Assignment 1

Name: Jinah Oh

Software: Climate Consultant

Data: energyplus.net/weather ----- TMY3.epw

WEATHER DATA SUMMARY

LOCATION: **Philadelphia International Ap, PA, USA**
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

MONTHLY MEANS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Global Horiz Radiation (Avg Hourly)	67	82	102	115	126	134	124	131	112	95	72	60	Btu/sq.ft
Direct Normal Radiation (Avg Hourly)	103	105	105	104	98	102	88	109	107	112	93	94	Btu/sq.ft
Diffuse Radiation (Avg Hourly)	29	33	43	48	57	59	62	57	46	40	34	28	Btu/sq.ft
Global Horiz Radiation (Max Hourly)	160	225	272	292	302	310	294	288	267	228	172	145	Btu/sq.ft
Direct Normal Radiation (Max Hourly)	294	294	286	302	268	279	267	292	271	296	292	290	Btu/sq.ft
Diffuse Radiation (Max Hourly)	86	114	128	146	143	156	151	143	152	106	90	76	Btu/sq.ft
Global Horiz Radiation (Avg Daily Total)	639	865	1210	1515	1792	1981	1811	1783	1383	1036	705	559	Btu/sq.ft
Direct Normal Radiation (Avg Daily Total)	978	1106	1243	1370	1390	1518	1276	1484	1321	1219	915	866	Btu/sq.ft
Diffuse Radiation (Avg Daily Total)	286	343	514	632	825	879	903	775	566	438	340	264	Btu/sq.ft
Global Horiz Illumination (Avg Hourly)	2106	2591	3220	3653	3983	4241	3962	4143	3541	2968	2237	1894	footcandles
Direct Normal Illumination (Avg Hourly)	2725	2917	2970	3008	2848	3001	2583	3207	3099	3130	2519	2438	footcandles
Dry Bulb Temperature (Avg Monthly)	29	32	45	54	64	71	77	74	69	54	45	38	degrees F
Dew Point Temperature (Avg Monthly)	19	20	31	37	50	60	65	63	58	42	36	24	degrees F
Relative Humidity (Avg Monthly)	68	59	60	56	64	70	69	70	71	67	72	60	percent
Wind Direction (Monthly Mode)	310	300	300	310	70	240	240	230	0	240	280	300	degrees
Wind Speed (Avg Monthly)	11	8	10	10	8	7	7	9	8	8	10	10	mph
Ground Temperature (Avg Monthly of 3 Depths)	41	38	39	42	52	60	67	70	69	64	56	48	degrees F

TEMPERATURE RANGE
California Energy Code

LOCATION: **Philadelphia International Ap, PA, USA**
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
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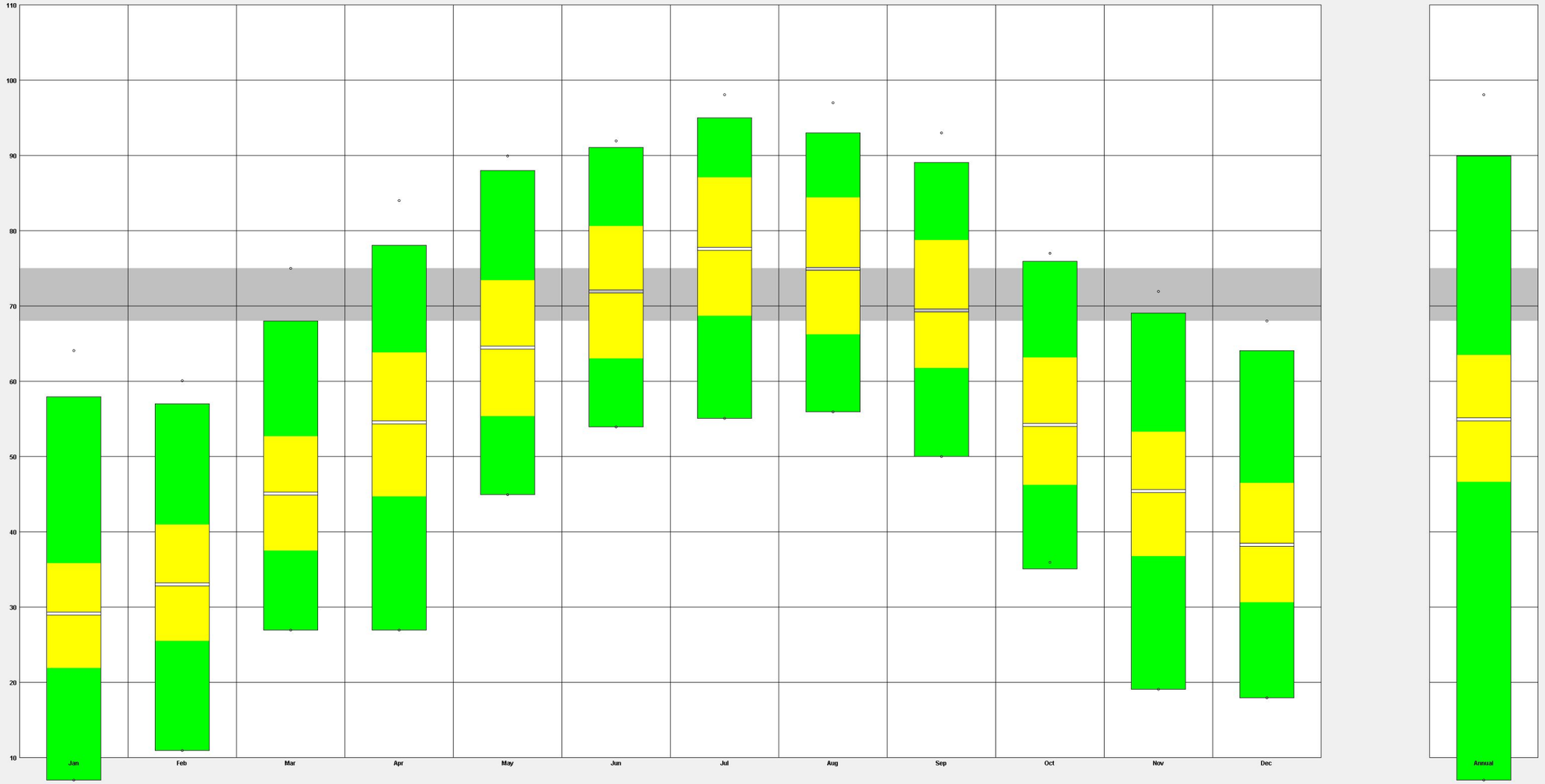
LEGEND

- RECORDED HIGH
- DESIGN HIGH
- AVERAGE HIGH
- MEAN
- AVERAGE LOW
- DESIGN LOW
- RECORDED LOW
- COMFORT ZONE



DESIGN HIGH: Residential
- (●) 1% of Hours Above
- ( ) .5% of Hours Above
- ( ) 0% of Hours Above

DESIGN LOW: Residential
- ( ) 1% of Hours Below
- ( ) .5% of Hours Below
- (●) 0% of Hours Below

