Office Building in India Project-Open Studio

EETBS 2017-2018 POLIMI-PIACENZA

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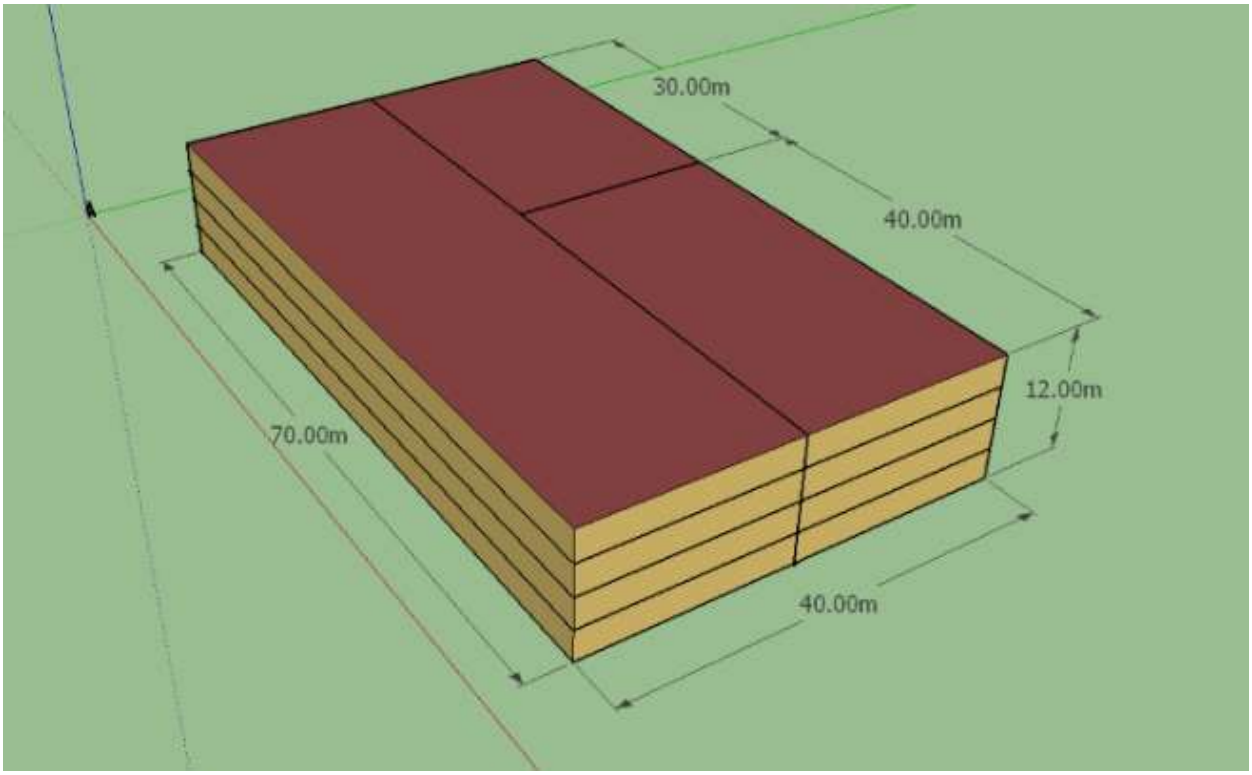
The following Building is being taken and following are the dimensions of the model:-

The building is assumed to be built in India. It's an office type building. Rooms which have been included are Open office space (on every floor), conference room, IT room, Electrical room and break room (on every floor) on every floor.



From the above dimensions the building is built,

We can use info tool to see the properties of each surface, and we can see that the boundary conditions are being automatically assigned. and the surfaces are being matched otherwise there will be windows inside the building.

After the surface Matching, windows and overhangs are being employed into our model and in our model windows have been added to all the directions except south. and no overhangs are taken in north and. We have taken window to wall ratio as 0.4 above the floor.

