

# Smart Buildings



**By:**

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# INTRODUCTION

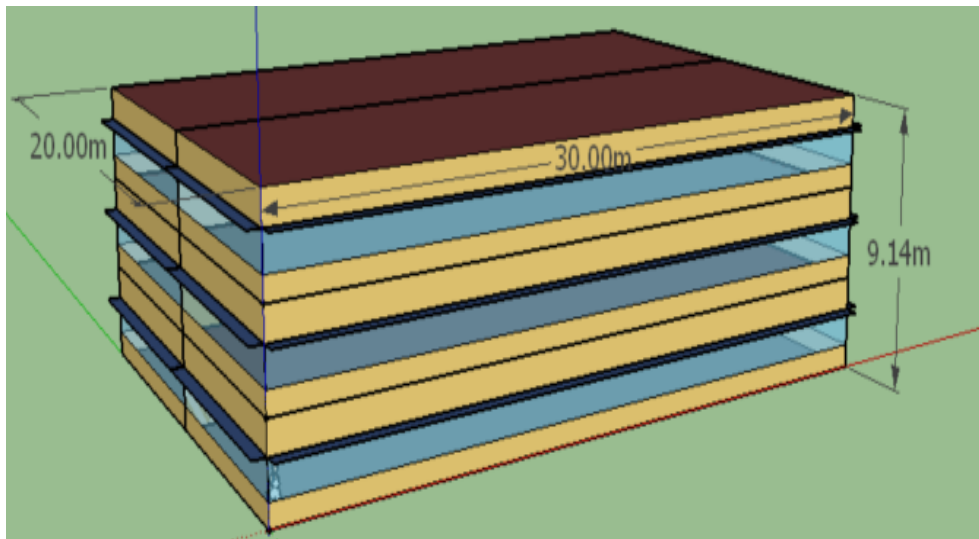
## Objective

The Commercial Building is modelled using SketchUp 2016 and rendered using OpenStudio 2.3.1. In this project, three different city are used for parametric study of the annual Heating and Cooling Consumption regarding:

- The effect of weather by changing the location of the building among Roma, Las Vegas and Moscow
- Wall construction where three types of walls are used in three different cities.

## Building Geometry

- Building Dimensions = 20 m\*30 m =600m<sup>2</sup>
- Building height = 9.14 m
- Windows for all walls and Overhangs for all except the northern wall
- 3-floor Commercial Building, each floor is divided into two rooms
  - First Floor (2 Open Offices)
  - Second Floor (Closed Office and Conference Room)
  - Third Floor (Mech/Elect Room and Breakroom)



