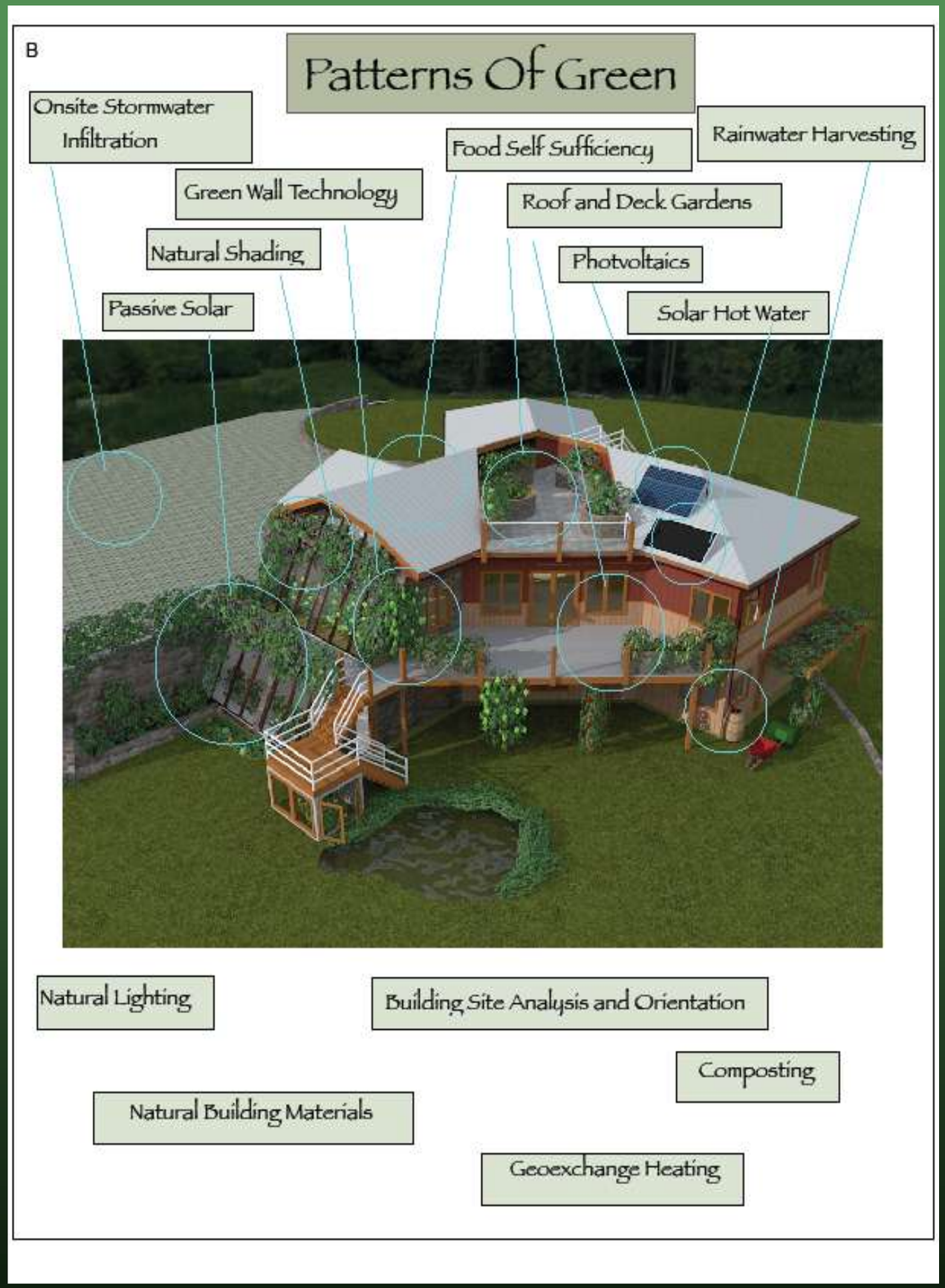
RDN Green Building Workshop 2011

Passive Solar Design

Jack Anderson
Greenplan.ca



Site Design
Geothermal
Passive solar
Solar hot water
Renewable Energy
Water Conservation
Rainwater harvesting
Green Wall Technology
Energy Conservation
Building Materials
Food Production
Roof Gardens
Bee Habitat
Natural Lighting
Recycling Center
…

