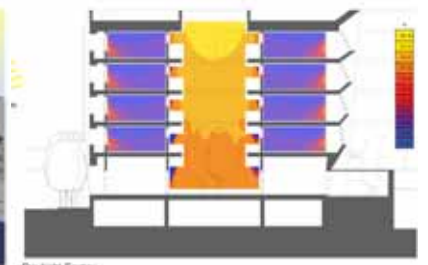
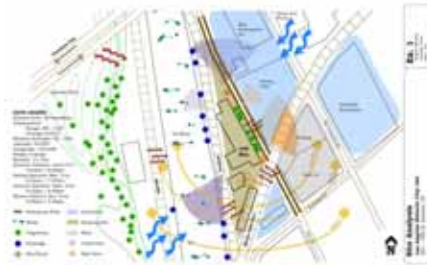


Teaching Climate Responsive Design to Beginning Architecture Students

Presentation in the Teaching in Architecture Conference
Oxford 2008

Pablo La Roche

*Department of Architecture, California Polytechnic State University
Pomona, United States of America*

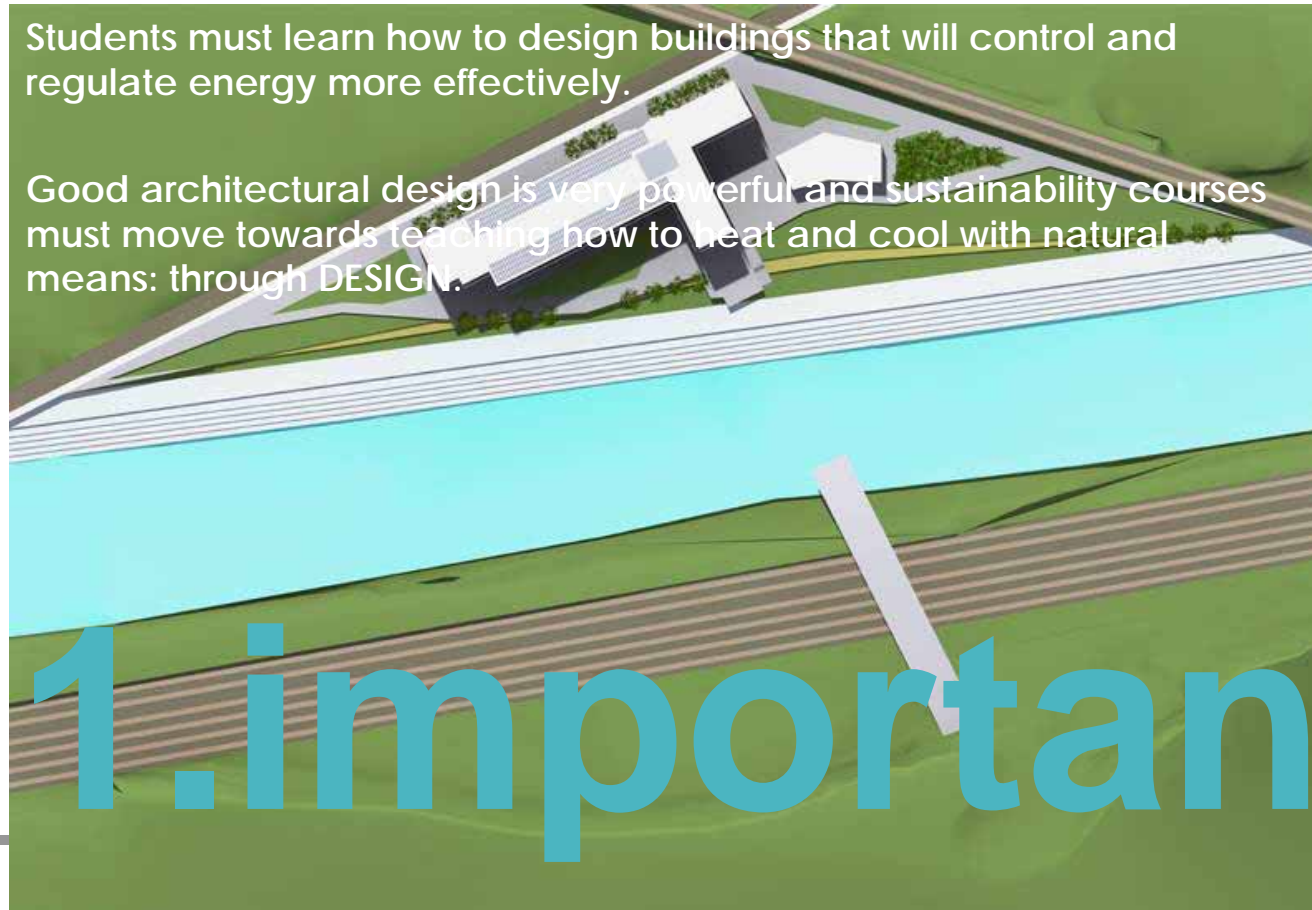




How we teach architecture affects our survival in this planet.

Students must learn how to design buildings that will control and regulate energy more effectively.

Good architectural design is very powerful and sustainability courses must move towards teaching how to heat and cool with natural means: through DESIGN.



1. importance

An overarching principle

Architecture students must become stewards of the environment. For this they must become ecologically literate.

In addition to enhancing the role of sustainability in the curriculum, successful stewardship includes educating across disciplines and integrating education with professional practice.

AIA Pomona Conference on Sustainability in Higher Education 07,
LaRoche, Bahe, Brems, Fraker, Janda, Pyburn

2. General principle: stewardship

Pedagogical Strategies

3.1. Delve Deeper

3.2. Studio and Lecture Integration



3. Pedagogical strategies

Delving deeper instead of bigger

Students should delve progressively deeper instead of bigger. This will increase their understanding of design problems.

