THE CITY of THURINGOWA

THURINGOWA
CLIMATE-RESPONSIVE DESIGN OF RESIDENTIAL LOTS

Planning Scheme Policy

THURINGOWA

CITY of LIFE AND GROWTH

Design by: WWd, www.wwd.net.au

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1. INTRODUCTION



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Purpose of this Policy

The purpose of this Planning Scheme Policy is to support the Residential Planning Area Code in regard to applications for reconfiguration of residential lots (code assessable).

The Policy seeks to ensure that the development of residential lots:

- is responsive to the City's climate
- is responsive to the micro-climatic factors pertaining to the site
- provides sites on which future dwellings can be constructed which are capable of being climate-responsive and energy efficient, and capable of providing an acceptable level of thermal comfort for residents.
- encourages the use of passive rather than active climatic controls for dwellings

The term 'climate-responsive lot design' means the design of residential lots which enhances the scope for subsequent development of dwellings which are climate-responsive.

2. BACKGROUND INFORMATION

Background Information

This Policy should be read in conjunction with **Climate-Responsive Lot Design – Research Paper** and reference should also be made to **Planning Scheme Policy – Climate-Responsive House Design** and associated **Research Paper**.

Generally, the Policy requires that the following factors be taken into account in the design of residential lots:

- Solar orientation: the development of lots which allow dwellings to be built with optimum orientation for solar control and sunshading, and which allow dwellings to be built with roofs oriented to optimise use of photovoltaic and solar water heating facilities.
- The direction of natural air-flow, particularly summer afternoon winds from the NE and ENE (referred to below as "target winds")
- Local micro-climate and topographic effects (if any) of the site which modify standard characteristics
- The need to maintain, as far as practicable, air-permeability in the resulting built environment, with a preferred overall ratio of buildings to open space of 30% or less
- Minimisation of areas where wind shadow (air-flow skimming) will take place
- A street pattern which enhances rather than detracts from air-permeability
- Adaptation of the layout to utilise parks, drainage and other reserves to maintain air-permeability
- Avoidance of concentrations of small lots, fencing or other barriers perpendicular to target winds
- Assessment across the site of circumstances where down-wind distance from one barrier to the next is less than 7 times the height of the up-wind barrier
- Possibility of off-setting parallel side boundaries to reduce wind-shadow effects
- Use of building and access envelope plans and landscape plans to enhance climate-response
- Avoidance of 'build-to-boundary' features unless attached development is proposed. (Note provisions of Draft BCA Energy Code.)
- Use of attenuation distances rather than solid fencing for acoustic protection.

3. RELATIONSHIP TO RESIDENTIAL AREAS CODE

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This policy provides guidance on how residential lot design can address Performance Criterion P7 of the Residential Planning Area Code. Performance Criterion P7 requires residential buildings to be responsive to the City's climate by taking into account prevailing breezes and solar orientation. The following 'Standards for Climate Responsive Residential Lot Design' identify separate components of P7 and suggest probable solutions which address each component.

The performance criteria and acceptable solutions set out in the climate responsive housing design planning scheme policy address solar radiation and air movements. Standards set out below for climate responsive residential lot design include site design elements which will facilitate air movement through dwellings subsequently constructed on the lots, will provide lots capable of maximising shading of external walls from direct summer solar radiation, while at the same time facilitating the construction of roofs oriented for photovoltaic and solar water heating purposes.

4. STANDARDS FOR CLIMATE-RESPONSIVE RESIDENTIAL LOT DESIGN

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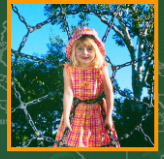
Component of Performance Criteria	Example of Possible Solutions
SOLAR ORIENTATION	
P7(C) Lot orientation is optimised for solar control and shading, and provides for optimum use of photovoltaic and solar water heating systems	**A1** Residential lots are oriented with long axes within 15° of north-south. Where east-west orientation is unavoidable or inappropriate, lots are proportioned to provide for appropriate building orientation (Illustrated - **Figure 1**)
AIRFLOW	
P7(C) Lot layout is responsive to target winds and facilitates air permeability	**A2** Where practicable parallel side boundaries are staggered (Illustrated **Figures 2** & **3**) **A3** Overall ratio of likely building area to private open space does not exceed 35% **A4** Generally, the layout minimises the areas where wind shadow (air skimming) is likely to occur **A5** The layout avoids concentrations of small lots, fencing or other barriers perpendicular to the target winds **A6** Where barriers exist perpendicular to target winds, the distance between a down-wind barrier or receptor and the up-wind barrier is not less than 7 times the height of the up-wind barrier (Illustrated **Figure 3**) **A7** Building access and envelope plans support climate-response **A8** 'Build-to-boundary' provisions in access and envelope plans are capable of being built in compliance with the BCA provisions for Climate Zone 1
P7(C) Street layout shall be responsive to target winds and facilitate air permeability	**A9** The street pattern provides for flow of target winds through the development **A10** Generally the layout is adapted to utilise parks, drainage and other open features to maintain air-permeability
LANDSCAPING	
P7(C) Landscaping where proposed as part of the lot layout is responsive to climate	**A11** Landscaping up-wind of residential lots is of a type which does not impede natural airflow **A12** Fencing up-wind of residential lots is air-permeable. Where acoustic buffering is required, this is provided by attenuation distances rather than solid fencing





