

CLIMATE ANALYSIS OF ANCHORAGE

ARCH 753 BUILDING PEFORMANCE SIMULATION

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INSTRUCTOR: MOSTAPHA SADEGHIPOUR

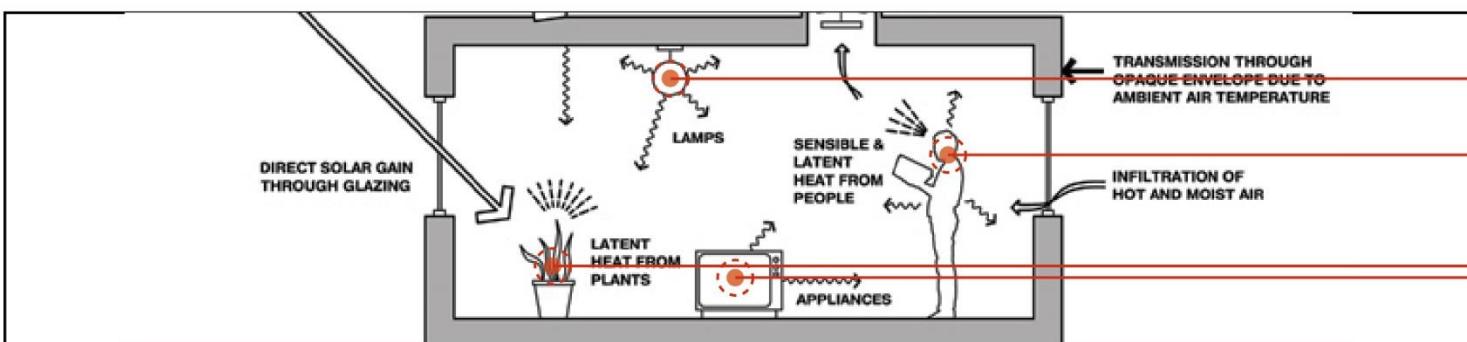
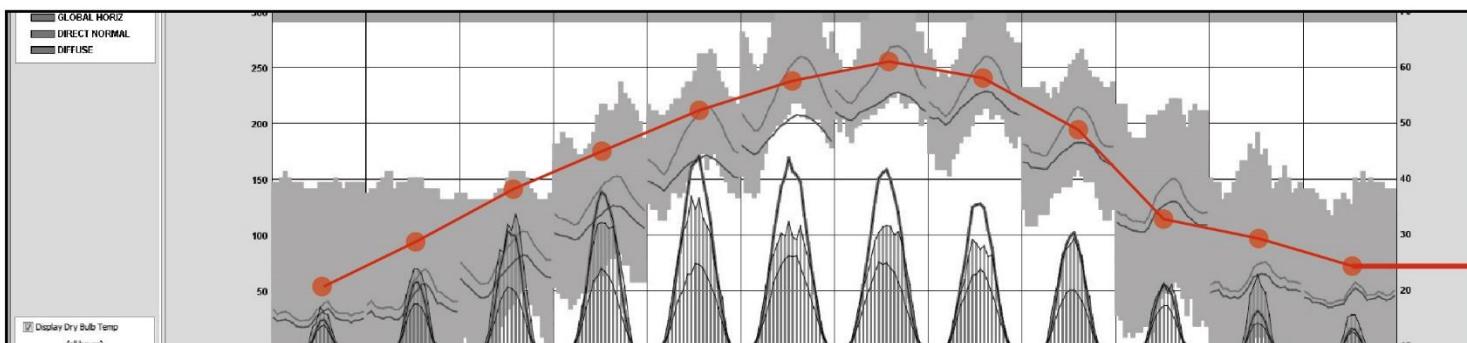
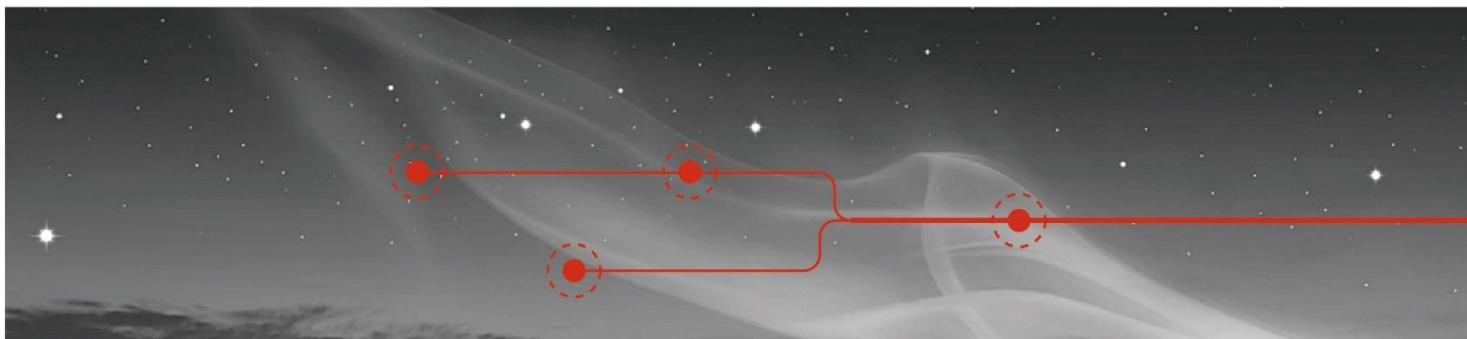
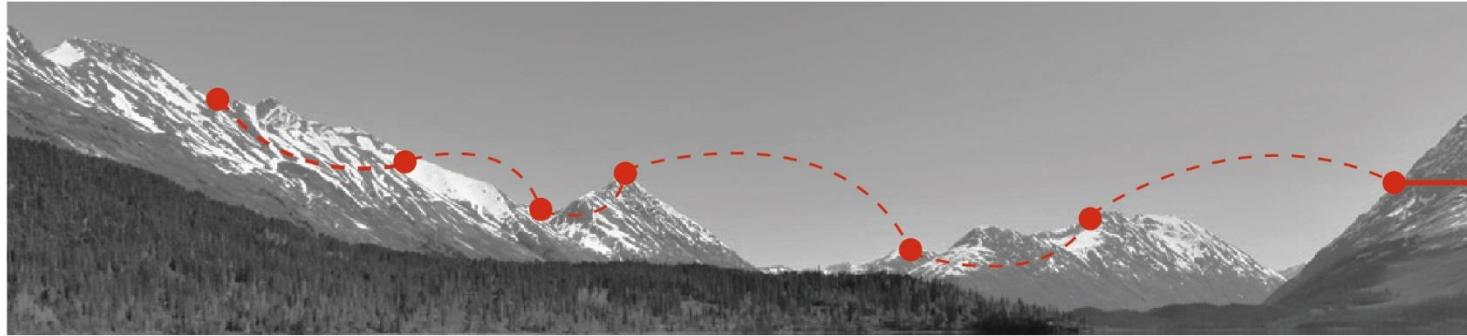
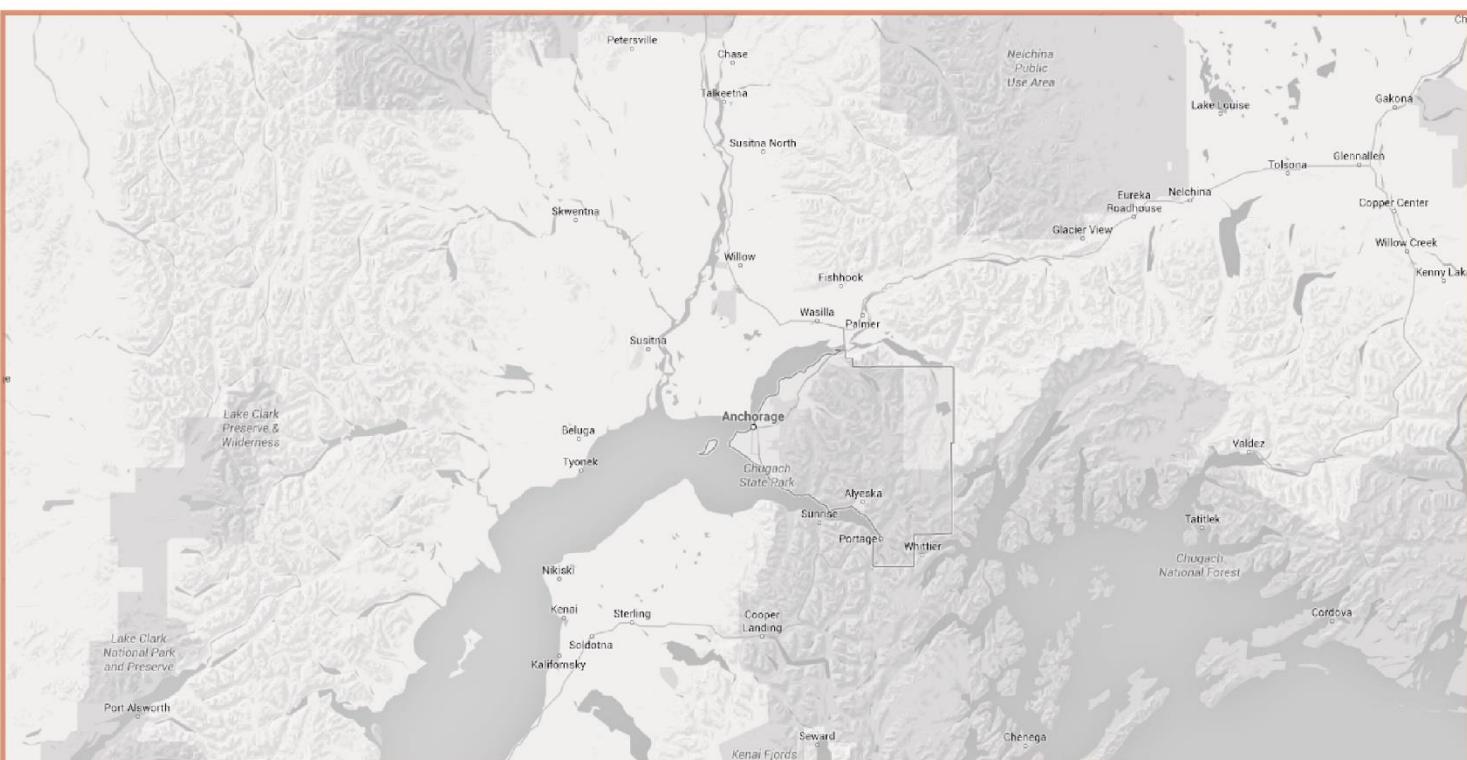
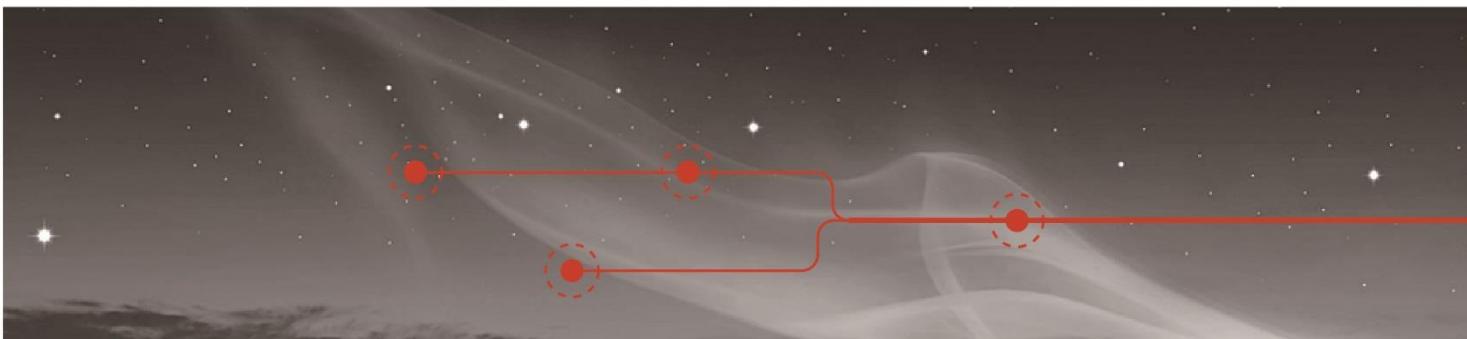
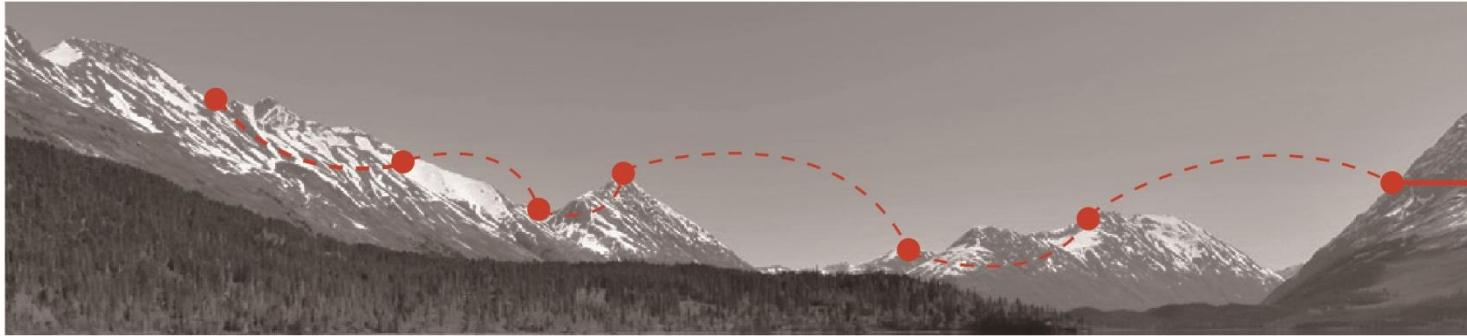


