Inner Melbourne Action Plan

Progress Report

Action 9.2 – Environmentally Sustainable Design

Purpose

1. To update the Committee on the progress of Action 9.2 Environmentally Sustainable Design – Communications Strategy – ESD Fact Sheets – Stage 2

Background

2. In May 2012 the IMAP Councils released the first round of fact sheets which covered the 10 key sustainable design categories for the Sustainable Design in the Planning Process (SDAPP) framework.
3. Through the first part of the project we identified that additional fact sheets could be created to provide more detail on relevant sustainable design issues within the planning scheme.
4. The orginal budget of $35K was exceeded, however the IMAP committee agreed to fund an additional $20K for the overspend ($5K) and for the additional fact sheets ($15K).

Discussion

5. Initial project team meeting was held in December to assign each member to research and produce the written content for the additional fact sheets, these include:

   Melbourne Climate (including adaptation) – CoY Gavin Ashley
   Site Permeability – CoS Nadia Ford
   External Shading – CoPP Steve McKellar
   Green Walls and Roofs – Growing Green Guide for Melbourne team and Fact Sheet Team
   Rating Tools – Fact Sheet Team

6. The fact sheet content has been developed for the initial fact sheet set; this methodology has been maintained and repeated for the additional sheets which includes:
   Awareness: of the need for change; e.g. a negative or positive household/environmental fact ie did you know that or % of etc.
   Desire: to support and participate in the change; e.g. what is the benefit for ME? Save money? Improve comfort?
   Knowledge: of how to change; the body of the Fact Sheet
   Ability: to implement the knowledge; e.g. reference to further information and other organisations
   Reinforcement: to sustain the change; e.g. other factsheets in this series, Councils best practice standards
7. The Murray Betts Group (MBG) are the nominated consultants for the project. They have been engaged to produce the additional fact sheets in order to maintain consistency with the look and feel of the initial set.
8. The size of the layout is intended to be a double sided A3 sheet for each of the additional fact sheets.
9. The Growing Green Guide for Melbourne team are not yet at a stage to progress with the development of their fact sheet. They will have developed the content further later this year (September-October) when they will be ready to create the Green Roofs and Walls fact sheet.
10. MBG has provided quotations for the fact sheets which are as follows:

***Project Team**: Steve McKellar [Team Leader] CoPP, Gavin Ashley CoY, Nadia Ford CoS*
Report prepared by: Steve McKellar

Melbourne Climate	$2 960
Site Permeability	$2 850
External Shading	$3 400
Green Walls and Roofs	$2 960
Rating Tools	$2 520
Total	**$14 690 excl. GST**

The above prices include authors corrections (avg 3 hrs per sheet).

All sheets will be produced as a template and then once finalised each sheet will be branded with each Councils logo and the IMAP logo for a generic set.

11. The remaining $238 of the budget will be used to cover printing costs, which we expect would cost between $500-600.00 for a once only run. We expect there to be an overspend of about $365.

Summary

12. That the Committee note the Action 9.2 approved additional funding of $20K in 2012/13 will be spent on graphic design/writing of 5 publicity documents as advised in the report including Melbourne Climate, Site Permeability, External Shading, Green Walls and Roofs and Ratings Tools.

