

TECHNICAL ENVIRONMENTAL SYSTEM

FINAL REPORT

DURMUS DILAN-ENUYSAL BASAK-KURTOGLU EYLEM

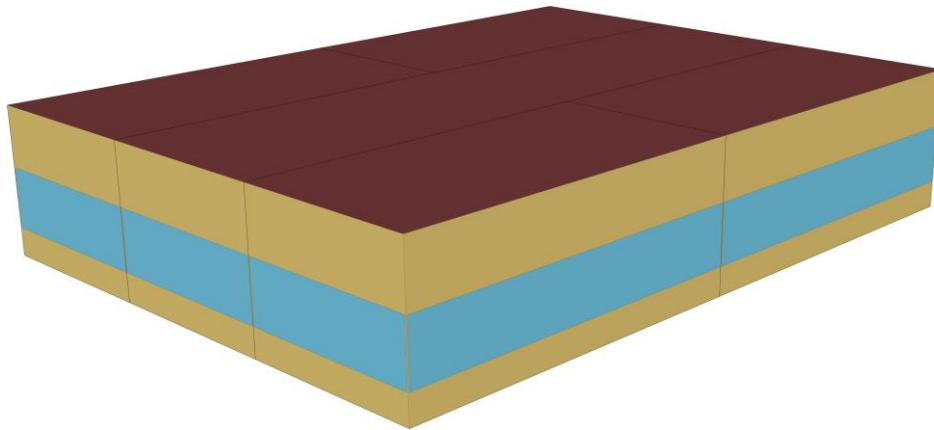


POLITECNICO DI MILANO
2017-2018 WINTER

INTRODUCTION

This paper explains the differentiation of results of the same building according to the different locations in different climate zones. First step is to create the building according to the sketch-up model. After the model the details and climate zone of the building is defined with the software of Open Studio. As a result of this work how the same wall thickness changes according to the three different cities which are Piacenza, Moscow and Bogota.

THE BUILDING



The designed building has one story height and it functions as an office. It has one entrance lobby and four offices which each office has a dimension of 5x10m. According to model, Energy Plus is used to identify what is changing by different locations. After claiming the main results of the building's materials software is put on use to see clearly what factors are changing due to Piacenza, Moscow and Bogota.

PIACENZA

In Piacenza it is also experimented that 3 different types of wall thickness for the compression of the insulation in the same weather condition.

1.PIACENZA-NORMAL INSULATION

BUILDING SUMMARY

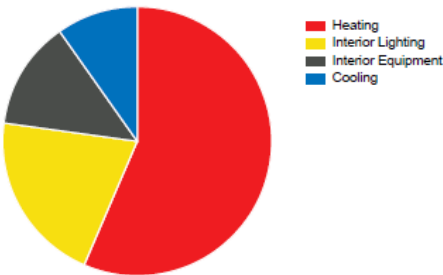
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Building Name	Building 1	building_name
Net Site Energy	180,152	kBtu
Total Building Area	3,229	ft^2
EUI (Based on Net Site Energy and Total Building Area)	55.79	kBtu/ft^2
OpenStudio Standards Building Type		

WEATHER SUMMARY

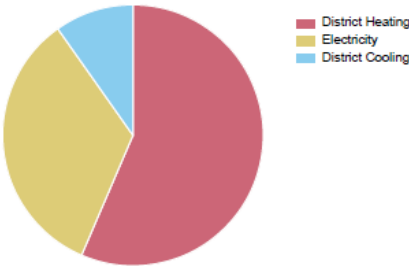
	Value
Weather File	Piacenza - ITA IGDG WMO#≈160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