5. ADDITIONAL INFORMATION COUNCIL MAY REQUEST

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Council may request specific information to assess the ability of a proposal to address the development standards listed above.

The type of information Council may request includes:

- Diagrams which illustrate the path of the summer sun over the development together with an indication of the shading provided by existing or proposed features such as landscaping
- An airflow diagram indicating the probable path of target winds over the site, and an indication of locations where air-flow attenuation is likely to occur
- A landscaping concept plan which identifies the location of proposed plantings of trees and shrubs and the type and species of trees to be planted.

6. FIGURES

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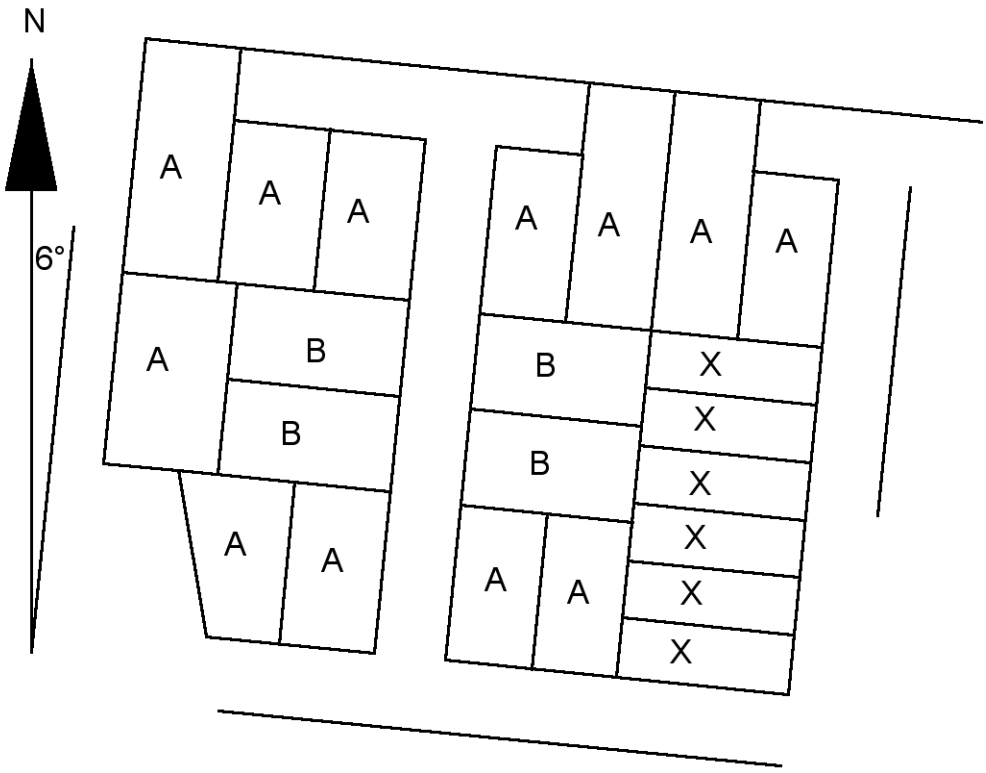
FIGURE 1 - ORIENTATION

On the below plan, the lots marked A are within +/- 15° of north, and are capable of containing a dwelling with an optimal solar aspect. Lots marked B are oriented east-west, but are wide enough to provide for appropriate orientation. Lots marked X have an adverse orientation, and provide little scope for adaptation.



FIGURES

Figure 2 - Airflow and Barriers

Lots with offset side boundaries tend to produce a smaller wind shadow.

