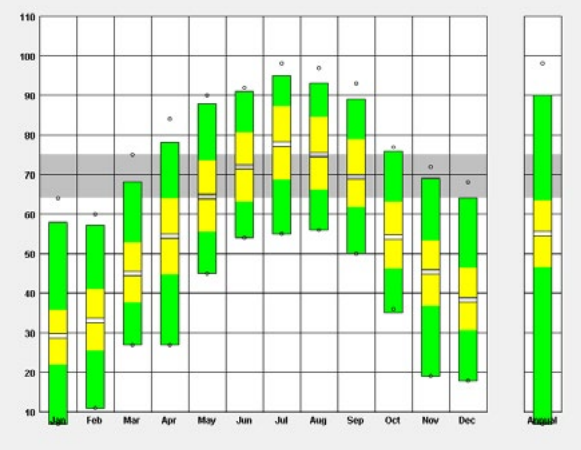
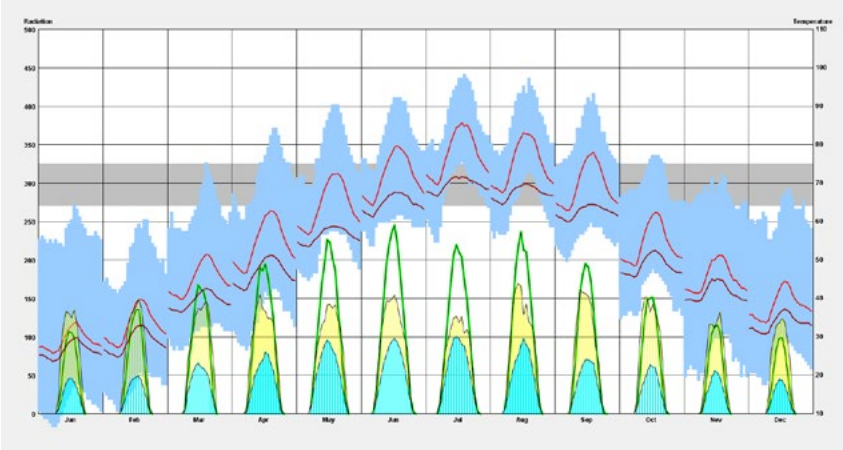
WEATHER REPORT
PHILADELPHIA

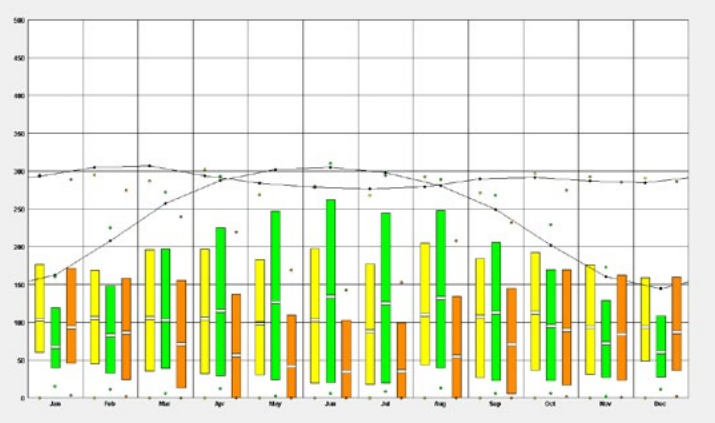
Yuchen LIU



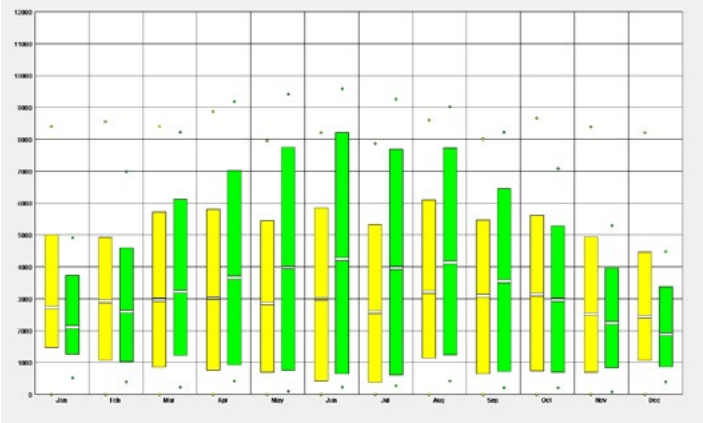
Temperature is below the comfort zone most time of the year. May - Sept is comforting compare to other months.



