Politecnico di Milano

School of Architecture Urban Planning Construction Engineering
Architecture and Urban Design
Laurea Magistrale (Equivalent To Master Of Science)

BUSHEHR SOCIAL HOUSING

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ACKNOWLEDGMENT

I would like to express my special appreciation to my advisor Professor Gian Luca Brunetti, he has been a great mentor for me. His assistance and guidance and encouragement during this project, helped me to achieve my goal. I also like to thank my family for the support and love they gave me.

The sphere upon which mortals come and go,
Has no end nor beginning that we know;
And none there is to tell us in plain truth:
Whence do we come and whither do we go

Omar Khayyam (1048–1131)

ABSTRACT

Iran is a vast country with almost all types of climates, but it only has one building code for all of them and there is no codified rule for each climate. As a result, the buildings are not designed and constructed based on their specific region and climate.

This lack of research and also cheap energy make architects and people unaware of the impact that a building could have on its environment.

Unfortunately, in Iran, like most of the developing countries, there is no will to make sustainable and energy-efficient buildings.

Bushehr is one of the most important ports of Iran and has a great architectural background due to its connection to all over the world throughout its history. But nowadays this valuable architecture is being neglected and it is replaced by a so-called "modern architecture" which has no identity and it is costly for the environment.

Also, due to its young population, Iran is facing the problem of affordable housing, as there are not enough houses and the prices are too high which people can not afford.

The Bushehr social housing project is an attempt to study and propose solutions based on the traditional architecture of the city combined with modern architecture. The main goal of the project is cost efficiency and also the energy efficiency of the building.

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1-1) INTRODUCTION

Bushehr port is the capital of Bushehr province, which is located at 50 degrees and 50 minutes longitude and 28 minutes and 59 degrees latitude. The neighbors of Bushehr are Behbahan from the north, Gachsaran from the east, Lar from the west and Persian Gulf from the south. This province is located in a wide plain and its pastures are irrigated by the rivers of Hilla, Shoor and Ahram.

The shore of Bushehr port is not very deep, so it is not possible to dock ships with a capacity of more than 30,000 tons in this port.

Bushehr province is one of the southern provinces of Iran and the seventeenth-largest province in terms of area, which is located on the shores of the Persian Gulf. The capital of this province is Bushehr port.

This province is of strategic and economic importance due to its location on the strategic coast of the Persian Gulf, maritime exports and imports, fishing industry, oil and gas reserves (South and North Pars), agriculture, palm groves, and the existence of a nuclear power plant. It is called the energy capital of Iran.

The struggle of the people of Dashti, Dashtestan, and Tangestan against foreign forces in the last one hundred years is one of the important historical features of this province.

1-2) GEOGRAPHY

Bushehr is 7m above sea level. It is located in south west of Iran and at distance from 27 and 17 minutes to 30 degree and 17 minutes latitude and 50 and 8 minutes to 52 and 58 minutes longitude. Bushehr province is surrounded by the Khuzestan province, the Kohkilouye and Bouyer Ahmad province from north, the Persian Gulf and the Hormozgan province from south, the Fars province from east and by the Persian Gulf from west. In addition to that, Bushehr has 625 kilometers water boundaries with the Persian Gulf. Bushehr covered about 1.4 percent of Iran's area with an area of 236,756 square kilometers.

Figure 1-1 ; Iran Location In The World Map

Figure 1-2 ; Bushehr Location In Iran Map

1-3) CLIMATE

Numerous factors such as low altitude in the low latitudes, proximity to the sea, warm southwest winds and hot and humid sea winds, and the autumn-winter passage of Sudanese and Mediterranean cyclones are the main factors determining the climatic situation in the region. Due to its proximity to the equator and low altitude, this region generally has a warm climate which is hot and dry inside the province, and hot and humid on the beach. Being near the Persian Gulf and the equator means that Bushehr has humid summer with high solar radiation and mild winter.

The difference in monthly temperature in the Bushehr province is much less than the plateau and highlands of Iran. But the heat regime is such that the heat increases from February and reaches its final level in April, May, and June, and in general, the amount of monthly heat decreases from July and August compared to the previous months. The difference between day and night temperatures, which is inversely related to the amount of air humidity, is small in this region.

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	14.3	15	18.8	23.3	28	30.4	32.1	32.6	30.4	26.6	21.5	16.6
Min. Temperature (°C)	10.6	11.5	14.7	19.1	24	26.9	28.9	28.9	26.1	22.2	17.2	12.8
Max. Temperature (°C)	18	18.6	23	27.5	32.1	33.9	35.3	36.4	34.8	31.5	25.9	20.4
Precipitation / Rainfall (mm)	61	28	16	8	1	0	0	0	0	2	34	66

Figure 1-3 ; Avg. Temperature Of Bushehr

The absolute maximum temperature of the province is 52.5 degrees Celsius and the absolute minimum temperature reaches-1 degrees Celsius. The average annual temperature in Bushehr is 25.7 degrees Celsius. Seasonal temperature changes are also a function of changes in sunlight throughout the year. The temperature difference in the winter and summer months is relatively large and is about 19.2 degrees Celsius. There is less difference between winter/autumn and spring/summer seasons. The average annual rainfall in Bushehr province is 220 mm. These rainfalls mostly occur in autumn and winter. In general, Bushehr has 6 months of warm weather, two months are almost mild to cold and about four months of the year are mild to warm. The humidity on the beach balances the temperature to some extent, but in some months the humidity rises so high that it reaches saturation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Relative Humidity (%)	75	72	65	60	56	58	61	65	66	66	67	72	65.3
Average Dew Point Temperature °C (°F)	9.7 (49.5)	10.7 (51.2)	12.6 (54.6)	15.5 (59.9)	19.2 (66.5)	21.9 (71.4)	24.3 (75.7)	25.3 (77.5)	23.5 (74.3)	19.8 (67.7)	14.6 (58.4)	11.2 (52.1)	17.3 (63.2)
Interpretation	A bit dry	Very comfort-able	Comfort-able	Comfort-able	Humid	Very humid	Muggy	Muggy	Very humid	Humid	Comfort-able	Very comfort-able	Ok

Figure 1-4

DAYLIGHT AND SUNSHINE HOURS

The average total number of annual sunshine hours in Bushehr, according to the statistics of 2001, is equal to 3021 hours, the highest amount of which was recorded in June at 370.4 hours, the lowest amount in February, equivalent to 178.5 hours.