## Thermal Zones:

Thermal zone 1 >>> Red

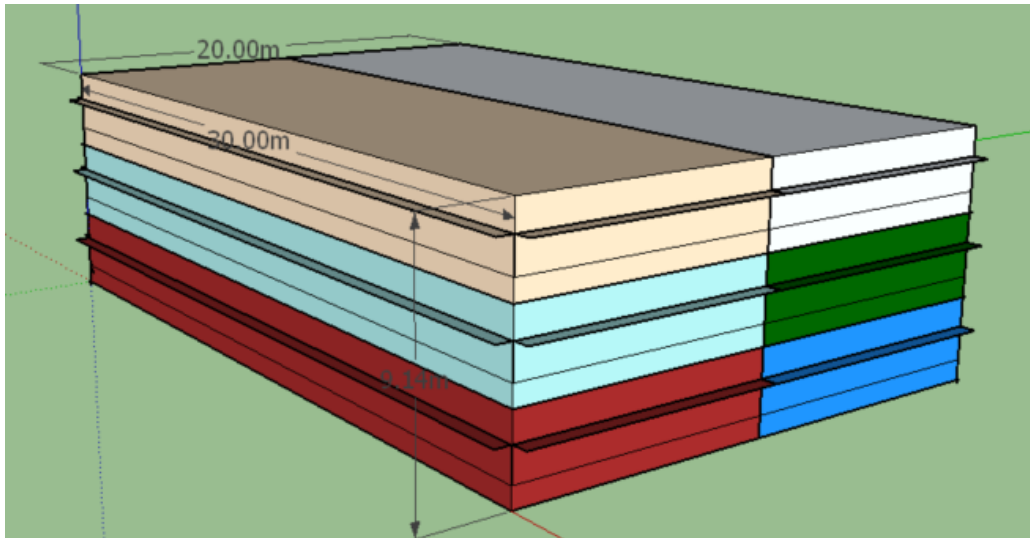
Thermal zone 2 >>> Heavy Blue

Thermal zone 3 >>> Light Blue

Thermal zone 4 >>> Green

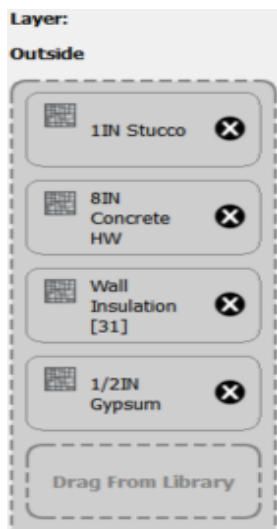
Thermal zone 5 >>> White

