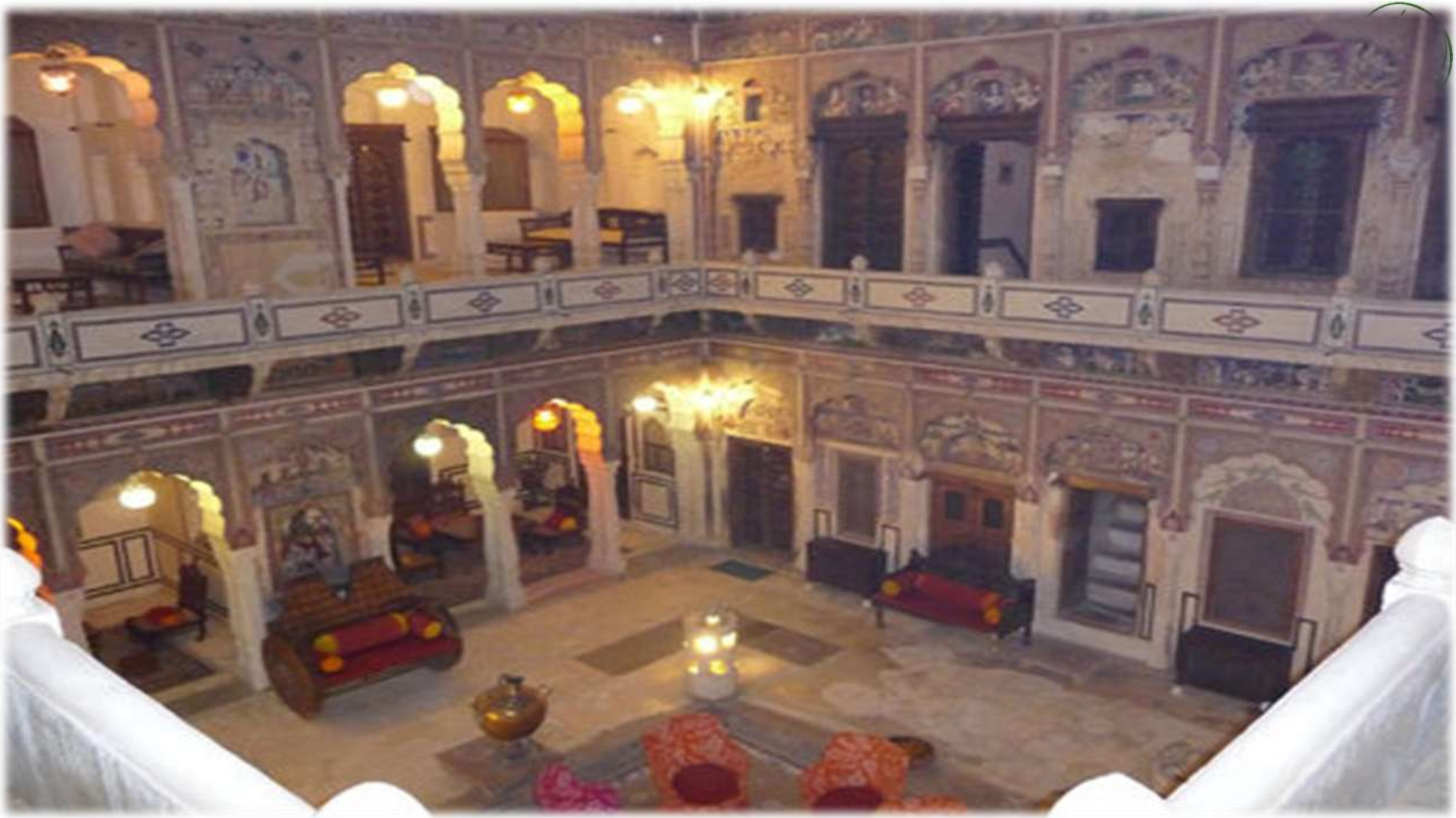
Materials & Energy Efficiency

ENVIRO CONSULTANCY

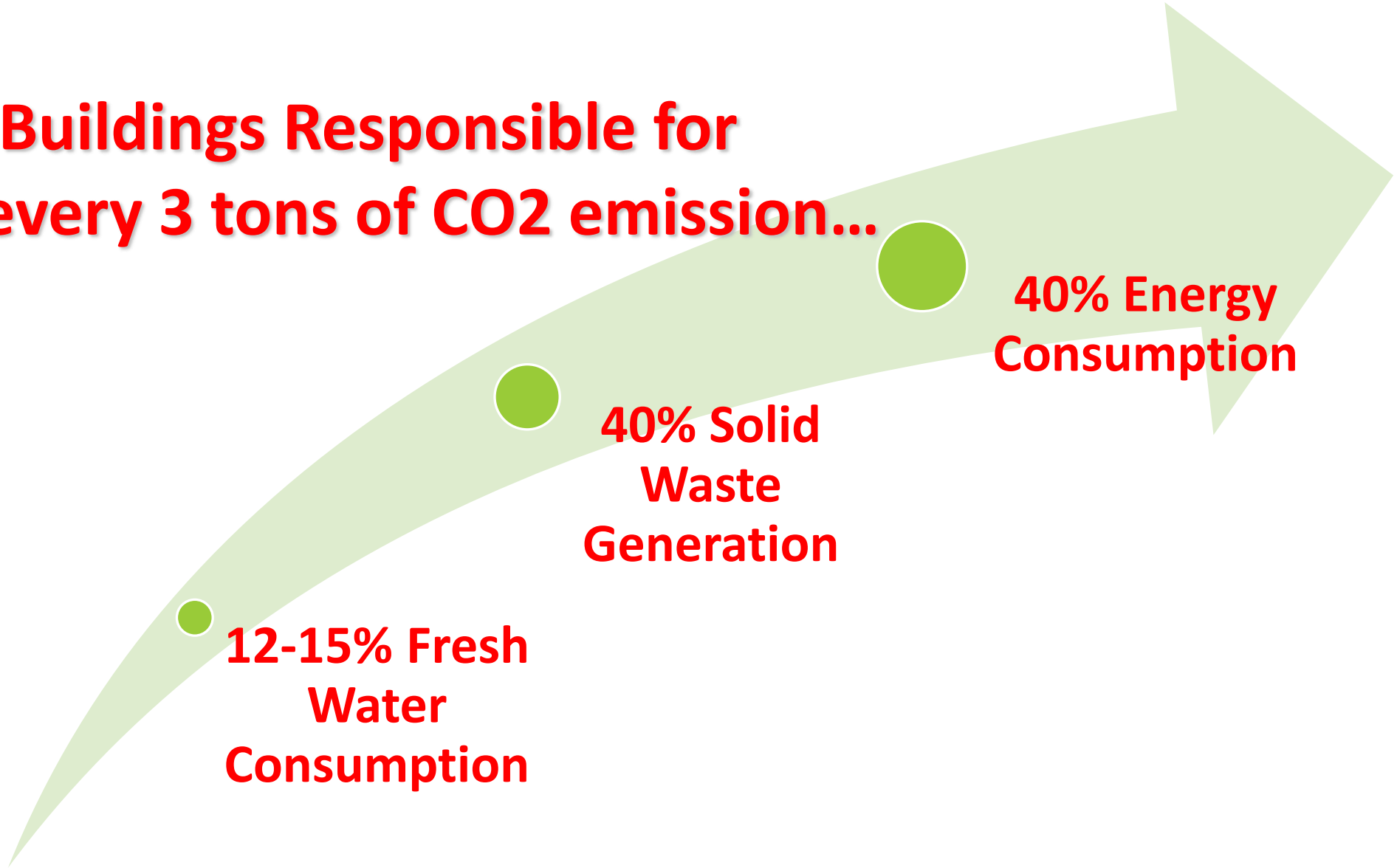
SUSTAINABILITY SOLUTIONS



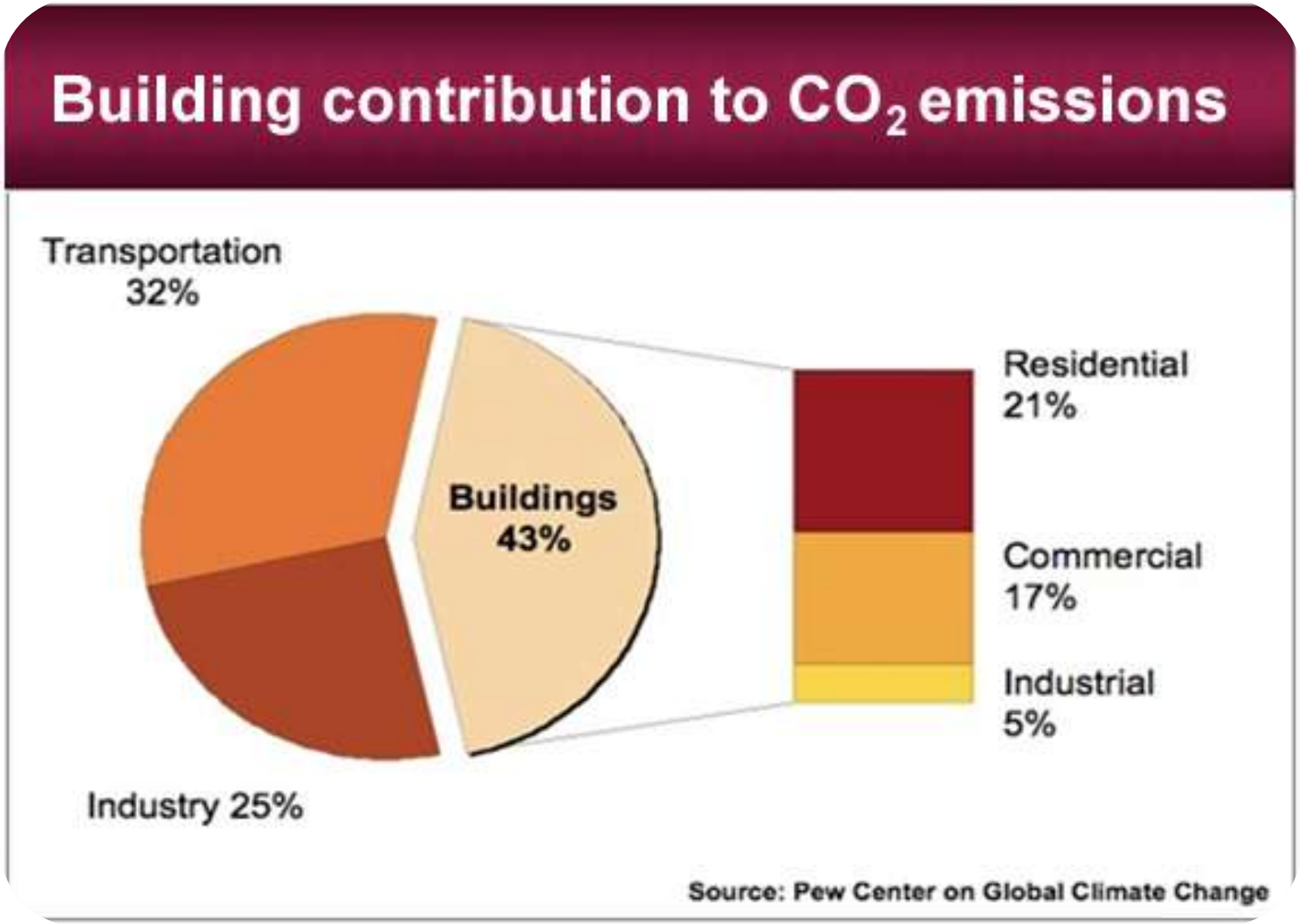
BUT TODAY THE SCENARIO IS DIFFERENT……


RAVEL HOUSE
IATA
LIDAY PACKAGES VISA & PASSPORT ASSISTANCE
MR H
R & TRAVELS
TOURIST
STAR
MUSHTAQ PAN

Need for Energy Performance



Need for Energy Performance



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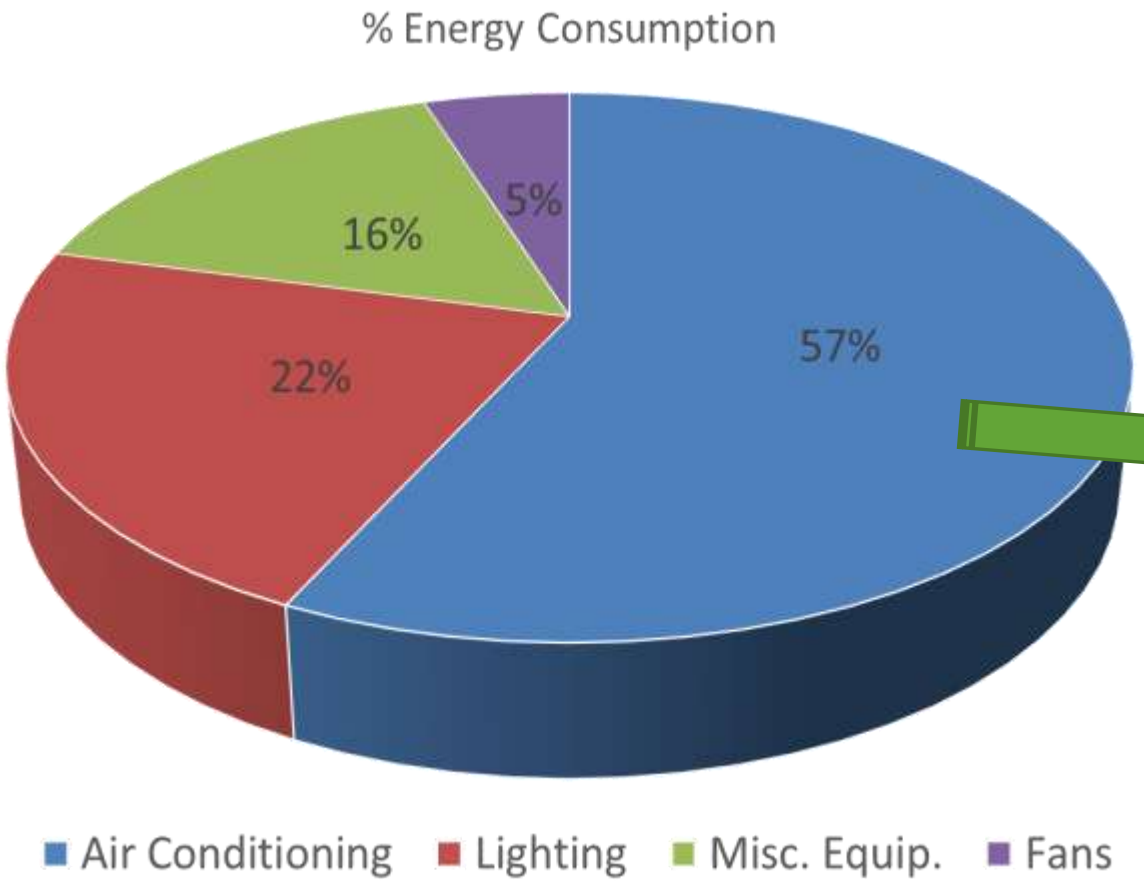
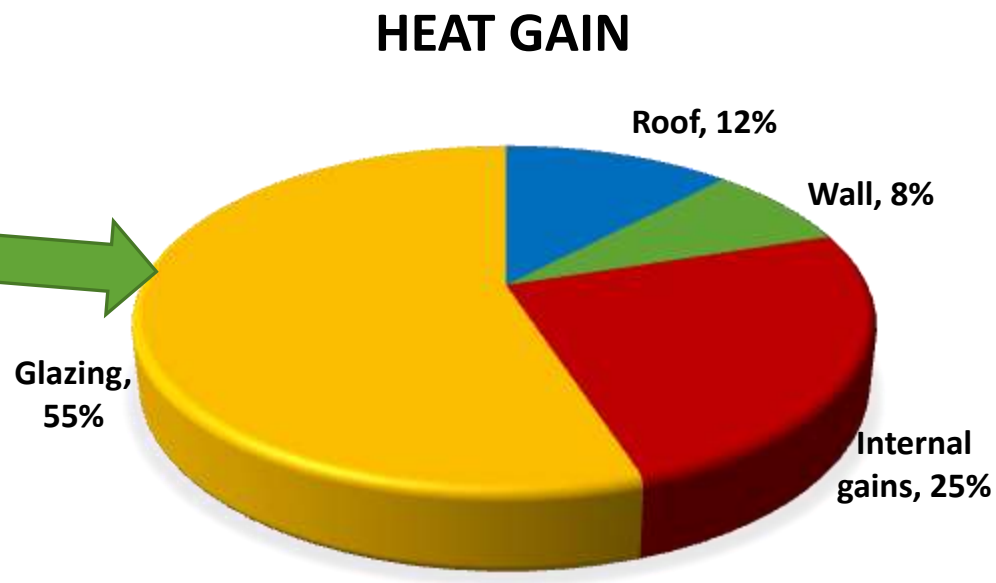
Energy Consumption of the Building





Opaque Construction – Wall & Roof

Most Common Assemblies

- RCC Walls
  - U-value: 1.95 W/m2 deg K
  - Heat Storage higher
    - Due to high mass
- Concrete Roof
  - U-value: 2.5 – 3.0 W/m2 deg K

Efficient roof in a flat building

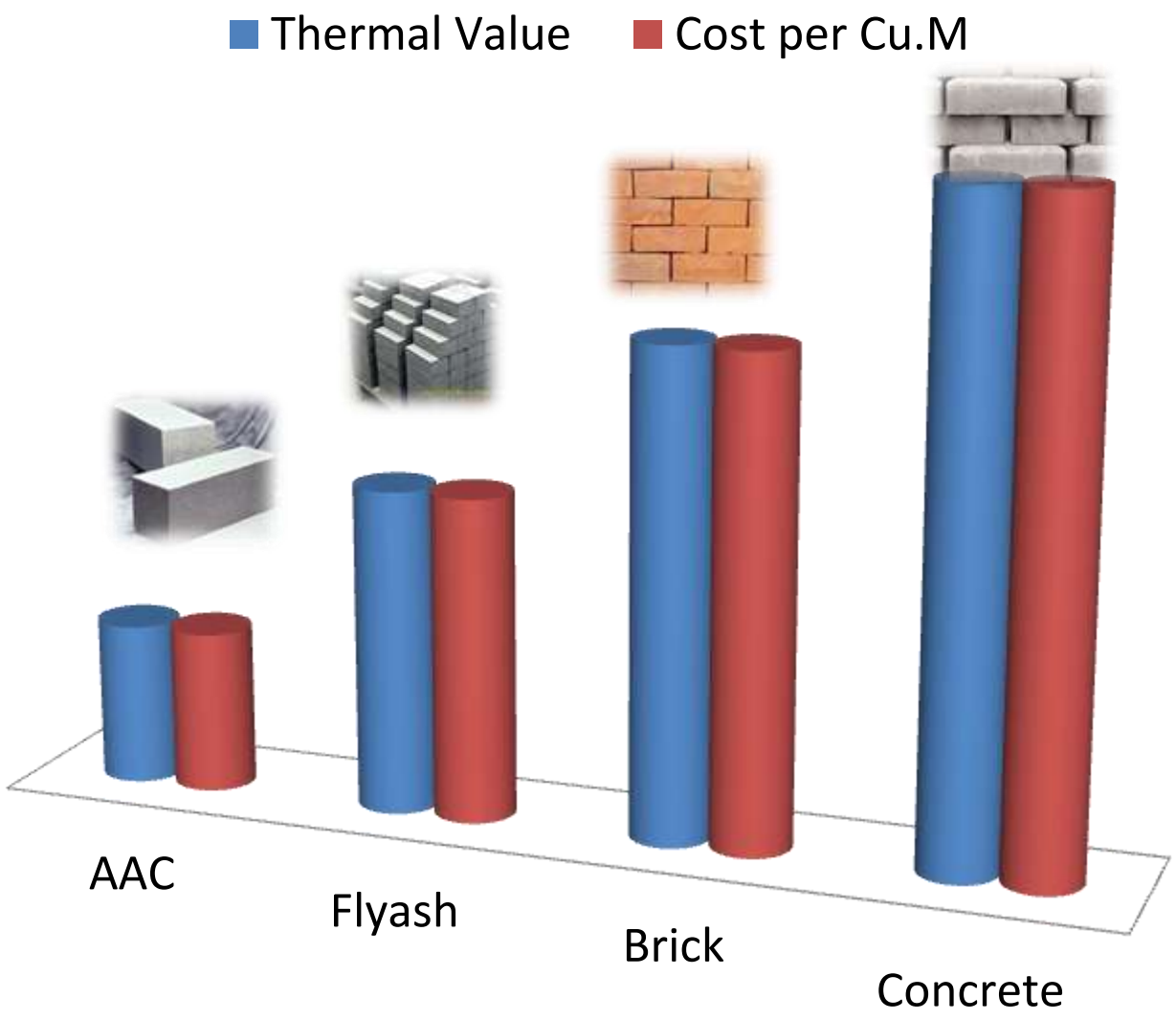
Efficient wall in multi-storied building

Opaque Construction – Wall

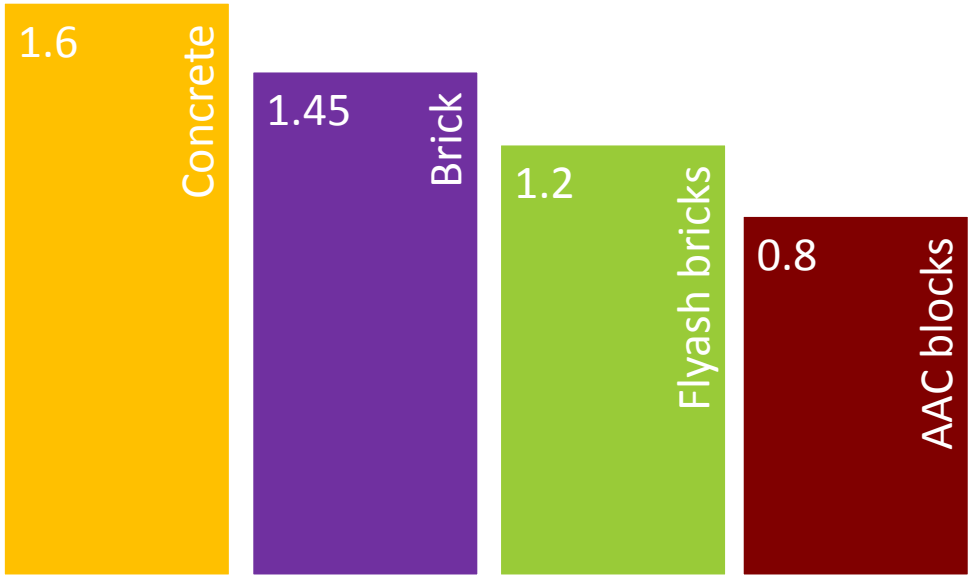
WALL OPTIONS

- Brick wall with insulation
  - Extruded polystyrene, Expanded polystyrene (thermocol), Glass wool, etc.
- Double wall with air cavity/Insulation
- Concrete blocks
- Flyash bricks
