SIMULATION OF BUILDING ENERGY PERFORMANCE VIA OPEN STUDIO

TECHNICAL ENVIRONMENTAL SYSTEM

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INTRODUCTION

OBJECTIVE

The objective of the experiment is to analyze the energy performance of a building in different conditions.
The experiment is performed by calculating the energy consumption in different locations and material and then comparing the result to determine the important factors in energy performance.

In this report, it has decided to consider the energy consuption of office building. The area of the building is 1200m^2 with 4 floors mainly consisting of open office in the center part of the building. In addition, sunshades have been the North elevation, in order to increase the sustainability.

It has been decided to locate the building in three different city in this report, Piacenza, Moscow, Shanghai,in order to have different comparison and results, in terms of energy consuption

In addition, it has been decided to change the construction of external walls, in order to en-hance the possibility of sustainability and at the end make a comparison between the three different walls in each different city.

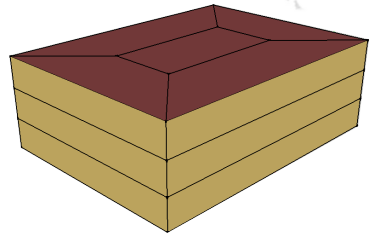
BUILDING

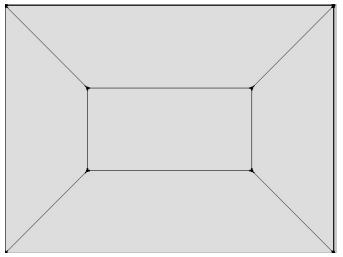
Building type: office

Area: 1200 m^2

Height: 12m

Number of floors: 4



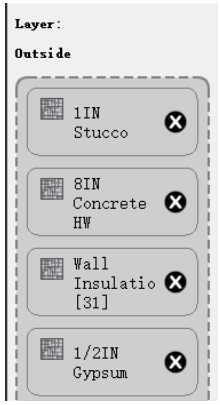


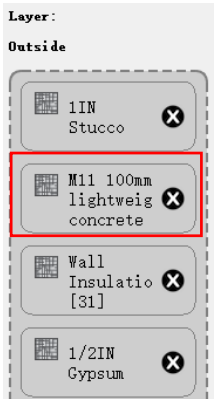
EXPERIMENTAL RESULT

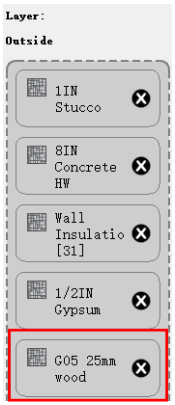
PERFOMENCE OF 3 DIFFERENT MATERIALS IN SAME CITY——PIACENZA

RESULT | 3 Different Materials in Piacenza

From the chart we can know that the data are most look like similar. From the fan chart. The electricity use are all more than 50%, the third type wall are using most electricity.
From the bar chart, cooling Consumptions are all the most in July. And it is the most that cooling consumption happens with the third type wall.







Building Summary — Original wall

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	418,727	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	38.90	kBtu/ft^2
OpenStudio Standards Building Type		

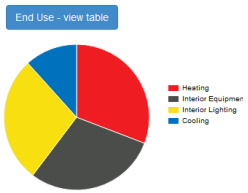
Building Summary — With 100mm concrete

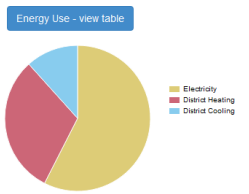
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	420,480	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	39.06	kBtu/ft^2
OpenStudio Standards Building Type		

Building Summary — Adding G05 25mm wood

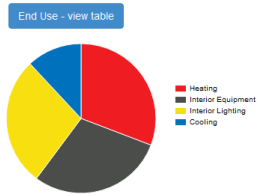
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	409,940	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	38.08	kBtu/ft^2
OpenStudio Standards Building Type		

