

ROBOTICS IN ARCHITECTURE

Light Control and Different Colors

"Architectural Robotics" is a course oriented by Professor Brett Balogh at Illinois Institute of Technology during the summer 2016. The objective is that each student researches and develops a robotic system over the period of two months, as a prosthesis that augments the built environment and adds some characteristics and behaviors to static structures.

Light Control and Color is the main theme for this project. With this topic, the intention is to work with relations between interior and exterior light, economy of energy and light color therapy, with a device that is supposed to make a modification into a building, changing its behavior and giving it personality as a result of people's action.

The project will present resources and inspirations, as well initial ideas to the system development, with images, diagrams and schemes that explain the main concept.



As a reference to the project, there is a responsive building called "Prairie House", it is located in Illinois and designed by ORAMBRA. Prairie House uses four systems in order to emit less carbon.

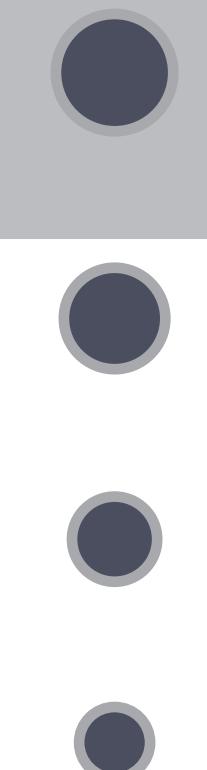
- Color: skins change color via thermo-chromatic inks. The interior membrane becomes lighter on warmer days, while on colder days it becomes darker, resulting in more or less absorption of heat. Annual Savings = 0.45%
- Openings: screens open or close according to the exterior. The exterior screen opens to let warming sunlight hit the dark interior on cold days, while closing to shade the interior during hot days. Annual Savings = 2.48%
- Insulation: thickness of insulation is reduced to shed heat in the summer while insulation is increased in thickness during colder periods. Annual Savings = 8.01%
- Shape and Volume: during hot days the building structure would expand to reduce the impact of internal heat loads and shrink to reduce heating requirements on cold days. Annual Savings = 23.72%



