TECHNICAL ENVIRONMENTAL SYSTEMS

BUILDING ENERGY REPORT

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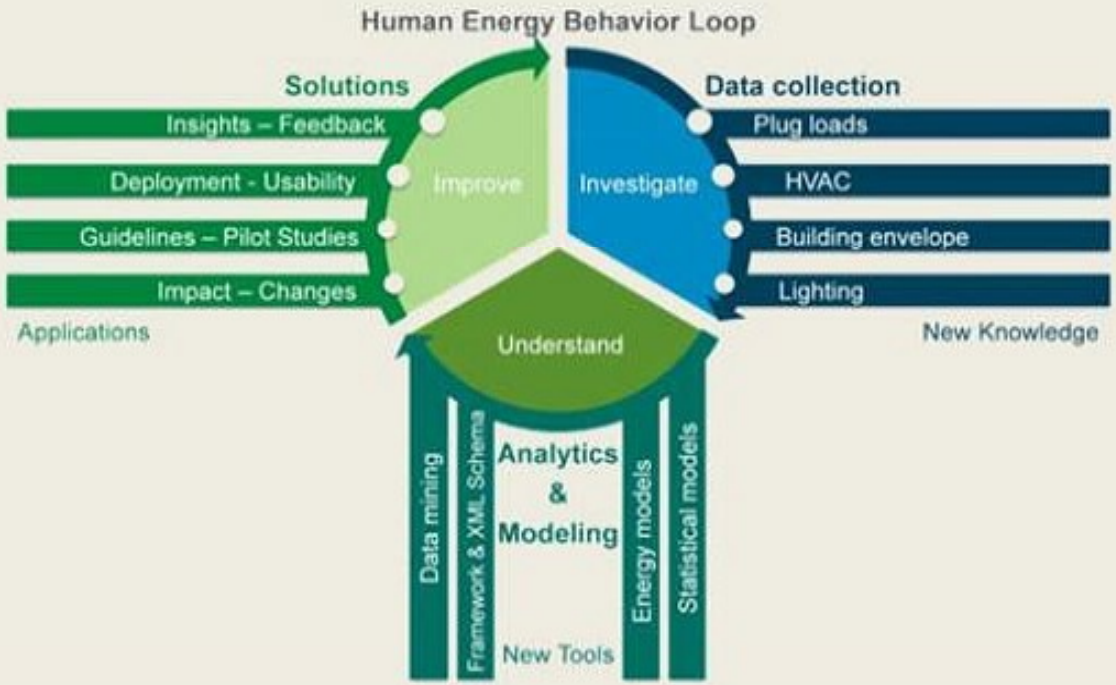
Introduction

