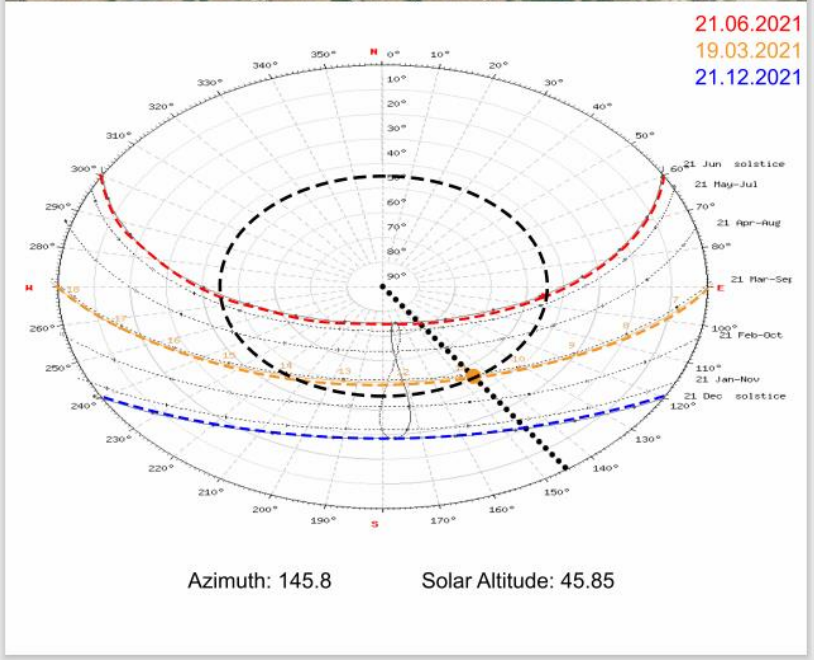
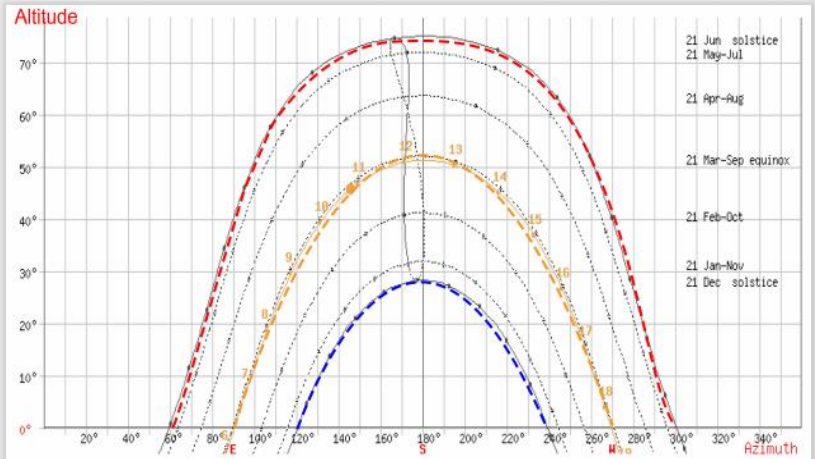
AR-483 FINAL PROJECT SPRING 2020-2021
ENERGY EFFICIENT COFFEE SHOP FOR URLA

LUMION
PRO STUDENT

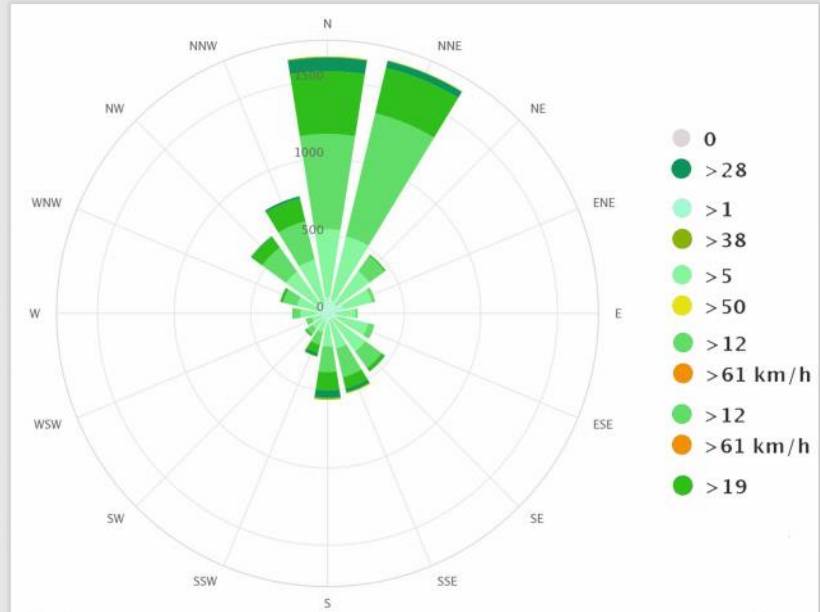
Climate, Wind, Sun Analysis of Location

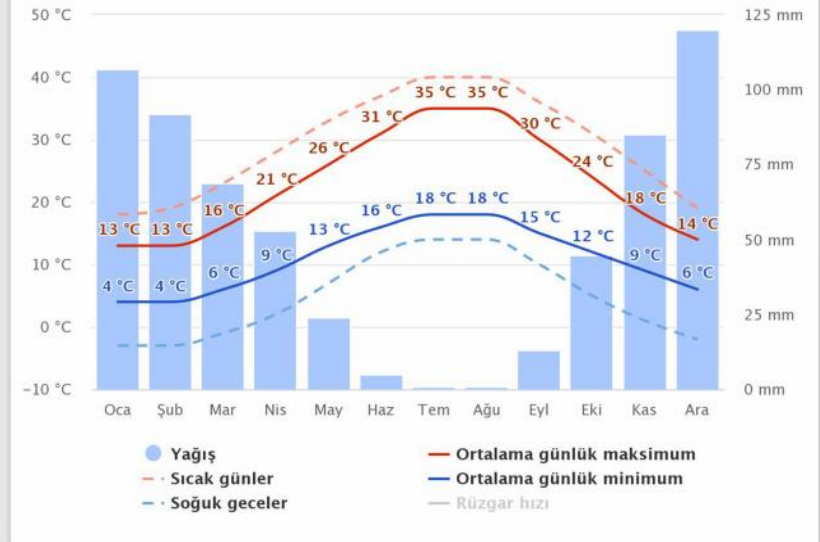

19.03.2021--10:50
N
İzmir Institute of Technology Gülbahçe/Urla, Turkey
38.31533190,26.63821710

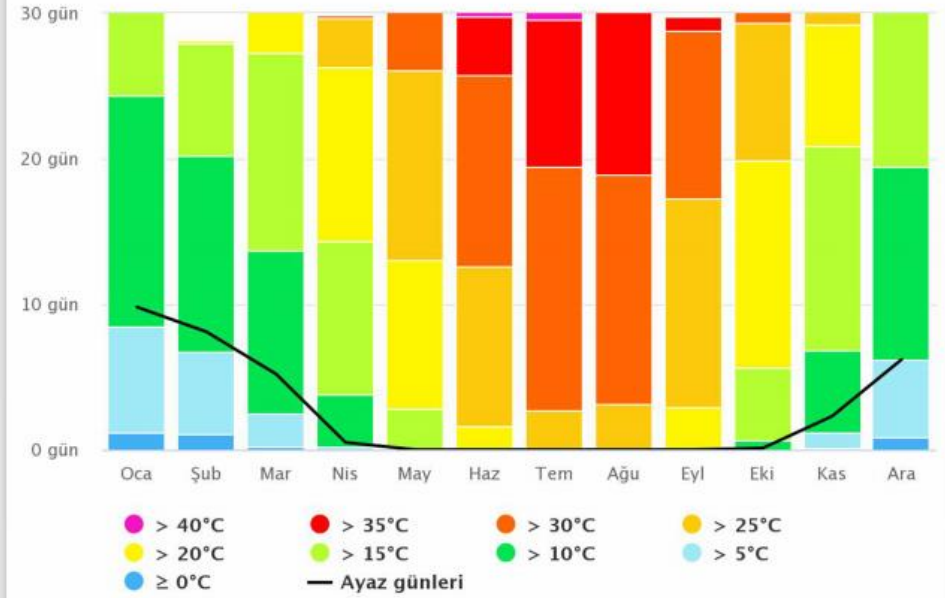

21.06.2021
19.03.2021
21.12.2021
21 Jun solstice
21 May-Jul
21 Apr-Aug
21 Mar-Sep
21 Feb-Oct
21 Jan-Nov
21 Dec solstice
Azimuth: 145.8
Solar Altitude: 45.85

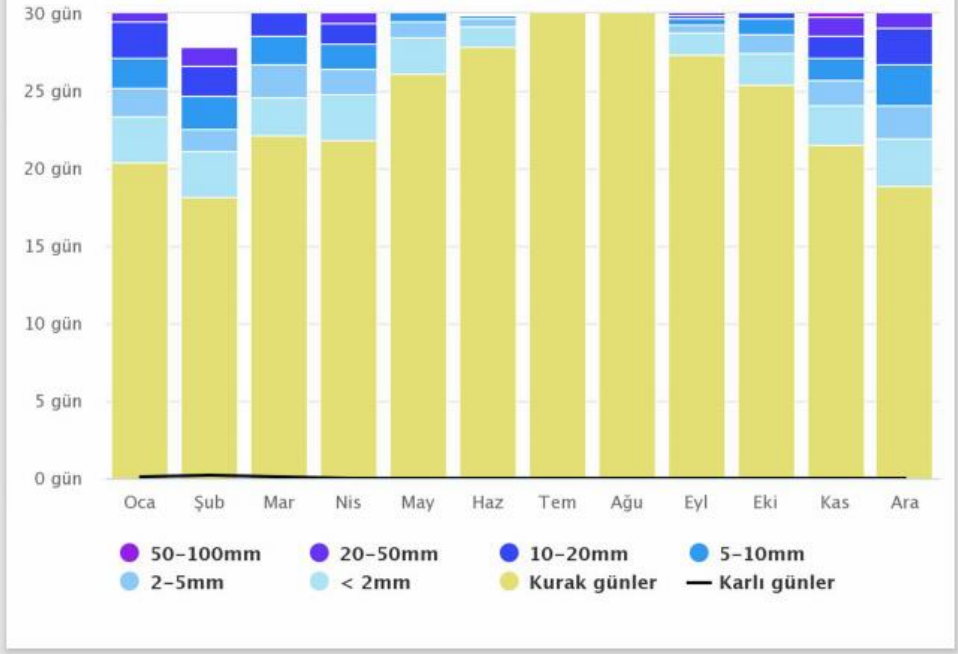

Altitude
21 Jun solstice
21 May-Jul
21 Apr-Aug
21 Mar-Sep equinox
21 Feb-Oct
21 Jan-Nov
21 Dec solstice
Azimuth

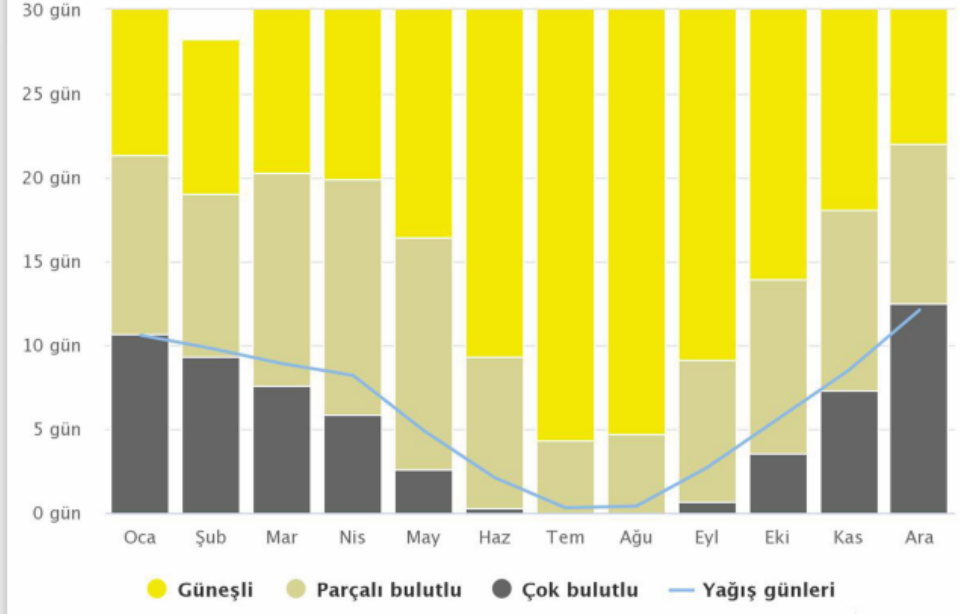

Ballıkaya Tepesi 93 m
CLOSE
LAT: 38.3162 LON: 26.6387
DIRECTION
SPEED
214° (SW) 41 km/h
İzmir-Çeşme yolu
İYTE Teknopark
D300


N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
0
>28
>1
>38
>5
>50
>12
>61 km/h
>12
>61 km/h
>19


50 °C
40 °C
30 °C
20 °C
10 °C
0 °C
-10 °C
125 mm
100 mm
75 mm
50 mm
25 mm
0 mm
Oca
Şub
Mar
Nis
May
Haz
Tem
Ağu
Eyl
Eki
Kas
Ara
Yağış
Sıcak günler
Soğuk geceler
Ortalama günlük maksimum
Ortalama günlük minimum
Rüzgar hızı







İzmir Institute of Tehnology Coffee Shop Project Program

Entrance; 5 m^2

Tea Area; 140 m^2 (10*four-person tables)

Bar & Checkout; 10 m^2

Cafeteria; 150 m^2 (10*four-person tables)

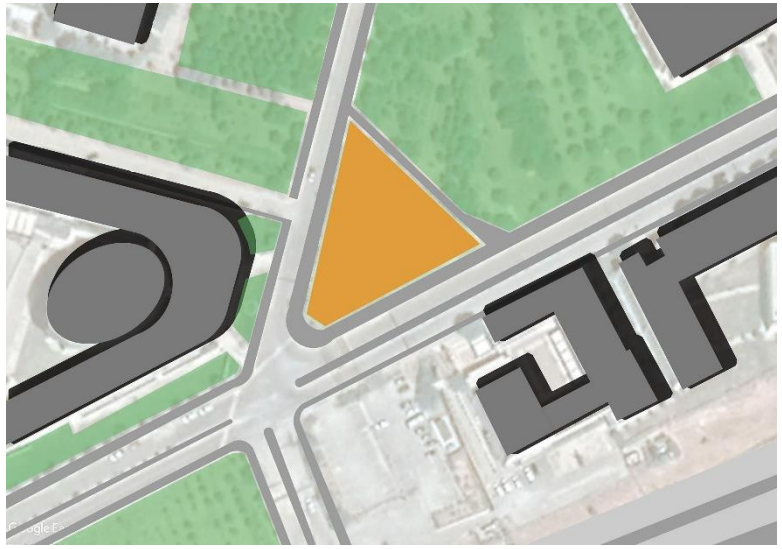
Kitchen; 50 m^2

Studying Space; 100 m^2

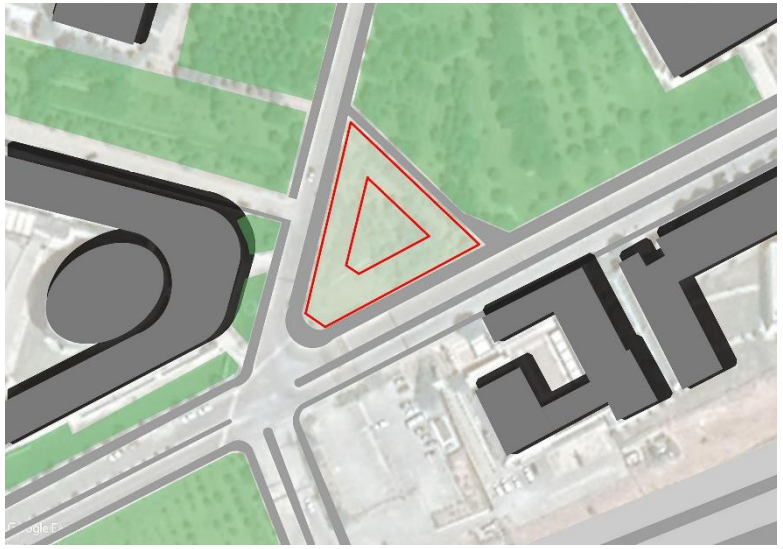
WC: 15 m^2 (2*4)

Open, Semi-open Spaces

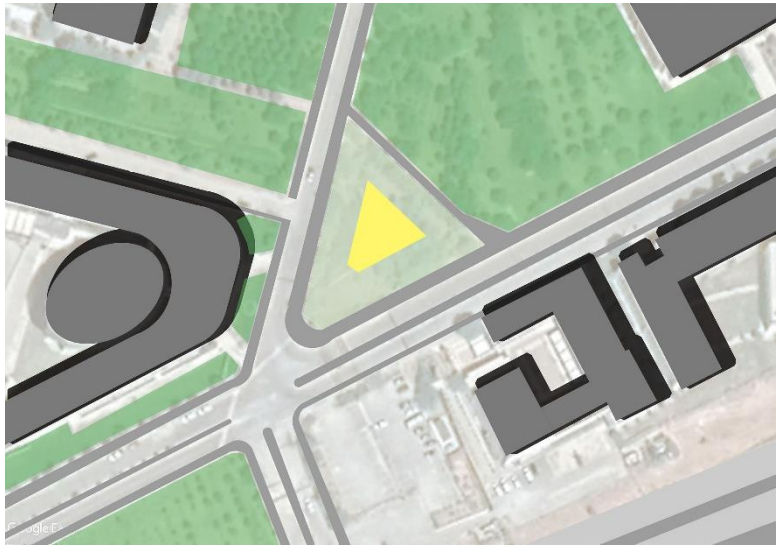
Site Strategies to Maximaze Energy Saving



