Architectural Environment

Analysis of English Village

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Content:

- Location of Site
- Site Analysis
- Sun Analysis
- Light Analysis of Single House
- Thermal Analysis of Building material
- Weather Analysis
- Heat gain calculation by occupants
- Heat gain calculation by ventilation
- Thermal resistance (U) and (R) value
- Problem and Solution

Location of Site

Location the Site in Erbil map

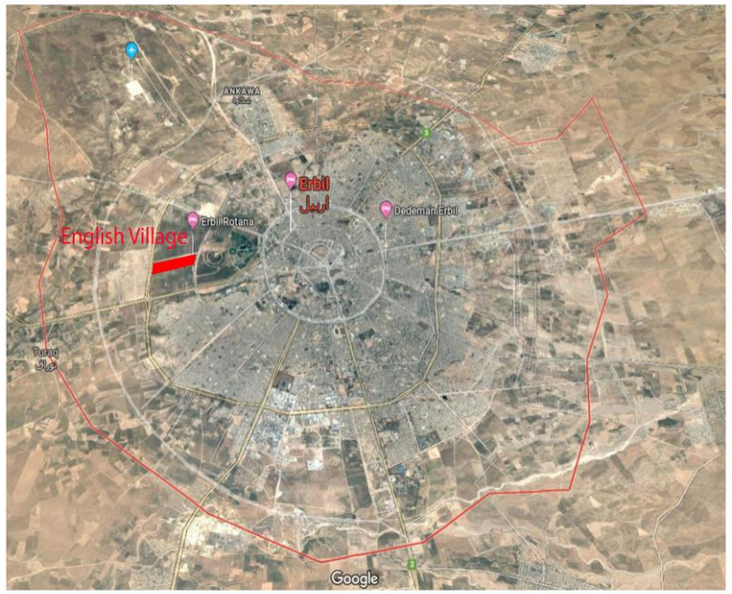
English Village (Erbil)

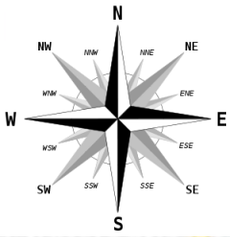
Location: Iraq – Kurdistan Region – Erbil – Road Resort Salah al-Din – Bahrka.

Abstract of the project: Investment

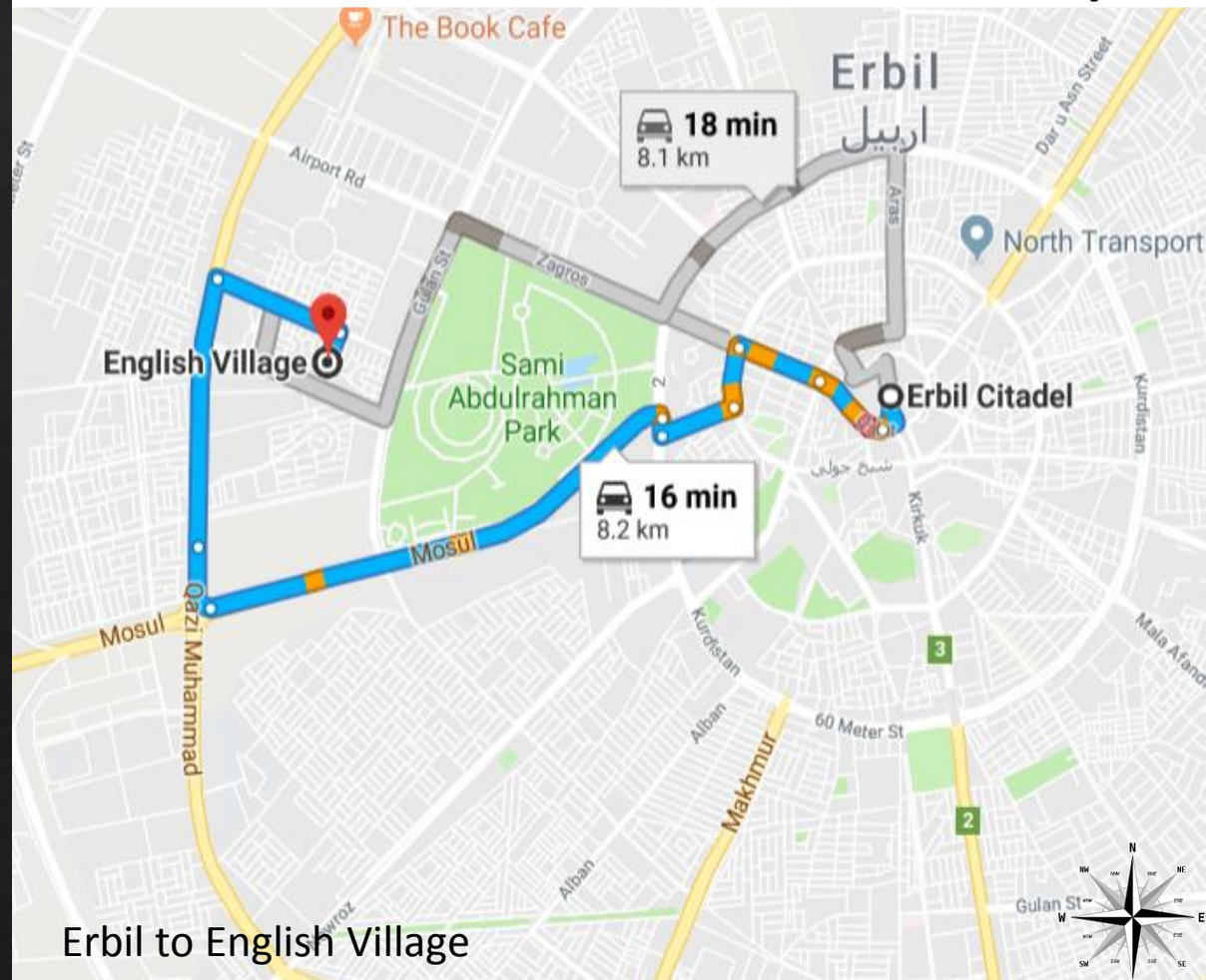
License number: (190) at 28/07/2009

The project area: 300 acres





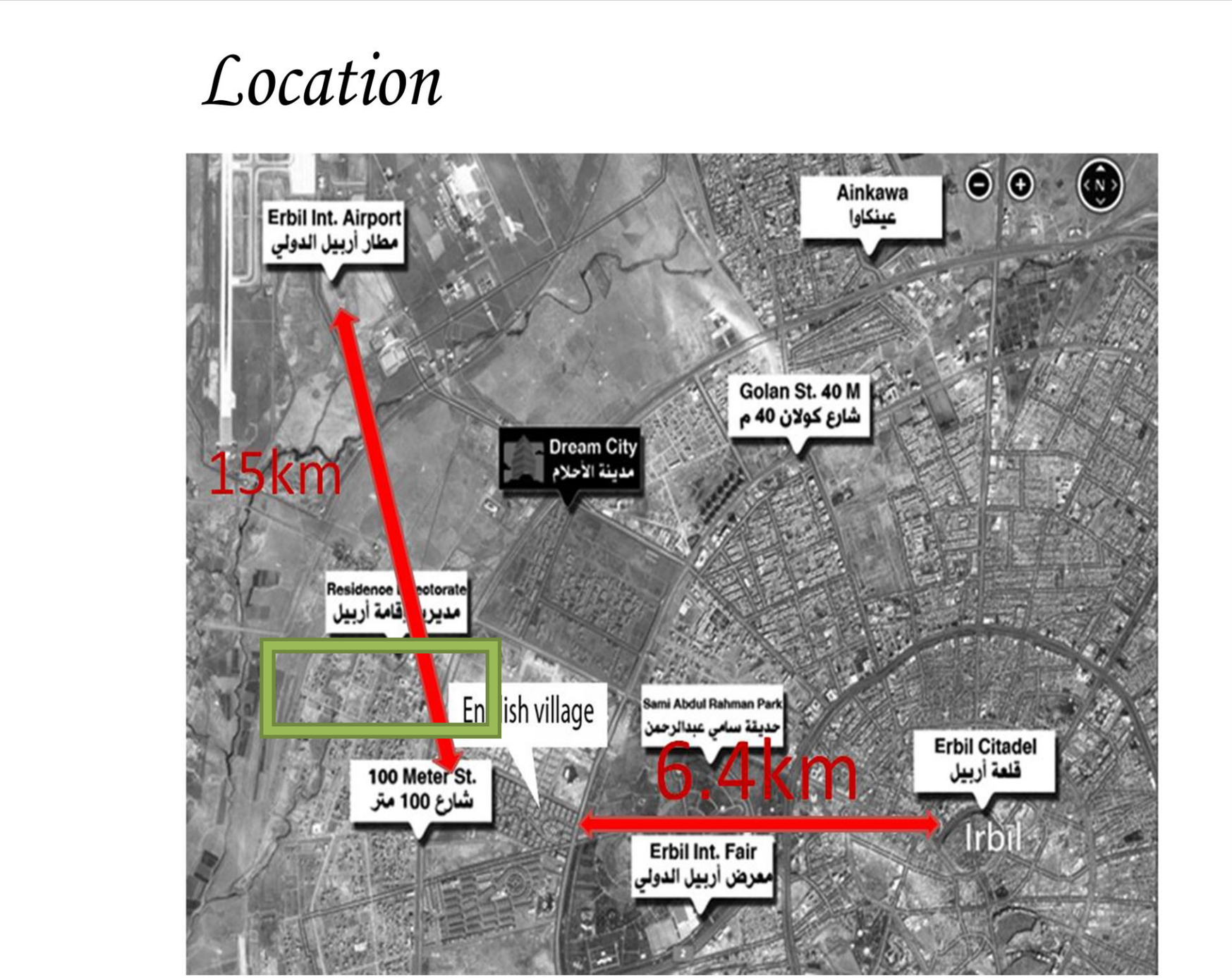
Baghdad to Erbil



Erbil to English Village

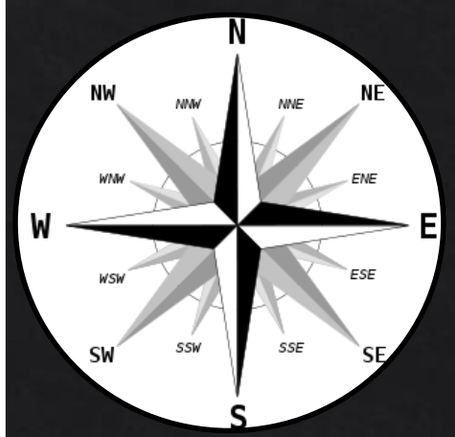
Location of Site

English Village in Erbil – Iraq is located between 100m and 40m roads at south of Erbil international airport , that 1.5km far from Erbil airport .Which is 6.4 km far from the city center.

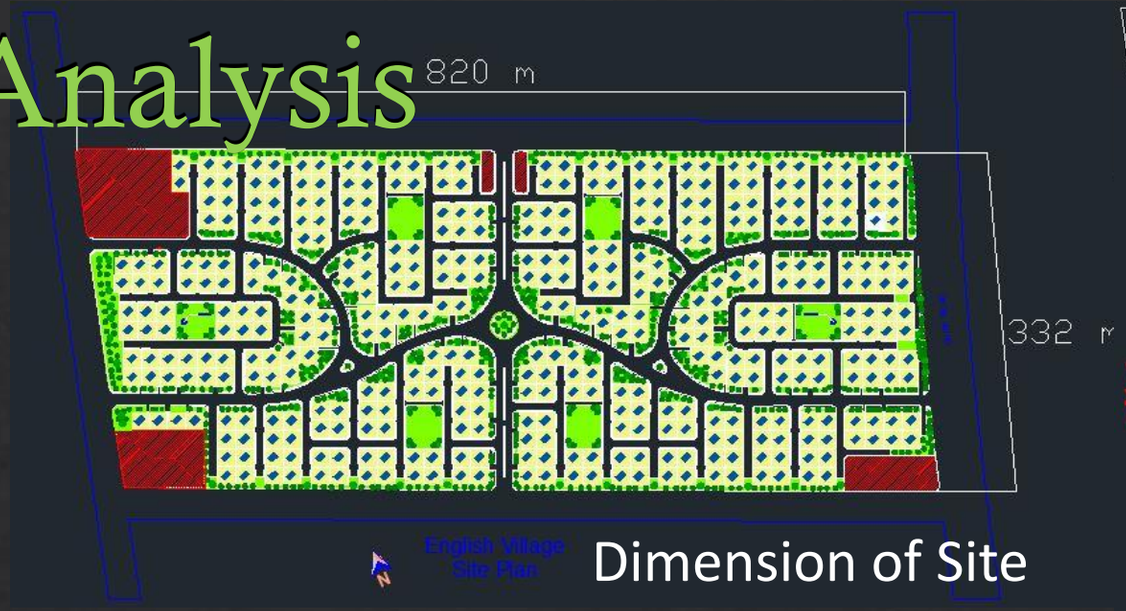


Distance from airport is 1.5 km

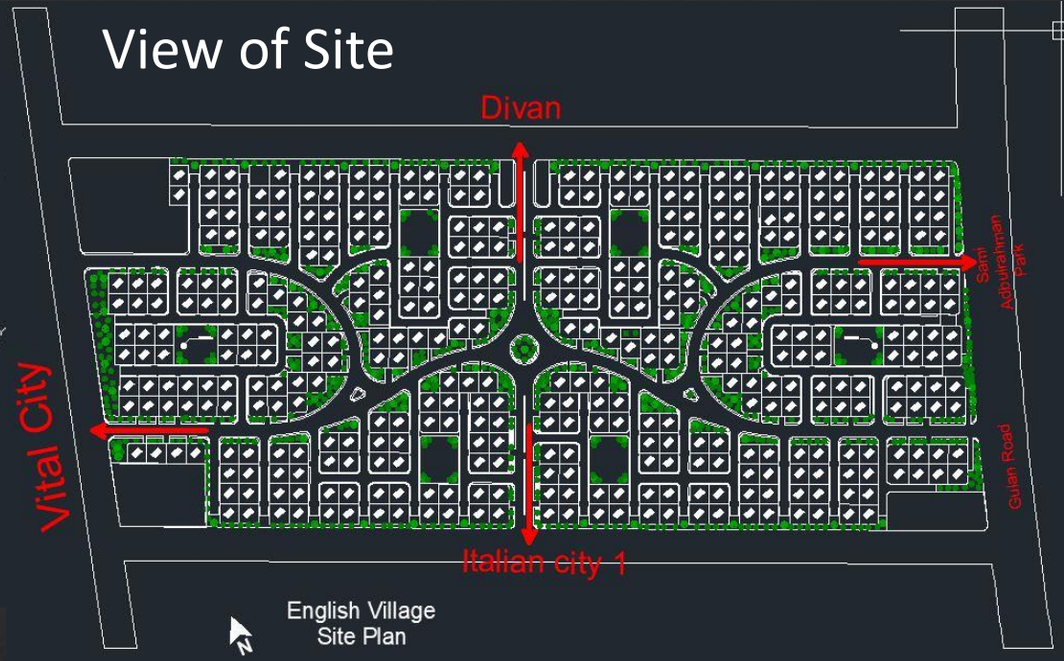
Distance from center is 6.4 km



Site Analysis



Dimension of Site

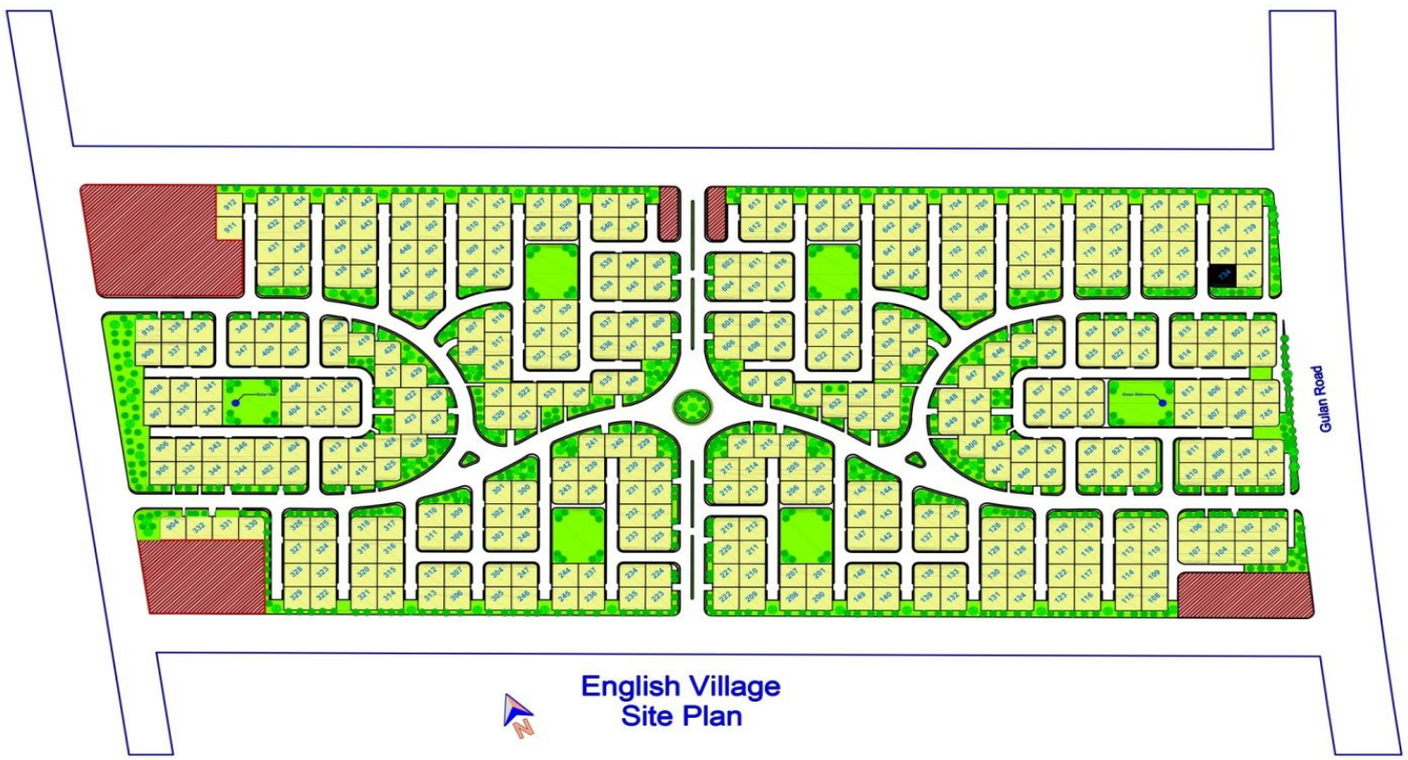


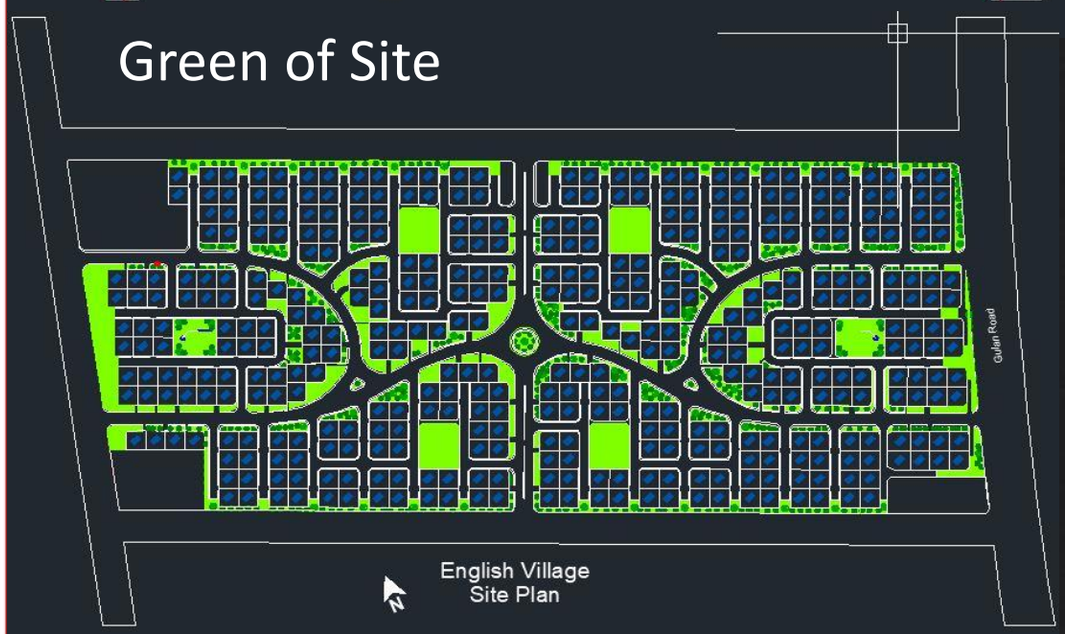
The English village Project spans a land area of

262,500 m2.

