THINK BRICK AUSTRALIA

Future proofing the built-environment

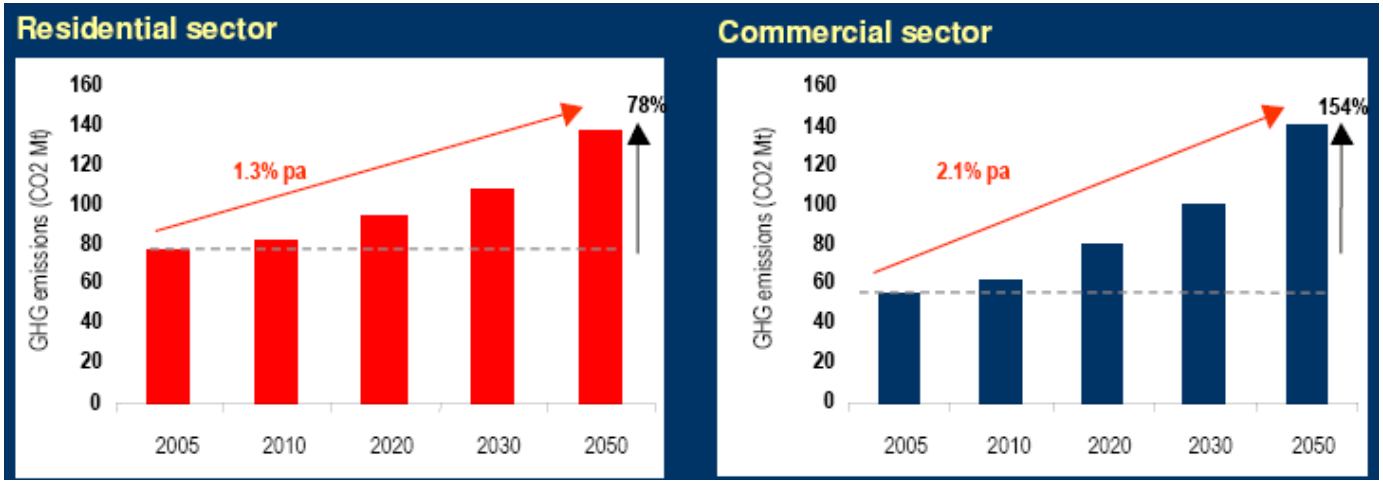
Ensuring carbon reduction metrics don't inadvertently increase carbon emissions

October 2008

Overview

- The challenge ahead
- Current metrics
- Identified shortcomings
- Industry taking action
- Desired outcome

The challenge ahead



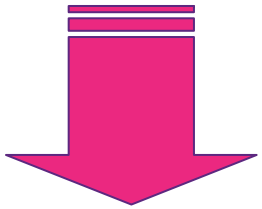
Source: Centre for International Economics (2008)

60% **2050**

- Carbon policy/ETS
- Energy efficiency targets – 5, 6, 7, 8+ Star
- Mandatory Disclosure

The current metrics

1. Predicting energy efficiency performance
   - R Value
2. Measuring environmental impact of building materials
   - Embodied Energy



Will they give us the results?

Research would suggest ‘NO’

The Research: Phase I

- Six years of data collection
- 4 full scale test modules/105 sensors/5 min measurements
- Free floating & conditioned state
- Funded by Think Brick Australia, Australian Research Council, The University of Newcastle

Aim

Undertake a comprehensive study of the thermal performance of typical housing under Australian climatic conditions

Findings:

- Thermal mass is crucial to improving energy efficiency
- Current metrics in the Building Code of Australia are inadequate to promote energy efficiency

R Value – thermal resistance

Limitations of energy efficiency metric

R value (m2k/w)	% of time in thermal comfort range
1. 0.44	51.6
2. 1.30	61.8
3. 1.51	55.1
4. 1.83	54.0

Highest R-value building spent 7.8% less time in comfort range than best performing building

Best performing building performed 14.4% better despite having 30% less R-value

Highest R-value building consumed 80% more energy than best performing building

Worse performing building consumed 173% more energy than the best performing building despite having a 16% higher R-value