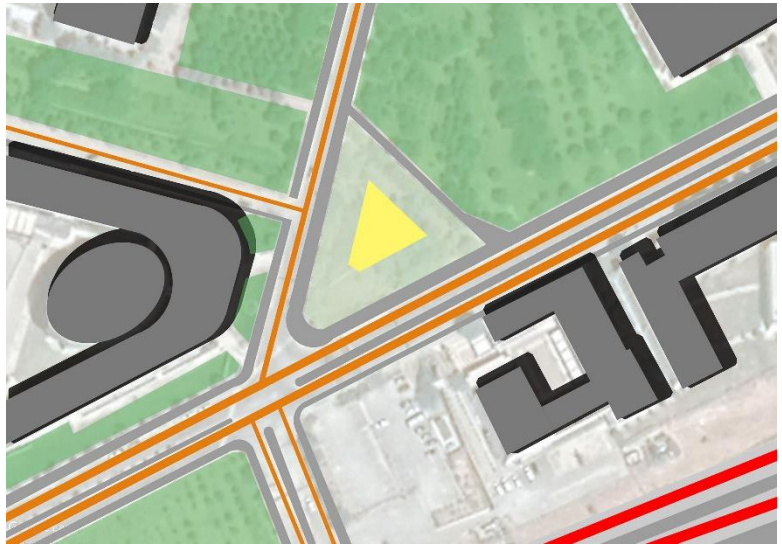
Project Area



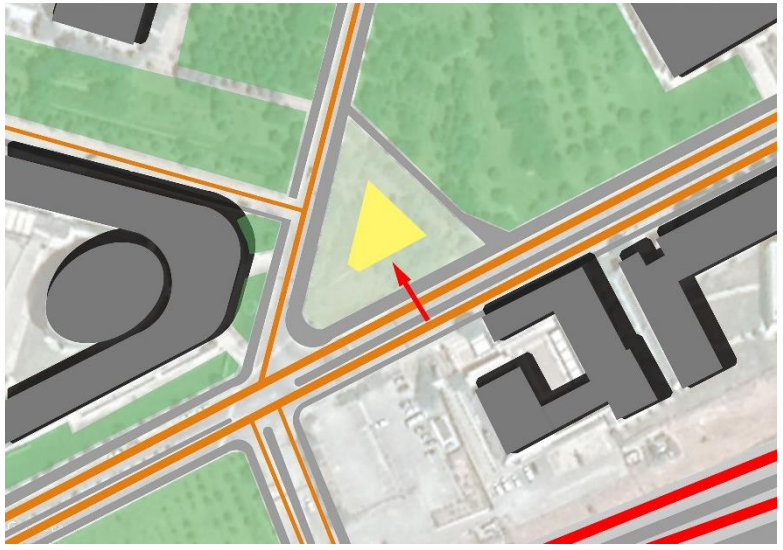
Ofseting the Area



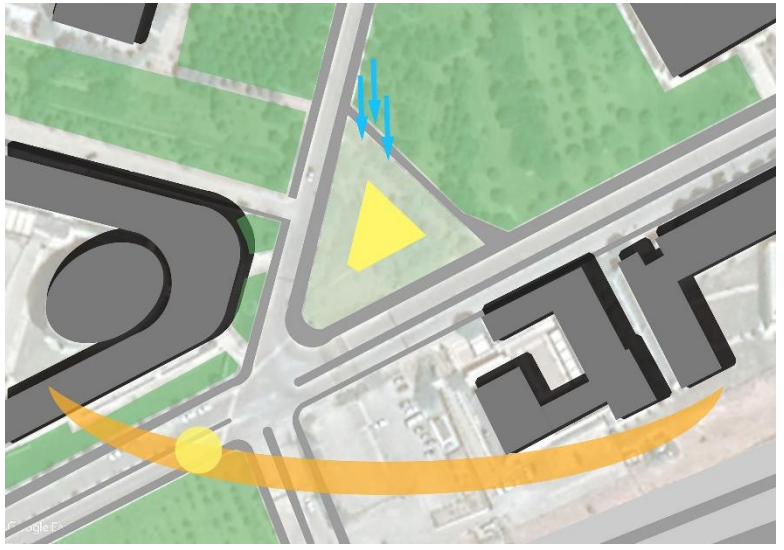
Ofseted Building Area



Roads



Entrance



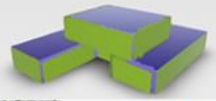
Orienting according to sun & wind

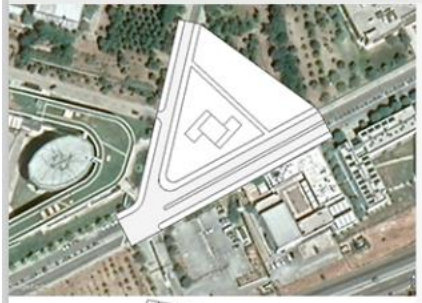
Site Plan 1:200

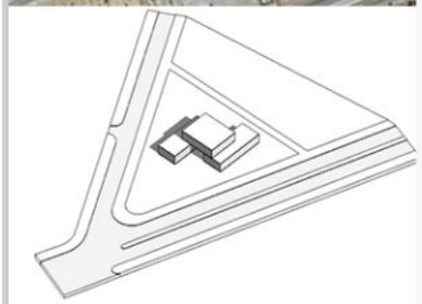
Mass Strategies

First Form: 515 m2

238 kWh / m² / yr

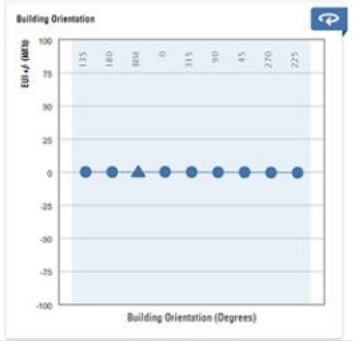






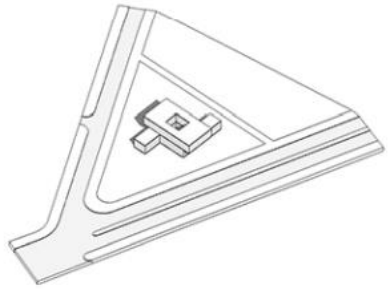
1023

Unlike the previous mass, it was wanted to see what effect it would have by creating a courtyard. The result is a better value than the **previous one.**



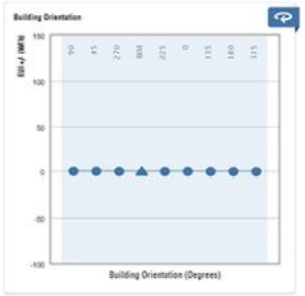
Second Form: 480 m2

205 kWh / m² / yr



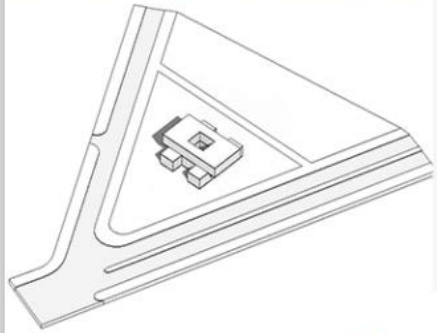
976

Unlike the previous mass, it was wanted to see what effect it would have by creating a courtyard. The result is a better value than the **previous one.**



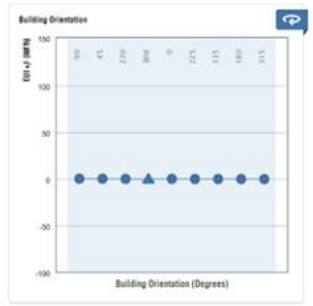
Third Form: 480 m2

208 kWh / m² / yr



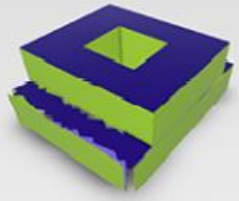
978

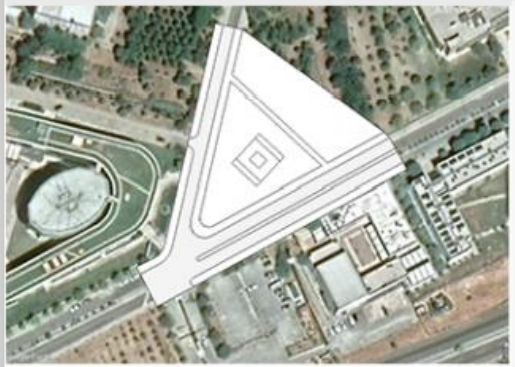
The entrance, which was not in the previous mass, was tried to be determined in this form. However, the new value was higher due to the **distortion of the** indentations and protrusions that appeared in the form.

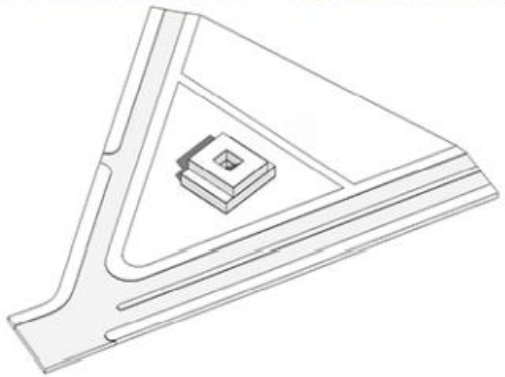


Fourth Form: 500 m2

217 kWh / m² / yr







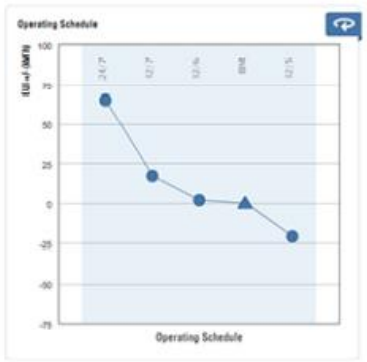
995

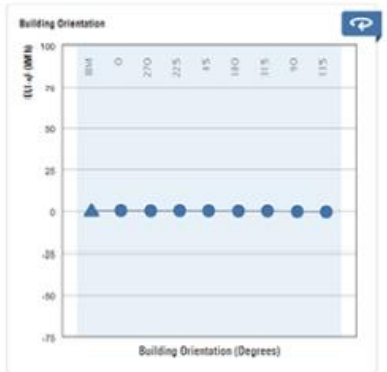
217

ASHRAE 90.1 154

10

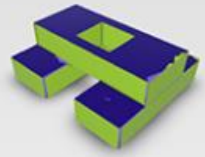
It is thought that the value can be decreased with a simple form by reducing the indentations and protrusions. However, the result was higher than the before.

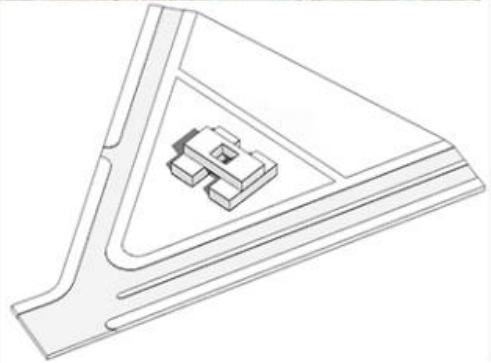




Fifth Form: 500 m2

249 kWh / m² / yr





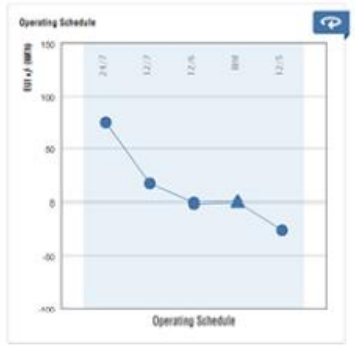
1097

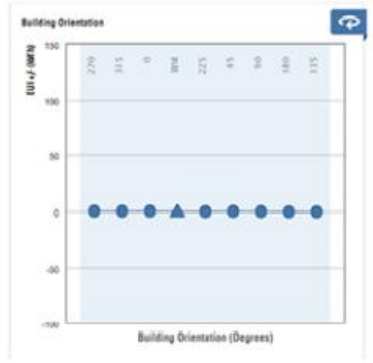
249

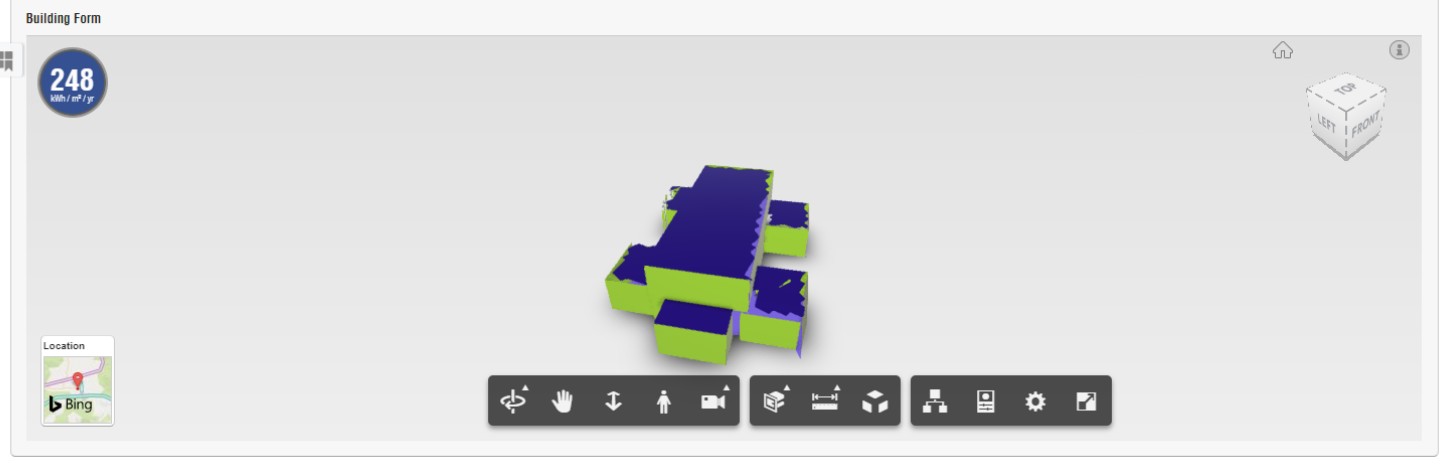
ASHRAE 90.1 166

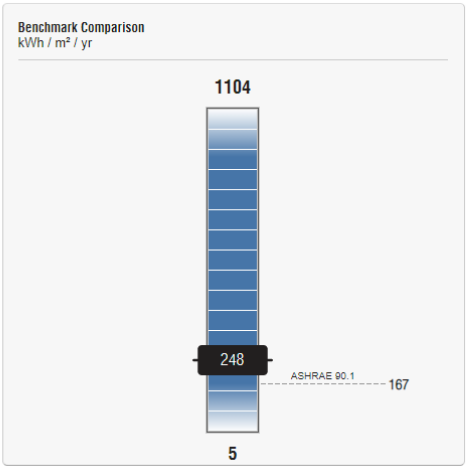
3

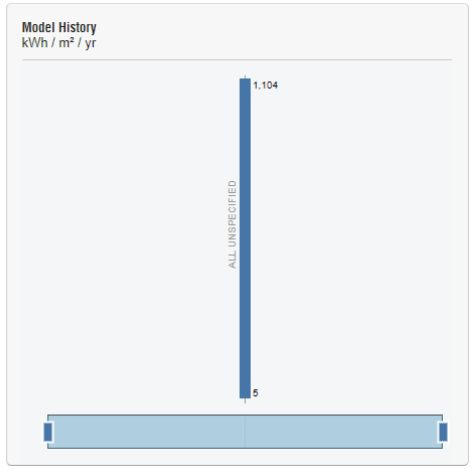
It is thought as a road leading through the building and two separate blocks on the ground floor. However, the result was higher than expected.

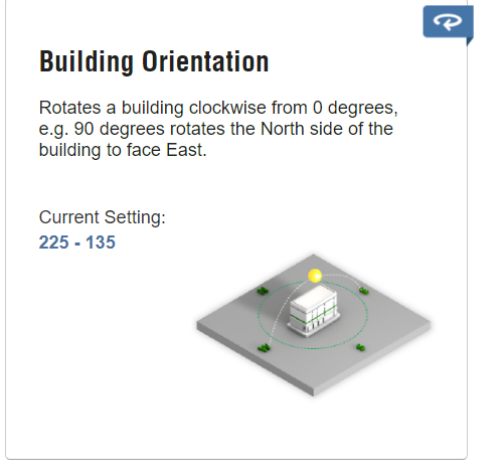


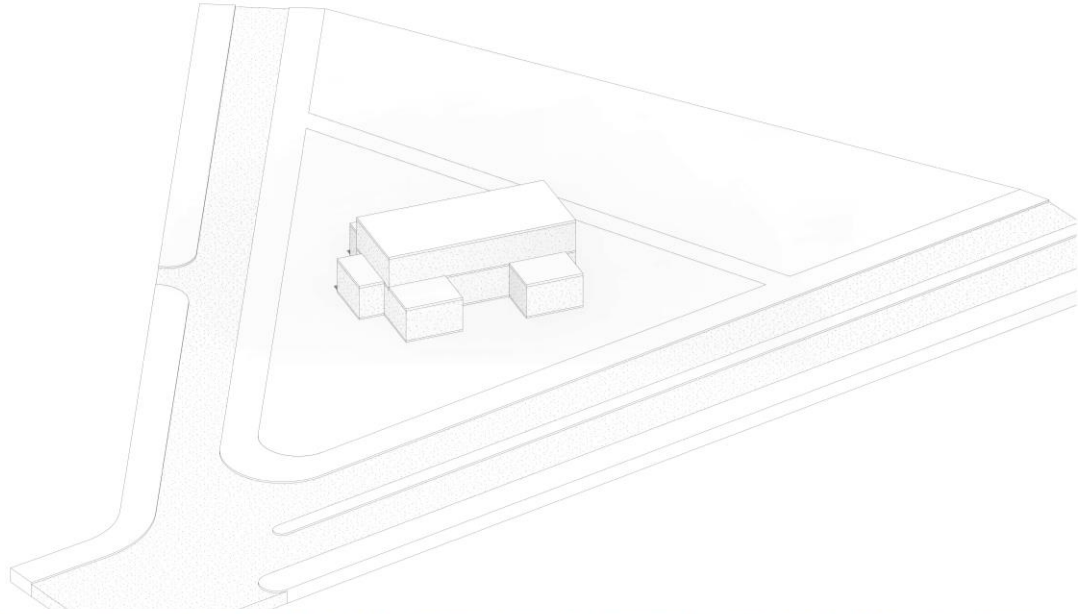


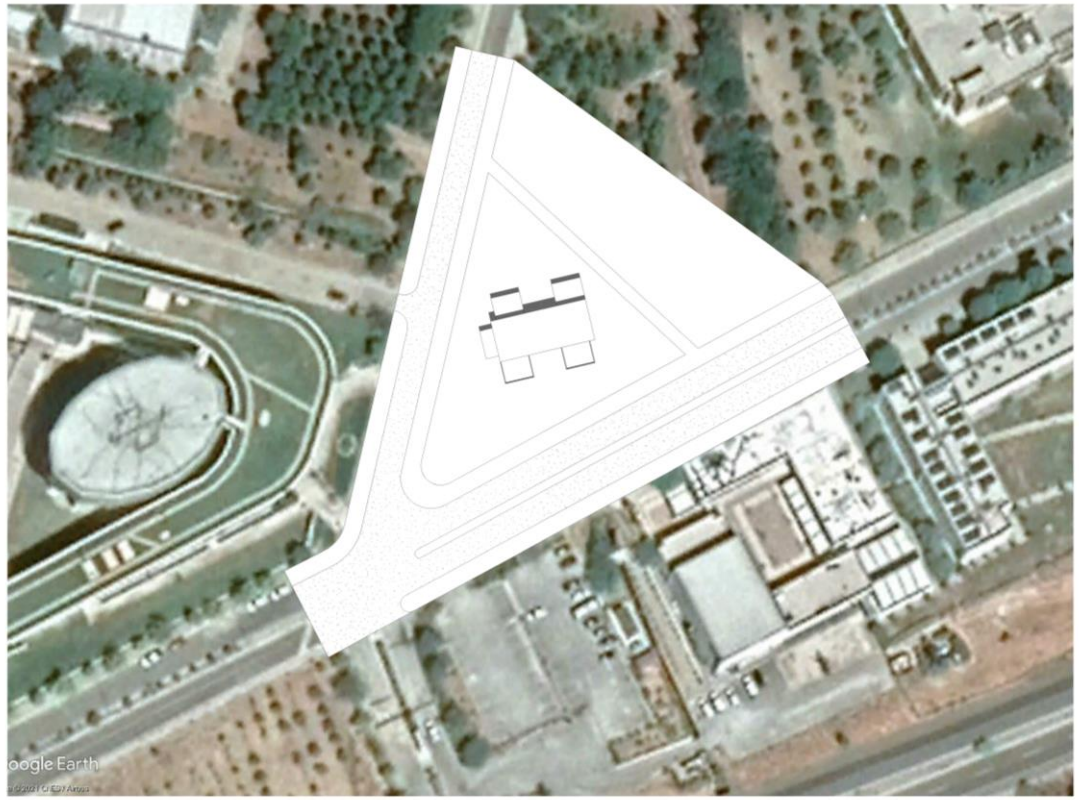






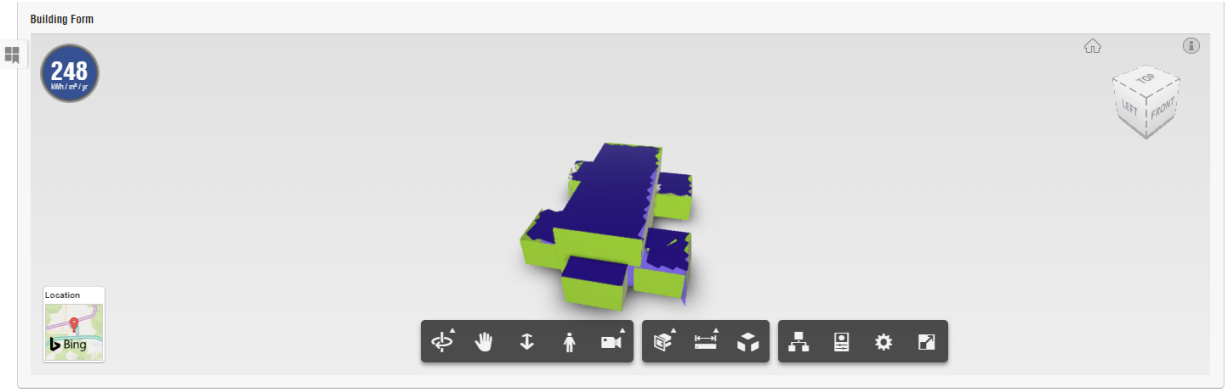


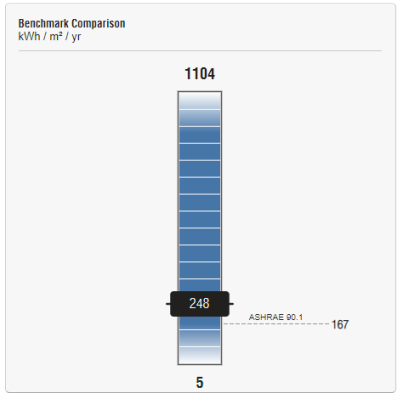


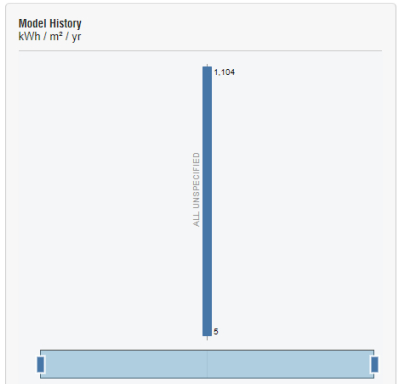


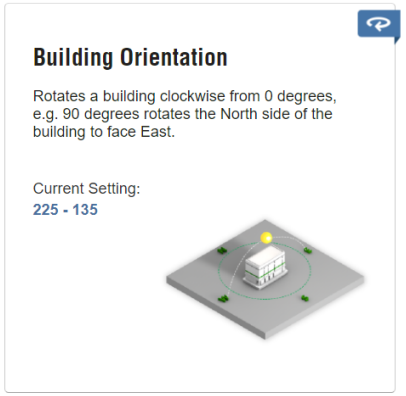
In this revise;we were concantrated on entrance and additional service area mass location.We used generated mass the previous revision which was 5th mass.We covered central gallerie to efficient usage for vertical circulation and efficient space qualities later on to reduce the KW/h/year.

