BUILDING ANALYSIS

TECHNICAL ENVIRONMENTAL SYSTEM

SUBMITTED BY

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BUILDING ANALYSIS INTRODUCTION

This report focuses on the Building Analysis by **calculating the energy performance of a selected built form using 'Open Studio' software**. The building chosen is an **Office building** with a set of rooms like Conference Room, Break Room, Lobby, Pantry etc. The office has a glass windows all along the 4 facades. 3 sides of the building have an overhang as a shading device. This building has been placed in 3 different cities of the world – **Almeria, Spain** : **New Delhi, India** : **Milan, Italy**. This model is then analyzed using the software to calculate different parameters such as Cooling and Heating Loads, Energy Use and Site and source Energy.

The second step was to **change the primary materials of the building** and calculate the Energy Performance of the same built form in one of the above mentioned cities. The city of comparison was chosen as Milan, Italy. The alterations accommodated in the building design are further mentioned in the report.

Once the recalculations of the Energy performance were done, it was compared to the parameters that were Cooling and Heating Loads, Energy Use and Site and Source Energy. The results were examined and conclusion was made.

BUILDING SUMMARY

1. ALMERIA - SPAIN

INFORMATION	VALUE	UNITS
Building Name	Office Building – Almeria	
Net Site Energy	1,636,776	kBtu
Total Building Area	38,750	ft^2
EUI (Based on Net Site Energy and Total Building Area)	42.24	kBtu/ft^2

2. NEW DELHI – INDIA

INFORMATION	VALUE	UNITS
Building Name	Office Building – New Delhi	
Net Site Energy	2,332,786	kBtu
Total Building Area	38,750	ft^2
EUI (Based on Net Site Energy and Total Building Area)	60.2	kBtu/ft^2

3. MILAN – ITALY

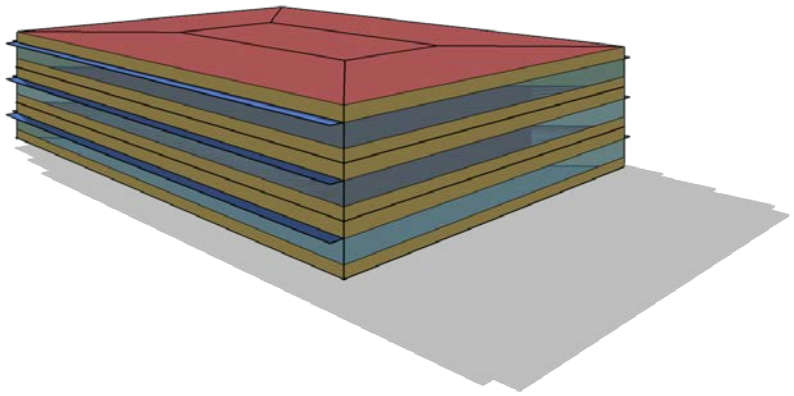
INFORMATION	VALUE	UNITS
Building Name	Office Building – Mian	
Net Site Energy	1,482,310	kBtu
Total Building Area	38,750	ft^2
EUI (Based on Net Site Energy and Total Building Area)	38.25	kBtu/ft^2

