

SUSTAINABILITY AND GLASS

- ❑ GLASS IS INCREASINGLY BEING USED AS A AESTHICTALLY APPEALING , EASY TO CONSTRUCT MATERIAL WITH LOW LIFETIME COST
- ❑ GLASS IS ALSO A SUSTAINABLE MATERIAL
 - Recyclable
 - Reusable
 - Provides for energy efficient structures
 - Safe to use
 - Sound insulation
 - U V Protection

USE OF SAFETY GLASS AS A SUSTAINABLE MATERIAL



LEED & Green Building Concept

- The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council (USGBC), provides a suite of standards for environmentally sustainable construction.
- The LEED rating system for Green buildings has six major areas of which four have the potential to be tapped through appropriate usage of High Performance Glass in design:
 - ENERGY & ATMOSPHERE (EA)
 - MATERIALS & RESOURCES (MR)
 - INDOOR ENVIRONMENTAL QUALITY (EQ)
 - INNOVATION & DESIGN PROCESS (ID)
- For a Green Building it is important to choose a glass solution that gives high performance without compromising on aesthetics.



LEED & Green Building Concept

- ENERGY & ATMOSPHERE (EA)- Optimize Energy Performance
 - The building facade, windows, doors, and skylights can be designed with high performance glass to meet the desired solar heat gain coefficient and U-value requirements. MATERIALS & RESOURCES (MR)
- MATERIALS & RESOURCES (MR) Regional Materials
 - The distance from the glass manufacturing/fabrication facility to the job site (within 500 miles radius) is a major factor in gaining points under the Regional Materials Credit.
- INDOOR ENVIRONMENTAL QUALITY (EQ) - Daylight and View
 - High Performance glass helps to blend the twin actions of achieving desired levels of daylight and transparency to enable external views. The letting in of natural light helps cut down on the artificial lighting costs.
- INNOVATION & DESIGN PROCESS (ID) - Innovation in Design
 - Addressable to the needs of Acoustic Insulation, Self-cleaning etc apart from the prescribed requirements of Energy Efficiency, choosing right kind of product in maximizing the benefits possible.



Innovations in glass to promote safety

Glass with safety features

- ✓ Less likely to break
- ✓ Less likely to pose a threat when broken
- ✓ If impacted by outside forces, it shatters but never splinters- protecting objects inside
- ✓ Protection from fire/heat ingress

SAFETY GLASS:

- ❖ TOUGHENED GLASS
- ❖ LAMINATED GLASS
- ❖ WIRED GLASS
- ❖ FIRE RATED GLASS



TOUGHENED OR TEMPERED GLASS

- Single piece of glass that gets tempered using a process that
 - ✓ Heats and then quickly cools the glass to harden it.
 - ✓ Increases the strength of the glass 5 to 10 times that of normal glass.
 - ✓ Tempered safety glass breaks differently than regular clear glass. When struck it does not break into sharp jagged pieces of shrapnel-like glass as normal window panes or mirrors do. Instead it breaks into little pebble-like pieces, without sharp edges.



TOUGHENED GLASS PROVIDES FOR SAFE STRUCTURES AND ELEMENTS

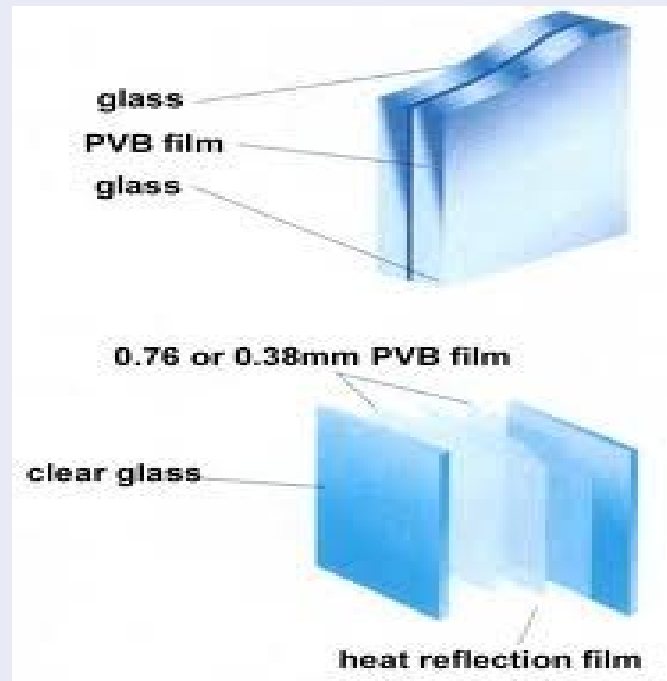
- Passenger vehicle windows
- Shower doors
- Architectural glass doors, Balustrades and tables
- Refrigerator trays
- As a component of bulletproof glass
- For diving masks
- Various types of plates and cookware.