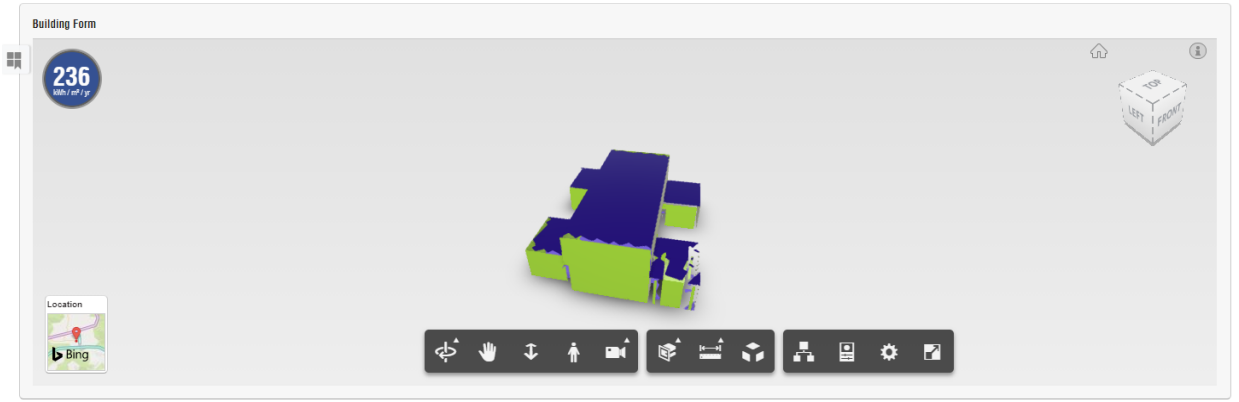
Mass Orientation Strategy

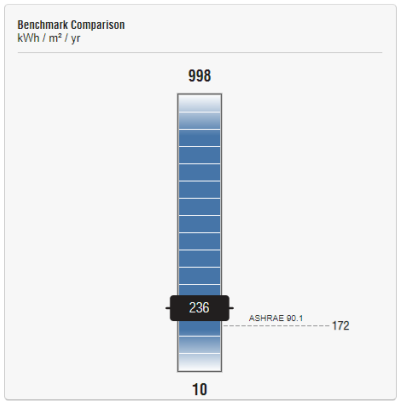


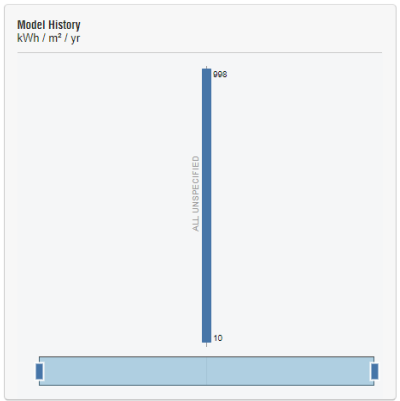


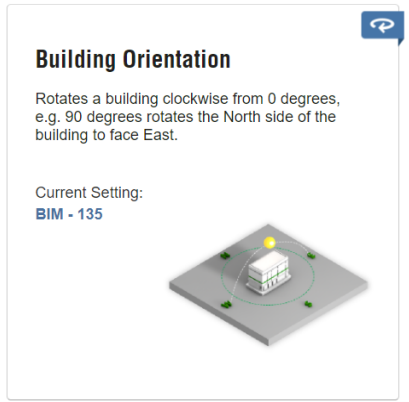






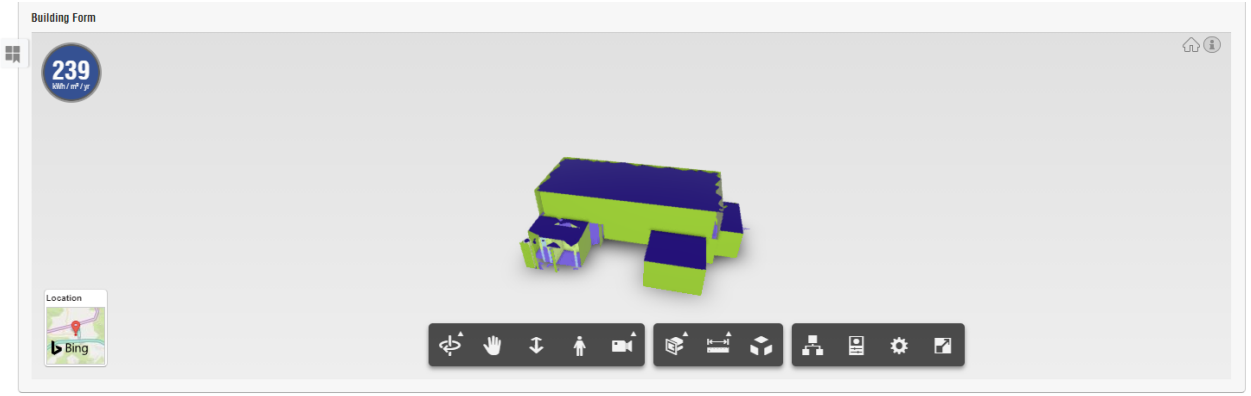


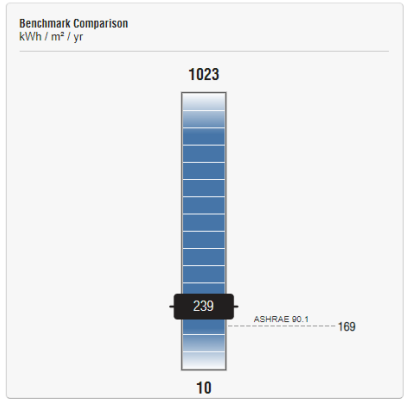


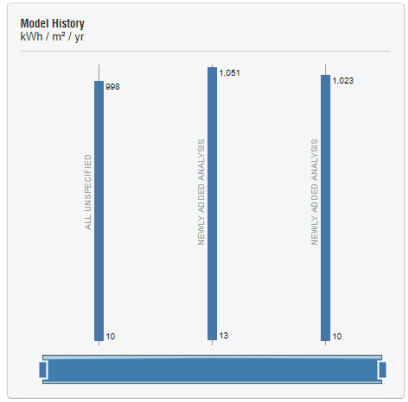


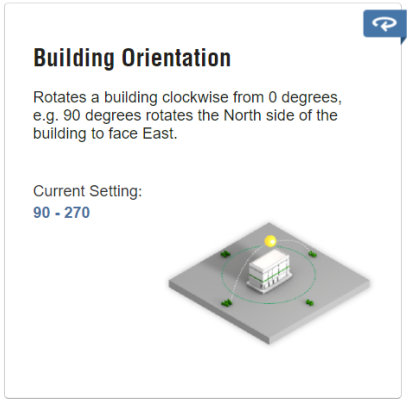
We see the north-south orientation is worse than this 180 degree rotation.

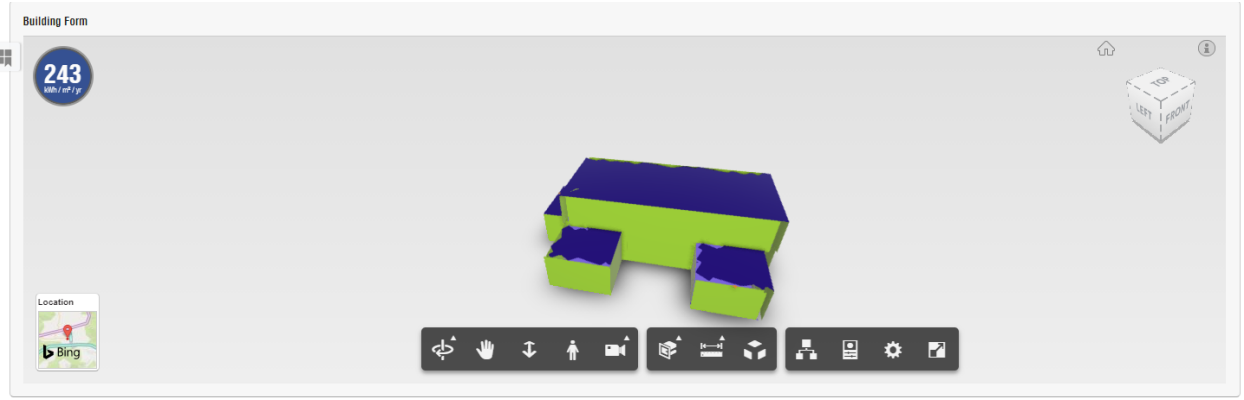
Here the difference between east-west 90 degree orientation around 4KW/h/year but still much from first orientation.

