FULL AIR SYSTEM SIZING
A.A 2024/25

Case Study 2					
Building data					
Location			Barcelona, Spain		
Building type			Office Building		
Geometrical data					
Total floor area (m^2)			1057.3		
Number of floors			1		
Window locations			Located on external walls		
Shading surfaces			-		
Height (m)			2.7		
Windows size (m)			1.8 x 1.5		
Building Envelope					
External wall	**s [m]**	**λ [W/(m·K)]**	**cp [J/kg·K)]**	**ρ [kg/m^3]**	**U [W/(m^2·K)]**
Brick	0.10	0.89	790	1920	
Wall air space resistance	0.04	0.27	1008	1	
Insulation board	0.03	0.03	1210	43	0.57
Fiberboard sheathing	0.01	0.07	1300	400	
Wall air space resistance	0.04	0.27	1008	1	
Gyp board	0.02	0.16	1088	801	
Internal wall	**s [m]**	**λ [W/(m·K)]**	**cp [J/kg·K)]**	**ρ [kg/m^3]**	**U [W/(m^2·K)]**
Internal plaster	0.01	0.7	1000	1400	
Concrete panel	0.2	0.58	1000	1400	1.58
Internal plaster	0.01	0.7	1000	1400	
Roof	**s [m]**	**λ [W/(m·K)]**	**cp [J/kg·K)]**	**ρ [kg/m^3]**	**U [W/(m^2·K)]**
Built-up roofing	0.01	0.16	1460	1120	
Fiberboard sheathing	0.01	0.07	1300	400	0.31
Insulation board	0.08	0.03	1210	43	
Lightweight concrete	0.10	0.53	840	1280	
Ground contact floor	**s [m]**	**λ [W/(m·K)]**	**cp [J/kg·K)]**	**ρ [kg/m^3]**	**U [W/(m^2·K)]**
Porcelain floor	0.015	1.47	1000	1700	
Cement mortar	0.03	1.4	1000	2000	
Lightened concrete	0.1	0.33	1000	1200	0.20
Scree	0.2	1.2	1000	1700	
Ueq ground losses	0.15	0.035	1000	30	
Windows	**Visible trasmittance**		**Solar heat gain**		**U [W/(m^2·K)]**
Single glazing	0.7		0.7		3

In the following picture the floor plan of the office building is presented:
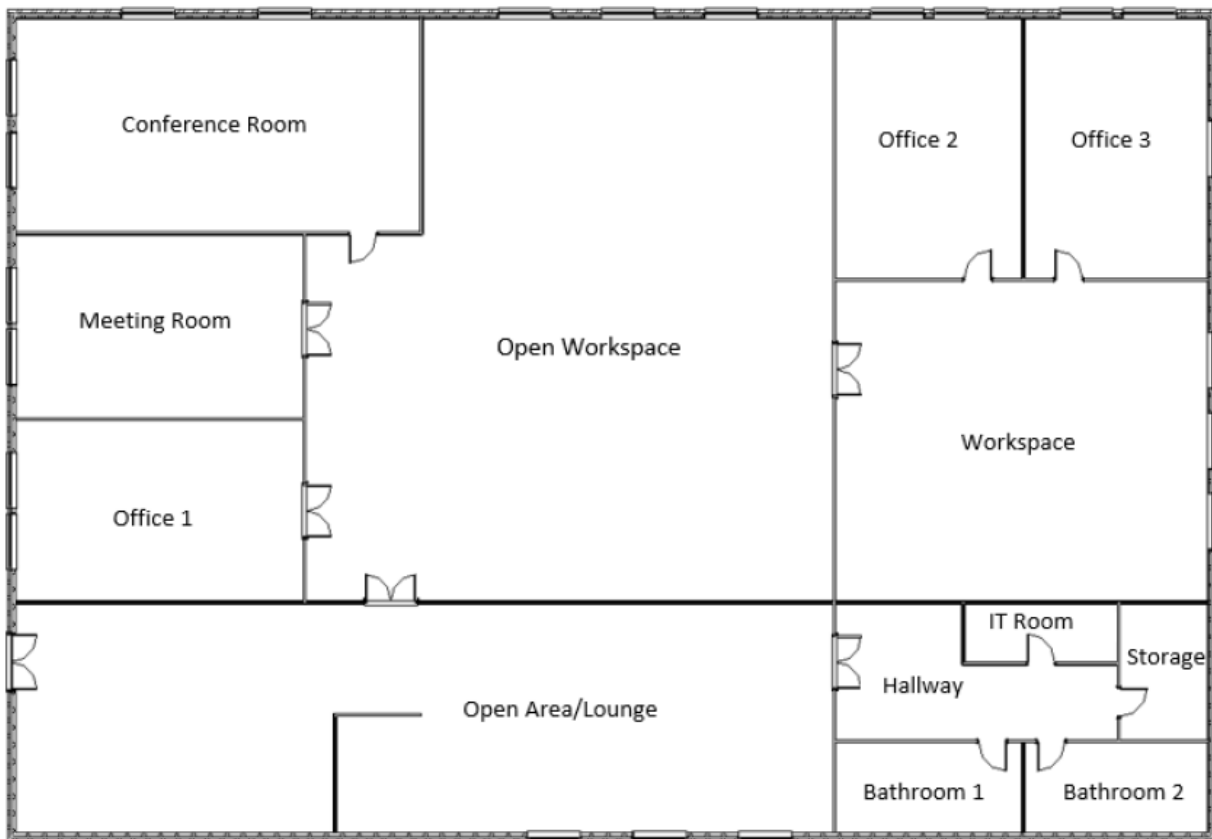
Figure 1: Floor plan of the office building