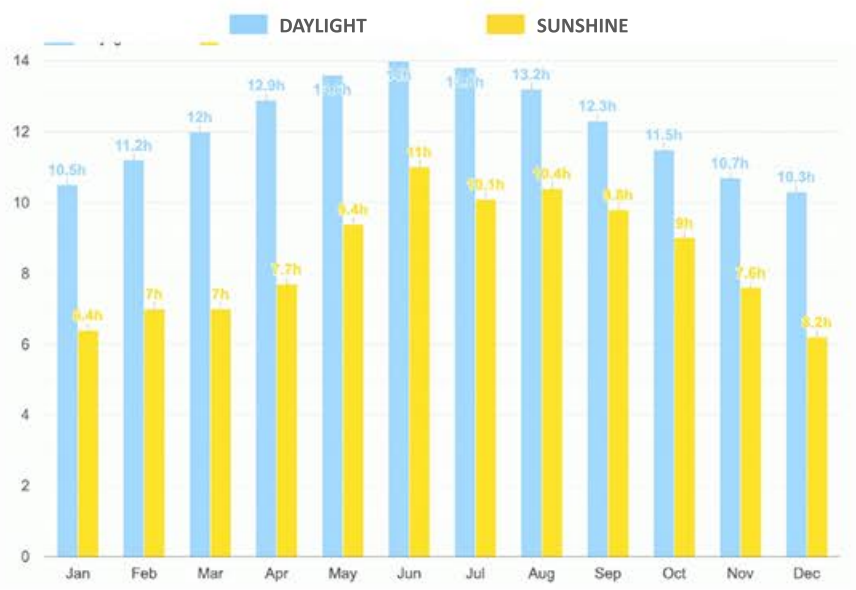


Figure 1-5

WIND ROSE

Bushehr winds are mostly west and southwest winds. The direction of the winds usually changes with the height of the sun, in other words, with the change of seasons. In hot days, which are long, the direction is south and southwest, but in autumn and winter, the direction of the winds is northwest and west.

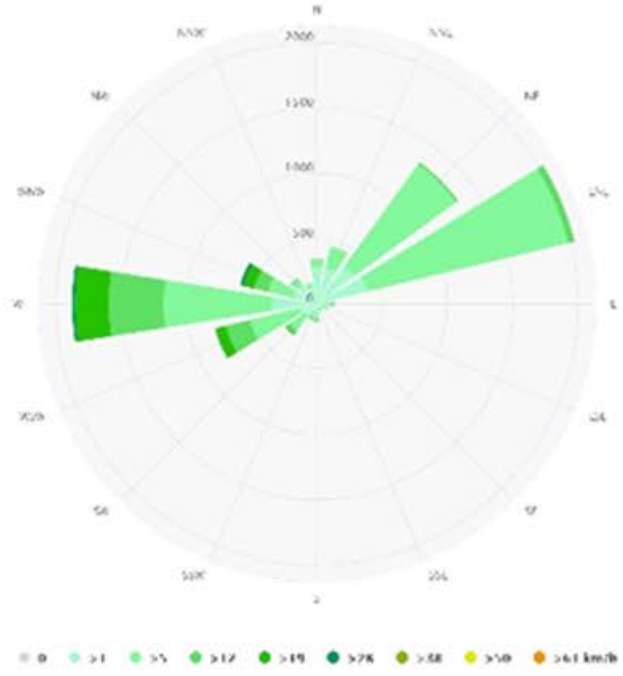


Figure 1-6

1-4) HISTORY OF BUSHEHR

The establishment of Bushehr is attributed to the Sassanid era, but the modern Bushehr city was built by the order of Nader Shara Afshar. Nader Shah intended to establish a port in southern Iran to strengthen the country's navy and economy. After being built by the order of Nader Shah, this port gradually became more prosperous until it became a strong competitor for the port of Basra, which was very prosperous at that time. But this area is older, artefacts obtained from Rishahr show that civilization has been going on for 5,000 years in this area. Rishahr is the name of a region 3 km away from Bushehr.

Bushehr went through difficult days in its history. After Iran invaded and occupied Herat in Afghanistan during the Qajar period, the British, who saw their interests at stake, attacked Bushehr and the port was occupied by the British army. When Bushehr was under British occupation, its people revolted against foreign tyranny and showed great courage. Finally, after the Qajar government accepted the Paris Agreement, the British evacuated Bushehr.

Figure 1-7 ; Bandar Bushehr, drawing by Eugène Flandin, 1840

1-5) CULTURE OF BUSHEHR

Population

According to the 2011 census, Bushehr province has a population of 1,032,949, of which 68.2% live in urban areas and the rest in rural areas, and less than 1% of them are non-residents. In this province, the population density in 2011 is equal to 45 people per square kilometer. The population growth rate from 2006 to 2011 was 3.11 percent. Bushehr has the highest population growth rate in Iran. This rate was equal to 4.1 between 1976-81.

Language

The language of the people of Bushehr is Persian in most areas. The northern parts of the province speak a Lori dialect. Accents and dialects are more diverse in rural areas than in cities. Some residents of Schiff Island and the ports of Kangan and Assaluyeh also speak Arabic. Persian is spoken in the Bushehr region in the Bardestani dialect. The people of the Persian Gulf coast and its islands speak a dialect that has its roots in the dialects and languages of Shabankareh, Baluchi, Turkmen, Lori, and some English, Dutch, Portuguese, Hindi, and Arabic words, but its roots are Persian.

In Bushehr province, the people of the southern cities, namely Dashtestan, Tangestan, Dashti, Dir, Kangan, and Jam, speak Persian and the people of the two northern cities of Genaveh and Deylam speak Lori.