- Autoclaved Aerated Concrete Blocks (AAC)
- Flyash/AAC Blocks with insulation

Thermal & Cost performance- Wall



Thermal values of Materials



Opaque Construction – Wall

Brick

- It is made by mixture of clay(alumina), Sand, Lime, iron oxide and Magnesia
- Red bricks are strong, hard, durable, therefore they are used as a structural material
- A raw material is easily and cheaply available.
- Red bricks are heavy in weight so that the structure needs to withstand greater weight, and hence construction cost increases.
- Less carpet area available compared to block work.
- The speed of construction of the brick wall is slower than the block construction

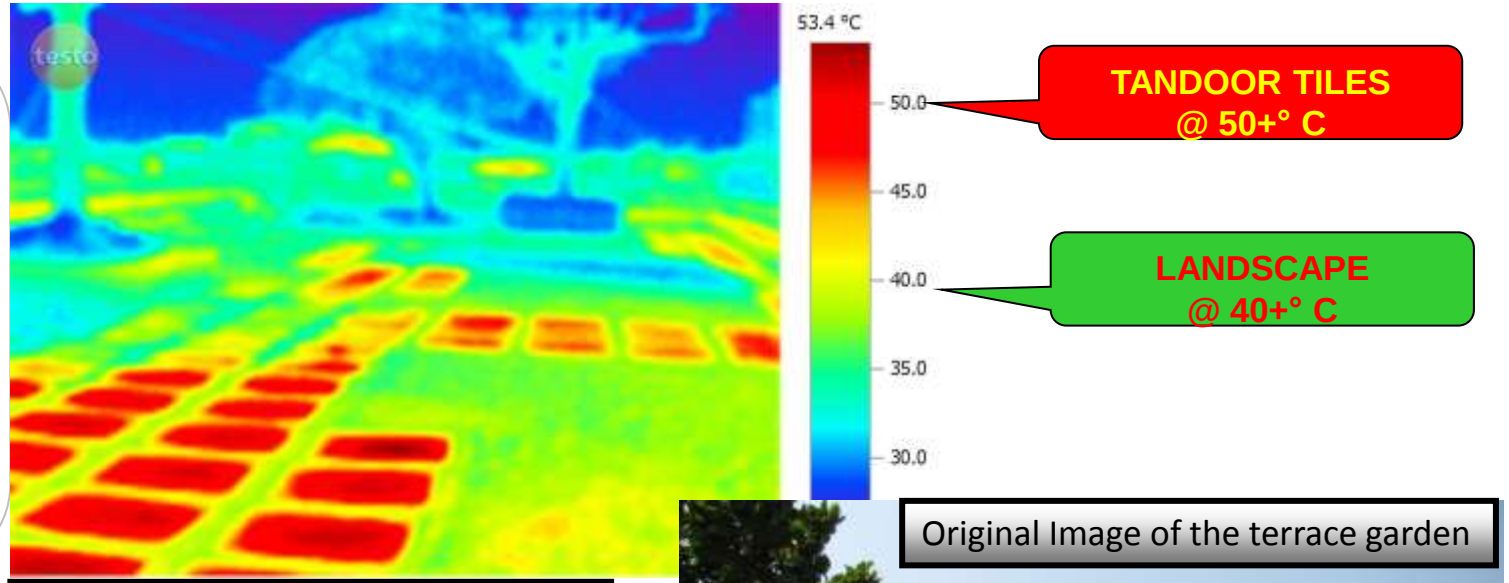
AAC

- It is made from the mixture of fly ash, cement, lime, gypsum and an aeration agent
- AAC Block can be used to build internal and external walls
- Availability in adequate quantities is an issue.
- AAC blocks reduces the load on foundation due to its light self-weight and saves consumption of steel.
- More carpet area available due to less thickness of the block
- Speedy construction of wall due to the bigger block size, light in weight and less number of joint.

