

**From the report below we learn that an internal Helioscreen solar shading can generate up to 50% savings on the energy bill of the cooling equipment!**

## CapsolVi Report

### 1. Building geometry (type B4: Corner Office )

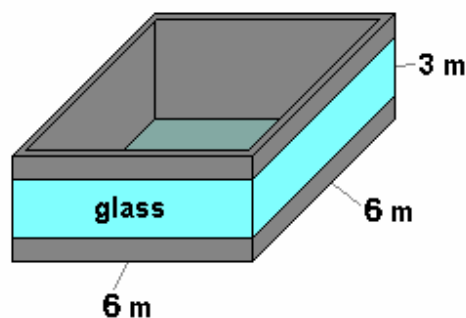


Figure 1: Office (building type B4)

#### Geometry

The geometry of the Office can be seen on Figure 1. The dimensions are 6 m x 6 m x 3 m (l x b x h). The two façades are each (6 m x 3 m) 18.0 m<sup>2</sup>. The glazing percentage is listed below. The Office is surrounded by the same kind of offices as itself. The properties of all walls are described in Table 1 and Table 2.

Table 1: Structures of constructions

Building type	Construction	Material	thickness d [mm]	conduction □ [W/mK]	density □ [kg/m <sup>3</sup> ]	spec. heat c [J/kg/K]
B4	Façade (orientation east, south)	brickwork (e)	90	0.9	1400	850
		insulation	60	0.04	40	600
		brickwork (i)	140	0.43	1100	940
	Intern wall	brickwork	100	0.43	1100	940
	Floor, plafond	Concrete (incl. plaster)	150	1.8	2400	1100
Glazing ** (orientation east, south)	glass	4	U [W/m <sup>2</sup> K] ***	2500	840	
	cavity	12				
	glass	4				

\* Thin wall layers, like a finishing, are neglected!

\*\* For the calculations the double glazing is replaced with an equivalent single layer with the same thermal properties as the double glazing. The solar properties of the glazing are: transmission 80 %, reflection 10 %, absorption 10 %.

\*\*\* See input parameters for value.

Table 2: building properties, re-calculated for 1 m<sup>2</sup> glazing in south\*\*\* façade

Building type:	B4
Total glass surface in south façade:	9.0 m <sup>2</sup>

Building properties per m<sup>2</sup> glass surface in south façade: \*

Base-volume:	12.0 m <sup>3</sup>
Façade surface, orientation south***:	1.0 m <sup>2</sup>
Façade surface, orientation east:	1.0 m <sup>2</sup>
Glazing surface, orientation south***:	1.0 m <sup>2</sup>
Glazing surface, orientation east:	1.0 m <sup>2</sup>
surface intern walls:	4.0 m <sup>2</sup>
floor surface:	4.0 m <sup>2</sup>
ceiling surface:	4.0 m <sup>2</sup>
internal gains:	60.0 W **

\* The total volume, the total façade-, glass- intern wall- and floor surface and the total internal heat gains are calculated by multiplying the total glass surface in the south façade with the values in the above table.

\*\* During the office hours (Monday - Friday, 09.00 h - 18.00 h)

\*\*\* Default orientations! See input parameters for the simulation.

### Ventilation

The Office is ventilated with external air through the whole year. The air change rate is shown in the input parameters list.

### Solar gains

The 100 % of the incident solar radiation is absorbed by the floor.

### Internal gains

During the office hours (Monday - Friday, 09.00 h - 18.00 h) an internal gain of

$q_i = 15 \text{ W/m}^2$  is taken into account. Outside the office hours there is no internal gain taken into account ( $q_i = 0 \text{ W/m}^2$ ).

*Comment: In case of higher internal gains there can be, of course different calculation results be expected. It is possible, for example that extra cooling is necessary for reaching the desired comfort conditions, since we must take the extra energy out of the Office.*

### Solar shading

The horizon is presumed to be at a vertical level of 5°. No other obstacles or buildings are taken into account.