Religion

More than 99% of the people in this province are Shiite Muslims. Also, in some southern regions of Bushehr province (Kangan and Assaluyeh cities in the southeast of the province and Shif Island), a minority of Sunnis live. Also in Genaveh city and the northern island of Bandar Rig and Bushehr city itself a Sunni minority lives, and a limited number of other religious minorities as well.

Figure 1-8 ; Bushehr 1924-1925

1-6) READING THE CITY

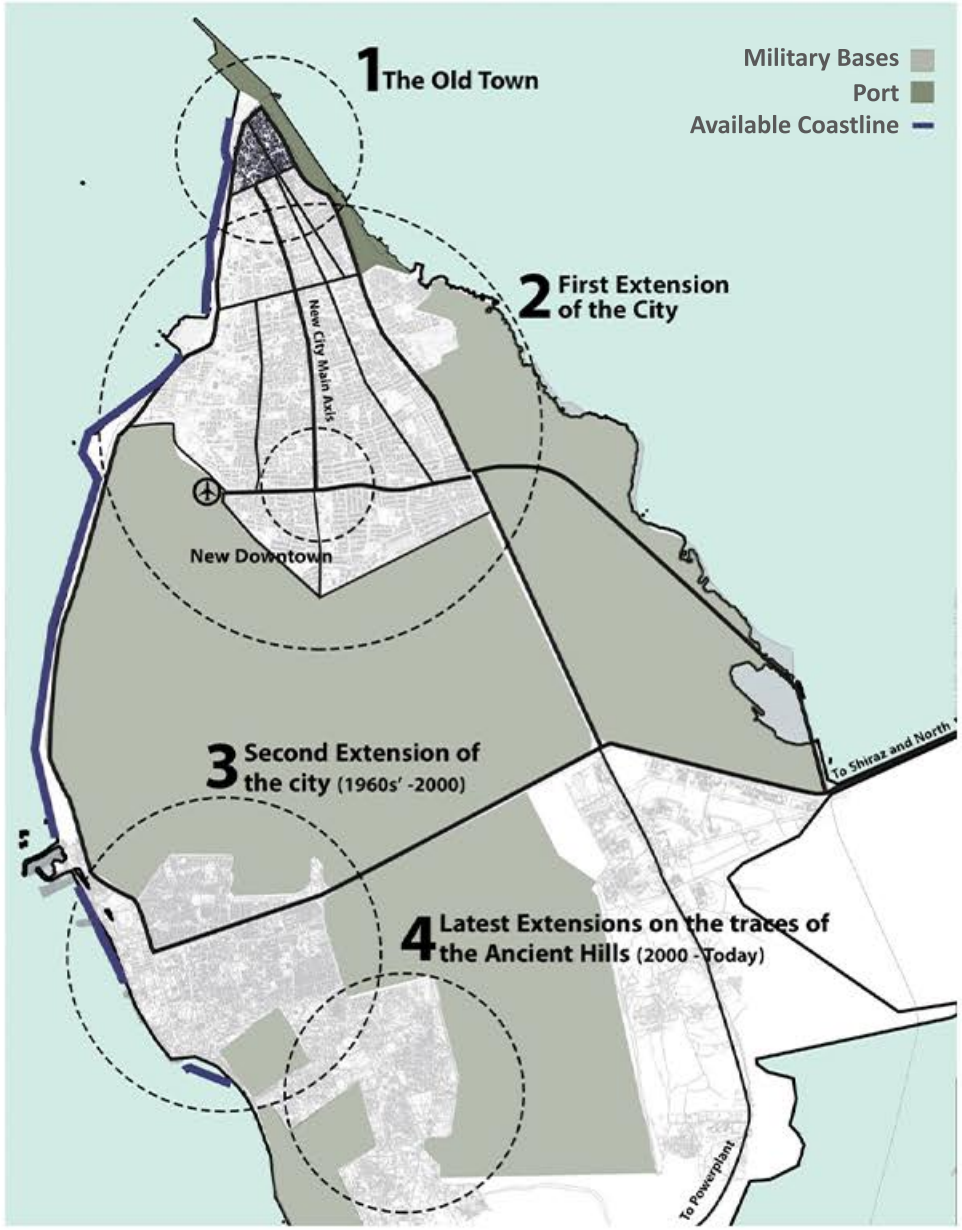
1-6-1) Urban Fabric

The old texture of Bushehr has special cohesion and interconnected places. Because of the hot and humid climate, buildings need to have a great deal of openings. The urban fabric of the old town is dense and complex.