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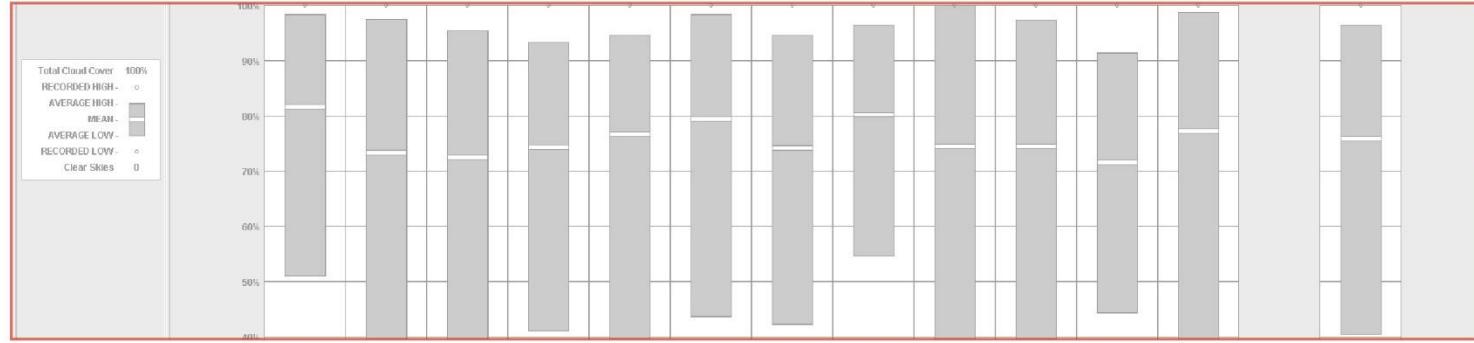
SECTION A GENERAL BACKGROUND

SECTION A General Background

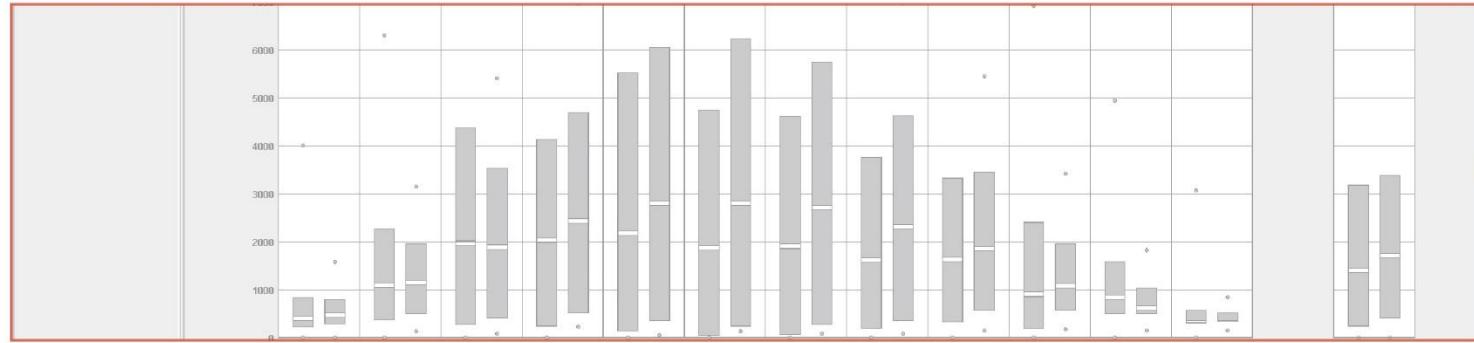
SECTION B Climate Analysis

SECTION C Design Recommendation

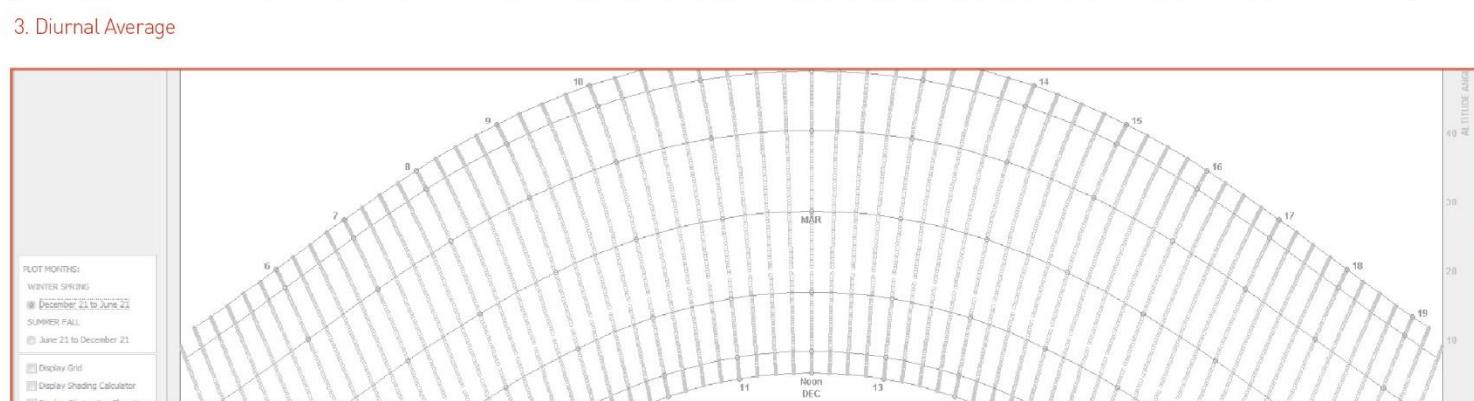
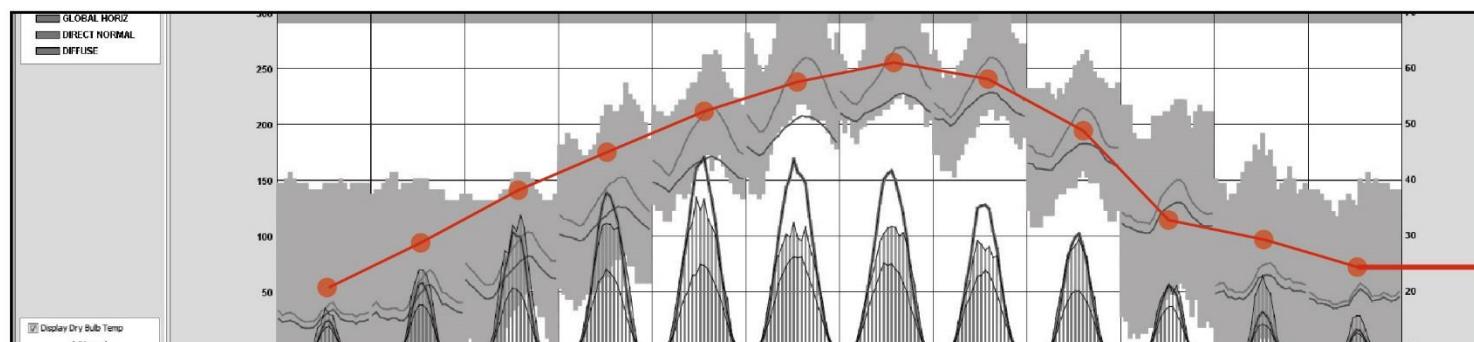
SECTION X Climate Changes



