environmental architecture
19/151 foveaux st surry hills nsw 2010
t: 02 9332 1211 f: 02 9332 1355 abn: 73 342 704 770

environa studio

WHAT IS SUSTAINABLE DESIGN IN ARCHITECTURE AND HOW CAN WE ACHIEVE IT?

SPEAKER: TONE WHEELER

Why is sustainability in building design important?
A discussion of the proportions of green house gas and water usage that is attributable to building design and the sensitivities of each of the uses in regard to possible savings in energy, green house gas and water. A short description of the various environmental consequences of green house gases, pollution, water depletion and pollution, resource depletion and peak oil.

<u>environmental threats</u>

resource depletion
- non renewable materials / renewable materials

water + air pollution
- building materials are major factors in pollution
- environmental damage/embodied energy/construction waste

climate change
- co_2 generation
- greenhouse effect

peak oil
- oil is vital for fuel + material
- “peak oil” = oil demand exceeds supply/discovery

population
- exponential growth
- inequality in energy/resource use
- convergence on lifestyle eg: growth in India + China

lifestyle
- 2x2x2x2x2

What is the Government doing about it?
An outline of the new initiatives being taken by the Federal Government to promote E2G2 (Energy Efficiency + Greenhouse Gas Reduction) in particular the matters to introduce savings in homes and schools. A short discussion of the new incentives and proposed regulations.

What can Architects do about it?
An explanation of the various areas of energy and water use within various building types and the sensitivities these activities have to making these to making savings. A discussion of the role of thermal comfort, the water cycle (including water heating), lighting and appliances and building materials.

What is real thermal design for sustainability?
A quick revision of basic yr2/3 university thermal comfort principles as a reminder of the basic physics. A demonstration of how this physics applies to real design and the major aspects for good climate design: insulation, orientation, thermal mass, fenestration. A series of illustrations of how these basic principles, easily understood as physics, an be extrapolated into exciting and interesting designs.

<u>thermal comfort - passive design systems/sitting</u>
- insulation / fenestration and shading / thermal mass
- warmth = passive solar
- coolth = passive cooling/ventilation
- active systems
  - heating : convection/air heating vs radiant/building heating
  - cooling: air conditioning vs evaporative cooling

design issues

- real thermal design
  - convection vs radiant comfort
  - air conditioning vs building conditioning
  - passive design as a better quality design
  - the “esky/chilly bin” vs the tent

Why don’t the simulation tools to examine thermal comfort work?
An explanation of the basis for simulation tools (Accurate, BERS Pro and First Rate 5), the second generation software that can be used to simulate thermal performance. Understanding the principles for this software can illustrate both its limitations and its great benefits. Knowing the principles can help a designer to exploit the best aspects of the simulation programs in achieving great design.

- thermal design simulation + rating tools
  - computer simulation engines: CSIRO “Cheenath”
  - NatHERS
  - AccuRate
  - BERS
  - First Rate 5
  - Ecotect
- green building rating tools
  - BASIX
  - Green Star
  - NABERS

What impact does water conservation design have on overall building design?
An explanation of how the technical aspects of water collection, storage and reuse can impact the design or roof forms (including solar water heaters) the aspects of gutters and down pipes and the new science of water storage and reticulation.

water

- traditional water systems
  - dams + distribution issues
- rainwater
  - guttering + collection
  - storage
  - pumps + filters
- stormwater
  - collection + detention
  - contamination issues
- grey water
  - separate sewer systems
  - treatment + reuse
- black water
  - wet treatment systems
  - dry/composting systems

What advances are there in lighting and appliances that can be adapted into building design?
A review of recent developments in improved appliance design and the star rating method; and a review of new techniques for lighting including electronically ballasted fluorescents and Light Emitting Diodes (LEDs). An explanation of how a change in bulb technology requires a radical rethink of luminaire.

fire = energy

- demand side
  - water heating
    - gas better than electricity / solar better than gas
  - refrigeration: ratings + numbers
  - appliances + cooking
  - lighting
- supply side
  - traditional sources
    - coal /oil / nuclear / hydro
  - renewable sources
    - solar / wind / tidal

What are good and bad sustainable materials?
A discussion of what constitutes good and bad sustainable materials and the criteria currently being used. An explanation of the impact of Life Cycle Assessment (LCA) and its impact on IEQ (Indoor Environmental Quality). A discussion and demonstration of the use of *Eco-Specifier* as a broad based specification for sustainable materials.

earth = construction

- building materials = life cycle assessment (LCA)
  - resources: mining/extraction/transport
  - raw materials manufacture + transport
  - component manufacture + transport
  - site assembly
  - maintenance + repair
  - demolition
  - reuse/recycle/downcycle/waste
- sustainable building practices
  - certified resources
  - quality manufacture
  - factory assembly v site construction
  - waste recycling + minimisation
  - 3L's: long life, loose fit, low energy
  - 3R's: repair/reuse/recycle

air = environmental health

- spatial size: quantity vs quality
- indoor air quality
- volatile organic compound (VOC's)
- fresh air vs heating + cooling
- building emissions + waste
- "good environmental choice" label

How does all this come together?
Presentation of three short case studies of the application of these principles to a single house, a medium density townhouse and a higher density apartment design, with all the above fields being shown in their design outcomes.

3 sustainable design + construction principles

- ecomould: form follows environment
- mid-tech: low impact materials with high quality assembly
- build once: exposed construction, raw finishes, capable of reconstruction.

sustainable advocacy

- green building vouncil (NZ, AUS)
- environmental design guide (BDP, RAIA)
- your home guide
- RAIA environment policy

10 websites

an inconvenient truth	www.aninconvenienttruth.com.au/truth/
your home	www.greenhouse.gov.au/yourhome
BASIX	www.basix.nsw.gov.au
eco specifier	www.ecospecifier.org
green building council of New Zealand	www.nzgbc.org.nz/
green building council of Australia	www.gbcaus.org/default.asp
Australian building greenhouse rating	www.abgr.com.au
eco sustainable	www.ecosustainable.com.au/links.htm#1
green building	www.en.wikipedia.org/wiki/green_building
cradle to cradle	www.mcdonough.com

10 books

W. McDonough & M. Braungart (2002), *Cradle to Cradle,* New York, North Point Press
Lisa Heschong (1979), *Thermal Delight in Architecture,* Massachusetts, The Massachusetts Institute of Technology.
Ian McHarg (1995), *Design With Nature,* New Ed edition, Wiley
Victor Olgyay (1963), *Design with Climate,* New Jersey, Princeton University Press
James Steele (2005), *Ecological Architecture,* London, Thames & Hudson
Ralph L. Knowles (2006), *Ritual House,* Washington, Island Press
Ed Melet (1999), *Sustainable Architecture,* Rotterdam, NAI Publishers
D Hawker, J McDonald & K Steemers (2002), *The Selective Environment,* London, Spon Press
G Hausladen, M de Saldanha, P Liedl & C Sager (2005), *Climate Design,* Munich, Birkhauser
Peter Smith (2001), *Architecture in a Climate of Change – A guide to sustainable design,* Oxford, Architectural Press