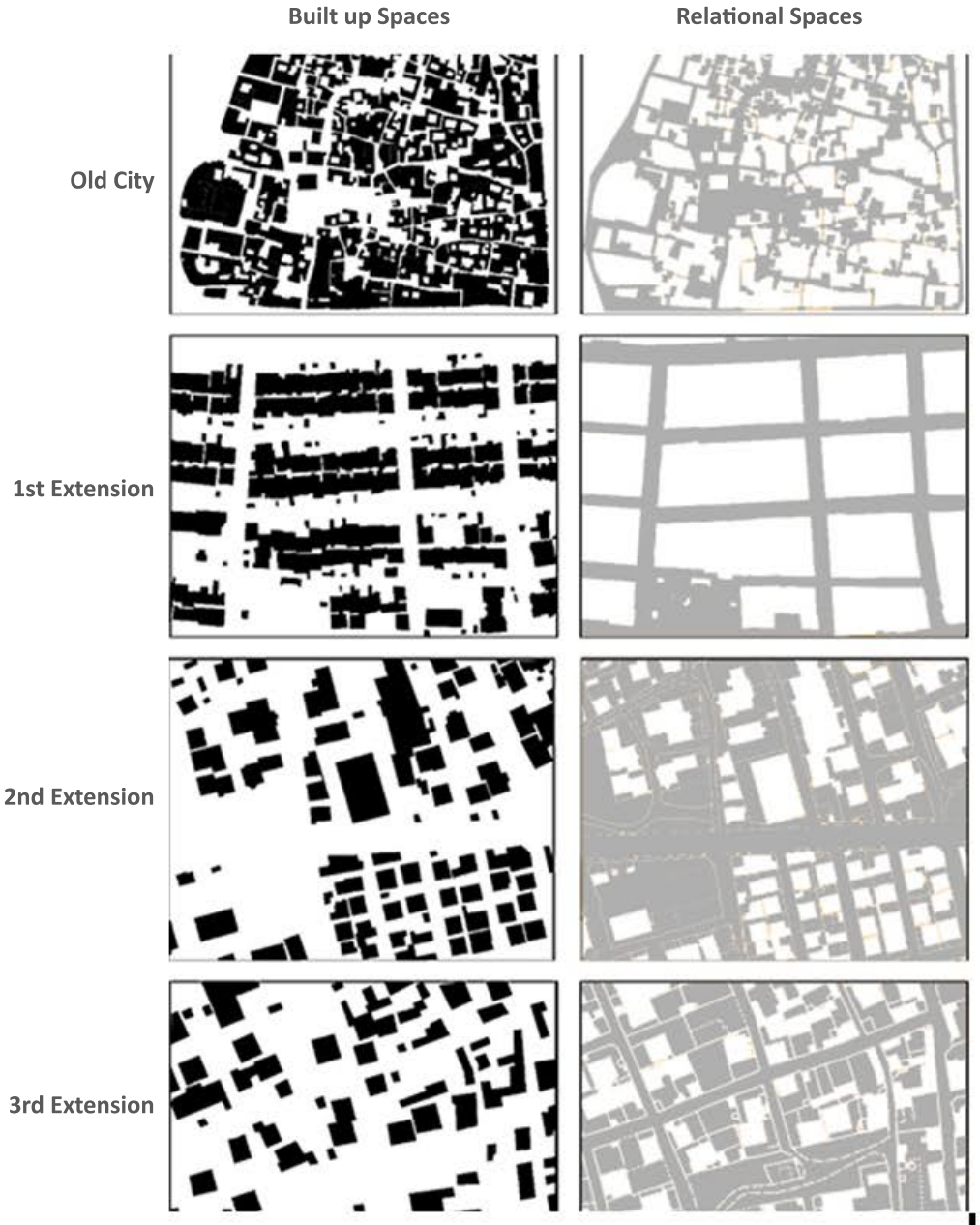
The old urban fabric of Bushehr, from a spatial and geographical point of view, has been born, grown, and expanded in the northern tip of Bushehr Peninsula, and is bounded on three sides (the north, east, and west) by the sea, and on the south side the new extension (or a mixture of old and new urban fabric). Four quarters have formed the structure and identity of the old town: Behbahani, Shanbadi, Dehdashti, and Kouti quarters, in which the factor of "ethnicity" has played a major role. Apart from the residential fabric, in the past, its commercial fabric was also of special importance, but now most of it found abandoned in the old town.

In general, until about 1930, Bushehr was limited to the old fabric and most urban functions were there , but due to the interventions of modern period, changes, and urban development, the organic texture of the city suffered severe physical damages.

The old urban fabric of Bushehr, due to its location and special elements, is different from the fabric of other coastal ports and it has unique characteristics.



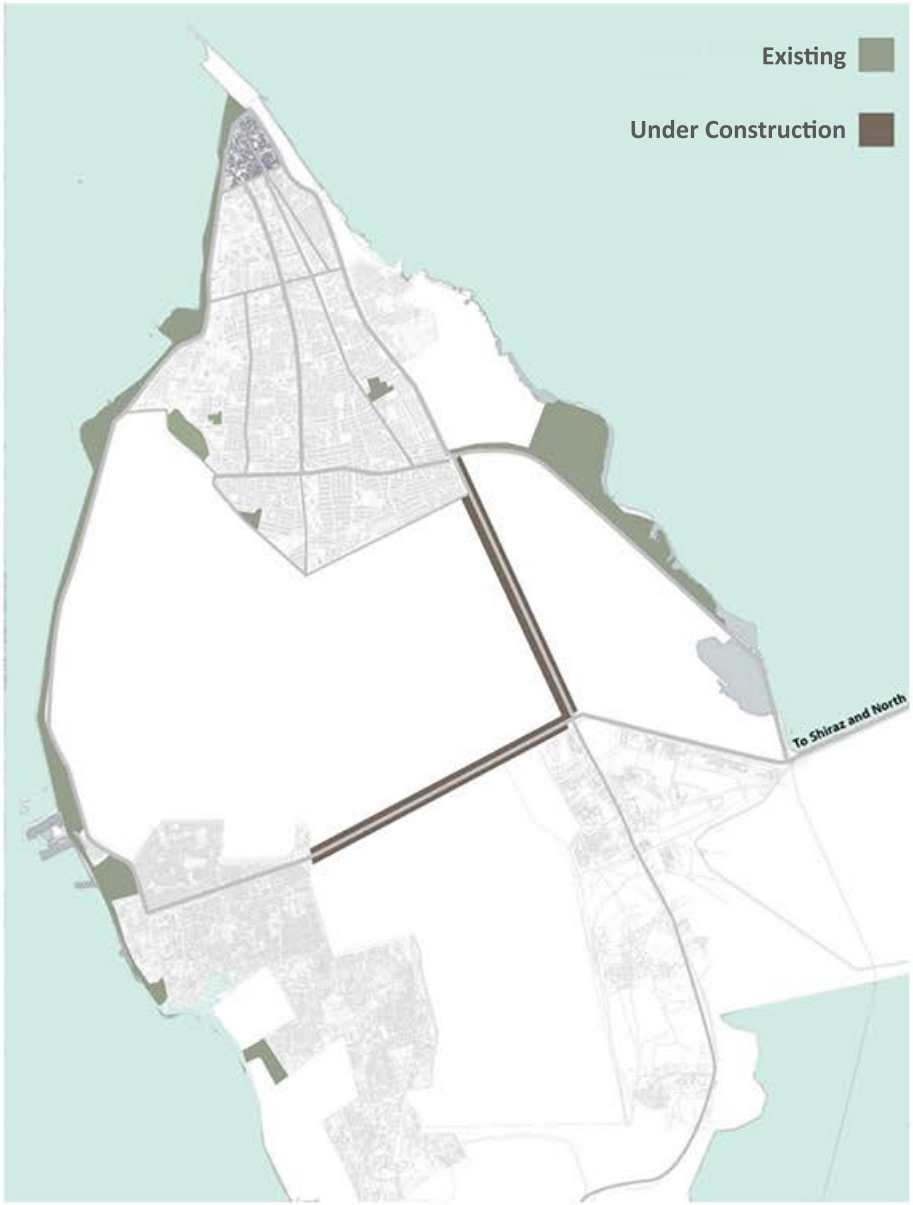
This graph shows the built-up spaces and the relational spaces during different phases of the extension. As it is clear with each extension there is more relational space and less built-up space. The urban texture used to be dense and compact for climatic reasons, but after widespread usage of cars, it was opened up to form streets.