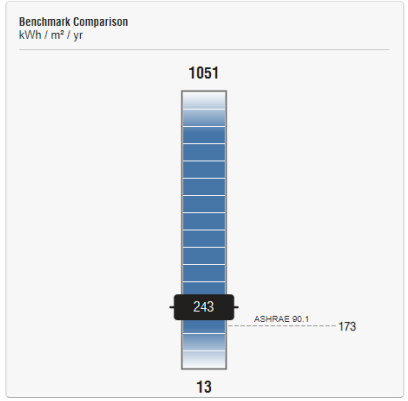


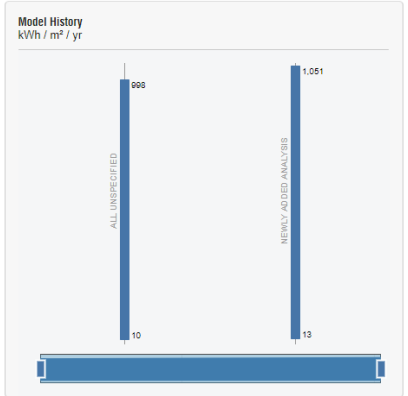


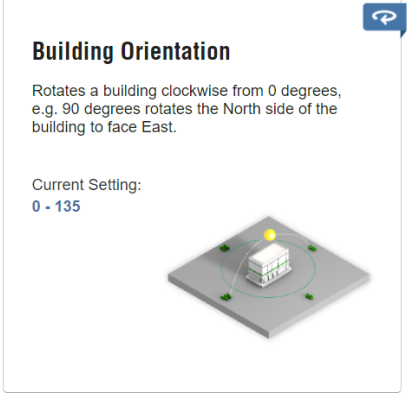


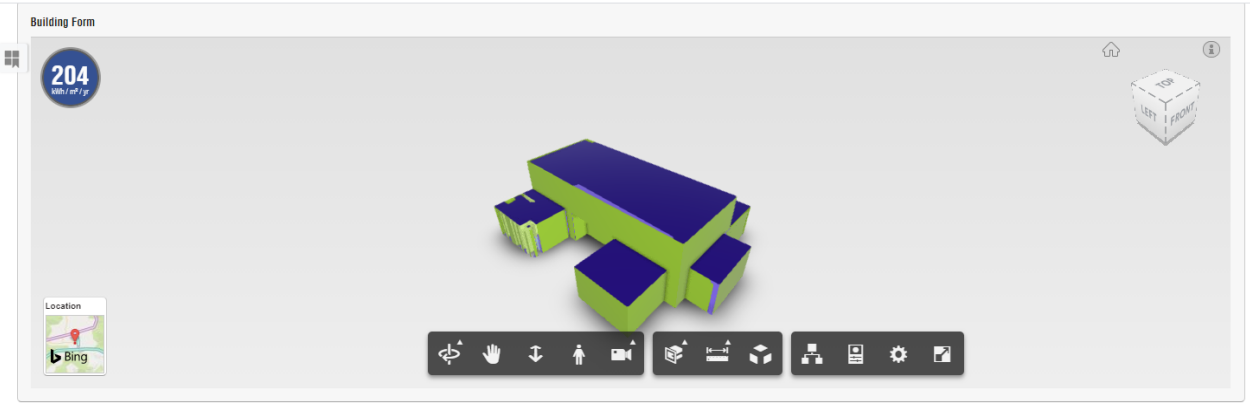


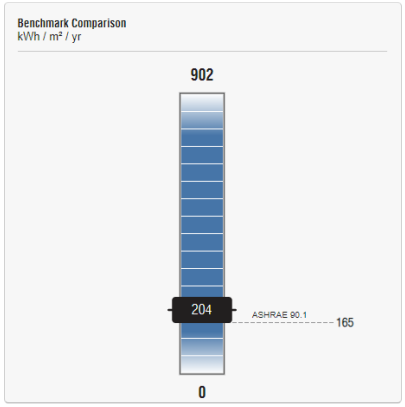


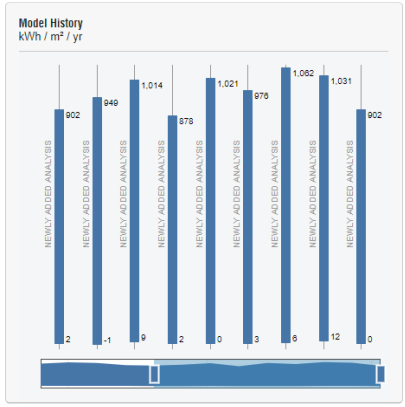


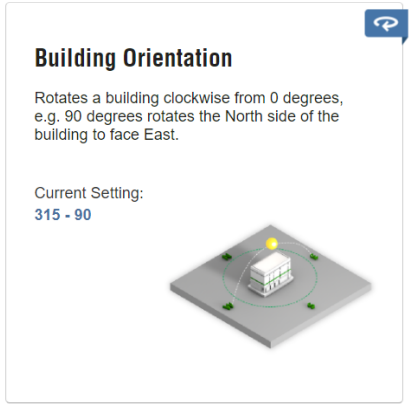


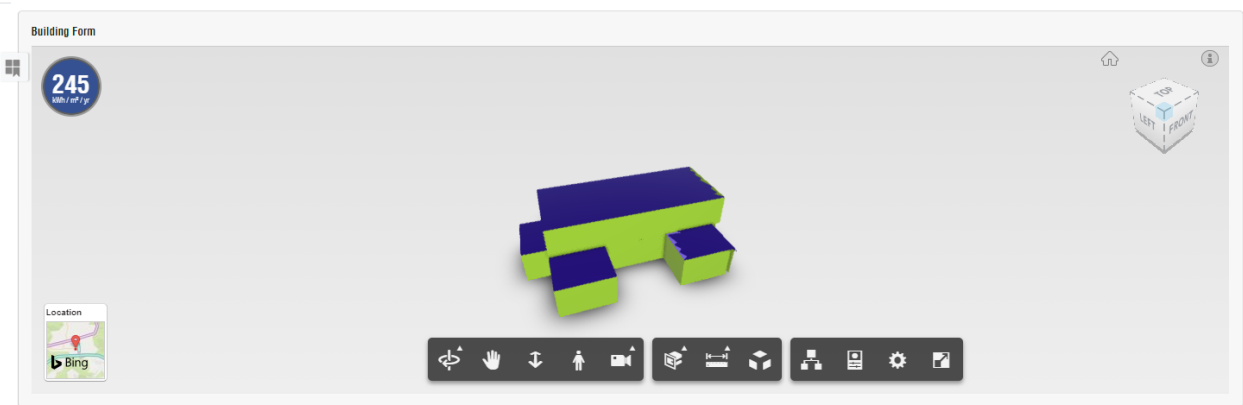


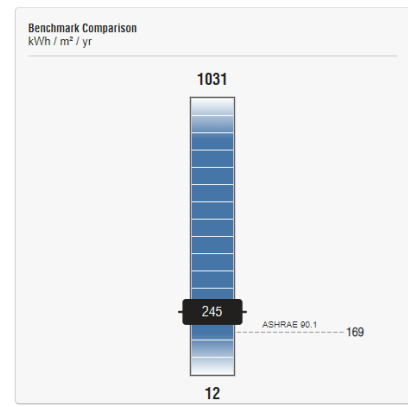


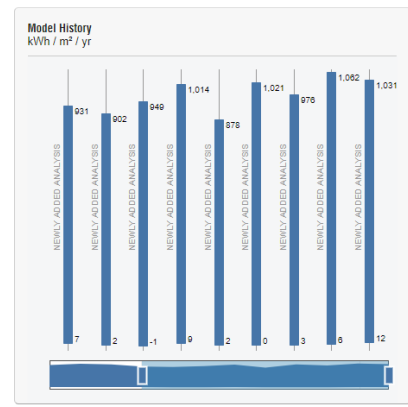


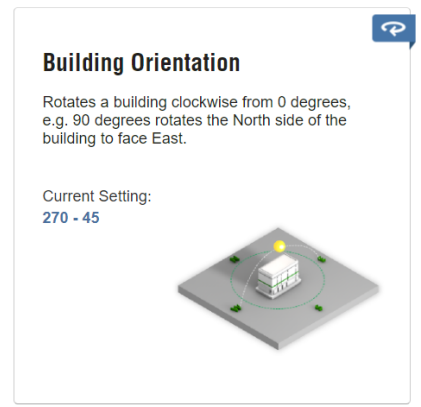






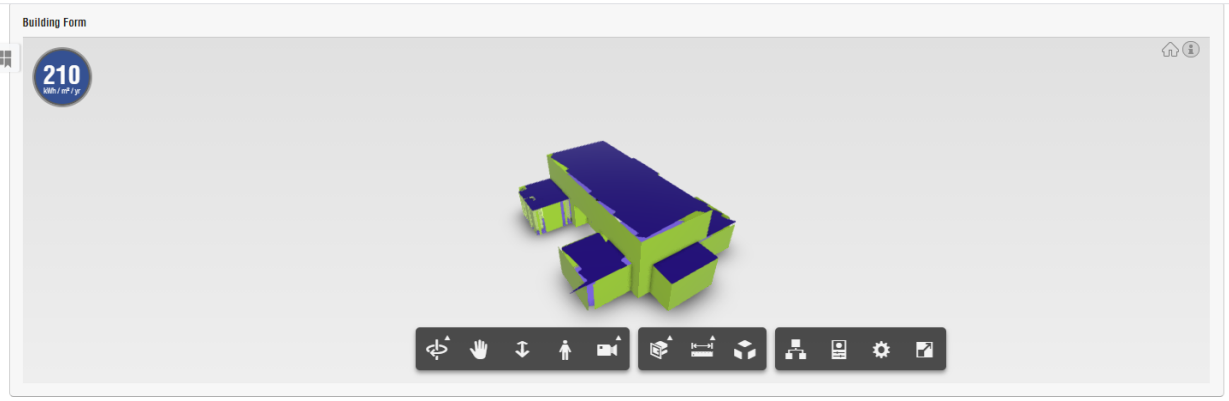


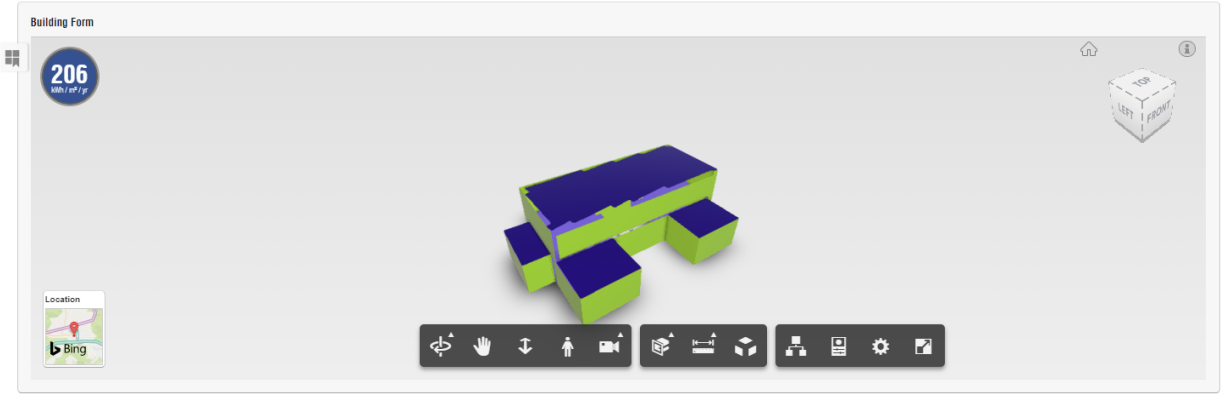


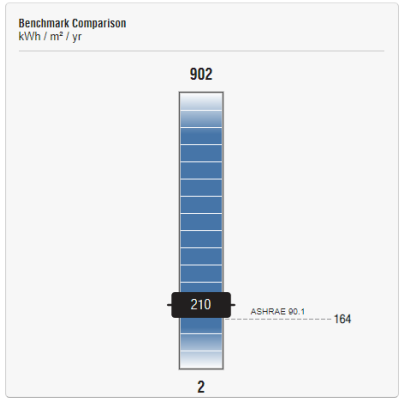


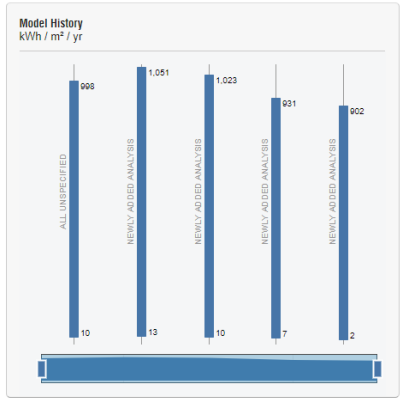
We have dramatic differantiation between east and west rotation because of the mass shape.

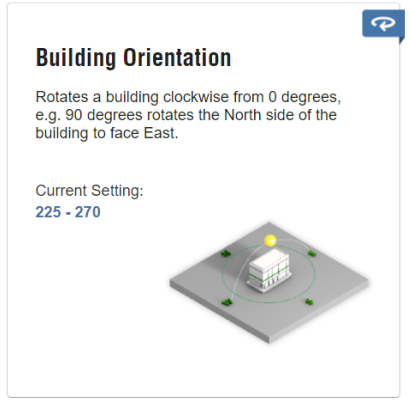
These orientations of the angle 45 is the very good energy consumption.

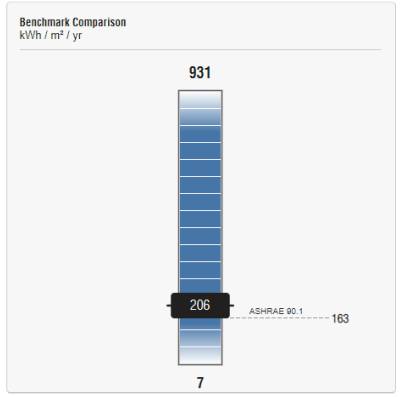


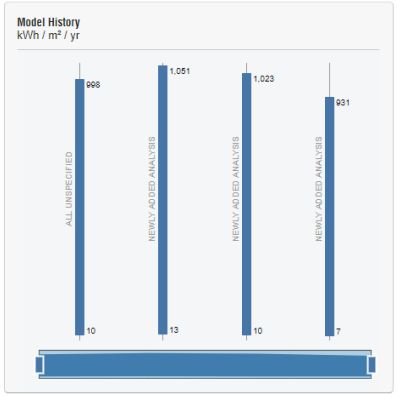


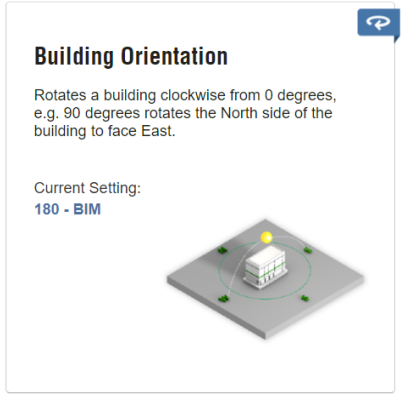


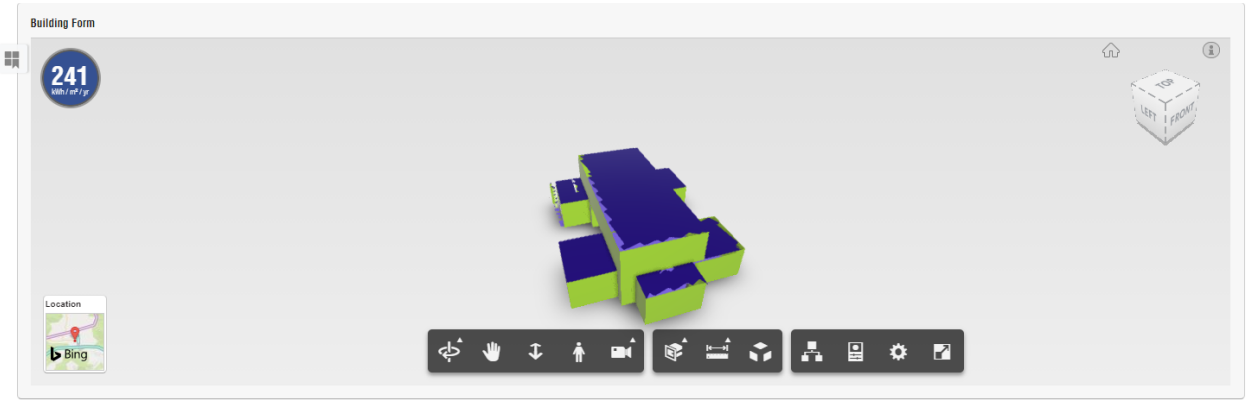


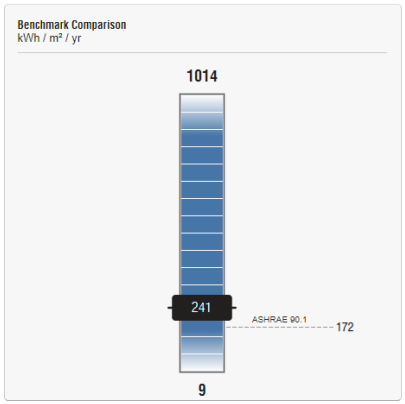


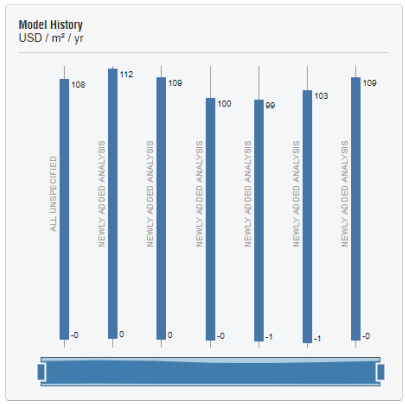


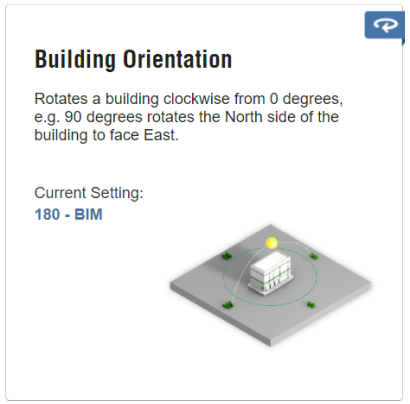


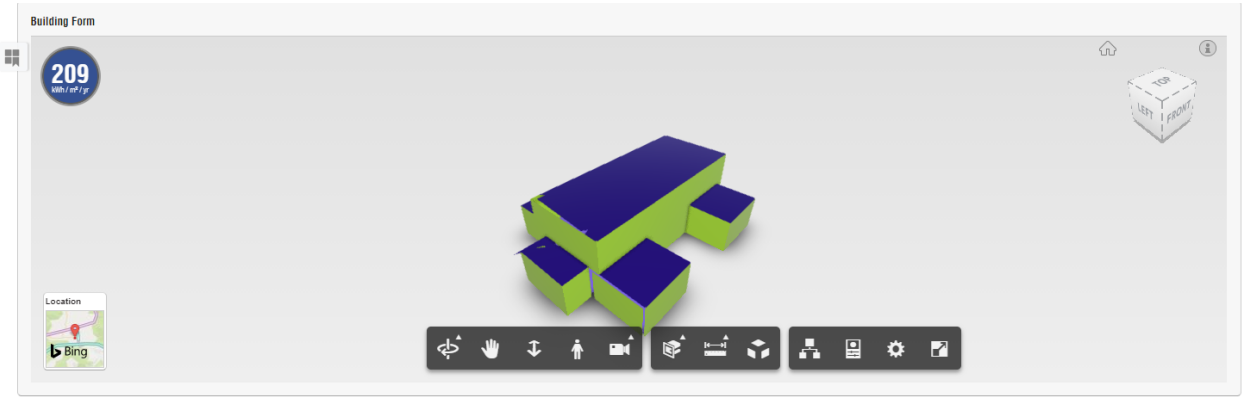


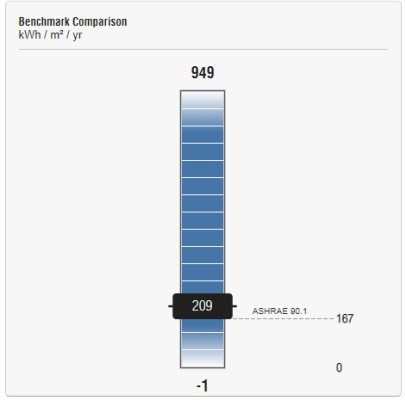


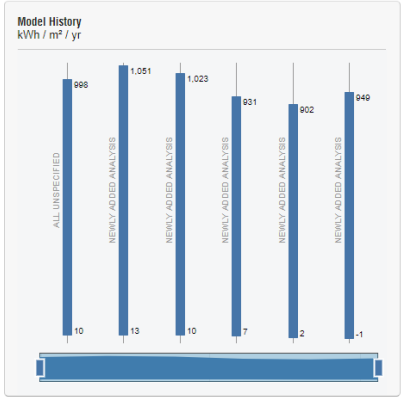


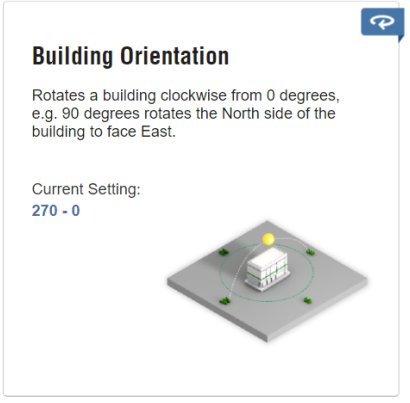






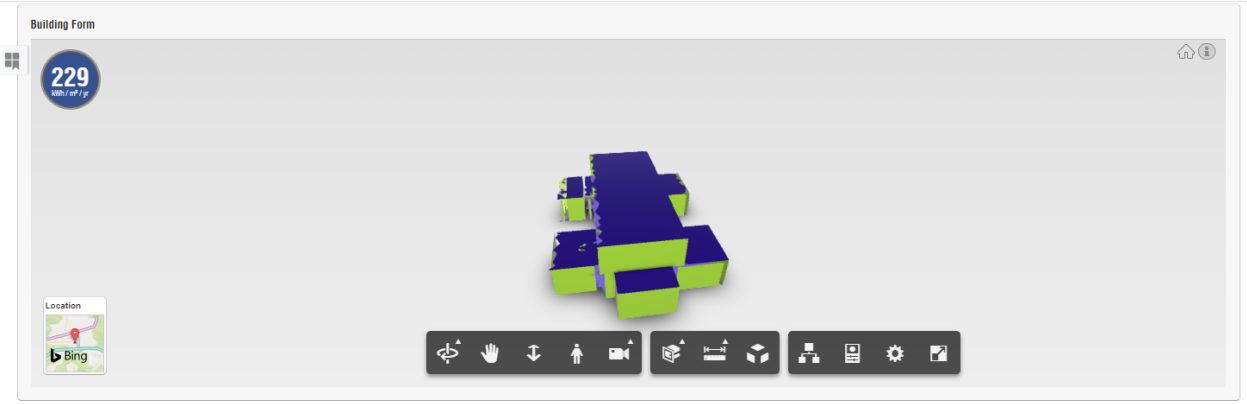


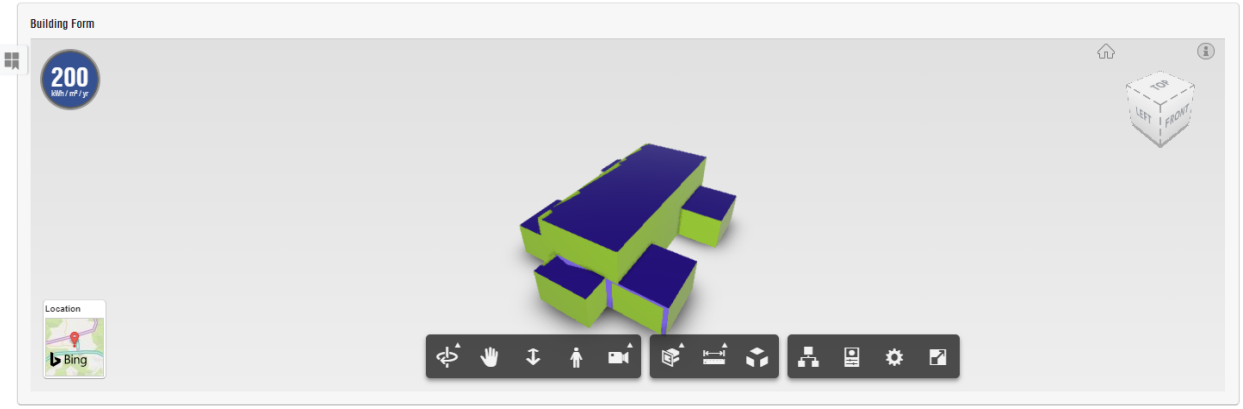


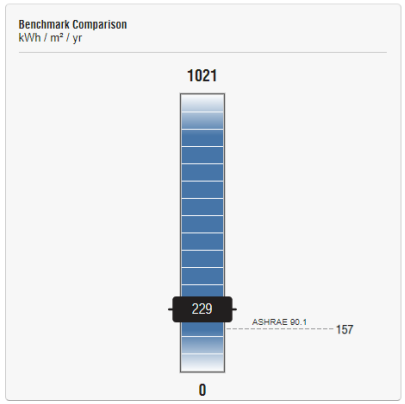


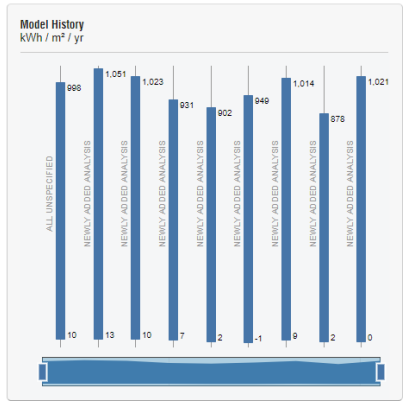
We had a same situation with 60 degree rotation the gap between west-east clearly seen.

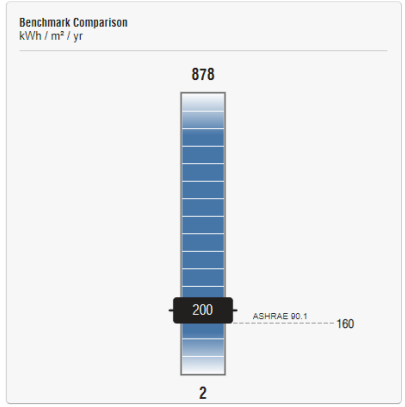
We see the decrease of the energy quantity from the numbers.Thanks to the different tries we caught the 200 KW number at 20 degree rotation to east.

