

# SIMULATION OF BUILDING PERFORMANCE

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# WALLS

## Base wall

 1IN Stucco

 8IN Concrete HW

 Wall Insulation [31]

 1/2IN Gypsum


## Wall 1


 1IN Stucco


 M11 100mm lightweight


 1/2IN Gypsum 2


## Wall 2


 G01a 19mm gypsum board 1

 Wall Insulation [42] 1

 8IN Concrete HW 1

 FU4 Wall air space resistance

 I01 25mm insulation board 1

 1/2IN Gypsum 4

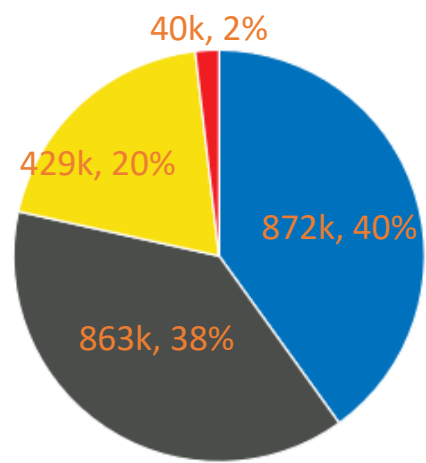
# CITY LOCATIONS



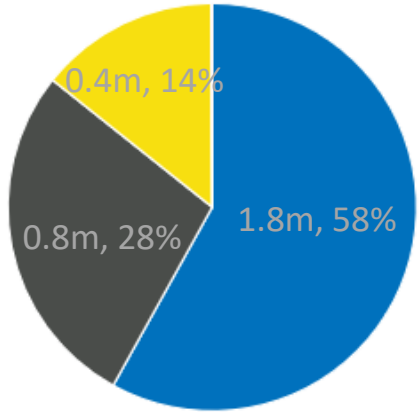
	ROMA	TAIPEI	TORONTO
LATITUDE	41.29	25.03	43.40
LONGITUDE	12.29	121.31	79.25
CLIMATE	Mediterranean climate	Humid subtropical climate	Humid continental climate
CHARACTERISTIC	During summer, regions of Mediterranean climate are strongly influenced by the subtropical ridge which keeps atmospheric conditions very dry with minimal cloud coverage. In winter, the subtropical ridge migrates towards the equator, making rainfall much more likely.	In a humid subtropical climate, summers are typically long, hot and humid. Monthly mean summer temperatures are normally between 25 and 27 °C; monthly mean temperatures in winter are often mild, typically averaging 7.5 to 16 °C.	Precipitation is relatively well distributed year-round in many areas with this climate. Snowfall occurs in all areas with a humid continental climate and in many such places is more common than rain during the height of winter. In places with sufficient wintertime precipitation, the snow cover is often deep.

# COMPARISON OF ANNUAL ENERGY CONSUMPTION

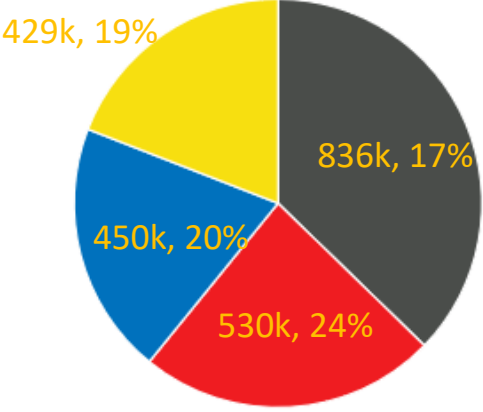
Site and Source Energy	ROMA Base Wall	TAIPEI Base Wall	TORONTO Base Wall
Total Site Energy	2177316.0	3021697.9	2244156.0
Net Site Energy	2177316.0	3021697.9	2244156.0
Total Source Energy	5071760.2	5867386.0	6394675.9
Net Source Energy	5071760.2	5867386.0	6394675.9