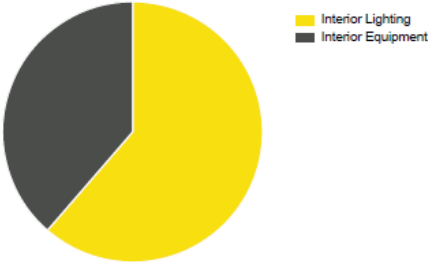
End Use - view table



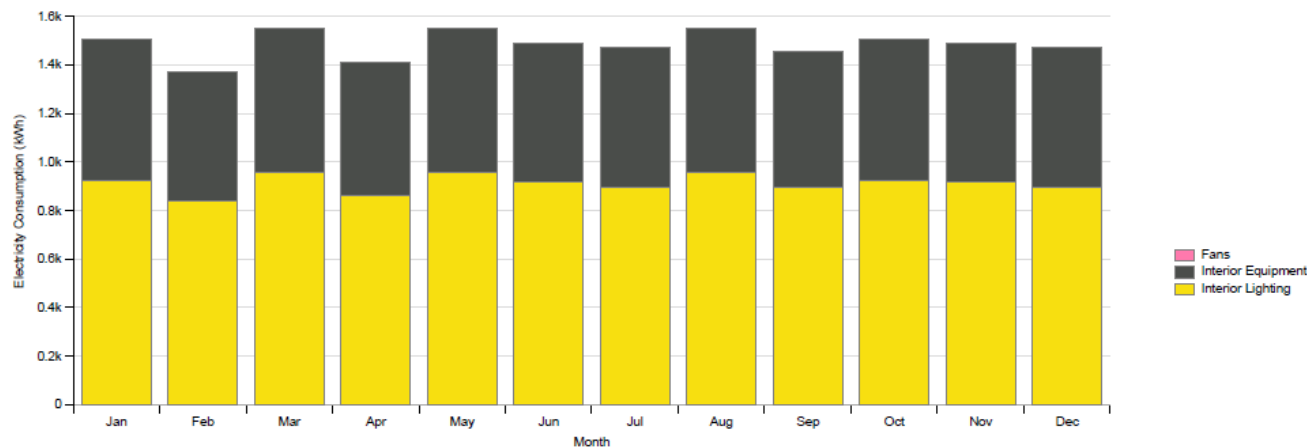
Energy Use - view table



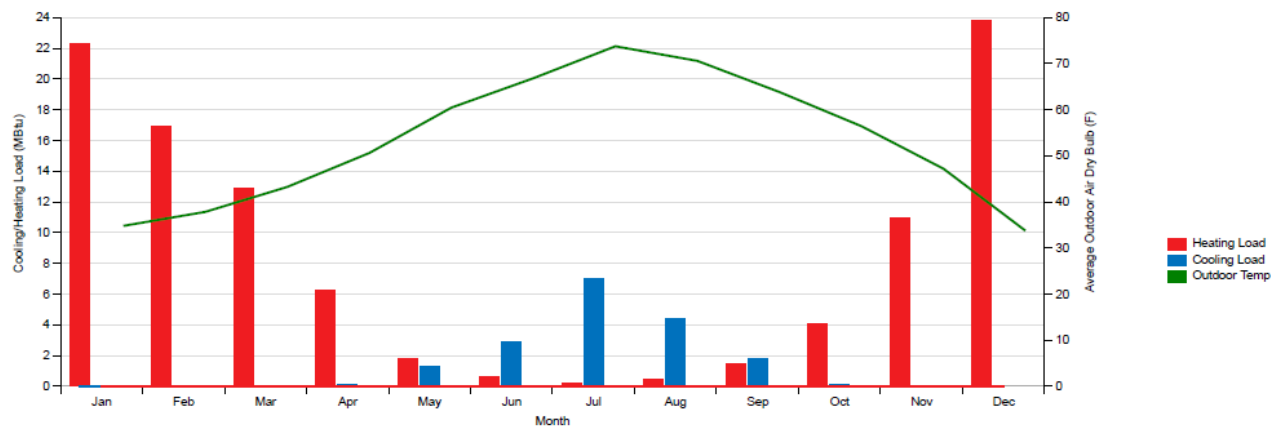
EUI - Electricity - view table



ELECTRICITY CONSUMPTION



HVAC LOAD PROFILES



INTERIOR LIGHTING SUMMARY

	Zone	Lighting Power Density (W/ft^2)	Total Power (W)	Schedule Name	Scheduled Hours/Week (hr)	Actual Load Hours/Week (hr)	Return Air Fraction	Annual Consumption (kWh)
THERMAL ZONE 1 189.1-2009 - OFFICE - CLOSED OFFICE - CZ1-3 LIGHTS	THERMAL ZONE 1	0.99	2131.25	OFFICE BLDG LIGHT	61.85	61.85	0.0000	6875.0
THERMAL ZONE 2 189.1-2009 - OFFICE - LOBBY - CZ1-3 LIGHTS	THERMAL ZONE 2	1.17	1259.38	OFFICE BLDG LIGHT	61.85	61.85	0.0000	4061.11

