

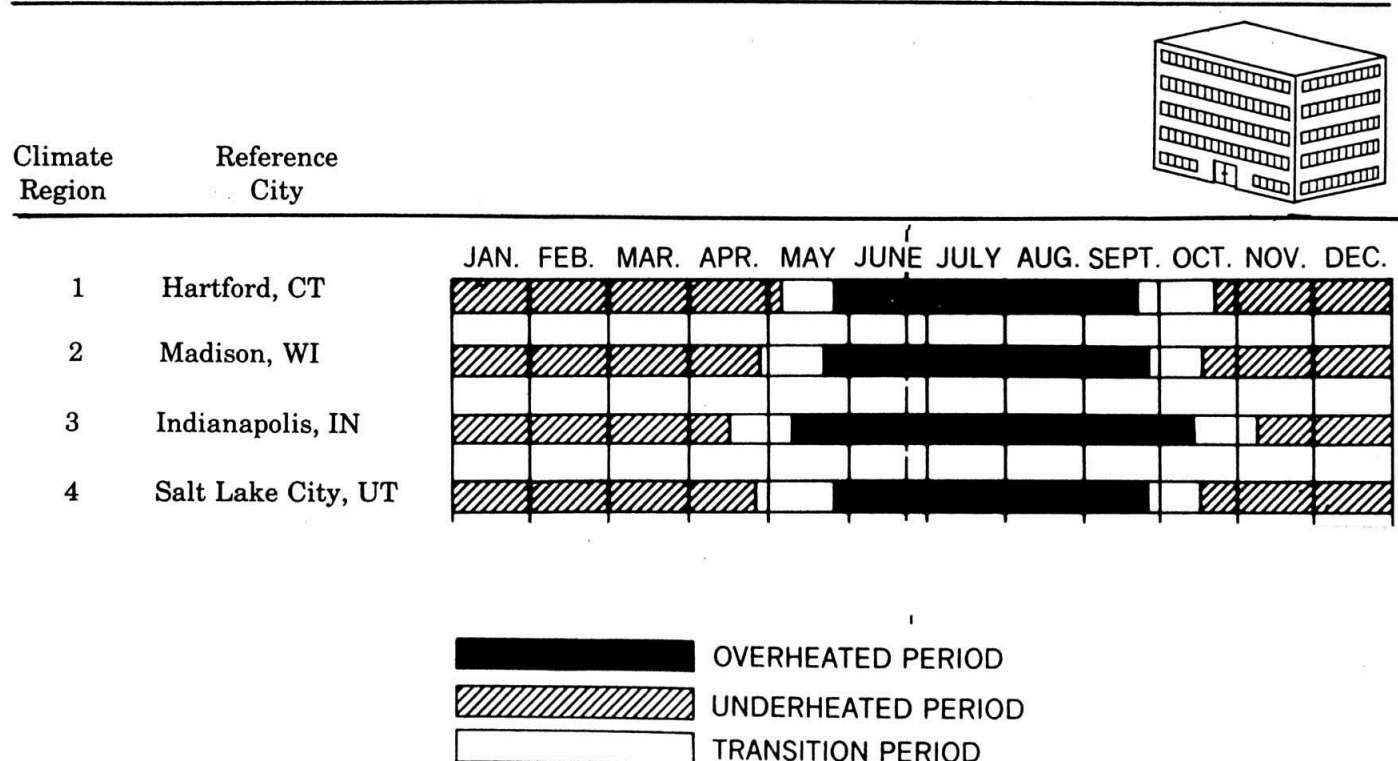
# تنظیم شرایط محیطی

نمونه هایی از معماری همسو با محیط  
جلسه 10

# Internally Dominated Buildings

## Heating/Cooling periods

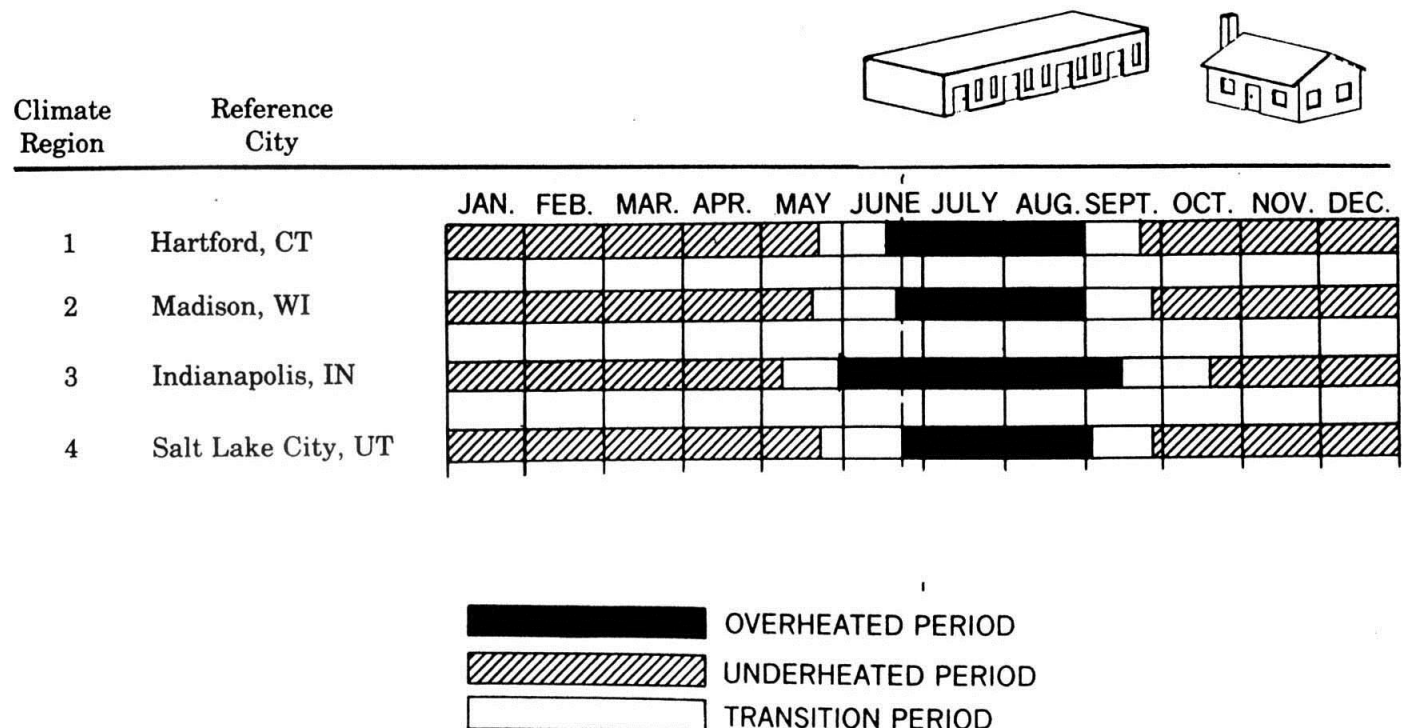
Overheated and Underheated Periods for Internally Dominated Buildings<sup>a,b,c</sup>



# Envelope Dominated Buildings

## Heating/Cooling periods

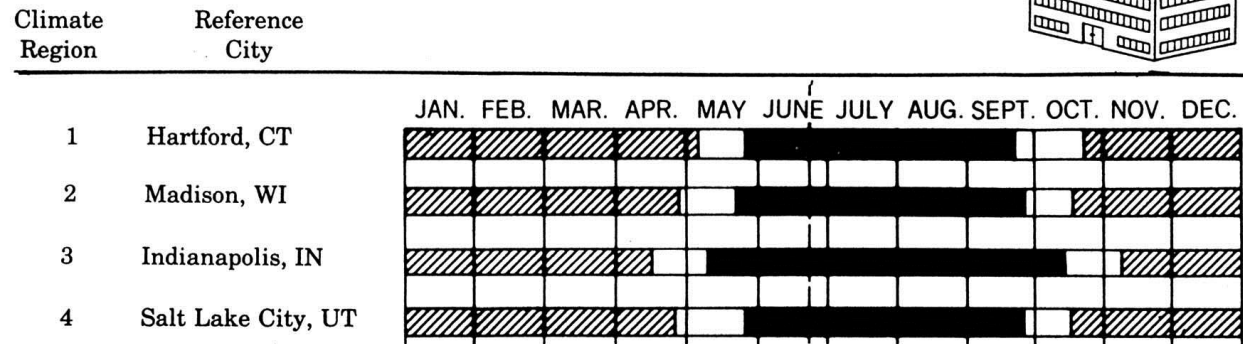
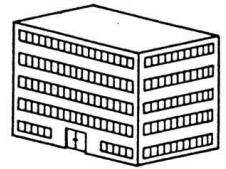
Overheated and Underheated Periods for Envelope-Dominated Buildings<sup>a,b,c</sup>