Recommendations

13. That the IMAP Implementation Committee resolves to **note** the progress comments provided.

IMAP - Sustainability Strategy 9.2 as at 20 May 2013	
2011-12	Action 9.2 ESD
EXPENDITURE 2011-12	
4105 Printing	
Action 9.2 Abacus - SDAPP Rollaway Banner	350.00
Action 9.2 Murray Betts - Graphic design: Launch Banner artwork	240.00
Action 9.2 PMI - 125 Presentation Folders: Printing	1,539.00
Action 9.2 PMI - 125 sets of 10 Factsheets: Print and fold	545.00
Total Printing	2,674.00
4108 Stationery - General	
Action 9.2 ESD Brochure Holders for Launch - Reimb. S McKellar	52.39
Total Stationery	52.39
4150 Consulting Fees	
Action 9.2 Murray Betts - Design concept of ESD Factsheet template (1st payment)	2,550.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #4 *(Design layout, illustrations, finished art)*	3,095.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #2	2,425.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #1	2,250.20
Action 9.2 Murray Betts - Graphic design-ESD factsheets #3	2,683.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #5	2,795.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #6	2,489.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #7	2,648.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #9	2,525.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #10	2,060.00
Action 9.2 Murray Betts - Graphic design-ESD factsheets #8	2,685.00
Action 9.2 Murray Betts - Design/development of Factsheet folders, 4 versions *(Design & finished art, print ready file)*	2,350.00
Action 9.2 Murray Betts -Final invoice - Preparing files in 4 versions for output, some new illustrations, supply digital print files and web pdfs - Nos #1 to #10	4,026.00
Total Consulting Fees	34,581.20
Total Expenditure 2011-12	37,307.59
2012-13	
EXPENDITURE 2012-13	
4150 Consulting Fees	
Action 9.2 Murray Betts SDAPP Introduction factsheet #11	2,280.00
Action 9.2 Payment to CoPP - Reimburse Basecamp costs to date (not yet invoiced)	196.36
Action 9.2 Basecamp payment to Basecamp $24 x 12 months (Total $288) - Payment 1	23.81
Action 9.2 Basecamp - Payment 2	23.72
Action 9.2 Basecamp 10 months balance	240.94
Total Consulting Fees	2,764.83
Total Expenditure to date	**40,072.42**

Action 9.2 ESD Factsheets	
Original Budget $35,000	
Adjusted Budget $35,000 + 20,000 =$55,000 (Approved IMAP February 2012)	
Balance:	**14,927.58**
Quotes for Stage 2	
Melbourne Climate	2,960.00
Site Permeability	2,850.00
External Shading	3,400.00
Green Walls and Roofs	2,960.00
Rating Tools	2,190.00
Authors corrections (avg 3 hrs per sheet) and GST.	330.00
	14,690.00
Forecast Balance:	237.58

SDAPP – Fact Sheets

Sustainable Design Assessment
in the Planning Process

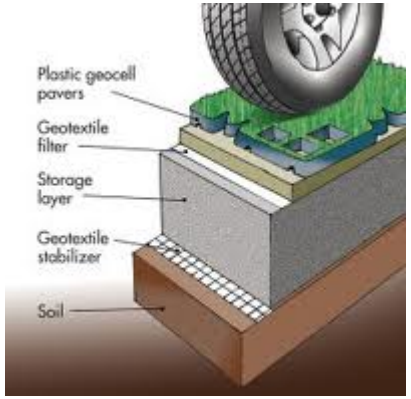
10 Key Sustainable Building Categories

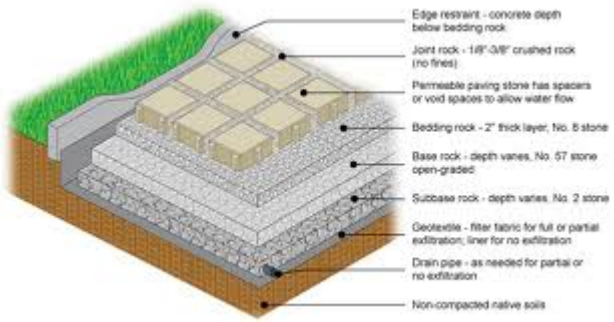
Inner Melbourne Action Plan
'Making Melbourne More Liveable'

SDAPP FACTSHEETS – SITE PERMEABILITY OUTLINE

SECTION	TEXT OUTLINE	EXAMPLES/GRAPHICS
Awareness: What is Permeable Paving?	Increasing densities in our urban environments have led to a dramatic reduction in permeable surfaces, through the construction of impervious roads, buildings and car parks. This lack of permeability increases stormwater run-off which in turn has capacity implications for drainage infrastructure and can degrade the water quality of Melbourne's rivers, creeks and ultimately Port Phillip Bay. Flooding in urban areas during storm events has also become common place, effecting not only infrastructure, but our homes as well. Many simple measures can be taken to counter-act this, and good building design should always consider ways in which site permeability can be enhanced or maintained.	USE 3D DIAGRAM FROM 1st PAGE OF FACTSHEET 4 ADAPTED TO SHOW FLOODING AND LACK OF INFILTRATION. Need to get a handle on when the landscape plan is actually required up front or post permit or at all.
Desire: How will consideration of site permeability benefit me?	Providing a contribution to your overall Water Sensitive Urban Design (WSUD) aims, enhancing or maintaining permeability on site can also: • Reduce the volume of peak-runoff which can cause localised flooding if local drainage infrastructure lacks capacity. Localised flooding can damage homes and property and greatly increase insurance premiums in certain areas. • Reduce the need for expensive upgrades to local stormwater infrastructure. • Reduce pollution of waterways and habitats • Increase infiltration to sub-soil and allow groundwater recharge. This will not only help maintain	

