADE AUDIT BY NSW CANCER COUNCIL

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SUMMARY of

ACTIONS TOWARDS SUSTAINABLE OUTCOMES

Environmental Issues/Principal Impacts

- Skin cancer is a serious, preventable disease responsible for over 1200 deaths annually in Australia. The primary cause is exposure to solar ultra-violet radiation (UVR).
- Managers and designers of outdoor spaces should provide environments that are safe for the public to use and enjoy – effective solar protection is an important factor which needs to be considered. By undertaking a shade audit, solar risk can be significantly reduced.

Basic Strategies

In many design situations boundaries and constraints limit the application of cutting EDGe actions. In these circumstances designers should at least consider the following:

- Essential aspects of shade planning include identifying the areas of an outdoor site where solar risk is high and planning where solar protective shade should be provided having regard to the usage patterns of the site.
- Shade should provide 'effective' solar protection by:
  - creating shade where it is needed, when it is needed
  - providing a minimum of 94 per cent UVR protection
  - protecting against indirect UVR
  - achieving summer and winter comfort

Cutting EDGe Strategies

- Late in 2005 an inter-active, web-based software programme will be available allowing inexperienced people to undertake a shade audit, model a range of shade outcomes and plan appropriate solar protective shade.
- Many local councils are currently considering whether to require that shade audits are submitted with development applications.

Synergies and References

- Greenwood, JS, Soulos, GP, Thomas, ND, 1998 *Under Cover: Guidelines for Shade Planning and Design* NSW Cancer Council.
- Greenwood, JS, Soulos, GP, Thomas, ND, 2000 *Under Cover: Guidelines for Shade Planning and Design* Anti-Cancer Foundation of SA.
- *Shade for the Public – Guidelines for local government* Cancer Foundation of Western Australia 1999
- WebShade shade planning software – www.webshade.com.au

THE SHADE AUDIT

NSW Cancer Council

Greenwood, JS, Soulos, GP, and Thomas, ND

The material in this Note is based on content from Under Cover: Guidelines for Shade Planning and Design *by the NSW Cancer Council. It is recommended that readers familiarise themselves with this document prior to commencing a Shade Audit.*

1.0 INTRODUCTION

The purpose of conducting a Shade Audit is to provide a strategic plan for the provision of sufficient UVR protective shade at a site. This is achieved by:

- establishing the usage patterns at the site
- assessing the quantity and useability of existing shade
- assessing the need for additional shade
- providing recommendations for how to create additional shade (if required) without compromising winter conditions at the site and/ or how to modify site usage patterns so that the best use is made of existing shade
- incorporating these recommendations into future development plans for the site and setting a timeframe for their implementation.

2.0 HOW TO CONDUCT A SHADE AUDIT

The Shade Audit comprises four main stages:

Stage 1: Interviews

Stage 2: Site fieldwork

Stage 3: Assessment

Stage 4: Recommendations.

It is recommended that a project team be formed to help undertake the Shade Audit procedure. Skills that would be helpful to include in the Audit team are:

- the ability to plot measurements to scale
- knowledge of horticulture
- if using the 'projection method', an understanding of sun angles and the ability to plot shade from a theoretical base.

People that would have some of these skills include tradespeople, eg. a builder or plumber, architects, surveyors, engineers, draftspeople, farmers, horticulturalists, nursery attendants, landscape architects and gardeners.

The Shade Audit should be presented in the form of a written report, documenting the findings from Stages 1, 2 and 3 as well as recommending options for additional shade provision at the site. An example of a completed Shade Audit can be found in Appendix E of *Under cover: Guidelines for shade planning and design.*

3.0 HOW TO MEASURE SHADE

One of the critical tasks of the Shade Audit (Stage 2: Site fieldwork) is determining the typical existing shade patterns at a site. However as these patterns are subject to seasonal variations, it is essential that this task be conducted for the Critical Protection Time as well as for a typical winter day.

The Critical Protection Time for a site is the time of day and year when protection from solar UVR will be most important at that site. Factors that should be considered when determining the Critical Protection Time include the site usage patterns (especially times of heaviest usage) as well the levels of UVR.

Information on site usage patterns will be obtained during Stage 1: Interviews. It is important that the Critical Protection Time is determined prior to commencing Stage 2: Site fieldwork.

An assessment of existing shade can be made by plotting or 'measuring' a site's shade patterns at the Critical Protection Time, which for sites in use throughout the year or mainly in summer, is on the summer solstice, ie. 22 December, or thereabouts. An assessment of shade at the same time of day on the winter solstice, ie. 21 June, or thereabouts, should also be made so that new shade initiatives can be planned to minimise negative effects on winter conditions at the site. In some situations there may need to be a variation from the solstice dates as:

- the Critical Protection Time for the site may not coincide with the period surrounding the 22 December, eg. the Critical Protection Time for a school may be at lunchtime in November because the students are on holidays for most of December; the Critical Protection Time at a sports ground used only for first grade rugby league may be early afternoon in winter.
- it may not be convenient to 'measure' the shade at a site during the weeks surrounding 22 December if the 'observation' method (see below) is being used.

