LONDON

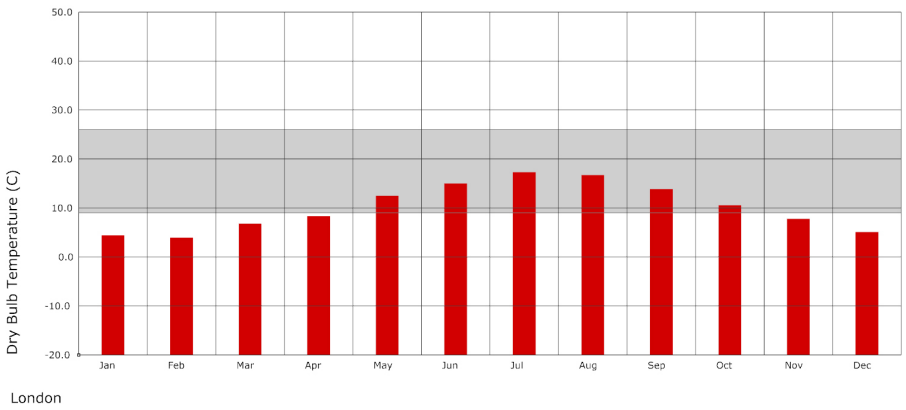
MUNAZZA BHATTI

ARCH-753 BUILDING PERFORMANCE SIMULATION

FALL 2015 FINAL PROJECT

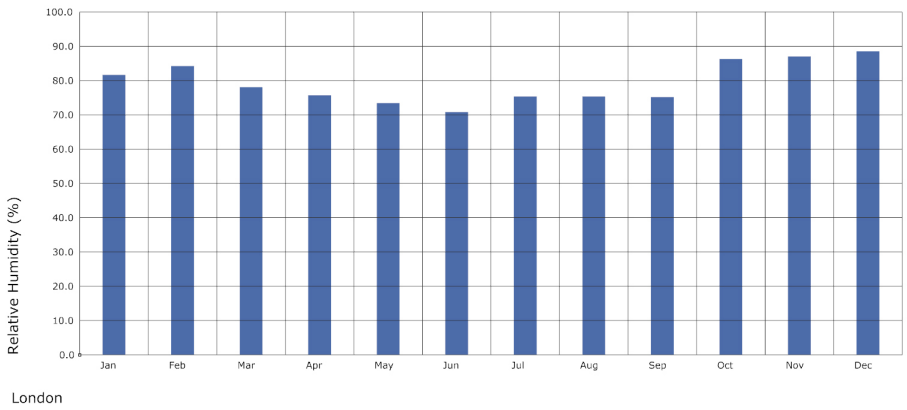
CLIMATE ANALYSIS

LONDON, ENGLAND



London

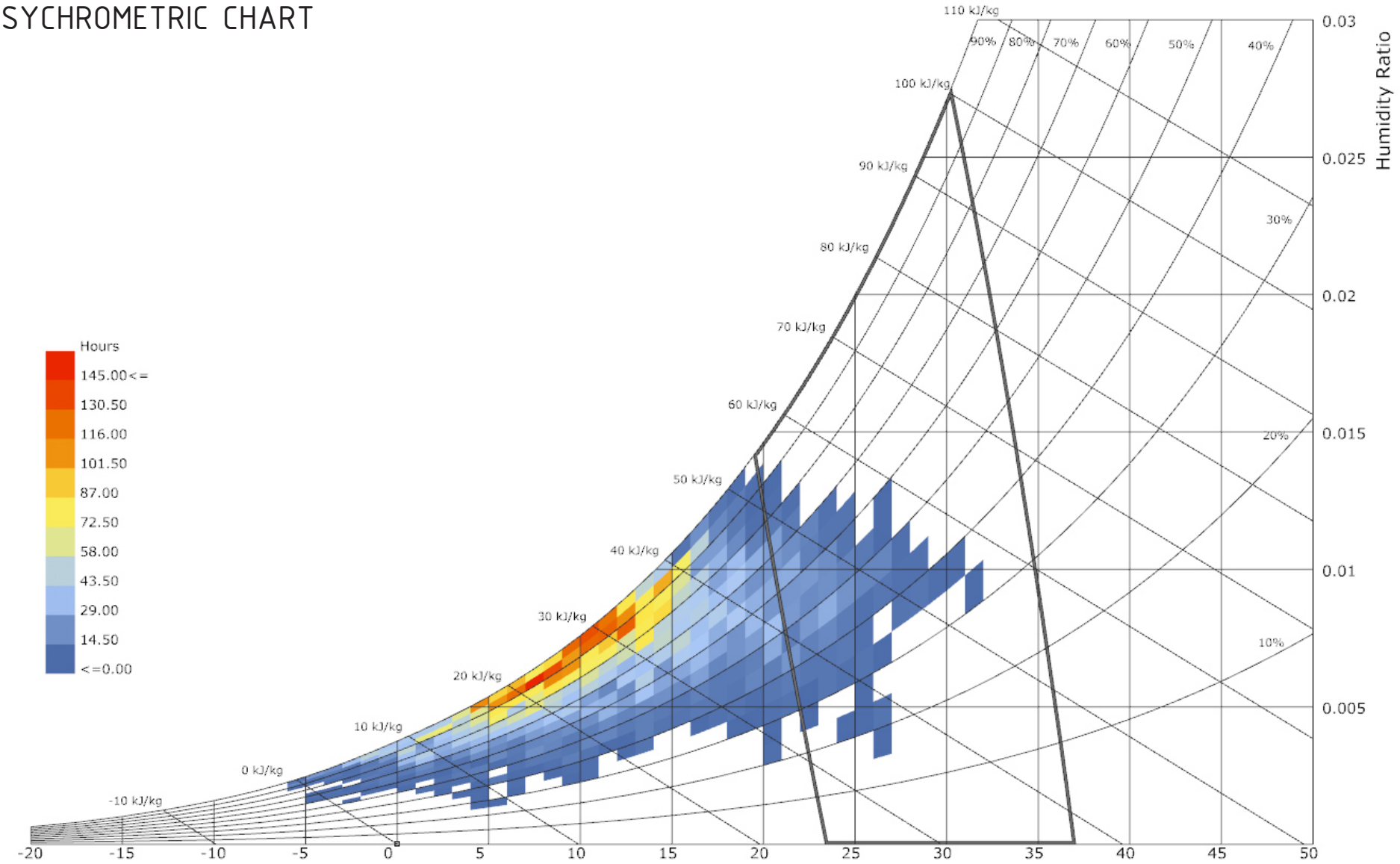
MONTHLY DRY BULB TEMPERATURE

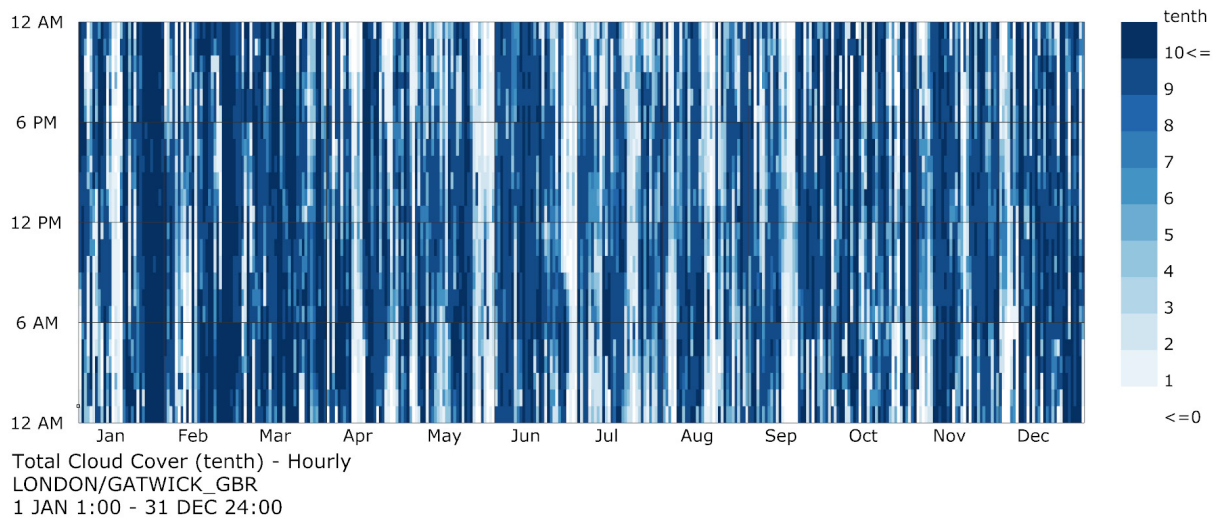


London

MONTHLY RELATIVE HUMIDITY

PSYCHROMETRIC CHART





