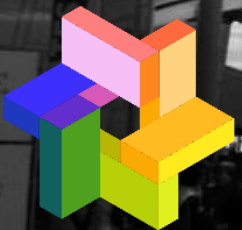


# HOW DO BUILDINGS IMPACT HEALTH AND WELLNESS

SANDEEP AHUJA

WELL AP, LEED AP BD+C

ILFI Facilitator and Ambassador, USGBC Faculty



pattern r+d

[www.patternarch.com](http://www.patternarch.com)

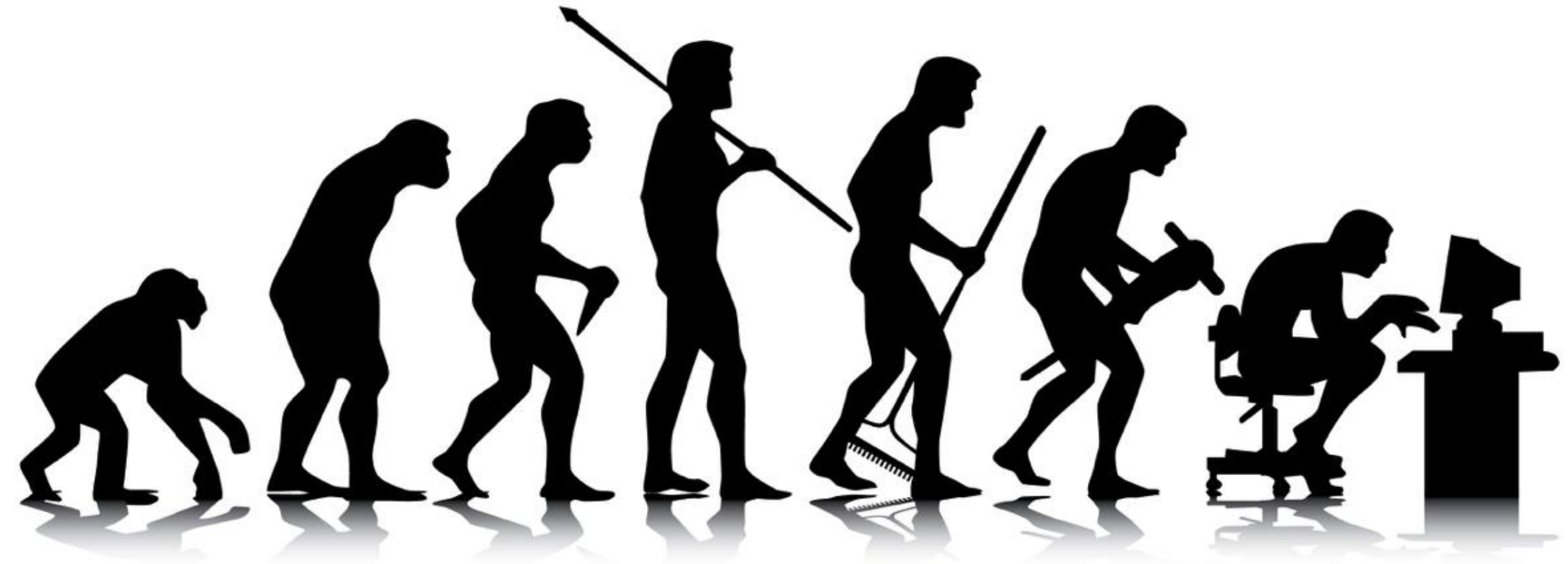
10.24.2018

We spend 90% of our time **indoors**.





OUR ENVIRONMENT IS CHANGING HOW WE LIVE



## WHAT MATTERS MOST?



# 90%

of employees admitted that their attitude about work is adversely affected by the quality of their workplace environment.

Unlock *human potential*  
through your building.



ASSURANCE



PERFORMANCE



VISIBILITY



What if your walls and ceiling could actually eliminate VOCs, so you breathe easier?





What if you could lose weight by changing your office furniture?