Net floor area of the rooms:

Office 1 = 54.15 m^2

Office 2 = 51.46 m^2

Office 3 = 49.8 m^2

Conference room = 89.78 m^2

Workspace = 136.13 m^2

Open workspace = 331.12 m^2

Open Area/ Lounge = 201.06 m^2

Meeting room = 61.66 m^2

Hallway = 29.83 m^2

IT Room = 8 m^2

Storage/ Closet = 11.34 m^2

Bathroom 1 = 16.17 m^2

Bathroom 2 = 16.77 m^2

Set point temperature for heating and cooling was assigned to each room.

Figure 2: Occupancy profiles and set point temperature for heating and cooling

1. **Monthly heating and cooling energy demand**

Attending only to the energy demand to be covered by the heating and cooling systems, the energy and instantaneous net power requirements throughout the year are shown below:
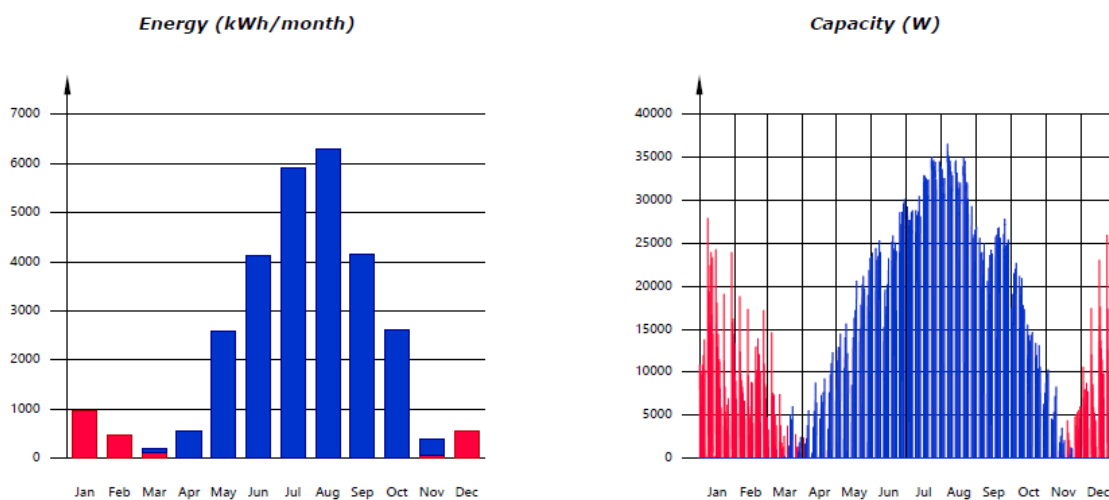
2. Peak load for heating and cooling

Heating peak load of the building = 28.59 kW

Cooling peak load of the building = 35.9 kW

Space	Peak Load Heating	Peak Load Cooling
Open Area/Lounge	5.47	6.59
Meeting room	1.92	2.73
Office 1	1.62	2.45
Conference room	3.27	3.70
Open workspace	6.18	9.18
Hallway	0.76	0.86
IT room	0.30	0.29
Storage	0.56	0.36
Bathroom 1	0.89	0.51
Bathroom 2	0.77	0.51
Office 3	2.05	2.30
Office 2	1.77	1.87
Workspace	3.07	5.13