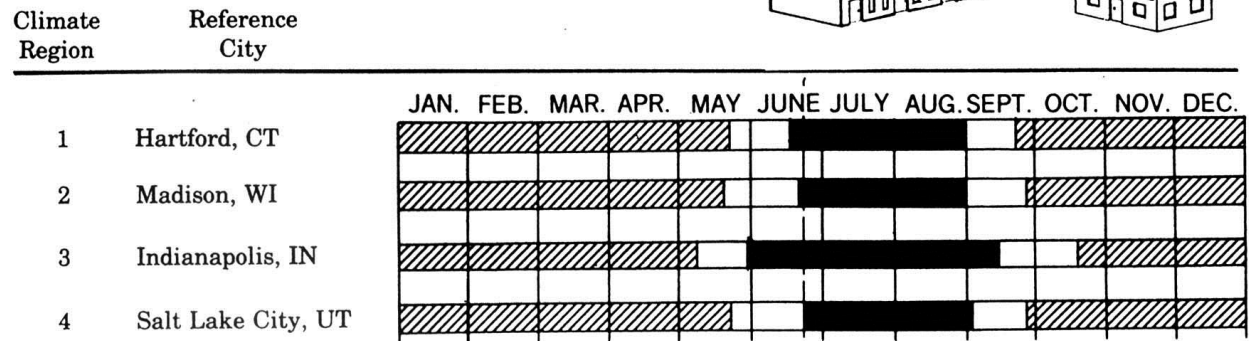
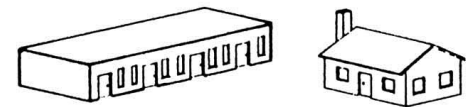
# Heating and Cooling Cycles

## Comparison of heating and cooling cycles

Overheated and Underheated Periods for Internally Dominated Buildings<sup>a,b,c</sup>



Overheated and Underheated Periods for Envelope-Dominated Buildings<sup>a,b,c</sup>



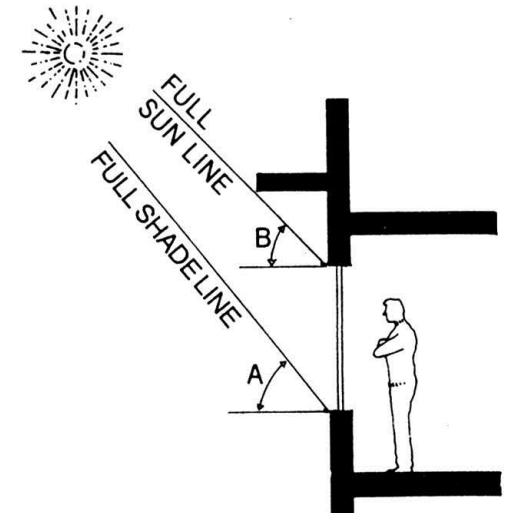
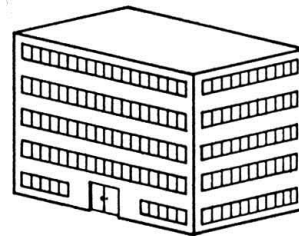
# Passive Thermal Control

- Sun Control
- Wind Control
- Evaporative Cooling
- Earth Cooling
- Radiant Cooling
- Dehumidification

# Sun Control

## South Façade Overhangs

Sizing South Overhangs on Internally Dominated Buildings<sup>a,b,c</sup>

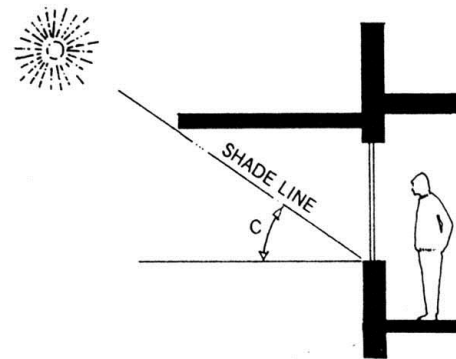


| Climate Region | Reference City     | Angle "A"<br>(Full Shade) | Angle "B"<br>(Full Sun) |
|----------------|--------------------|---------------------------|-------------------------|
| 1              | Hartford, CT       | 59                        | 54                      |
| 2              | Madison, WI        | 58                        | 47                      |
| 3              | Indianapolis, IN   | 53                        | 47                      |
| 4              | Salt Lake City, UT | 60                        | 49                      |

# Sun Control

## East/West Façade Overhangs

Sizing East and West Horizontal Overhangs<sup>a,b</sup>



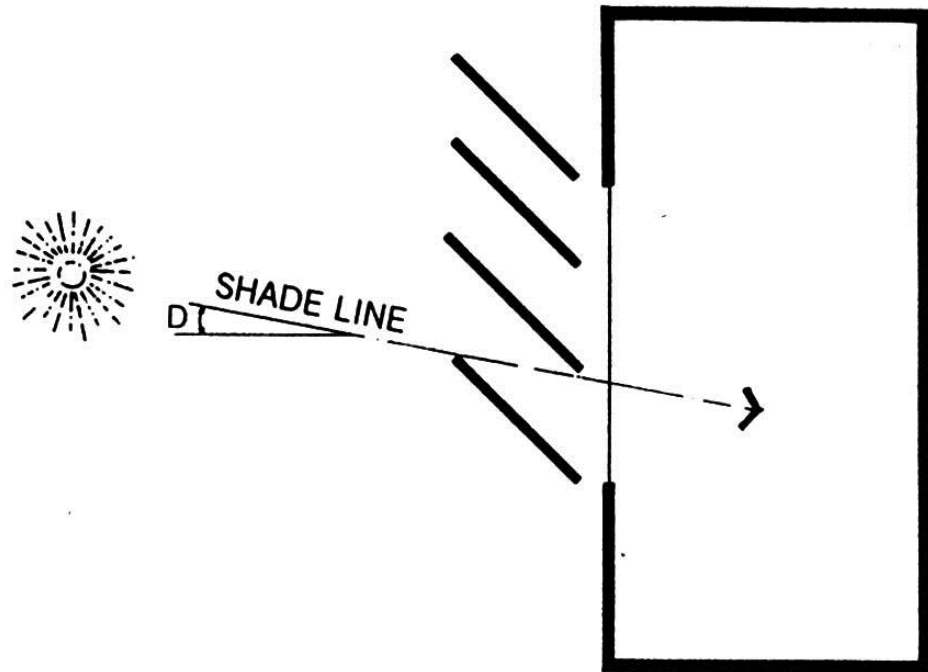
| Climate Region | Reference City     | Angle "C"            |                    |
|----------------|--------------------|----------------------|--------------------|
|                |                    | Internally Dominated | Envelope Dominated |
| 1              | Hartford, CT       | 30                   | 34                 |
| 2              | Madison, WI        | 30                   | 34                 |
| 3              | Indianapolis, IN   | 25                   | 32                 |
| 4              | Salt Lake City, UT | 30                   | 33                 |

# Sun Control

## East/West Façade Vertical Fins

Shade Line Angle for Slanted  
Vertical Fins<sup>a</sup>

| Latitude | Angle "D" |
|----------|-----------|
| 24       | 18        |
| 28       | 15        |
| 32       | 12        |
| 36       | 10        |
| 40       | 9         |
| 44       | 8         |
| 48       | 7         |