In the United States, since 1977 Federal law has required glass located within 18 in (46 cm) of a floor or doorway to be tempered



Laminated glass

- Holds together when shattered / in the event of breaking
 - Is held in place by an interlayer
 - produces a characteristic "spider web" cracking pattern



Laminated glass

Additional benefits:

- It reduces transmission of high frequency sound
- It blocks 97 percent of [ultraviolet radiation](#).
- Applications:
 - 1) Bus station, airport and others where sound-insulation is specially demanded
 - 2) Banks and show rooms
 - 3) Windows of automobile and ships
 - 4) Furniture and interior decoration
 - 5) Bulletproof or violence prevention (bulletproof glass)



GLOBAL SCENARIO - TODAY

33%
of all energy in EU is
used for transport



26%
of all energy in EU is
used by industry



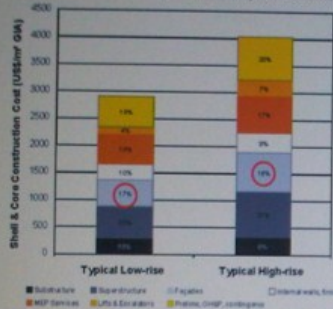
41%
of all energy in EU is
used by buildings



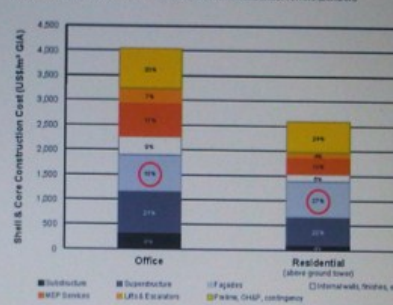
**2/3 of energy consumption
in buildings is used for heating
and cooling**

**80% of energy consumption
is used in small buildings
< 1000 m²**

Relative Elemental Costs for Low and High-rise Office Buildings (Central London)

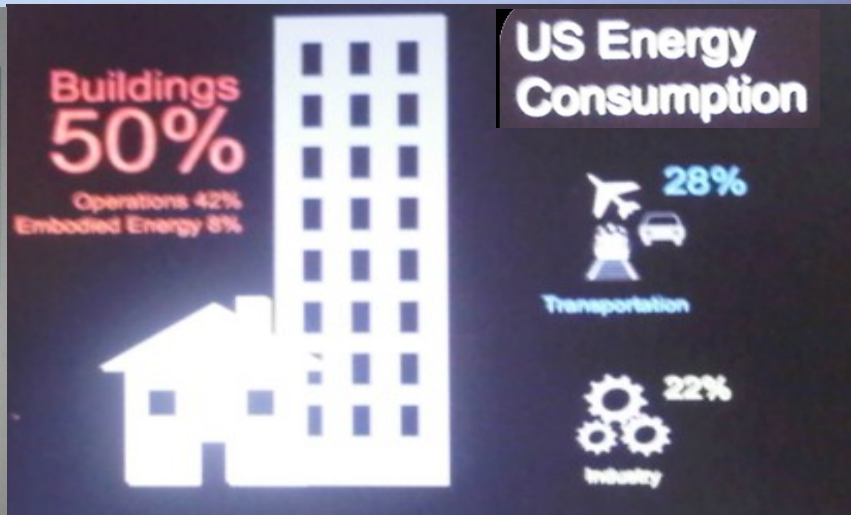


Typical Shell and Core Construction Costs: Office vs Residential Towers (London)



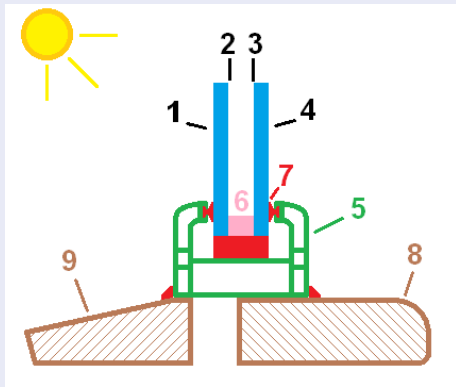
Shell and Core High-rise Construction Cost Range (US\$/m² GIA)

The biggest cost items in high-rise office buildings
are typically **SUPERSTRUCTURE, FACADES** and
MEP SERVICES



sustainability and glass'

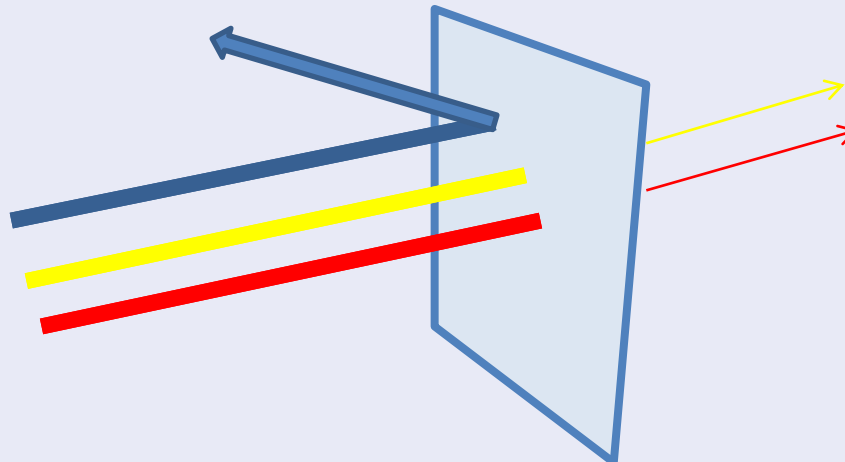
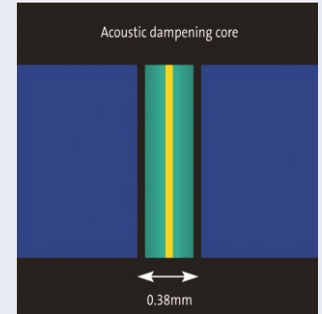
LAMINATED SAFETY AND ENERGY EFFICIENT GLASS



