

LV-8 Daylight Credit study

An initial Sunlight hour analysis was carried out for 24 orientations at an interval of 15° to determine the worst case orientation. The sunlight analysis was carried out to find the number of monthly hours with maximum area of direct incident solar radiation. The orientation where the north direction was rotated to 128° from vertical axis had the lowest number of sunlight hours at 110 hours. This orientation was taken as the worst case orientation for the daylighting study.

A subsequent daylight study was carried out using Rhino + Grasshopper software for daylighting. As per ESTIDAMA the following requirements had to be met in order to comply for daylighting credit :

“Demonstrate a minimum daylight illuminance of 200 Lux is achieved for 50% of the net floor area of each living area and bedroom. Home theatres are excluded from the requirements.”

The daylight illuminance in Lux must be calculated based on a CIE standard clear sky at 10am, 12pm and 2pm on the equinox and summer solstice and must exclude any artificial lighting.

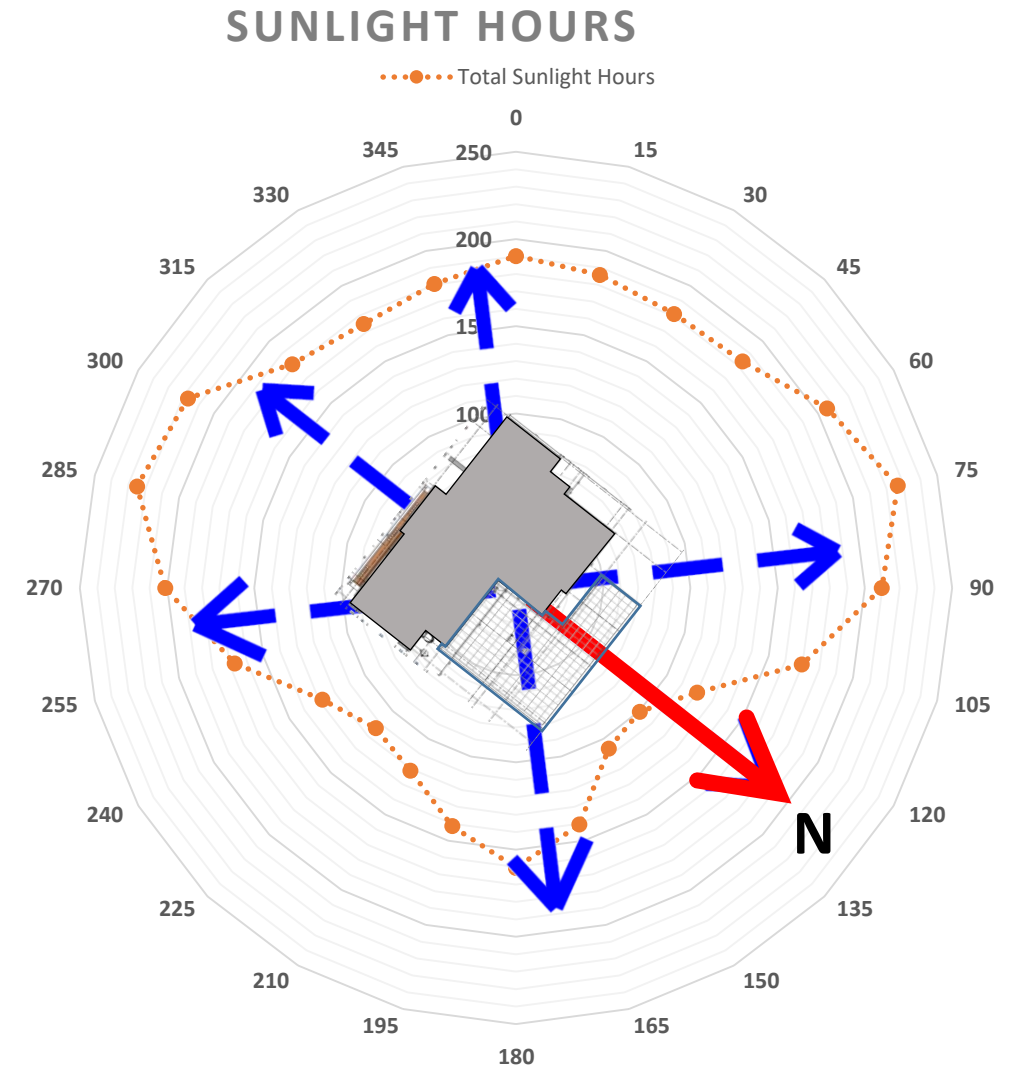


Fig 1 : Orientation Study – Sunlight Hours

- Daylight Simulation was carried out for the **Spring Equinox (March 21st) 10am, 12pm, & 2pm** using Radiance as simulation engine with Grasshopper & Honeybee Interface.
- The Grid size for the daylight simulation is taken as 0.25mX0.25m.
- All occupied spaces were considered for the daylight study including all bedrooms & living, dining & Majlis areas.
- The plans below have occupied areas marked for reference. (summarised in Table 1.)
- **Glazing Transmittance** : Since Double Glazed Units are used through out the project with low Solar Heatgain Coefficient (SHGC), the VLT for the project is taken as 40% as it is feasible to achieve this VLT.
- **Interior Reflectances**: The Interior surface reflectances assigned to the internal surfaces are as per Table 2

