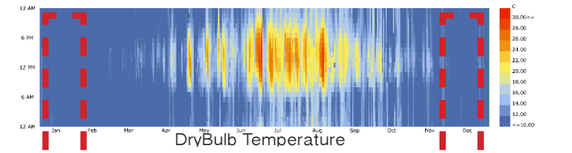
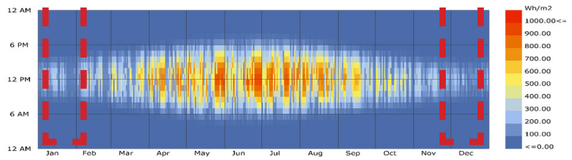
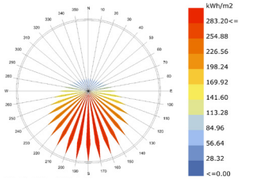
CLIMATE ANALYSIS

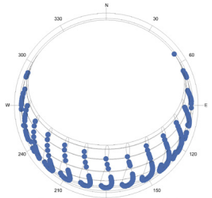
Due to low outdoor temperatures in winter (January, December) with lack of the radiation, it is impossible to create thermal comfort inside without systems on this months. However, energy usage for HVAC may be significantly reduced using passive heating - thermal mass and glazing, and cooling - shading and ventilation.







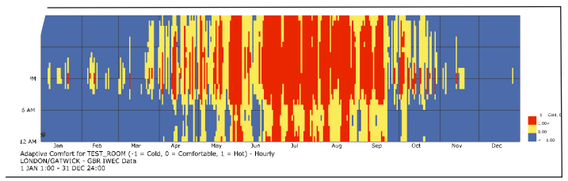
Winter Solar rariation Rose According to it South facing orientation was chosen

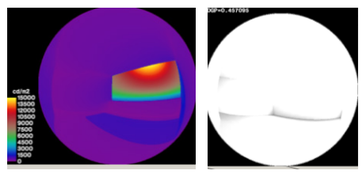


Sunpath with cold (<15C) hours

BASECASE

Adaptive comfort without usig systems is 25% wth prevaling cold hours (51%). DGP on July 9am (wich is the most problematic hour for this case is 0.46)



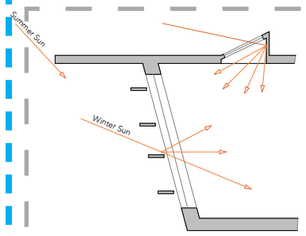


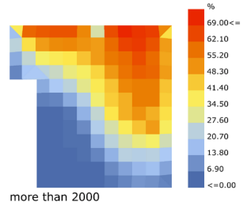
Daylight Autonomy

WORKFLOW

1. Let as much solar radiation inside as possible by creating **glazing facade** to reduce cold uncomfortable hours.
2. Since glazing facade leads to overheat and glare, design a shading

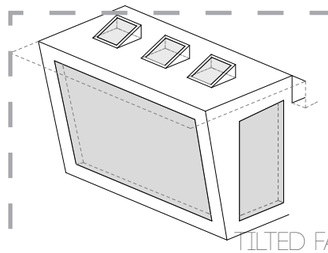
The main design problem of the project was to find a balance between thermal and light comfort, since increase in one leads to reduction in the other.

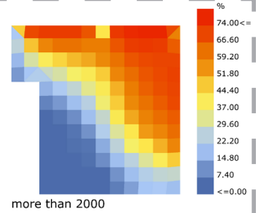




LOUVERS & OVERHANGING ROOF

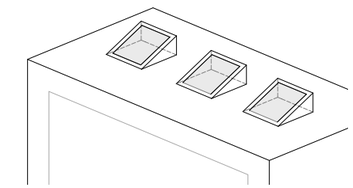
To prevent overheated and over lighted spaces as well as to keep glare on acceptable level roof overhang were designed. Horizontal ouvres diffuse sunlight and prevent glare. Have been tryed different depth of louvers .