DEFAULT MATERIAL

EXTERIOR WALLS – ASHRAE EXTERIOR WALLS

EXTERIOR SLAB – 4 INCH SLAB WITH CARPET

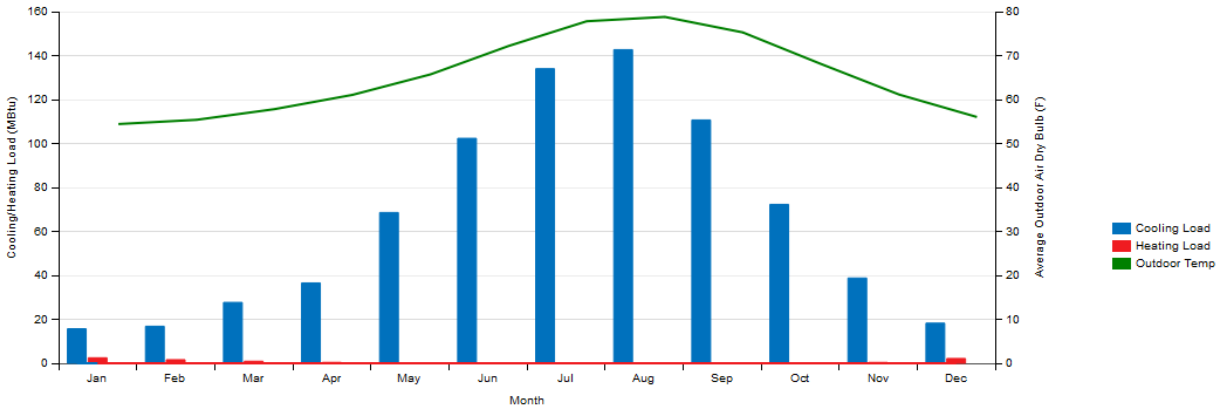
ROOF – AHRAE EXTERIOR ROOF



COOLING/HEATING LOADS

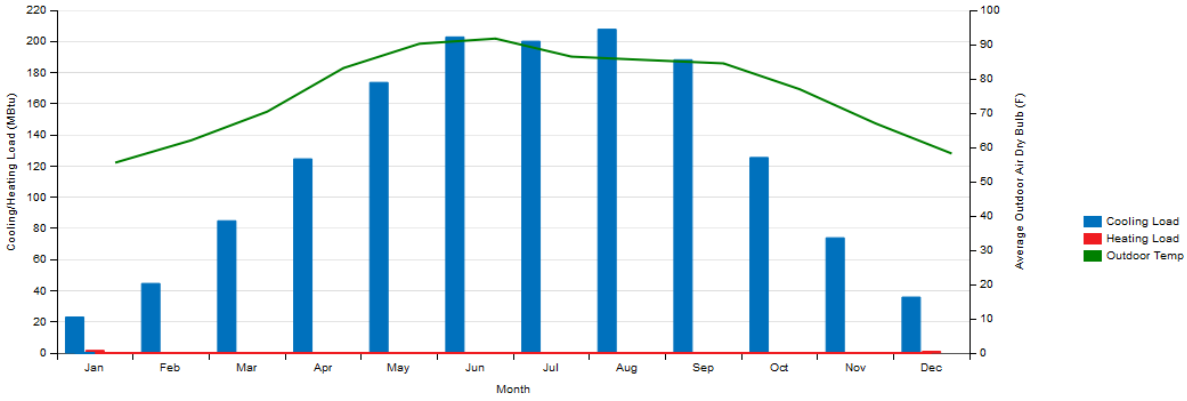
1. ALMERIA - SPAIN

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	54.4	55.4	57.8	61.1	65.7	72.2	77.8	78.8	75.3	68.1	61.1	56
Cooling Load (MBtu)	15.7	16.84	27.69	36.56	68.6	102.35	.34.03	142.72	110.72	72.29	38.79	18.25
Heating Load (MBtu)	2.5	1.61	0.92	0.41	0.09	0	0	0	0	0.03	0.4	2.16