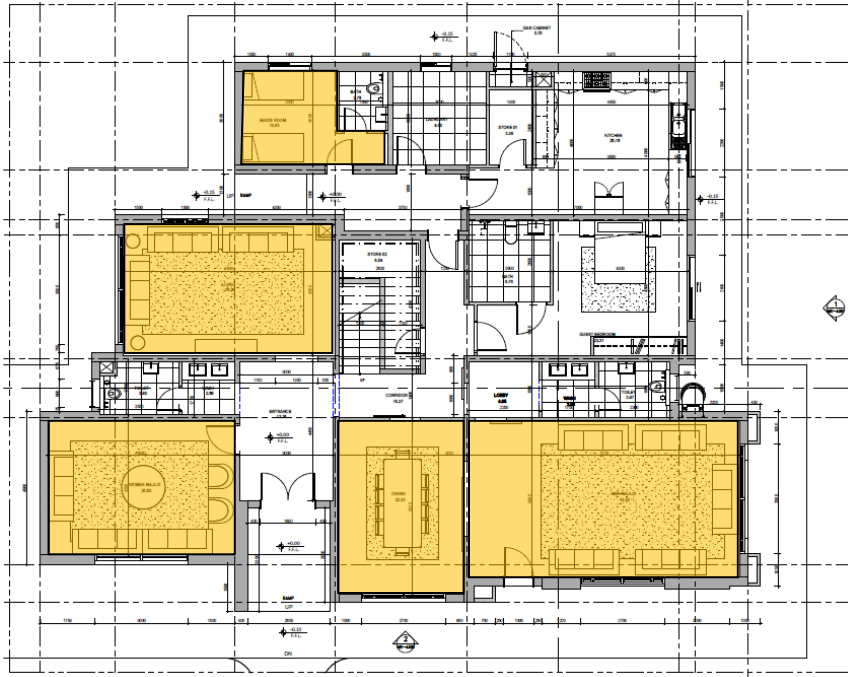


Fig 3 : Ground floor Plan

