Technician Environmental Systems

[Building Simulation Project]

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Politecnico Di Milano
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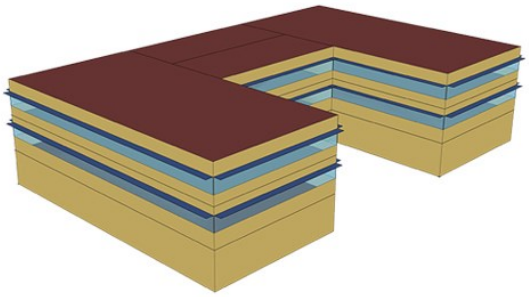
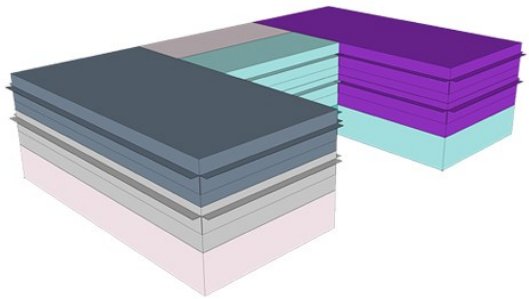
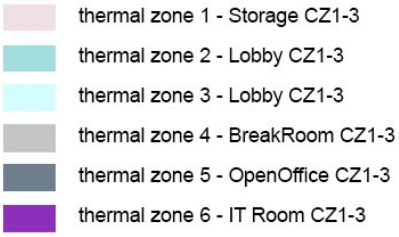
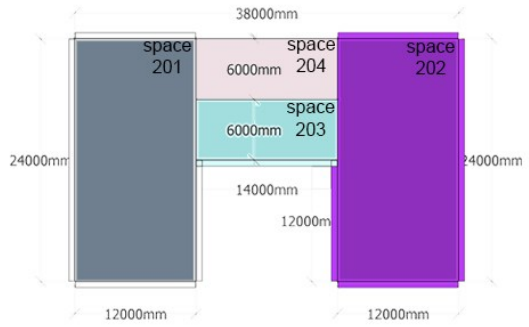


- **Building Introduction:**

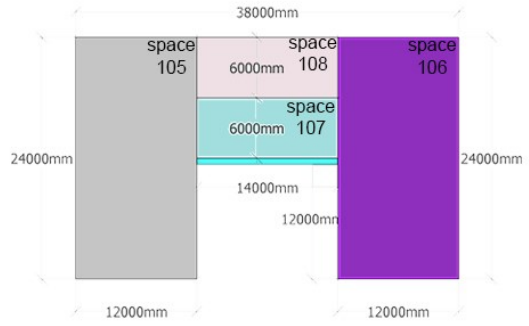
The project consists of the layout for an institutional office with the total area of 744 m^2 in each floor Designed in 3 stories, this building includes lobby, offices, lounge and breakroom, storage rooms and professional IT Rooms.



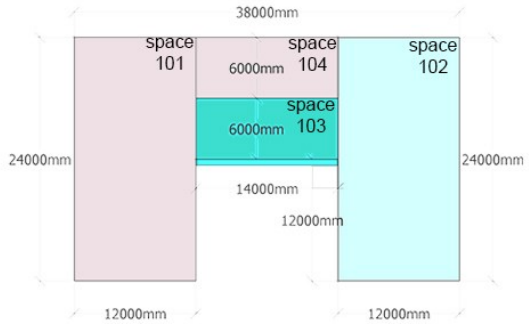




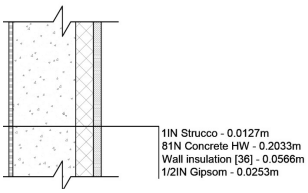
- This distribution created 6 thermal zones. Shown in the correspondent diagrams, we can see the function of each area, the dimension of areas and the codes which is used for the calculations. The purpose of this project is to determine how climate and environmental variation affect energy consumption of the building. Pursuing this goal three cities of Milan, Moscow and Tehran were selected in far different climate situations, such as Southern Europe, Northeastern Europe and Southwestern Asia respectively.



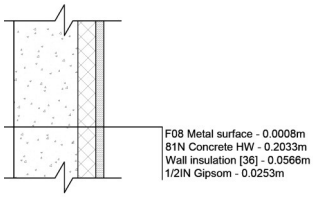
- Three external walls made of different materials are chosen in order for us to observe the differences in sustainability and energy consumption.



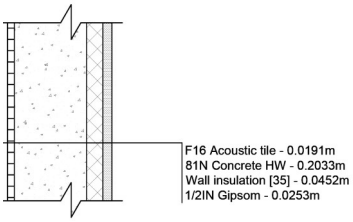
wall type 1



wall type 2



wall type 3



Milan– Wall Type 1

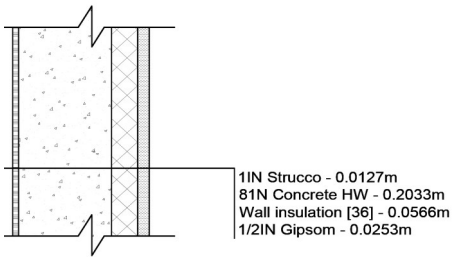
OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,122,433	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	61.63	kBtu/ft^2
OpenStudio Standards Building Type		

wall type 1



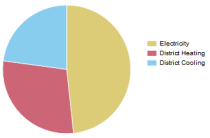
Weather Summary

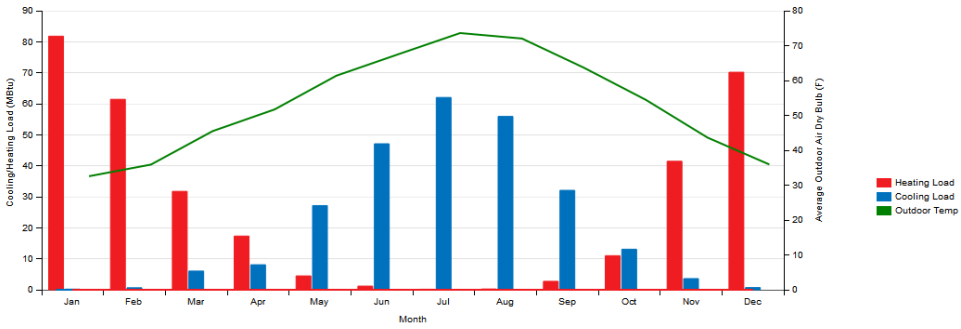
	Value
Weather File	MILAN - ITA IWEC Data WMO#=160660
Latitude	45.62
Longitude	8.73
Elevation	692 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Milan, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that almost half of the energy is used in form of Electricity, a quarter in Cooling and another quarter in Heating.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	256,640
District Heating	323,736





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	32.6	35.9	45.5	51.7	61.4	67.5	73.6	72.0	63.7	54.5	43.6	35.9
Cooling Load (MBtu)	0.21	0.65	6.03	8.07	27.16	47.09	62.04	55.91	32.08	13.09	3.6	0.71
Heating Load (MBtu)	81.79	61.44	31.75	17.32	4.48	1.18	0.17	0.25	2.73	11.0	41.45	70.18

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 328,9526.

