

Analysis of the impact of the facade materials in temperature and energy needed: Case Study in a housing complex of social interest

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1- CASE STUDY



Vila São José – Belo Horizonte – Minas Gerais – Brasil (slum)



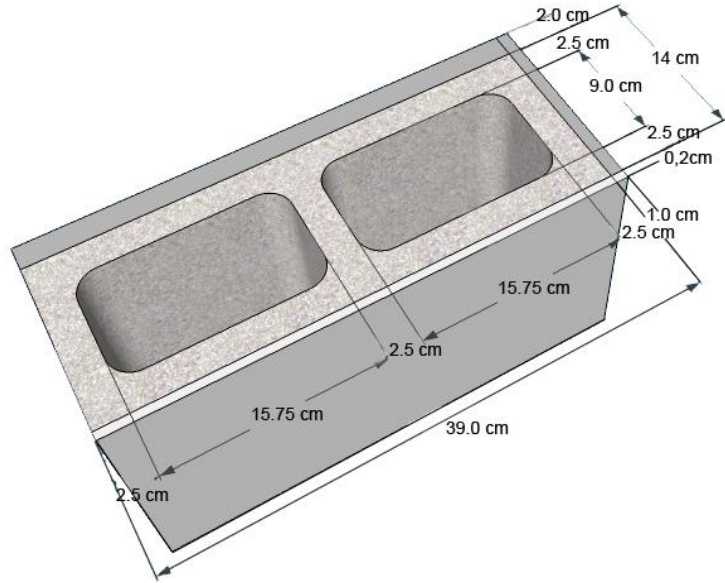
Vila **Viva** São José – Belo Horizonte – Minas Gerais - Brasil



