TAYLOR'S UNIVERSITY
Wisdom · Integrity · Excellence

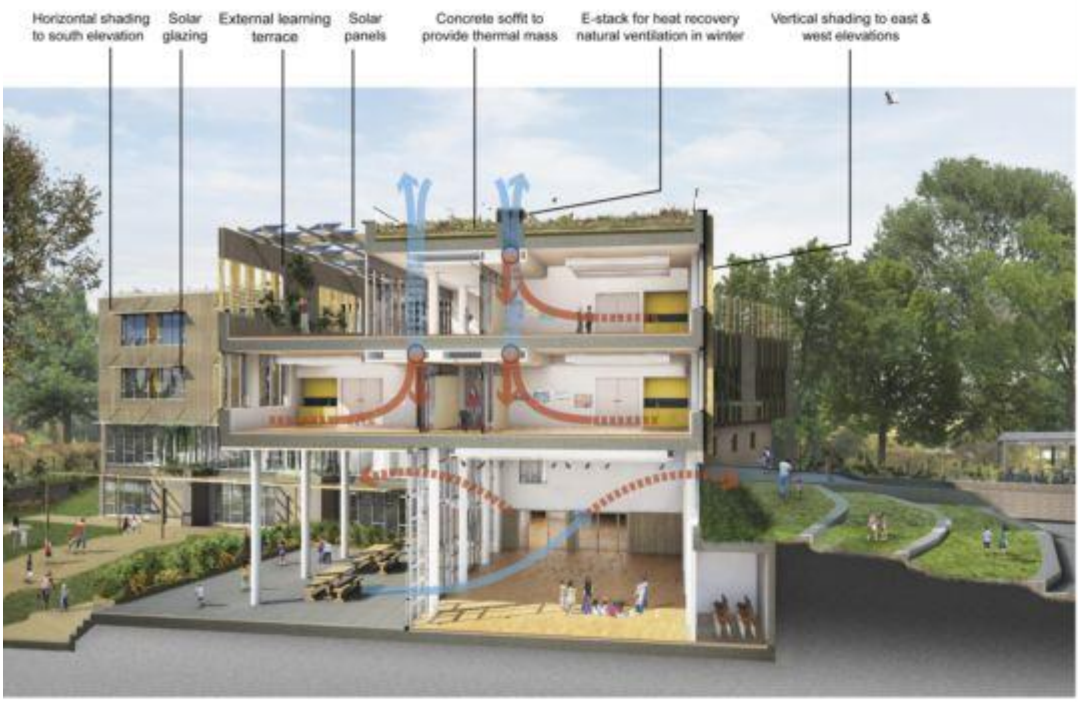
SCHOOL OF ARCHITECTURE, BUILDING & DESIGN

Centre for Modern Architecture Studies in Southeast Asia
Bachelor of Science (Honours) in Architecture

BUILDING SCIENCE 1 (BLD60803 / ARC2413)
Prerequisite: NONE

Project – Case Study: Analyzing Passive building design strategies
40% of final Marks (including Peer Evaluation)
Submission date: Week 11 (15 June 2017)

Project	**Group**	**LO 1, 2, 3,7**	**40%**	• **2 A3 presentation board**	**Presentation Board**



Section through Ashmount School

source: http://www.architecture.com/SustainabilityHub/Casestudies/9a-CrouchHill,London.aspx

Introduction

Basic building design does not require mechanical heating or cooling. Buildings that are passively designed take advantage of natural climate to maintain thermal comfort.

Incorporating the principles of passive building design in building:

- Significantly improves comfort
- Reduces or eliminates heating and cooling bills
- Reduces greenhouse gas emissions from heating, cooling, mechanical ventilation and lighting.

Building envelope is a term used to describe the roof, walls, windows, floors and internal walls of a building. In a tropical climate, the envelope should controls heat gain and exclusion of rainwater. Well-designed envelopes maximize cooling through air movement and exclude the solar radiation. The fundamental principles of basic building design are relatively simple and can be applied to various climate zones, house types and construction systems.

Objectives

The objectives of this project are:

- To identify and define the principles of heat transfer in relation to building and people
- To understand what is thermal comfort and discuss factors relating to thermal comfort
- To analyze the effect of thermal comfort factors in a person and in a space
- To be able to criticize design of the space in terms of thermal comfort by referring to MS1525, UBBL and GBI standards.