Opaque Construction – Roof

ROOF OPTIONS

- Slab with Insulation (Overdeck/Underdeck)
  - Extruded polystyrene, Expanded polystyrene (thermocol), Glass wool, etc.
- Slab with brickbat coba
- Terrace Garden
- High Reflective Paint



Thermal Image of the terrace garden

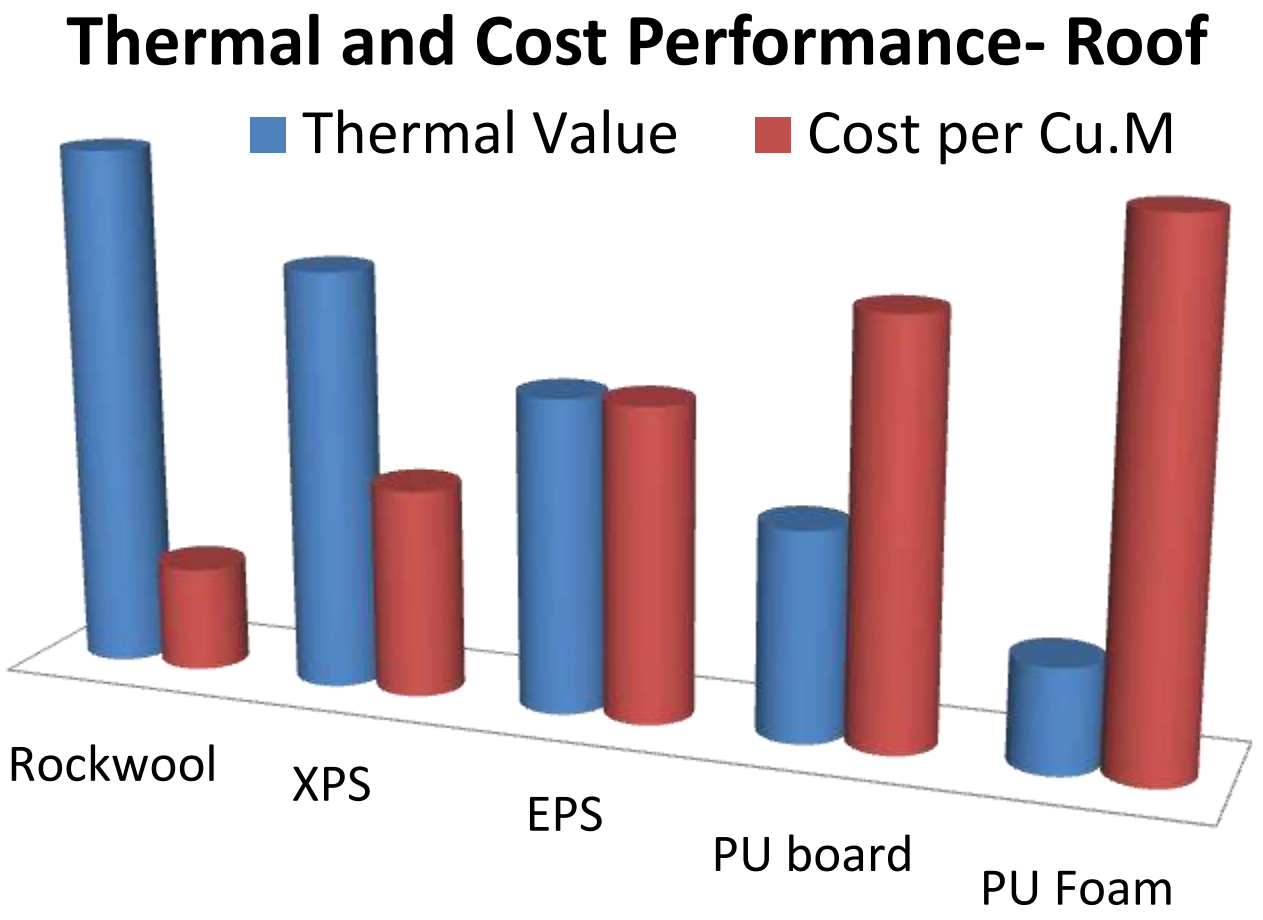
Original Image of the terrace garden

Thermal Image of Terrace Garden.

Vegetated Landscape helps in reducing the Heat Island effect.

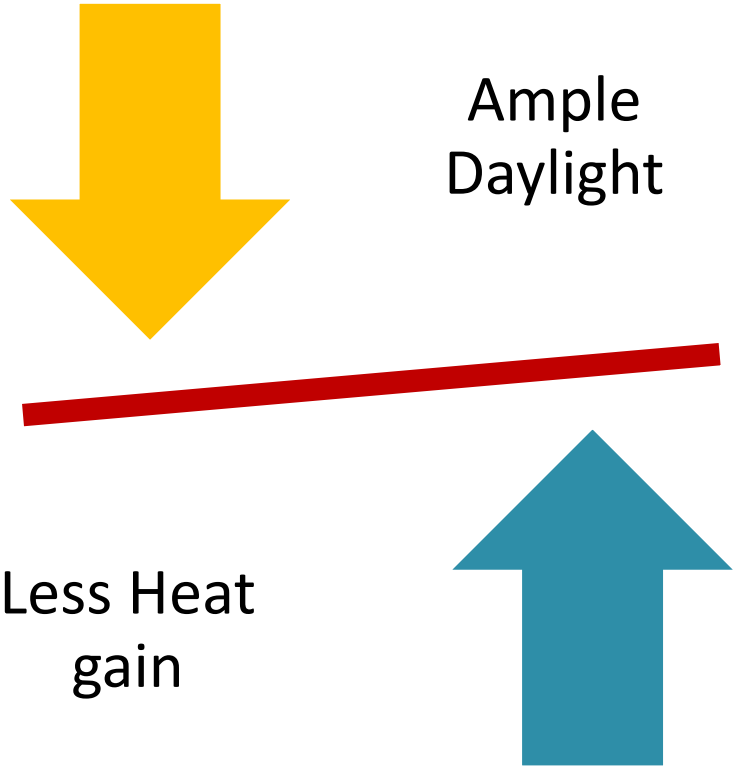
Insulation materials

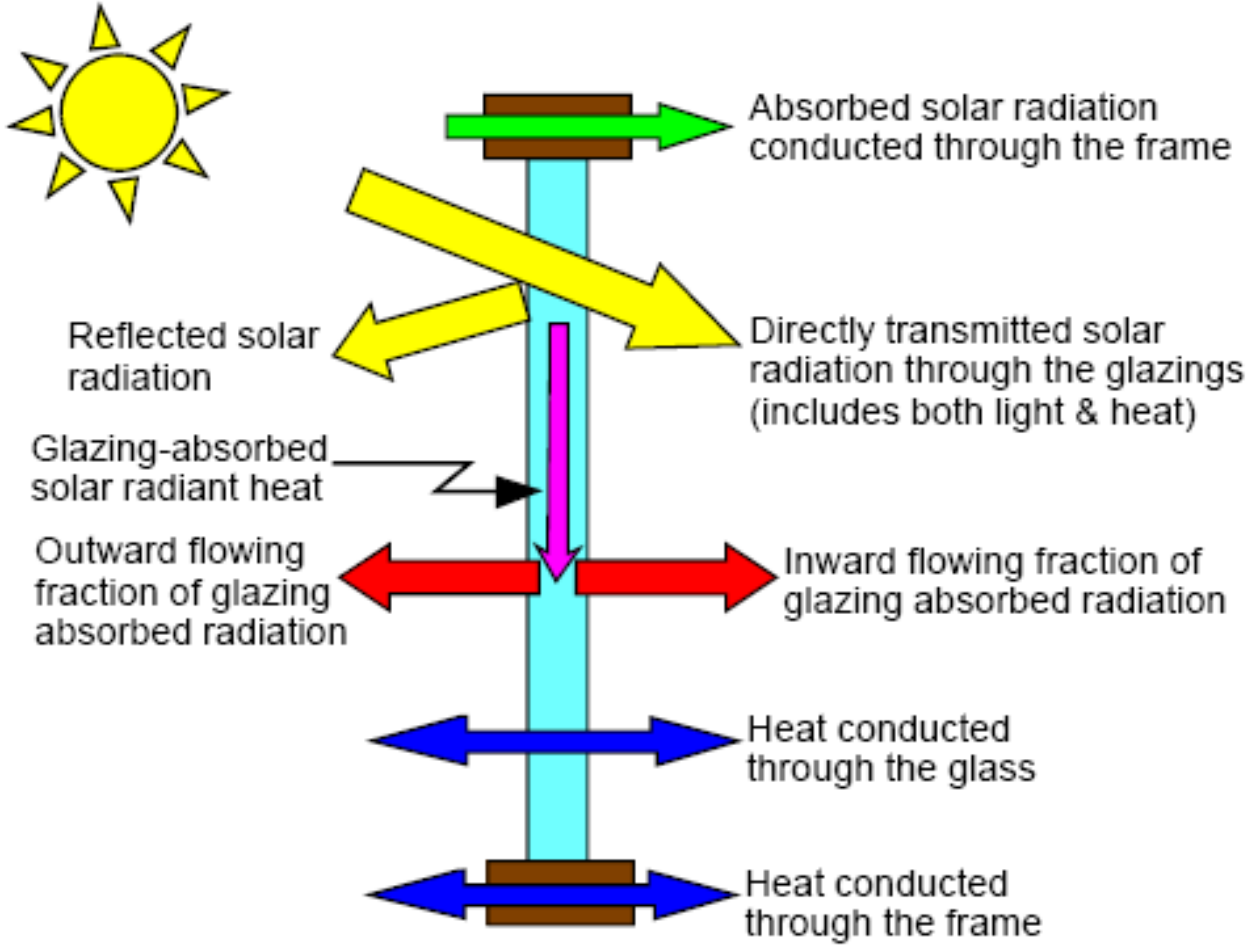
- Glass wool stuffed
  - U value : 0.53 W/m^2°K
- Thermocol
  - U-Value : 0.47 W/m^2°K
- Expanded Polysterene
  - U-Value : 0.34 W/m^2°K