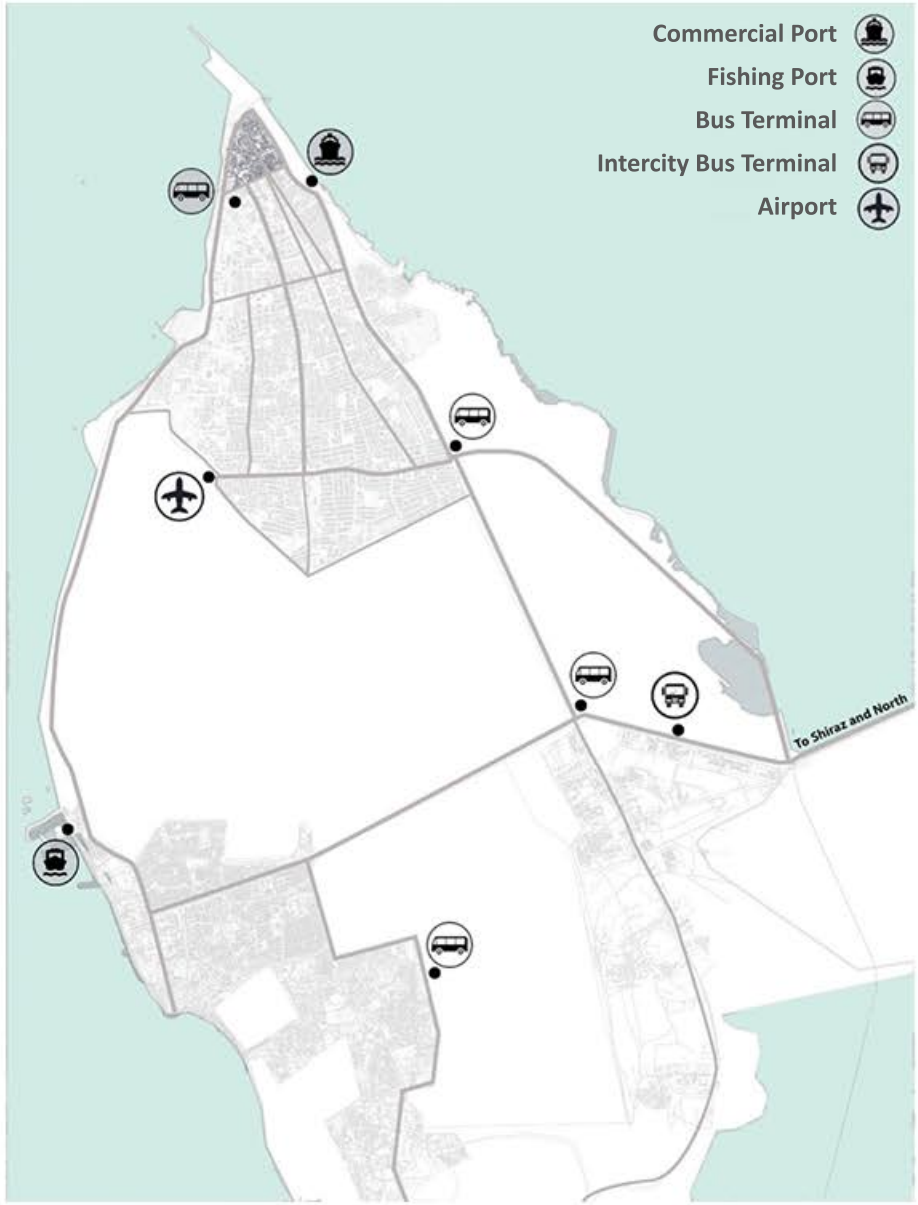
TOURISTIC ATTRACTIONS

Apart from the beautiful Persian Gulf, Bushehr has many tourist attractions. Among the touristic attractions of Bushehr, we can mention the museum of Raees Ali Delvari, the Persian Gulf Maritime Museum, Rishahr, Rafael ship, Ghavam reservoir, cemetery and the ancient site of Siraf, Malek Mansion, Bardak Siah Palace, Jashak salt dome, Ahram hot spring, Bardestan Grand Mosque, Gokhtar, Mushir Al-Molk Dashtestan Caravanserai, Khormuj Castle, Tooz Archaeological Site and traditional grand bazaar.

GREEN AREAS



TRANSPORTATION



1-6-2) ARCHITECTURAL SPECIFICATIONS

Building Blocks

The old quarter of Bushehr is a big block exploded into smaller parts (blocks or houses) separated by streets or alleys.

Extraversion and arranging the common "bodies”in the neighborhoods with the aim of making the most of the airflow has divided the fabric of the city into separate blocks consisting of one or more residential units. Intertwined blocks with irregular grids of intersecting alleys that pass through small squares and eventually reach the sea.

Figure 1-9 ; Bushehr in 1956

The Density of The Quarter

The old quarters of Bushehr have high density. During the formation of the old quarters, the walls surrounding the city still existed. The city was limited to a small proportion of the land and citizens tended to live inside the city walls. This created a high density which was also beneficial for reducing solar radiation (by casting shadows on the surrounding buildings) and also allowing for improved wind circulation inside the alleys.

Form of construction

The houses located in the old four quarters of Bushehr (Behbahani, Dehdasht, Shanbadi, and Kuti) were built around a central courtyard; This means that the courtyard was in the middle and rooms on one, two, and three floors were built in its four directions.