2.PIACENZA-LOW INSULATION

BUILDING SUMMARY

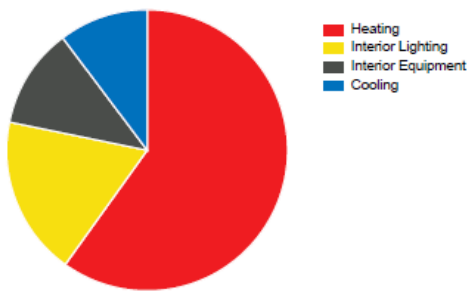
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Building Name	Building 1	building_name
Net Site Energy	203,838	kBtu
Total Building Area	3,229	ft^2
EUI (Based on Net Site Energy and Total Building Area)	63.12	kBtu/ft^2
OpenStudio Standards Building Type		

WEATHER SUMMARY

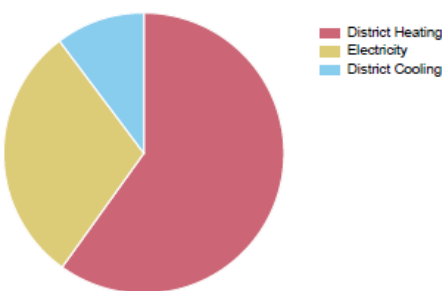
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Weather File	Piacenza - ITA IGDG WMO#=160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

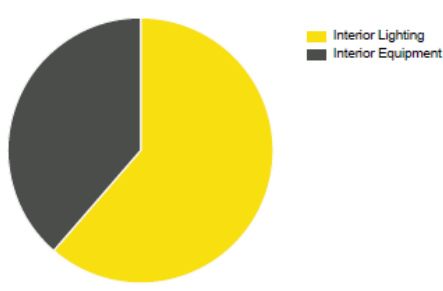
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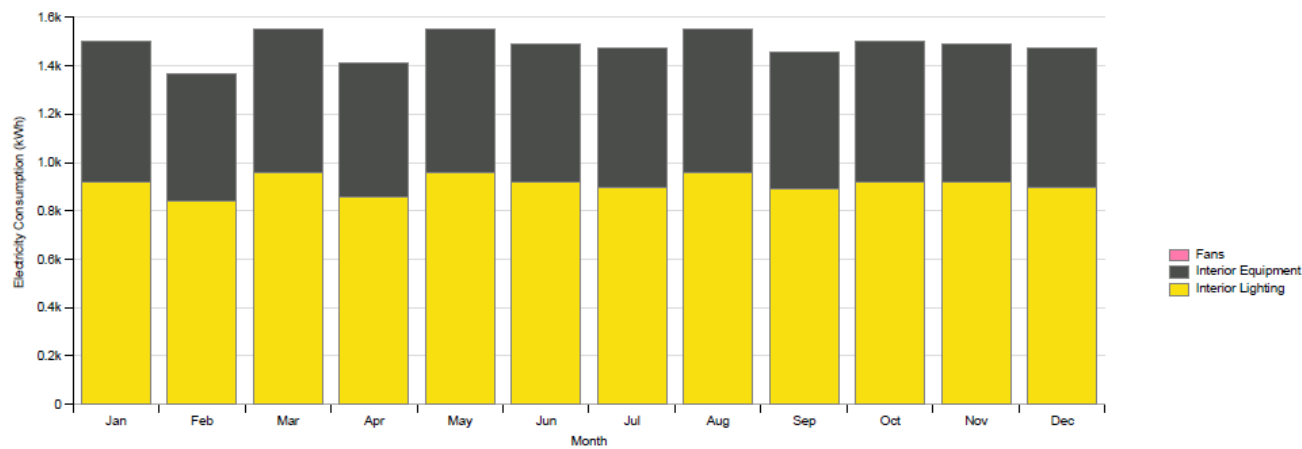
Energy Use - view table