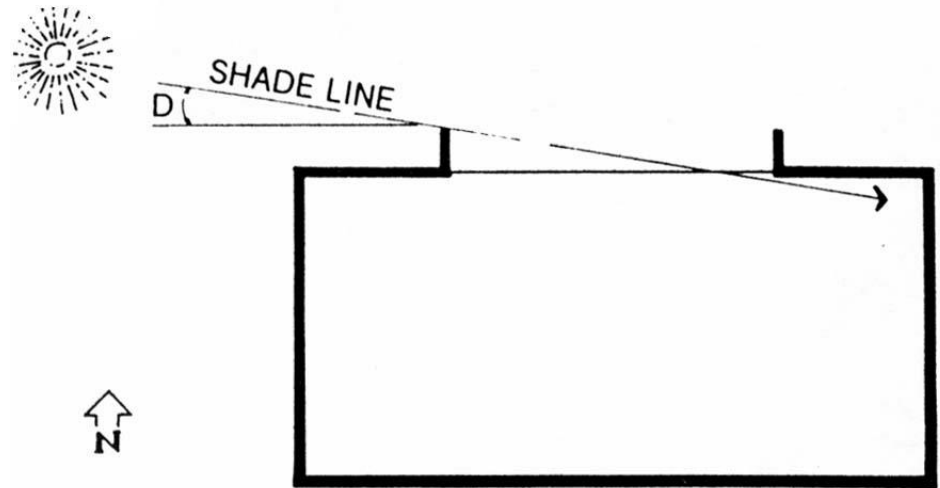


# Sun Control

## North Façade Vertical Fins

Shade Line Angle for Slanted Vertical Fins<sup>a</sup>

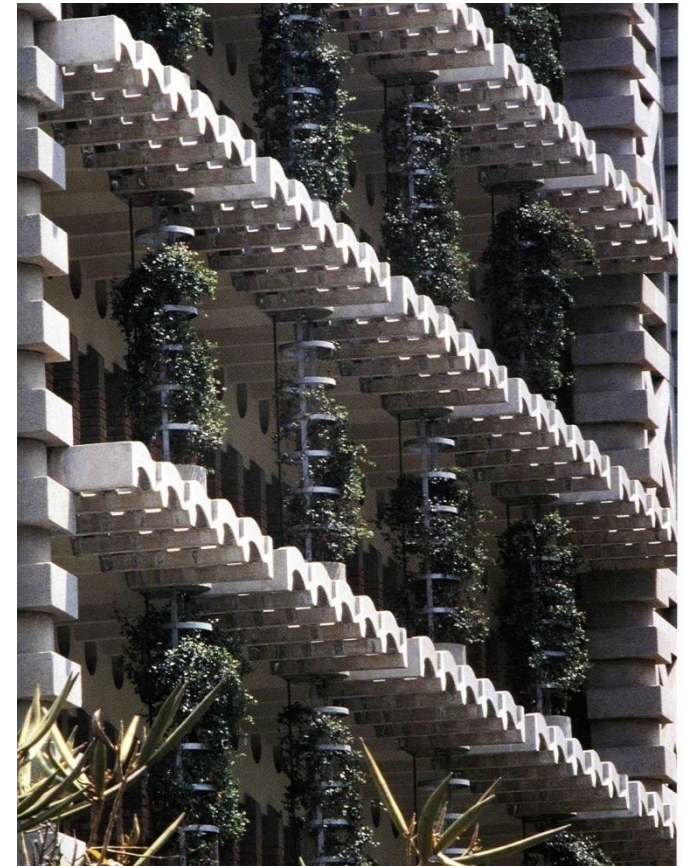
| Latitude | Angle "D" |
|----------|-----------|
| 24       | 18        |
| 28       | 15        |
| 32       | 12        |
| 36       | 10        |
| 40       | 9         |
| 44       | 8         |
| 48       | 7         |



# Sun Control



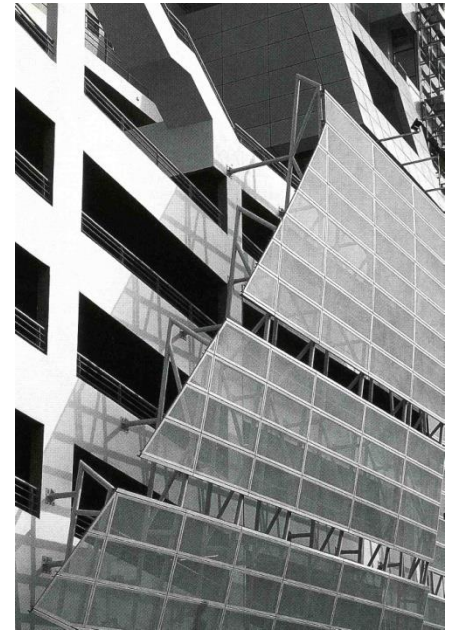
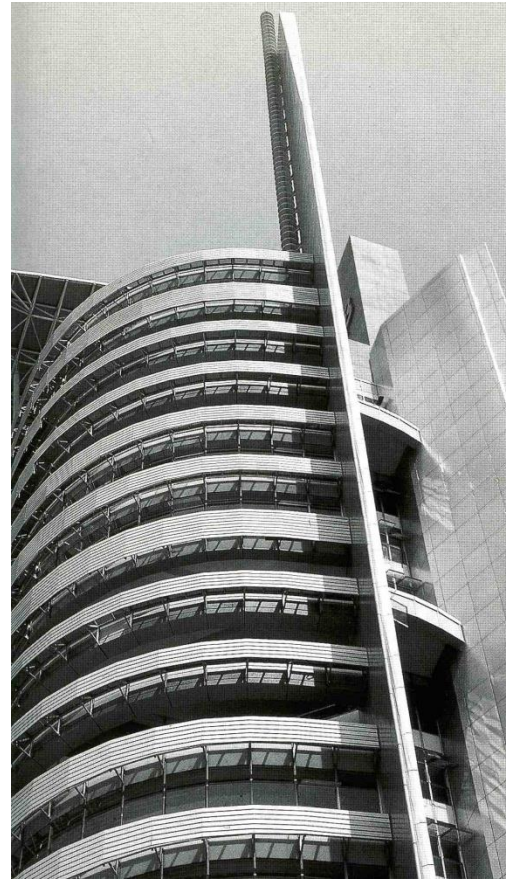
**Lycee Polyvalent; Frejus France, Norman Foster, 1993**