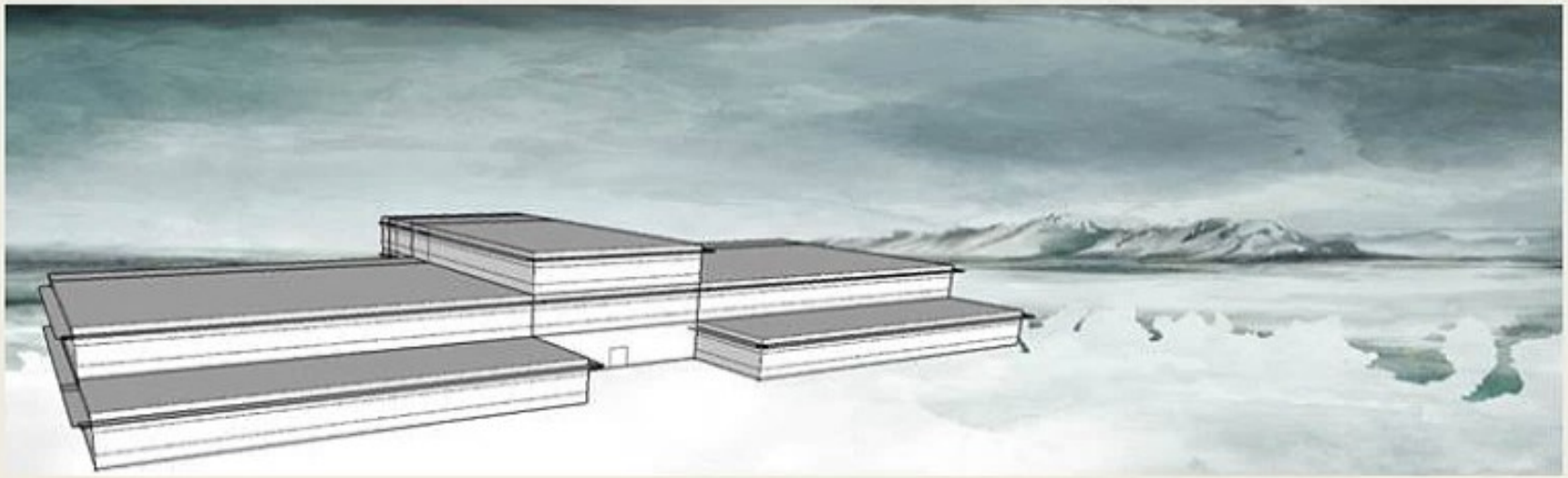
Three steps of the technical approach to the human energy behavior loop:
(1) Investigate the operations of building energy and services systems through behavior-related data collection,
(2) Understand the human behavior through data analytics, data mining, and modeling,
and (3) Improve the building performance by applying behavioral solutions.

In the following steps of this presentation, our group is trying to understand the energy consumption of one building with three different wall insulation in three cities and compare them in an open studio project.