Learning Outcomes

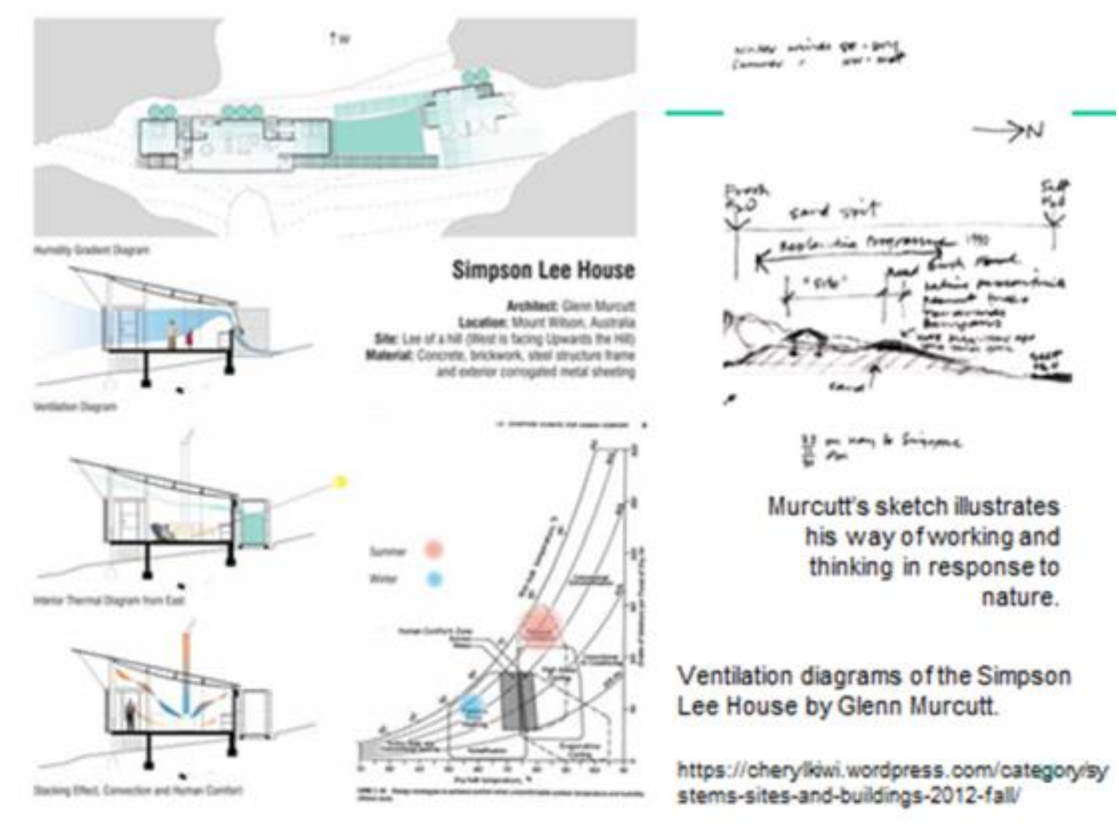
Upon successful completion of the module, students will be able to:

1. Identify environmental conditions related to site conditions, climate, etc.
2. Explain the effects of the sun on the thermal performance of buildings
3. Explain the effect of insulation, thermal mass and air movement on thermal performance of buildings.

Tasks – Methodology

<u>Group work with maximum **6 students** is required to:</u>

- Choose a space in Taylor's Uni Lakeside Campus, identify basic building design for thermal comfort for this space and also the external surfaces for this space. Record and analyze the existing condition in terms of thermal comfort of the interior directly affected by the environmental factors such as sun and wind. Think in 3D and sections as the image in Pg 1.
- Have a thorough research on the basic design strategies and existing thermal comfort level and environmental factors affecting it. Document all environmental factors (4) for a day and average for a year.
- Picture below showcases Architect Glenn Murcutt's Simpson Lee House design addressing the environmental factors. The diagrams best shows how the site analysis data and environmental factors have been used in designing to provide for thermal comfort. Also refer the use of charts to explain.



- Propose a passive design for the roof and elaborate the principles, strategies and details needed to perform best in tropical climate in order to achieve thermal comfort in this building/space. Eg. Roof garden, roof pond. Research the principles behind the usage and its relation to climate and thermal comfort.

