



DAYLIGHTING

a green approach to Underused Resource

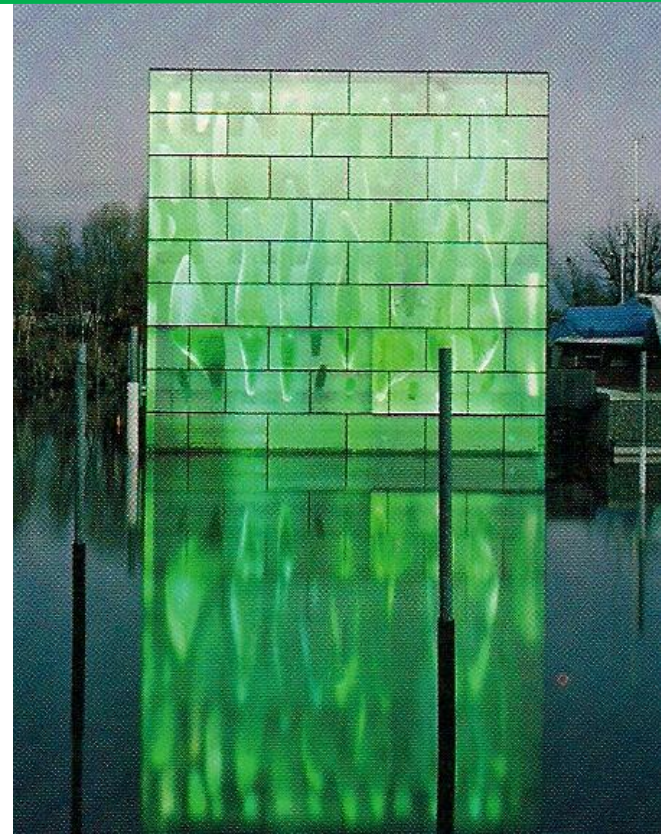
jimmy priatman

(jpriatman@yahoo.com)

■ *architect-researcher*

Centre for Building Energy Study

Petra Christian University Indonesia



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EVOLUTION OF
DAYLIGHTING :

HISTORICAL
OVERVIEW

**GOTHIC
ARCHITECTURE**



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EVOLUTION
OF
DAYLIGHTING

HISTORICAL
OVERVIEW

GOTHIC

ARCHITEC -

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DAYLIGHTING :

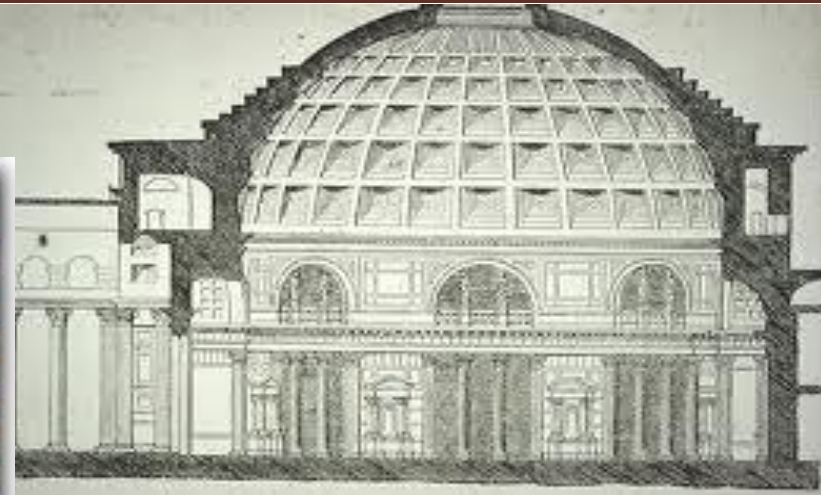
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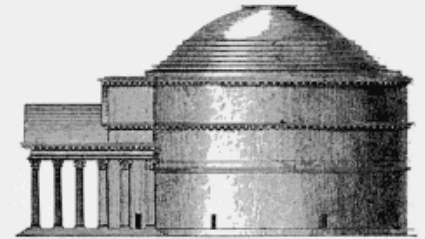
EVOLUTION OF
DAYLIGHTING

HISTORICAL
OVERVIEW

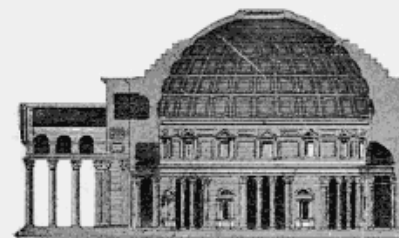
THE
PANTHEON
ROME



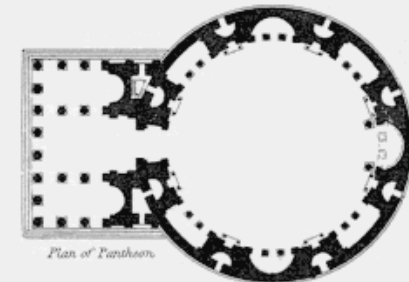
The Pantheon, Rome. Front Elevation



The Pantheon, Rome. Side Elevation



Section of Pantheon



Plan of Pantheon

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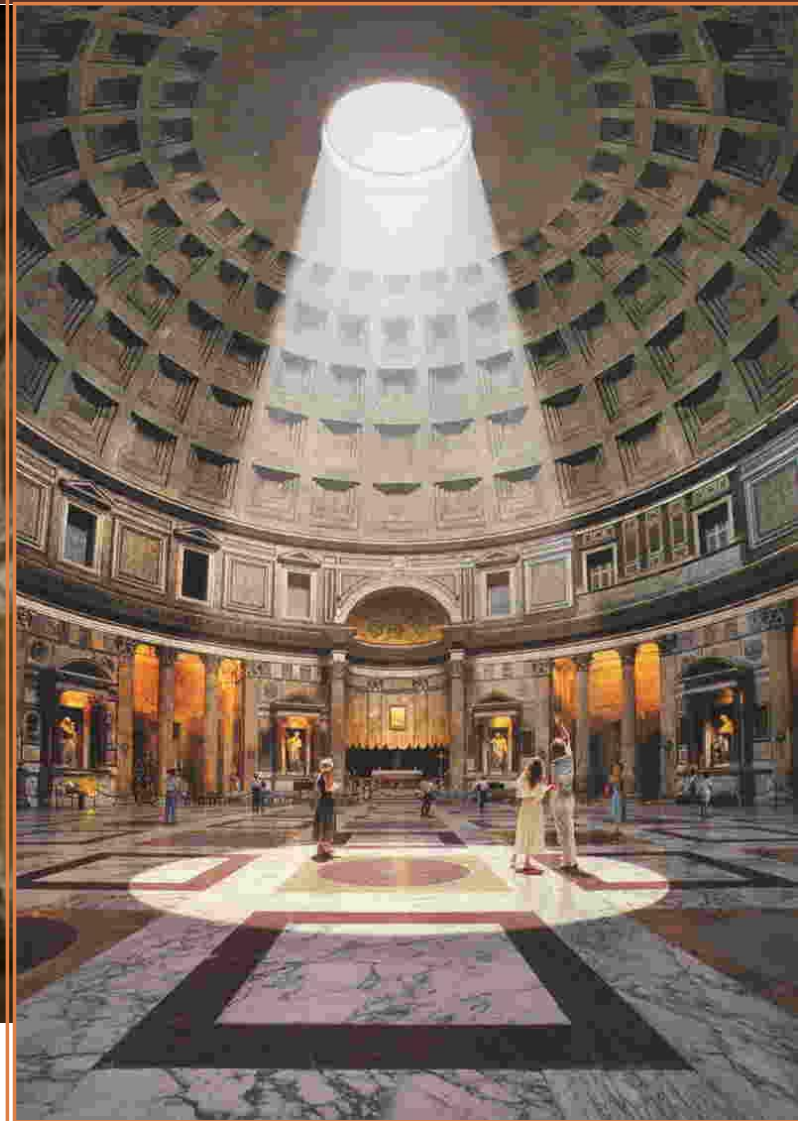
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EVOLUTION OF
DAYLIGHTING