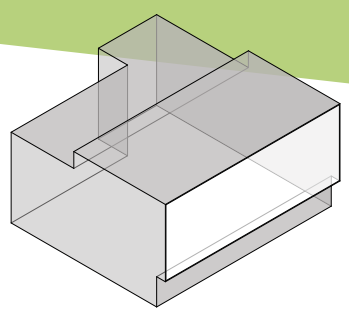
Generally, London's climate is moderate.

The temperature does not get too high and does not go higher in comfort level. However, in the winter months, the temperature drops very low.

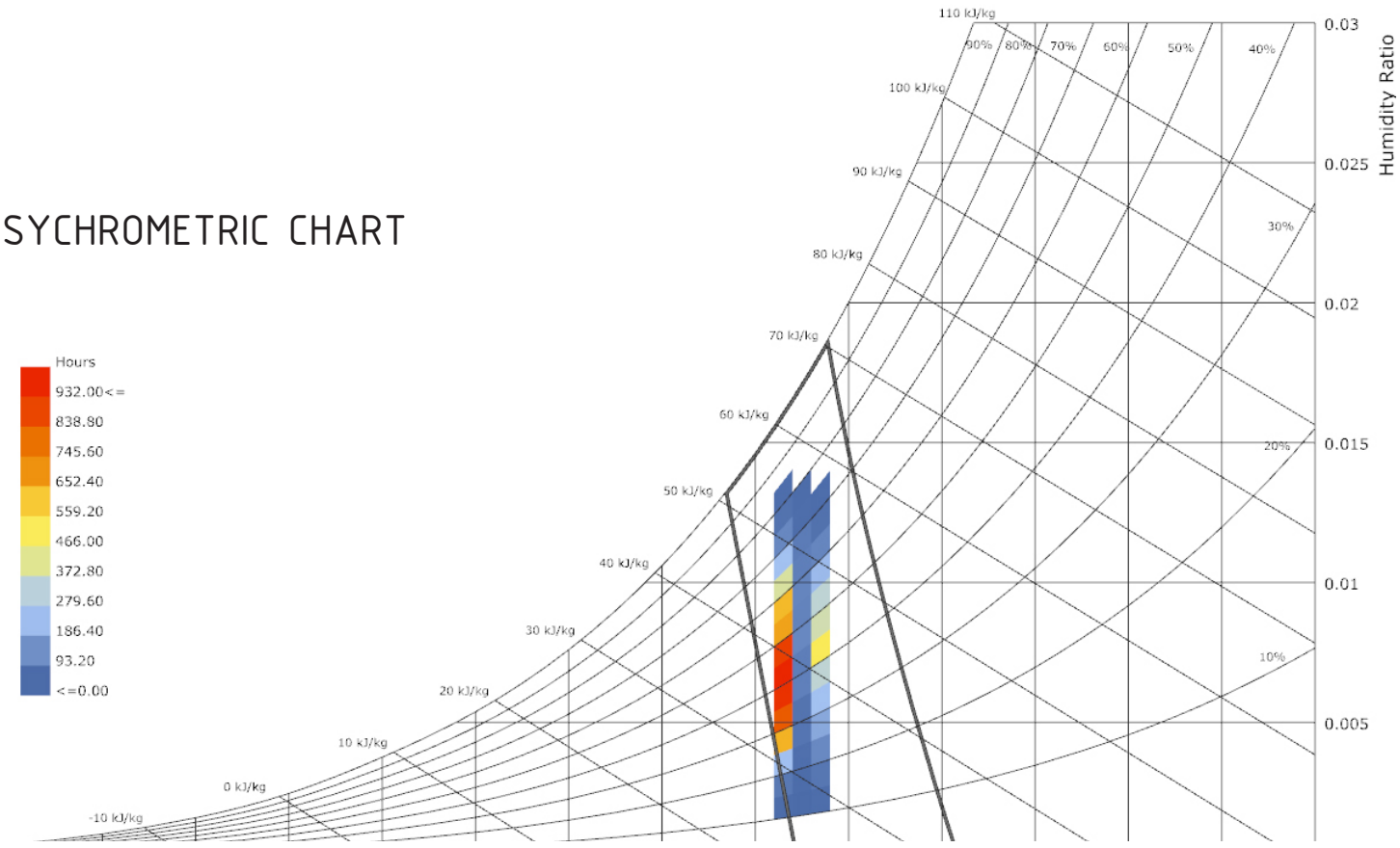
Things to consider when designing is the majority of the year is cloudy so emphasis has to be made on daylighting.