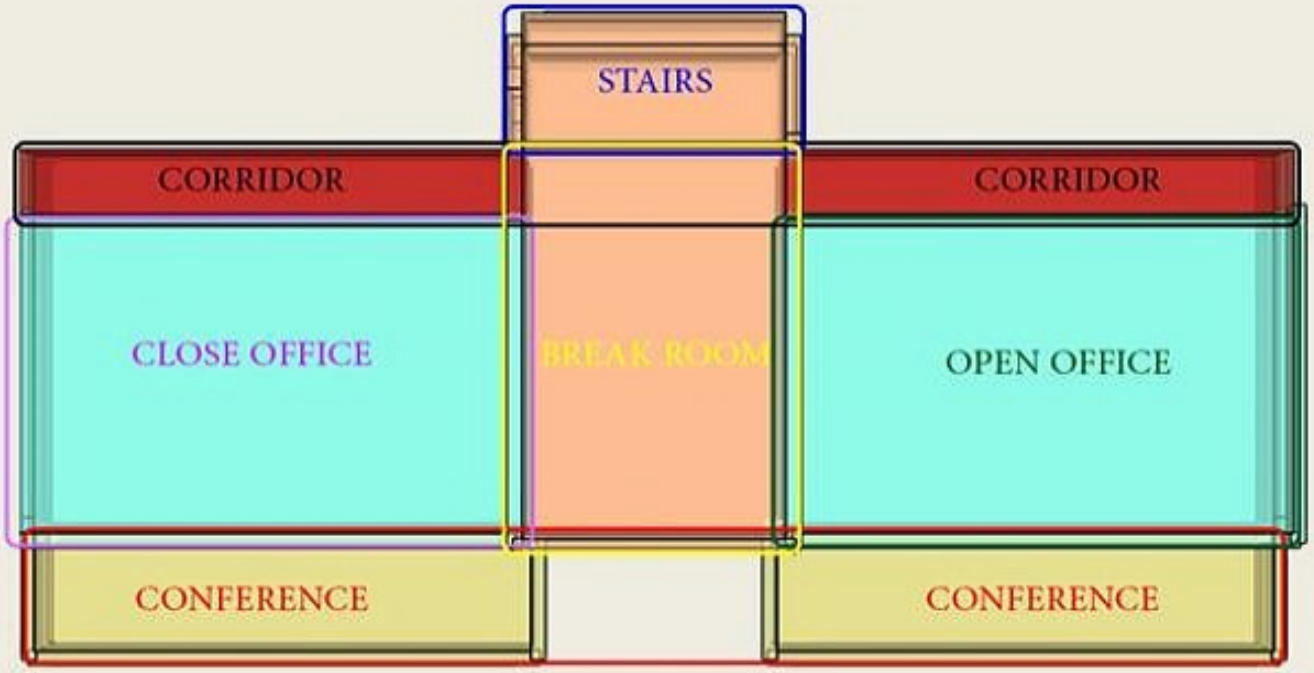


Project description

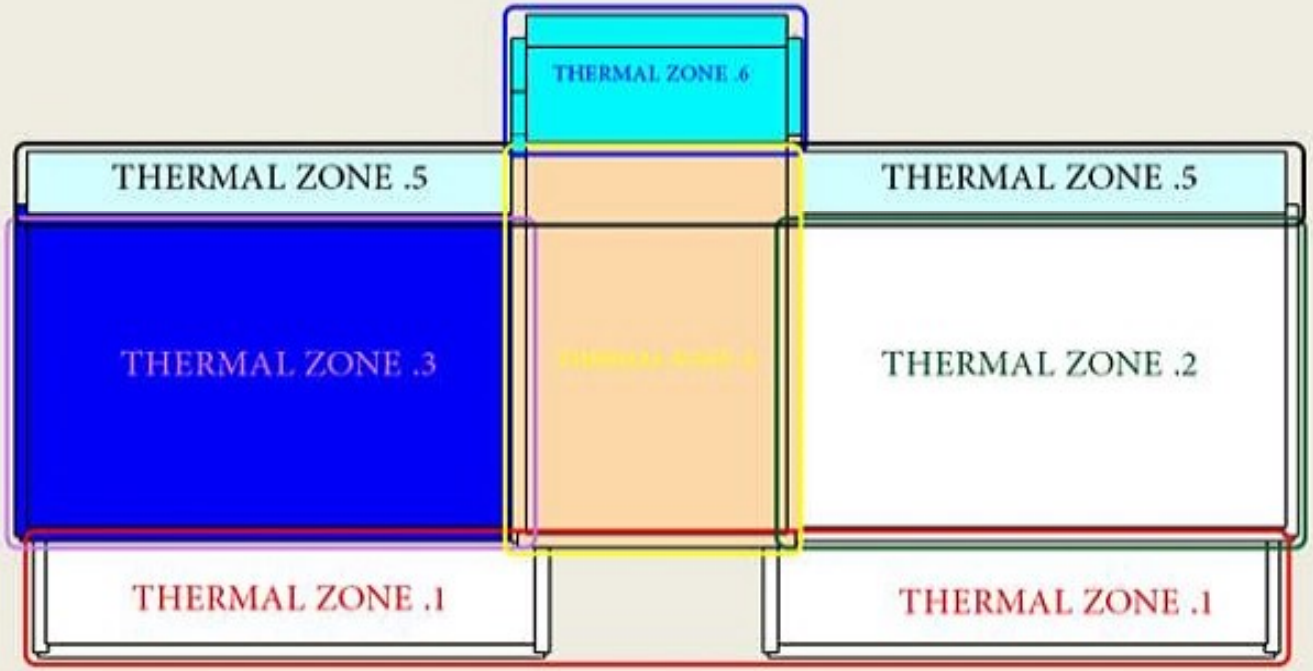
Project: Office building
Locations : 1. Piacenza-Italy 2. Tabriz- Iran 3. Sydney- Australia