1 Color



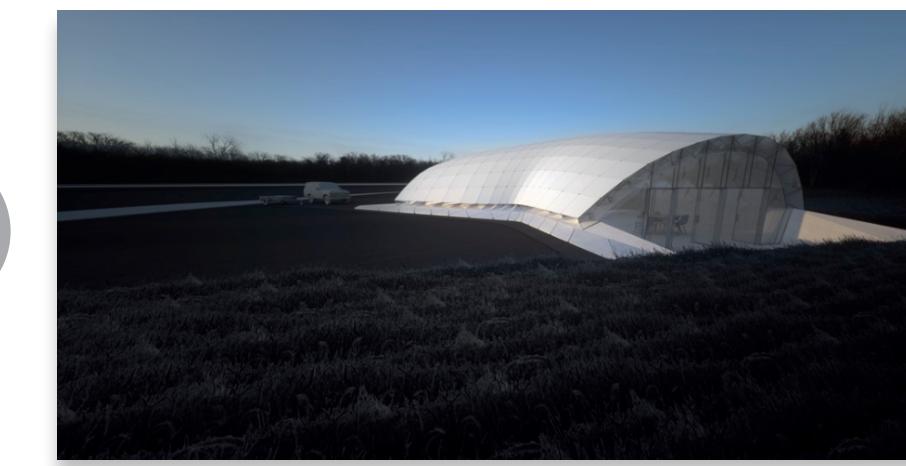
2 Openings



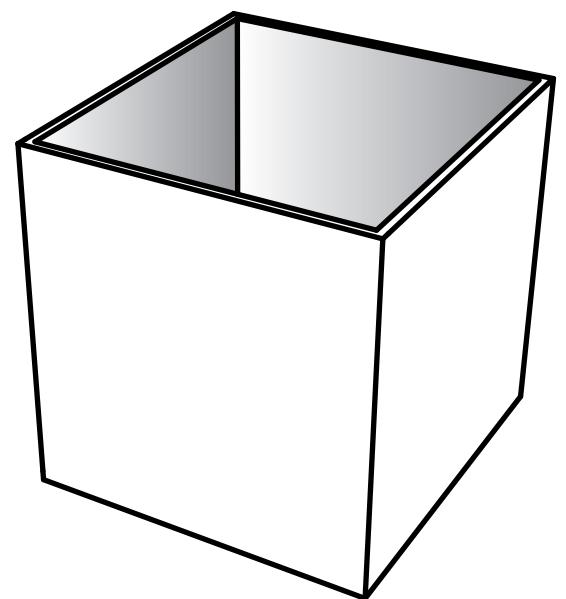
Insulation 3



Volume 4

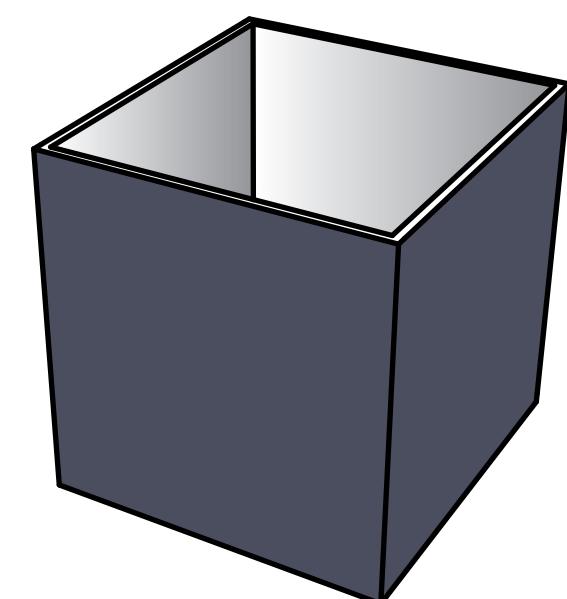


EXTERIOR COLOR



SUMMER

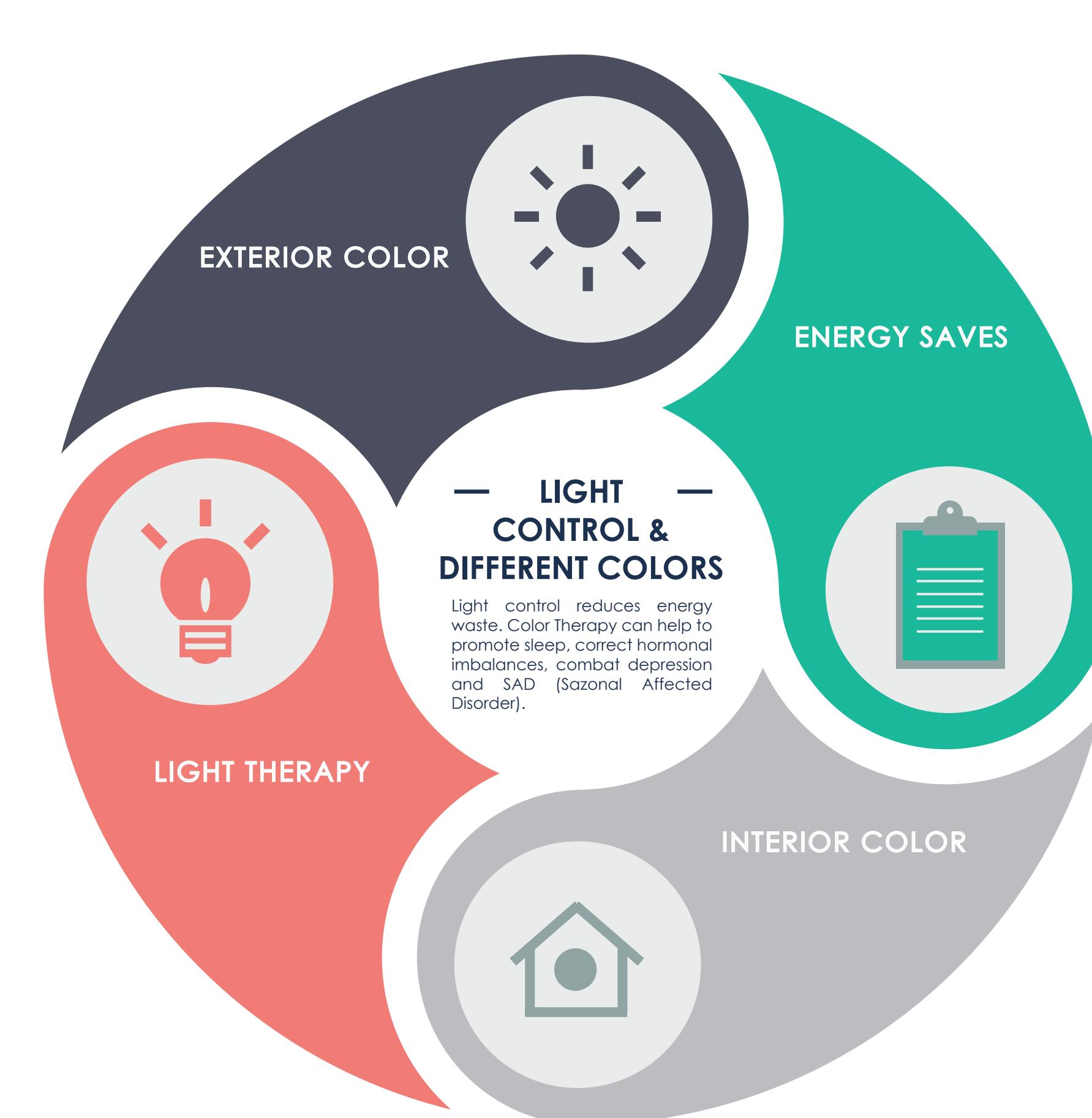
- During the summer, external walls would change color to white, by thermochromism.
- White reflects the sun light and helps the building to absorb less heat.