Ralph Knowles

AIA Pomona Conference 07

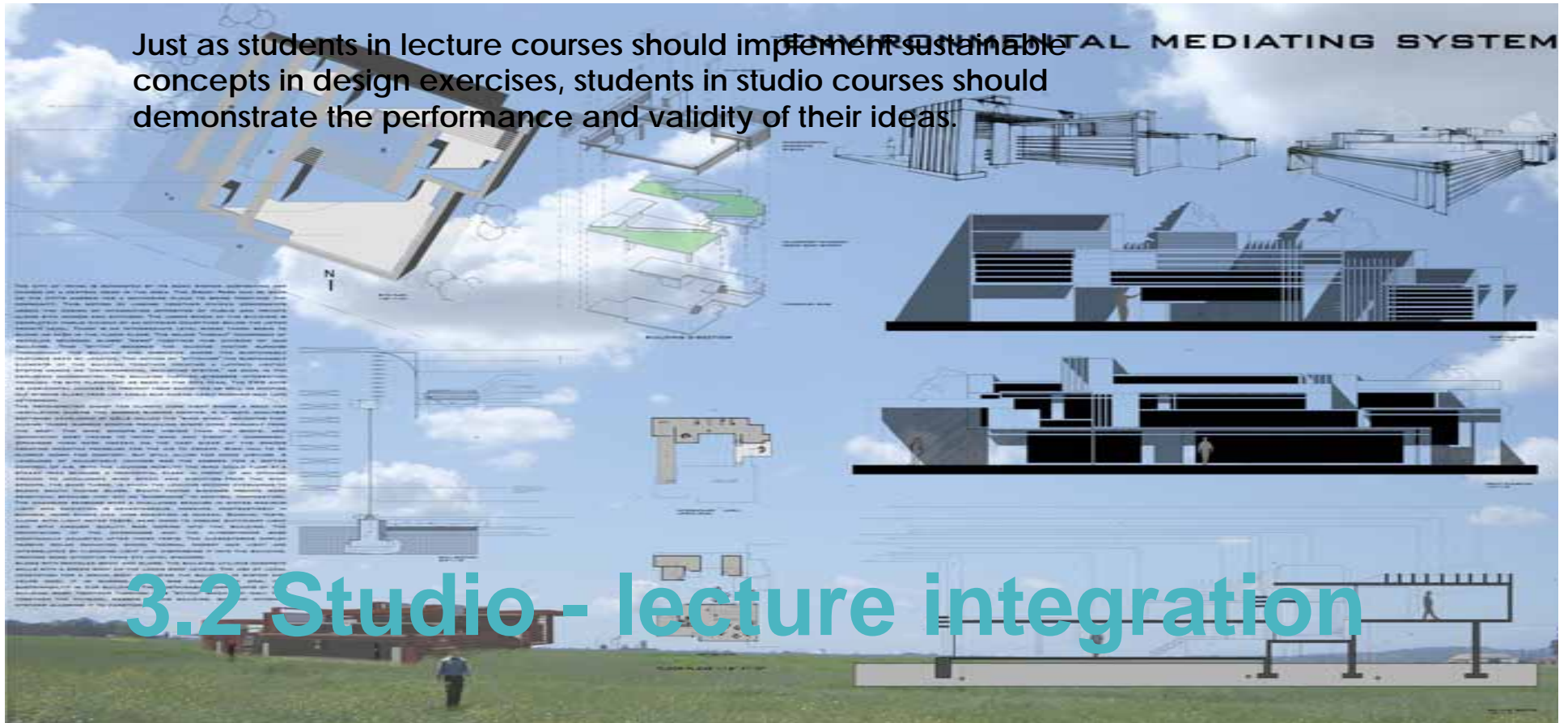
3.1 Delve Deeper

Introductory Level: Second Year Design Studio

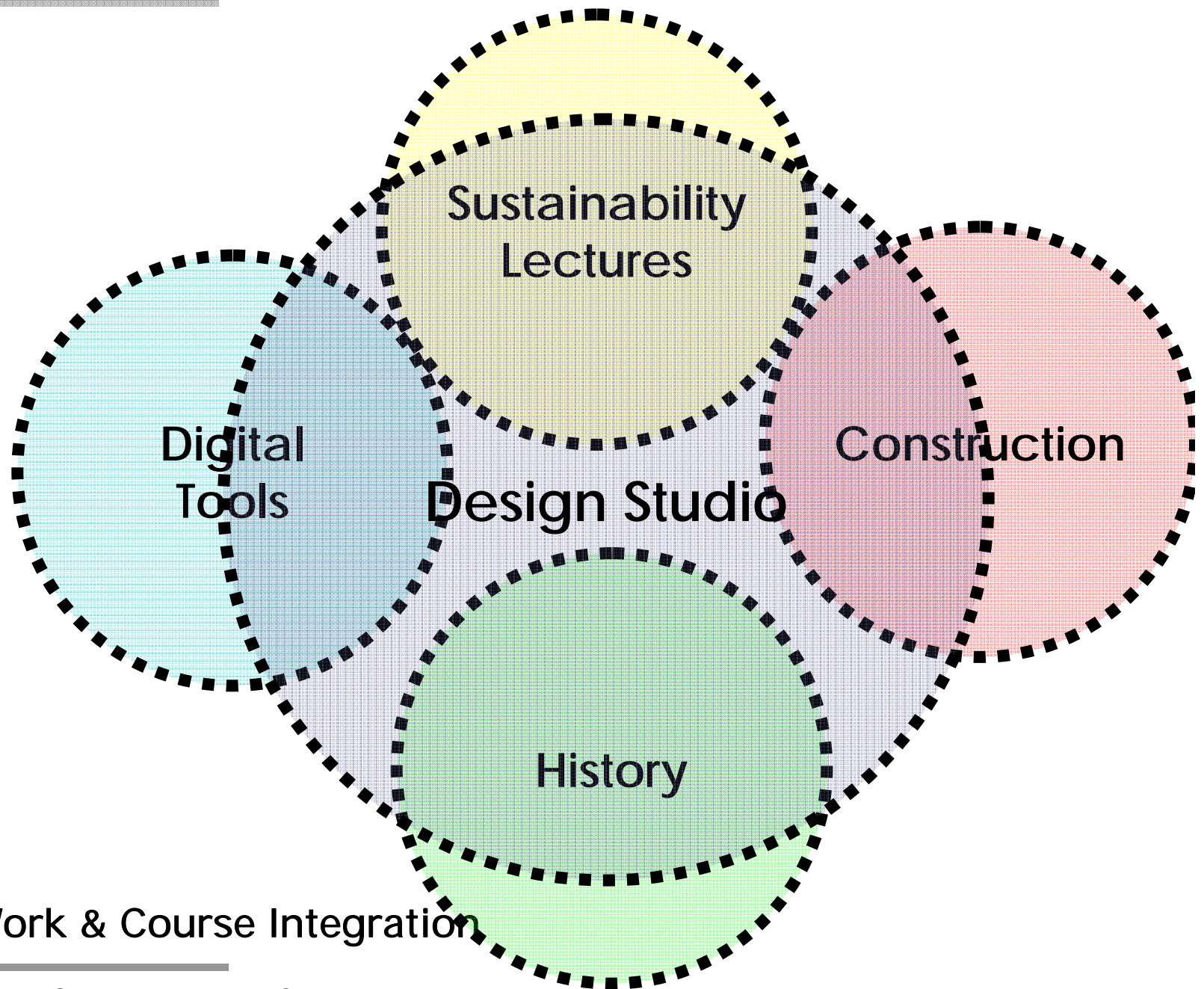


Implementing *Design* in Lecture Courses and *Analysis* in Design Courses

Just as students in lecture courses should implement sustainable concepts in design exercises, students in studio courses should demonstrate the performance and validity of their ideas.