TEMPERATURE RANGE:
- (●) 10 to 110 °F
- ( ) Fit to Data

MONTHLY DIURNAL AVERAGES
California Energy Code

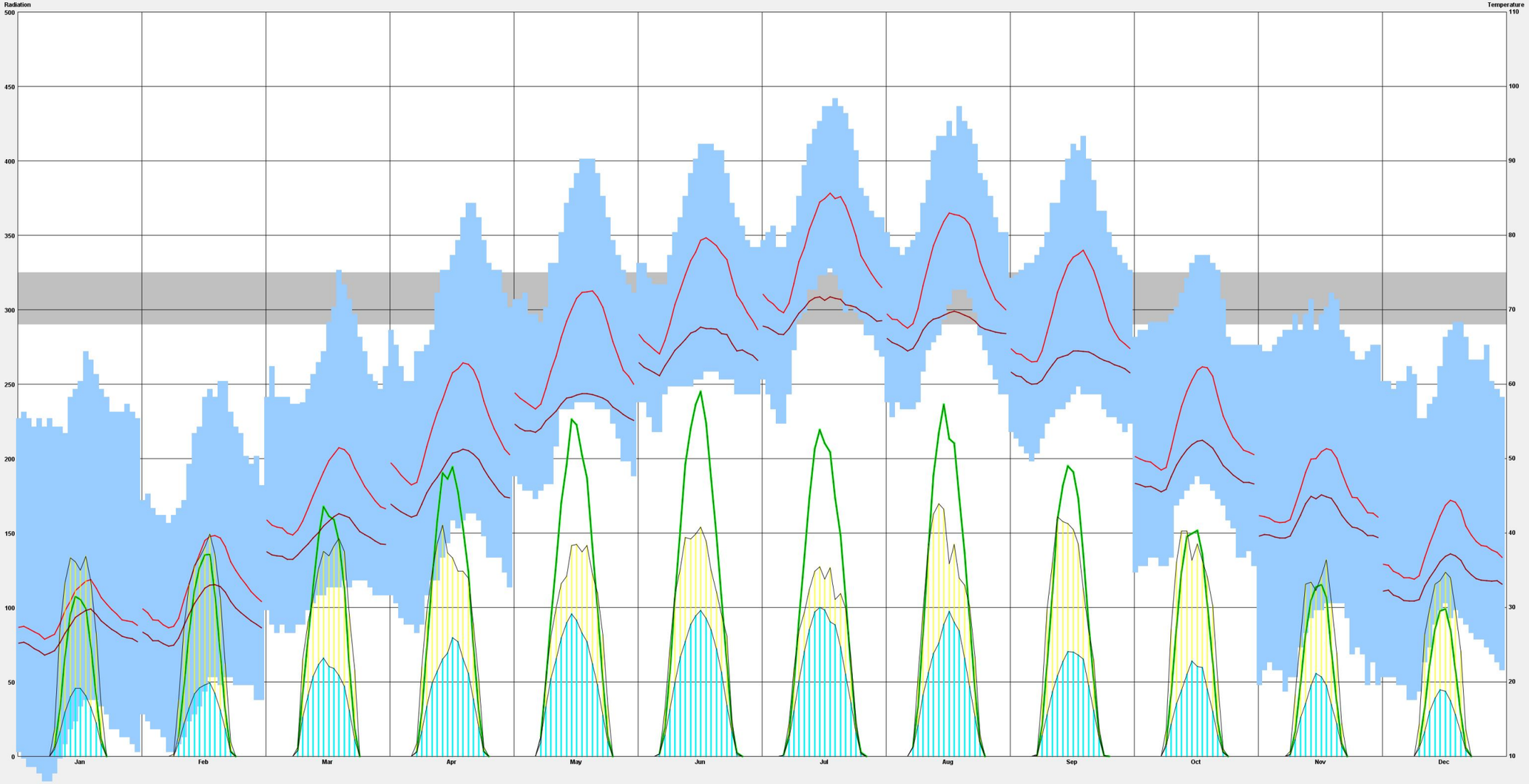
LOCATION: **Philadelphia International Ap, PA, USA**
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number; **Elevation** 6 ft

LEGEND

HOURLY AVERAGES

TEMPERATURE: (degrees F)
- DRY BULB MEAN
- WET BULB MEAN
- DRY BULB (all hours)
- COMFORT ZONE

RADIATION: (Btu/sq.ft)
- GLOBAL HORIZ
- DIRECT NORMAL
- DIFFUSE



☑ Display Dry Bulb T... (all hours)

TEMPERATURE RANGE:
- ◉ 10 to 110 °F
- ○ Fit to Data

RADIATION RANGE

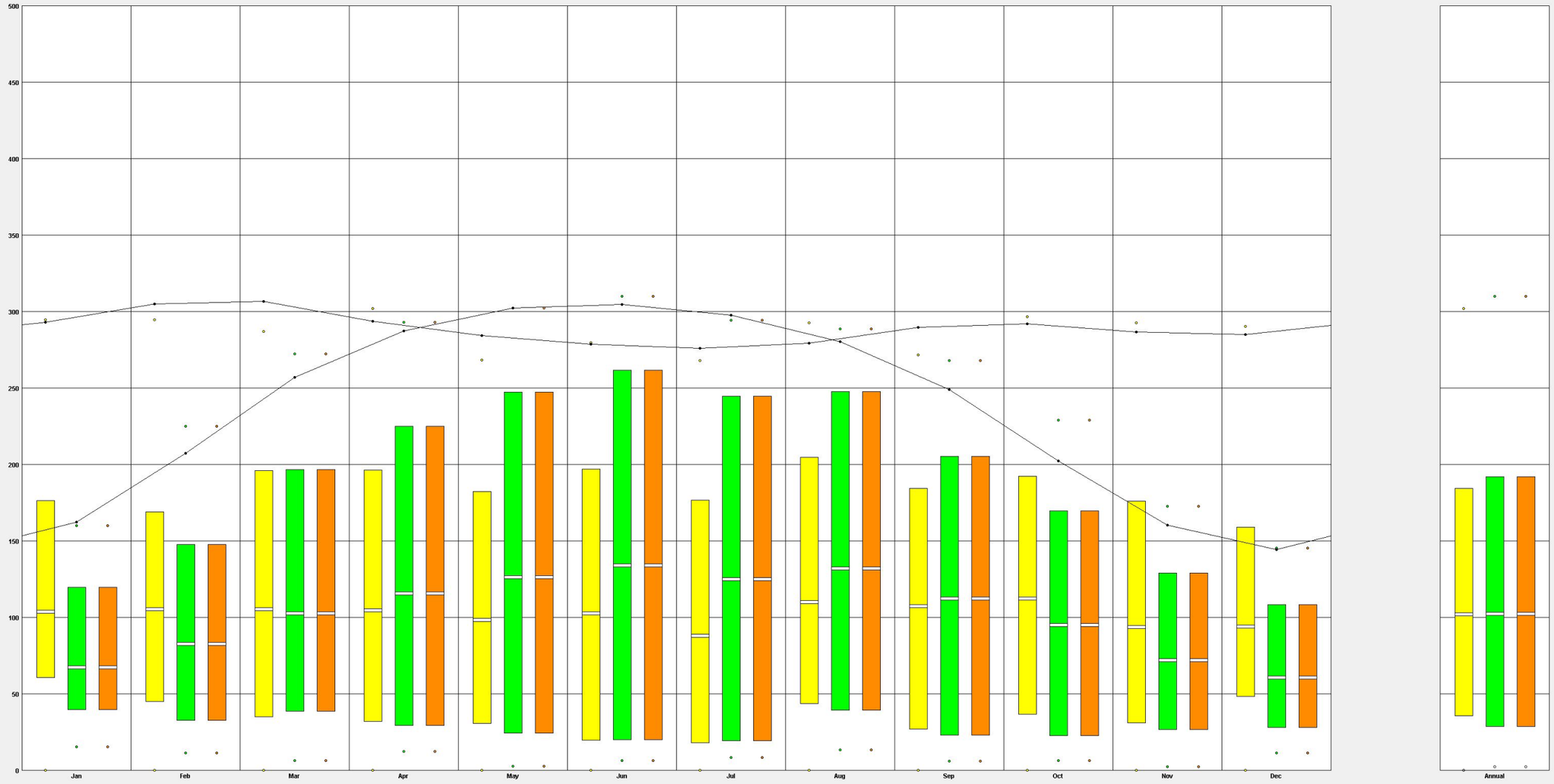
LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

HOURLY AVERAGES
DAYLIT HOURS ONLY

RECORDED HIGH -
AVERAGE HIGH -
MEAN -
AVERAGE LOW -
RECORDED LOW -

RECORDED:
DIRECT NORMAL
GLOBAL HORIZONTAL
TOTAL SURFACE
(Btu/sq.ft per hour)
THEORETICAL:



Tilted Surface Radiation Input:

0.0 Tilt degrees from ... (Vertical = 90°)

0.0 Bearing degrees f... (South = 0°,West...

20.0 % Ground Reflect... (20% = grass)