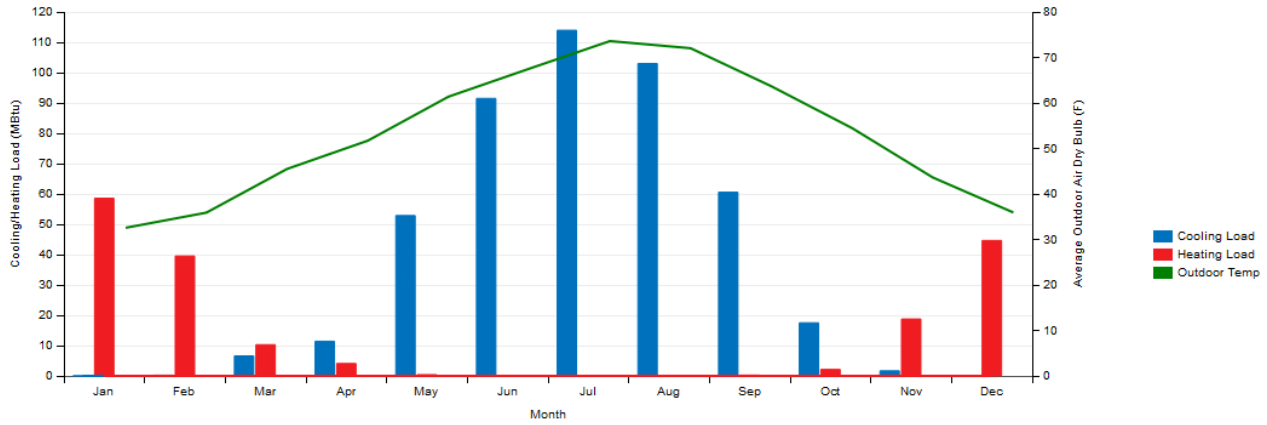
2. NEW DELHI – INDIA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Outdoor Air Dry Bulb (F)	55.5	62.1	70.4	83.1	90.2	91.7	86.5	85.5	84.5	77	67	58.2
Cooling Load (MBtu)	23.1	44.65	84.89	124.6	173.67	202.88	200.12	207.82	188.24	125.5	73.95	35.89
Heating Load (MBtu)	1.69	0.36	0.09	0	0	0	0	0	0	0	0.1	1.1



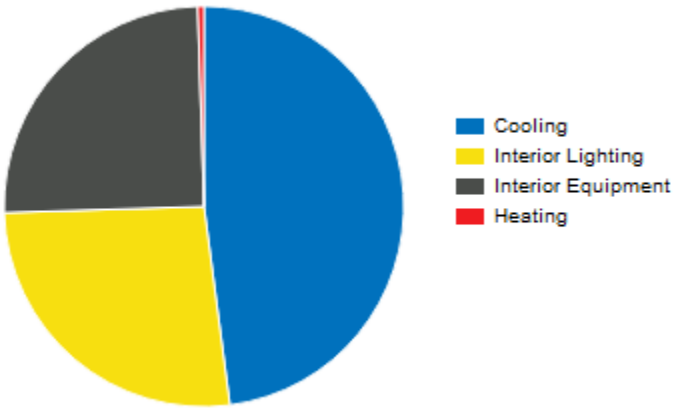
2. MILAN – ITALY

	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	63.7	54.5	43.6	35.9
Cooling Load (MBtu)	0.02	0.24	6.6	11.43	52.87	91.5	113.96	103	60.57	17.51	1.68	0.01
Heating Load (MBtu)	58.57	39.54	10.3	4.09	0.41	0.04	0	0	0.26	2.13	18.77	44.66