1. Sky Cover Range



2. Illumination Range



4. Sun Shading Chart

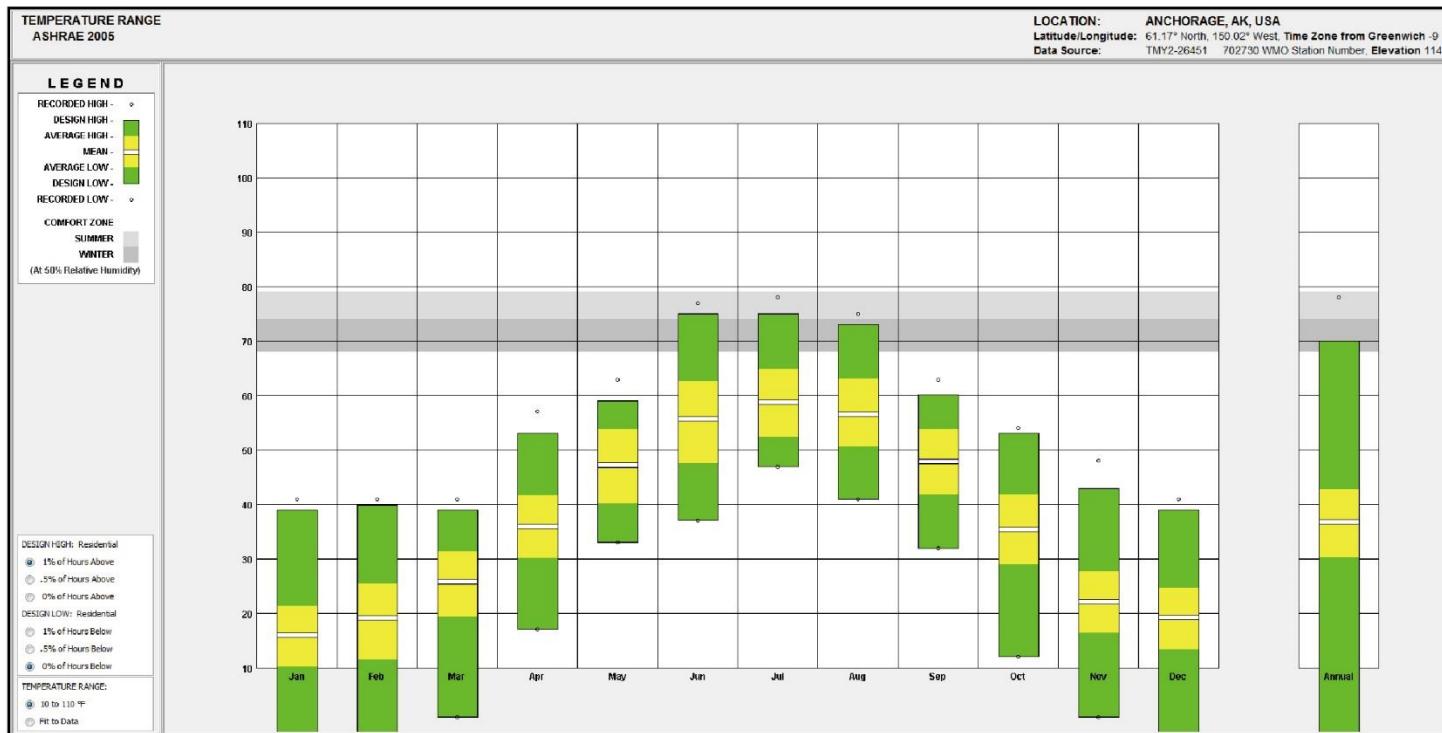
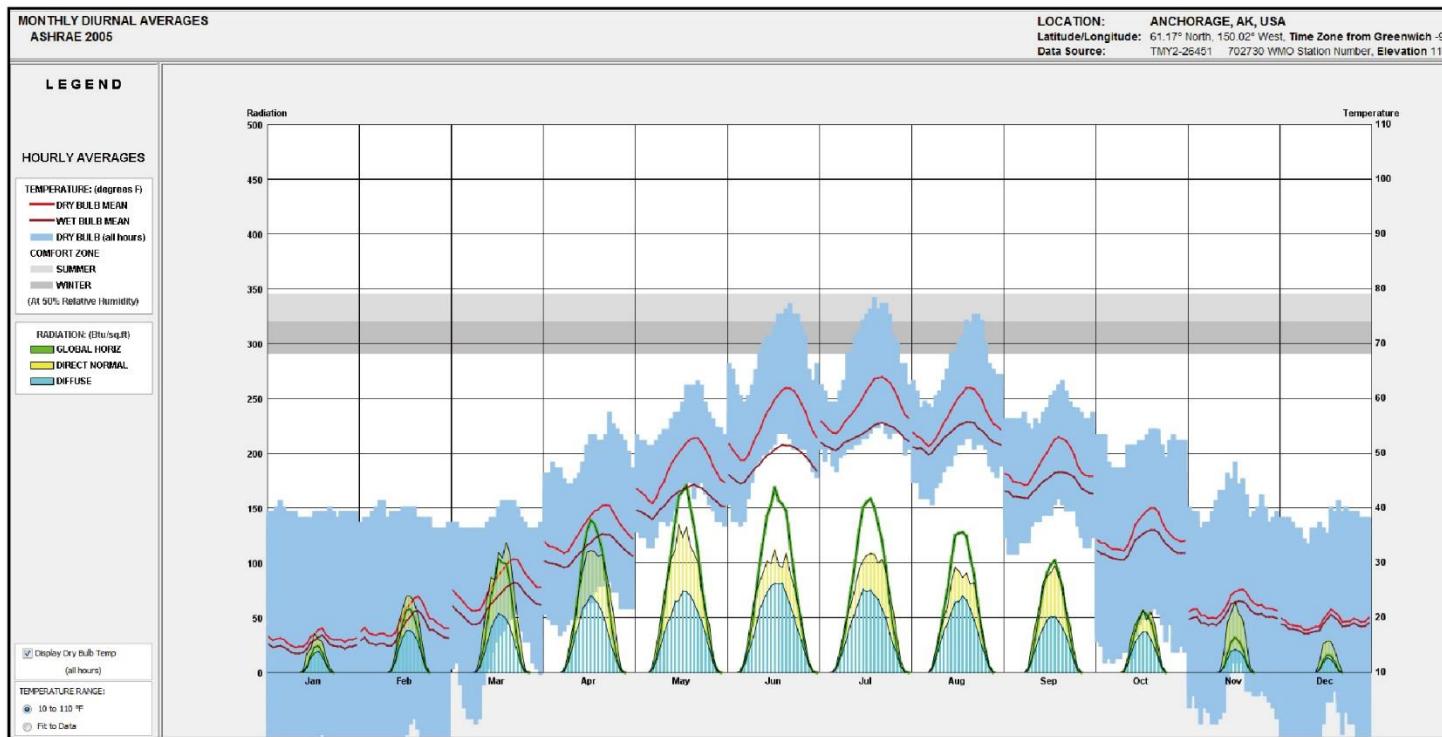
SECTION B CLIMATE ANALYSIS