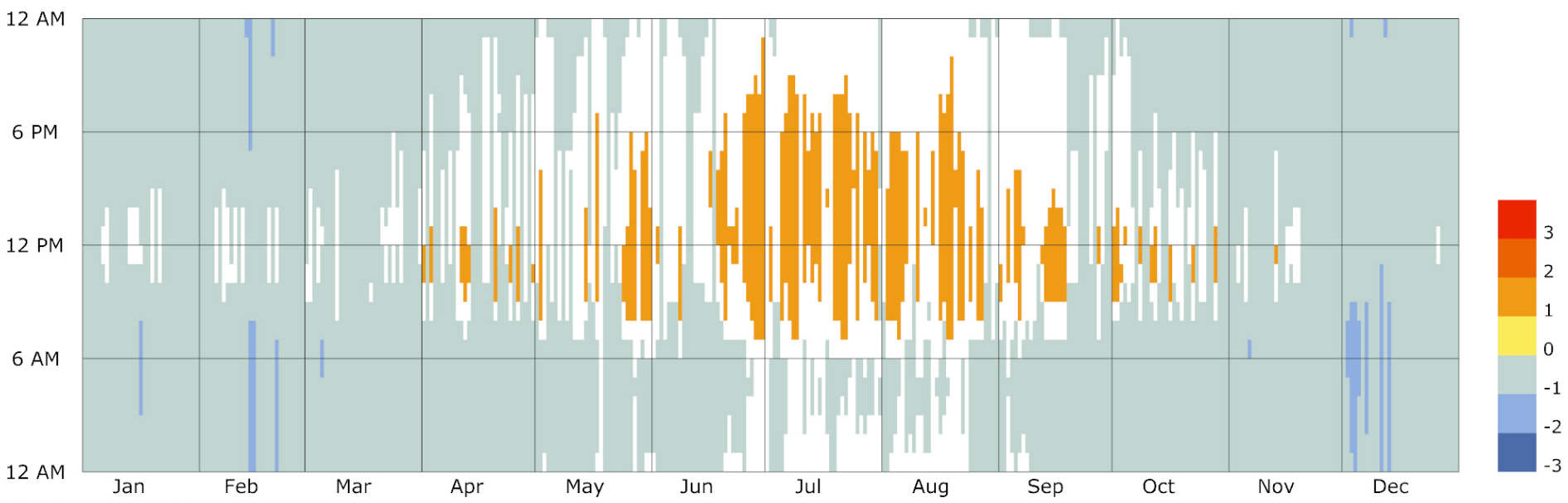
The winter months will be given priority to lower heating load, as well as, provide sufficicent lighting.
There is hardly any need to work on cooling down the building due to the moderate temperatures in the summer.

BASE CASE



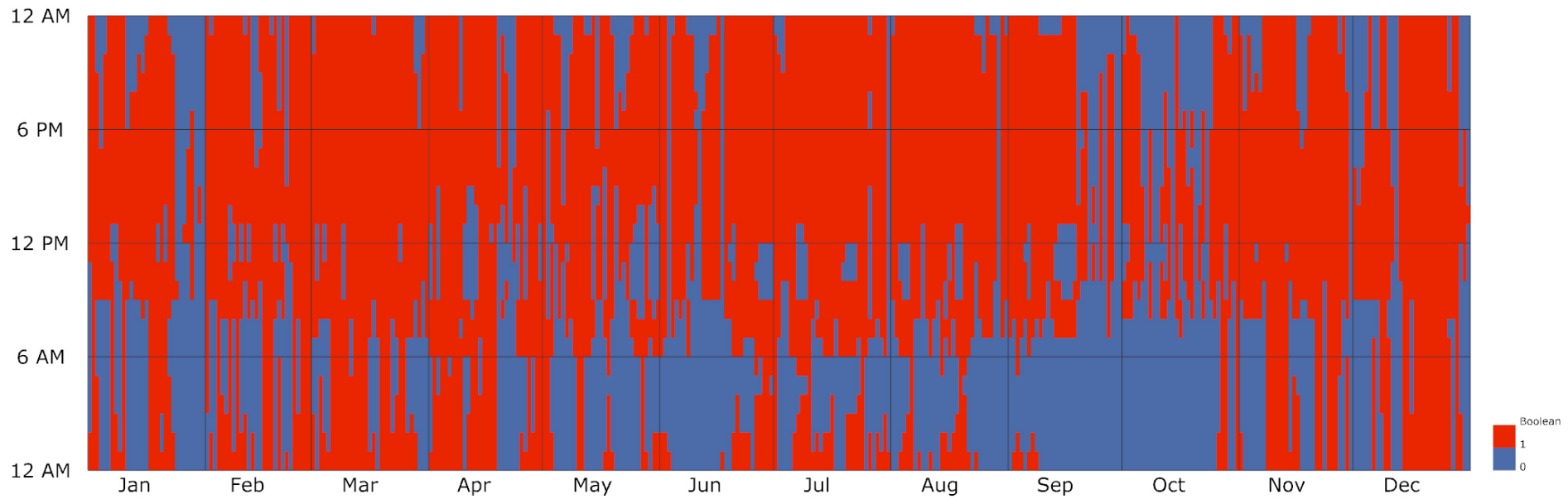
PSYCHROMETRIC CHART





Predicted Mean Vote
London, England
1 JAN 1:00 - 31 DEC 24:00

+3 hot, +2 warm, +1 slightly warm, 0 neutral, -1 slightly cool, -2 cool, -3 cold



ADAPTIVE COMFORT ANALYSIS

BUILDING ORIENTATION : 45 DEGREES
PSYCHROMATIC : 98.7%

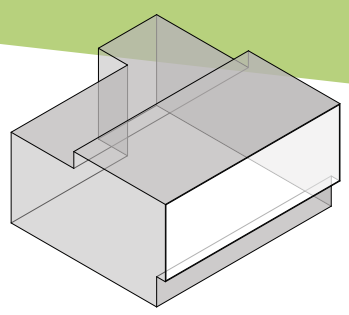
ADAPTIVE COMFORT: 64.7%
(UNDER EUROPEAN STANDARDS)
PMV COMFORT: 24.7%

HEATING LOAD: 5423
COOLING LOAD: 765
LIGHTING LOAD: 1211

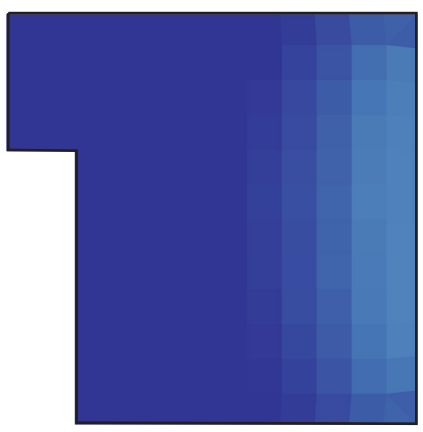
The comfort level within the building is generally good, with slightly cooler temperature in the winter and slightly warmer temperature in the summer.