INSULATING

SOLAR GLASS

filters 99% UV rays



LIGHT
HEAT

THICKNESS - 0.76 MM

BULLET PROOF

reflective appearance

Pyrolysed coating

toughened CONTROL

0.38mm polyvinyl butyral (PVB) fil

reduces 25% sound inside building

ACOUSTIC



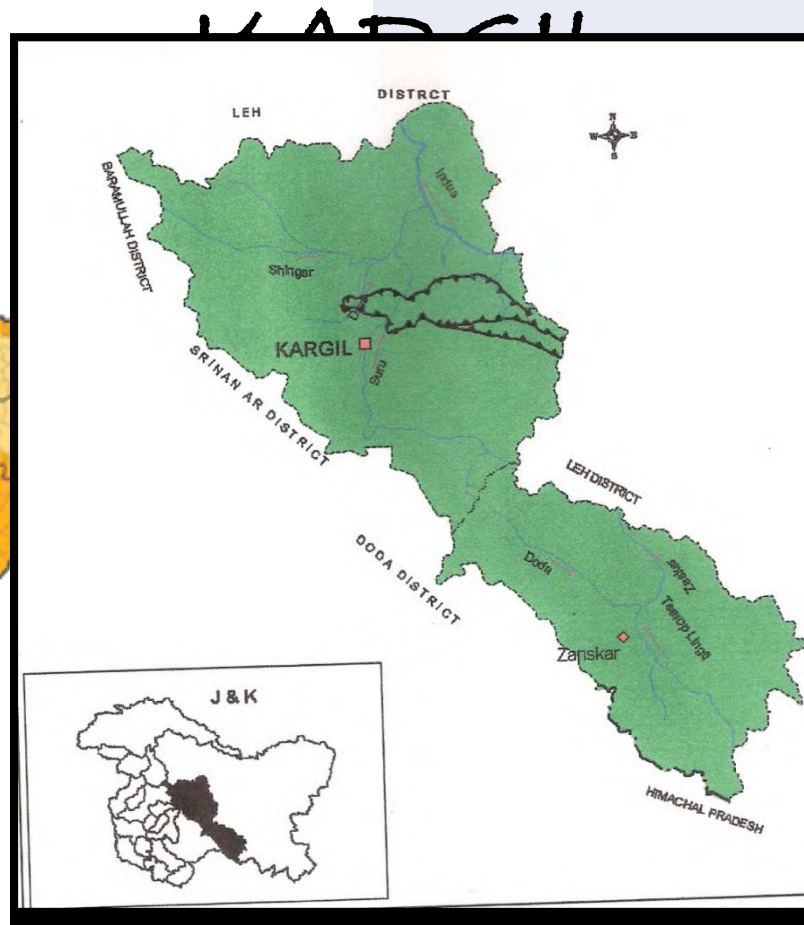
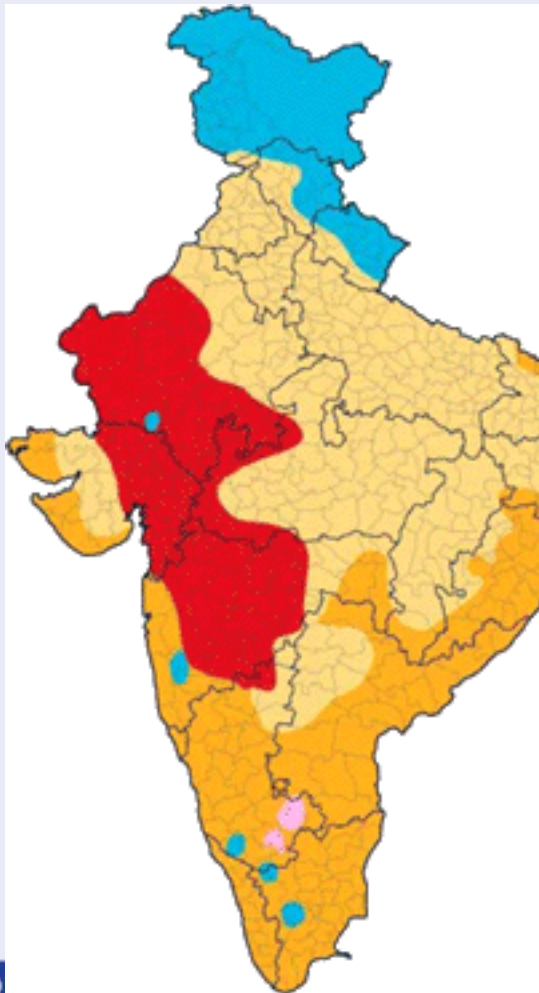
LANDSCAPE DESIGN INCLUDING GLASS FAÇADE

