

# NCI PHOENIX

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## THE PROJECT:

Phoenix is home to beautiful landscapes along with amazing weather for about half the year. This project primarily focuses on the harshest months of the year, April to October, where high temperatures and cloudless skies make venturing outside unbearable. Because our site is so large, we've developed a master plan that is designed to become a model for Phoenix to promote a healthy environment for residential and commercial use.

The New Chautauqua Institute (NCI) will include two buildings, the first as the educational institution and the second as a small hotel for the New Chautauqua Institute attendees.

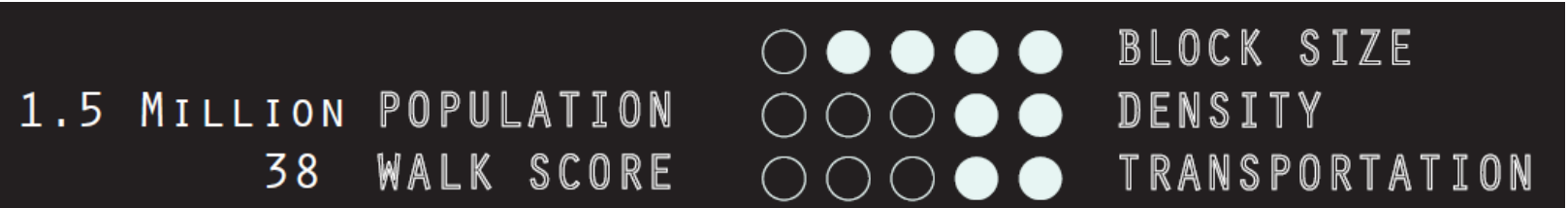
## THE GOALS:

The primary goals to achieve this is to improve walkability of the already too large city blocks, provide a system of convenient housing and retail for those commuting to and from downtown and midtown Phoenix. Our site is intended to be a destination to those surrounding our site.

Minimizing heat gain is our primary environmental objective. On an urban scale we achieve this by densely populating the site to provide a system of narrow, shaded paths.



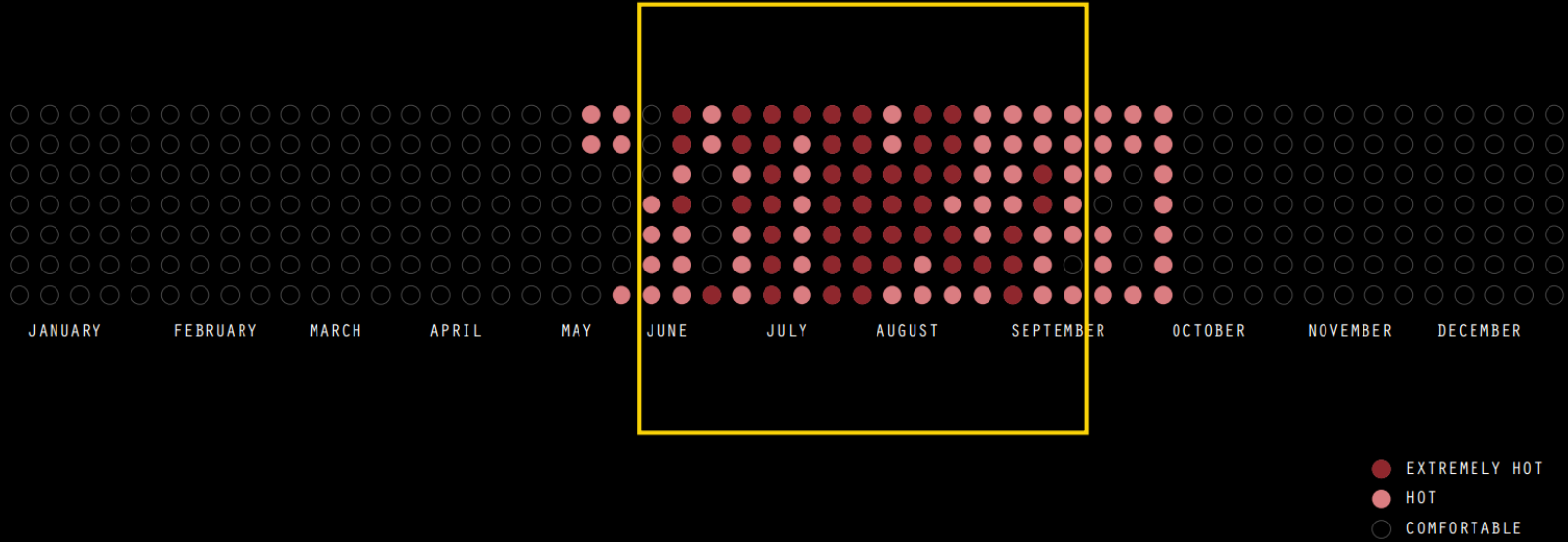
Utilizing the Walk Score tool, Phoenix received a score of 38 (Philadelphia, 78) which is due to the city’s low density and big block sizes as well as a less reliant public transportation system which makes car use the only proper way to move around the city.



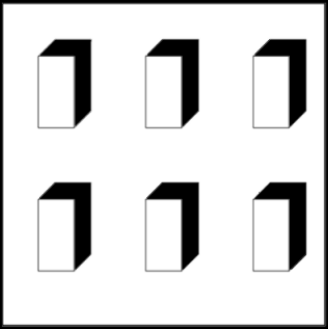
The chosen site is located at the heart of the city, between the downtown and midtown, which is a great opportunity for promoting a walking lifestyle while providing housing opportunities on site and create a connection between the commercial strip and the neighborhood adjacent to the site.



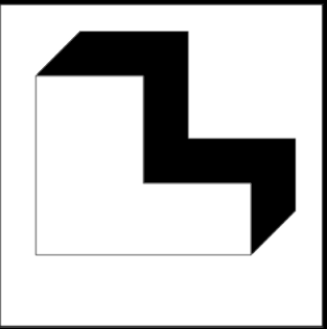
The climate resembles a major challenge in regards to outdoor thermal comfort. As shown in the chart, uncomfortable hot periods last for about 30% of the year. It is an obstacle to that must be tackled in order to promote the alternative lifestyle for the people of phoenix.



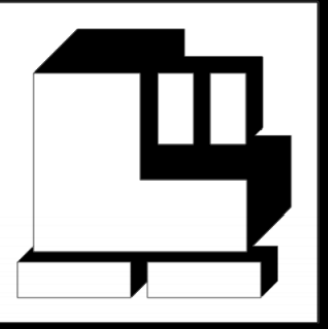
The main approach to minimizing direct solar radiation is through breaking free from the norm, which is the low density urban fabric. Through the introduction of narrow paths within the site will provide self shading between the buildings and ultimately create a reduction in heat



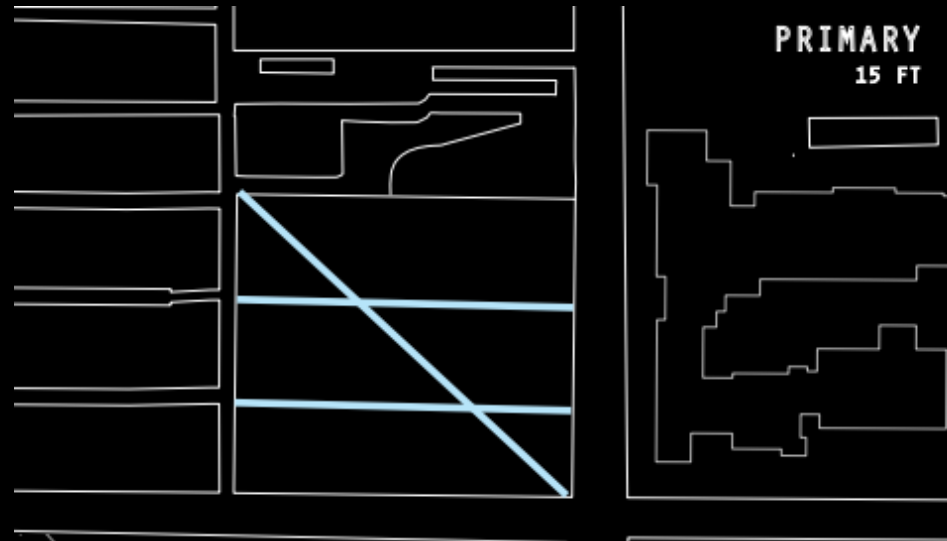
TYPICAL RESIDENTIAL FABRIC  
(MINIMAL SHADING)



TYPICAL COMMERCIAL BUILDING  
(ACCEPTABLE SHADING)

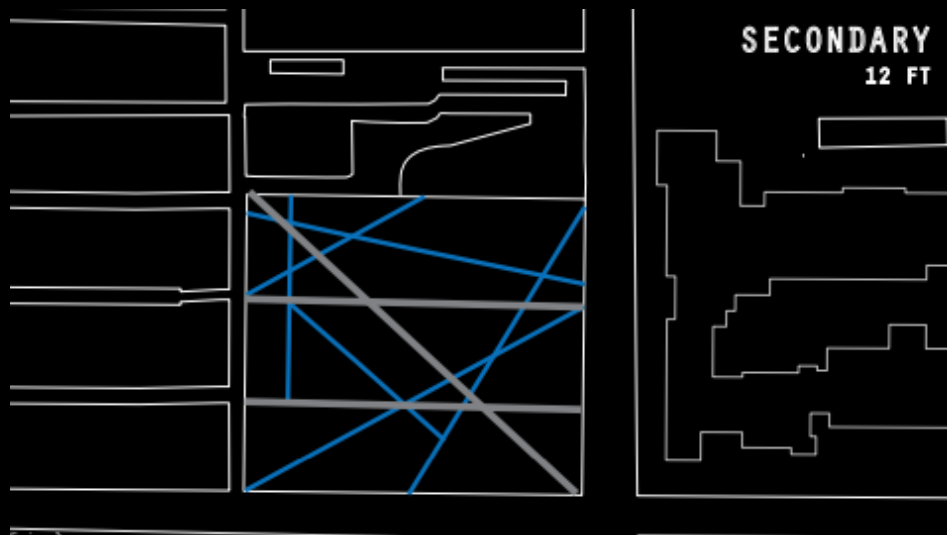


NARROW FABRIC OF MULTIPLE  
BUILDINGS  
(SUFFICIENT SHADING)



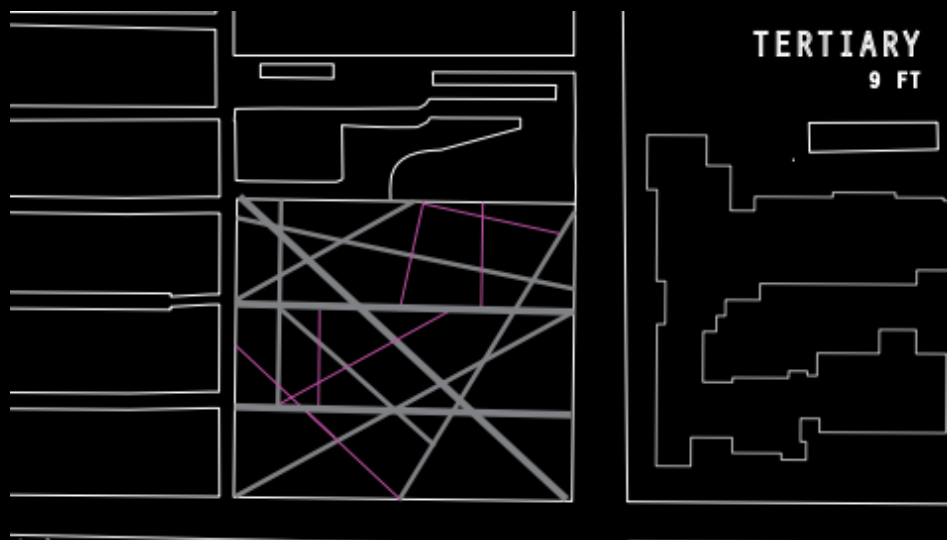
## PRIMARY:

Pathways with the main intent of creating a connection between the residential neighborhood and the downtown to encourage walkability and decrease the reliance on cars. Big stores, restaurants, café's, etc. would be along these axes.



