

# **ARCH633 Environmental Systems I**

## **Assignment 4: Outdoor Comfort Simulation**

**Yefan Zhang**

## Site Basic Information



Campus Map



Perelman Quadrangle Map

**Location:**

Perelman Quadrangle, between College Hall & Houston Hall

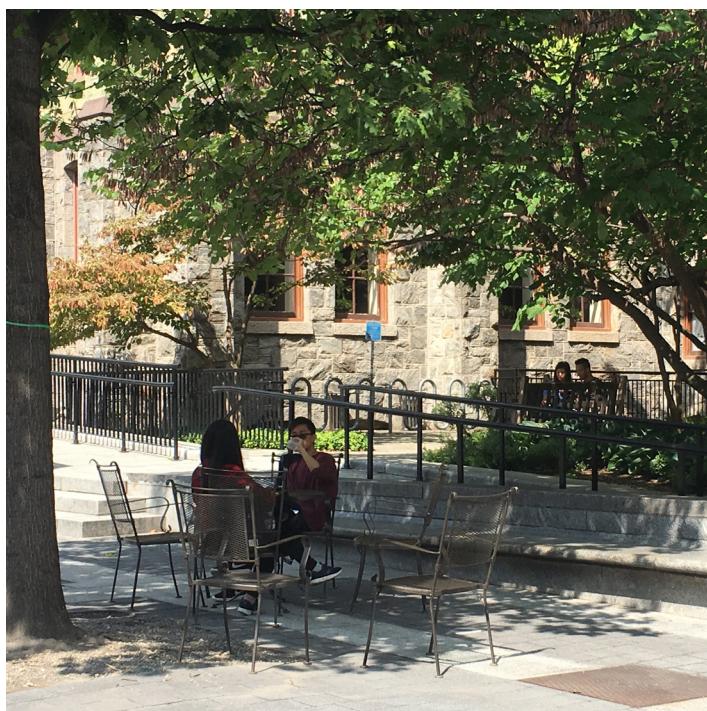
**Area:**

20,000 m<sup>2</sup>

