TWEED SHIRE COUNCIL

A9 - ENERGY SMART HOMES POLICY

TWEED SHIRE COUNCIL | TOGETHER FORWARD

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A9 – ENERGY SMART HOMES POLICY

A9.1 INTRODUCTION

A9.1.1 Aims of this Section

- Optimise solar access to residential land and buildings.
- Improve the quality and energy efficiency of residential subdivisions and buildings.
- Assist professionals, technicians and trades persons by providing relevant information, and resources in relation to energy efficient design.
- Foster partnerships between the Council, State government and the building industry.
- Provide detailed provisions to ensure that energy efficient residential development occurs within Tweed Shire.

Promote and create homes which:

- Use less non renewable energy.
- Use energy more efficiently.
- Are more comfortable to live in.
- Contribute positively to an overall reduction in greenhouse gas emissions.
- Minimise environmental pollution.
- Cost less to run.
- Are affordable to purchase.

A9.1.2 Land to which this Section applies

This Section applies to all land in Tweed Shire. It applies to all development applications for:-

- Residential subdivision in zones 2(a), 2(b), 2(c), 2(d) and 2(e)
- Dwelling houses in all zones
- Multi dwelling housing in all zones
- Alterations and additions to dwelling houses and multi dwelling housing in all zones.

Alterations and additions to existing dwellings can benefit the energy efficiency and comfort of the whole dwelling, even if the existing dwelling components are not upgraded to improve their energy efficiency. Where major alterations and additions occur, the existing dwelling can often be upgraded in the process to achieve a higher overall level of energy efficiency.

A9.1.3 How does this Section relate to other Sections and Environmental Planning Instruments?

Within Part A

This Section is generally consistent with the other Sections from Part A of this DCP. Where there is an inconsistency then the higher standard/requirement shall prevail.

Between Part A and Part B

In the event of any inconsistency between this Section and a Section from Part B of this DCP, the provisions of the Section from Part B shall prevail.

To encourage good design and to comply with Council's Policies, it is important that this Section be used in conjunction with the various other Sections and Policies for Tweed Shire and which may be relevant to a particular development. These include the following:

Section A1 - Residential and Tourist Development Code

Section A5 - Subdivision Manual

A9.1.4 What does 'Energy Smart' mean?

Energy efficient homes are homes that, through their design, construction and choice of appliances, maximise use of renewable energy sources (such as sunshine), and use less energy more efficiently. They are 'smart' because they simultaneously help preserve scarce resources, reduce the level of greenhouse gas emissions, and provide significant savings. This is supported by a recent study by the Australian Consumers Association (July 1997) which estimated that an energy efficient home is almost $1,000 a year cheaper to run than an average new home.

An energy efficient dwelling incorporates passive solar design principles to minimise household energy needs. These principles apply to services such as lighting, heating in winter and cooling in summer. Passive solar design principles minimise energy use by combining and balancing the effects of building design, orientation, shading, insulation, thermal mass, ventilation and landscaping to create comfortable internal living spaces.

Where the optimum use of passive solar design principles cannot be achieved due to existing physical conditions, this policy seeks to ensure that energy efficiency is maintained where possible.

A9.1.5 Why Energy Smart Homes?

This Section has been developed in response to the growing community desire to achieve greater efficiency in domestic energy use. It stems from a general concern about greenhouse gases generated by energy use, their effect on the environment and in particular, their contribution to global warming.

This Section shows how energy efficiency can be achieved in all new residential subdivisions and buildings, including alterations and additions to existing dwellings. It includes design alternatives — such as passive solar design — that will dramatically reduce the demand for non-renewable energy, thus reducing both costs and air pollution, and increasing the level of comfort in the average Australian home.

A9.1.6 How to use this Section

Instructions on information that must be submitted with any development application are contained in Section 2.1.

In preparing an application for development there are a number of specific steps that should be followed:

Step 1: Determine what information must be provided with your development application in regard to this Section and energy efficient design (Clause A9.2).

Step 2: Establish what other Sections or Policies apply to the site (Clause A9.1.3).

Step 3: Familiarise yourself with the Background Principles, Objectives and Preferred Outcomes of this Section (Clauses A9.3 – A9.5). It is these components that will be used by Council to assess the merits of any development proposal for land to which this Section applies.

Step 4: Discuss your final application with Council staff then lodge it for determination. Compliance with the provisions of this Section does not necessarily imply that Council will grant consent to an application.

The energy efficiency ratings are calculated by using either the 'Deemed to Comply' checklist or the Scorecard, both of which are available from Council, or by NatHERS certification.

A9.2 COMPLIANCE REQUIREMENTS

A9.2.1 Information to accompany application

The specific information that must be submitted with any development application is shown in Table 1 below. The 'Deemed to Comply' checklist and Energy Smart Scorecard are both available from Council. Details concerning NatHERS certification are provided in Section 2.4.

Table 1 - Information to Include with Development Application

DEVELOPMENT PROPOSED	REQUIRED COMPLIANCE DETAILS	DETAILS TO BE PROVIDED ON PLAN	DESIGN SPECIFICATIONS REQUIRED
Dwelling house	Deemed to Comply checklist OR Part A of Energy Smart Building Scorecard OR NatHERS certificate PLUS Part B of Energy Smart Building Scorecard	Site Analysis (not required for minor ground floor additions) True solar north point Floor plan layout Passive solar elements Cross ventilation elements Shadow diagrams (if required by Council) Clothes drying areas	Thermal mass elements Insulation type, rating Window areas; N, S, E, W walls Window shading elements Construction materials and colours Mechanical ventilation Water saving devices
Multi-dwelling housing	NatHERS certificate of Energy Smart Building Scorecard for typical dwellings PLUS An Energy Performance Statement (see Section 2.3 below for details)	Site Analysis True solar north point Floor plan layout Passive Solar elements Cross ventilation elements Shadow diagrams	Thermal mass elements Insulation type, rating Window areas; N, S, E, W walls Window shading elements Construction materials and

DEVELOPMENT PROPOSED	REQUIRED COMPLIANCE DETAILS	DETAILS TO BE PROVIDED ON PLAN	DESIGN SPECIFICATIONS REQUIRED
		Clothes drying areas	colours Mechanical ventilation Water saving devices
Subdivision	Energy Smart Subdivision Scorecard	Site Analysis True solar north point Contours Building height envelopes Solar access star rating for each lot Lot sizes and dimensions Transport links, access	Schedule of lots showing percentage yields of 3, 4 and 5 star rated lots

A9.2.2 How to determine compliance

Compliance is to be determined by each application satisfactorily addressing the Objectives and Preferred Outcomes of this Section and meeting the minimum energy rating standards provided in Table 2 below. Designs are given a rating from one to five stars. The most energy efficient design is given a five star rating. The Assessment of a development's energy rating standard will require the completion of either a 'Deemed to Comply' checklist, an Energy Smart Scorecard (both available from Council) or NatHERS certification (see Clause A9.2.4), or a combination of the latter two options. The star rating system is explained on the scorecards. The 'Deemed to Comply' checklist will ensure a minimum rating of 3.5 stars. NatHERS and the scorecards are not prescriptive about which energy efficiency features are required, thereby retaining maximum flexibility for designers.

Table 2 - Minimum Energy Ratings

DEVELOPMENT PROPOSED	COMPLIANCE REQUIREMENTS
Dwelling house	*Completion of 'Deemed to Comply' checklist* *OR* *Completion of Part A of the Energy Smart Building Scorecard. The minimum score to be achieved in each Part is 3.5 Stars.* *OR* *A certificate from an accredited certifier showing a minimum NatHERS or equivalent rating of 3.5 stars.* *In all of the above cases:* *Water supply: At least AAA rated water efficient shower heads, toilets and aerators on bathroom hand basins and kitchen sinks* *Clothes Dryers: 3.5 star rating or greater (star rating as shown on product)*
Multi-dwelling Housing	*A certificate from an accredited certifier showing a minimum NatHERS rating of 3.5 stars.*

DEVELOPMENT PROPOSED	COMPLIANCE REQUIREMENTS
	Ratings are to be provided for each typical layout and thermal exposure condition eg. ground floor; middle floor, top floor, corner and middle units etc. *Water supply and Clothes dryers: As for Dwelling house above*
Subdivision	*Completion of Energy Smart Subdivision Scorecard.* *80% of all lots shall achieve a five star rating with the remainder achieving a minimum of 4 or 3 stars.*

A9.2.3 Energy Performance Statements

Multi-Dwelling housing development applications must be accompanied by a satisfactory Energy Performance Statement (EPS). The EPS is required to demonstrate how the intent of this Section has been met and evaluate the performance of the proposal in relation to (but not necessarily limited to) the following issues: -

1. The energy ratings of the typical units and the justification as to why those units chosen are considered to be 'representative'.
2. What levels of solar access have been achieved for:
   a) north facing windows.
   b) clothes drying areas.
   c) private open space.
3. Energy efficiency influences on the design in general.
4. Energy efficiency influences on landscape design.
5. Overshadowing of adjoining land and buildings.
6. A summary table of key information as required under Table 1 - 'Information to include with Development Application'.

An Energy performance statement is to be certified by a NatHERS accredited certifier.

A9.2.4 NatHERS Certification

A range of computer software tools has been developed in Australia to simulate and rank building thermal performance across a wide variety of climatic zones and building types and configurations. NatHERS (or its equivalents — refer to Definitions) is a sophisticated thermal modelling tool designed for use by experienced professionals, industry personnel and Council staff.

It is not expected nor intended that all applicants will use the NatHERS simulation program. NatHERS certification is only required to be supplied by the applicant under this Section of the DCP in the following circumstances:-

1. If the application is for multi-dwelling housing.
2. If an applicant's submitted Energy Smart Scorecard Rating is challenged by Council officers and the applicant disagrees with Council's assessment.
3. If Council requires it (eg if the proposed design is particularly complex).