HISTORICAL
OVERVIEW

THE
PANTHEON
ROME

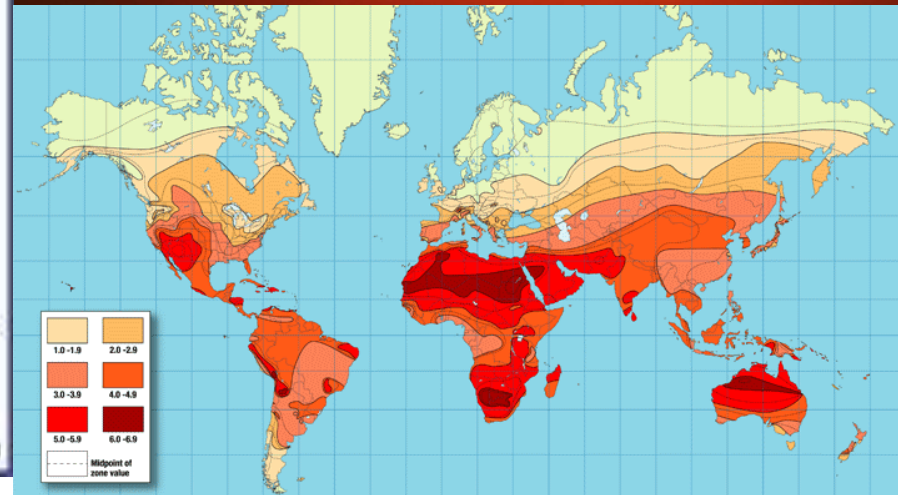
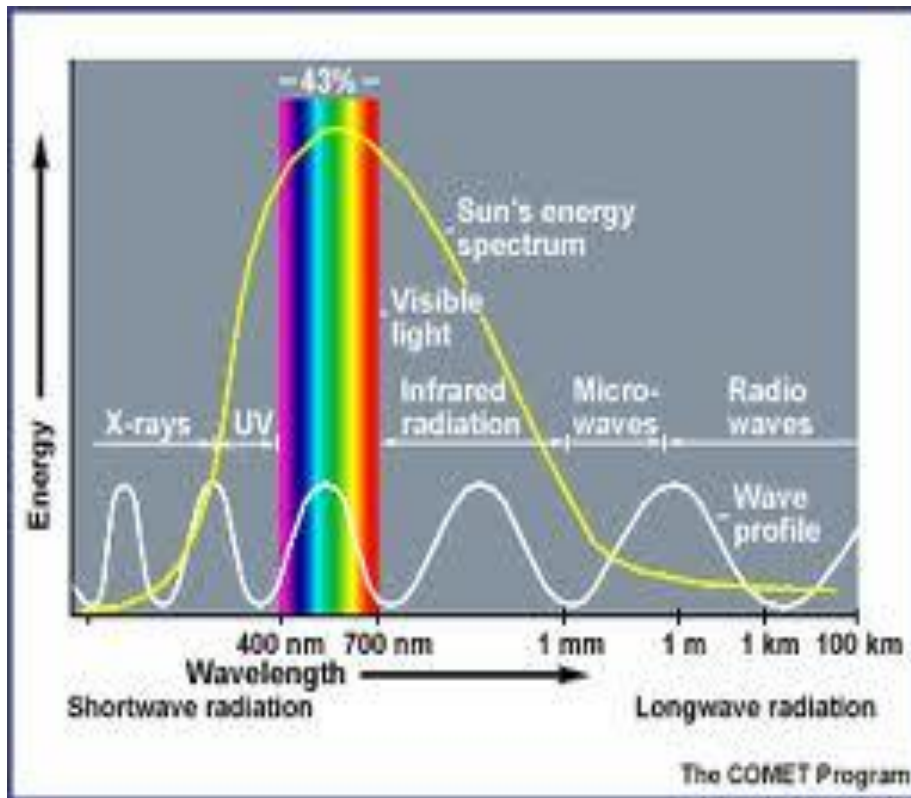


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LIGHT IN THE ATMOSPHERE

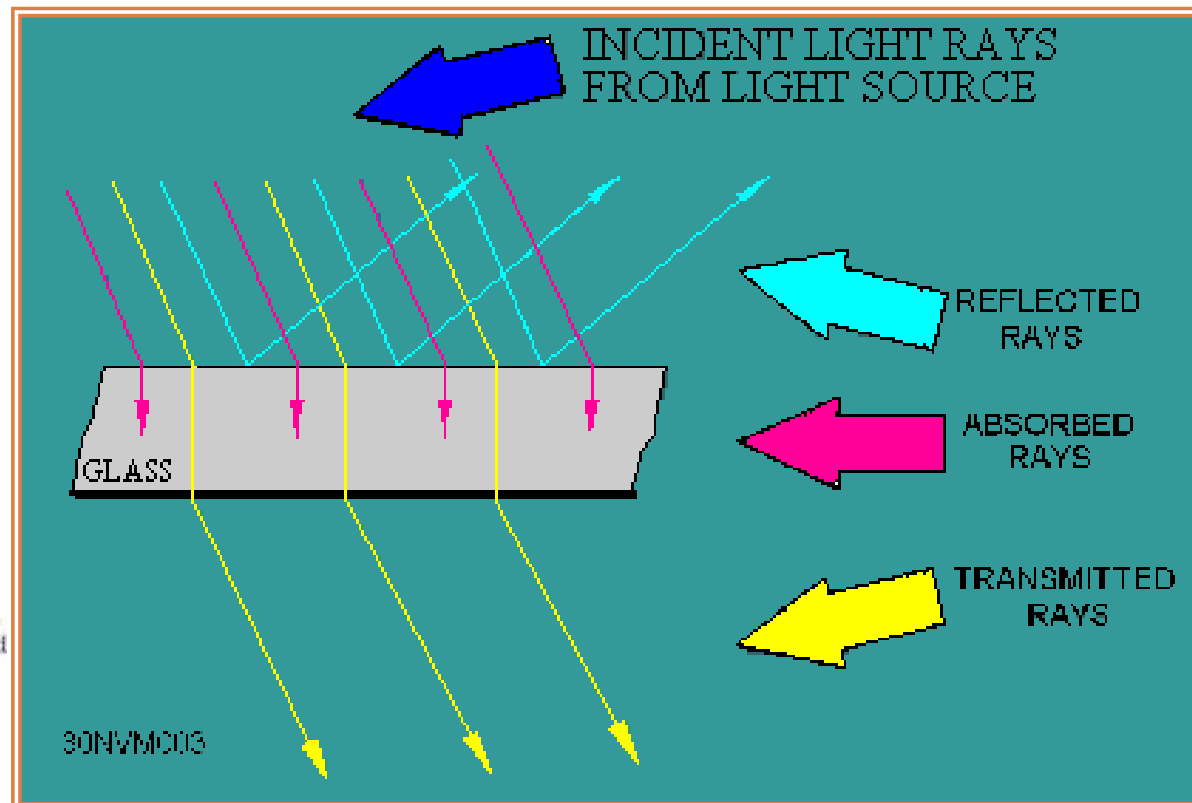
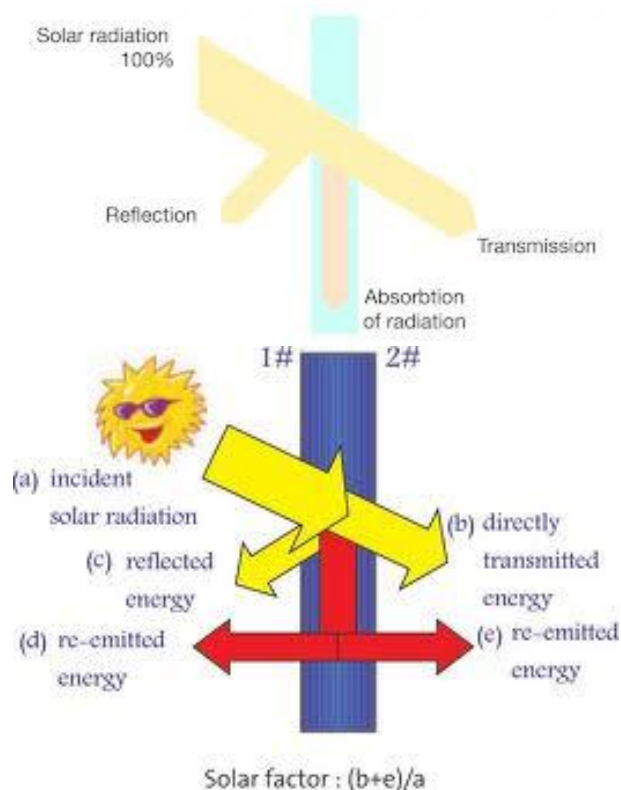