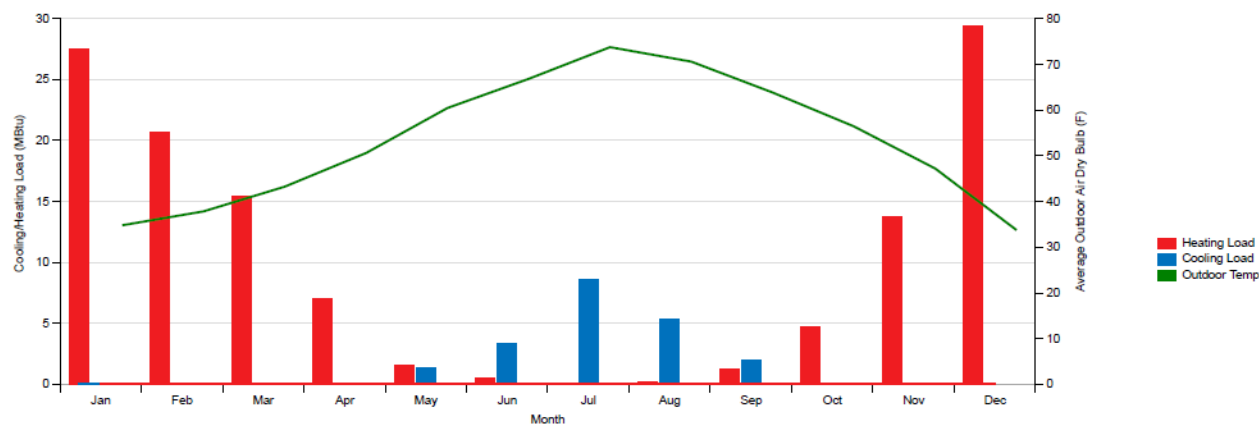
EUI - Electricity - view table



ELECTIRICITY CONSUMPTION



HVAC LOAD PROFILES



INTERIOR LIGHTING SUMMARY

	Zone	Lighting Power Density (W/ft^2)	Total Power (W)	Schedule Name	Scheduled Hours/Week (hr)	Actual Load Hours/Week (hr)	Return Air Fraction	Annual Consumption (kWh)
THERMAL ZONE 1 189.1-2009 - OFFICE - CLOSED OFFICE - CZ1-3 LIGHTS	THERMAL ZONE 1	0.99	2131.25	OFFICE BLDG LIGHT	61.85	61.85	0.0000	6875.0
THERMAL ZONE 2 189.1-2009 - OFFICE - LOBBY - CZ1-3 LIGHTS	THERMAL ZONE 2	1.17	1259.38	OFFICE BLDG LIGHT	61.85	61.85	0.0000	4061.11

3.PIACENZA-HIGH INSULATION

BUILDING SUMMARY

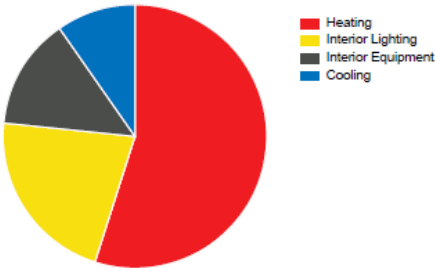
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	171,811	kBtu
Total Building Area	3,229	ft^2
EUI (Based on Net Site Energy and Total Building Area)	53.21	kBtu/ft^2
OpenStudio Standards Building Type		

WEATHER SUMMARY

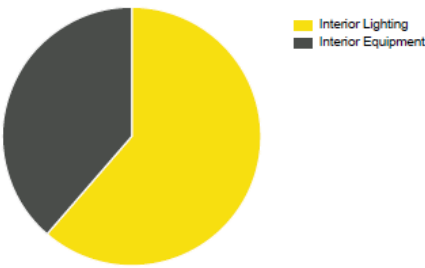
	Value
Weather File	Piacenza - ITA IGDG WMO#=160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

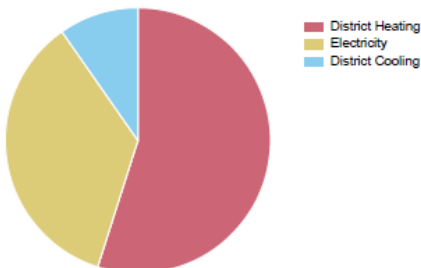
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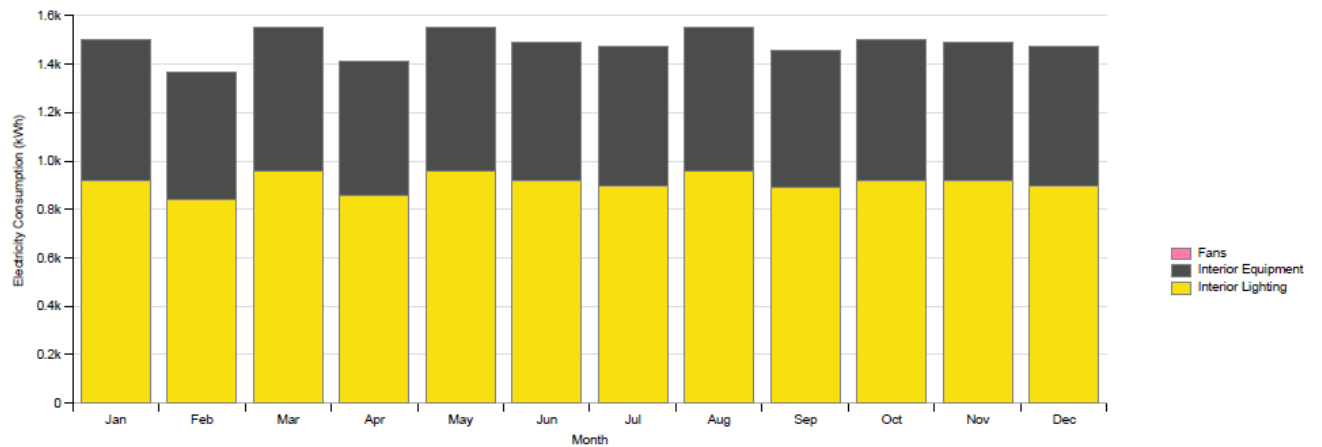
EUI - Electricity - view table