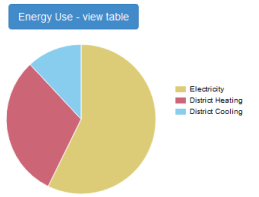
Original wall



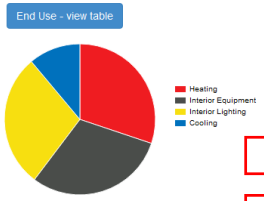


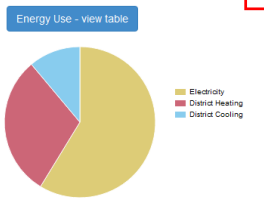
With 100mm concrete



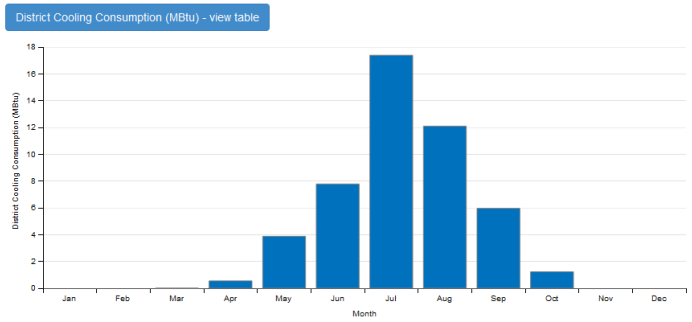


Adding G05 25mm wood

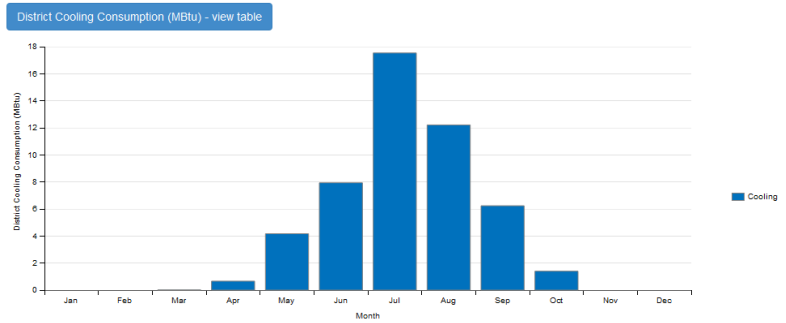




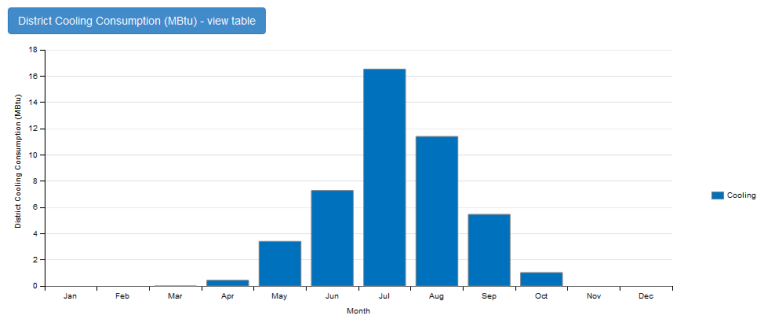
Original wall