One necessary thing to be considered, as mentioned in the climate anlaysis, is lighting. Daylighting at 100 to 2000 lux varies only between 20-40%
By changing the orientation of the room and adding another window, both and lighting and thermal comfort will be addressed.

BASE CASE



WINTER SOLSTICE



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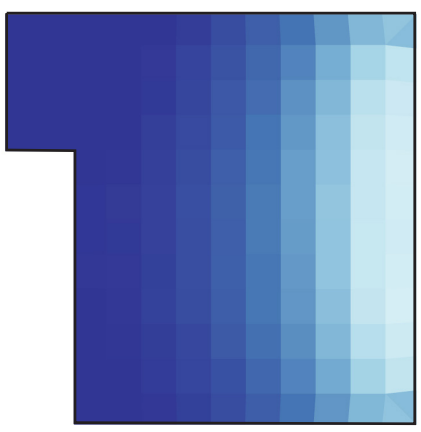

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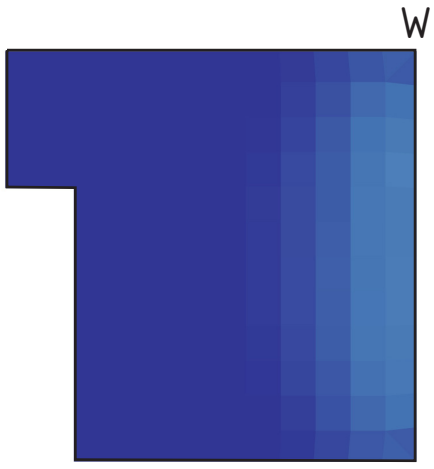

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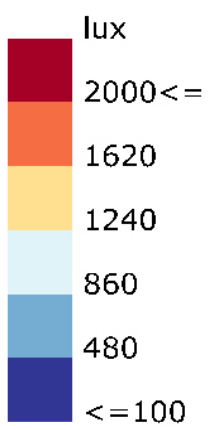
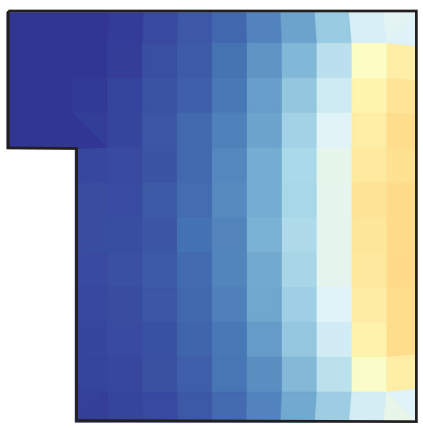


SPRING EQUINOX



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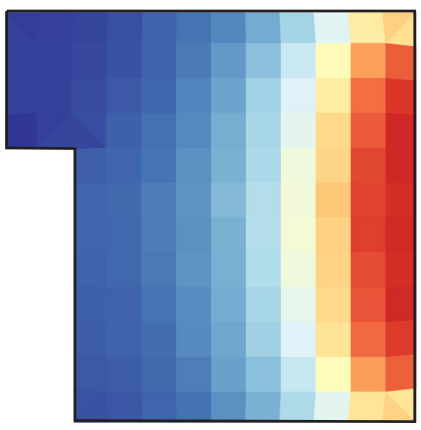

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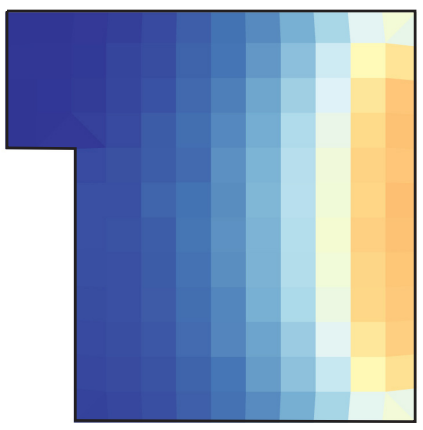

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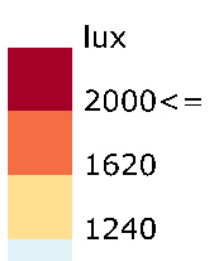
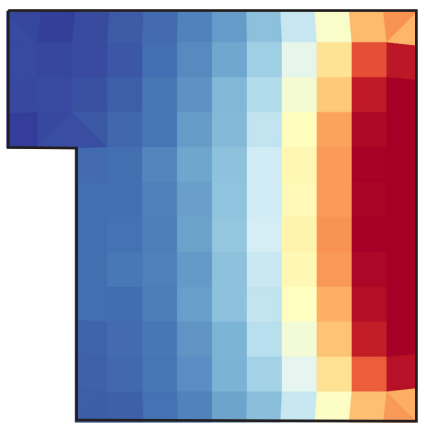


SUMMER SOLSTICE



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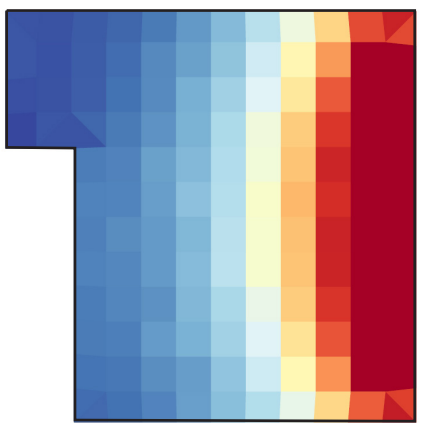