SECTION A General Background 01

SECTION B Climate Analysis 08

SECTION C Design Recommendation 14

SECTION X Climate Changes 20



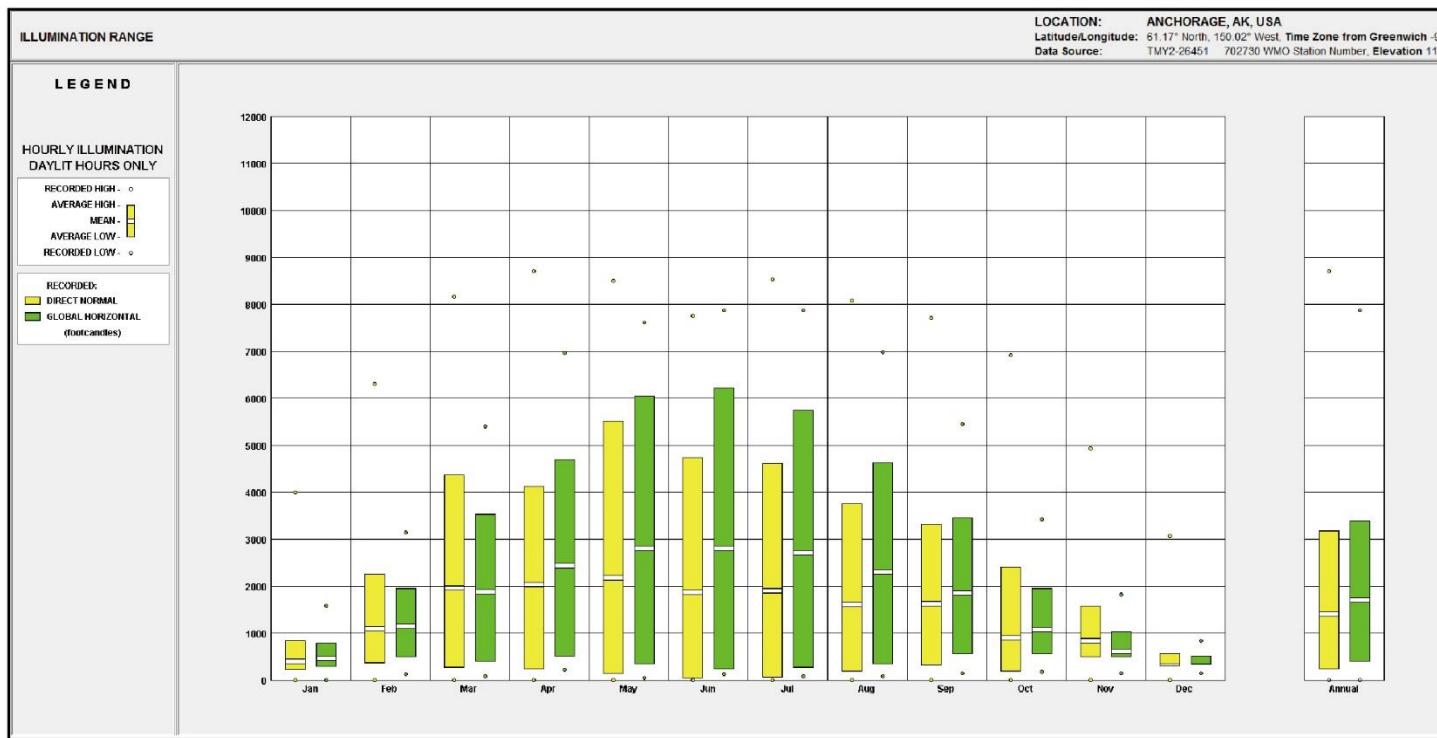
SECTION B TEMPERATURE

1. TEMPERATURE

The temperature in Anchorage, AK is extremely low. In January, February, March, November and December, the design high temperature is below 40 F and the mean temperature of the whole month is below 20 F. Annual mean temperature is below 40 F.

2. Monthly Diurnal Average

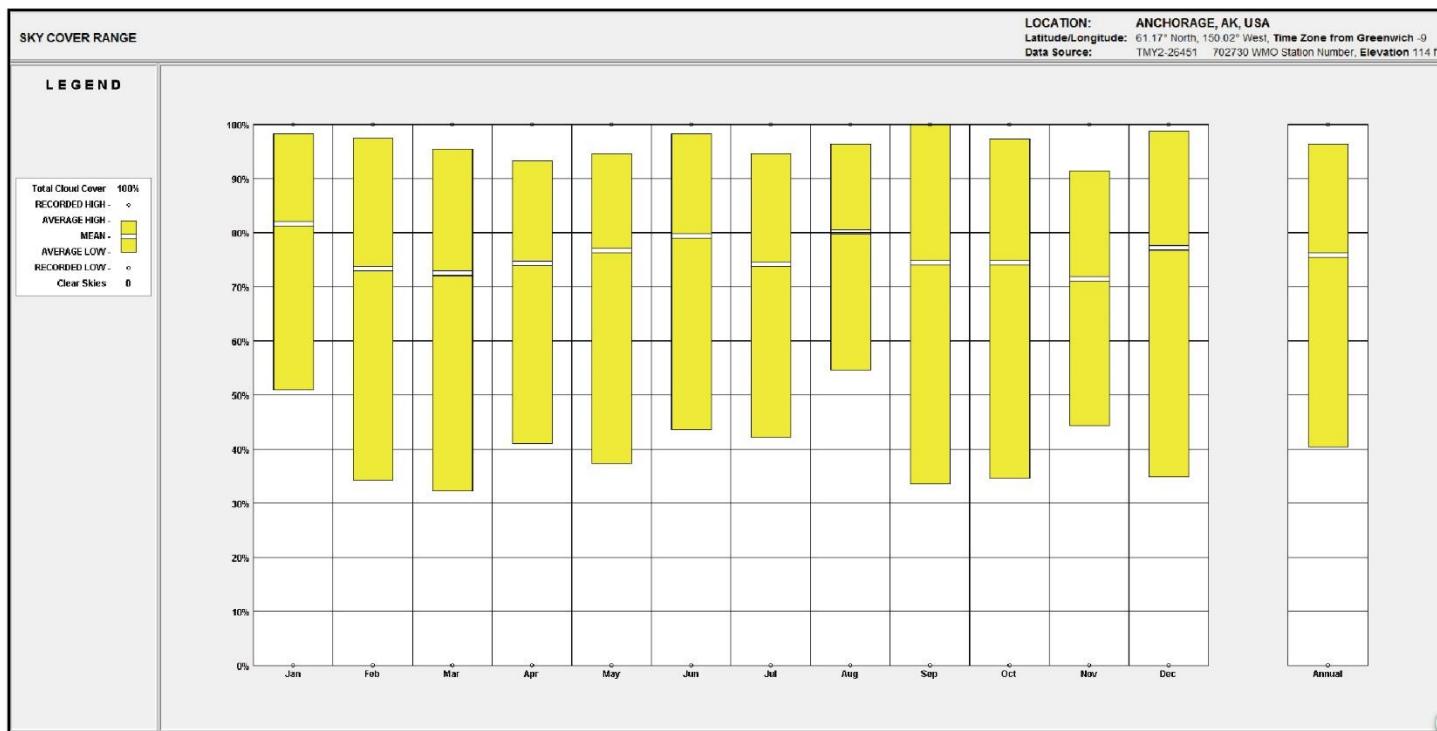
In most months, the temperature is below the comfort zone. It is extreme cold in winter (November to March). Besides, the radiation is weak (especially from October to February). In summer, the direct normal is strong. However, in winter, the direct normal is extreme weak, but the diffuse is relatively stronger.



SECTION B RADIATION

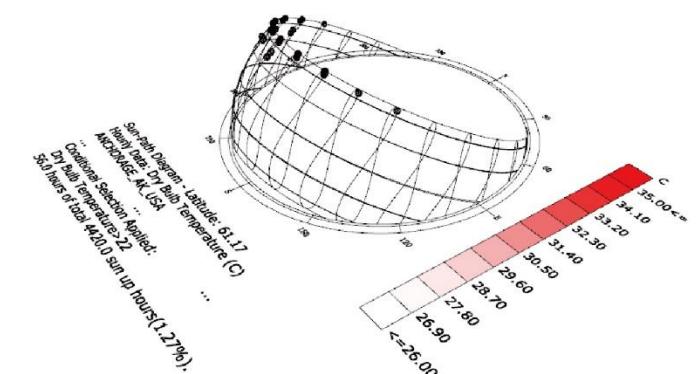
1. ILLUMINATION

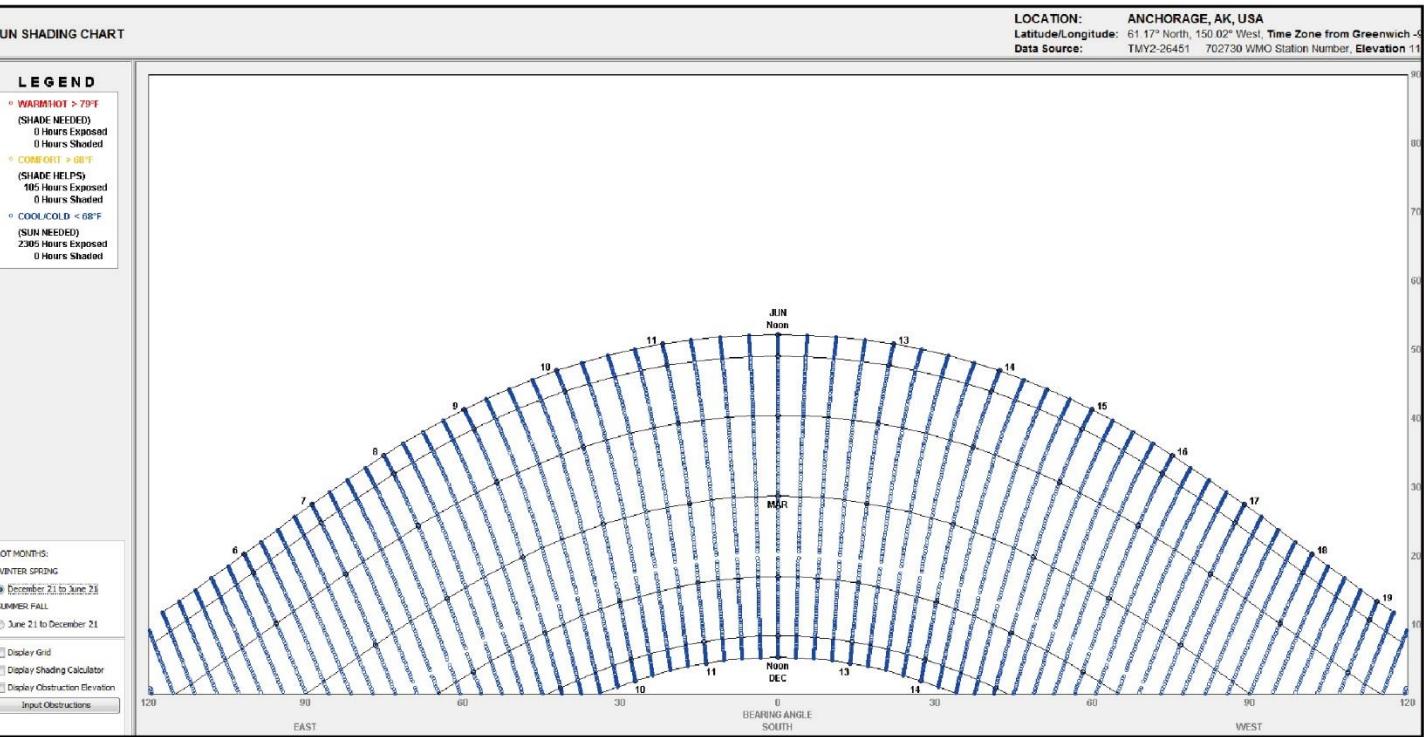
The hourly illumination daylight hours vary in different seasons. The illumination daylight time in winter is very short. In December and January, the illumination daylight time is less than 500 hours. The illumination daylight time in summer is relatively longer. Besides, the direct normal radiation is much stronger in the summer than in the winter. The illumination daylight time in winter is not long enough and radiation is not strong enough to meet the basic needs in winter.