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Overview

Zone Summary

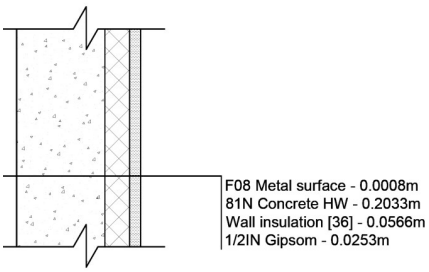
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	196.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	196.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.6 tton	0.69 tton	572.92	430.13	7/21 15:00:00	91.4	0.02
THERMAL ZONE 2	Heating	8.35 kBtu/hr	10.41 kBtu/hr	226.72	283.93	1/21 06:00:00	22.82	0.0
THERMAL ZONE 3	Cooling	2.93 tton	3.37 tton	1824.36	2097.69	7/21 15:15:00	91.13	0.02
THERMAL ZONE 3	Heating	41.24 kBtu/hr	51.55 kBtu/hr	1123.13	1406.94	1/21 06:00:00	22.82	0.0
THERMAL ZONE 4	Cooling	11.78 tton	13.55 tton	7348.28	8452.21	7/21 15:30:00	90.84	0.02
THERMAL ZONE 4	Heating	35.2 kBtu/hr	44.0 kBtu/hr	959.05	1924.41	1/21 06:00:00	22.82	0.0
THERMAL ZONE 5	Cooling	3.96 tton	4.56 tton	2466.38	2837.18	7/21 17:30:00	87.91	0.02
THERMAL ZONE 5	Heating	52.0 kBtu/hr	65.0 kBtu/hr	1419.65	1773.5	1/21 06:00:00	22.82	0.0
THERMAL ZONE 6	Cooling	5.36 tton	6.16 tton	3338.88	3839.93	7/21 16:45:00	89.2	0.02
THERMAL ZONE 6	Heating	93.6 kBtu/hr	117.0 kBtu/hr	2553.25	3191.03	1/21 06:00:00	22.82	0.0
THERMAL ZONE 1	Cooling	0.94 tton	1.08 tton	582.69	669.57	7/21 15:45:00	90.57	0.02
THERMAL ZONE 1	Heating	56.81 kBtu/hr	71.01 kBtu/hr	1548.9	1936.66	1/21 06:00:00	22.82	0.0

Milan– Wall Type 2

wall type 2



OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,125,002	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	61.77	kBtu/ft^2
OpenStudio Standards Building Type		

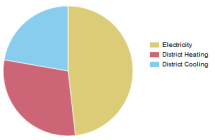
Weather Summary

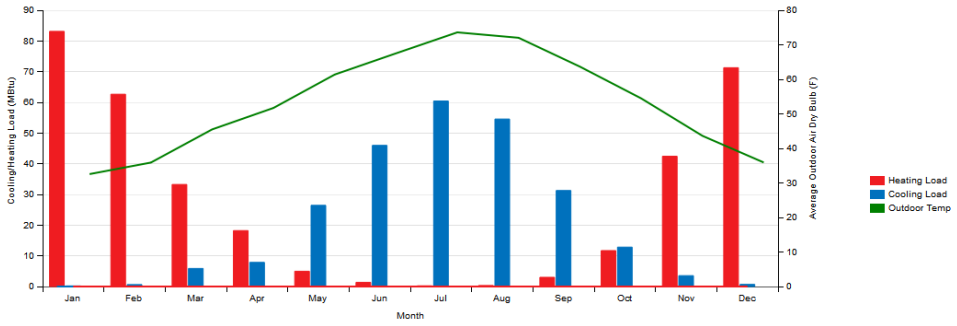
	Value
Weather File	MILAN - ITA IWEC Data WMO#=160660
Latitude	45.62
Longitude	8.73
Elevation	692 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Milan, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used in form of Electricity, less than a quarter in Cooling and more another quarter in Heating.

Energy Use - view table

Fuel	Consumptio
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	250,356
District Heating	332,589





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	32.6	35.9	45.5	51.7	61.4	67.5	73.6	72.0	63.7	54.5	43.6	35.9
Cooling Load (MBtu)	0.2	0.63	5.89	7.87	26.45	45.98	60.44	54.56	31.28	12.83	3.54	0.69
Heating Load (MBtu)	83.13	62.65	33.25	18.22	4.98	1.37	0.23	0.33	3.0	11.7	42.44	71.29

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 329,7055

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Overview

Zone Summary

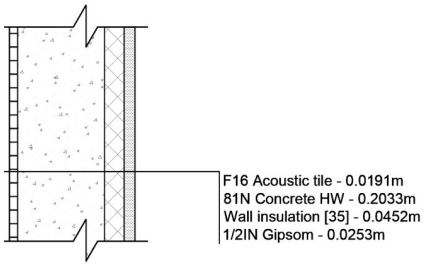
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3546.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.81 tons	0.93 tons	500.06	576.34	7/21 15:00:00	101.3	0.01
THERMAL ZONE 2	Heating	13.75 kBtu/hr	17.19 kBtu/hr	375.04	468.27	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.73 tons	4.29 tons	2320.17	2669.79	7/21 15:30:00	100.72	0.01
THERMAL ZONE 3	Heating	67.2 kBtu/hr	84.62 kBtu/hr	1847.66	2309.58	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	14.2 tons	16.33 tons	8829.37	10153.67	7/21 15:15:00	101.61	0.01
THERMAL ZONE 4	Heating	61.31 kBtu/hr	76.63 kBtu/hr	1671.0	2324.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.8 tons	5.52 tons	2983.5	3432.59	7/21 16:45:00	99.91	0.01
THERMAL ZONE 5	Heating	89.63 kBtu/hr	112.03 kBtu/hr	2445.19	3055.43	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.62 tons	7.61 tons	4112.73	4731.46	7/21 16:15:00	99.77	0.01
THERMAL ZONE 6	Heating	163.08 kBtu/hr	203.86 kBtu/hr	4447.53	5559.94	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.44 tons	1.65 tons	892.05	1027.66	7/21 15:45:00	100.44	0.01
THERMAL ZONE 1	Heating	93.7 kBtu/hr	117.13 kBtu/hr	2555.37	3195.27	2/21 06:00:00	-9.58	0.0