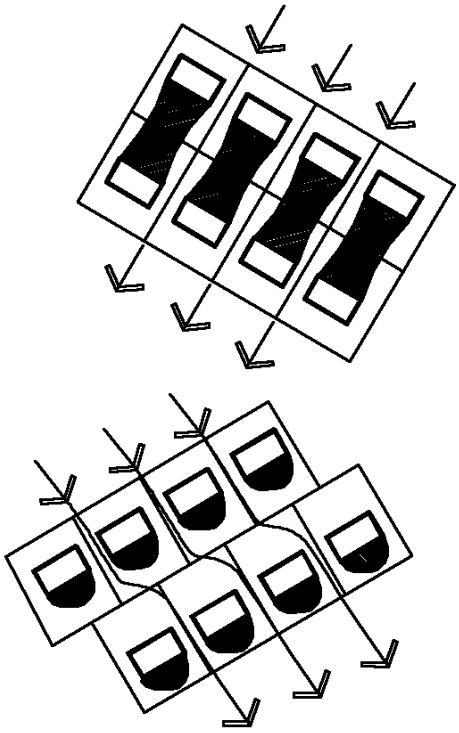
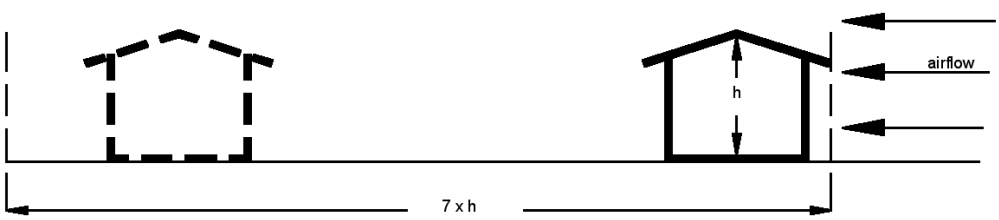


Figure 3 - Airflow and Barriers

Research confirms that long horizontal barriers perpendicular to airflow, such as solid fencing or continuous building lines, attenuates airflow for a horizontal distance of seven times the height of the barrier. Where a second barrier occurs airflow continues to 'skim' and does not return to the unimpeded pattern for the same seven-times-height distance.





7. USEFUL REFERENCES

7

The following references provide further background and supporting information relating to energy efficient housing and lot design.

Thuringowa City Council, 1999, *Turning Down the Heat*, City of Thuringowa Urban Design Forum Papers, TCC

Koenigsberger, o et al., 1973, *Manual of Tropical Housing and Building*, Longman, London UK

Szokolay, S, 1987, *Thermal Design of Buildings*, University of Queensland

Thuringowa City Council, 2000 - *Thuringowa 2000 - Residential Strategy and Planning Guidelines* - Final Report

Reardon, C et al, 2001, *Your Home: Your Future Your Lifestyle*, Commonwealth of Australia

Lee, Su San 1998, *Natural ventilation and medium density house forms in the tropics*, PhD Thesis JCU

Aynsley R & Gulson L 1999, *Microclimate and Urban Planning in the Humid Tropics*, RAPI National Congress paper.

Aynsley R & Potangaroa R 1998, *Natural Ventilation; Dealing with the Unpredictable*, ANZASCA Proceedings Wellington NZ

Aynsley R 1999, *Estimating summer wind driven natural ventilation potential for indoor thermal comfort*, Journal of Wind Engineering and Industrial Aerodynamics.

[Various] 2000, *Solar Access for Lots Review*, Solarch, Sustainable Energy Development Authority, Sydney

SquareOne 2002 (Dr. A Marsh and C Raines Environmental Design), Website and various articles, UWA Perth/Welsh School of Architecture Cardiff.

Brown R 1985, Allotment Orientation and Shape for Solar Access and Energy Conservation, in Planning Practice - Selected Queensland Papers UQ 1987

WEBSITES

www4.tpg.com.au/users/mclark
(Building and Urban Design in the Tropics)

www.greenhouse.gov.au/energyefficiency/building/index.html
(Resources - Federal Greenhouse Office)

http://www.bom.gov.au/climate/environ/design/design.shtml
Bureau of Meteorology - Sustainable Urban Design and Climate

www.greensmart.com.au
HIA/Pathe Greensmart initiative.


Balgal Beach
Toomulla
Toolakea
Bluewater
Saunders Beach
Bluewater Park
Yabulu
Bushland Beach
Mt Low
Burdell
Blue Hills
Black River
Jensen
Shaw
Lynam
Gumlow
Hervey Range