Fenestration – Glass

Selection of glass is crucial factor in building design





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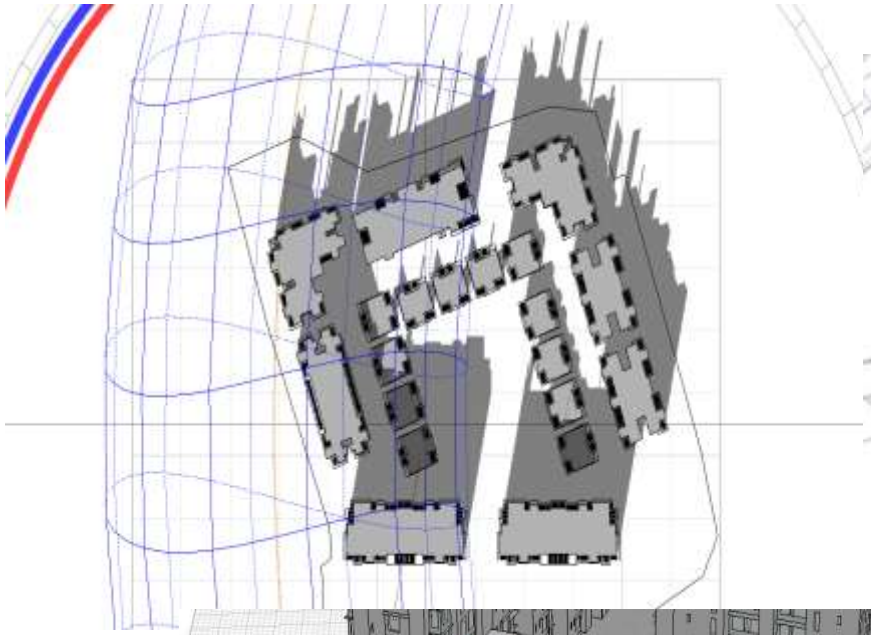
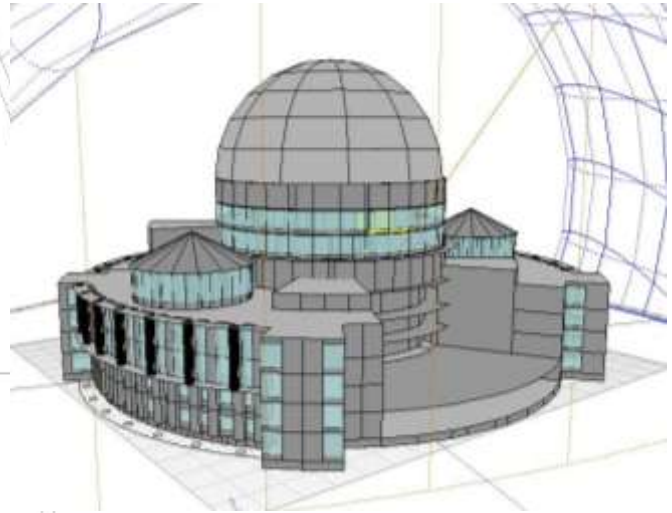
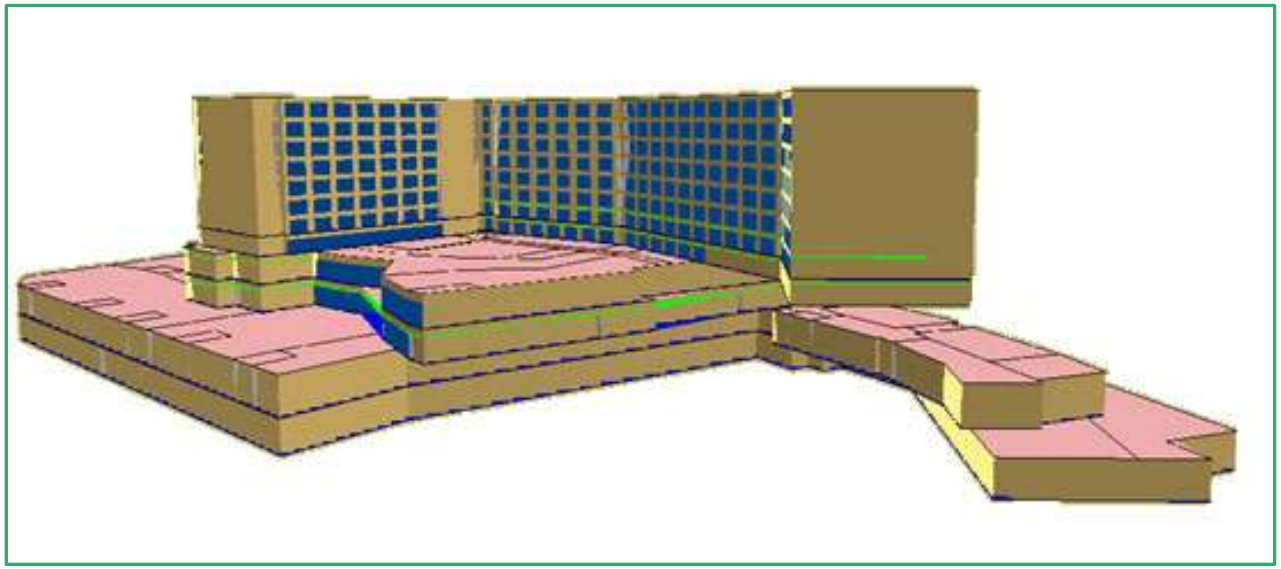
Scientific Analysis – Study of Glass







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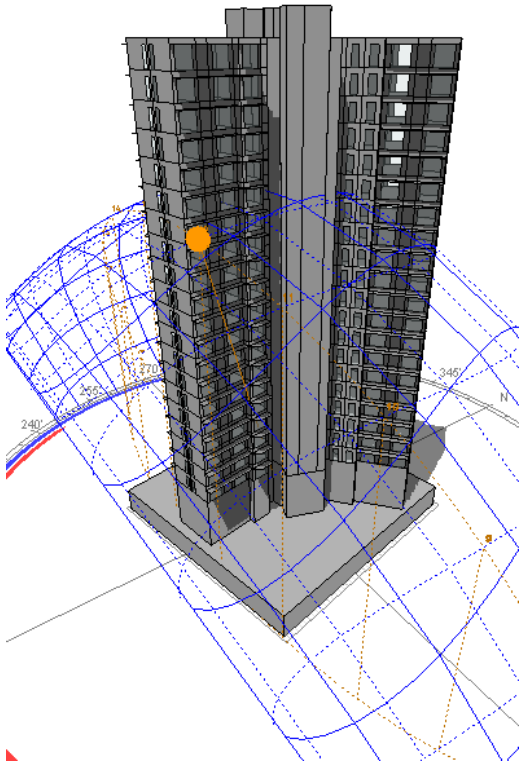
Glass in Residential

- Glass shade in NEUTRAL shade
- Single Glazing Unit
- **Cheapest Possible Glass**

Case Study- Residential

With respect to Daylight and Energy



G+19 floors

Bedrooms & Living rooms treated as conditioned

WWR: 23%

Almost 34% Window Wall Ratio on the West Facade

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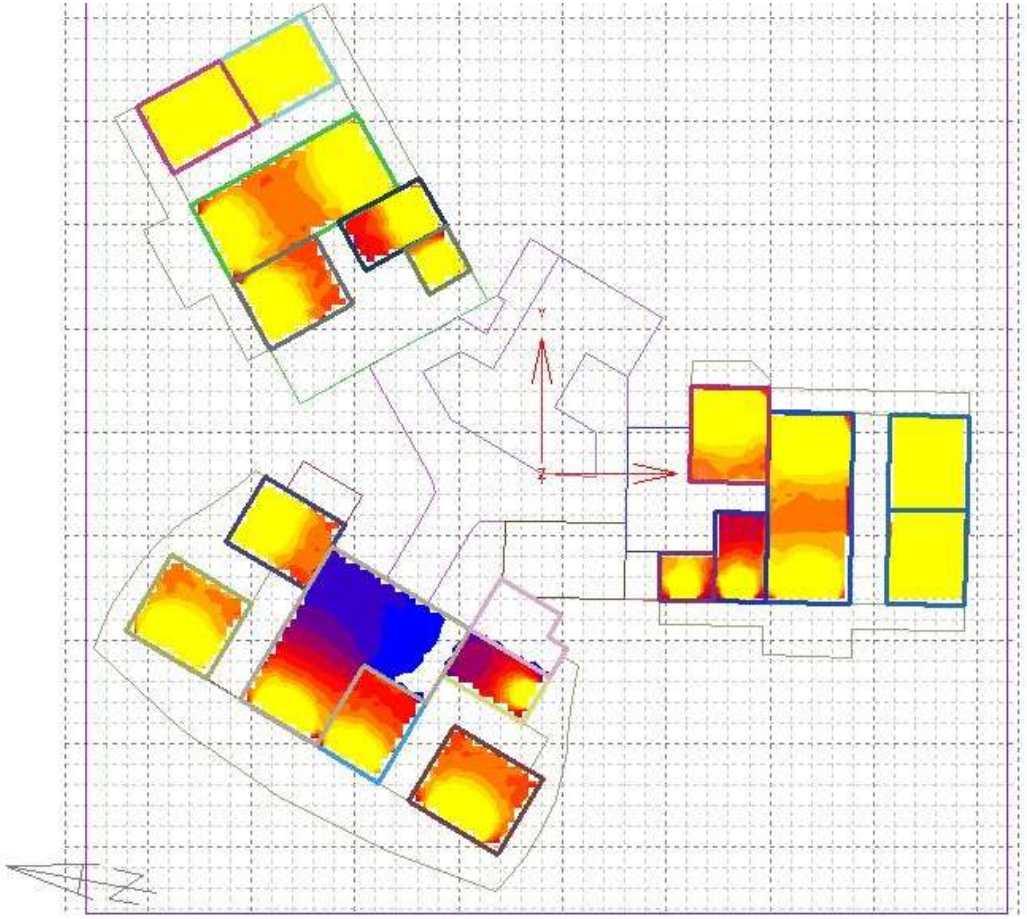
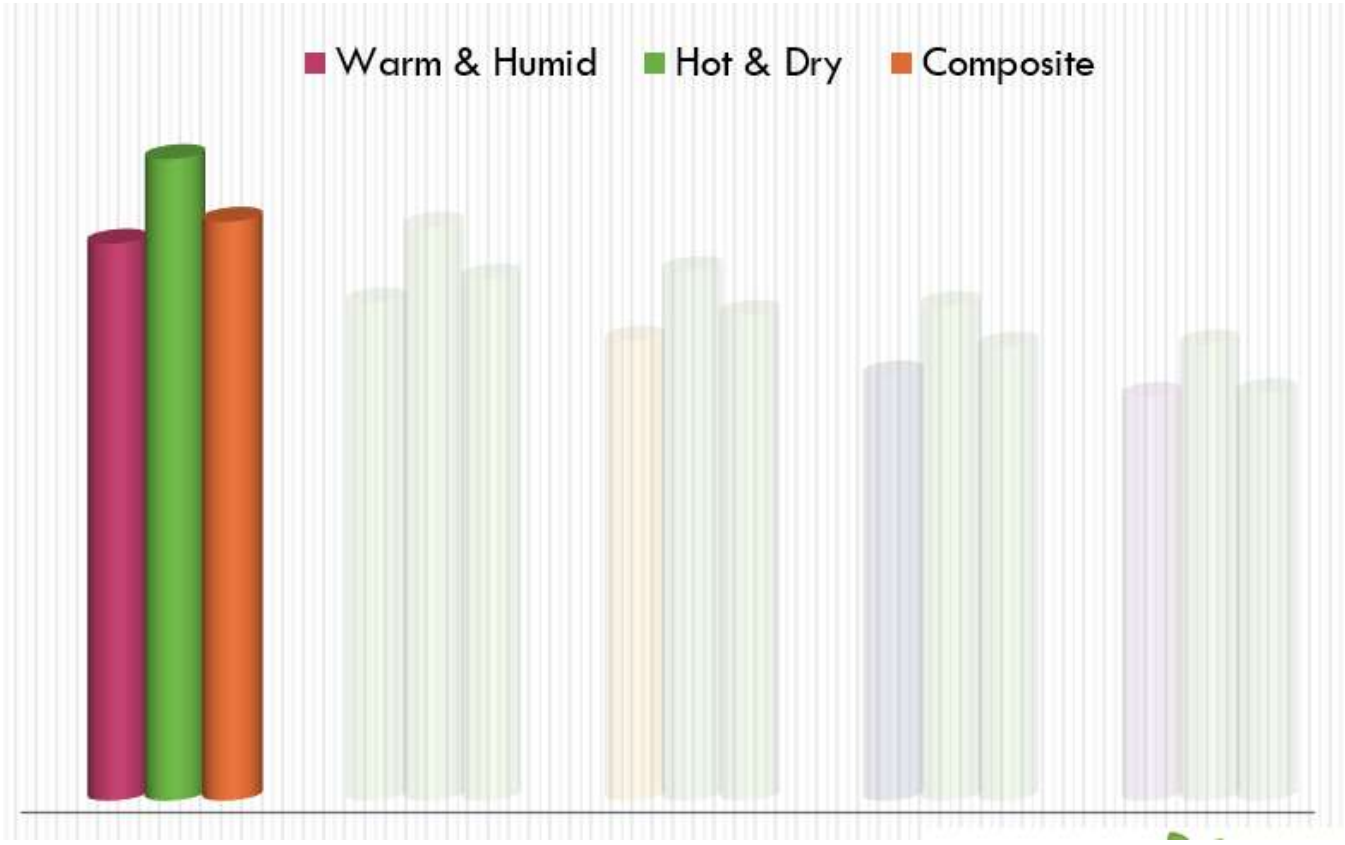
Glass in Residential