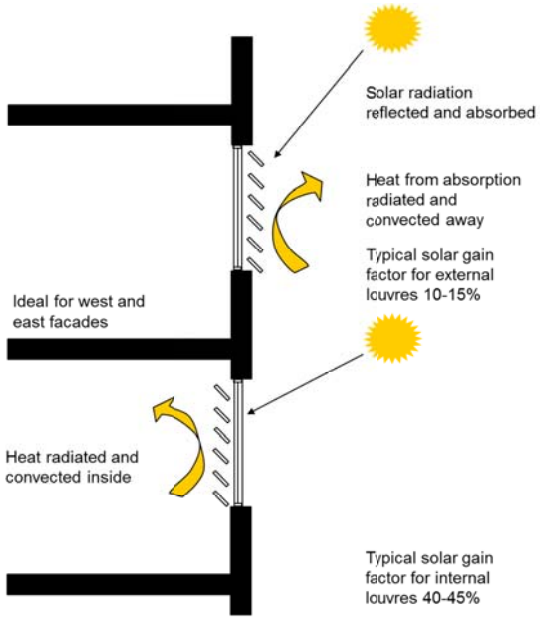
	groundwater supplies, but also aid local site ecology by ensuring sufficient water reaches tree root zones • Reduce downstream flooding and stream-bank erosion	
Knowledge: 1. How can I increase site permeability?	The simplest way to maintain your site permeability is to maximise areas where natural drainage can occur. These will include garden beds and lawn areas. However, where areas of hardstand, such as paving or driveways, are required, the type of treatment applied can greatly affect the overall permeability outcome. When selecting your treatment type, consider the following: GRAPHIC/TABLE RANKING MOST TO LEAST PERMEABLE 1. Garden bed/natural ground 2. Gravel with permeable sub-base layer or membrane 3. Decking – unmade ground below, or with permeable treatment. 4. Porous/permeable paving-Typically used where pavement is required to have a load bearing capacity such as: • Car parks • Driveways • Streets with low traffic volumes • Public squares 5. Concrete or brick pavers – spacing to allow drainage. If not possible, slope paving to drain to garden beds, swales etc. 6. Non-porous concrete, tarmac etc. – where porous/permeable paving cannot be applied, slope hardstand drainage towards swales and grassed buffer zones to reduce stormwater run-off.	Graphic could be like the bike parking stuff which includes table to delineate level of permeability for different ground treatments  

Knowledge 1. What specific measures – permeable paving	Whilst most increases in site permeability can be achieved without specialist treatment, in some situations measures such as porous/permeable paving will be required. For example, where the paving is required to carry a certain load capacity with a high frequency of use such as a car park. Porous or permeable pavements are load bearing structures comprised of a pervious base and sub-base, which allow the infiltration of water, and in some cases, retain polluting particles.	INSERT TYPICAL CROSS-SECTION/ IMAGES OF EXAMPLES.  Source:www.riversides.org  source: www.buildinggreen.com
2. Design Considerations/	Whilst use of permeable paving can have many beneficial outcomes, not all sites are suitable for its installation. In	

limitations	addition, lack of maintenance can lead to clogging which in turn reduces infiltration levels. Therefore, to ensure effectiveness of permeable paving, the following must be considered: • What is the primary design purpose? flood mitigation, water quality improvement, water conservation • Depth to groundwater table • Soil type • Soil depth • Type of traffic (weight and volume) • Slope • Design life • Maintenance and clogging • Local regulations Once site suitability is established, the following structural considerations should be made for permeable paving base and sub-base layer materials: • should possess adequate water storage capacity to be able to drain water without erosion or migration of fines • should possess adequate stiffness to carry full spectrum of traffic loads • should be capable of trapping and removing contaminants from draining water • should satisfy filter criteria which prevent movement of fines between bedding and base, base and sub-base or base/sub-base and subgrade	 Source: www.vdcgreen.blogspot.com.au
Ability: (Where can I find out more) Resources and Tools	Water Sensitive Urban Design: www.melbournewater.com.au	