Milan– Wall Type 3

wall type 3



OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,123,012	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	61.66	kBtu/ft^2
OpenStudio Standards Building Type		

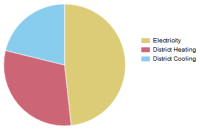
Weather Summary

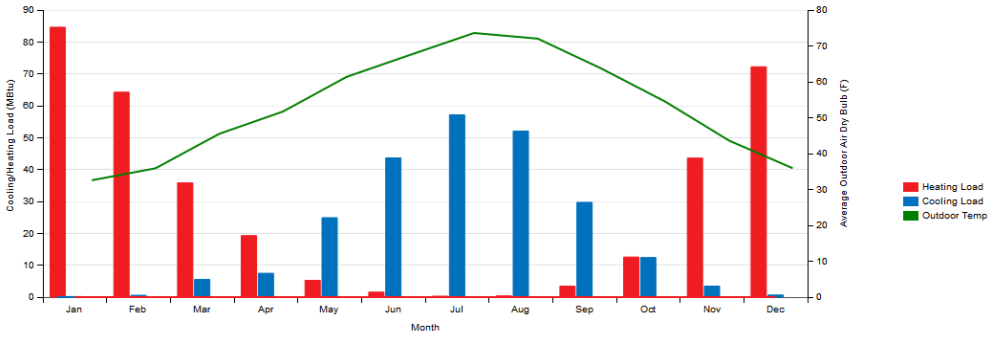
	Value
Weather File	MILAN - ITA IWEC Data WMO#=160660
Latitude	45.62
Longitude	8.73
Elevation	692 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Milan, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that almost half of the energy is used in form of Electricity, less than a quarter in Cooling and more than a quarter in Heating.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542.057
Natural Gas	0
Additional Fuel	0
District Cooling	237.722
District Heating	343.224





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	32.6	35.9	45.5	51.7	61.4	67.5	73.6	72.0	63.7	54.5	43.6	35.9
Cooling Load (MBtu)	0.18	0.58	5.54	7.47	24.89	43.65	57.16	52.04	29.71	12.41	3.44	0.66
Heating Load (MBtu)	84.62	64.26	35.81	19.28	5.24	1.56	0.29	0.39	3.42	12.55	43.59	72.21

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 329,1223.

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Overview

Zone Summary

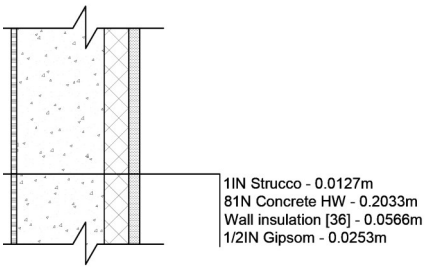
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.8 (ton)	0.92 (ton)	485.82	560.98	7/21 15:00:00	101.3	0.01
THERMAL ZONE 2	Heating	13.7 (kBtu/h)	17.12 (kBtu/h)	372.92	466.15	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.61 (ton)	4.15 (ton)	2246.01	2580.8	7/21 13:15:00	101.01	0.01
THERMAL ZONE 3	Heating	67.23 (kBtu/h)	84.03 (kBtu/h)	1834.95	2292.63	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	14.12 (ton)	16.24 (ton)	8782.76	10100.7	7/21 13:15:00	101.01	0.01
THERMAL ZONE 4	Heating	61.05 (kBtu/h)	76.31 (kBtu/h)	1665.44	2324.41	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.72 (ton)	5.43 (ton)	2932.53	3373.26	7/21 16:45:00	99.01	0.01
THERMAL ZONE 5	Heating	89.36 (kBtu/h)	111.72 (kBtu/h)	2436.71	3046.95	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.44 (ton)	7.41 (ton)	4004.68	4606.45	7/21 16:15:00	99.77	0.01
THERMAL ZONE 6	Heating	162.6 (kBtu/h)	203.25 (kBtu/h)	4434.82	5542.99	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.33 (ton)	1.53 (ton)	826.36	949.26	7/21 13:15:00	101.01	0.01
THERMAL ZONE 1	Heating	93.15 (kBtu/h)	116.44 (kBtu/h)	2540.54	3176.2	2/21 24:00:00	-9.58	0.0

Moscow– Wall Type 1

wall type 1



OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,384,372	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	76.01	kBtu/ft^2
OpenStudio Standards Building Type		

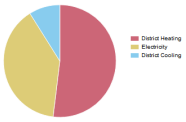
Weather Summary

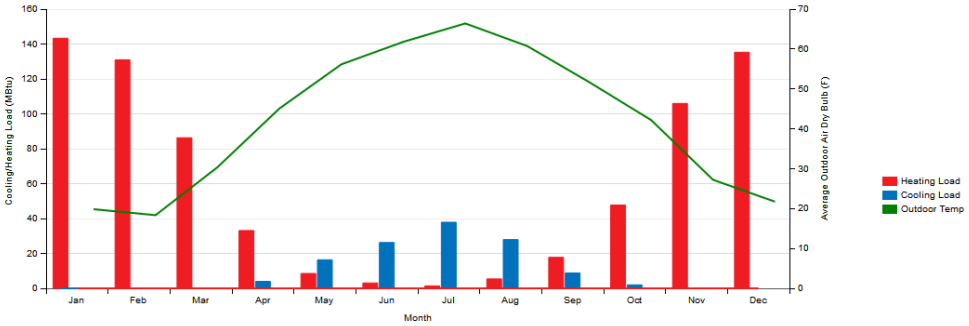
	Value
Weather File	MOSCOW - RUS IWEC Data WMO#=276120
Latitude	55.75
Longitude	37.63
Elevation	512 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Moscow, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used for Cooling, about 15 percent in Cooling and about 35 percent in Heating.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	123,520
District Heating	718,787





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	19.8	18.3	30.4	45.1	56.2	61.8	66.4	60.7	51.7	42.2	27.2	21.7
Cooling Load (MBtu)	0.0	0.04	0.19	3.99	16.37	26.26	37.88	27.94	8.82	2.0	0.02	0.0
Heating Load (MBtu)	143.33	130.94	86.29	33.11	8.52	3.09	1.4	5.38	17.75	47.74	105.95	135.27

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 405,7194.