NatHERS certification can be determined by accredited third party assessors within the building industry or other appropriately qualified assessors as determined by Council, as well as accredited Council officers. A list of accredited assessors is available from Tweed Shire Council upon request.

A9.2.5 Exemptions from Policy

Dwelling houses and Multi-dwelling housing

There are eight conditions under which an exemption can be claimed from the minimum energy performance requirements for dwelling houses and multi-dwelling housing. Where one or more of the conditions apply, approval is subject to merit assessment by Council. Compliance with those elements that can be reasonably complied with will still be required.

Exemption conditions:

1) Block geometry - orientation, width or shape of block such as to preclude the northerly orientation defined as 20^{o} west of north to 30^{o} east of north.

2) Block overshadowing - the adverse slope of a block, existing obstruction or planned or existing development resulting in overshadowing of northerly windows, private or communal open space, or clothes drying areas.

3) Block topography or geology - slope drainage or geotechnical constraints such as to preclude slab-on-ground type construction.

4) Novel construction - where the prescribed assessment techniques do not address or reliably assess the performance of the construction being adopted and there are prima facie grounds for believing the prescribed techniques significantly underestimate the construction's performance.

5) Conflicting guidelines - existing lease and development conditions, other Sections of this DCP, Australian Standards or any other Policy or Guidelines that Council determines will have priority over this Plan eg. heritage requirements, which preclude the attainment of the minimum rating requirement.

6) Uneconomic requirements - where it can be demonstrated that the attainment of the 3.5 star rating would require additional expenditure which is not cost effective within a five year period.

7) Adverse impact on material amenity of adjoining land and buildings.

Subdivisions

In certain situations, various factors may preclude full compliance with the subdivision provisions of this Section. It is acknowledged that solar access is one of many factors to consider in the design of new subdivisions. Other important factors include:

Environmental constraints, such as topography, geo-technical stability, location of waterways and environmentally sensitive areas;

Service constraints, such as drainage paths, sewer and water lines, road grade requirements;

Urban design constraints, such as relationship to existing street patterns, location of existing public reserves.

Subdivision exemption conditions:

In circumstances where it can be proven that constraints such as those mentioned above make full compliance with the energy smart provisions of this DCP impractical or unachievable, Council may approve the application on a merit basis. However, in such cases, the applicant must satisfactorily demonstrate a commitment to the aims and objectives of this Section and detail measures taken to off- set the areas of non-compliance.

A9.3 SUBDIVISIONS

Background Principles

Subdivision design is about manipulating the key variables of lot aspect, shape and density in combination with site characteristics such as topography and slope, to achieve an optimum mix of appropriately sized and oriented lots. Design should also facilitate and promote pedestrian access, bicycle use and public transport. Such measures will reduce the amount of energy required for transportation purposes.

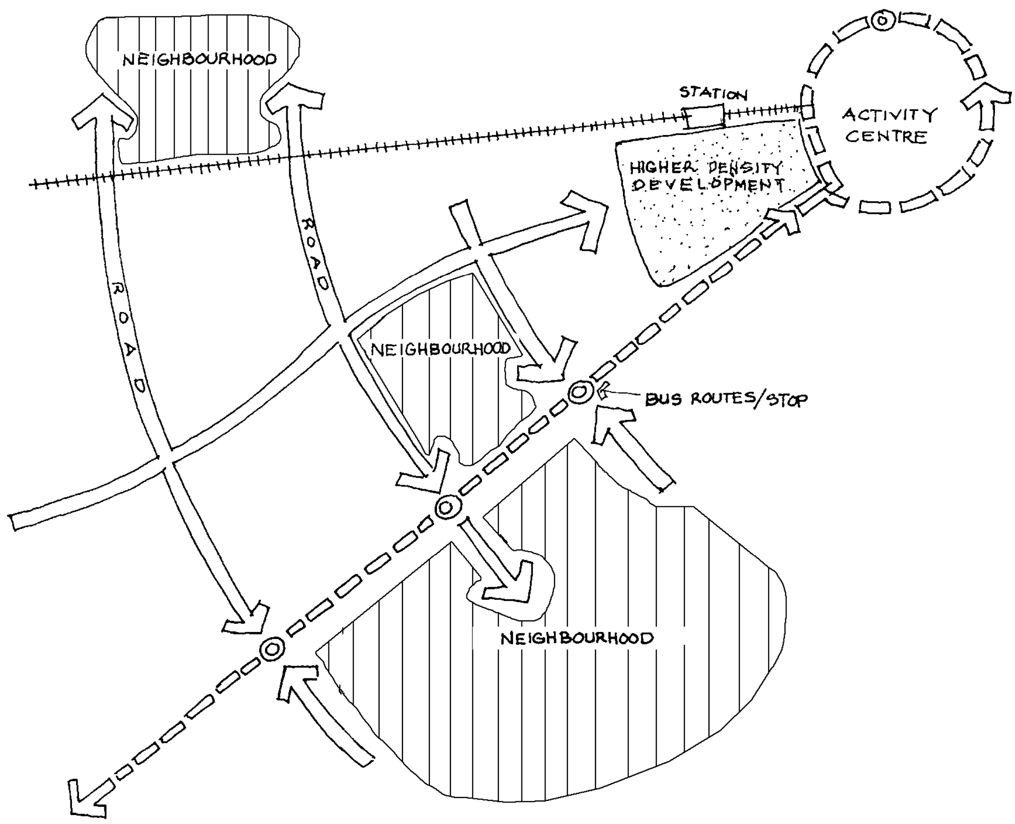


Figure 1: Subdivision layout to encourage walking, cycling and public transport

A solar efficient subdivision will ensure that the overall development is significantly more energy efficient than a conventional subdivision. The appropriate alignment, shape and width of lots will facilitate the establishment of residential development which can optimise solar access.

To protect solar access to each lot, solar setback lines and building envelopes can be nominated. Solar access can be protected indefinitely, provided that future residential development complies with Clause A9.4.2 of this Section - Orientation and solar access.

Objectives

- Maximise solar access through the appropriate design and orientation of roads and lots.
- Encourage walking, cycling and the use of public transport.
- Minimise energy required for street lighting.

Preferred Outcomes

Street orientation

- Align streets east-west and north-south wherever possible
- North-south streets should be within 20^{o} west and 30^{o} east of true north
- East-west streets should be within 30o degrees south and 20o north of true east.

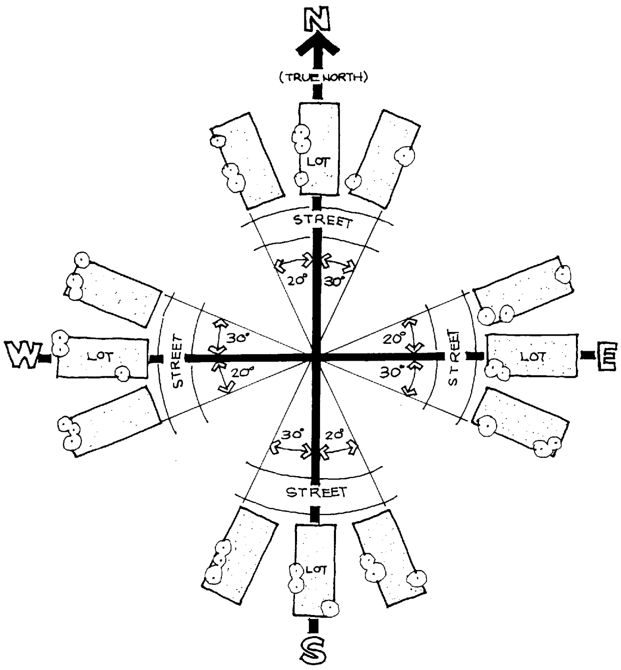


Figure 2: Street orientation for maximum solar access

Lot orientation, size and shape

- Lots should be oriented so that one axis is within 30^{o} east and 20^{o} west of true solar north.
- North-facing slopes improve opportunities for solar access; small lots are therefore best suited to north-facing slopes with gradients of less than 15% (or 1:9).
- South-facing slopes impose a penalty on solar access; therefore, large lots/lowest densities are best suited to south-facing slopes or other areas where solar access is poor.

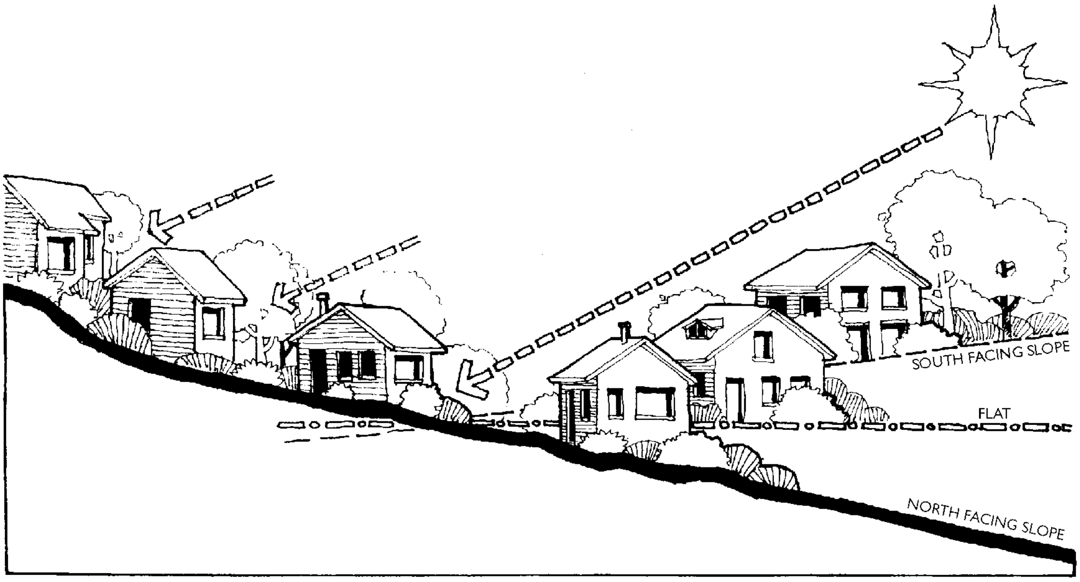


Figure 3: Topography and solar access

- The north side of east-west aligned streets is suitable for narrow lots.
- Lots aligned on an east-west axis generally need to be wider than lots aligned on a north-south access, to prevent undue shadow effects on lots to the south.
- Where streets are within the acceptable orientation range, use rectangular shaped lots.
- Sloping sites are not as suitable as flat sites for smaller lots.