Thermal zone 6 >>> Beige



## Wall Characteristics: (10-inch thickness)

Base Case



Case 1



Case 2



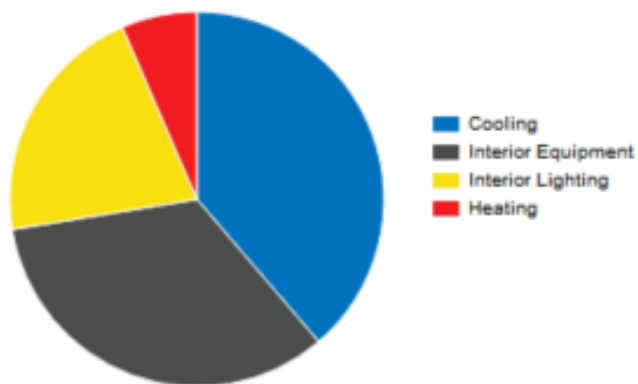
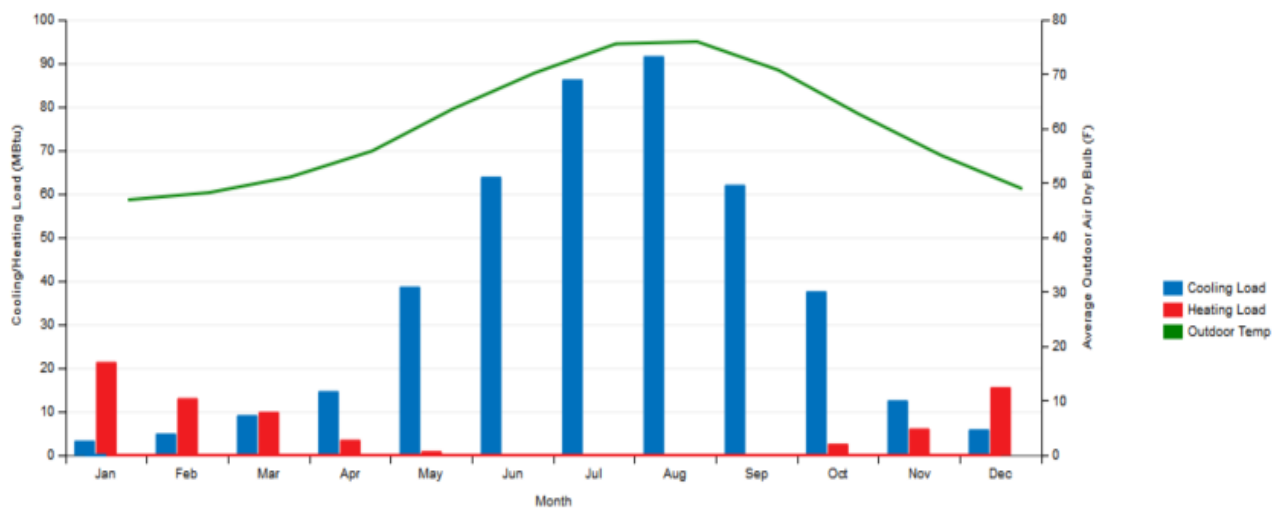
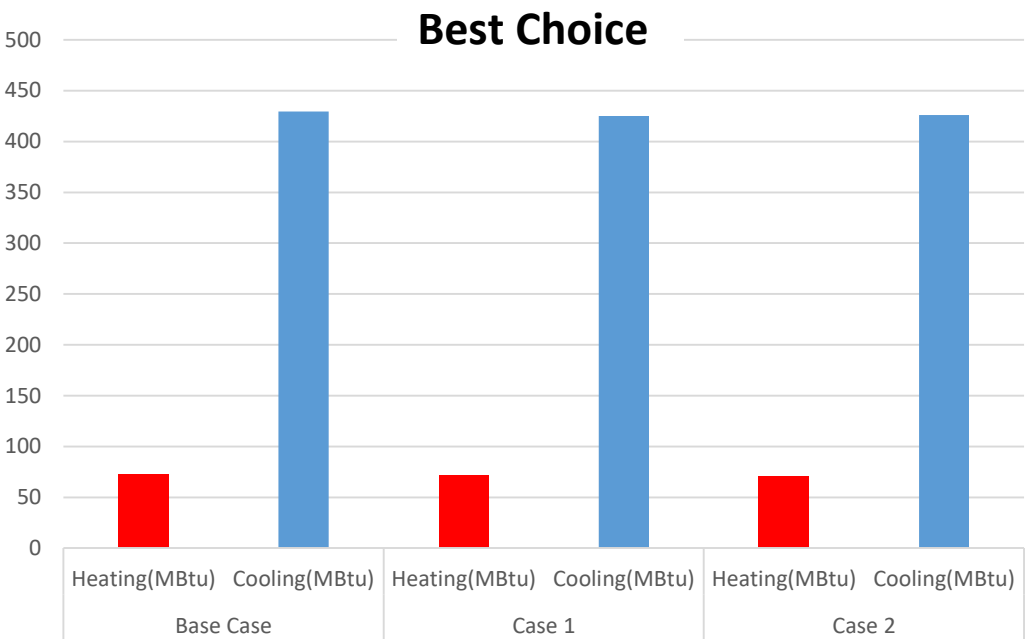
# Data Analysis