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LIGHT ON A SURFACE



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LIGHT ON A SURFACE

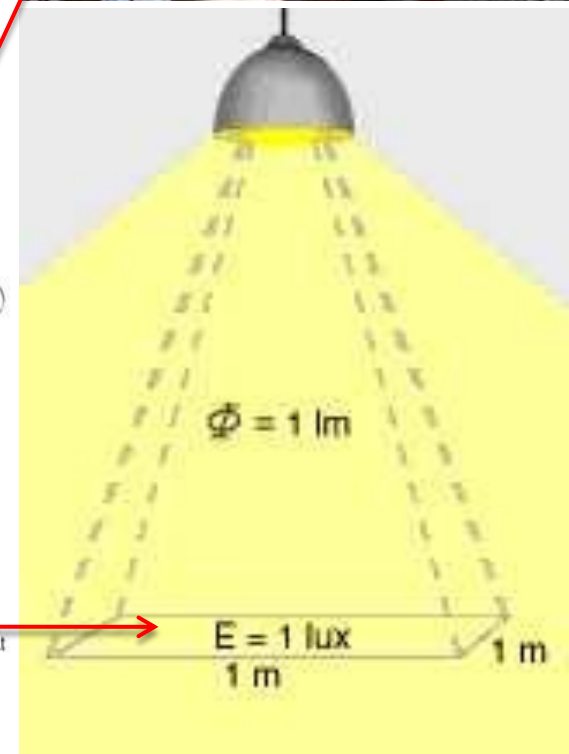
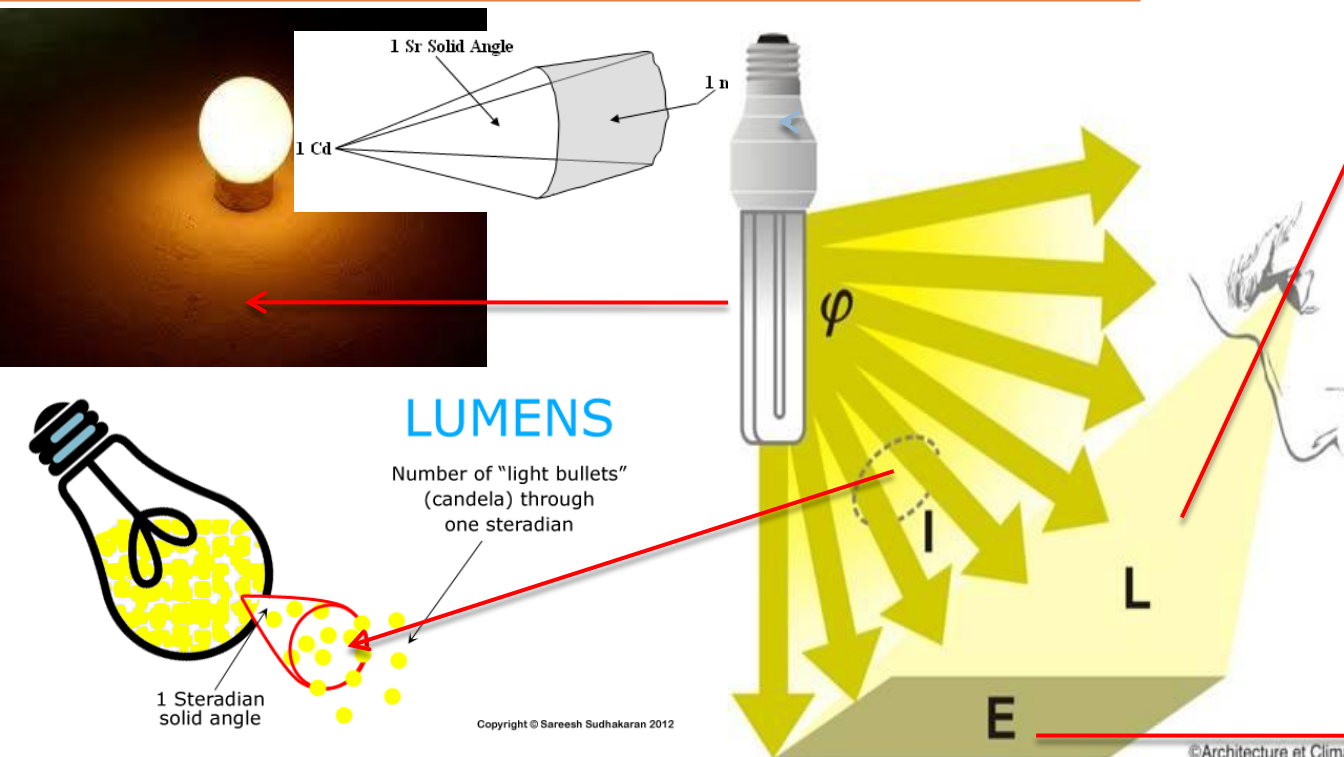


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PHOTOMETRY PRINCIPLES OF LIGHT



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GOOD DAYLIGHTING STRATEGY
means

*Maximize the potential of building and
architectural form while taking
advantage of technologies to further
refine solutions”*

Guzowski M.

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lighting the outlines
and shapes of objects



the absence of
unwanted shadows



View to the exterior
and pleasant shade of light



Absence
of glare and dazzle

**GOOD
DAYLIGHTING
STRATEGY
*means***

THE IMPACT OF BUILDING AND CONSTRUCTION TO ENVIRONMENT

- **72% ELECTRICITY CONSUMPTION**
- **39% ENERGY USAGE**
- **38% CO2 EMISSION**
- **40% RAW MATERIAL EXPLOITATION**
- **30% WASTE**
- **14% WATER CONSUMPTION**

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➔ TO ACHIEVE SUFFICIENT
ILLUMINATION LEVEL

eg lecture hall = 300 lux



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➔ TO ENHANCE QUALITY OF SPACE
creating an ambience



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➔ TO RESPECT FOR ENVIRONMENT
bringing outside to inside



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➔ TO RESPECT FOR ENVIRONMENT
bringing outside to inside

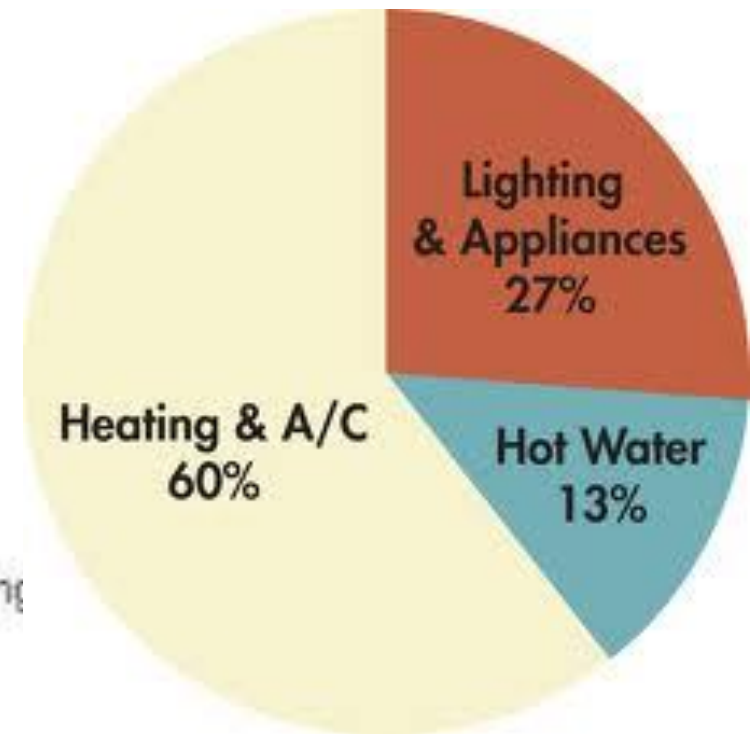
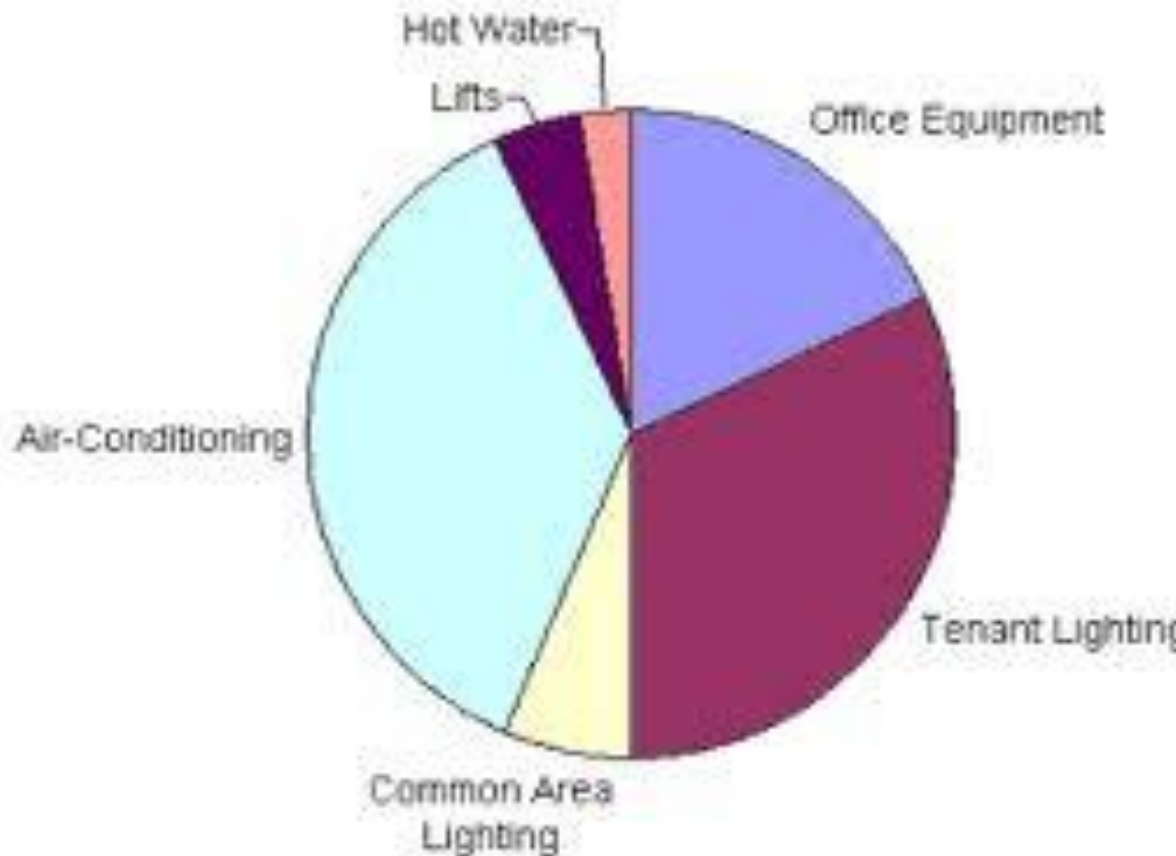