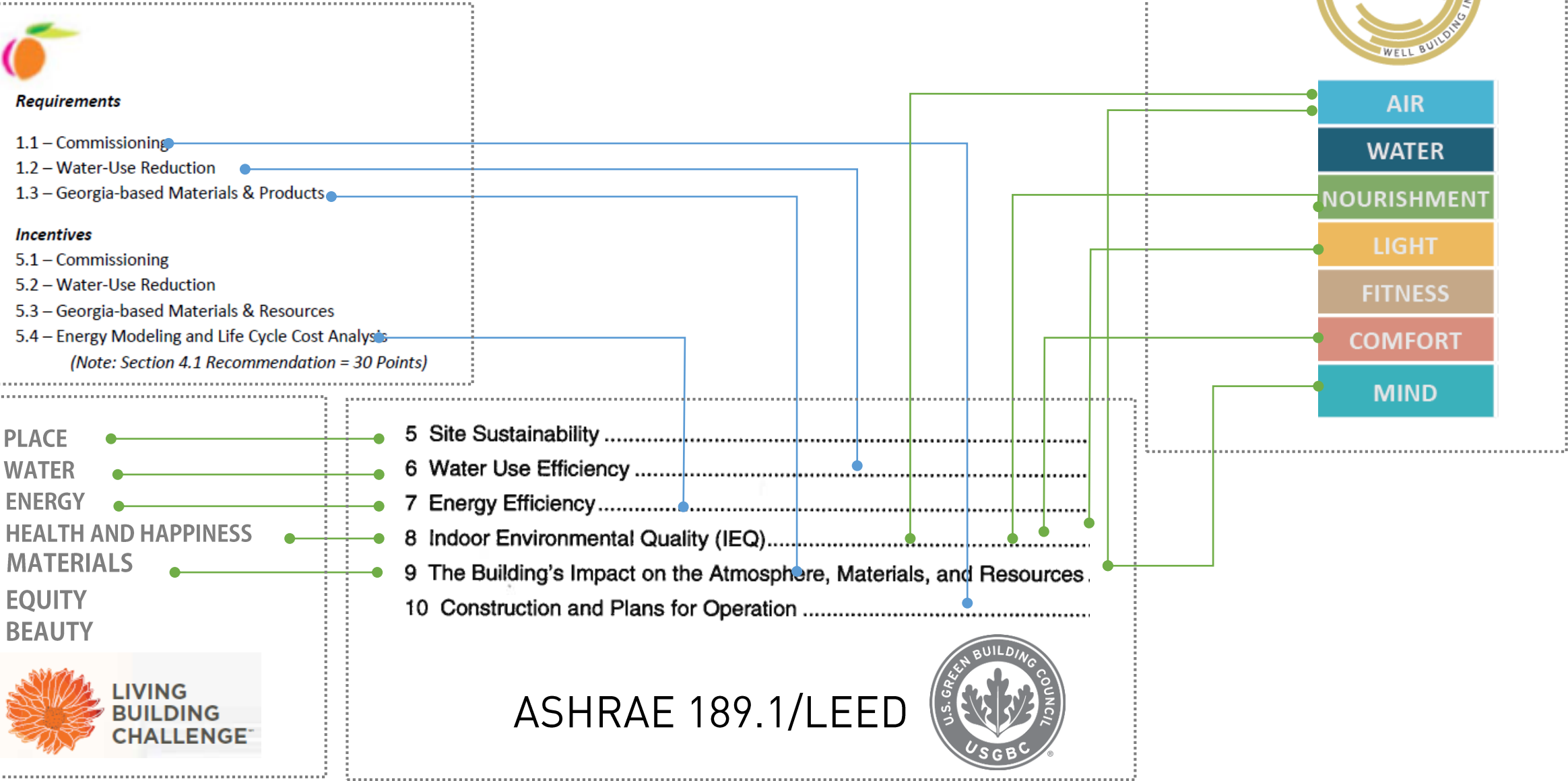






# WELL GREEN

# OVERLAPS BETWEEN BUILDING STANDARDS







air



water



nourishment



light



fitness



comfort



mind

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Impacts Community Health



Reduces Morbidity + Absenteeism



Supports Social Equity for Vulnerable Populations



Instills Feelings Of Wellbeing



Provides Healthy Food Options



Promotes Occupant Safety



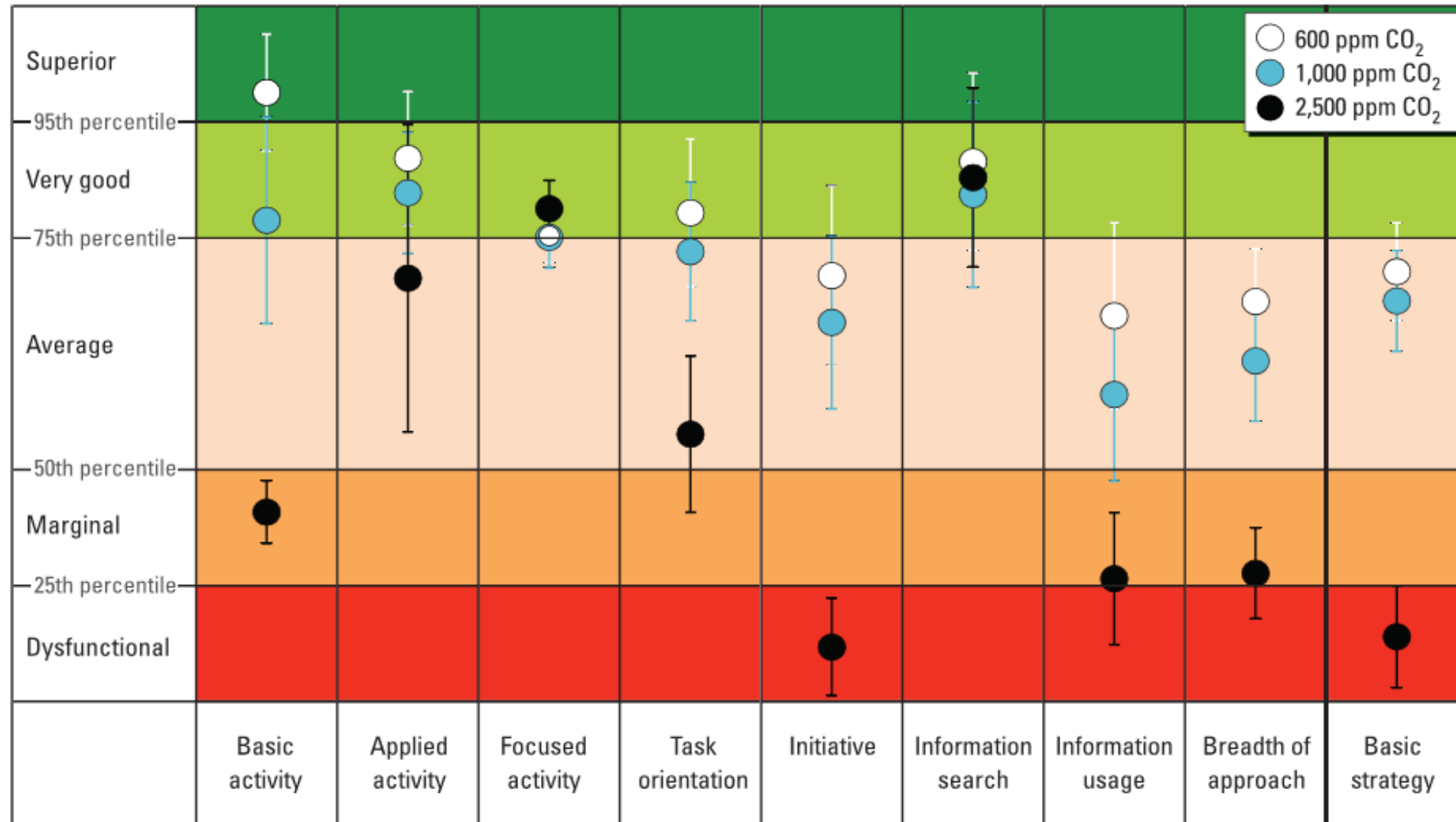
Increases Physical Activity

# AIR





# HARVARD STUDY : CO2 AND PRODUCTIVITY



## CO2 LEVELS IN REAL TIME



Start



20 min



45 min





## BOARD OF REGENTS

University System of Georgia

LIGHT





What if the right light was a better morning “pick me up” than a cup of coffee?



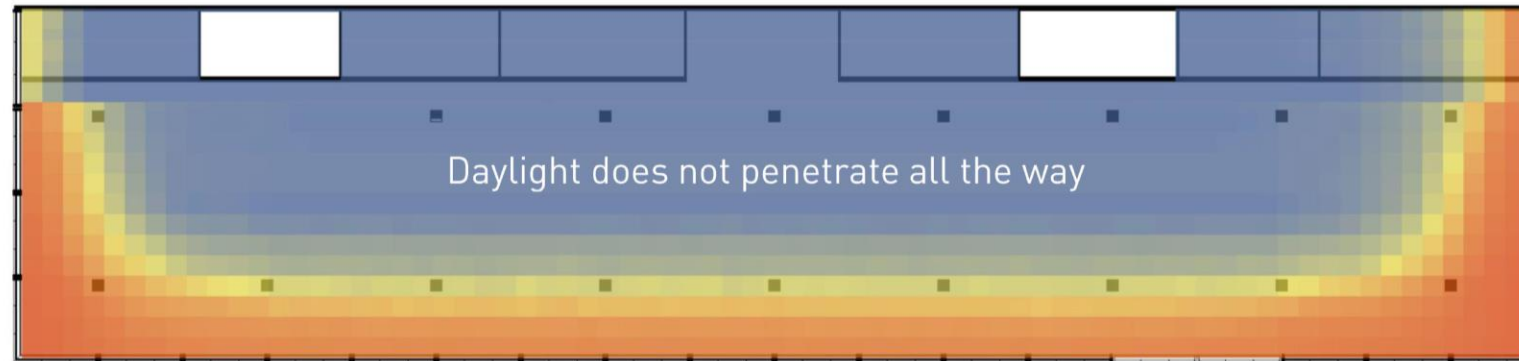


Project Name: Dalney Building  
University: Georgia Tech  
Architect: Collins Cooper Carusi Architects and  
Eskew Dumez Ripple



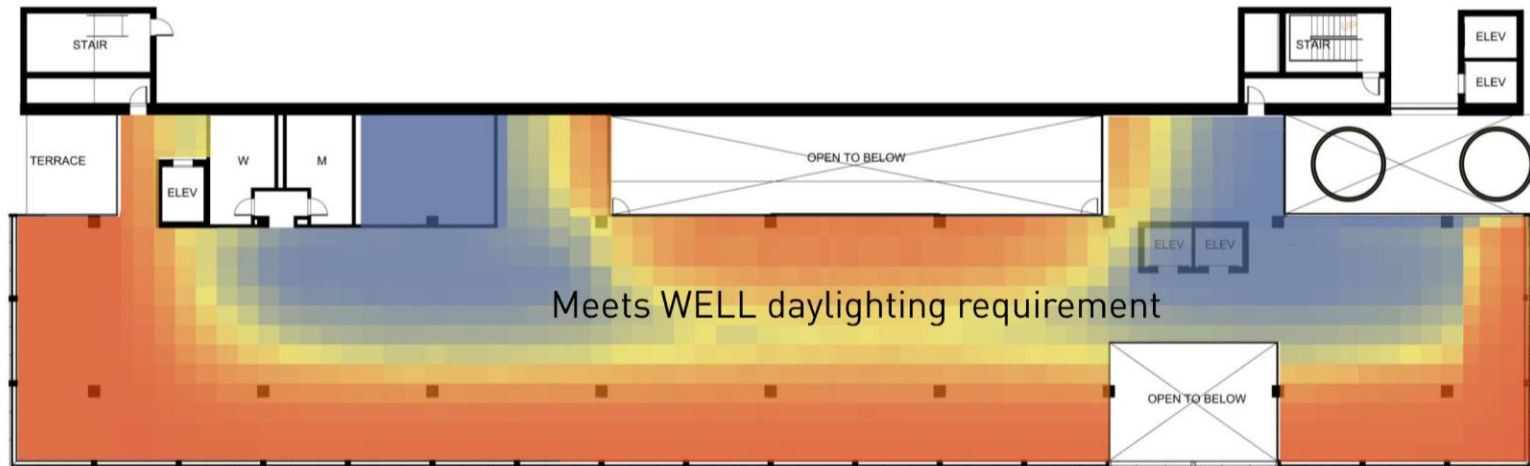
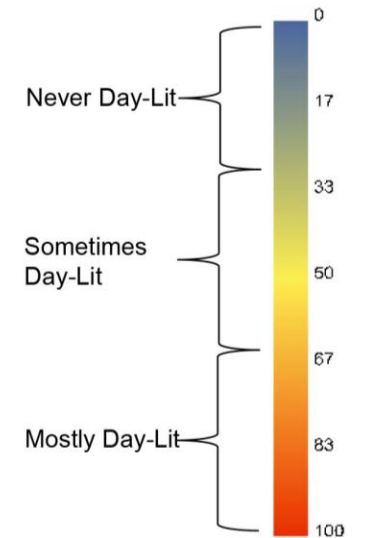


# IMPACT ON MASSING



Base Option

32.8 %



Modified Options

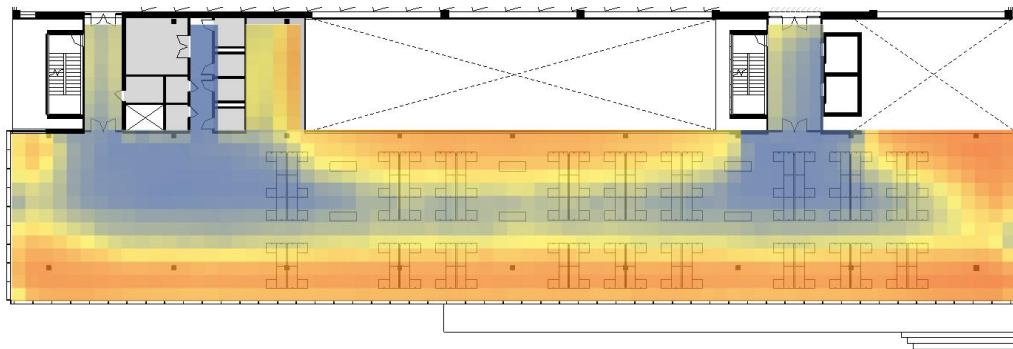
63.7 %

## sDA

Spatial Daylight Autonomy describes the percentage of floor area that receives at least 300 lux for at least 50% of the annual occupied hours. As per the WELL requirements, a 55% sDA is the minimum to achieve the optimization