	Sustainable Gardening in the City of Melbourne guide: City of Melbourne www.melbourne.vic.gov.au Sustainable Landscaping and a list of water saver garden centres: Department of Sustainability and Environment www.ourwater.vic.gov.au Stormwater management Education Programmes: Clearwater www.clearwater.asn.au Maintaining Water Sensitive Urban Design Elements: Environmental Protection Authority www.epa.vic.gov.au Permeable Paving Design tools: LockPave and PermPave software: www.cmaa.com.au Selection of WSUD materials: Ecospecifier www.ecospecifier.org Also refer to SDAPP Factsheet 4: Stormwater Management	
Reinforcement:	**Mandatory Requirements:** ARE THERE ANY? **Best Practice Standard:** Landscape design that maintains or enhances infiltration of stormwater on site Show on planning application drawings: • percentage site permeability • location of garden beds/lawns	

	• location and extent of paving/hardstand areas • type of paving and hardstand areas • Cross-sections for stormwater treatment type. E.g. permeable paving, raingardens etc. • Slope/direction of run-off from hardstand areas to garden beds, swales or buffers Information in reports – SDA/SMP: • Type of paving type proposed • Suitability for site conditions. • Maintenance regime	

Title	Sun shading	Possible / Example Graphics
Awareness: *of the need for change; e.g. a negative or positive. E.g household/ environmental fact .... did you know that ... xx% of .... do ....*	Traditional architecture relied on passive design approaches to provide comfortable indoor conditions. Since the second half of the 20th century, when technology became affordable and readily available, building design was able to rely on energy hungry devices, such as air conditioning and artificial lighting to provide the desired comfort. With energy becoming more expansive and showing the effects on our environment, Council encourages you to design buildings that thrive on passive design, rather than active appliances.	**Comparison of heat gains through different window treatments in summer** 
Desire: *to support and participate in the change; e.g. what is the benefit for ME? Save money? Improve comfort?*	Did you know that external sun shading can be up to 5 times more effective than internal shading? External shading devices protect the building envelope and reduce heat transfer through the building fabric, where internal shading devices can only deflect heat that has already penetrated the buildings fabric. Appropriately designed sun shading will not only support comfortable building temperatures but will help you save energy and money on the sizing and running of cooling and heating devices.	

Knowledge:

of how to change; basically the body of the Fact Sheet

Melbourne's climate requires building design that responds to changing summer and winter temperatures and high and low sun angles. Fixed or flexible external shading should protect your windows from unwanted heat gain in summer and allow for desired heat gain in winter. This Fact Sheets explains what to design sun shading for different facades and what else to consider.

External Shading

The graphic on the side shows how sun angles change, depending on the time of the year, the orientation and time of the day. Generally speaking, summer sun angles are high (up to 75°) and winter angles are considerably lower (up to 29°). Furthermore, mid day sun in the North is higher than morning or evening sun in the east and West.

Melbournes Sun Angles

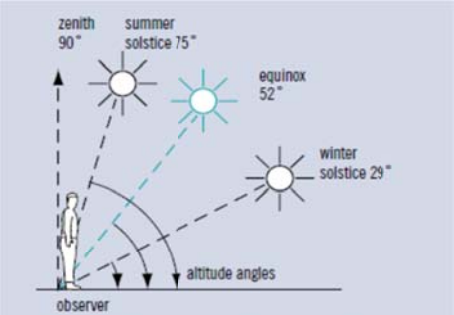
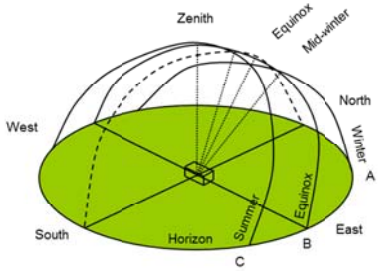