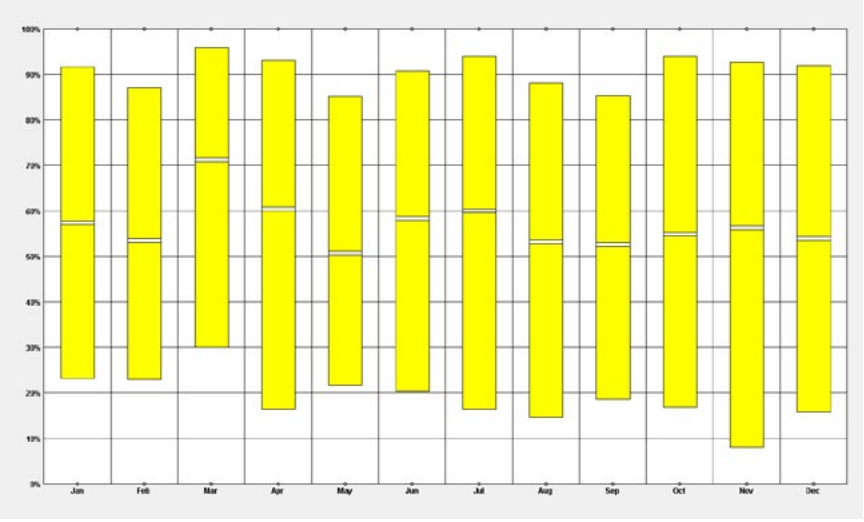
The air temperature is comforting mostly in from May - Sept.



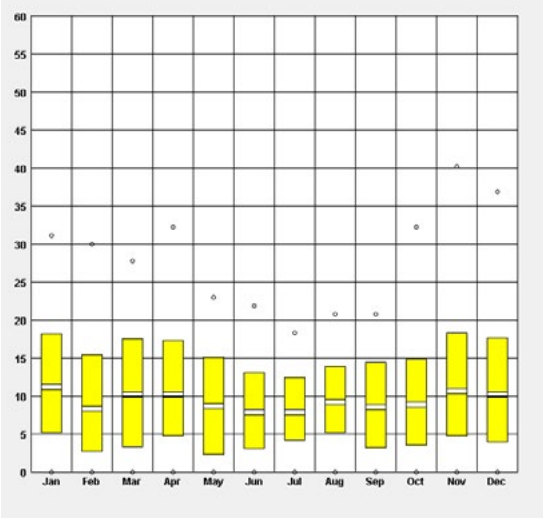
Radiation is getting higher in summer and lower in winter.



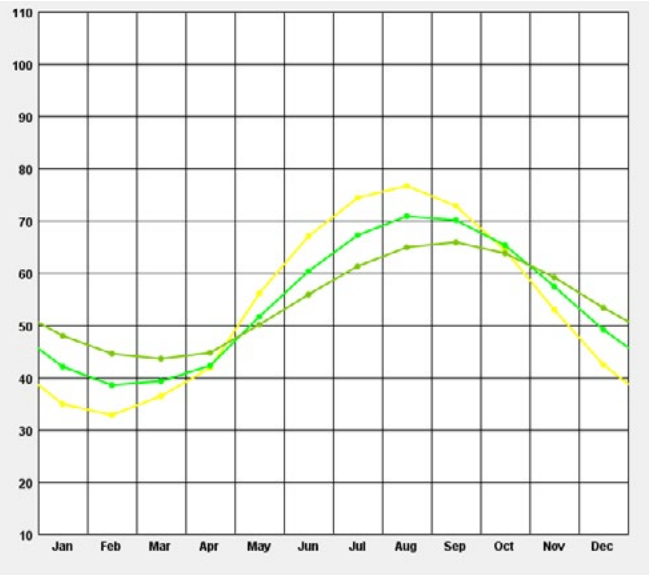
Illumination is getting higher in summer and lower in winter.