## Site Photos Documentation



Site Condition

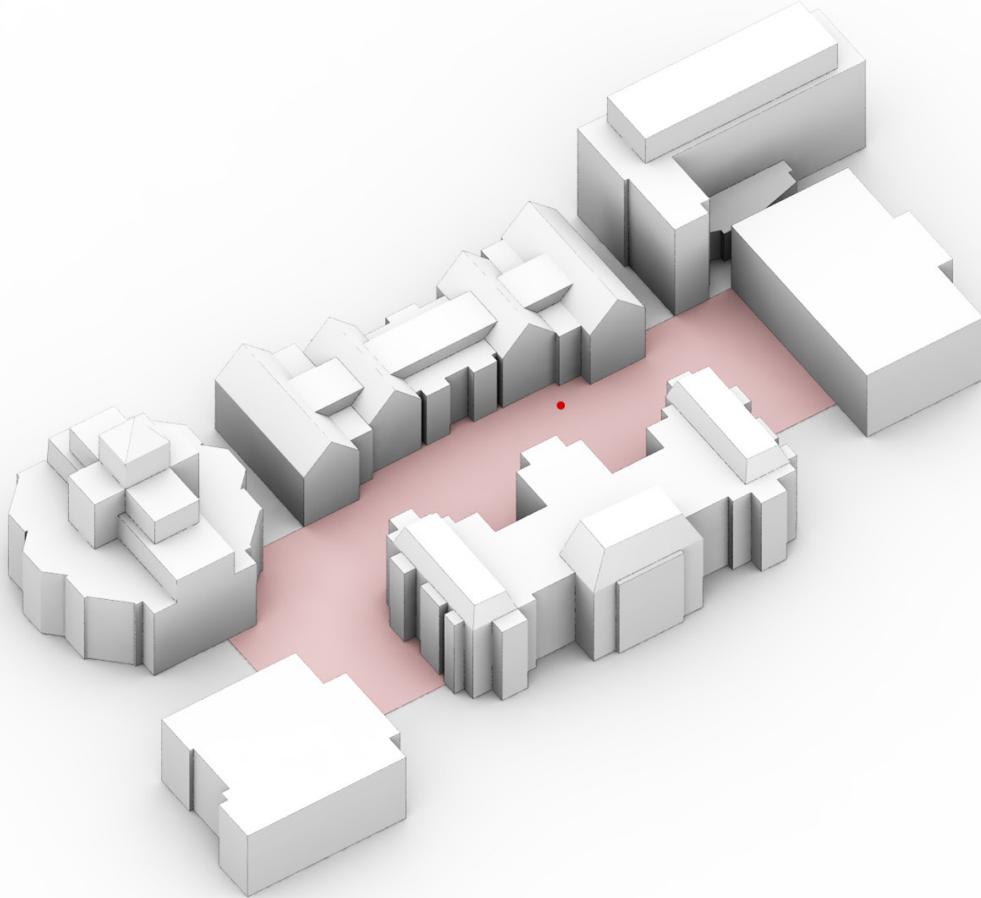


Sitting Condition

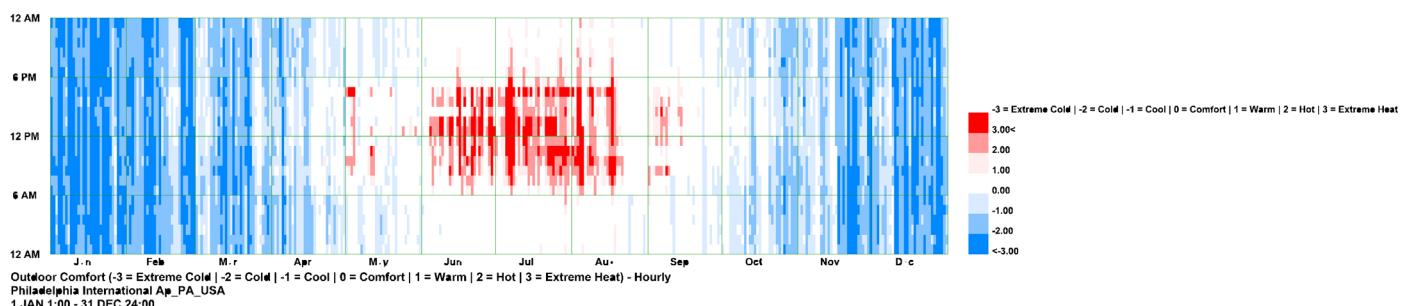
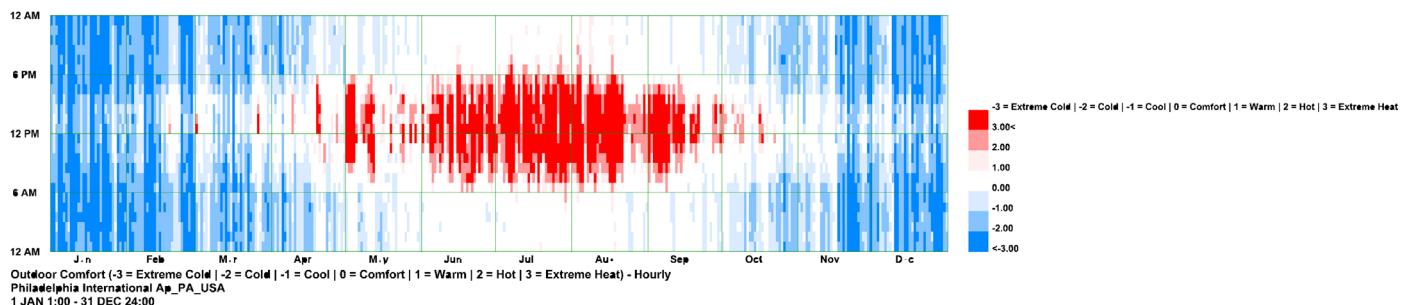
### Different Types of Sitting Space:

Iron seats in sunshine / Iron seats in shadow  
Masonry seats in sunshine / Masonry seats in shadow