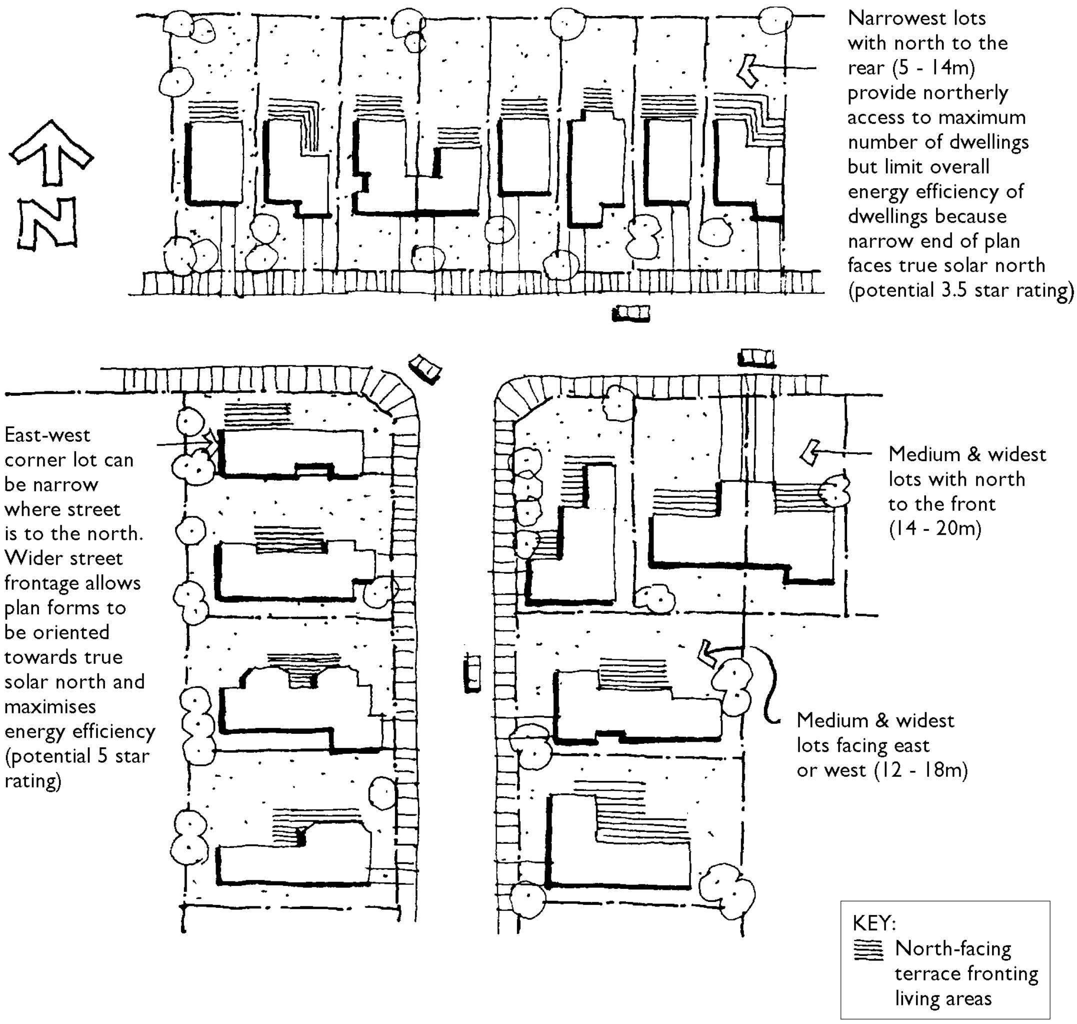


Figure 4: Lot orientation and width

Access

- Footpaths are designed to access public transport routes.
- Subdivision design includes: clearly marked bicycle network; marked kerbside bike lanes, dedicated cycleways, links to regional cycleways.
- Subdivision design should maximise the ability to travel directly between any given destination and origin.

Public Transport

- Subdivision design should allow for circuitous public transport routes and maximise the number of lots within a short walking distance of potential public transport routes.
- Suitable areas for bus stops and layback areas should be identified.
- Long cul-de-sacs should be avoided as these reduce accessibility to public transport.

Setbacks

- Variable setbacks and zero lot lines are a means of maximising solar opportunity, especially with small or narrow lots. Setbacks are manipulated to maximise solar access for all lots (see Figure A9-4).

- Preferred setback lines can be shown on subdivision plans, to help builders, designers and home buyers make the best use of solar energy.

Street lighting

- Locate street lights in suitable locations so as to minimise the overall need for street lights.
- Consider the incorporation of solar powered street lights.

A9.4 BUILDING PRINCIPLES

A9.4.1 Site Analysis

Background Principles

Where solar access is constrained by existing development or vegetation, a site analysis is required to be submitted in accordance with this Section of the DCP.

Site analysis involves consideration of a range of environmental factors that will influence the site and the building/s to be developed on it. These factors may well be both internal and external to the site. The complexity of the site analysis will depend on the size and complexity of the project.

For small alterations and single residential infill projects, a simple annotated plan/diagram showing key site characteristics including true solar north, and relationships to existing trees, buildings and streets may be all that is necessary. For larger sites, a complete analysis including infrastructure will be required.

Objective

- To optimise solar access to new and existing development by analysing the existing site conditions and the site's relationship to adjoining land and development.

Preferred Outcomes

- A typical site analysis diagram will include the following details:
- Physical characteristics of the site, such as slope, drainage etc.
- Site context: such as adjacent buildings or structures affecting the site, relationship of the site to the street, identification of key features (views, orientation, etc.).
- The overshadowing caused by existing buildings, on or adjacent to the site.
- The orientation of true solar north, and a range of 30^{o} east and 20^{o} west of true north.
- Trees on or affecting the site, identifying location, type, size and condition.
- Prevailing seasonal winds, sun and shade characteristics.

A9.4.2 Orientation and Solar Access

Background Principles

Solar access is the term applied to the ability of a solar collector that is part of or situated on a dwelling or lot (including open space and clothes drying area) to capture sunlight and take advantage of that energy to a reasonable level.

Design for solar access can begin with the design of a subdivision, but it may also relate to a rooftop solar hot water system panel or might involve preserving sunlight for the northern windows of a dwelling. If residential lots have been designed to maximise solar access, energy efficiency is much easier to achieve in the design of subsequent residential buildings.

Conflicts can arise in already developed areas, where tall buildings exist or are planned, or where trees block solar access. Situations such as these will require careful site analysis (as discussed in Clause A9.4.1) to be undertaken.

Solar access is at its lowest level on the mid-winter solstice, 21 June. Shadow diagrams for the winter solstice at 9am, 12 noon and 3pm must be submitted for all developments that have the potential to impact on the solar access of an adjoining property (see Information to accompany application, Clause A9.2.1). This is particularly relevant for dwellings comprising of two or more storeys.

Passive solar design maximises solar access to north facing solar collectors. For maximum effect, solar collectors should face between 30^{o} east and 20^{o} west of true solar north. The 20^{o} West and 30^{o} East range for 'north-facing' elements represents the limits to energy efficient orientation. Any further variance to these angles will have a significant impact on energy consumption and comfort levels and would not be in compliance with this Section of the DCP.

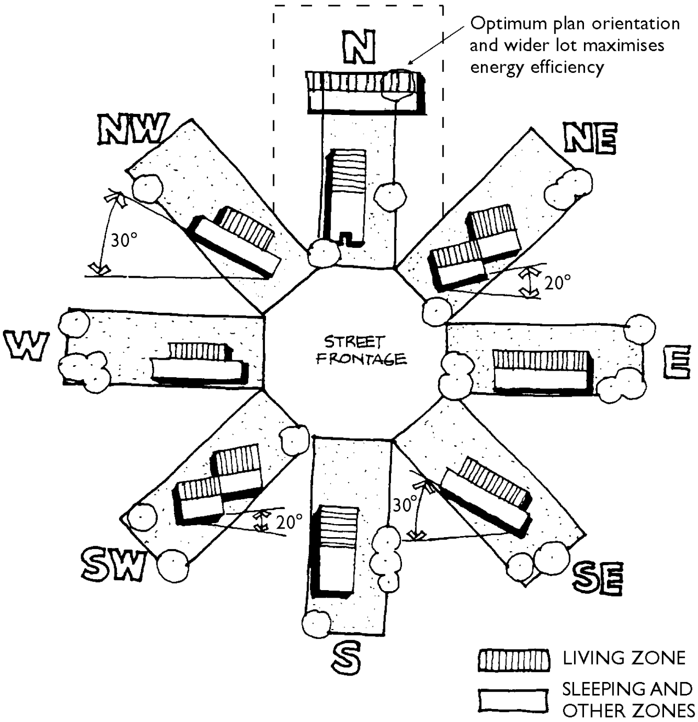


Figure 5: Solar access and building orientation principles

Objectives

- To preserve solar access to north facing 'solar collectors' (collectors include windows, photovoltaic cells, solar hot water/air panels, clerestory windows etc.) in all residential development.
- To allow for adequate solar access to private open space and clothes drying facilities in all residential development.

