Passive design in site and subdivision planning

Brought to you by Wodonga Council’s planning team

Elements of Passive Solar Design

- Summer Sun
- Control
- Distribution
- Absorber
- Thermal Mass

- Direct and reflected radiation is absorbed by brick walls and released at night to keep your house warm.
- Low-angle winter sun penetrates under eaves.
- Open windows and doors allow cross ventilation.
- Easy shade planes from high-walled summer sun.
- Thick walls absorb heat from external air, helping to keep your home comfortable.

Living
Sleeping

Winter sun
Summer sun
Up to 15° West
Solar North
Outline

• Why is this important?

• Orientation
  – Principles and benefits
  – Orientation and flat sites
  – Orientation on irregular sites
  – Orientation on sloped sites

• Ventilation
  – Principles and benefits

• References
Why is it important?

Common myths of sustainable design

• If you can’t design it perfectly there’s no point doing it at all
  – Incorporating any element will make a difference, for example, more winter sun less heating needed

• Good design costs more
  – Good design in many cases can cost less than bad design, for example, smart use of space, materials

• Sustainable designs are ‘weird looking’
  – Passive solar principles can be applied to any design
Why is it important?

**Increased promotions with The Government**
- Not a new concept, but a set of well established and tested design principles
- Energy saving and low running costs

**Consumers’ awareness and expectations for their properties (demand and supply)**
Why is it important?

Energy consumption reduced: Better long term investment yield higher property value

• Anticipated rising demand for relevant products

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria
Orientation

Principles

• Positioning of a building lot in relation to seasonal variations in sun’s path as well as prevailing wind patterns
Orientation

Benefits

• Good orientation can increase the energy efficiency of homes, making them more comfortable to live in and cheaper to run.

Source: Your Home: Australia’s guide to environmentally sustainable homes, Australian Government
Orientation

Benefits

• Passive heating
• Passive lighting
Orientation

How to achieve good orientation in Wodonga

Solar noon altitude angles for Wodonga

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria

Sun paths of Wodonga

Source: gaisma.com
Orientation

Orientation on flat sites – for best passive solar performance at minimal cost

• N-S gridded street layout, rectangular lots

Orientation does not have to be precise, there is a degree of flexibility

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria
Orientation

Orientation on flat sites – for best passive solar performance at minimal cost

- Siting: Living areas on the northern side of lots

Source: Your Home: Australia’s guide to environmentally sustainable homes, Australian Government
Orientation

Orientation on flat sites – for best passive solar performance at minimal cost

• Built form, setback and separation

Source: Your Home: Australia’s guide to environmentally sustainable homes, Australian Government

~5.5m min
~10m min
Orientation

Orientation on flat sites – for best passive solar performance at minimal cost

• Siting: examples

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria
Orientation

Orientation on lots of irregular shapes, for example, cul-de-sacs

• Siting: Same principles as flat sites

Source: Your Home: Australia’s guide to environmentally sustainable homes, Australian Government
Orientation on sloped sites

- Depending on slope orientation

Distance can be less on north-facing slopes

Distance need to be extended on south-facing slopes, OR consider installing high windows

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria
# Orientation

## Orientation on sloped sites:

- **Preferred built forms based on gradients**
- **Achieve best orientation based on built form**

<table>
<thead>
<tr>
<th>Slope Type</th>
<th>Recommendations</th>
</tr>
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<tbody>
<tr>
<td><strong>FLAT SITES</strong></td>
<td>Single slab on ground (most project homes are only really appropriate up to a slope incline of 4° or 7° as the cut/fill required becomes excessive (over 1.5m). Slopes between 4-6° should accommodate some level change within the building footprint.)</td>
</tr>
<tr>
<td><strong>MEDIUM SLOPE</strong></td>
<td>On slopes of 6-12° (up to 1:5) steps or use part slab / part post and beam construction to accommodate the slope.</td>
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<tr>
<td><strong>STEEP SLOPE</strong></td>
<td>On slopes over 12°-18° (1:5:1:3) post and beam construction which steps with the site. This may include a lower part level which is a concrete slab.</td>
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<tr>
<td><strong>EXTREME SLOPE</strong></td>
<td>Slopes over 18° (1:3) suspended or pole construction is required. This degree of slope is more suited to a downslope configuration. Driveway access is generally difficult on upslope lots which require large batters/retaining walls and a curving driveway.</td>
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</tbody>
</table>

**Source:** Sloping Sites: Your guide to building a house, Tweed Shire Council.
Ventilation

Orientation and siting to encourage natural ventilation

- Wodonga: Temperate Inland Zone

Cross-ventilation can provide most of summer cooling needs

Temperate climate orientation – day time heating and cool sleeping required

Source: Energy Smart Housing Manual, Sustainable Energy Authority Victoria
Ventilation

- Challenging sites
- Building layout improvements

Source: Your Home: Australia’s guide to environmentally sustainable homes, Australian Government
References

- Sloping Sites: Your guide to building a house, Tweed Shire Council.
- http://www.gaisma.com/