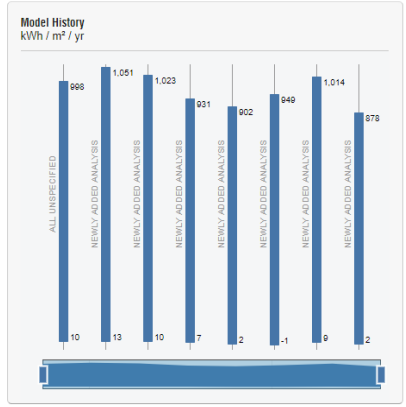


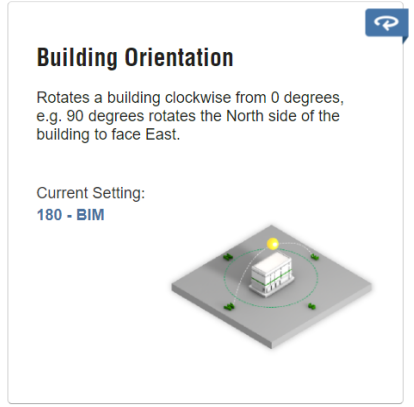


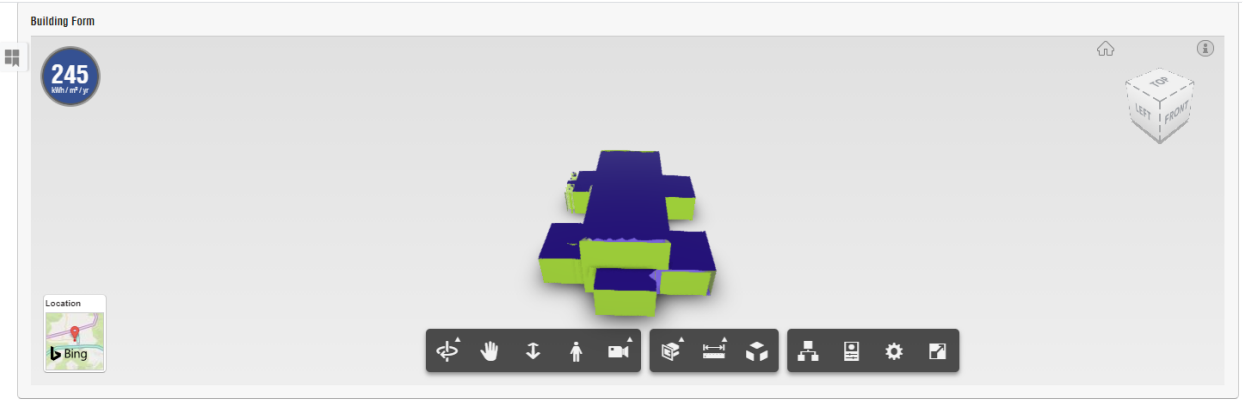


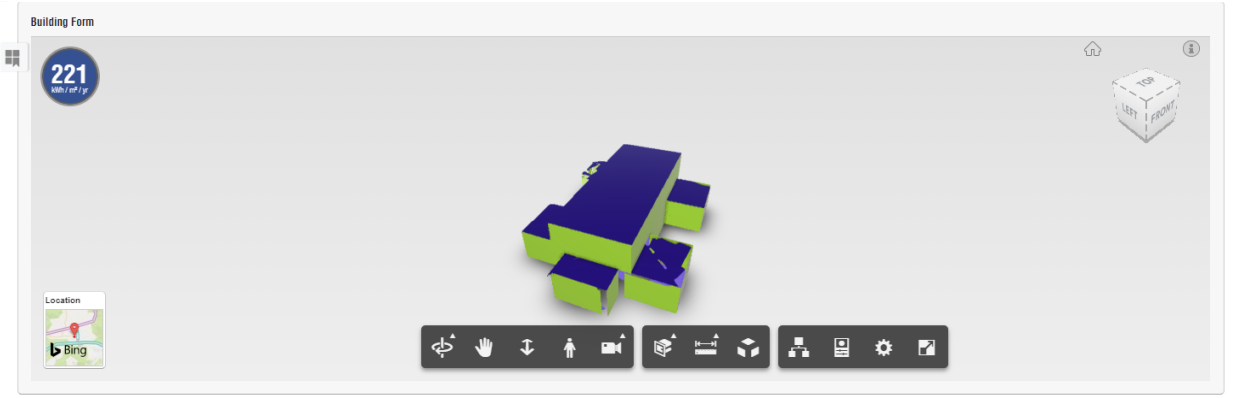


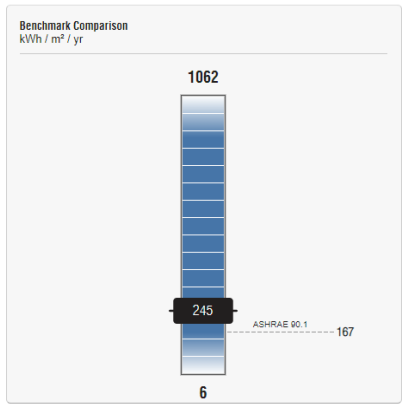


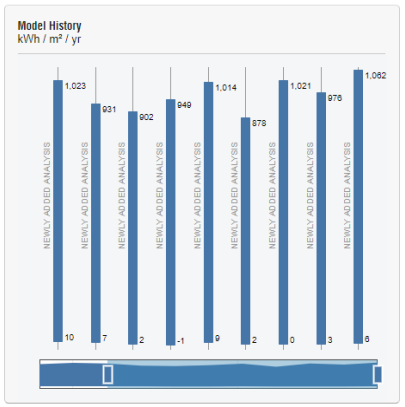


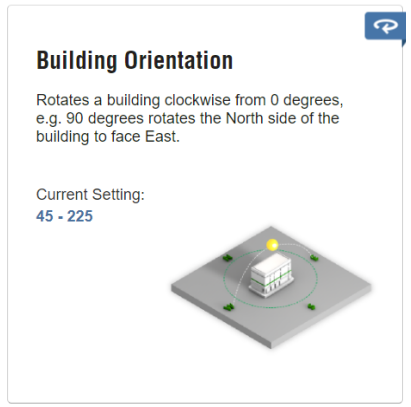


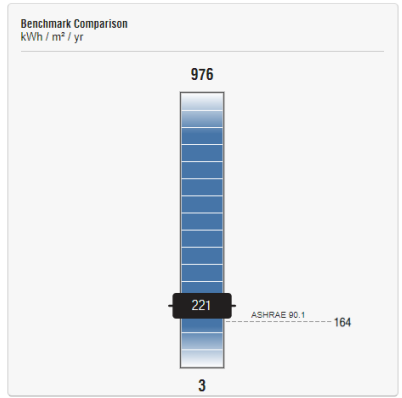


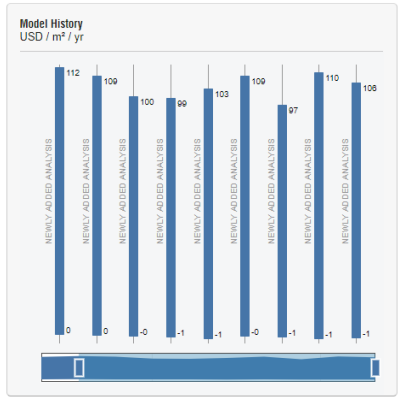


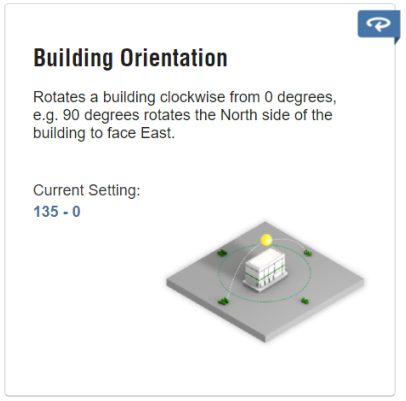






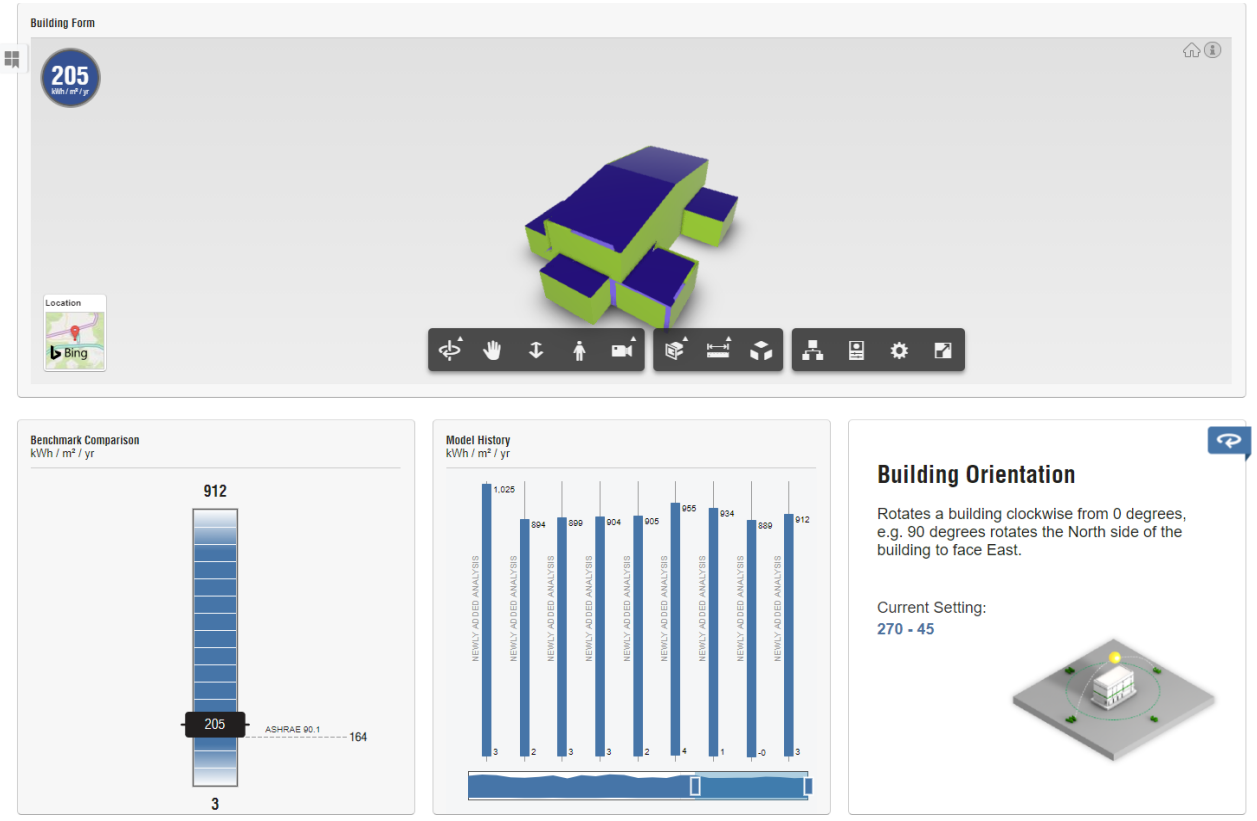


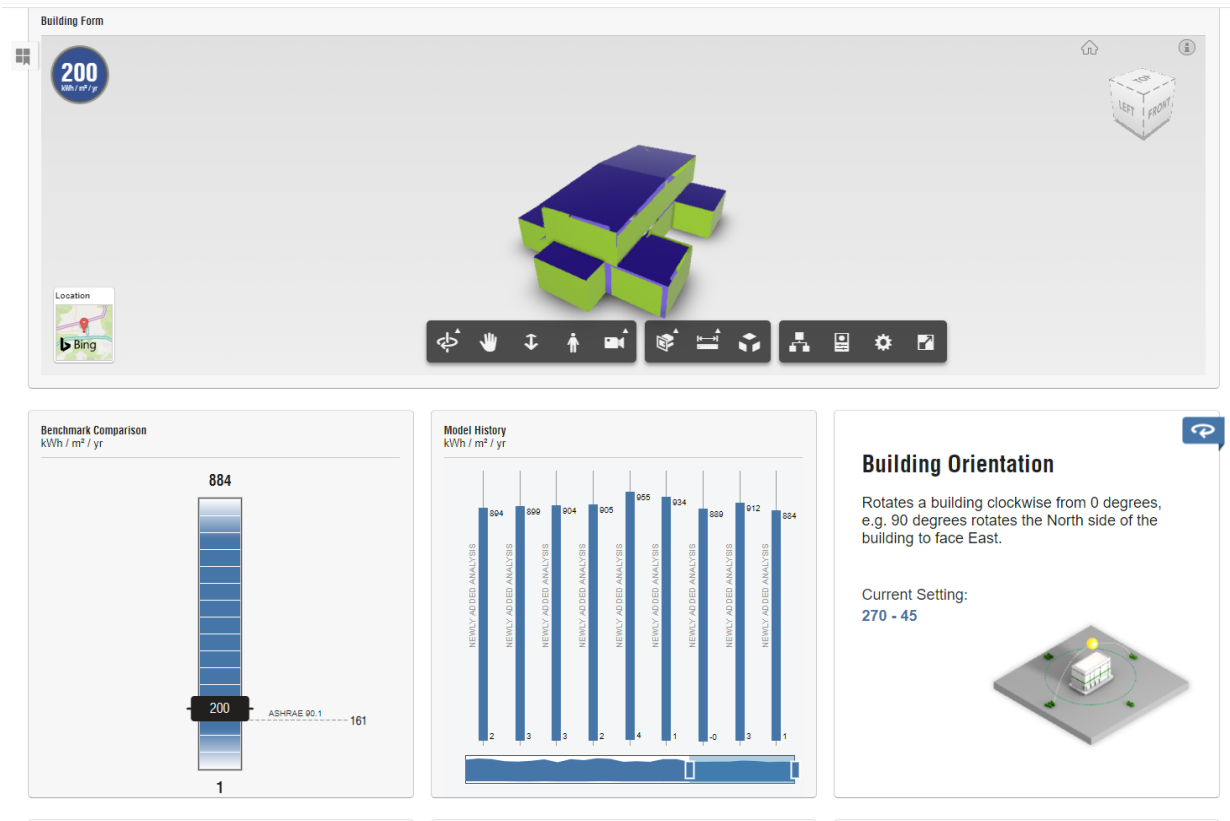




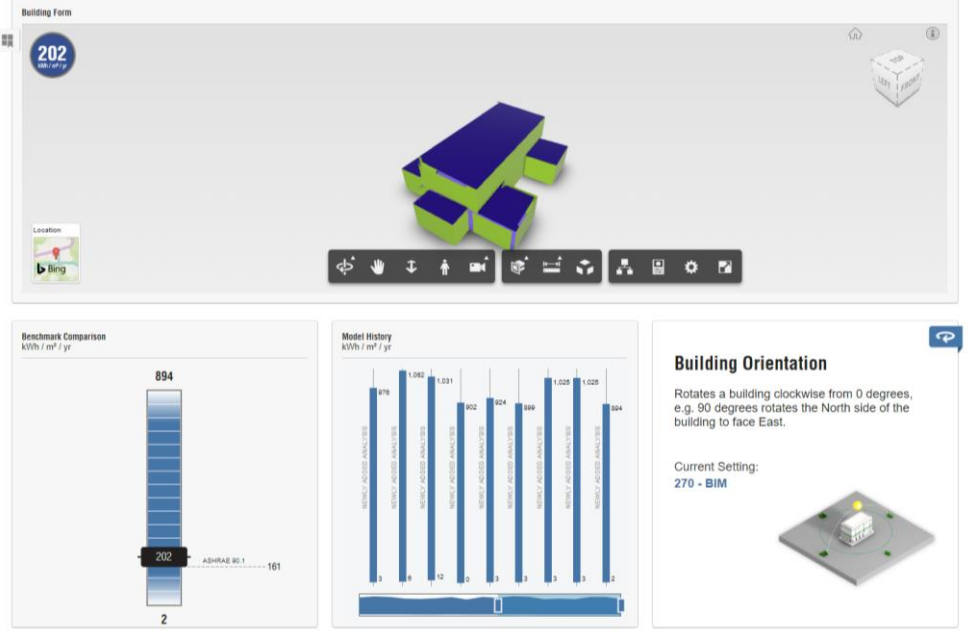
Here the energy consumptions is much from original orientation about 15-20 KW

Roof Shape Strategies

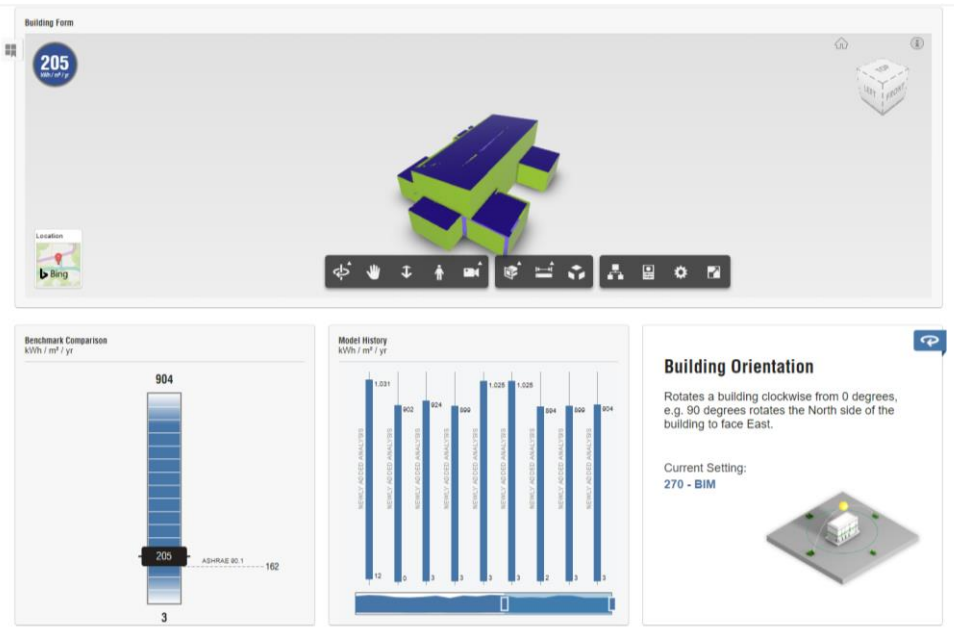




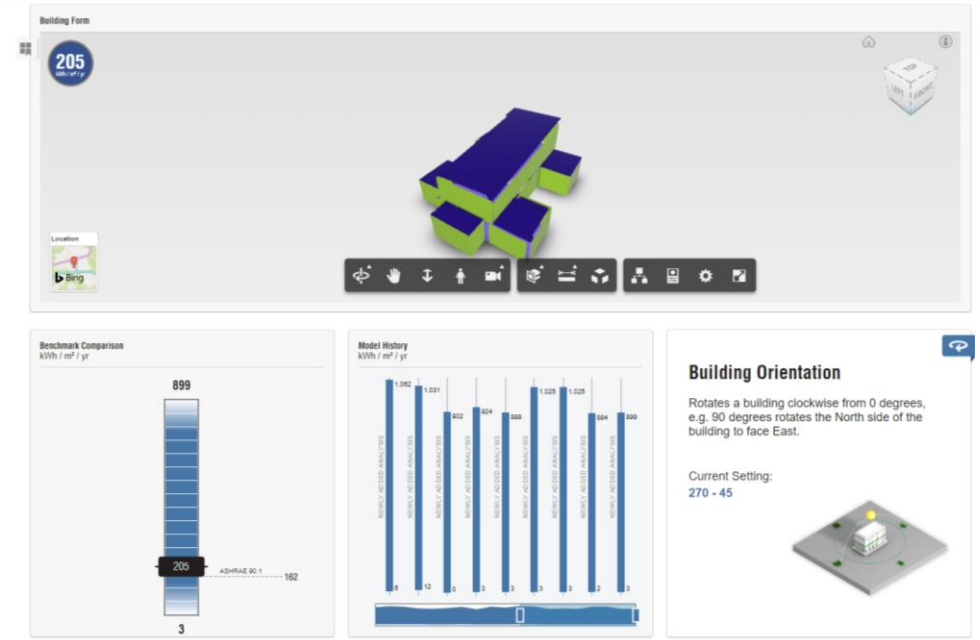
The slope of 2 side converging hipped roof at the middle is very good values for KW/h/per year. We could reach the 200 KW with 5 degree close the parameter of 200! With the increase of the rib degree to 8 we had 205 KW/h/per year.