**Eastgate; Harare, Zimbabwe, Pierce Partnership, 1996**



# Sun Control



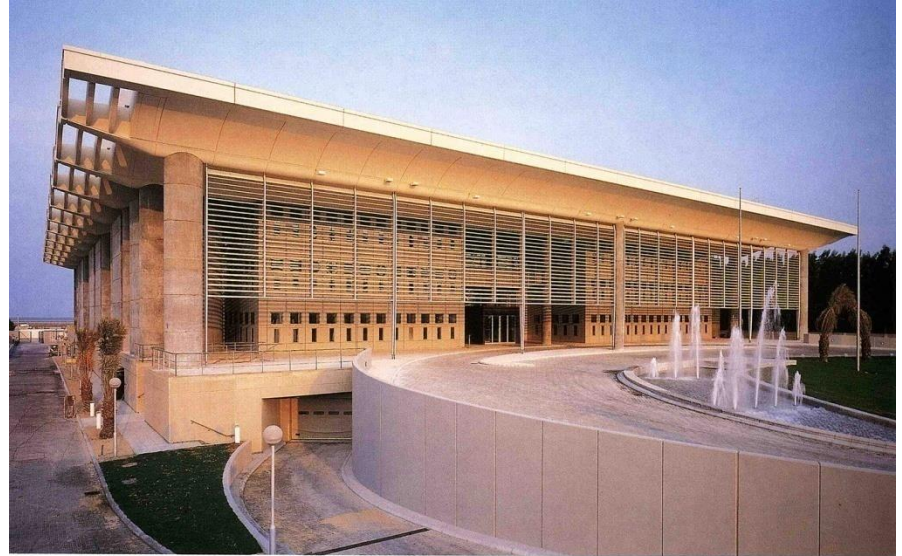
**Sun Control  
Details**

**Menara UMNO; Penang,  
Ken Yeang, 1998**

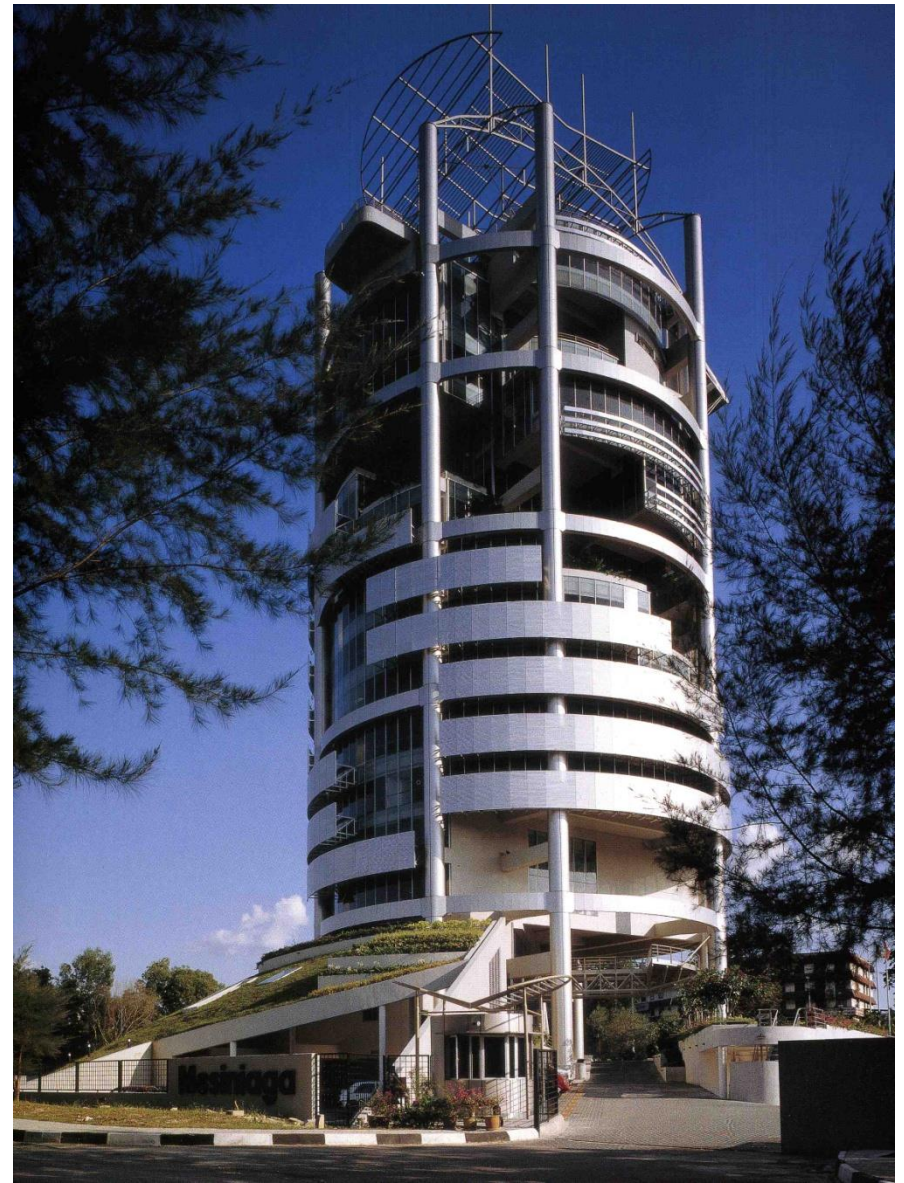


# Sun Control

**Offices for Apicorp;  
Al Khobar, Saudi  
Arabia, DEGW, 2000**

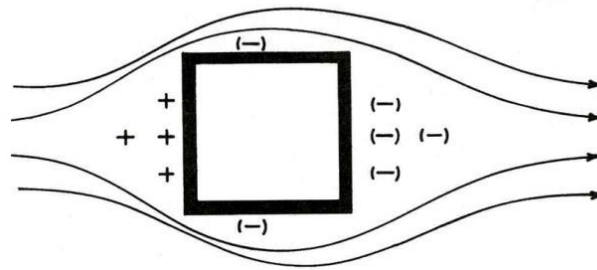


# Sun Control

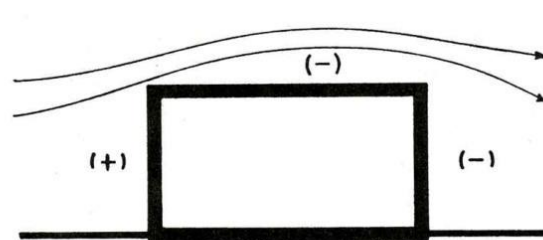
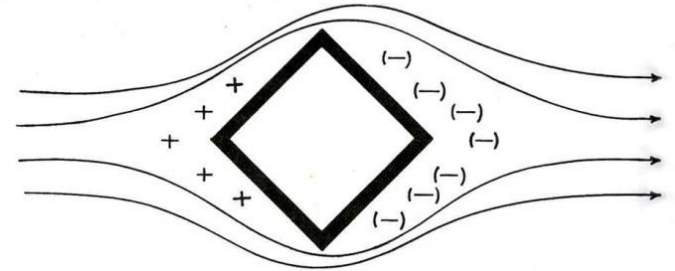


**Menara Mesieniaga; Subang Jaya,  
Malaysia, Ken Yeang, 1992**

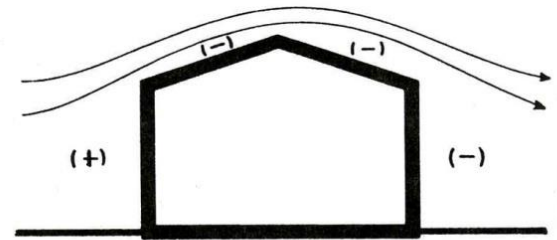
# Wind Control- Exterior



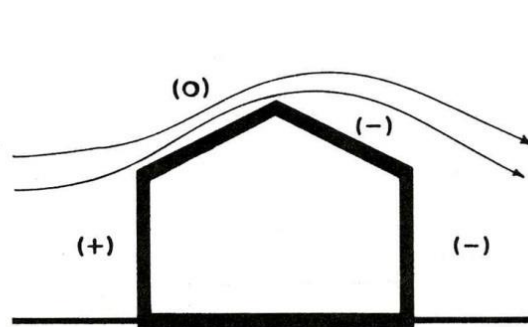
PLAN



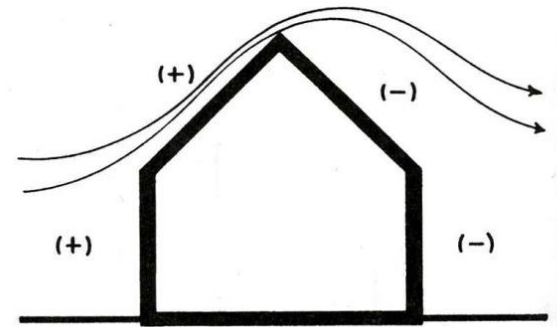
FLAT ROOF



1:4 SLOPE



1:2 SLOPE



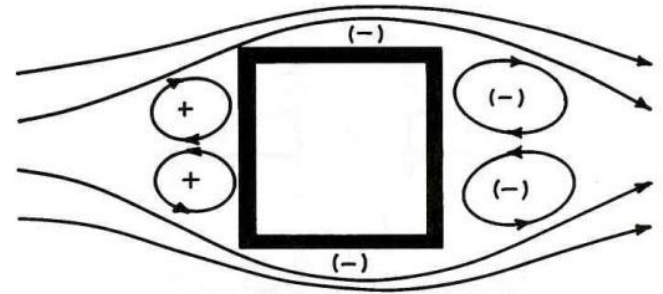
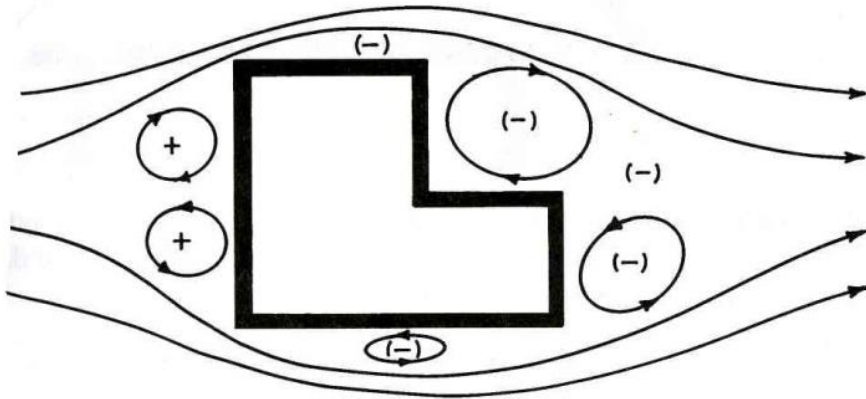
1:1 SLOPE