- Prove with appropriate methods; eg. That heat gain is reduced through calculations of before and after.
- Conclude your findings with photograph/sketches of the interior ambiances and outline the thermal comfort of before and after.
- Explicitly detail visuals and narrate strategies that accompany this design feature.
- Research should contain the following:
  a. Building Introduction (images, pictures, diagrams, drawings and description)
  b. Site analysis; micro (wind, sun, topography, etc.)
  c. Concept and analysis of buildings basic design strategies and proposed passive design strategy.

d. A proposal to achieve thermal comfort in the chosen space/building, elaborate design features with details, the effect on thermal comfort and importance of it.

e. Appropriate visuals and diagrams (tables, charts, etc.) with appropriate referencing and citation where applicable.

Submission Requirement

- Research Board to be printed on **<u>2A3 Coloured and neatly compiled</u>**. All components must be presented in a well-organized and logical manner.
- Must – name, id, module, intake
- Observe standard margins, font size, spacing and organization.
- More visuals are expected in this poster. Pictures, images, tables, charts and diagrams should be properly labelled, clear and presentable.
- Avoid and double check spelling & grammatical errors.
- Observe and use proper referencing.

a. Building Introduction & Documentation

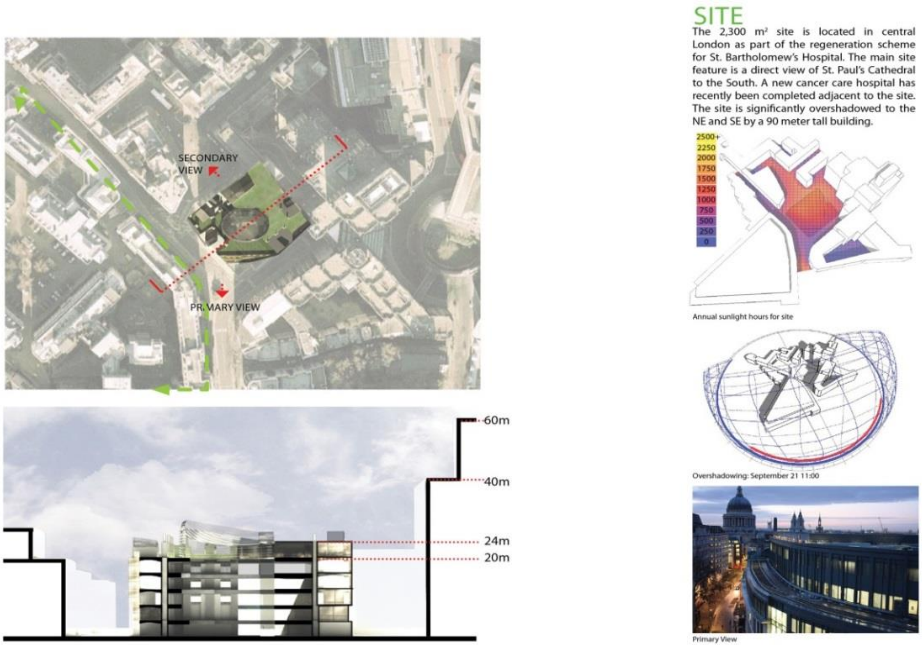


Figure 1. Building Introduction and Documentation (pictures, diagrams & text)

b. Thermal Analysis

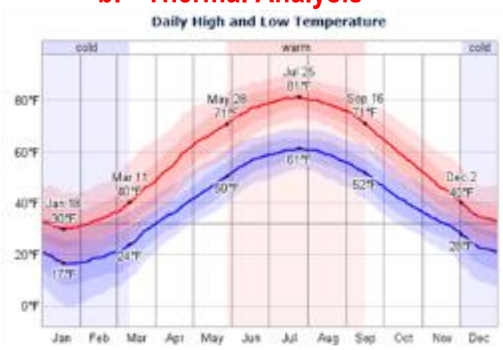


Figure 2. Temperature Chart

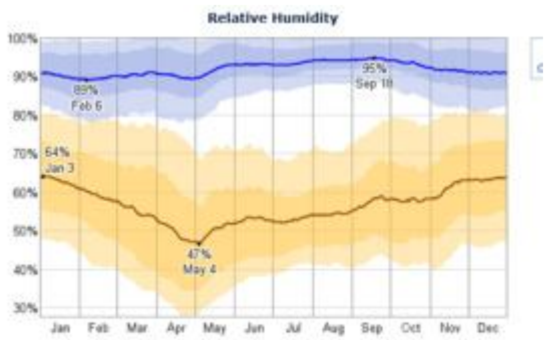


Figure 3. Relative Humidity Chart

sources:
www.timeanddate.com/weather/**malaysia**/kuala-lumpur
http://app2.nea.gov.sg/training-knowledge-hub/publications/annual-weather-review)