## Original Site



Location Picked On Site



Outdoor Comfort Chart

**Percentage of Comfortable Hours during the Year:**

**37.9%**

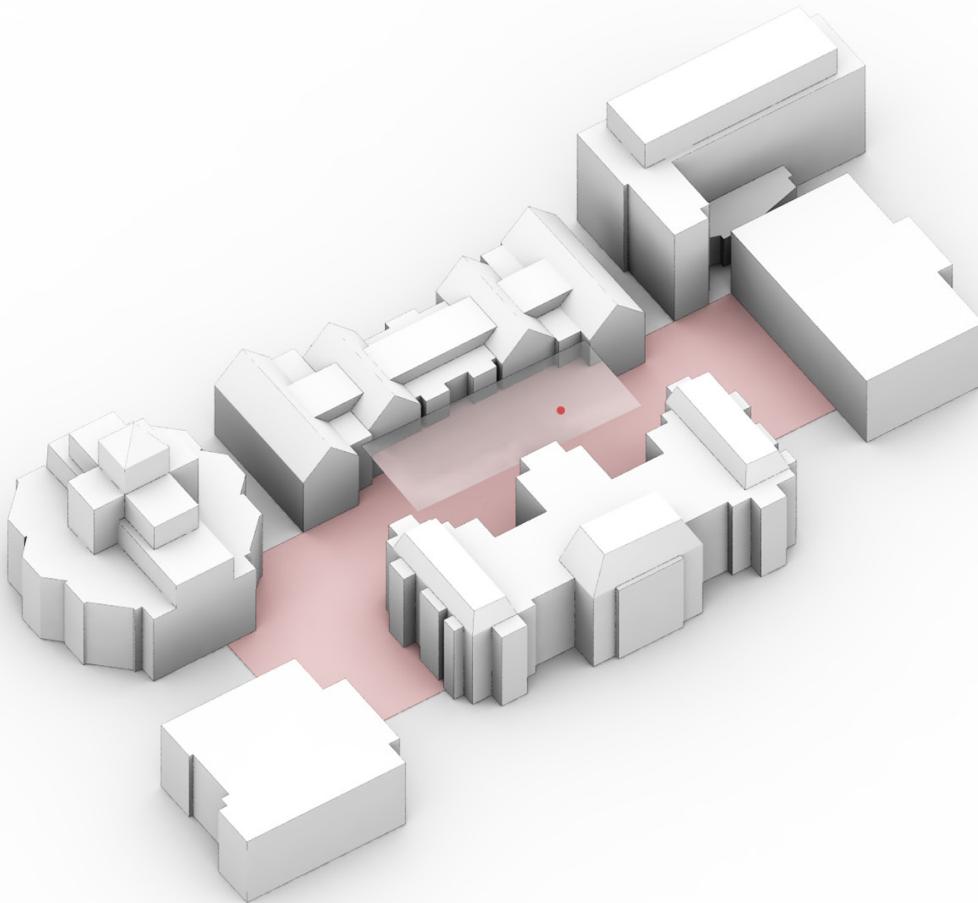
**Percentage of Heat Stress during the Year:**