With 100mm concrete

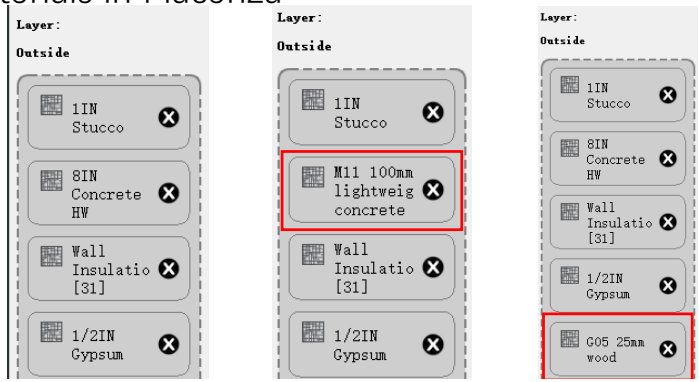


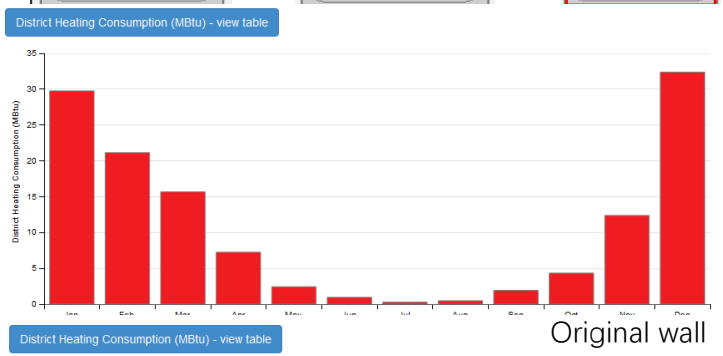
Adding G05 25mm wood

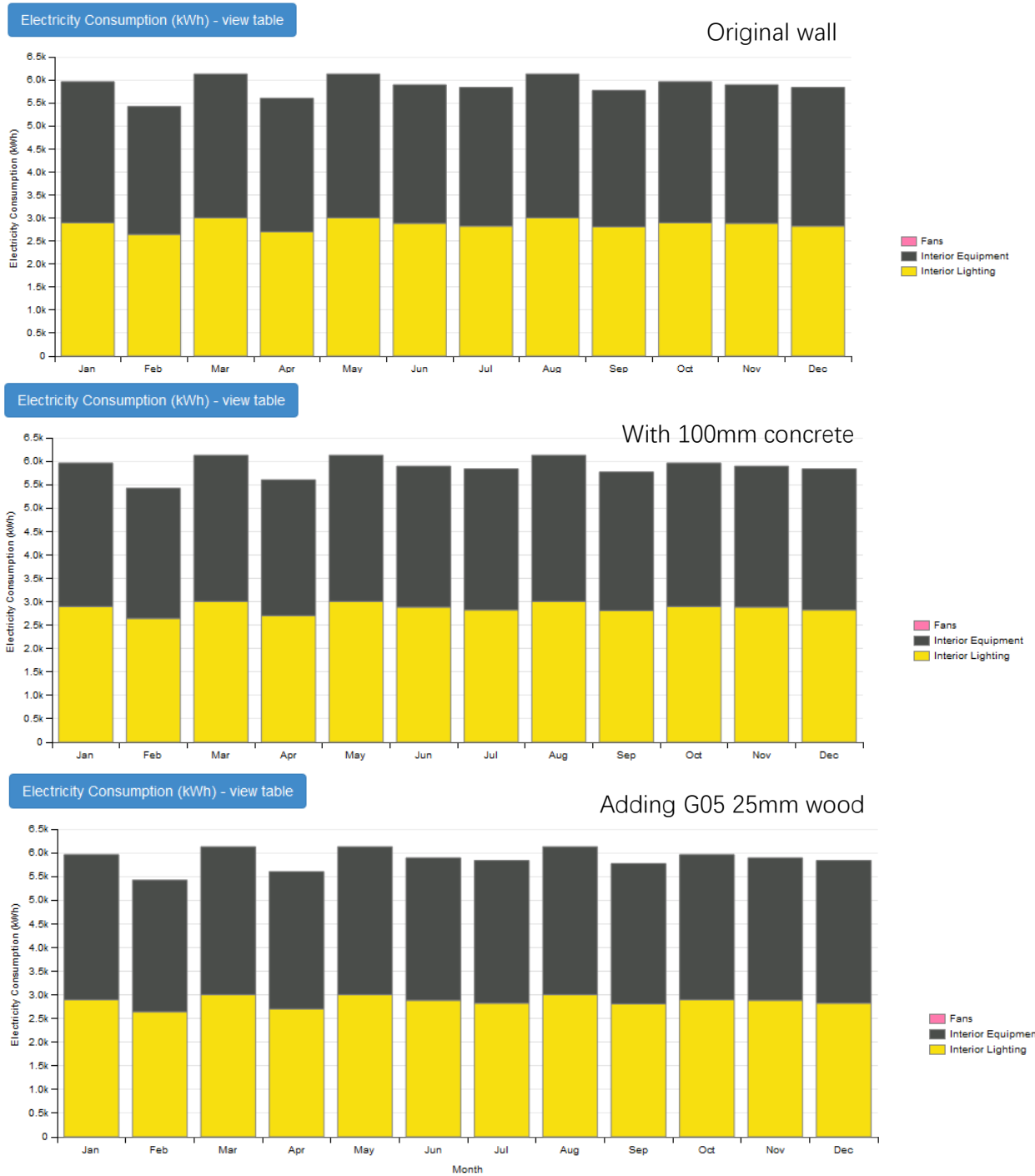


RESULT | 3 Different Materials in Piacenza

From the chart we can know that the data are most look like similar. From the bar chart. The heating