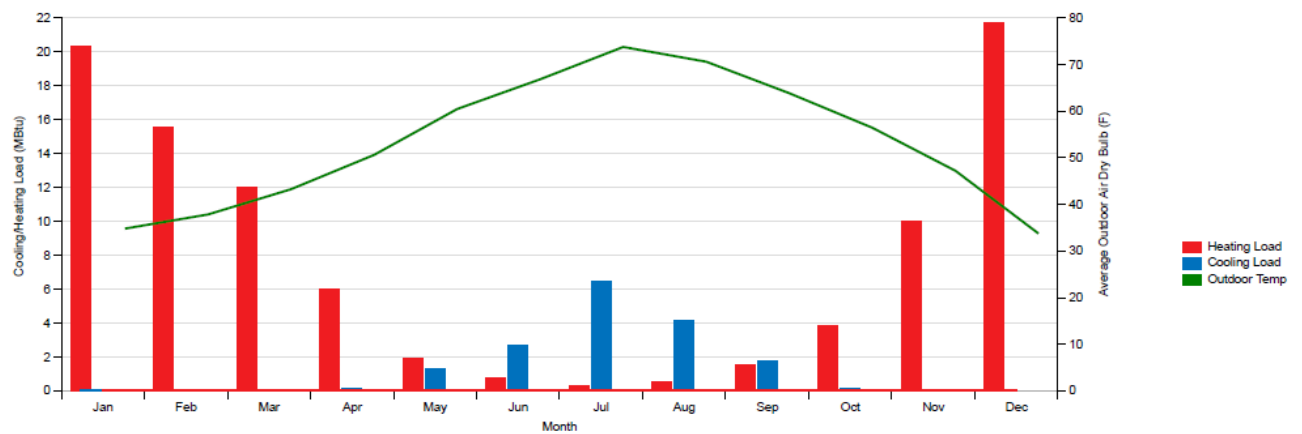
Energy Use - view table



ELECTRICITY CONSUMPTION



HVAC LOAD PROFILES



INTERIOR LIGHTING SUMMARY

	Zone	Lighting Power Density (W/ft^2)	Total Power (W)	Schedule Name	Scheduled Hours/Week (hr)	Actual Load Hours/Week (hr)	Return Air Fraction	Annual Consumption (kWh)
THERMAL ZONE 1 189.1-2009 - OFFICE - CLOSED OFFICE - CZ1-3 LIGHTS	THERMAL ZONE 1	0.99	2131.25	OFFICE BLDG LIGHT	61.85	61.85	0.0000	6875.0
THERMAL ZONE 2 189.1-2009 - OFFICE - LOBBY - CZ1-3 LIGHTS	THERMAL ZONE 2	1.17	1259.38	OFFICE BLDG LIGHT	61.85	61.85	0.0000	4061.11

BOGOTA

BUILDING SUMMARY

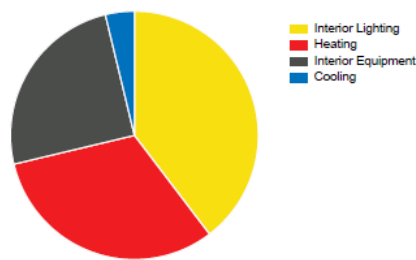
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	94,147	kBtu
Total Building Area	3,229	ft^2
EUI (Based on Net Site Energy and Total Building Area)	29.16	kBtu/ft^2
OpenStudio Standards Building Type		