SGU- 5 mm- SHGC **0.83** and VLT **89%**



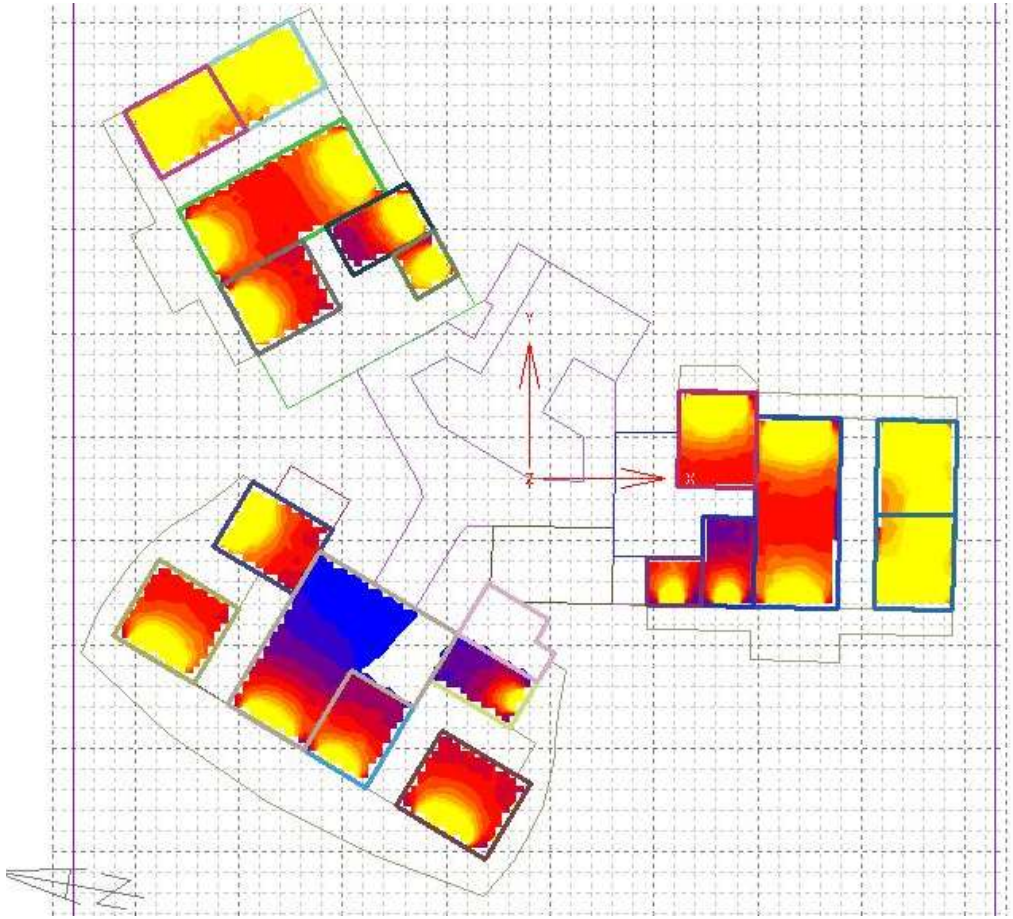


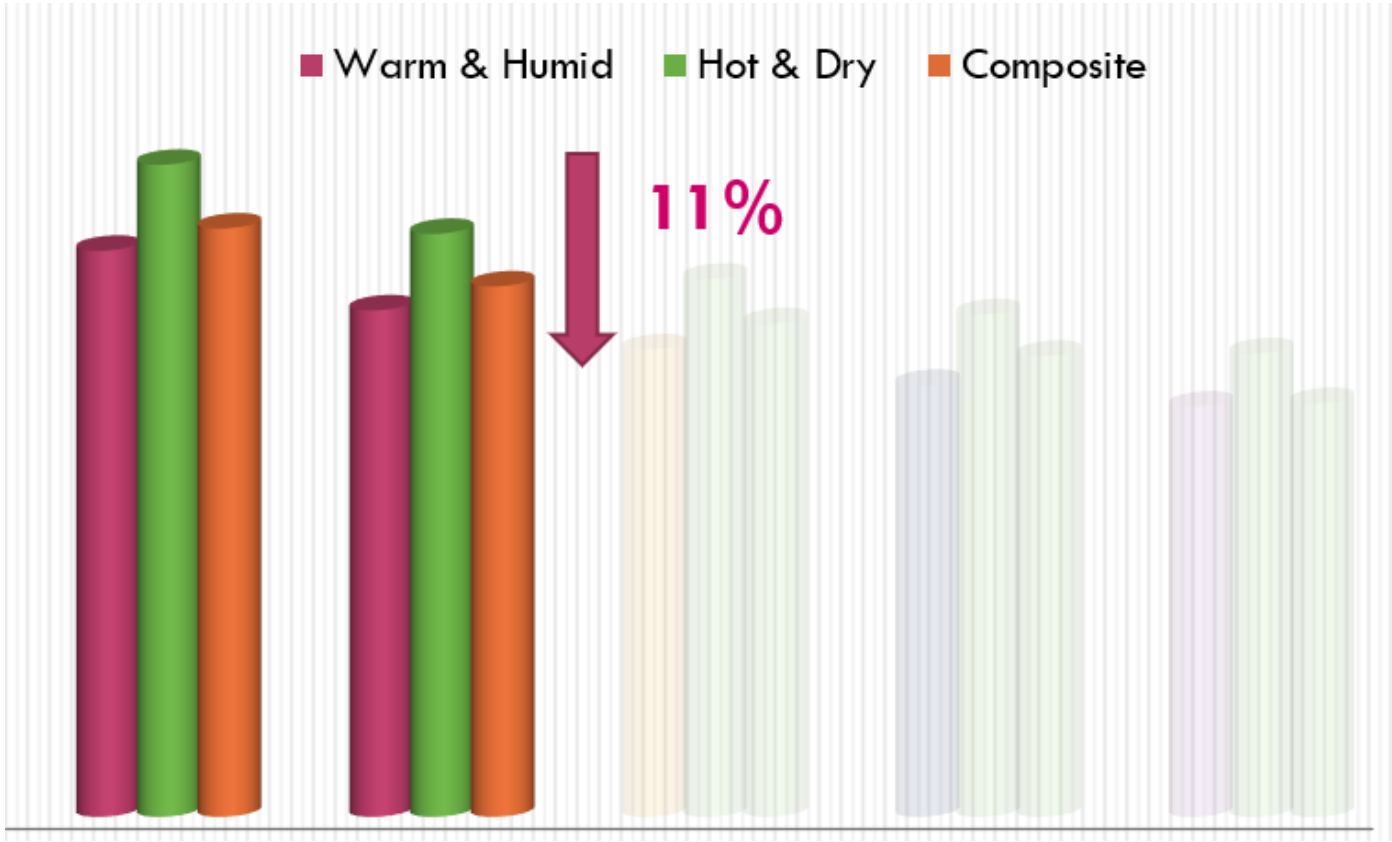
Average lux level achieved 1398.84 lux

Enviro

Glass in Residential

SGU- 6 mm- SHGC **0.67** and VLT **67%**



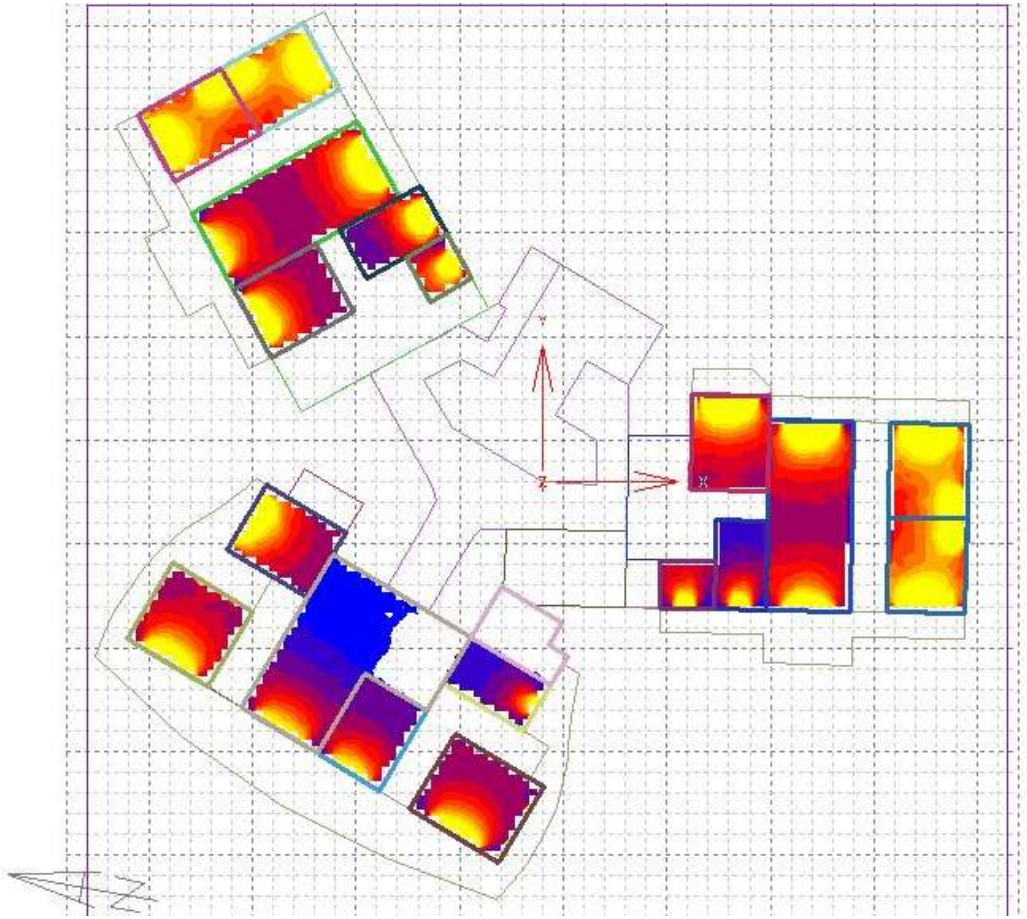


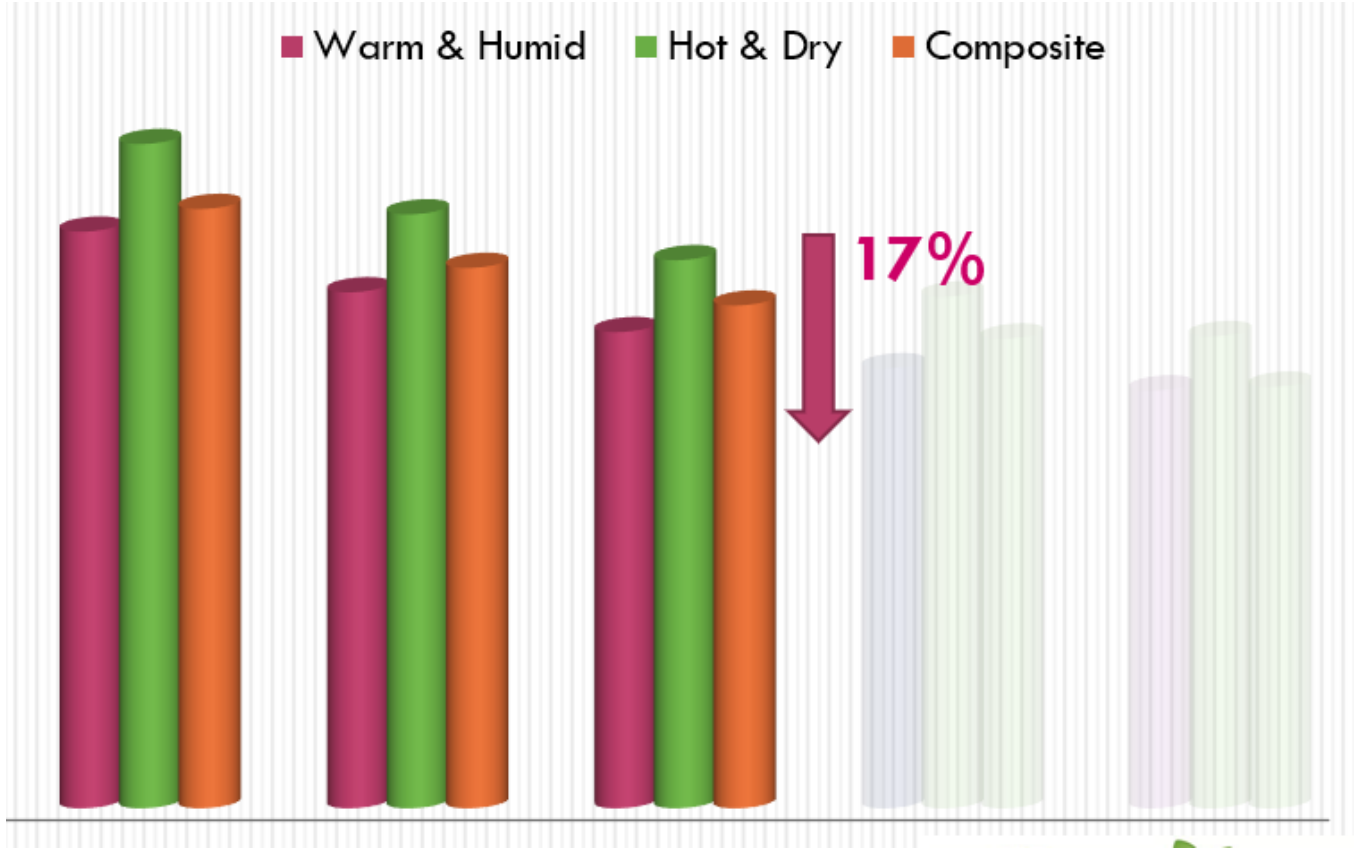
Average lux level achieved 1021.05 lux

Enviro

Glass in Residential