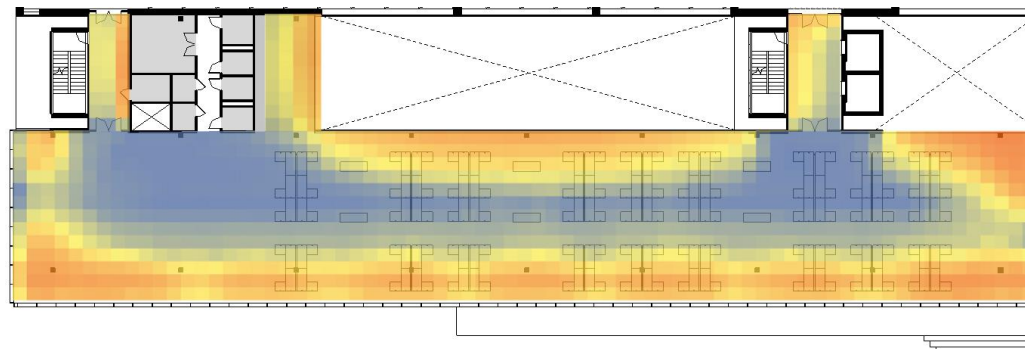
# IMPACT ON FACADE DESIGN LANGUAGE

## PUNCHED VS RIBBON WINDOWS



sDA  
47%

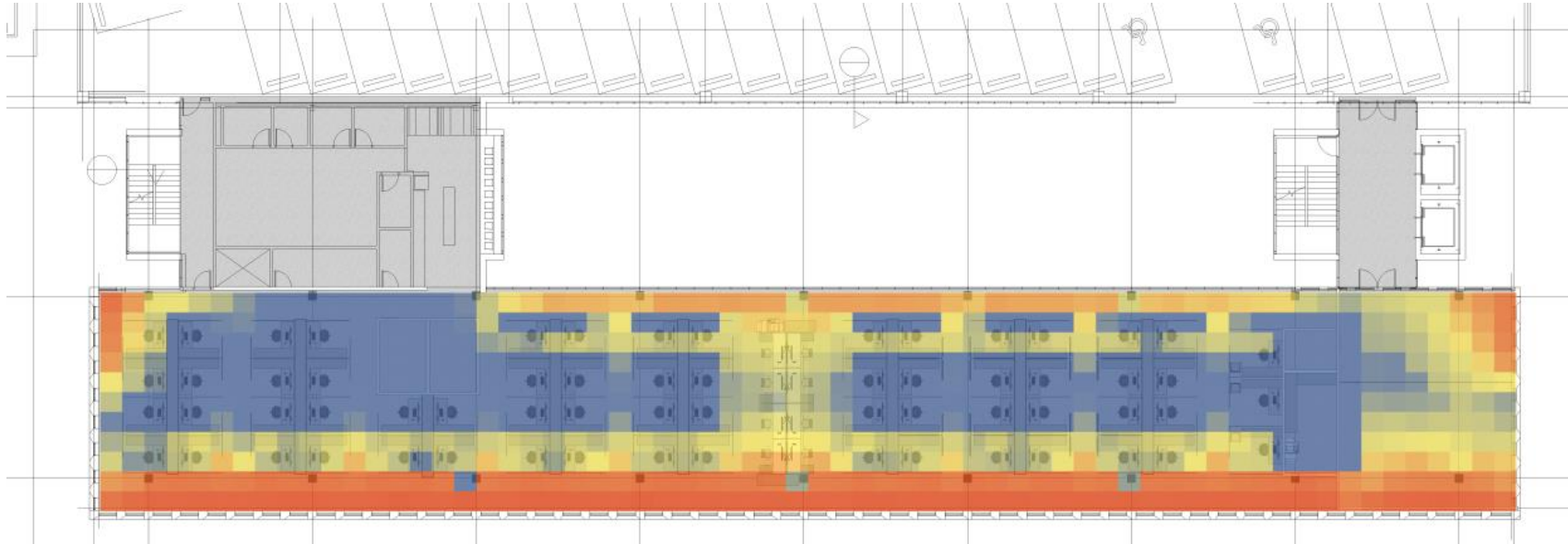
Higher sDA is better



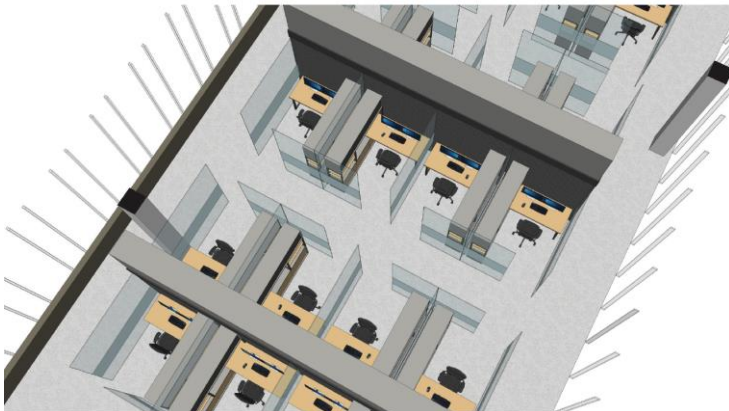
sDA  
39%

# IMPACT ON INTERIOR DESIGN

## 0% OPEN/100% CLOSED



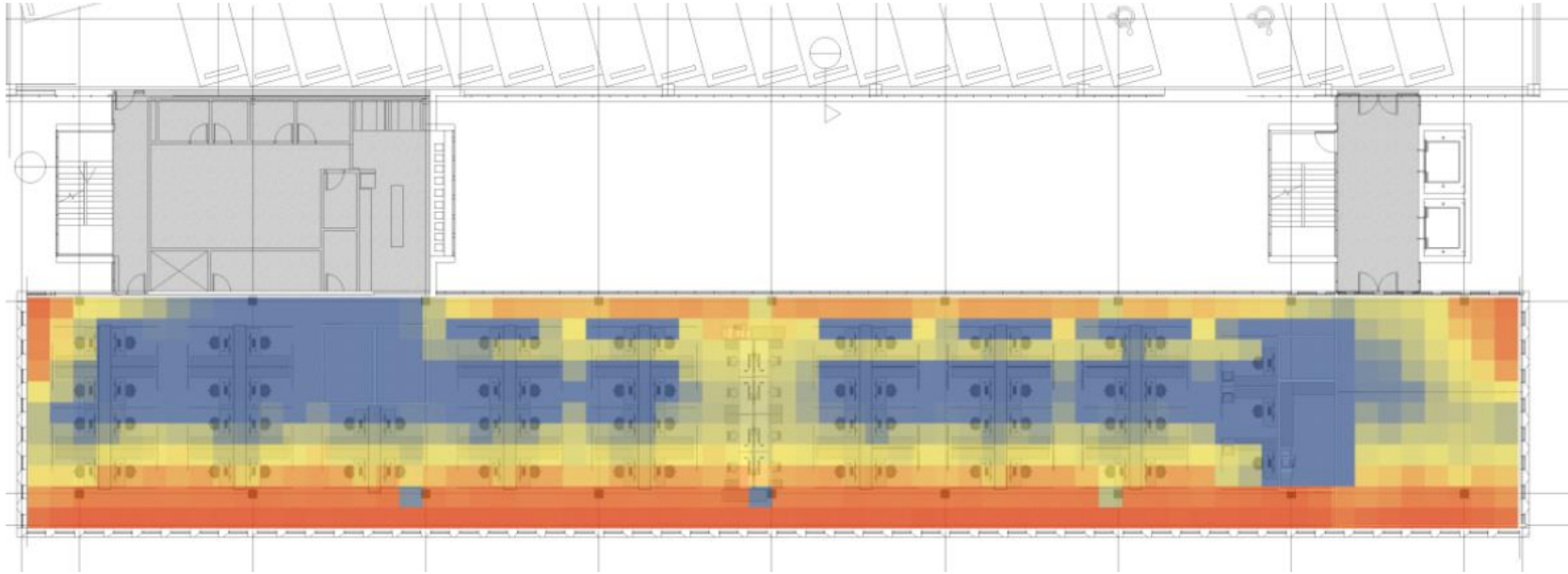
sDA **28%**



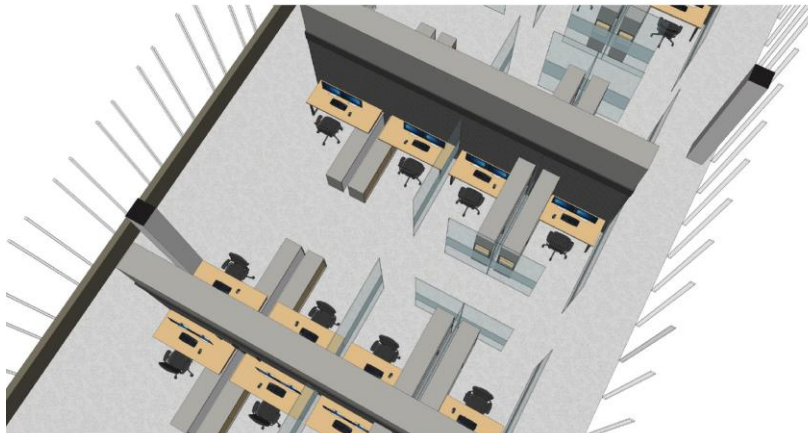


## IMPACT ON INTERIOR DESIGN

### 50% OPEN/50% CLOSED

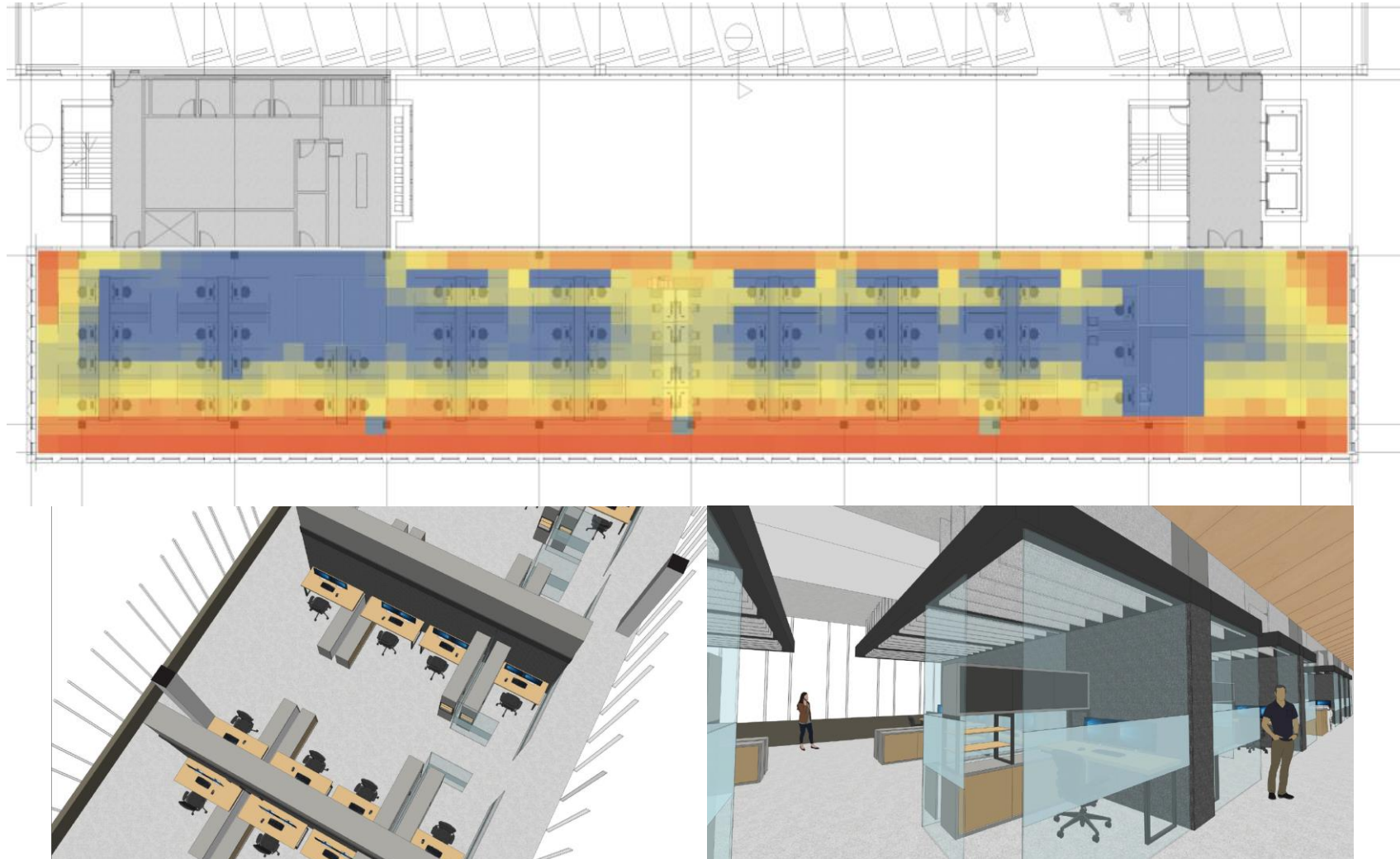


sDA **35%**



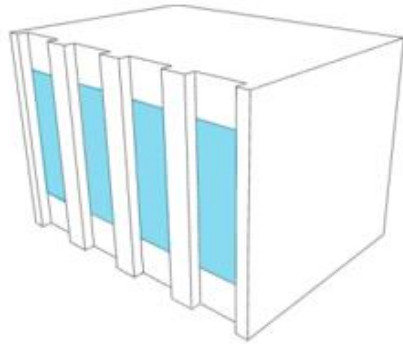