Building plot area: 63,350m2. (3 towers and 410 luxury villas.)

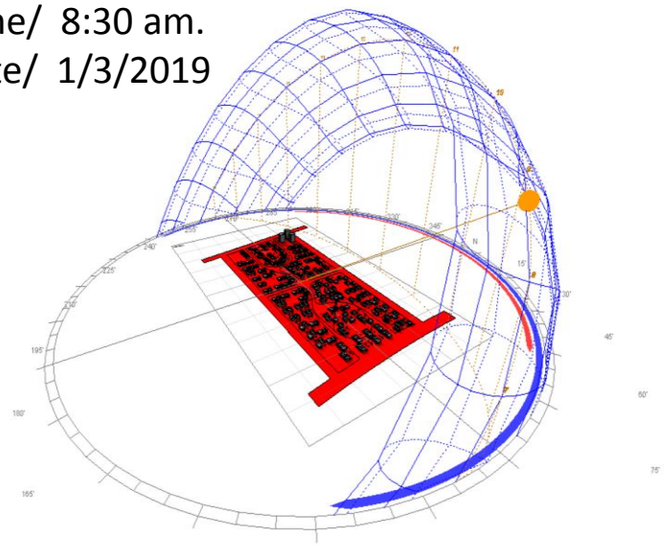
Total green area and roads: 106,485 m2.