consumption are the most in December in a year. And heating consumption happens the most with the third type wall.

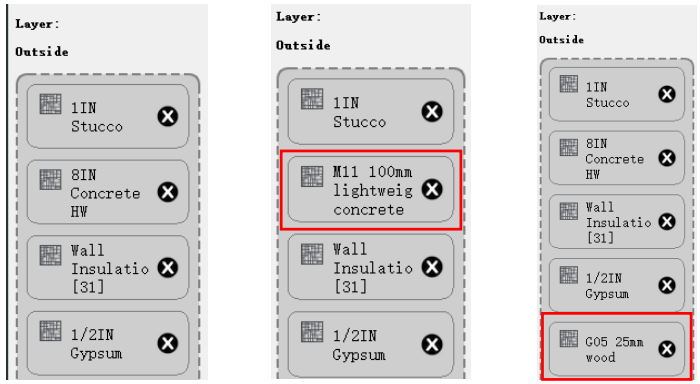


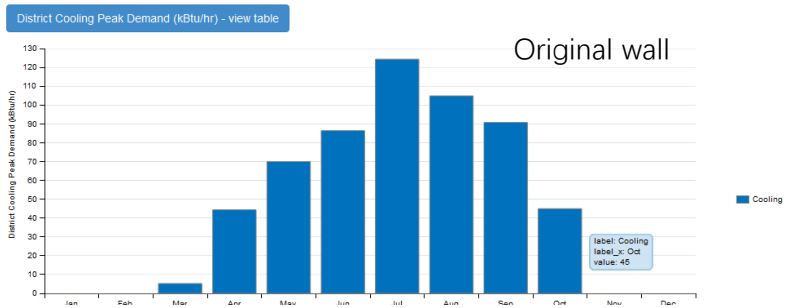


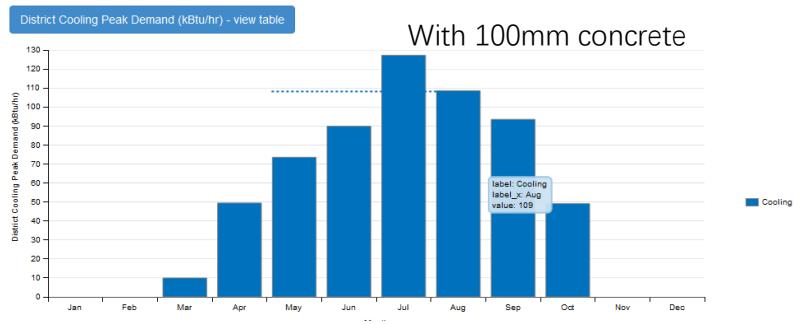


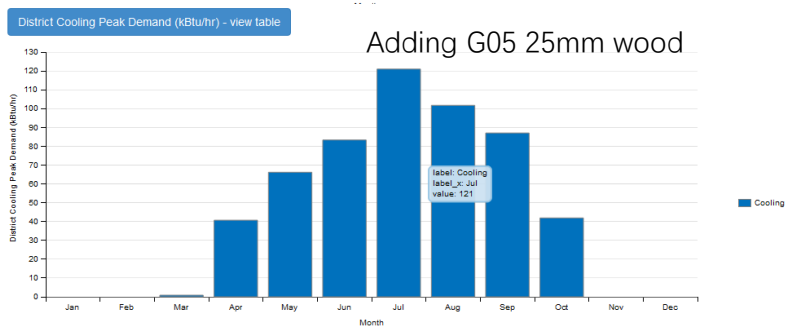
RESULT | 3 Different Materials in Piacenza