And then thermal zones are being added to the different spaces so that each of the room has different thermal loads. then the model is being employed into the Open Studio Model.

While We are using Open Studio Model., we can add different weather files and can run the simulation,

The following cities from India are being employed into the open studio model

1.Kolkatta (Base city)

2.Ahmedabad

3.Hyderabad

In the open studio model at first the city weather file which consists of various dry bulb temperatures, irradiance etc. Are taken and then corresponding to that city design day files are also being employed into the model.

After that the simulation is being run and we can obtain the results from the results viewer

The following are the heating and cooling consumption for the above cities.

1.Kolkatta:

	Electricity [GJ]	Natural Gas [GJ]	Additional Fuel [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	0.00	0.00	0.00	0.00	0.58	0.00
Cooling	0.00	0.00	0.00	8515.43	0.00	0.00
Interior Lighting	1484.72	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	3027.74	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	4512.46	0.00	0.00	8515.43	0.58	0.00

Note: District heat appears to be the principal heating source based on energy usage.

2.Ahmedabad:-

	Electricity [GJ]	Natural Gas [GJ]	Additional Fuel [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	0.00	0.00	0.00	0.00	0.57	0.00
Cooling	0.00	0.00	0.00	8168.99	0.00	0.00
Interior Lighting	1484.72	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	3027.74	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	4512.46	0.00	0.00	8168.99	0.57	0.00

Note: District heat appears to be the principal heating source based on energy usage.

3.Hyderabad:-

	Electricity [GJ]	Natural Gas [GJ]	Additional Fuel [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	0.00	0.00	0.00	0.00	0.21	0.00
Cooling	0.00	0.00	0.00	7583.24	0.00	0.00
Interior Lighting	1484.72	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	3027.74	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	4512.46	0.00	0.00	7583.24	0.21	0.00

Note: District heat appears to be the principal heating source based on energy usage.

Modified Wall for Kolkata:-

1.Upon modification of wall characteristics with climate zone 2

End Uses By Subcategory

	Subcategory	Electricity [GJ]	Natural Gas [GJ]	Additional Fuel [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	General	0.00	0.00	0.00	0.00	0.99	0.00
Cooling	General	0.00	0.00	0.00	8586.18	0.00	0.00
Interior Lighting	General	1484.72	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	General	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	General	3027.74	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	General	0.00	0.00	0.00	0.00	0.00	0.00
Fans	Ventilation (simple)	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	General	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	General	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	General	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	General	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	General	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	General	0.00	0.00	0.00	0.00	0.00	0.00
Generators	General	0.00	0.00	0.00	0.00	0.00	0.00

2.Modified Wall 2:-

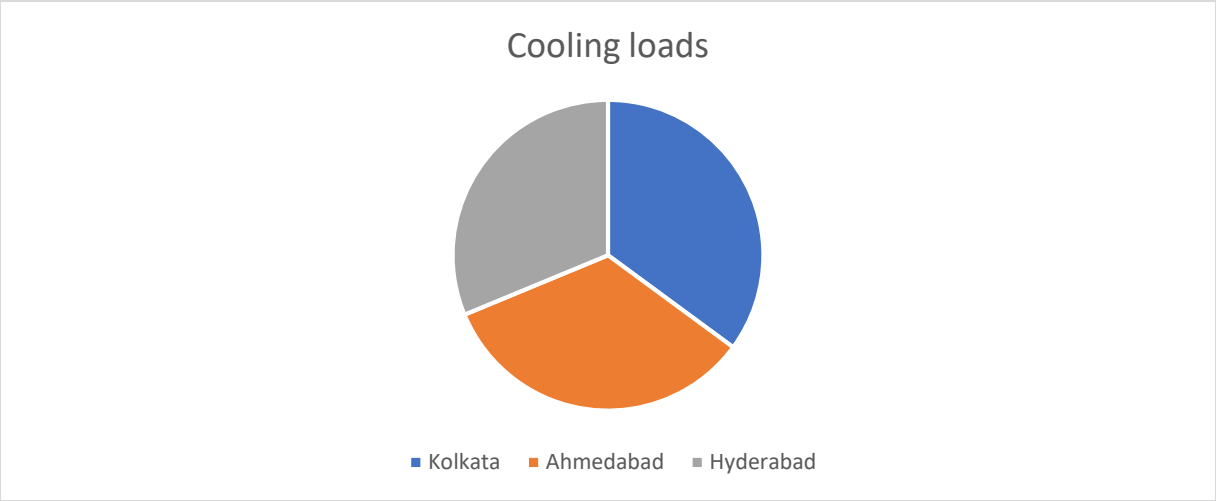
Upon modification of wall with climate zone 3