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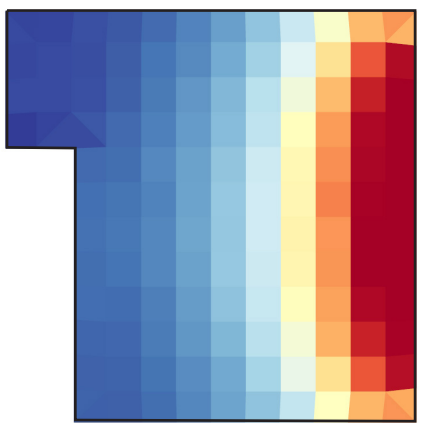

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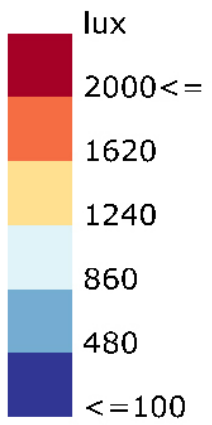

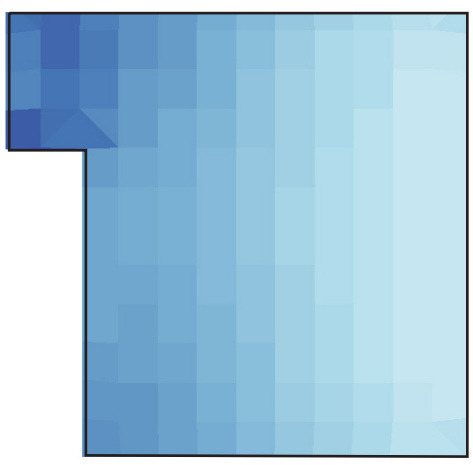

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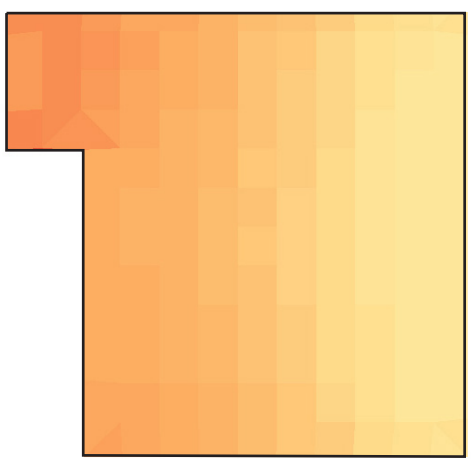
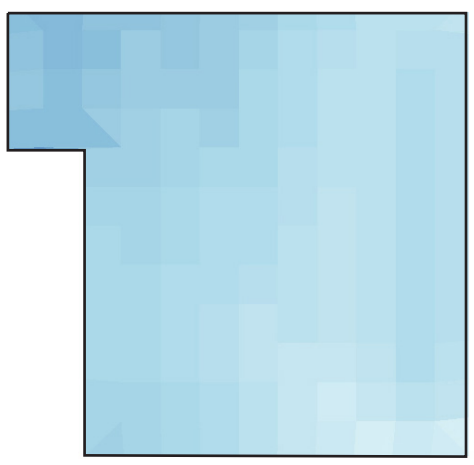
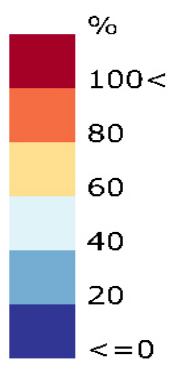


UDLI LESS THAN 100

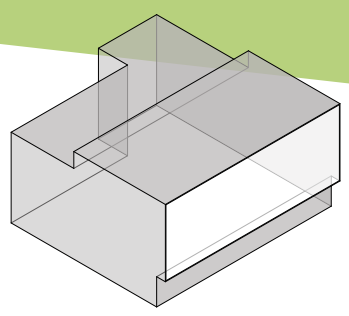


UDLI 100 TO 2000



Daylighting needed in the winter

DESIGN STRATEGIES



As mentioned earlier, the primary objective is to maximize solar heat gain in for the winter months.

ROOM ORIENTATION

Room orientation allows the largest wall with the largest window to face a direction that would allow the maximum amount of sun. In most cases, like this one, this direction in facing south. Changing the room orientation from 45 degrees north to 90 degrees north in this design improved heating loads by almost 50%. The largest wall and window face the sun entirely

WINDOW PLACEMENT

Window placement deals with daylighting, as well as, some solar gain. With London colder winters, placing the windows low and on the west facade, allows the winter morning sun heat up the building for the cooler afteroon.

BUILDING MATERIALS

Adding more insulation in the exterior walls, and triple pane windows, makes the building's thermal mass higher and therefore retains more heat longer.
By upgrading the wall insulation to 46 and putting in triple pane windows, it increased the PMV by 9% and adaptive comfort by 23%

NATURAL VENTILATION

When the winter months are finally more bearable, the design can then explore the use of natural ventilation to make the summer months more comfortable. London's weather in the summer is not very hot, so adding natural ventilation did not have much effect on comfort.

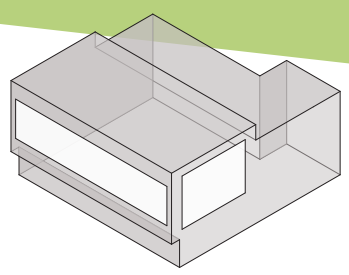
LOUVERS

In most cases, if there is still need for more cooling in the summer or less daylighting, the design would require some sort of louvers. However, in London's cool and cloudy climate, there are not necessary