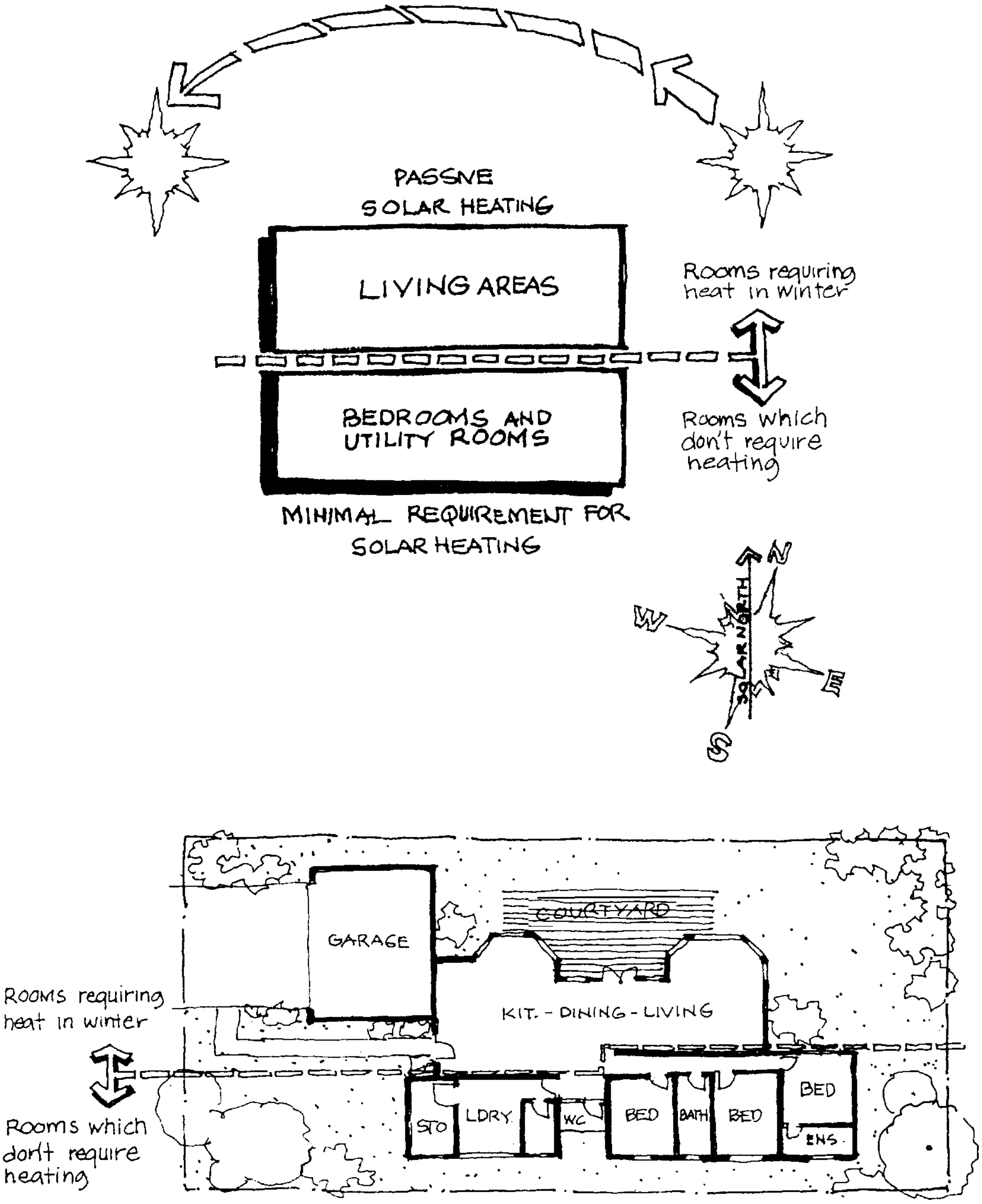
- To maximise the thermal performance, thermal comfort, and energy efficiency of all new residential development.

Preferred Outcomes

- Solar collectors face between 20^o West of North and 30^o East of North and receive direct sunlight for 2 hours on June 21.
- Step building heights, plans and setbacks to permit solar access requirements.
- Full solar access is to be maintained to solar hot water or photovoltaic panels. In the absence of existing solar hot water panels, provision must be made for future installations.
- Position solar collectors in areas where no shadows fall (determine through site analysis). Two hours of direct sunshine is received by 50% of north facing solar collectors designed/installed under this Plan (see Definitions).
- Where existing constraints exist (eg. adjacent buildings or trees), it is possible to upgrade the building envelope specifications or daylight design to partially offset the lack of heat gain and direct sunlight, eg. by installing high performance skylights, slightly larger high performance or double glazed windows and/or higher insulation levels (see Scorecard).
- Dwelling orientation: Design dwelling specifically for its site, ie. locate northern wall to maximise solar access, and orient one of the building's axes between 30o east and 20o west of true solar north (see Figure A9-5). Where this is not possible in existing subdivisions, provide properly shaded north facing glass to living areas and maximise solar access by the use of site analysis including existing shadows diagram.
- **Living zones** (eg. lounge, family, dining, kitchen) are generally the most heavily used, therefore are located on northern side, for maximum thermal comfort. When rating the design, the most used Living area/s should be assessed if more than one is proposed. When considering the orientation of the long direction or axis of north facing living areas, scores can be partially awarded for the proportion of total living areas facing north.
- **Bedrooms:** have different thermal comfort requirements and can be located on the southern or eastern sides. Bedrooms used for play or study may be located on northern side.
- **Service areas** (eg. bathroom, laundry, walk-in robe, garage) are usually located on southern or western side. Minimal thermal comfort requirements. Service areas and kitchen are clustered to minimise hot water pipe runs.
- **Circulation zones** (eg. entry, corridors, halls) have minimum thermal comfort requirements; will not generally benefit from solar access, but can impact on other zones if they are open between those zones (see Figure A9-6).
- **Building setbacks:** Distances between buildings are sufficient to allow solar access to major dwelling windows.
- **Window orientation:** The proportion of north-facing (30^o east to 20^o west of true solar north) windows in a plan compared to other aspects should be as close to 75% as the site and plan will allow. Credit is given when more than 50% of all glass faces north or where high efficiency windows are employed.

However, penalty points accumulate when east or west windows predominate (unless they are shaded).

- **Open space:** Sunlight is available to at least 40% of required private open space for at least two hours.
- **Adjoining development:** Any new development will not reduce the solar access of solar collector/s of an adjoining property to less than two hours per day in mid-winter except solar hot water panels to which full access must be maintained.
- **Clothes drying:** Sunlight is available to a clothes drying area for at least two hours on June 21.



Source: Amcord, 1995

Figure 6: Dwelling design for solar access

A9.4.3 Thermal mass and building colour

Background Principles

The term ‘thermal mass’ describes the ability of heavyweight materials to store thermal energy. Using materials with thermal mass in the floor or walls of a building enables those elements in the structure to:-

- absorb heat from the sun during the winter day, and release that heat back into the living spaces at night or during cooler periods, producing more comfortable and even temperatures;
- absorb heat from the building during hot summer days as they have been cooled down via natural ventilation during the previous cooler evening ie. they provide a ‘natural air conditioning’ effect, resulting in more comfortable and even temperatures;

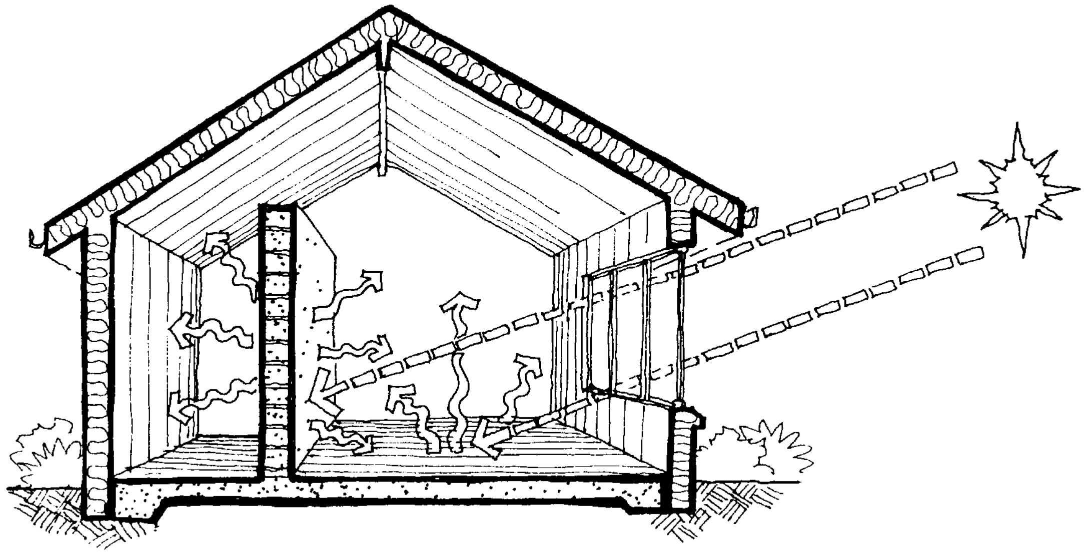


Figure 7: Thermal mass principles

Due to the climate-moderating effects of common walls, medium density and attached dwellings are potentially more energy efficient than other dwelling types. Therefore, in general, less measures are required to achieve similar energy efficient outcomes as compared to detached dwellings.

The colour of building materials affects the micro-climate of a dwelling. Generally, dark colours absorb heat and light colours reflect heat.

Objective

- To use building materials which help to stabilise the temperature of internal living spaces.

Preferred Outcomes

In scoring the provision of thermal mass, the scorecard assesses the construction material and the type of finish in descending order of performance, ie. whether it is in contact with the ground, sealed underfloor area or suspended and ventilated.

Thermal Mass

- The floor is commonly the most economical place to locate heavy thermal mass materials (eg. concrete slab) and its thermal performance will be best in north facing rooms receiving direct sunlight (see Figure A9-7).

- Hard floor finishes are preferable because they thermally connect the air mass in the dwellings to the thermal mass in the earth below.
- Wall materials such as reverse brick veneer, cavity brick, concrete blocks, stone, mud brick, rammed earth and even contained water in walls, are also very useful in providing more comfortable internal room temperatures.
- Where external walls are lightweight and insulated, providing mass in internal walls minimises the daily temperature fluctuations and improves comfort considerably.