# IMPACT ON INTERIOR DESIGN

75% OPEN/25% CLOSED

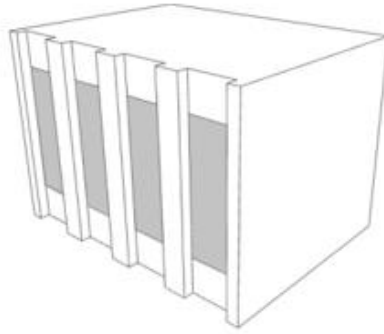


sDA **39%**

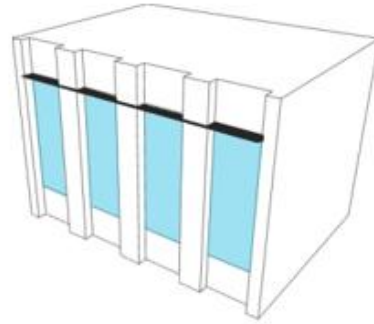
# DAYLIGHT QUANTITY VS QUALITY



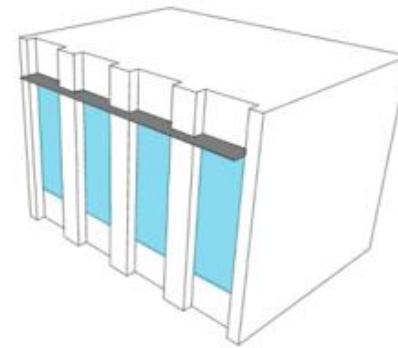
No Shades



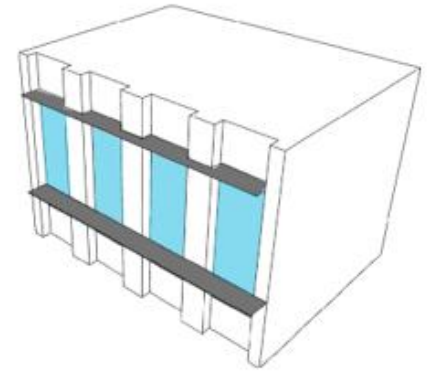
Exterior Blinds



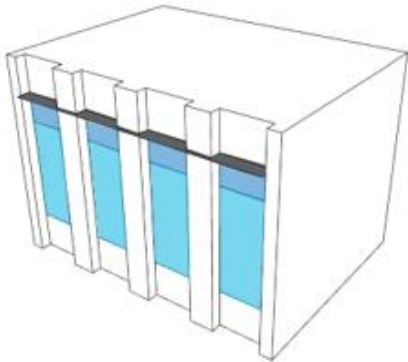
12" Horizontal Fin



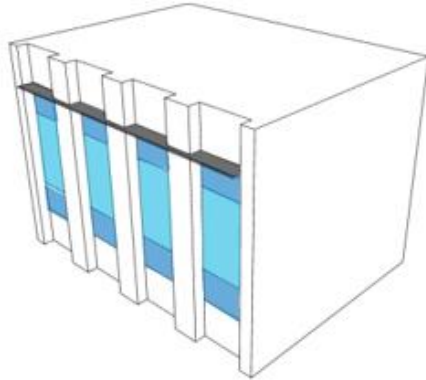
18" Horizontal Fin



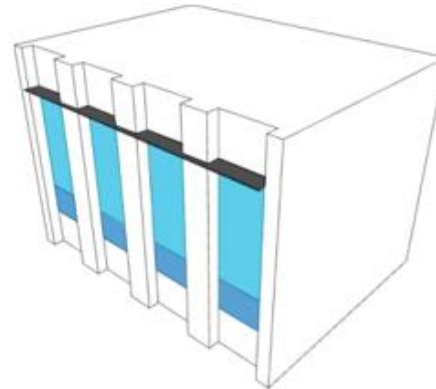
Two 18" Horizontal Fin



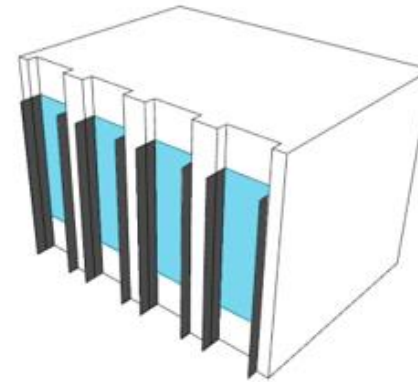
12" Horizontal Fin  
With 2' 40% Frit at Top