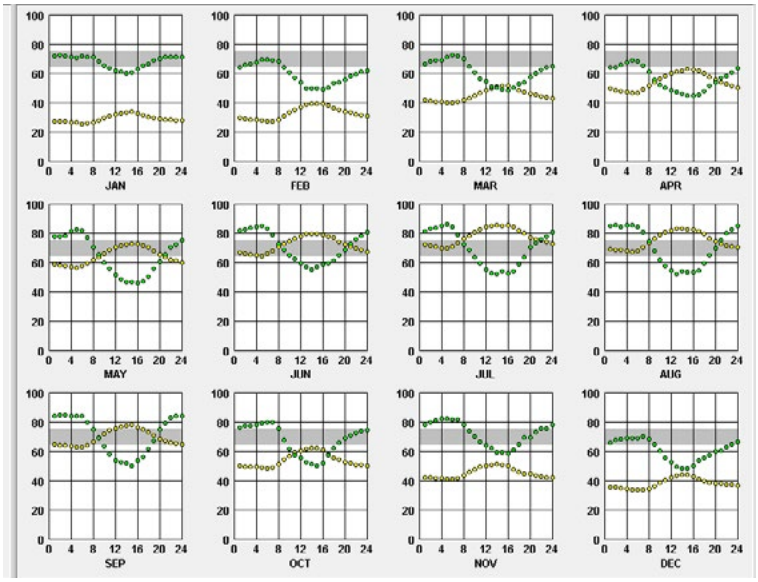
The average coverage of sky by clouds is around 50% -60% during the year.



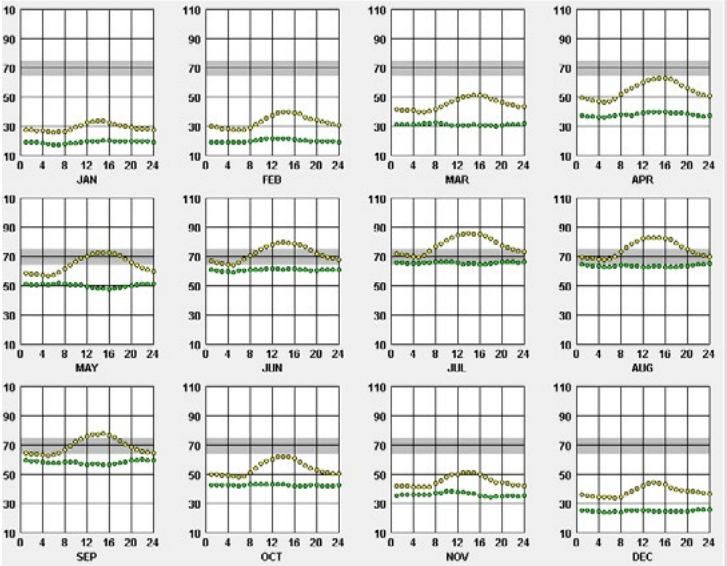
The annual average of the wind speed is around 10mph which is 4.47 m/s. The wind speed in Philadelphia is good for natural ventilation (openings) on building designs.



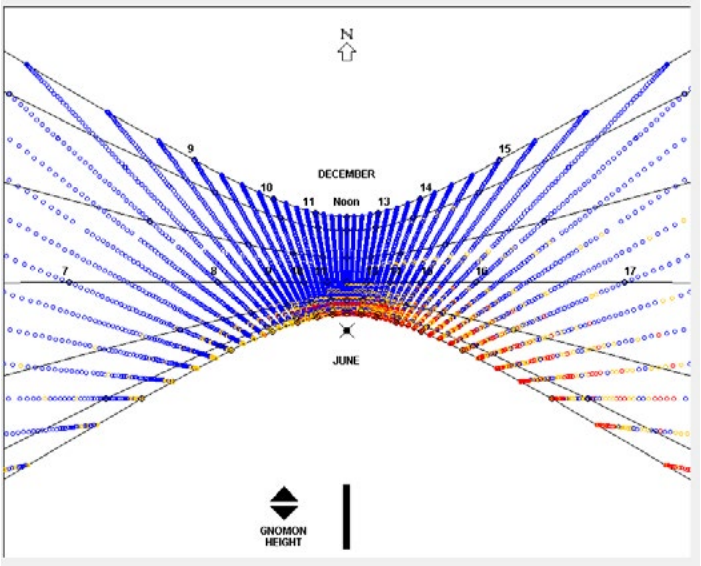
The ground temperature is comforting in July, Aug and Sept, which is around 70 F.