**6.6%**

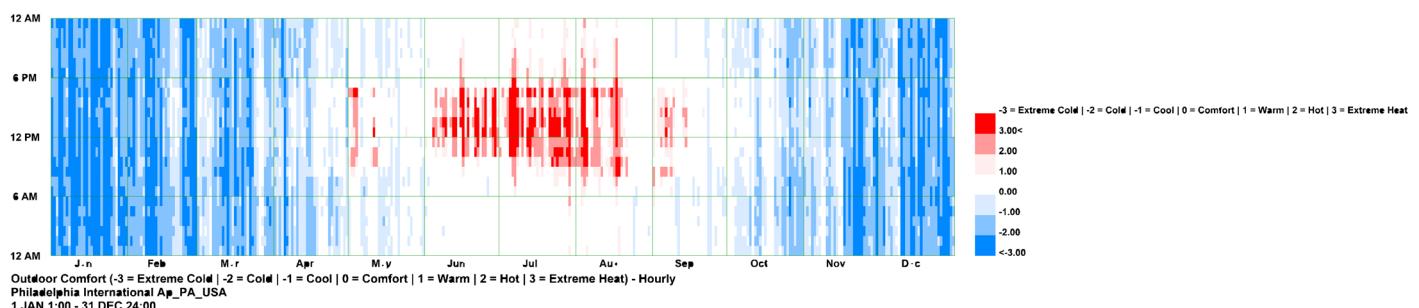
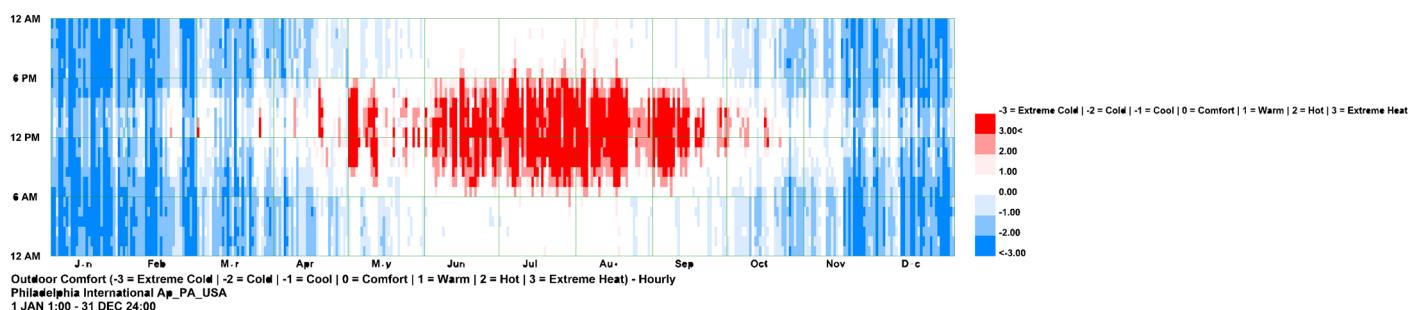
**Percentage of Cold Stress during the Year:**

**35.1%**

## Strategy 1: Add a Big Canopy



Location Picked On Site



Outdoor Comfort Chart

**Percentage of Comfortable Hours during the Year:**

**39.5%**

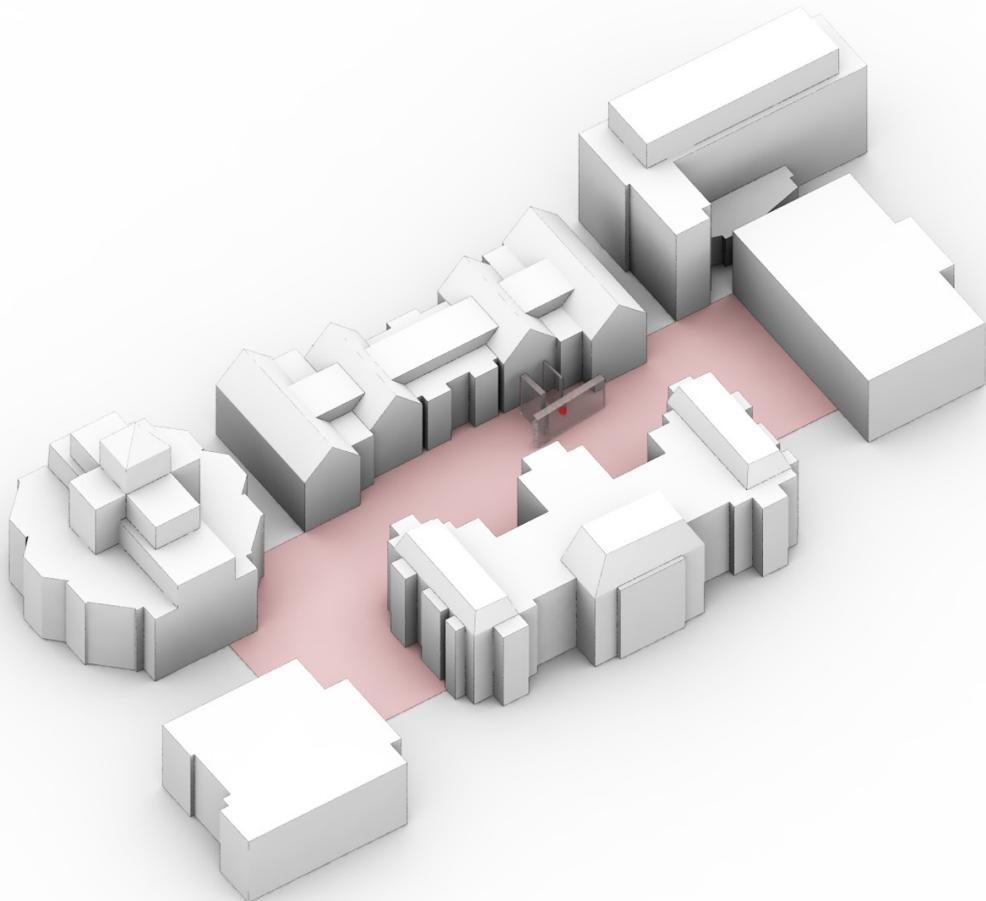
**Percentage of Heat Stress during the Year:**