There are two methods for assessing shade:

- the 'observation' method: where shade is marked on the ground at the site and measured on two occasions (the Critical Protection Time and at the same time on a typical winter day); or
- the 'projection' method: which involves the use of sun angles and charts to plot where shade will theoretically fall on two occasions (the Critical

Protection Time and at the same time on a typical winter day).

The lay shade planner may prefer to use the 'observation' method, as specialist knowledge of shade projection techniques is required for the 'projection' method. When using the 'observation method', shade planners must be able to allow for at least a six month period to lapse so that the shade patterns can be assessed at both the Critical Protection Time and in winter.

Stage 1: Interviews

Important background information can be obtained by conducting interviews with site managers, employees and users. The advantage of interviewing representatives from each of these groups is that a range of opinions and observations can be collected for consideration in Stage 3: Assessment.

To assist with this stage of the Audit, sample questions for site managers, employees and users for use in face-to-face or self-completion interview situations can be found in the publication *Under cover: Guidelines for shade planning and design*. The questions need to be modified to suit the particular issues for different sites or deleted if irrelevant. The information in Chapter 6 of *Under cover: Guidelines for shade planning and design*, Site Specific Considerations, will be a useful starting point for the development of tailor-made questions for different sites. So that the areas of a site can be referred to with minimal confusion during the interviews, it is suggested that a site plan (roughly drawn if an existing plan is not available) be used for reference.

Information obtained during the interviews will include:

- the availability of a site plan or survey including the location of services, eg. pipes and underground cables, and other relevant site data
- site usage patterns, ie. the main outdoor activities undertaken at the site, where they occur and when they occur
- the time of year the site is most in use
- the number of people using the site and their age breakdown
- opinions on the adequacy of existing shade at the site and the need for more shade
- long-term development plans for the site, ie. building, landscaping, shade provision
- required performance characteristics of new shade structures, eg. rain protection
- other considerations, eg. vandalism, areas that cannot be accessed by users.

Stage 2: Site fieldwork

This stage of the Audit involves the collection of site data, as well as the confirmation of information obtained during the interviews. As both observation and detailed measurement need to be made, it is recommended that two site visits be conducted:

- the first, at a time of typical site use, so that observations of usage patterns can be made and the Critical Protection Time confirmed (This step could coincide with Stage 1: Interviews.);
- the second, at a time when users will not be inconvenienced so that measurements can be made.

If the 'observation' method is being followed, additional site visits may need to be conducted so that shade patterns are measured at both the Critical Protection Time and at the same time of day during winter.

The main tasks for the site fieldwork are outlined below. Most tasks need to be completed regardless of which shade measurement method is being followed. This is indicated by a ✓ appearing under both headings for the particular task. Some of the tasks however are relevant for only one of the shade measurement methods, ie. either the 'observation' method or 'projection' method. Where this is the case, a ✓ will appear under the heading to which the task applies, and a ✗ will appear under the heading to which the task does NOT apply.

The site fieldwork will require the use of a measuring tape and camera.

