Congratulations on deciding to improve shade at your facility. Shade brings many benefits including helping to create a healthy outdoor space. However not all shade is equal, and some products provide less protection from the sun's harmful ultraviolet radiation than others. For example, a Queensland study by Parisi and colleagues showed that shade cloth provides far less protection than solid rooves[1]. Other studies have shown that the angling of the shade and ensuring there are no visible gaps is vital for sun protection[2].

In this document, researchers from QUT's Cool and Covered program have compiled some tips on assessing your site prior to planning your shade as well as a series of tips on choosing materials for shade and effective shade trees.

Choosing Effective Shade: Audit Tool

It is useful if all assessments are made during the middle of the day (12 noon is a good time), when the sun is close to directly overhead. The shade protection is important during the hours of 9am and 3pm and this should be considered when undertaking this process[3].

1) Name and Location of the facility requiring shade:

_____

_____

2) Time of day:

_____

3) Identify the expected UVR reflection:
Using the table on the right, estimate the amount of UVR which will potentially be reflected from existing surfaces on the areas of human activity. TIP #1: Consider planting natural shade trees and shrubs alongside reflective surfaces to provide even more shade protection.

Surface	% Reflected UVR

Material	Reflection (% of UVR)
Grasslands	0.8-1.6
Lawn Grass	2.0-5.0
Soil-clay	4.0-6.0
Open Water	3.3-8.0
Bitumen Road	4.1-8.9
Beach Sand – Wet	7.1
Light Coloured Concrete	8.2-12
Beach Sand – Dry	15-18
House Paint – White	22

4) Identify the effectiveness of existing shade:
   a. How much natural and built shade is on site?

_____

_____

_____

_____

   b. Estimate the average number of people using the site per day:
      Weekday _____ Weekend _____
   c. Document the daily and seasonal impacts of the sun on the shade provided at the facility

_____

_____

_____

_____

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d. Are there any negative impacts that are limiting the effectiveness of the shade currently provided at the facility?
Examples of impacts include:
Concave or scalloped edges of the shade structure; gaps between structures or trees; the size of the structure; height above the equipment being shaded, or lack of overhang or any other issues.
Please identify and comment:

_____
_____
_____
_____
_____
_____

5) To identify the action required to improve shade at the site:
   a. Identify an action plan for the upgrade of shade for the facility

Equipment or Area within the facility requiring action	Shade or action to be considered for each item or area	Suggested Special Conditions	Priority Ranking & Timelines

Design features for built shade structures:

- Consider the movement of the sun throughout the day, with particular emphasis between the highest risk hours of 9.00am to 3.00pm. This solar movement impacts on the effectiveness of shape and size of a shade structure. Generally east and west positions require wider overhangs to improve shade protection.
- Vertical sides should be considered as part of shade structures, wherever possible. (Example: On the back and sides of a bus shelter.)
- Wherever possible, the combination of natural and built shade should be considered as the most effective and sustainable outcomes for shade creation. This combination will allow the built structures to provide effective shade whilst the trees are growing, and/or to allow for a greater coverage of shaded area for the facility.
- Shade only reduces the level of direct exposure to UVR and does not offer 100% protection. However, to maximise the shade coverage choose materials with maximum UVR protection factor ratings. Some materials, such as low-grade shade cloth, are less effective at screening out high levels of UVR and are not encouraged.

Choosing materials:

- Ensure that you are choosing materials that offer the highest ultraviolet radiation (UVR) protection possible.
- Choose a material that limits the reflectance of indirect UVR- select darker colours, textured and matte surfaces. Soft rather than hard surface finishes limit reflectance more effectively.[4]

Fabrics:

- Fabrics must have UPF of 10 or over
- There should be no visible gaps/holes, in fabric; the weave needs to be as tight as possible,
- Select darker colours/tones
- Choose the highest quality you can.
- Consider the effect of stretching the fabric; make sure any stretching doesn't reduce UVR protection.[3]
- Please note that some shade structures provide less protection than others. For example, shade cloth can provide inferior protection compared to other more solid roof structures, as found in a QLD study calculating UVR protection of built shade structures.[1]

Design considerations for using tree shade:

- Try to locate seats, tables, BBQs and play equipment under existing canopies wherever possible. Try to select the most appropriate shade trees for your geographical region.
- Trees that do not drop branches or lose leaves in winter are a good start!
- Try to select trees that have wide spreading, dense leaf canopies.
- Try to plant trees in clusters to provide the most effective shade cover.

  Please Note: It is important not to create a public safety issue by having the canopies so low as to block the line of sight from adjoining properties, the street or supervisor seating.

Trees scientifically proven to have the best UV protection and shade provision[5]:

1. *Ficus benghalensis* (Banyan Tree)
2. *Ficus microcarpa* (Malayan Fig)
3. *Albizia saman* (Rain Tree)
4. *Cupressus torulosa* (Bhutan Cypress)
5. *Mangifera indica* (Mango Tree)

For more information on Cool and Covered shade and apparel research check out
www.coolandcovered.com.au

Sources:

1. Parisi, A.V., Amar, A., Downs, N.J., et al. (2019). Development of a model for calculating the solar ultraviolet protection factor of small to medium sized built shade structures. *Building and Environment, 147*, 415-421. Doi: https://doi.org/10.1016/j.buildenv.2018.10.010
2. Turnbull, D.J & Parisi, A.V. (2004). Annual variation of the angular distribution of the UV beneath public shade structures. *Journal of Photochemistry and Photobiology B: Biology,* 76(1-3), 41-47. Doi: https://doi.org/10.1016/j.jphotobiol.2004.07.006
3. Stoneham, M., Earl, C., & Baldwin, L. (2006). Creating Shade at Public Facilities: Policy Guidelines for Local Government. AIEH: Brisbane. Retrieved https://eprints.qut.edu.au/101278/1/101278.pdf
4. Department of Health. (n.d.). Built shade materials and structures. Retrieved from Queensland Government website https://www.health.qld.gov.au/__data/assets/pdf_file/0027/443916/built-shade-materials-structures.pdf
5. Downs, N.J., Baldwin, L., Parisi, A.V., et al. (2019) Comparing the annualised dynamic shade characteristics of twenty-one tree canopies across twenty-six municipalities in a high ambient UV climate, Queensland-Australia. *Applied Geography, 108*, pp. 74-82. Retrieved https://www.coolandcovered.com.au/projects/effective-tree-shade/

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