*OBJECTIVE : To design a lecture room for
the NCC at Kargil...*

**A CASE STUDY FROM AN ARCHITECTURAL VIEW
POINTS**



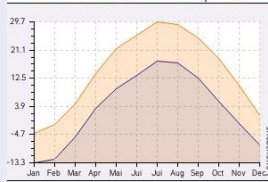
COLD AND DRY CLIMATE





OPEN YOUR WORLD

AVG. TEMPERATURE



24 °C

23 °C

RELATIVE HUMIDITY

51%

PRECIPITATION

150 mm

Mainly snowfall

SKY CONDITIONS



SUMMER

PARTLY CLOUDED

MOSTLY CLEAR SKY

34° 34' N

WIND

15 m/hr

76° 06' E

WINTER



OVERCAST

ALTITUDE

2676 m

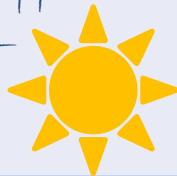
8780 ft.

SOLAR RADIATION

DIFFUSED SUNLIGHT

ALL THROUGHOUT

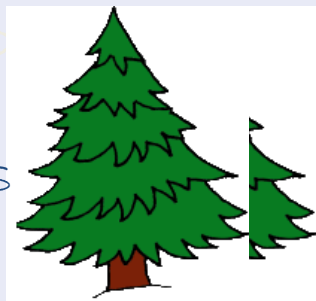
THE YEAR



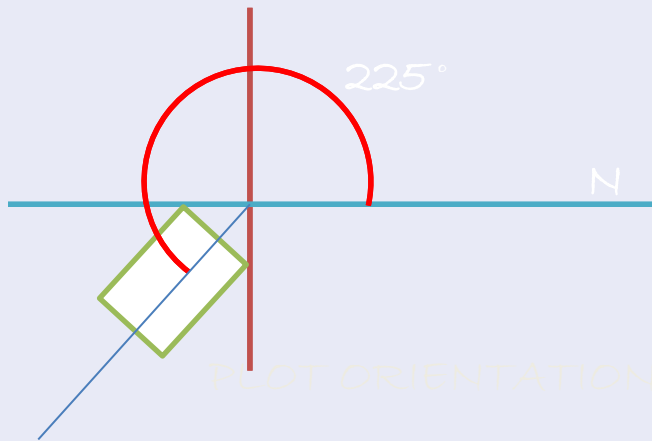
VEGETATION

EVERGREEN

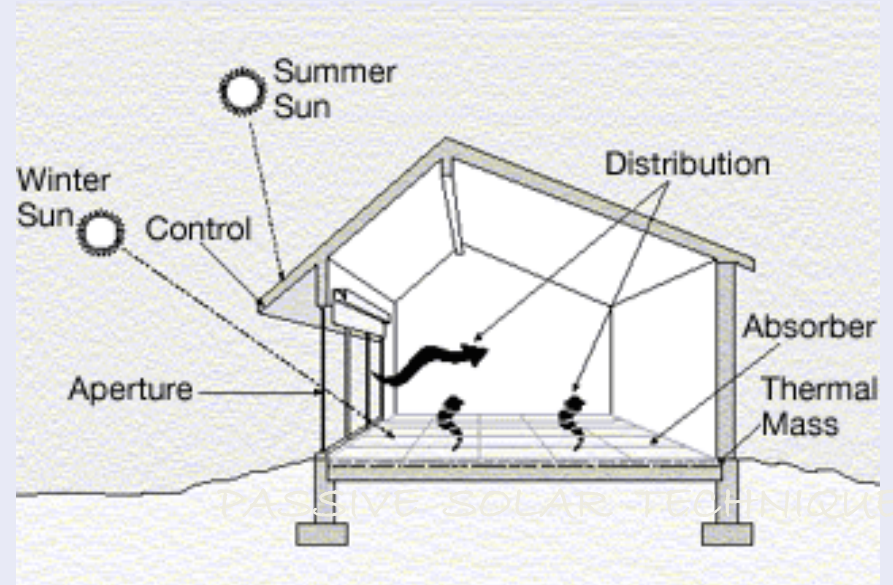
CONIFEROUS



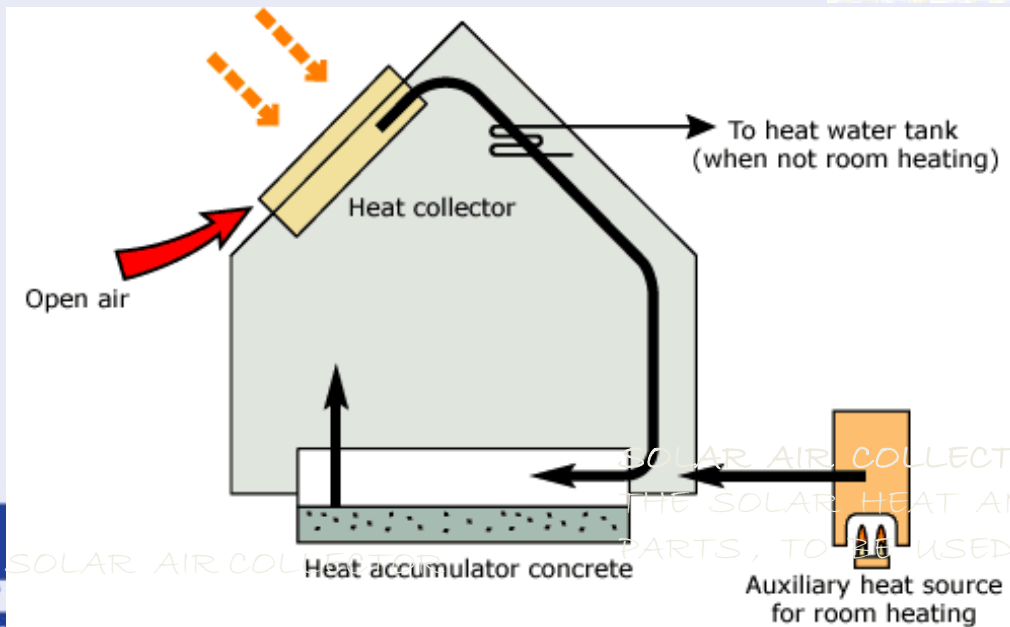
CONCEPT OF DESIGN APPROACH



PLOT ORIENTATION



PASSIVE SOLAR TECHNIQUE