PLOT:
◉ Hourly Avg ○ Daily Total

ILLUMINATION RANGE

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West. **Time Zone from Greenwich** -5
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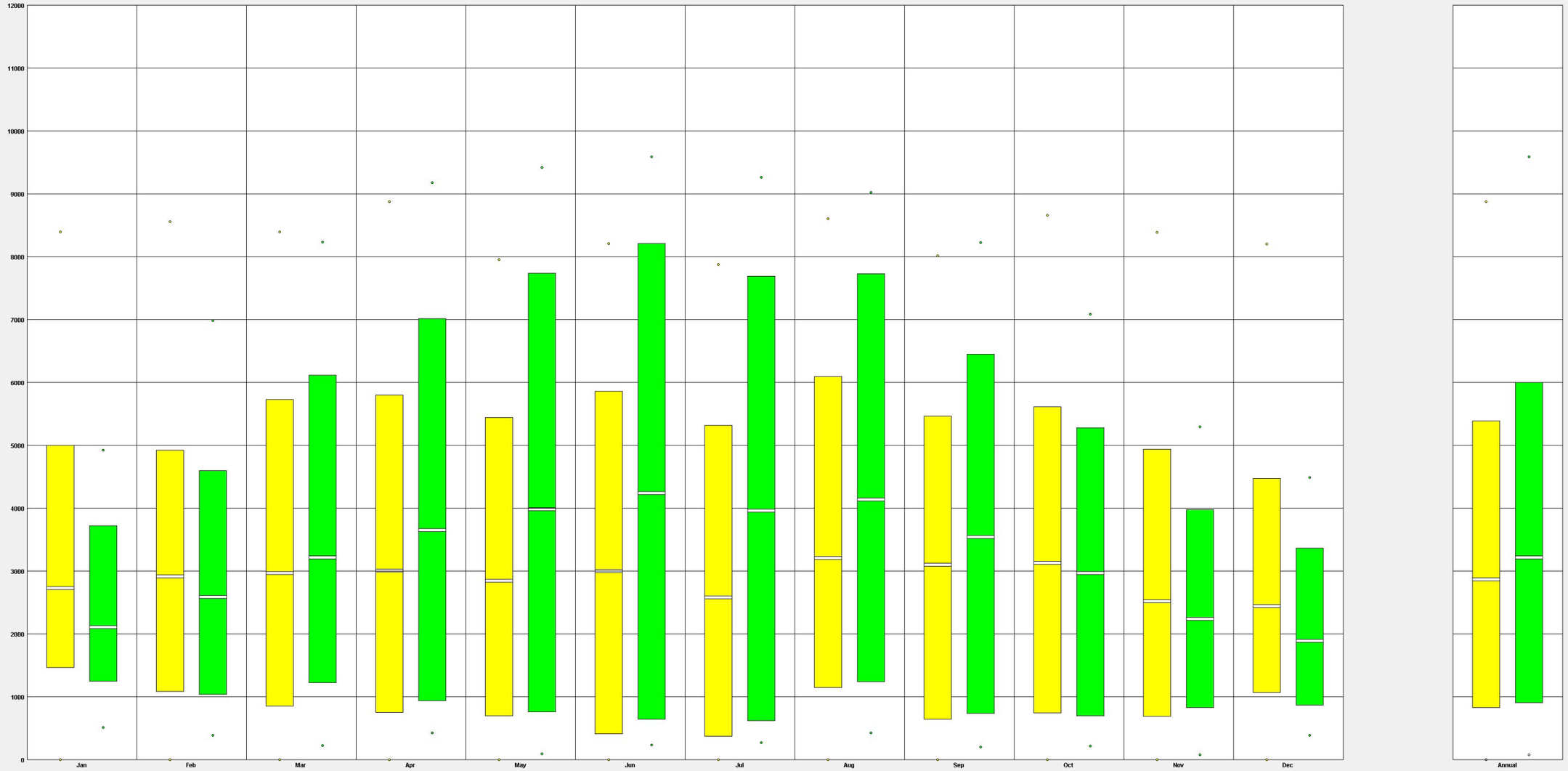
LEGEND

HOURLY ILLUMINATION
DAYLIT HOURS ONLY

RECORDED HIGH -
AVERAGE HIGH -
MEAN -
AVERAGE LOW -
RECORDED LOW -

RECORDED:
DIRECT NORMAL
GLOBAL HORIZONTAL
(footcandles)

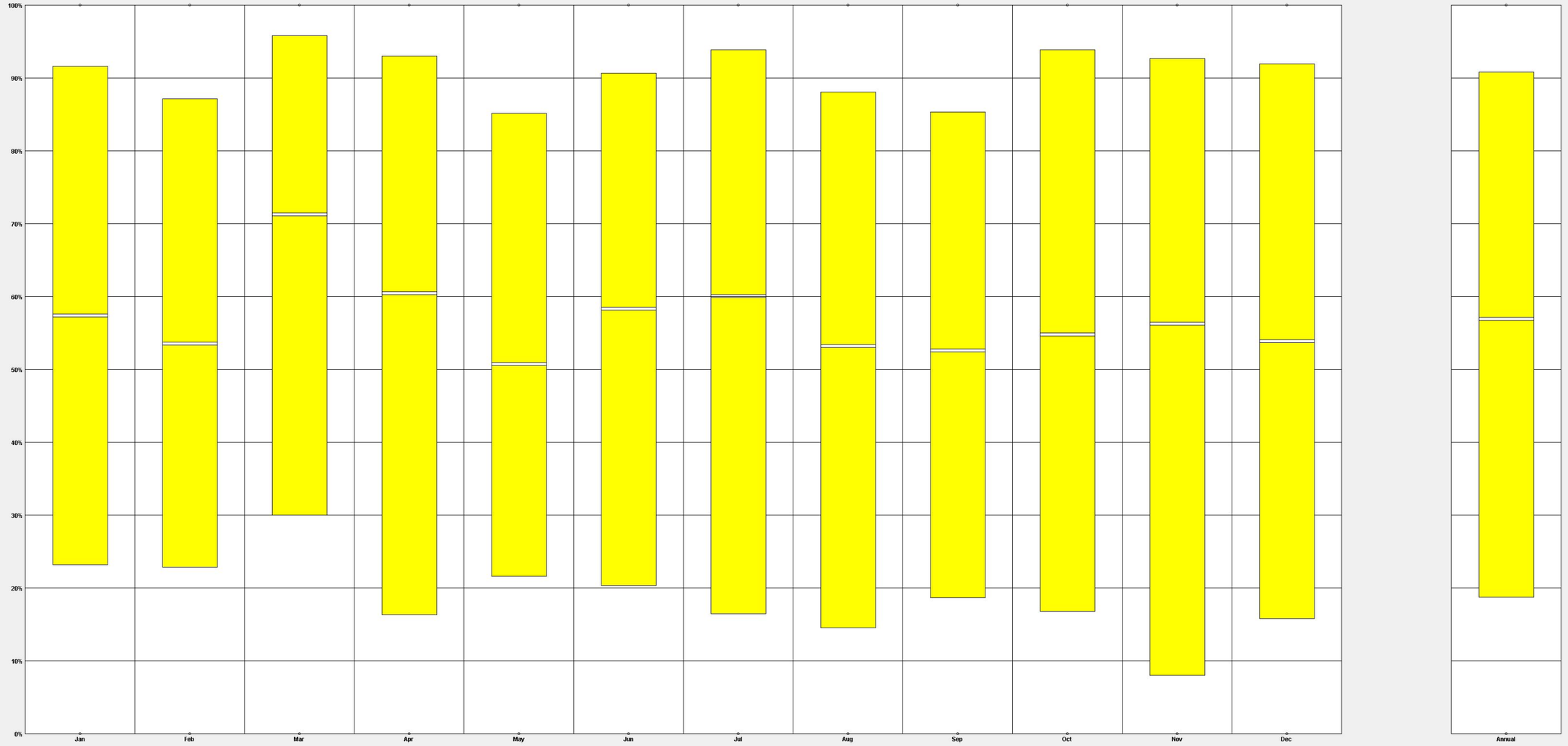


SKY COVER RANGE

LOCATION: **Philadelphia International Ap, PA, USA**
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

Total Cloud Cover	100%
RECORDED HIGH -	◦
AVERAGE HIGH -	
MEAN -	
AVERAGE LOW -	
RECORDED LOW -	◦
Clear Skies	0