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Overview

Zone Summary

	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.63 (ton)	0.73 (ton)	391.99	449.2	7/21 14:30:00	91.4	0.02
THERMAL ZONE 2	Heating	13.71 (kBtu/h)	17.14 (kBtu/h)	370.8	464.03	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.02 (ton)	3.47 (ton)	1866.73	2148.54	7/21 13:00:00	91.4	0.02
THERMAL ZONE 3	Heating	67.38 (kBtu/h)	84.23 (kBtu/h)	1826.47	2282.03	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	11.84 (ton)	13.62 (ton)	7339.8	8441.62	7/21 13:15:00	91.13	0.02
THERMAL ZONE 4	Heating	61.14 (kBtu/h)	76.43 (kBtu/h)	1656.96	2324.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	3.97 (ton)	4.57 (ton)	2455.78	2824.47	7/21 17:30:00	87.91	0.02
THERMAL ZONE 5	Heating	89.47 (kBtu/h)	111.83 (kBtu/h)	2424.0	3030.0	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	5.42 (ton)	6.23 (ton)	3345.71	3847.89	7/21 16:30:00	89.56	0.02
THERMAL ZONE 6	Heating	162.77 (kBtu/h)	203.46 (kBtu/h)	4409.39	5513.33	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	0.96 (ton)	1.1 (ton)	591.17	678.04	7/21 13:45:00	90.57	0.02
THERMAL ZONE 1	Heating	93.34 (kBtu/h)	116.67 (kBtu/h)	2529.94	3161.37	2/21 06:00:00	-9.58	0.0

Moscow– Wall Type 2

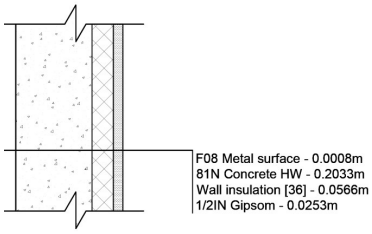
OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,391,680	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	76.41	kBtu/ft^2
OpenStudio Standards Building Type		

wall type 2



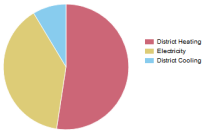
Weather Summary

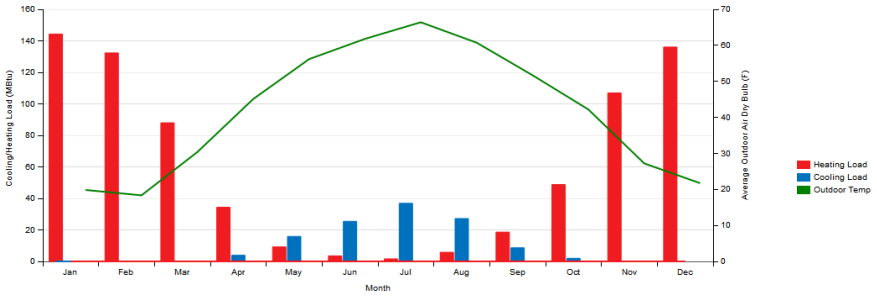
	Value
Weather File	MOSCOW - RUS IWEC Data WMO#=276120
Latitude	55.75
Longitude	37.63
Elevation	512 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Moscow, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used for Cooling, about 10 percent in Cooling and about 40 percent in Heating.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	120,155
District Heating	729,468





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	19.8	18.3	30.4	45.1	56.2	61.8	66.4	60.7	51.7	42.2	27.2	21.7
Cooling Load (MBtu)	0.0	0.04	0.19	3.9	15.87	25.45	36.89	27.2	8.64	1.97	0.02	0.0
Heating Load (MBtu)	144.31	132.33	87.98	34.36	9.2	3.51	1.6	5.8	18.6	48.78	106.95	136.05

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 407,8611.

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Overview

Zone Summary

	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.83 ton	0.95 ton	512.77	589.05	7/21 14:30:00	101.3	0.01
THERMAL ZONE 2	Heating	13.75 kBtu/hr	17.19 kBtu/hr	372.92	466.15	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.81 ton	4.38 ton	2351.96	2705.81	7/21 15:00:00	101.3	0.01
THERMAL ZONE 3	Heating	67.7 kBtu/hr	84.62 kBtu/hr	1834.95	2292.63	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	14.27 ton	16.41 ton	8812.42	10134.6	7/21 15:15:00	101.01	0.01
THERMAL ZONE 4	Heating	61.31 kBtu/hr	76.63 kBtu/hr	1661.2	2324.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.8 ton	5.52 ton	2964.31	3409.28	7/21 16:45:00	99.01	0.01
THERMAL ZONE 5	Heating	89.63 kBtu/hr	112.03 kBtu/hr	2428.24	3036.35	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.64 ton	7.64 ton	4102.15	4718.75	7/21 16:00:00	100.15	0.01
THERMAL ZONE 6	Heating	163.68 kBtu/hr	203.86 kBtu/hr	4417.86	5523.92	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.44 ton	1.66 ton	892.05	1025.54	7/21 15:45:00	100.44	0.01
THERMAL ZONE 1	Heating	93.7 kBtu/hr	117.13 kBtu/hr	2538.42	3174.08	2/21 06:00:00	-9.58	0.0

Moscow– Wall Type 3

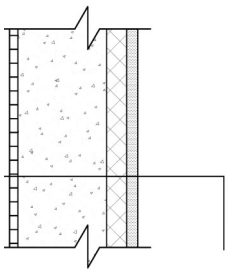
OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,393,926	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	76.54	kBtu/ft^2
OpenStudio Standards Building Type		

wall type 3



F16 Acoustic tile - 0.0191m
81N Concrete HW - 0.2033m
Wall insulation [35] - 0.0452m
1/2IN Gipsom - 0.0253m