## 2.1 Input parameters for Hong Kong simulation with airco and without solar shading

Project Name:	Hong Kong
Calculation period:	14 days, start date: 1 September
Base orientation:	228 °
Outdoor climate:	Ukkel (Belgium)
Ventilation rate:	1st October - 31st March: $n = 0.5 \text{ Vol/h}$

Glazed surface in façade(s):  
glazing U-value / g-value:  
Cooling:  
Solar protection:  
Comment:

1st April - 30th September: n = 2.0 Vol/h  
70 %  
2,9 W/m<sup>2</sup>K / 0.84  
YES  
NOT

## 2.2 Calculation results

Maximum temperature : 25,5 °C  
Duration with temperature > 25 °C : 4,9 h  
Duration with temperature > 28 °C : 0,0 h  
Heating energy demand per m<sup>2</sup> glass\* : 0 kWh  
Cooling energy demand per m<sup>2</sup> glass\* : 27 kWh  
\* for main orientation

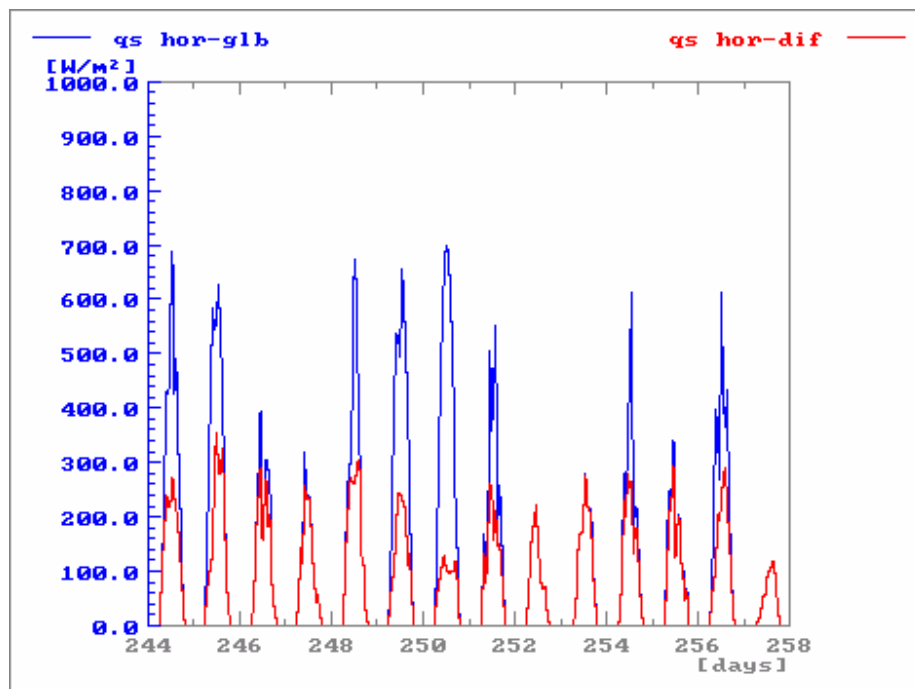


Figure 1. Global horizontal and Diffuse horizontal solar radiation (W/m<sup>2</sup>)