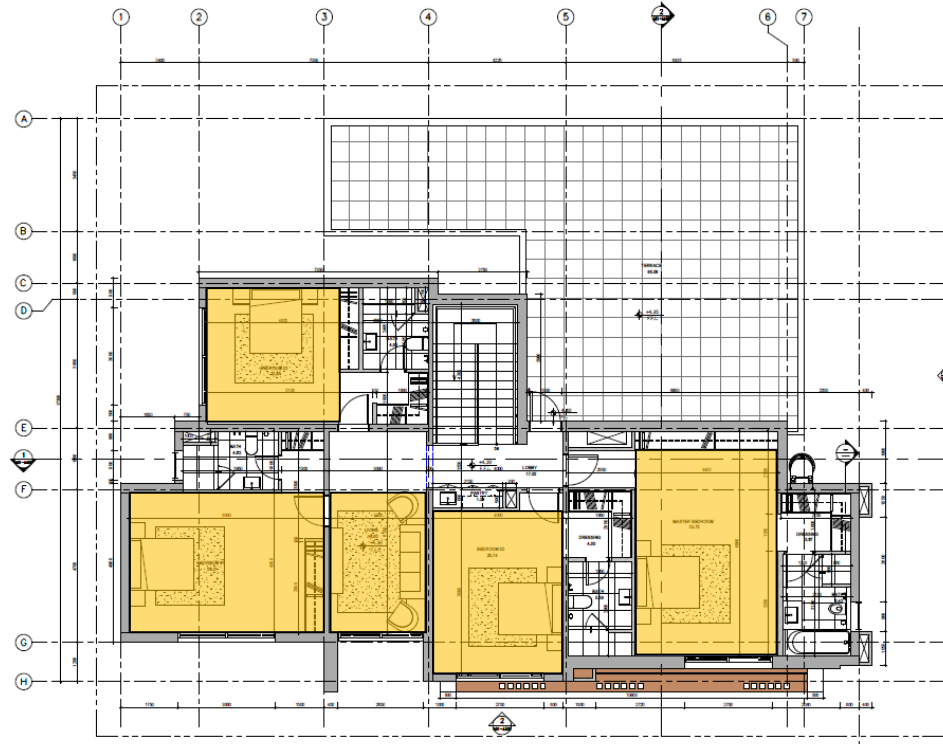
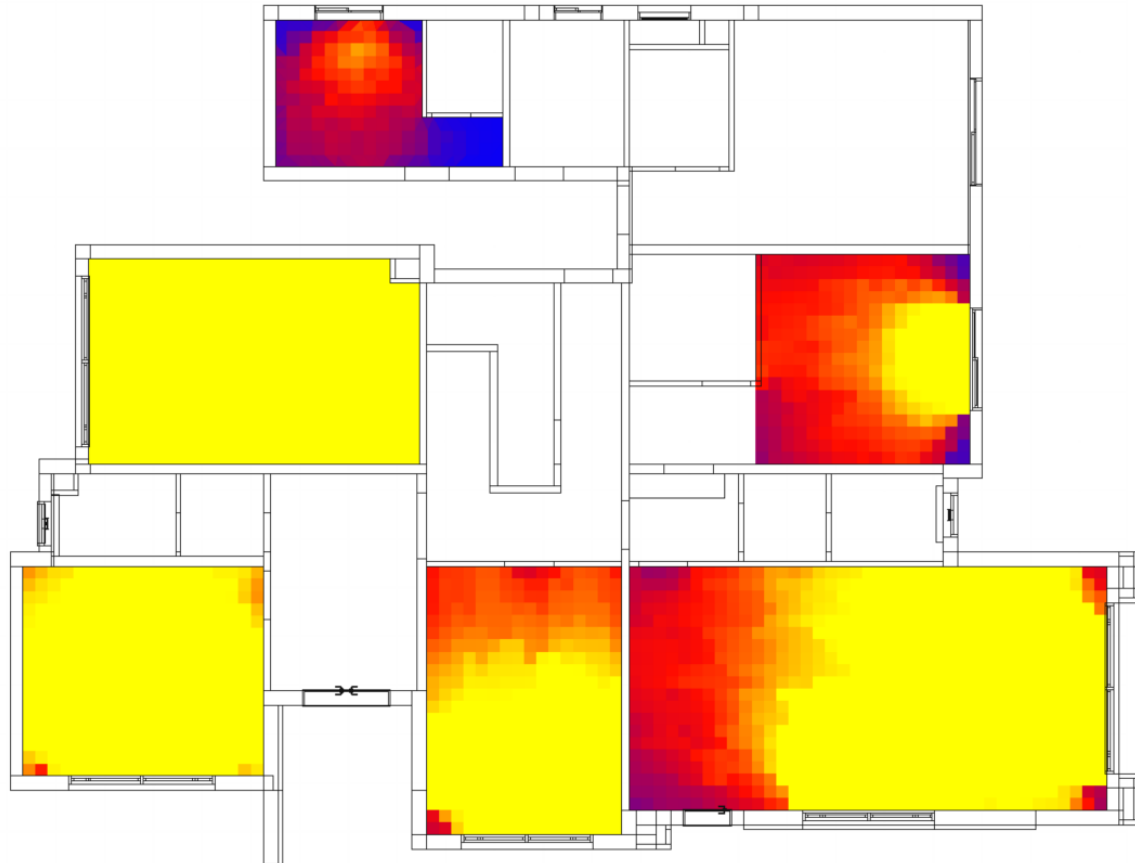