Roma

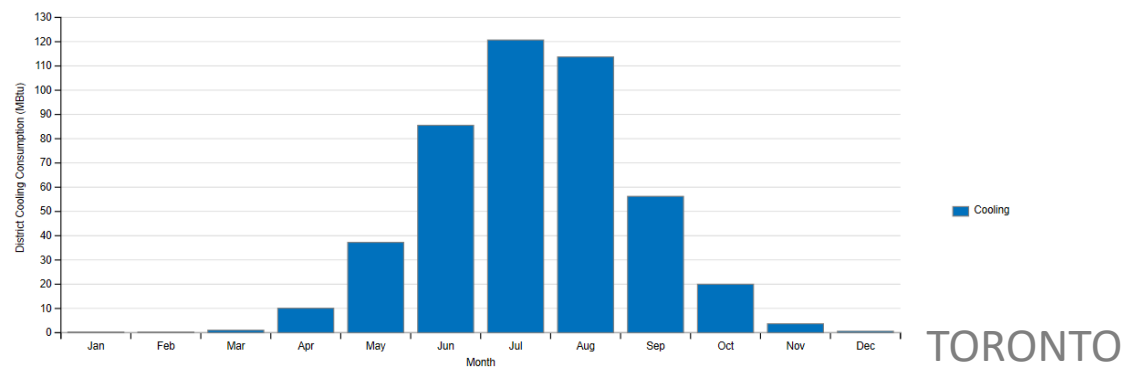
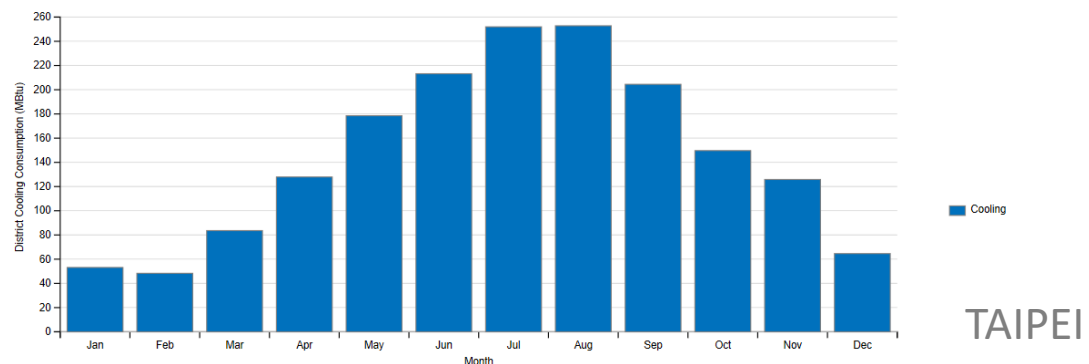
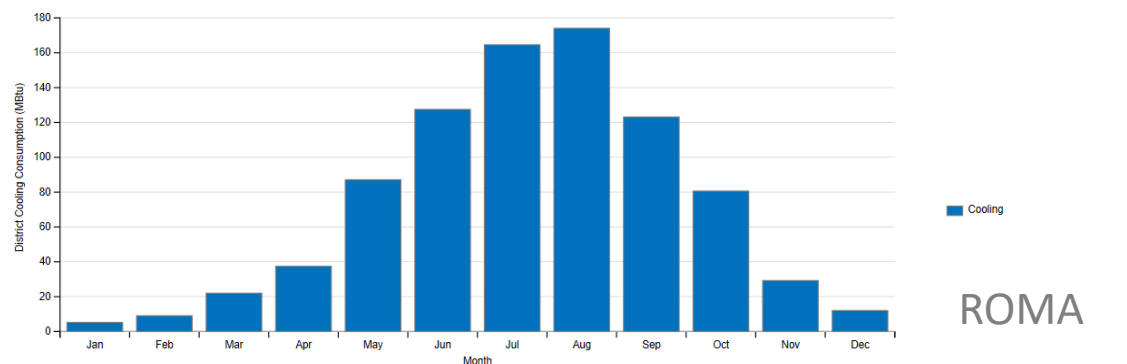