3.2 Studio - lecture integration



Team Work & Course Integration

Introductory Level: Second Year Design Studio

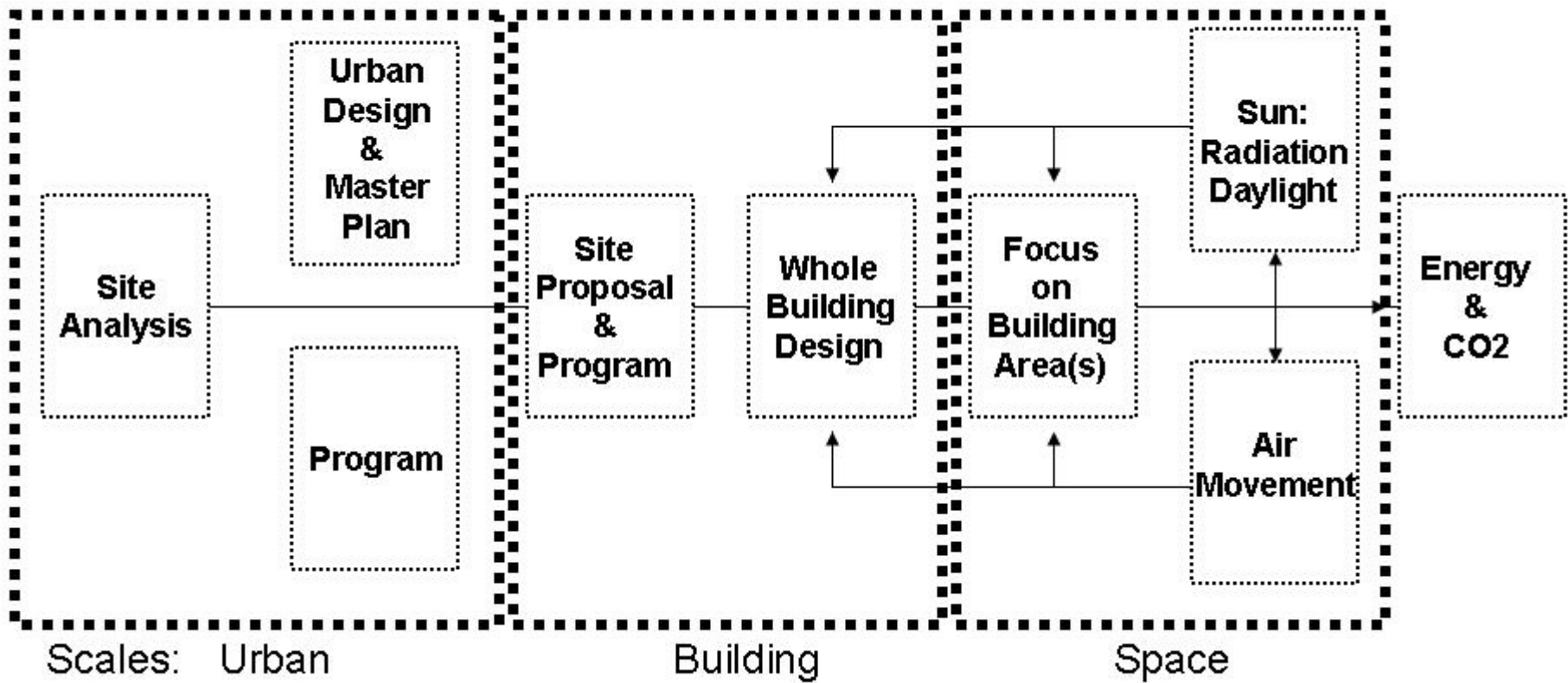
4

Environmental principles



4.Environmental Principles

Introductory Level: Second Year Design Studio



4.1. Carbon Neutral Design Process

Energy

Intelligent use of energy from the sun should play a major role in a sustainable building:

Through the appropriate use of.

Low energy materials and Low energy operation

4.2. Understanding Energy

Second Year Students Beryl Lopez Marlen Alvarez 1st Place USGBC Competition

Students should learn how to use analogue and digital tools as needed.

Students must demonstrate that their design ideas perform as intended.

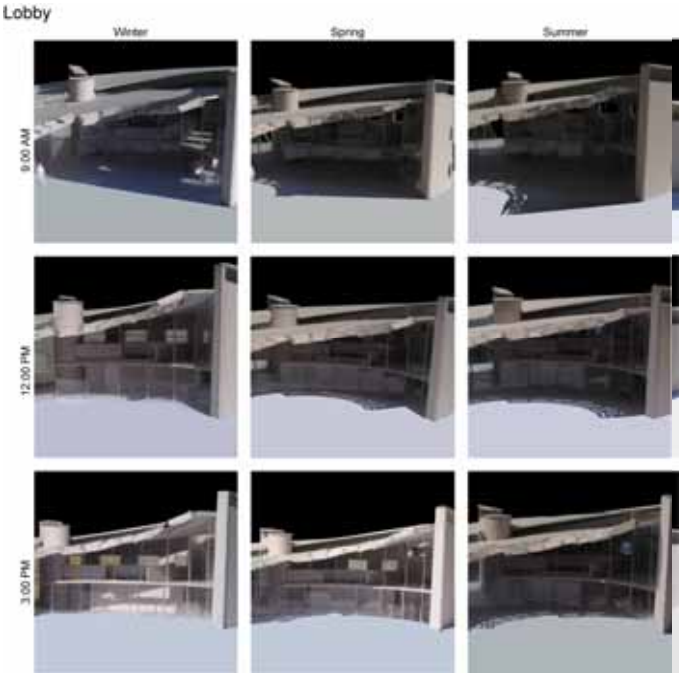


4.3. digital and analogue tools

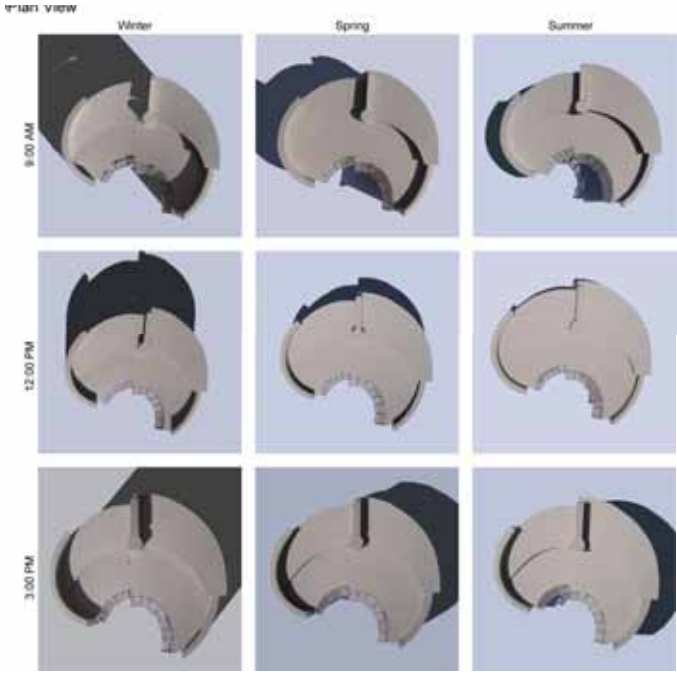
These tools should be used to understand the sun



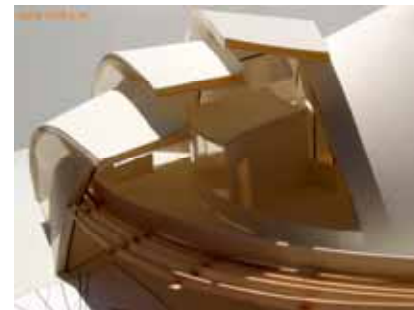
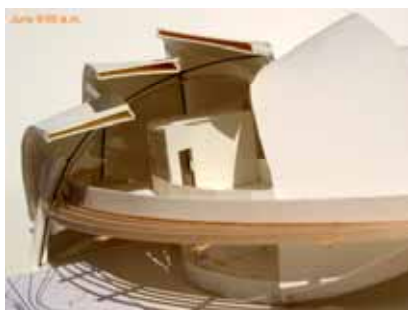
Solar Analysis w Sundials