SGU- 6 mm- SHGC **0.56** and VLT **51%**



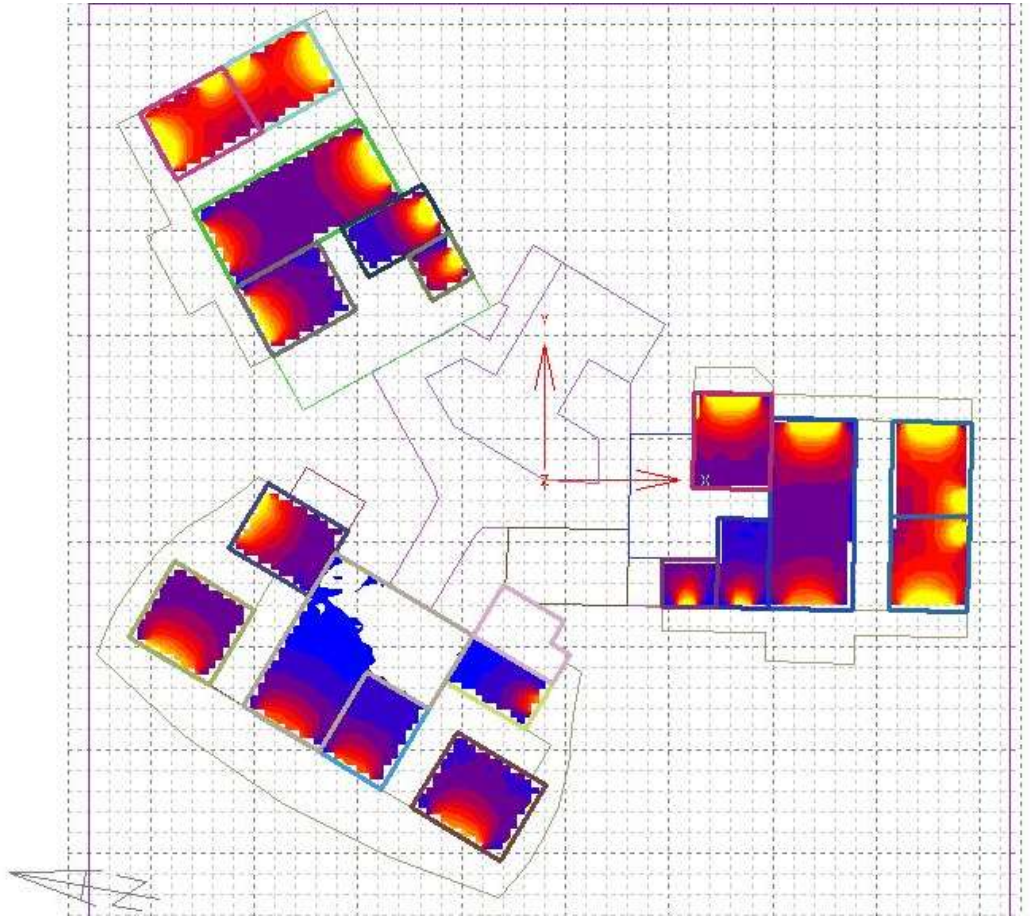


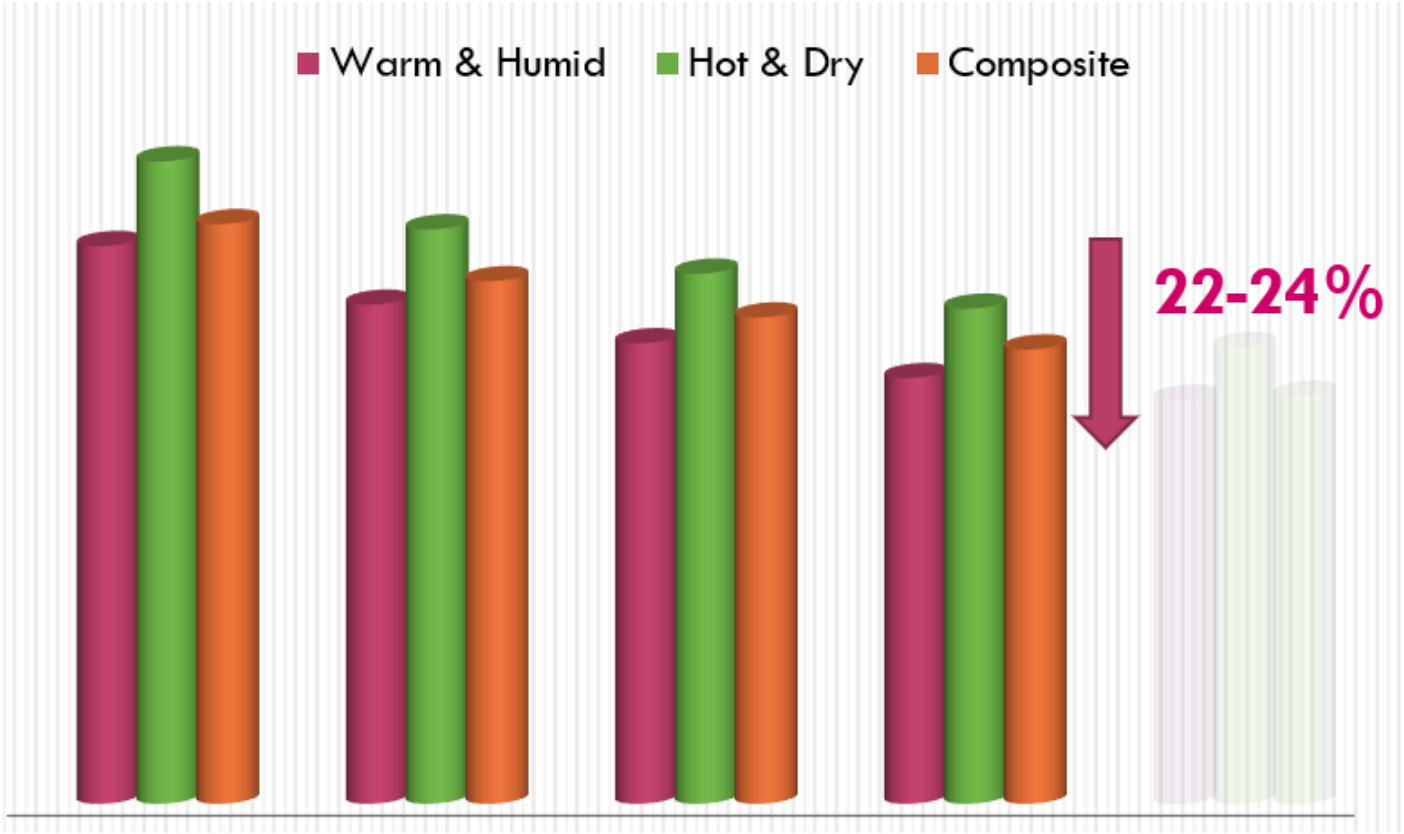
Average lux level achieved 781.53 lux

Enviro

Glass in Residential

SGU- 6 mm- SHGC **0.44** and VLT **37%**





Average lux level achieved 537.52 lux

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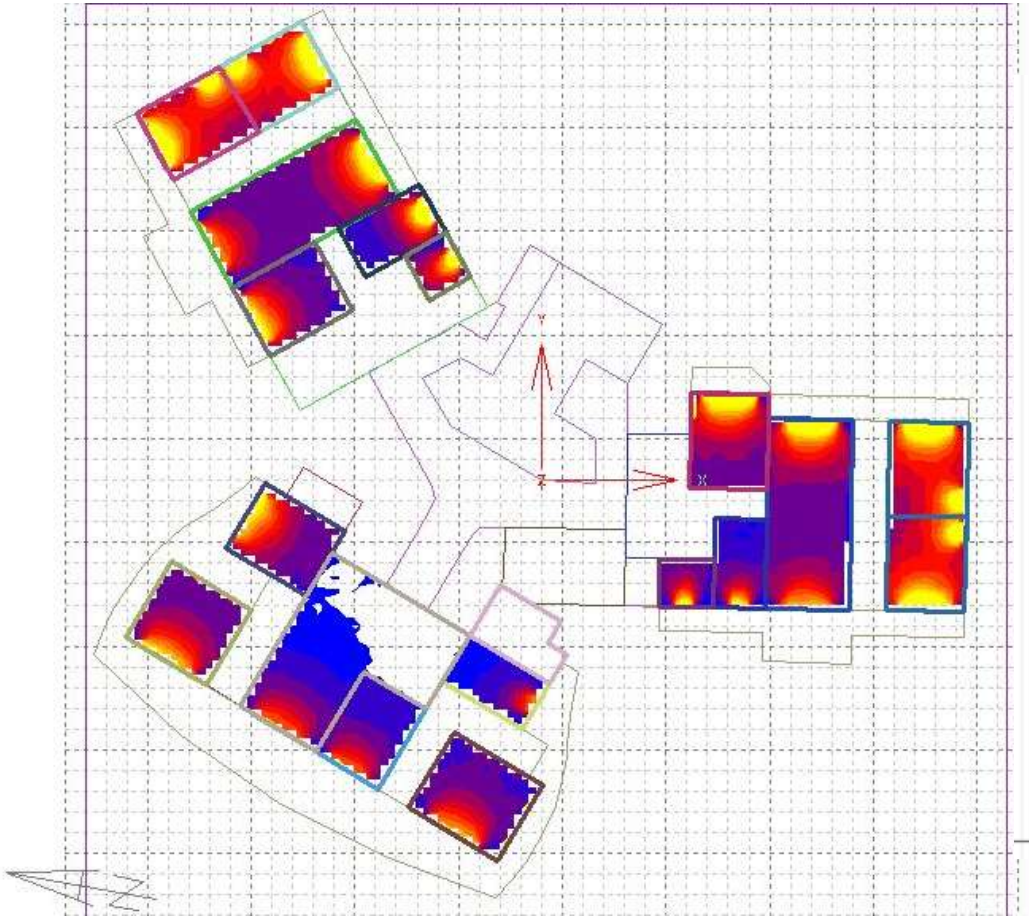
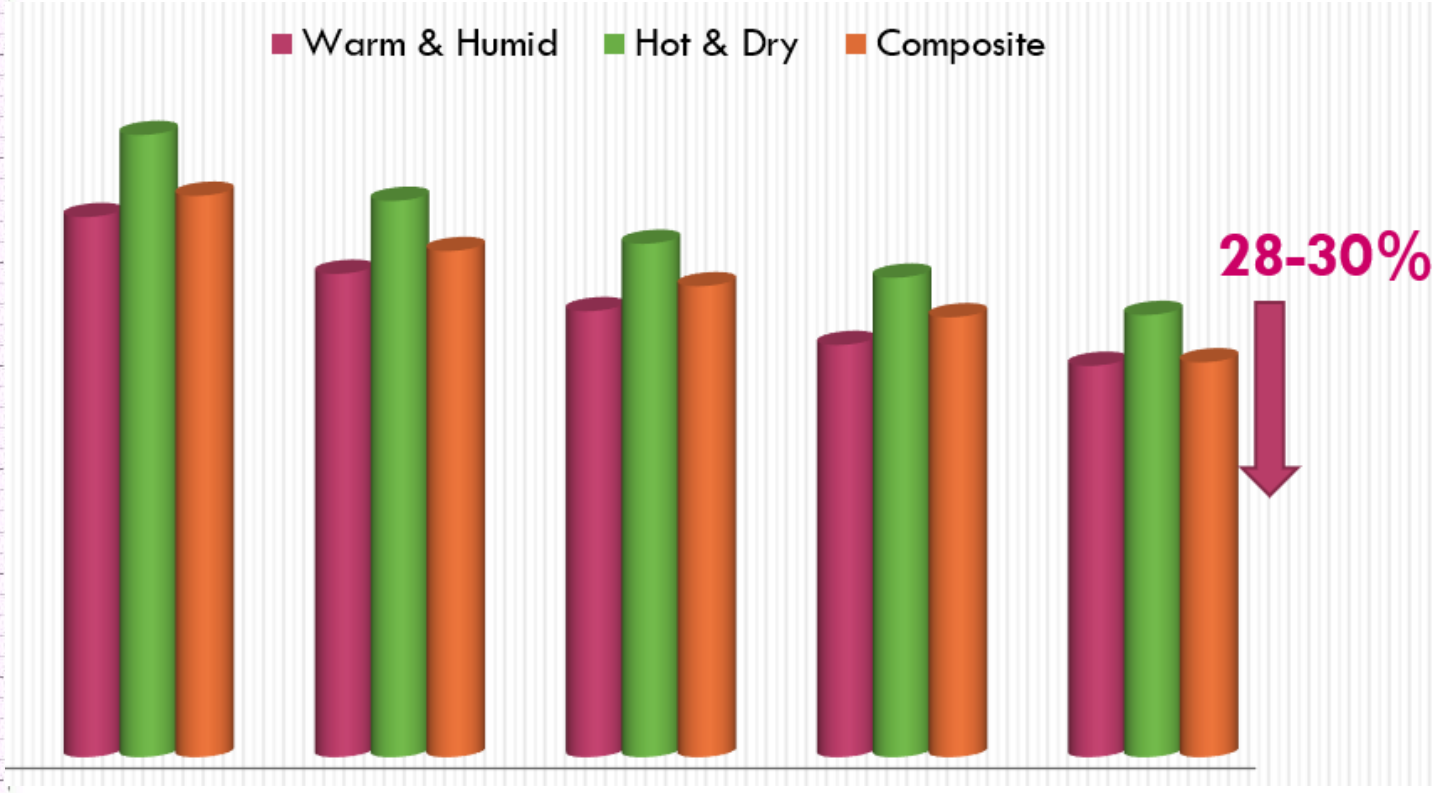
Glass in Residential