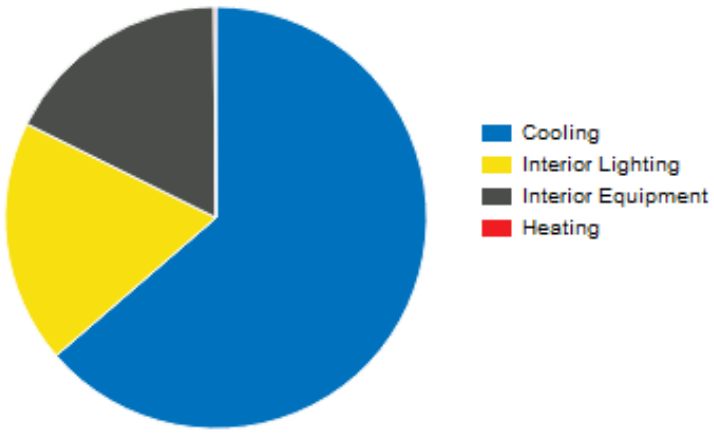
ENERGY USE

1. ALMERIA - SPAIN



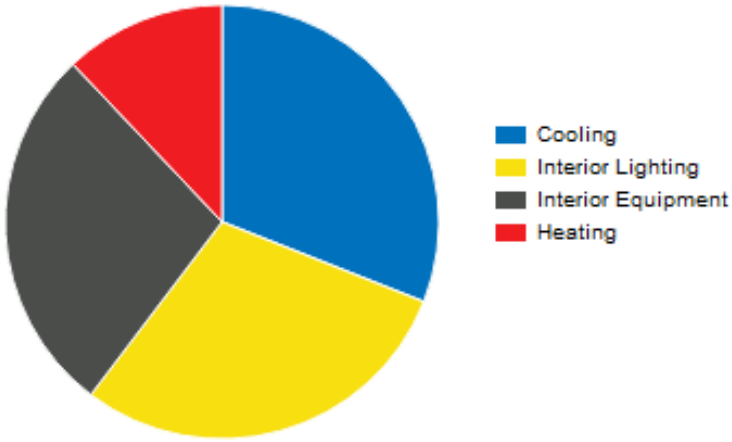
END USE	CONSUMPTION (KBTU)
Heating	8,113
Cooling	784,527
Interior Lighting	434,963
Exterior Lighting	0
Interior Equipment	409,163

2. NEW DELHI - INDIA



END USE	CONSUMPTION (KBTU)
Heating	3,327
Cooling	1,485,324
Interior Lighting	434,963
Exterior Lighting	0
Interior Equipment	409,163

3. MILAN - ITALY



END USE	CONSUMPTION (KBTU)
Heating	178,768
Cooling	459,407
Interior Lighting	434,963
Exterior Lighting	0
Interior Equipment	409,163

SITE AND SOURCE ENERGY

1. ALMERIA - SPAIN

	TOTAL ENERGY (KBTU)	ENERGY PER TOTAL BUILDING AREA (KBTU/FT^2)	ENERGY PER CONDITIONED BUILDING AREA (KBTU/FT^2)
Total Site Energy	1636775.9	42.2	42.2
Net Site Energy	1636775.9	42.2	42.2
Total Source Energy	3530893.7	91.1	91.1
Net Source Energy	3530893.7	91.1	91.1

2. NEW DELHI – INDIA

	TOTAL ENERGY (KBTU)	ENERGY PER TOTAL BUILDING AREA (KBTU/FT^2)	ENERGY PER CONDITIONED BUILDING AREA (KBTU/FT^2)
Total Site Energy	2332786.4	60.2	60.2
Net Site Energy	2332786.4	60.2	60.2
Total Source Energy	4253414.5	109.8	109.8
Net Source Energy	4253414.5	109.8	109.8

3. MILAN – ITALY

	TOTAL ENERGY (KBTU)	ENERGY PER TOTAL BUILDING AREA (KBTU/FT^2)	ENERGY PER CONDITIONED BUILDING AREA (KBTU/FT^2)
Total Site Energy	1482310.2	38.3	38.3
Net Site Energy	1482310.2	38.3	38.3
Total Source Energy	3804310.5	98.2	98.2
Net Source Energy	3804310.5	98.2	98.2

RECALCULATING THE ENERGY PERFORMANCE BY CHANGING THE BUILDING MATERIAL FOR

MILAN – ITALY

EXTERIOR WALLS – AIR WALLS

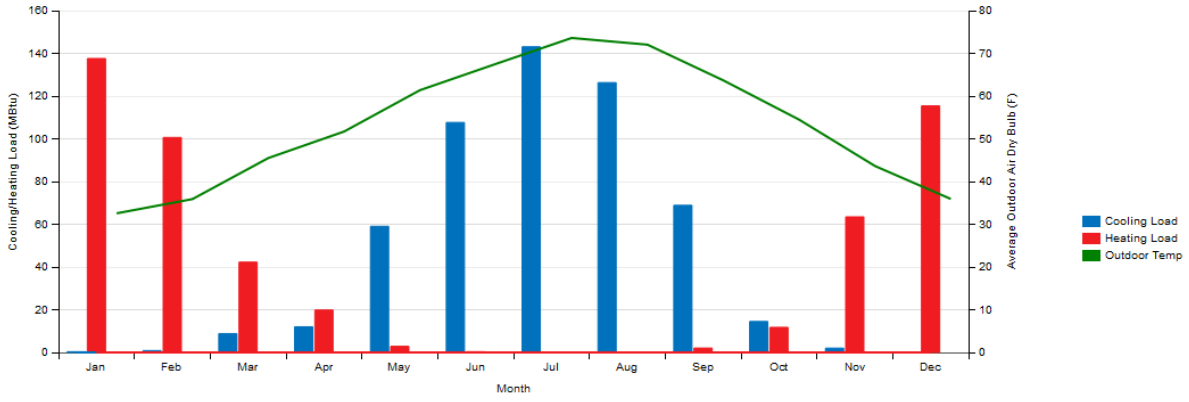
EXTERIOR SLAB – 8 INCH SLAB WITHOUT CARPET