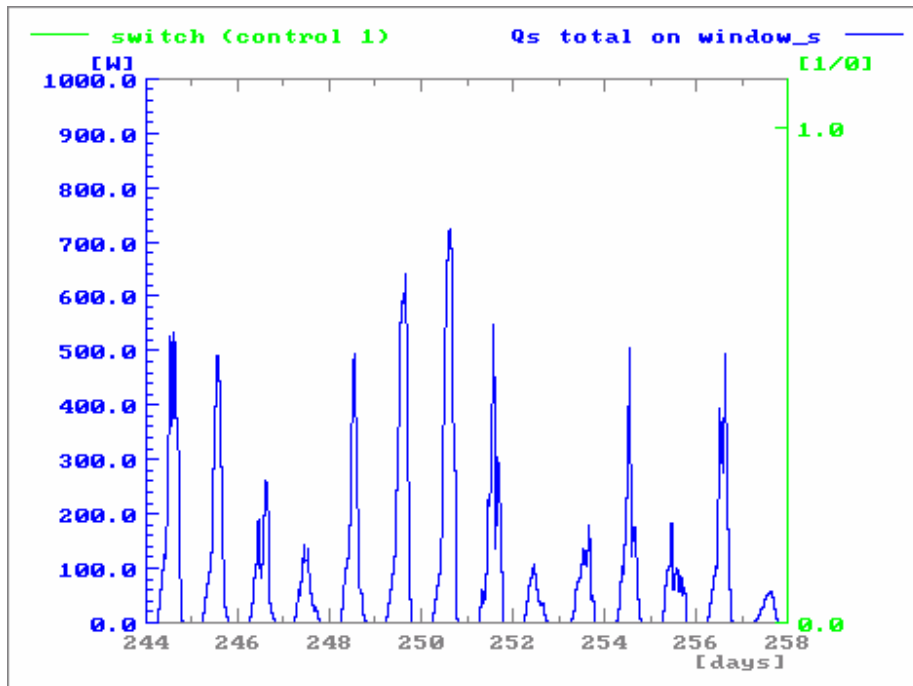


Figure 2. Incident solar radiation on South glazing ( $W/m^2$ ), Solar protection control ON (1)/ OFF (0)

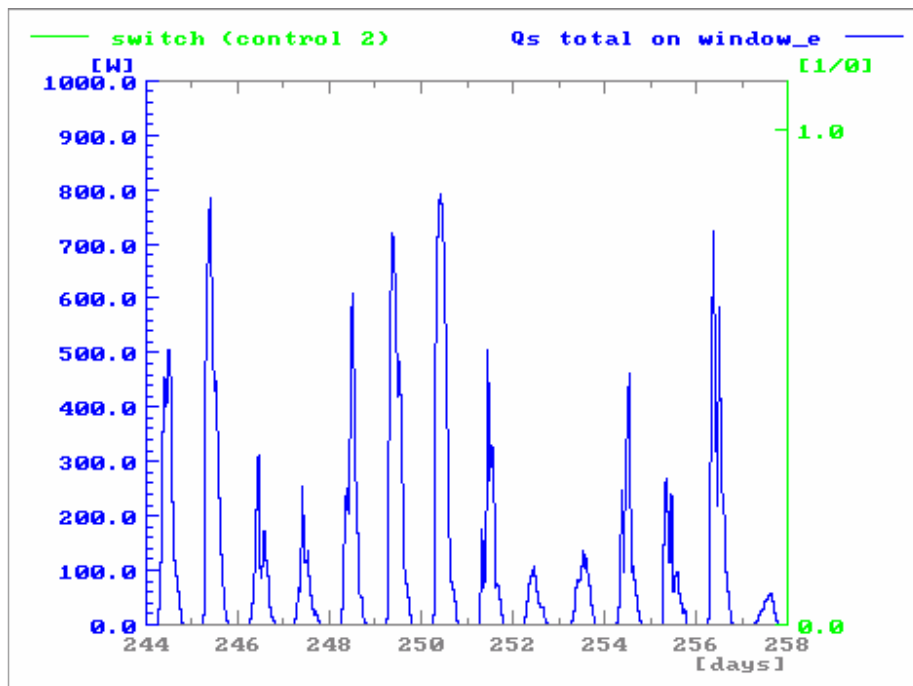


Figure 3. Incident solar radiation on East glazing ( $W/m^2$ ), Solar protection control ON (1)/ OFF (0)