PASSIVE SOLAR BUILDING DESIGN. WINDOWS, WALLS AND FLOORS ARE MADE TO COLLECT, STORE AND DISTRIBUTE SOLAR ENERGY IN THE FORM OF HEAT IN THE WINTER AND REJECT SOLAR HEAT IN THE SUMMER. IT DOESN'T INVOLVE THE USE OF MECHANICAL AND ELECTRICAL DEVICES.



SOLAR AIR COLLECTORS ARE DEVICES WHICH COLLECT THE SOLAR HEAT AND THEN TRANSFER IT TO OTHER PARTS, TO BE USED FOR OTHER PURPOSES.

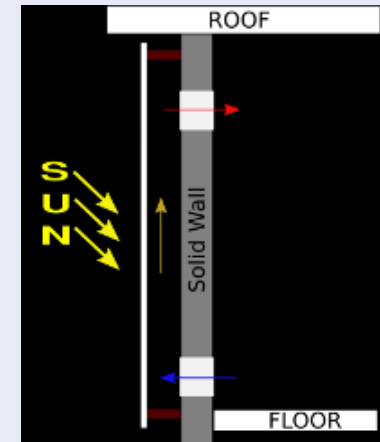


STONE FRONT

STONE FRONT USED IN THE LOWER SIDE OF THE BUILDING, ACTS AS A DOUBLE WALL, WHICH PREVENTS THE COLD WAVES TO TRAVEL INTO THE INTERIOR OF THE ROOM.

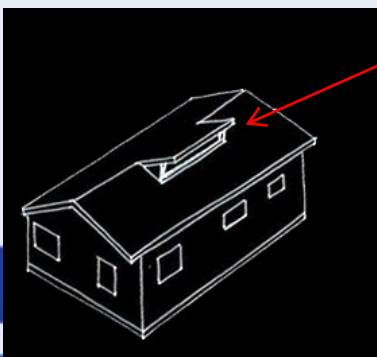
TROMBE WALLS

TROMBE WALL IS A SUN-FACING WALL SEPARATED FROM THE OUTDOORS BY GLASS AND AN AIR SPACE, WHICH ABSORBS SOLAR ENERGY AND RELEASES IT SELECTIVELY TOWARDS THE INTERIOR AT NIGHT. THEY CAN BE USED TO PROVIDE FREE HEATING, COOLING AND VENTILATION.