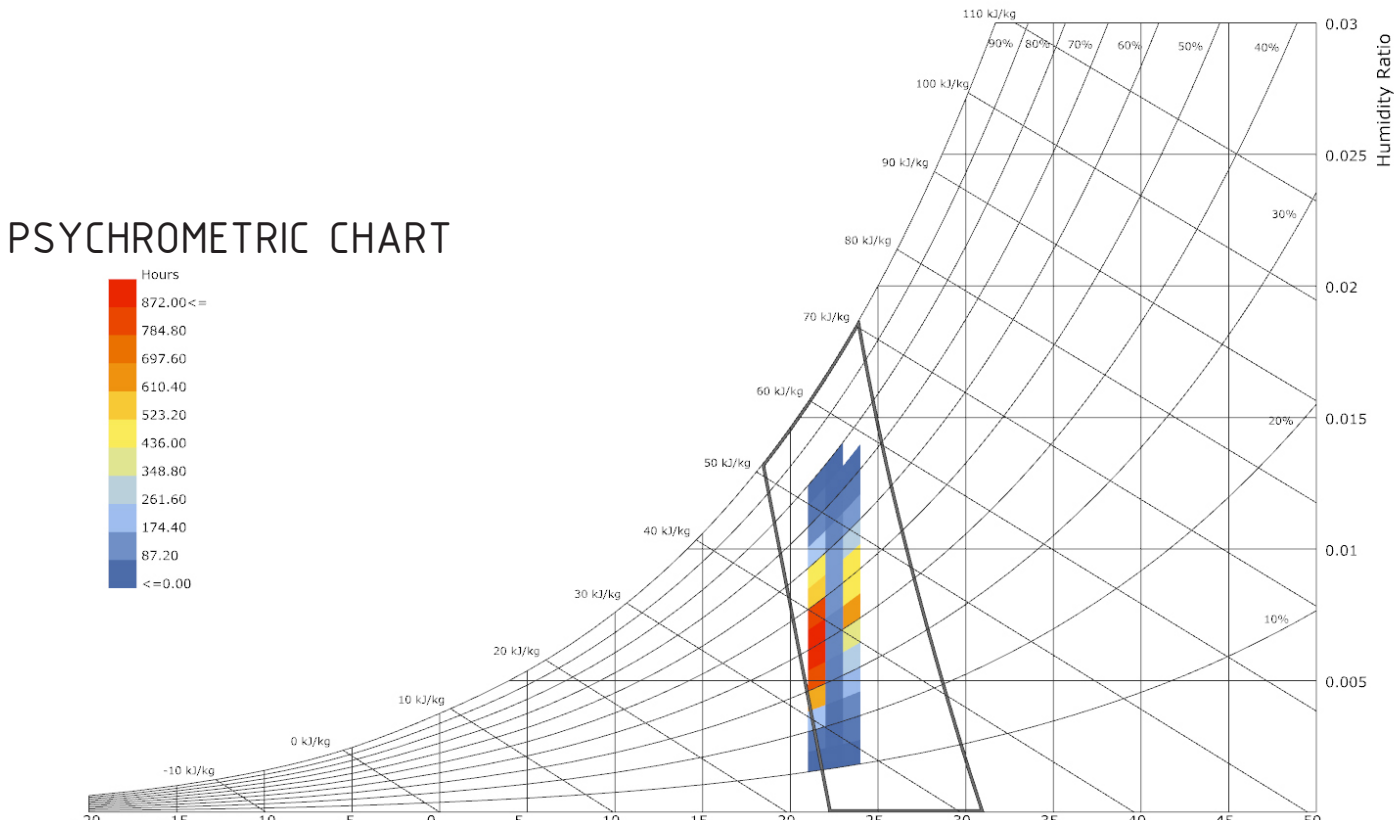
	PMV	ADAPTIVE	LOADS
ROOM ORIENTATION	24.4%	62.9%	H:5266 C:543
WINDOW PLACEMENT	32%	88%	H:3596 C:448
BUILDING MATERIALS	36%	91%	H:2684 C:455