Fig 4 : First floor Plan

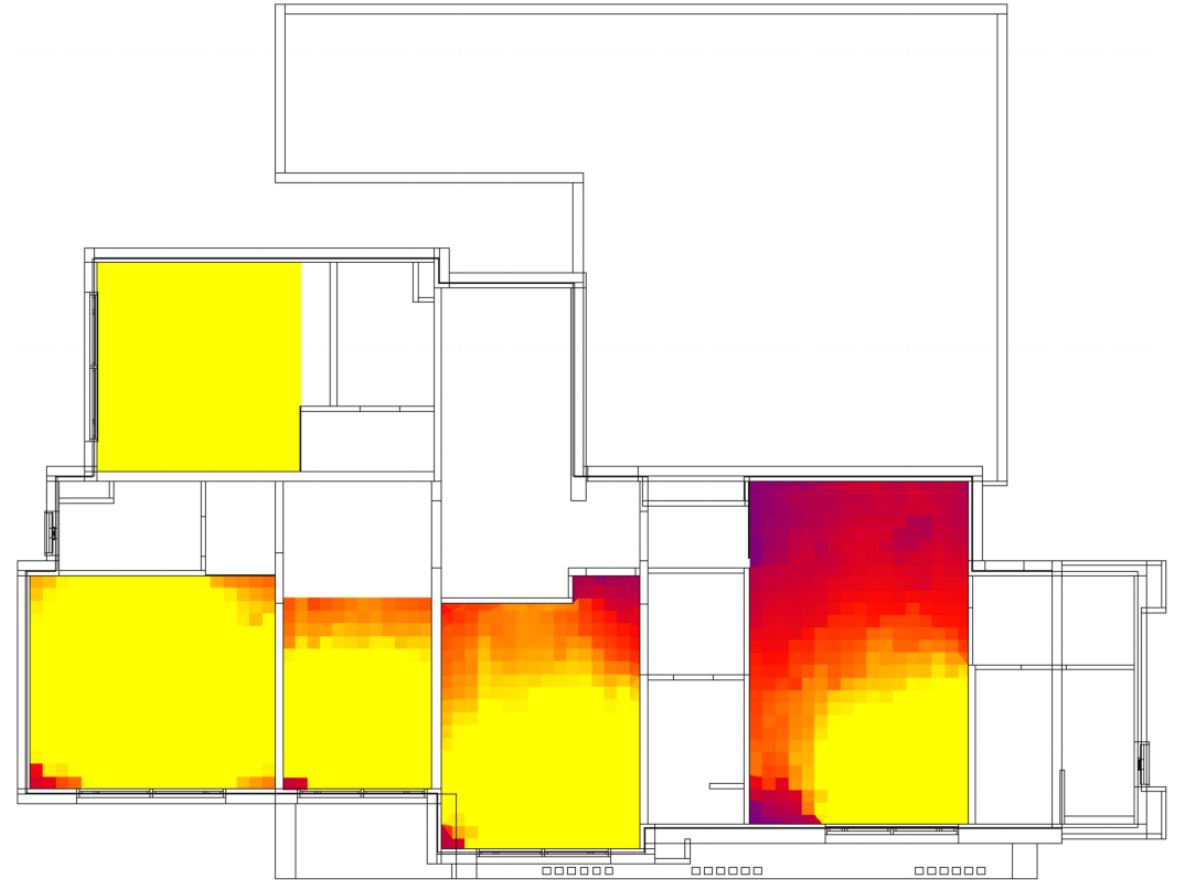
Villa Regularly Occupied Spaces	
Men Majlis	Ground Floor
Dining	Ground Floor
Living Room	Ground Floor
Women's Majlis	Ground Floor
Guest Bedroom	Ground Floor
Maid's room	Ground Floor
Bedroom 1	First Floor
Bedroom 2	First Floor
Bedroom 3	First Floor
Master Bedroom	First Floor
Living	First Floor