WEATHER SUMMARY

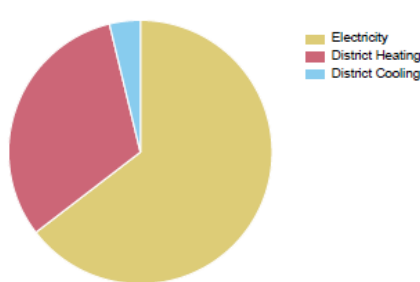
	Value
Weather File	BOGOTA - COL IWECDATA WMO#=-802220
Latitude	4.70
Longitude	-74.1
Elevation	8360 (ft)
Time Zone	-5.0
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

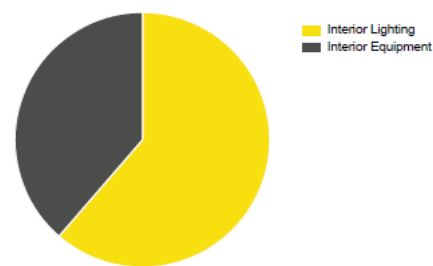
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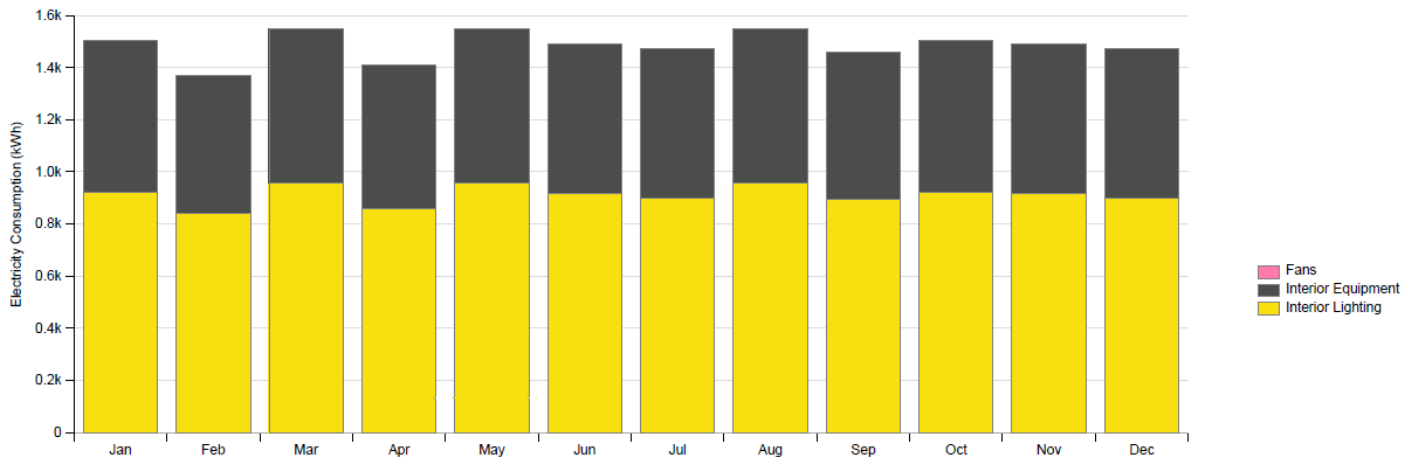
Energy Use - view table



