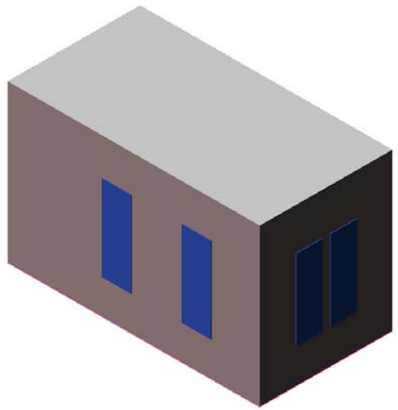
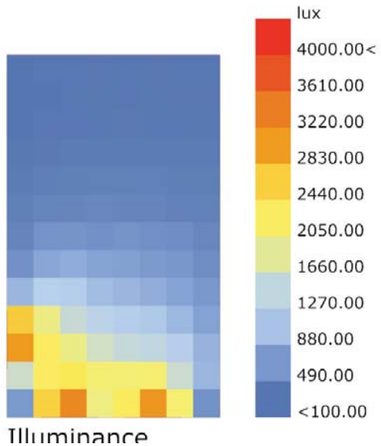
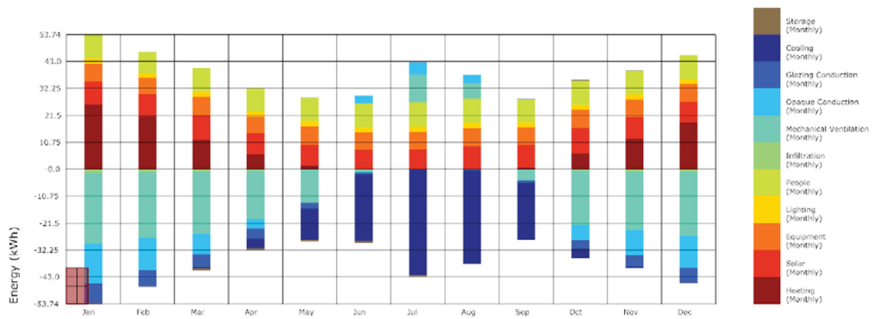
MAXIMISING UDI & THERMAL COMFORT

GRAHAM NELSON
NOVEMBER 19, 2017





Illuminance



GOALS AND TAKEAWAYS:

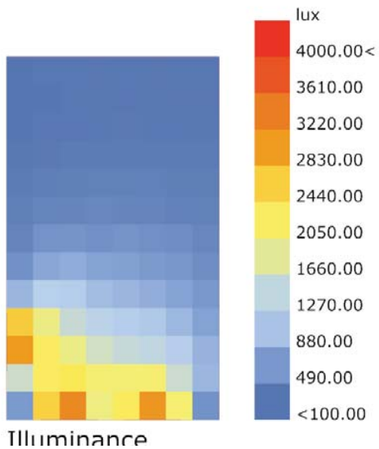
The goals of this analysis were to maximise the Usefull Daylight Illuminance and thermal comfort levels of a specific space in question. This involved determining the primary factors affecting the environmental performance of a south-facing room in a 1915 Philadelphia row-house. These effects can be seen in the associated Energy Balance charts, and the variations due to certain factors, and relate directly to the comfort of the space. In this case, the Energy Balance relative to air changes per hour, number of occupants per square meter, U-Value of the windows, and R-Value of the exterior walls are of particular importance. In the case of UDI, the analysis involved changing parameters associated with reflectance and transmissivity of the floors, walls, and glazing.

USEFULL DAYLIGHT ILLUMINANCE

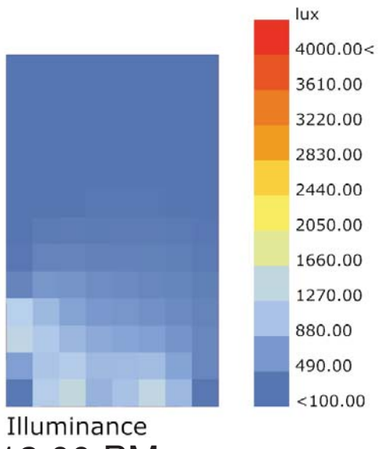
AS RELATED TO MATERIALS

Maximising usefull daylight penetration into the space at specific points in time.

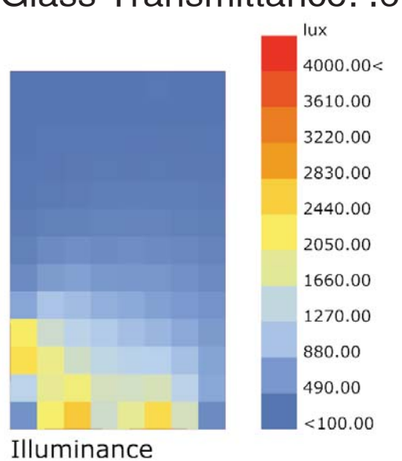
Winter Solstice 12/21



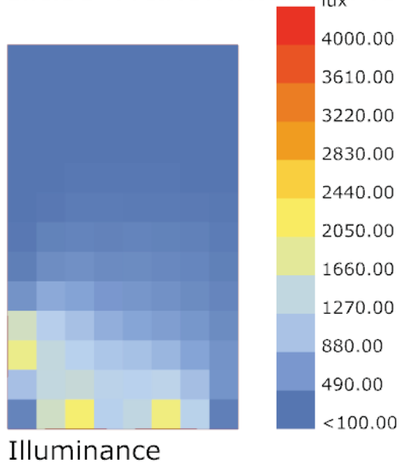
12:00 PM
Floor Reflectance: .2
Glass Transmittance: .6