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➔ TO REDUCE ENERGY DUE TO LIGHTING BY OPTIMIZATION OF DAYLIGHTING



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➔ **TO PROMOTE BIOPHILIA**

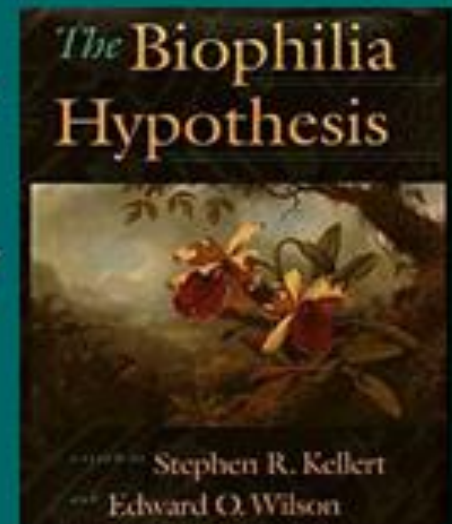
encouraging human relation to nature



Biophilia Hypothesis *E.O. Wilson, 1984*

means “love for life”

*“There is a instinctive bond
among human as living species
to natural forms, natural
processes, as well as pattern of
others living system”*



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Economic Aspect of Biophilic Design



Offices with minimum daylight and natural ventilation have greater potency of stress with increasing heart illness risk

Thayer 2010

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Education Aspect Biophilic Design



Learning outcome of children increases 20-26% at school with good natural daylighting

Nicklas and Bailey, 1996



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Health Aspect of Biophilic Design



- Patients room with direct view to nature indicates faster recovery rate

Ulrich, 1984



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Health Aspect of Biophilic Design

- Recovery times of patient shorter in the room with natural daylight

Beauchemin & Hays, 1996



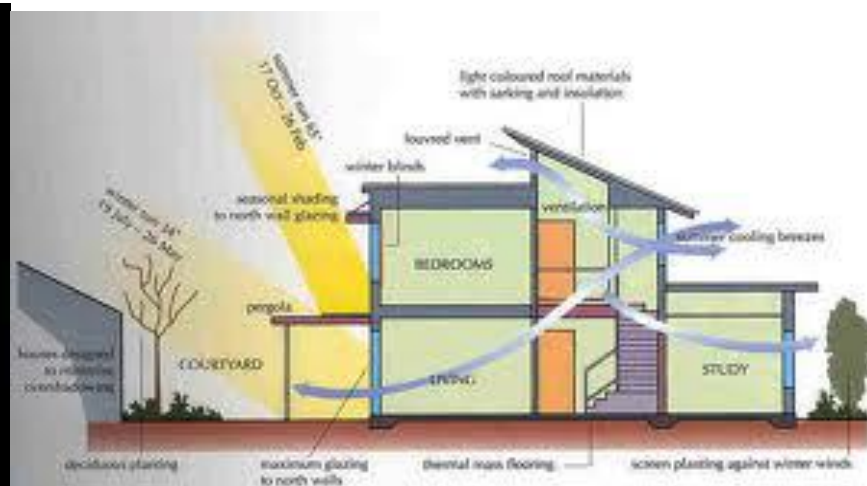
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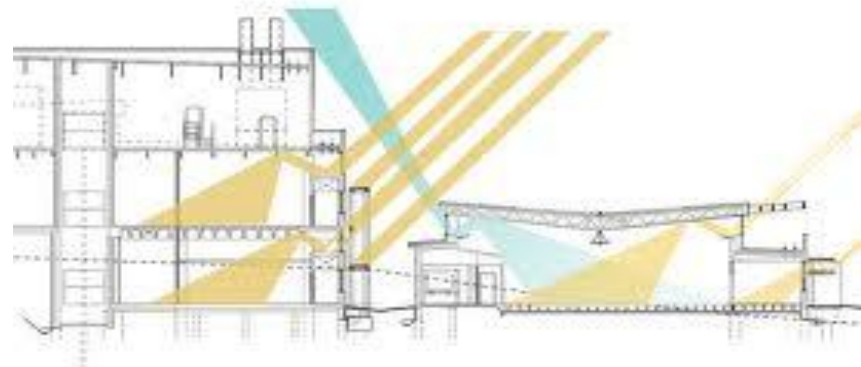
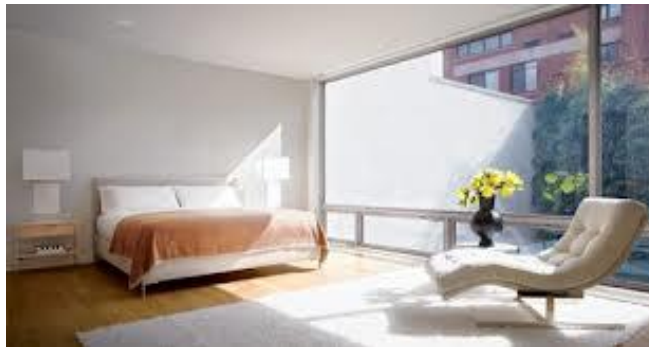
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POSITION OF WINDOW OPENINGS



SIDE WINDOW



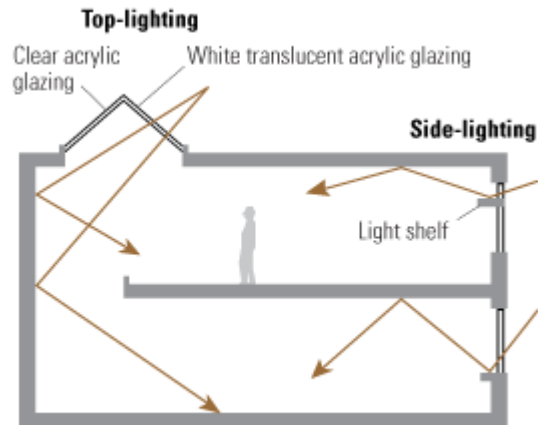
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POSITION OF WINDOW OPENINGS