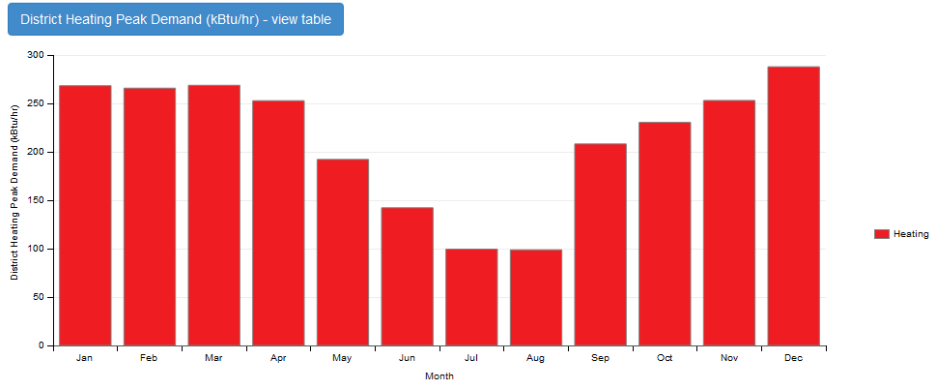
From the chart we can know that the data are most look like similar. From the bar chart. The cooling peak demands are the most in July, and it happens the most with the second type wall.
For the heating peak demand, it is the most lower in July and August, and it happens the most lower with the third type wall.



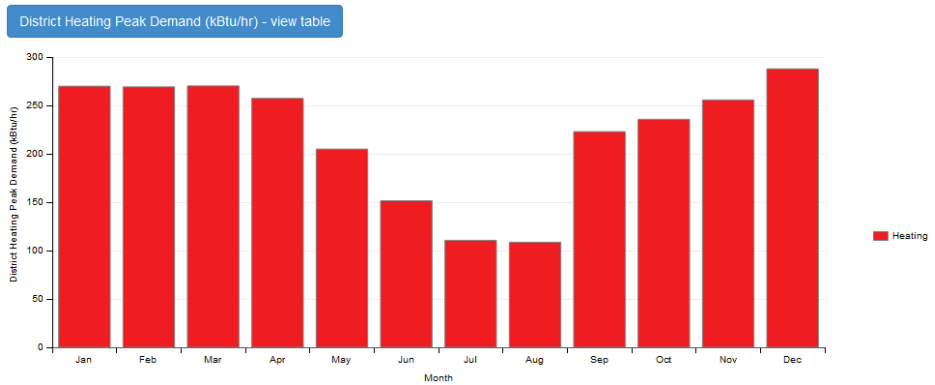




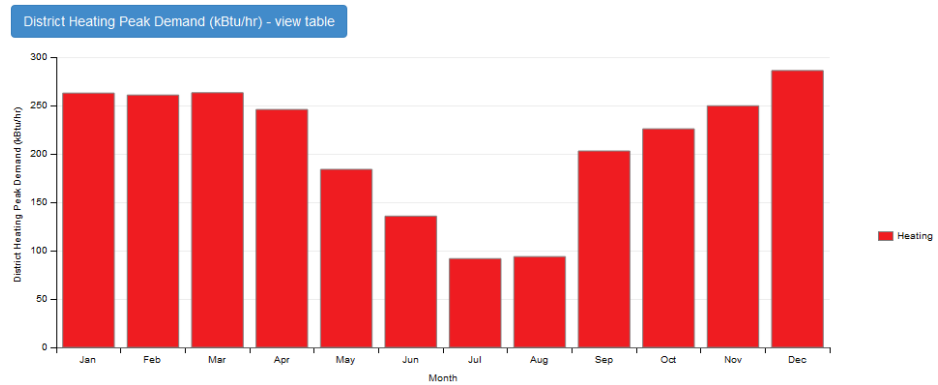




Original wall



With 100mm concrete



Adding G05 25mm wood

EXPERIMENTAL RESULT

PERFOMENCE OF THE SAME WALL IN 3 DIFFERENT CITIES

RESULT | solid concrete with steel frame ext walls in 3 cities

DATA SUMMARY

Building Summary PIACENZA

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	420,480	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	39.06	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	