## SECONDARY:

With the arrow fabric pathways, buildings would shade themselves and create a much more cozy atmosphere.



## TERTIARY:

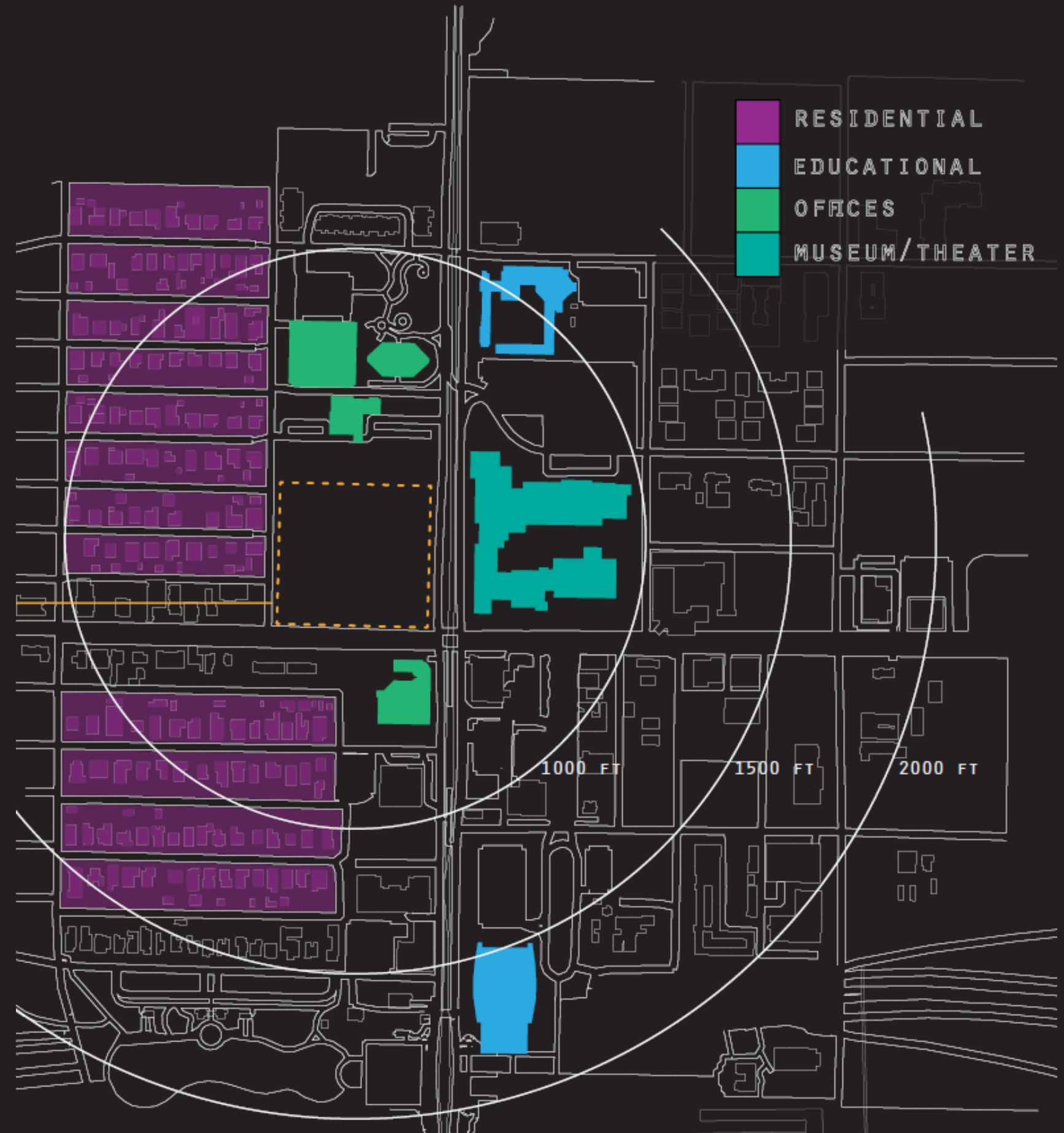
These pathways would be mostly used for residences who get to and from their apartments.



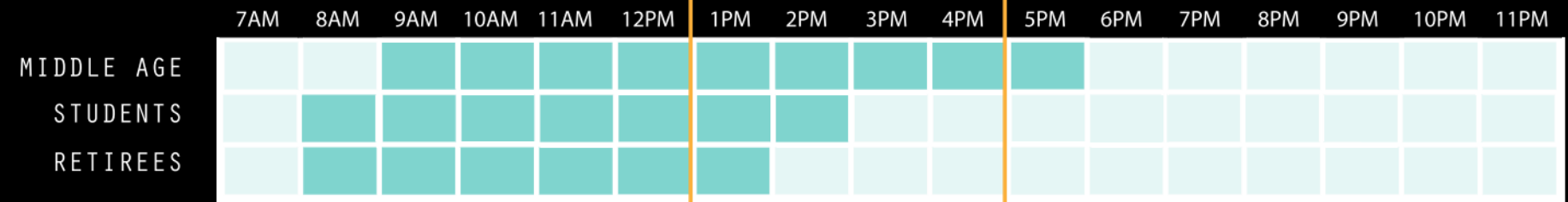
It is of utmost importance of the surrounding context, and what could attract people to engage with the site and spend some time away from a typical energy demanding lifestyle through providing an atmosphere that allows for an increased outdoor comfort zone.

The main approach was to analyze the surrounding area in regards to the uses and users. In another term, understanding the schedules and tasks of the people who surround the site in order to provide that desired atmosphere for them to experience and enjoy.

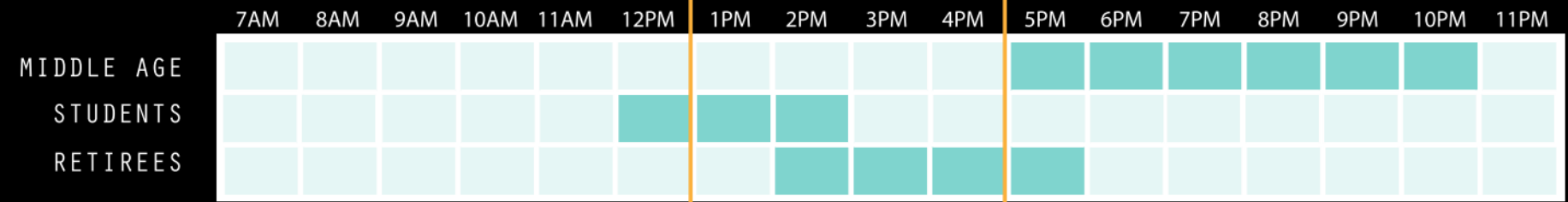
By understanding the schedules, employees in offices can come to have lunch. Visitors to surrounding museums can visit to have dinner after the museum closes at 5 pm. Etc.