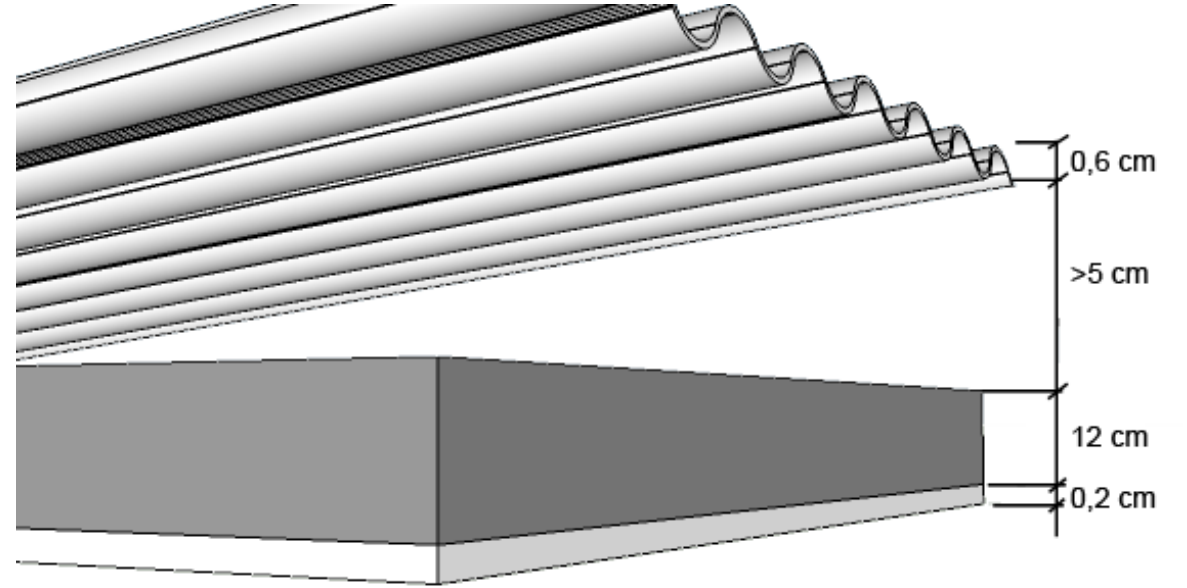
Plant of the floors – 200m²

Materials

Concrete block



Fibercement roofing

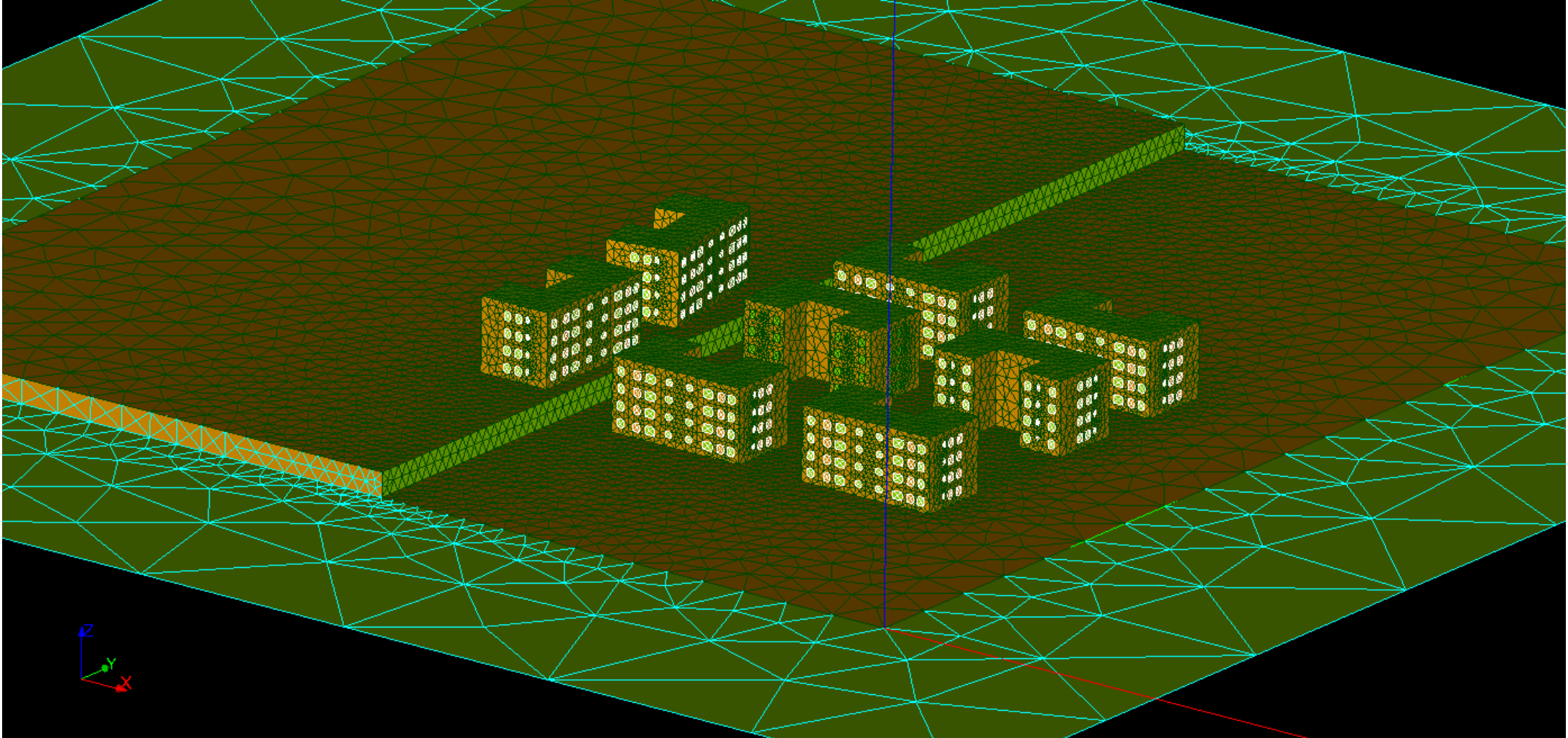


Dark colors on the facades



2- OBJECTIVE

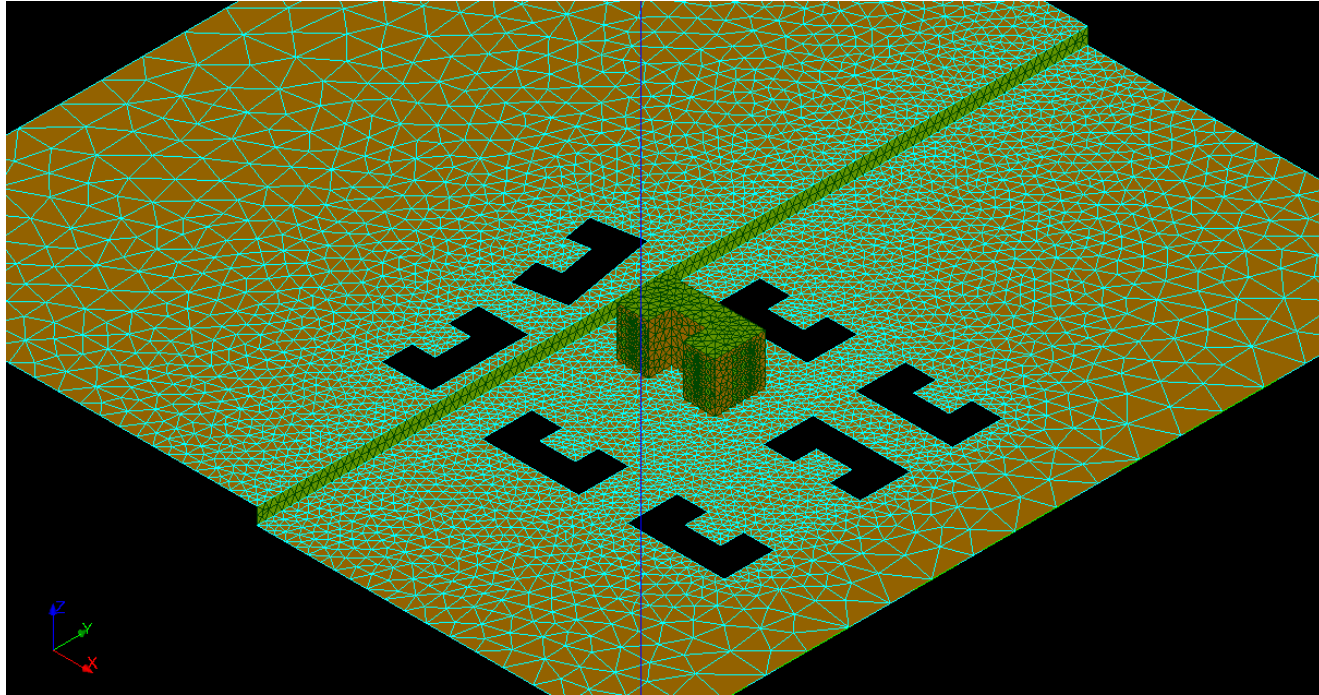
The aim of this study is to analyse how the modification of the facades materials of these buildings, and the substitution of mineral soil by grass area can influence the temperature and the energy needed to cool in summer.



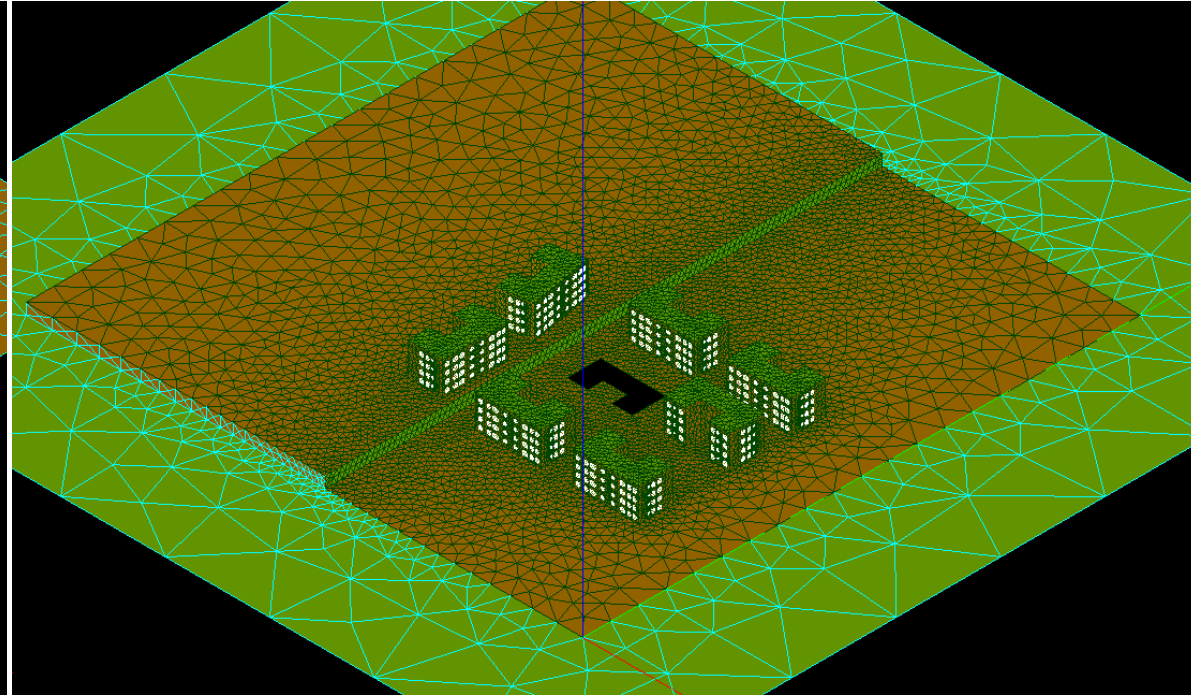
3- METHOD

The methodology used was the computational simulation with Solene microclimate in order to evaluate the surface temperature of the facades and the internal temperature in one of the buildings.