2. SKY COVER RANGE

The sky cover in Anchorage is large throughout the year, which means it is cloudy heavily there. The recorded high of sky cover is 100% through the year. Even the average high of sky cover is almost 100% and the average low of the sky cover throughout the year is above 40%. In other word, as for design, large windows are needed in order to let more sunlight in and artificial lighting is needed when necessary.





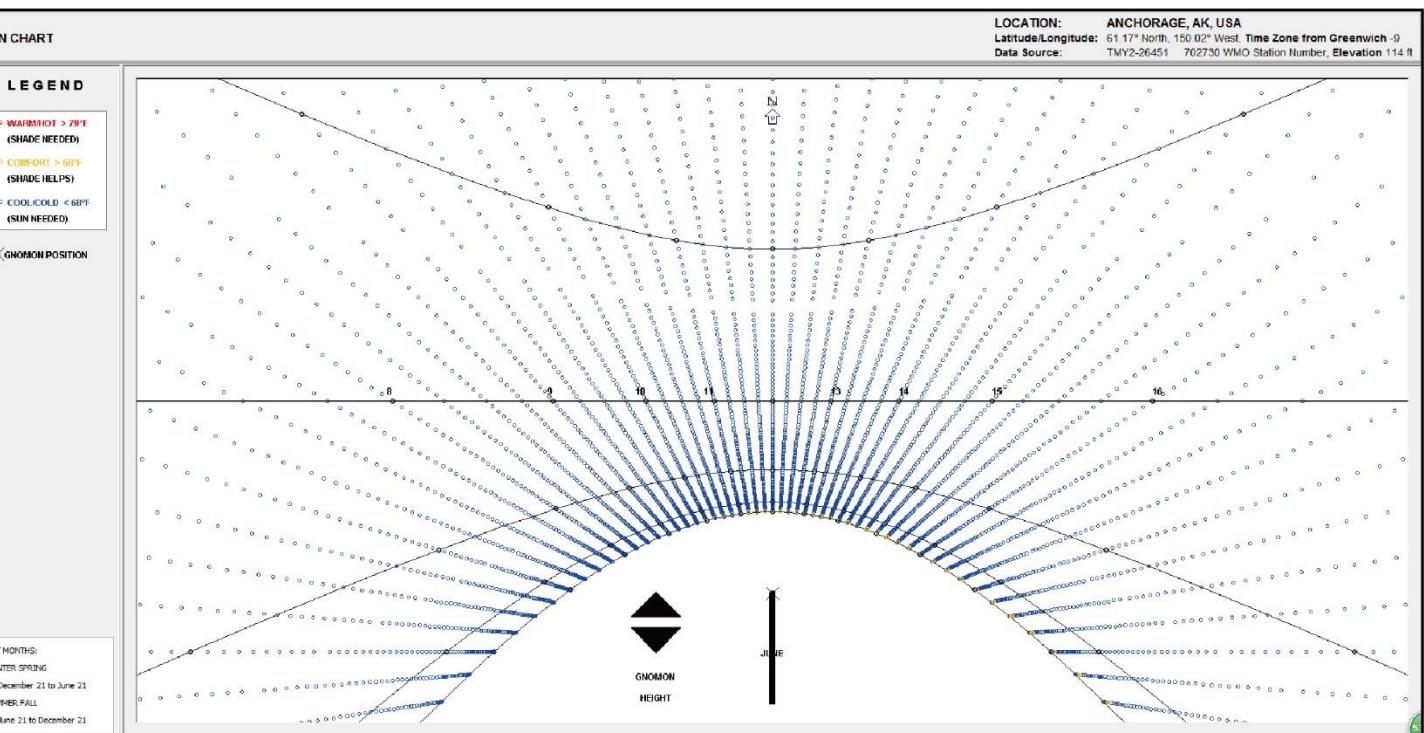
SECTION B SUN SHADING

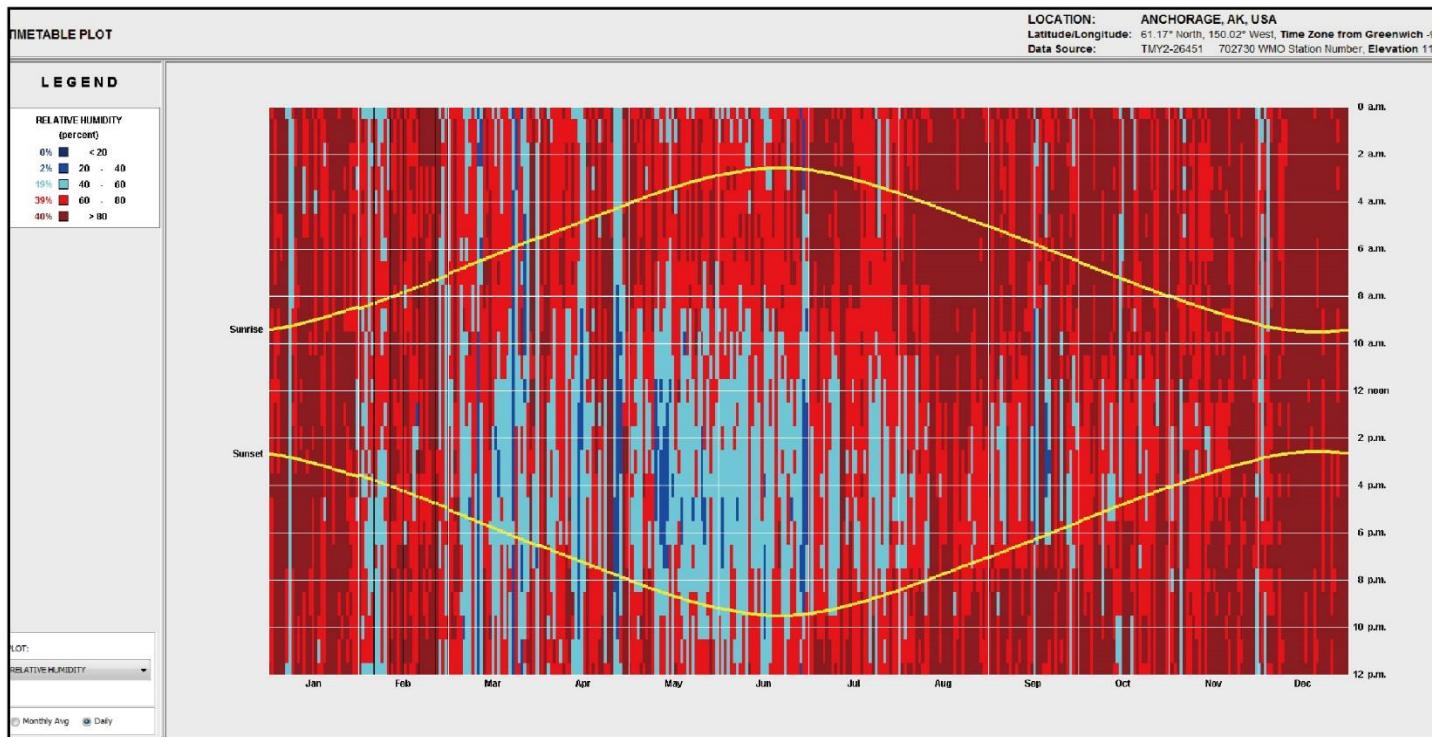
1. SHADING

Because of the extreme cold weather and heavily cloudy, the sunlight is not enough over the year. Therefore, there is no need for shading even in summer. On the contrary, in winter extra artificial lighting is needed in order to meet the basic daylight needs.