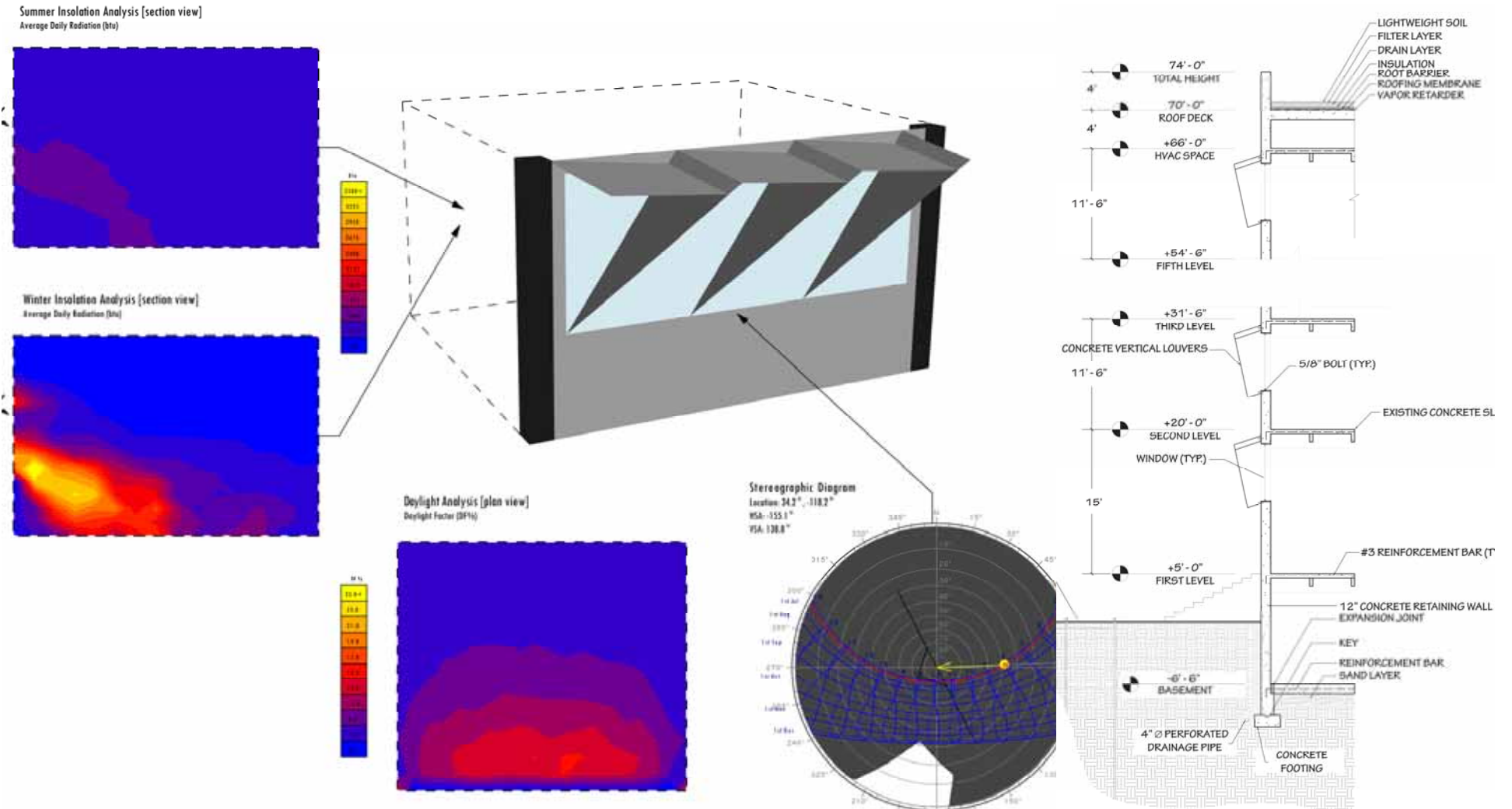
2nd year project by Gregory Ladjimi, Ernie Ceja



Shade Analysis



Top: 2nd year project by Kelly Felker, Quang Tran

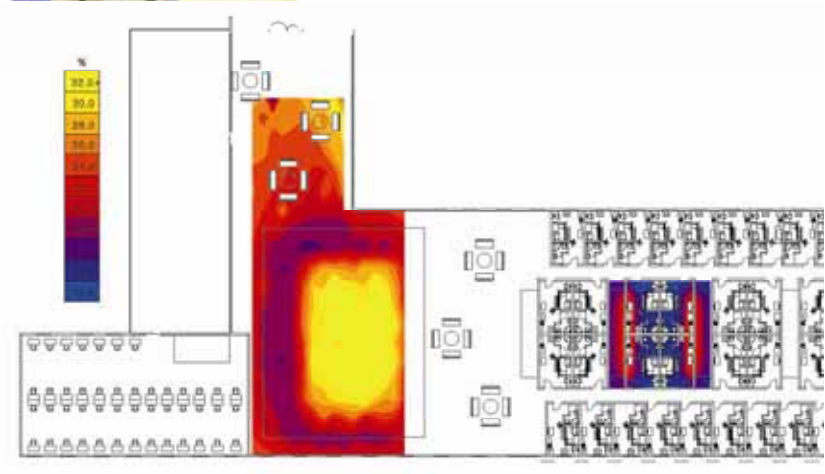
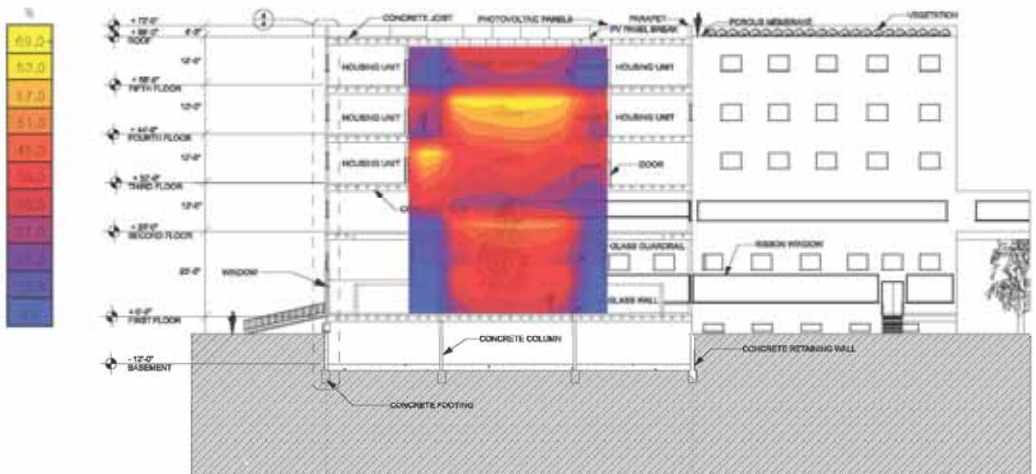