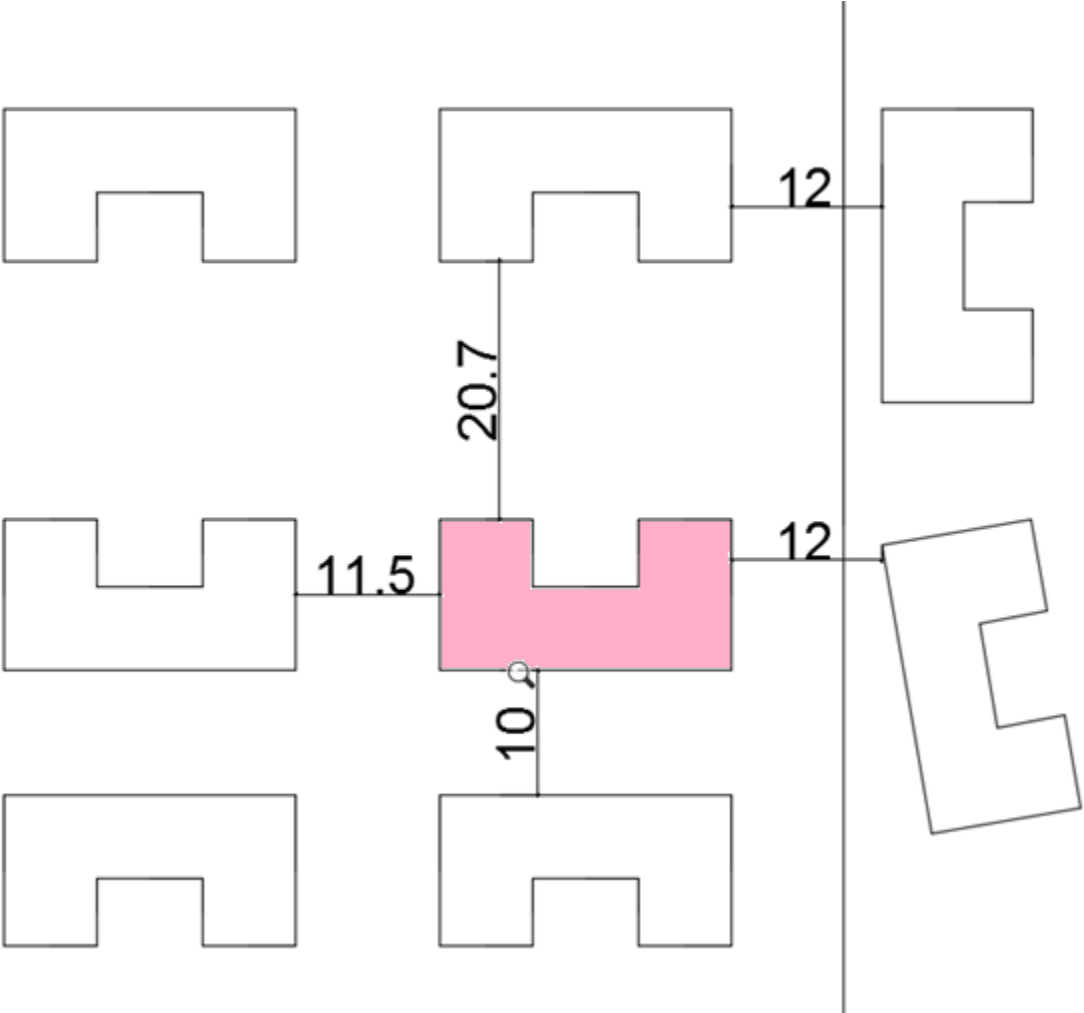
Classe: mur



Classe: bâtiment



Distance between buildings

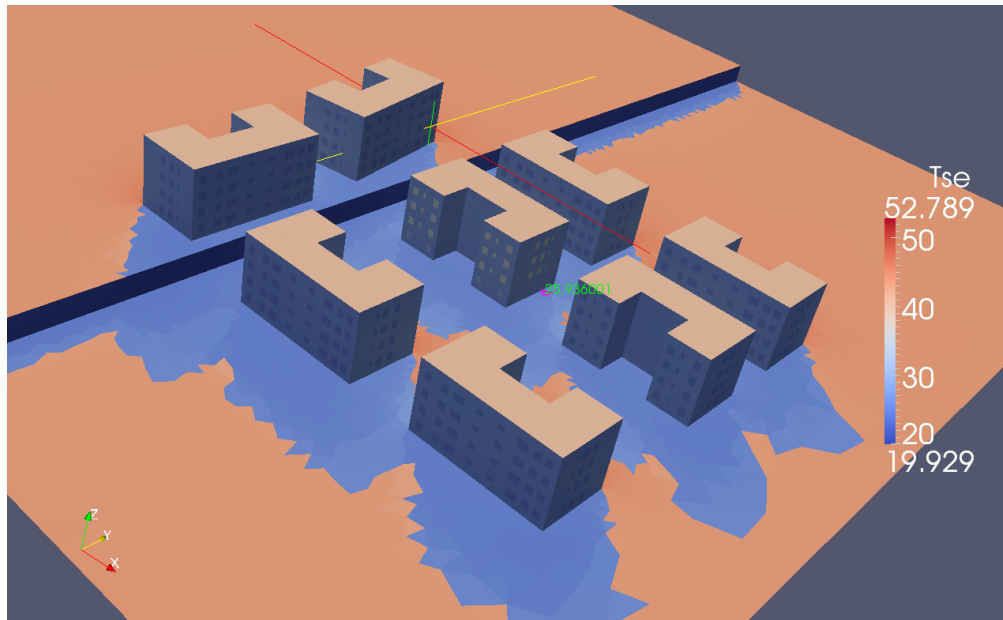


3.1 Simulations

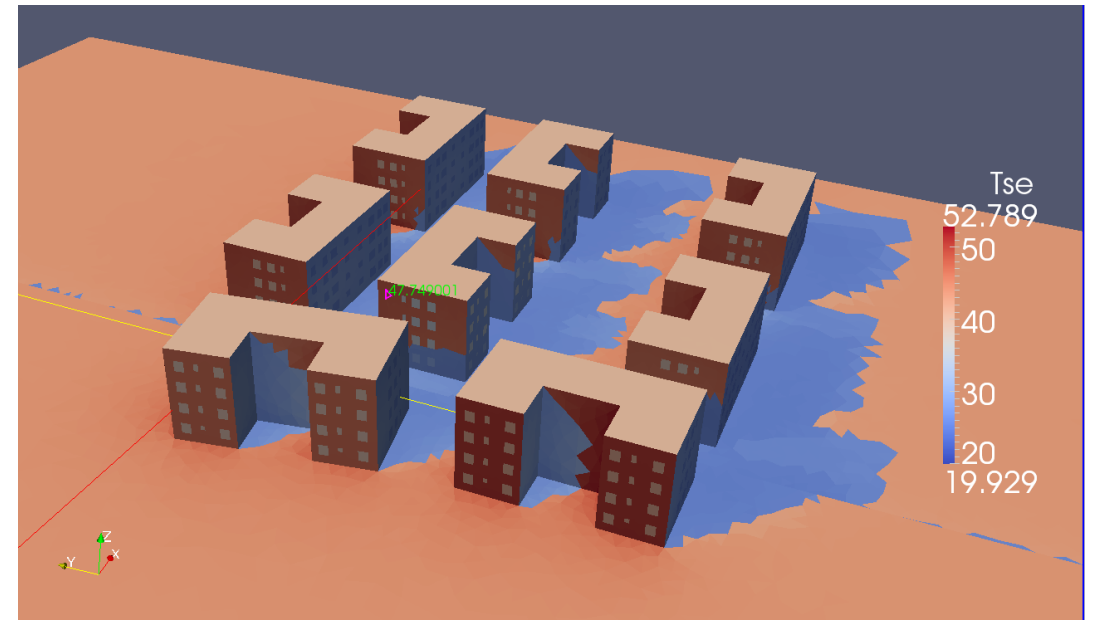
- WINTER – DARK COLORS – 23/06 – 15 HOURS
- WINTER –LIGHT COLORS – 23/06 – 15 HOURS
- SUMMER – LIGHT COLORS – 23/12– 15 HOURS
- SUMMER – DARK COLORS – 23/12– 15 HOURS
- SUMMER –ENERGY NEEDED DARK COLORS
- SUMMER –ENERGY NEEDED LIGHT COLORS
- SUMMER – DARK COLOR – VEGETATION IN SOIL