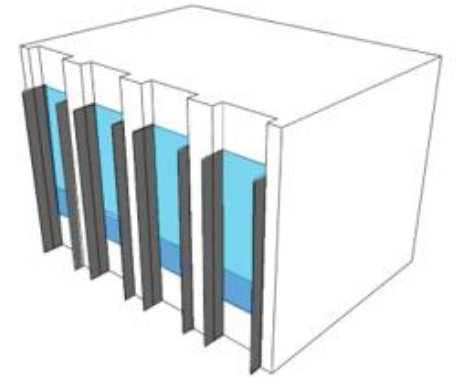
12" Horizontal Fin  
With 2' 40% Frit at Top and  
Bottom



12" Horizontal Fin  
With 2' 40% Frit at Bottom



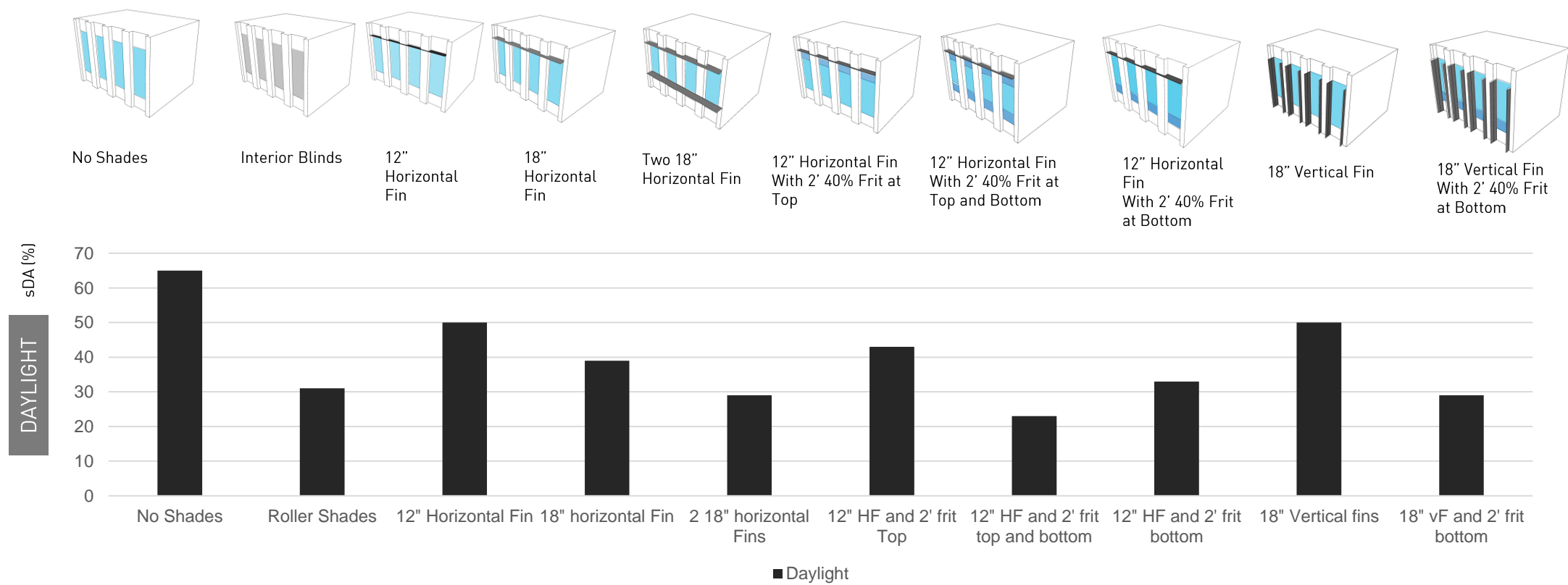
18" Vertical Fin



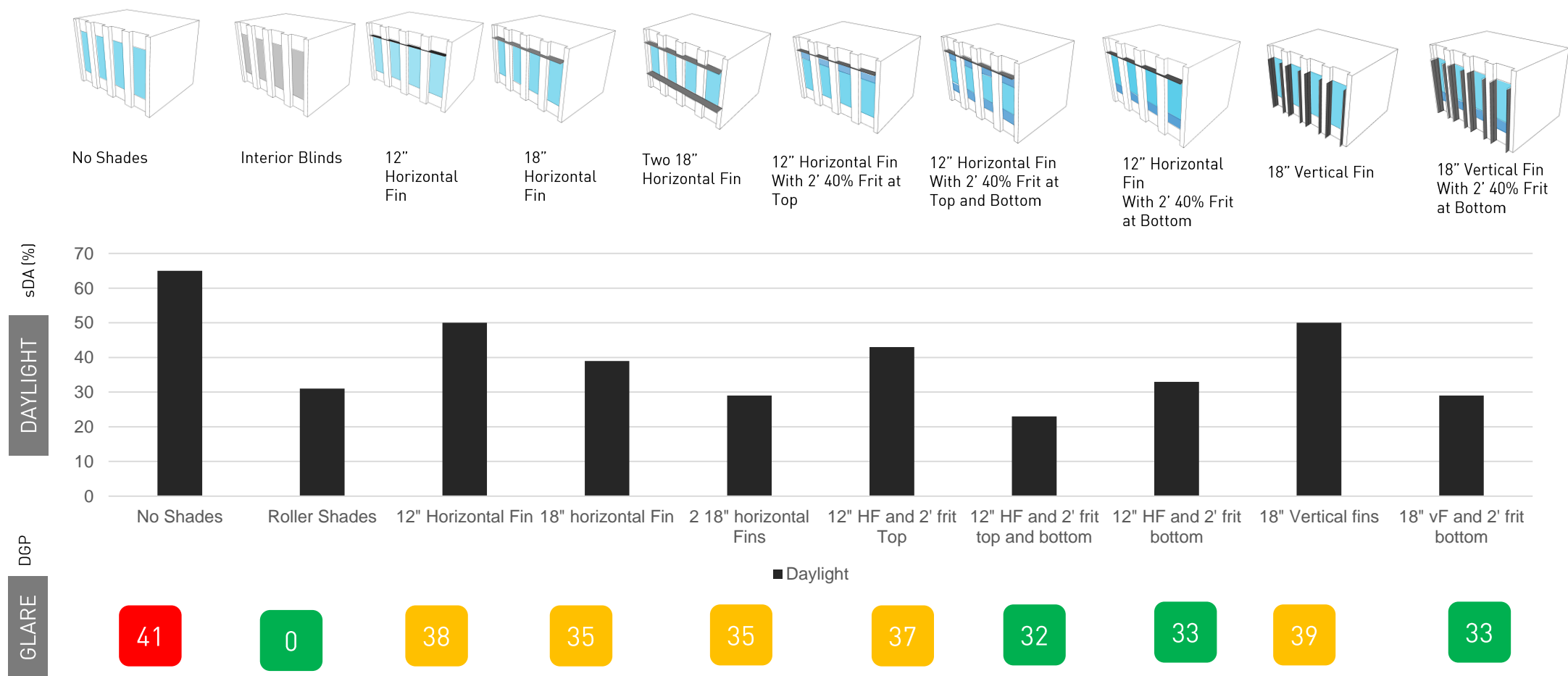
18" Vertical Fin  
With 2' 40% Frit at Bottom