Insolation Analysis

Introductory Level: Second Year Design Studio

2nd year project by Rogelio, Emmanuele and Tyler

4 Environmental principles

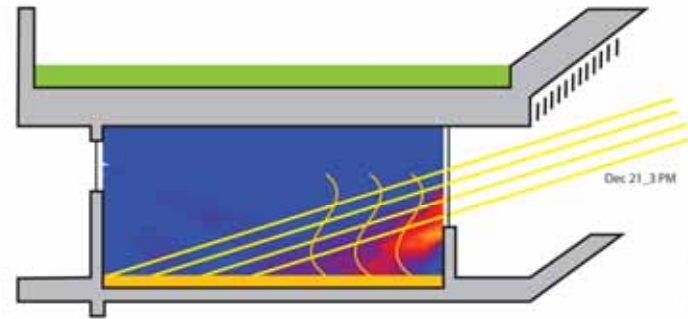
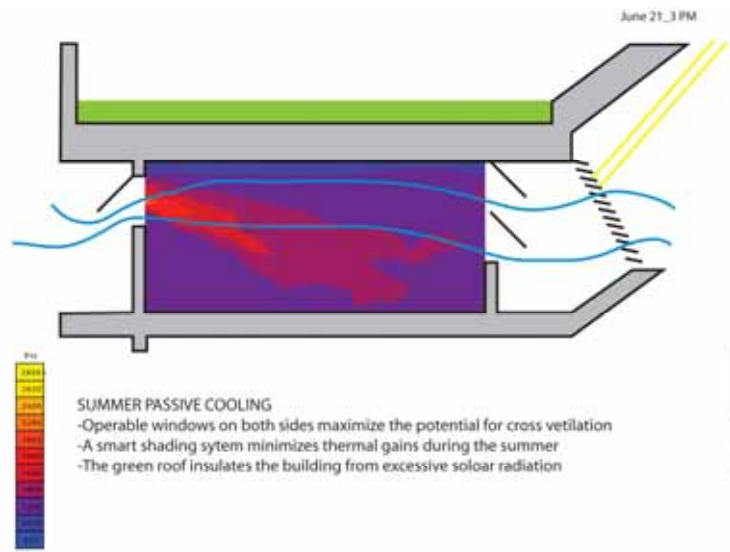


2nd year project by Sophia and Veronica Kim

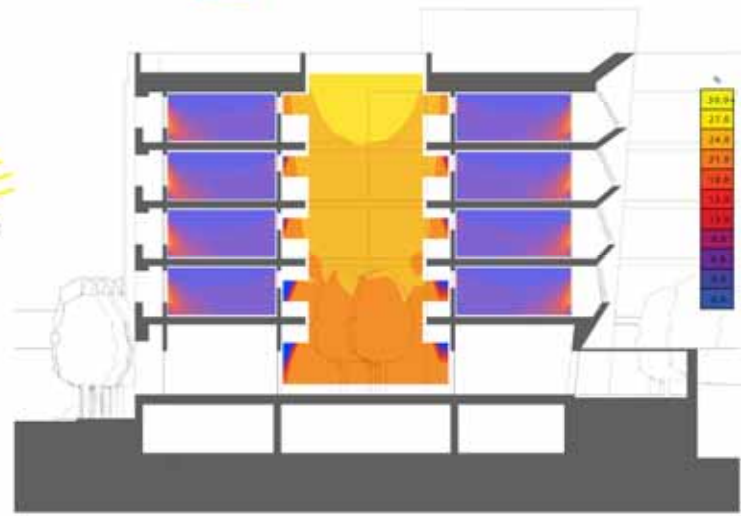
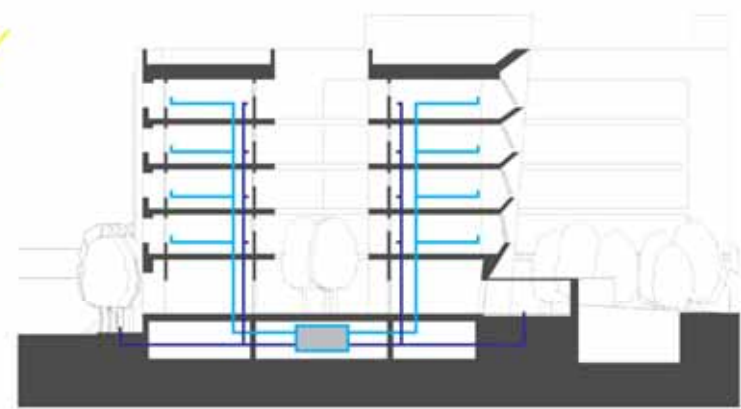
Daylight

Introductory Level: Second Year Design Studio

4 Environmental principles



Jeremy Brunel - Ryan Dayag



Daylight

Introductory Level: Second Year Design Studio

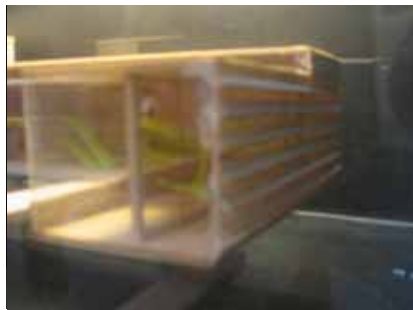
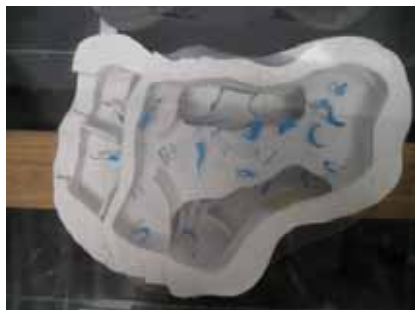
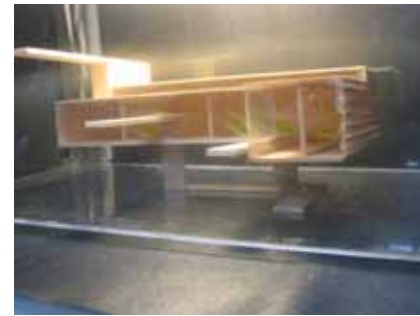
4

Environmental principles

...and the wind



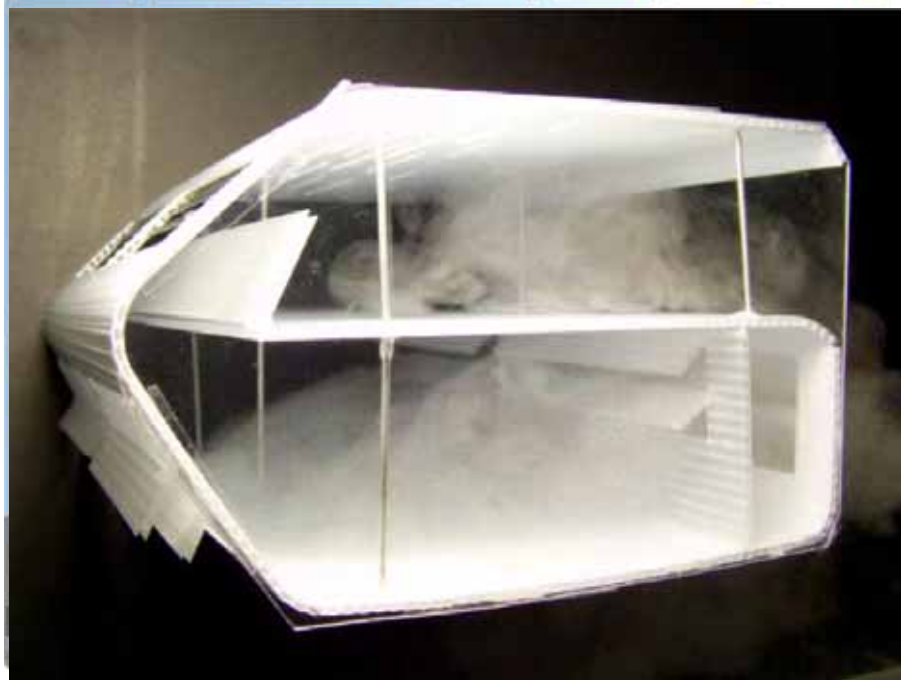
“Class Made” Wind Tunnels to understand air flow