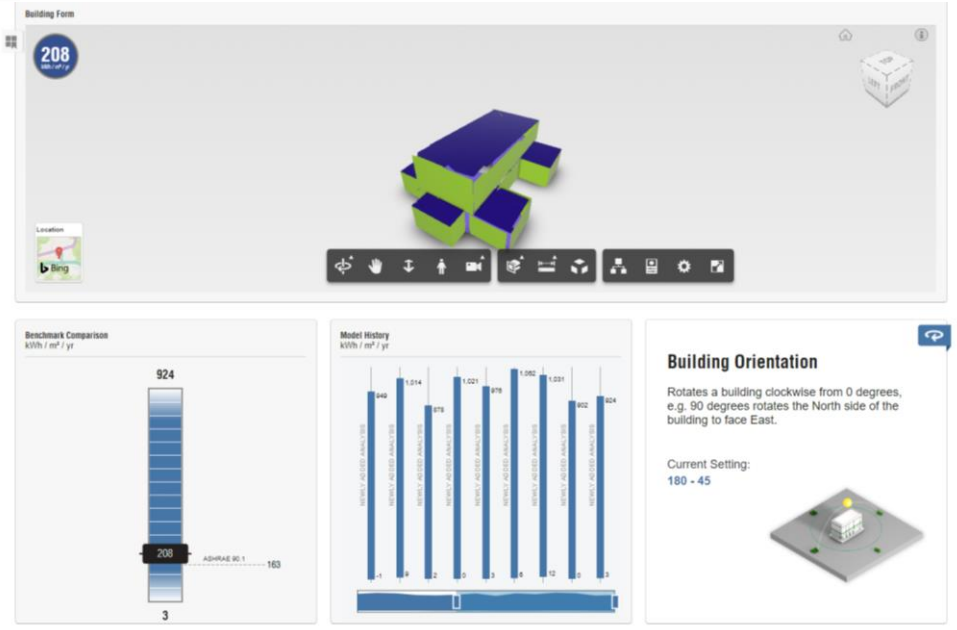
NORTH SLOPED



SOUTH SLOPED



EAST SLOPED



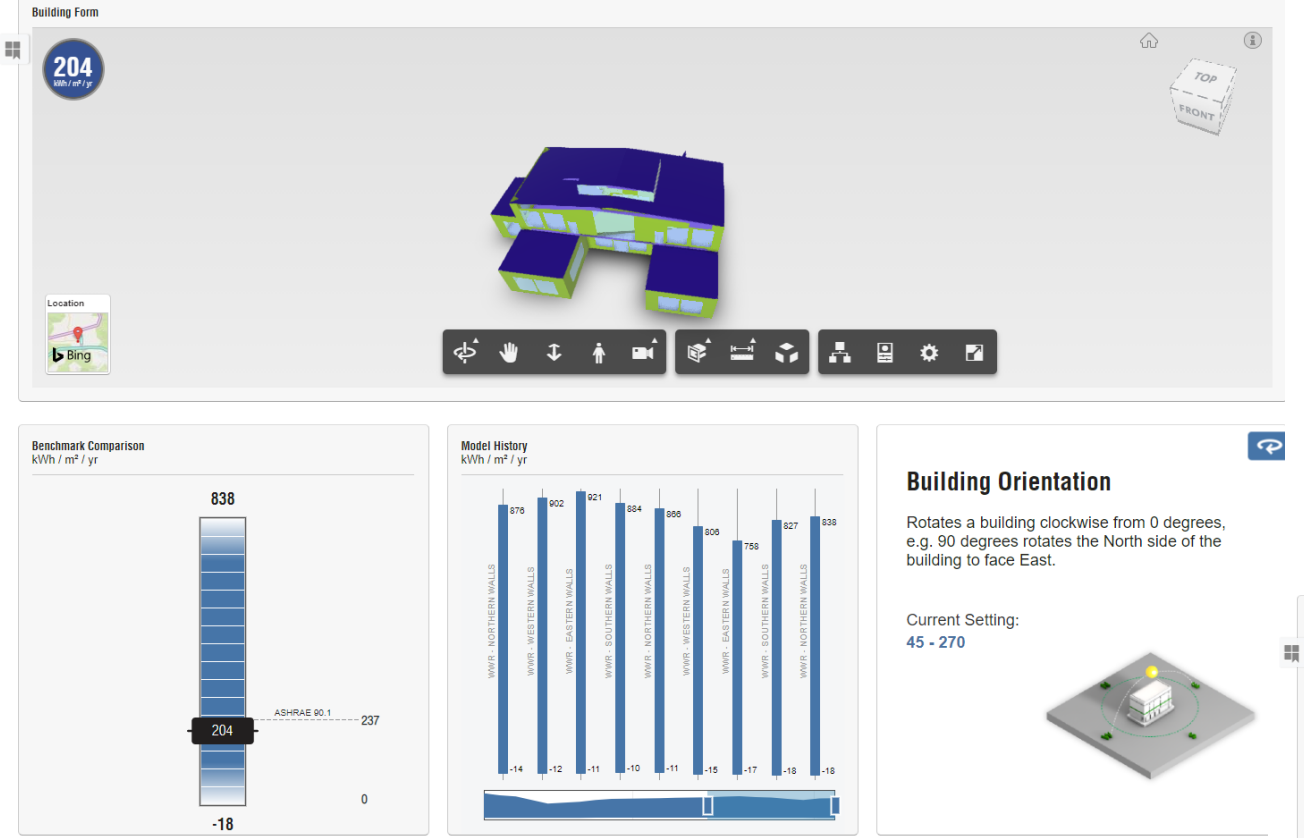
WEST SLOPED

5 DEGREE SLOPED ROOF FOR 4 DIRECTION

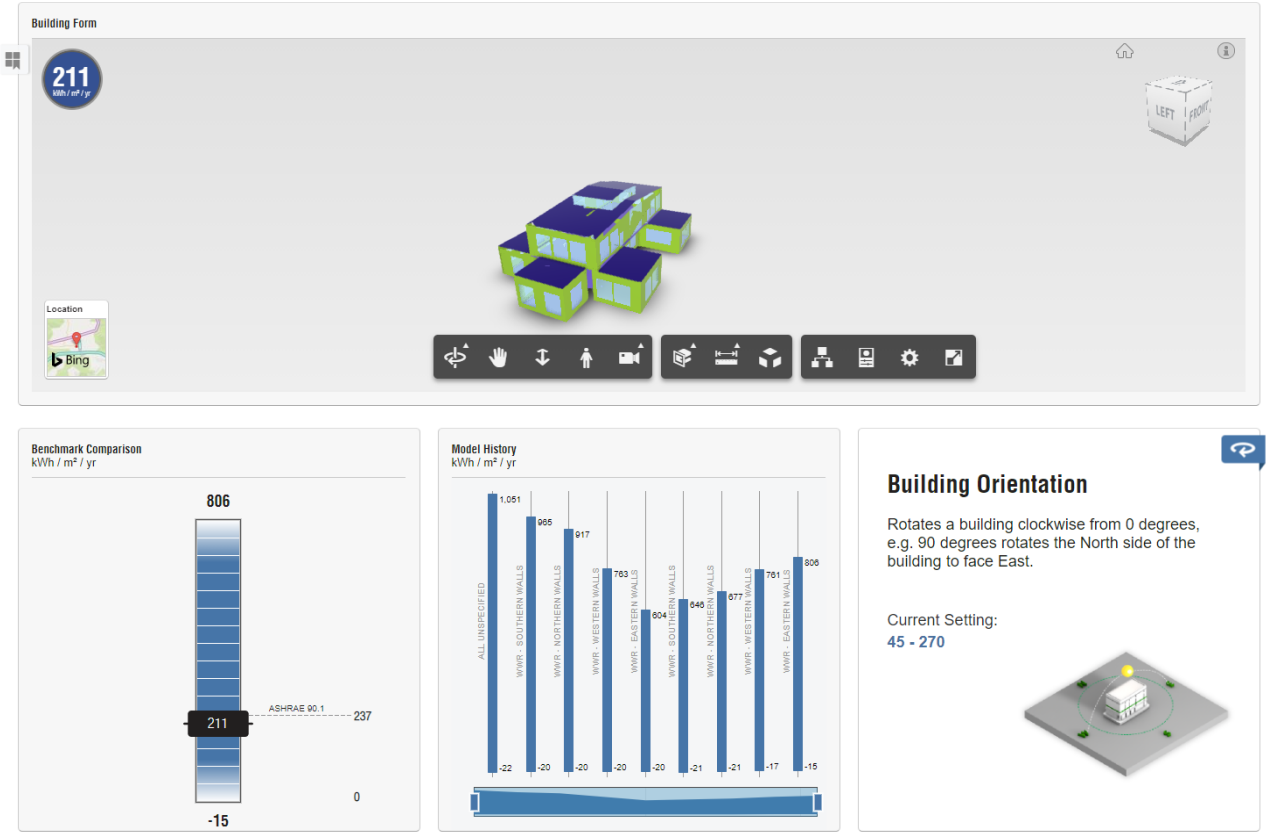
We try to analyze one way sloped roof with 5 degree with 4 way orientated.Especially for short edges of slope are not good for KW per h. For long side slopes are acceptable.

Opening Strategies

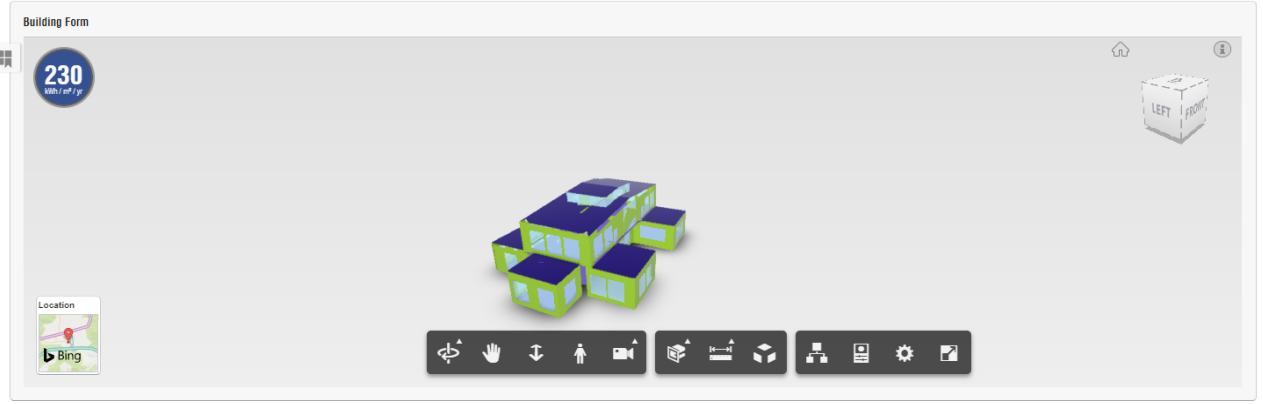
- In this excercise, we were trying to effect of glazing area percentage to the energy consumption. Here wee see the little increase at 30 to 40 percentage.



%30 glazing

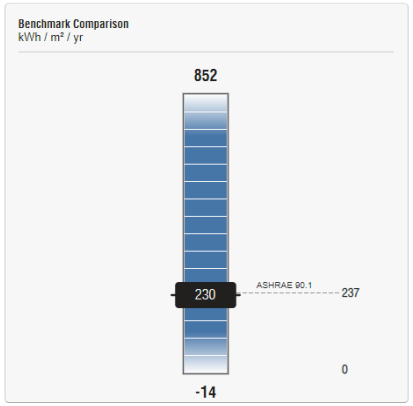


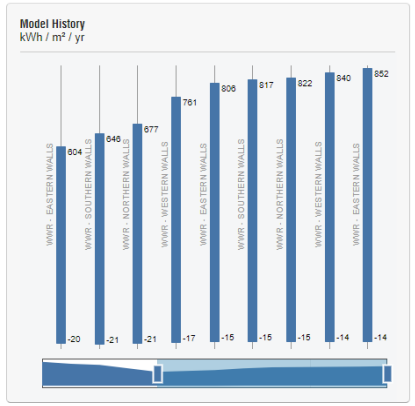
%40 glazing

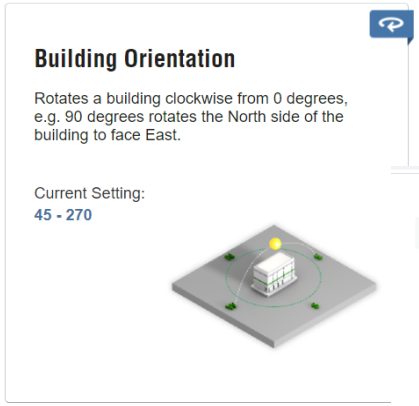


We examined the higher glazing values for our project.

While we increasing the glazing percentage,we see the energy consumption value is increasing rapidly.

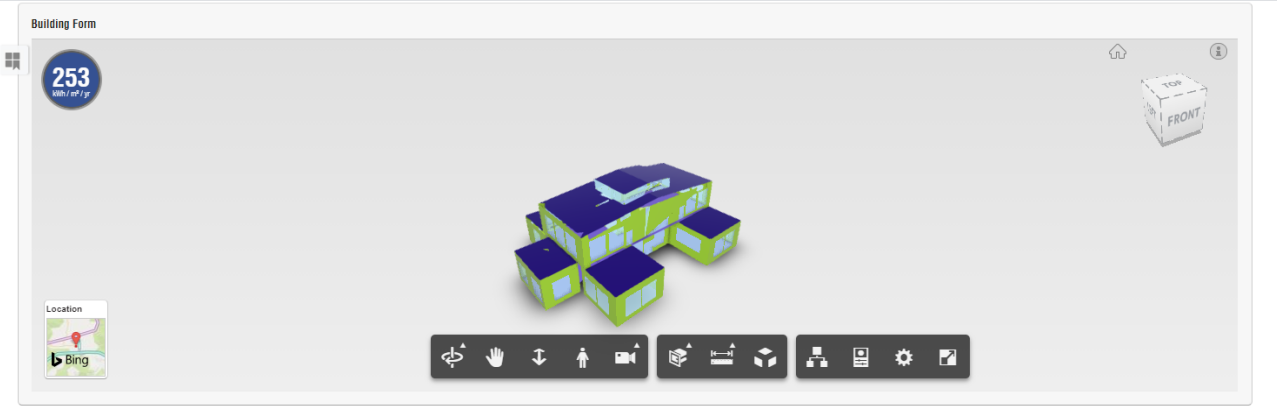


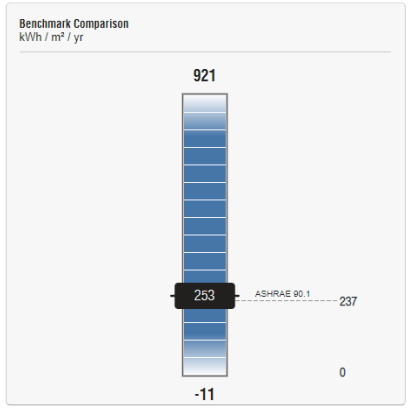


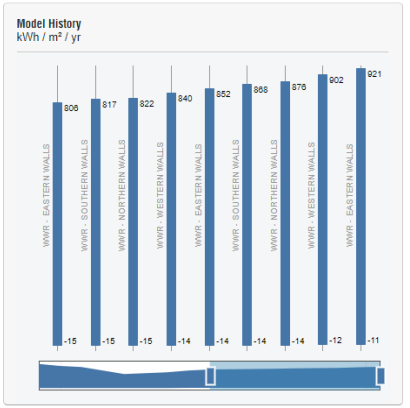


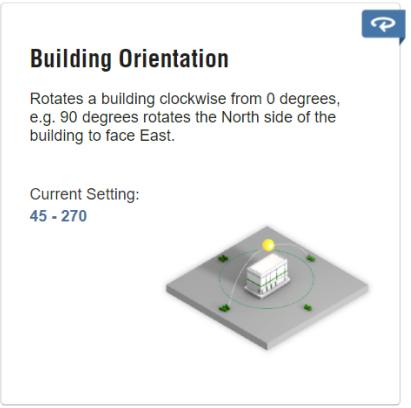
%50 glazing

So that,We selected the %40 percentage of glazing for taking natural light efficiently and for nice heat consumption.



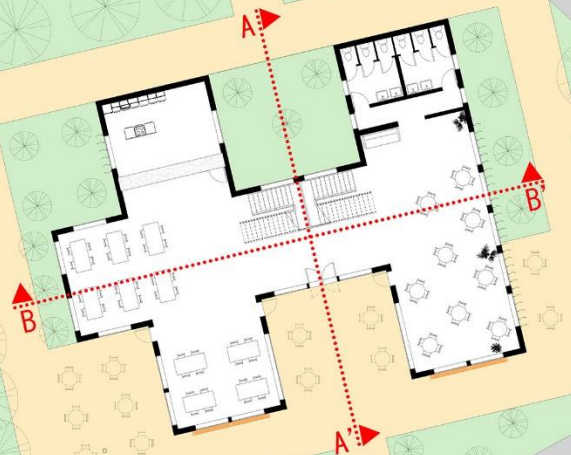






%65 glazing

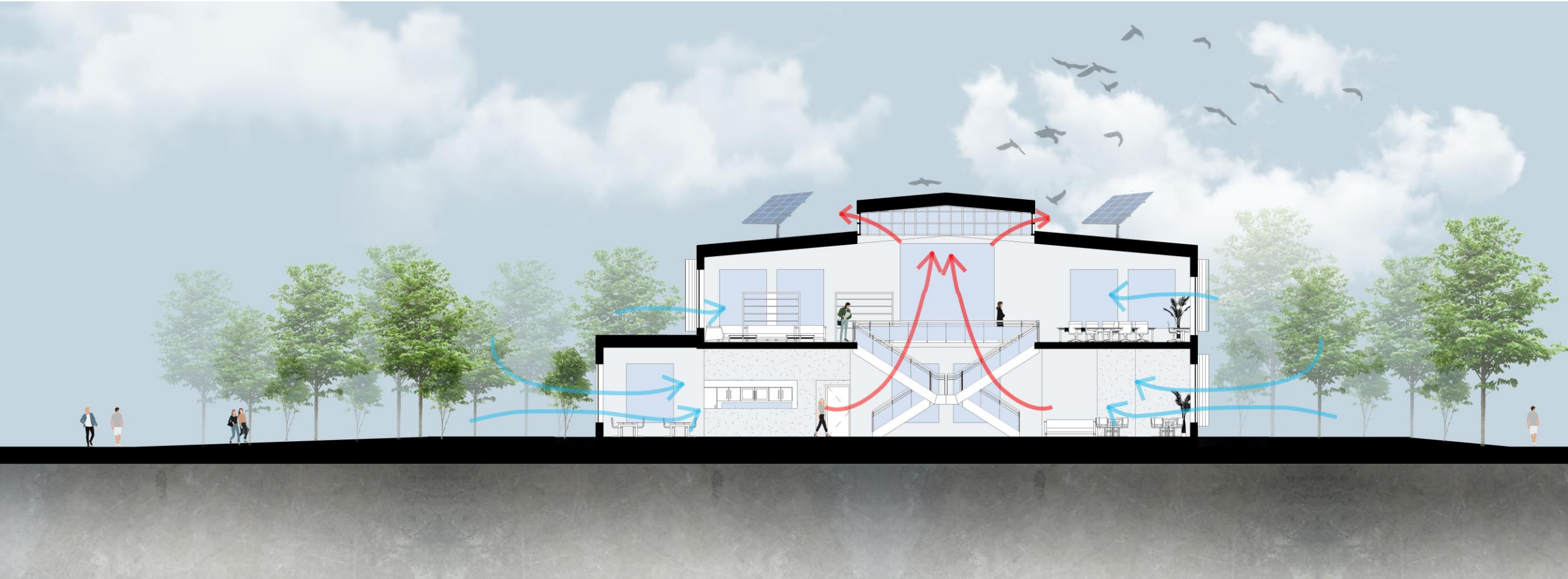
Floor Plans & Sections 1/100



First Floor Plan

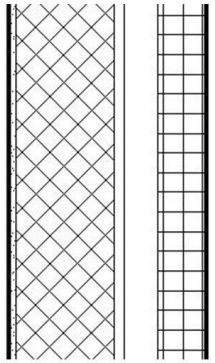
SECTION A-A

SECTION B-B



Material Strategy

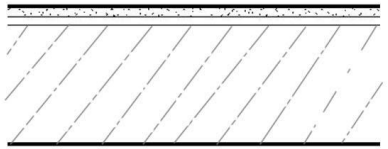
Walls



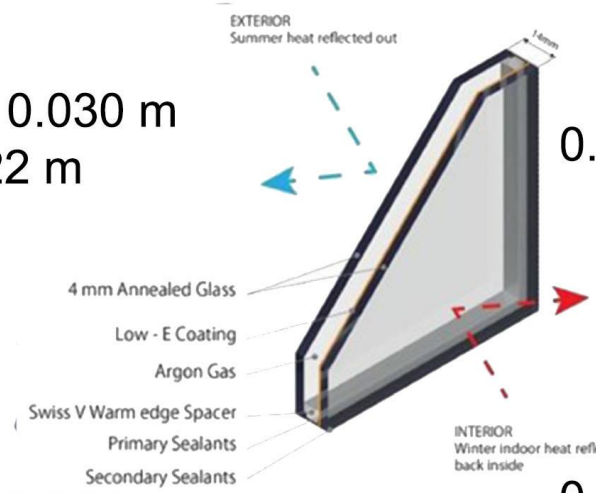
EIFS, Exterior Insulation -- 0.075 m
Air -- 0.05 m
Air -- 0.00 m
Plywood Sheating -- 0.015 m
Metal Studs -- 0.15 m
Vapor Retarder -- 0.00 m
Gypsum Wallboard -- 0.012 m