12:00 PM
Floor Reflectance: .2
Glass Transmittance: .3

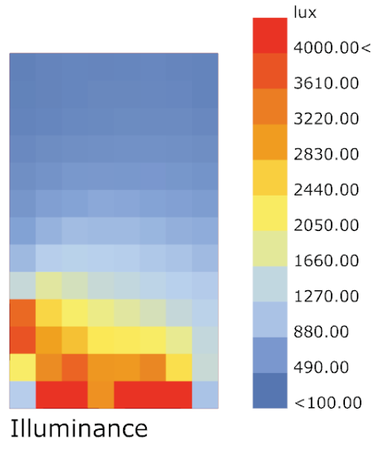


12:00 PM
Floor Reflectance: .4
Glass Transmittance: .5

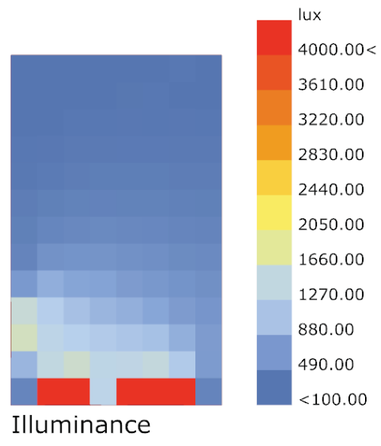


12:00 PM
Floor Reflectance: .6
Glass Transmittance: .4

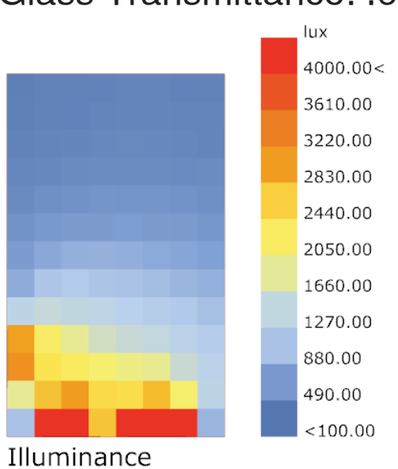
Summer Solstice 06/21



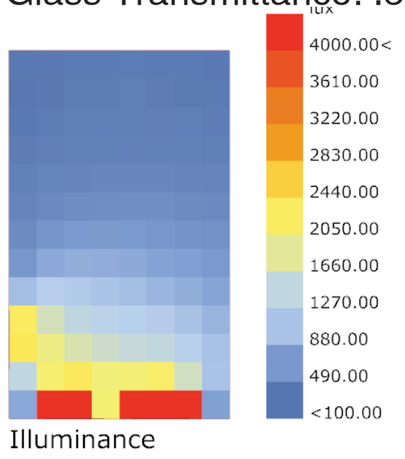
12:00 PM
Floor Reflectance: .2
Glass Transmittance: .6



12:00 PM
Floor Reflectance: .2
Glass Transmittance: .3



12:00 PM
Floor Reflectance: .4
Glass Transmittance: .5



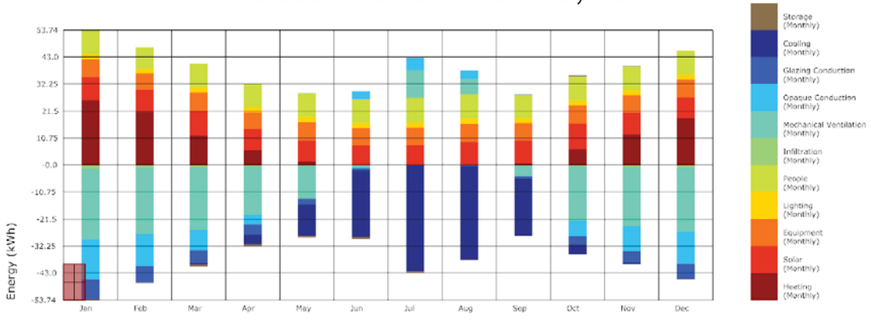
12:00 PM
Floor Reflectance: .6
Glass Transmittance: .4