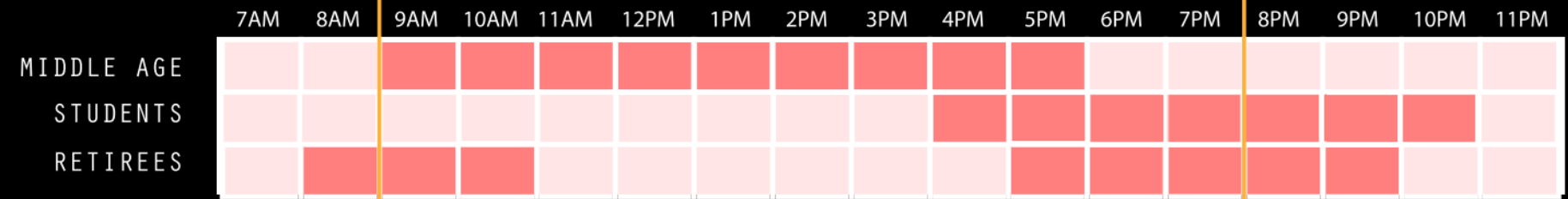
WINTER WEEKDAY SCHEDULES



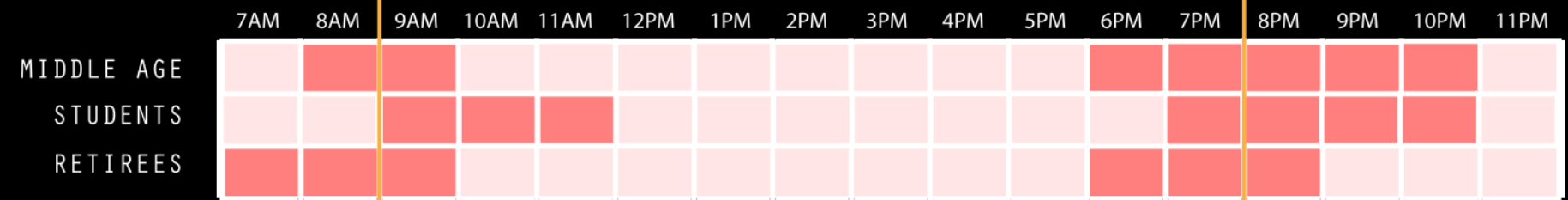
WINTER WEEKEND SCHEDULES



SUMMER WEEKDAY SCHEDULES



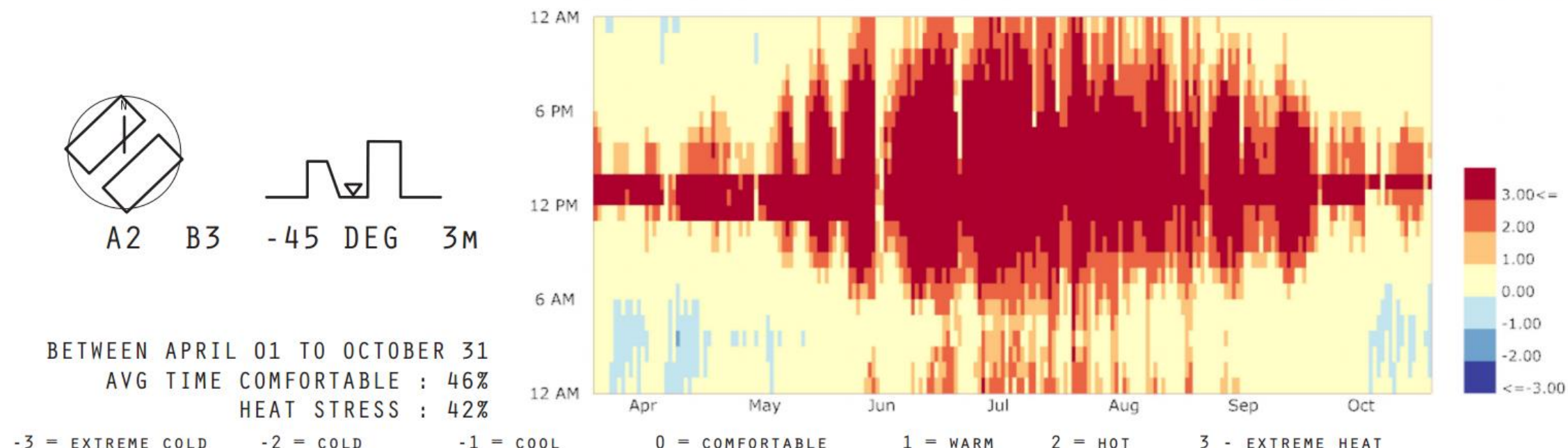
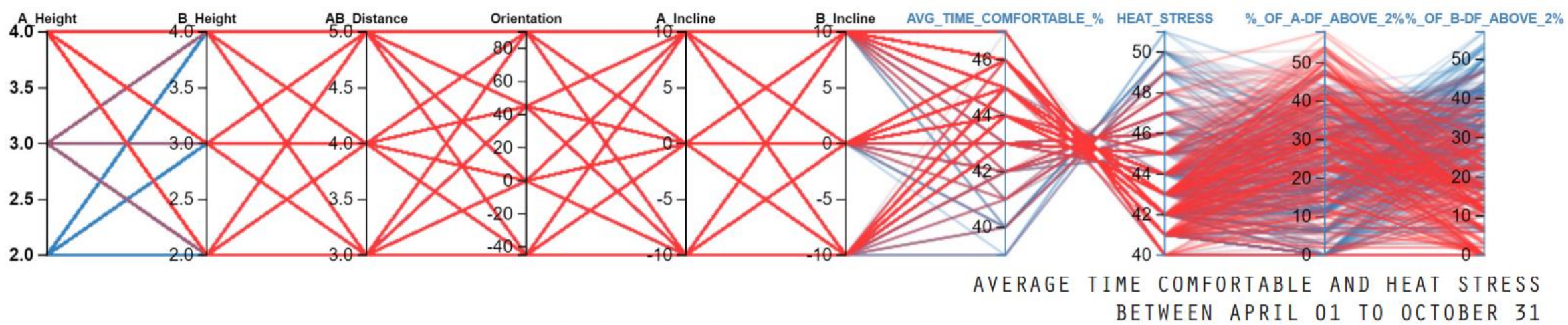
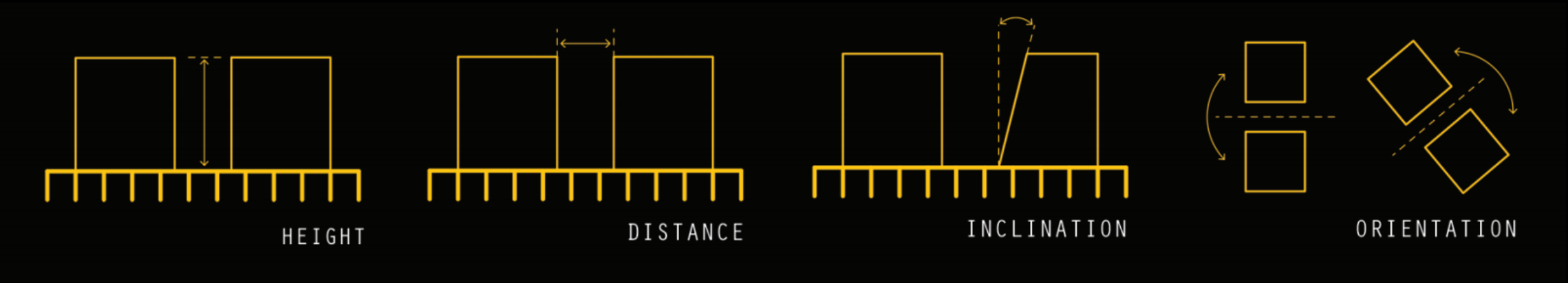
SUMMER WEEKEND SCHEDULES



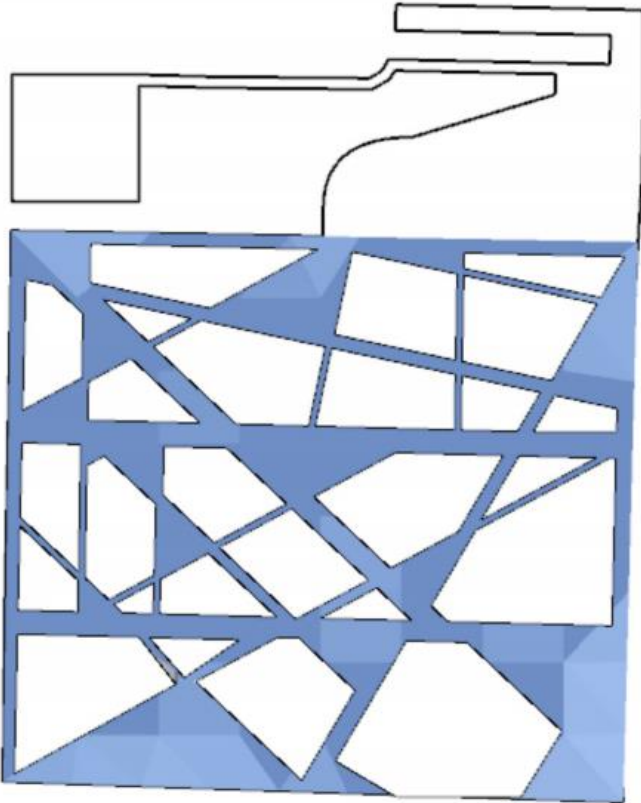
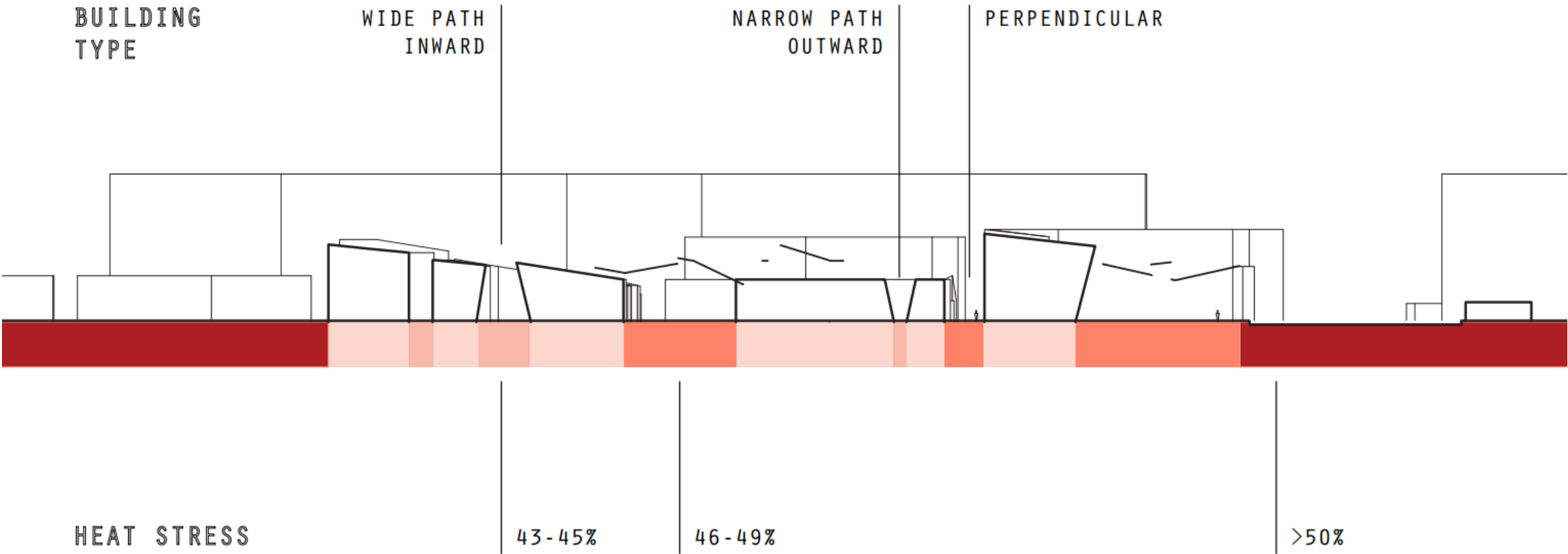


TO OBTAIN A FURTHER UNDERSTANDING ABOUT ON HOW TO  
CREATE THE IDEAL CONDITIONS IN THE SITE, AN  
INVESTIGATION HAS BEEN CONDUCTED USING “DESIGN  
EXPLORER” TO DETERMINE WHICH COMBINATION OF  
VARIABLES ARE CAPABLE OF ACHIEVING THE DESIRED  
CONDITIONS, WHICH ARE:

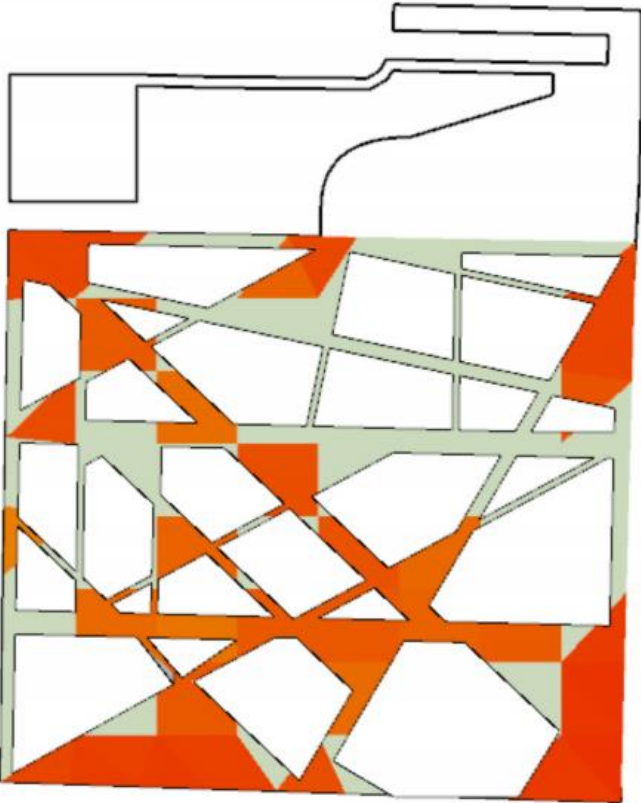
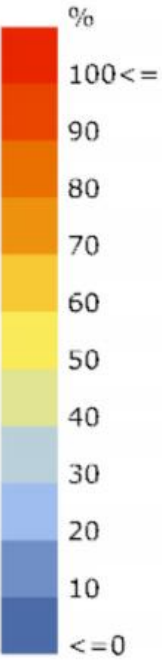
- INCREASING OUTDOOR COMFORT
- DECREASING HEAT STRESS
- SUFFICIENT INDOOR DAYLIGHTING