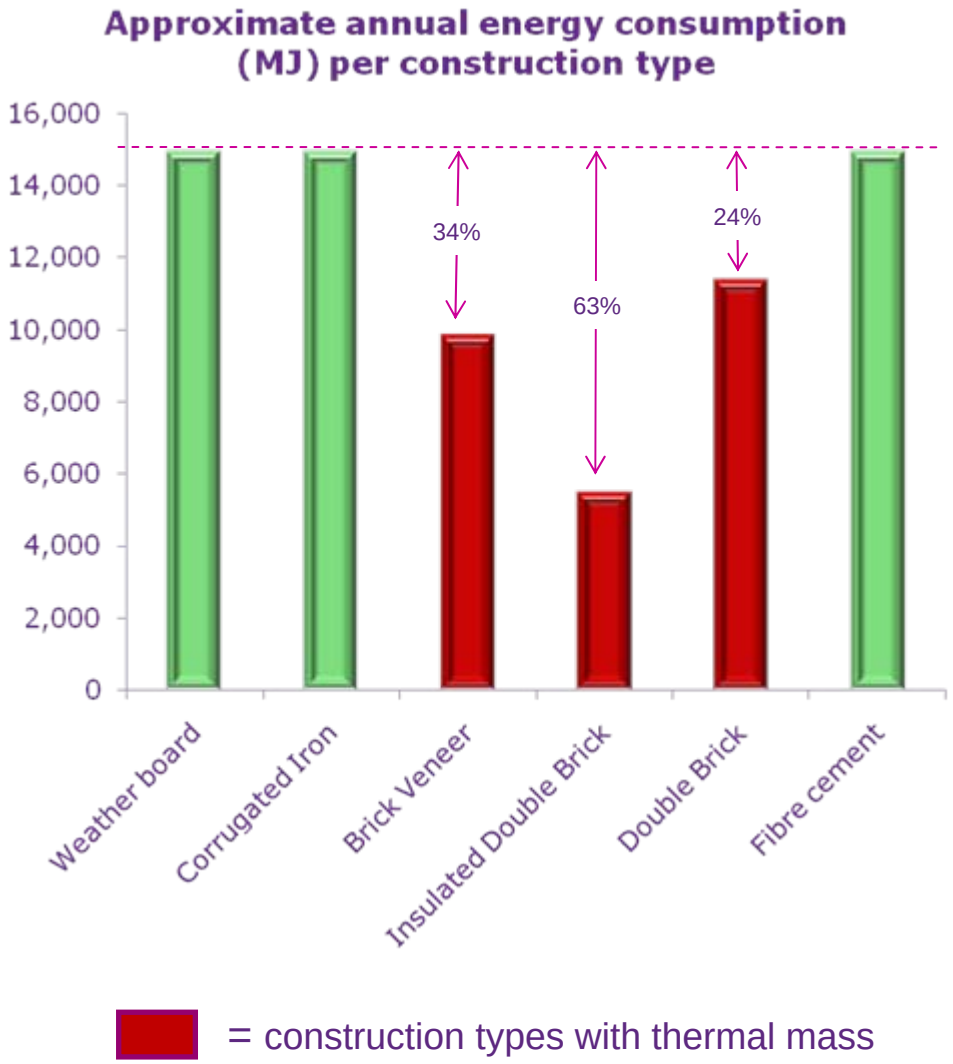
R value (m2k/w)	Approximate annual energy consumption (MJ)
1. 0.44	11,414
2. 1.30	5,485
3. 1.51	14,981
4. 1.83	9,882

R Value has limitations

The missing piece – thermal mass

Thermal mass delays, reduces and absorbs heat: this means less temperature fluctuations and less need for artificial cooling & heating

Thermal mass is most effective when used for internal walls because it absorbs heat entering through windows