DGU- 6-12-6 mm- SHGC **0.28** and VLT **37%**





Average lux level achieved 537.52 lux

Enviro

Glass in Commercial

- Glass of any shade as per consultants/ architects requirement
- High performance Double Glazing Unit

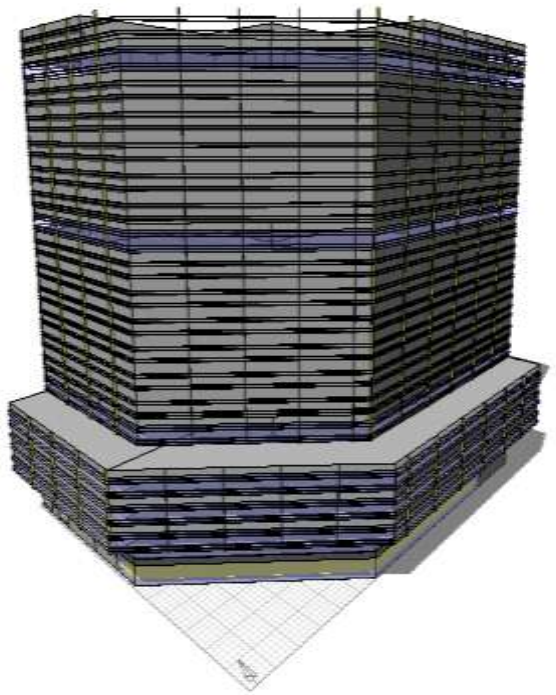
Case Study- Commercial

Window-to-wall ratio (WWR)

G+19 floors

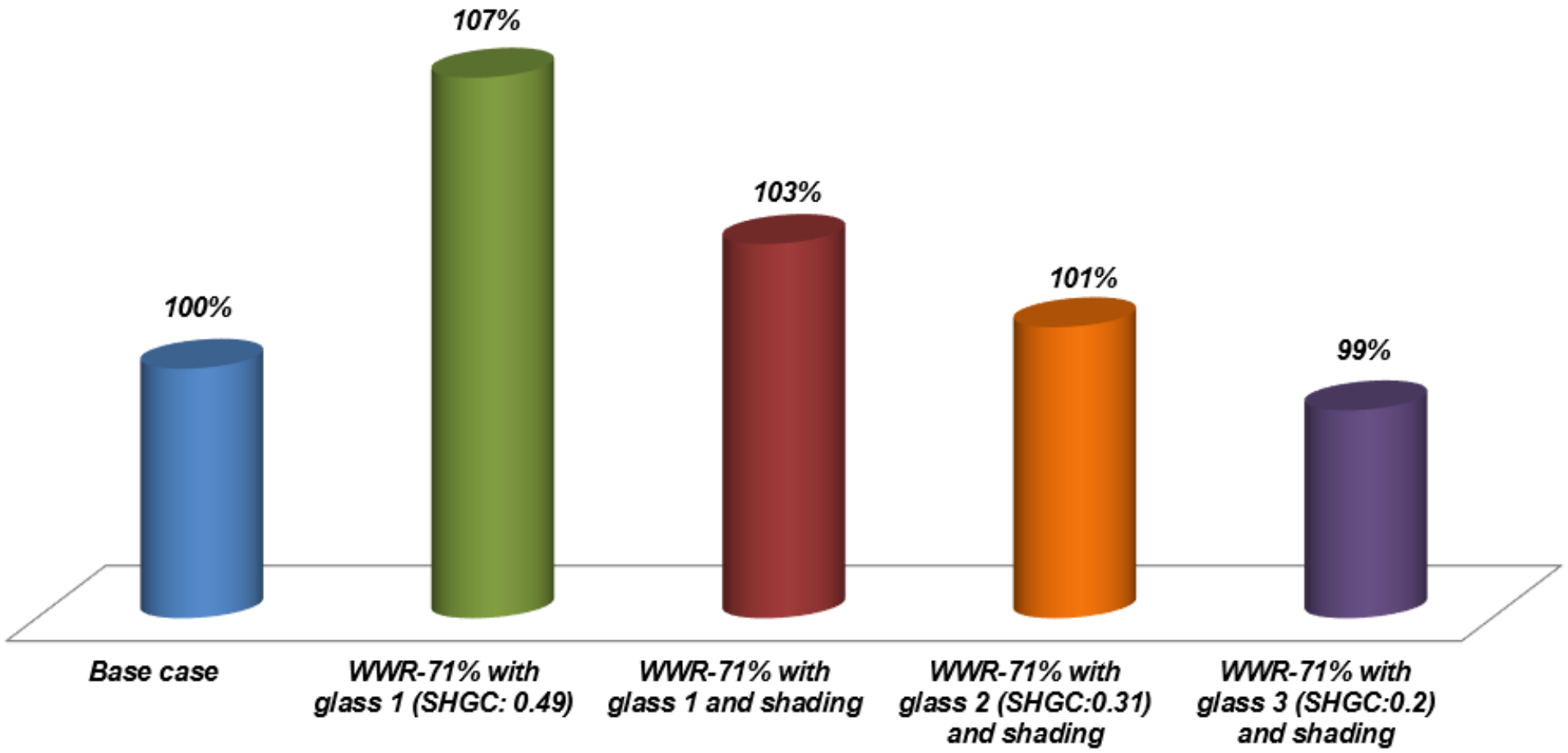
All the office area treated as conditioned
Conditioned Area – 75,000 sqm