ENERGY BALANCE CHARTS

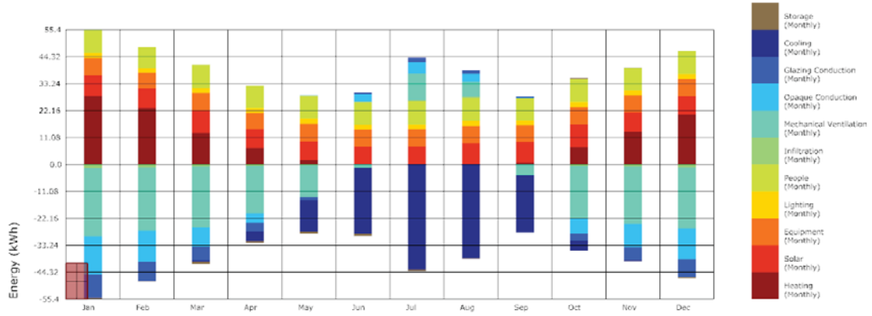
WITH RESPECT TO WALL TYPE AND INSULATION

Changes in energy balance due to different levels of insulation, Glazing U-Value, and SHGC.

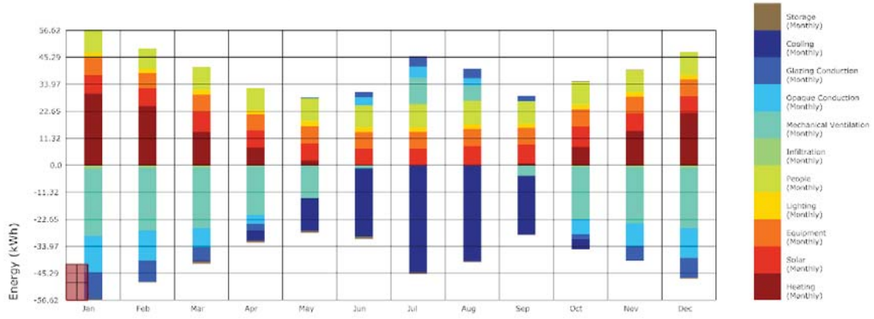
Wall R-Value, 25
SHGC, .55
Visual Transmittance, .6



Window U-Value, .45

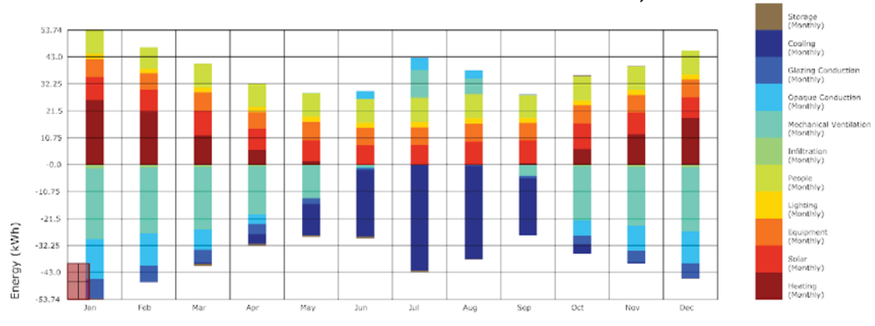


Window U-Value, .7

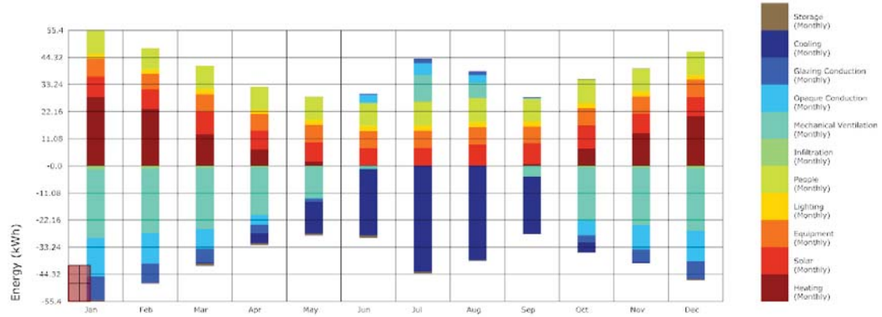


Window U-Value, .95

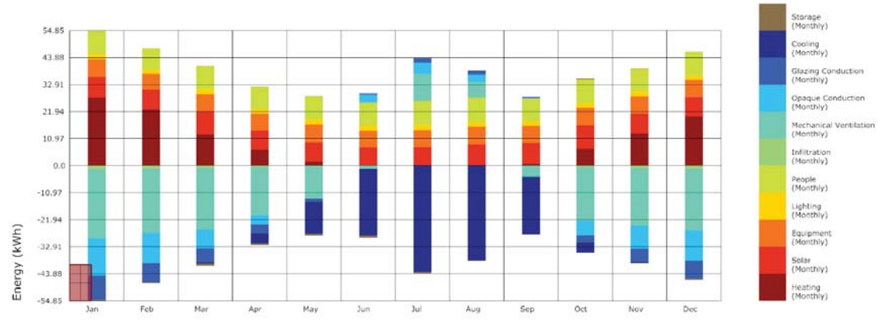
Window U-Value, .65
SHGC, .55
Visual Transmittance, .6



Wall R-Value, 20



Wall R-Value, 25



Wall R-Value, 35