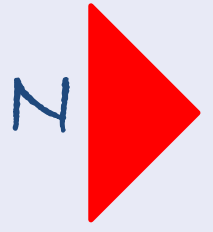
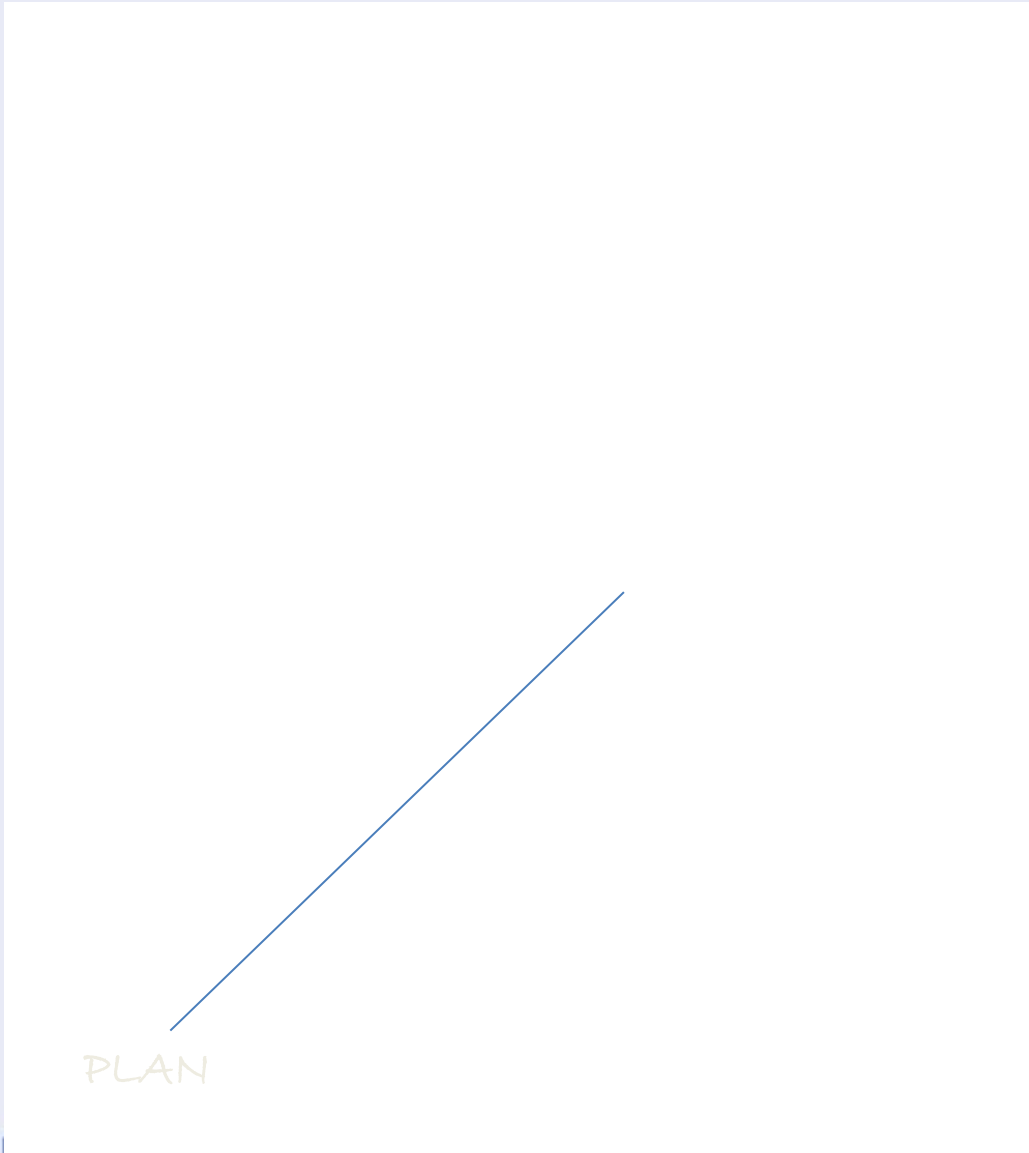
FALSE CEILINGS

FALSE CEILINGS USED INSIDE, WITH A LAYER OF POLYURETHANE FOAM (PUF)



CLERESTORY WINDOWS

WINDOW ABOVE THE LINTEL HT. USUALLY PLACED CUTTING OUT THE SLANTING ROOF SLAB. THE PURPOSE IS TO BRING OUTSIDE LIGHT, FRESH AIR, OR BOTH INTO THE INNER SPACE.