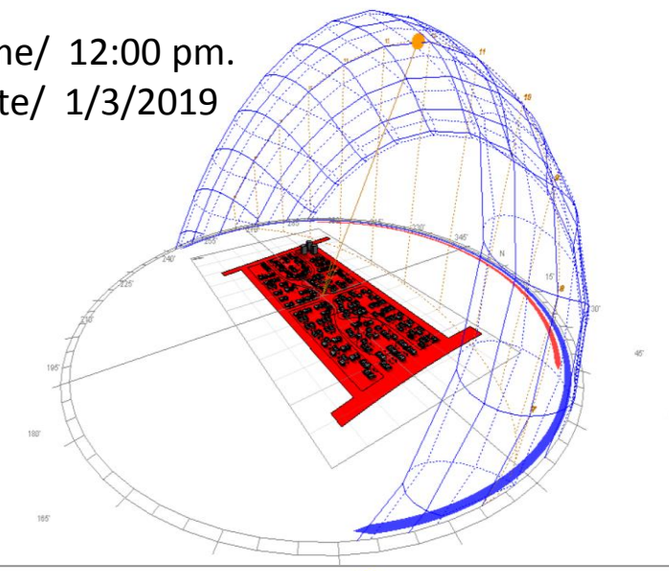


Sun analysis

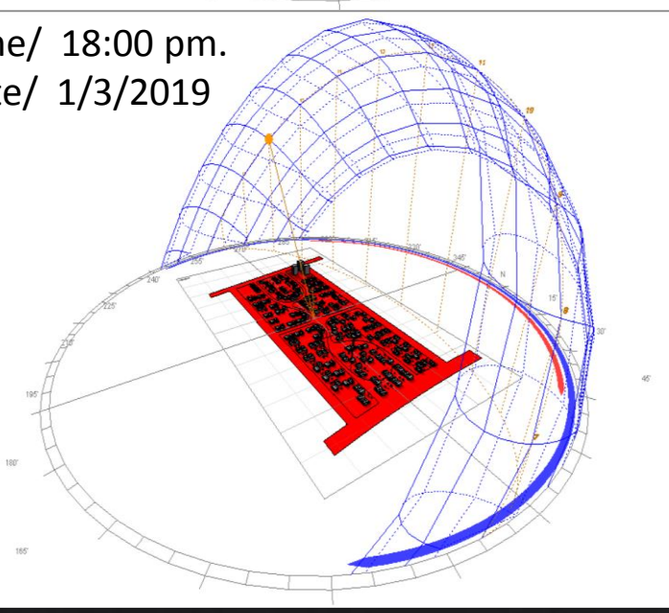
Time/ 8:30 am.
Date/ 1/3/2019

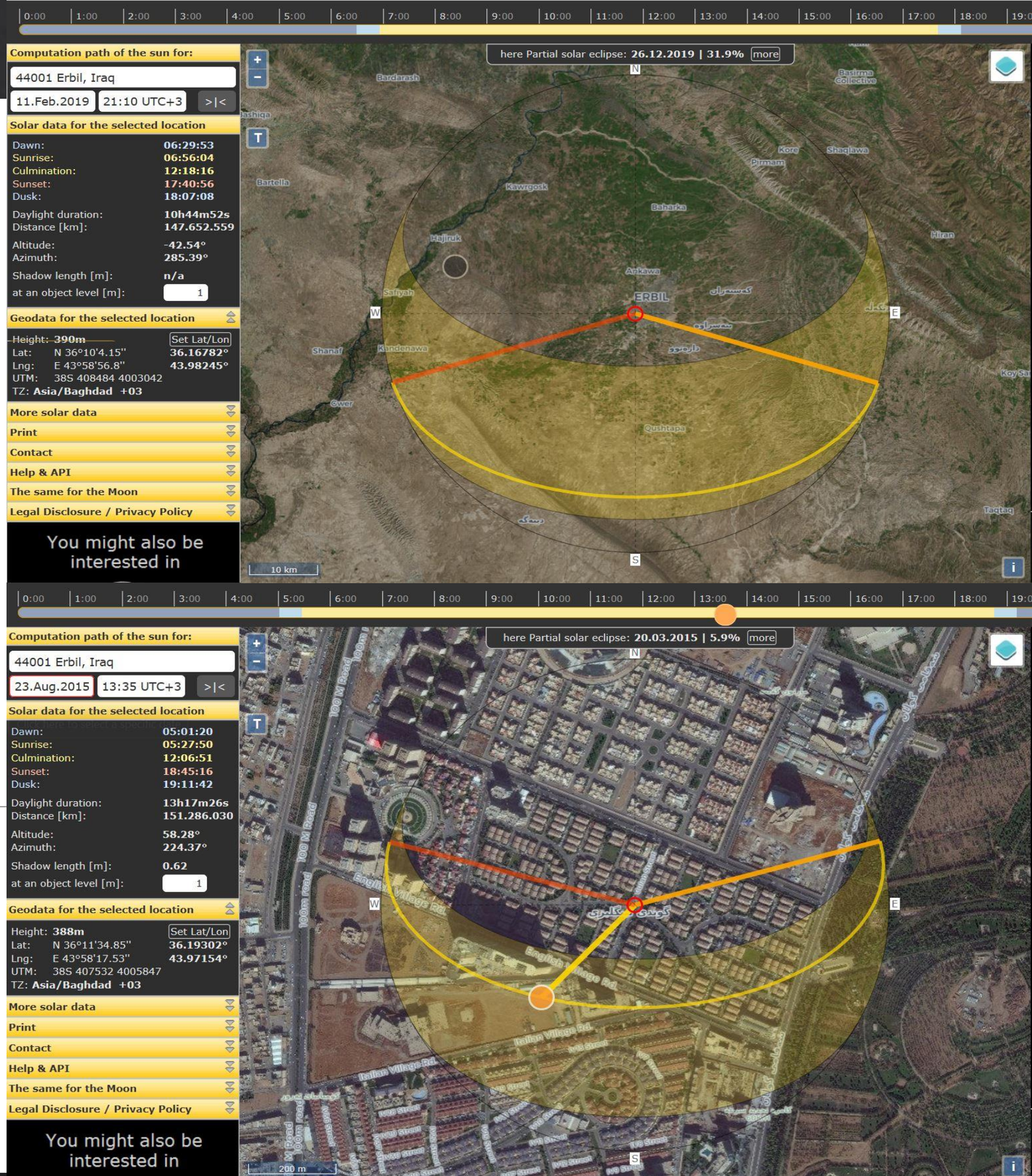


Time/ 12:00 pm.
Date/ 1/3/2019

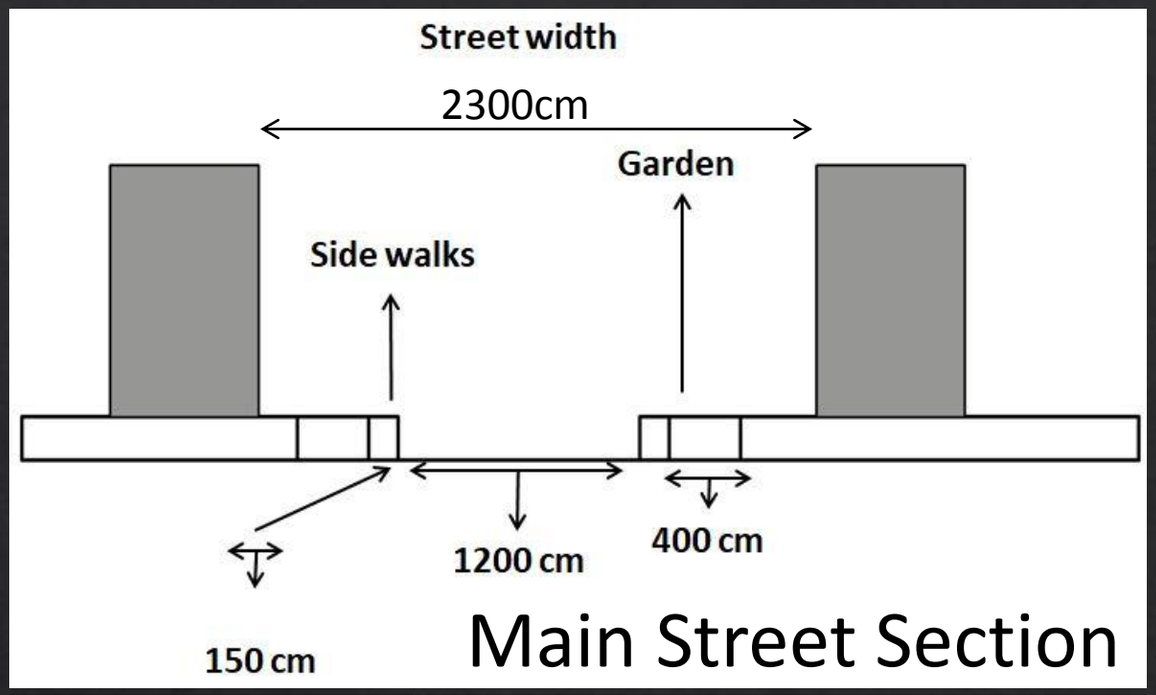


Time/ 18:00 pm.
Date/ 1/3/2019

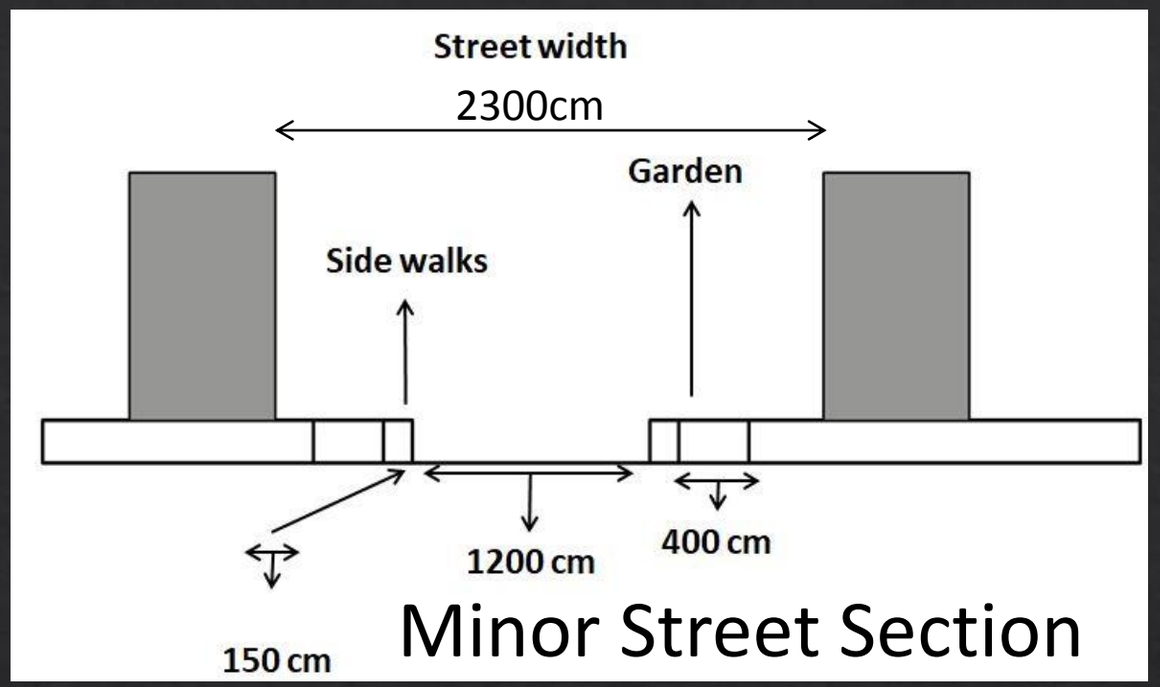




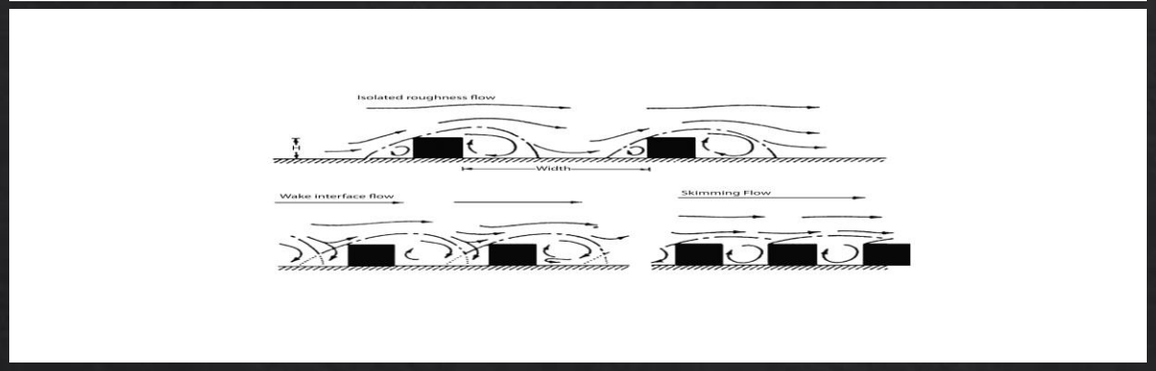
Distance between Houses

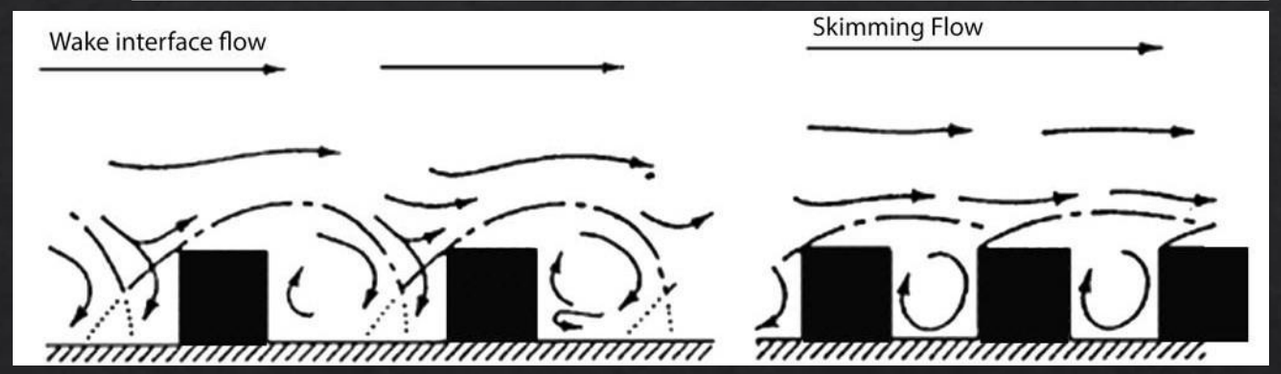


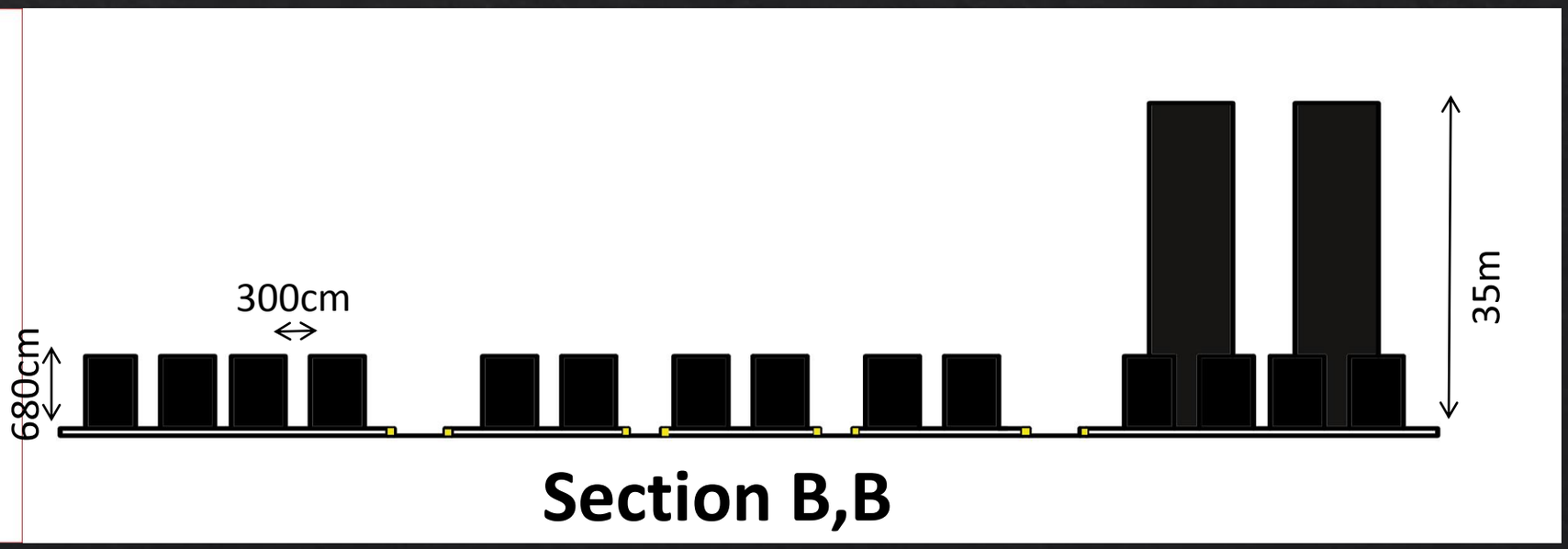
Main Street Section



Minor Street Section







Section B,B

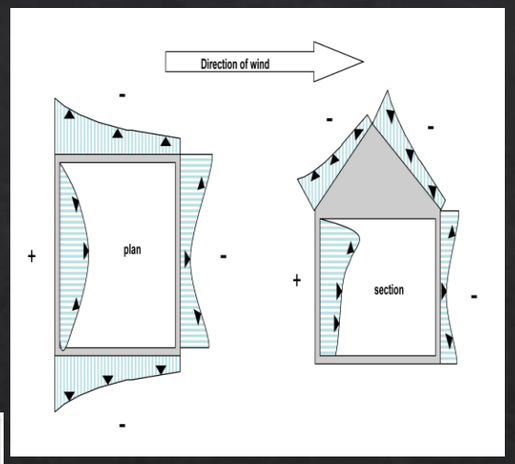
Height of the Apartments : 35 m /Height of the Villa : 6.8 m

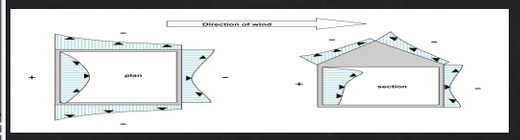
House Plan

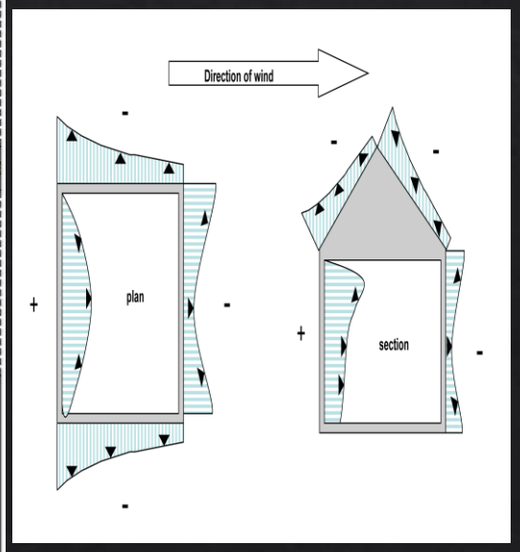
Area for each Villa : 324 m

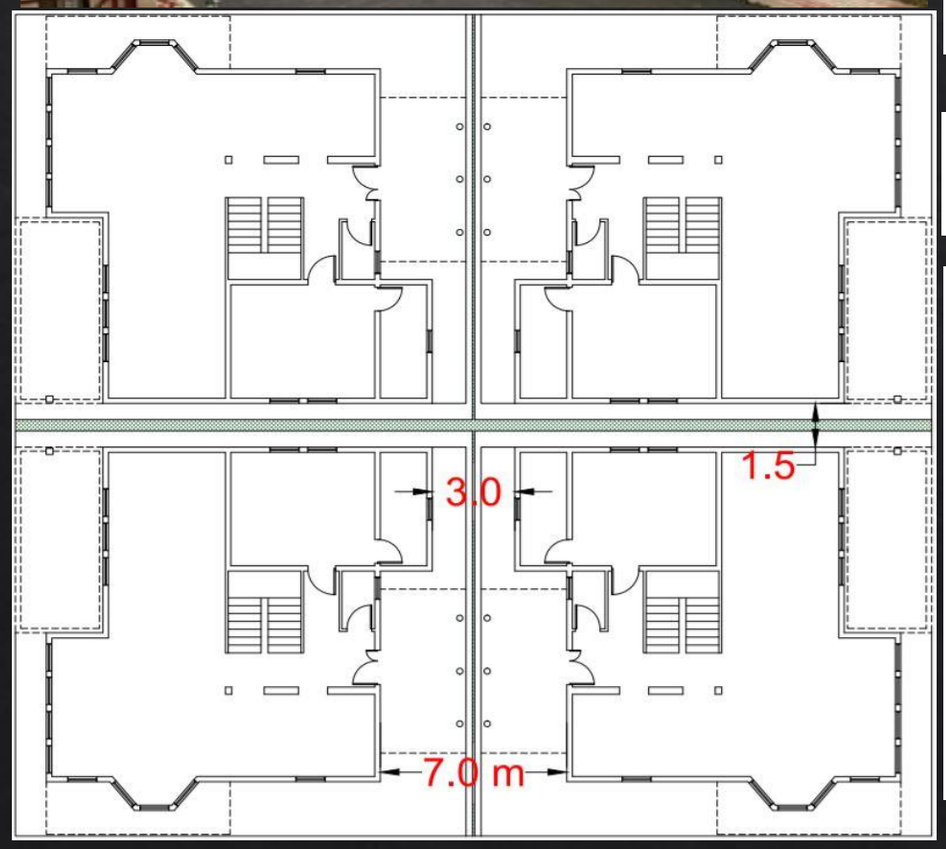
Area Of One floor : 132 m

Green area For each Villa : 140m



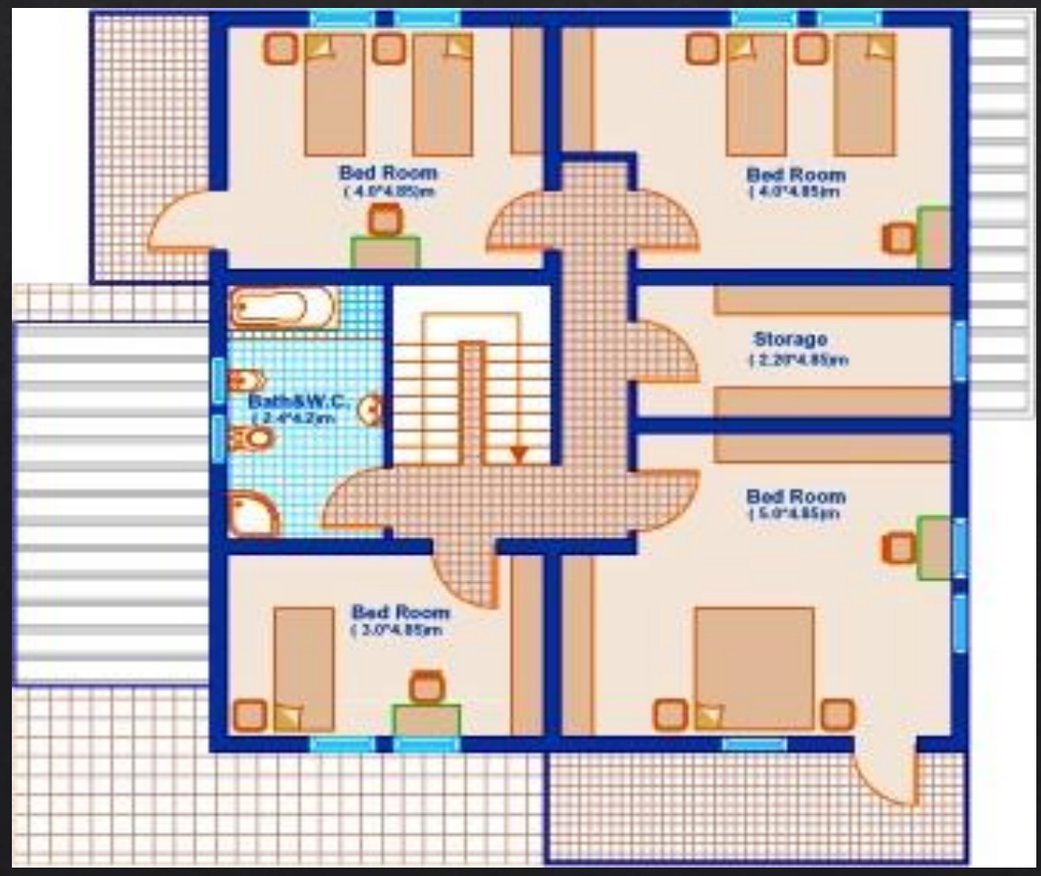






Distance between Houses

Ground Floor Plan



First Floor Plan

Light Analysis of single House

Ratio of window size to floor area, type of window

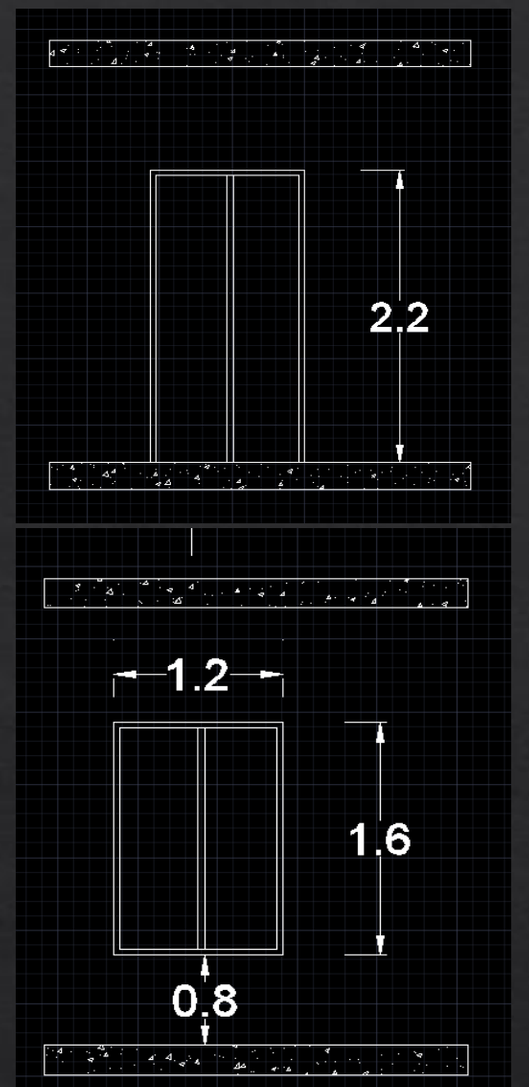
A window is an **opening** in a wall, door, roof or vehicle that allows the passage of light, sound, and air. Modern windows are usually glazed or covered in some other transparent or translucent material, a sash **set** in a frame in the **opening**, the sash and frame are also referred to as a window . The **importance** of home **windows**, **Windows** provide our homes with light, warmth, and ventilation, but they can also negatively impact a home's energy efficiency. ... Adding storm **windows** can reduce air leakage and improve comfort. **Energy efficient windows** are an important consideration for both new and existing homes. Heat gain and heat loss through **windows** are responsible for 25%–30% of residential heating and cooling **energy** use

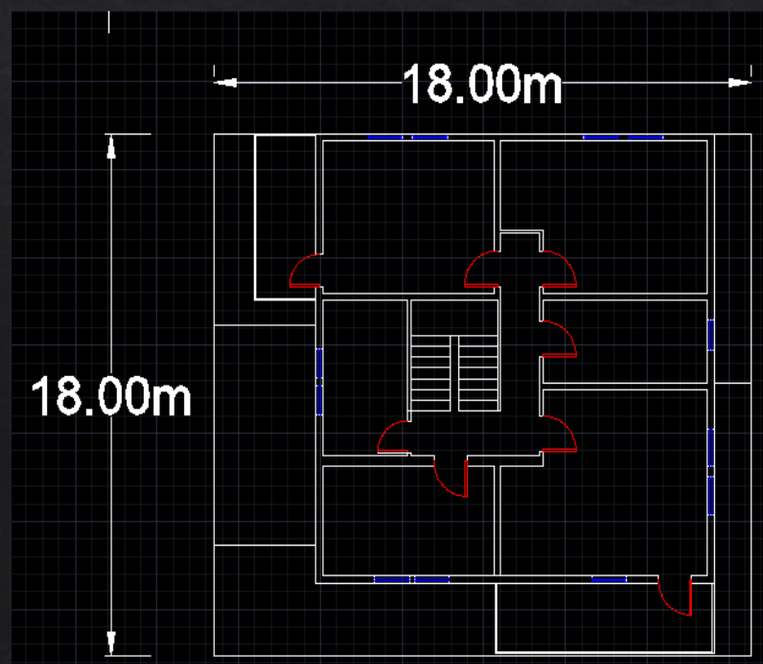
Gross Area of House =342 m2

net Area of House =124 m2

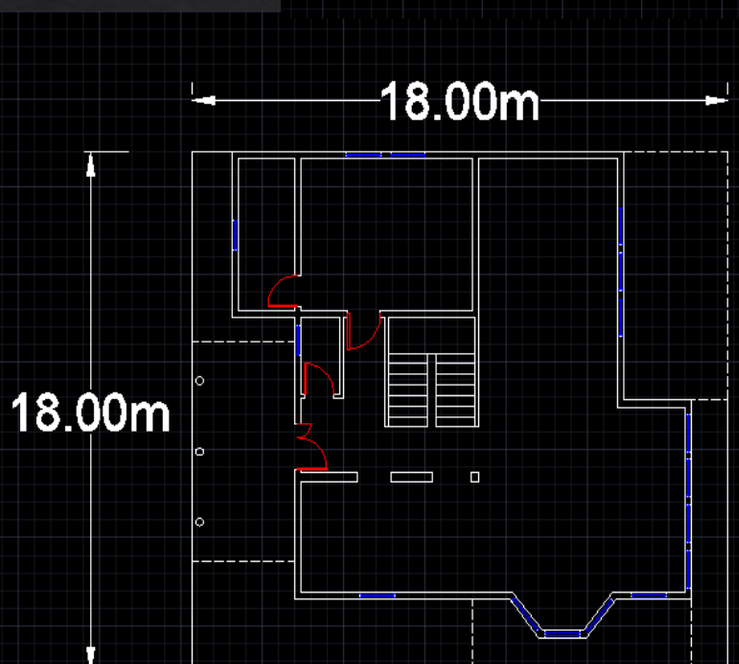
Ratio of window size to net area=30

Window Type= Casement Hang-one side Open





FIRST FLOOR



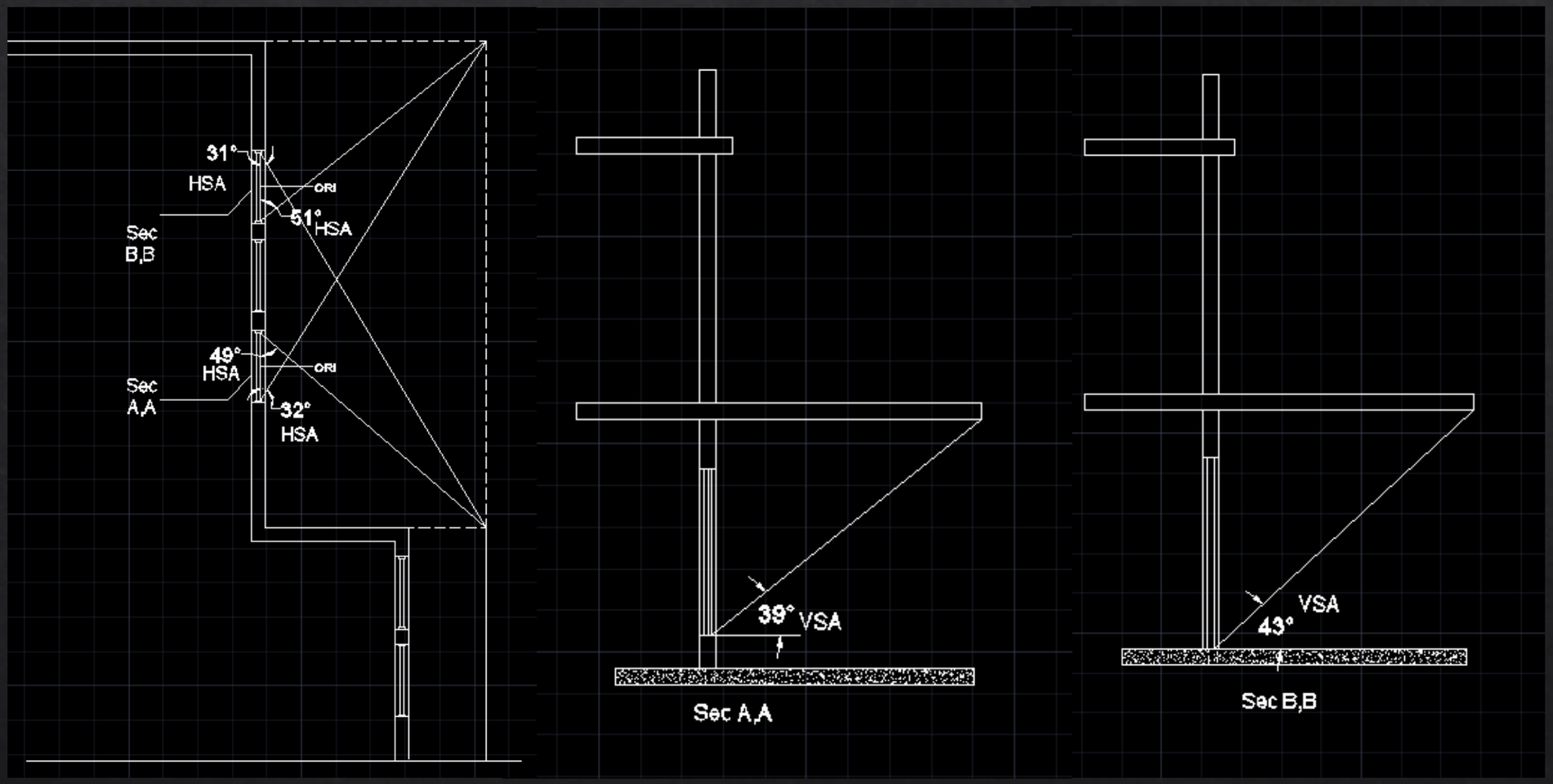
GROUND FLOOR

Light Analysis of single House

Shading devise analysis(Type-Material-Drawing)