Taipei



Toronto

- Heating
- Interior Equipment
- Interior Lighting
- Cooling



CRITICAL MONTH

COMSUMPTION

August

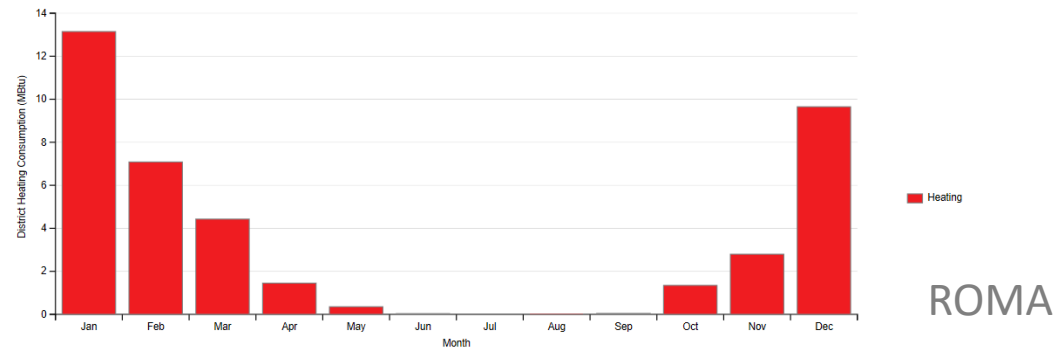
174

August

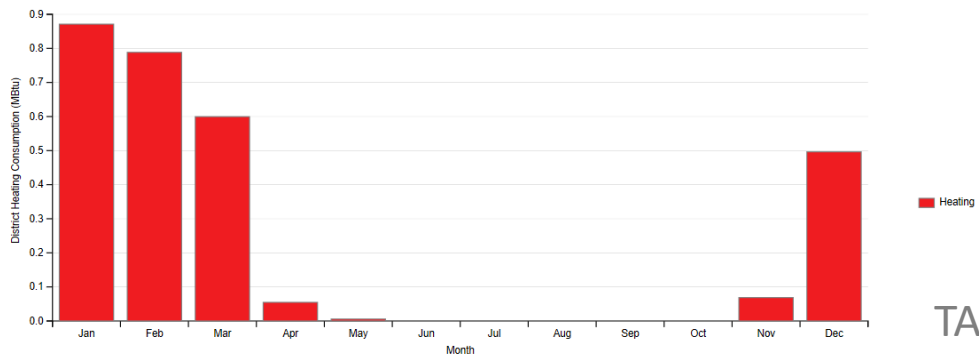
253

July

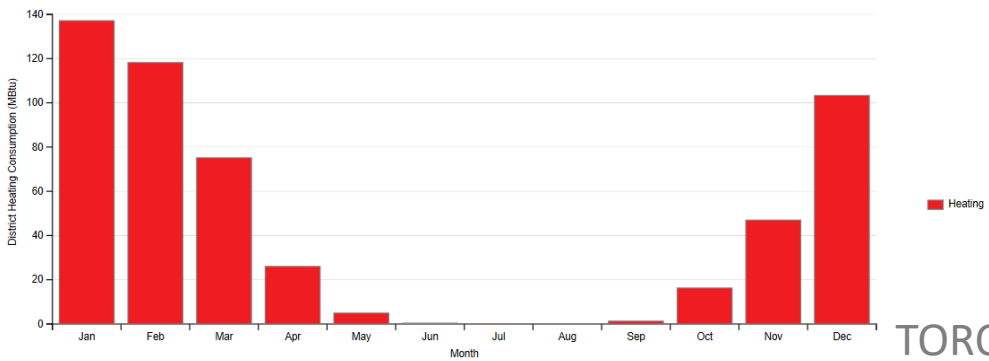
121



ROMA



TAIPEI



TORONTO

CRITICAL MONTH

COMSUMPTION

January

13

January