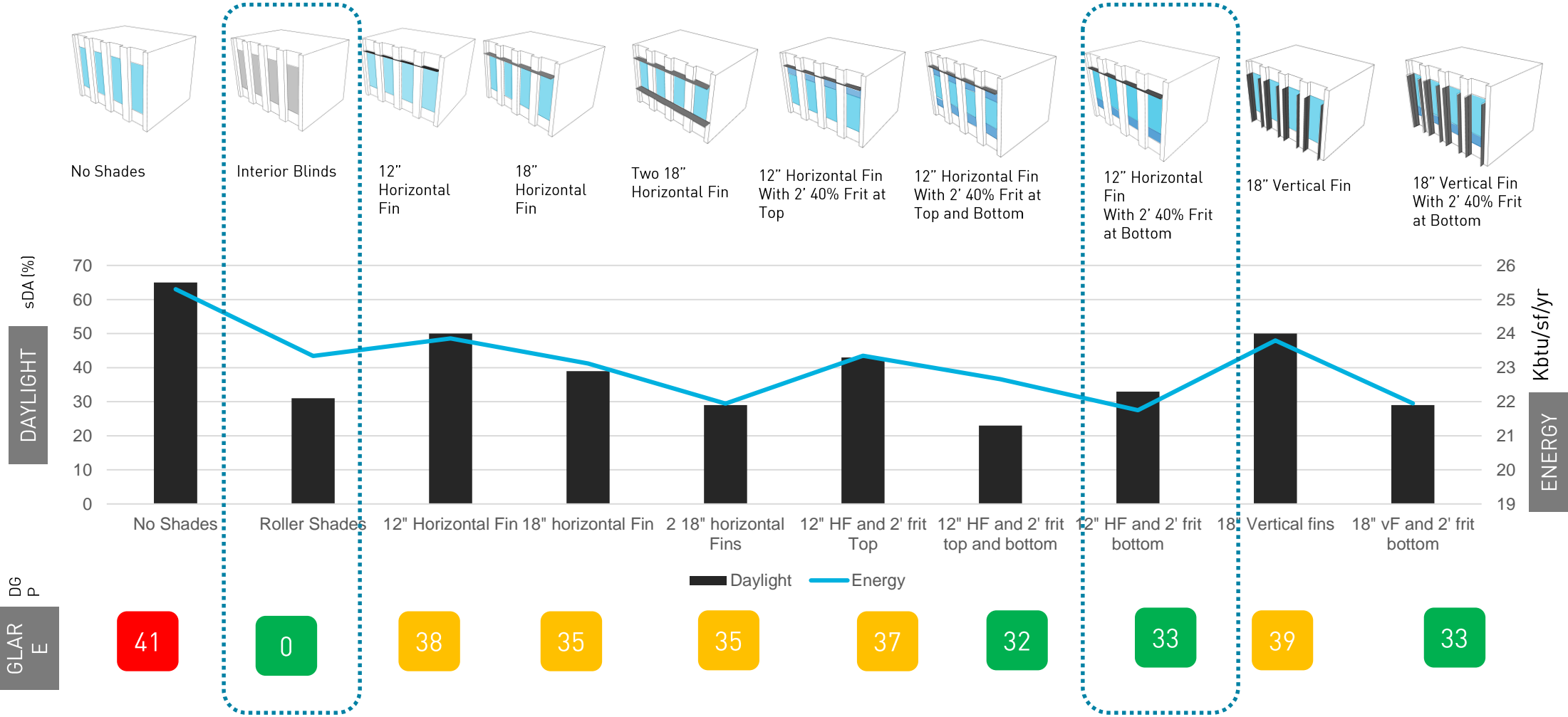
# FINDING THE OPTIMAL FAÇADE STRATEGY



# FINDING THE OPTIMAL FAÇADE STRATEGY



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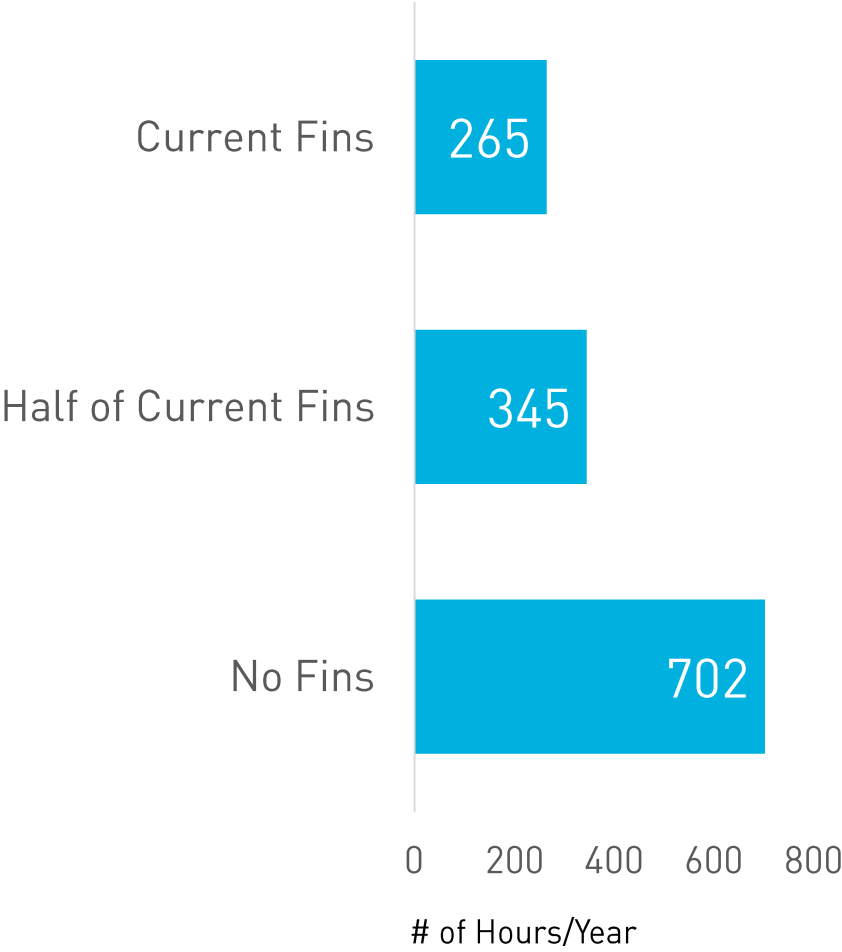
## THE FAÇADE DESIGN



# FAÇADE GLARE STUDY

## HOW MANY FINS DO WE NEED?

Total Uncomfortable Hours  
between 8am-6pm



# Circadian Lighting Emulates the Natural Environment

The eyes detect light and send this information to the brain, triggering the calibration of our 24-hour cycle. Light has impacts on human health and well-being outside of image formation and color perception – including:

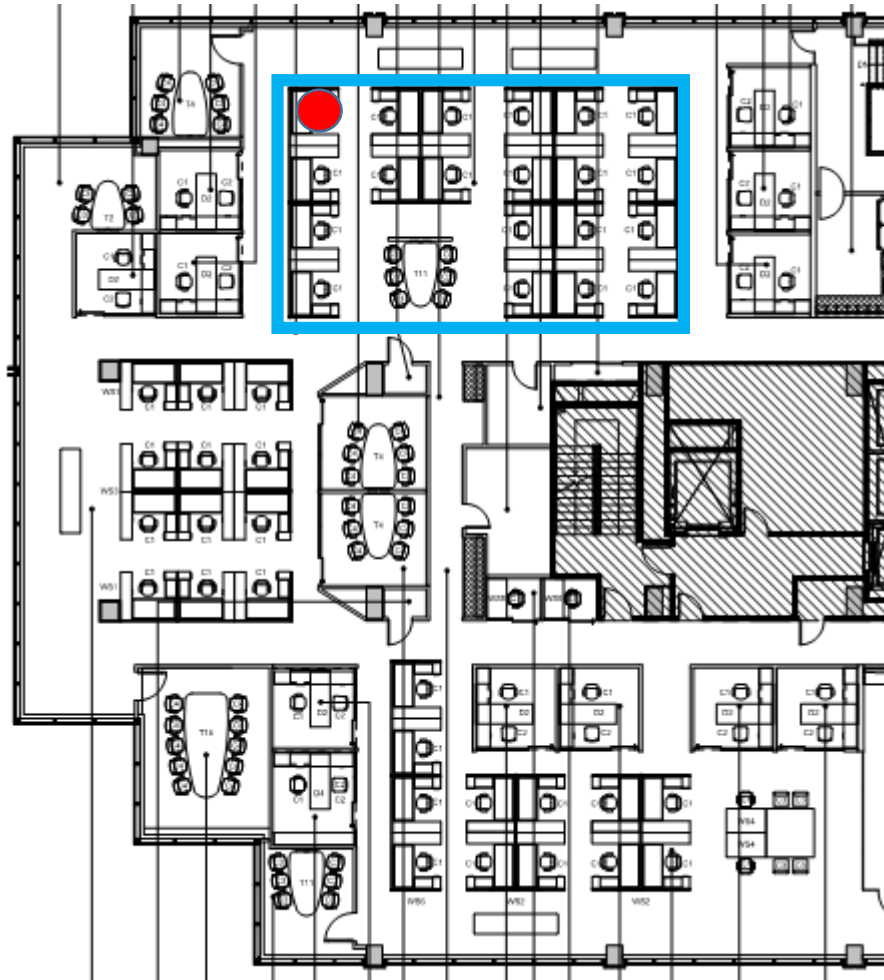
*calibration of the body's biological clock and circadian rhythms*