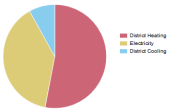
Weather Summary

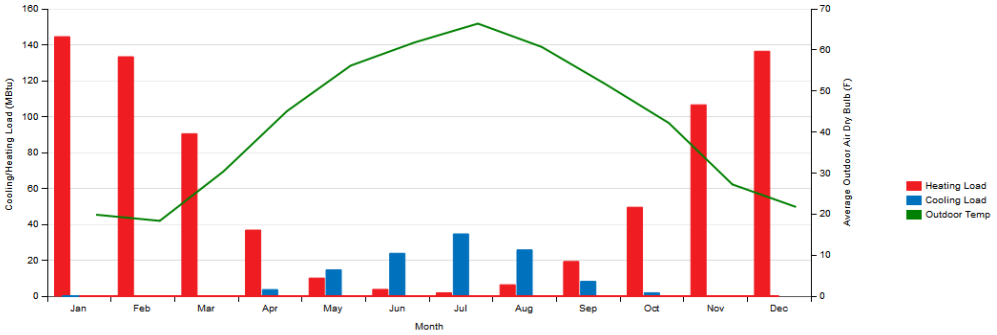
	Value
Weather File	MOSCOW - RUS IWEC Data WMO#=276120
Latitude	55.75
Longitude	37.63
Elevation	512 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Moscow, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used for Cooling, about 10 percent in Cooling and about 40 percent in Heating.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	112,989
District Heating	738,880





Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	19.8	18.3	30.4	45.1	56.2	61.8	66.4	60.7	51.7	42.2	27.2	21.7
Cooling Load (MBtu)	0.0	0.03	0.17	3.66	14.67	23.87	34.65	25.78	8.23	1.9	0.02	0.0
Heating Load (MBtu)	144.49	133.32	90.46	36.79	10.06	3.75	1.88	6.34	19.3	49.52	106.56	136.39

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 408,5194.

The bar chart shows January and December have the highest heating load. Also July and August have the lowest cooling load respectively.

Zone Summary

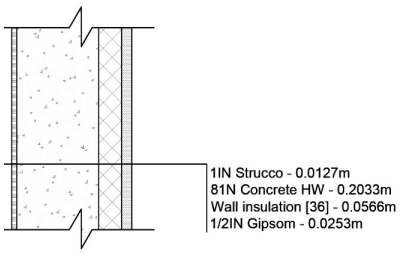
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3546.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.82 ton	0.94 ton	586.41	582.69	7/21 14:30:00	101.3	0.01
THERMAL ZONE 2	Heating	13.7 kBtu/h	17.12 kBtu/h	370.8	464.03	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.68 ton	4.23 ton	2273.56	2614.7	7/21 14:45:00	101.3	0.01
THERMAL ZONE 3	Heating	67.23 kBtu/h	84.03 kBtu/h	1822.24	2277.8	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	14.19 ton	16.32 ton	8763.69	10079.51	7/21 15:15:00	101.01	0.01
THERMAL ZONE 4	Heating	61.65 kBtu/h	76.51 kBtu/h	1654.85	2324.41	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.71 ton	5.42 ton	2909.22	3345.71	7/21 16:45:00	99.01	0.01
THERMAL ZONE 5	Heating	89.38 kBtu/h	111.72 kBtu/h	2421.88	3027.88	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.47 ton	7.44 ton	3994.09	4593.73	7/21 15:45:00	100.44	0.01
THERMAL ZONE 6	Heating	162.6 kBtu/h	203.25 kBtu/h	4405.15	5506.97	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.33 ton	1.53 ton	824.24	947.14	7/21 15:15:00	101.01	0.01
THERMAL ZONE 1	Heating	93.15 kBtu/h	116.44 kBtu/h	2523.59	3155.01	2/21 24:00:00	-9.58	0.0

Tehran– Wall Type 1

wall type 1



OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,153,958	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	63.36	kBtu/ft^2
OpenStudio Standards Building Type		

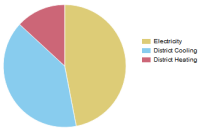
Weather Summary

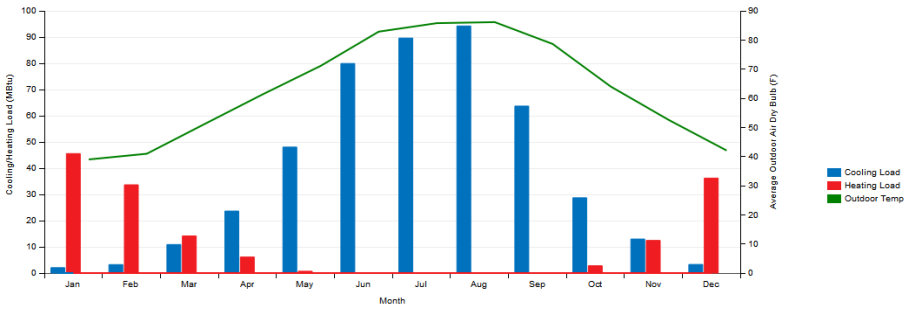
	Value
Weather File	Tehran Mehrabad - IRN ITMY WMO#=407540
Latitude	35.41
Longitude	51.19
Elevation	3904 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Tehran, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used in form of Electricity, about 10 percent in Heating and about 40 percent in Cooling.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	460,269
District Heating	151,632





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	39.0	41.0	51.2	61.3	71.1	82.9	85.8	86.1	78.6	64.0	52.5	42.1
Cooling Load (MBtu)	2.05	3.23	10.88	23.64	48.04	79.93	89.61	94.23	63.68	28.7	12.98	3.29
Heating Load (MBtu)	45.57	33.66	14.15	6.11	0.69	0.0	0.0	0.0	0.02	2.78	12.45	36.21

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 338,1917.

The bar chart shows January and December have the highest heating load. Also August and July have the lowest cooling load respectively.