Building Summary MOSCOW

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	554,160	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	51.48	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	

Building Summary SHANGHAI

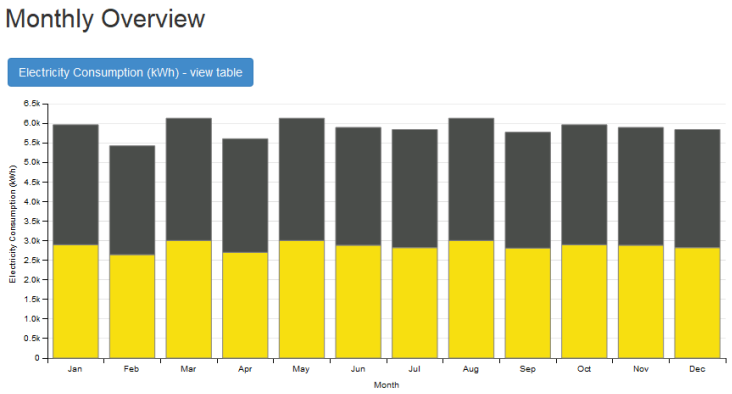
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	418,727	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	38.90	kBtu/ft^2
OpenStudio Standards Building Type		

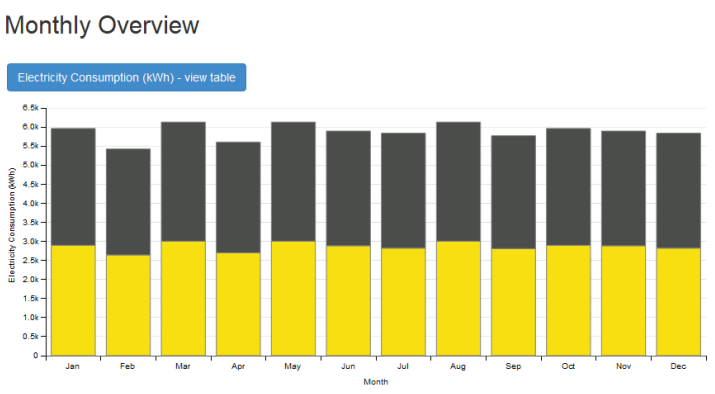
Weather Summary

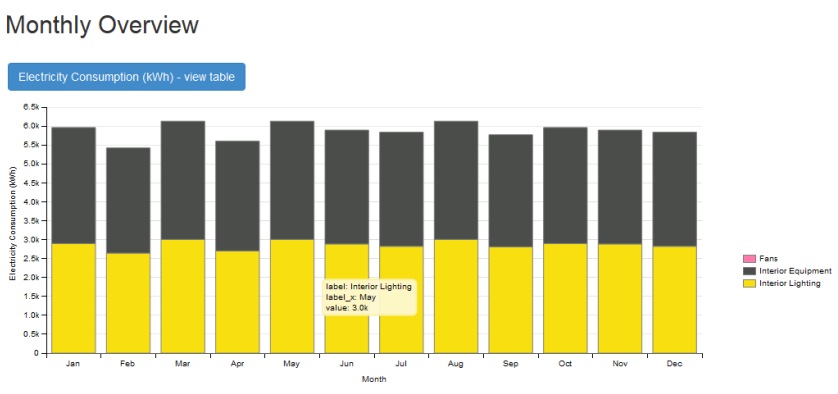
	Value
Weather File	Piacenza - ITA IGDG WMO#=160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