Passive Solar Statistics

Unplanned ps / ig contribution - 25 to 30%
Conventional construction

Unplanned ps / ig contribution - 40 to 45%
Energy efficient home

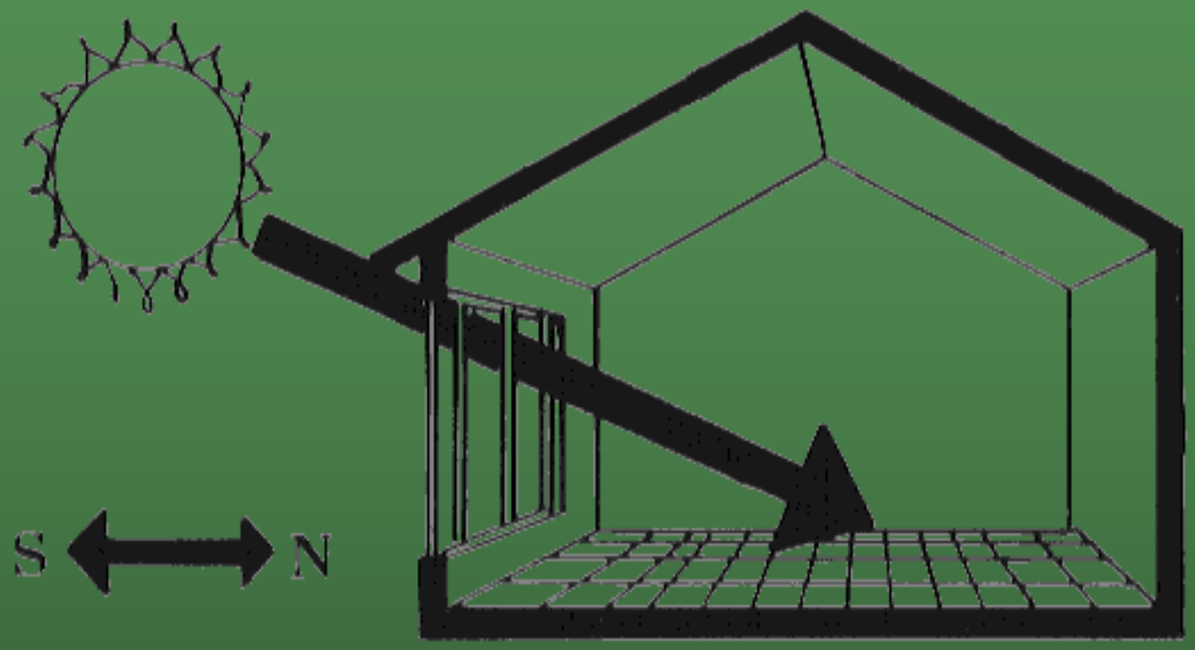
Passive solar home ps / ig - 60 to 75%

ps / ig = passive solar and internal gains

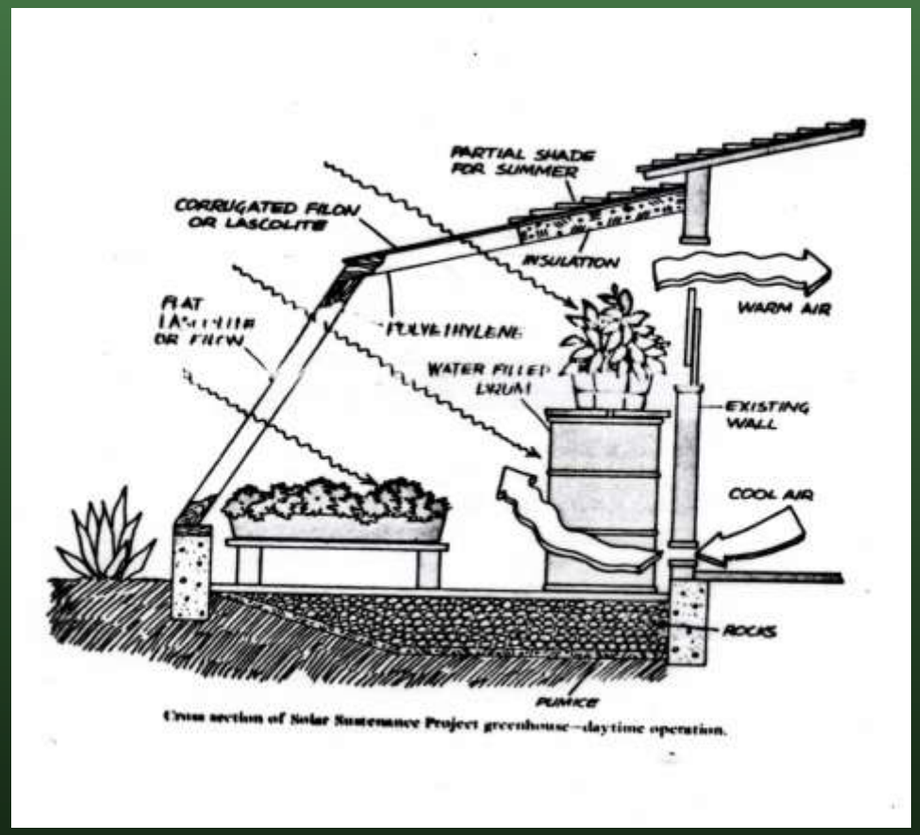
Passive Solar Principles

- Direct vs Indirect Gain Systems
- Location & Orientation
- Glazing
- Shading
- Thermal mass
- Ventilation
- Sunspace function

Direct vs In-direct Gain



Direct gain



Cross section of Solar Sustenance Project greenhouse—daytime operation.