Figure 3.1: Solar noon altitude angles for Melbourne

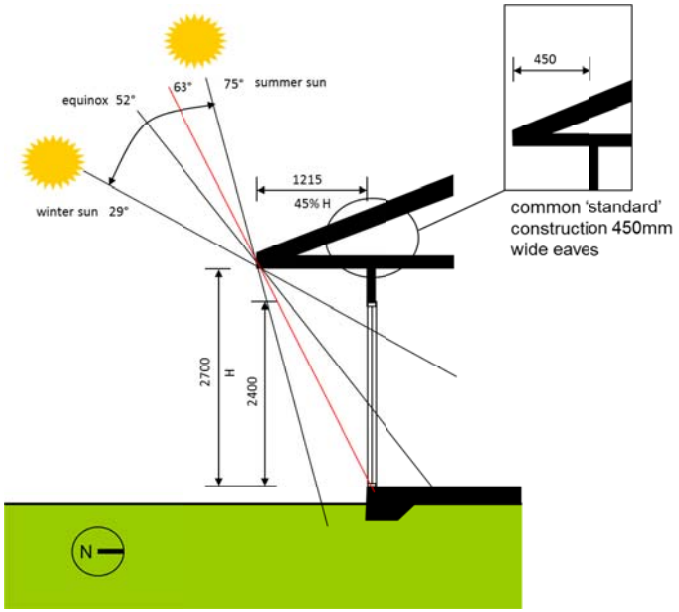


Sun path in Melbourne throughout the year

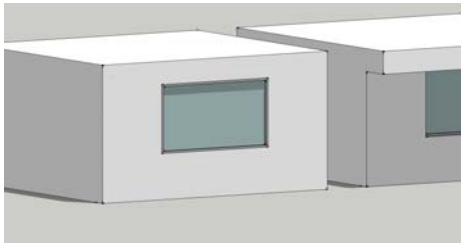
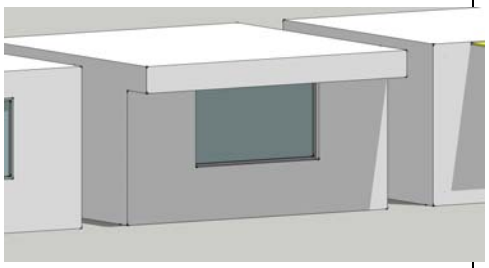
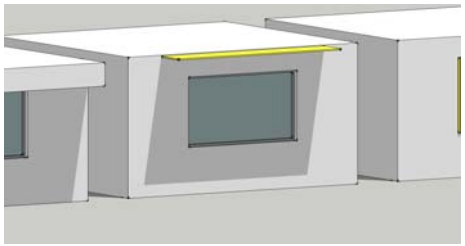
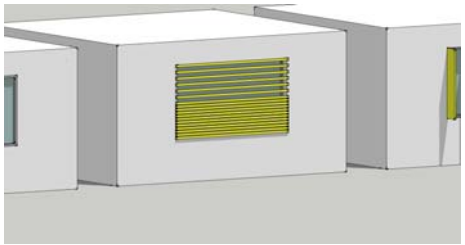
- **North:** Due to the sun's high angle in summer, shading can be horizontal and fixed. To provide full shading from late October to late February in Melbourne, the depth of the horizontal overhang should be approximately 45% of the vertical height to be shaded, measured from the sill of the window underside to the underside of the shading device. This depth represents an acceptable compromise between shading in late summer and direct solar gain in late spring, while allowing winter sun to penetrate fully. Furthermore, for horizontal shading to be effective, it should extend past the edges of the window for at least the same distance as its depth. Fixed horizontal shading can be provided through structures, such as eaves, awnings, pergolas and verandas. Adjustable external shading devices are also an option for north facing glazing, however they rely on the occupier understanding when to operate them for maximum benefit.

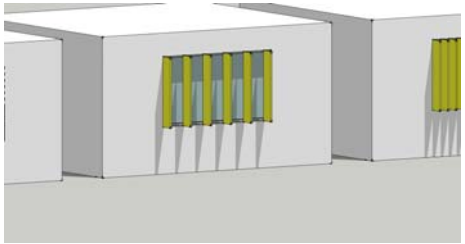
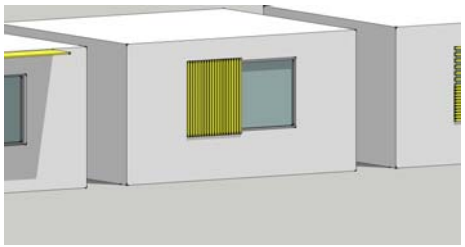
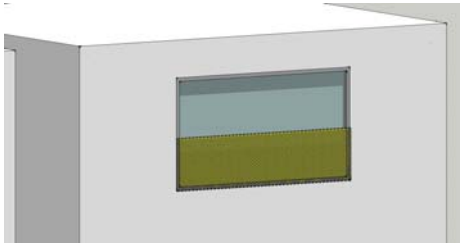
- **East and West:** Even in summer, eastern and western facades are exposed to relatively low sun angles. On 21 June (midsummer), eastern and western sun angles remain below 60°. Due to those low sun angles, normal fixed horizontal sun shading becomes ineffective. Alternatively, adjustable shading devices are recommended. These include canvas blinds, conventional or roller shutters, angled metal or timber slats and shade cloth over pergolas. The flexibility will allow occupants to respond to weather conditions and individual comfort levels. Furthermore, well