**5.1%**

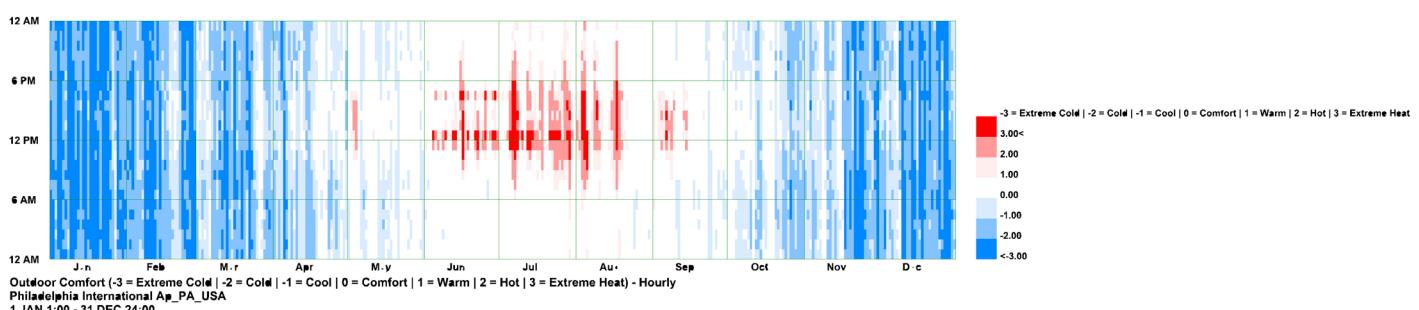
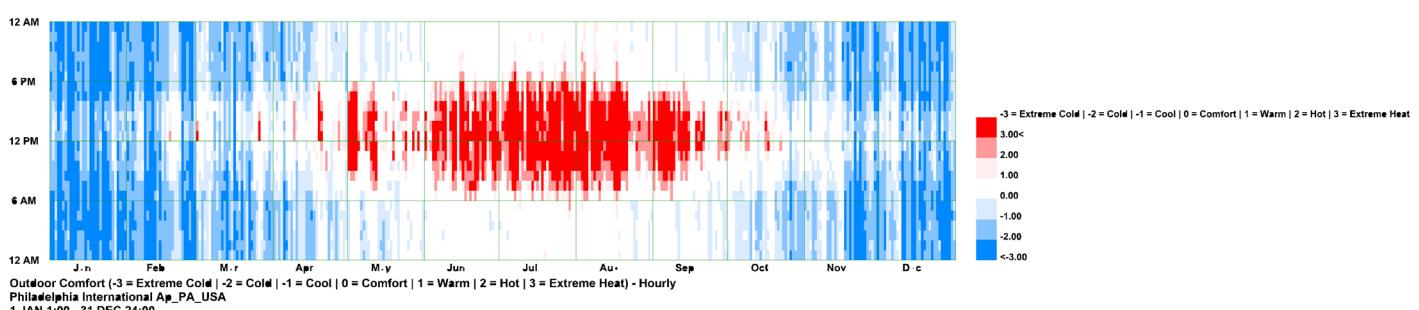
**Percentage of Cold Stress during the Year:**