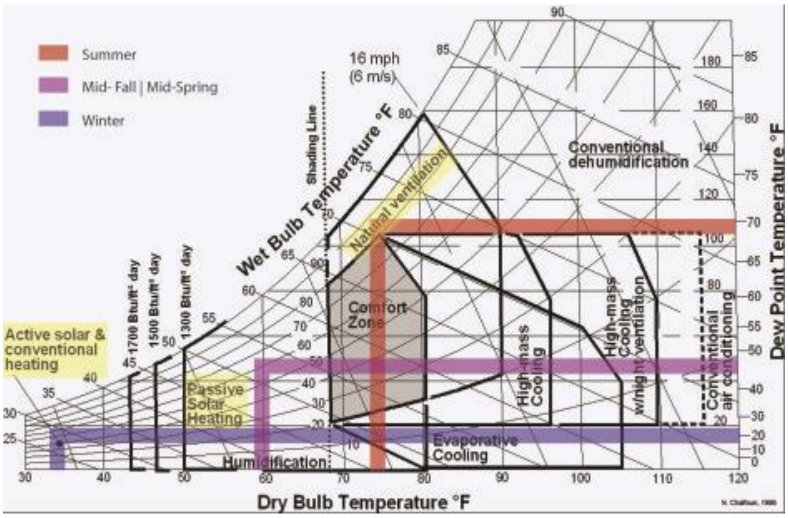
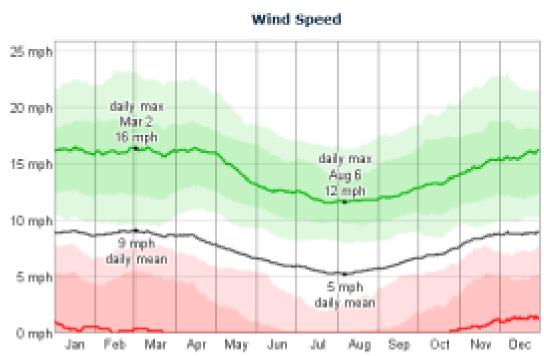


Figure 4. Psychometric Chart

c. Wind Analysis



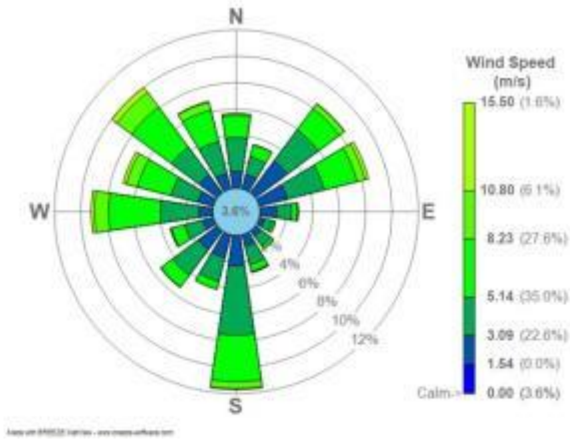
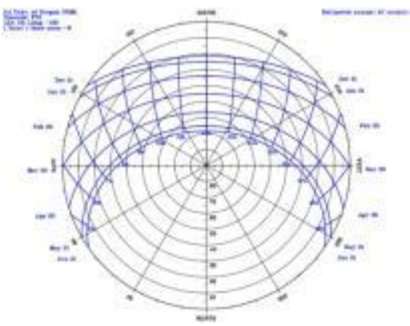