Material Colour

- The roof is the dominant heat path as reflected by the Energy Smart Scorecard. However, wall colour is nonetheless important. Darker colours, in absorbing more heat all year have a bigger negative impact on summer comfort than they do a positive impact on winter comfort so are rated accordingly. The lighter the colour of roof and walls, the better.

A9.4.4 Shading

Background Principles

Shading elements such as eaves or awnings should be designed relative to the aspect of the windows requiring shade, considering the seasonal variations in the angle of the sun for each location and access to views.

Windows should be shaded externally as a first preference with fixed or moveable devices such as blinds, shutters or awnings. Alternatively, where designs preclude such measures, windows can be insulated internally with opaque, close-fitting curtains, preferably with pelmets.

Generally, major windows in dwellings should be shaded from direct sun during between 9.00 am and 3.00 pm during summer, and insulated with curtains. Shading elements incorporated into an elevation should be integrated as design elements (see Figure A9-8).

Alternatively, high performance glass such as variable transmission glass (glass that only transmits certain wavelengths of light) can be combined with curtains.

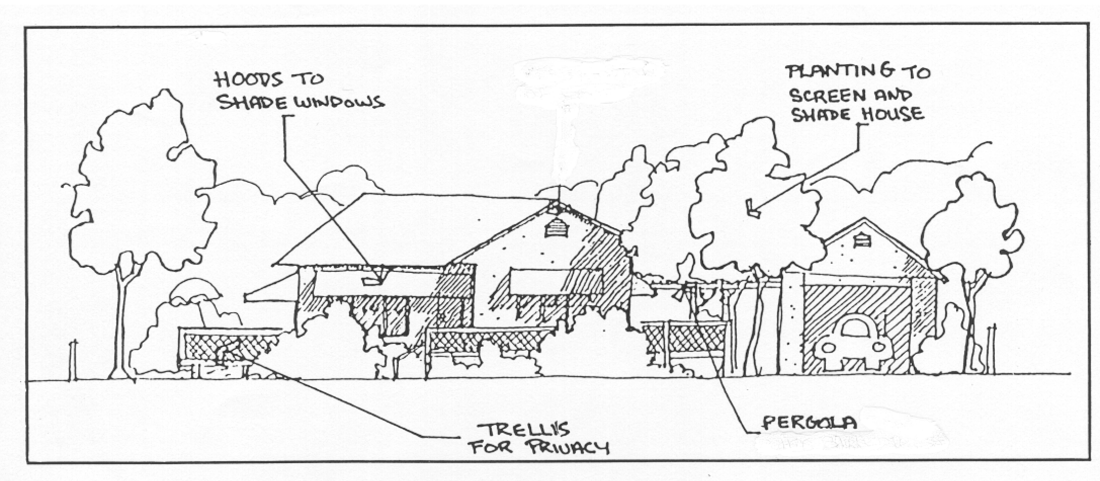


Figure 8: Traditional North Coast shading elements *Source: North Coast Design Guidelines*

Objective

- To reduce the sun's solar heating effect on dwellings, through the provision of suitable shading measures.

Preferred Outcomes

- External shading to North facing windows (see Figure A9-9) should provide maximum shading in summer with less shading required in winter. This type of shading can be simply provided by incorporating eave overhangs or fixed awnings designed to meet a 70^{o} (from the horizontal) line drawn from the bottom of the window to the eave.
- Pergolas, verandahs and eaves to the western and eastern aspects should also be designed to maximise summer shade and where possible reduce winter shade, eg, by deciduous climbing vines on pergolas or operable louvres.
- Window shading devices suitable for all windows but particularly westerly and easterly windows include external blinds (fabric and louvre), shutters (both hinged and roller), awnings (both fixed and roller) and close-fitting curtains.

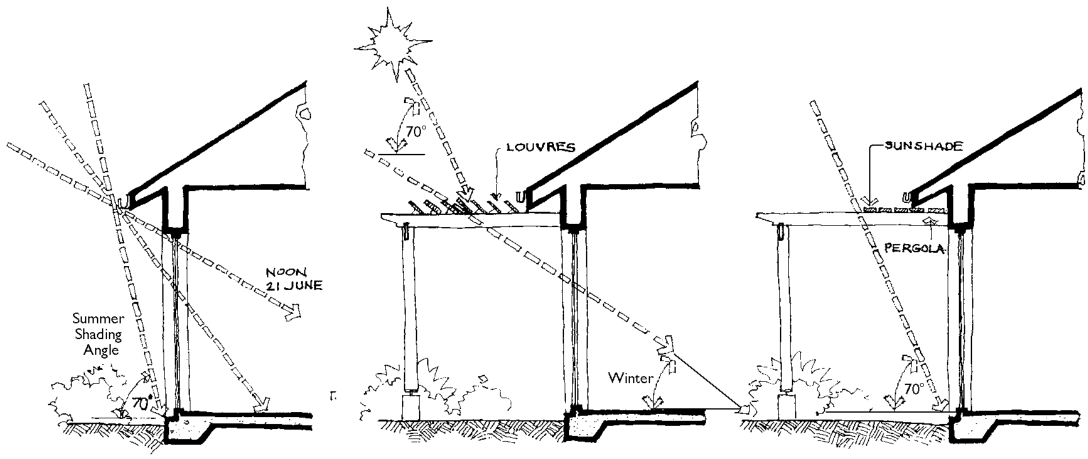


Figure 9: Window shading principles

A9.4.5 Ventilation

Background Principles

Natural ventilation is an important design feature for all dwellings subject to the warm, humid climate of Tweed Shire. Natural ventilation is primarily achieved through the appropriate design and location of doors and windows. Generally, windows need to be designed to provide access to sun in winter, but be shaded from direct sun during summer. Windows let in light, heat and air, and provide access to views. In terms of an energy balance, the critical variables are windows' orientation, shading and size, and the area of glass relative to both the floor area and solid wall area.

Natural cross ventilation is induced by wind motion and is used most effectively during cool conditions in summer. Cross ventilation occurs more efficiently through a room with openings in opposite walls than through a room with openings in adjacent walls.

Figure 10: Ventilation principles *Source: North Coast Design Guidelines*

Designs should ensure security provisions for windows and doors, while still allowing for cross ventilation during summer. To maintain energy efficiency, winter winds and draughts need to be minimised by the application of seals around all door and window openings.

Natural ventilation is preferable for underground car parks in Multi-dwelling housing developments.

Objective

- To ensure that all dwellings can be adequately ventilated by the appropriate design and location of windows and doors.

Preferred Outcomes

- For summer conditions, a dwelling's openings should be designed to take advantage of prevailing wind direction; passive solar design not only takes advantage of cooling daytime breezes but depends on cool night-time ventilation to flush out the heat of the day so that the structure is cool for the next day (see Figure A9-10).
- The effectiveness of built-in cross ventilation depends on placement of openings to create breeze pathways (or breeze-paths) with minimum obstruction. Openings in a room are best placed in opposite walls to create air movement across the room and maximise the effect in that room. Likewise in the home overall, the scorecard provides credits when 2 or more separate breeze-paths exist and are relatively obstruction-free. Where multiple breeze-paths are incorporated, effective ventilation can be achieved when wanted, irrespective of whether some doors might be closed.
- Ceiling fans provide assistance to both ventilation and personal cooling in summer.

- While it is not rated in the scorecard, an important feature to include when installing windows is that they be lockable in a partly open position, for ventilation and security.
- Exhaust fans are used where moisture is present, eg. kitchen, bathroom. Fans have built-in shutters, to prevent draughts.

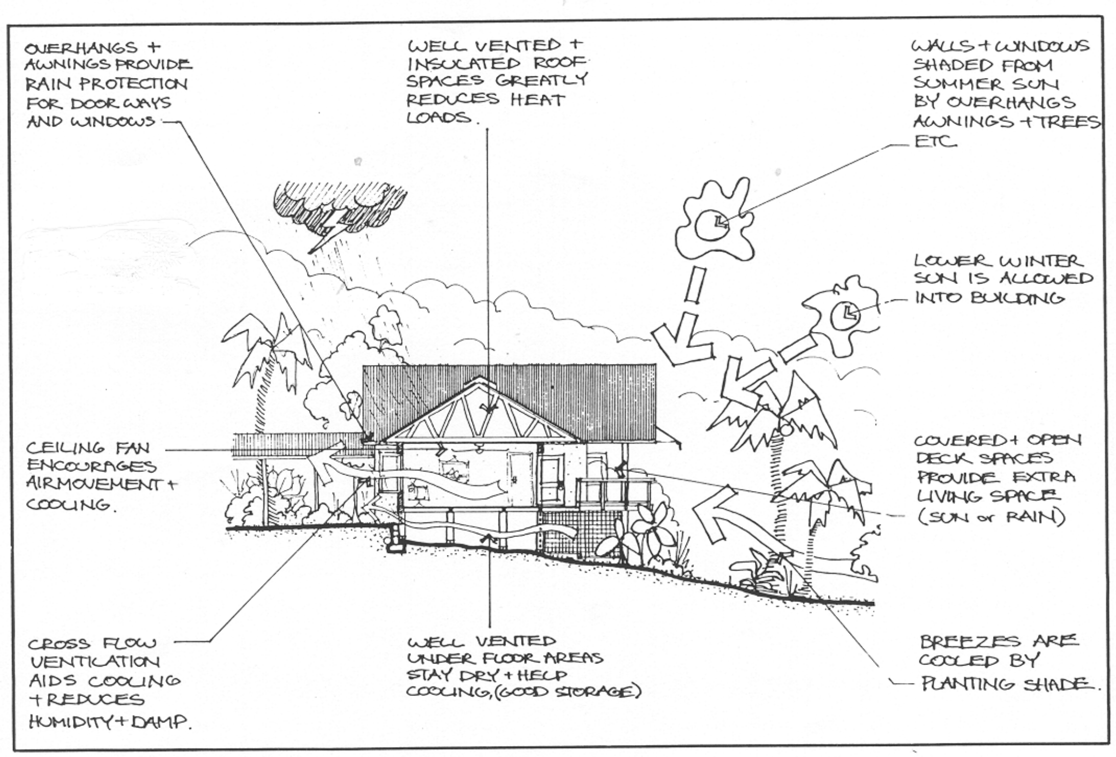


Figure 11: Building ventilation elements *Source: North Coast Design Guidelines*

A9.4.6 Heating and Cooling

Background Principles

If a dwelling is designed to optimise its passive solar potential, it is possible to all but eliminate the need for fuel-based space heating or cooling. Heating and cooling systems should target only those spaces which require heating and cooling. Where a heating/cooling system is installed, it should be selected for maximum energy efficiency to ensure the efficient distribution of warm and cool air. The choice of system should be compatible with and integral to the design of the individual dwelling in question.