**34.5%**

## Strategy 2: Landscape Design



Location Picked On Site



Outdoor Comfort Chart

**Percentage of Comfortable Hours during the Year:**

**40.6%**

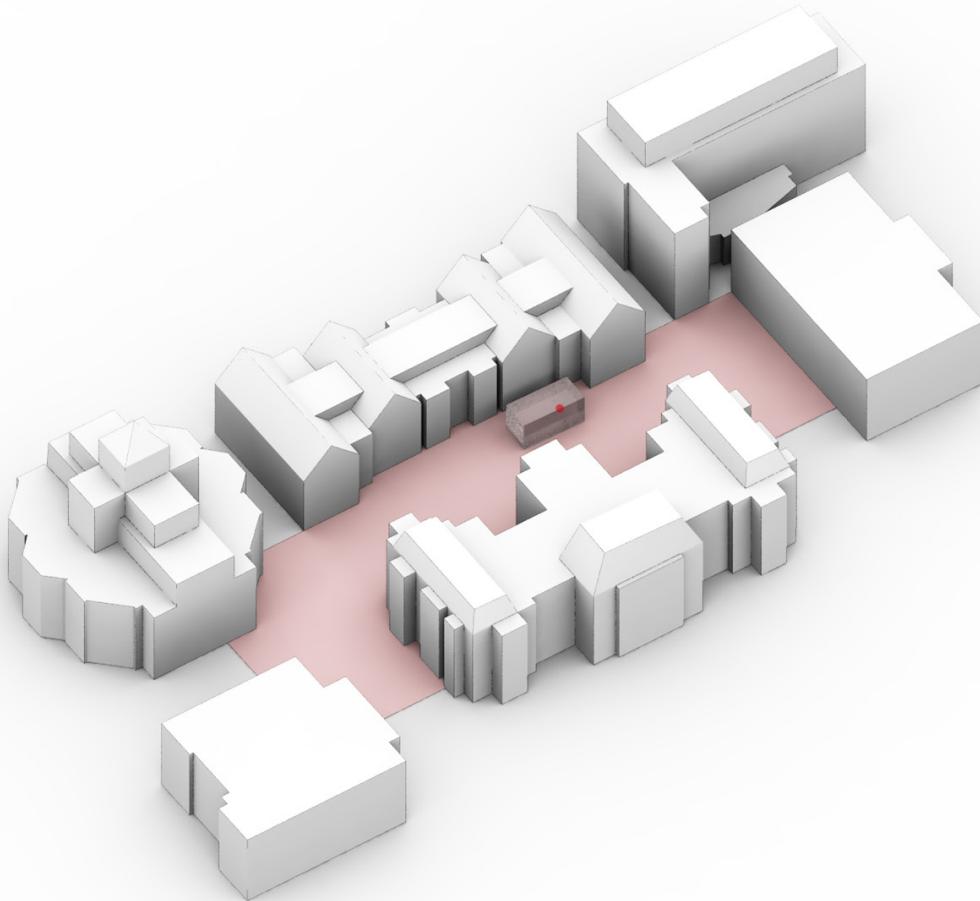
**Percentage of Heat Stress during the Year:**