Space Type



Thermal Zone



- Existing site conditions

I. Piacenza

	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	

II. Tabriz

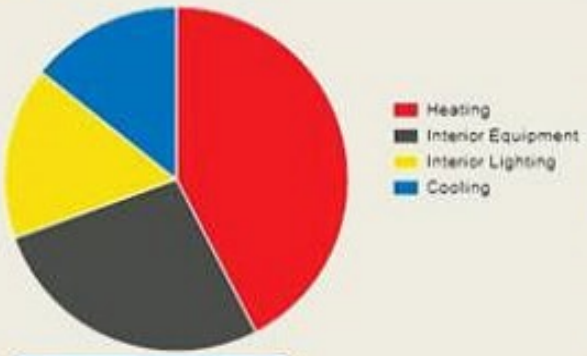
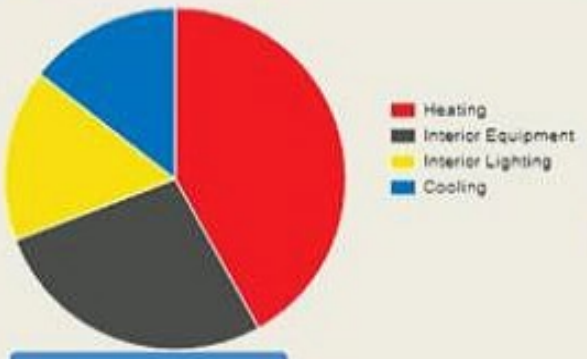
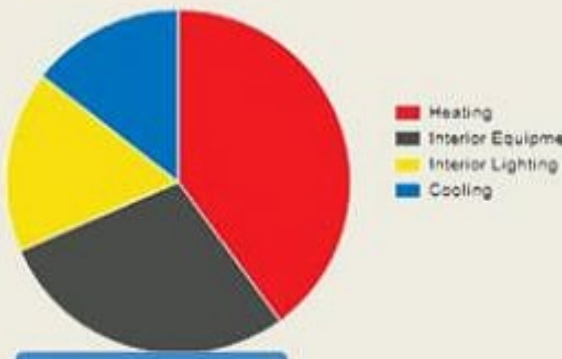
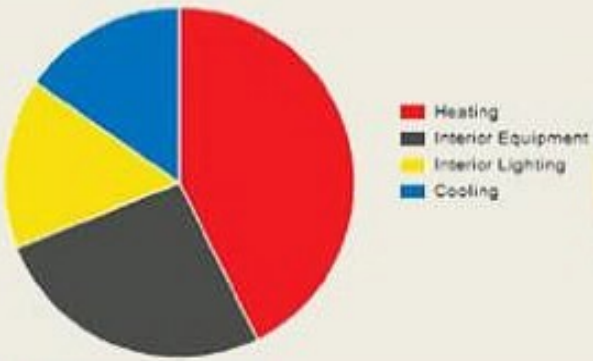
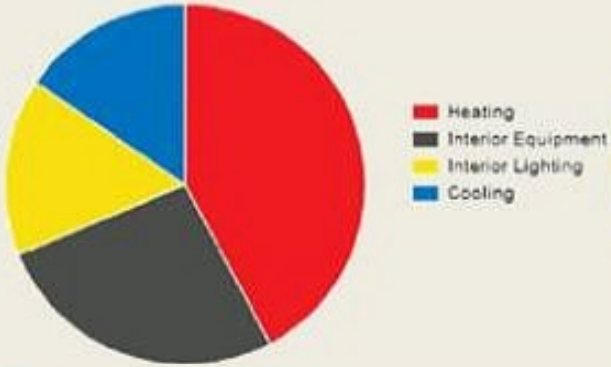
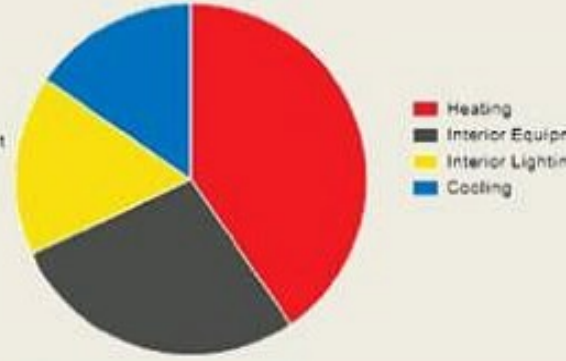
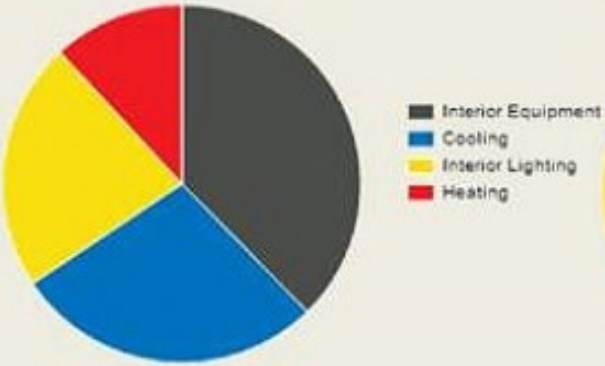
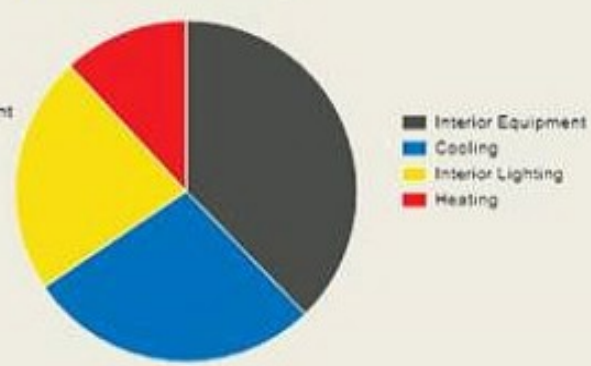
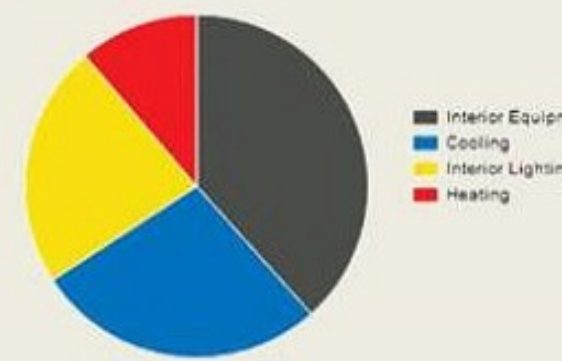
	Value
Weather File	Tabriz - IRN ITMY WMO#=407060
Latitude	38.05
Longitude	46.17
Elevation	4465 (ft)
Time Zone	3.00
North Axis Angle	0.00
ASHRAE Climate Zone	