Sun needed:

In winter: 2305 hours exposed
 In Summer: 2248 hours exposed

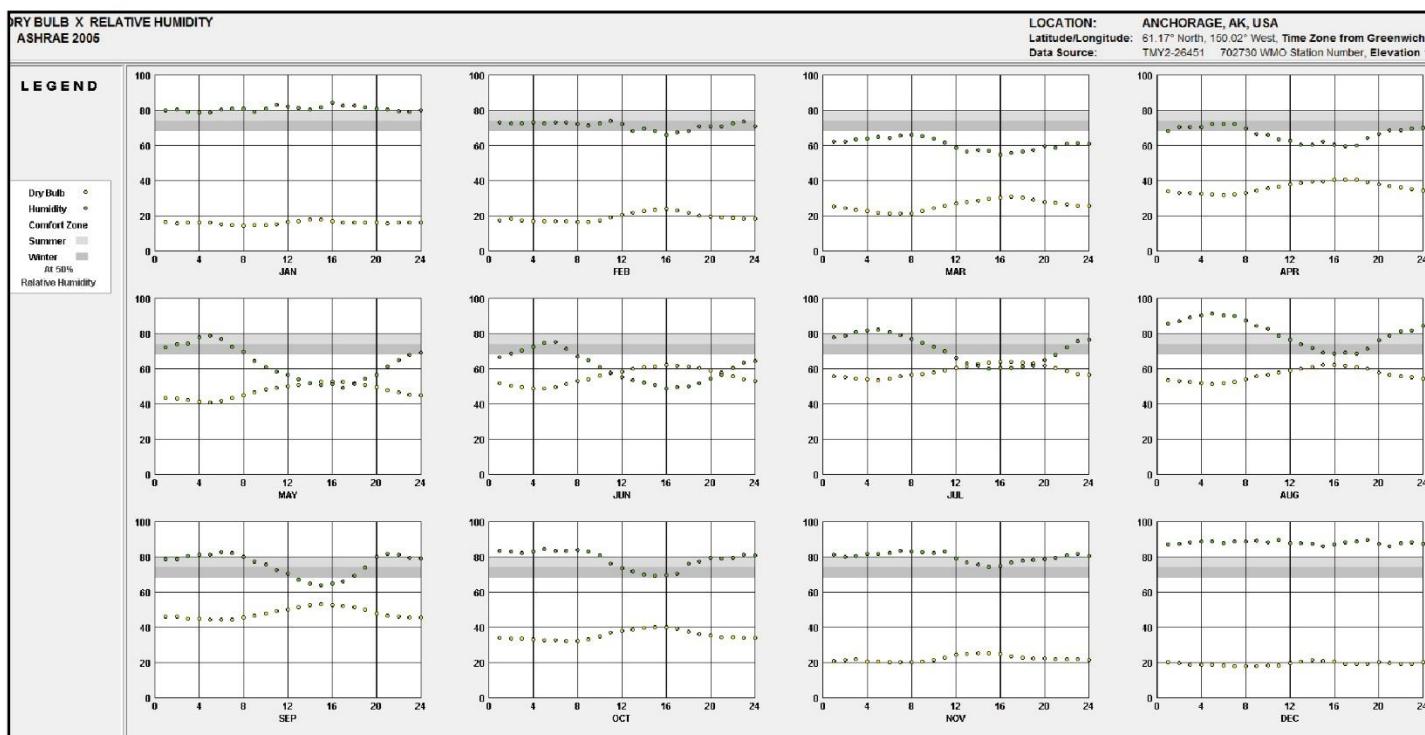


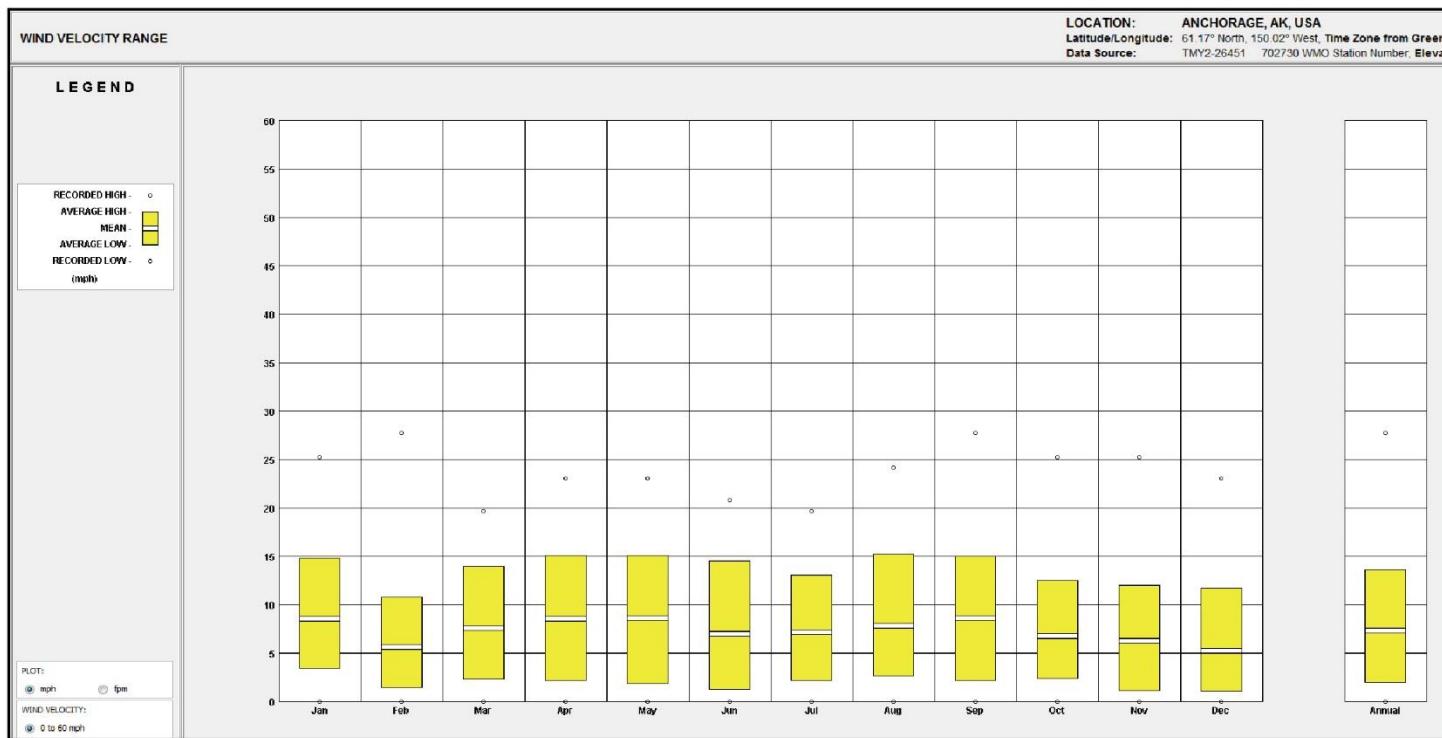


SECTION B HUMIDITY

1. HUMIDITY

According to the diagram, the percentage of relative humidity is pretty high in the whole year. In summer, it is relatively drier. However, in winter, the relative humidity is 100% all day and night.