Figure 5. Wind Speed Chart

Figure 6. Wind Rose Diagram

d. Sun Analysis



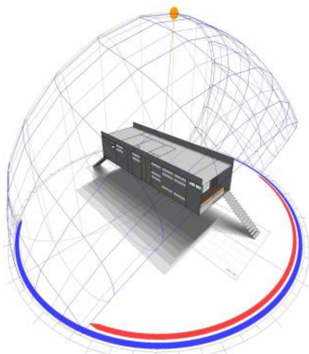


Figure 7. Sun Path Chart

Figure 8. Ecotect Diagram

e. COMMENTS & ANALYSIS of Building on Passive Design Strategies

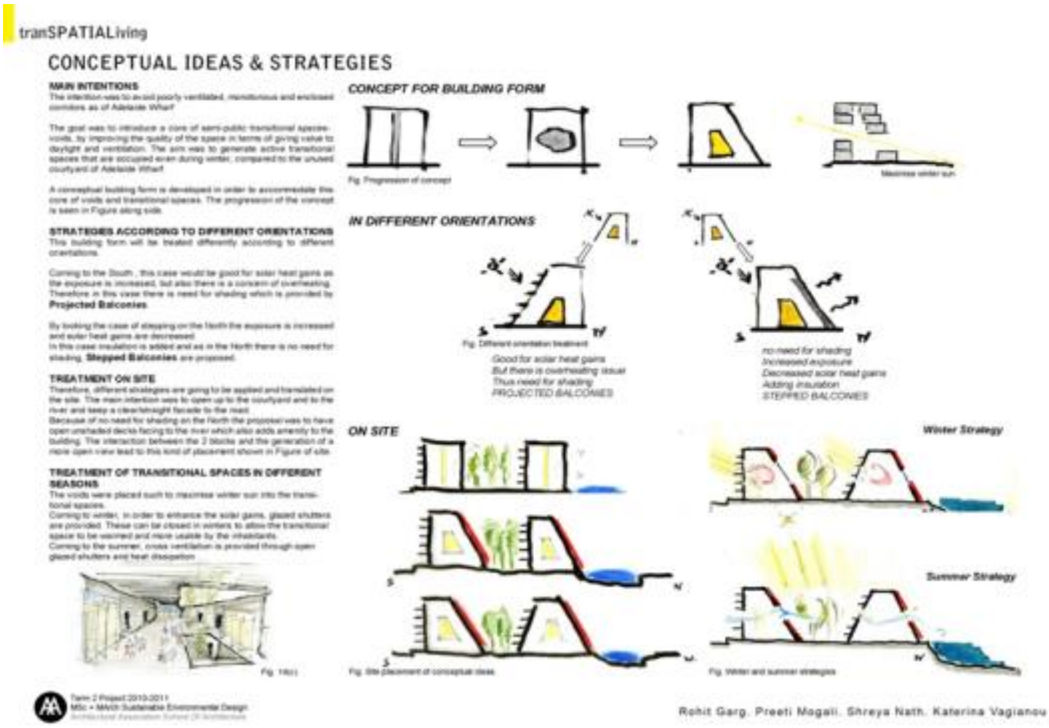


Figure 9: Sample Analysis of Passive Design & Cooling Strategies through sketches and diagrams