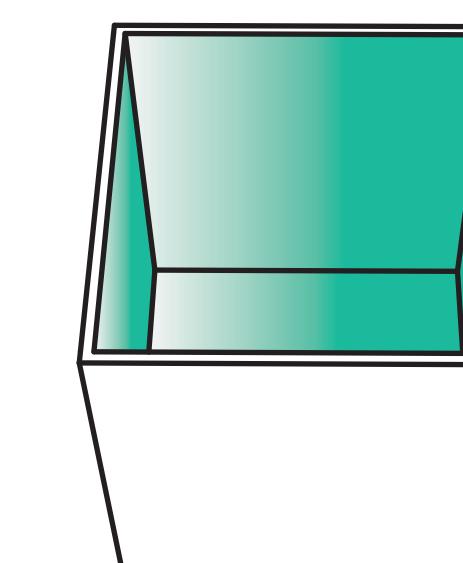
WINTER

- During the winter, external walls would change color to black or grey, by thermochromism.
- Dark colors absorb the sun light and helps the building to catch more heat.

Thermochromic inks were developed in the 1970's and they change their color according to the temperature. Devices will measure the temperature outside and regulate the color inside automatically.

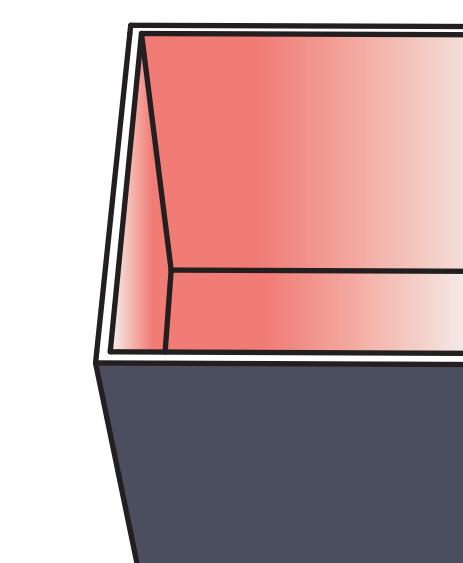


INTERIOR COLOR



SUMMER

- During the summer, interior light will be lighter as blue and green.
- Cold colors can give the sensation of a cold room to who is inside.
- Green: balance, compassion, harmony.
- Blue: calm, loyalty, expressive.



WINTER

- During the winter, interior light will be warmer as red and orange.
- Warm colors can give the sensation of a warm room to who is inside.
- Red: dynamic, energizing, stimulating
- Orange: active, creative, warming
- Yellow: positive, confidence, strength