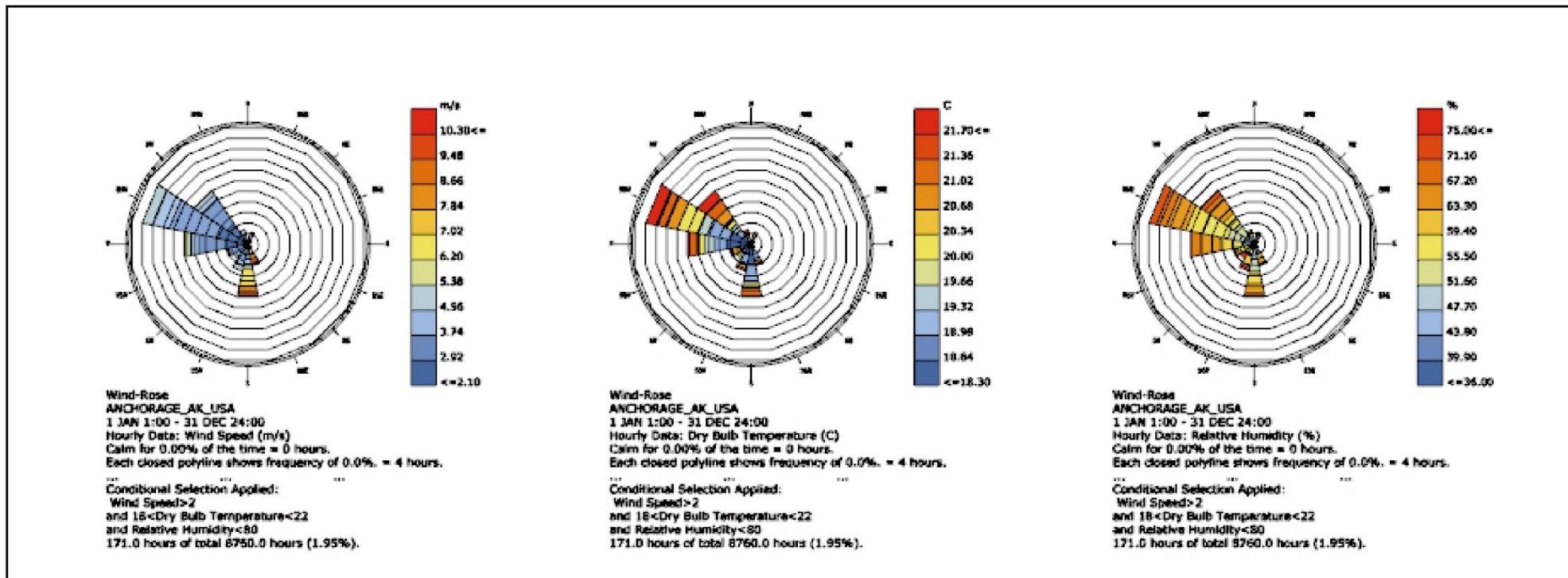




SECTION B WIND

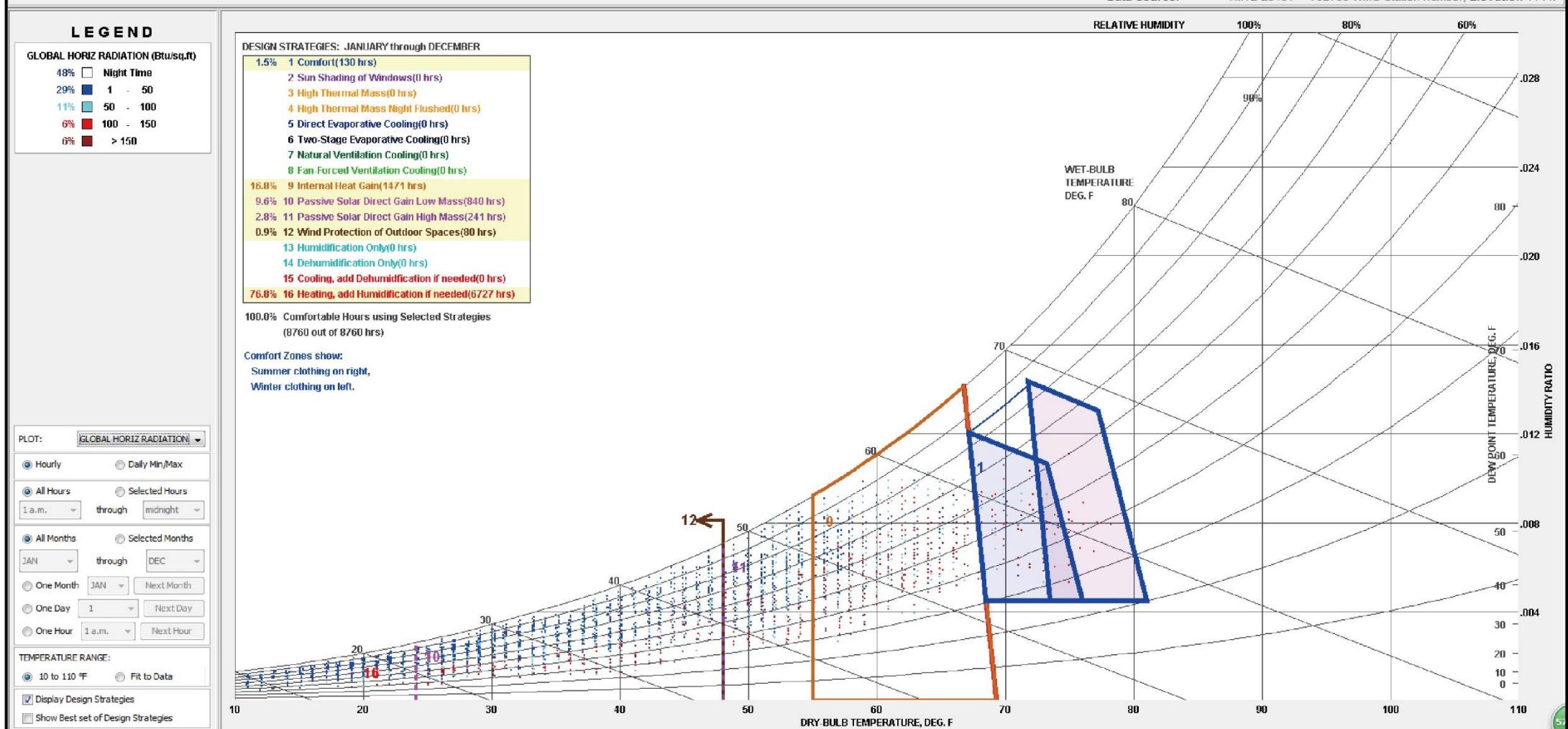
1. WIND VELOCITY RANGE

According to the chart from climate consultant, the wind is mild throughout the year. Therefore, there is no strategy is needed for avoid strong wind. In Wind-Rose diagram, the dominant wind direction is from south, so we need to avoid south wind causing the loss of heat.



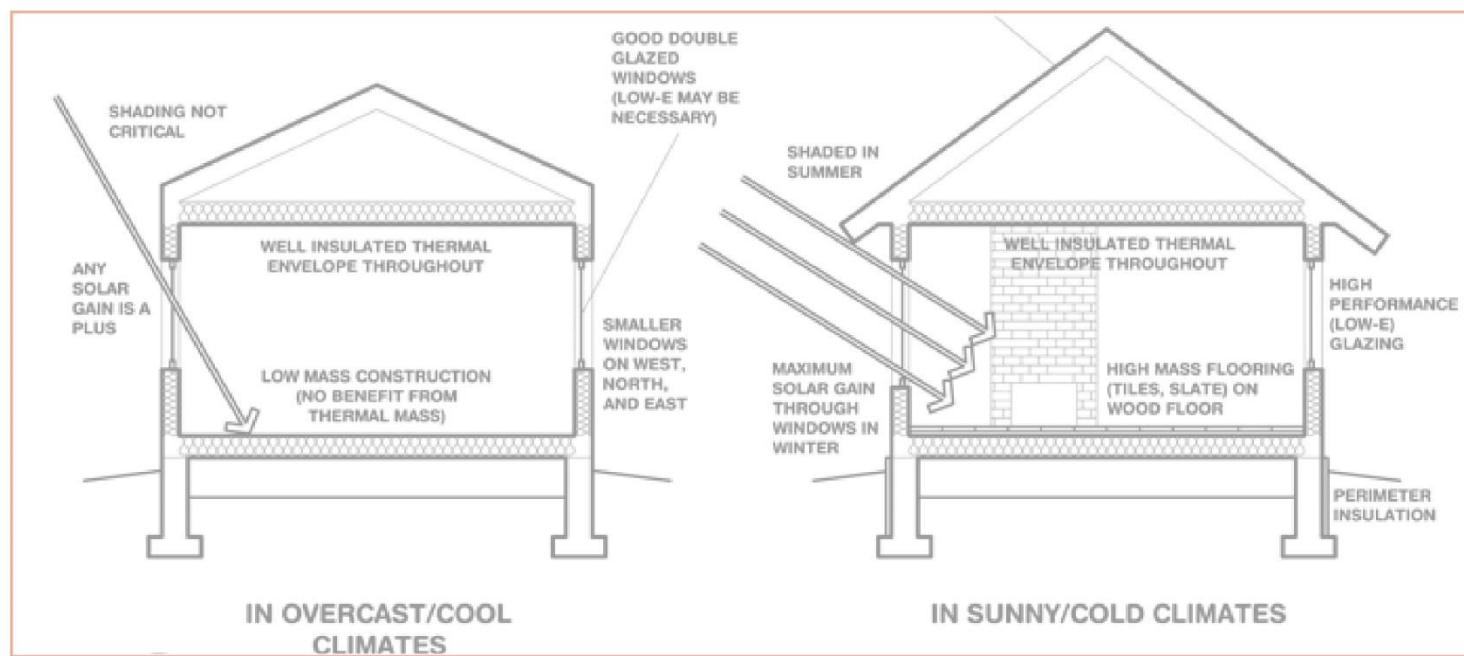
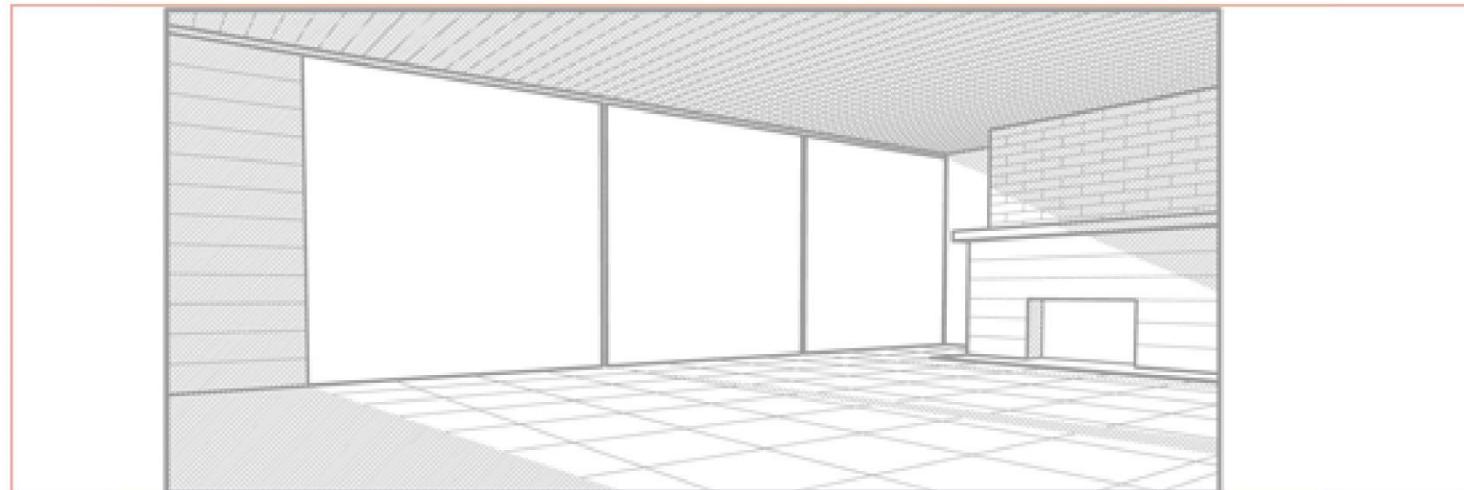
PSYCHROMETRIC CHART
ASHRAE 2005

LOCATION: ANCHORAGE, AK, USA
Latitude/Longitude: 61.17° North, 150.02° West, **Time Zone from Greenwich -9**
Data Source: TMY2-26451 702730 WMO Station Number, **Elevation 114 ft**