4- RESULTS

Winter – Dark Colors – 23/06 – 15 Hours



TSE: 25,9°C

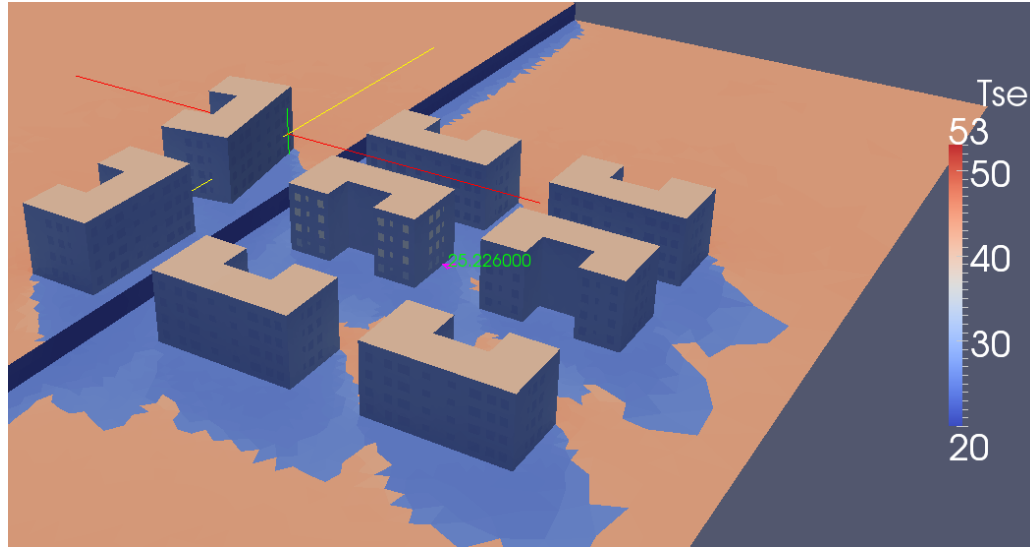


TSE: 47,7°C

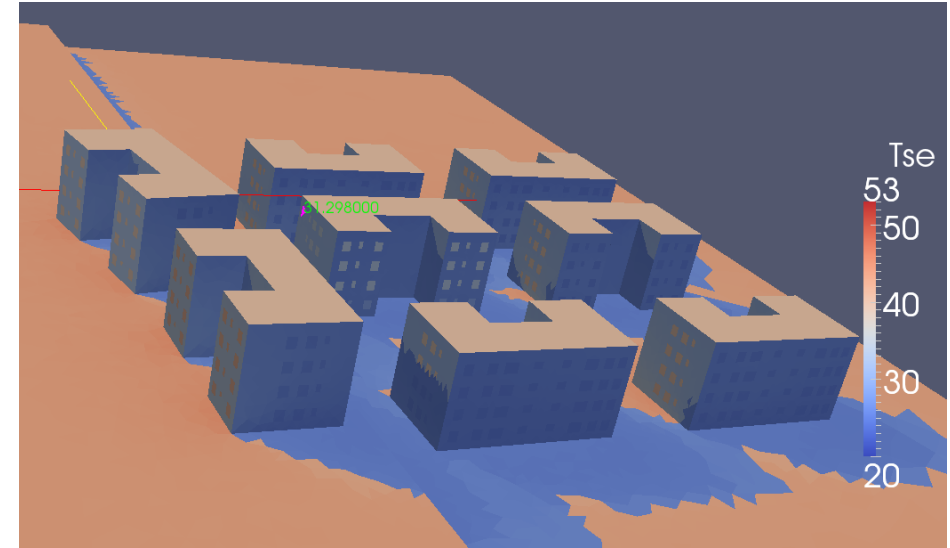


TSE: 35,3°C

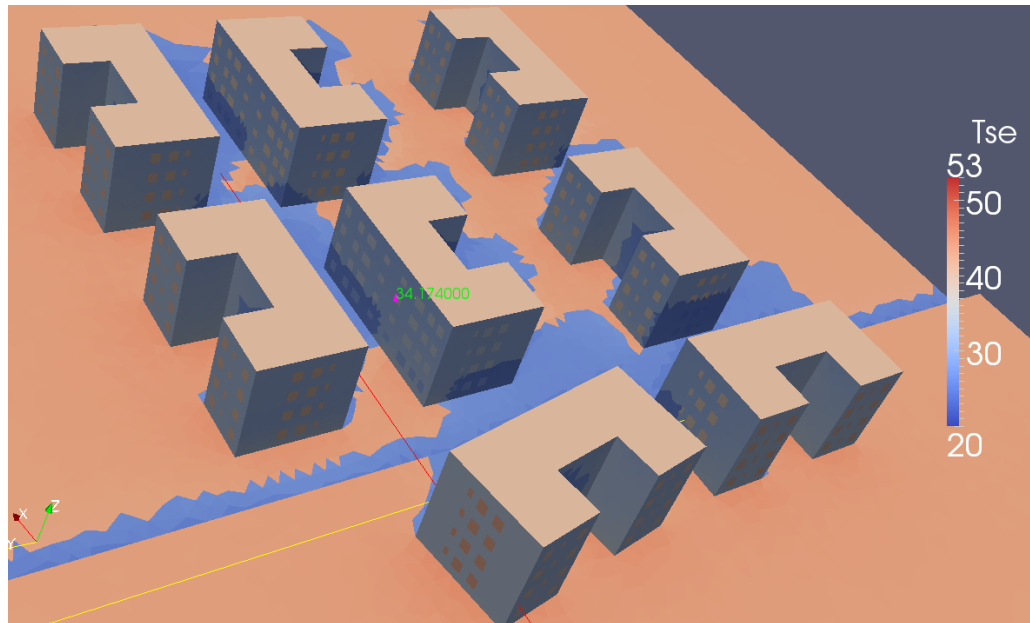
Winter – Light Colors – 23/06 – 15 Hours