SECTION

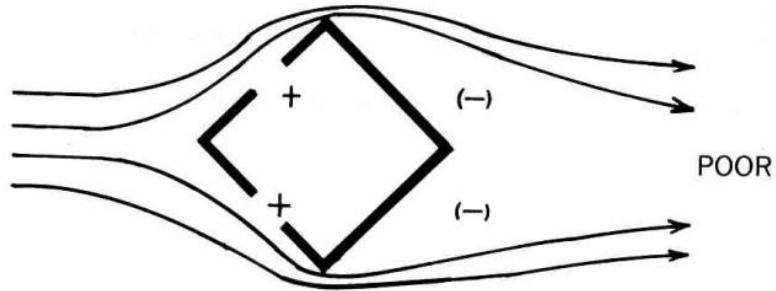


# Wind Control-Exterior

جابه جایی هوا از طریق خاصیت گردباد



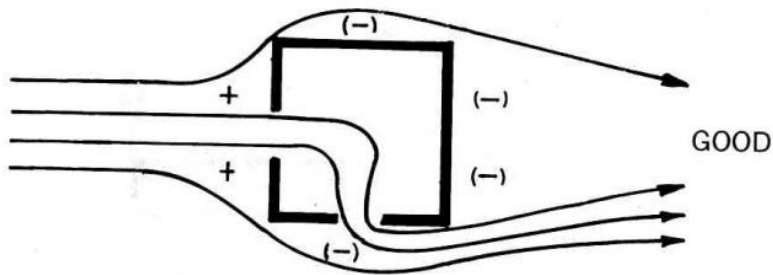
# Wind Control-Interior



○ تهویه عرضی

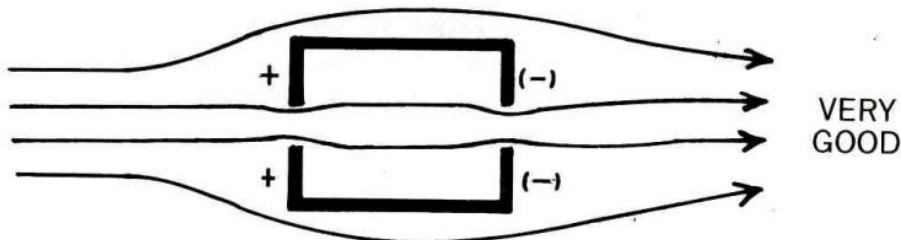
○ جهت باد

○ پیوستگی مسیر وزش



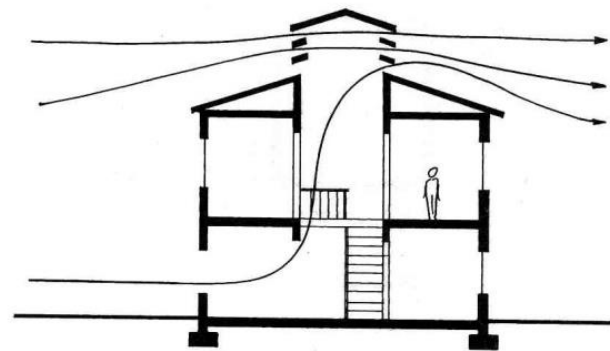
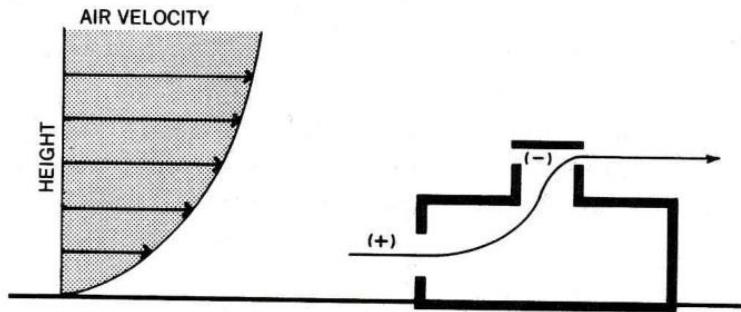
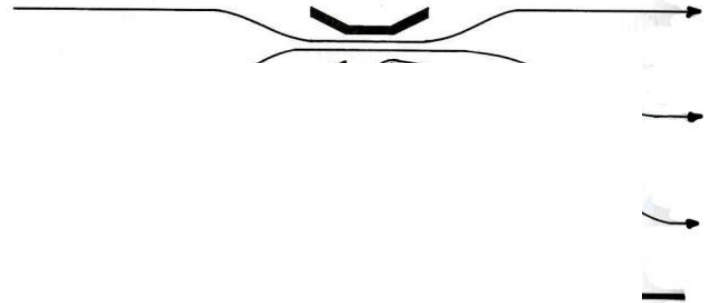
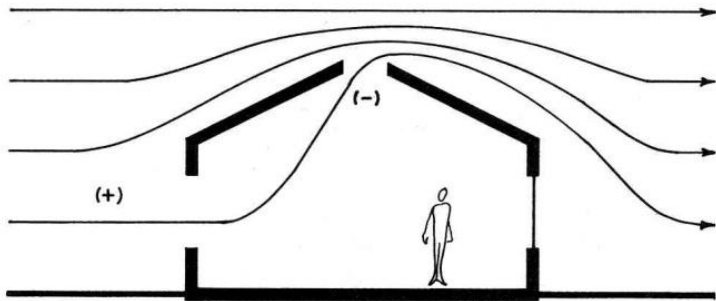
○ شکل بدنه

○ اثر ونتوری (افزایش  
سرعت حرکت سیال با با  
کاهش قطر مسیر).