Rule of thumb for sizing north window overhang

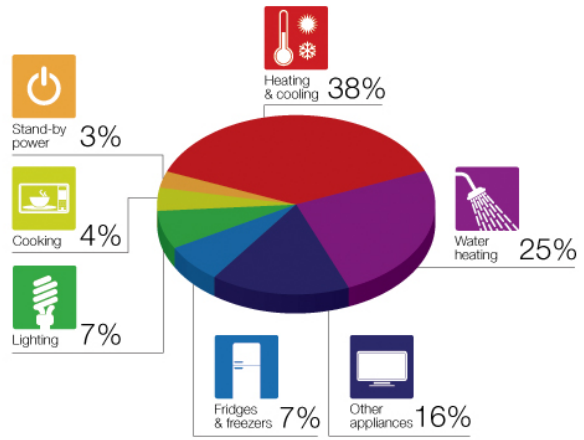


	designed flexible shading will contribute to a building's architectural appearance and meet occupant's privacy requirements. • **South:** In Australia, southern facades receive very little direct sunlight. Only very early and very late summer sun meets a southern facade, Therefore it is not required to provide external shading devices. Nevertheless, especially for working environments, internal glare protection should be provided.	

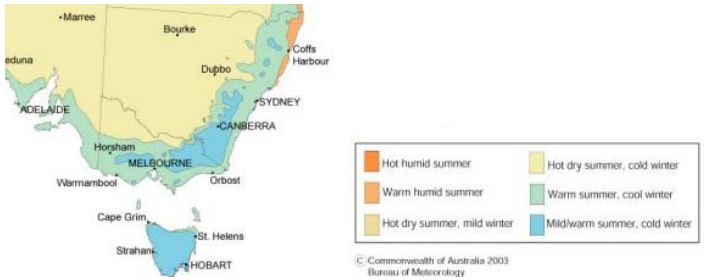
Shading Type	Description	Benefits and limitations	
	No Shading device Relies solely on the thermal performance of the window and glazing system to prevent heat transfer which is usually the buildings weakest point, internal blinds will be minimally effective.	Not effective **North** Good during winter Not good during summer **East and West** Good during winter Not good during summer	
	Integrated or 'built in' devices System is usually integrated into the design of the building such as an eaves, overhang or balcony which cant be easily removed and is considered within the overall design of the building.	- Fixed 100% effective - **North** Ideal if designed at 45% rule - **East/West** Ok is not optimal	
	Fixed horizontal projection Commonly fixed above the glazing to the buildings façade. If designed to the 45% rule for Melbourne it will effectively shade the glazing during summer and allow for the sun to penetrate through the building envelope in winter.	- Fixed 100% effective - **North** Ideal if designed at 45% rule - **East/West** Ok is not optimal	
	Fixed horizontal battens Timber, steel or aluminium rectangular sections placed at various spacings across the glazing and fixed to the façade of the building. Can be really effective if designed to the 45% rule for each batten.	- Fixed 80-100% effective Can prevent overlooking - **North** - Ideal if designed at 45% rule - **East/West** Ok is not optimal	

	Adjustable horizontal projection(s)	-	
	Fixed vertical fins Timber, steel or aluminium elements cover the glazing and are fixed to the façade of the building. Can work really well by providing shading from one direction ie on west facing glazing could block most west sun if placed on an angle. Spacings are important as protection will be at its least when sun is parallel to device angle.	- Fixed Can prevent overlooking - **North** Ok, wont protect glazing at optimal times - **East/West** Ok	
	Fixed vertical battens Timber, steel or aluminium rectangular sections placed at various spaces vertically across the glazing. Provide some level of shading but will not optimally protect the glazing at all times.	- Fixed Can prevent overlooking - **North** Ok, wont protect glazing at optimal times - East/West Ok	
	Adjustable vertical fins/battens Timber, steel or aluminium rectangular sections/ elements which run vertically across the glazing. Can be manually or automatically operated to protect the glazing at optimal times.	- Adjustable - **North** Up to 100% depending on operation - **East/West** Up to 100% depending on operation	
	Fixed perforated screens Timber, steel or aluminium perforated screens or meshes. These systems will provide varying levels of shading to the glazing which depends highly on their percentage of transparency. Some patterns are generic and some can be custom designed to suit different applications.	- Fixed Can prevent overlooking - **North** Up to 100% depending on transparency factor - **East/West** Up to 50% depending on transparency factor	