TSE: 25,2°C

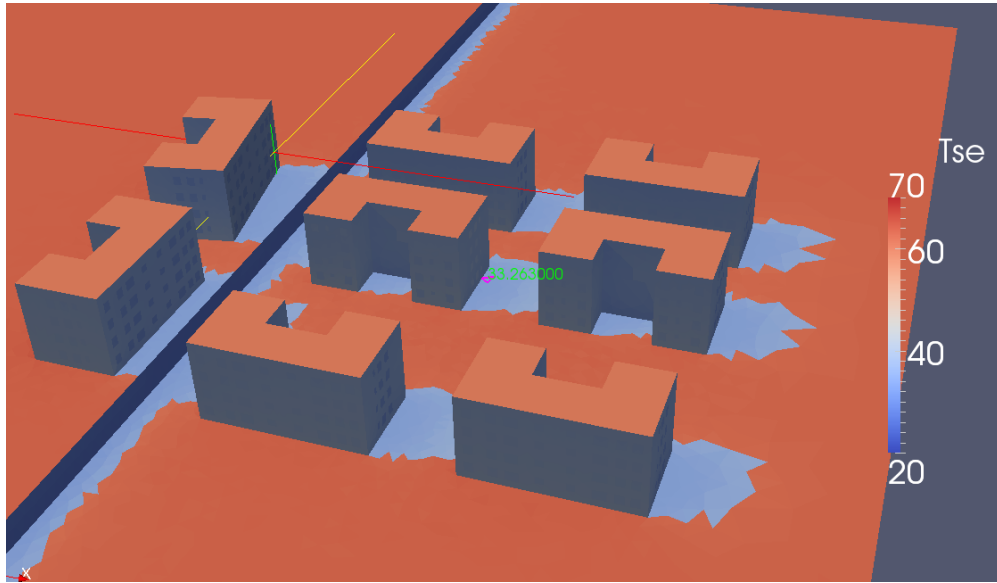


TSE: 31,3°C

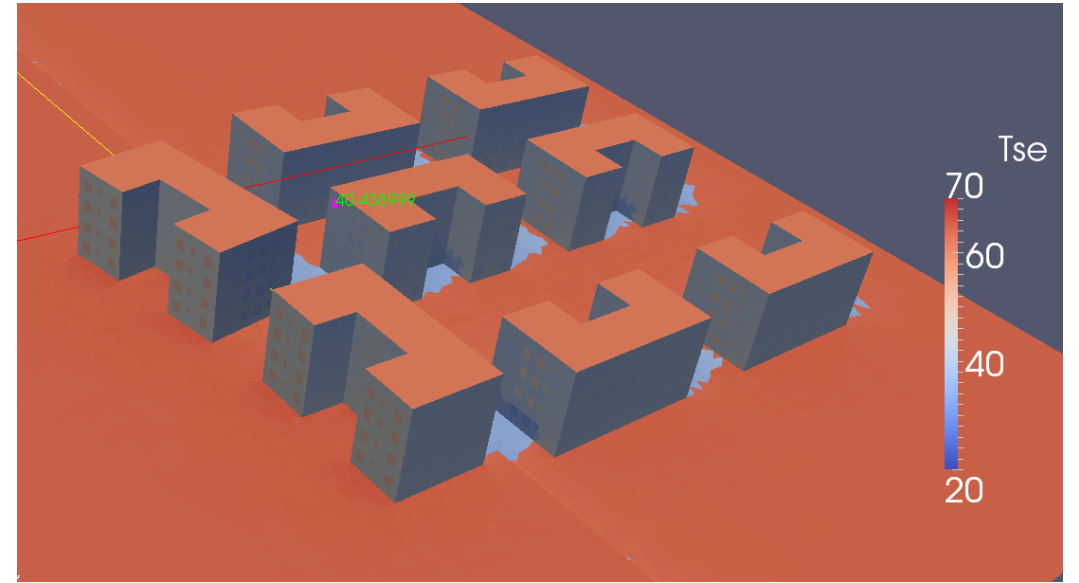


TSE: 34,2 °C

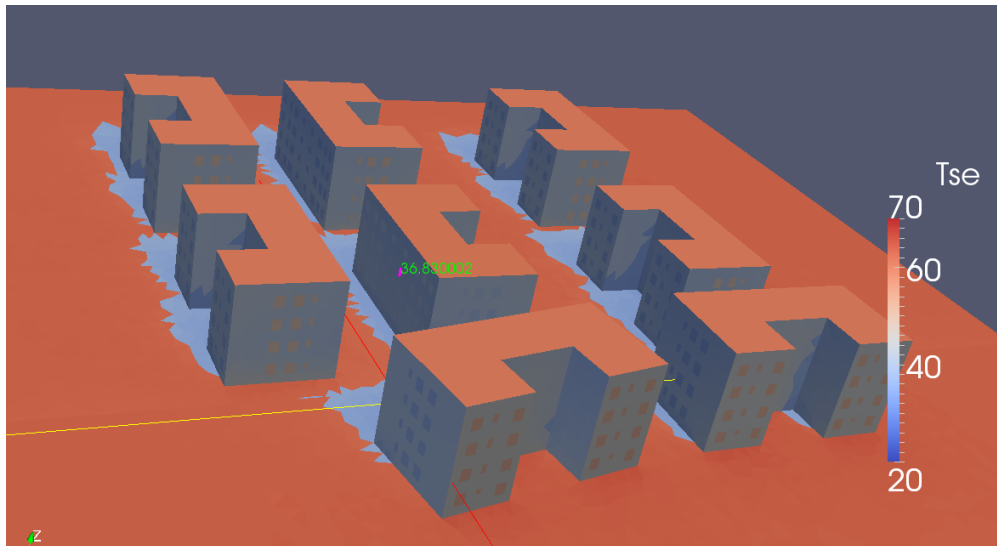
Summer – Light Colors – 23/12 – 15 Hours



TSE: 33,26°C



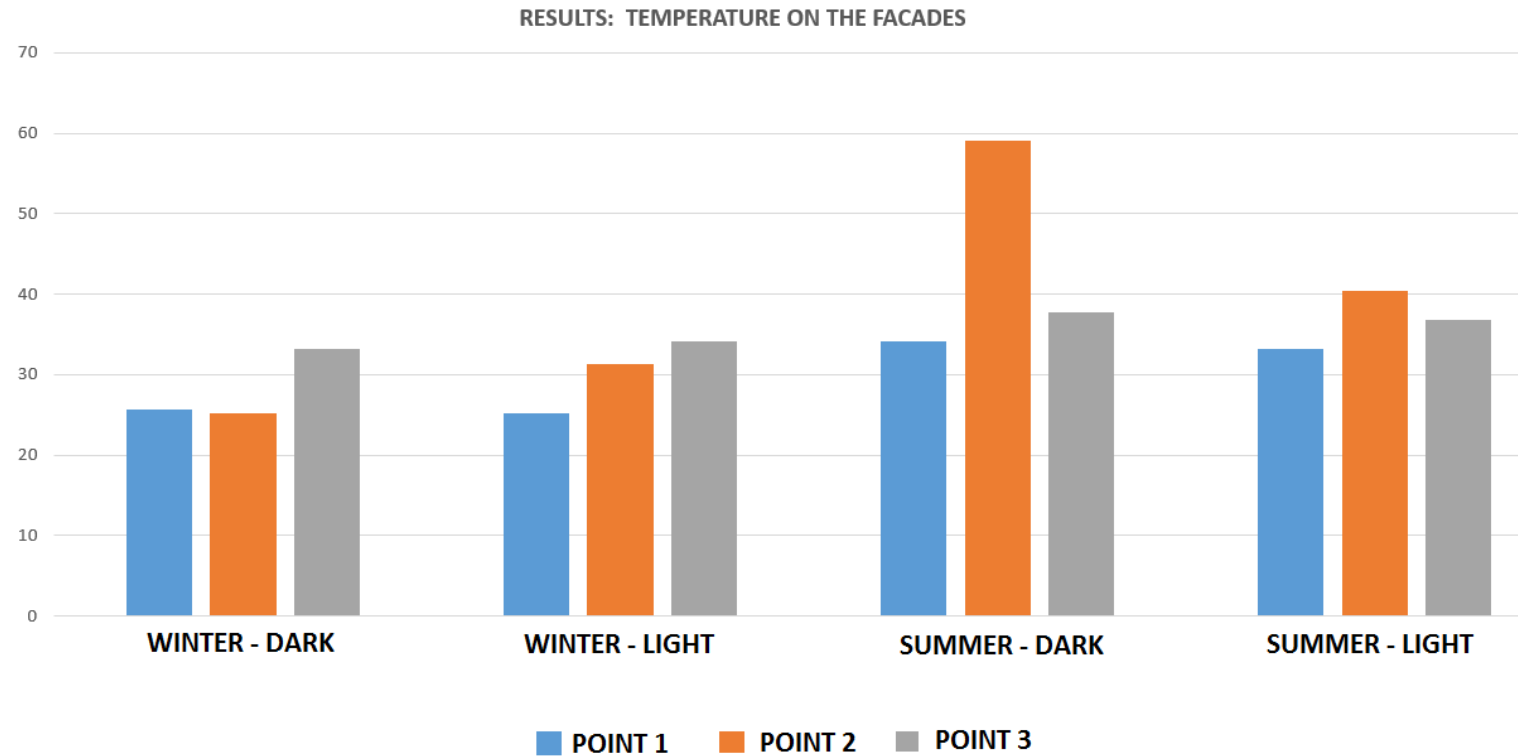
TSE: 40,43°C



TSE: 36,83°C

RESULTS: TEMPERATURE ON THE FACADES

	Point 1	Point 2	Point 3
Winter- Dark	25,6°C	25,2°C	33,2°C
Winter – Light	25,2°C	31,3°C	34,2°C
Summer - Dark	34,2°C	59,1°C	37,8°C
Summer -Light	33,2°C	40,4°C	36,8°C