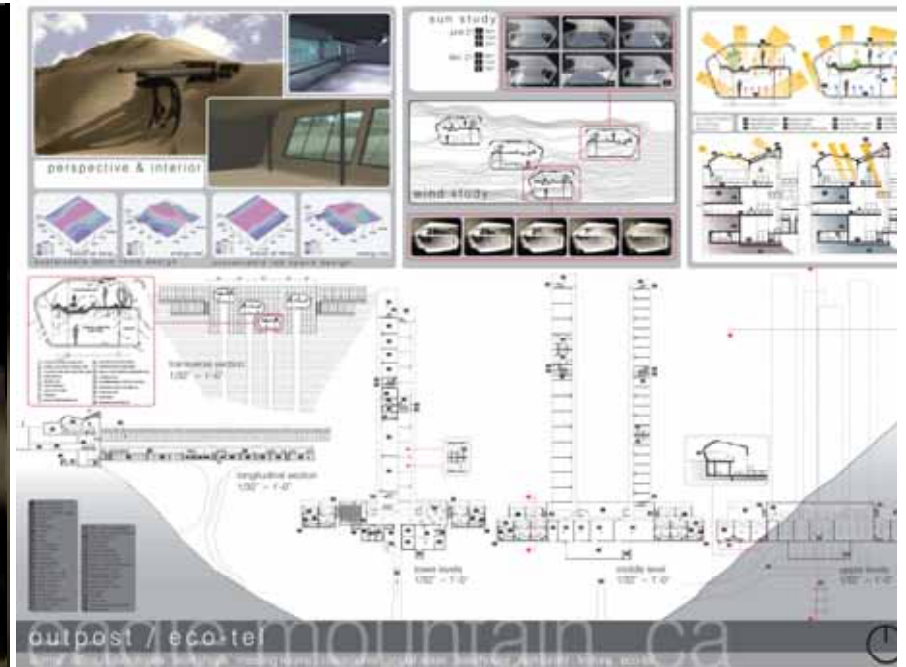
Demonstrating how the building regulates the sun and the wind.

Ventilation

Introductory Level: Second Year Design Studio



2nd year students: Calvin Mensonides & Emily Tragish



Honorable Mention USGBC Competition

Ventilation

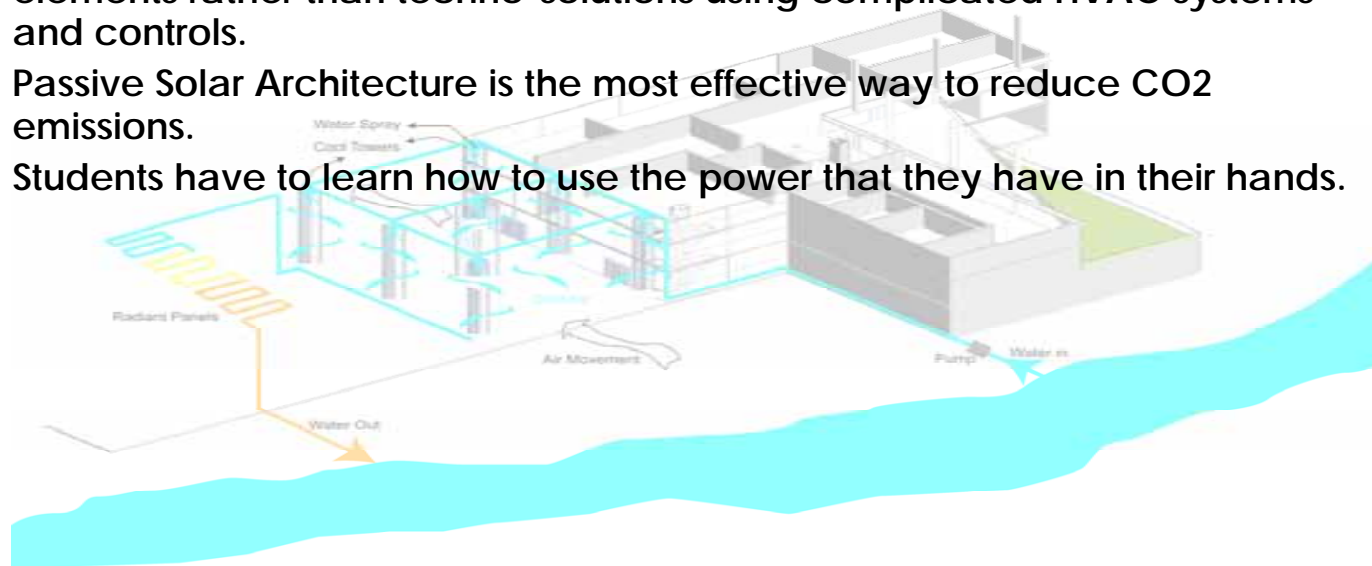
Introductory Level: Second Year Design Studio

Emphasis in Passive Solar.

Low energy buildings result primarily from envelope and architectural elements rather than techno-solutions using complicated HVAC systems and controls.

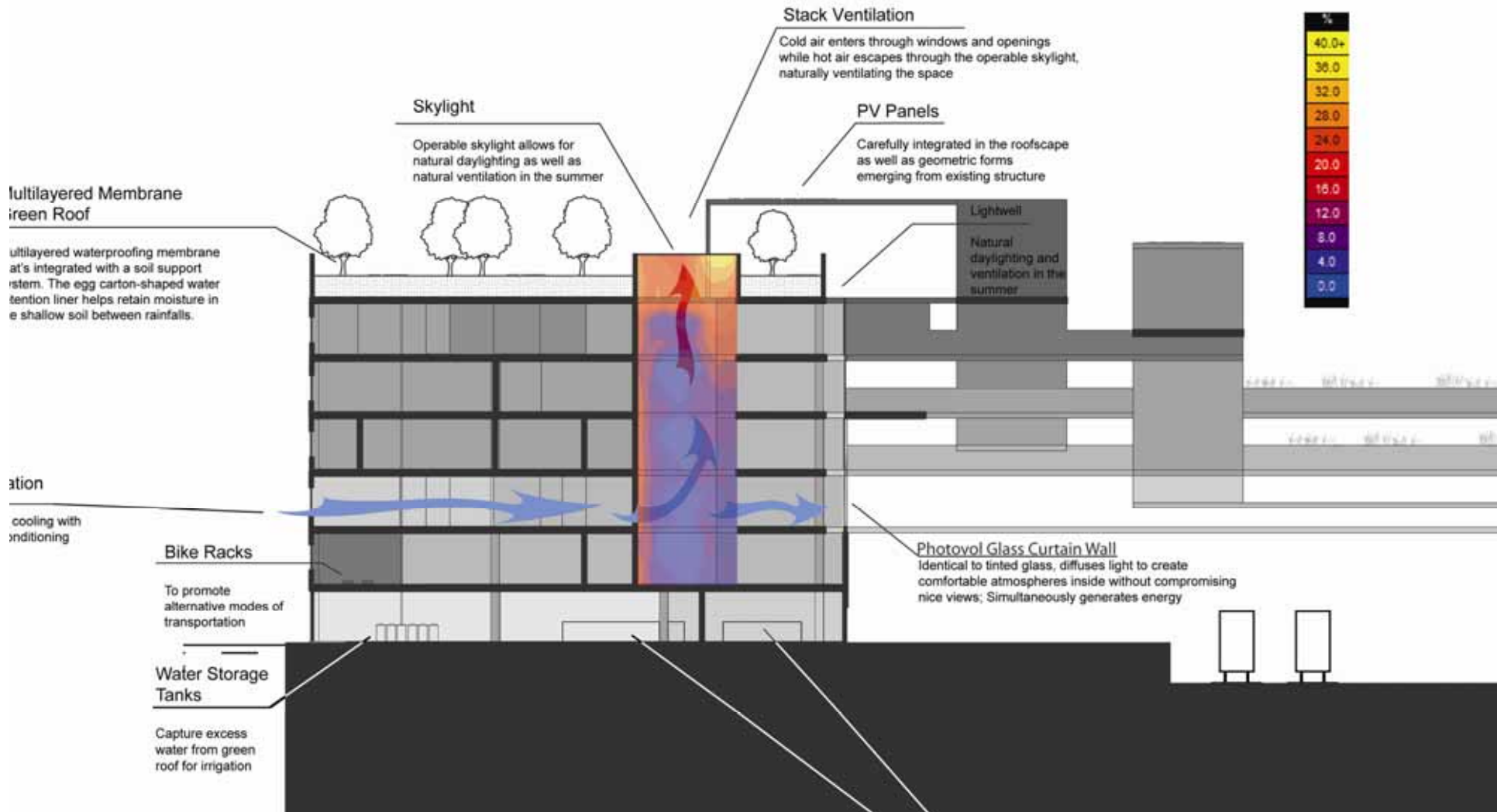
Passive Solar Architecture is the most effective way to reduce CO2 emissions.