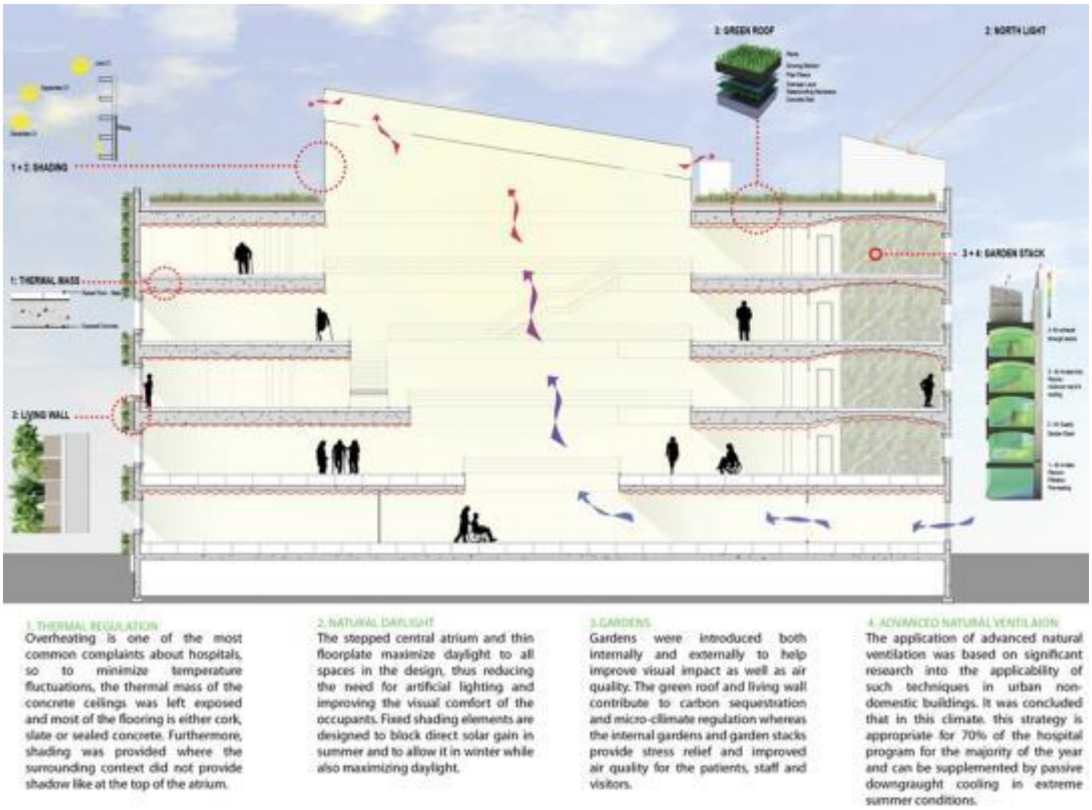


Figure 10: Sample analysis through section.

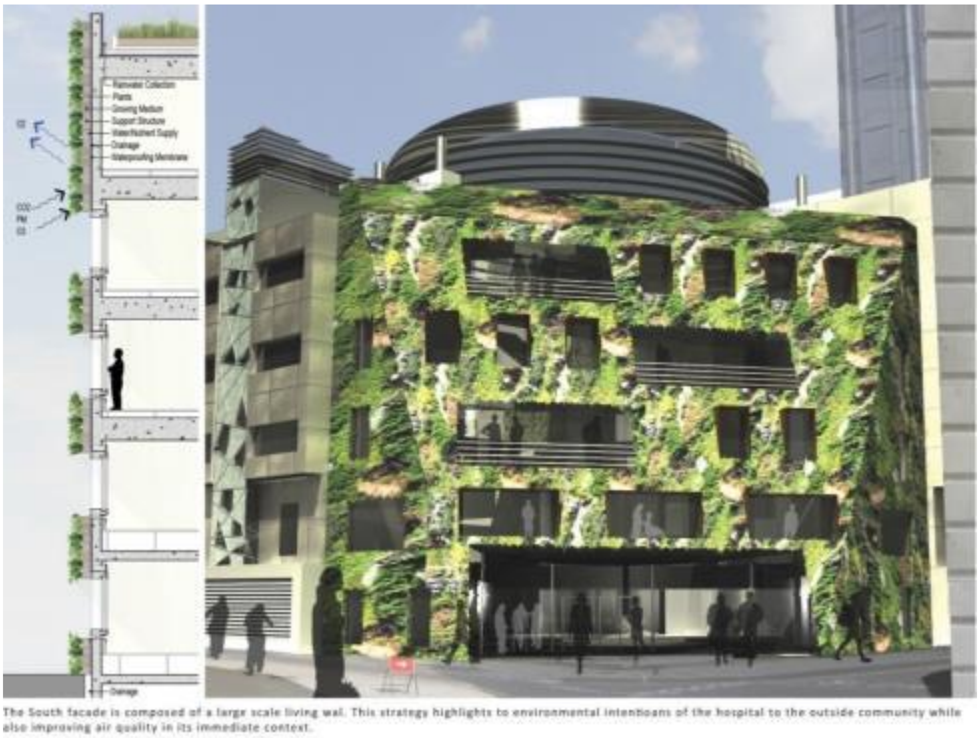


Figure 11: Sample analysis through 3D Drawings and detailed section.