RESULTS: INTERNAL TEMPERATURE

Winter - Dark Color (0,25 Albedo) 23 June

1º floor	12:00	13:00	14:00	15:00
	20,6745	21,3216	21,6659	21,8307

2º floor	12:00	13:00	14:00	15:00
	21,3679	22,0576	22,6879	23,1414

3º floor	12:00	13:00	14:00	15:00
	21,7779	22,465	23,0968	23,59

4º floor	12:00	13:00	14:00	15:00
	22,1056	23,0126	23,8	24,3677

Winter - Light Color (0,8 Albedo) -23 june

1º floor	12:00	13:00	14:00	15:00
	19,76	20,32	20,58	20,71

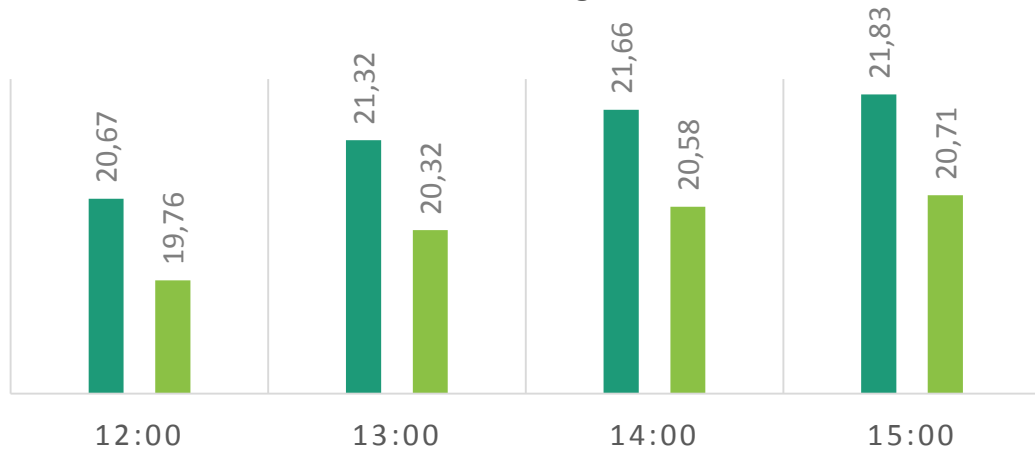
2º floor	12:00	13:00	14:00	15:00
	20,03	20,61	21,12	21,5

3º floor	12:00	13:00	14:00	15:00
	20,23	20,5	21,31	21,71

4º floor	12:00	13:00	14:00	15:00
	20,32	21,4	22,1	22,5

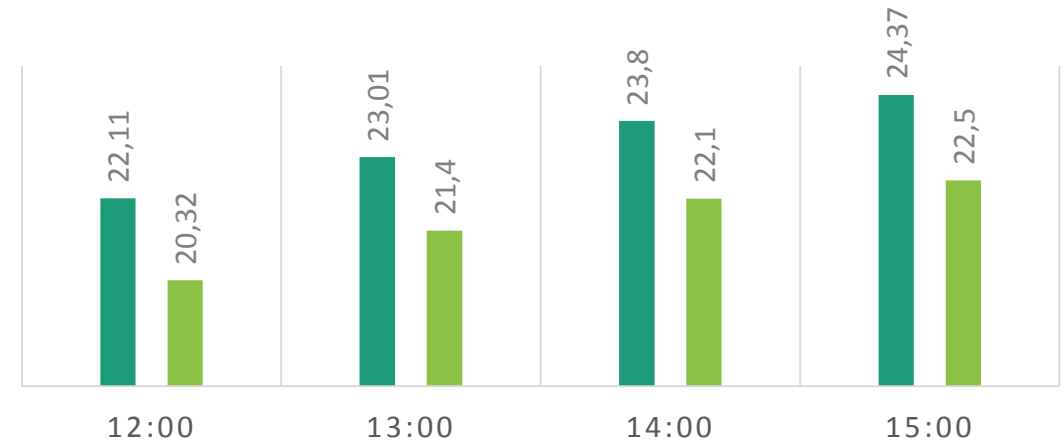
1º FLOOR

■ Dark Colors ■ Light Colors



4º FLOOR

■ Dark Colors ■ Light Colors

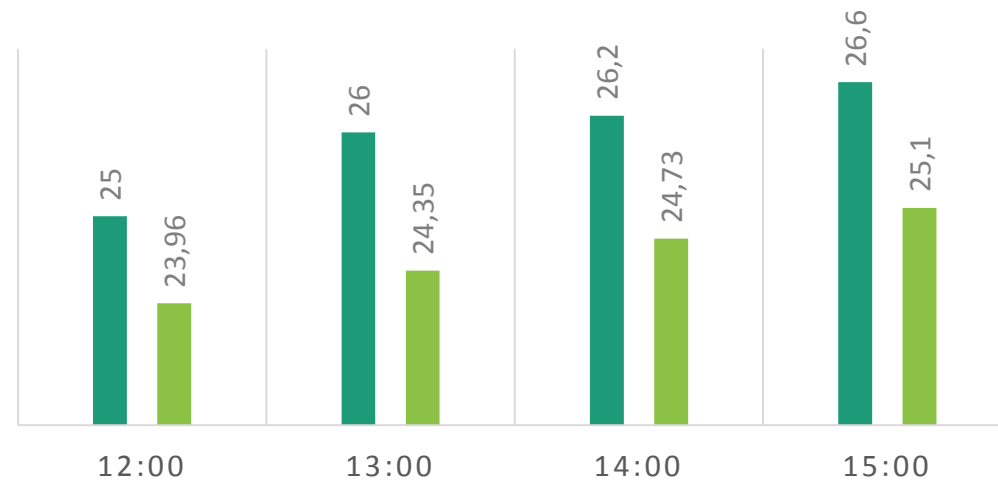


Summer - Dark Color (0,25 Albedo) - 23 December				
1º floor				
	12:00	13:00	14:00	15:00
	25	26	26,2	26,6
2º floor				
	12:00	13:00	14:00	15:00
	25,18	25,62	26,1	26,6
3º floor				
	12:00	13:00	14:00	15:00
	25,64	26,06	26,6	27
4º floor				
	12:00	13:00	14:00	15:00
	27,9	28,9	29,3	30,3

Summer - Light Color (0,8 Albedo) - 23 December				
1º floor				
	12:00	13:00	14:00	15:00
	23,96	24,35	24,73	25,1
2º floor				
	12:00	13:00	14:00	15:00
	24,38	24,79	25,2	25,6
3º floor				
	12:00	13:00	14:00	15:00
	24,7	25,09	25,92	26,22
4º floor				
	12:00	13:00	14:00	15:00
	26,8983	27,6033	28,8	29,11