	Electricity [GJ]	Natural Gas [GJ]	Additional Fuel [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	0.00	0.00	0.00	0.00	1.01	0.00
Cooling	0.00	0.00	0.00	8550.42	0.00	0.00
Interior Lighting	1484.72	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	3027.74	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Fans	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	4512.46	0.00	0.00	8550.42	1.01	0.00

The Following chart shows the cooling loads for different cities: -

1	Kolkata	8515.43 GJ
2	Ahmedabad	8168.99 GJ
3	Hyderabad	7583.24 GJ

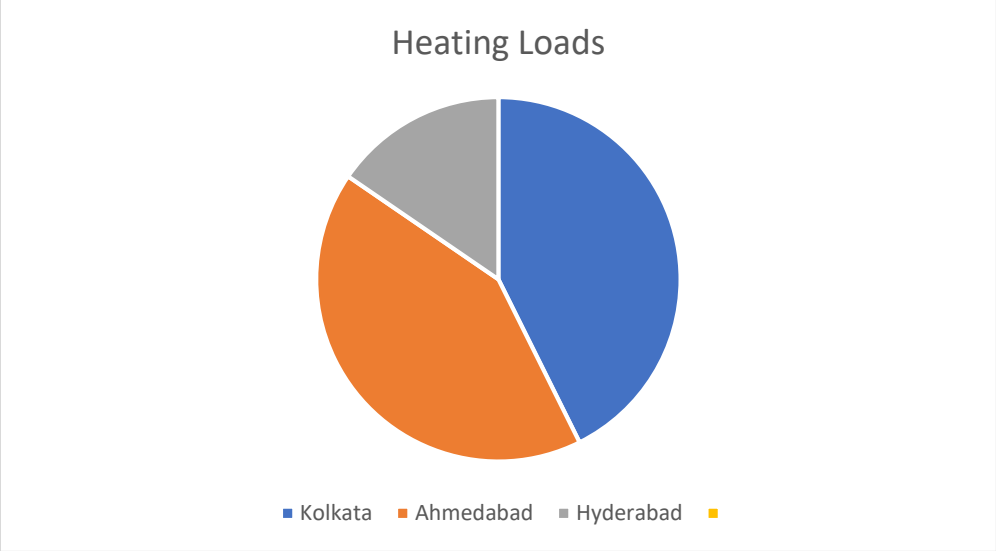
Figure1



The Following chart shows the Heating loads for different cities:-

1	Kolkata	0.58 GJ