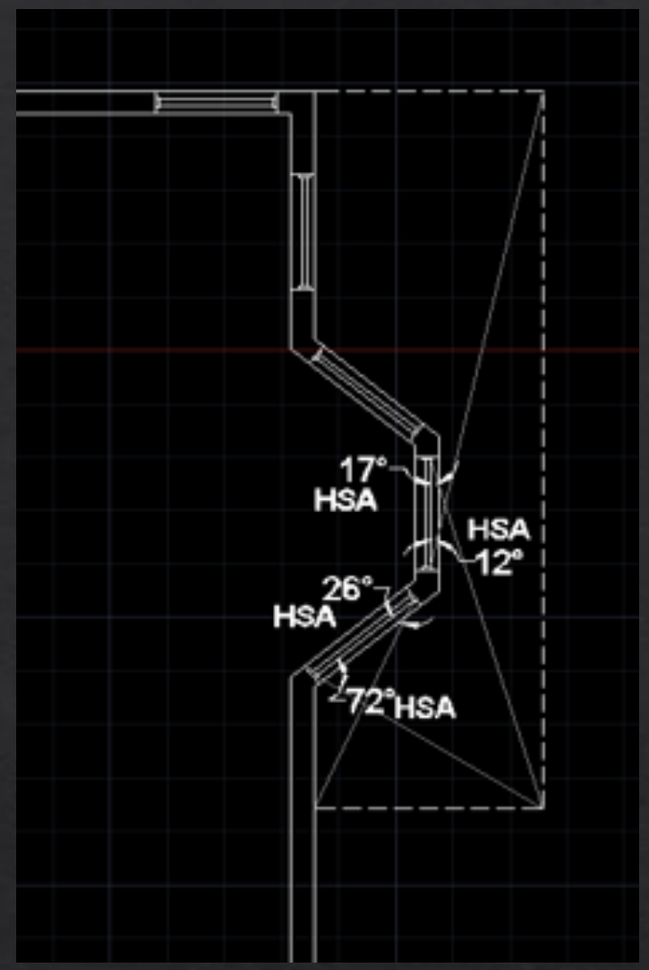
Shading devise Type= Horizontal shading devise-overhang type

Shading devise Material= Concrete-Fix Shading Devise

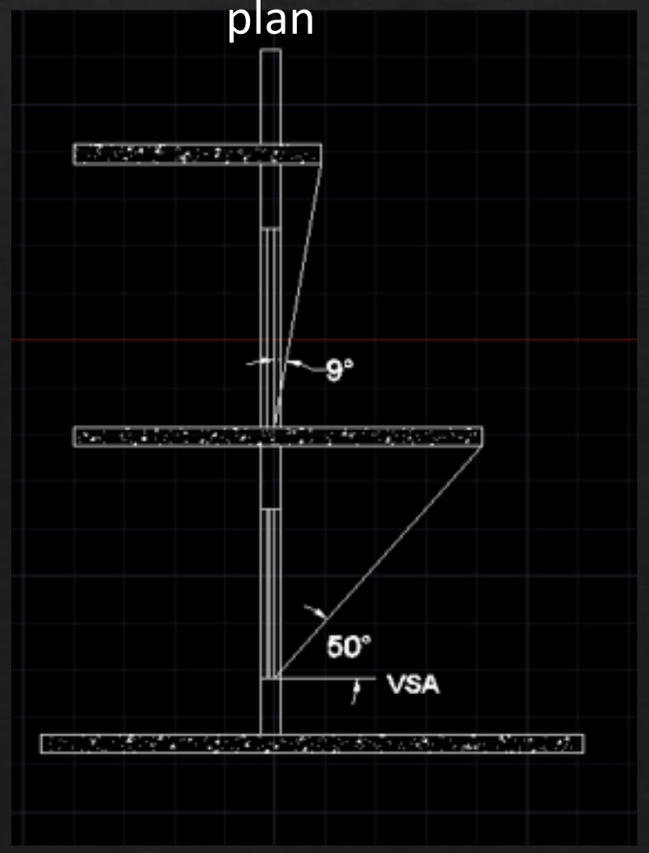


Horizontal shadow angle plan

Vertical shadow angle section



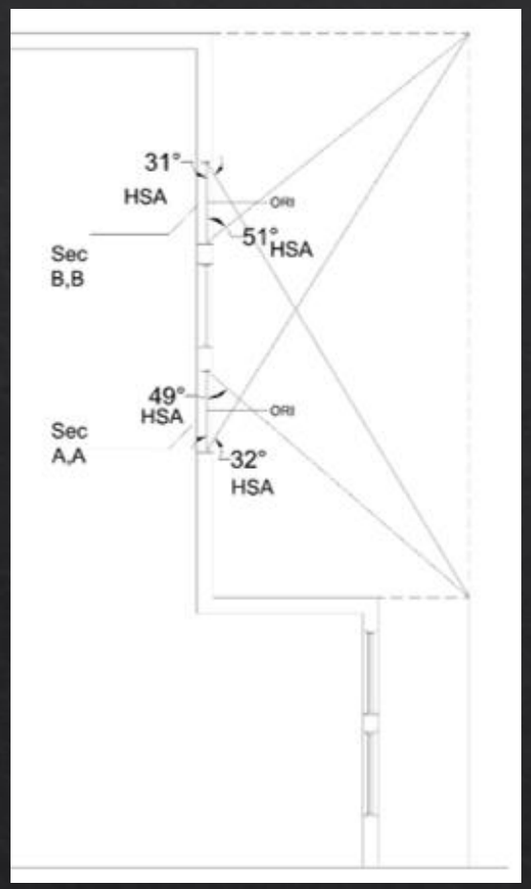
Horizontal shadow angle plan



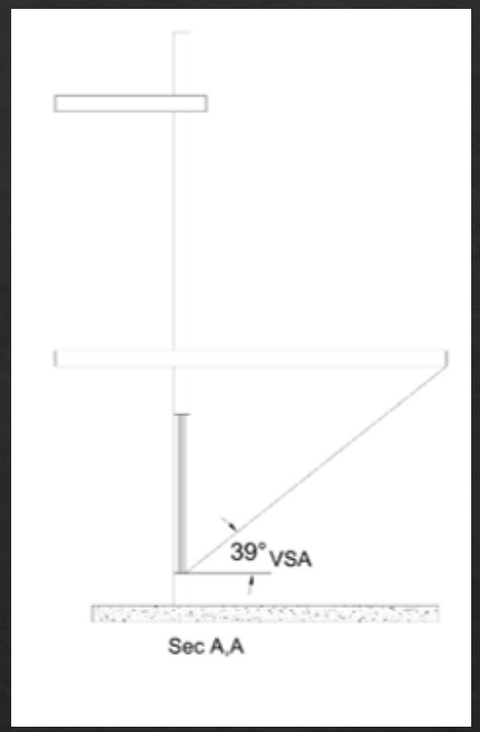
Vertical shadow angle section

Light Analysis of single House

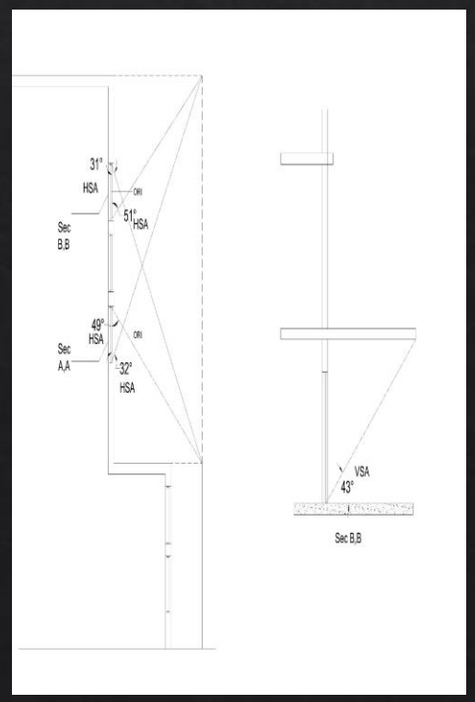
Shading Mask of shadow angle protractor



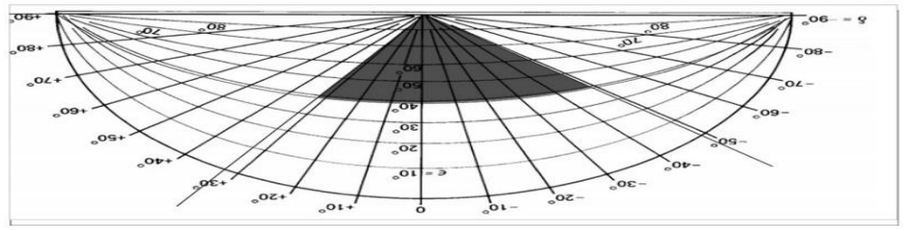
HORIZONTAL SHADOW ANAGLE PLAN



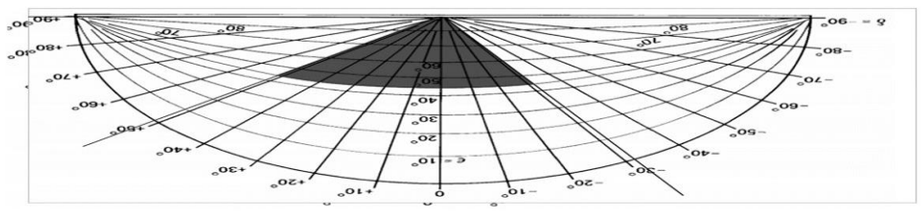
VERTICAL SHADOW ANAGLE PLAN



Drawing Shading Mask



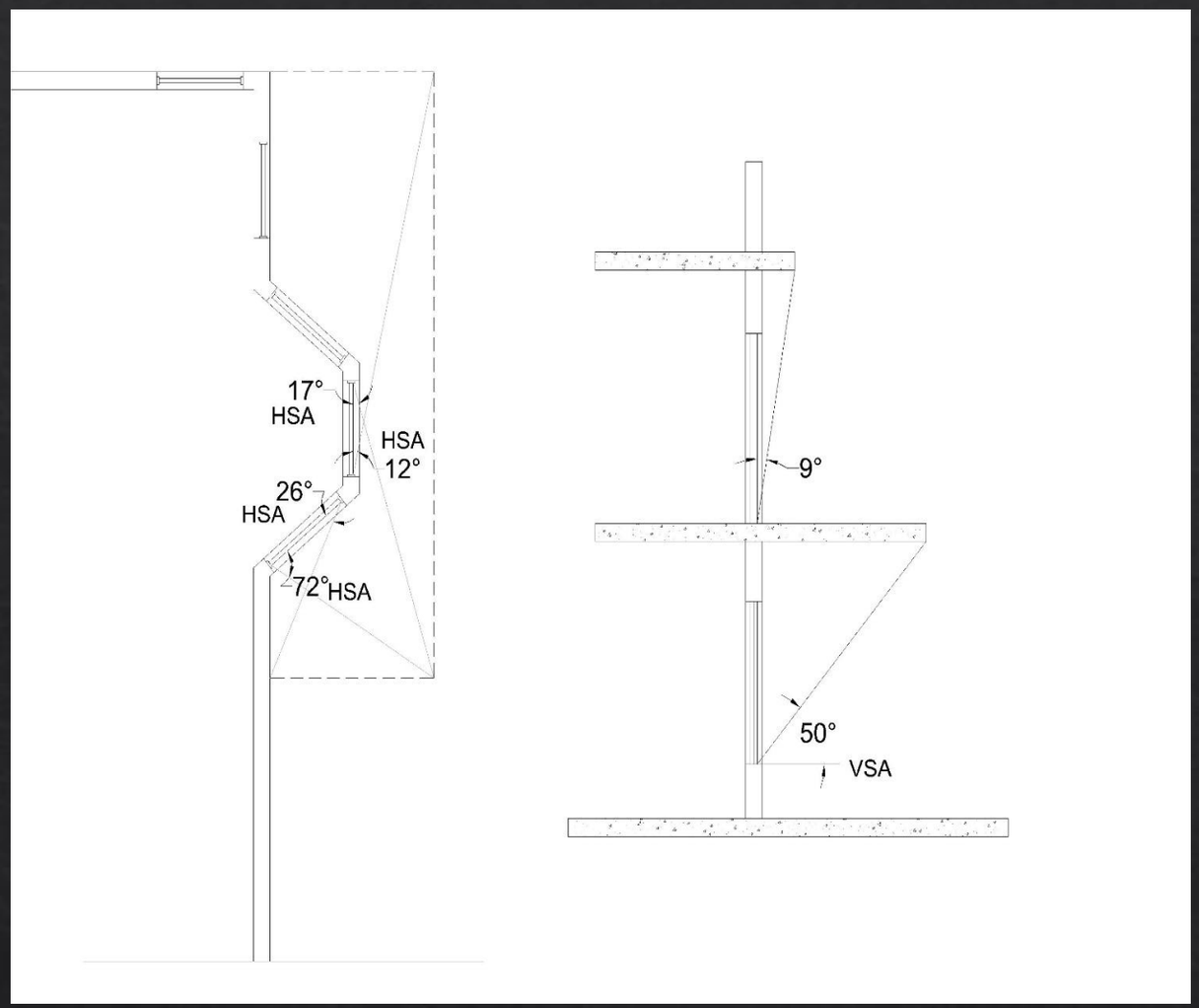
VSA= 39
HSA=-49
HSA=32



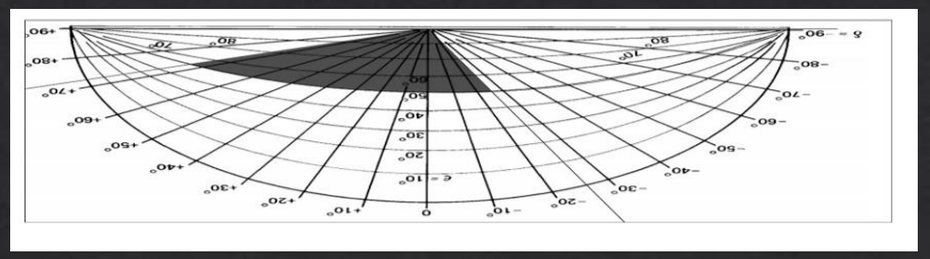
VSA= 43
HSA= -31
HSA=51

Light Analysis of single House

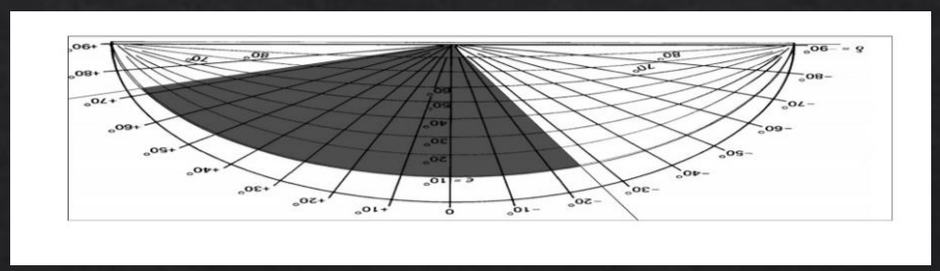
Shading Mask of shadow angle protractor



Drawing Shading Mask



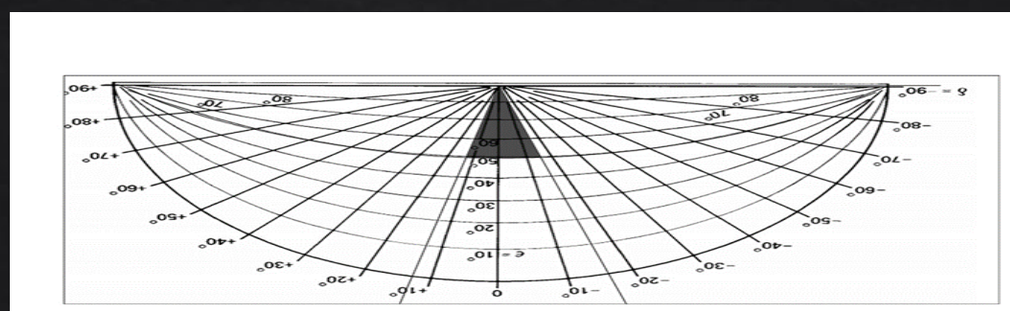
Ground floor
VSA=50
HSA= -26
HSA=72



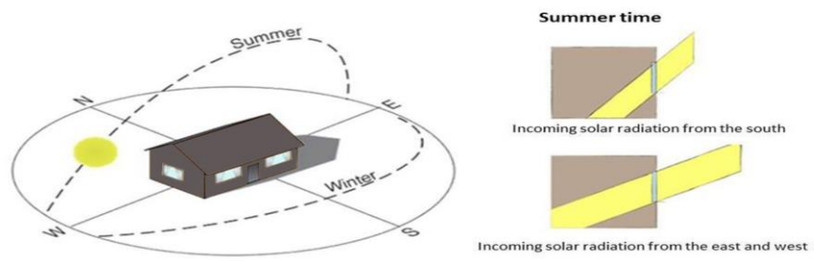
First floor
VSA=9
HSA= -26
HSA=72

HORIZONTAL SHADOW ANAGLE PLAN

VERTICAL SHADOW ANAGLE PLAN



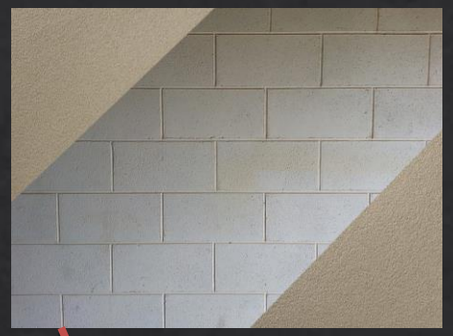
First floor
VSA=9
HSA= -17
HSA=12



Structure & material

In the Structure of the Villas, Bearing Wall is used.