0.2568 W/(m².K)

Floors



Oak Flooring -- 0.030 m
R.C. Slab -- 0.22 m



0.5302 W/(m².K)

Slab on Grade

Slab on Grade
Oak Flooring -- 0.030 m

0.3096 W/(m².K)

Double Glazed

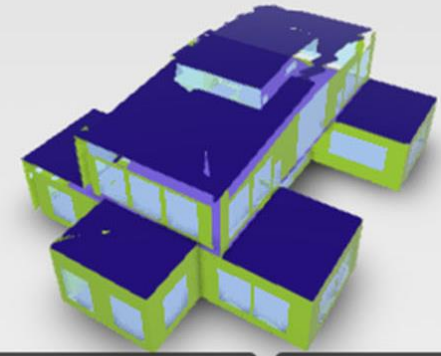
1.667 W/(m².K)

Roofs

Roofing, EPDM Membrane -- 0.005 m
Rigid Insulation 0.10 m
Metal Deck -- 0.005 m
Structure, Steel Bar Joist -- 0.40 m

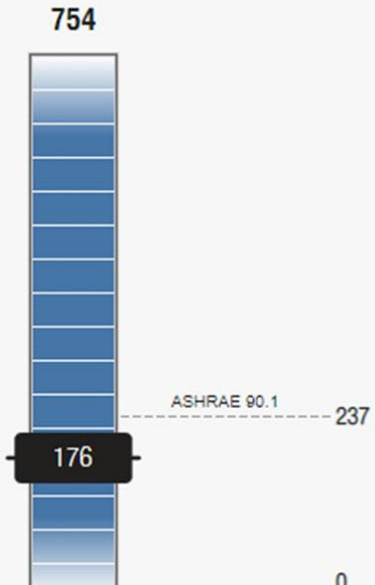
0.1708 W/(m².K)

176
kWh / m² / yr

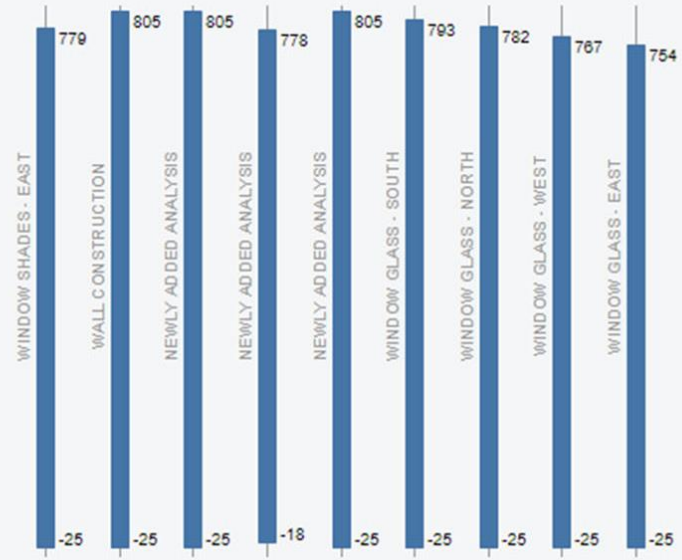


Location

Benchmark Comparison
kWh / m² / yr



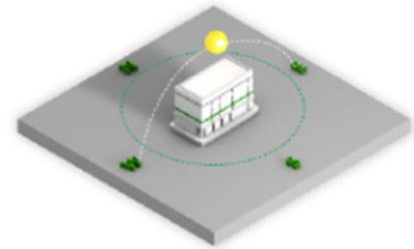
Model History
kWh / m² / yr



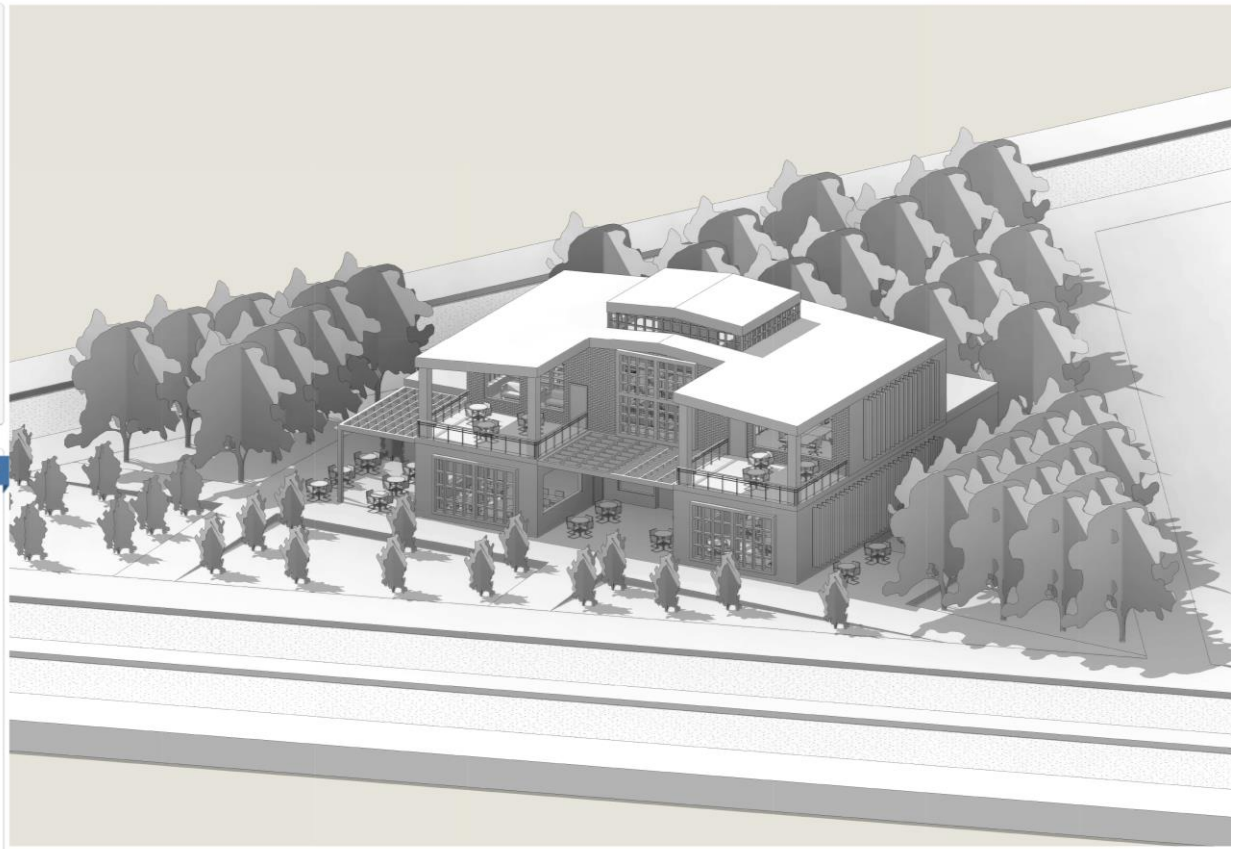
Building Orientation

Rotates a building clockwise from 0 degrees, e.g. 90 degrees rotates the North side of the building to face East.

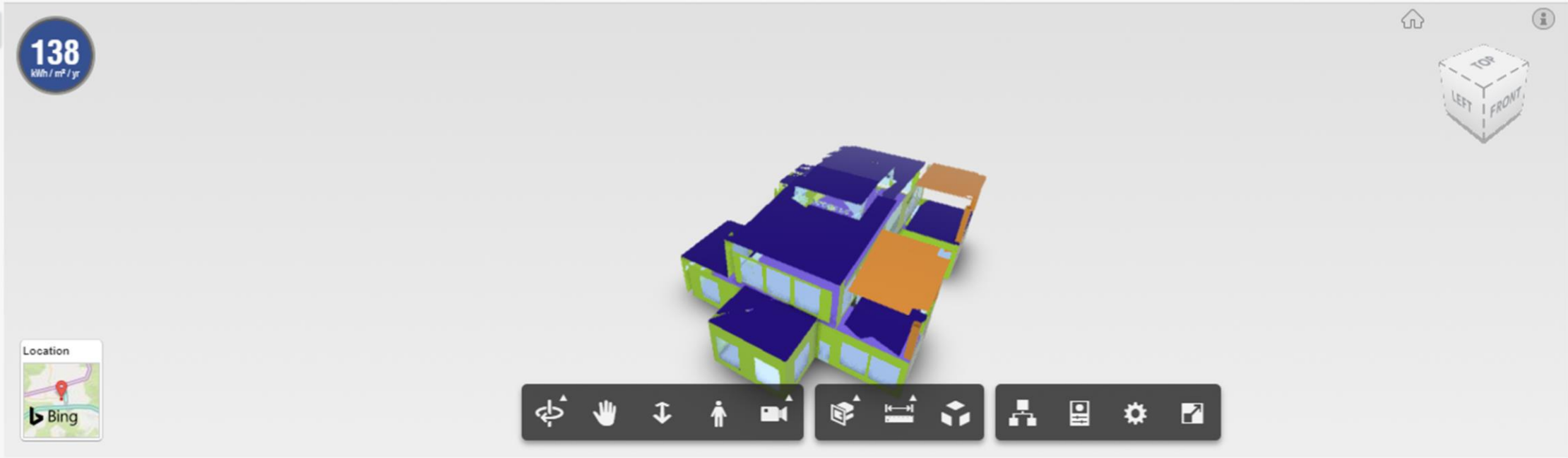
Current Setting:
45 - 270



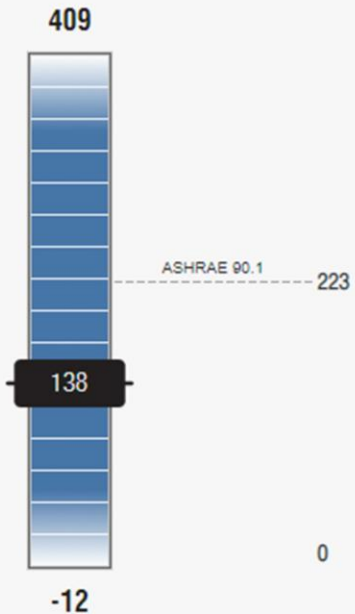
Shading Strategy



General shading elements format south(horizantal) east-west(vertical).However,here we were used mix-design for south parth to minimize heat gain.
Also we were add artificial elements in the program which are trees.
We did not need any shading elements for the north parts.



Benchmark Comparison
kWh / m² / yr

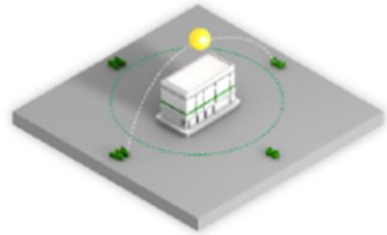


Model History
kWh / m² / yr

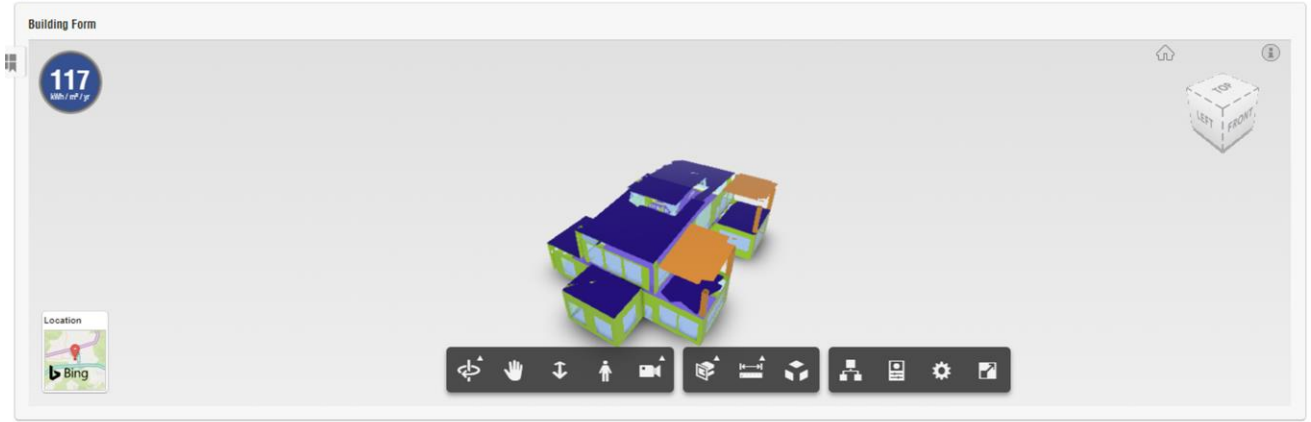
Building Orientation

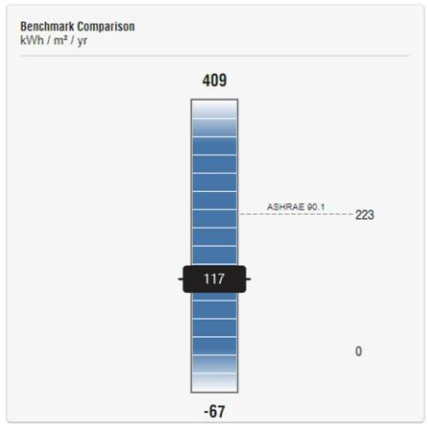
Rotates a building clockwise from 0 degrees, e.g. 90 degrees rotates the North side of the building to face East.

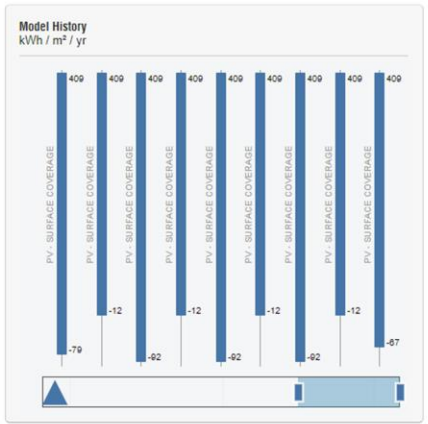
Current Setting:
225 - BIM



Energy Reduction Strategy by Using PV Panels







REVIT CALCULATION

We calculated general calculation settings in revit PV panels.

Revit has a common settings for standart PV panels for approximately 20KW per 100 m2 over a year.(In this İzmir Climate)

In addition we have to choose the persantage of roof surface area.

We chose the %70 of surface area which is 110 m2 area (efficient surface for PV panels.(total roof area 160 m2).

MANUAL CALCULATION

EGE SOLAR SYSTEM PANELS

1000W SYSTEM = $2950 total prize

This system produces It has an electricity generation capacity of 3 kWh/m2/day in December/January and 7.5 kWh/m2/day in May/August.Average= 5kWh/m2/day for a year period.

5kWh/m2/day /360day = 0,013kWh/m2/year

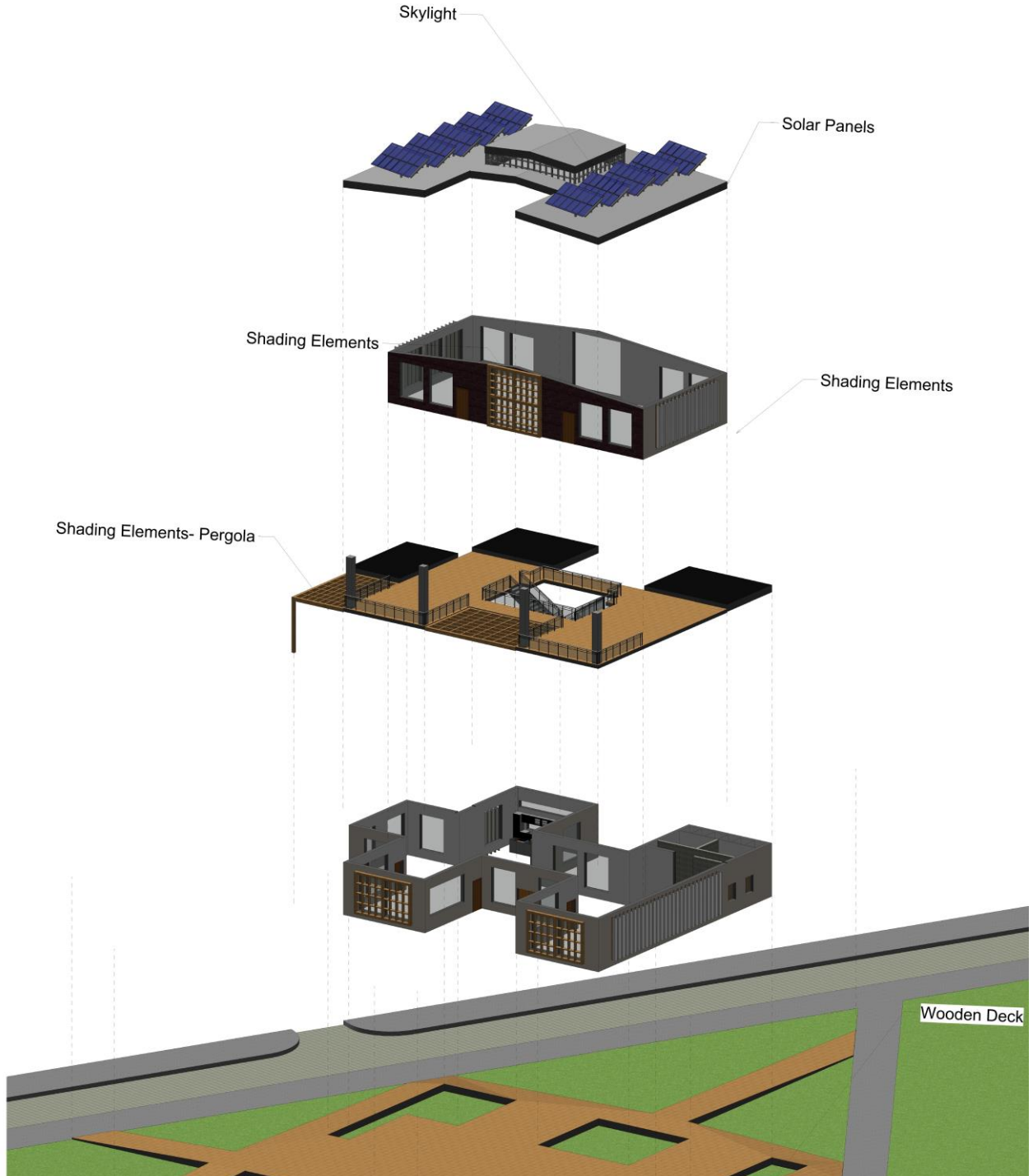
Our project is suitable for 10 panels 10x0,013=0,13