2	Ahmedabad	0.57 GJ
3	Hyderabad	0.21 GJ

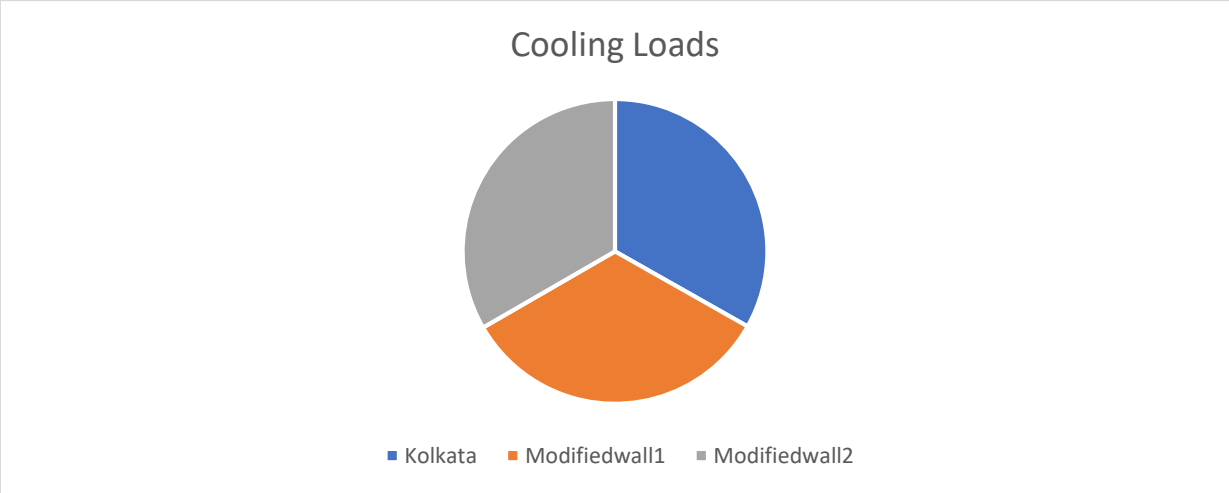
Figure2: -

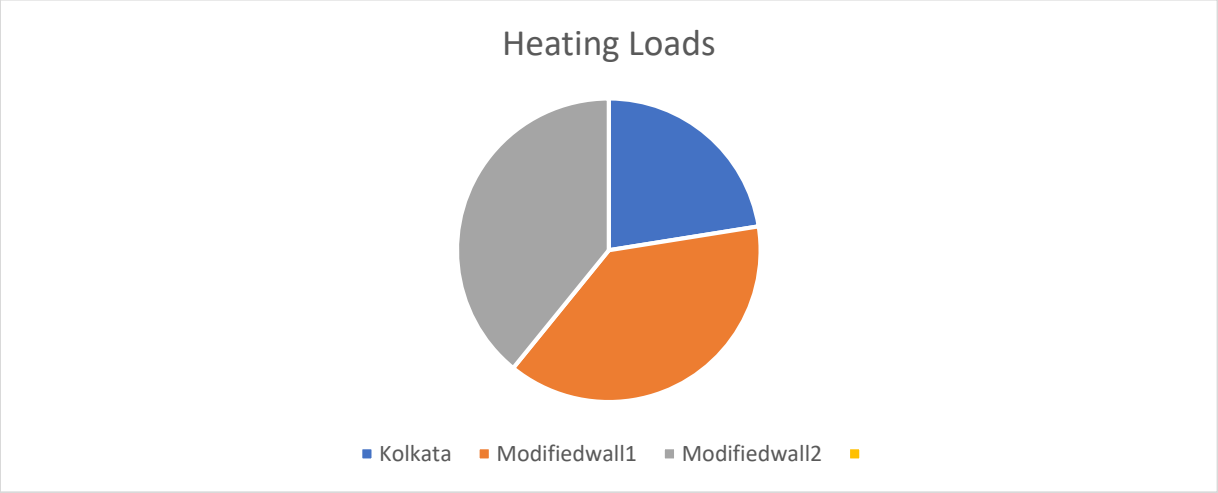


Upon Modification of wall characteristics for the base city the following loads are obtained: -

	City	Cooling Load	Heating Load
1	Kolkata	8515.43	0.58
2	Modified Wall 1	8586.18	0.99
3	Modified Wall 2	8550.42	1.01

Figure 3: -





Conclusion:

Hence for overall comparison among the cities, we conclude that we don’t need any kind of heating systems while the cooling plays a major role. Also, changing the walls is not affecting the cooling load. Which means you don’t have to change the construction type in these three cities to reduce the load.