- Brick
- Wood or concrete
- Marble
- Paint



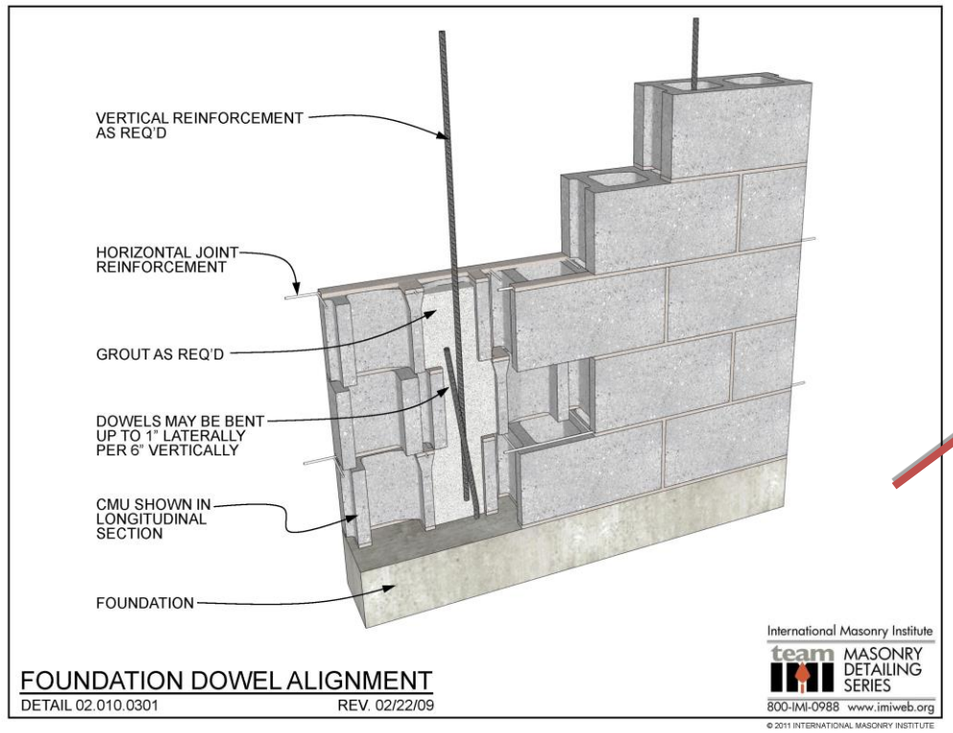
Paint

Wood

Brick

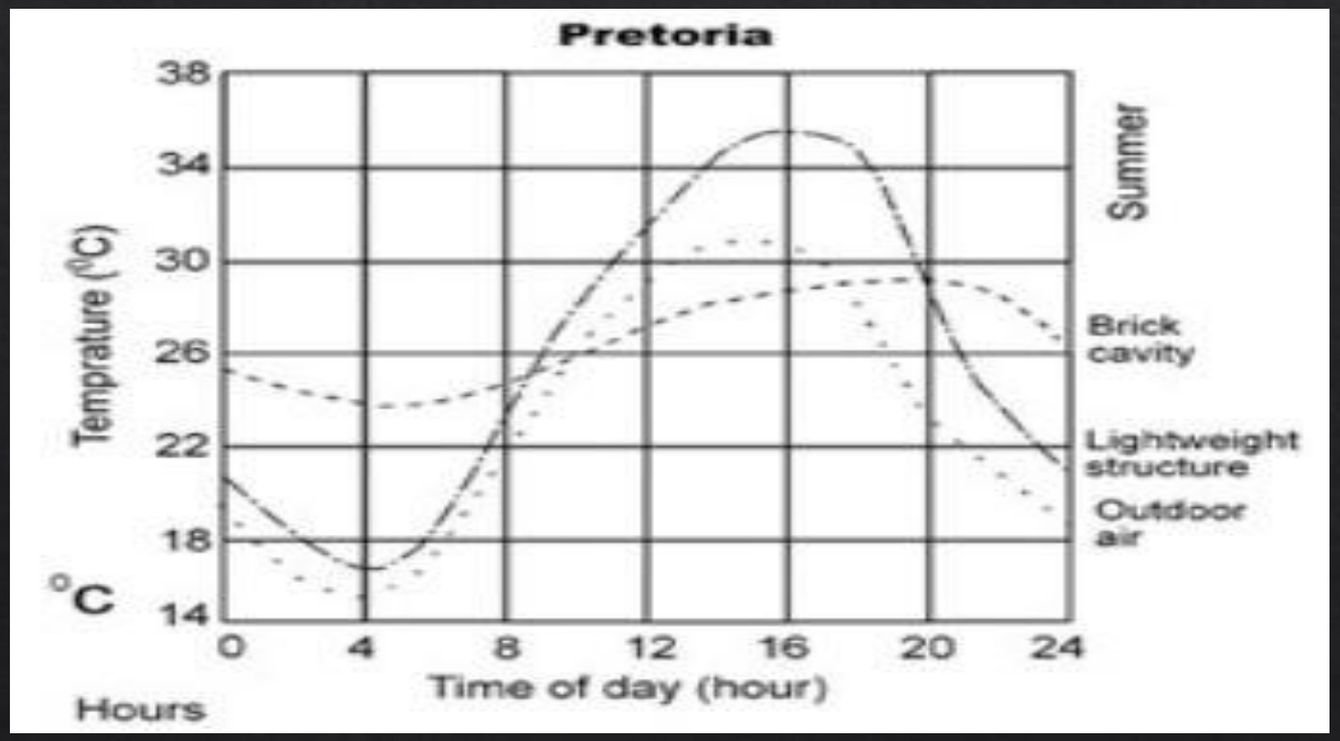
Marble

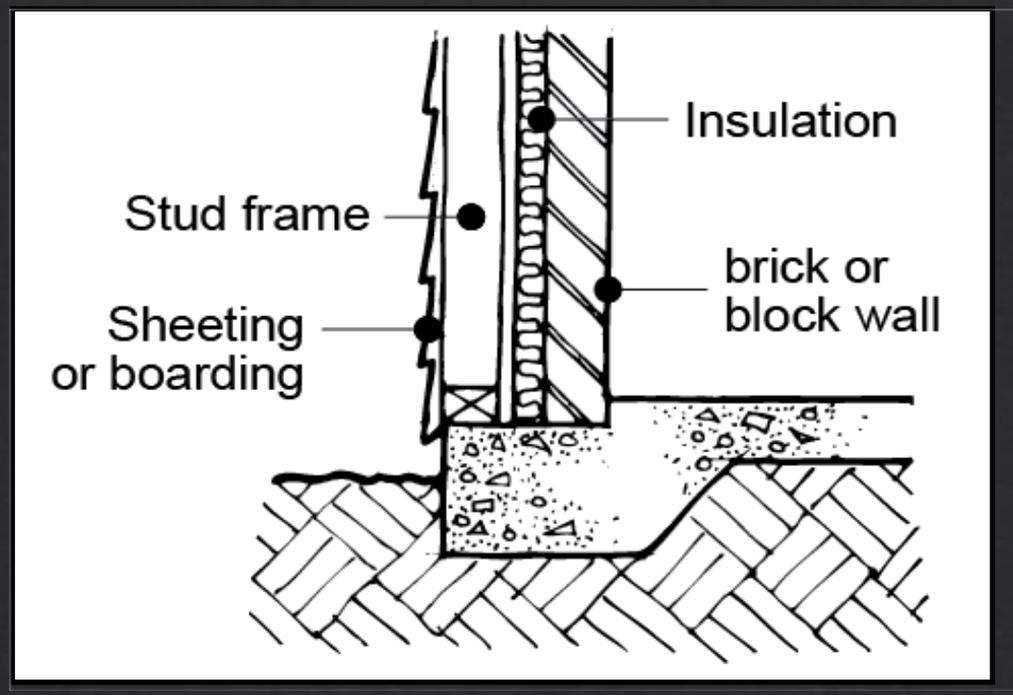
Bearing wall



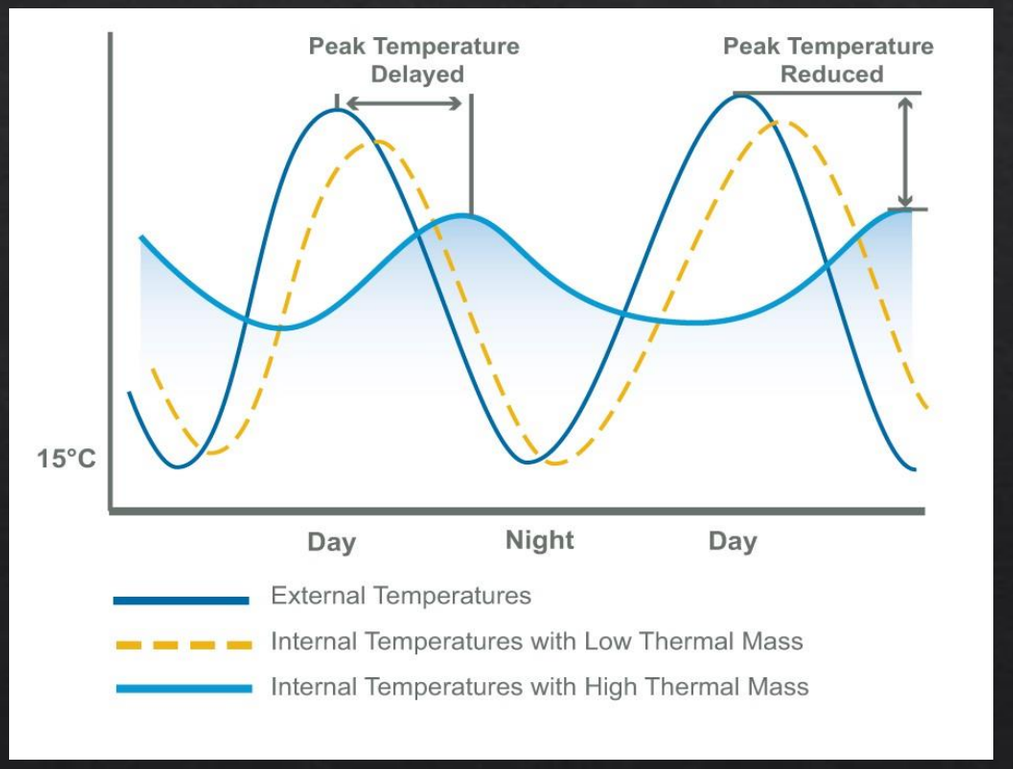
Structure & material

Thermal mass is the ability of a material to absorb and store **heat** energy. A lot of **heat** energy is required to change the temperature of high density materials like concrete, **bricks** and tiles. They are therefore said to have high **thermal** mass. Lightweight materials such as timber have low **thermal** mass.