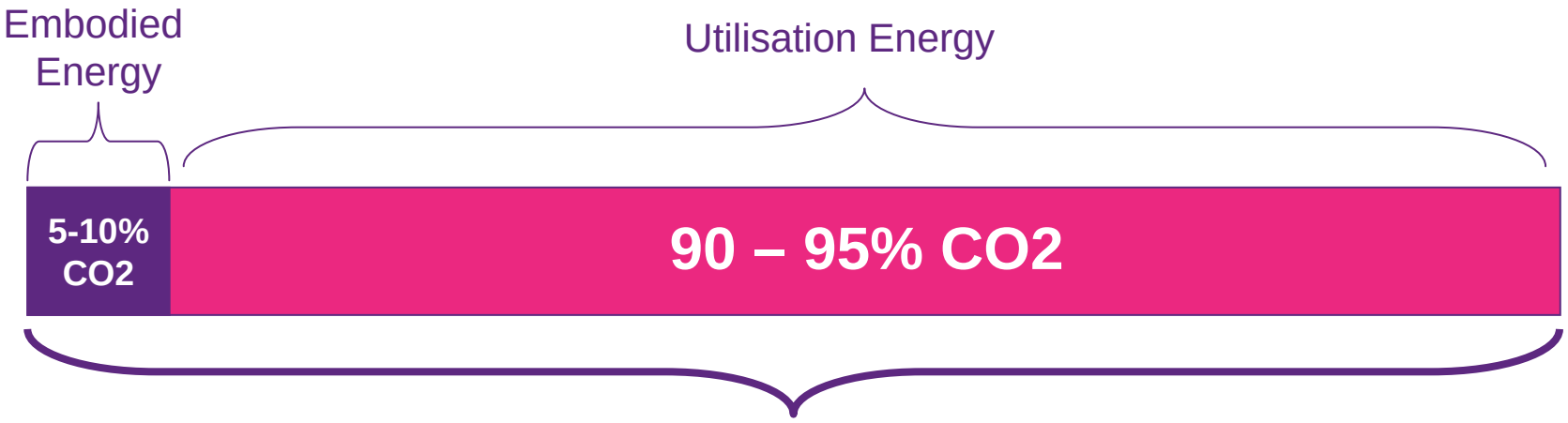


Key points

- BCA regulates product performance for thermal efficiency according to R-value
  - Table 3.12.1.3, Vol 2, pp 512-514
  - There are significant limitations in R-value's ability to reduce residential energy consumption
  - Thermal mass has significant role in improving energy efficiency, but has a low R-value
- A new metric is needed
  - That encompasses both thermal mass and thermal resistance
  - Has been tried before with limited success because no comprehensive database existed
  - Phase II of the research seeks to find a new metric
- CPRS in conjunction with existing market forces has the potential to
  - Exacerbate the principal-agent barrier
  - Dramatically increase energy consumption

Embodied energy... a small part of the story

- The amount of energy required to manufacture a product
- Research - BHP Research and The Centre for Sustainable Technology at The University of Newcastle.



60 years

Typical Sydney project home
Non-solar passive design

BHP Research in collaboration with The Centre for Sustainable Technology at The University of Newcastle.

Reduction of EE the answer?

The embodied energy alternative – Life Cycle Assessment (LCA)

- LCA measures the total cost/benefit of a product; not just the energy used to make it!

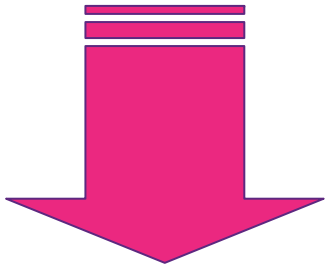
- BPIC (Building Products Innovation Council)
  - Government AusLCI project to enable comparative, level playing field approach to building material selection and the impact across the building's life

Outcomes of AusLCI

- Database of material data (LCI) for use in LCA design tools
- Foundation for the development of Ecolabels
- Common methodology for collecting data to measure the costs & benefits of building materials
- Building material industry developed & endorsed protocol for data use

How do we future proof the built-environment?

- Develop new metric that combines the value of thermal mass and thermal resistance
  - Replace R-value from DTS provisions in Building Code of Australia
  - Integrate with existing 2nd generation thermal modelling software (eg AccuRate, BERS)
- Introduce life cycle analysis for building systems that combines embodied energy, operational energy, maintenance and end-of-life emissions



Takes time to get it right!!!!

However research helps **NOW**

Putting research into practice

‘Revolution Road’

- Landcorp initiative
- 11 display homes at Seville Grove, City of Armadale
- Showcasing innovation & sustainability

‘8 Star House’

Verifies and contributes to thermal research program

- 185m2 family home
- Showcases affordability ($200k) and sustainability (8 Star)
- Educates consumers (3,000 visitors)