Objectives

- To encourage dwelling designs which eliminate or reduce the need for fuel-based heating or cooling.
- To ensure that any mechanical heating or cooling will be energy efficient and minimise generation of greenhouse gases.

Preferred Outcomes

- Where they are necessary, ducted air conditioning systems should have a greenhouse rating of 3.5 or better and be ‘zoned’ to allow targeting of specific spaces.

- Where financially feasible, zoned control systems should be employed with programmable thermostats in each zone.
- To maximise energy savings the control system can be employed to regulate the flow of air between zones by adjusting mechanised dampers in duct work and regulating fan speed according to the number and size of zones being heated or cooled.
- Ductwork should be insulated to at least R1.5 and any refrigerant lines insulated with at least 20mm of foam insulation.
- Energy efficient or renewable energy space heating and cooling systems are recommended. For example, an active solar system or gas system combined with solar, heat pump reverse cycle air conditioning systems, solar heated hydronic floor heating or heat re-distribution system.
- If timber is chosen as a fuel source, it should be burned in high efficiency heaters (and preferably sourced from sustainable sources).
- In winter, it is important to be able to close off areas, so that only those areas which need heating are heated. The scorecard provides winter credits for 3 or more individual zones that can be closed off. A ‘zone’ is defined as two or more rooms. Zones can be created by providing doors between separate open planned areas, eg. Living/Dining and Kitchen/Family or across corridors eg, to bedrooms.
- Specific credits are provided to those dwellings that provide an air-lock to main entry and/or exit doors of the home because of the significant amount of ‘conditioned’ air that can escape when doors are left open even for relatively short periods.

A9.4.7 Insulation

Background Principles

Insulation is a vital component of energy efficient dwelling design, helping to eliminate or drastically reduce the need for mechanical heating and cooling systems, as well as enhancing the efficiency of any such systems. Insulation materials should be selected for the particular situation for which it is required ie. whether the insulation is being used for walls, floor, roof, or some other purpose.

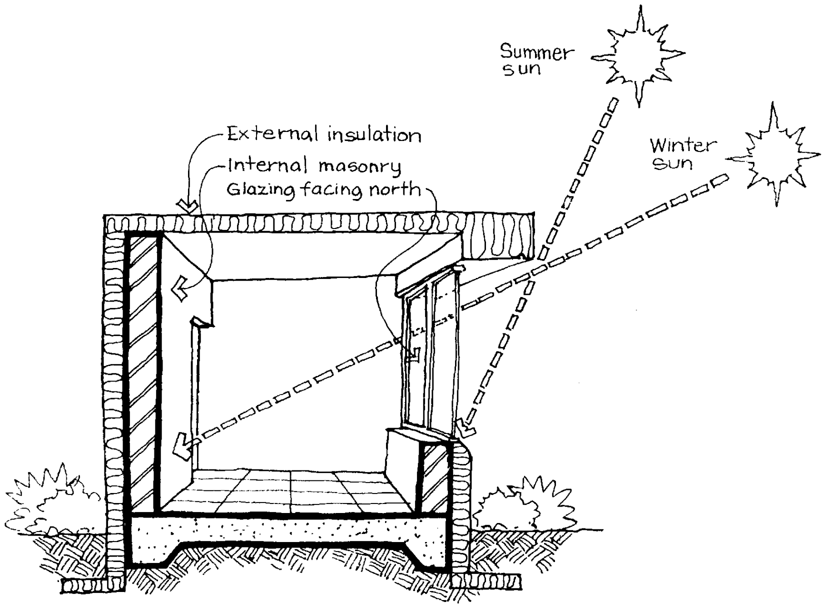


Figure 12: Insulation principles

Insulation in buildings should meet the levels specified in AS2627.1, 1993. The performance of insulation materials should meet the requirements specified in the appropriate Australian Standard for the material. In the case of synthetic mineral fibres (fibreglass and mineral wool) the applicable standard is AS3742. The performance of other insulation materials should be demonstrated by a NATA (National Association of Testing Authorities) registered laboratory and field studies to at least compare with the thermal performance of materials included in AS3742. Testing of individual insulations is to comply with AS2464. The installation of all insulation materials is to comply with AS3999 for bulk insulations or AS4200.2, 1994 for pliable building membranes.

Objective

- To provide appropriate insulation measures to dwellings in order to reduce the need for artificial heating and cooling systems.

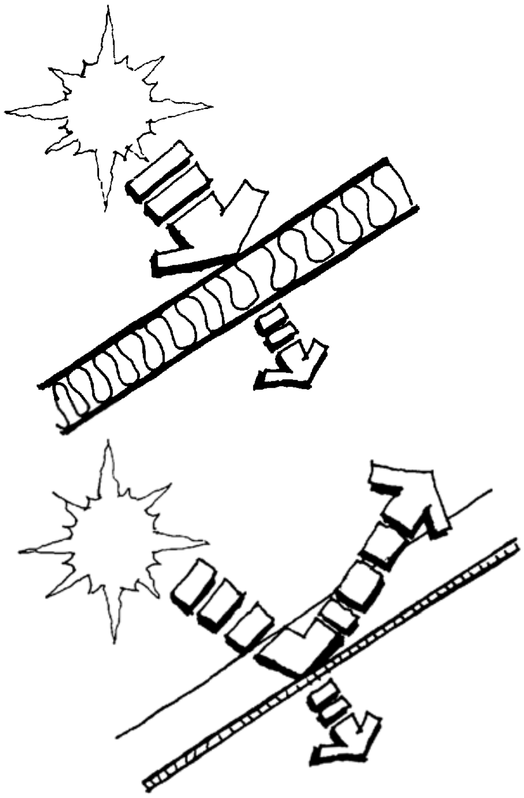


Figure 13: Insulation components

Top: Bulk insulation for roof and wall

Bottom: Reflective insulation in roof

Preferred Outcomes

Floors

- The scorecard assesses from an energy consumption point-of-view, the floor area of the living areas, as it is assumed that this is the area where heating and cooling is likely to be most used.
- Floors in contact with the ground are thermally most efficient. Nonetheless, slabs lose heat around the edges and benefit from slab-edge insulation. Suspended floors, particularly of timber or sheet materials will often benefit from underfloor insulation, (concrete slab floors on ground only require under-slab insulation where the slab is used to centrally heat the dwelling).

Walls

- Walls represent a significant proportion of the external area of the building envelope and should be insulated. Bulk, lightweight insulating materials (eg. batts) are the most common choice for framed or veneer external walls (see Figure A9-13).
- Vapour barriers are sometimes recommended on the warm side of the insulation layer to keep moisture from condensing within the insulation. In some climatic or air-conditioned situations, condensation within the insulation can dramatically reduce the effectiveness of insulation and the life of both insulation and the surrounding structure.
- Where reflective sarking is used, an effective R-value of R1.0 can be attributed and the bulk insulation level reduced accordingly.

- Walls between garages and dwellings should be insulated similarly to external walls.
- Walls include bulk resistive materials eg batts or reflective insulation.
- Walls between garages and dwellings are insulated.

Roof

- The roof is a major heat path in all weather. The most appropriate insulation level is R3.0. When assessing the scorecard do not deduct points for an uninsulated roof if the ceiling is insulated.
- Roofs include bulk resistive materials such as batts, or reflective insulation (see Figure A9-13).

Ceiling

- The ceiling is also a major heat path in all weather. If the roof is uninsulated, the ceiling should be insulated instead.
- Where a metal deck is specified, the manufacturer’s recommendations often specify an insulation blanket below the decking. Unfortunately, when installed under sheeting like this, bulk insulation compresses and loses some of its efficiency. In this circumstance, it is advisable to provide insulation on the ceiling to the total level specified in AS2627.1, 1993.

Windows

- Windows can best be insulated internally by providing close-fitting, opaque curtains preferably with pelmets.

Seals

- Credits are provided for doors and windows that have draught excluders and weather seals. Without seals the comfortable conditions within the building will ‘leak’ and be lost with consequent increases in energy consumption and cost.
- Exhaust fans vented to the exterior are used where moisture is present, eg. kitchen, bathroom etc. but fans should have built-in shutters, to prevent draughts.
- If installed, fireplaces and chimneys should have covers or dampers for the same reasons discussed above.

A9.4.8 Lighting

Background Principles

A dwelling should be designed to maximise availability of natural light without creating major heat gain or heat loss pathways. Artificial lighting should not be necessary for general activities in a room during daylight hours.

A room should be lit according to its purpose. For example, a kitchen or family room requires an even spread of bright lighting. Other rooms such as living rooms require a mix of general and task lighting options. Layout of energy efficient lamps, fittings and switches in such rooms should allow several possibilities for lighting the room, such as low background lighting, supplemented by task or effect lighting for use as required. Separate switches should be used for special purpose lighting.

Lighting for common areas, car parks and stairwells in medium density developments should be energy efficient and time switched or motion sensitive. Consideration should be given to the use of solar powered external lighting.