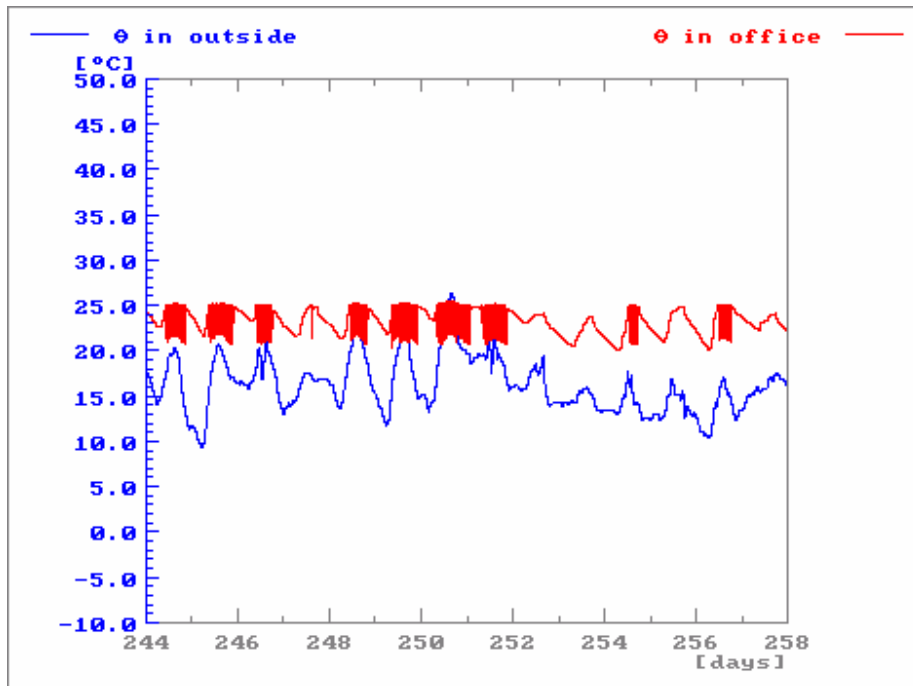


Figure 4. Outdoor and indoor (corner office) temperature (°C)

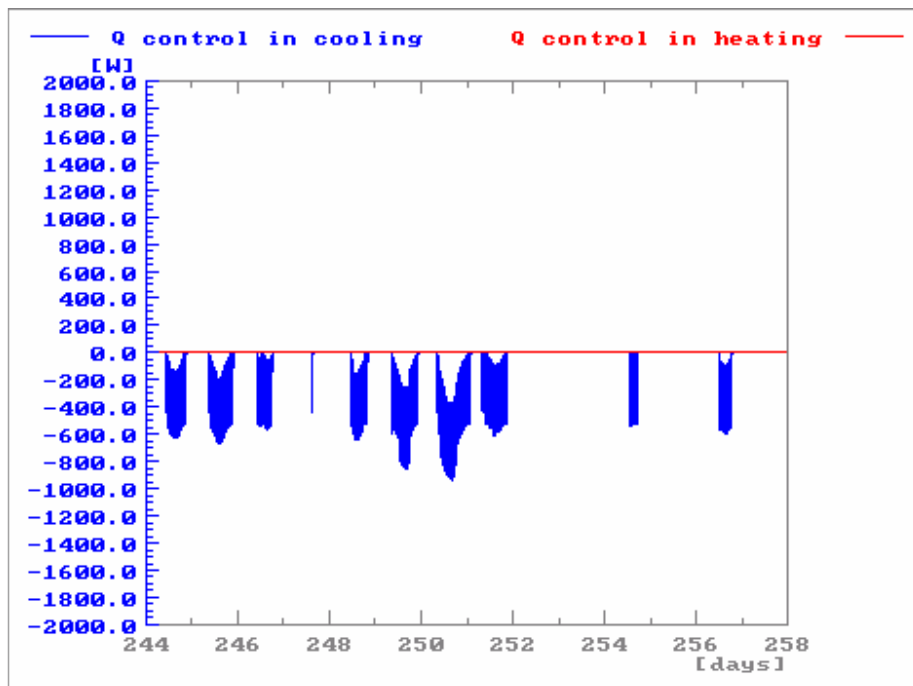


Figure 5. Injected heating and cooling power (W)