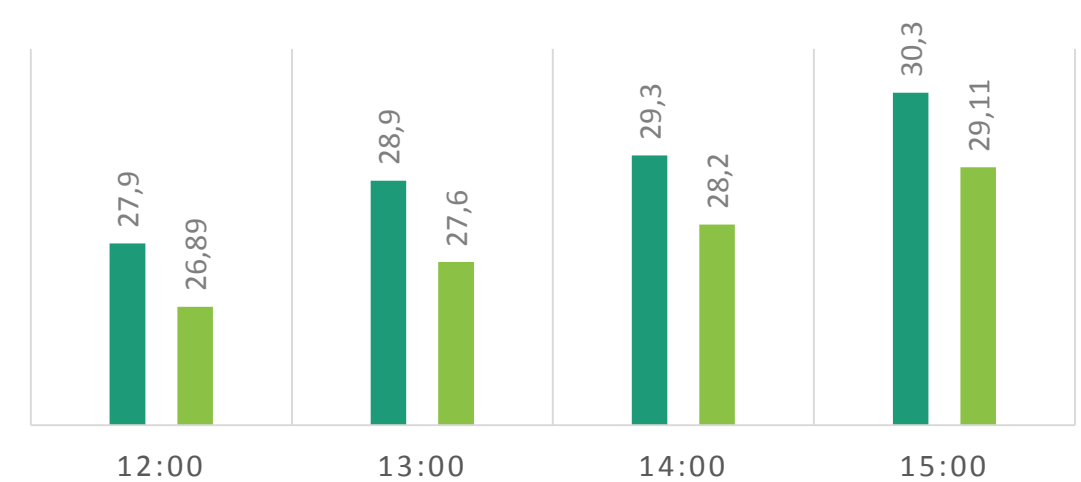
1º FLOOR

■ Dark Colors ■ Light Colors



4º FLOOR

■ Dark Colors ■ Light Colors



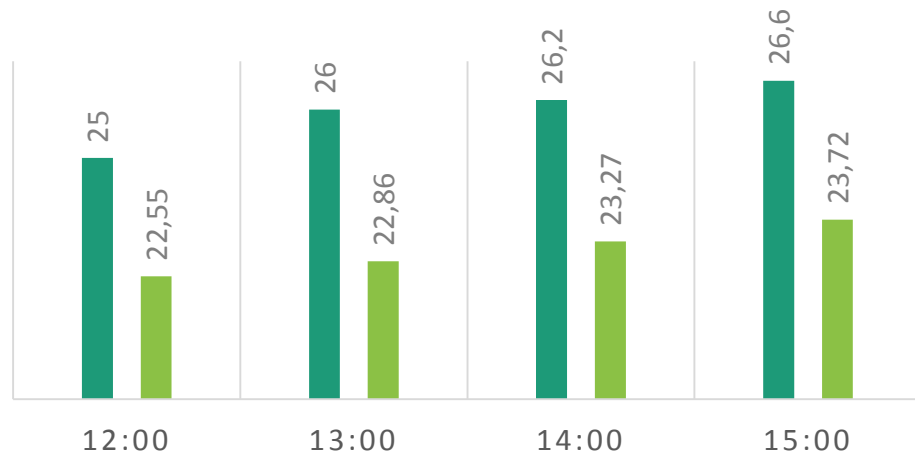
RESULTS: VEGETATION

Summer - Dark Color (0,25 Albedo) - 23 December				
1º floor				
	12:00	13:00	14:00	15:00
	25	26	26,2	26,6
2º floor				
	12:00	13:00	14:00	15:00
	25,18	25,62	26,1	26,6
3º floor				
	12:00	13:00	14:00	15:00
	25,64	26,06	26,6	27
4º floor				
	12:00	13:00	14:00	15:00
	27,9	28,9	29,3	30,3

Summer -Dark Color (0,25 Albedo) - vegetation				
1º floor				
	12:00	13:00	14:00	15:00
	22,55	22,86	23,27	23,72
2º floor				
	12:00	13:00	14:00	15:00
	23,24	23,57	24,01	24,51
3º floor				
	12:00	13:00	14:00	15:00
	23,97	24,3	24,75	25,73
4º floor				
	12:00	13:00	14:00	15:00
	26,56	27,22	27,92	28,58

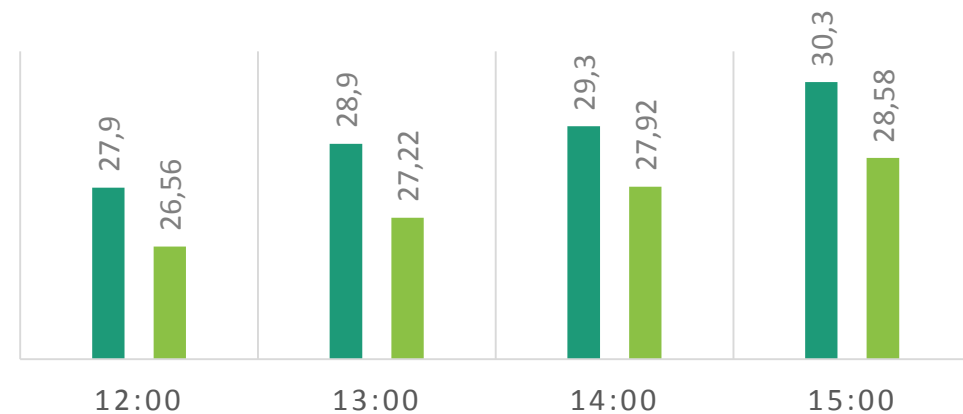
1º FLOOR

■ Dark Colors ■ Dark Colors - Vegetation



4º FLOOR

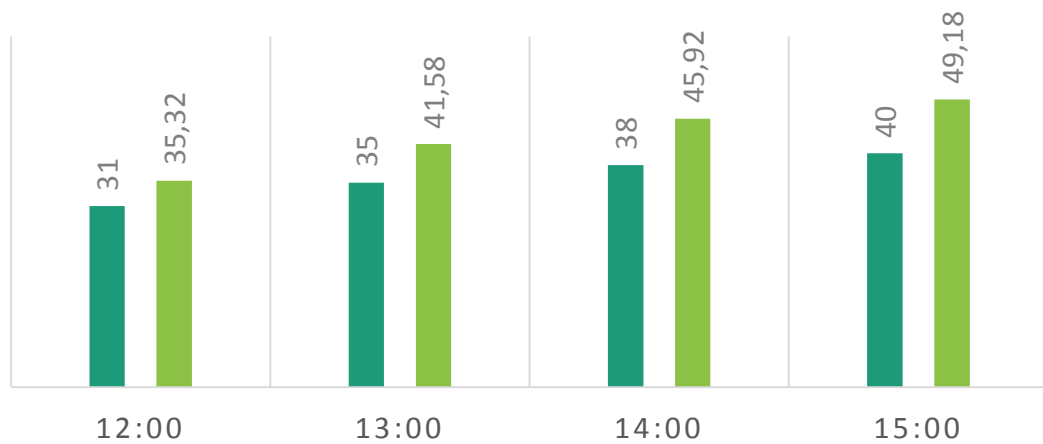
■ Dark Colors ■ Dark Colors - Vegetation



Energy needed				
Summer -Light Color (0,8 Albedo)				
1º floor				
	12:00	13:00	14:00	15:00
	31	35	38	40
2º floor				
	12:00	13:00	14:00	15:00
	32	35	39	43
3º floor				
	12:00	13:00	14:00	15:00
	31	35	38	42
4º floor				
	12:00	13:00	14:00	15:00
	58	69	72	76

1º FLOOR

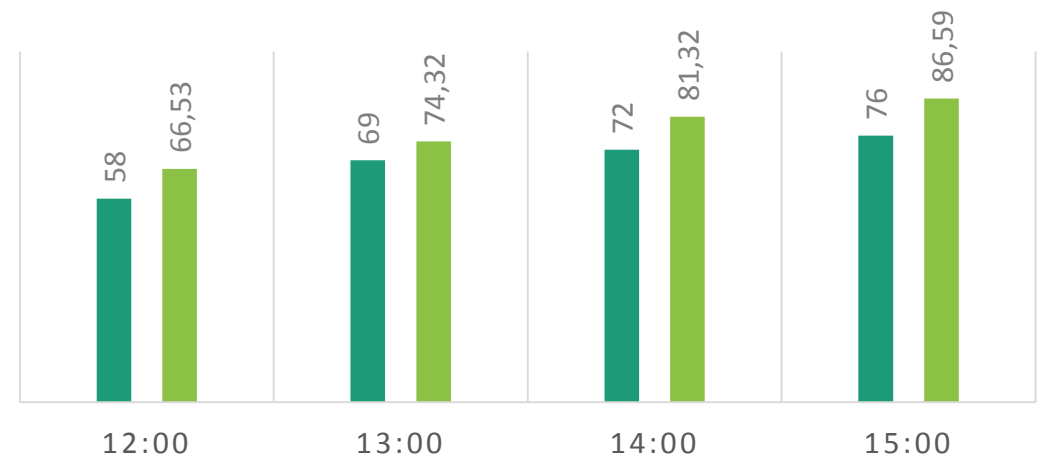
■ Energy needed- Light ■ Energy needed- Dark