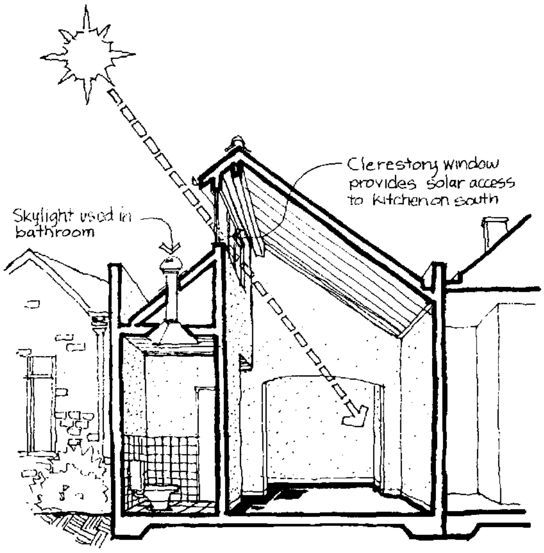


Figure 14: Lighting for dwellings with limited solar access

Objectives

- to encourage maximum use of natural light inside dwellings.
- to minimise energy use for lighting.

Preferred Outcomes

Artificial Lighting

- Dwellings to be designed such that artificial light is unnecessary during daylight hours.
- Light switches should be located at main exits, to encourage the switching off of lights when people leave a room.
- Light switches in common areas should be time switched.
- Motion-detectors should be used for externally lighting doorways and entrances, or for outdoor security lighting.
- Automatic turn-off switches are used for outdoor purposes.
- Dimmer switches should be used where practicable to provide flexibility in lighting levels.
- Fittings with high efficiency reflectors suitable for compact fluorescent lamps or fluorescent tubes should be used (these consume up to four times less electricity than standard incandescent light bulbs to provide the same level of light, and last up to eight times longer than incandescent bulbs).

Skylights and day lighting

- Scoring of skylight/daylight design reflects the importance of appropriate design to provide suitable daylighting levels while avoiding unwanted heat gain or loss. To achieve this clerestories or skylights generally require some sort of shade device, either externally or internally such as with an eave or a solar blind, (see Figure A9-14). Further, they should be either double glazed or made from a high efficiency selective glazing material.

- Appropriate design of clerestory windows, including summer shading.

A9.4.9 Domestic appliances and swimming pools

Background Principles

Domestic energy consumption is not only a function of the design, orientation and construction of a dwelling. It is also a function of the choice of appliances used in a home for heating, lighting, cooling, refrigeration, cooking, washing/drying clothes and washing dishes. Additionally, many homes in the Tweed Shire have outdoor pools which consume energy to heat. Therefore, improvements in energy efficiency can be made by installing energy efficient appliances and swimming pools.

Objectives

- to encourage the installation of energy efficient appliances and swimming pools that minimise the need for greenhouse gas generation.
- to maximise opportunities for use of solar energy for clothes drying and swimming pool heating.

Preferred Outcomes

- Domestic appliances with maximum energy efficiency should be installed. Use appliances with a minimum 5-star rating.
- Thermostats should be used with all central heating and cooling systems.
- All dwellings have access to an outdoor clothes line, located in a sunny position, preferably close to the laundry.
- Electrical dryers, where required, ideally have direct ventilation to outside.
- Swimming pools should be insulated to reduce the amount of energy needed to maintain water temperature and reduce heat losses.
- Heated pools and spas should rely on solar energy for water heating.
- Heated swimming and spa pools should be kept covered when not in use.

A9.5 LANDSCAPING FOR ENERGY EFFICIENCY

Background Principles

Streets and public spaces in a subdivision can be designed to contribute to solar efficiency through the selection and location of suitable trees. Trees provide much needed shading to dwellings, outdoor living areas (including verandahs and gardens) and public footpaths. In the sub tropical climate of Tweed Shire, the shading effect of trees is beneficial all year round. Care should be taken to select trees which, when mature, will not unduly shade solar collectors to the south. Many of the species native to Tweed Shire are ideal shade trees for private gardens.

Trees, shrubs and grass native to the Shire and region are preferred, as not only do they preserve the region’s unique biodiversity, but they also require less maintenance and rely purely on rainfall for their water requirements.

Trees can also be used as wind breaks, and many native species are ideal for this purpose, provided that the potential conflicts between plant bulk and solar access are properly managed.

Additionally, trees can be used to channel or deflect breezes to suit the required microclimate of a dwelling and its outdoor living areas.

Vines and creepers can provide a shading effect if planted in front of windows and verandahs. The process of transpiration, by which leaf moisture is converted to vapour, also provides a beneficial cooling effect in summer.

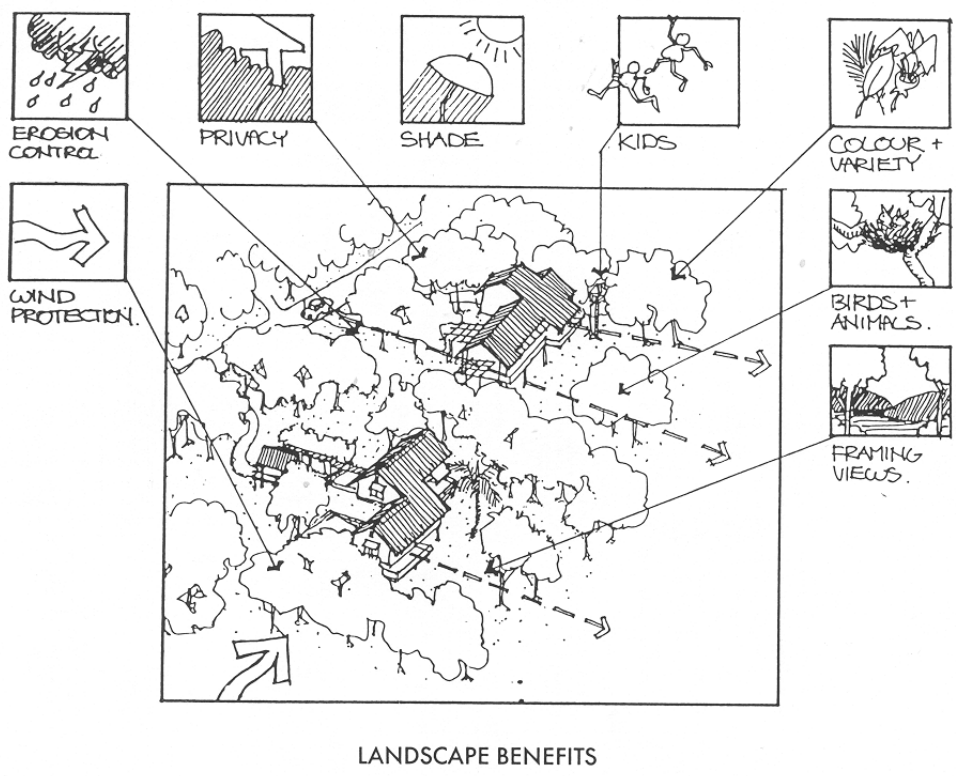


Figure 15: Landscaping for energy efficiency *Source: North Coast Design Guidelines*

Objectives

- To achieve landscape design that promotes the energy efficiency of individual dwellings.
- To ensure that solar access is maintained to all land and buildings. By assessing which trees are likely to create unwanted shadows as they mature, future conflicts are likely to be prevented.
- To encourage the use of trees native to the Tweed region, which reduces the need for water consumption and preserves biodiversity.

Preferred Outcomes

- Street tree species are selected to provide summer shading while not unduly impeding solar access to dwellings in winter.
- Garden trees are planted or retained so as not to impede solar access to solar collectors.
- Street trees contribute as winter windbreaks.

- Specific areas of a dwelling are targeted to receive sunlight in winter and shade in summer, through the appropriate location and choice of trees, shrubs, vines, creepers etc.
- Garden landscaping is used to protect against cool winter winds and to channel summer breezes.
- Select plantings with low maintenance and low water consumption. Generally, trees, shrubs and grasses native to Tweed Shire should be used.
- Select densely growing species for windbreaks (such as Banksias) and plant them along south or west sides of area being protected against the wind.
- Variations in mature heights of different species of trees and shrubs should be taken advantage of for shading walls and windows.
- Consider sheltering outdoor space areas with vegetation. Vegetation can provide strong shadow effects in summer (eg. deciduous vine over a pergola, palm trees in courtyards) and should contribute significantly to comfort levels within a dwelling.

A9.6 DEFINITIONS

- *Ecologically Sustainable Development (ESD):* A commonly accepted definition of ESD in Australia is development which 'uses, conserves and enhances the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in the future, can be increased' (*ref*. *National Strategy for Ecologically Sustainable Development*).
- *Multi dwelling housing:* The development of more than one residential dwelling on a lot. This includes dual occupancy development and residential flat buildings.
- *NatHERS:* NatHERS is a computer simulation tool for rating the thermal performance of houses across Australia. The Energy Management Task Force is responsible for delivering a NatHERS compliance protocol. Any software or paper checklist which passes under this protocol is deemed "NatHERS or equivalent".
- *North Point:* In any discussion relating to orientation of a dwelling or part thereof, a reference to 'north' is a reference to true solar north and not magnetic, or compass north. True solar north varies from magnetic north depending upon the location. In Tweed Shire, magnetic north is approximately 11.5 degrees east of true solar north.
- *Passive Solar Energy Systems:* Systems which combine the sun's energy with local climate characteristics, to achieve thermal comfort inside buildings without the use of mechanical devices. In a passive system, the building itself is a solar collector, as well as a heat storage and transfer medium.
- *Solar Collectors:* Any building element or appliance specifically designed to capture or collect the sun's rays for the benefit of the occupants eg. windows including clerestory (or highlight) windows, solar hot water collector panels, photovoltaic (solar-electricity) cells/panels.
- *Solar Setback Line:* An imaginary line drawn on a lot, indicating the minimum setback from that lot's northern boundary, behind which the

northern wall of a (new) dwelling or north-facing living space may be located so as to allow its compliance with the SOLAR ACCESS provisions of this Section.