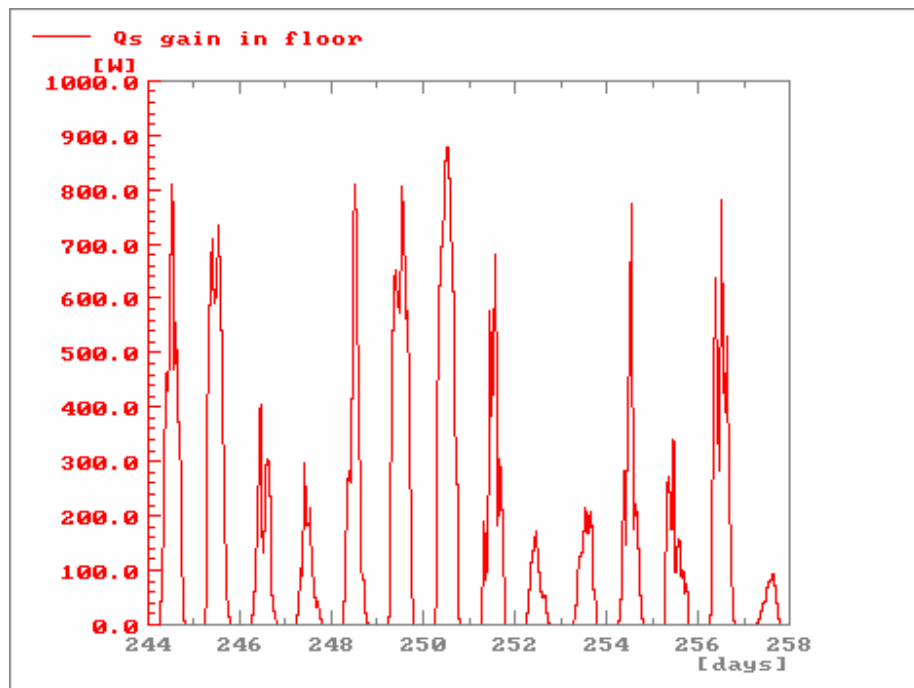


Figure 6. Total solar gains in the building (absorbed in the floor) (W)

### 3.1 Input parameters for Hong Kong simulation with airco and with Helioscreen internal solar shading

Project Name:	Hong Kong
Calculation period:	14 days, start date: 1 September
Base orientation:	228 °
Outdoor climate:	Ukkel (Belgium)
Ventilation rate:	1st October - 31st March: n = 0.5 Vol/h 1st April - 30th September: n = 2.0 Vol/h
Glazed surface in façade(s):	70 %
glazing U-value / g-value:	2,9 W/m2K / 0.84
Cooling:	YES
Solar protection:	Internal sunscreen
Sunscreen:	NATTE 2115 TN150117 Name: silver Transmission: 0,2 Reflection: 0,48 Absorption: 0,32

Comment:

### 3.2 Calculation results

Maximum temperature :	25,5 °C
Duration with temperature > 25 °C :	2,4 h
Duration with temperature > 28 °C :	0,0 h
Heating energy demand per m2 glass* :	0 kWh
Cooling energy demand per m2 glass* :	13 kWh
* for main orientation	