UPPER WINDOW SKYLIGHT



Source: E SOURCE



Source: E SOURCE

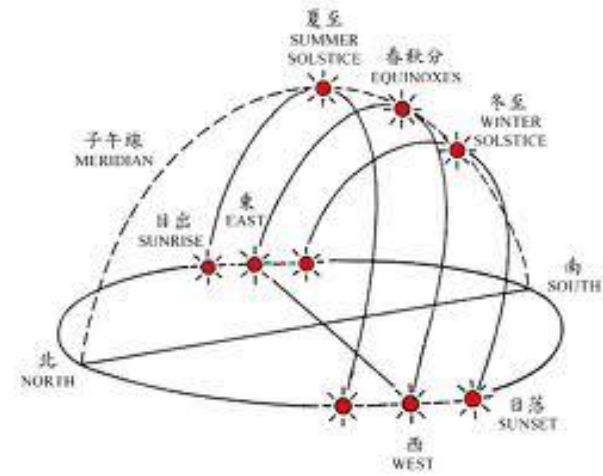
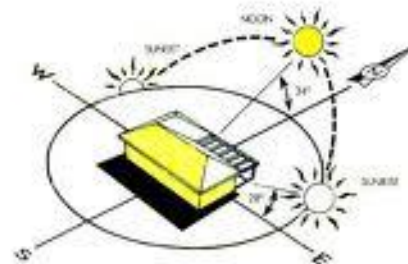
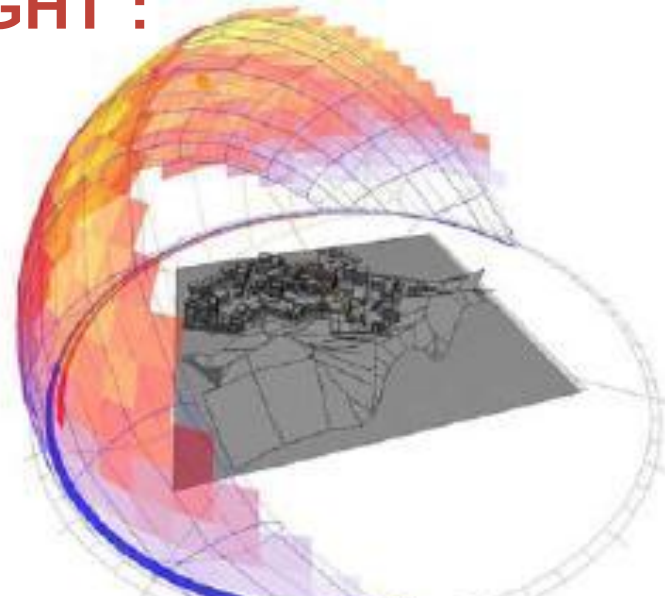
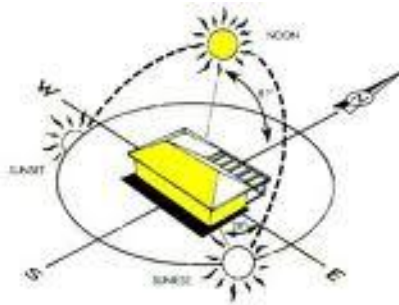
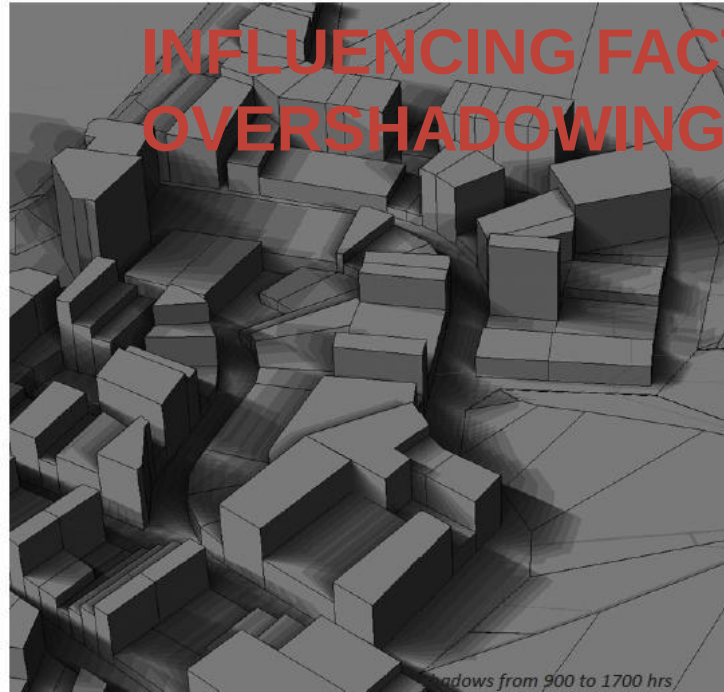


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INFLUENCING FACTORS TO DAYLIGHT : OVERSHADOWING

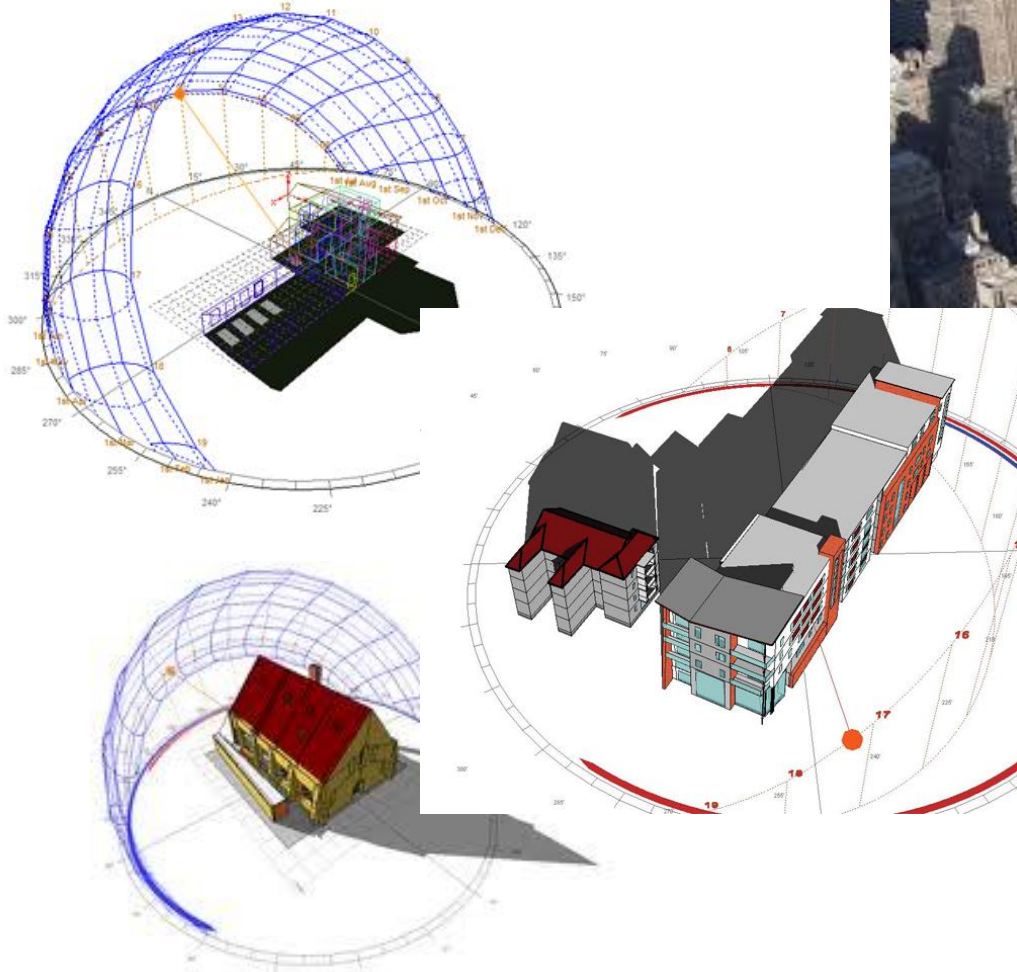


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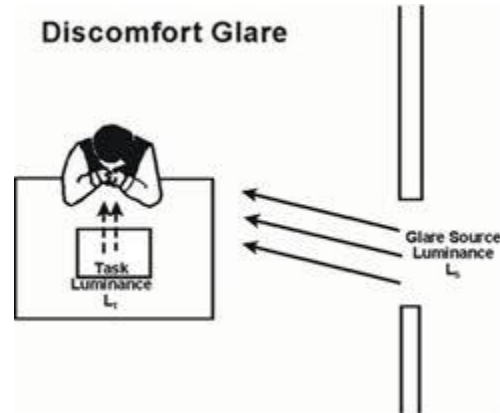
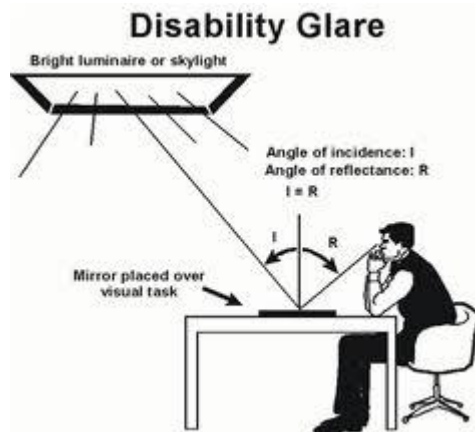