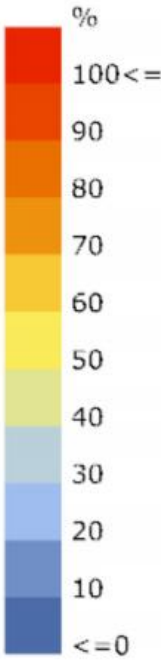
# HEAT STRESS ANALYSIS



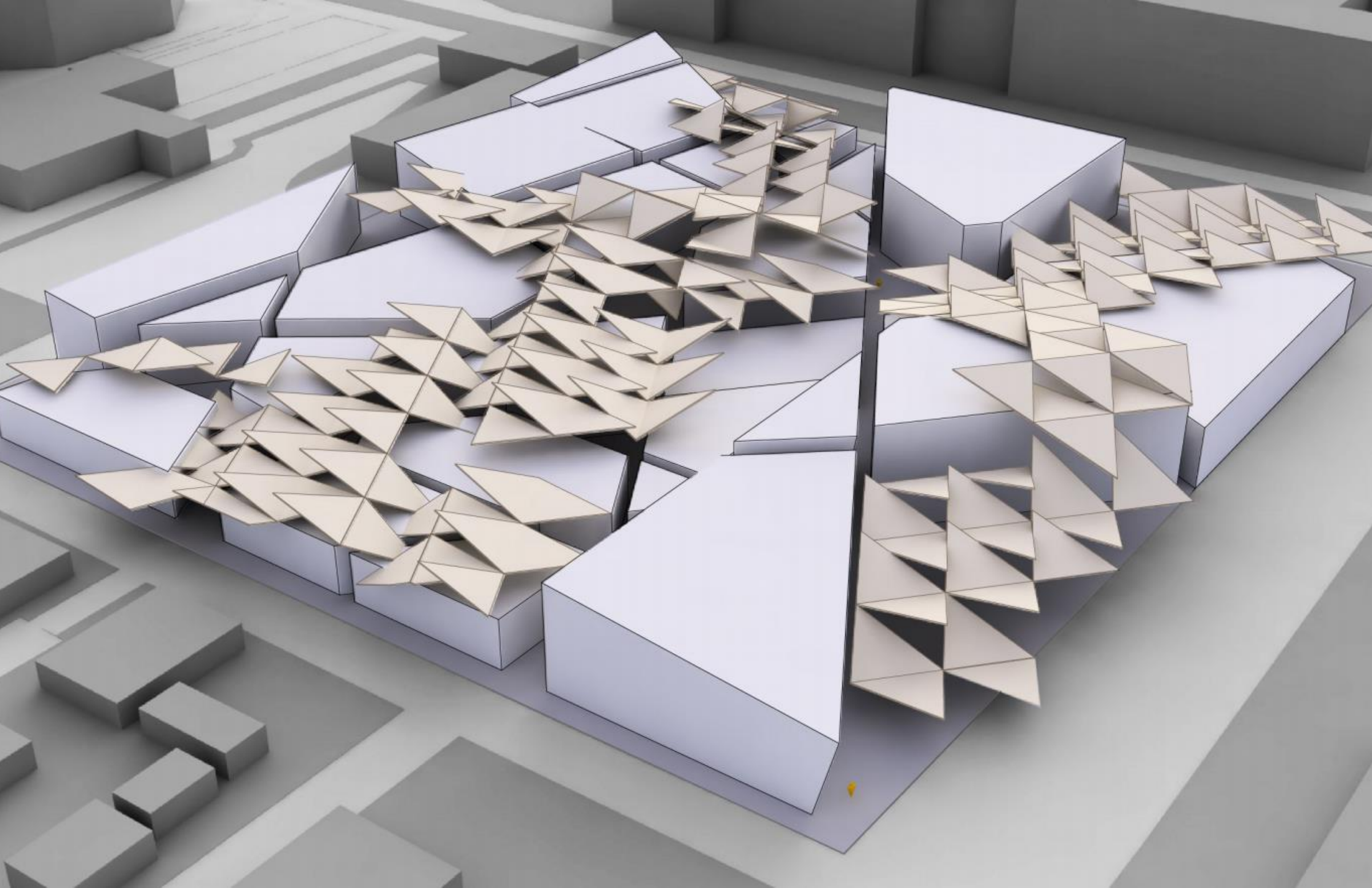
WINTER HEAT STRESS %



SUMMER HEAT STRESS %

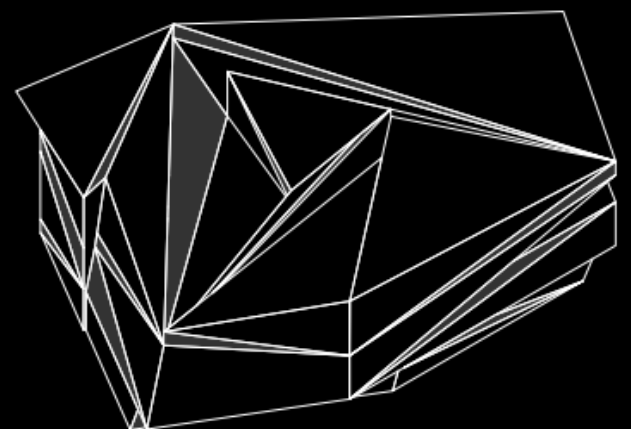
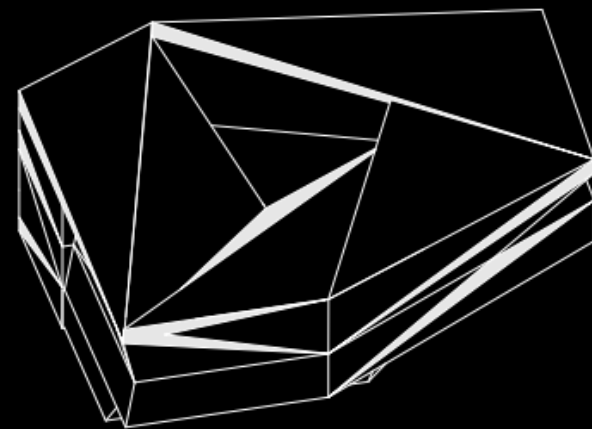
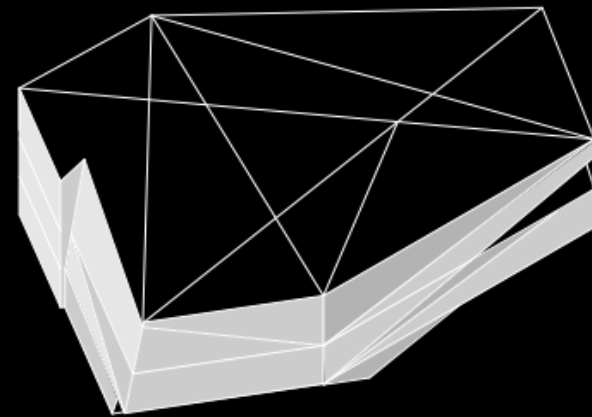
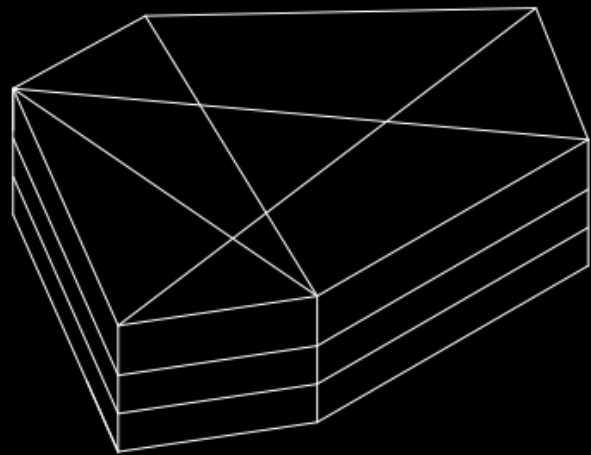
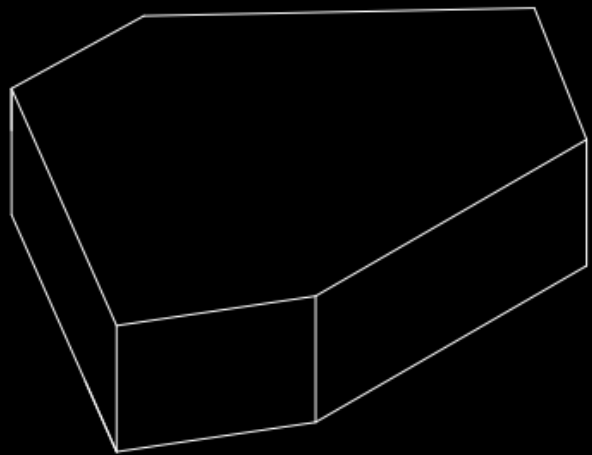