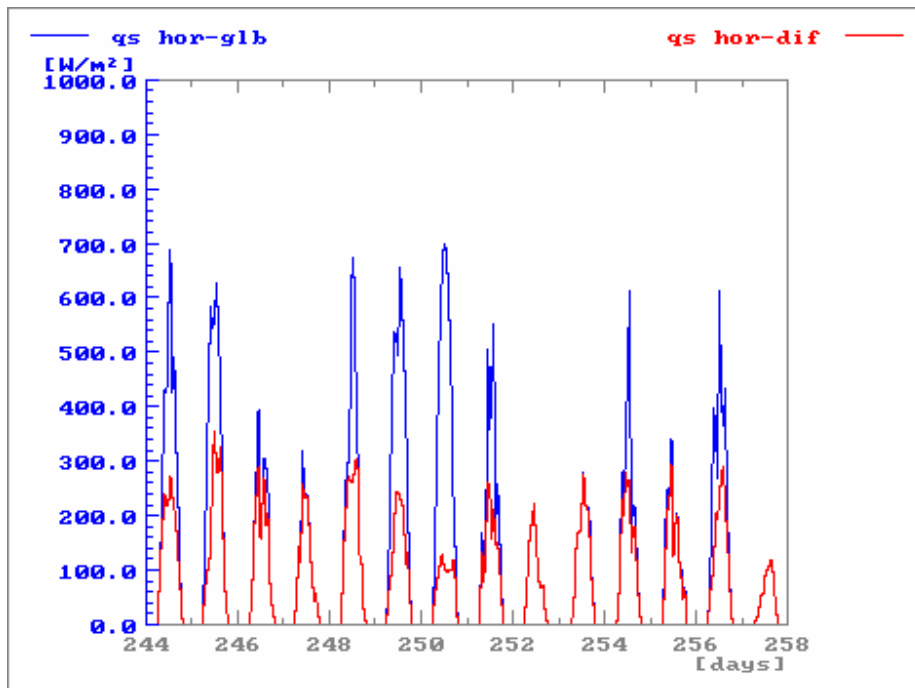


Figure 1. Global horizontal and Diffuse horizontal solar radiation ( $\text{W/m}^2$ )

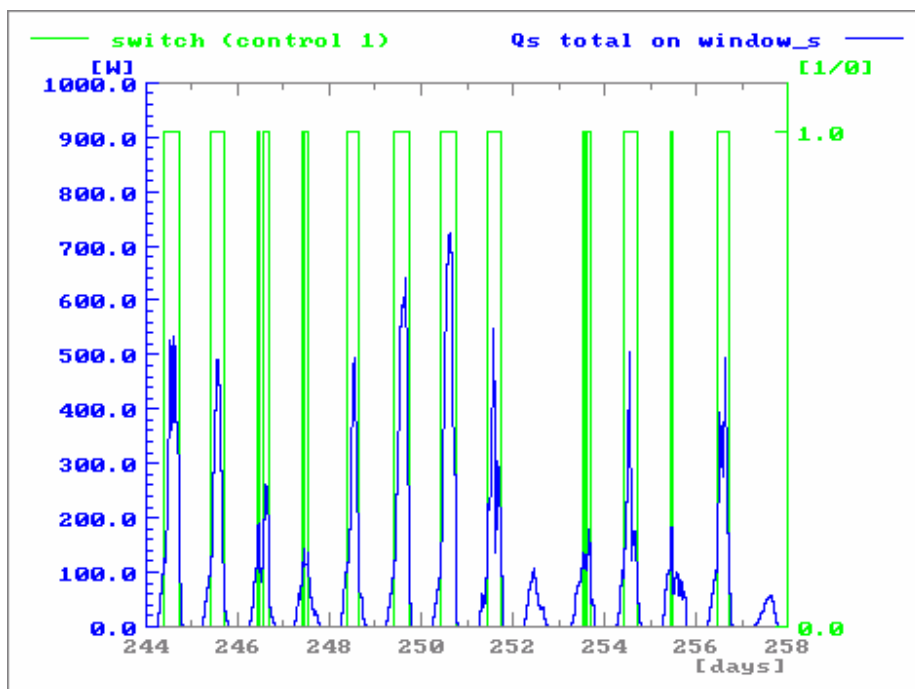


Figure 2. Incident solar radiation on South glazing ( $\text{W/m}^2$ ), Solar protection control ON (1)/ OFF (0)