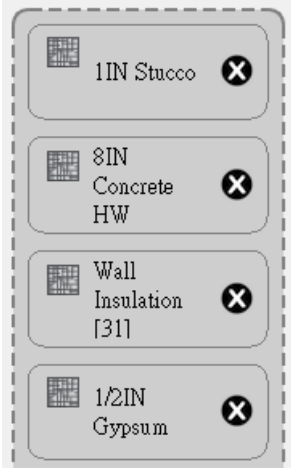
0.9

January

137

# SENSITIVITY ANALYSIS OF THE WALL CONFIGURATIONS

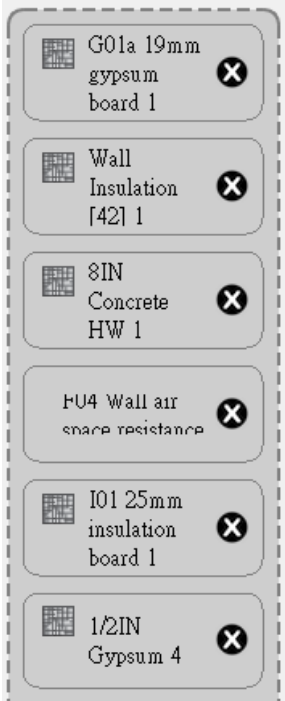
## Base wall



## Wall 1



## Wall 2



R Value(ft<sup>2</sup>\*h\*R/Btu):

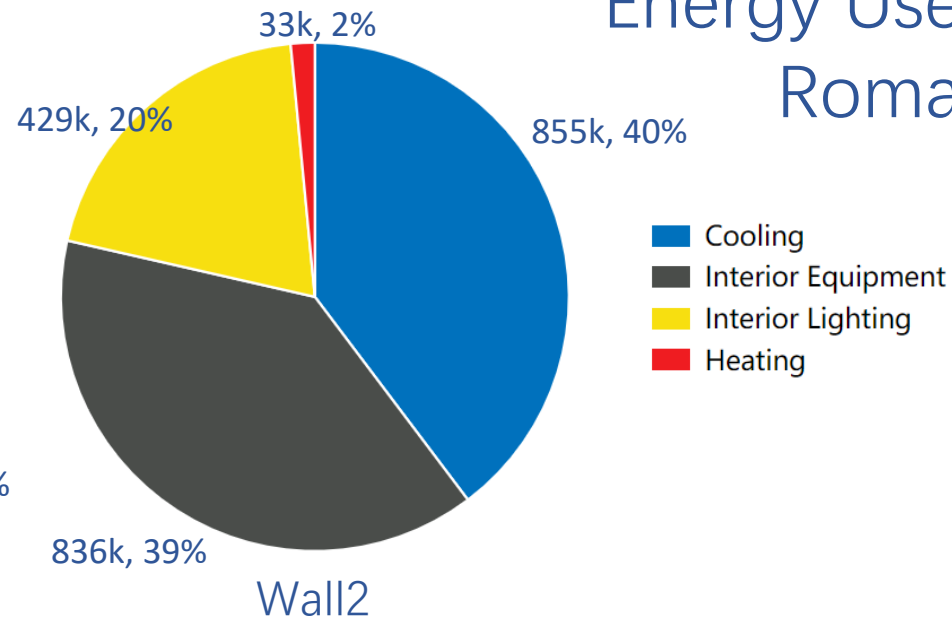
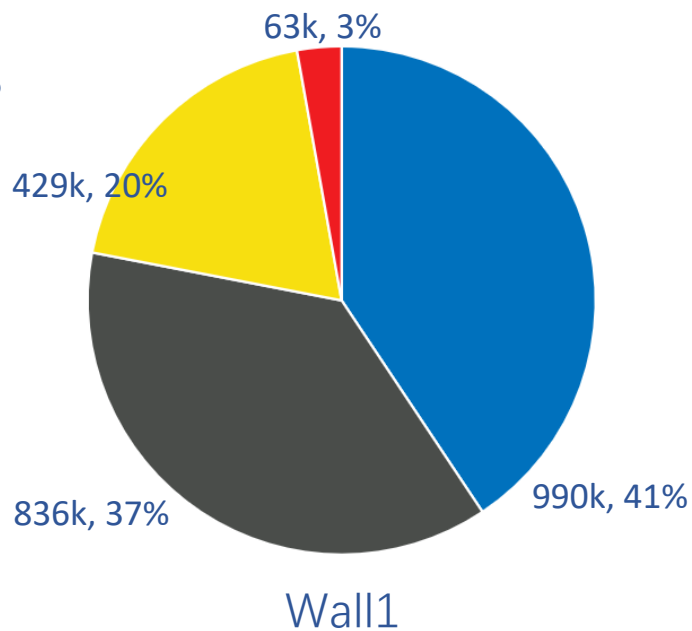
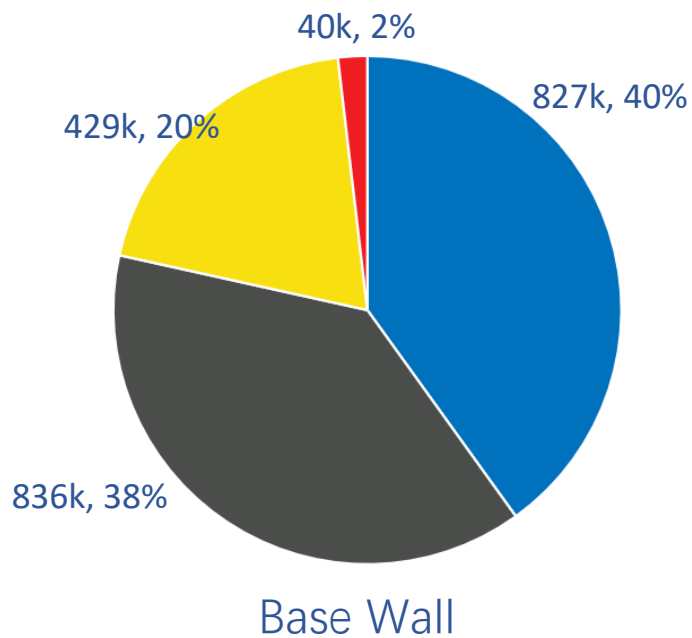
5.76