Design to be compared with ECBC code
Base Line WWR – 40%



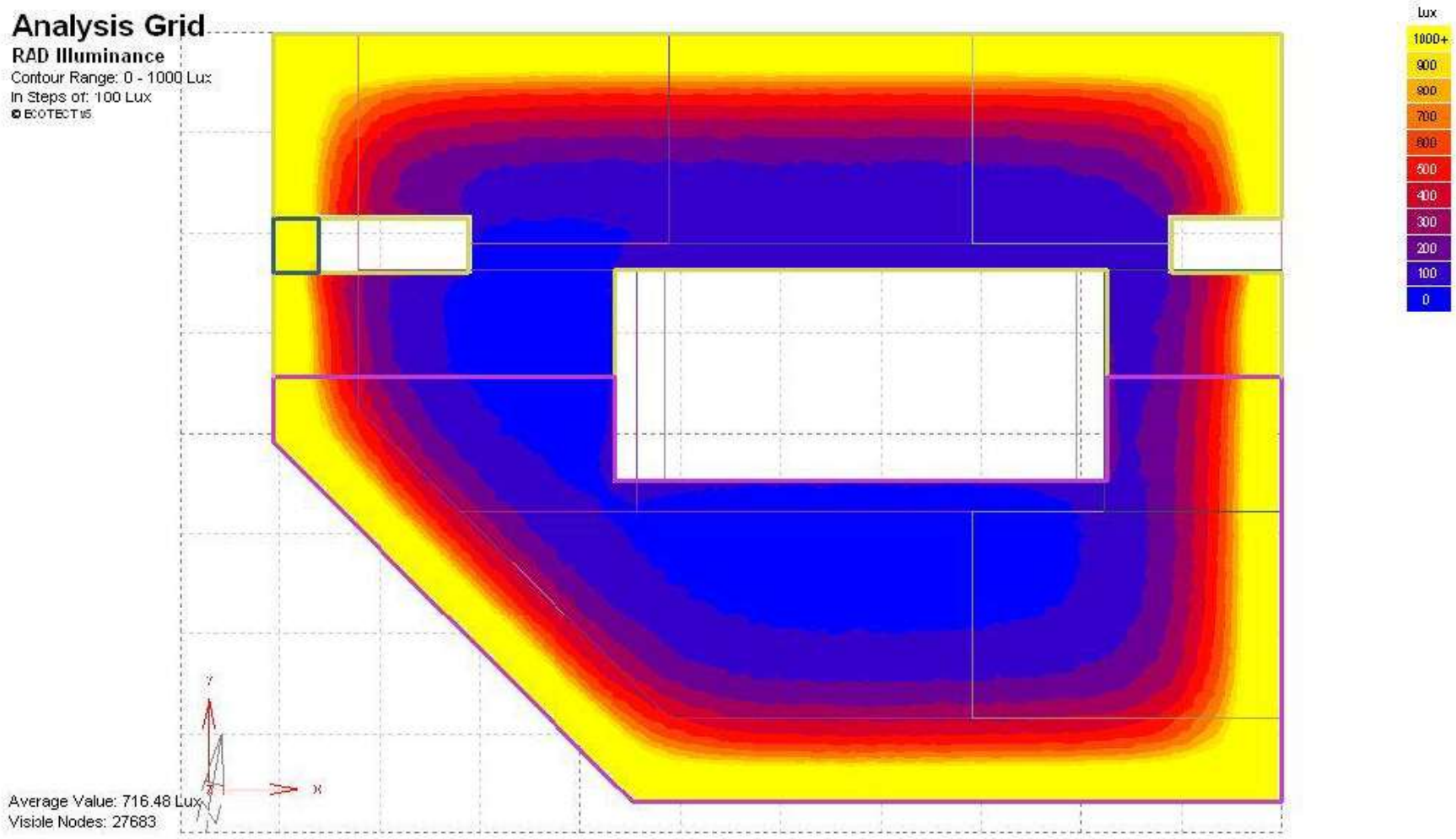
Glass in Commercial

Window to wall ratio of the project – 71%



Glass in Commercial

Window to wall ratio of the project – 71%



Average lux level achieved 715 lux, with glass of SHGC 0.31 and VLT 0.35

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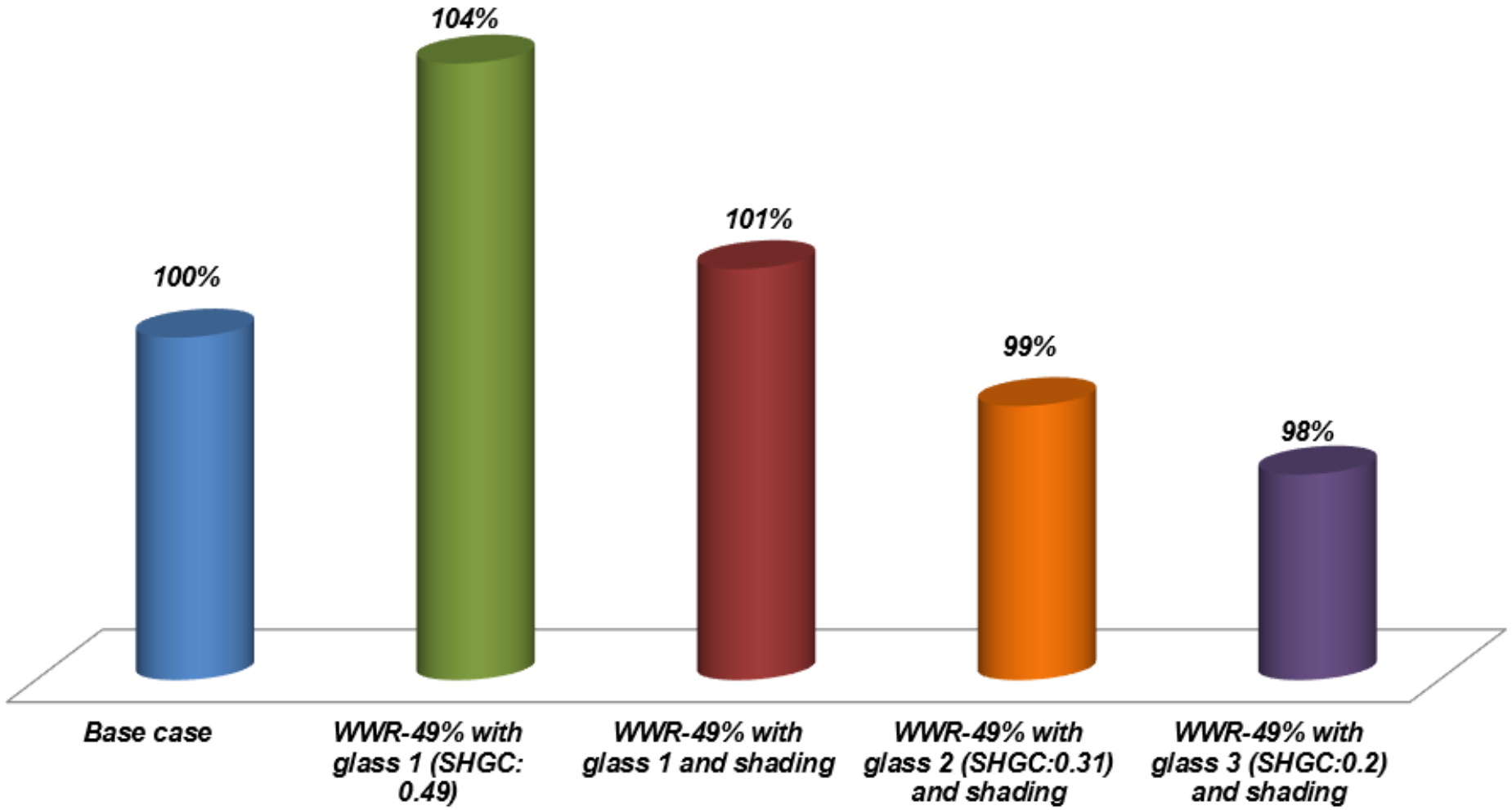
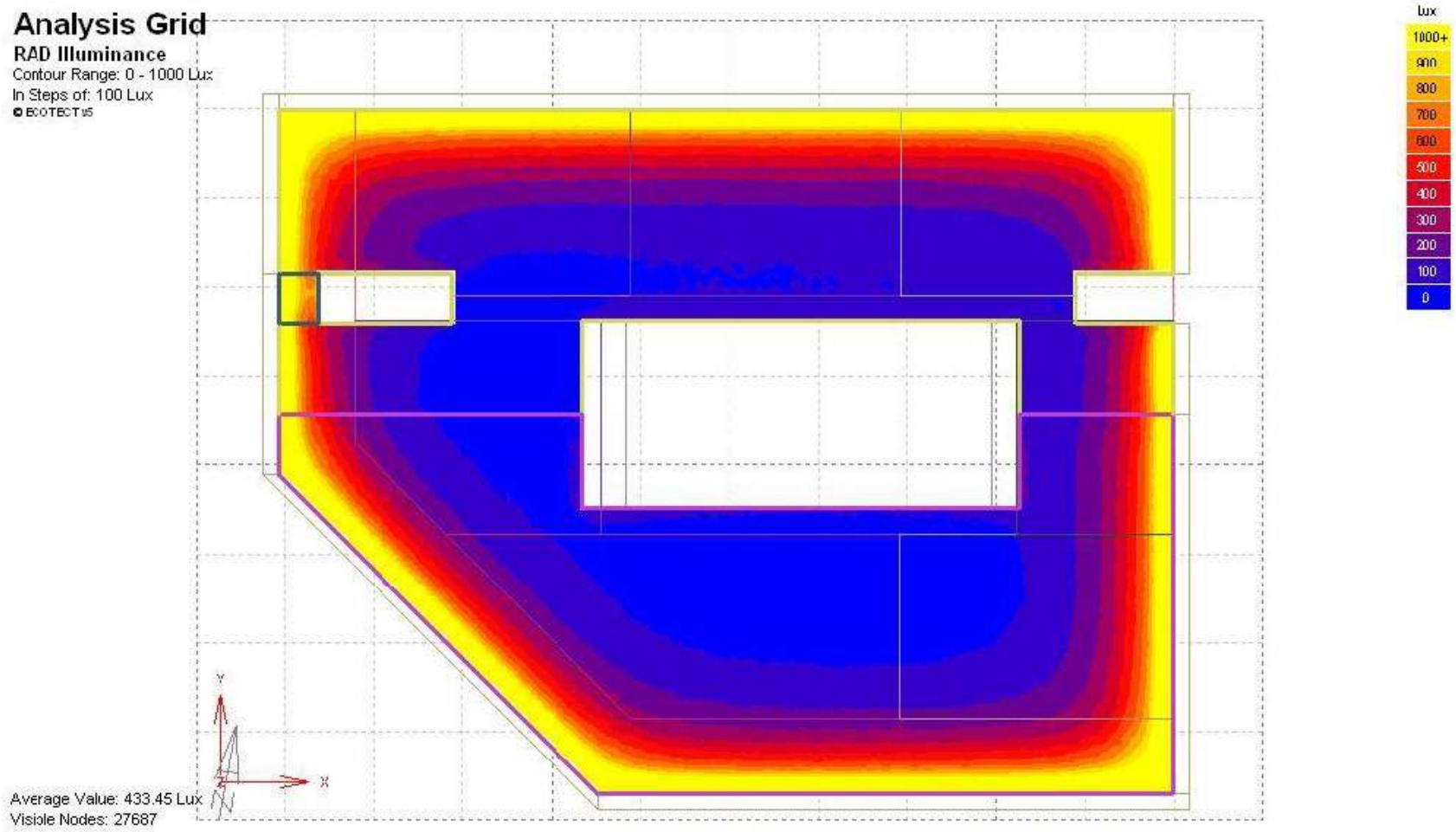
Glass in Commercial

Window to wall ratio of the project – 49%



Glass in Commercial

Window to wall ratio of the project – 49%

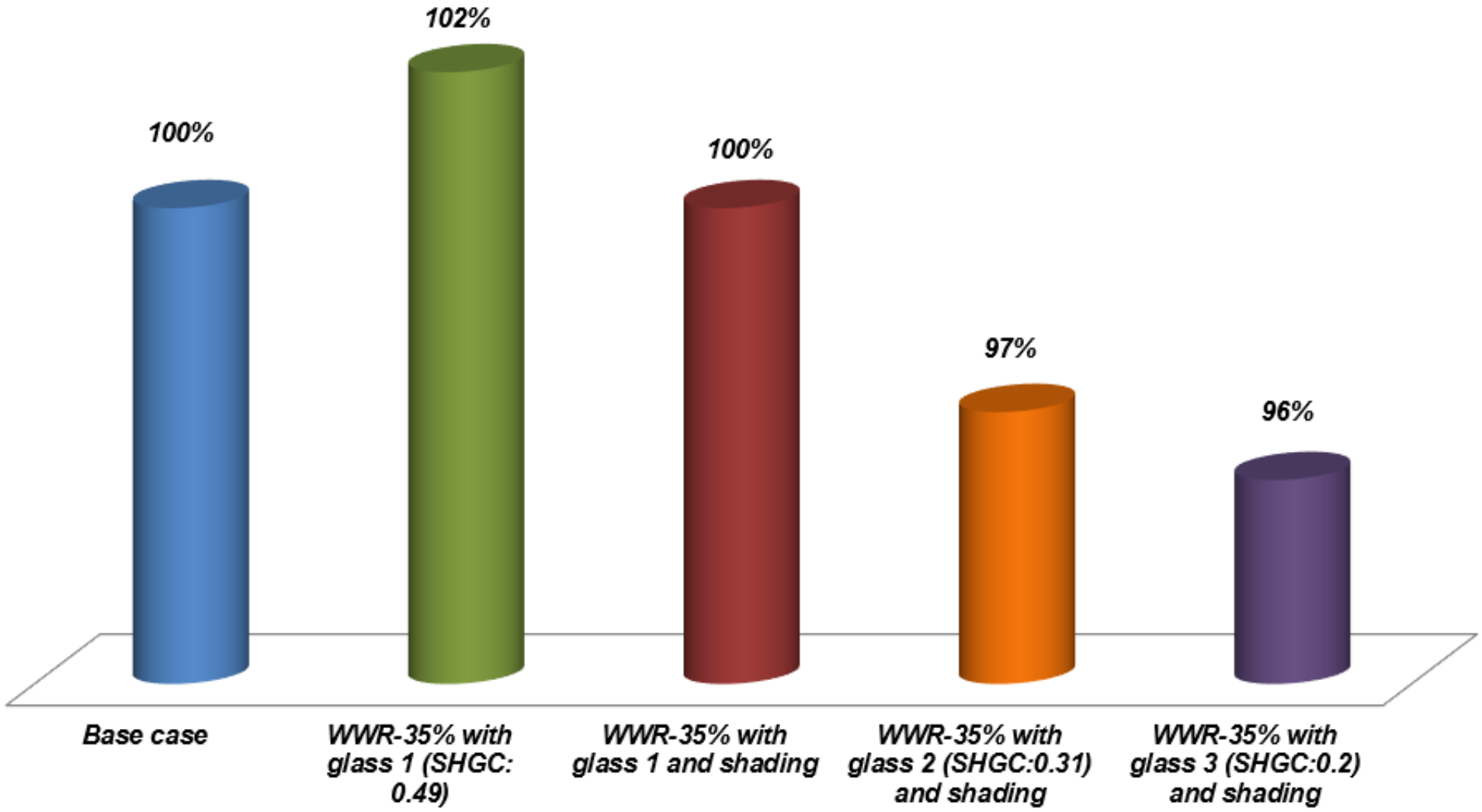


Average lux level achieved 433 lux, with glass of SHGC 0.31 and VLT 0.35

Enviro

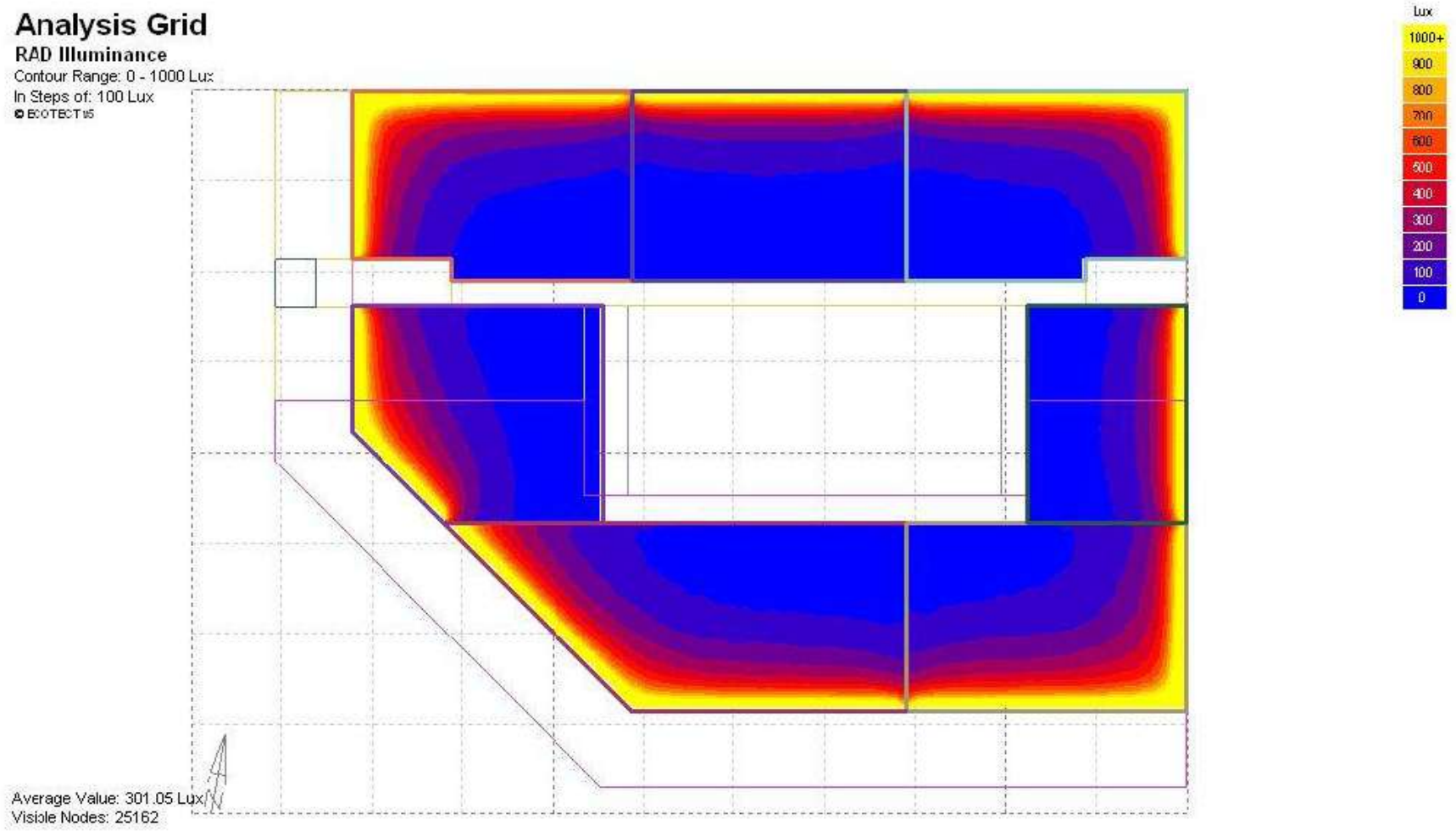
Glass in Commercial

Window to wall ratio of the project – 35%



Glass in Commercial

Window to wall ratio of the project – 35%



Average lux level achieved 301 lux, with glass of SHGC 0.31 and VLT 0.35

Enviro

Comparison of Envelope Materials

Sr. No.	Building Components	Conventional	"U" value	IGBC Homes	"U" value	% Reduction in Heat Gain
1.	External Wall	**Clay Bricks**	2.03 w/sq.m.*k	**AAC Blocks**	0.79 w/sq.m.*k	39%
2.	Roof	**No Insulation**	3.92 w/sq.m.*k	**2" XPS/PUF/PIR**	0.33 w/sq.m.*k	8.5%
3.	Glazing	**Single Glazing** **SHGC: 0.67**	5.7 w/sq.m.*k	**Double Glazing** **SHGC: 0.3**	1.7 w/sq.m.*k	31.5%

Take Away

- Different climate zones have different impact on the same material and construction assembly
- Scientific analysis help to chose the correct materials with actually laying a brick!!
- The impact of architecture design, passive cooling techniques help to trade-off few of “not so Green materials”
- Don’t copy blindly. Each project is different and unique.

Thank You..!!

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