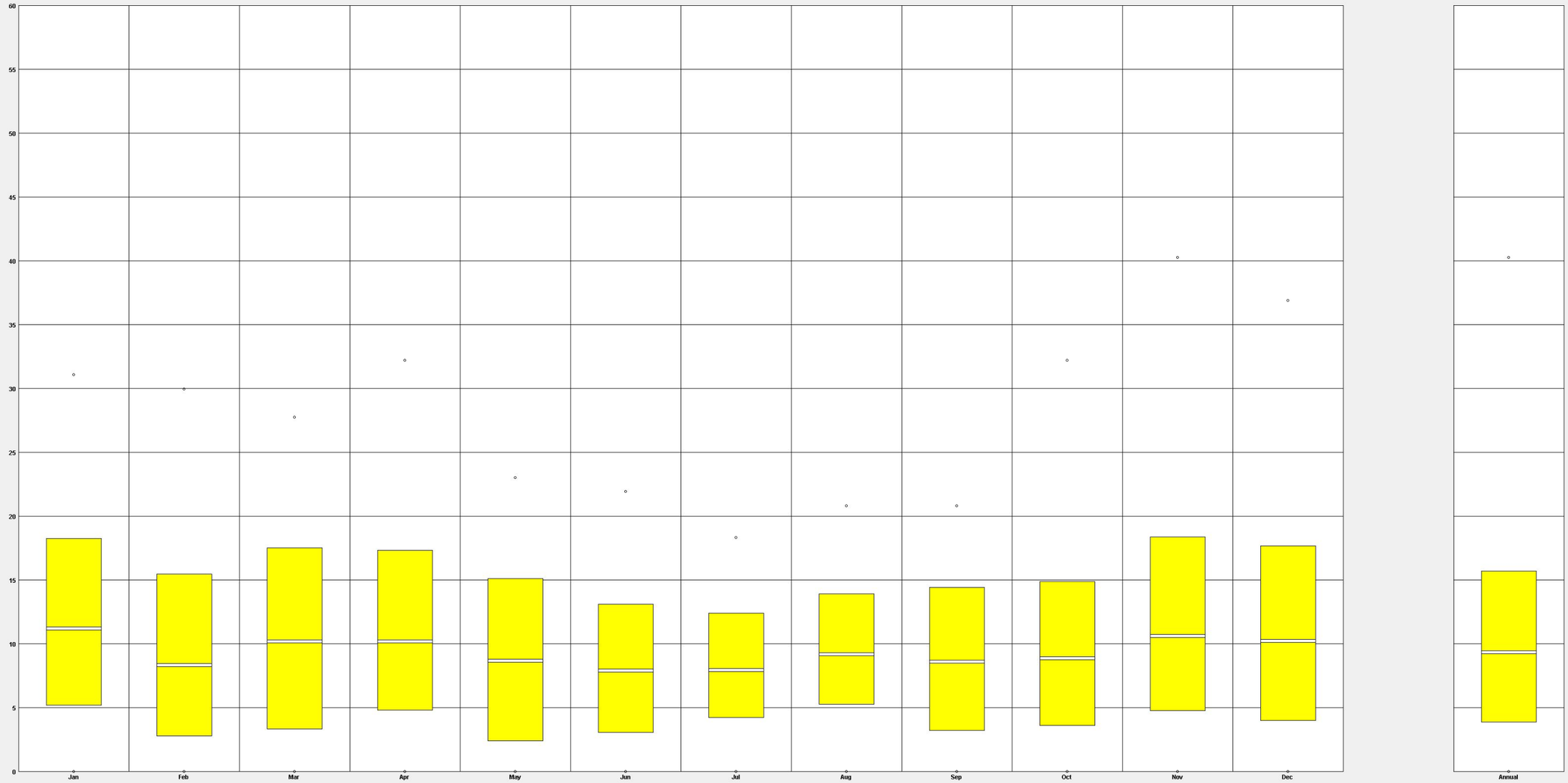


WIND VELOCITY RANGE

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number; **Elevation** 6 ft

LEGEND

RECORDED HIGH -
AVERAGE HIGH -
MEAN -
AVERAGE LOW -
RECORDED LOW -
(mph)



PLOT:
(●) mph ( ) fpm

WIND VELOCITY:
(●) 0 to 60 mph
( ) Fit to Data

GROUND TEMPERATURE (MONTHLY AVERAGE)

LOCATION: Philadelphia International Ap, PA, USA
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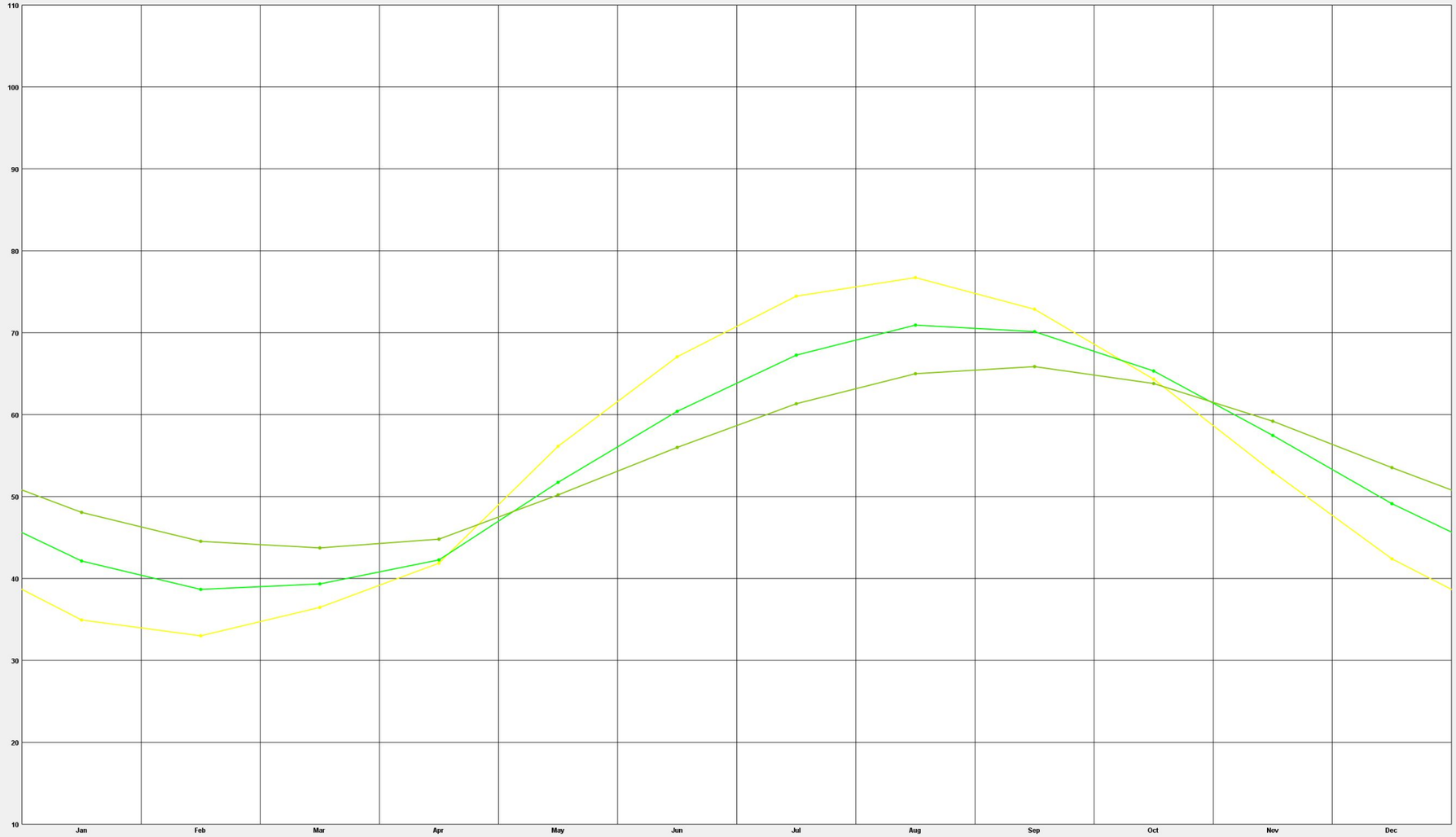
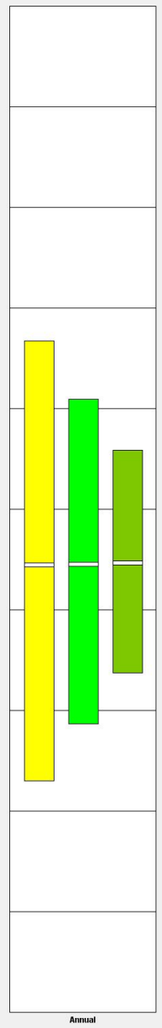
LEGEND

DEPTH
(feet)
1.64
6.56
13.12
(Surface is freshly mown grass.)





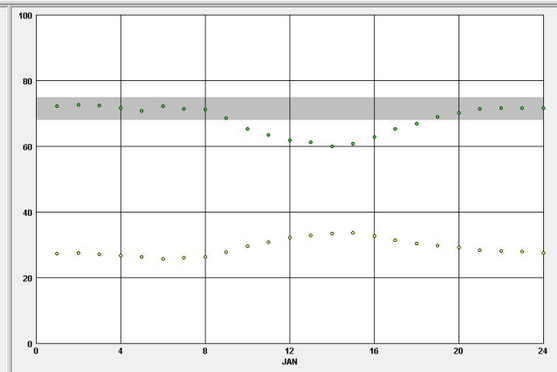
TEMPERATURE RANGE:
(•) 10 to 110 °F
( ) Fit to Data

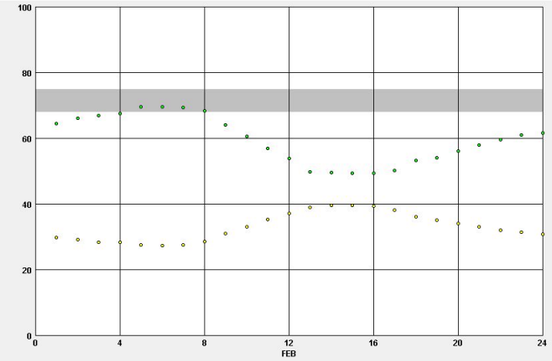
DRY BULB X RELATIVE HUMIDITY
California Energy Code

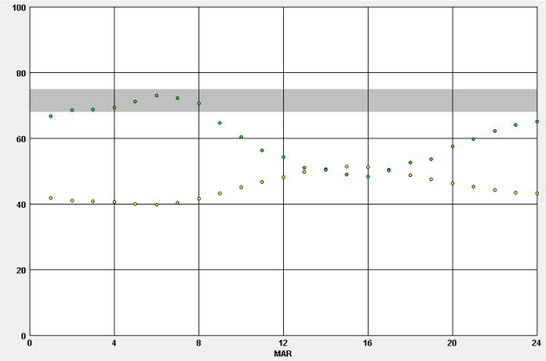
LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, Time Zone from Greenwich -5
Data Source: TMY3 724080 WMO Station Number, Elevation 6 ft