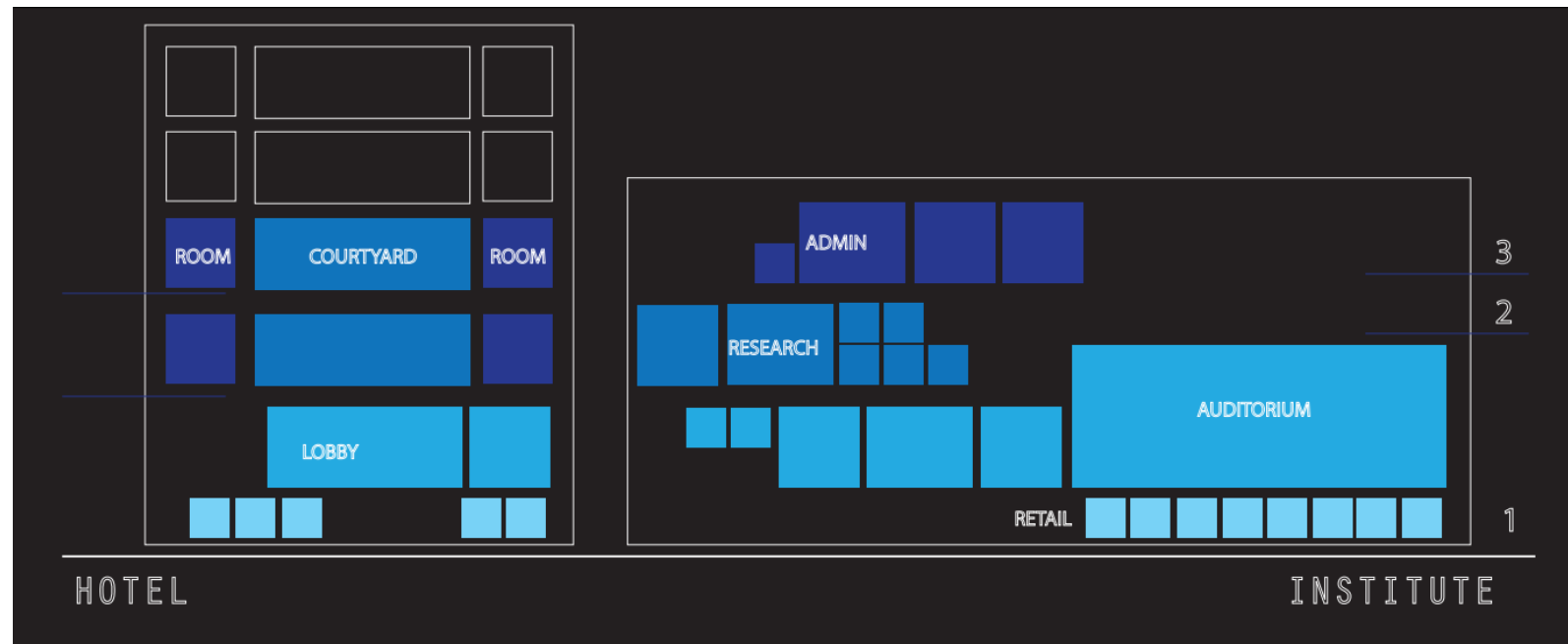
# THE INSTITUTE



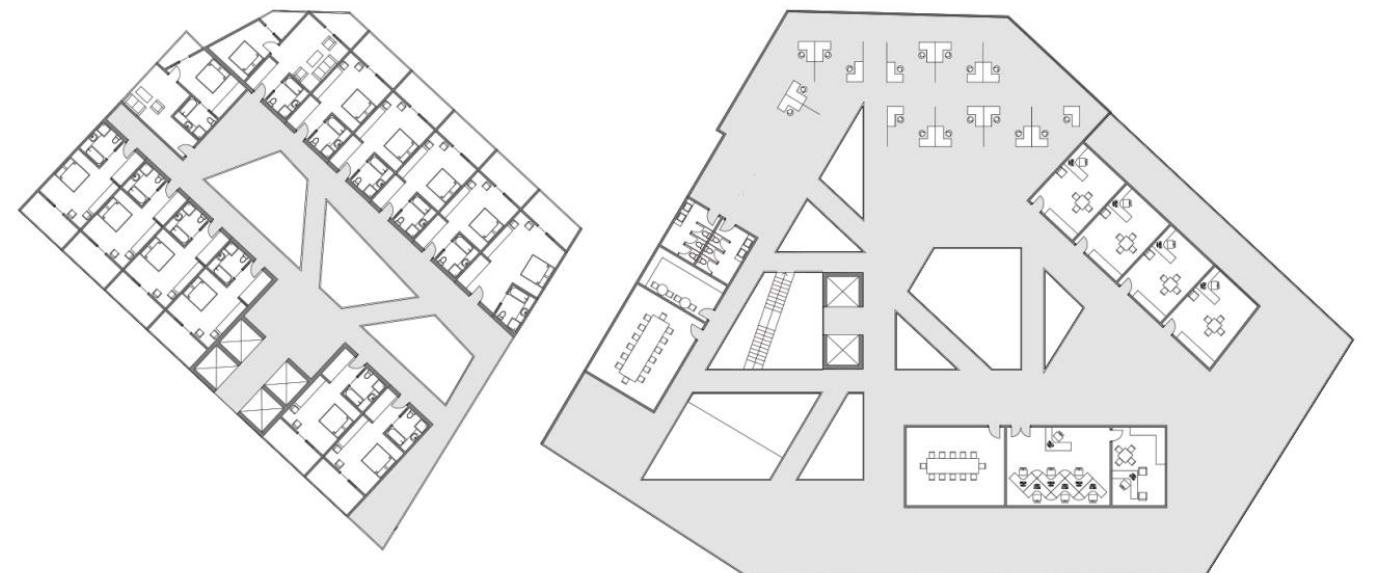
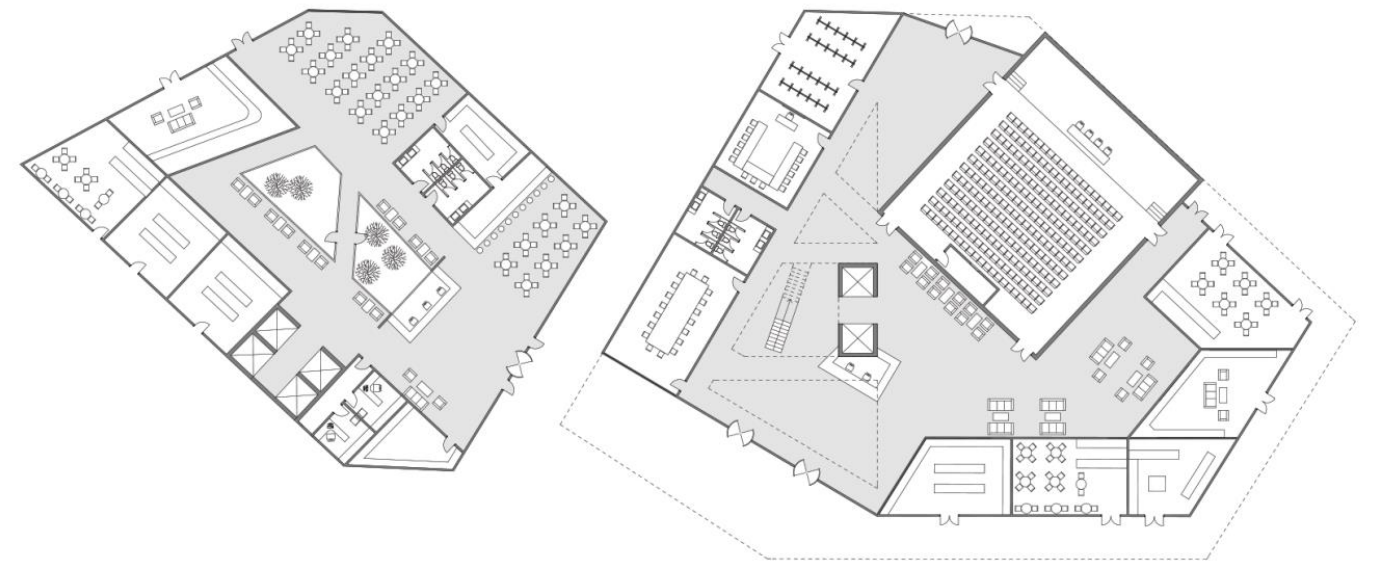


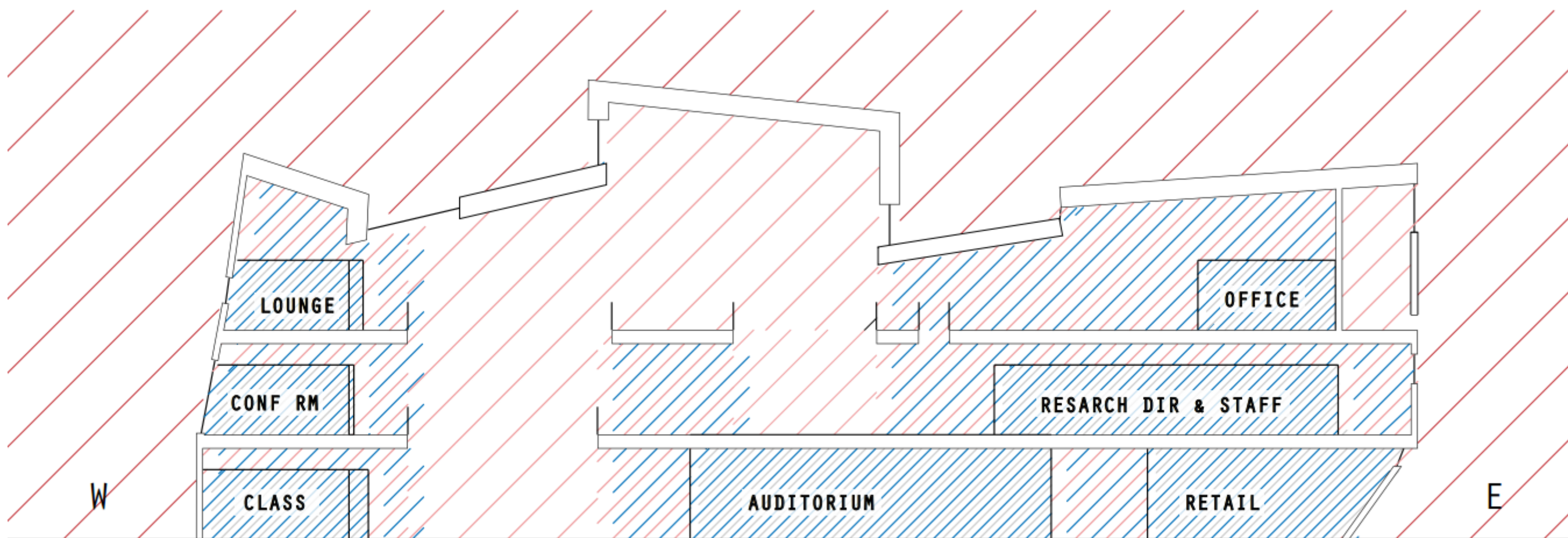
## THE PROGRAM:

The idea was to create and distribute the spaces based on the degree of how public or private they would be. In which the lower the floor, the more public. And vice versa.

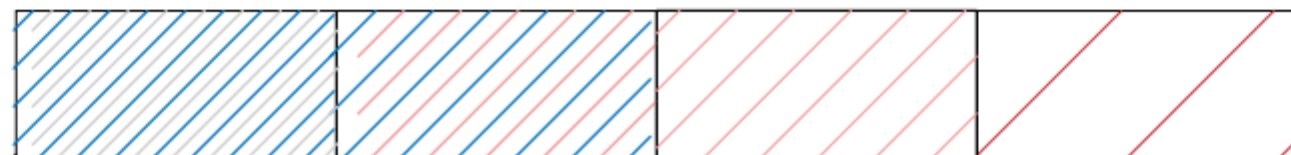


The main feature in the buildings would be the atriums and how “Bridges” connect the free flowing spaces .