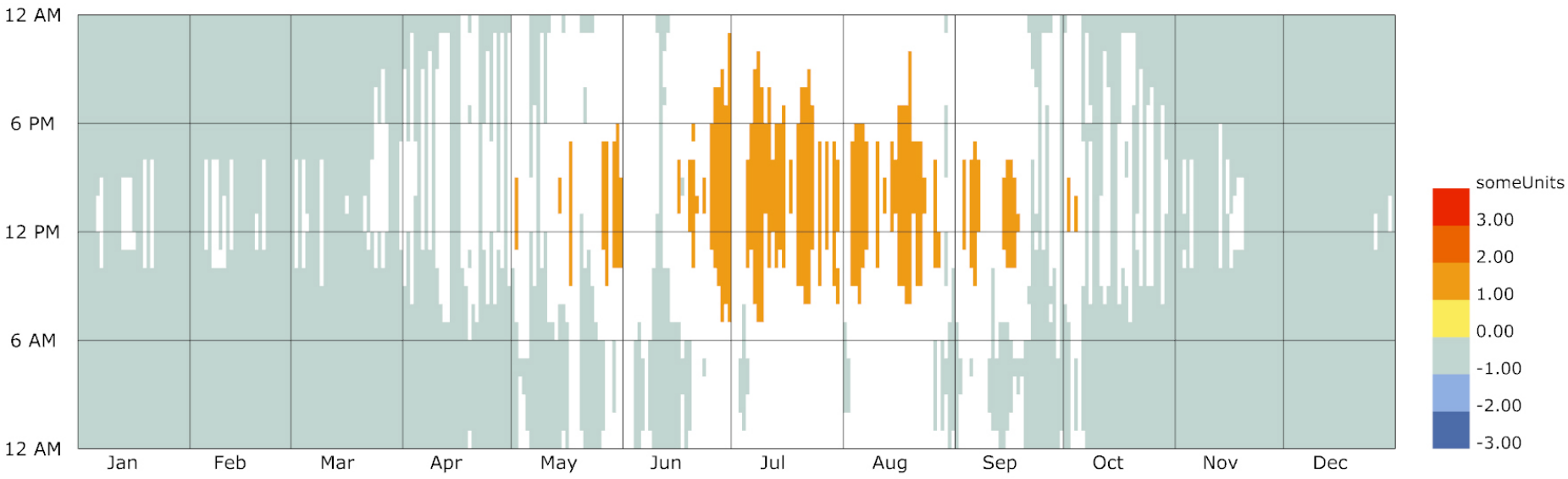
DESIGN ASSESMENT

THERMAL COMFORT



PSYCHROMETRIC CHART





Predicted Mean Vote
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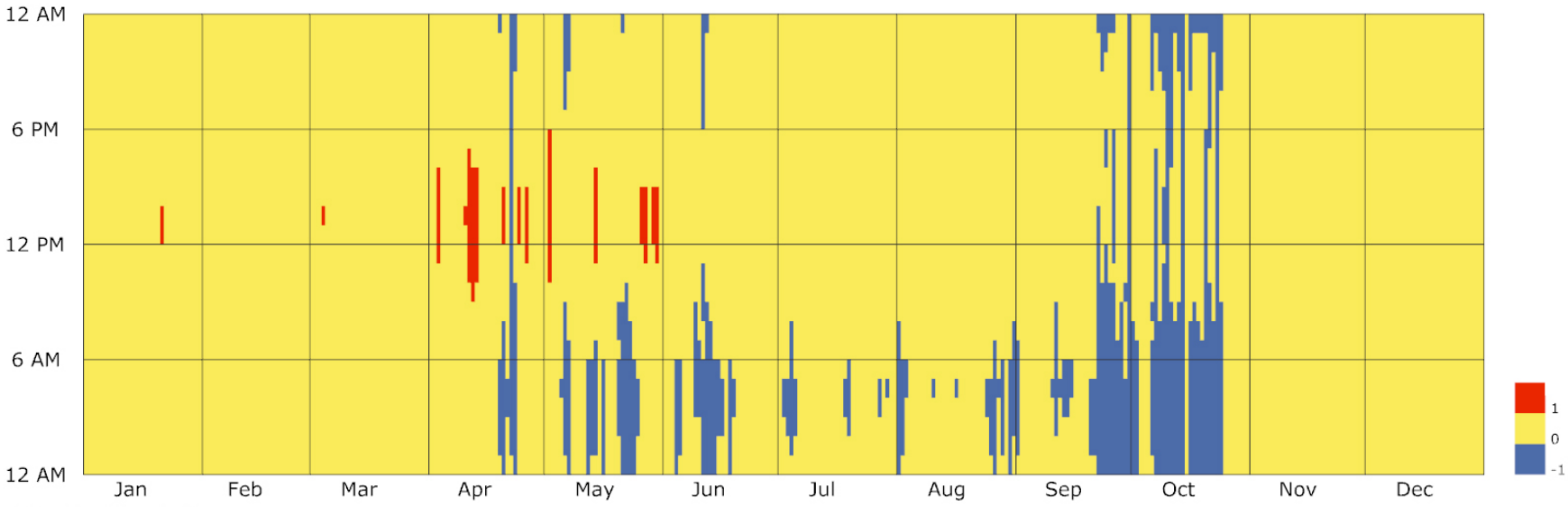


Adaptive Comfort
London, England
01 JAN 1:00 - 31 DEC 24:00

+1 hot, 0 neutral, -1 cold

BUILDING ORIENTATION : 90 DEGREES
PSYCHROMATIC : 98.7%

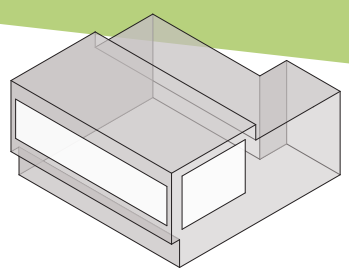
ADAPTIVE COMFORT: 64.7%
(UNDER EUROPEAN STANDARDS)
PMV COMFORT: 24.7%

HEATING LOAD: 2704
COOLING LOAD: 435
LIGHTING LOAD: 1212

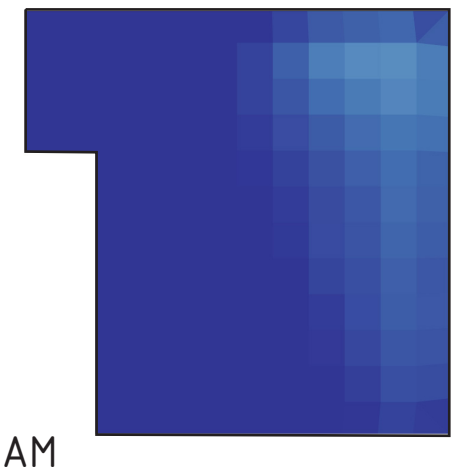
Adaptive Comfort Analysis tells me that from October 25 to April 10, the building reaches 100% comfort.
This tells me that the colder months are under control while the warmer months have mixed temperatures that are difficult to address

DESIGN ASSESMENT

VISUAL COMFORT



WINTER SOLSTICE



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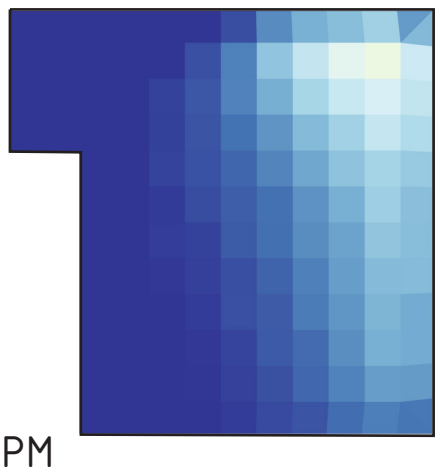

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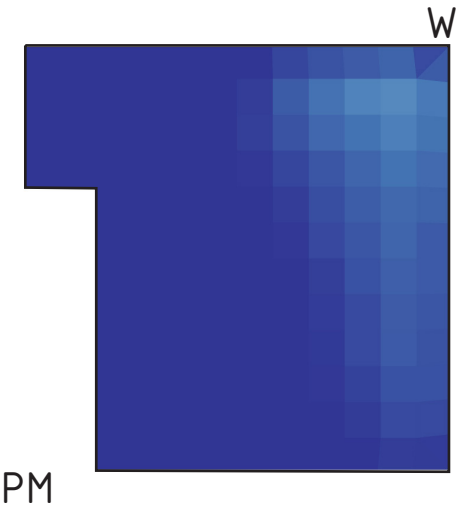

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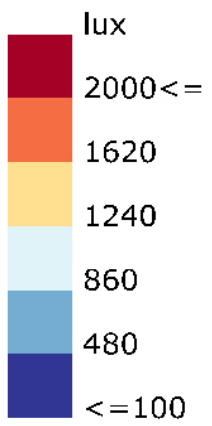
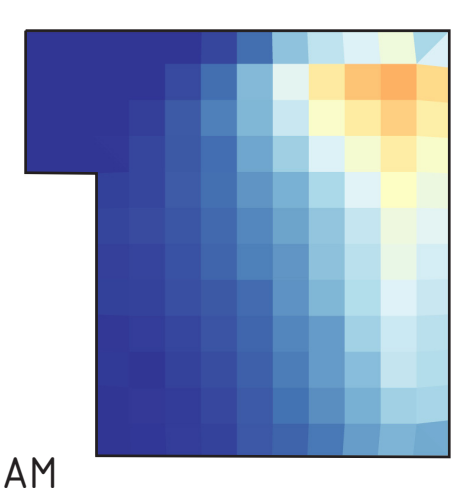


SPRING EQUINOX



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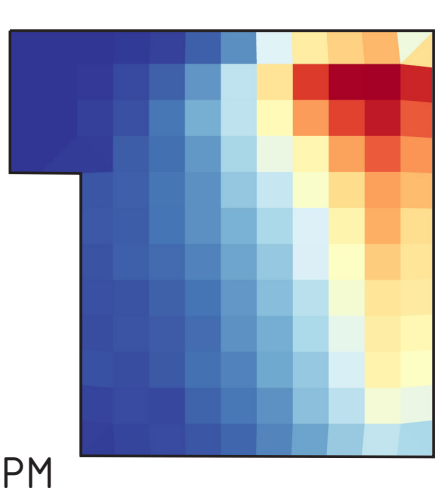