Ability: *to implement the knowledge; e.g. reference to further information and other organisations*	~~Sustainability Victoria – www.sustainability.vic.gov.au and www.resourcesmart.vic.gov.au~~ Building Guide – www.yourhome.vic.gov.au ~~Shading devices – www.ecospecifier.org~~	
Reinforcement: *to sustain the change; e.g. other factsheets in this series, register for Council's environmental newsletter.*	**Mandatory Requirements** BCA Part 3.12 and Section J shading to walls and windows. Overlooking in clause 54 and 55 Daylight requirements? **Best Practice Standard:** A window design that balances undesired heat gain in summer and desired heat gain winter and maximises daylight throughout the year. **Show on Planning Application Drawings:** External fixed and flexible shading devices, toned or clear glazing.	

Title	Melbourne Climate	Possible / Example Graphics
Awareness: *of the need for change; e.g. a negative or positive. E.g household/ environmental fact .... did you know that ... xx% of .... do ....*	Melbourne's climate is often referred as to having four seasons in one day (Crowded House even wrote a song about it). But how do you design buildings for a climate like this? Designing for the local environment means acknowledging Melbourne's climatic patterns including temperature variations, prevailing winds and rainfall patterns. It means orientating your building correctly, locating thermal mass where it can trap winter warmth and sizing rainwater tanks to get us through the drier months. Best practice building design should not only account for these climate variations, but use them to passively heat and cool the building, just as your wardrobe accounts for different seasons so should the buildings we inhabit….but it is a balancing act.	Key graphic is an overall one that depicts the design decisions that are either affected by Melbourne's climate or the design features that Melbourne's climate bring rise to. Secondary graphic may describe the key climate change impacts and what that might mean for design.
Desire: *to support and participate in the change; e.g. what is the benefit for ME? Save money? Improve comfort?*	A totally passive building is one which requires no heating or cooling but remains comfortable all year round. There are many benefits to passive design; **Liveability** – Avoid hot and cold spots by shading windows and eliminating drafts and have a home that is comfortable all year round. **Utility cost savings** – 38% of an average home's energy use is in heating and cooling, so designing buildings to limit the need for it can really pay off **Passively designed buildings are worth more** – purchasers and tenants are increasingly starting to recognise the benefits of lower ongoing costs and factor this into their up-front decision making. ***"I'm finding it increasingly difficult to sell apartments that are less than 7-star"*** **Melbourne based real estate agent** **Designing out infrastructure** – Designing buildings which offer protection from the summer sun, have the ability to passively cool and use ceiling fans can	**This is from Airsky wind** 

	completely design out the need for air conditioning in residential buildings, providing a significant up-front saving.	

Knowledge: *of how to change; basically the body of the Fact Sheet* **Understanding Melbourne's Climate**	Melbourne's climate has a temperate climate, dominated by cool to cold winters, warm to hot summers and only moderate rainfall fluctuations month to month. <u>Understanding temperature differences throughout the year.</u> A satisfactory indoor temperature is between 18° and 26° degrees. Melbourne's annual average temperature is 19.8°(well within this range). What this means is that if buildings can passively respond to these temperature variations, thermal comfort can be maintained without the need for significant heating and cooling. For more information on **thermal comfort** see the *Fact Sheet 1.0 – Indoor Environment Quality.* <u>How to protect your building from unwanted heat loss and gain</u> The keys to protecting your building from unwanted heat loss and gain include; • A well insulated building envelope – by specifying above standard insulation for floors, slabs, walls and roofs, more stable indoor temperatures can be maintained • Sealing the building well by eliminating draughts • Specify windows with a low U-factor (eg high quality double glazing) and ensure that window and door seals are installed correctly. <u>Thermal mass</u> Insert when I can get into the environmental design guide – this is a pretty tricky (and often contentious) one. During a hot summer's day, building structures absorb heat build-up from solar gain, electronic equipment and user	 Refer graph –should show rain days and average rainfall. Wind picture