Observing site usage patterns

Observation method	Projection method	Tasks	Comments
		Observing site usage patterns	
✓	✓	1 Pay particular attention to the type and location of outdoor activities and where people tend to congregate.	The purpose of this task is to confirm the information gained from the interviews.
✓	✓	2 Consider if people gather in a location because it is the only place where they can undertake a particular activity, or if the activity could be moved to a shaded area.	The observations should be made at a time of typical site use.
✓	✓	3 Make a note of whether people are using the available shade.	If there are any discrepancies between your observations and the information obtained during the interviews, consider whether they should be discussed with some of the interviewees.
		Preparing the site plan	
✓	✓	1 Obtain a copy of an accurate, scaled site plan (if available): • confirm the accuracy of the site plan by **making some random measurements** and checking that all buildings appear on the plan • if all the buildings do not appear on the plan, measure, locate and plot the measurements to-scale.	The purpose of this task is to prepare the site plan for the site investigation and shade measurement stages of the Audit.
		If a site plan is not available • firstly, draw a freehand plan of the site and record the overall dimensions of the land, as well as the length and width of buildings and their distance from each other and from the site boundaries • draw an accurate site plan by plotting the measurements to scale	If an accurate site plan is available, the time consuming task of comprehensively measuring the site and drawing up a plan to-scale will be avoided.
✓	✓	2 Mark on the site plan the direction of north, noting whether it is 'magnetic' or 'true' north.	
		Investigating the site	
✓	✓	1 During the site fieldwork, take photographs of the following for your records: the site and patterns of usage trees (to assist identification) existing shade structures problem areas, eg. unshaded seats shade opportunities.	A photographic record of the site will assist in Stage 3: Assessment, as it may help to reinforce data and prompt memory. Photographs can also be helpful for presentation purposes as they illustrate particular aspects of a site.
✓	✓	2 Record the location of the following items on the site plan with a name or number: • buildings, eg. assembly hall, canteen or B1, B2, etc • other built items, eg. pools, play equipment etc • existing shade structures, eg. S1, S2.	
✓	✓	3 Divide the outdoor areas between buildings and other built items into zones, based on the site usage patterns. Record each zone on the site plan with numbers, eg. Z1, Z2 or names, eg. assembly area, lunch area, etc.	Chapter 6 in *Under cover: Guidelines for shade planning and design* provides information on the typical usage patterns for different sites.
✓	✓	4 Record on the site plan any significant ground level changes, ie. in excess of 600mm.	This task will help with the planning and location of new shade structures.
		5 Record on the site plan any special site conditions that may impact on the design of new shade structures, eg. emergency access points, topography.	
✓	✓	6 Make a note of the ground surface/s within each outdoor zone, eg. concrete, grass. Pay particular attention to ground surface changes within a zone.	These tasks will assist with the assessment of the degree of reflected UVR at a site.
✓	✓	7 Make a note of the buildings' surfaces/finishes (wall and roof) as well as their roof shapes. Pay particular attention to walls that may reflect high levels of UVR, due to their material/finish and the direction faced, ie. north or up to 45° either side of north.	
✓	✓	8 Measure the heights of buildings at the eaves and ridges.	You do NOT need to do this if you are using the observation method.
✓	✓	9 Measure the length, width and height of existing shade structures.	You do NOT need to do this if you are using the observation method.

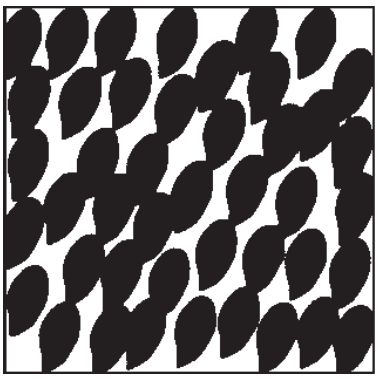
Observation method	Projection method	Tasks	Comments
✓	✓	10 Record on the site plan, the location of trees or groups of trees. • For small or simple sites, it may be possible to number each tree, eg. T1, T2, etc. • For large or complex sites, it is easier to nominate areas of planting, eg. P1, P2, etc, than to number individual trees.	
✓	✓	11 Note details of each tree or planted area as follows: • the species, or within each planted area, the predominant tree/shrub species • estimated height (metres) • maturity, eg. 3 years old • condition (particularly any problems) • the density of the canopy (see Canopy Density Guide) • the estimated canopy diameter (metres) • whether it is deciduous or evergreen. Also, for planted areas, assess any particularly significant individual trees/shrubs within the group eg. a large tree with dense foliage and a wide spreading canopy, or trees that are situated by themselves.	This task will require some horticultural knowledge. So that existing natural shade is correctly documented, try to include a person with such expertise in your Shade Audit team, eg. landscape gardener, nursery attendant.
		Measuring existing shade – 'observation' method	
✓	✗	1 Mark the shade patterns at the site on the ground using chalk, rope or a similar method (at the Critical Protection Time as well as at the same time of day during winter).	This task must be conducted twice, once at the Critical Protection Time and again during winter (typically 21 June).
✓	✗	2 Measure the dimensions of the shade outline.	
✓	✗	3 Plot the data to scale on the site plan.	
		Measuring the existing shade – 'projection' method	
✗	✓	1 Project the shade patterns at the site using sun angles (at the Critical Protection Time, as well as at the same time of day during winter).	This task is necessarily technical as it involves the projection and drafting of theoretical shade patterns and will require a detailed knowledge of sun projection techniques.
✗	✓	2 Plot the data to scale on the site plan.	

Canopy density guide

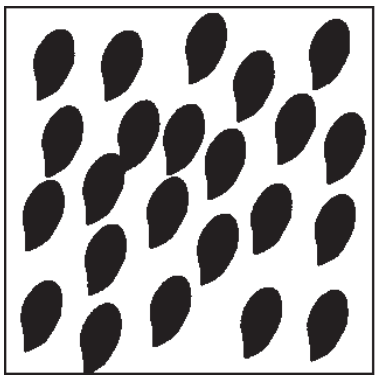
The canopy density guide will help you to assess the level of UVR protection provided by different trees.