Building a greener future
JADEPROJECTS AUSTRALIA

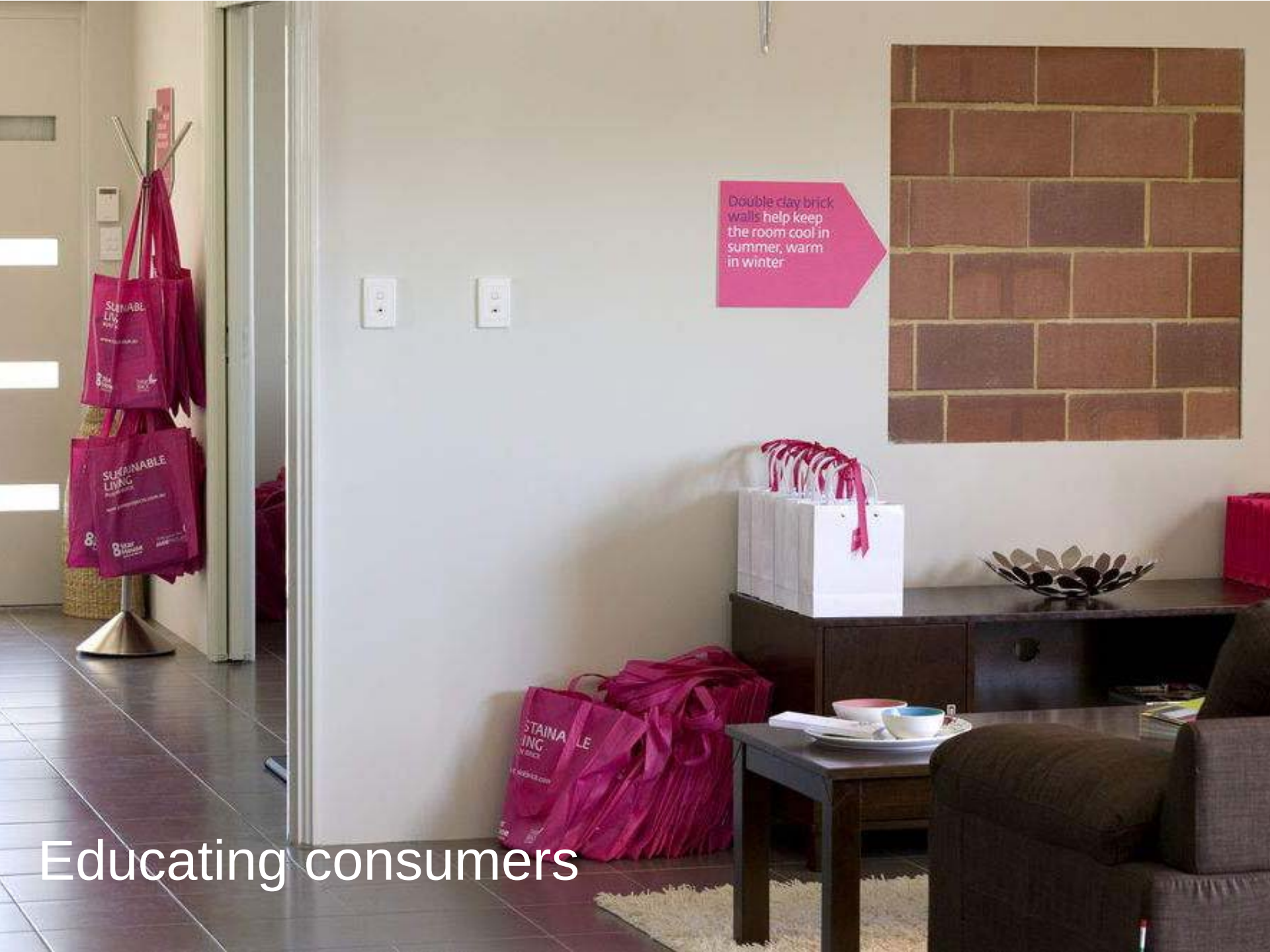
8 Star House
BUILT IN BRICK


Double clay brick & tile construction

Solar Passive Design Principles


Universal access


76% less energy & 72% less water*
*than the average WA home using BSA tool by the DIP