Students have to learn how to use the power that they have in their hands.



4.4. Low Energy Passive Design

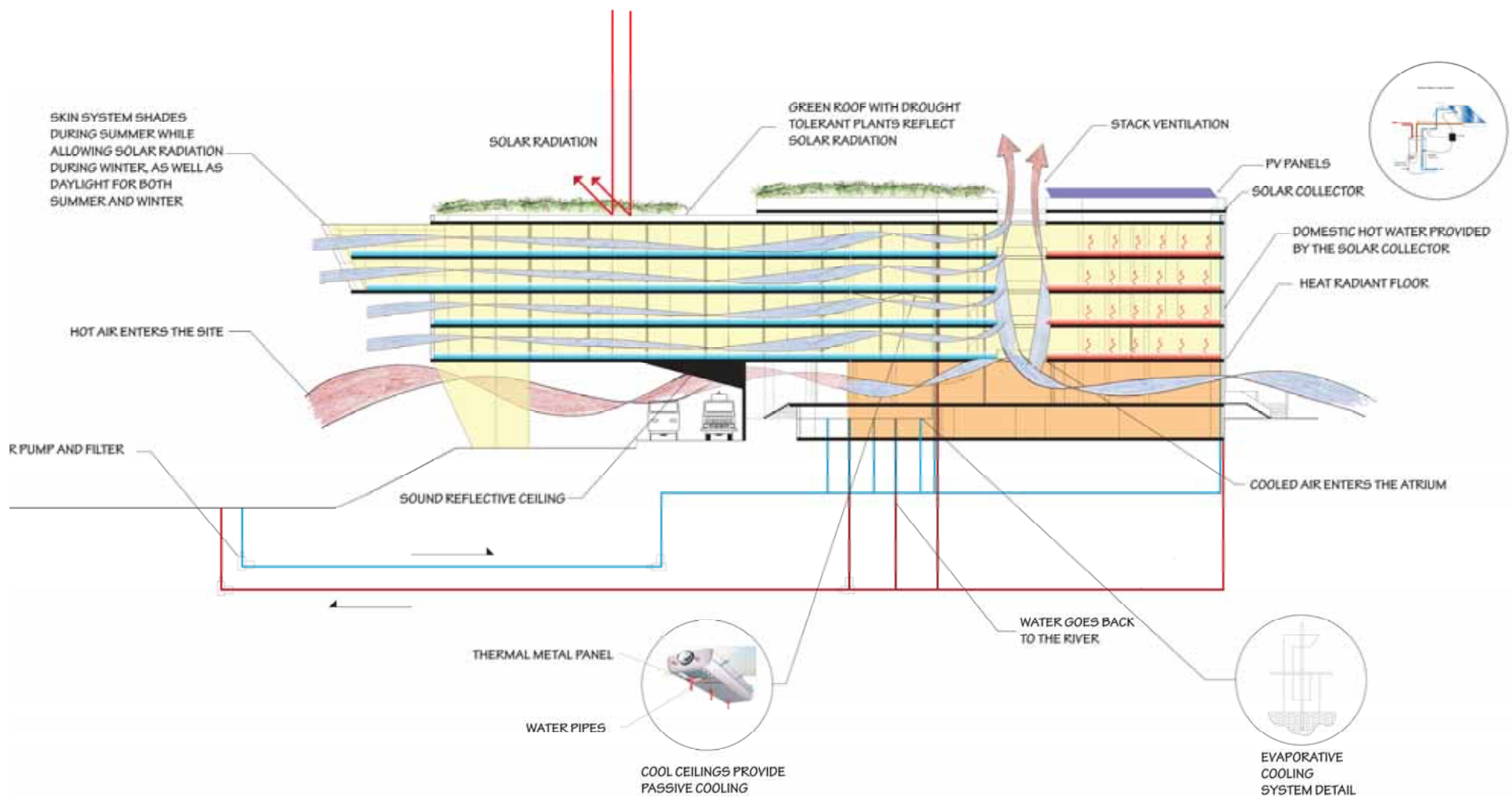
4 Environmental principles



Air movement and daylight

Introductory Level: Second Year Design Studio

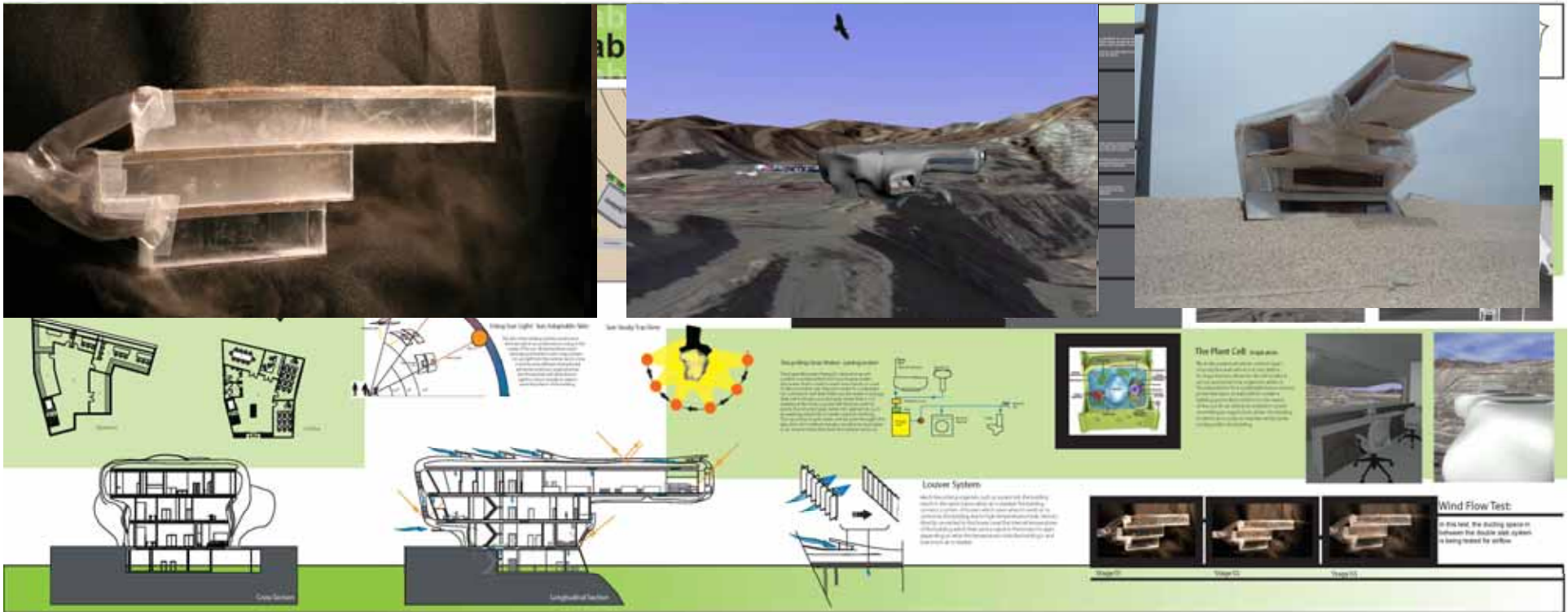
4 Environmental principles



Cooling, air movement

Introductory Level: Second Year Design Studio

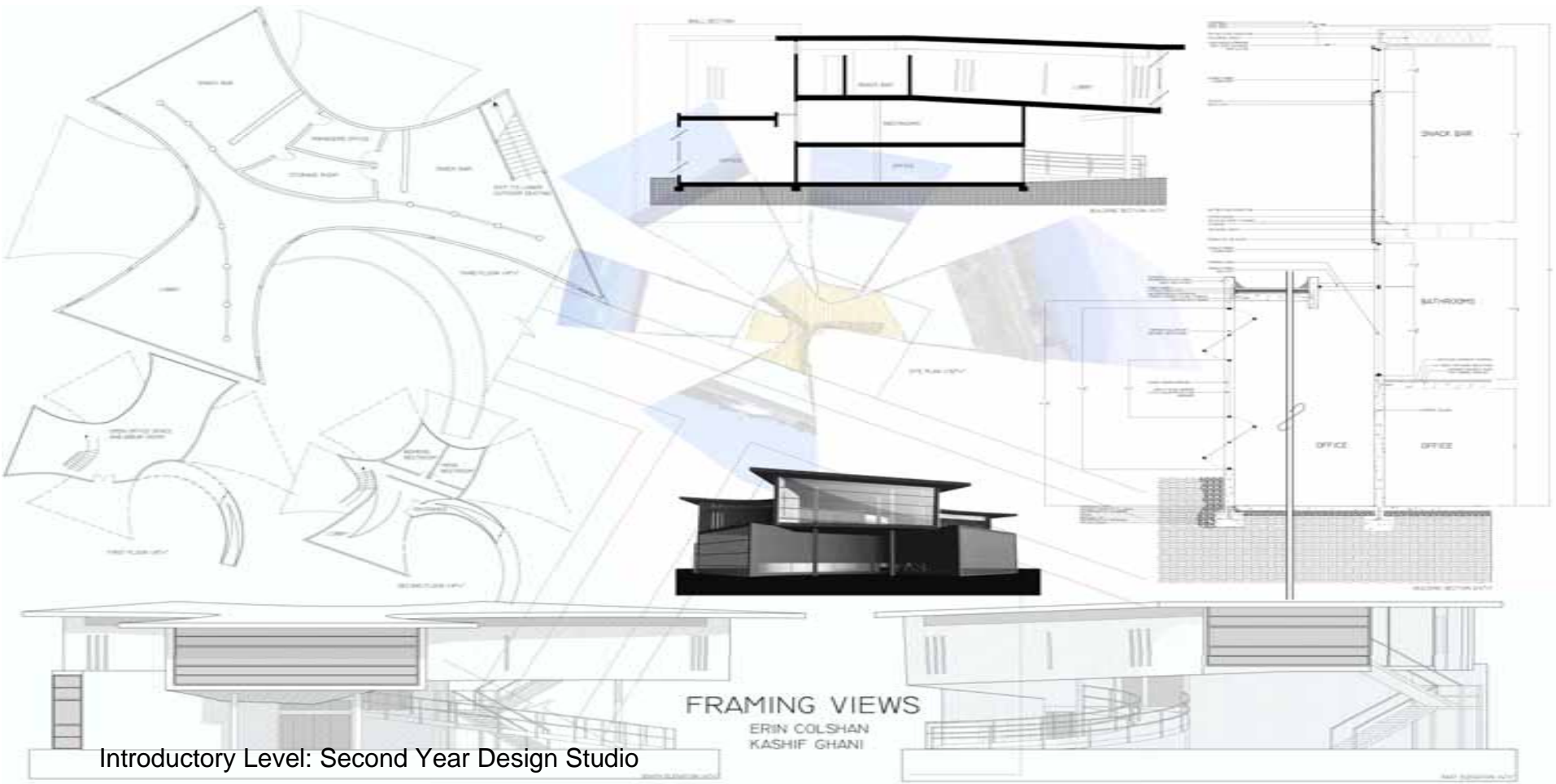
4 Environmental principles



2nd Year Students David Castro & Luis Torres. 3rd place Los Angeles USGB Competition

Introductory Level: Second Year Design Studio

4 Environmental principles



FRAMING VIEWS
ERIN COLSHAN
KASHIF GHANI

Introductory Level: Second Year Design Studio

4 Environmental principles

Boy's and Girl's Club Goshen, Indiana

Objective: To design an innovative, sustainable Boy's and Girl's Club using organic forms which are consistent with the concept of growth. This concept of growth is intended to inspire the positive growth of the boys and girls of Goshen Indiana. The sustainable features utilized in this building include the use of thermal mass, natural ventilation, natural lighting, and water conservation.



Site Plan
1/64"=1'

Pervious surfaces are used in the parking lot and out door spaces to conserve and return rain water to the water table.

Aero dynamic organic forms are incorporated into the design in order to communicate the concept of growth and to deflect and shelter the building from Indiana's cold winter winds. The north facade consist of a earth mound which serves as a thermal mass.



Floor Plan
1/32"=1'