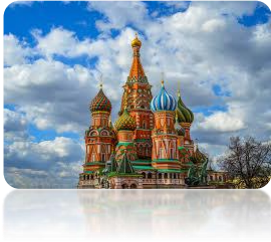
Roma



Base Case:

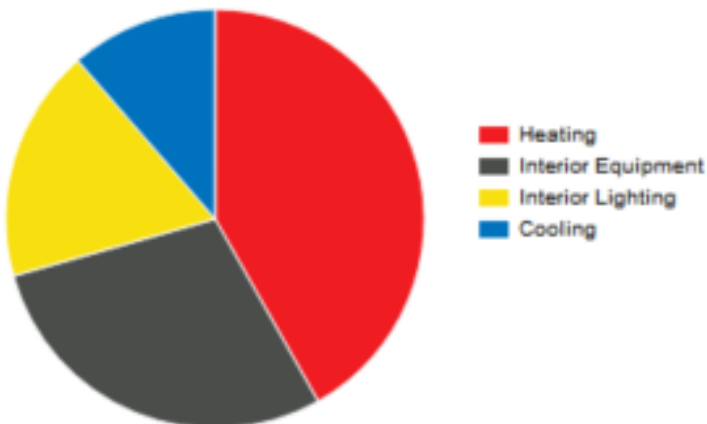
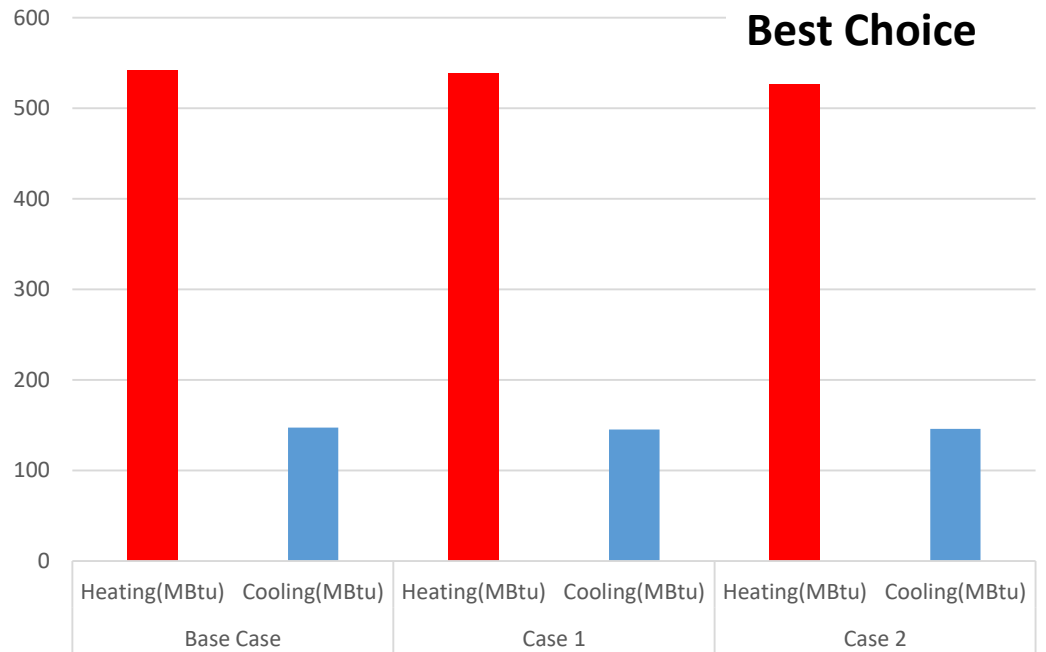