*direct effects on alertness, mood and cognition*

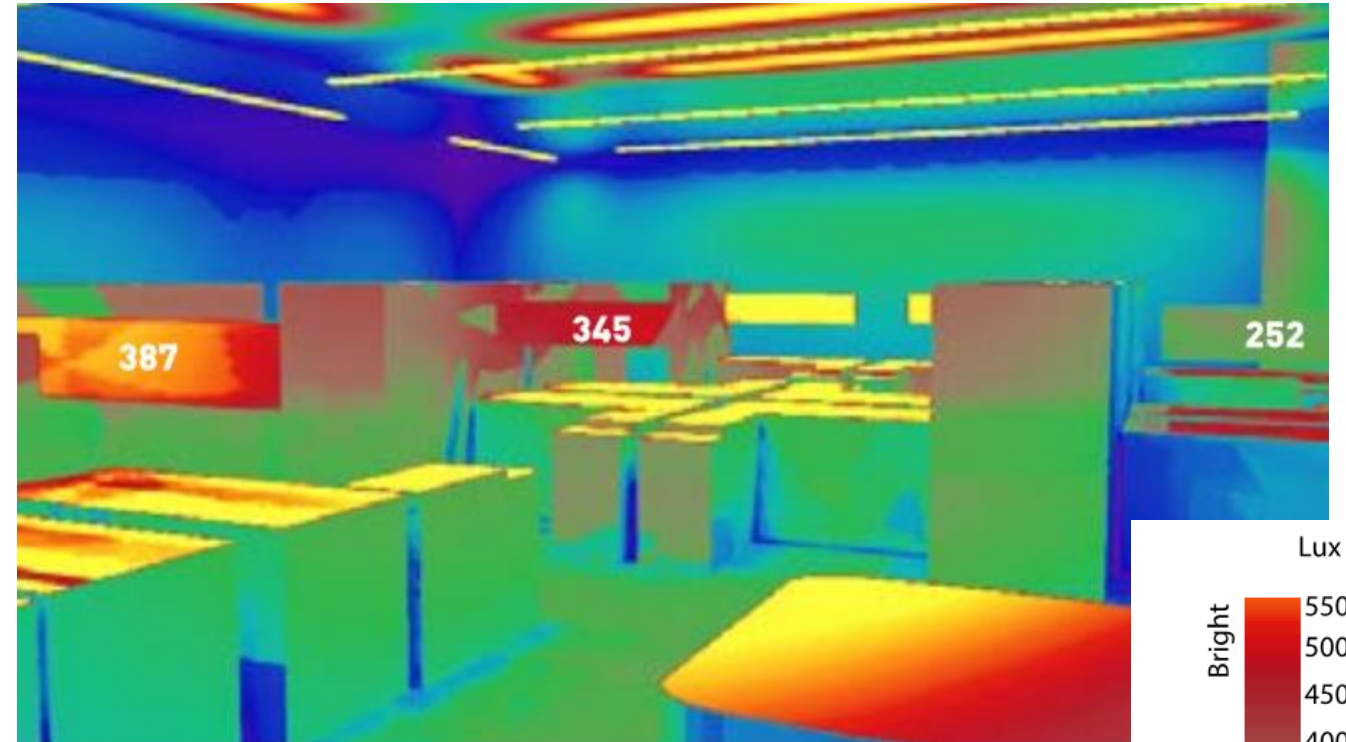




# CIRCADIAN LIGHTING DESIGN

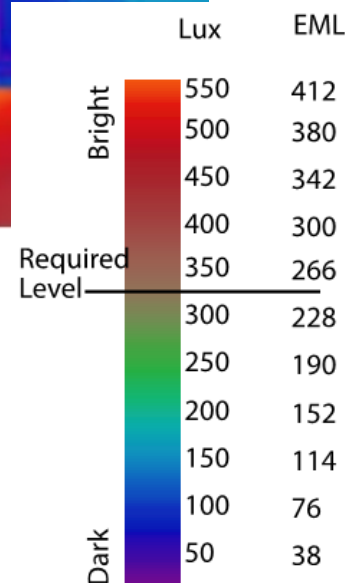


11<sup>th</sup> Floor

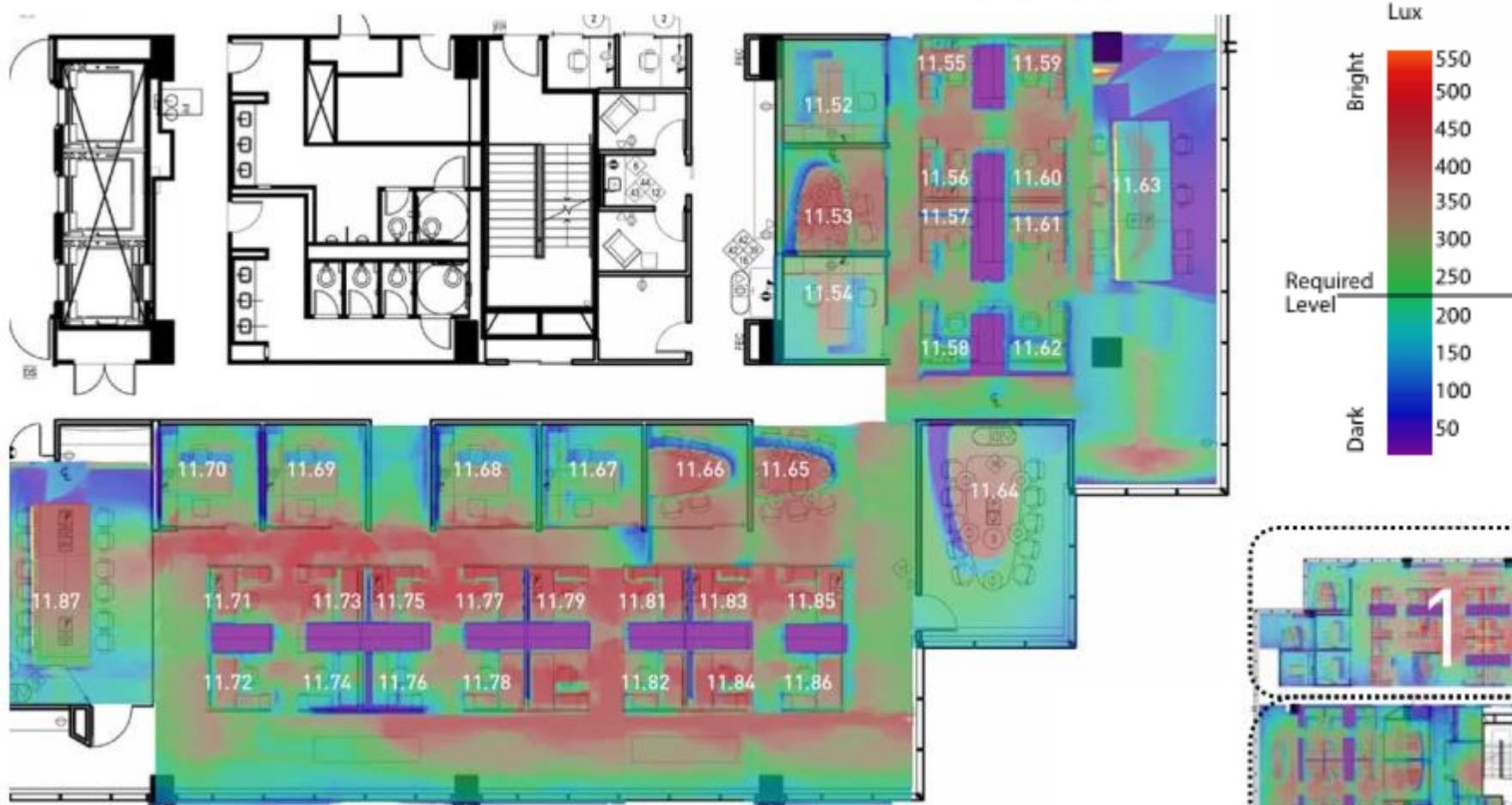


Perspective View Looking at Workstations Overlayed with Lux Values

Measures optimal light levels for non-image-forming photoreceptors in the human eye (ipRGCs)