RESULT | solid concrete with steel frame ext walls in 3 cities

DATA SUMMARY





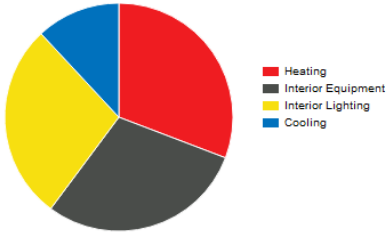


RESULT | solid concrete with steel frame ext walls in 3 cities

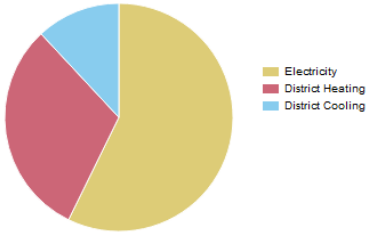
DATA SUMMARY

Annual Overview

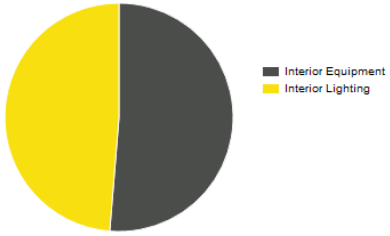
End Use - view table



Energy Use - view table

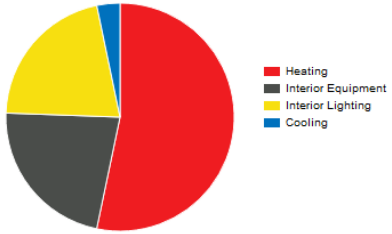


EUI - Electricity - view table

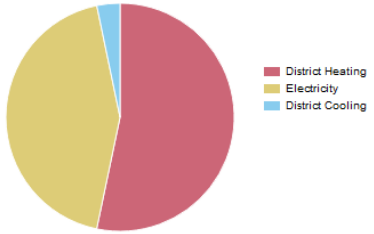


Annual Overview

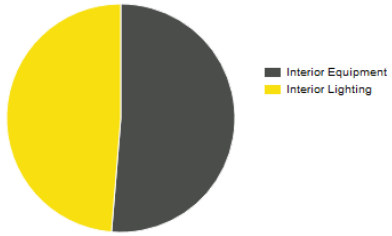
End Use - view table



Energy Use - view table

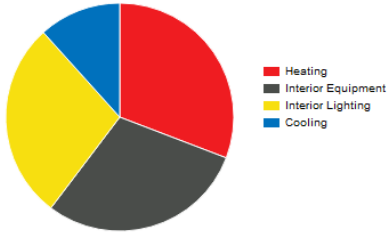


EUI - Electricity - view table

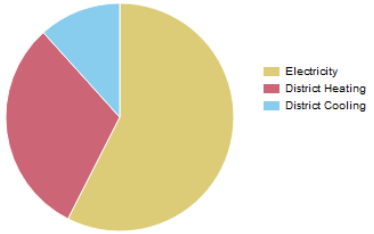