Direction of the houses

One of the most important components in the construction of Bushehr buildings was the use of shade and wind. For this purpose, strategies such as adopting the central courtyard, Keepeng the buildings high, creating an alley around the building, using multiple openings in the rooms, narrowing the alleys, and decreasing the height of the wall of the west or north side is common.This is because these strategies played an important role in reducing the temperature and increasing thermal comfort.

White Color

Most of the buildings in the old quarter of Bushehr had a white color, although over time the color was changing and losing its brightness. The main objective was reducing solar radiation impact on the thermal comfort of the building.

Figure 1-10

Openings

Most of the rooms in the old quarter of Bushehr ahave 3, 4, 5, or 7 openings on both sides. This makes possible better air circulation in the room and reduces the humidity and temperatures. Usually, shading was provided by the thickness of the walls.

Figure 1-11

Extroverted Architecture

Although Iran architecture is introverted (because of the weather and religious believes of people), Bushehr's architecture is extroverted. One of the reasons was the urgent need for ventilation and it has more openings in the facade in comparison to the other parts of Iran.

Figure 1-12

1-6-3) ARCHITECTURAL ELEMENTS

Courtyard

The courtyard is one of the main elements of Bushehr's architecture. Ventilation and reduction of humidity is the main reason for having the courtyard inside the house. There were also other uses of courtyards like holding religious ceremonies and weddings. Because of the proportion of the height of the building and dimension of the courtyards, usually, courtyards were in shadow during the day. Some bigger mansions have two yards, one of which is dedicated to private use, in those areas, women of the family and the other belongs to guests and viewers.

Figure 1-13

Figure 1-14

Shanashir (Balcony)

Shanashir is the name of a type of balcony that is used in Bushehr. The structure of shanashir is in wood, and wood is used for the shading device. has wooden cover as the shader. The texture of the wooden cover is designed to block the view of the outside but does not cover the sunlight and ventilation.

Figure 1-15

Tarmeh (Terrace)

Tarmeh (called Ivan in other parts of Iran) is a part of Bushehr's traditional architecture. Tarmeh is a terrace covered with 2-3 sides and usually has a roof. The main use of Tarmeh was for the summer's night as a place to sleep.

Figure 1-16

Hashti (entrance)

Hashti is a small room next to the entrance of the house. Hashti has been used as a waiting room for the guests before entering the house and also for the short visits. The hashti was working as a filter between the entrance and the house.

Figure 1-17

Staircase

Staircases in Iran's architecture were always extra elements, located in the corners with the smallest possible dimensions and without landings. Sometimes they were also working as docts.

Figure 1-18

Roof

Roof (Boon in Bushehry dialect) was usually used as a place for sleeping in summers. In large houses, the roof had also a toilet service. The staircase ends in the roof with an opening through the sea to work also as a wind catcher and moves the wind to the building. The rainwater on the roof was drained through Shife (pipes) to the cisterns.

Figure 1-19

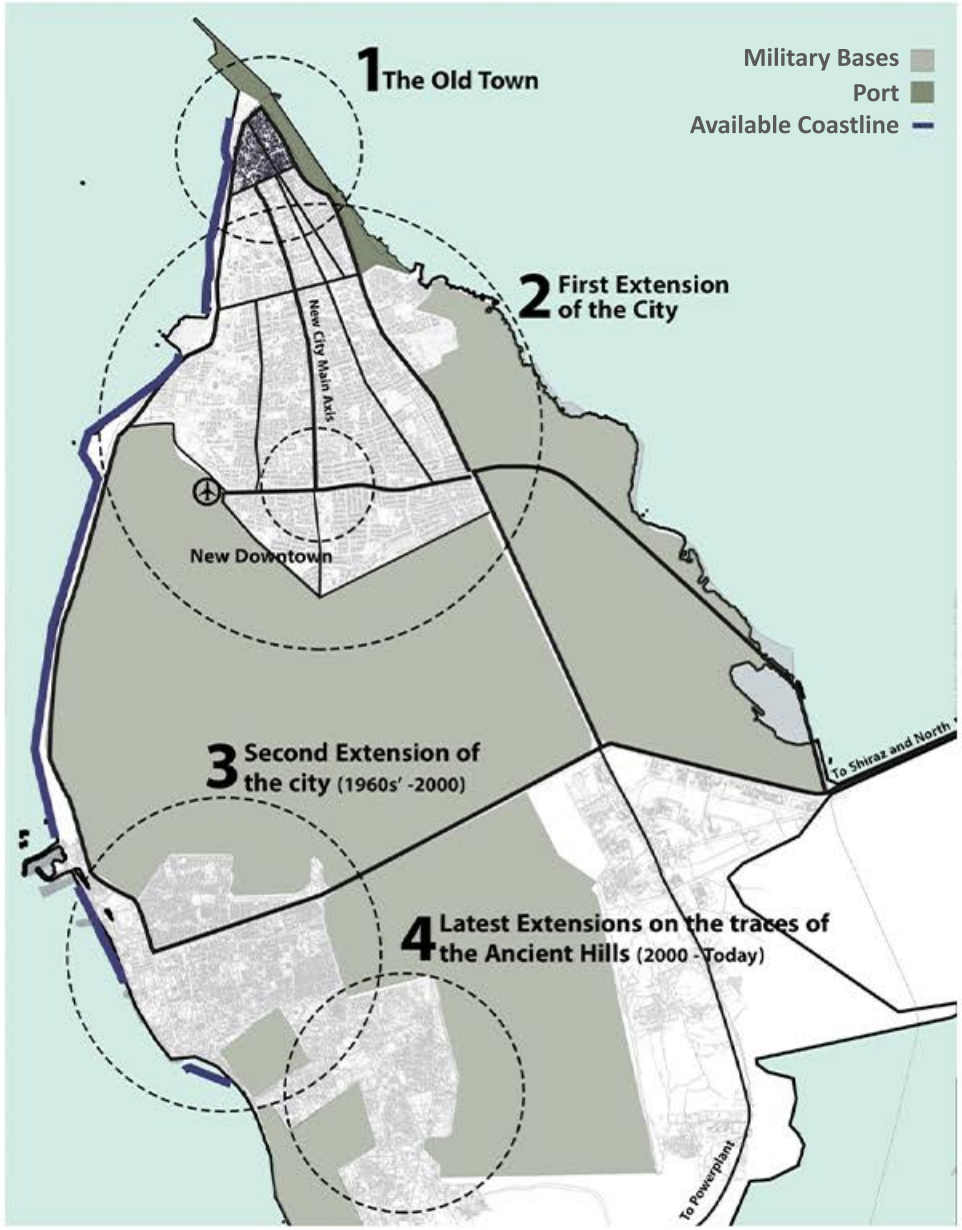
CHAPTER TWO (PROJECT)