Appl. No. ________

TWEED SHIRE COUNCIL
ENERGY SMART HOMES POLICY
DEEMED TO COMPLY CRITERIA
FOR DWELLINGS AND ADDITIONS OR ALTERATIONS TO DWELLINGS

Part A

1. Orientation

☐ At least 50% of living areas are sited on the north side of the building.

NOTE: North is defined as being within the range from 20 degrees west of north to 30 degrees east of north.

2. Thermal Mass

☐ Floor is constructed of concrete slab, or timber floor with minimal venting.

3. Building Envelope

☐ Roof eaves are provided a minimum of 450mm wide.

☐ Roof colour is a light to medium colour.

NOTE: When medium colours are used, the roof is to be foil sarked, or vented with an appropriate wind powered fan.

4. Ventilation and Zoning

☐ Design provides for a minimum of two breeze paths through the building, (ie. windows located on opposite or adjacent walls).

NOTE: At least one breeze path is to be through the major living areas.

5. Insulation

☐ Roof/ceiling insulation provided to R 2.5 value.

I, ____(owner) certify that all of the abovementioned features are or will be incorporated into the building design and construction for the building proposal at ***Lot*** *_____* ***DP*** *______________________________*
Street____

____________________ ____________________

Signature ***Date***

OFFICE USE ONLY

Application No. ______________________________

Checked By: ______________________________

PAR

SINGLE RESIDENCES SCORECARD

PART A — BUILDING ENVELOPE

Applicant ....
Address ....
Application No. .... Date ....

		SUMMER		WINTER	
1.0	**ORIENTATION**				
1.1	Orientation of living areas				
	75% - 100% on north side	10		10	
	50% - 75% on north side	7		7	
	25% - 50% on north side	3		3	
1.2	Orientation of house living areas				
	long direction of living areas face true solar north (must have north windows)	5		5	
	long direction of living areas face within 15° of true solar north	4		4	
	long direction of living areas face within 30° of true solar north	1		1	
		TOTAL		*TOTAL*	
2.0	**THERMAL MASS**				
2.1	Floor — *Finish*				
	concrete slab on ground — *tiled/vinyl or concrete*	45		30	
	concrete slab on ground — *carpet/timber*	26		14	
	suspended concrete slab vented under min. — *tiled/carpet*	35		18	
	suspended concrete slab vented under min. — *carpet/timber*	29		8	
	suspended concrete slab enclosed under — *tiled/carpet*	43		15	
	suspended concrete slab enclosed under — *carpet/timber*	35		8	
	suspended timber minimal venting — *tiled/polish timber/vinyl*	14		6	
	suspended timber minimal venting — *carpet*	11		5	
	suspended timber vented under — *see 5.1 floor - living area*				
2.2	Walls - internal - north facing living areas				
	brick, stone, water or earth walls	5		8	
	autoclaved aerated concrete (AAC)	3		5	
	plasterboard/on timber frame or 10mm+ render coat	1		1	
		TOTAL		*TOTAL*	
3.0	**BUILDING ENVELOPE**				
3.1	No eaves/shading	-34		4	
	Window shading devices used (eg. eaves, verandahs, pergolas etc.)				
	north horizontal 0.45m - 1.0m — *max. in summer, min. in winter*	9		2	
	1.0m - 1.5m	16		0	
	over 1.5m	20		0	
	add if fixed east shading (or no windows) — *provides full shade in summer and winter*	6		0	
	add if fixed west shading (or no windows) — *provides full shade in summer and winter*	8		0	
	additional score if east/west shading devices are operable	0		6	
3.2	Glazing (apply score for each relevant feature)				
	75% of glass on north side	12		15	
	50% of glass on north side	8		10	
	more than 50% on east, south and west sides	-17		-22	
	window/floor ratio greater than 25% for concrete slab floor	-15		-15	
	window/floor ratio less than 24% for suspended timber floor	16		16	
3.3	Skylights				
	shaded double glazed, or angular selective	2		2	
	specular reflective light tubes - smooth	2		2	
	specular reflective light tubes - non-smooth	1		1	
	no skylights	0		0	
	unshaded double glazed	-2		1	
	shaded single glazed	-1		-2	
	unshaded single glazed	-3		-2	
3.4	Walls				
	light/medium	1		1	
	dark colour	0		0	
3.5	Roof				
	light colour	8		0	
	medium colour	-12		3	
	dark colour	-30		5	
3.6	Landscaping				
	deciduous planting to north	1		1	
	shade planting to south, east, west (no shading of other buildings)	1		1	
		TOTAL		*TOTAL*	
		PAGE TOTAL		*TOTAL*	

This Scorecard has been prepared for Tweed Shire Council and is not to be used for any other purpose. PA

SINGLE RESIDENCES SCORECARD

PART A — BUILDING ENVELOPE - *Page 2*

No.	Item		SUMMER		WINTER	
4.0	**VENTILATION AND ZONING**					
4.1	Ventilation minimum of 2 breeze paths		25		0	
4.2	Zoning 3 closed off zones		0		3	
4.3	åir lock entry areas		2		2	
			TOTAL		*TOTAL*	
5.0	**INSULATION**					
5.1	Floor					
	insulated concrete slab on ground	*to slab edge*	6.5		5.5	
	uninsulated concrete slab on ground		7		3	
	insulated suspended concrete slab	*to underneath*	2		2	
	uninsulated suspended concrete slab		0		0	
	insulated timber floor	*minimal venting*	0		1.5	
	uninsulated timber floor	*minimal venting*	0		-2	
	uninsulated timber floor	*20-30% venting*	-2		-8	
	insulated timber floor	*open underneath*	-2		-8	
	uninsulated timber floor	*open underneath*	-14		-16	
5.2	Walls (apply score for each relevant feature)					
	insulated: (added insulation levels except AAC)					
	autoclaved aerated concrete (AAC)	*R 1.5 value*	4		8	
	double brick plus insulation	*R 1.0 value*	4		12	
	reverse brick veneer plus insulation	*R 1.0 value*	4		12	
	brick veneer plus insulation	*R 1.0 value*	3		11	
	earth wall	*250mm*	5		10	
	timber frame plus insulation	*R 1.0 value*	1		11	
	***R 1.5 elevated locality as defined in DCP**					
	add for two storey		-7.5		-7.5	
	uninsulated:					
	double brick		4		8	
	brick veneer		4		7	
	timber frame		2		7	
5.3	Roof					
	insulated metal deck roofing	*R 2.5 value*	20		5	
	sarking only (do not deduct if ceiling insulated)	*R 1.0 value*	-10		-25	
	uninsulated roof (do not deduct if ceiling insulated)		-60		-80	
	sarking in combination with ceiling insulation	*R 2.5 value*	6		4	
	add for two storey		-7		-7	
5.4	Ceiling insulated ceiling	*R 1.5 value*	20		5	
5.5	Windows					
	alumiumum frame clear glass		0		0	
	aluminium frame toned glass (shading coefficient 0.66)		15		-10	
	aluminium frame single glazed average double glazing to south side only		0		10	
	timber frame or aluminium "thermal break" windows		0		5	
	aluminium frame average double glazing all round		0		8	
	timber or aluminium "thermal break" frame double glazed 6/10/3 toned glass (shading coefficient 0.66) plus low emissivity glass		15		5	
	timber or aluminium"thermal break" frame double glazed argon filled 4/12/4 clear glass and low emissivity glass		6		-10	
5.6	Seals (apply score for each relevant feature)					
	seals to all external doors		2		5	
	seals to all internal doors		1		1	
	seals to all windows		2		4	
5.7	Fireplace (apply score for each relevant feature)					
	fireplace flue dampers installed (or no fireplace)		1		1	
	fireplace installed		0		-5	
	no fireplace damper installed		0		-10	
			TOTAL		*TOTAL*	
			PAGE TOTAL		*TOTAL*	
			PREVIOUS PAGE TOTAL		*PREVIOUS PAGE TOTAL*	
			TOTAL		*TOTAL*	

S - SUMMER SCORE *W - WINTER SCORE*

SINGLE RESIDENCES SCORECARD

PART A — BUILDING ENVELOPE - *Page 3*

PART A FINAL SCORE

To caluclate final score: add S plus W divide total by 2 place in box called final score — TOTAL

(see table below) — STAR TOTAL

SCORECARD STARS

-19	—	-10	=	0
-9	—	0	=	1
1	—	10	=	1.5
11	—	20	=	2.0
21	—	30	=	2.5
31	—	40	=	3.0
41	—	50	=	3.5
51	—	60	=	4
61	—	70	=	4.5
71	—	80+	=	5

Note: *The scorecards provide an approximation of energy efficiency. For an accurate assessment, a NatHERS rating should be obtained.*

Ratings from this scorecard cannot be used for marketing purposes — a NatHERS rating must be obtained.

Apportionment:

i) Where a combination of features exist, apportion the relevant scores to each feature prior to adding together. For example, section 2.1 floor area/s; a north facing living room area has half concrete slab on ground (tiled) and half suspended timber (minimal venting, carpet); or

ii) Where windows do not face exact cardinal directions the scores can be apportioned between directions eg. a 2m² window facing north west can be attributed 1m² north facing and 1m² west facing.

	SUMMER	WINTER
concrete slab	$\frac{63}{2}$ = 31.5	$\frac{17}{2}$ = 8.5
suspended timber	$\frac{19}{2}$ = 9.5	$\frac{5}{2}$ = 2.5
TOTAL	41* = 41 points	11 points

* *round to the nearest 0.5 points.*

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Acknowledgements

Model Energy Smart Homes Policy Implementing Agency:

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(Energy and local government consultant: David Baggs FRAIA)

'**Solecta' energy checklist (scorecard basis) and NatHERS/scorecard correlations:**

Australian Institute of Building Surveyors

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