ROOF – AHRAE EXTERIOR ROOF

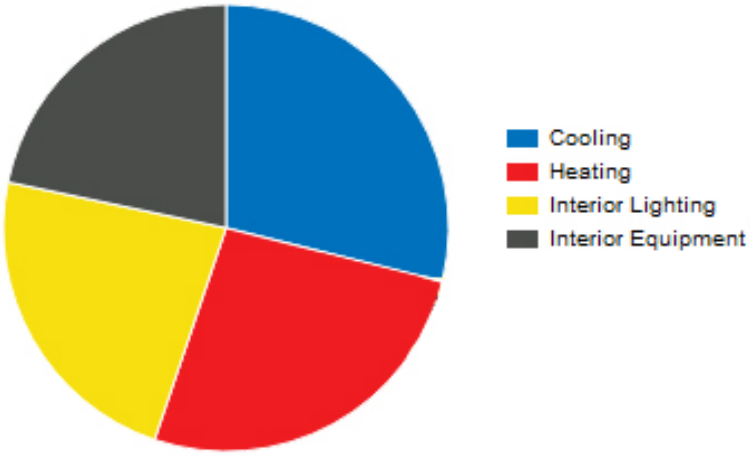
INFORMATION	VALUE	UNITS
Building Name	Office Building – Mian – New Material	
Net Site Energy	1,482,310	kBtu
Total Building Area	38,750	ft^2
EUI (Based on Net Site Energy and Total Building Area)	38.25	kBtu/ft^2

COOLING/HEATING LOADS

	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	63.7	54.5	43.6	35.9
Cooling Load (MBtu)	0.35	0.88	8.84	12.03	59.05	107.66	43.07	126.31	68.88	14.5	2.02	0.14
Heating Load (MBtu)	137.59	100.64	42.28	19.86	2.87	0.35	0.02	0.07	2.06	11.75	63.47	115.41



ENERGY USE



END USE	CONSUMPTION (KBTU)
Heating	496,381
Cooling	543,715
Interior Lighting	434,963
Exterior Lighting	0
Interior Equipment	409,163

SITE AND SOURCE ENERGY

	TOTAL ENERGY (KBTU)	ENERGY PER TOTAL BUILDING AREA (KBTU/FT^2)	ENERGY PER CONDITIONED BUILDING AREA (KBTU/FT^2)
Total Site Energy	1884232	48.6	48.6
Net Site Energy	1884232	48.6	48.6
Total Source Energy	5040956.1	130.1	130.1
Net Source Energy	5040956.1	130.1	130.1

CONCLUSION

The foremost aspects that should be kept in mind while analyzing energy performance of a built structure are:

1) Where the building is located
2) What are the functions of the particular building
3) What are the materials used in its construction and their characteristics.

In order to maximize the performance one has to take advantage of the above mentioned aspects.

In this report we have analyzed one built form in 3 different cities around the world with default materials. Furthermore the energy performance of the same built form has also been reviewed with different set of building material in one of the previously analyzed city.

It was recorded that by altering the material, the heating load of the building increases, hence the energy performance of the built structure was reduced by 25%. Hence it can be concluded that the same built form in the same location can require more energy or less energy depending on the building materials used and can be made more comfortable in the interior spaces by altering few aspects of the design construction.