PLAN



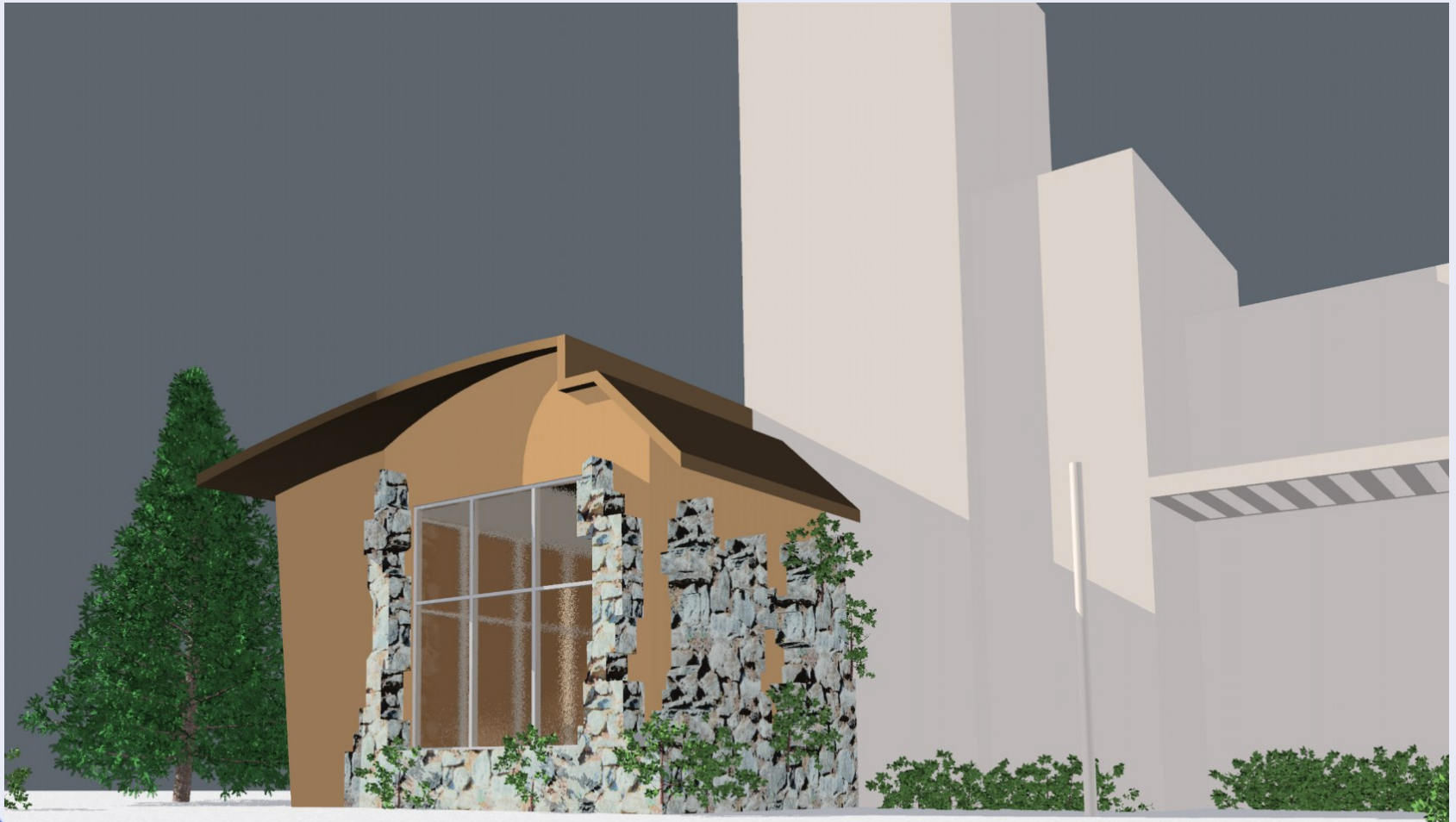
VIEW

South side

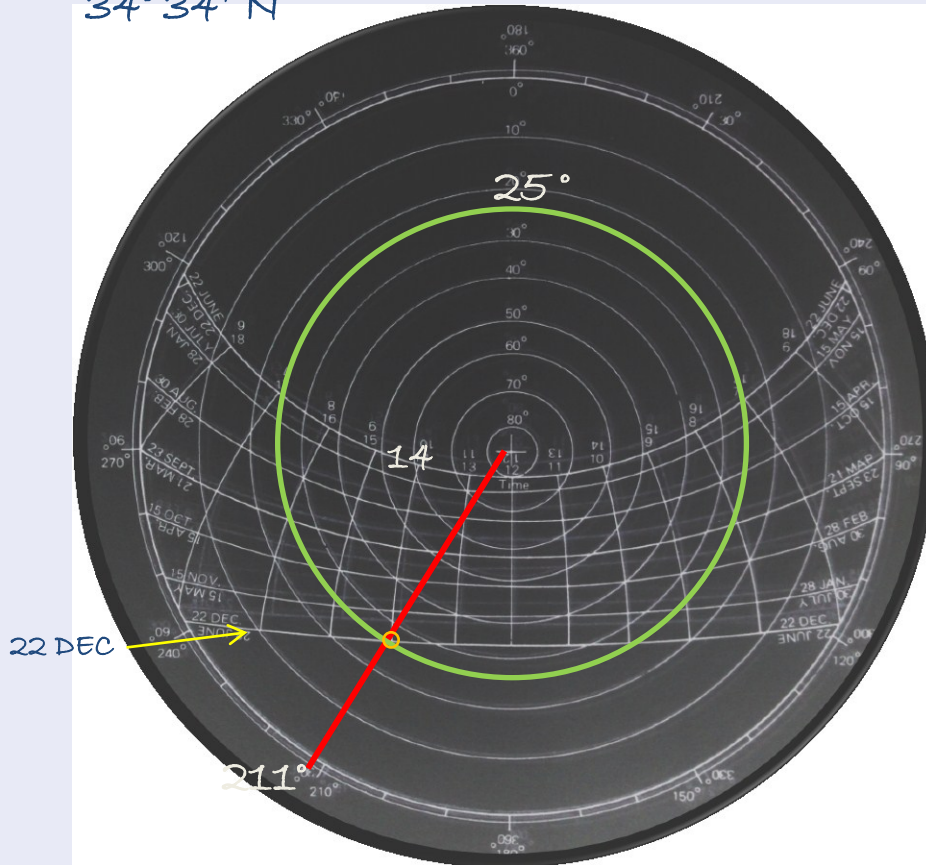


VIEW

East side



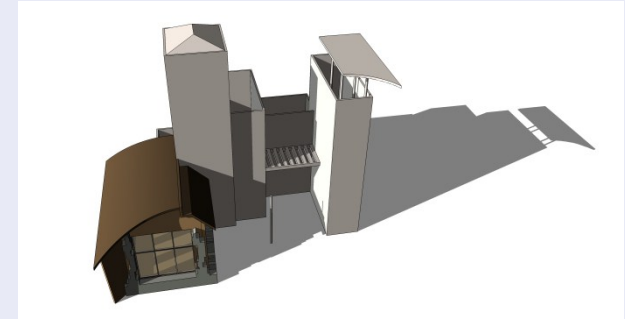
34° 34' N



SUN CHART DIAGRAM

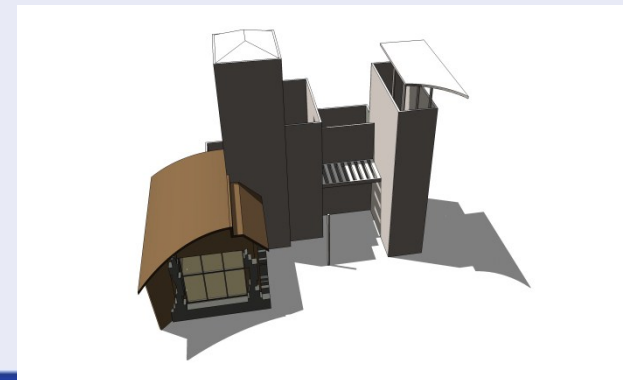
AZIMUTH = 211°
ALTITUDE = 25°

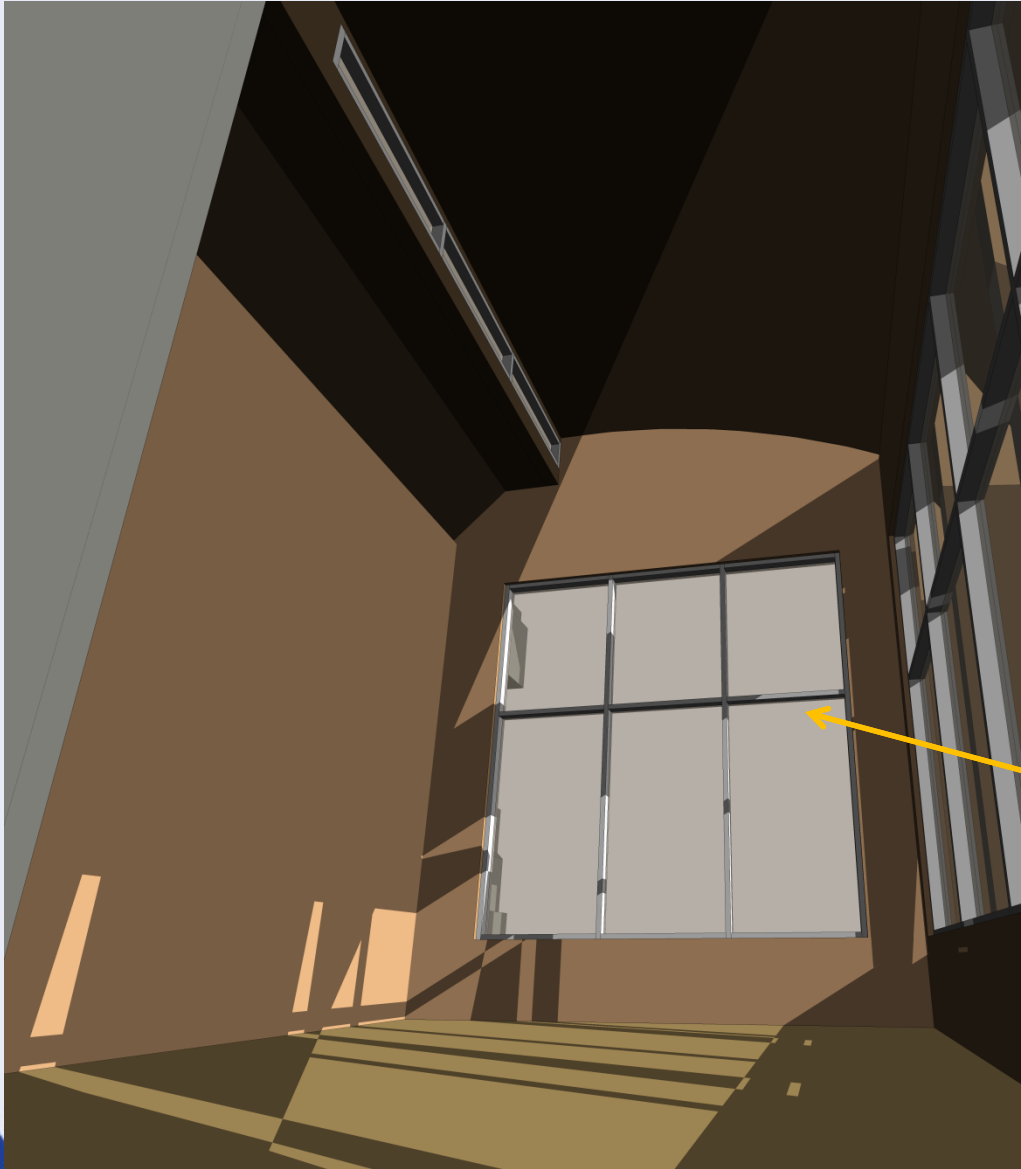
On the 22nd of December, at 2:00pm



Similarly,
on the 22nd of June at 2:00pm

AZIMUTH = 253°
ALTITUDE = 60°





Internal view,
of the lecture hall

4:00 pm
September 23rd

LARGE WINDOWS

TO FACILITATE MAXIMUM
ENTRY OF SUNLIGHT IN
THE ROOM.

ARCHITECTURAL MARVELS USING GLASS



CURTAIN WALLS , BALUSTRAEDS



WINDOWS , DOORS , LANDINGS



DESIGN INNOVATIONS IN GLASS



DESIGN INNOVATIONS IN GLASS