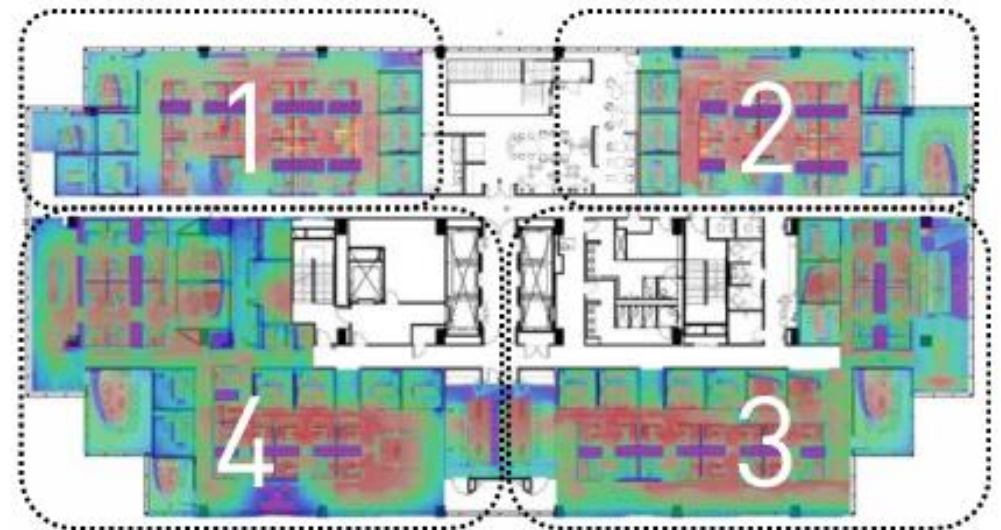


# GETTING ENOUGH LIGHT ON WORK STATIONS



Desk-by-Desk Work  
Surface Light Level  
Study

11<sup>th</sup> Floor – Area 3





# FITNESS







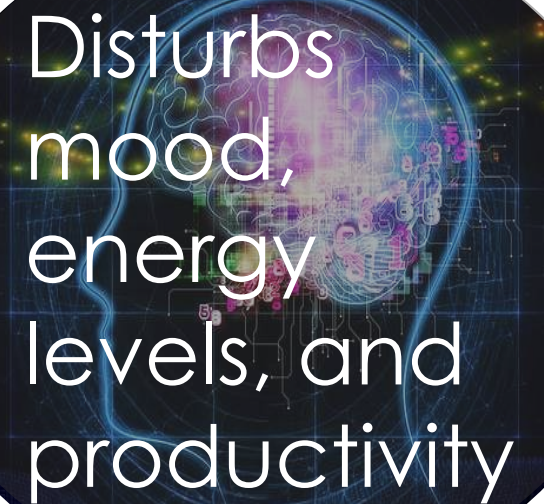
Sitting is the New Smoking



Calorie  
burning  
drops to <1  
per minute

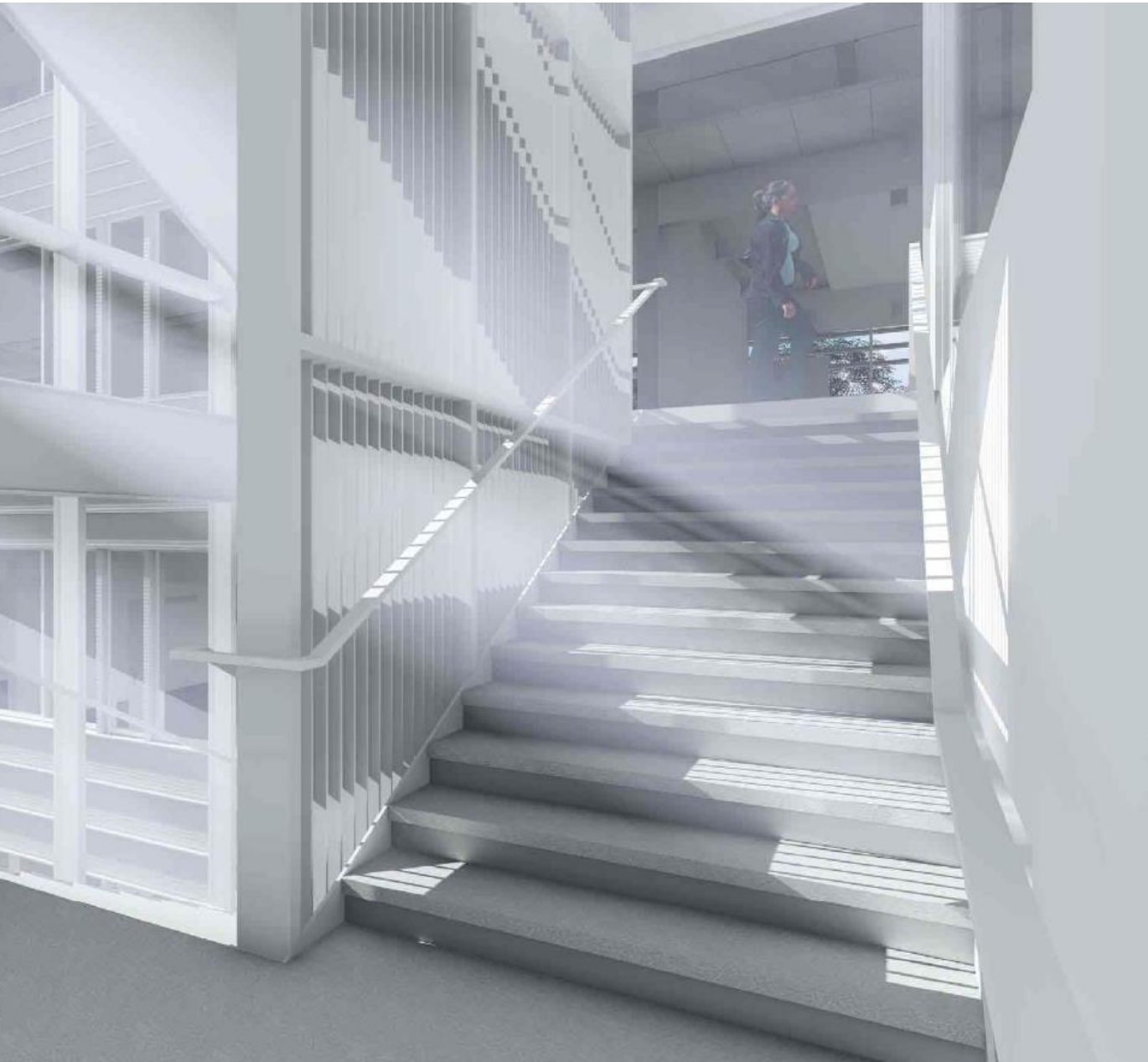


Multiple  
systems are  
negatively  
affected.



Disturbs  
mood,  
energy  
levels, and  
productivity

## IRRESISTIBLE STAIR





## HOW EFFECTIVE ARE SIT STAND DESKS IN CLASSROOMS?



# COMFORT





# Thermal Considerations

4% reduction in performance at warmer temperatures.<sup>1</sup>

6% reduction in performance at cooler temperatures.<sup>1</sup>

# Acoustic Considerations

66% drop in performance when exposed to distracting noise.<sup>2</sup>

<sup>1</sup>Lan L, Wargocki P, Wyon DP, Lian Z. (2011) Effects of Thermal Discomfort in an Office on Perceived Air Quality, SBS symptoms, physiological responses, and human performance. *Indoor Air* 21:5, pp. 376-90.  
<sup>2</sup>Banbury SP and Berry DC. (1998) Disruption of Office-related Tasks by Speech and Office Noise. *British Journal of Psychology* 89:3, pp. 499-517.





# Biophilia

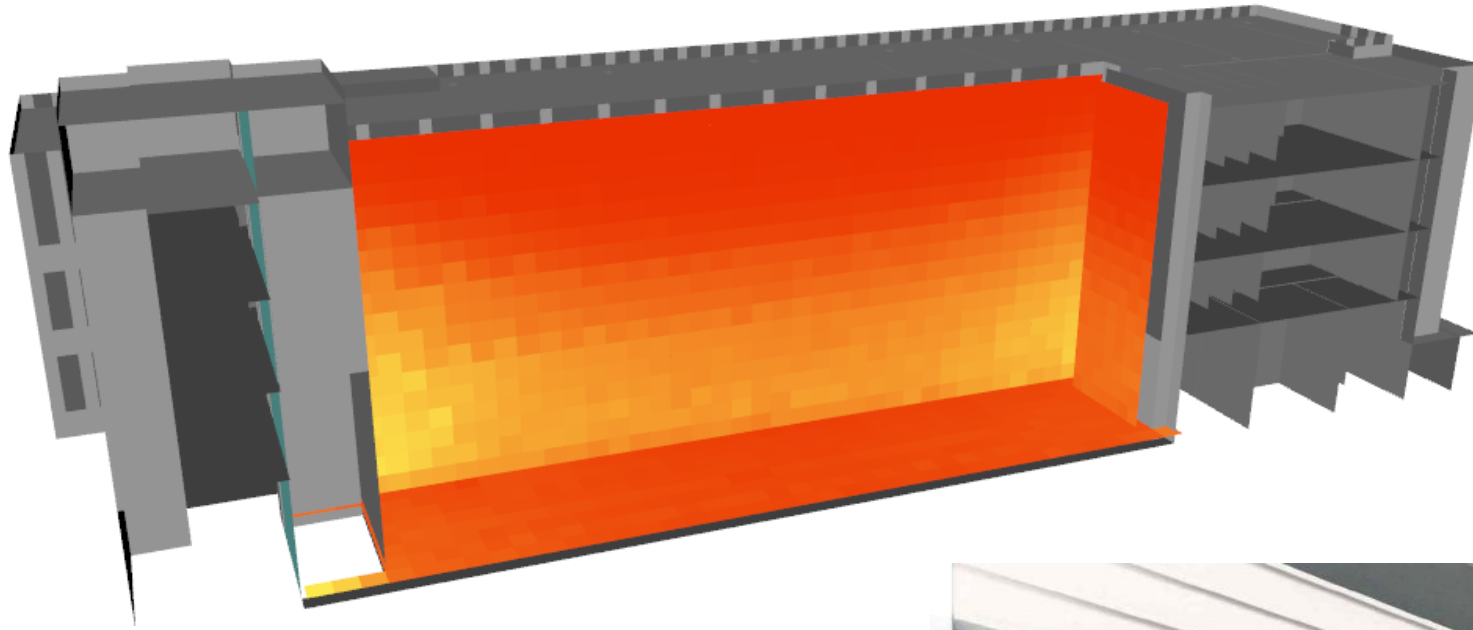
After 40-second microbreak, subjects who see green roofs, instead of concrete roofs, demonstrate higher concentration levels.

**6%** increase in concentration levels for those who saw the green roof.

**8%** drop in concentration levels for those who saw the concrete roof.



# INCORPORATING BIOPHILIA IN DESIGN



Section Perspective