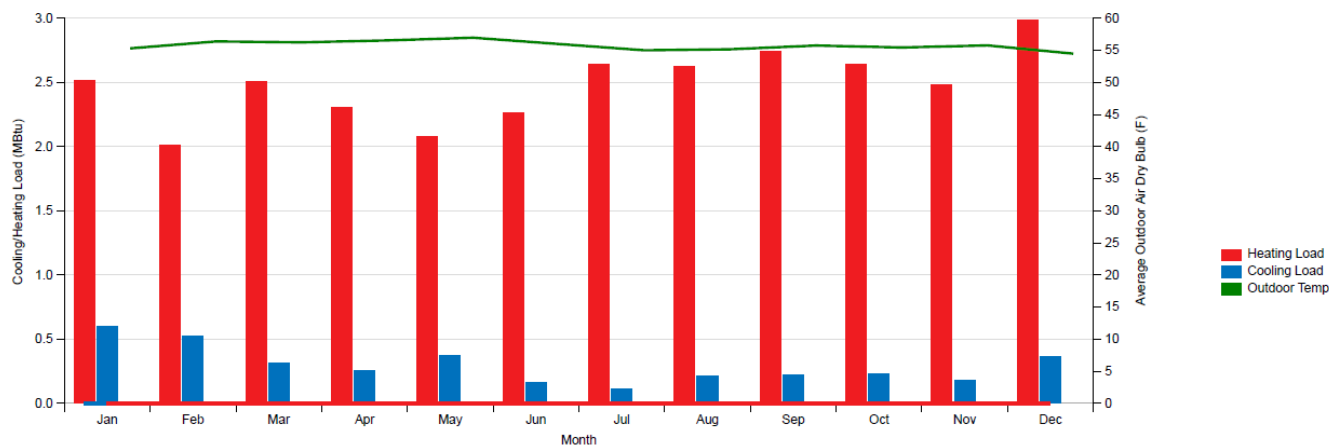
EUI - Electricity - view table



ELECTRICITY CONSUMPTION



HVAC LOAD PROFILES



INTERIOR LIGHTING SUMMARY

	Zone	Lighting Power Density (W/ft^2)	Total Power (W)	Schedule Name	Scheduled Hours/Week (hr)	Actual Load Hours/Week (hr)	Return Air Fraction	Annual Consumption (kWh)
THERMAL ZONE 1 189.1-2009 - OFFICE - CLOSED OFFICE - CZ1-3 LIGHTS	THERMAL ZONE 1	0.99	2131.25	OFFICE BLDG LIGHT	61.85	61.85	0.0000	6875.0
THERMAL ZONE 2 189.1-2009 - OFFICE - LOBBY - CZ1-3 LIGHTS	THERMAL ZONE 2	1.17	1259.38	OFFICE BLDG LIGHT	61.85	61.85	0.0000	4061.11

MOSCOW

BUILDING SUMMARY

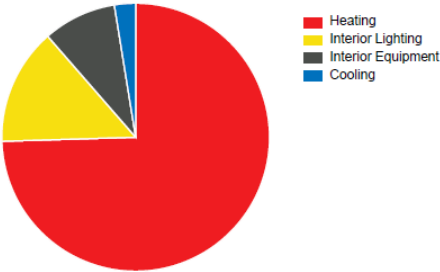
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	265,218	kBtu
Total Building Area	3,229	ft^2
EUI (Based on Net Site Energy and Total Building Area)	82.13	kBtu/ft^2
OpenStudio Standards Building Type		

WEATHER SUMMARY

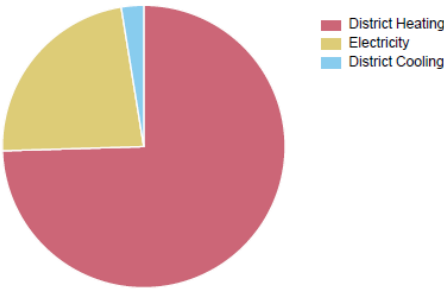
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Weather File	MOSCOW - RUS IVEC Data WMO#=276120
Latitude	55.75
Longitude	37.63
Elevation	512 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

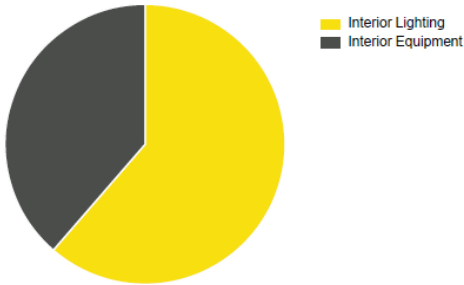
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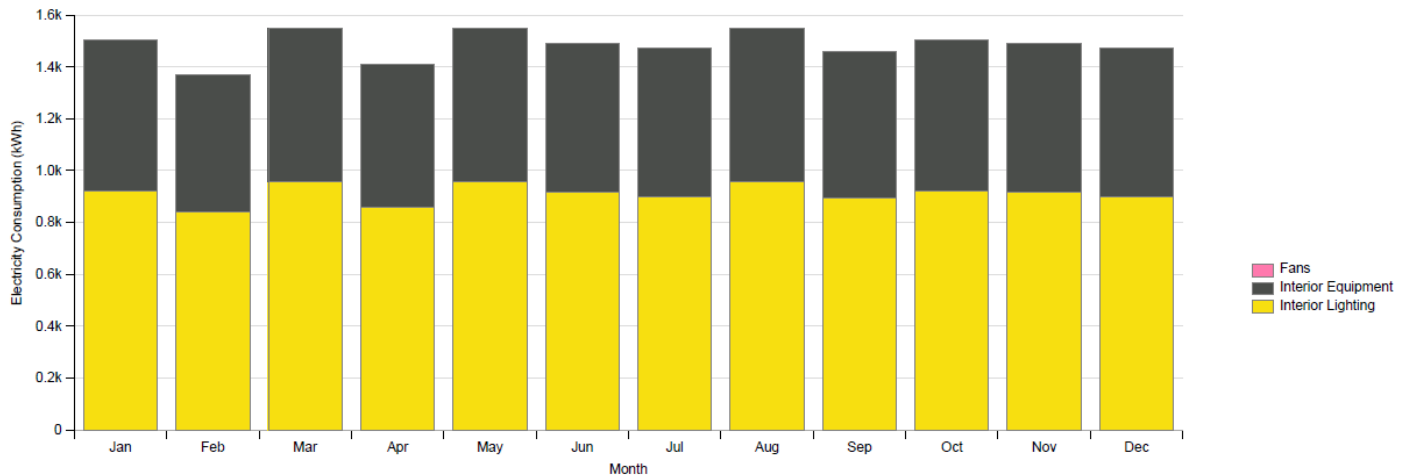
Energy Use - view table