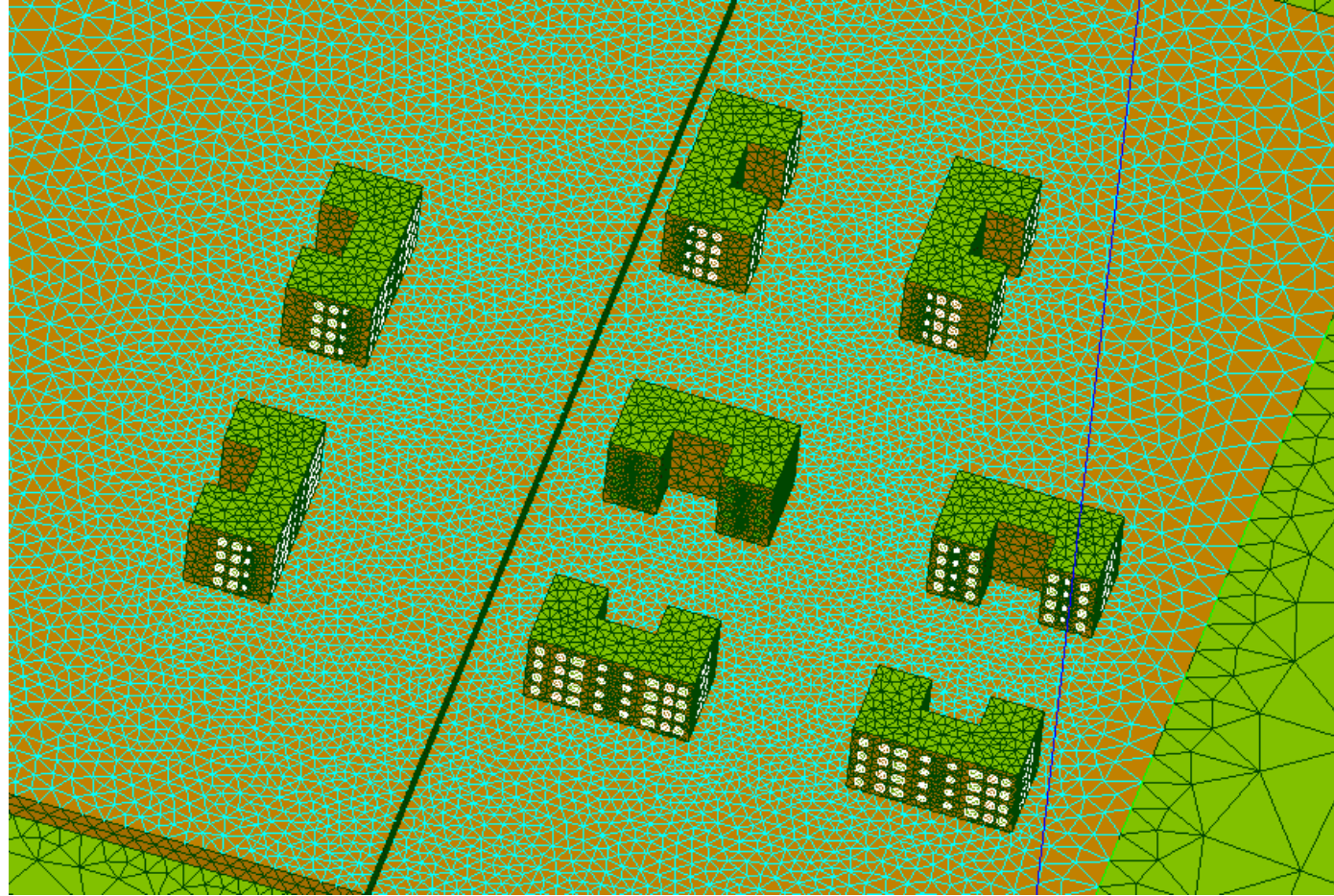
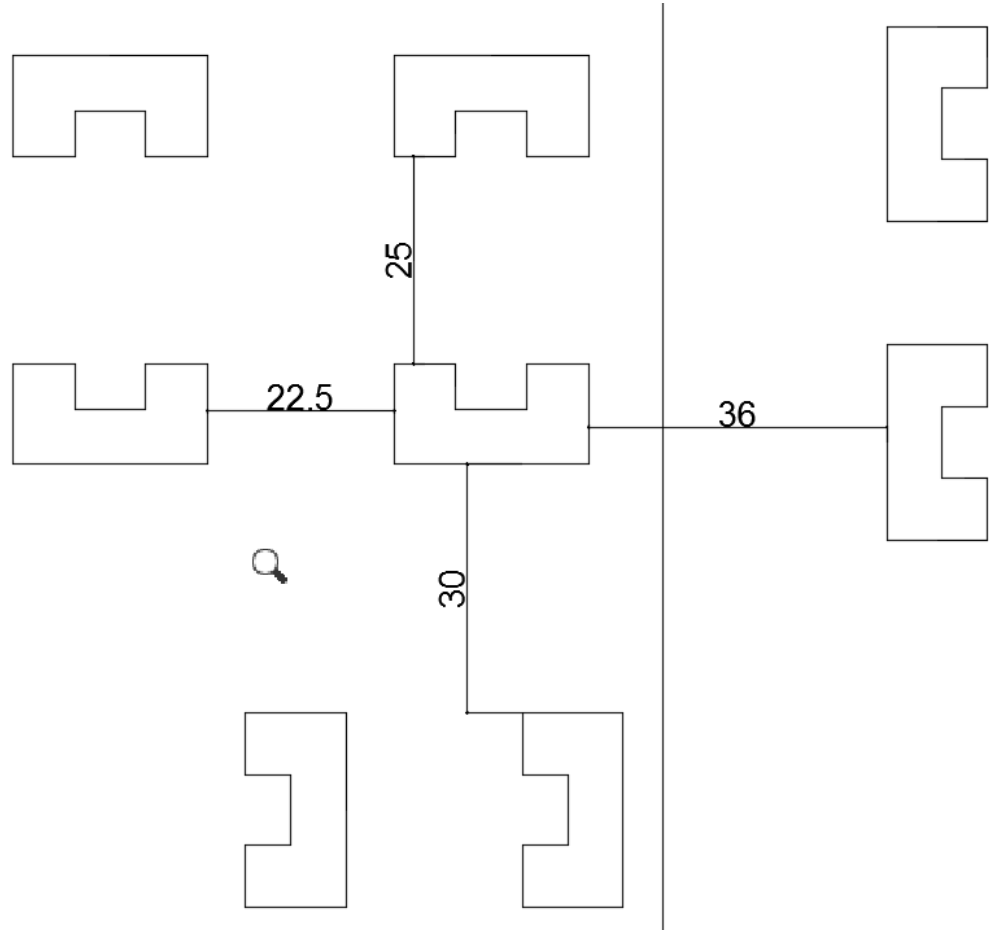
Energy needed				
Summer -Dark Color (0,25 Albedo)				
1º floor				
	12:00	13:00	14:00	15:00
	35,32	41,585	45,925	49,18
2º floor				
	12:00	13:00	14:00	15:00
	39,17	43,585	49,805	52,58
3º floor				
	12:00	13:00	14:00	15:00
	38,625	42,77	47,49	52,01
4º floor				
	12:00	13:00	14:00	15:00
	66,535	74,325	81,325	86,59

4º FLOOR

■ Energy needed- Light ■ Energy needed- Dark



NEXT STEPS – Improve the spaces between the buildings



Merci de votre attention!!!