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GLARE



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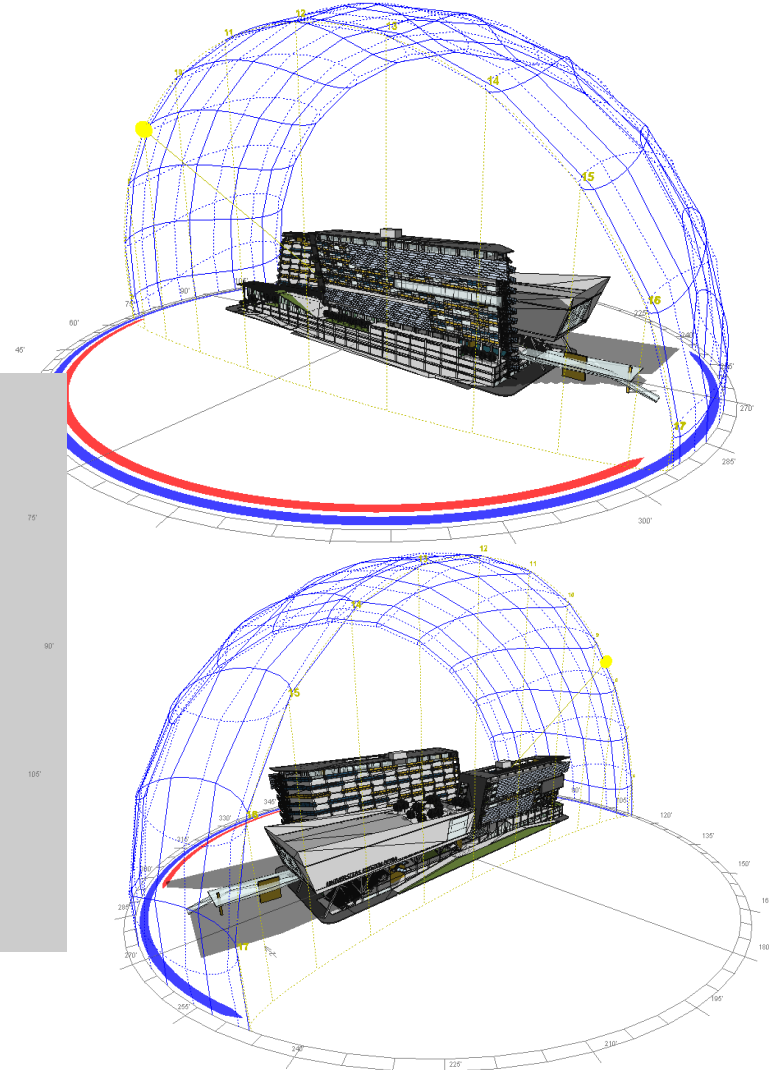
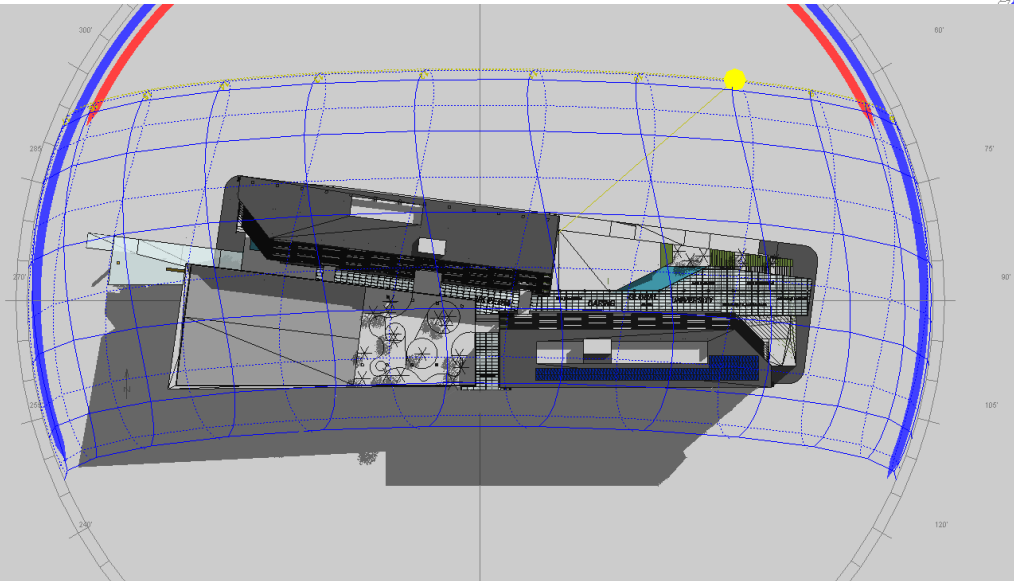
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THE GEOMETRY OF SUNLIGHT

Sunpath Diagram



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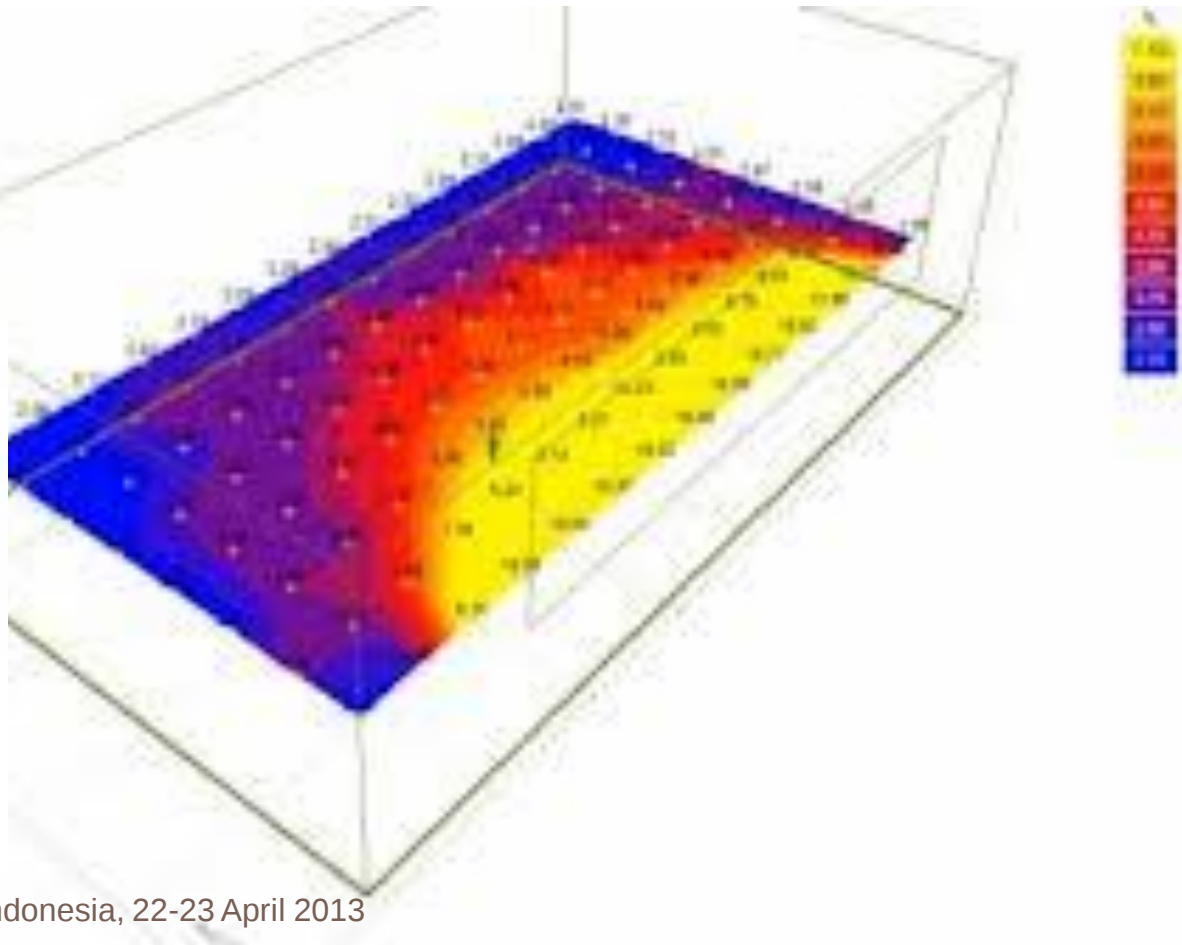
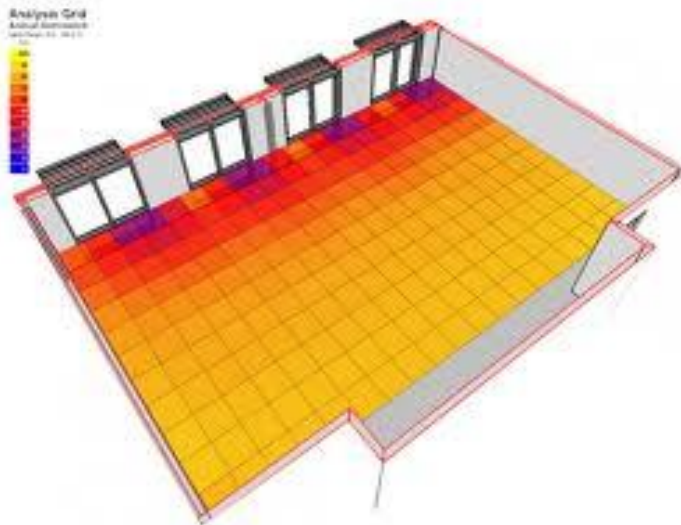
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ILLUMINANCE STUDY