	occupancy. The more thermal mass (i.e. polished concrete floors or brick walls) is exposed to the interior, the more heat can be stored. But just as a sponge that is absorbing water – at one point it cannot take any more. It needs to be wrung out, before it can absorb any more. By controlling the amount of direct solar energy striking your thermal mass it can be your friend in winter and summer. *"Reverse brick veneer is an increasingly popular construction technique which internalises the thermal mass allowing good reflection of summer heat gain off external cladding and internal warmth to be retained"* <u>Wondering how to utilise a summer's fresh breeze for passive cooling?</u> In Melbourne summers, when ambient temperatures reach up to 40°C, wind directions can change during the day delivering a cool change. Your facade design should be designed to capture this cool breeze and provides some passive cooling for the building. Refer wind direction pic For more information on **natural ventilation** see the *Fact Sheet 1.0 – Indoor Environment Quality* <u>Cooling down your building at night</u> As the external temperature drops on a warm summer's night, building structures can be cooled by opening windows and doors - often called night-cooling or night-purging. Given heat's propensity to rise the higher up in the building the better (skylights, thermal chimneys and clerestory windows are best). <u>The changing angle of the sun</u>	

	Melbourne's latitude is 37° south. This has important ramifications for the design of buildings, particularly eave width and shading options. In winter the sun angle is low in the north (XX°) which means that northern windows can allow good sun penetration into buildings to passively warm the home. In summer the sun angle is higher (XX° on December 22) which means a fixed eave or other structure over the northern façade can shade windows from unwanted heat gain. (Refer section diagram) **Shading** Western and eastern shading is essential most buildings types to minimise heat gain in a Melbourne summer. To ensure that winter gains can still occur adjustable shading such as awnings or shutters are best. **Melbourne's rainfall.** Melbourne has an annual rainfall of 650mm relatively evenly spread over the year and with some variation within various parts of Melbourne (western areas are considerably drier). This changes from year to year however; during 'el nino' southern oscillations the climate in south-eastern Australia is much drier and during la nina considerably wetter. There are however significantly more rain days in winter than in summer meaning our summer rain generally comes in bigger bursts. These variations should be considered when sizing rainwater tanks to reduce demand on potable water resources. For more information on **Rainwater reuse** see *Fact Sheet 3.0 – Water Efficiency*. **<u>Don't forget about the role of vegetation</u>**	

	As a temperate climate, Melbourne is able to grow a huge variety of different plants, which when combined with good building design can significant reduce heat loads in summer whilst protect them in winter. This includes green roofs, walls and facades as well as landscaping for seasonal heat control. For more information see *Fact Sheet 8.0 - Urban Ecology*. **<u>Our changing climate</u>** The impact of climate change will directly affect the performance of our building stock. Given the lifetime of a building is generally 50 years or more this has a significant impact on the way we design **now**. Alan's slide on cooling / heating loads. Localised direct impacts are likely to include; • Increase land and sea temperatures (Australia has already experienced an increase of 0.9° since 1950) • Further sea level rises (20mm per decade over last 5 decades), • A reduction in annual rainfall across south-eastern Australia • An increased number of extreme weather events (more heatwaves, bushfires and peak rainfall and wind events) Buildings which are designed passively for the local climate respond much better to temperature extremes, including higher expected temperatures through shading, natural ventilation and landscaping for seasonal heat control. Buildings which incorporate water reuse will respond better to future constraints on potable water.	

Ability: *to implement the knowledge; e.g. reference to further information and other organisations*	Bureau of Meteorology Historic Climate Data www.bom.gov.au/climate/ Climate statistics for Australian locations www.bom.gov.au/climate/averages/tables/cw_086071.shtml CSIRO – Climate change impacts Your Home Technical Manual EDG – Subscription required – but important reference I think ATA Tankulator Also refer to our Fact Sheet on Sun shading	
Reinforcement: *to sustain the change; e.g. other factsheets in this series, register for Council's environmental newsletter.*	**Mandatory Requirements** Meting BCA Energy Efficiency requirements. Note, these requirements are minimum necessary standards, not best practice standards. **Best Practice Standard:** A building design that not only accommodates but utilises Melbourne's changing climate. **Show on Planning Application Drawings:** • Solar orientation. • Landscaping near the building • Tank locations • Shading • External structures • Location of significant internal mass	