III. Sydney

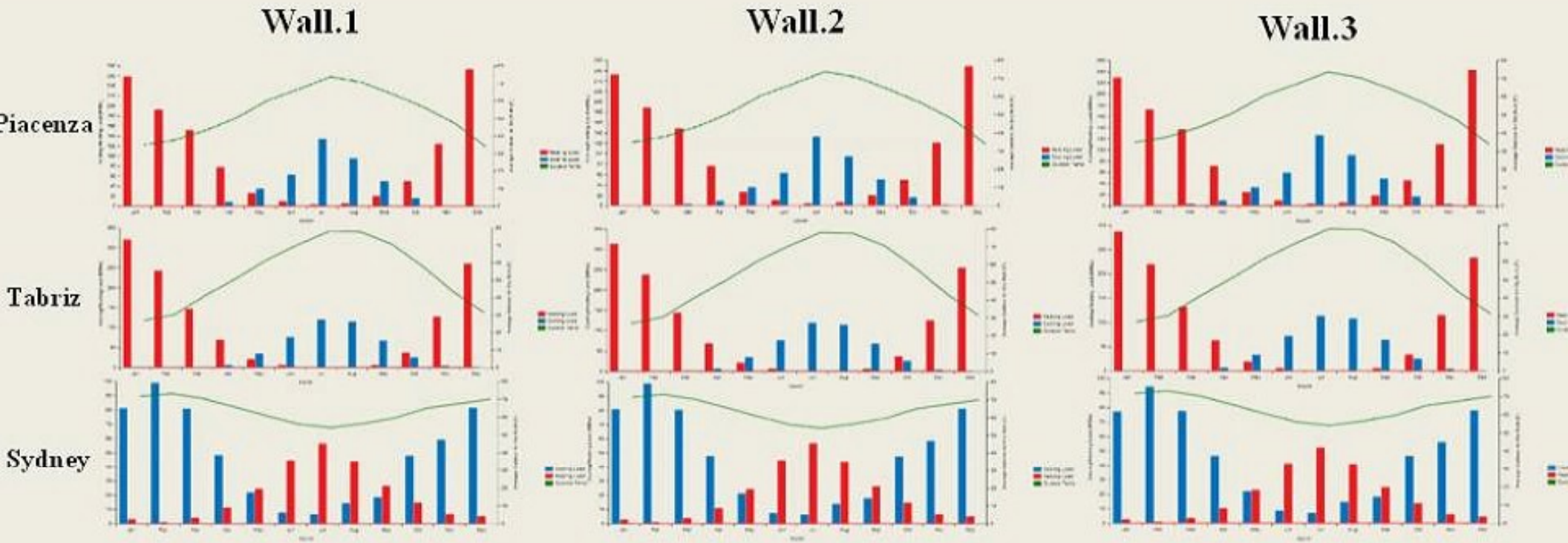
	Value
Weather File	SYDNEY - AUS IWEC Data WMO#=947670
Latitude	-34.0
Longitude	151.18
Elevation	10 (ft)
Time Zone	10.00
North Axis Angle	0.00
ASHRAE Climate Zone	