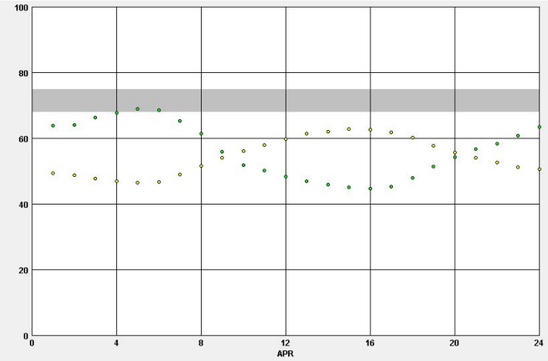
LEGEND

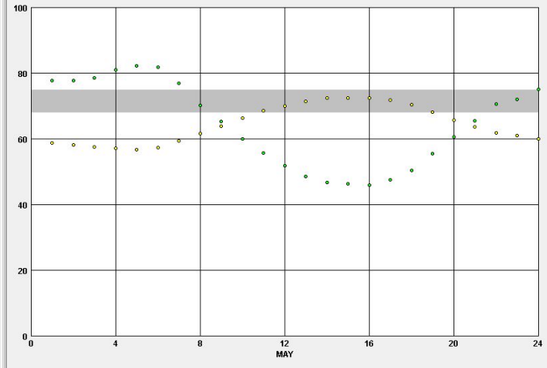
Dry Bulb
Humidity
Comfort Zone

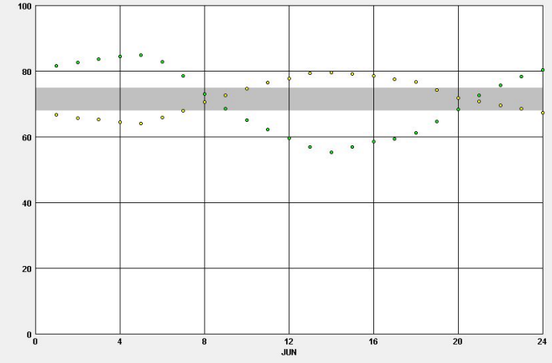


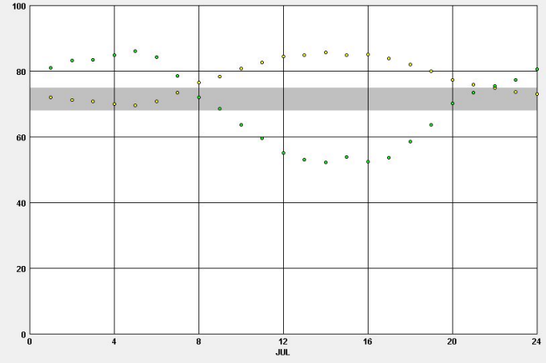


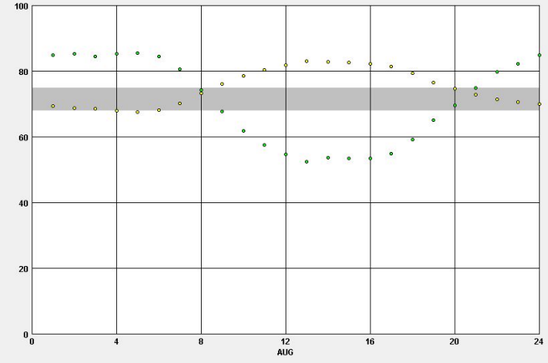


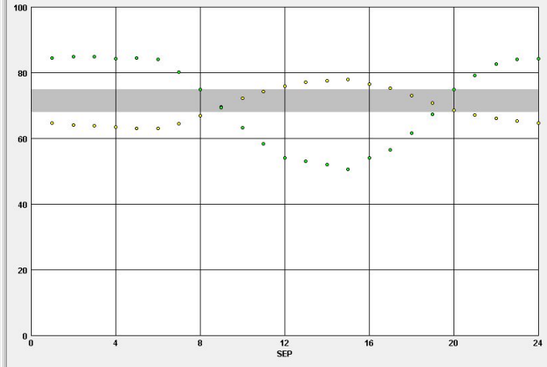


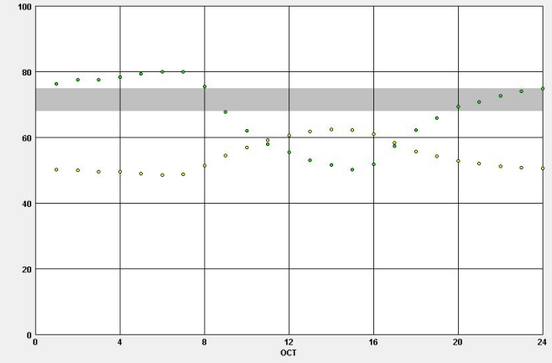


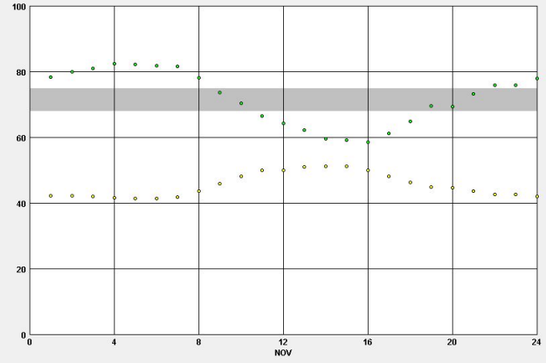


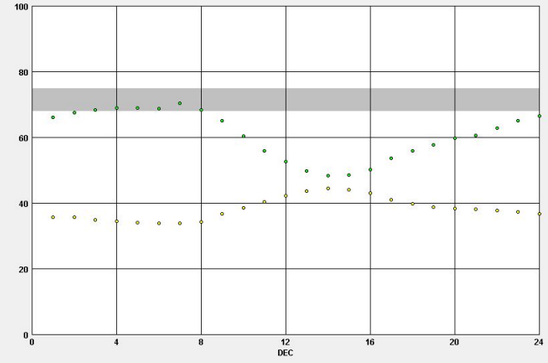












DRY BULB X DEW POINT
California Energy Code

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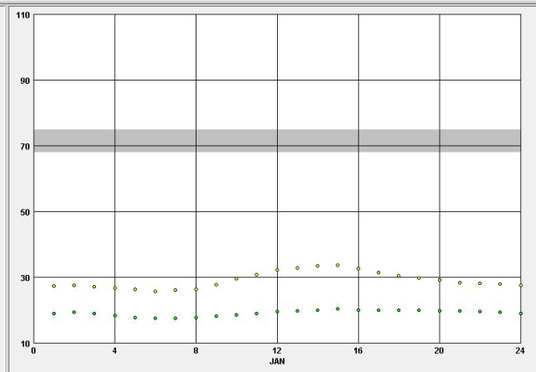
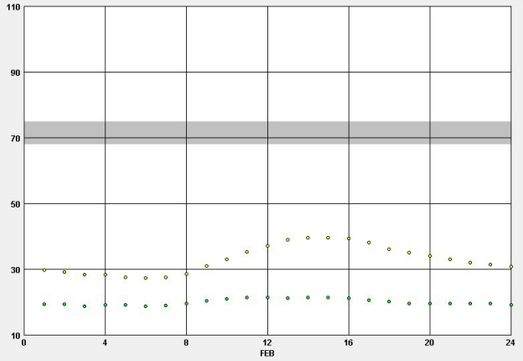
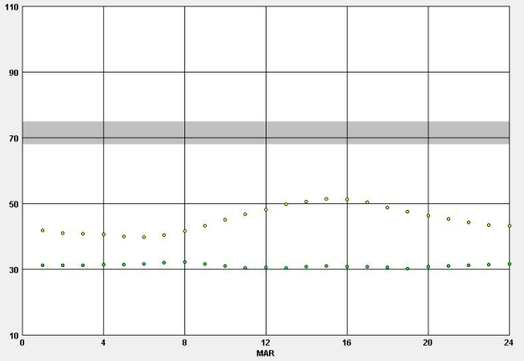
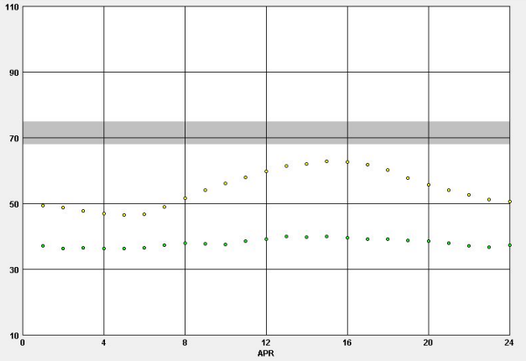
LEGEND