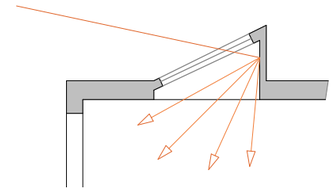




TILTED FACADE

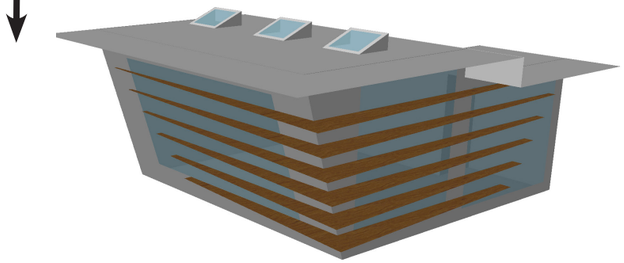
Tilted facade by itself prevent high summer sun rays to overheat and overligh the room without additional shading. thw angle is chosen by “sensitive” method.
However space is still overlighted. DGP is 0.45



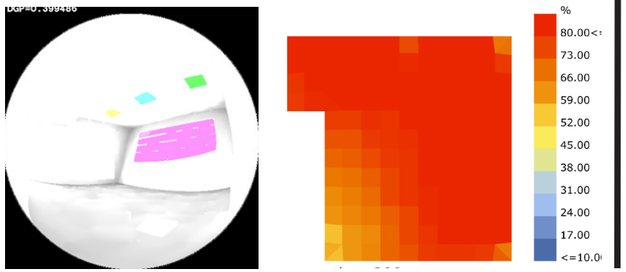


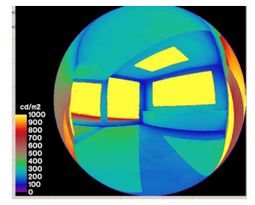
SKYIGHTS

Windows on flat roof let even more solar heat. Final design is chosen to diffuse light all over the room and let more winter sun rays, while blocking summer ones



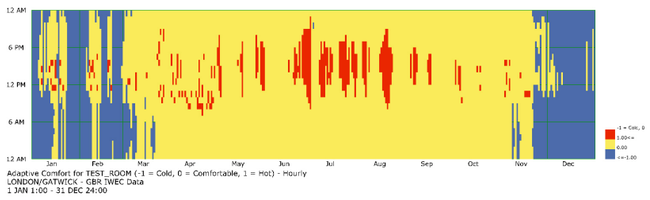
Annual Daylight & Glare
DGP 0.39

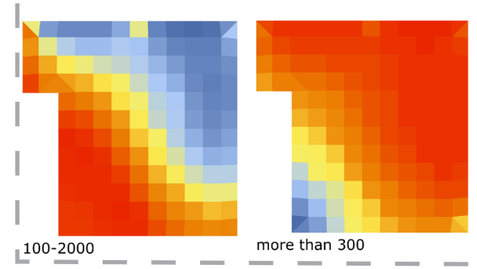


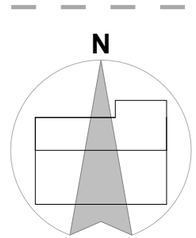


Simple flat skylight : DGP = 0.82

Adaptive comfort 71%



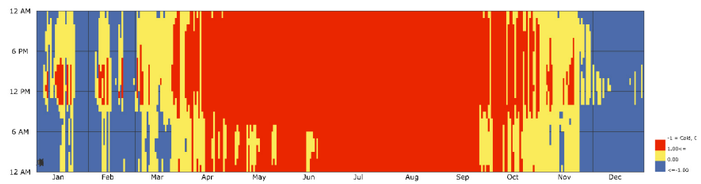




ORIENATATION

Due to the direction of the prevalent solar iradiation the orientation has been chosen. Main facade is facing south

Adaptive comfort 22.6% **Cold Hours 22.6%**



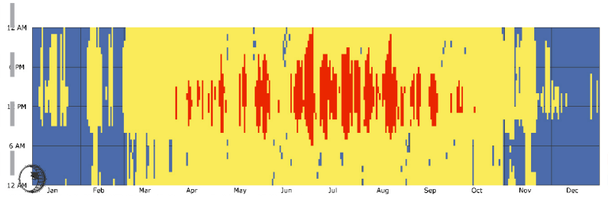
THERMAL MASS & GLAZING

Increasing glazing area (80% south, 70% east, 40% skylights) to let solar heat in and adding thermal mass (by changing materials) to absorb it and to deal with temperature swings

INSULATION

While saouth and north - fasing facades as well as roof designed to have a high thermal mass, west-east facades have a layer of insulation, due to cold wind from the east and possible overheating by evening west sun

Adaptive comfort 65.6% **Cold Hours 25.3%**



NATURAL VENTILATION

Large wndows area creates more comfortable hours in cold weatherm but to prevent overheating in during warm outside temperature natural ventilation is designed.Comfort increased to 65.6.
However, even though comfort increased, with such big glazing glare and DLA are not aceceptable.