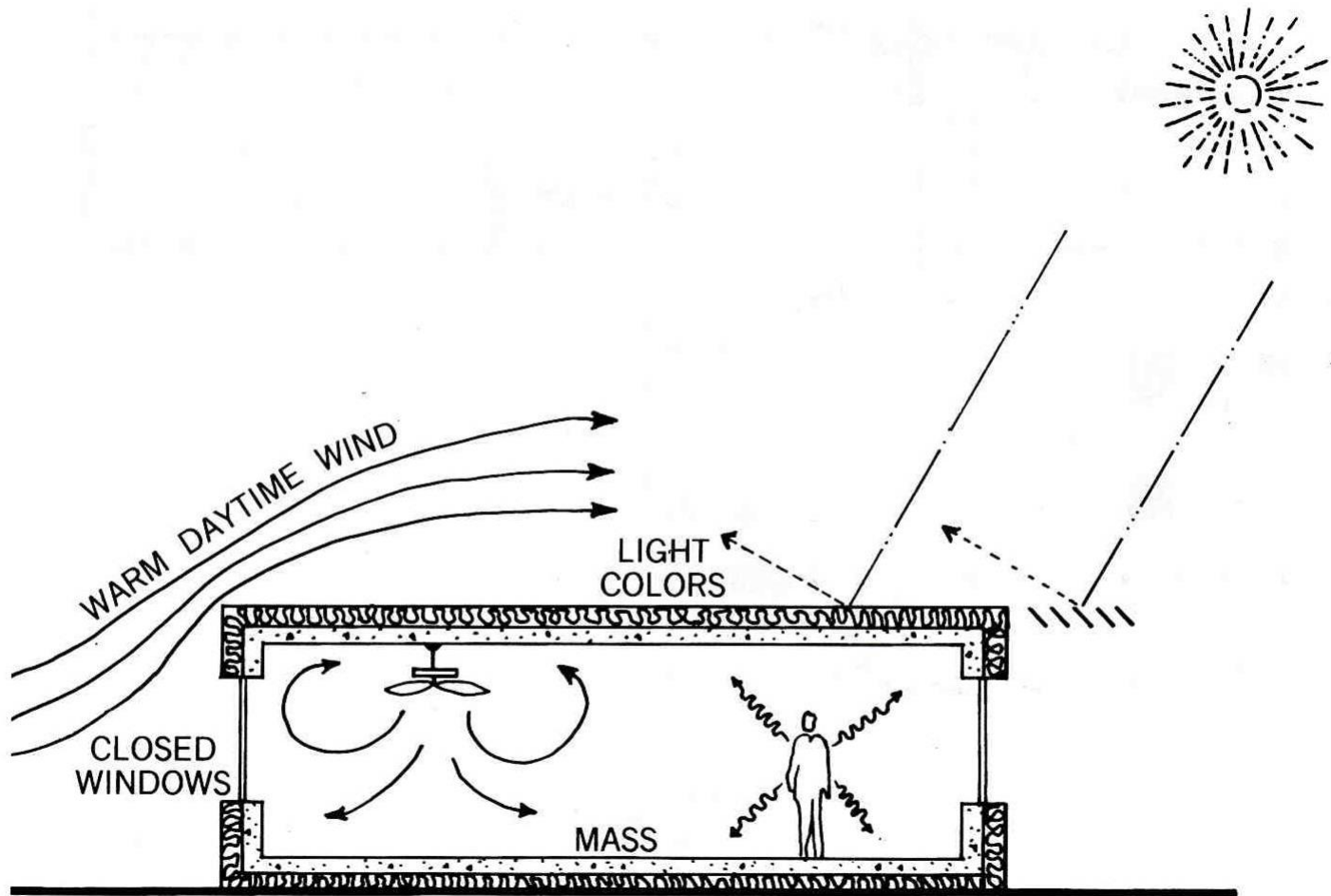


# Wind Control-Interior



**SECTIONS**

# Wind Control-Interior



**daytime mode**

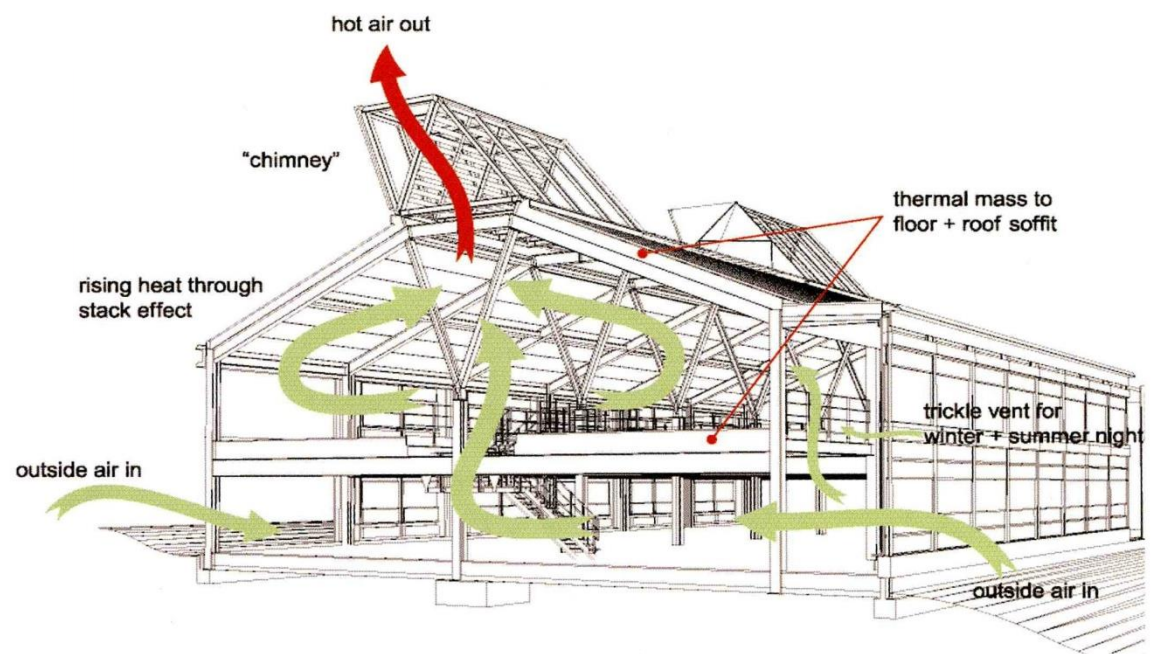
# Wind Control

**ARUP Campus; Solihull, UK,  
ARUP Associates, 2001**





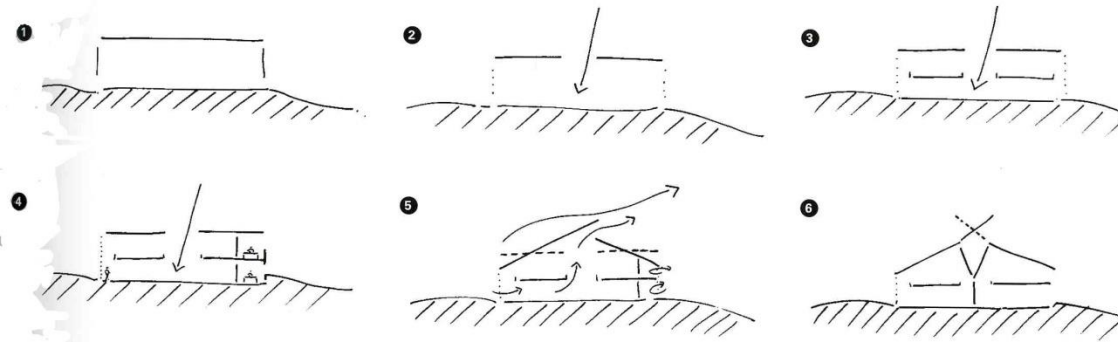
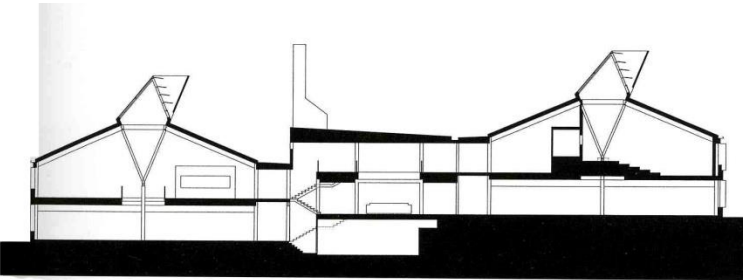
# Wind Control



↑  
Stack-assigned  
natural ventilation.

←  
Section through  
auditorium and office  
floor.

**ARUP Campus; Solihull, UK,  
ARUP Associates, 2001**



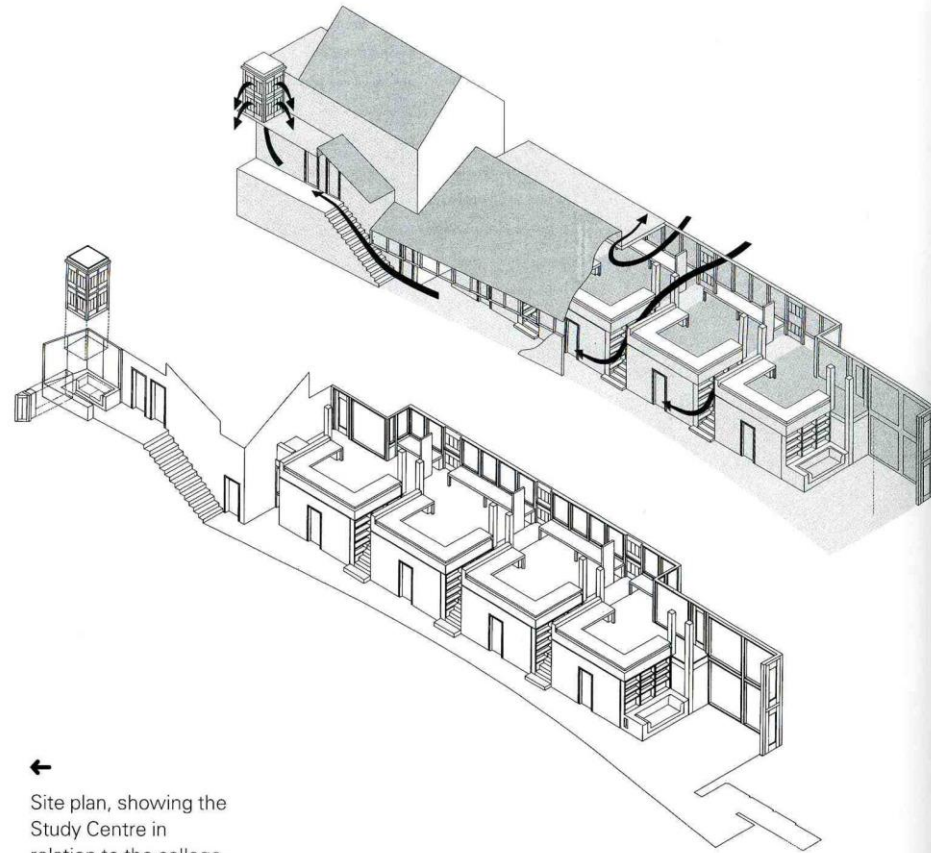
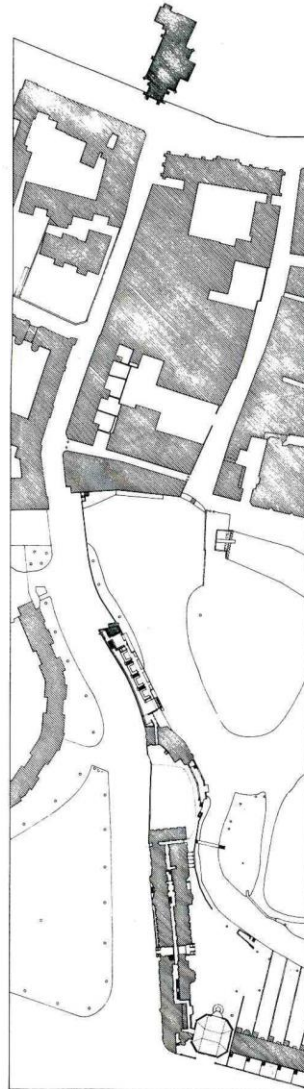


# Wind Control



**Study Center Darwin College; Cambridge, UK,  
Jeremy Dixon and Edward Jones, 1994**

# Wind Control



Site plan, showing the Study Centre in relation to the college, the River Cam and the historic fabric of Cambridge.