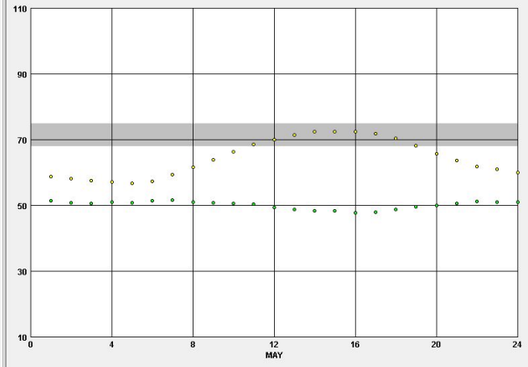
Dry Bulb
Dew Point
Comfort Zone

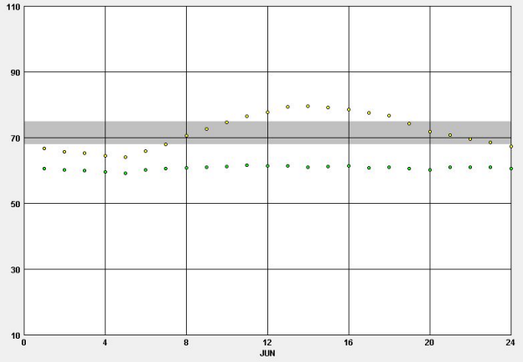


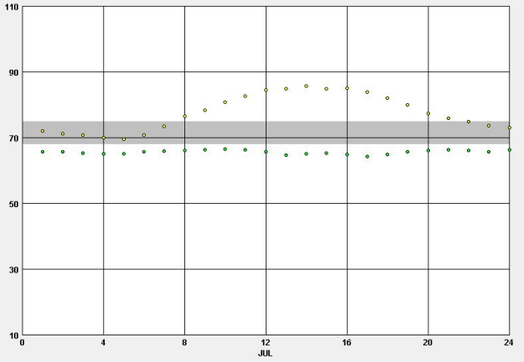


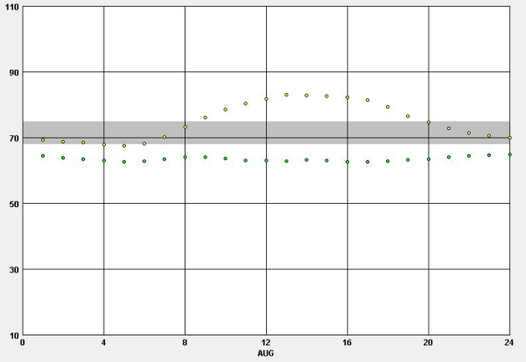


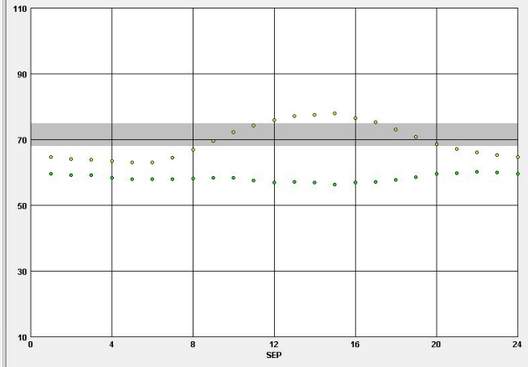


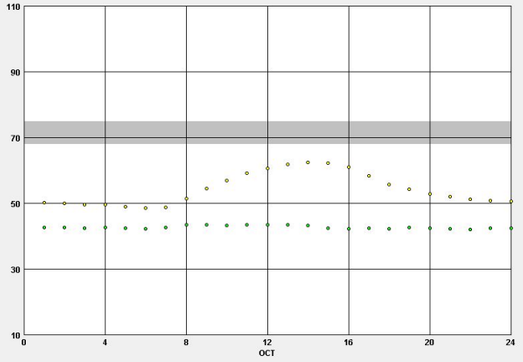


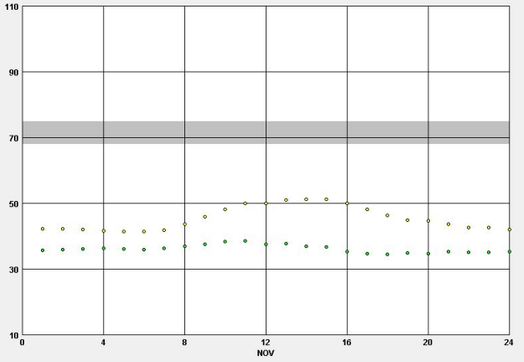


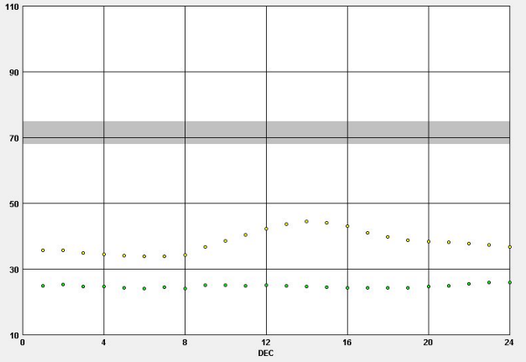












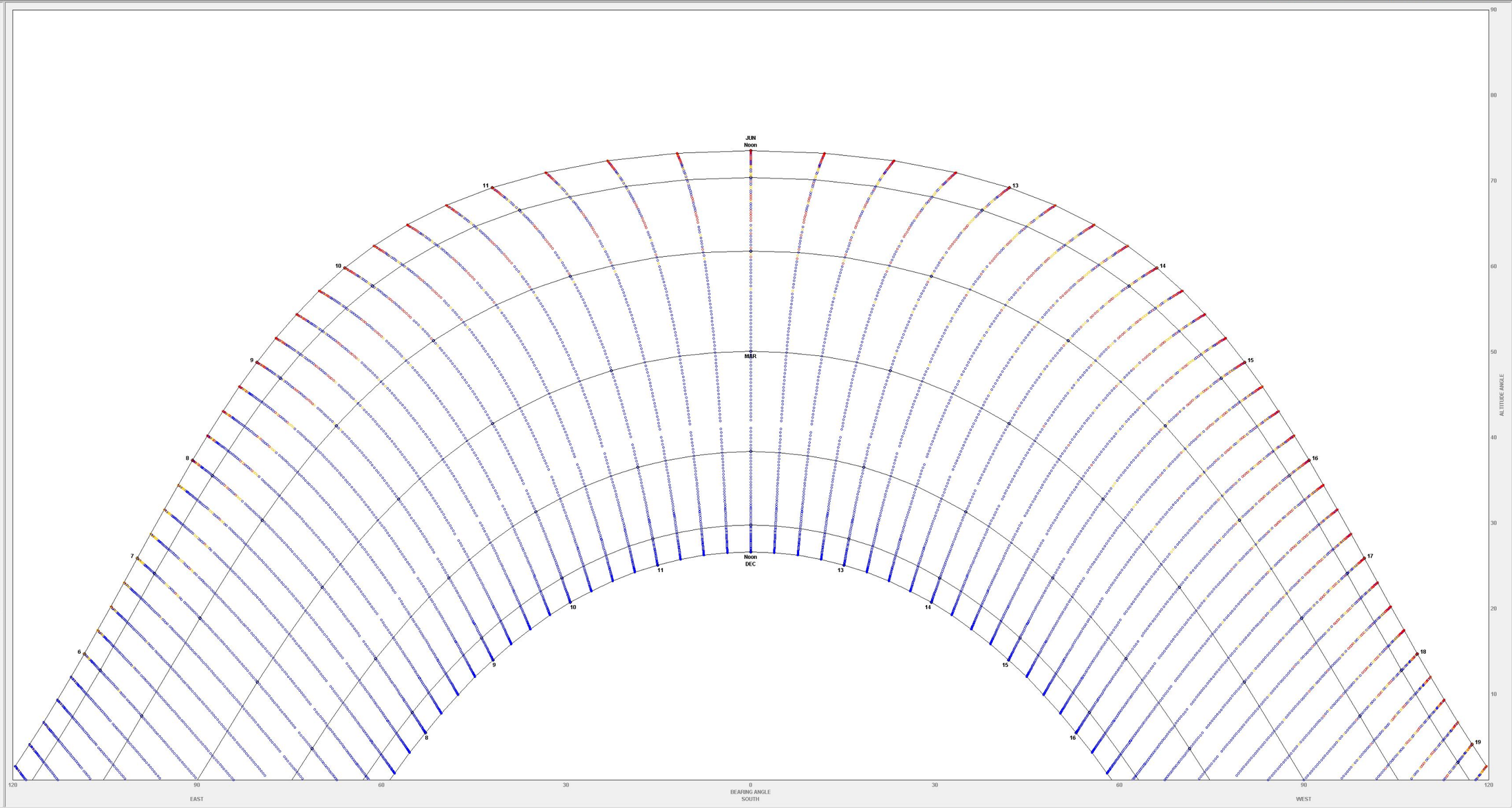
TEMPERATURE RANGE:
(●) 10 to 110 °F
( ) Fit to Data

SUN SHADING CHART

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number; **Elevation** 6 ft

LEGEND

- WARM/HOT > 75°F
  (SHADE NEEDED)
  357 Hours Exposed
  0 Hours Shaded
- COMFORT > 68°F
  (SHADE HELPS)
  239 Hours Exposed
  0 Hours Shaded
- COOL/COLD < 68°F
  (SUN NEEDED)
  1914 Hours Exposed
  0 Hours Shaded



PLOT MONTHS:

WINTER SPRING

(●) December 21 to June 21

SUMMER FALL

( ) June 21 to December 21

☐ Display Grid

☐ Display Shading Calculator

☐ Display Obstruction Elevation

Input Obstructions

SUN CHART

LOCATION: **Philadelphia International Ap, PA, USA**
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
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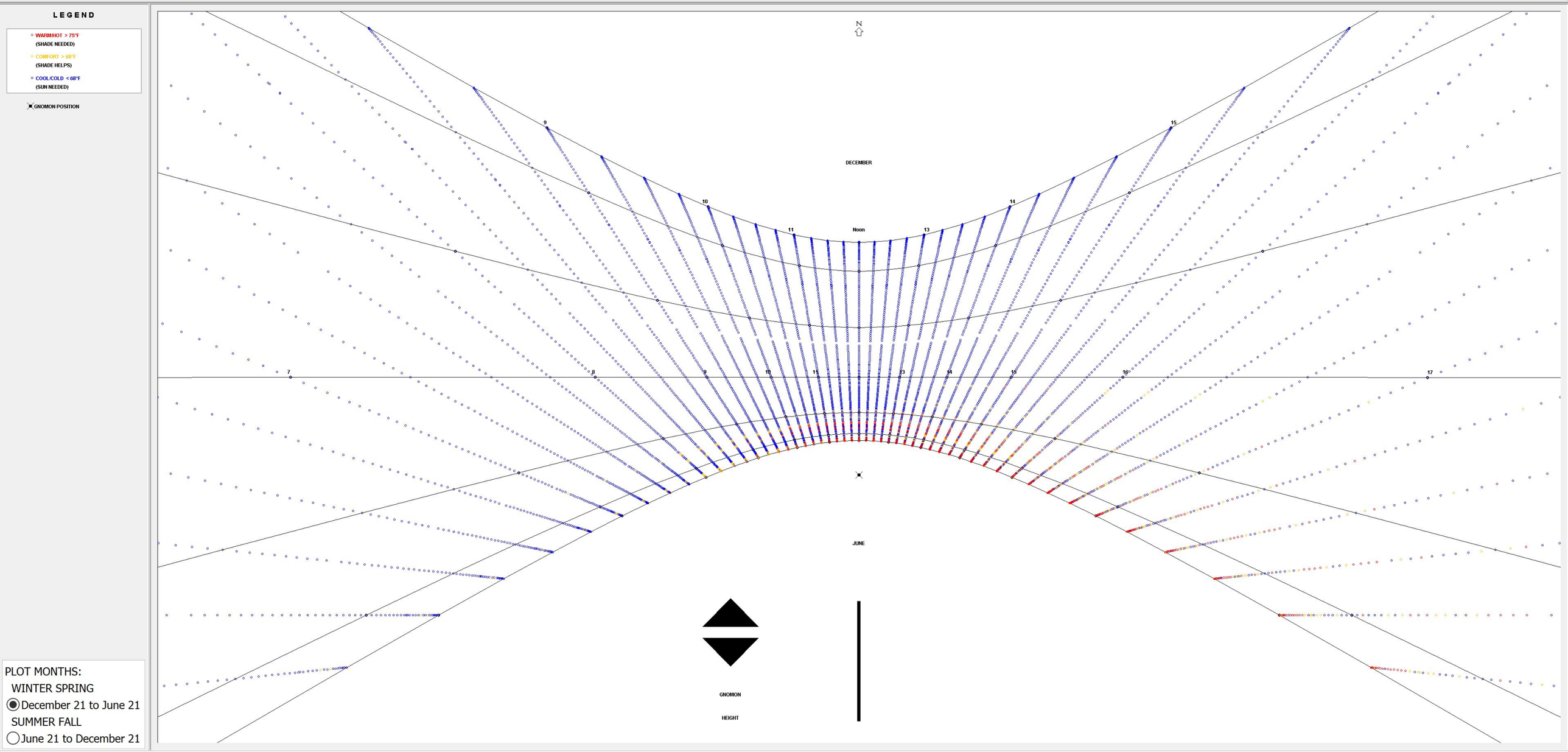

PLOT MONTHS:
WINTER SPRING
(●) December 21 to June 21
SUMMER FALL
( ) June 21 to December 21

TIMETABLE PLOT

LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
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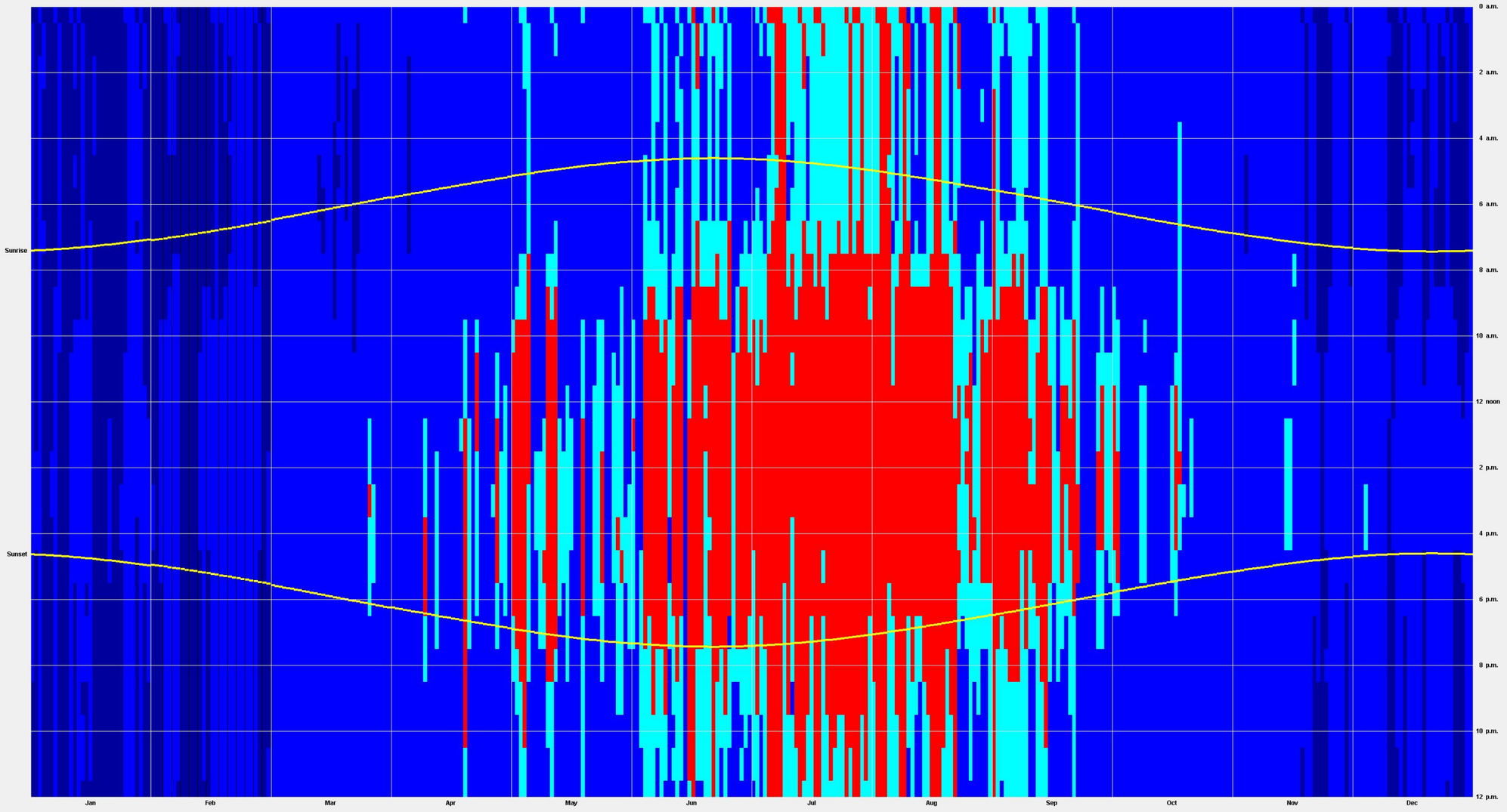
LEGEND

DRY BULB TEMP
(degrees F)

12%		< 32		
58%	32	-	68	
13%	68	-	75	
16%	75	-	100	
0%	> 100			



PLOT:

DRY BULB TEMP

◯ Monthly Avg ◉ Daily

3D CHARTS

LOCATION: Philadelphia International Ap, PA, USA
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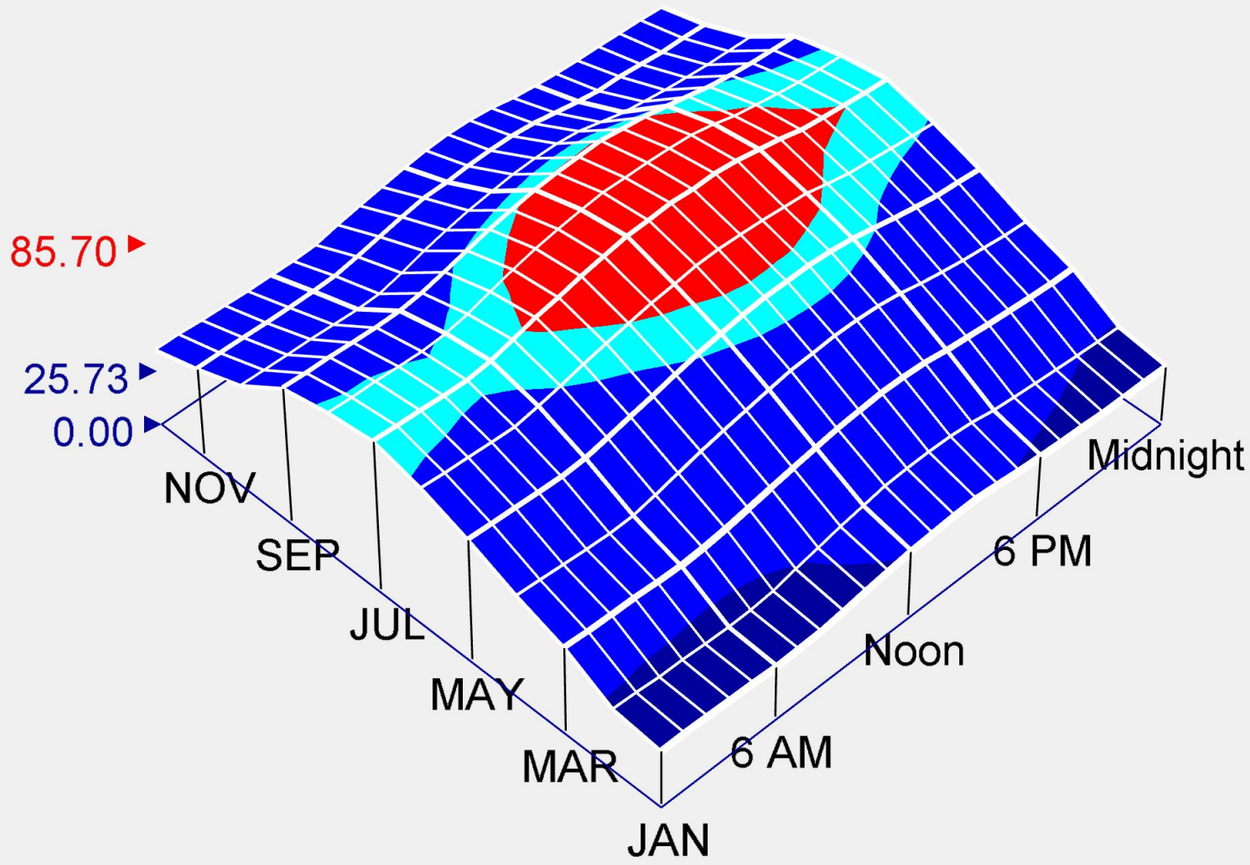
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

DRY BULB TEMP
(degrees F)

10%		< 32
60%	32	- 68
16%	68	- 75
14%	75	- 100
0%	> 100	



PLOT: (•) Not Shaded ( ) Shaded

DRY BULB TEMP

(•) Monthly Avg ( ) Daily

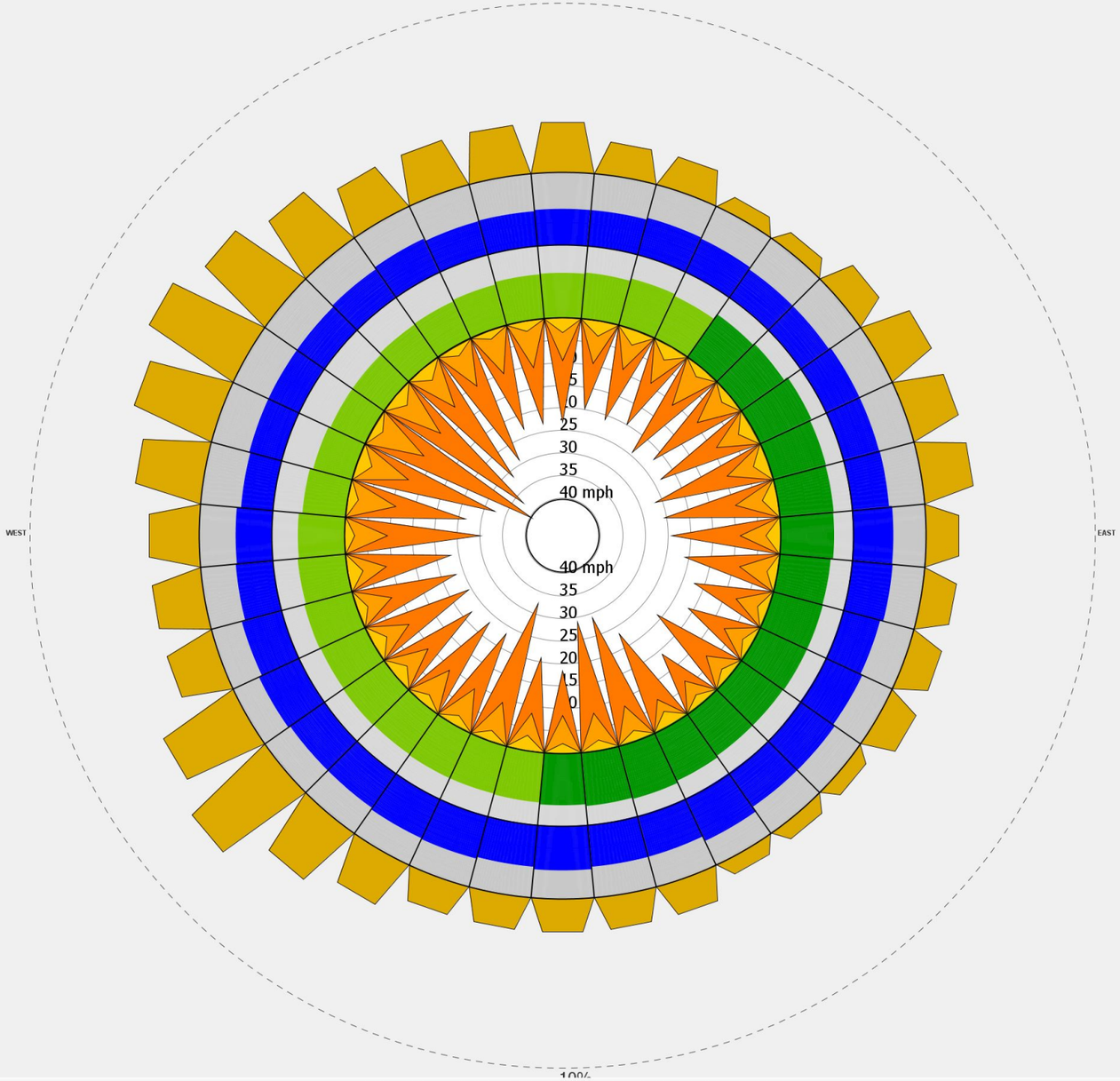
WIND WHEEL

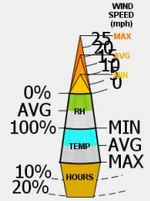
LOCATION: Philadelphia International Ap, PA, USA
Latitude/Longitude: 39.87° North, 75.23° West, **Time Zone from Greenwich** -5
Data Source: TMY3 724080 WMO Station Number, **Elevation** 6 ft

LEGEND

TEMPERATURE (Deg. F)
- < 32
- 32 - 68
- 68 - 75
- 75 - 100
- > 100

RELATIVE HUMIDITY (%)
- <30
- 30-70
- >70





All Hours / Selected Hours
1 a.m. through midnight

All Months / Selected Months
JAN through DEC

One Month JAN Next Month

One Day 1 Next Day

Animate
Monthly / Daily / Hourly

Start / Pause / Stop

3 MOST IMPORTANT PASSIVE DESIGN STRATEGIES:

1) Philadelphia experiences lower hourly illumination in the Winter months, and higher hourly illumination in the Summer. This was most explicitly indicated by chart 5 “Illumination Range” of Climate Consultant. A passive design strategy would be to put the windows or glass of the building on the south side to maximize the exposure to the sun in the Winter. In contrast, some sort of shading device would have to be implemented for the Summer months. Additionally, implementing floors with high thermal mass such as stone or concrete could be a strategy for passive cooling and heating.
2) In warmer months, it is important to try mitigate excess heat by taking advantage of cooling breezes. As shown in chart 2, July in Philadelphia has a mean temperature of ~77 degrees which is above the indicated comfort zone. One passive design strategy is to use casement windows (that also have a shading device) so that breezes from various directions can be caught and redirected into the building. To maximize efficiency, windows should also be placed such that they take advantage of the prevailing winds.
3) Another passive design strategy to mitigate heat is to increase natural ventilation through use of a solar chimney because it boosts the temperature difference between the air that enters and exits the building.