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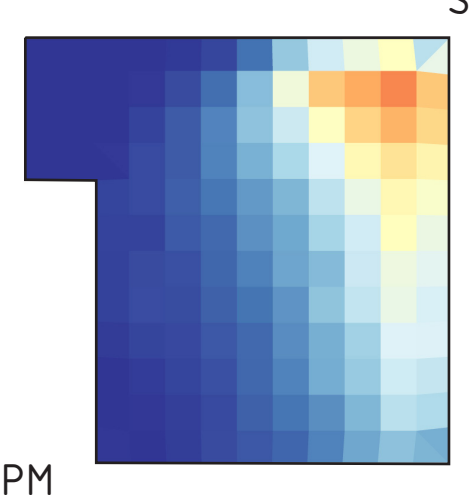

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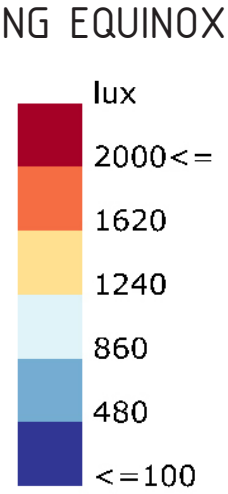
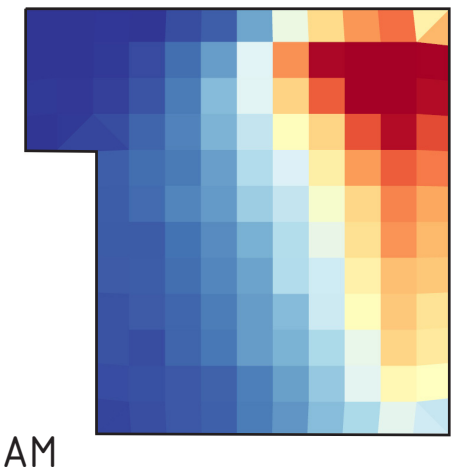


SUMMER SOLSTICE



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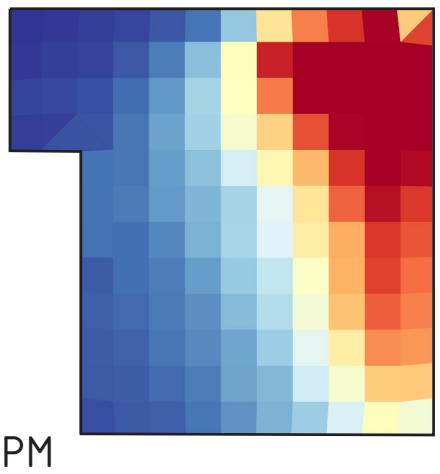

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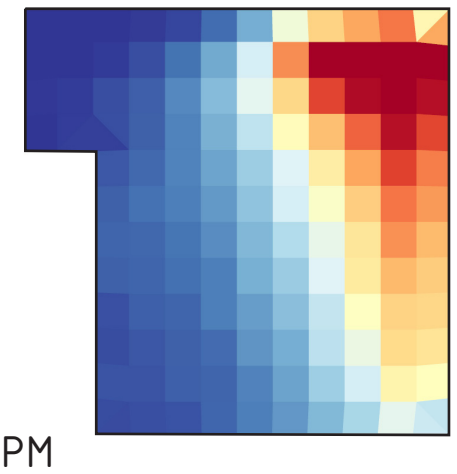

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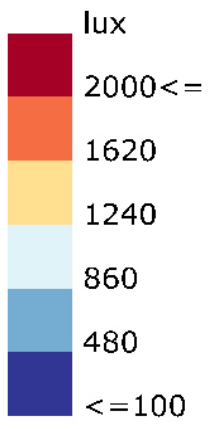

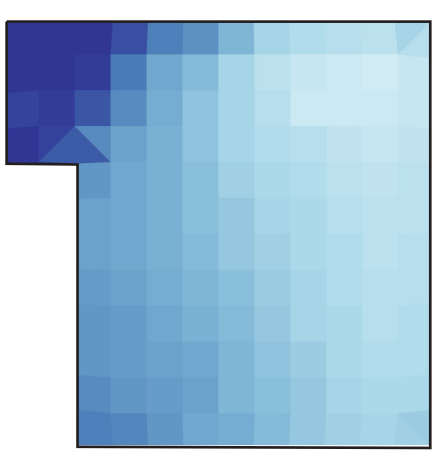

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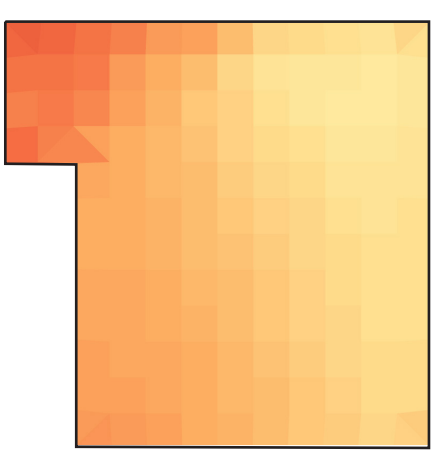
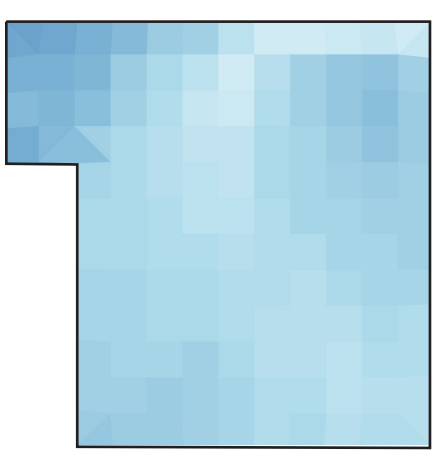


UDLI LESS THAN 100



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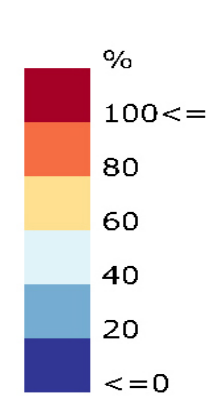

Adding another window to the west facade proved to be very slightly helpful in the winter.