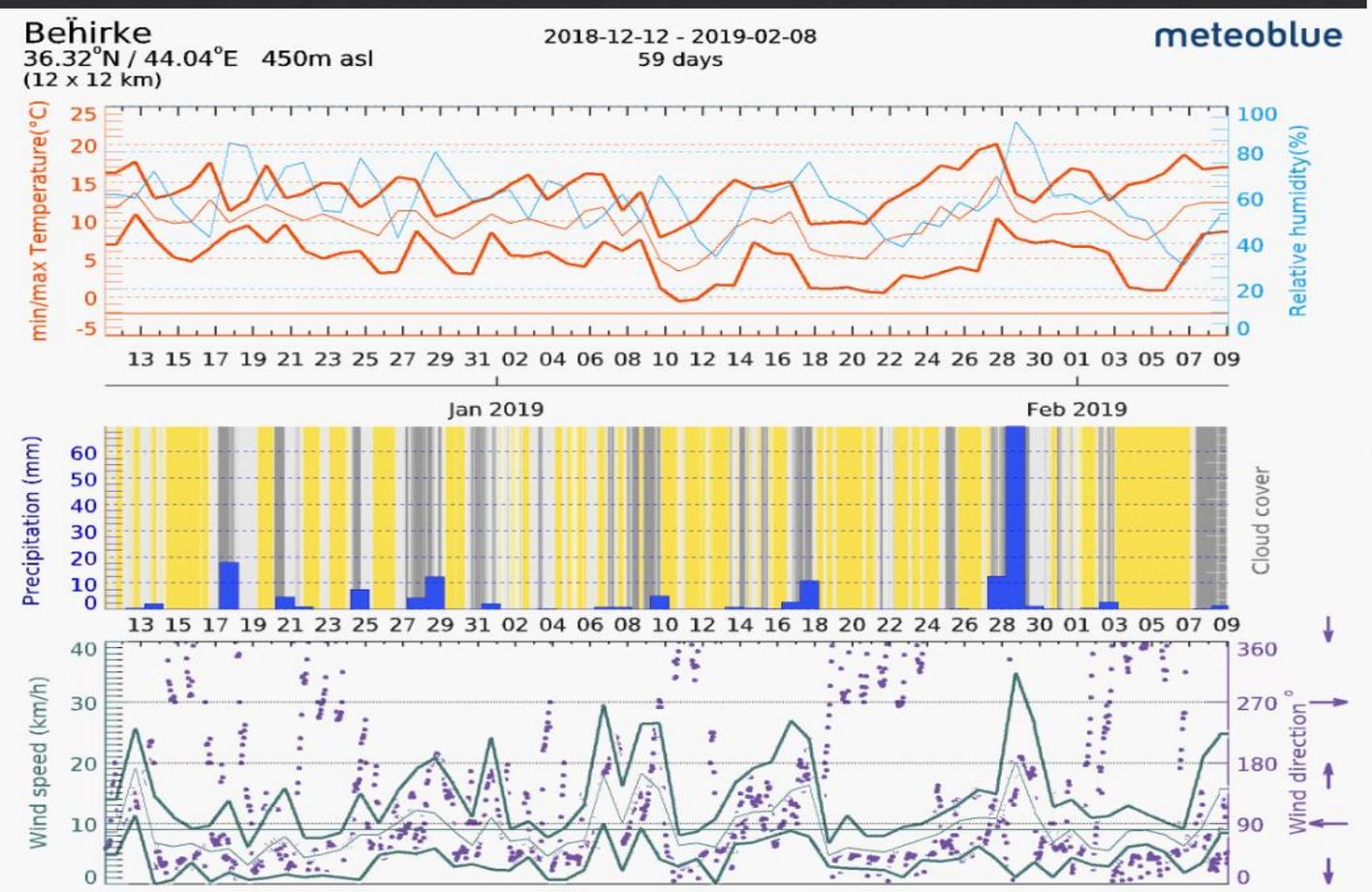


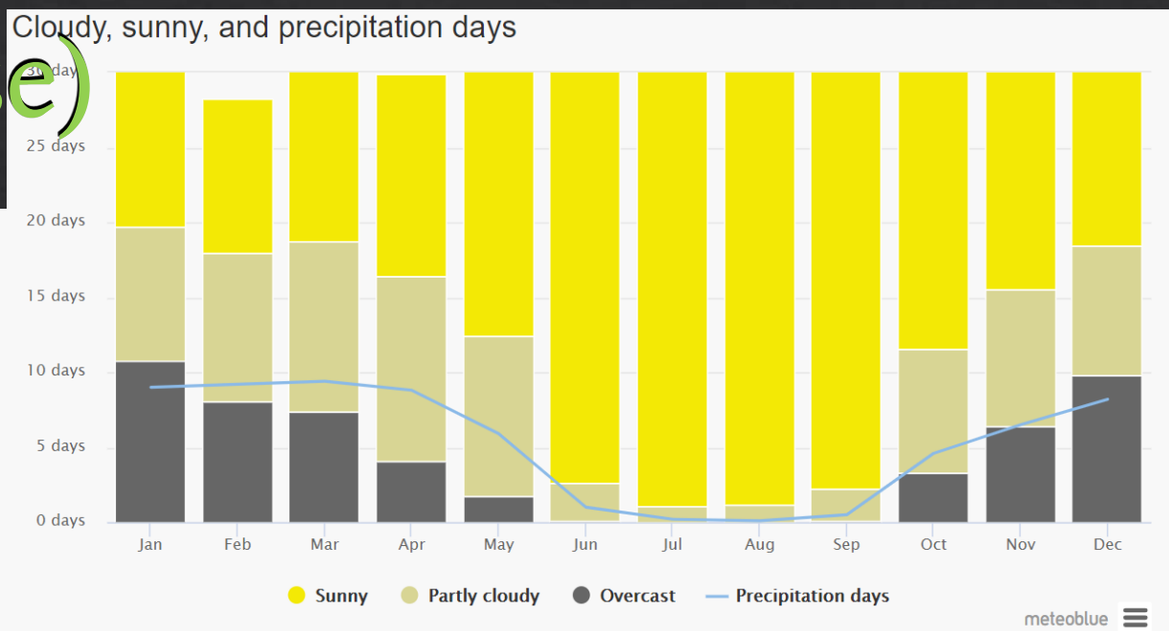
Thermal Mass

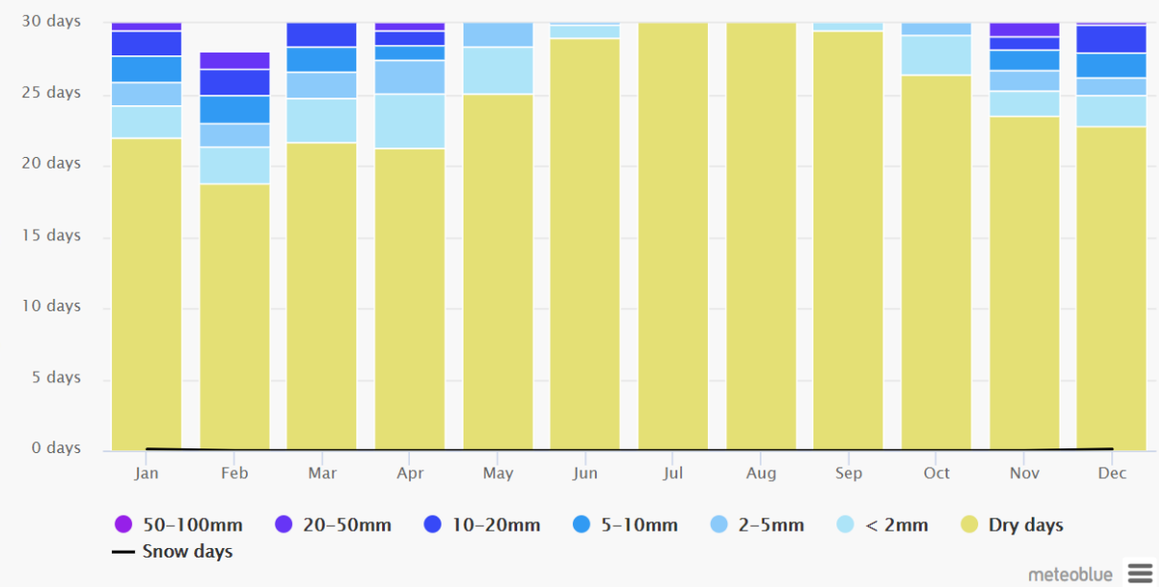


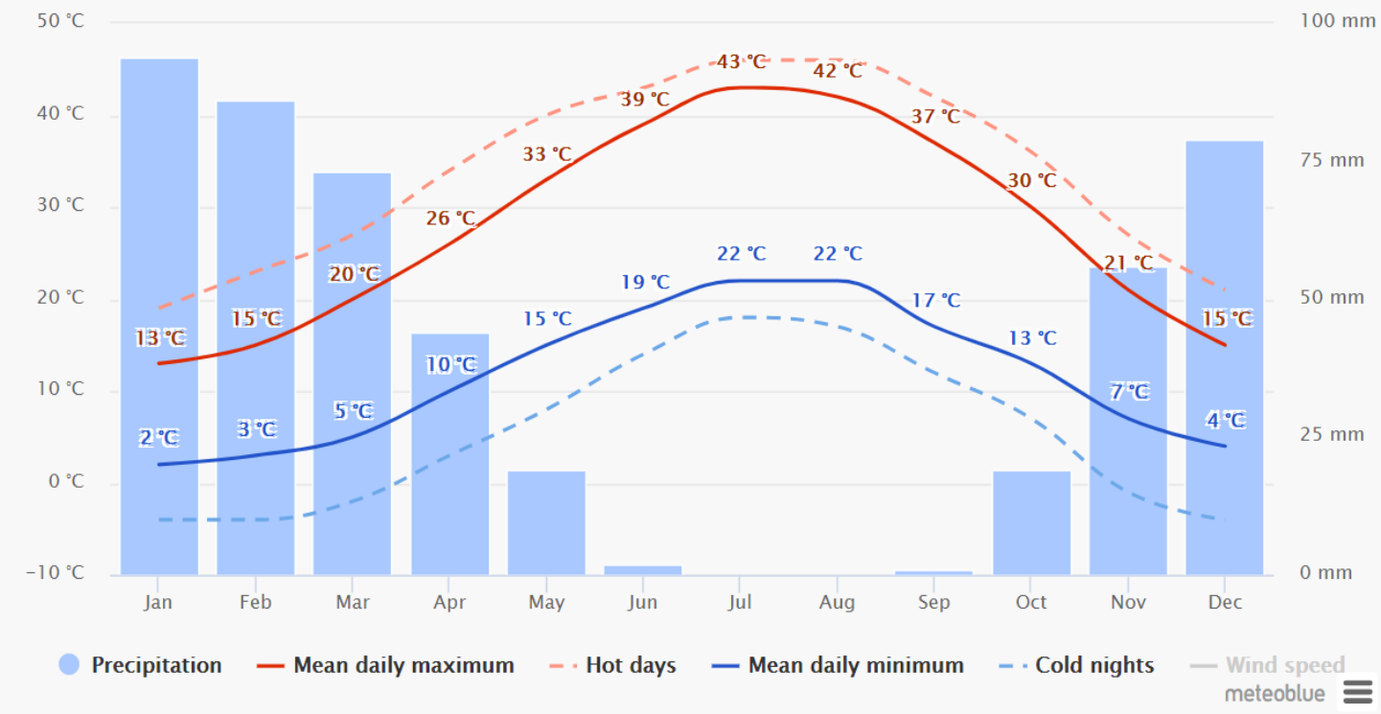
Brickwork, by the virtue of its high bulk density, has a corresponding large thermal capacity, with the ability to absorb and store a significant quantity of heat during periods of daytime, increasing temperature, and to isolate this heat in a controlled manner during periods of right time decreasing temperature

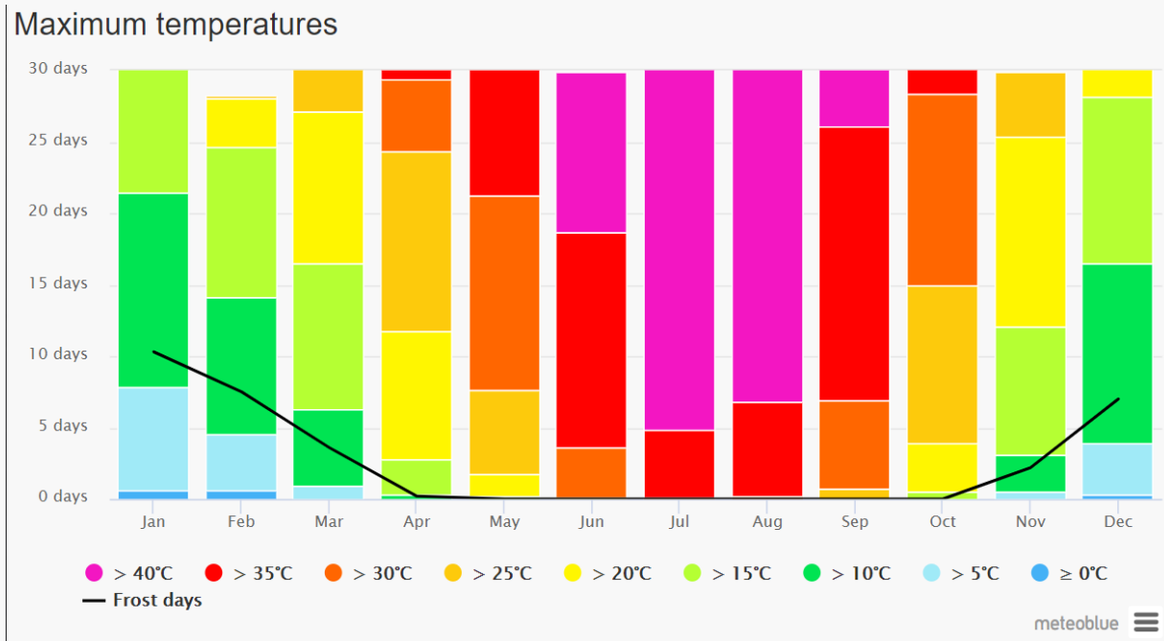
Weather of Erbil (Wind rose)





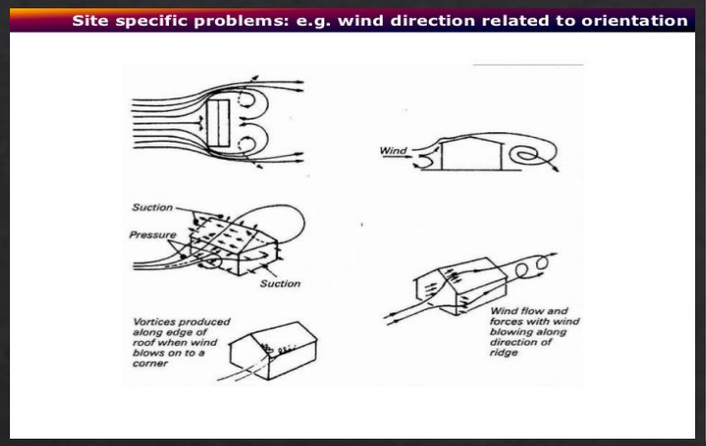


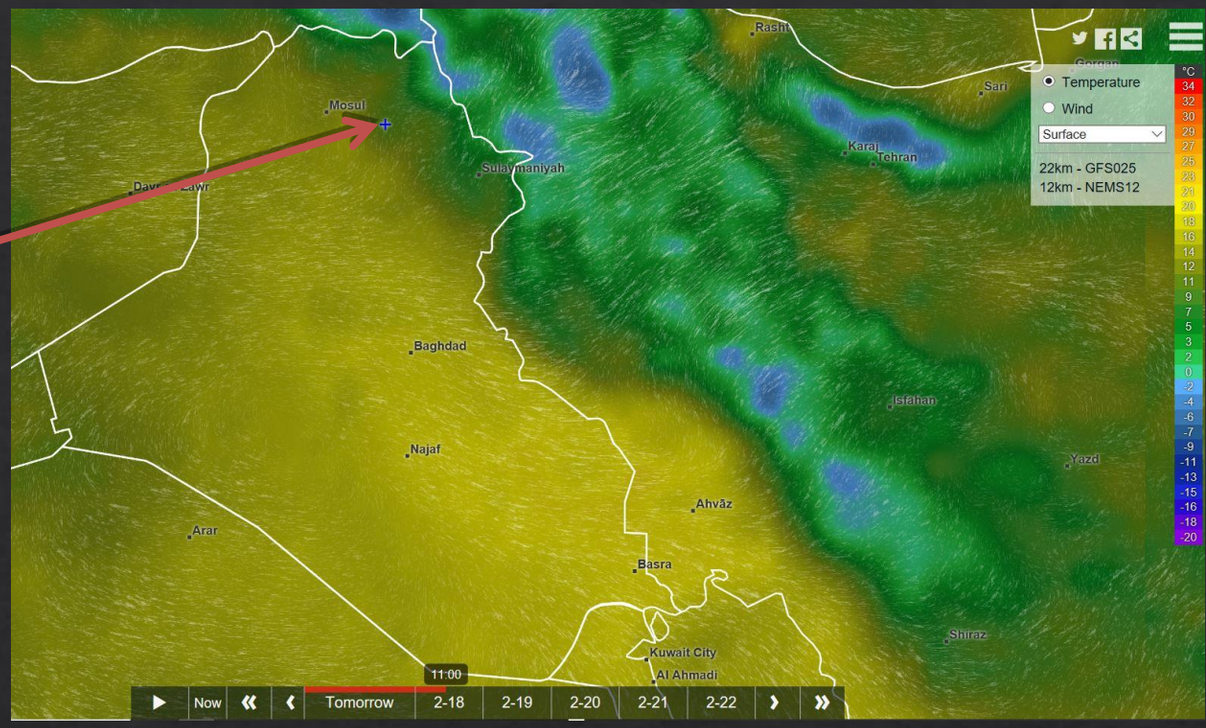




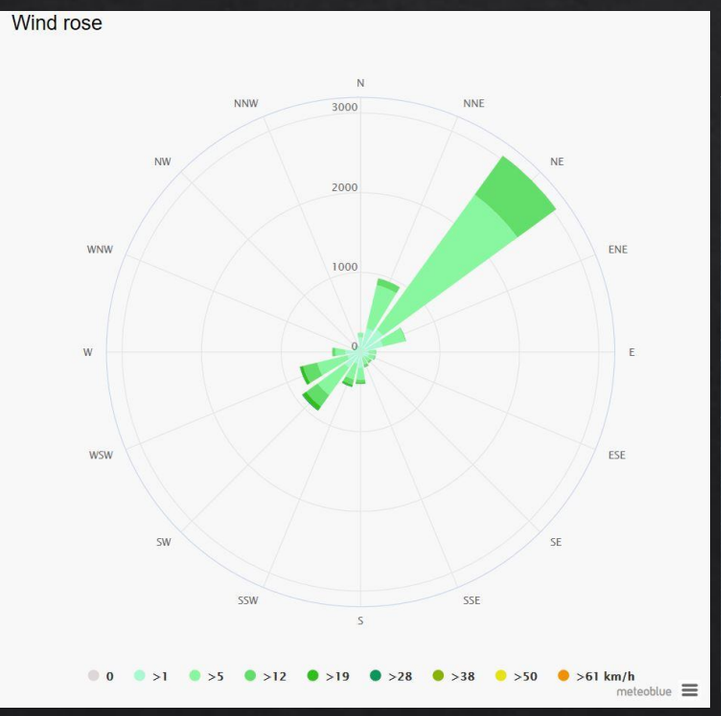
Weather of Erbil

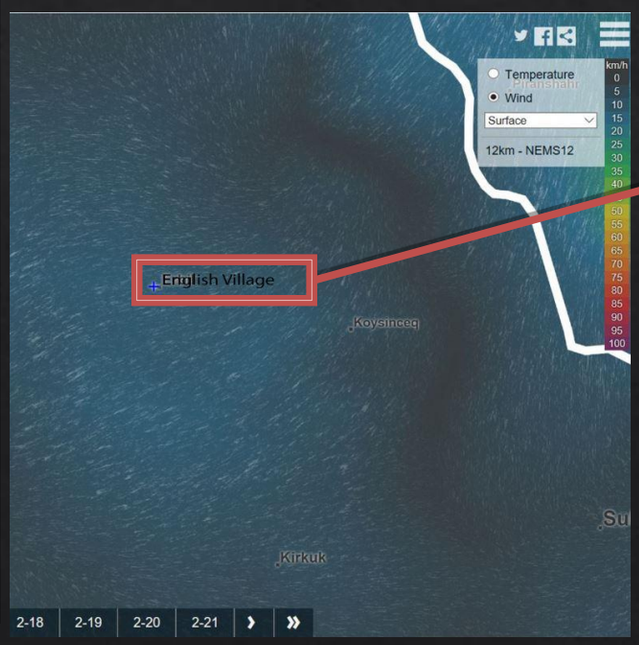
Wind direction related to the orientation

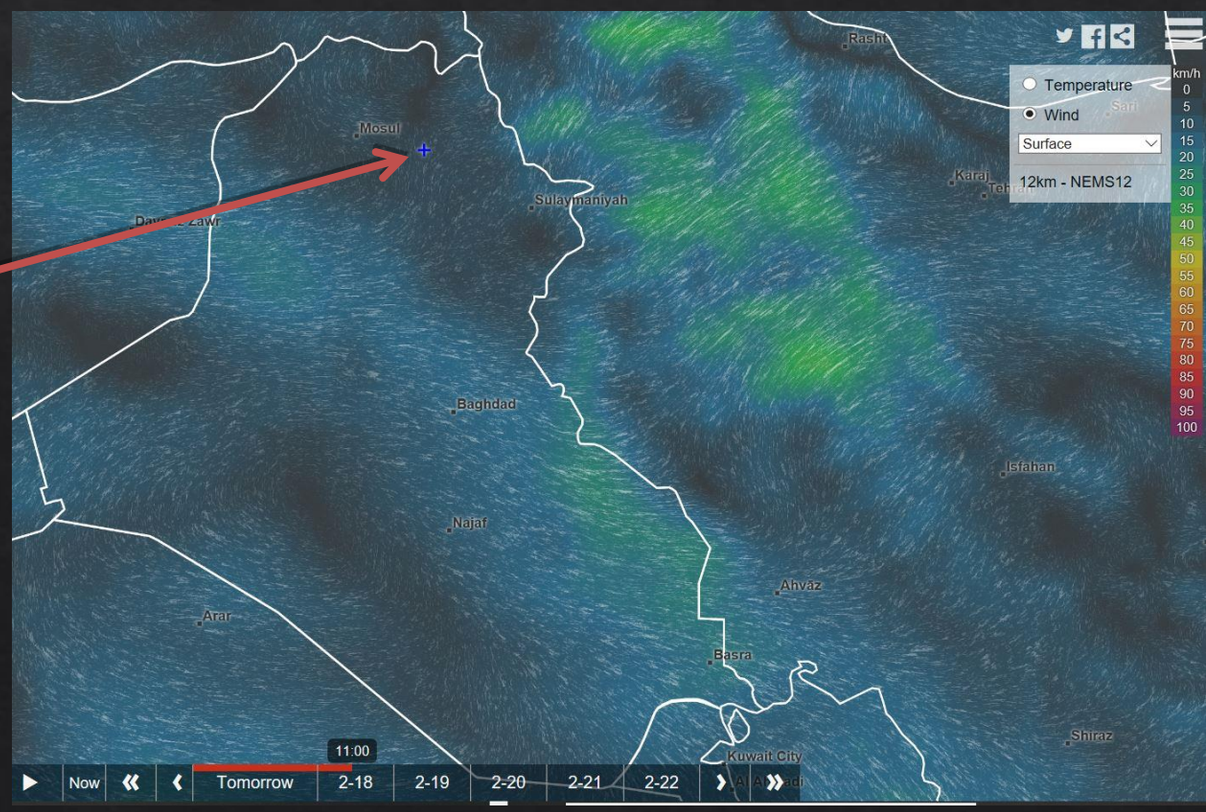




Temperature in Erbil





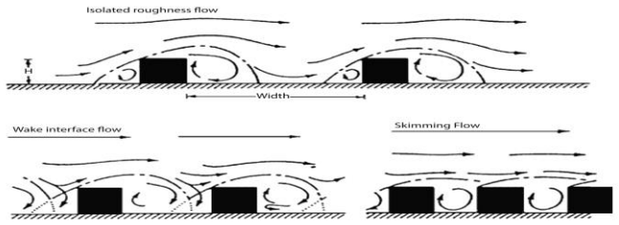


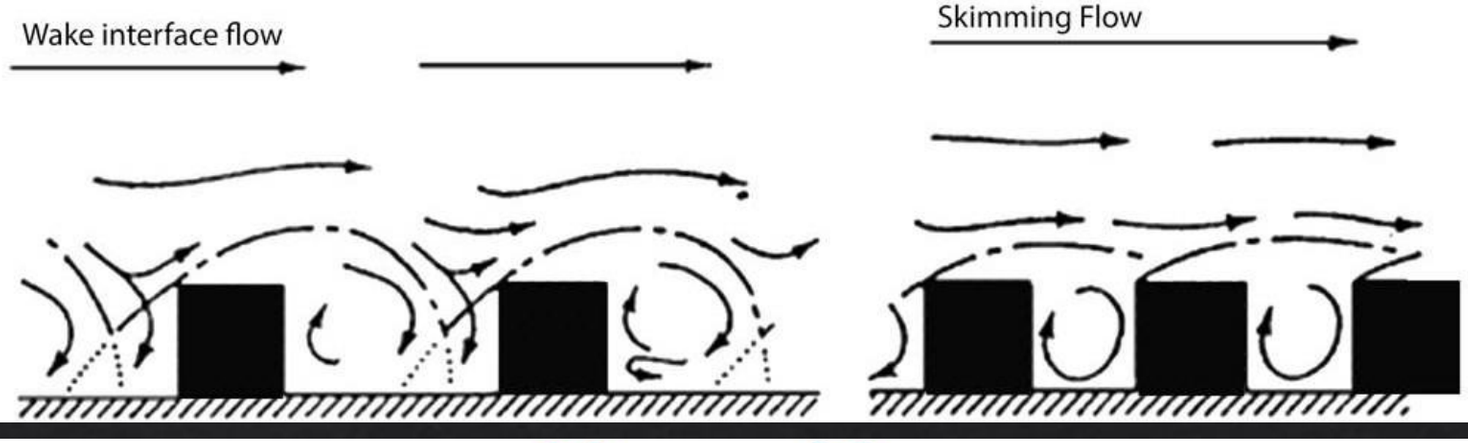
Wind Direction in Erbil

Wind direction

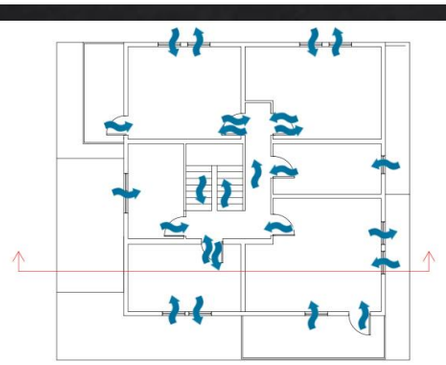
Height of the Apartments : 35 m /Height of the Villa : 6.8 m