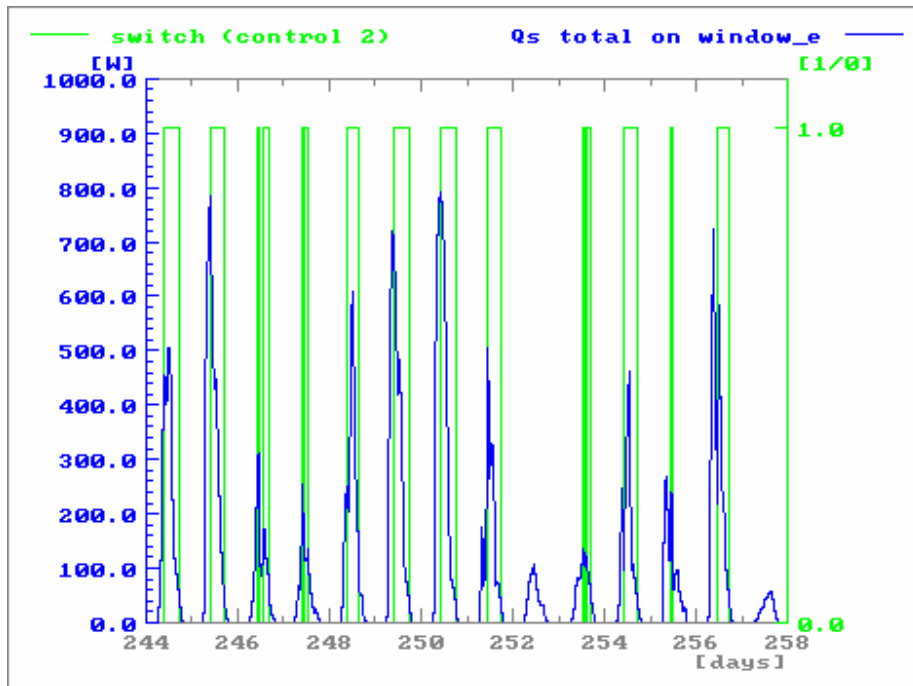


Figure 3. Incident solar radiation on East glazing (W/m2), Solar protection control ON (1)/ OFF (0)

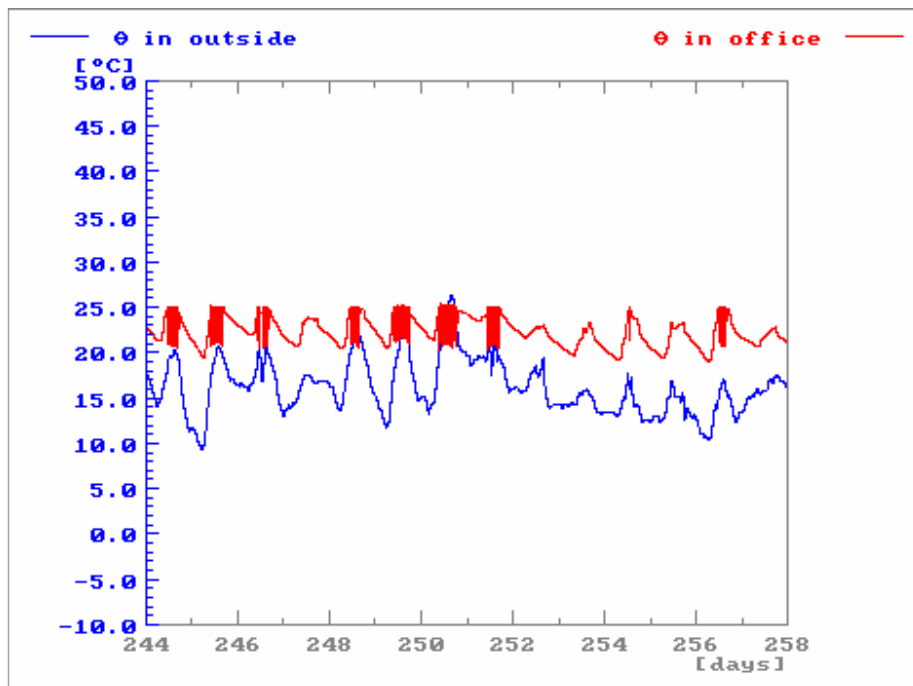


Figure 4. Outdoor and indoor (corner office) temperature (°C)