The internal spaces of the Boy's and Girl's Club are implied by curved transparent or opaque partitions. These partitions are designed to provide supervision opportunities for the staff and allow natural light to penetrate the spaces.

Efficient natural lighting is achieved through the use of mechanical louvers located on the south facade which provides maximum passive heating, maximum light in the winter, and maximum shade in the summer.



December Sun Study
Sun angle = 35 degrees



March Sun Study
Sun angle = 50 degrees

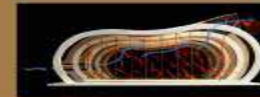


June Sun Study
Sun angle = 60 degrees

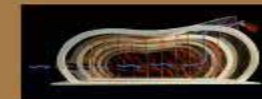
In order to provide efficient natural ventilation, operable windows are utilized on the south facade's double skin. A combination of operable windows and air vents which penetrate the thermal mass provide maximum natural ventilation in the summer months and are closed off in the winter months to help maintain internal temperatures which are consistent with the comfort zone of the psychometric chart. This ventilation system was tested in a controlled wind tunnel.



Wind tunnel



Wind studies



Elevation
1/32"=1'



"A" Section
1/32"=1'



"B" Section
1/32"=1'

Conclusion.

Beginning architecture students are capable of integrating in their studio projects basic principles of sustainable architectural design. The studio is the best place to do this supported by lecture courses in construction, computers, history and sustainability.

More second year student work at
<http://www.zerocarbonesign.org/spring2008/index.html>

5. conclusion