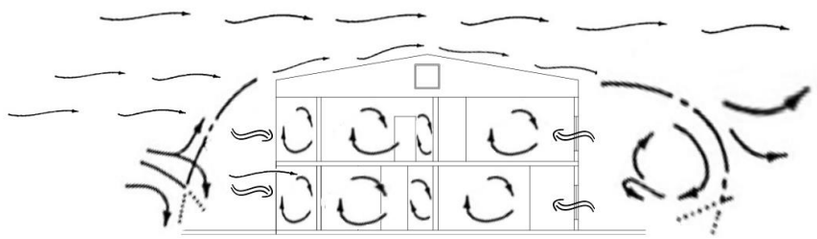
Section B-B

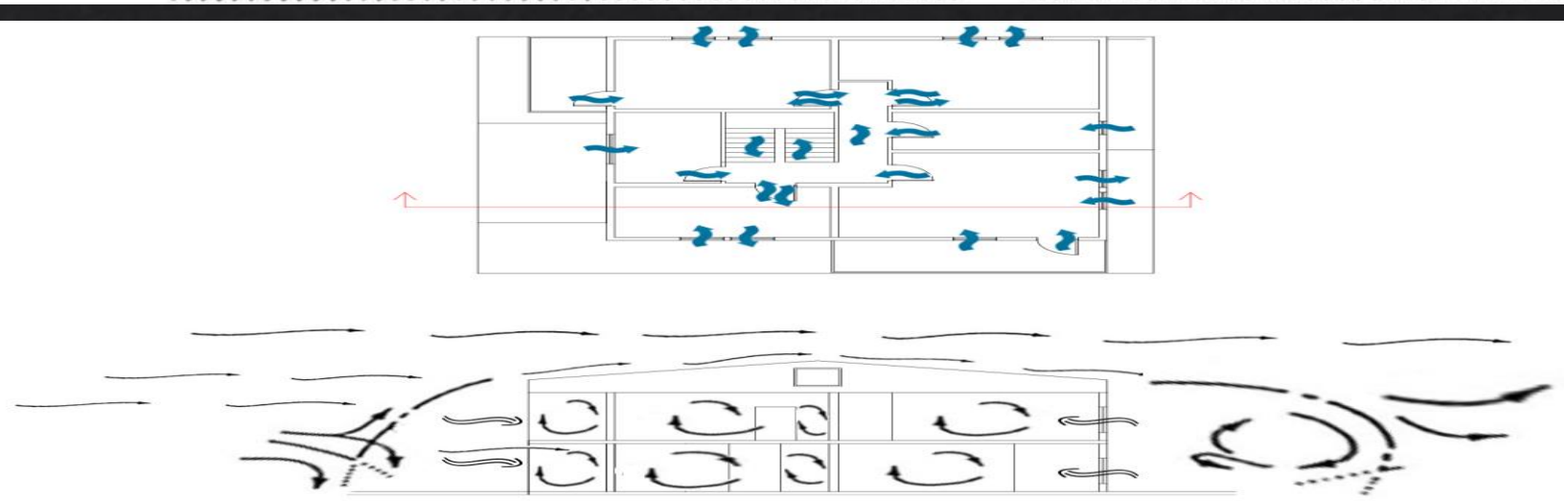




plan



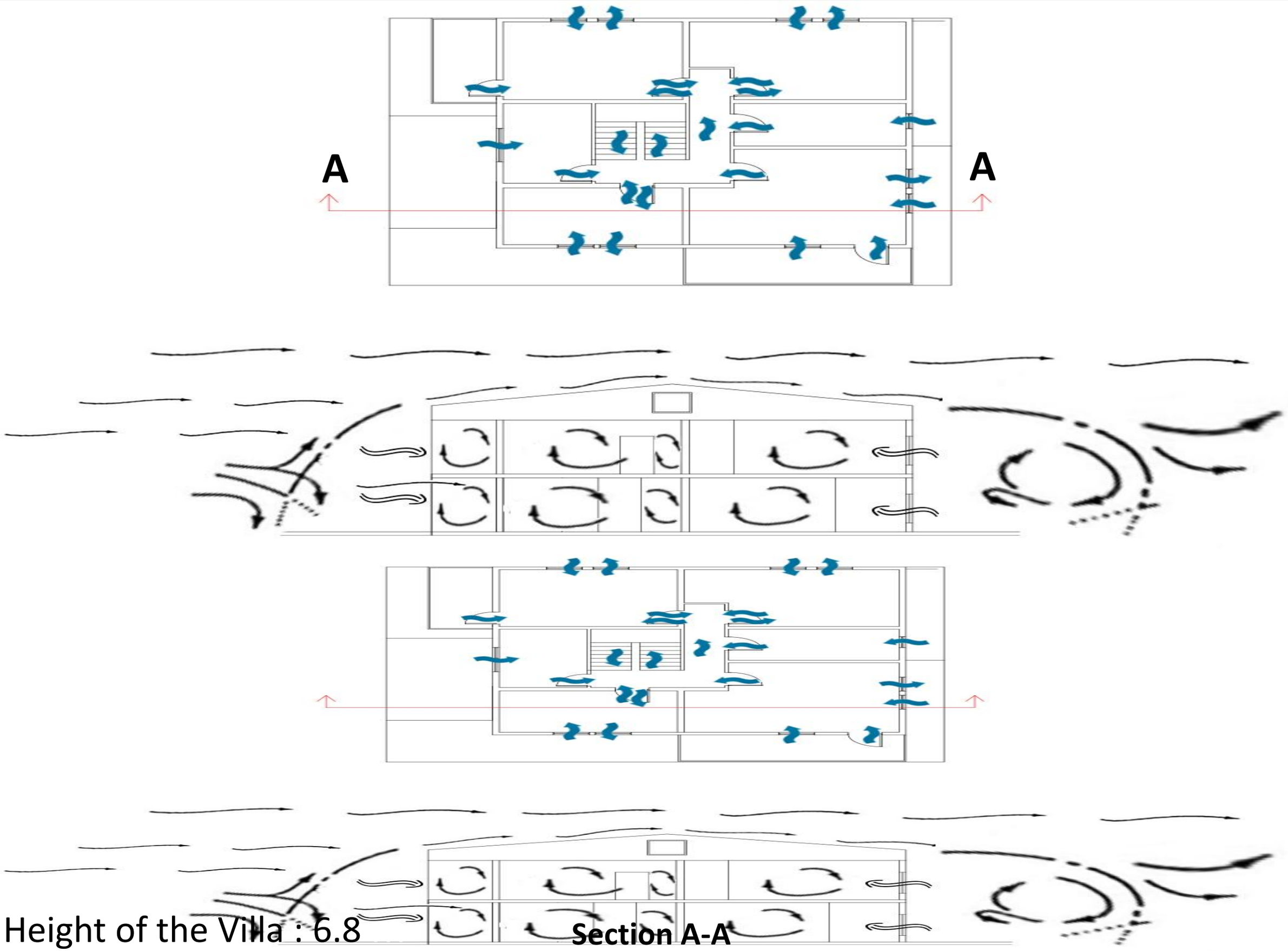




Height of the Villa : 6.8 m

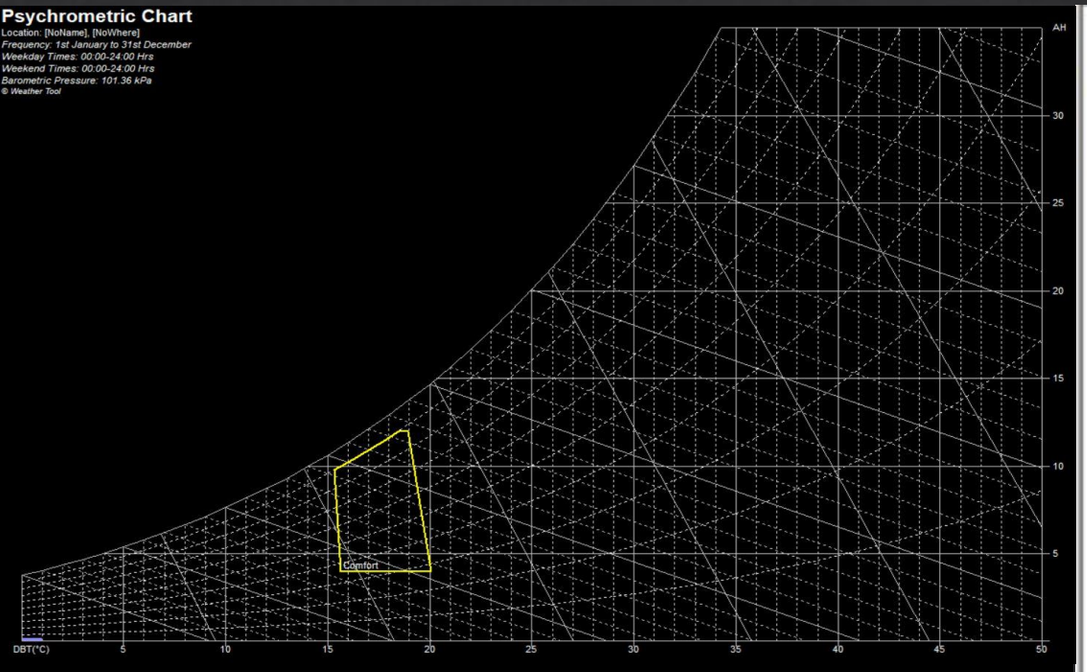
Section A-A

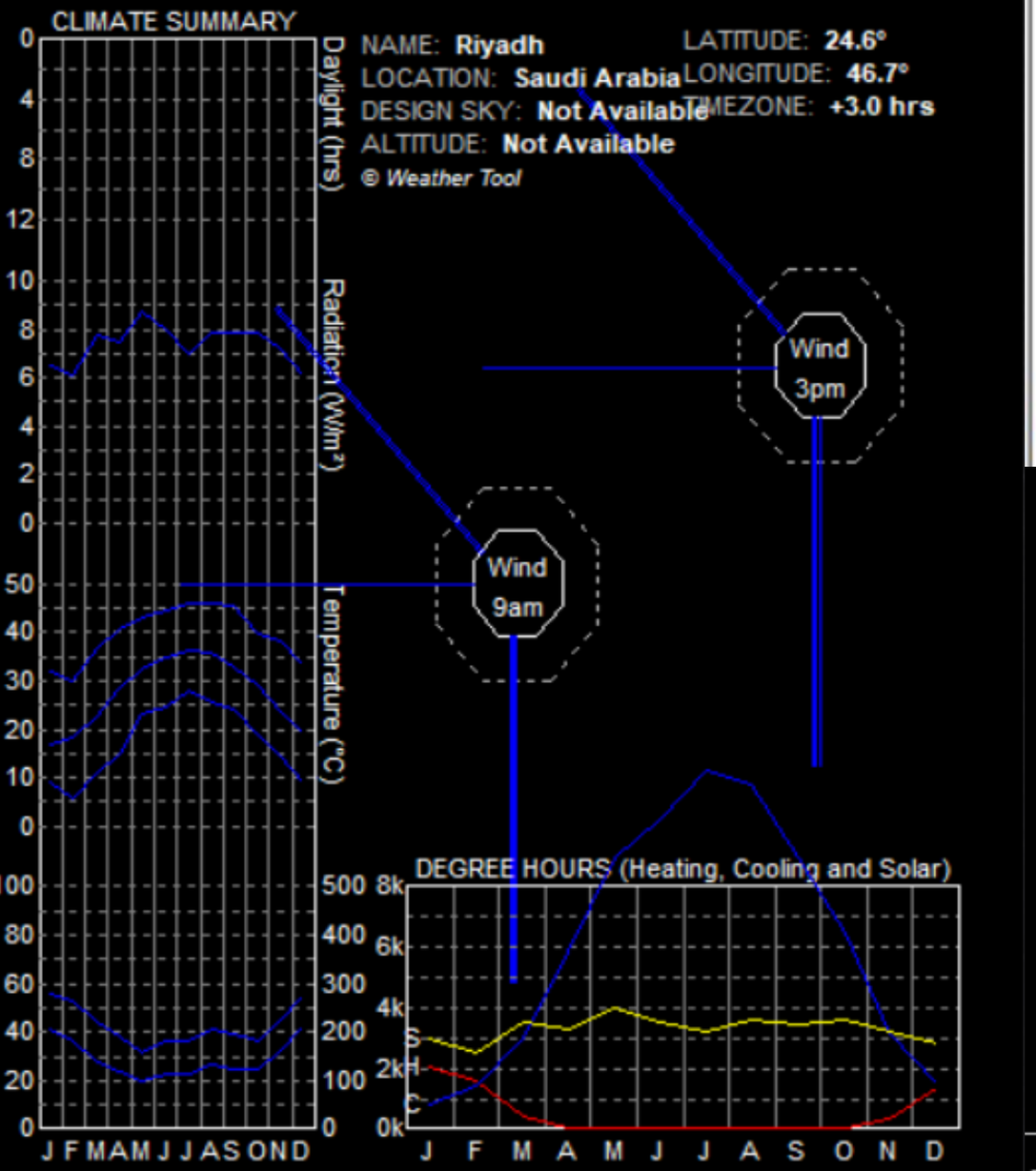
Wind direction in house

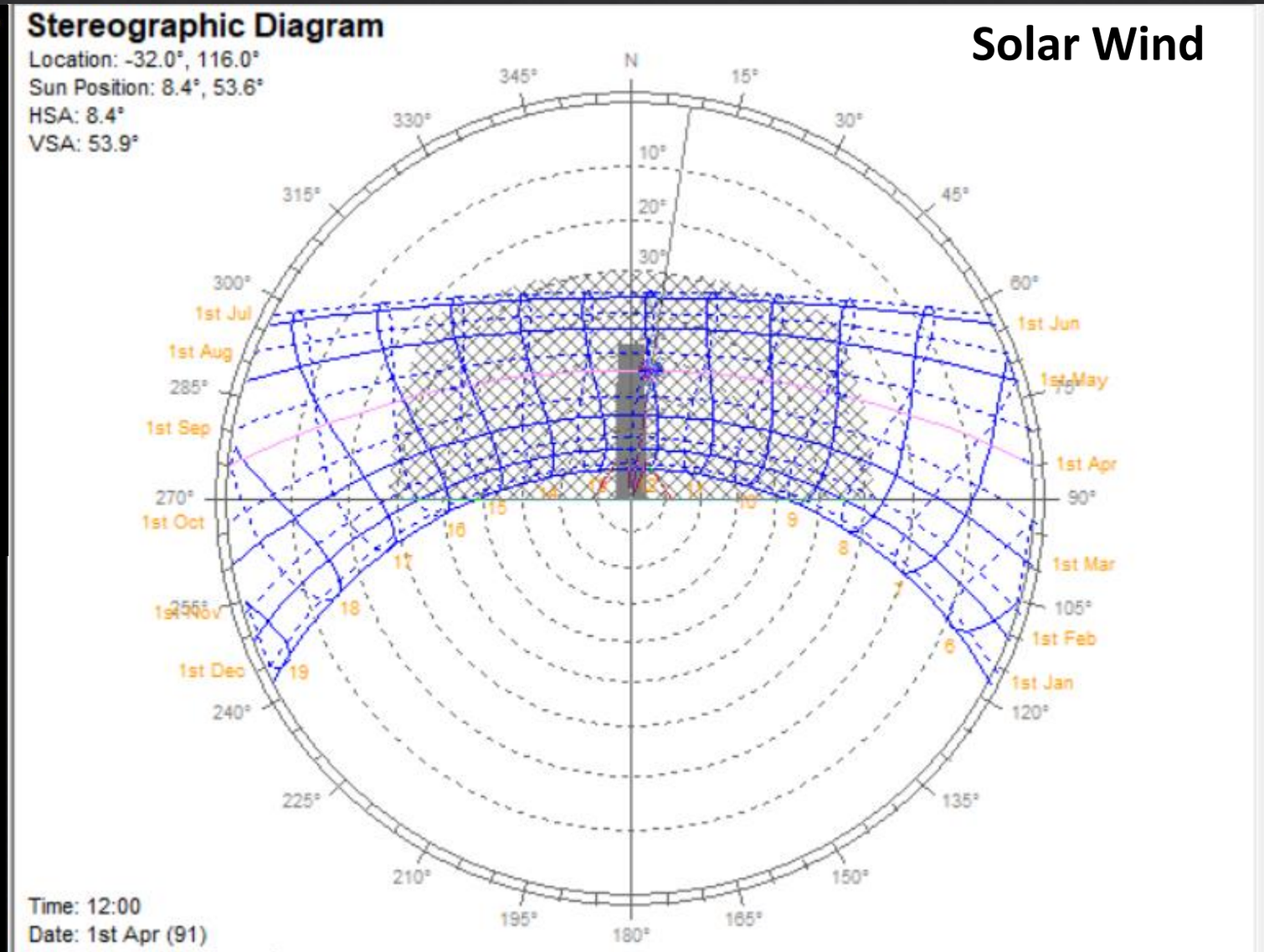


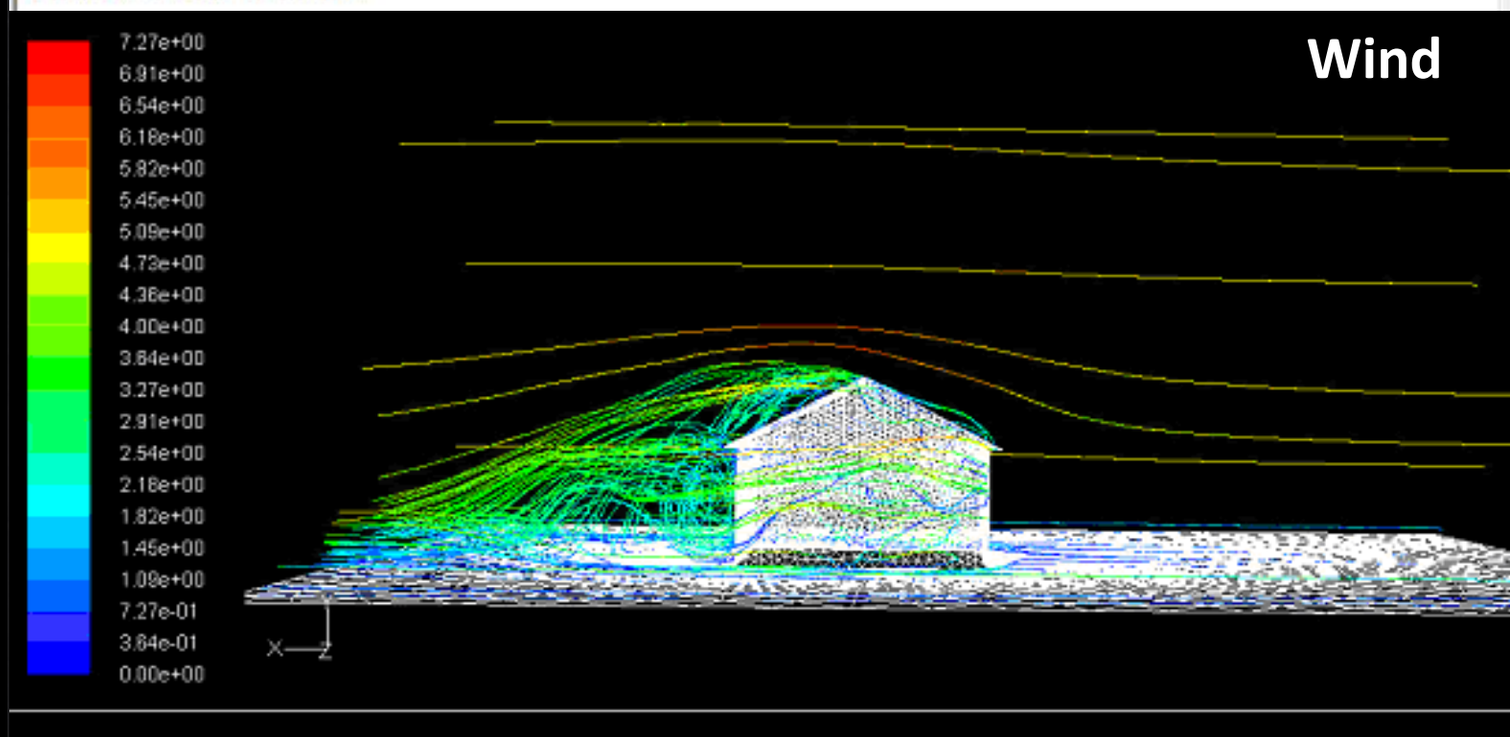
Height of the Villa : 6.8

Section A-A


Psychrometric Chart
Location: [NoName], [NoWhere]
Frequency: 1st January to 31st December
Weekday Times: 00:00-24:00 Hrs
Weekend Times: 00:00-24:00 Hrs
Barometric Pressure: 101.36 kPa
© Weather Tool
AH
DBT(°C)
Comfort


CLIMATE SUMMARY
NAME: Riyadh
LOCATION: Saudi Arabia
DESIGN SKY: Not Available
ALTITUDE: Not Available
LATITUDE: 24.6°
LONGITUDE: 46.7°
TIMEZONE: +3.0 hrs
© Weather Tool
Daylight (hrs)
Radiation (W/m²)
Temperature (°C)
Wind 3pm
Wind 9am
DEGREE HOURS (Heating, Cooling and Solar)
J F M A M J J A S O N D


Stereographic Diagram
Location: -32.0°, 116.0°
Sun Position: 8.4°, 53.6°
HSA: 8.4°
VSA: 53.9°
Solar Wind
N
1st Jul
1st Aug
1st Sep
1st Oct
1st Dec
1st Jun
1st May
1st Apr
1st Mar
1st Feb
1st Jan
Time: 12:00
Date: 1st Apr (91)
Dotted lines: July-December.


Wind
7.27e+00
6.91e+00
6.54e+00
6.18e+00
5.82e+00
5.45e+00
5.09e+00
4.73e+00
4.36e+00
4.00e+00
3.64e+00
3.27e+00
2.91e+00
2.54e+00
2.18e+00
1.82e+00
1.45e+00
1.09e+00
7.27e-01
3.64e-01
0.00e+00
Pathlines Colored by Velocity Magnitude (m/s) (Time=5.1000e+00)

Heat gain calculation by occupants

1-Kitchen (2person)

Sensible head gain=78.5w
Latent heat gain =78.5w
Total sensible heat gain= $\frac{2*78.5}{1000}$ = 0.157kw

Total latent heat gain = $\frac{2*78.5}{1000}$ =0.157kw

Total heat gain =0.157+0.157=0.314kw

2-Dining (6person)

Sensible head gain=70w
Latent heat gain =44w
Total sensible heat gain= $\frac{6*70}{1000}$ = 0.42kw

Total latent heat gain = $\frac{6*44}{1000}$ =0.264 kw

Total heat gain =0.42+0.264= 0.684kw

3-Reception (6person)

Sensible head gain=70w
Latent heat gain =44w
Total sensible heat gain= $\frac{7*70}{1000}$ = 0.49kw

Total latent heat gain = $\frac{7*44}{1000}$ =0.308 kw

Total heat gain =0.49+0.308 = 0.798 kw

4-BATH(person)

Sensible head gain=64w
Latent heat gain =30w
Total sensible heat gain= $\frac{1*64}{1000}$ = 0.064kw

Total latent heat gain = $\frac{1**30}{1000}$ =0.03 kw

Total heat gain =0.03 +0.064 =0.094 kw

5-Bedroom (2person)

Sensible head gain=64w
Latent heat gain =30w
Total sensible heat gain= $\frac{2*64}{1000}$ = 0.128kw

Total latent heat gain = $\frac{2*30}{1000}$ =0.060 kw

Total heat gain =0.128+0.060 = 0.188 kw

6-Bedroom (1person)

Sensible head gain=64w
Latent heat gain =30w
Total sensible heat gain= $\frac{1*64}{1000}$ = 0.064kw

Total latent heat gain = $\frac{1*30}{1000}$ =0.03 kw

Total heat gain =o.064+0.03 = 0.094 kw

Total heat gain of the house =2.172kw

Thermal resistances for surfaces (U) and (R) value

Layer	**Resistance /m2kw-1**
Inside surface (R_{si})	0.13
Air gap	0.18
Outside surface (R_{so})	0.04

Layer	thickness/m	conductivity	Resistance
Outside thermal resistance			0.04
marble	0.05m	2.08	0.05/2.08=0.024