INDOOR  
CONTROLLED



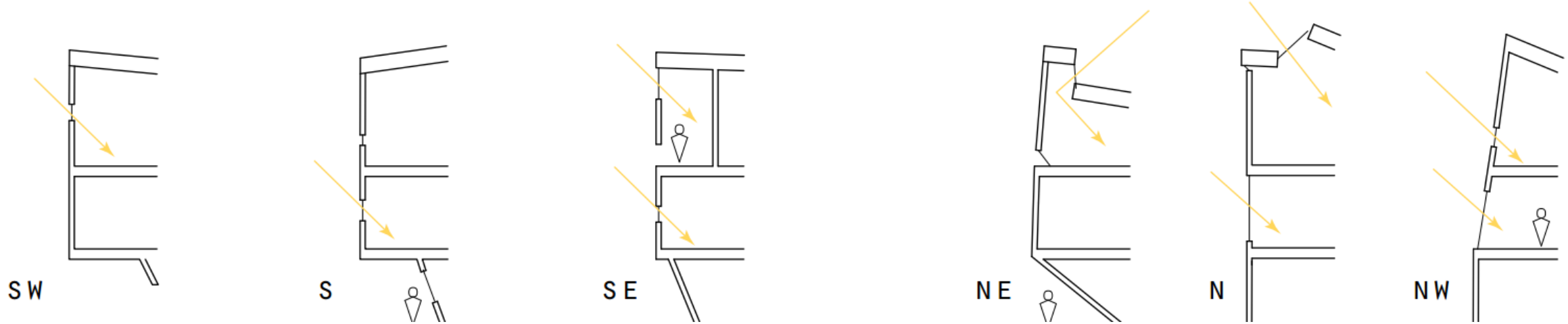
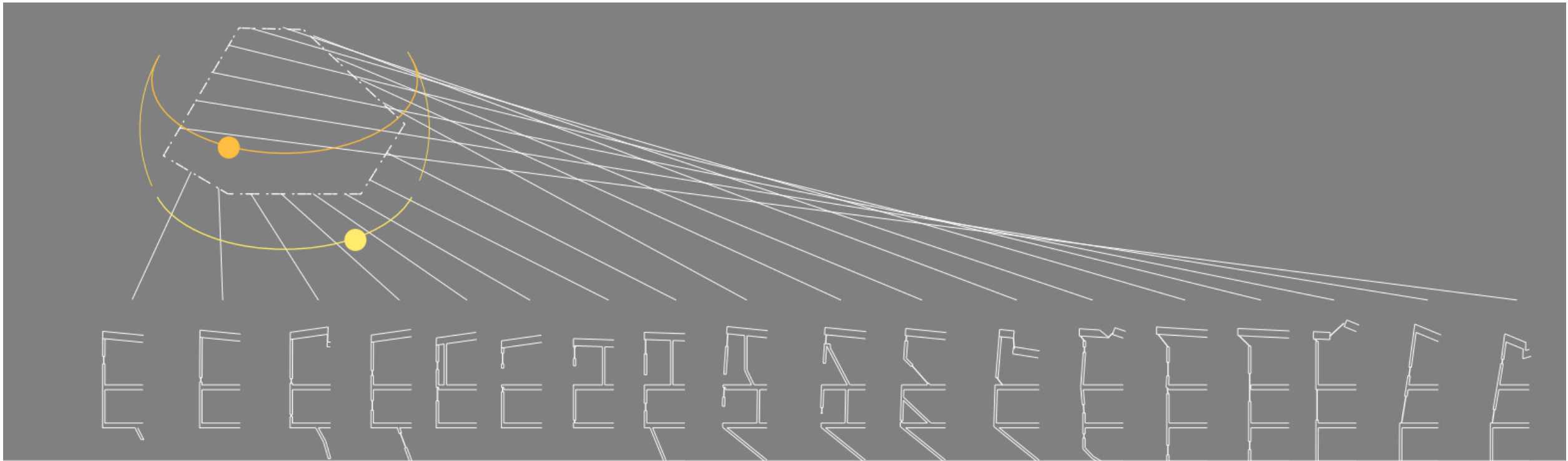
OUTDOOR  
NOT CONTROLLED



FAÇADE ITERATIONS:

To reach optimal daylight and comfort percentages indoors, an analysis was conducted to investigate the proper size, depth, angle of windows in the facades.

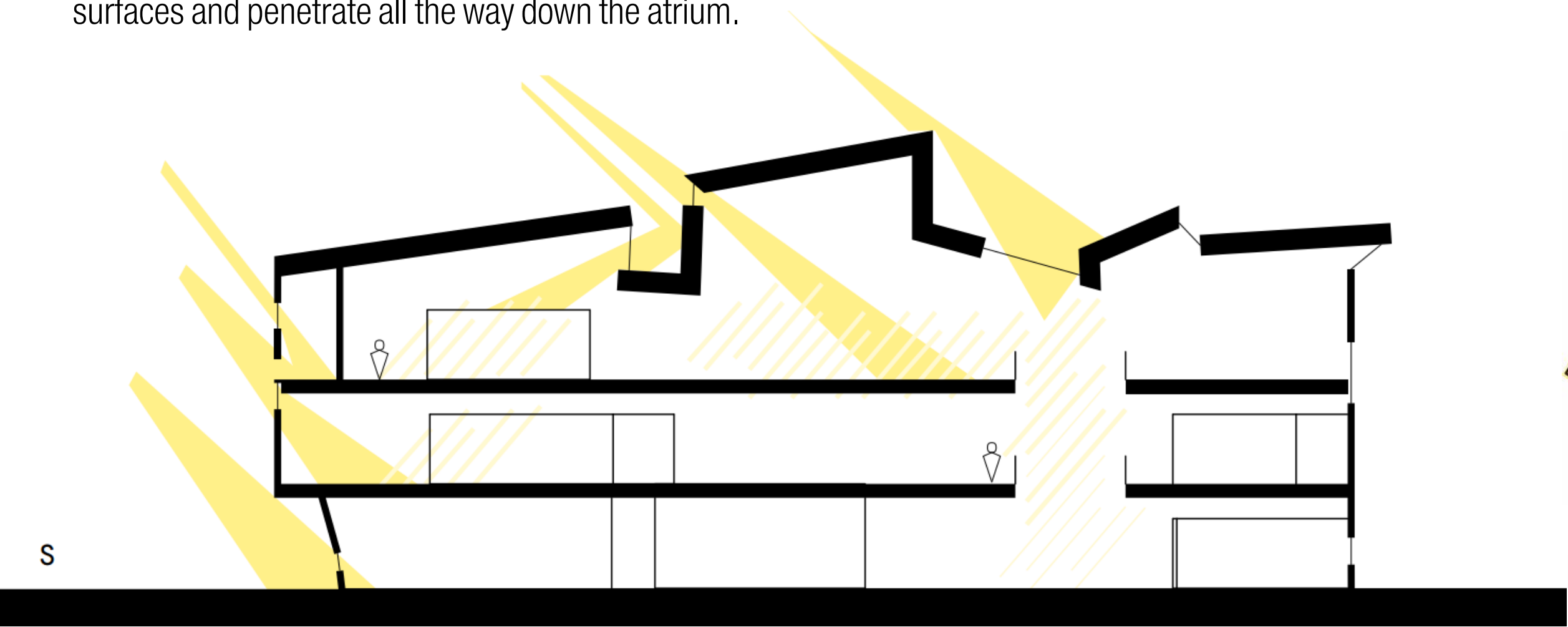
- THE VARIABLES:
- Dimension of openings
  - Depth of openings
  - Number of openings
  - Orientation of openings



DAYLIGHTING ANALYSIS:

Based on the findings in the façade iteration study, the façade was designed to allow optimal daylighting performance both for visual and thermal comfort.

The roof was also designed in the same language by allowing light to bounce of surfaces and penetrate all the way down the atrium.



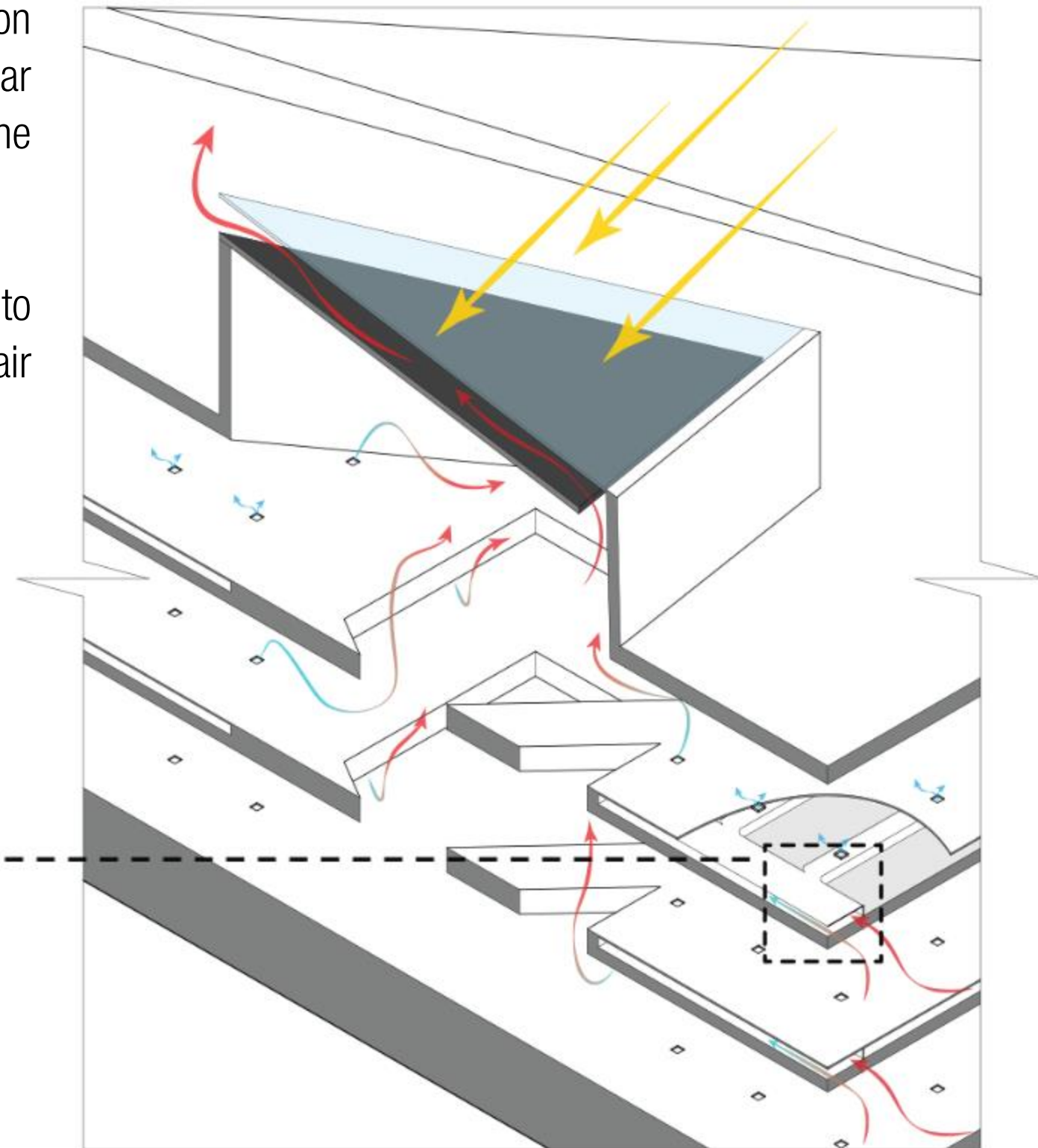
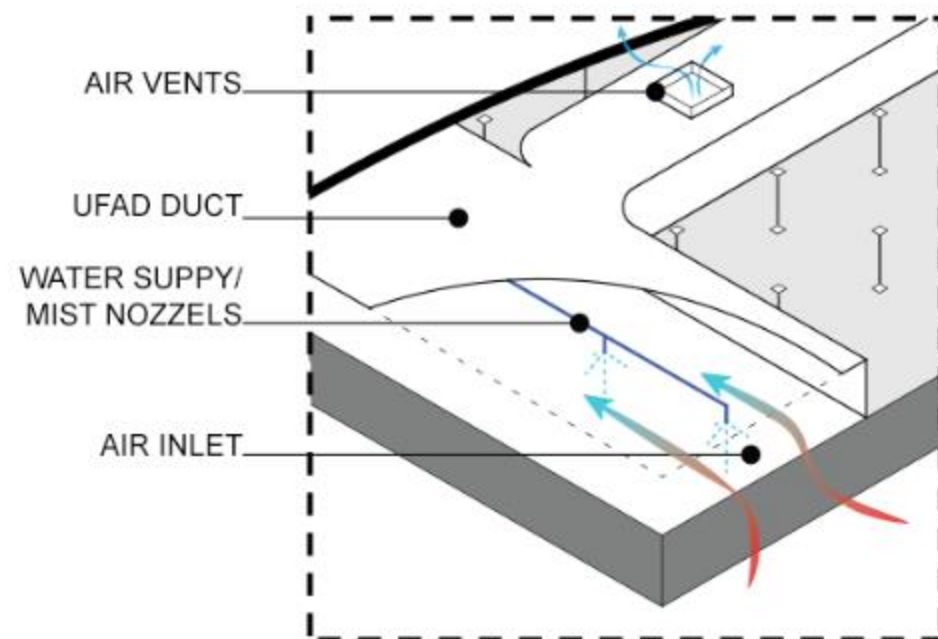
DF ABOVE 2% 

## INDOOR AIRFLOW:

The cooling method that was introduced is a stack-driven evaporative cooling system.