The exploded axonometric shows the disposition of the principal spaces of the

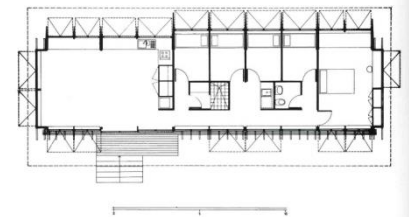
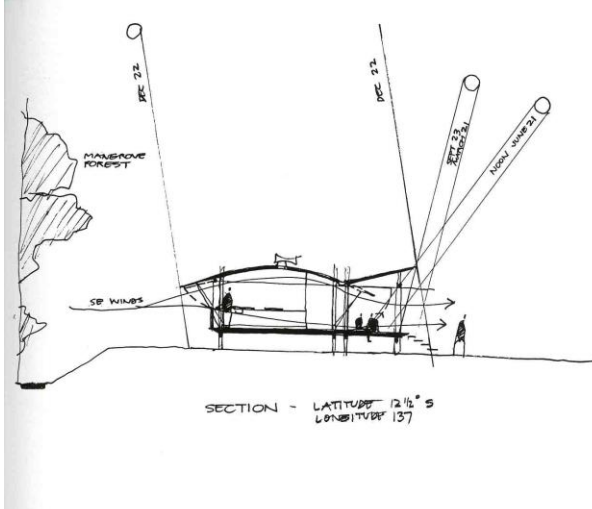
building and the primary flows of the natural ventilation system.

**Study Center Darwin College; Cambridge, UK,  
Jeremy Dixon and Edward Jones, 1994**

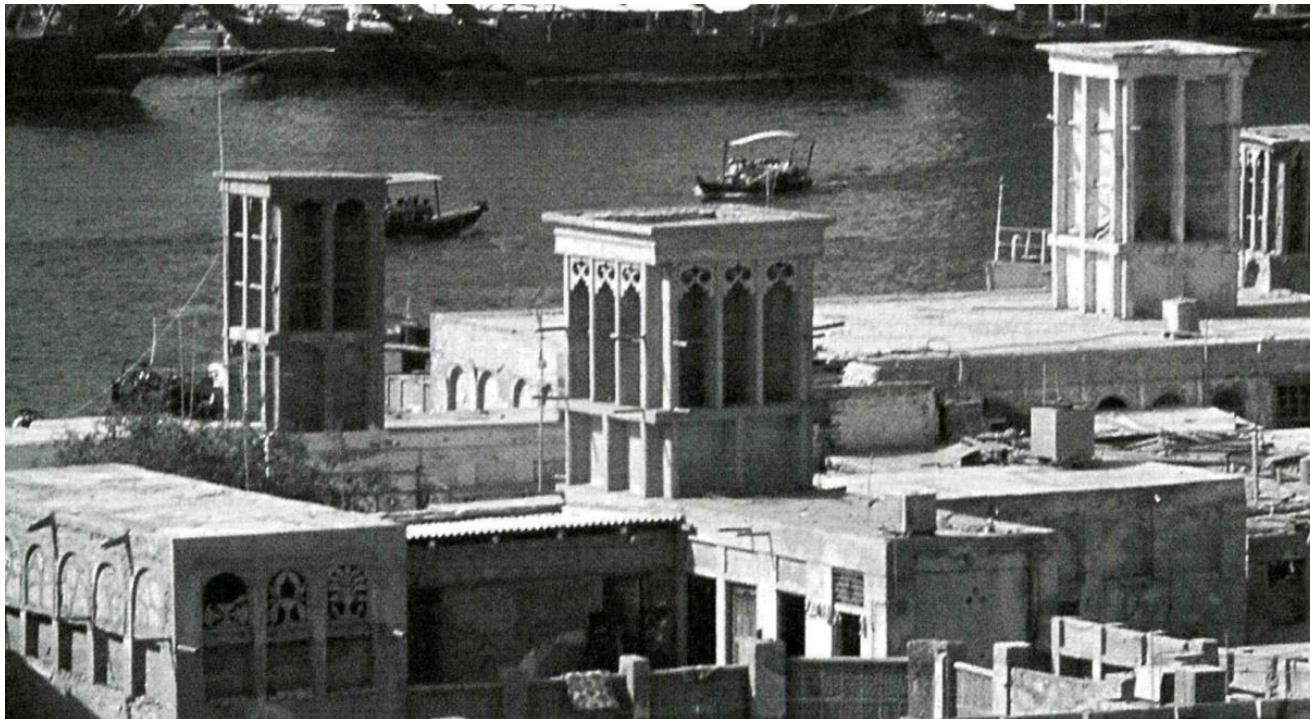
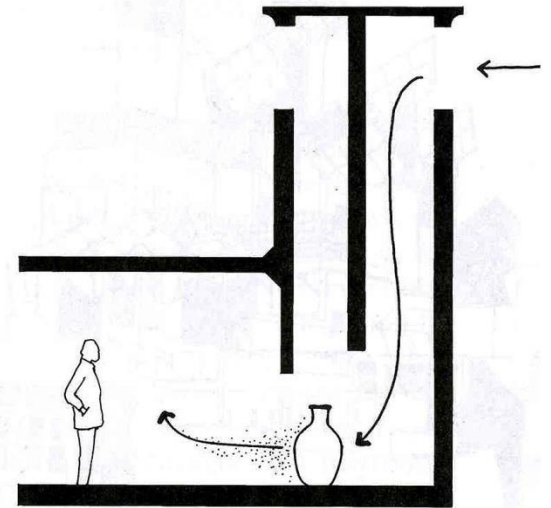


# Sun & Wind Control

**Marika Alderton House;  
Arnhem Land, Australia, Glenn  
Mercutt, 1994**



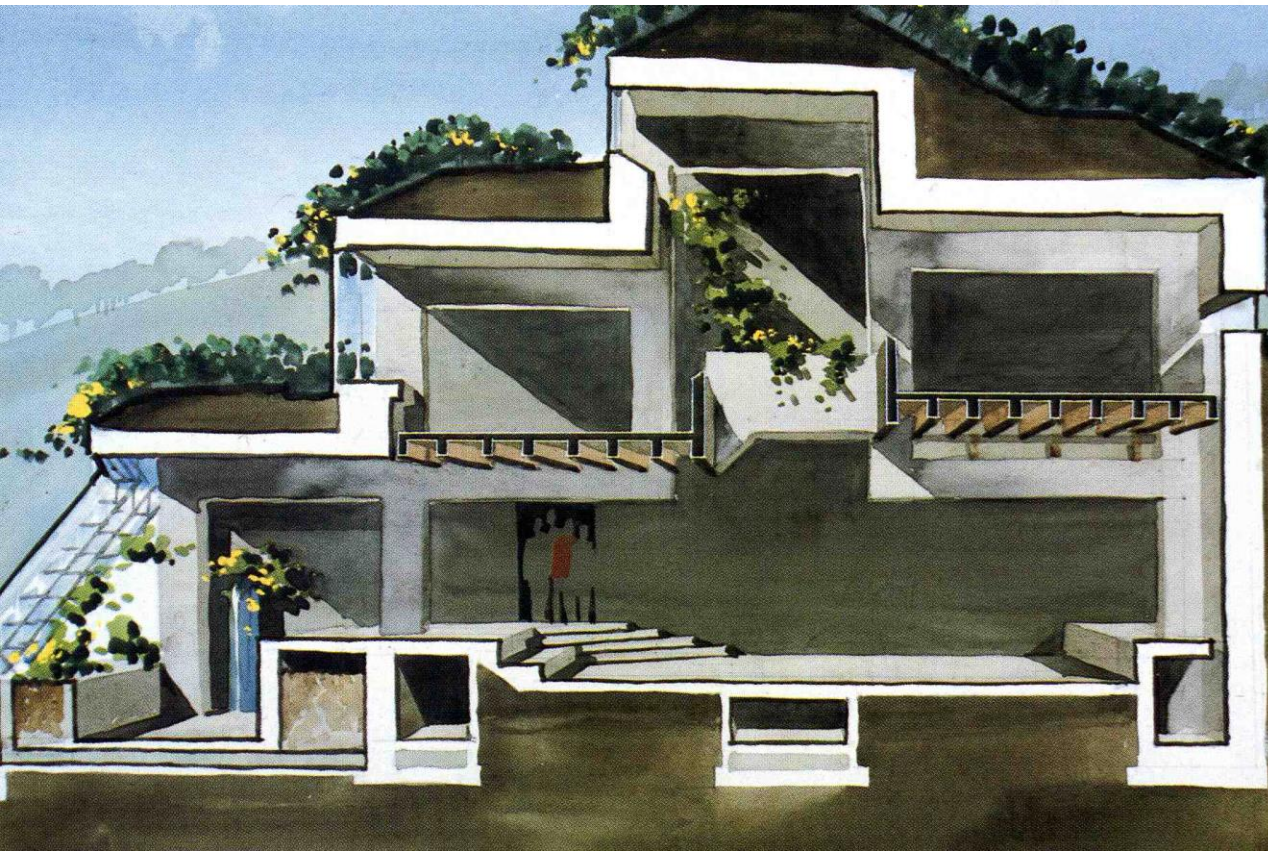
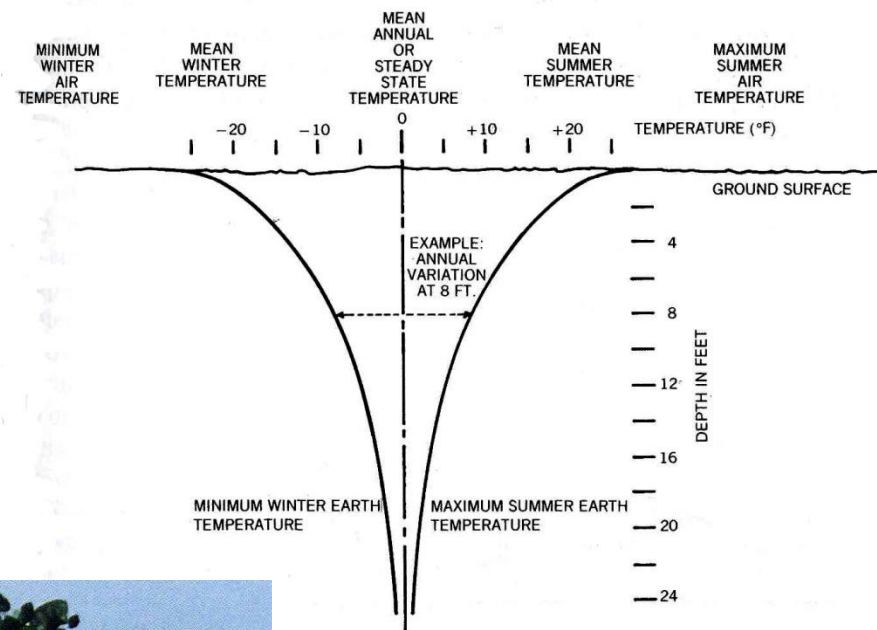
# Evaporative Cooling