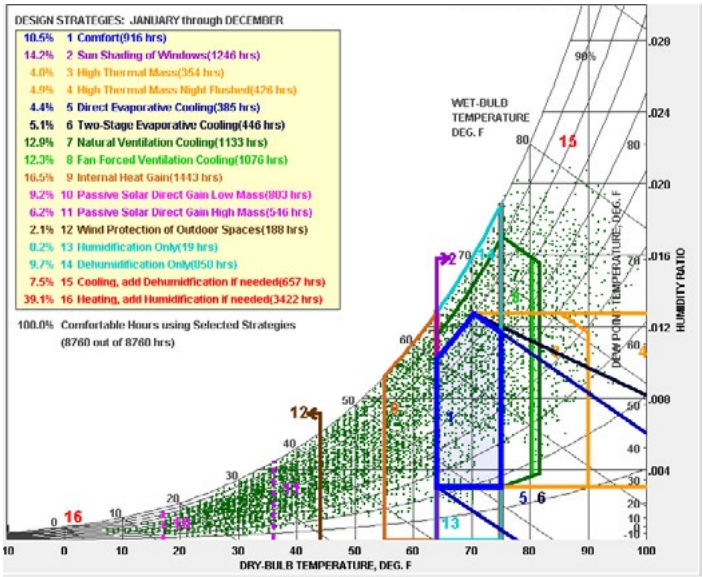
Relative humidity seems always around the comforting zone around the year.



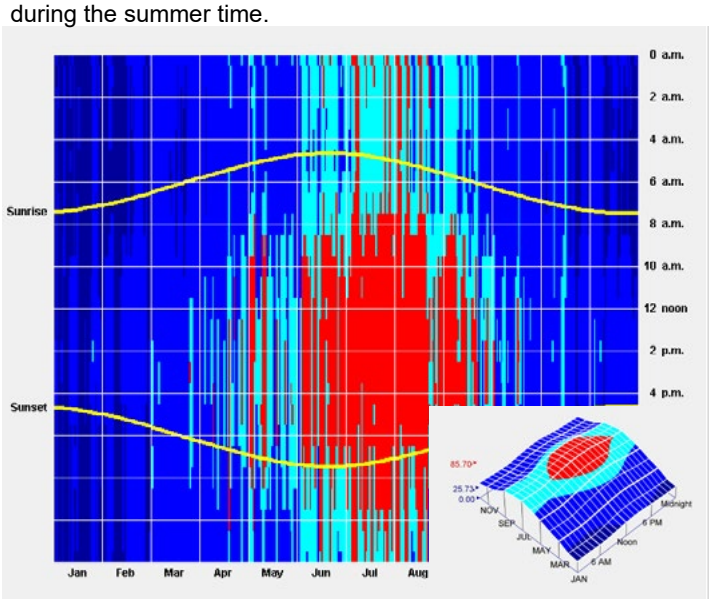
Dew point is always below the dry bulb.



Indoor heating is need during the winter. Shading is needed during the summer time.