Daylight Analysis

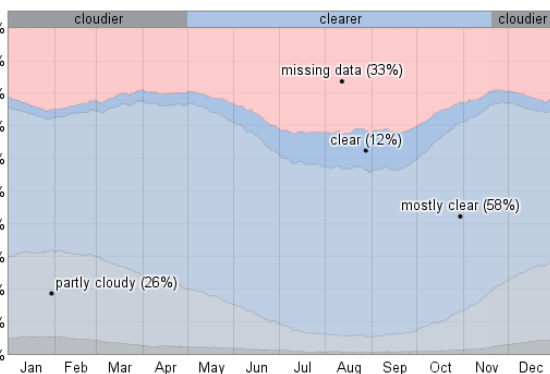
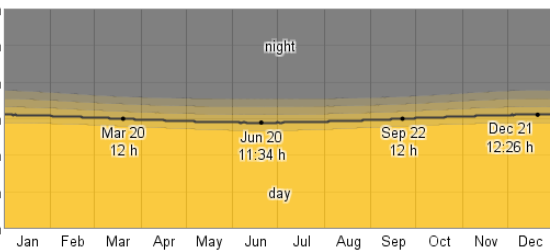
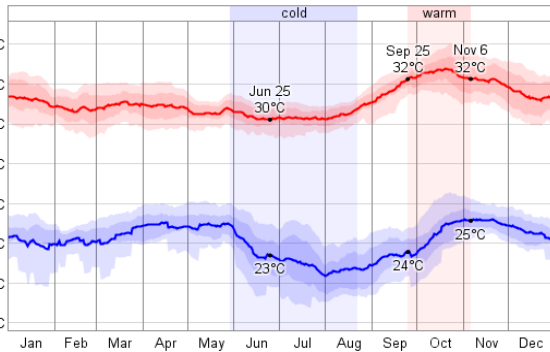
Daylight Factor
Current Design: 1.0% - 3.0%
4.0% (at 1.0% to 3.0%)
4.0% (at 1.0% to 3.0%)



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CASE STUDY :