The indoor airflow shall be created by a buoyancy-driven, Underfloor Air Distribution system that is achieved by PV panels that serve as a heat source for the solar chimney. The system could potentially allow for conduction to occur through the raised floor and slab.

Due to the high temperature of outdoor air, it is useful to cool down the air prior to entering indoor spaces by passing it first through a misting system before the air makes its way out through the solar chimney.





## CFD ANALYSIS:

To investigate the performance of this proposed system, a CFD analysis was conducted to determine the effectiveness in increasing indoor thermal comfort.

The input parameters...

Date **8/15**

Time **13:00**

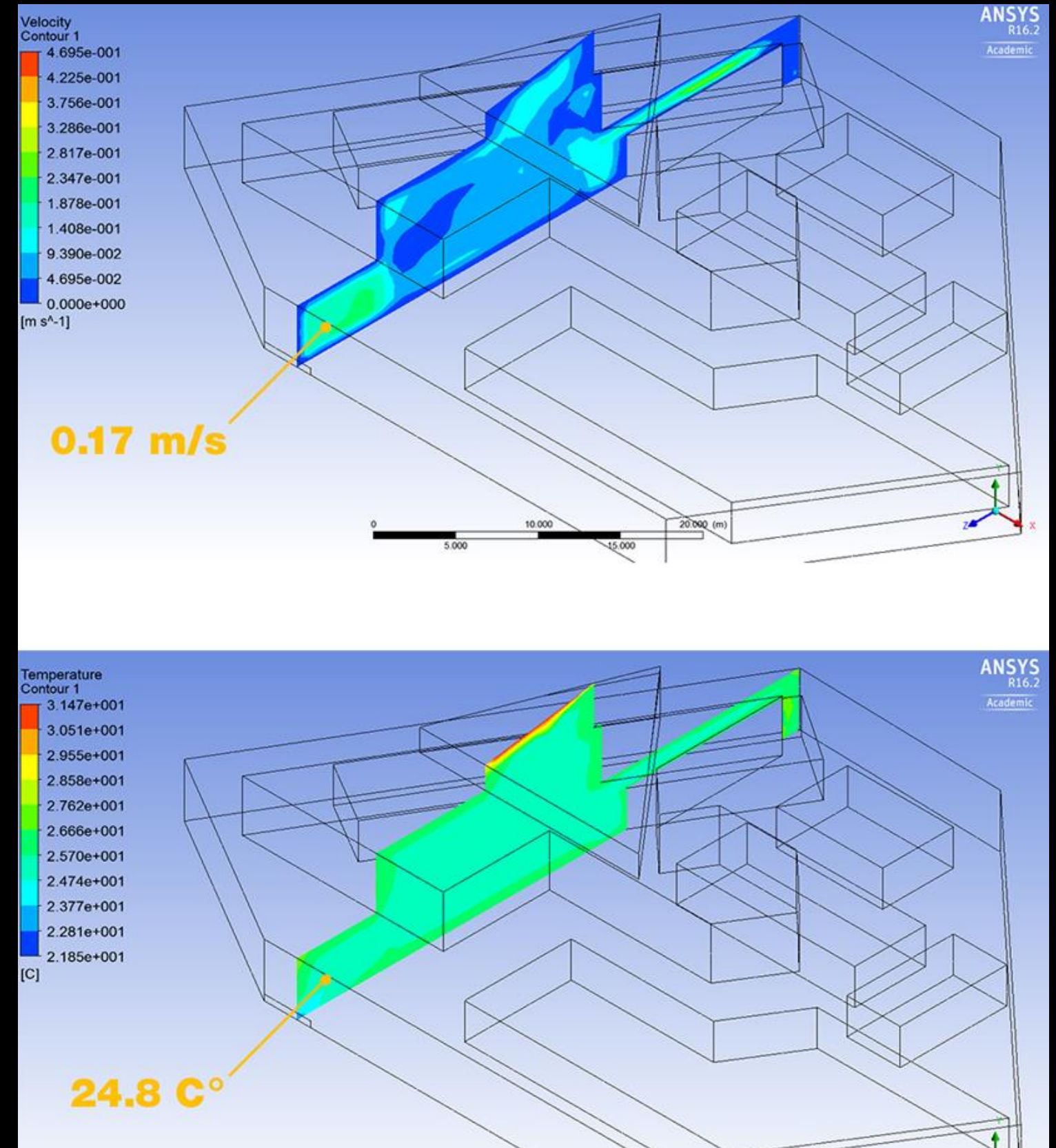
Outdoor temp **37C**

Outdoor air humidity **36%**

Temp. in inlet **22C**

Air velocity in inlet **0.2 m/s**

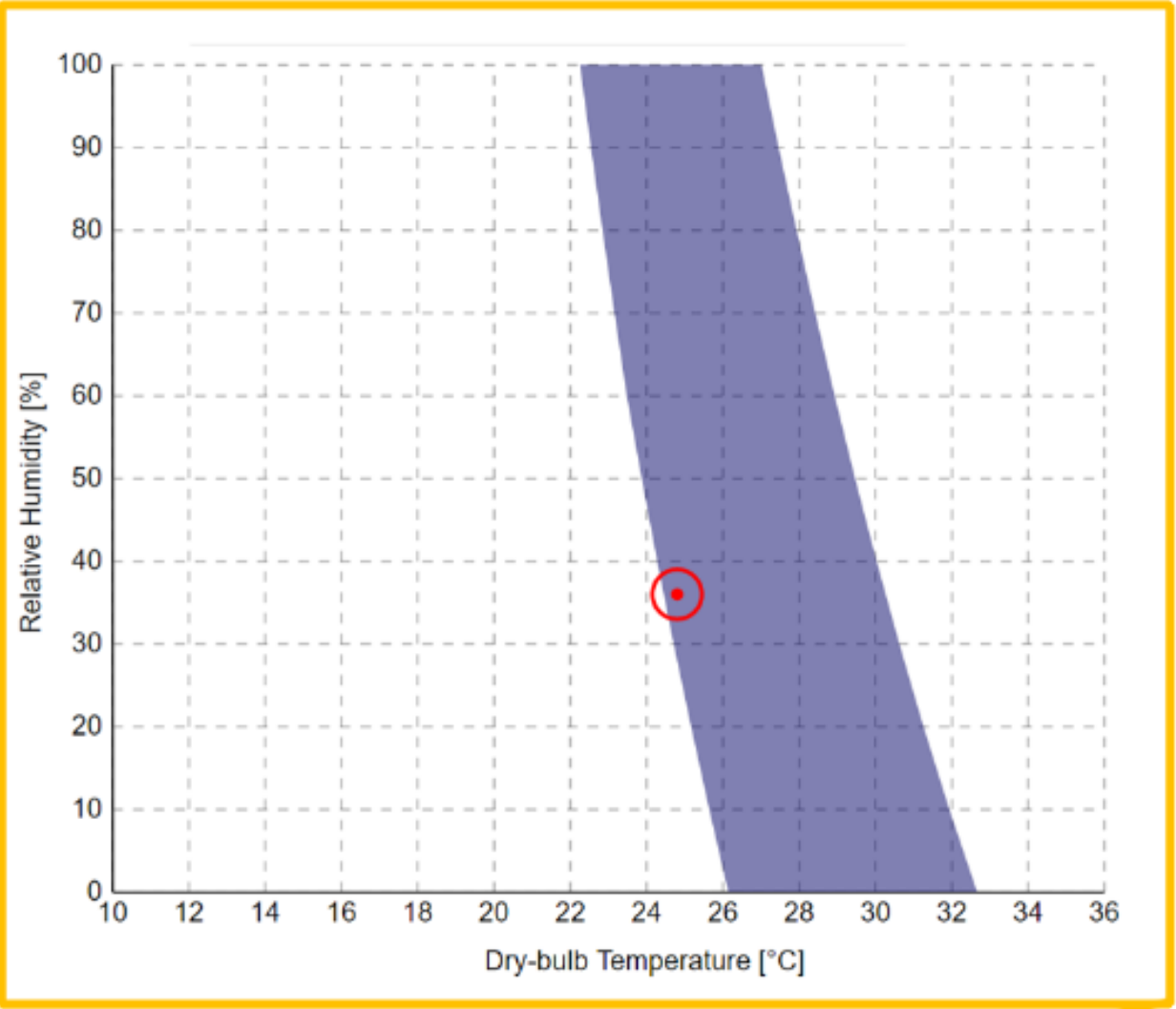
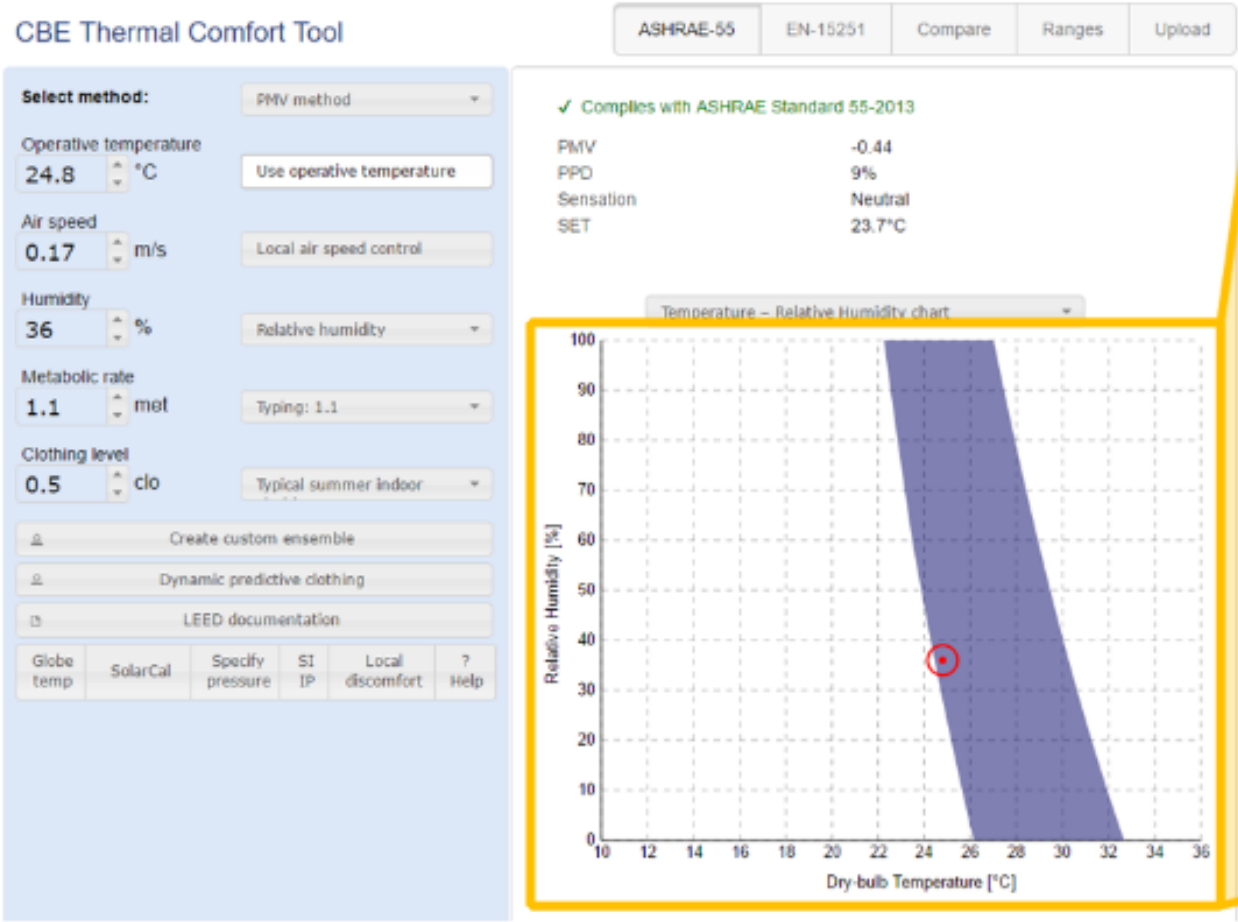
Choosing a single point within the space, the airflow speed decreases upon entering indoor spaces. The Temperature is increased in the process.