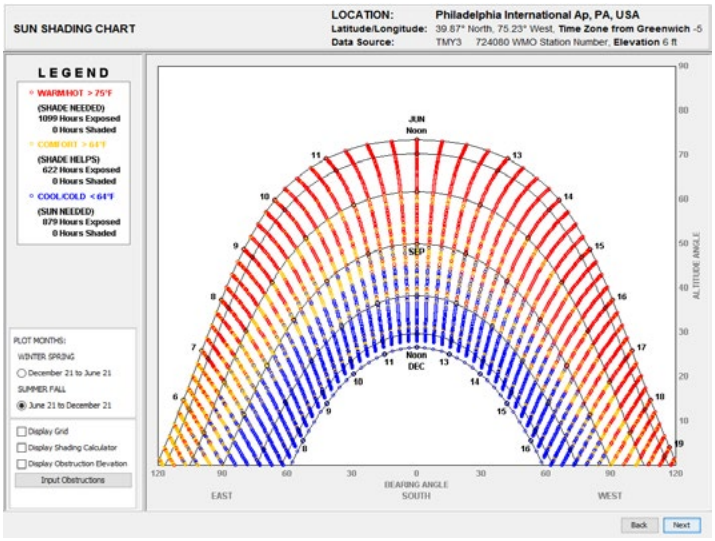


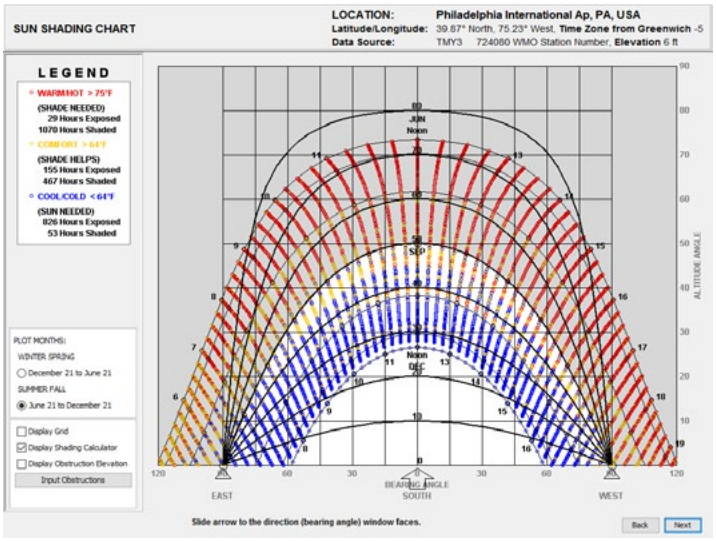
Strategies of getting most of the comforting time around a year. Heating and humidification is device is the most effective way to increase the comforting time.

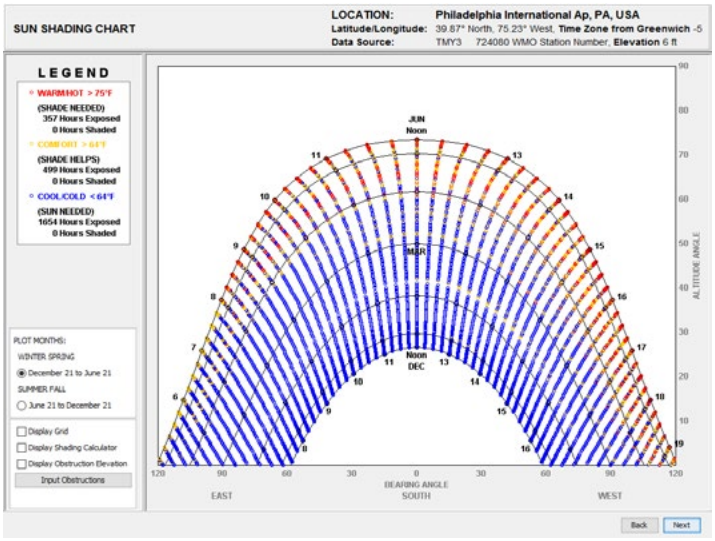


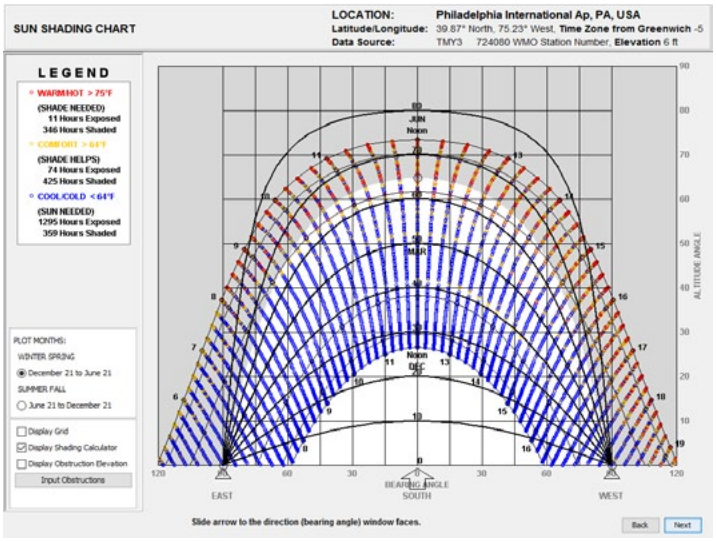
64% of the year is under cold weather, 14% of the year is under hot weather. This means heating is more important than cooling.