110m2 surface = 110x0,13 **14,3** Kwh/m2/year

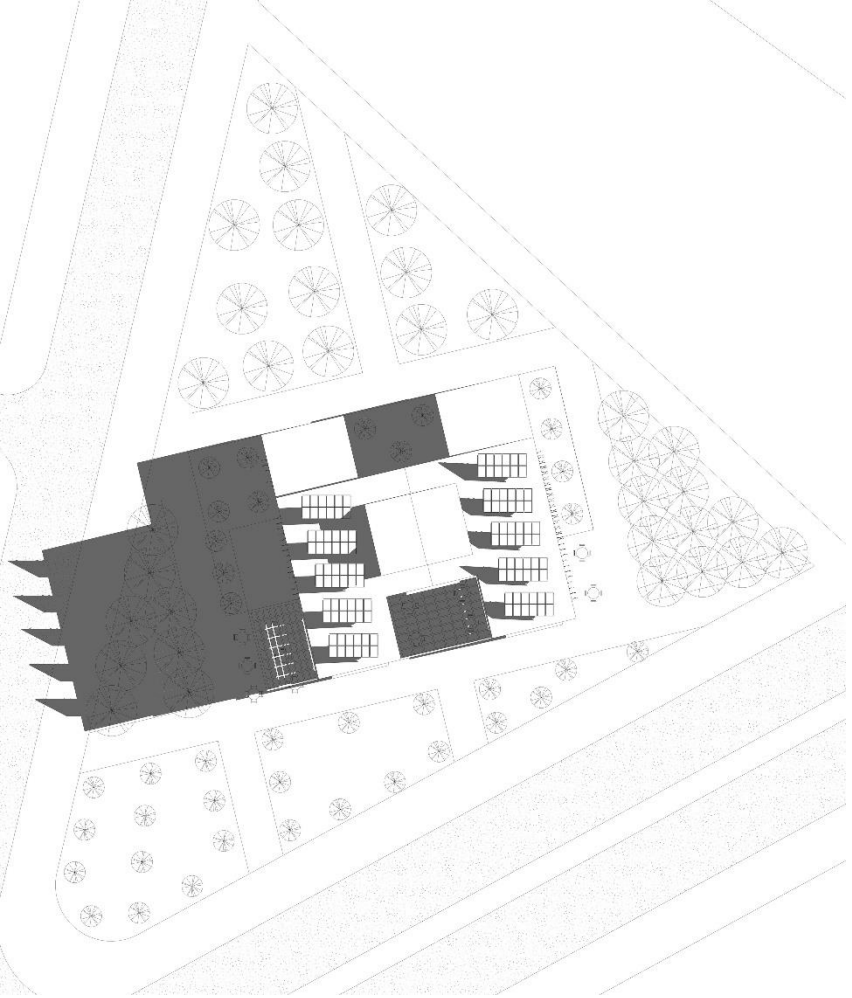
ASS(9) value 138-14= We might have ***124***kWh/m2/year with this calculations.

http://egessolar.com/1000w-sistem-bag-evi-paketi-5/

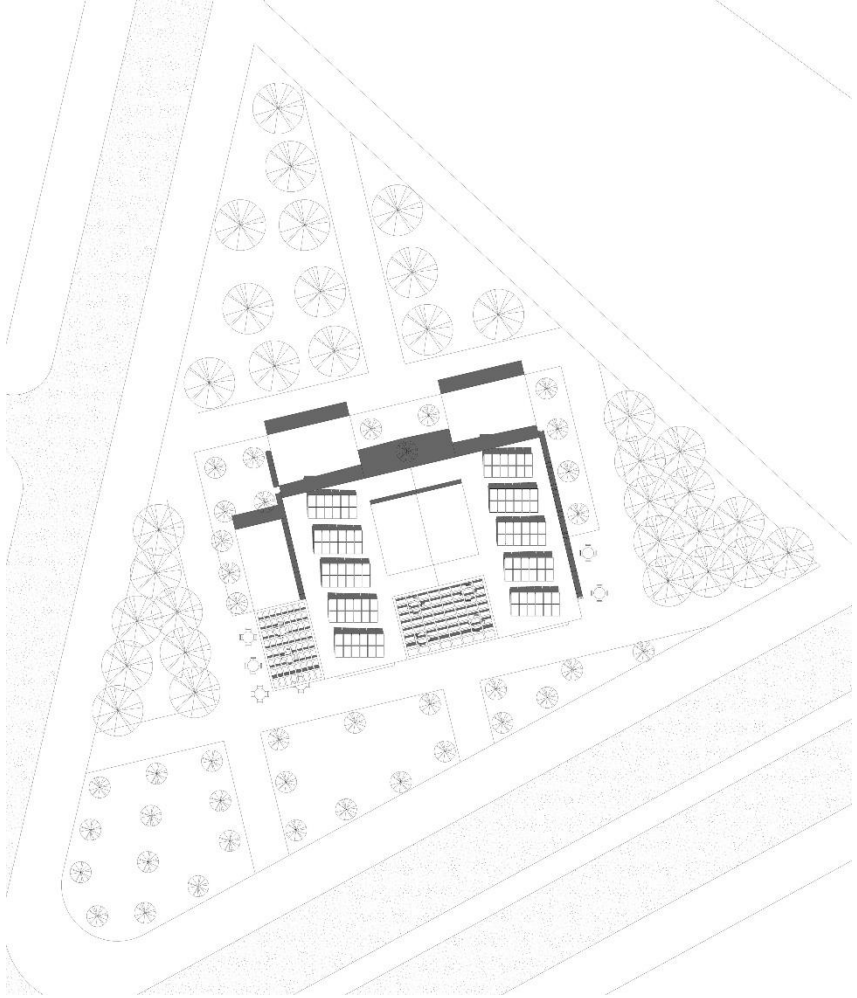
3D Drawings


Skylight
Solar Panels
Shading Elements
Shading Elements
Shading Elements- Pergola
Wooden Deck

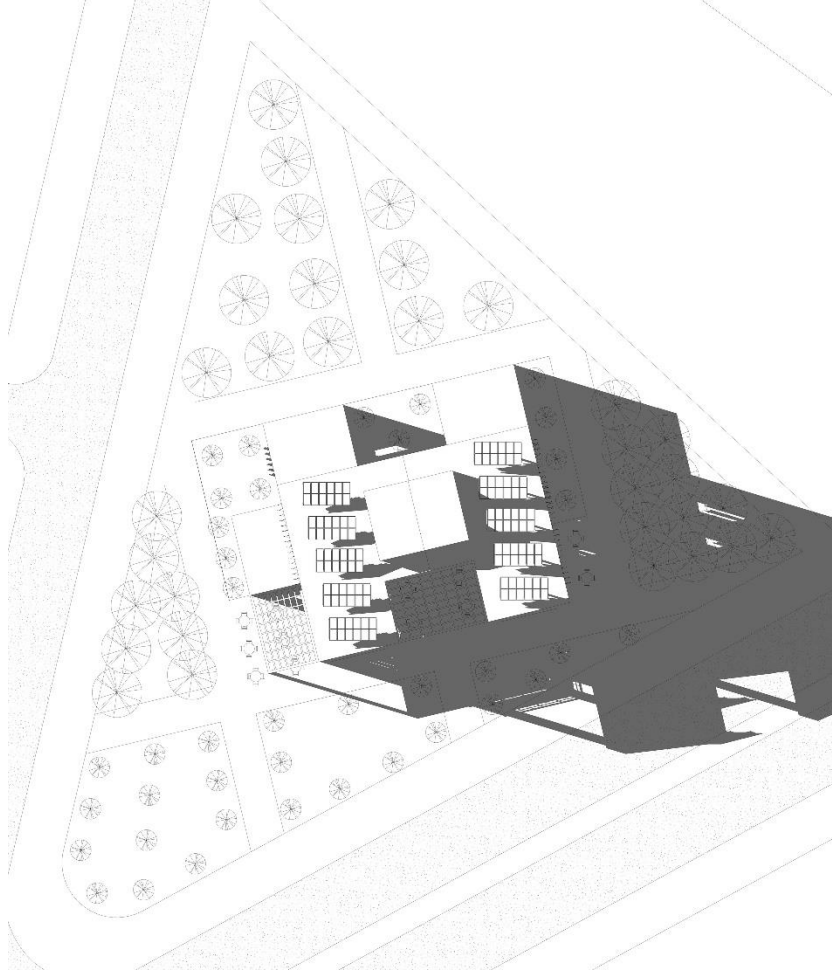
Shadow Footprints



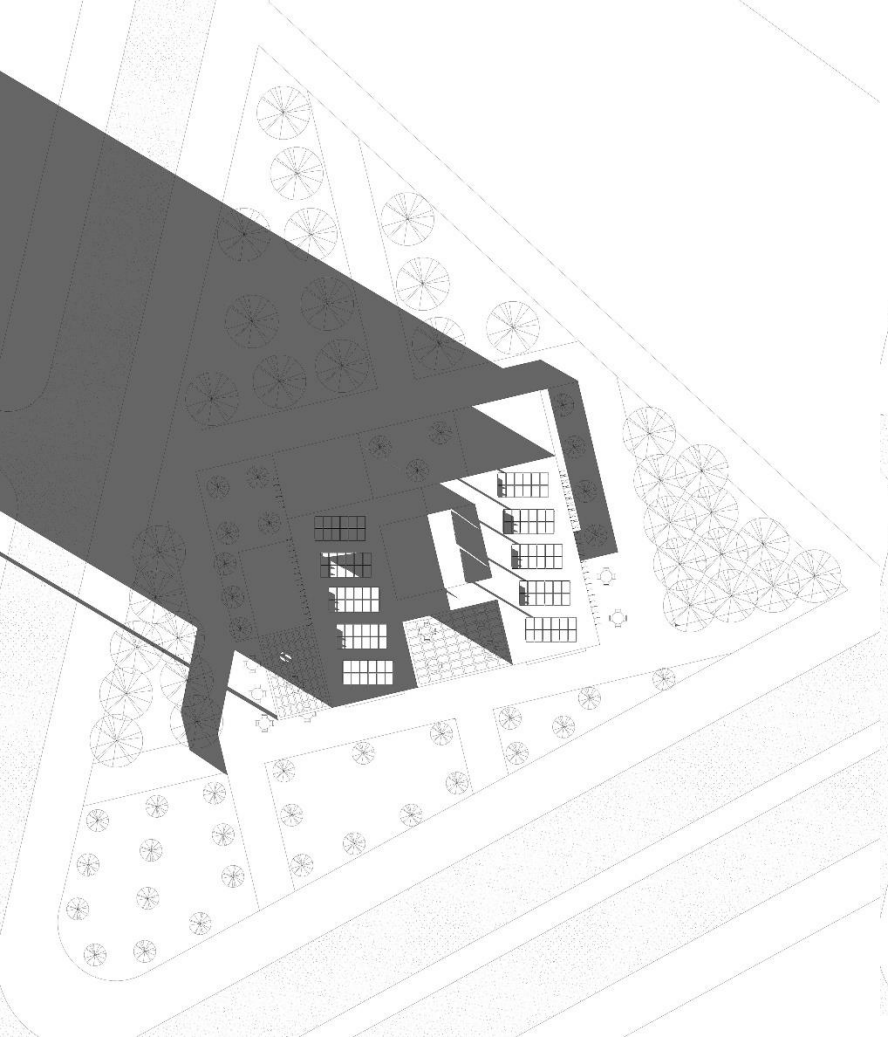
07.00 am 21st JUNE



12.00 pm 21st JUNE

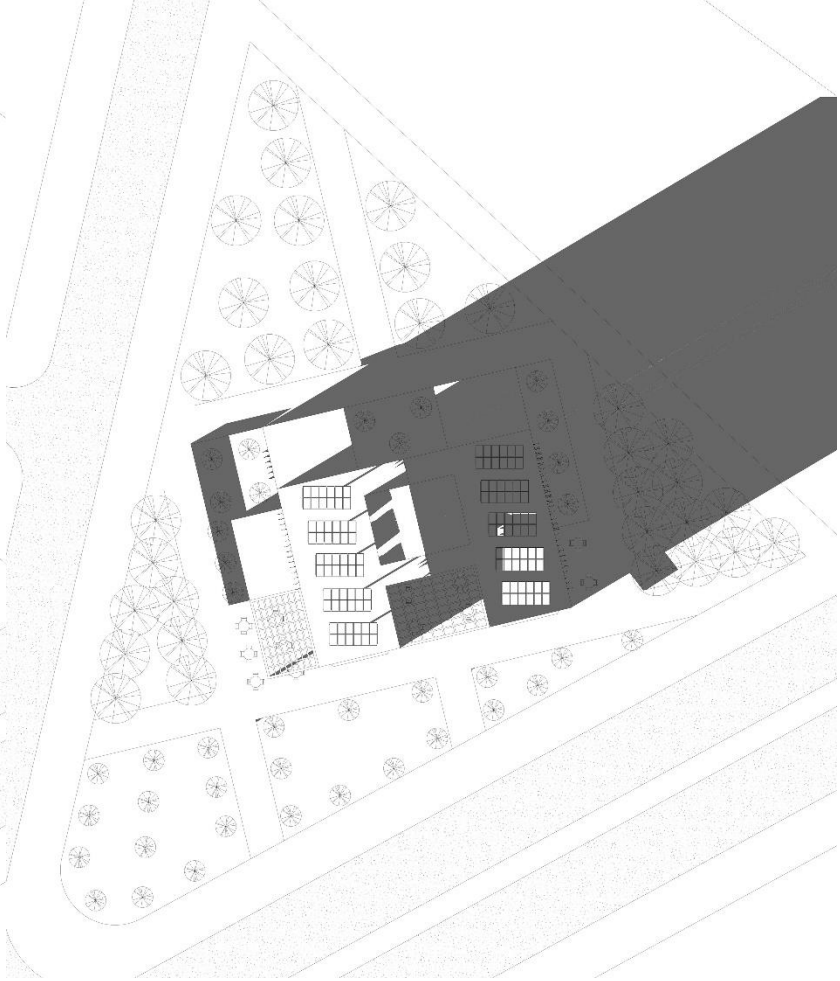


18.00 pm 21st JUNE



07.00 am 21st JUNE

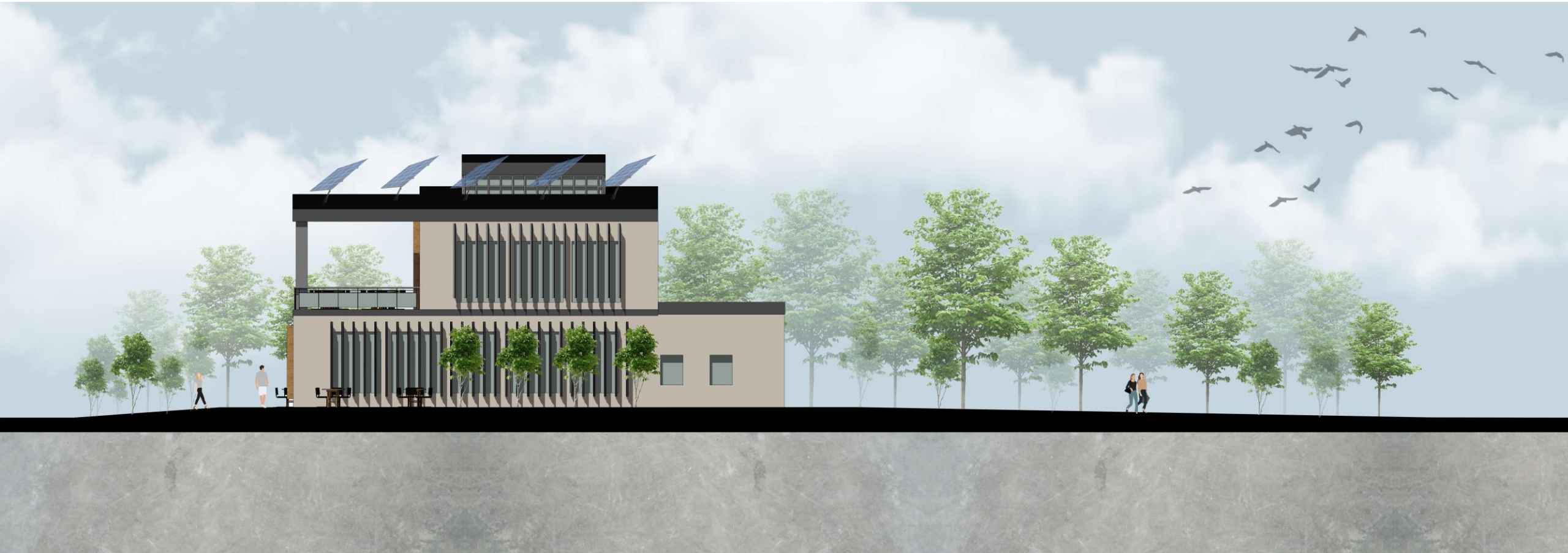
12.00 pm 21st JUNE



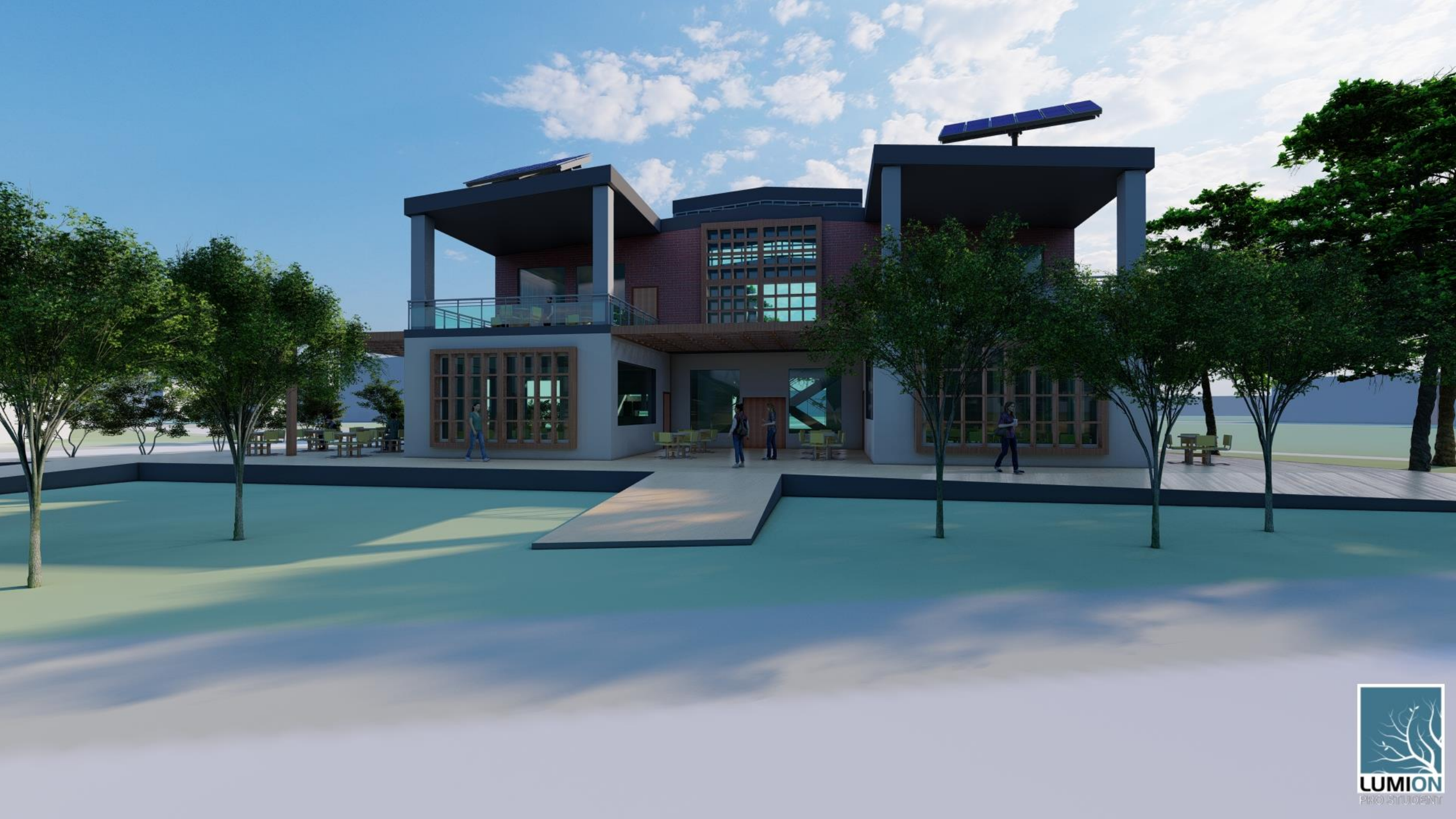
18.00 pm 21st JUNE

Elevations & Renders

NORTH EAST ELEVATION 1/100



SOUTH-EAST ELEVATION 1/100


LUMION
PRO STUDENT


LUMION
PRO STUDENT


LUMION
PRO STUDENT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