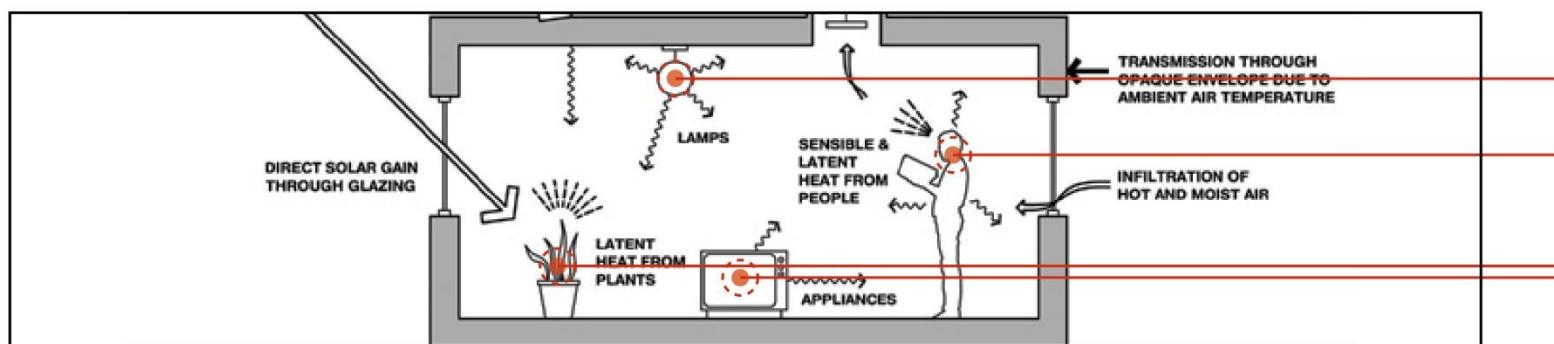
SECTION C DESIGN RECOMMENDATION

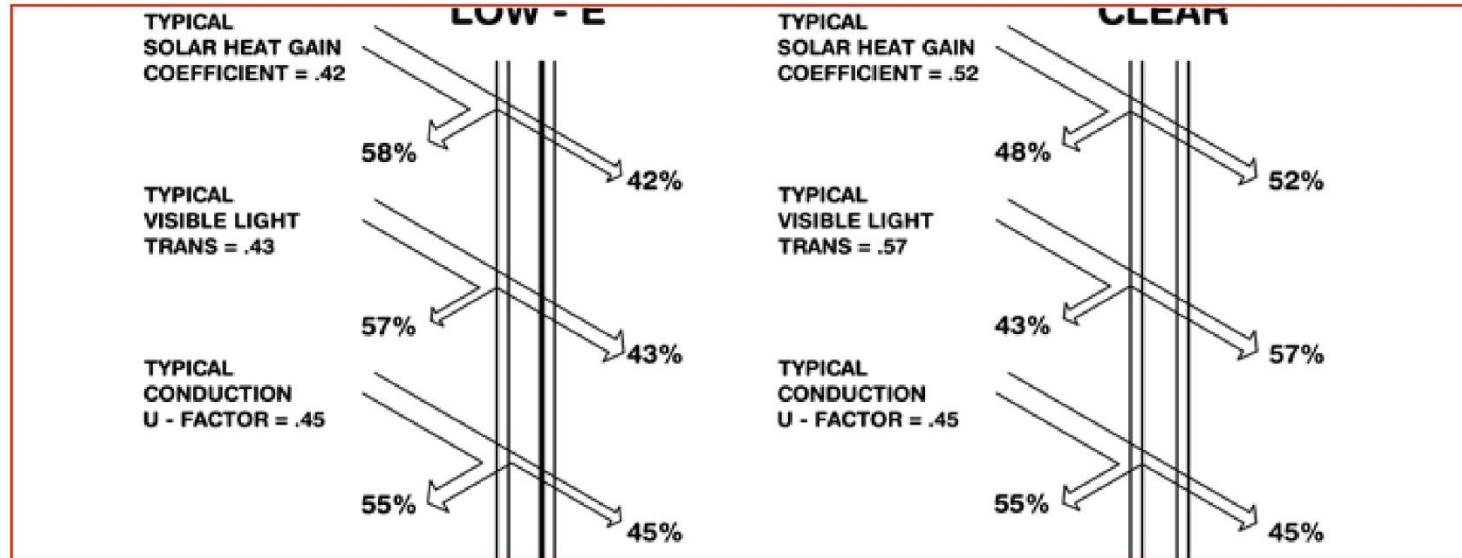
1. The temperature is extremely cold with very little time in indoor comfort zone throughout the year , especially in winter.
2. Much HVAC or heating system is needed in order to meet the indoor comfort in winter.
3. No shading and cooling strategies are needed in Anchorage.
4. Solar Direct Gain Low Mass is needed to collect heat in the daytime to warm up the rooms at night.
5. Solar Direct Gain High Mass is needed to collect heat in the daytime to warm up the rooms at night.



SECTION C DESIGN RECOMMENDATION

- SECTION A General Background
- SECTION B Climate Analysis
- SECTION C** Design Recommendation
- SECTION D Climate Changes

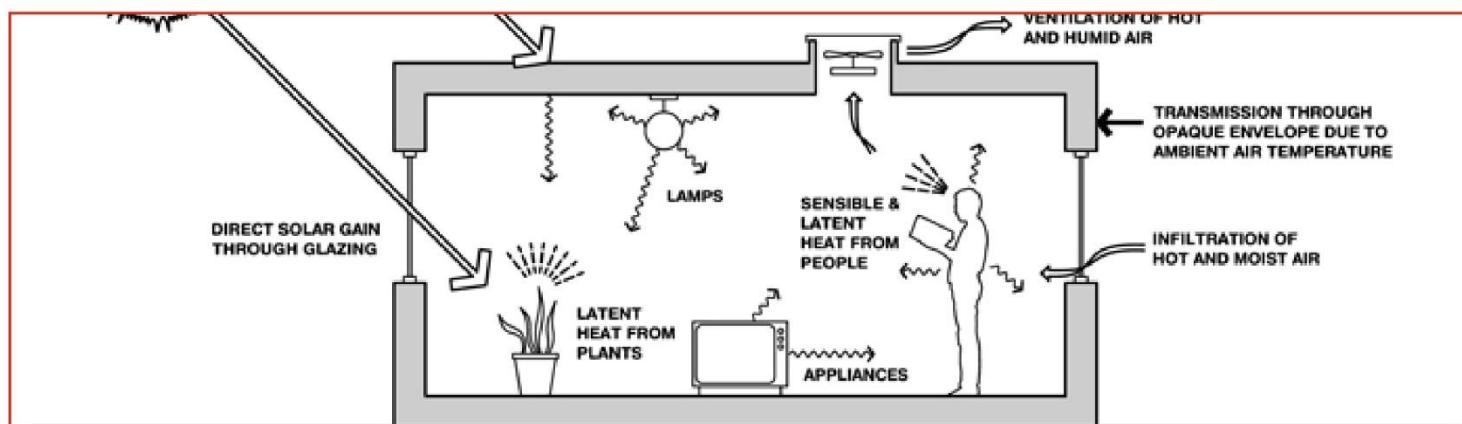
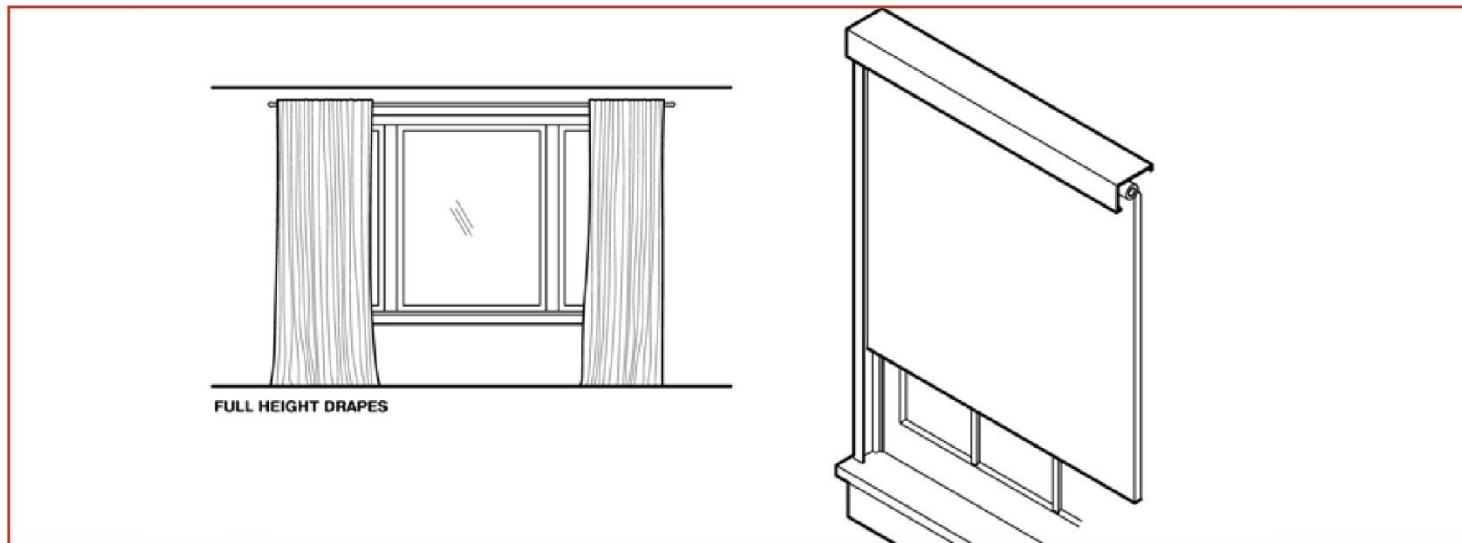




SECTION C DESIGN RECOMMENDATION

STRATEGY A BASED ON PANE

Provide double pane high performance glazing(Low-E) on west, north and east, but clear on south for maximum passive solar gain.



STRATEGY B INSULATION

Insulating blinds, heavy draperies, or operable window shutters will help reduce winter night time losses.

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STRATEGY C HEAT GAIN

Heat gain from light, people, and equipment greatly reduces heating needs to keep home tight, well insulated (to lower Balance Point temperature).



SECTION D Climate Change

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| SECTION A | Gerneral Background |
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| SECTION D | Climate Changes |

With the air pollution becoming more and more serious, the global warming now is an important factor to affect the strategies for sustainable design. Some possible changes are listed below:

1. The temperature becomes higher in the future, there is no need to have inslation windows or heavy draperiers.
2. No additional heating system is needed for warm up the rooms in anchorage.
3. Windows filters are needed to clean the dirty air before letting in. In summer, nature ventilation system is needed to cool down the indoor temperature.