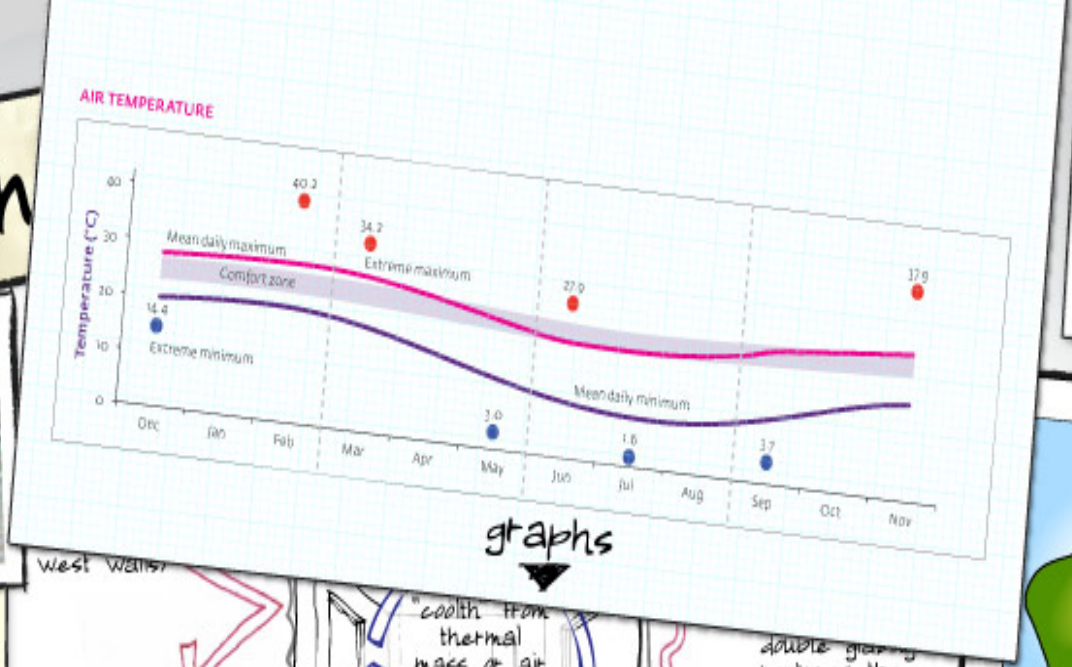


Educating consumers

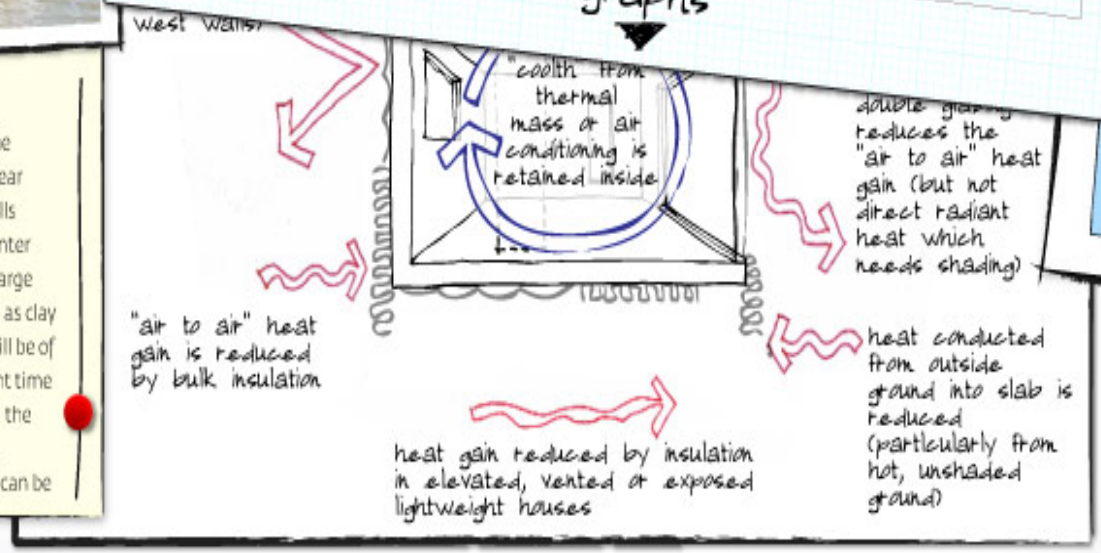
Brisban

Air temperature

The daily maximum is above the comfort zone for most of the year whilst the diurnal minimum falls below the comfort zone for winter and spring, suggesting that a large amount of thermal mass, such as clay brick walls inside the house, will be of great benefit. This ensures night time "coolth" is stored for use during the day in summer and conversely, daytime warmth from the sun can be



graphs



Sustainable Design Strategies for Brisbane

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LIVE IN IT.

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