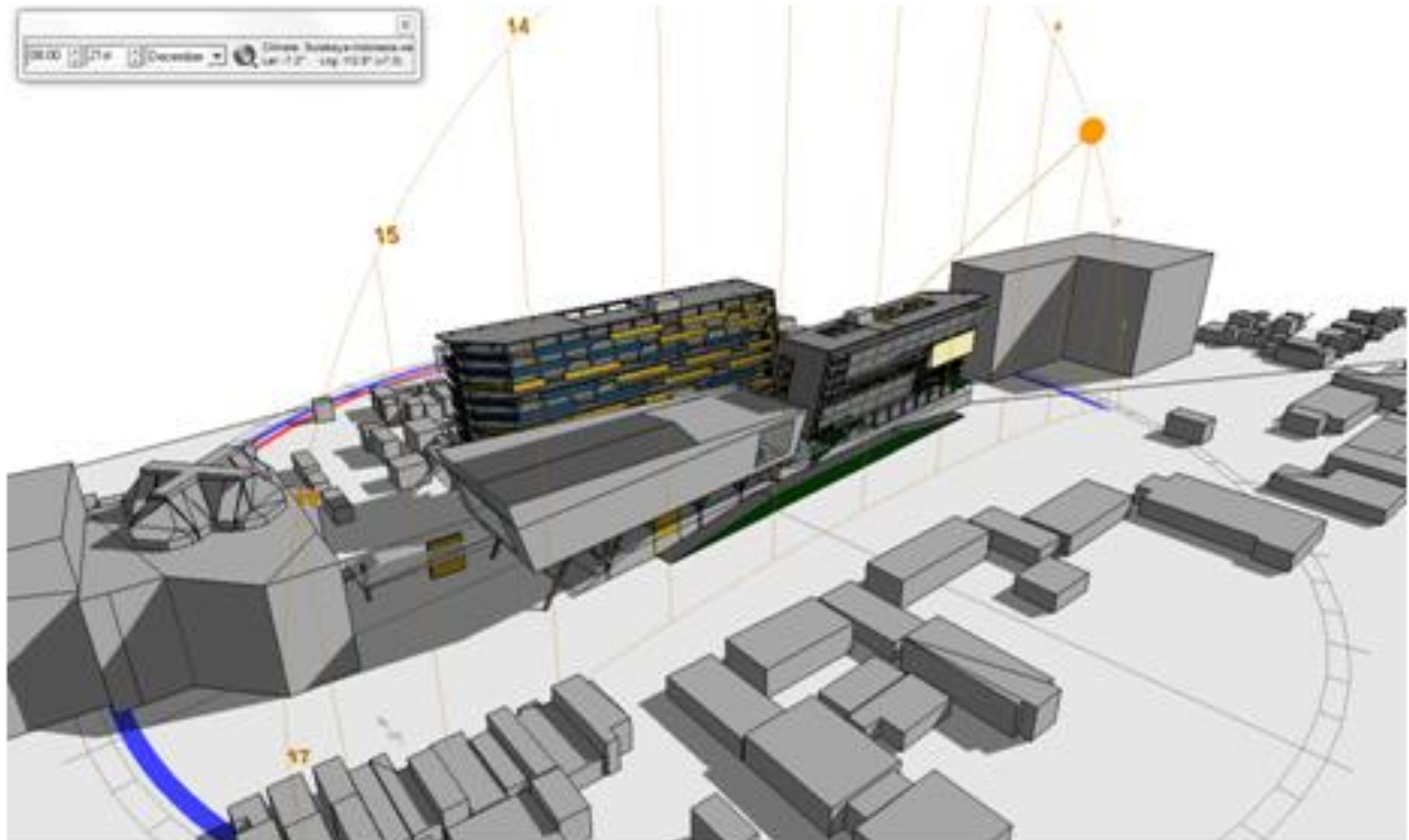
FACULTY OF ART AND DESIGN

PETRA UNIV. SURABAYA-INDONESIA

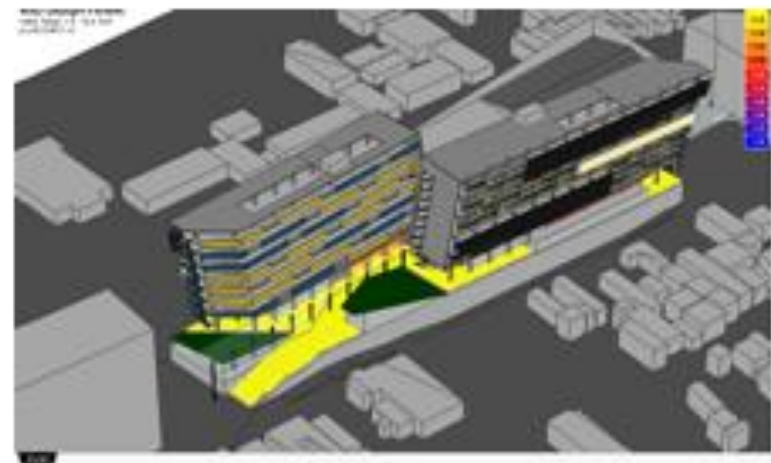
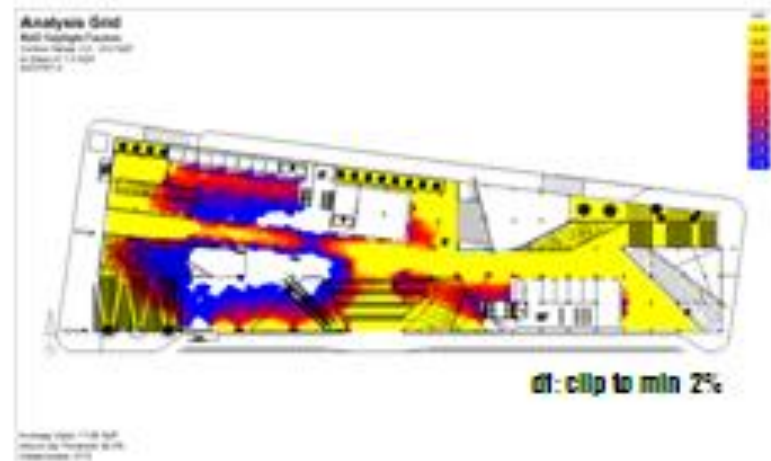
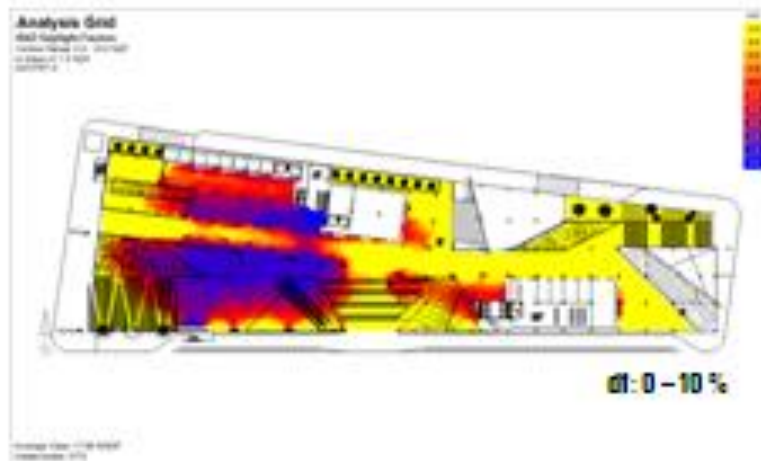
Arch.: Ivan & Jimmy Priatman



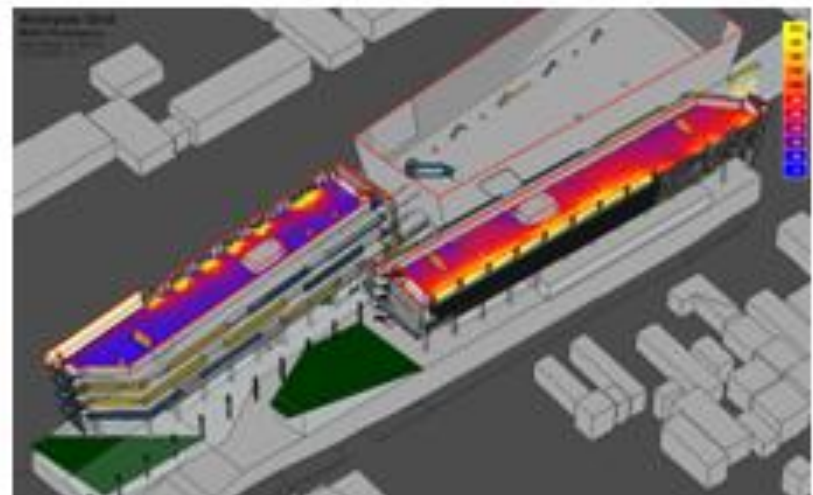
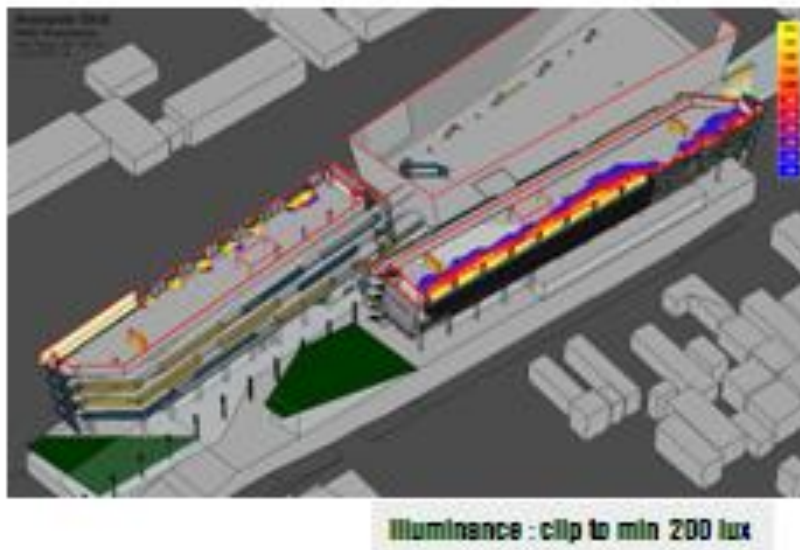
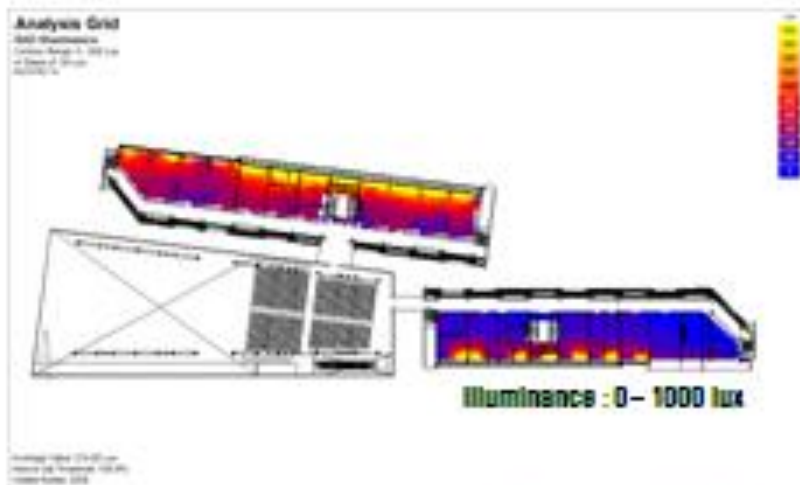




DAY LIGHT FACTOR LANTAI 3



ILLUMINANCE LANTAI 7

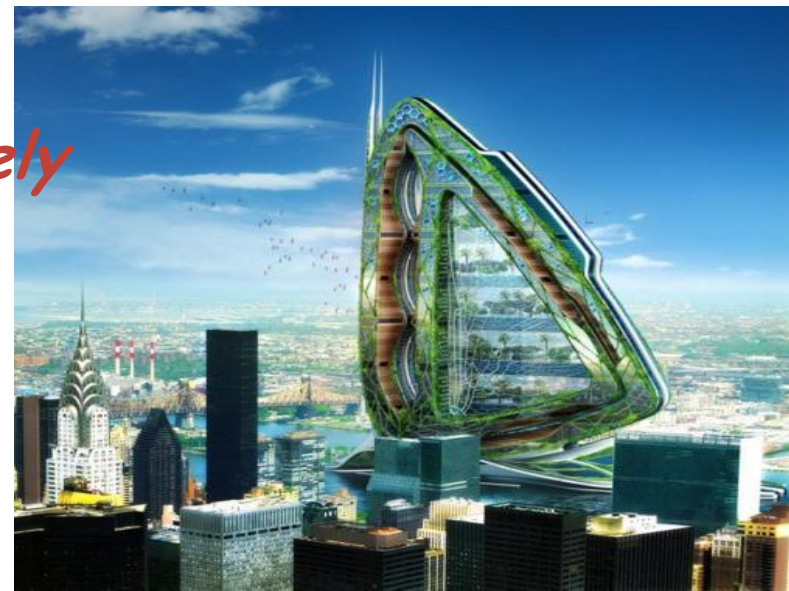


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- *Daylight strategies can be used simultaneously with lighting system to search for optimum integration especially during the day.*
- *The synergy between daylighting and artificial lighting definitely results in reducing energy as well as enhancing the quality of room ambience.*



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■ *It is worth to say that daylighting plays an significant role toward green building in future as well as a form-giver to the world of architecture*

Jimmy Priatman

april 2013