Zone Overview

Zone Summary

	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.77 tons	0.88 tons	536.08	616.59	7/21 13:00:00	101.3	0.01
THERMAL ZONE 2	Heating	13.23 kBtu/hr	16.53 kBtu/hr	406.82	508.53	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.6 tons	4.14 tons	2519.35	2898.63	7/21 13:15:00	101.01	0.01
THERMAL ZONE 3	Heating	64.46 kBtu/hr	80.58 kBtu/hr	1979.03	2473.73	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	13.72 tons	15.78 tons	9607.0	11047.84	7/21 15:15:00	101.01	0.01
THERMAL ZONE 4	Heating	59.07 kBtu/hr	73.83 kBtu/hr	1813.76	2324.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.79 tons	5.51 tons	3349.95	3854.24	7/21 16:15:00	99.77	0.01
THERMAL ZONE 5	Heating	85.23 kBtu/hr	106.54 kBtu/hr	2614.7	3268.43	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.63 tons	7.63 tons	4640.35	5337.46	7/21 15:45:00	100.44	0.01
THERMAL ZONE 6	Heating	154.61 kBtu/hr	193.26 kBtu/hr	4744.17	5930.75	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.42 tons	1.63 tons	991.64	1139.96	7/21 15:45:00	100.44	0.01
THERMAL ZONE 1	Heating	87.76 kBtu/hr	109.7 kBtu/hr	2693.1	3366.9	2/21 06:00:00	-9.58	0.0

Tehran– Wall Type 2

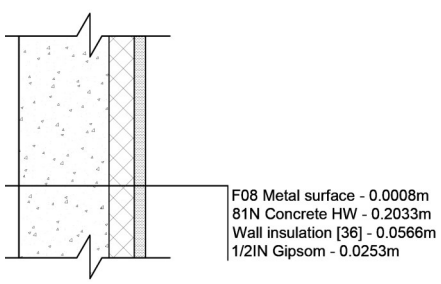
wall type 2

OpenStudio Results

Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,152,005	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	63.25	kBtu/ft^2
OpenStudio Standards Building Type		



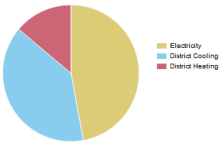
Weather Summary

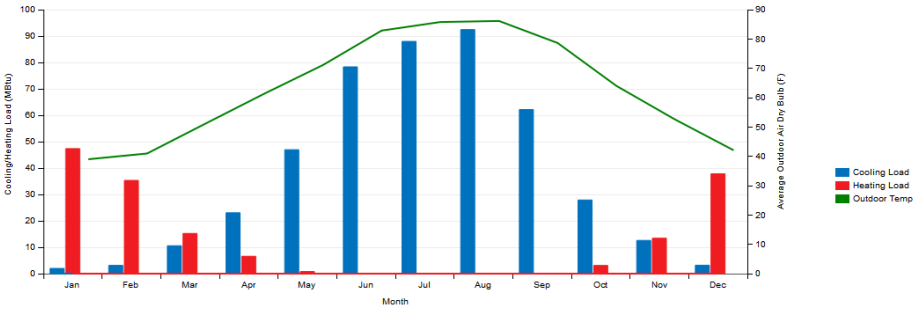
	Value
Weather File	Tehran Mehrabad - IRN ITMY WMO#=407540
Latitude	35.41
Longitude	51.19
Elevation	3904 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Tehran, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used in form of Electricity, about 15 percent in Heating and about 35 percent in Cooling.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	450,261
District Heating	159,688





HVAC Load Profiles

Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	39.0	41.0	51.2	61.3	71.1	82.9	85.8	86.1	78.6	64.0	52.5	42.1
Cooling Load (MBtu)	1.98	3.13	10.57	23.06	46.94	78.33	87.98	92.43	62.16	27.9	12.59	3.19
Heating Load (MBtu)	47.36	35.32	15.23	6.59	0.79	0.0	0.01	0.0	0.03	3.1	13.42	37.83

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 338,1917.

The bar chart shows January and December have the highest heating load. Also August and July have the lowest cooling load respectively.

Zone Overview

Zone Summary

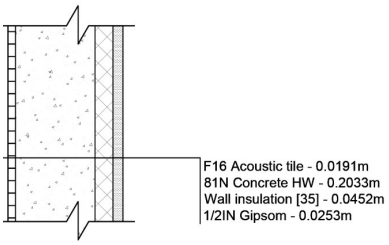
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

Zone Sensible Cooling and Heating Sensible Sizing

	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.76 ton	0.88 ton	533.96	614.48	7/21 15:00:00	101.3	0.01
THERMAL ZONE 2	Heating	13.26 kBtu/h	16.58 kBtu/h	406.82	508.53	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.57 ton	4.1 ton	2496.04	2871.08	7/21 15:15:00	101.01	0.01
THERMAL ZONE 3	Heating	64.77 kBtu/h	80.97 kBtu/h	1987.51	2483.45	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	13.69 ton	15.74 ton	9585.81	11022.41	7/21 15:15:00	101.01	0.01
THERMAL ZONE 4	Heating	59.23 kBtu/h	74.04 kBtu/h	1818.0	2324.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.77 ton	5.48 ton	3333.0	3833.05	7/21 16:15:00	99.77	0.01
THERMAL ZONE 5	Heating	85.39 kBtu/h	106.74 kBtu/h	2621.05	3275.79	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.59 ton	7.58 ton	4608.56	5299.32	7/21 15:45:00	100.44	0.01
THERMAL ZONE 6	Heating	154.92 kBtu/h	193.66 kBtu/h	4754.77	5943.46	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.38 ton	1.59 ton	966.21	1112.41	7/21 15:45:00	100.44	0.01
THERMAL ZONE 1	Heating	88.12 kBtu/h	110.15 kBtu/h	2703.69	3381.73	2/21 06:00:00	-9.58	0.0

Tehran– Wall Type 3

wall type 3



Model Summary

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	1,141,001	kBtu
Total Building Area	18,213	ft^2
EUI (Based on Net Site Energy and Total Building Area)	62.65	kBtu/ft^2
OpenStudio Standards Building Type		