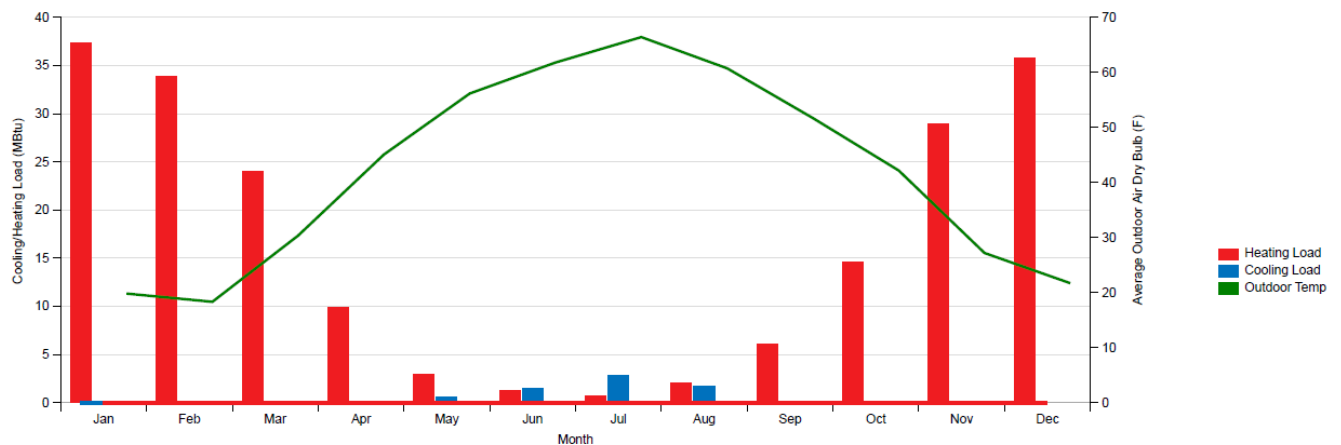
EUI - Electricity - view table



ELECTIRICITY CONSUMPTION



HCAV LOAD PROFILES



INTERIOR LIGHTING SUMMARY

	Zone	Lighting Power Density (W/ft^2)	Total Power (W)	Schedule Name	Scheduled Hours/Week (hr)	Actual Load Hours/Week (hr)	Return Air Fraction	Annual Consumption (kWh)
THERMAL ZONE 1 189.1-2009 - OFFICE - CLOSED OFFICE - CZ1-3 LIGHTS	THERMAL ZONE 1	0.99	2131.25	OFFICE BLDG LIGHT	61.85	61.85	0.0000	6875.0
THERMAL ZONE 2 189.1-2009 - OFFICE - LOBBY - CZ1-3 LIGHTS	THERMAL ZONE 2	1.17	1259.38	OFFICE BLDG LIGHT	61.85	61.85	0.0000	4061.11

CONCLUSION

As a result, the focus was on the how different climate zones can changes building's energy requirements since a building in different climate zones require different kinds of materials. To understand the differences between these cities, in which respect the results changes is defined. In the end, climatic data summary, shading summary, input fields and sensible heat gain summary differentiates from each other. The climate zone is taken into account to built more efficient building and increase energy efficiency of the building can decrease the consumption drastically with the detailed analysis of the energy consumption. After analyzing the data from the report, varies are summed up according to different climate zones. Since consideration of three different climate zones the project varied according to environmental conditions like humidity, daily temperature range (for shading), wind speed (for both insulation of the building and for the heat gain of the building). Since the energy consumption of the building varies according to heat gain and heat loss through the window, heat addition and heat removal from infiltration, those varies in the reports named Sensible Heat Gain Summary and Shading Summary has been summed up.