DESIGN STRATEGY







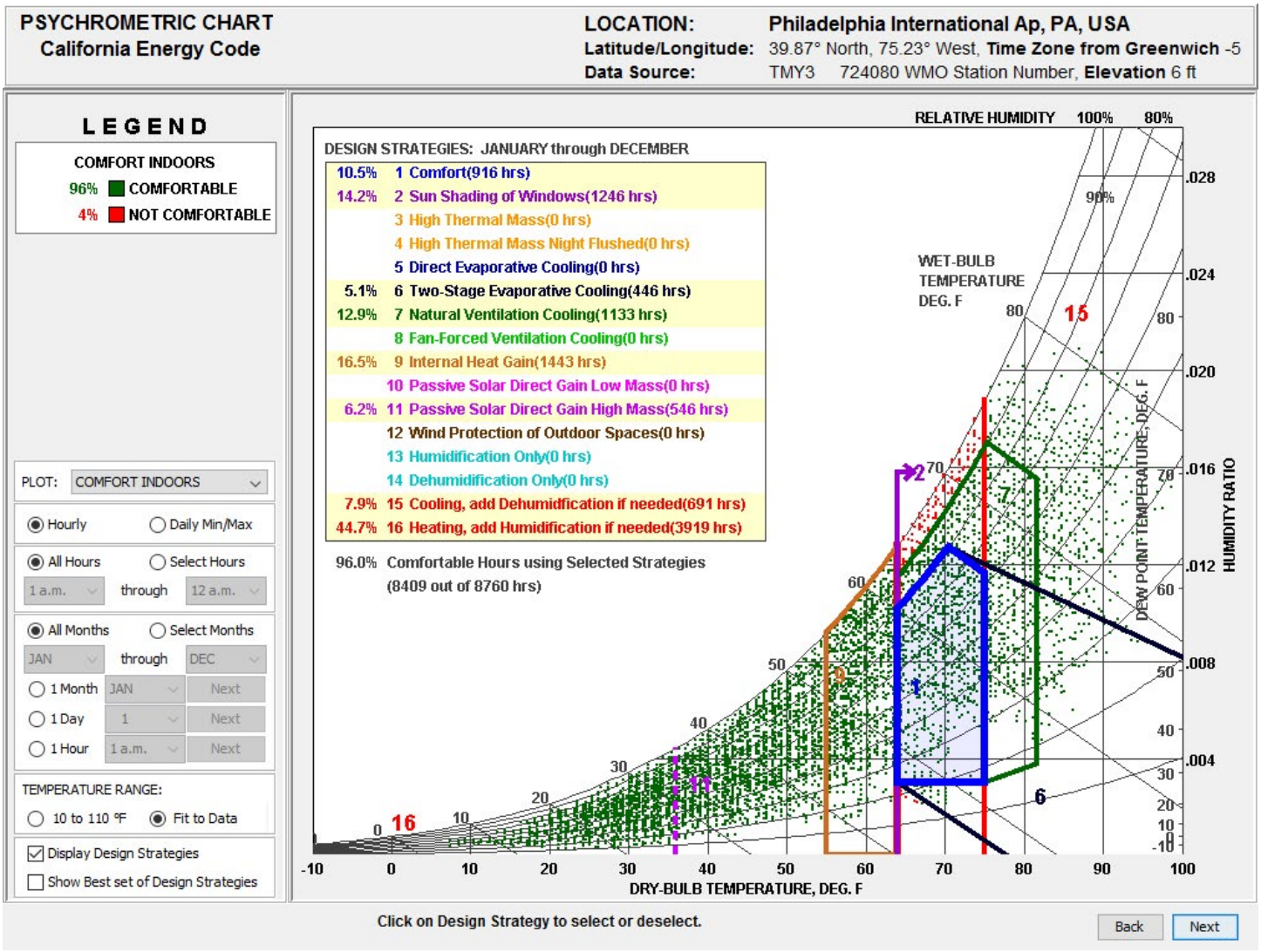


1. FROM JUNE 21-DECEMBER 21(SUMMER):

Chart 1: All the red dots indicate that the weather is quite hot in June from morning to night, also the mid Aug. So we do actually need some shading for summer time.
Chart 2: The facade shading device should be 50 degree to the horizontal line of the window bottom to effectively block the summer sun if the building is facing true South. Vertical shading is not necessary.

FROM DECEMBER 21- JUNE 21(WINTER):

Chart 3: All the blue dots indicate that the weather is quite cold in winter from morning to night through out December to April, also October to December. So apparently, the time of old weather is longer than that of hot weather in Philadelphia. Heating device, sun, radiation is useful for enhance the comfort feeling of people.
Chart 4: Some 65 degree shading facade would be beneficial from May to June. verticaly shading is not necessary.



2. From the chart above, we could tell that heating is the most effective method to increase the comforting hours(increase the comfortable hours by 44.7%), such as using heating device, internal heating and adding humidification. Building should facing south since it could receive more sun radiation to increasing the indoor temperature during winter.

3.Other than that, using openings to enhance natural ventilation to cooling the building is a good strategy when designing a building in Philly, comfort hours will increase significantly according to the chart. Sun shading is needed for facade design which could increase 14.3% of comforting times. Having a canopy or an stretching form of architecture for outdoor shading can be considered.