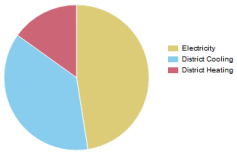
Weather Summary

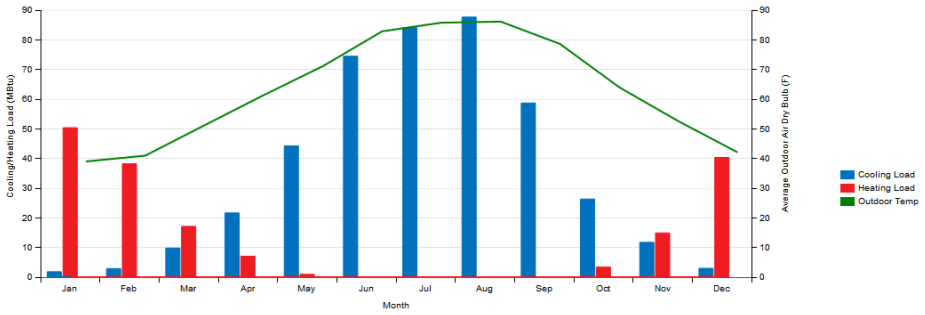
	Value
Weather File	Tehran Mehrabad - IRN ITMY WMO#=407540
Latitude	35.41
Longitude	51.19
Elevation	3904 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Considering the fact that the location is city of Tehran, the simulation ran on the first type of the wall which its characteristics is available above.
- The pie chart below reveals that more than half of the energy is used in form of Electricity, about 15 percent in Heating and about 35 percent in Cooling.

Energy Use - view table

Fuel	Consumption (kBtu)
Electricity	542,057
Natural Gas	0
Additional Fuel	0
District Cooling	426,404
District Heating	172,541





Monthly Load Profiles - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	39.0	41.0	51.2	61.3	71.1	82.9	85.8	86.1	78.6	64.0	52.5	42.1
Cooling Load (MBtu)	1.84	2.89	9.8	21.66	44.24	74.47	84.07	87.67	58.7	26.33	11.74	2.99
Heating Load (MBtu)	50.39	38.24	17.12	7.07	0.97	0.0	0.01	0.0	0.06	3.4	14.91	40.36

Concluding from these charts and tables, specially Building Summary, it is obvious that the annual energy consumption is 338,1917.

The bar chart shows January and December have the highest heating load. Also August and July have the lowest cooling load respectively.

Zone Overview

Zone Summary

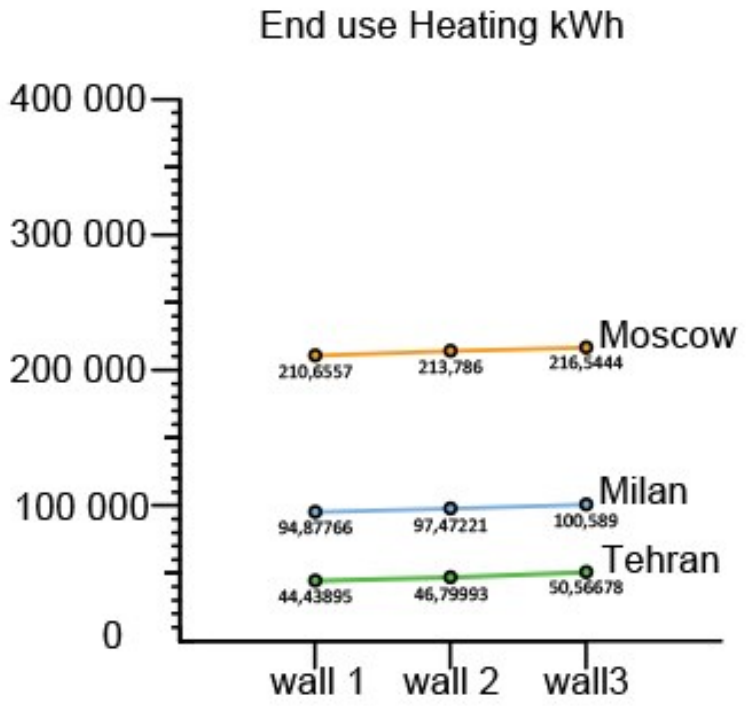
	Area (ft^2)	Conditioned (Y/N)	Part of Total Floor Area (Y/N)	Volume (ft^3)	Multiplier	Gross Wall Area (ft^2)	Window Glass Area (ft^2)	Lighting (W/ft^2)	People (ft^2/person)	Plug and Process (W/ft^2)
THERMAL ZONE 1	4004.17	Yes	Yes	58125.12	1.00	3346.5	367.48	0.72	0.0	0.0
THERMAL ZONE 2	904.17	Yes	Yes	9041.61	1.00	459.3	183.74	1.17	100.0	0.07
THERMAL ZONE 3	4004.17	Yes	Yes	49083.5	1.00	2887.1	367.48	1.17	100.0	0.07
THERMAL ZONE 4	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	1.08	20.02	4.46
THERMAL ZONE 5	3100.01	Yes	Yes	30999.92	1.00	1968.5	787.38	0.99	190.52	0.71
THERMAL ZONE 6	3100.01	Yes	Yes	62000.2	1.00	3937.01	1574.76	0.99	199.99	1.56
Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Conditioned Total	18212.54			240250.63		14566.91	4068.22	0.99	77.18	1.16
Unconditioned Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0
Not Part of Total	0.0			0.0		0.0	0.0	0.0	0.0	0.0

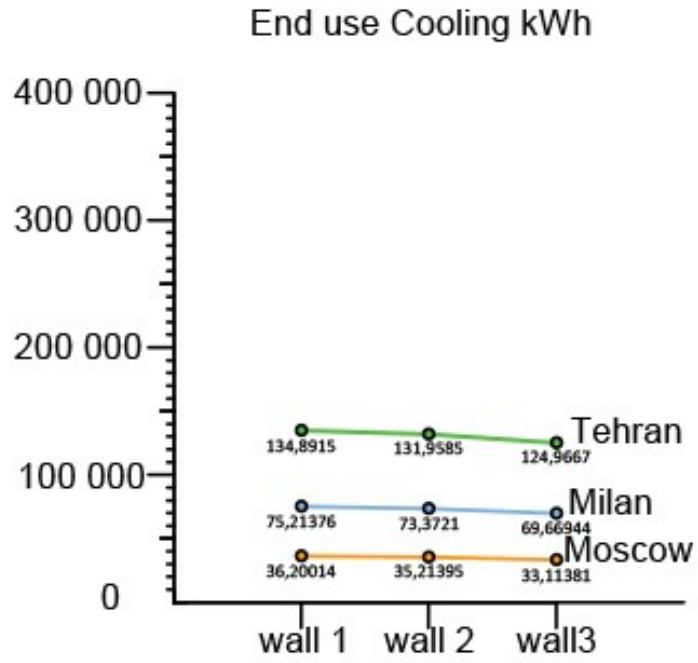
Zone Sensible Cooling and Heating Sensible Sizing