Surface Reflectance	
Walls	60%
Floors	30%
Ceiling	80%
Ground Reflectance	20%
Doors & Shading	60%
Visible Light Transmittance	
VLT	40%

March 21st 2021 10AM



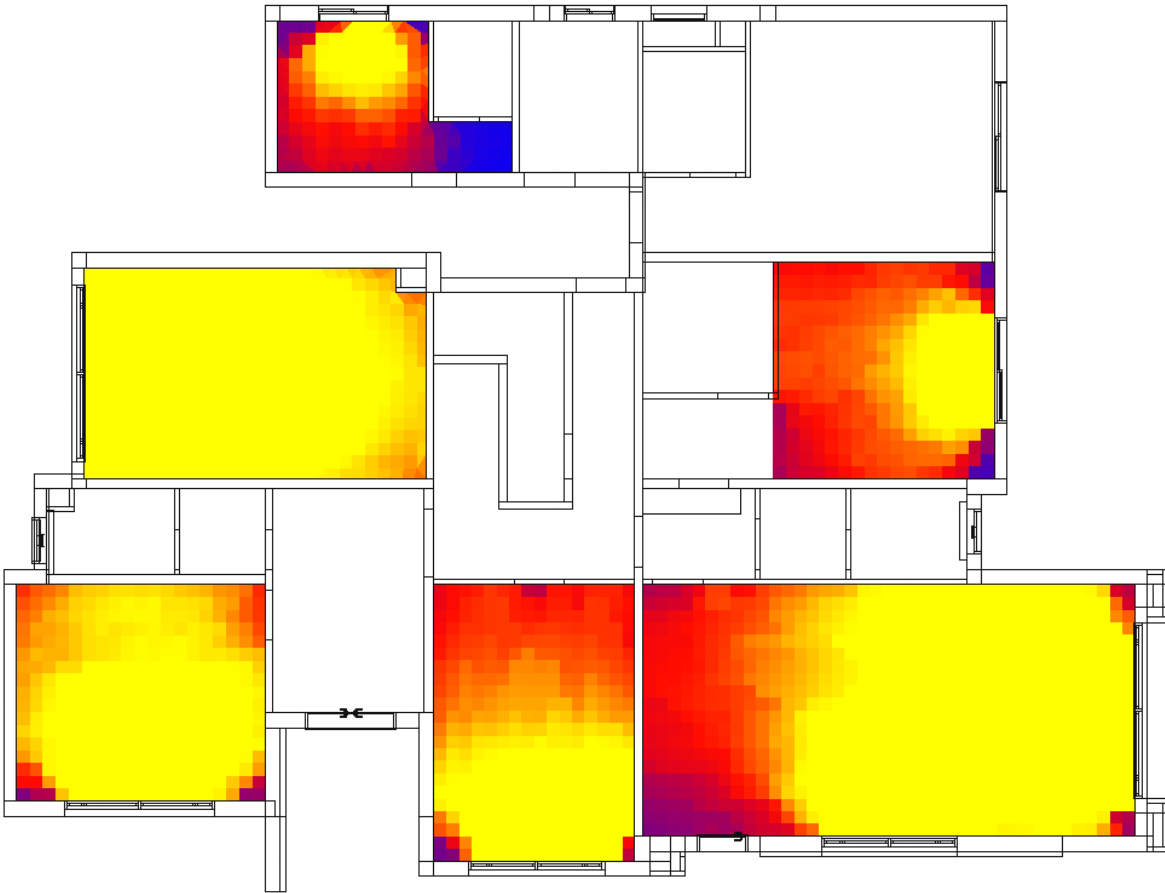
Ground floor



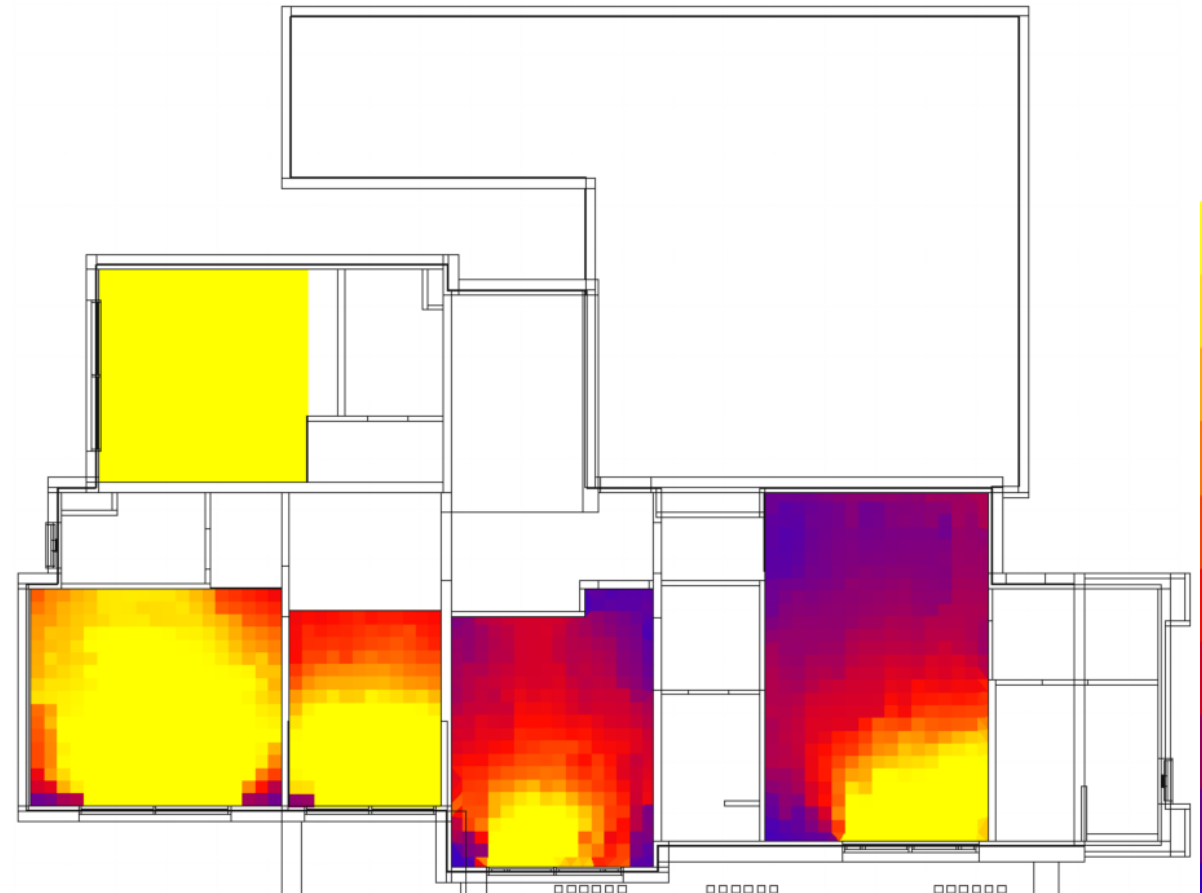
First floor



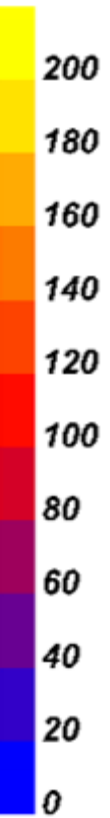
March 21st 2021 12PM



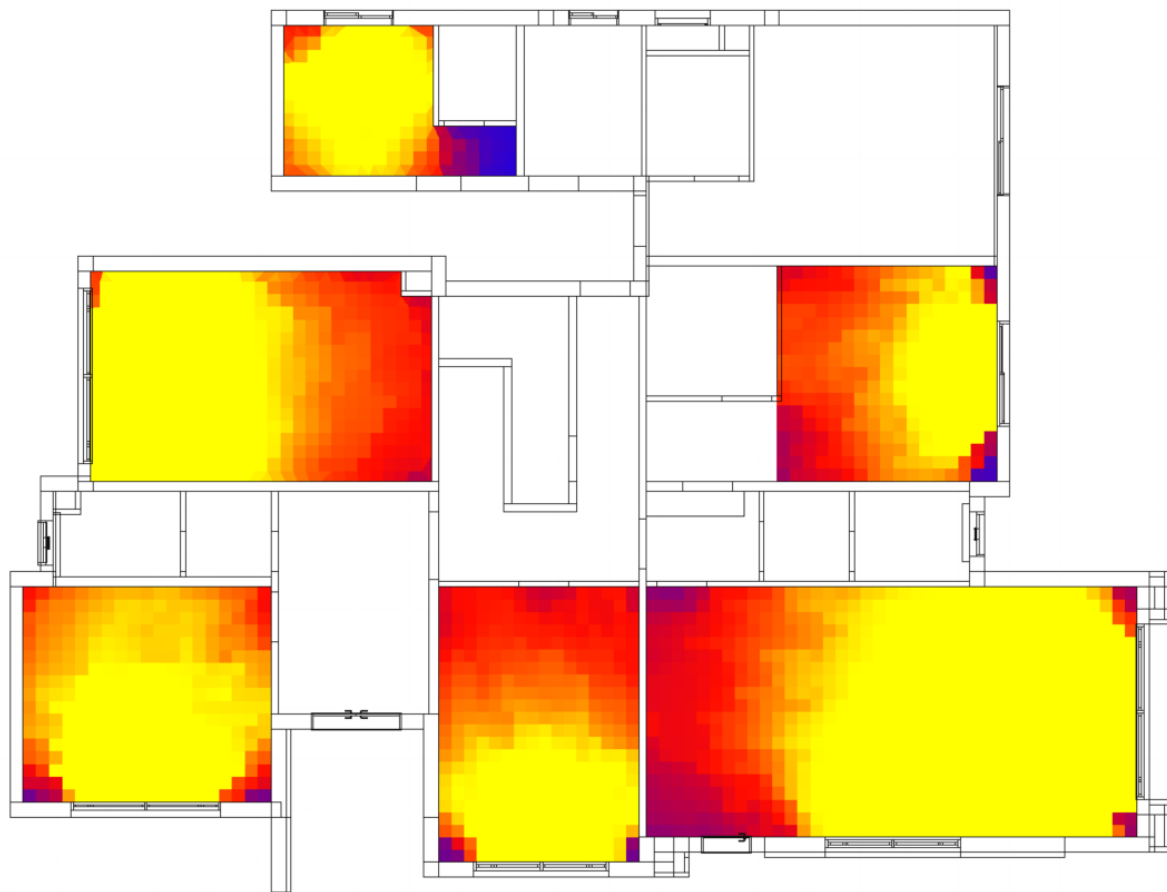
Ground floor



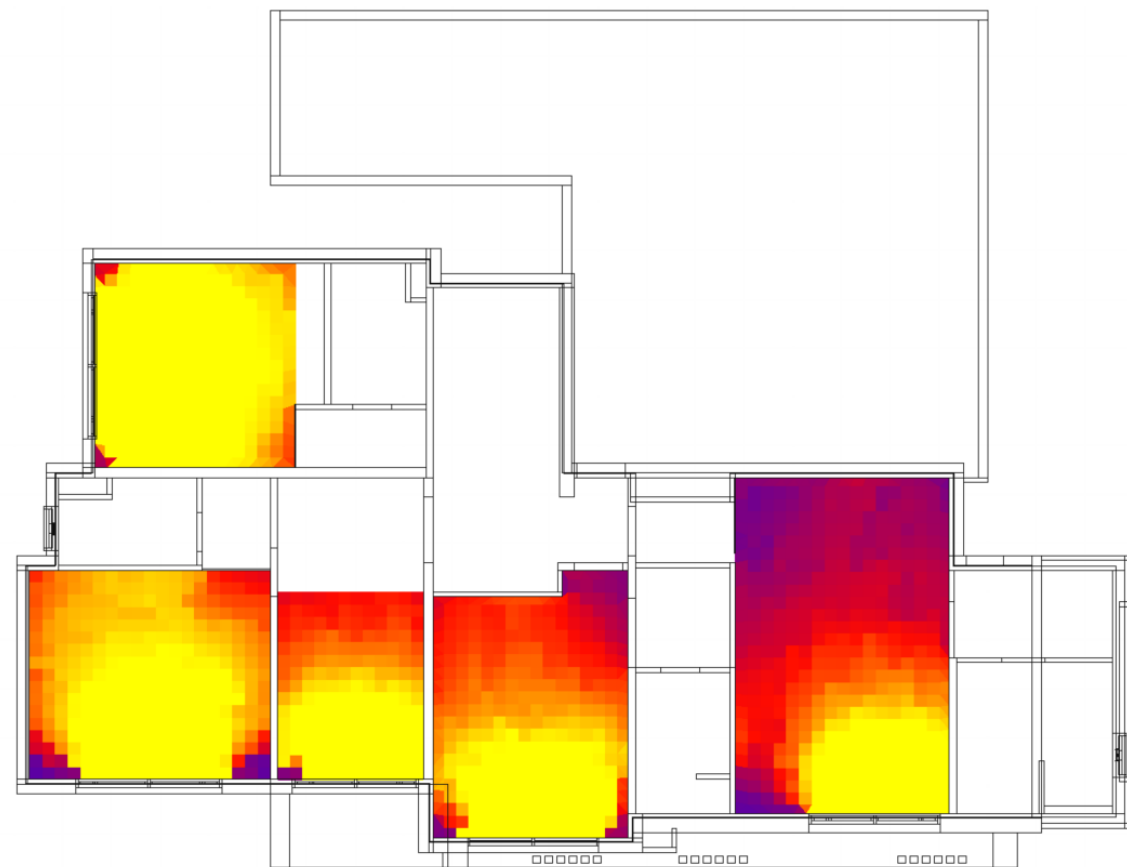