In-direct gain

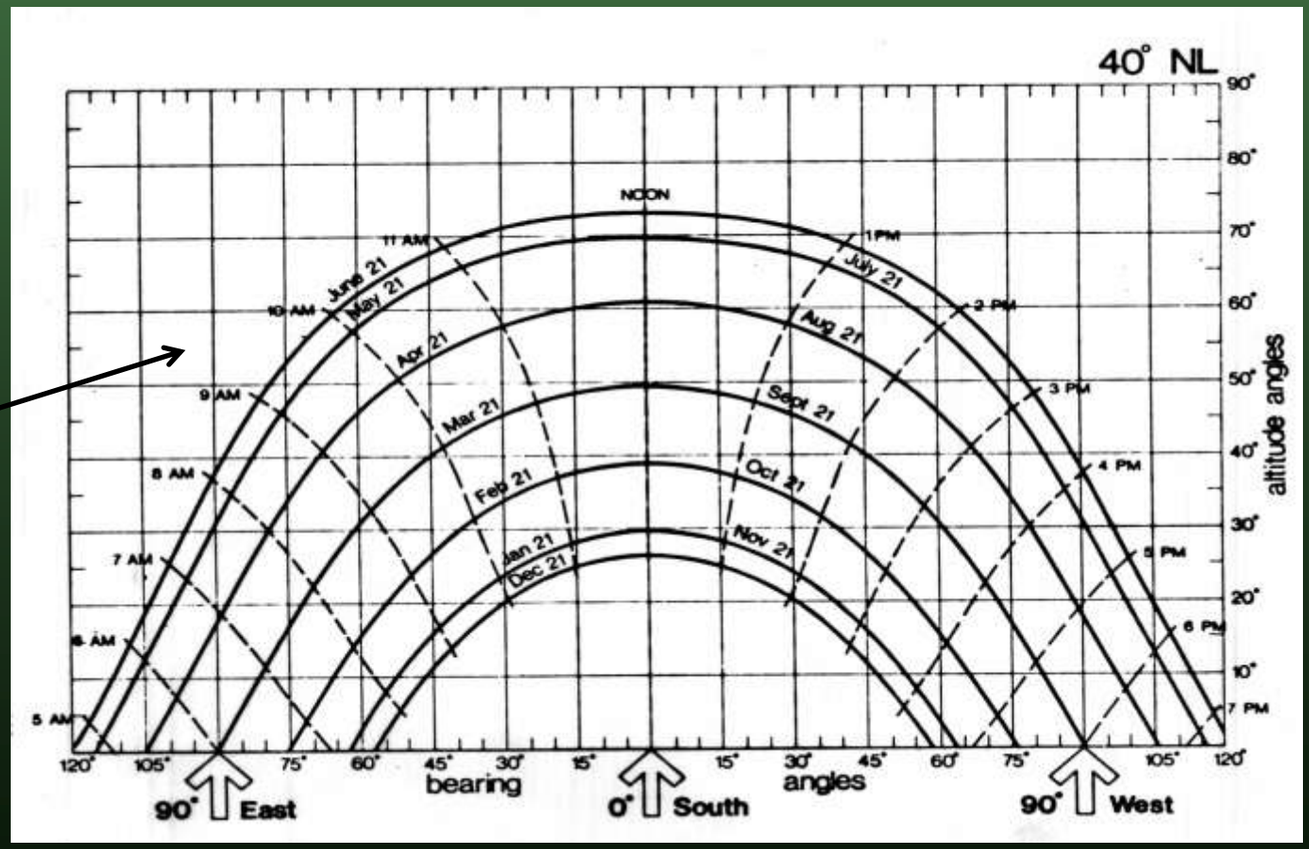
Advantages of in-direct gain systems

- Heat loss and heat gain control
- Flexibility in use
- Multi-story options

Location and Orientation

- Build sunspace on south slope
- Prime corner is south east
- Orientate glazing +/- 20 deg of due south

sun path diagram



- south slope
- due south
- west glass

Glazing

- Glass quantity – match to end use
- Sloped glazing – heat collector or growing
- Roof glazing – advantage to skylights
- Window insulation – reduce night heat loss