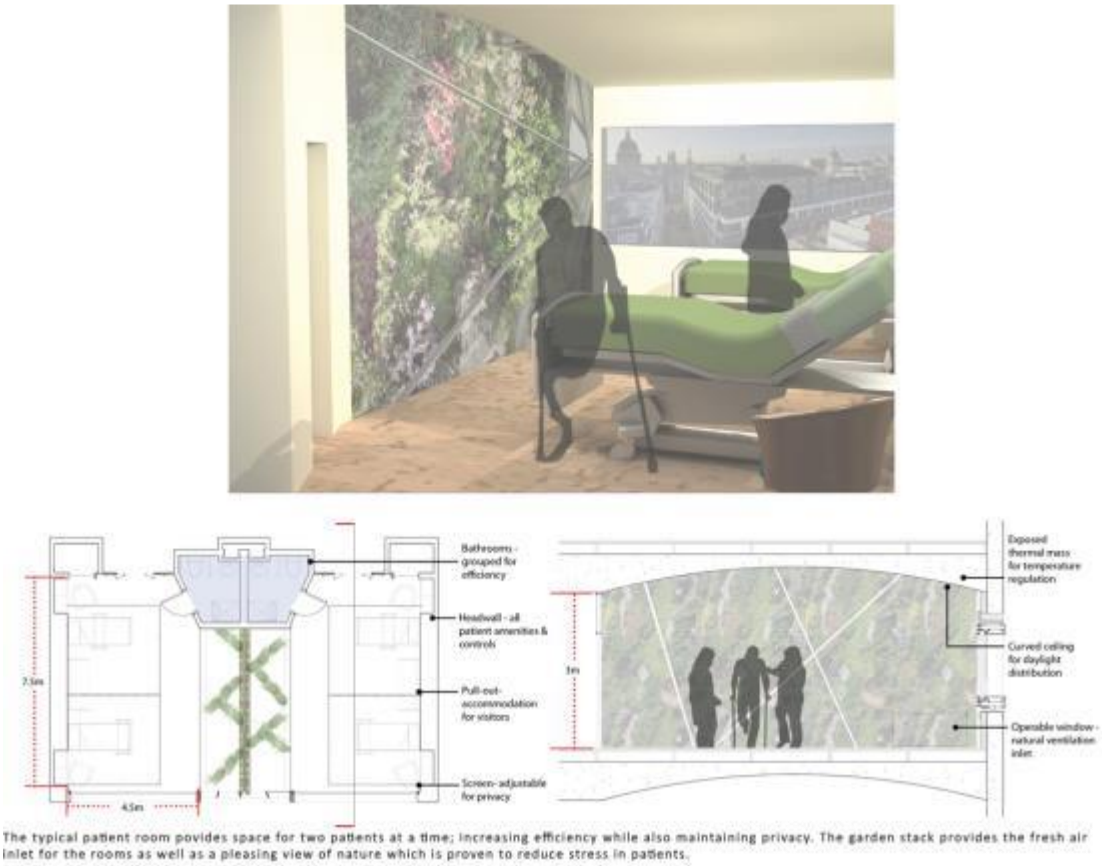


Figure 12: Sample analysis showing interior ambiance, thermal comfort, passive cooling strategies & green features of the building

Submission Date

Week 11: 15/06/2017 Thursday 4:00 PM @ Staffroom, Block C, Level 5

Marking Criteria

- To obtain a pass in this project group must follow the minimum set requirements specified in the Project brief and submission requirements.
- NOTE: PLEASE BE INFORMED THAT INVIDUAL COMPONENTS IN GROUP WORKS IS EVALUATED BASED ON PEER EVALUATION AND INSTRUCTOR'S EVALUATION ON INDIVIDUAL PERFORMANCE OF A GROUP MEMBER.

Additional References

- Phillips, R. (1996) Sunshine & Shade in Australia. AGPS
- Szokolay S. (1982) Climatic Data and its use in Design RAIA Canberra
- Szokolay S. (1996) Solar geometry. Univ of Queensland Printery
- Paolino, S. 1979, Living with the Climate, Advance Press, Perth.
- Baverstock, G. and Paolino, S. 1986.Low Energy Buildings in Australia, Graphic Systems, Perth.
- http://vancouver.ca/files/cov/passive-home-design.pdf
- http://www.inive.org/members_area/medias/pdf/inive/ibpsa/ufsc6.pdf
- G.Z. Brown and Mark DeKay (2001), SUN, WIND & LIGHT, J. Wiley & Sons Inc.
- Mary Guzowski (2010) TowardsZero-Energy Architecture New Solar Design, Laurence King, UK

Prepared by:

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……………………………
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Approved by:

Name of PD/DD

……………………………
Date:
Deputy Dean

Remarks:

1. The project brief is to be distributed to the students in the first week of the semester.
2. Any changes to the project brief shall be communicated (in writing) to the Programme Director and the approved revised version must be communicated to the students.

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BUILDING SCIENCE 1 (BLD60803)
Project 1 – Case Study: Analysing Passive building design strategies
Name: **ID:**

PROJECT Progress Report

(to be printed front n back, to be attached with submission)

No.	Progress (By Student)	Comment (By Lecturer)
1.	Date:	
2.	Date:	
3.	Date:	

4.	**Date:**	
5.	Date:	
6.	Date:	
7.	Date:	
8.	Date:	