CFD ANALYSIS RESULTS:

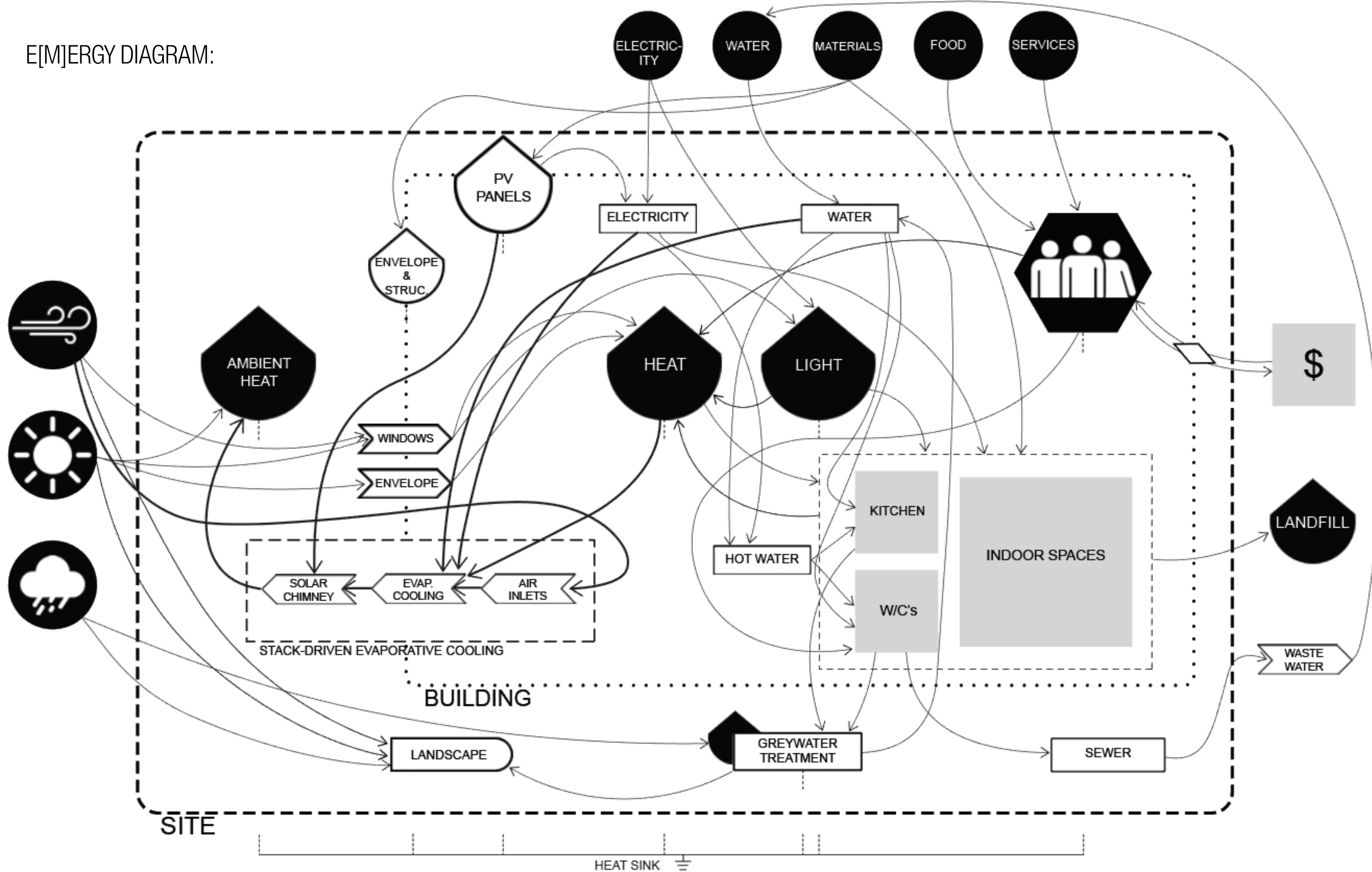
To further interpret the results and what they resemble in regards to indoor thermal comfort, the Center for Built Environment (CBE) Comfort Tool was utilized to analyze the results based on ASHRAE 55-2013 standards.

It was determined that the results at the specified test point comply with ASHRAE comfort standard.

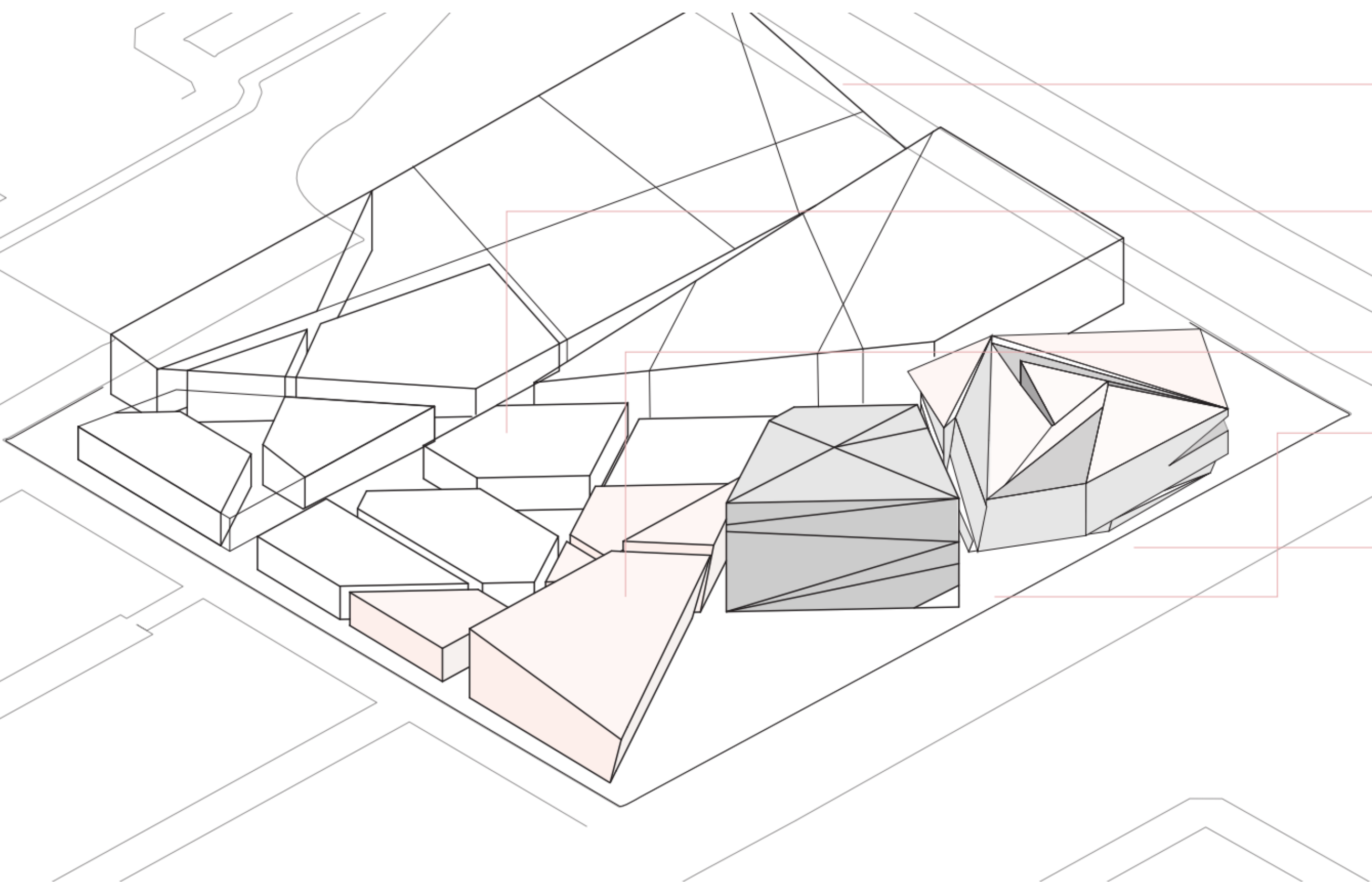




E[M]ERGY DIAGRAM:







BREAKING THE SITE UP  
WITH PATHWAYS TO CREATE  
MANAGABLE BLOCKS

EXTRUSION OF CUTS TO  
MAKE BUILDING BLOCKS

MANIPULATION OF BUILDINGS  
BLOCKS TO SHADE ADJACENT PATHS  
AND BUILDING ITSELF

FURTHER CARVING TO  
REVEAL OUTDOOR SPACES  
AND BREAK APART FACADE

MITAGATION OF PERFORATIONS TO  
PROVIDE A COMFORTABLE  
EXPERIENCE FOR USER