1.75

19.47



# Energy Use Roma



- Cooling
- Interior Equipment
- Interior Lighting
- Heating

Site and Source Energy	Base Wall	Wall1	Wall2
Total Site Energy	2177316.0	2236744.0	2152208.3
Net Site Energy	2177316.0	2236744.0	2152208.3
Total Source Energy	5071716.2	5192606.8	5026151.1
Net Source Energy	5071716.2	5192606.8	5026151.1

# CONCLUSION

## ANNUAL HEATING AND COOLING CONSUMPTION

1. The cooling consumption and heating consumption of the same material wall in different cities will be reflected differently due to the difference in the latitude of the city. Normally the higher the latitude, the less sun radiation the city receives, thus the higher the heating consumption is and the lower the amount of cooling is.

2. The cooling consumption and heating consumption of the same material wall in different cities will be reflected differently due to the difference in climate types. In humid subtropical area (Taipei), the cooling consumption has the highest value.

3. The influence of climatic conditions on the cooling consumption and heating consumption of the wall is greater than that of latitude.

4. The same material wall had the highest cooling consumption in Taipei in August and the highest heating consumption in Toronto in January, which corresponds the weather characters.

1. The thickness of the wall effect the total thermal resistance of the wall.

2. Wall 1, which has no insulation or air gap and the lowest thermal resistance value, has the highest value for the heating and cooling consumption, as well as the total energy consumption between the 3 different wall configurations.

2. Introducing an air gap in the wall greatly affects the total thermal resistance of the wall. But it dose not effect the total energy use very much.

3. Simple adding the thickness of the wall and increase the total thermal resistance of the wall is not an economic way the reduce the total energy consumption.

## SENSITIVITY ANALYSIS