**Latent heat of vaporization...only works efficiently in dry climates**

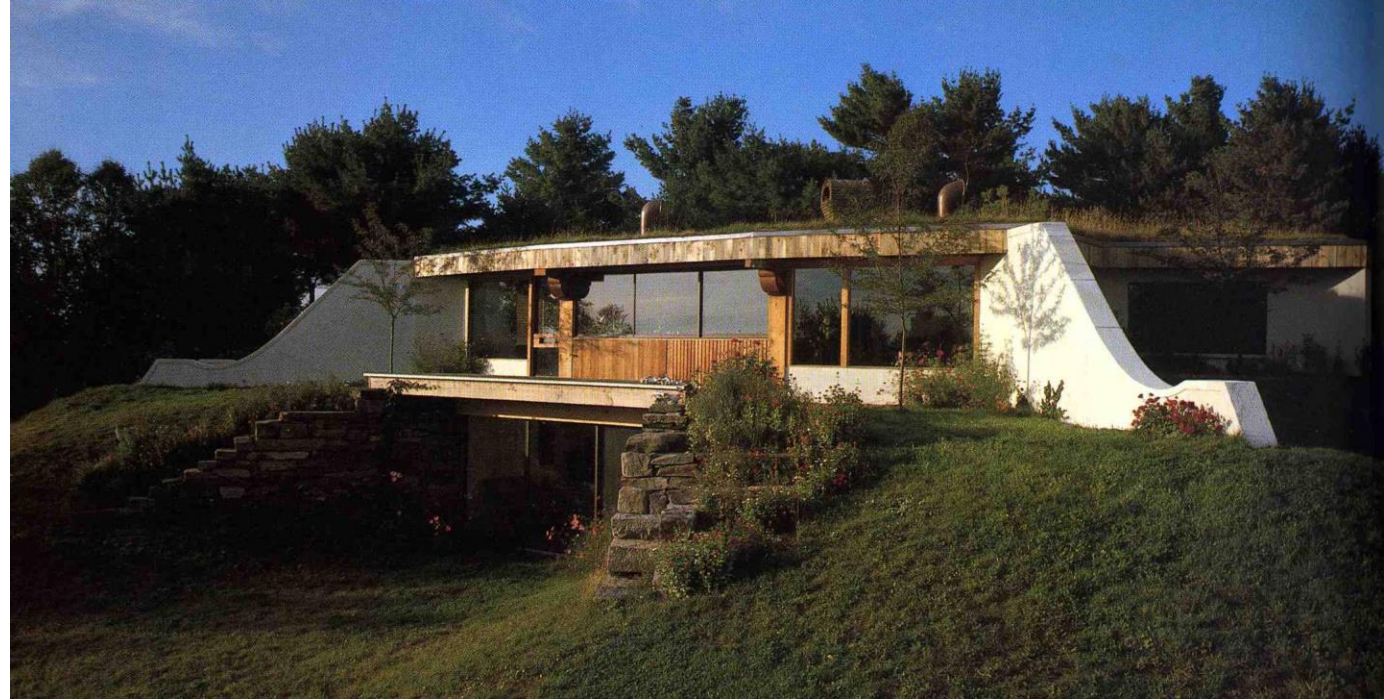


# Earth Cooling

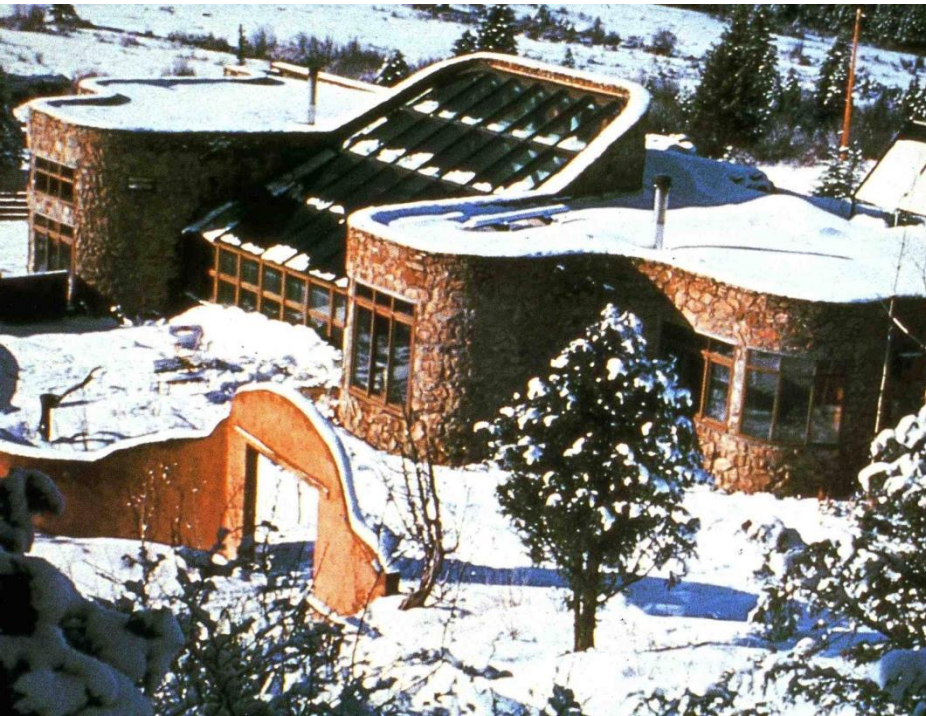




# Earth Cooling



**Winston House; Lyme, NH,  
Donald Metz, 1972**



**Rocky Mountain Institute;  
Old Snow Mass CO,  
[Amory Lovins], 1984**

# Earth Cooling

## Green Roof

California Academy of  
Science, San Francisco, CA  
Renzo Piano, 2008

<http://www.archdaily.com/6810/california-academy-of-sciences-renzo-piano/>





# Composite Strategies



**Beyeler Foundation Museum; Basel,  
Switzerland, Renzo Piano, 1997**



# Composite Strategies



**The Guthrie Pavilion; Shah-Alam, Malaysia, Ken Yeang, 1998**