- Energy Performance of Building

Annual Overview

	Wall.1	Wall.2	Wall.3
Piacenza			
Tabriz			
Sydney			

- HVAC Load Profile



- Tables of Comparison

City: Piacenza	Wall No.1		Wall No.2		Wall No.3	
Information	Values		Values		Values	
Net site energy	2967.29	824247.2	2949.83	819397.2	2820.5	783472.2
Total building area	43059	4000.312	43059	4000.312	43059	4000.312
EUI	741.82	206.04	737.46	204.83	705.12	195.85

Units	
GJ	kWh
Feet^2	m^2
MJ/m^2	kWh/m^2

Wall 1: Insulation3 cm	33.95%
Wall 2: Insulation4.5cm	33.76%
Wall 3: Insulation8 cm	32.27%

City: Tabriz	Wall No.1		Wall No.2		Wall No.3	
Information	Values		Values		Values	
Net site energy	3059.65	849902.77	3035.88	843300	2910.48	808466.66
Total building area	43059	4000.312	43059	4000.312	43059	4000.312
EUI	764.91	212.45	758.97	210.80	727.62	202.10

Units	
GJ	kWh
Feet^2	m^2
MJ/m^2	kWh/m^2

Wall 1: Insulation3 cm	34%
Wall 2: Insulation4.5cm	33.70%
Wall 3: Insulation8 cm	32.31%

City: Sydney	Wall No.1		Wall No.2		Wall No.3	
Information	Values		Values		Values	
Net site energy	2137.70	593805.55	2132.20	592277.77	2099.19	583108.33
Total building area	43059	4000.312	43059	4000.312	43059	4000.312
EUI	534.43	148.43	533.05	148.05	524.80	145.76

Units	
GJ	kWh
Feet^2	m^2
MJ/m^2	kWh/m^2

Wall 1: Insulation3 cm	33.56%
Wall 2: Insulation4.5cm	33.47%
Wall 3: Insulation8 cm	32.95%

- Final Conclusion

City	Wall.1 Net site energy	Wall.2 Net site energy	Wall.3 Net site energy	Highest (%)	Lowest (%)
Piacenza	824247.2	819397.2	783472.2	**33.95%**	**32.27%**
Tabriz	849902.77	843300	808466.66	**34%**	**32.31%**
Sydney	593805.55	592277.77	583108.33	**33.56%**	**32.95%**

To conclude, after applying all the walls in the chosen cities, we can see that with eight centimeter insulation, the energy consumption of the building has the lowest amount in Piacenza.
Further more, with three centimeter insulation, the building will have the highest energy consumption in Tabriz.