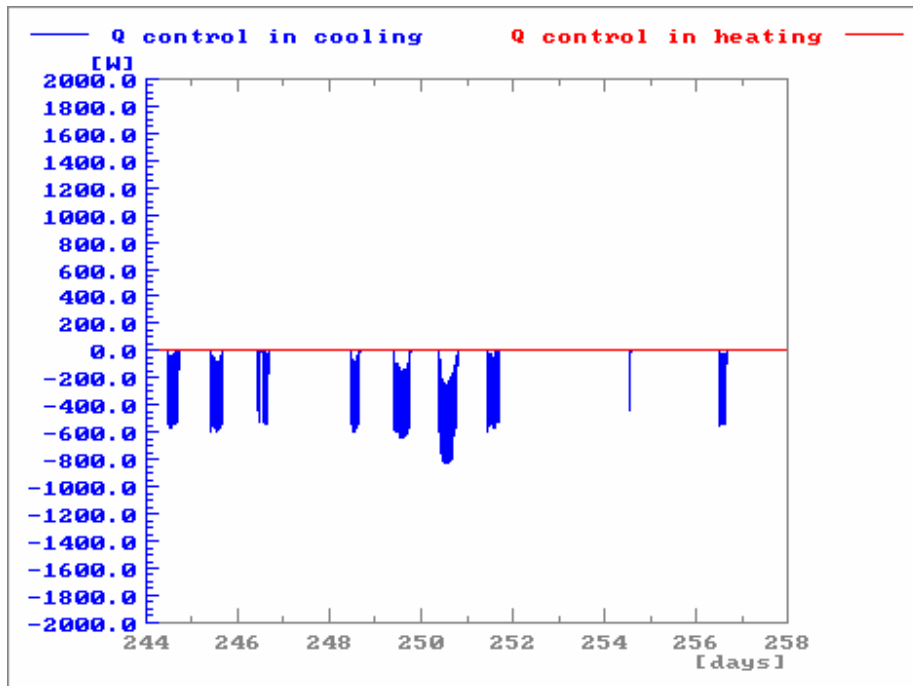


Figure 5. Injected heating and cooling power (W)

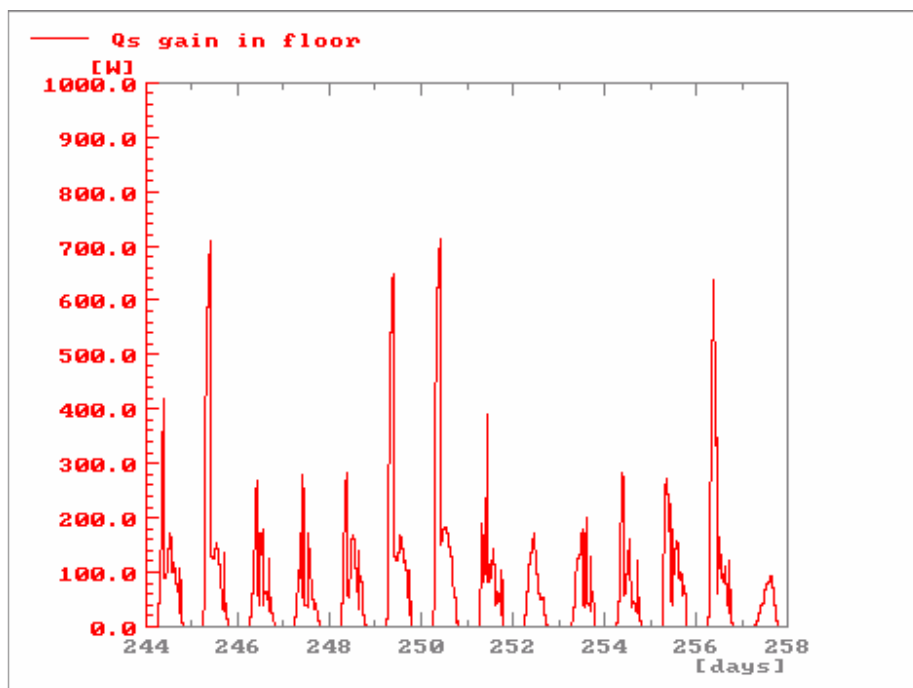


Figure 6. Total solar gains in the building (absorbed in the floor) (W)