| End Use            | Consumption (kBtu) |
|--------------------|--------------------|
| Heating            | 72,262             |
| Cooling            | 429,428            |
| Interior Lighting  | 233,476            |
| Exterior Lighting  | 0                  |
| Interior Equipment | 373,677            |



Moscow

Base Case:

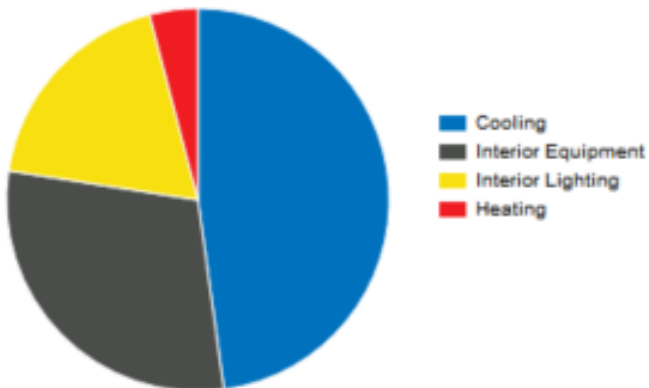
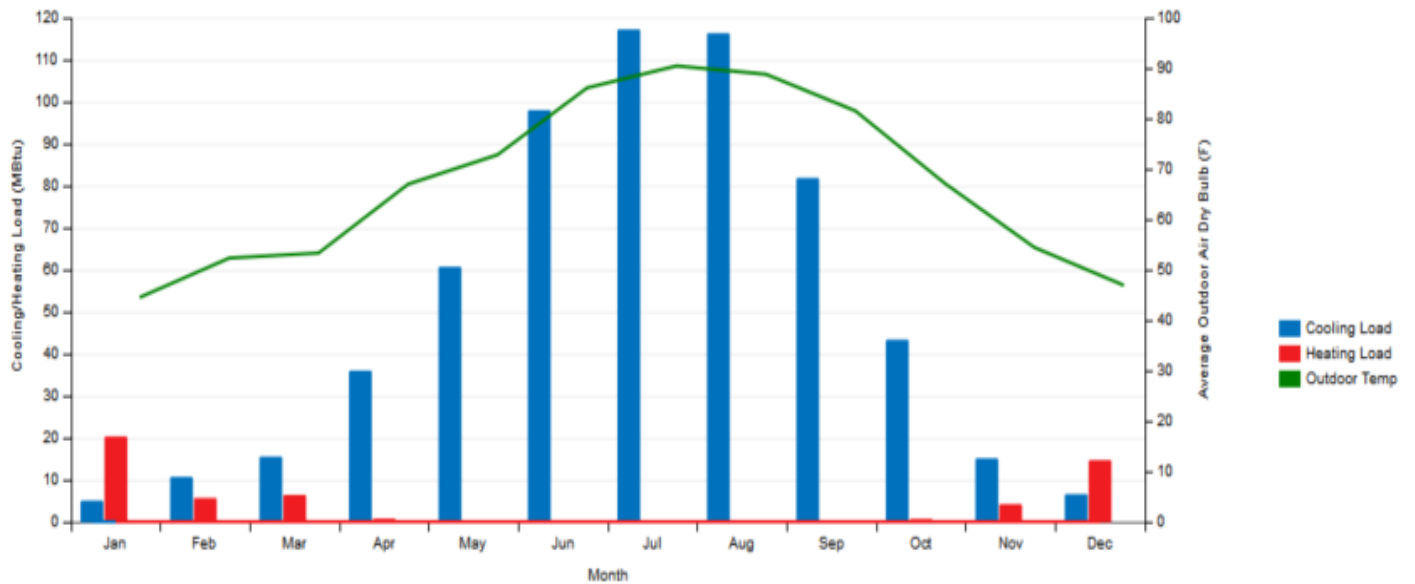
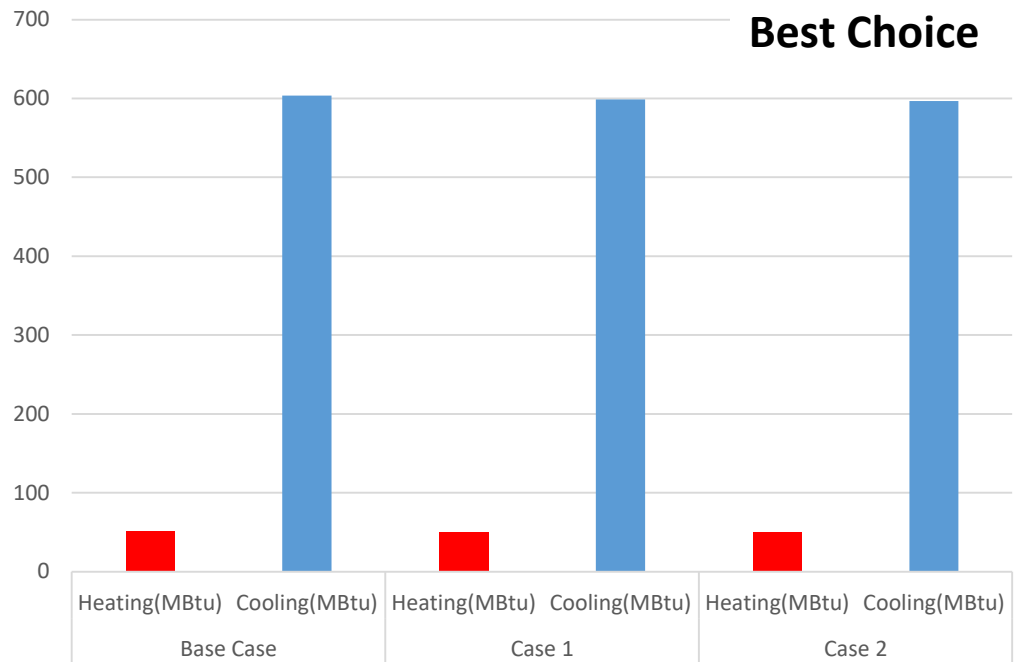


| End Use            | Consumption (kBtu) |
|--------------------|--------------------|
| Heating            | 542,237            |
| Cooling            | 147,556            |
| Interior Lighting  | 233,476            |
| Exterior Lighting  | 0                  |
| Interior Equipment | 373,677            |



# Las Vegas

## Base Case:



| End Use            | Consumption (kBtu) |
|--------------------|--------------------|
| Heating            | 51,353             |
| Cooling            | 603,760            |
| Interior Lighting  | 233,476            |
| Exterior Lighting  | 0                  |
| Interior Equipment | 373,677            |

# Heating and Cooling Load Variations among different walls cases for three different Cities:

|           | Base Case     |               | Case 1        |               | Case 2        |               |
|-----------|---------------|---------------|---------------|---------------|---------------|---------------|
|           | Heating(MBtu) | Cooling(MBtu) | Heating(MBtu) | Cooling(MBtu) | Heating(MBtu) | Cooling(MBtu) |
| Roma      | 72.262        | 429.428       | 71.323        | 425.030       | 70.138        | 426.176       |
| Moscow    | 542.237       | 147.556       | 538.360       | 145.255       | 526.512       | 146.115       |
| Las Vegas | 51.353        | 603.760       | 50.320        | 598.698       | 50.301        | 596.736       |