brick	0.28m	0.7	0.28/0.7=0.4
internal plaster	0.02m	2	0.02/2=0.01
Inside thermal resistance			0.13
Total thermal resistance			0.564

The overall U-value id then U=1/R 1/564=1.77

Ventilation calculate :

V=897.6 m3
CV=1300J/M3.C
Outside temperature =30 C
Inside temperature=25 C
$\triangle T$=30-25=5C
Air change/hr =o.5
$QV=CV*V*\triangle T$

$$= 1300* \frac{(0.5*897.6)}{(3600)} *5$$

QV=810 Watt

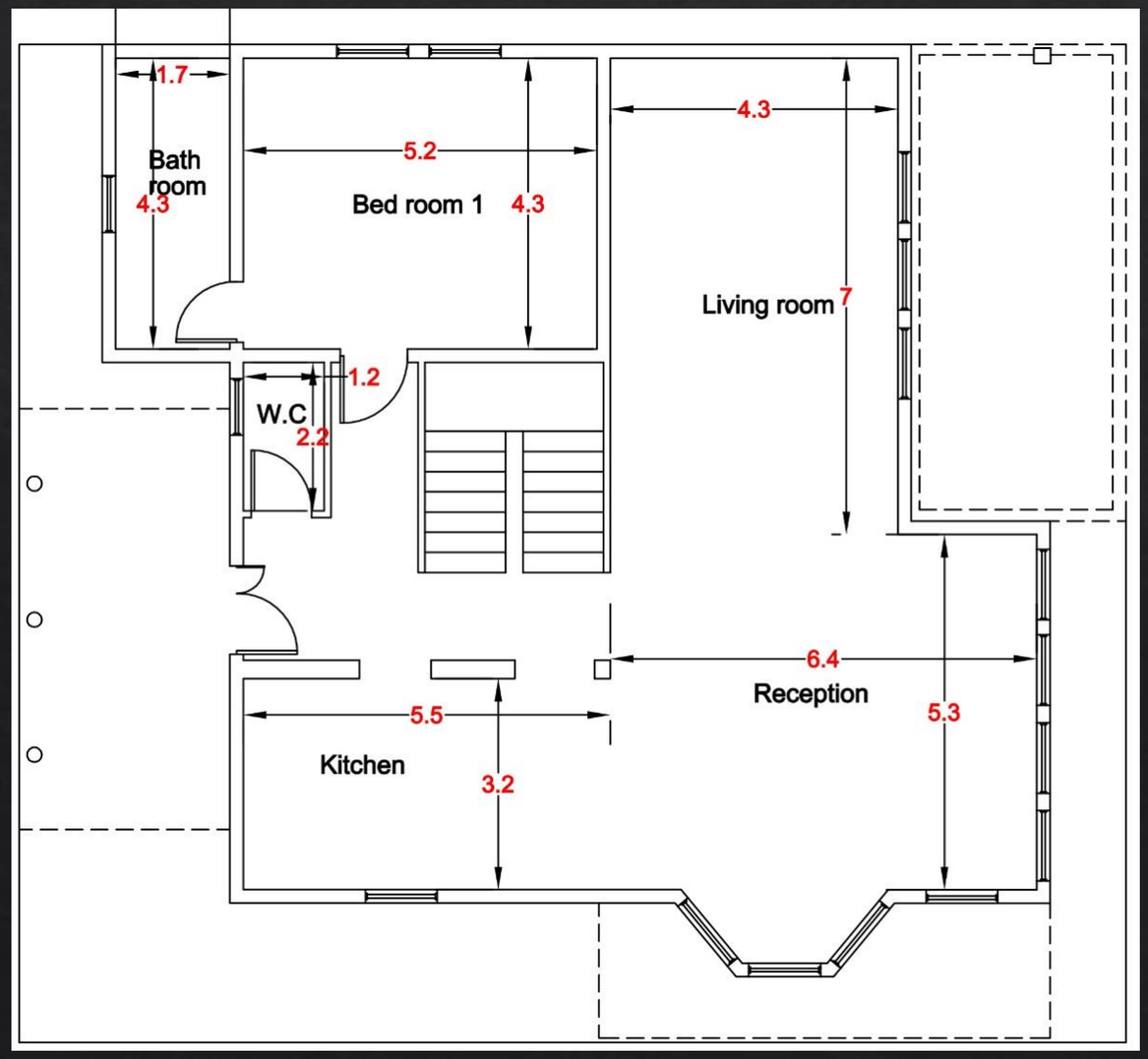
Typical Air changes per hour :

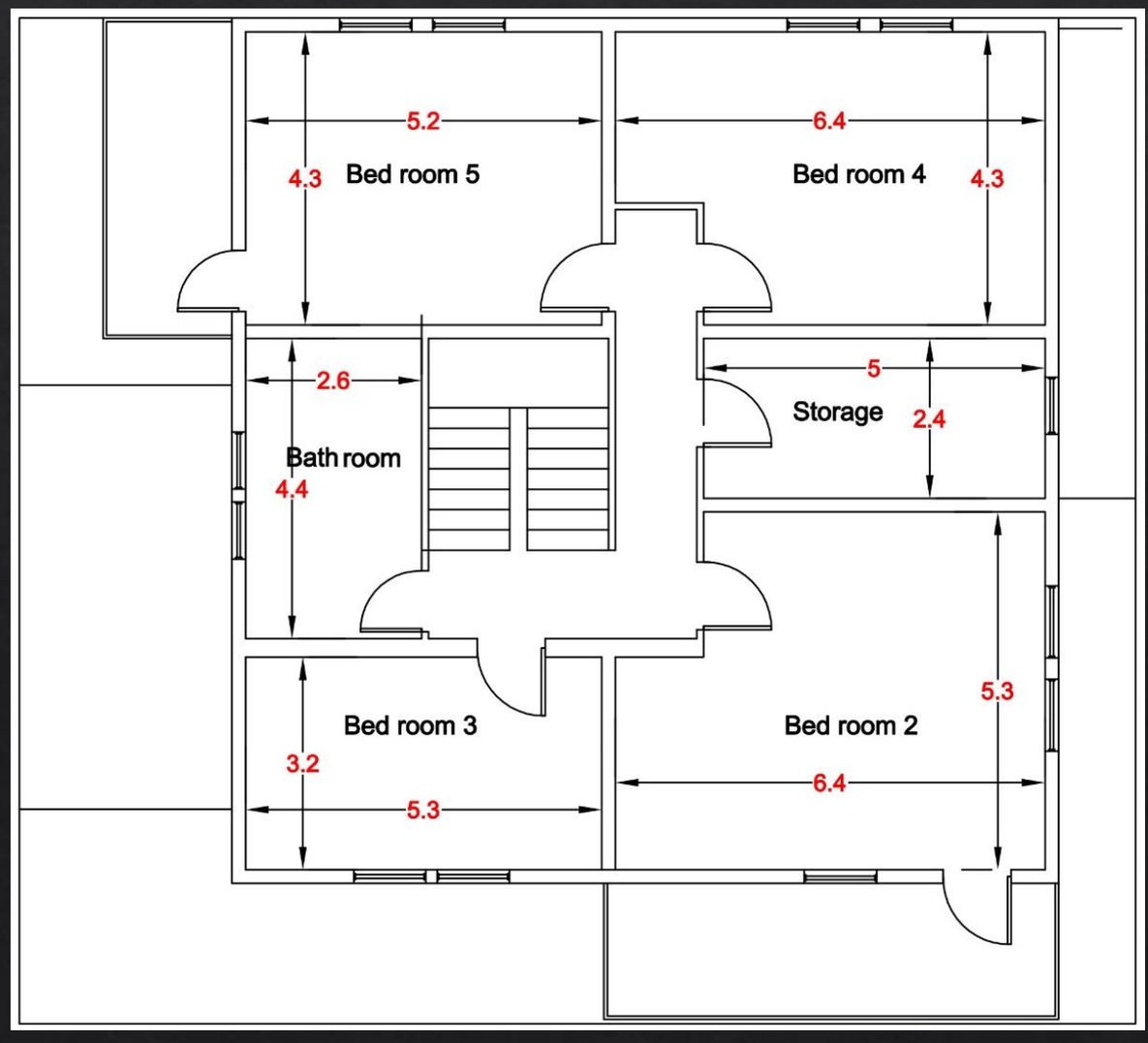
ground floor

kitchen	5.5*3*2=17.6	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{17.6}$ =1022.73
reception	6.4*5*3=33.92	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{33.92}$ =530.66
living room	7*4.3=30.1	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{30.1}$ =598.01
bed room1	5*2.4*3=22.36	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{22.36}$ =805.01
bath room	4.3*1.7=7.31	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{7.31}$ =2462.38
wc	2.2*1.2=2.64	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{2.64}$ =6818.18

first floor

bed room2	6.4*5*3=33.92	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{33.92}$ =530.66
bed room3	5.3*3*2=17.6	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{17.6}$ =1022.73
bed room4	6.4*4.3=27.52	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{27.52}$ =654.07
bed room5	5*2.4*3=22.36	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{22.36}$ =805.01
bath room	4.4*2.6=11.44	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{11.44}$ =1573.43
storage	5*2.4=12	air changes/hr= $\frac{CFM*60min}{Volume\ of\ room} = \frac{300*60}{12}$ =1500





Problem & Solution

-The project have a low passive solar heating and shading device.

solar control and shading can be provided by a wide range of building components including:

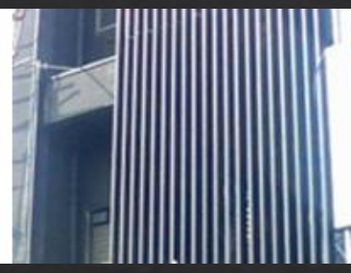
.Landscape features such as mature trees or hedge rows.

.Exterior elements such as overhangs or vertical fins.

.Horizontal reflecting surfaces called light shelves.

.Low shading coefficient (SC) glass.

.Interior glare control devices such as Venetian blinds or adjustable louvers.



-They used wood in some of the villas , Wood That Burns as a hard, fibrous material composed mostly of cellulose and lignin, the wood releases its heat quickly.

Sedimentary Sand. ...

Expanded Polystyrene. ...

The Air Breathed.

Prefer used Concrete instead of wood because **Concrete** has a high thermal mass with properties similar to brick and stone. It is possible to absorb **heat** from the atmosphere in warm weather and release it during cooler periods, e.g. overnight.

-The Houses have a low ventilation because the kitchen open to the living room.

To increase ventilation in the house we should do:-

.Create cross-**ventilation** ,it is important because it pushes warm air, together with the circulating dust and pollutants, out of the **home** and allows fresher and cooler air to enter. .Keep it clean and cool. Regularly clean your air-con filters — at least once every quarter.

.Purify naturally.