First floor



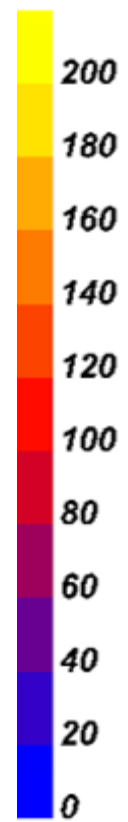
March 21st 2021 2PM



Ground floor



First floor



Floor	Space	Area	Compliance at Equinox 10am		Compliance at Equinox 12pm		Compliance at Equinox 2pm	
			%	Area (m2)	%	Area (m2)	%	Area (m2)
Ground	Men's Majlis	49	59%	28.96	59%	28.90	57%	28.14
	Maid's room	10.65	0%	0.00	12%	1.27	42%	4.49
	Living room	28.3	100%	28.30	80%	22.65	48%	13.68
	Guest Bedroom	22.8	14%	3.23	18%	4.02	25%	5.76
	Dining	22	51%	11.19	35%	7.63	30%	6.50
	Women's Majlis	21.28	91%	19.37	50%	10.61	37%	7.84
	Living	18.6	71%	13.12	49%	9.20	40%	7.44
First floor	Bedroom 1	23.94	52%	12.45	50%	12.01	25%	5.99
	Bedroom 2	20.54	89%	18.25	35%	7.09	29%	5.91
	Bedroom 3	22.2	100%	22.20	100%	22.13	70%	15.64
	Master Bedroom	32.9	26%	8.41	19%	6.29	17%	5.73
	Sum	272.21			165.49		131.79	
	Average Compliant Area	134.80						
	Over all Percentage Compliant Area		50%					

SUMMARY:

- The above highlighted in yellow are the spaces that do not comply with the credit requirements.
- Even through the villa over all area comply with 250lux threshold the individual spaces fail to meet the requirements.
- The reason for these non-compliances is constraint of an existing design with deep spaces and no opportunity for provision for exterior windows.