**3.5%**

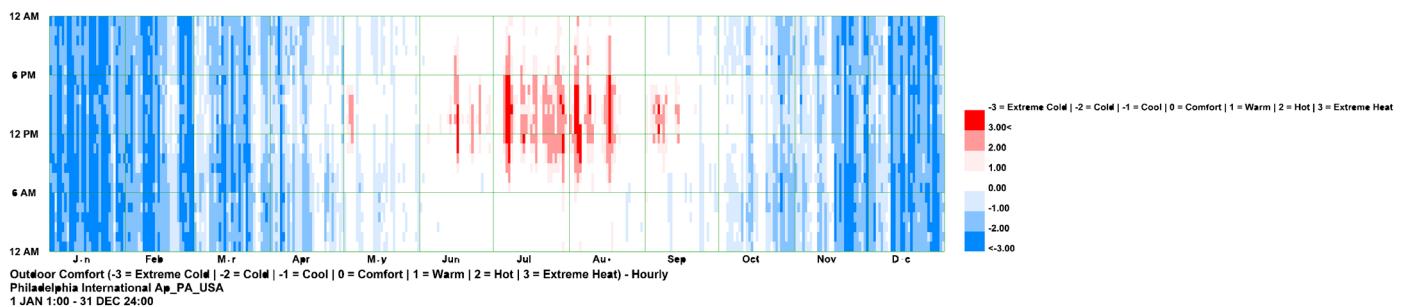
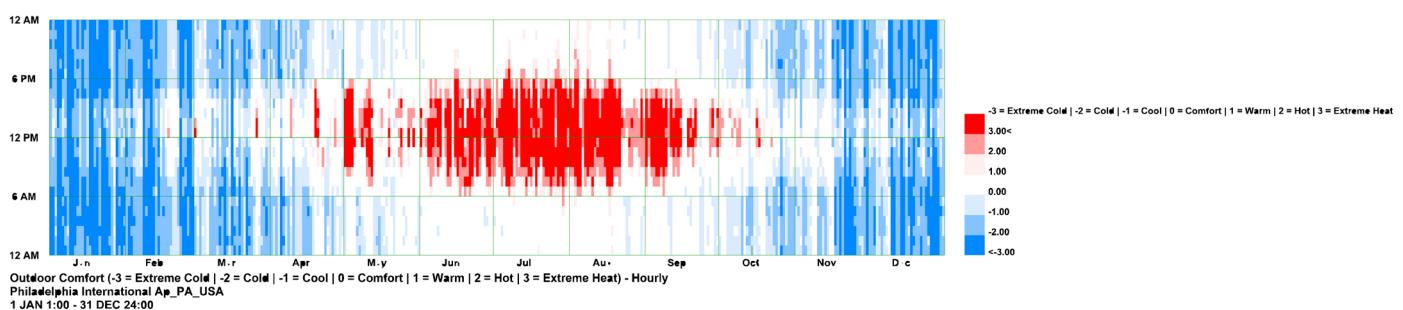
**Percentage of Cold Stress during the Year:**

**34.2%**

## Strategy 3: Build a Green House



Location Picked On Site



Outdoor Comfort Chart

**Percentage of Comfortable Hours during the Year:**

**43.3%**

**Percentage of Heat Stress during the Year:**

**2.5%**

**Percentage of Cold Stress during the Year:**

**30.3%**

## **Summary**

### **3 Different Passive Design Strategies:**

1. The first strategy is to add a big canopy across the plaza area, which could slightly block some sunlight during the hot days but not apparently, so does in cold days. The main reason perhaps is that the position selected is in front of the Houston Hall on the south, which is already in shadow area during most time of the day. The percentage of comfortable hours during the year is 39.5%.
2. The second strategy is to improve the outdoor comfort condition by some landscape design, including building partitions, sculpture walls or trees. However, because the landscape design cannot help to improve the thermal performance in outdoor space, the heat and cold stress also doesn't improve much. Under this condition, the percentage of comfortable hours during the year is 40.6%.
3. The best passive design strategy is to build a glass greenhouse in the position area. The percentage of comfortable hours during the year could get the highest, 43.3%. It is difficult to increase annual comfort hours largely, because in outdoor space, it is impossible to control the temperature or humidity only through passive design without air conditioning or other active mechanism system. In addition, the position selected also is in a good condition, where most sunlight were blocked by the buildings on the south. Overall, to achieve 100% of time comfort is impossible for Philadelphia.