View the tree canopy against sky and compare with illustrated leaf canopy patterns. Estimate which pattern of sky and leaves most closely approximates the observed canopy.

Heavy – over 90% UVR protection Good protection from direct UVR. Protection from indirect UVR will depend on canopy size and where a person is positioned under the canopy. Suitable for long-stay use if personal sun protection measures are also used.



Medium – around 60% UVR protection Filtered shade provides low levels of protection from direct and indirect UVR. Suitable for short-stay use only. Personal sun protection measures should also be used.



Light – less than 30% UVR protection Poor protection from direct and indirect UVR. Suitable for transit shade only.

Stage 3: Assessment

By this stage of the Shade Audit, the shade patterns at the Critical Protection Time and in winter will have been plotted to scale on the site plan. The next stage of the Audit involves an assessment of the quantity and useability of existing shade and the need for additional shade.

There are a number of tasks that need to be completed. They are as follows:

Consider the likely impact of *future tree growth* on the amount of shade at the site

Will tree growth significantly alter the amount or distribution of shade?

If it will, how long will it take before significant changes occur? It may be necessary to consult a person with horticultural expertise for information regarding tree growth rates.

Consider the *amount of existing shade* at the Critical Protection Time and compare this with the need for shade, taking into account the additional shade that may result from tree growth

Is the amount of shade adequate for the number of people using the site?

How much additional shade is likely to be required to provide an adequate amount of shade for the number of people using the site?

Are there opportunities to better utilise or access existing shade?

Consider whether the *location of existing shade* is appropriate, given the usage patterns at the site

Are there areas of use where shade is inadequate?

Is adequate shade provided in areas of non-discretionary use, ie. areas where people are compelled to be? (In non-discretionary use areas, eg. numbered seating in grandstands at sports grounds, most of the patrons should be able to access shade, particularly during summer.)

Are there adequate opportunities for people to find shade in discretionary use areas, ie. areas where people choose to go? (In discretionary use areas, eg. grassed spectator areas at sports grounds, at least 50% of the patrons should be able to access shade, particularly during summer.)

Are there priority areas for further shade provision, given site usage patterns?

Should/can existing shade be re-located to be more compatible with site usage patterns?

If *additional shade* is required, consider where it should be located, keeping in mind the site usage patterns and winter shade patterns

Are there locations that will allow additional summer shade to be achieved without creating excessive shaded areas in winter?

Are these locations compatible with site usage patterns?

Consider the *impact of indirect UVR* on the site and possible means of reducing its impact

Are some areas of the site likely to have high levels of indirect UVR as a result of surface finishes, eg. smooth paving, reflective walls?

Can these surfaces be modified to reduce the likelihood of indirect UVR?

Can other measures be adopted to minimise the impact of indirect UVR?

Stage 4: Recommendations

The Recommendations stage of the Shade Audit involves documenting the potential strategies to achieve a site's shade requirements. Specific recommendations should be made regarding each of the following:

- *the desired shade goal/s* for the site, eg. increase shade over passive playground areas (where children eat their lunch, where assemblies are held)
- *the strategies* for achieving the goal/s, including:
  - revising site management practices, eg. accessing shaded 'out-of-bounds' areas, rescheduling outdoor activities
  - optimising the use of existing shade eg. relocating activities or outdoor equipment to shaded areas, removing low branches from trees to allow access
  - creating new shaded areas (include information on the performance characteristics of the proposed shade ie. amount of additional shade that is needed, where it should be located, the time/s of day and year that the shade is required; also think about the range of shade options (both natural and built) that may be appropriate and their likely costs)
  - minimising the effects of indirect UVR on the site (or areas within it), eg. modifying surfaces by planting ground covers or covering concrete with synthetic turf, designing shade structures that protect from indirect UVR.
- the *desired timeframe* for achieving the shade goal/s for the site
- the *project management options* for achieving the shade goal/s, for example:
  - organising a working bee with volunteers to relocate seating and lop low branches off trees
  - engaging an architect to design a shade structure that can be constructed by semi-skilled volunteer labour
  - engaging an architect to manage the design and construction stages of the shade project
  - asking a project team member with an interest in landscaping to recommend a tree planting strategy

- inviting shade manufacturers to submit a proposal for supply and installation of a shade structure
- implementing a staged shade project (to allow for fundraising).

A Shade Plan should be prepared (based on the site plan), indicating where the above strategies will be implemented. An example of a Shade Plan can be found in Appendix E of *Under cover: Guidelines for shade planning and design*.

The recommendations and the Shade Plan should be incorporated into the design brief, a document that is provided to professionals such as architects and shade manufacturers. A comprehensive design brief will help to ensure that the shade solution/s for a site (off-the-shelf or custom made) will meet a site's shade requirements.