roof glazing

Shading

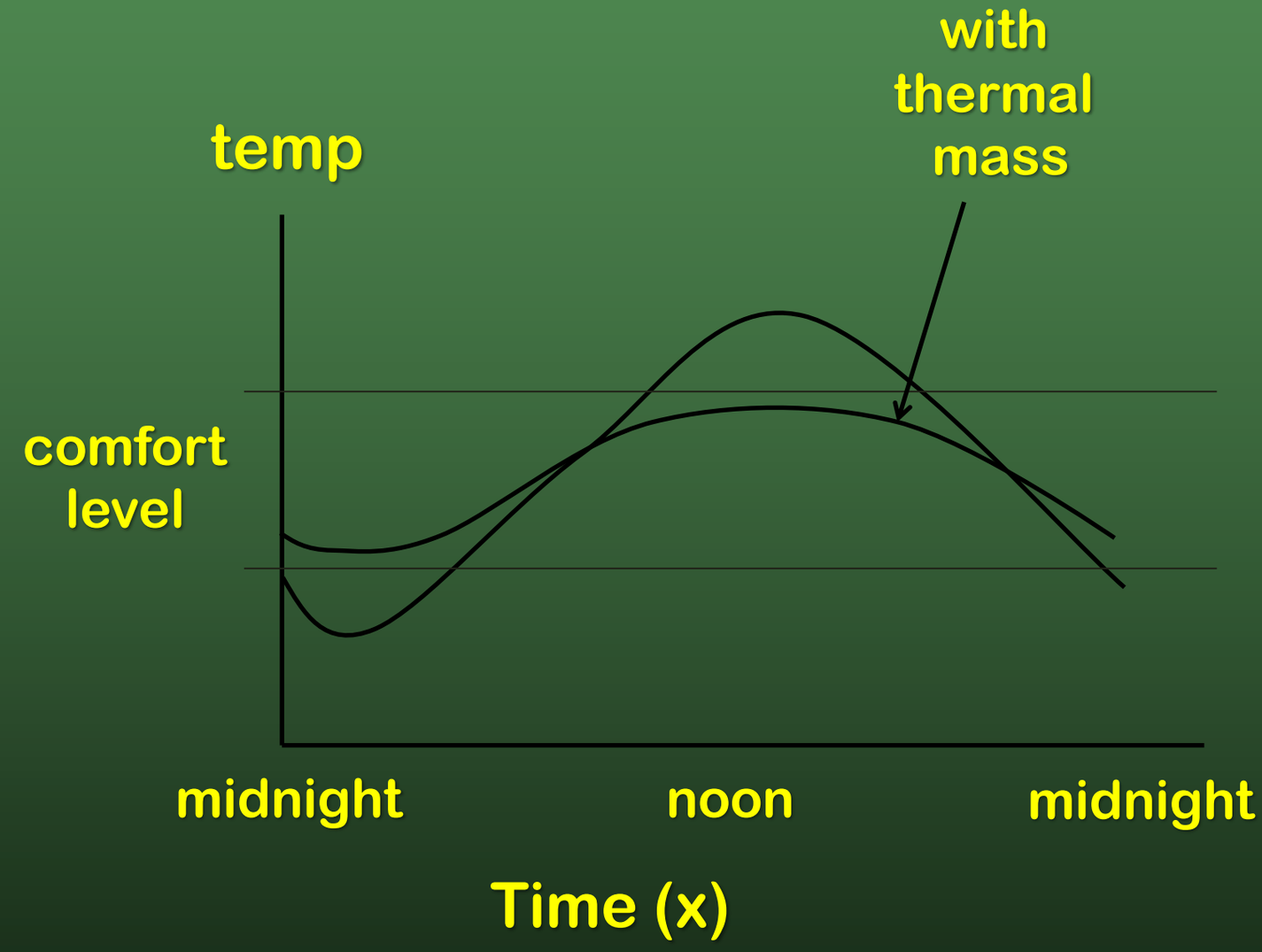
- Permanent overhangs vs seasonal shading
- Deciduous trees & vines (esp. west side)
- Blinds, awnings and glass paint

Thermal Mass

- Controls temperature fluctuations

- Mediums
water, stone, cob

- Future
seasonal
systems



masonry tiles
dark color &
non-glossy

water tank
plant irrigation & domestic
hot water preheat

Ventilation

- **Heat distribution & exhaust**
  interior & exterior vents

- **Vent sizing**

  approx 5% of total glazing area
  exhaust to intake ratio between 2:1 and 3:1

- **Natural thermosyphon**

- **Solar cooling**

- **Temperature controlled fans & vents**

Sunspace Function

- Meeting the dual challenges of rising energy and rising food costs
- Sunspace pays for itself
- Warmth, comfort and aroma for stress reduction and socializing

Passive solar reduces our footprint

The PS Quiz

What are the main disadvantages of a direct gain passive solar home?

Glass and the greenhouse effect provide solar gain, what are the 3 principles we can use to control this heat?

Is passive solar the most reliable form of renewable energy?

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