Annual Overview

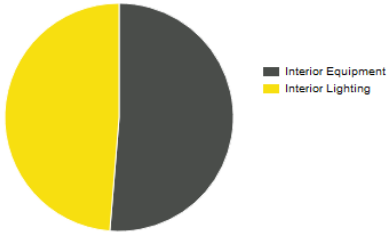
End Use - view table



Energy Use - view table

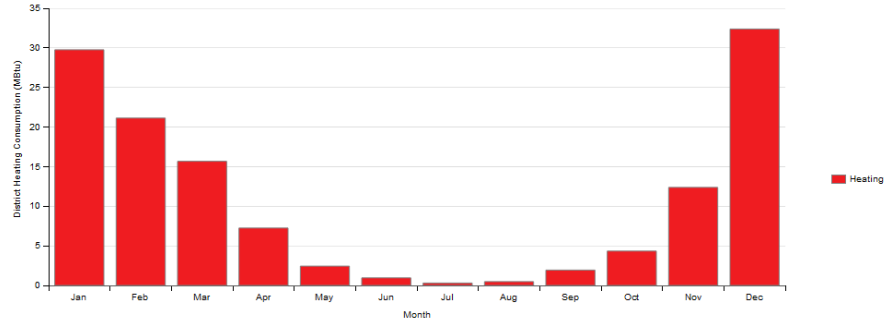


EUI - Electricity - view table

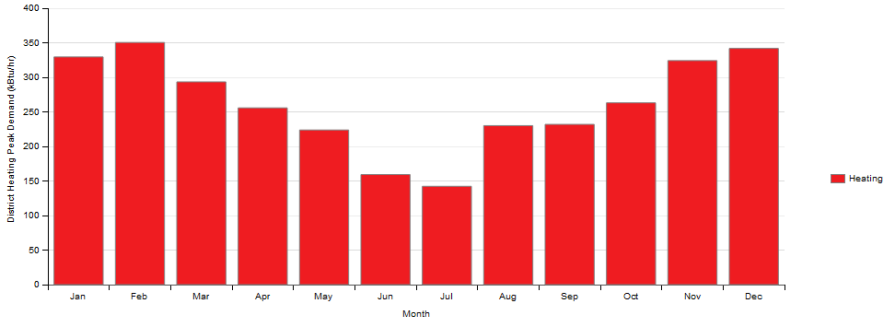


RESULT | Same Wall in 3 Different Cities

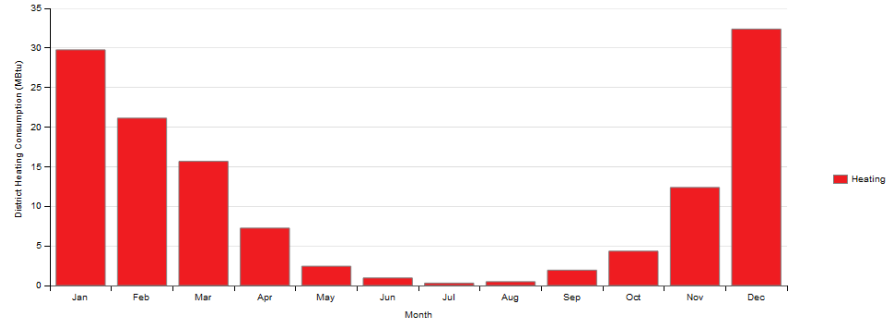
District Heating Consumption (MBtu) - view table



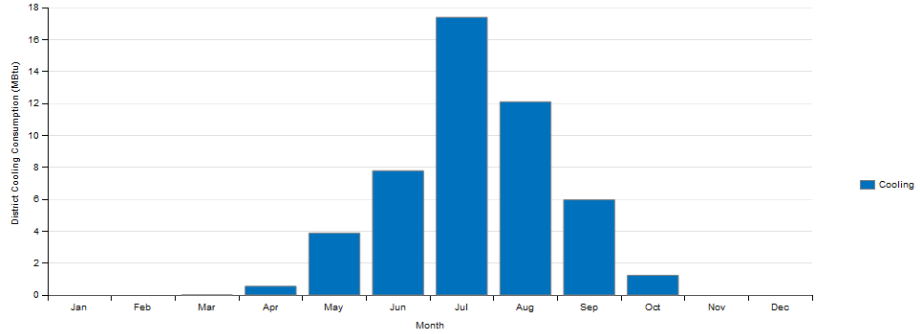
District Heating Peak Demand (kBtu/hr) - view table



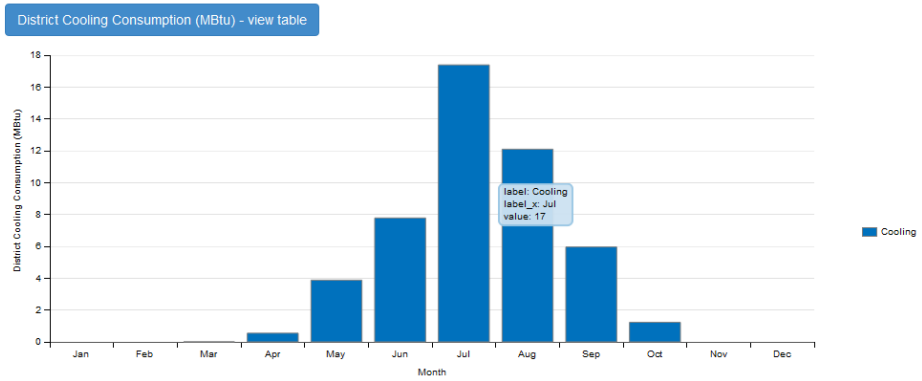
District Heating Consumption (MBtu) - view table



District Cooling Consumption (MBtu) - view table



District Cooling Consumption (MBtu) - view table



District Cooling Peak Demand (kBtu/hr) - view table