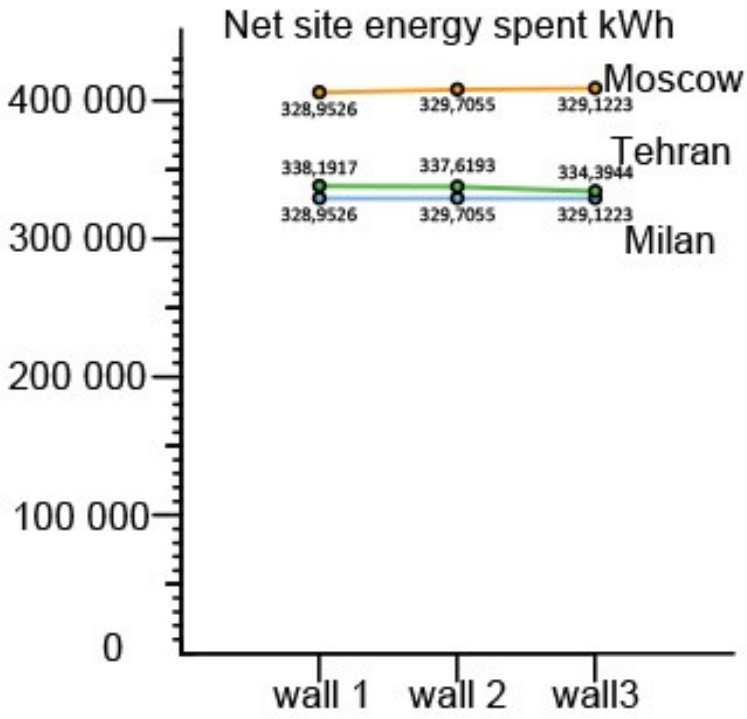
	Heating/Cooling	Calculated Design Load	Design Load With Sizing Factor	Calculated Design Air Flow (ft^3/min)	Design Air Flow With Sizing Factor (ft^3/min)	Date/Time Of Peak	Outdoor Temperature at Peak Load (F)	Outdoor Humidity Ratio at Peak Load (lbWater/lbAir)
THERMAL ZONE 2	Cooling	0.76 ton	0.87 ton	529.72	610.24	7/21 14:45:00	101.3	0.01
THERMAL ZONE 2	Heating	13.21 kBtu/hr	16.51 kBtu/hr	404.71	506.41	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 3	Cooling	3.45 ton	3.97 ton	2415.52	2777.85	7/21 15:00:00	101.3	0.01
THERMAL ZONE 3	Heating	64.3 kBtu/hr	80.38 kBtu/hr	1974.8	2466.38	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 4	Cooling	13.62 ton	15.66 ton	9534.96	10965.2	7/21 15:15:00	101.01	0.01
THERMAL ZONE 4	Heating	58.98 kBtu/hr	73.72 kBtu/hr	1809.52	2324.41	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 5	Cooling	4.69 ton	5.39 ton	3280.03	3771.61	7/21 16:15:00	99.77	0.01
THERMAL ZONE 5	Heating	85.15 kBtu/hr	106.43 kBtu/hr	2612.58	3267.31	2/21 06:00:00	-9.58	0.0
THERMAL ZONE 6	Cooling	6.43 ton	7.39 ton	4496.26	5172.19	7/21 15:45:00	100.44	0.01
THERMAL ZONE 6	Heating	154.44 kBtu/hr	193.05 kBtu/hr	4739.93	5924.39	2/21 24:00:00	-9.58	0.0
THERMAL ZONE 1	Cooling	1.27 ton	1.46 ton	889.93	1023.42	7/21 15:15:00	101.01	0.01
THERMAL ZONE 1	Heating	87.57 kBtu/hr	109.47 kBtu/hr	2686.74	3360.54	2/21 24:00:00	-9.58	0.0

Conclusions:

Situation	end use heating kBtu	kWh	end use cooling kBtu	kWh	Interior Lighting kBtu	kWh	Int equip-ment kBtu	kWh	net site energy spent kBtu	kWh
milan wall 1	323.736	94.87766	256.64	75.21376	199.316	58.41375	342.74	100.4472	1122.433	328.9526
milan wall 2	332.589	97.47221	250.356	73.3721	199.316	58.41375	342.74	100.4472	1125.002	329.7055
milan wall 3	343.224	100.589	237.722	69.66944	199.316	58.41375	342.74	100.4472	1123.012	329.1223
moscow wall 1	718.787	210.6557	123.52	36.20014	199.316	58.41375	342.74	100.4472	1384.372	405.7194
moscow wall 2	729.468	213.786	120.155	35.21395	199.316	58.41375	342.74	100.4472	1391.68	407.8611
moscow wall 3	738.88	216.5444	112.989	33.11381	199.316	58.41375	342.74	100.4472	1393.926	408.5194
Tehran wall 1	151.632	44.43895	460.269	134.8915	199.316	58.41375	342.74	100.4472	1153.958	338.1917
Tehran wall 2	159.688	46.79993	450.261	131.9585	199.316	58.41375	342.74	100.4472	1152.005	337.6193
Tehran wall 3	172.541	50.56678	426.404	124.9667	199.316	58.41375	342.74	100.4472	1141.001	334.3944







Final Assessment:

After 3*3 comparison in which the first variation is the location and the second variation is wall characteristics.

- In terms of used energy for heating generally wall No.1 has the best resilience. Then wall No.2 and 3 respectively. Also in the matter of effect of climate, Moscow has the highest heating demand and Tehran the lowest one.

- In terms of used energy for cooling generally wall No.3 has the best resilience. Then wall No.2 and 1 respectively. Also in the matter of effect of climate, Moscow has the lowest cooling demand and Tehran the highest one.

- In terms of Net site energy generally wall No.2 has the best resilience. Also in the matter of effect of climate, Moscow, then Tehran, and at last Milan are in order.