2-1) INTRODUCTION

As it was mentioned before, Bushehr is a strategic city both in terms of economy and military, due to its geographical location, but it doesn't have enough land for its increasing population. Indeed, nowadays housing is one of the most important problems of the city. The city expansion was not successful as it is surrounded by the Persian Gulf and most of the usable lands are located inside the numerous military bases throughout the city and the nuclear power plant. The lack of land to build new houses, the price of housing is increasing dramatically in recent years. As a result, there is a great need for social housing which is affordable to the middle class.

This project is an effort to show that it is possible to have social housing which is based on the culture of the people yet it is functional and energy-efficient.

The project is located in one of the old quarters of the city name " Kouti Quarter" in the Old Town.

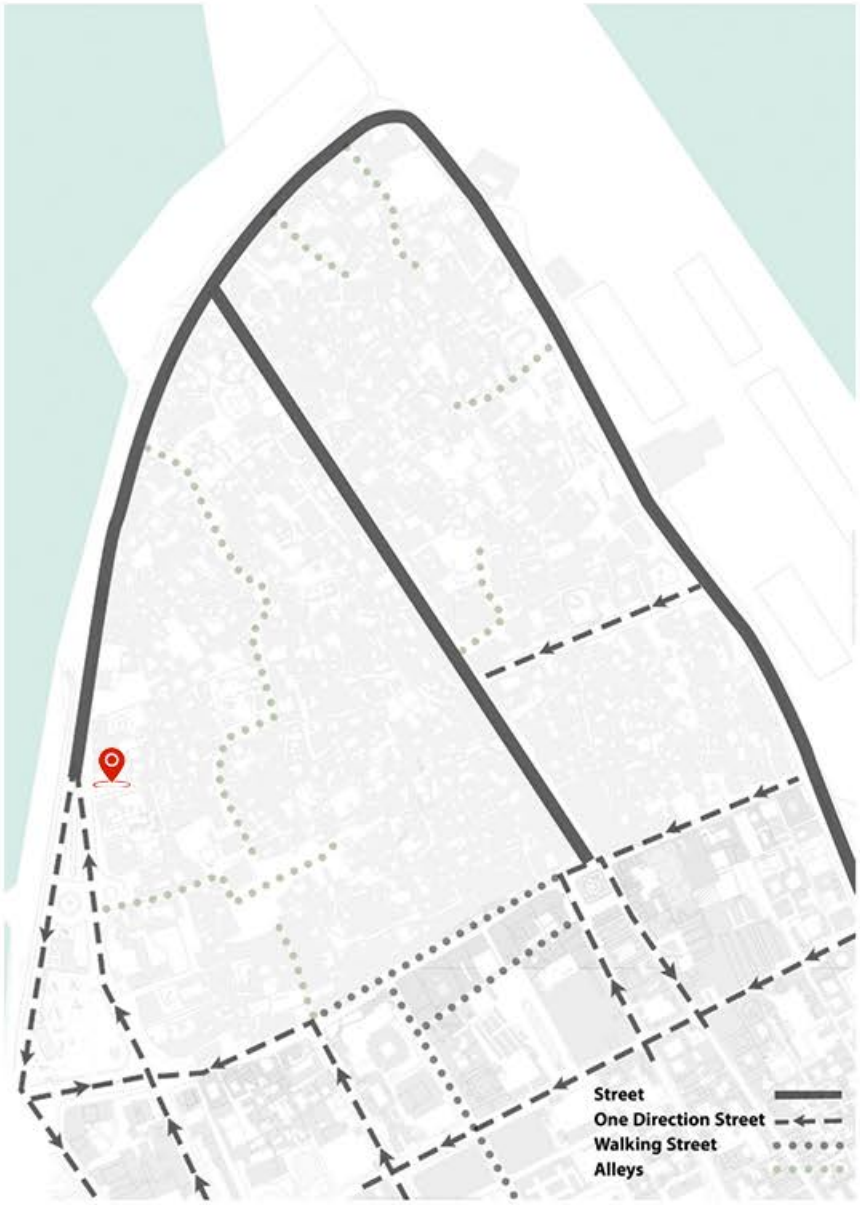


2-2) READING THE SITE

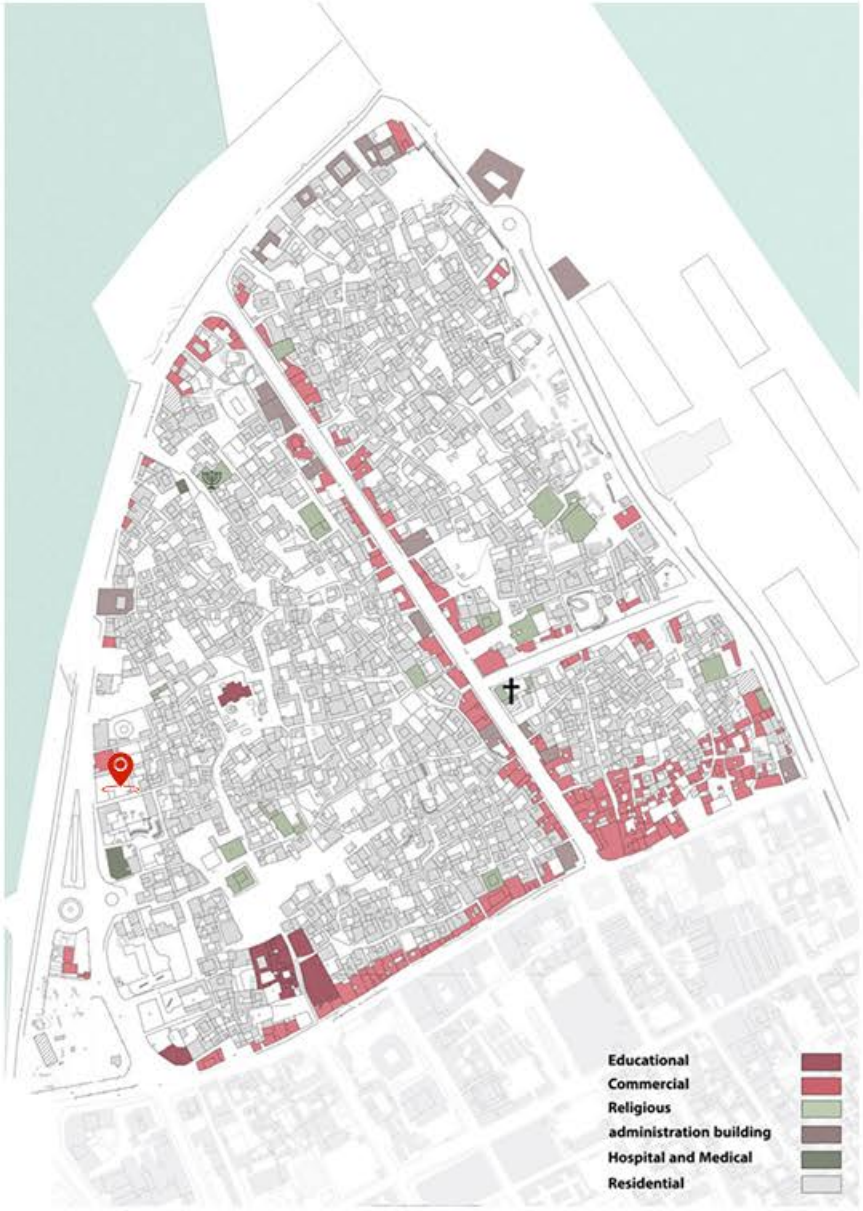
Kouti Quarter

Kouti is the biggest and oldest quarter in the historic part of Bushehr and because of that, most of the administrative buildings of the city and the main Meydan of the city were located in Kouti. The name of Kouti comes from an Indian company that was located in the quarter with the same name in 1750.

ACCESSIBILITY OF THE OLD TOWN

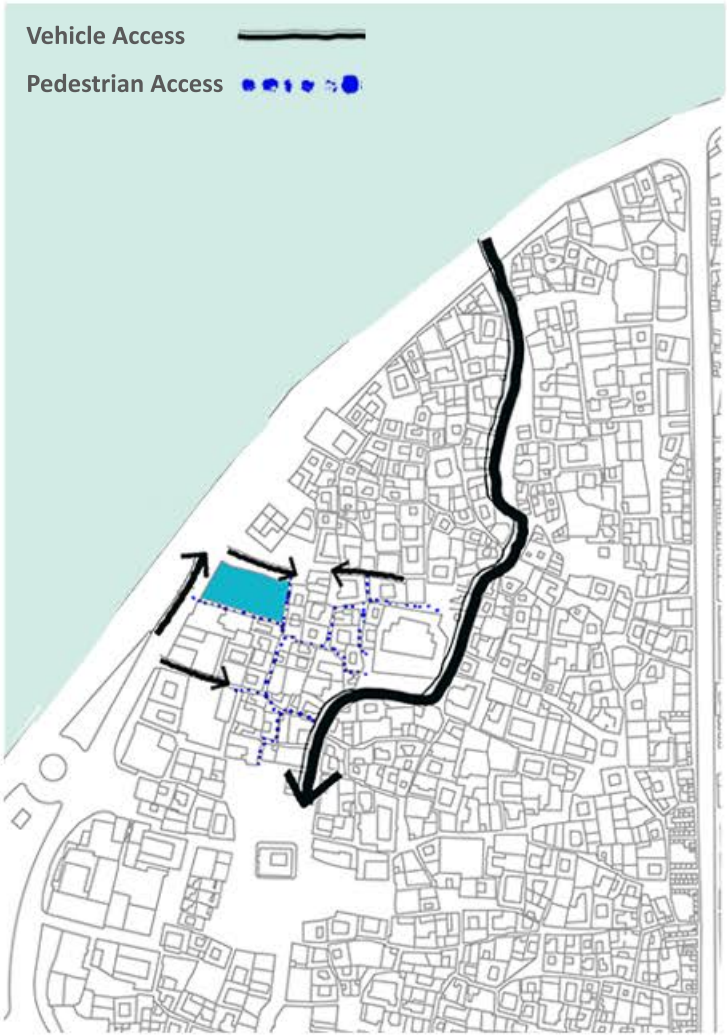


FUNCTIONS IN THE OLD TOWN



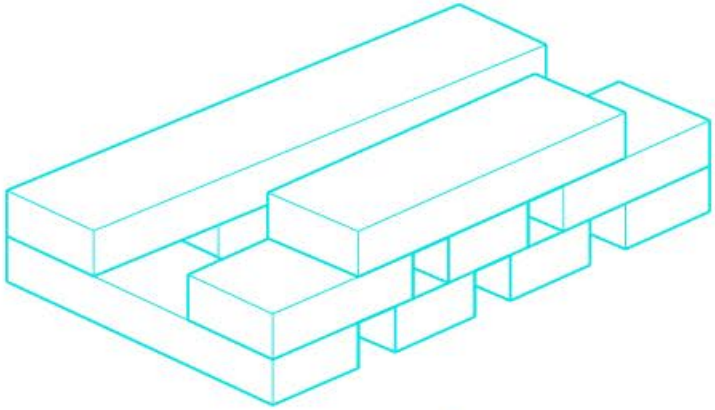
MAIN ZONES IN THE OLD TOWN

ACCESSIBILITY OF THE SITE

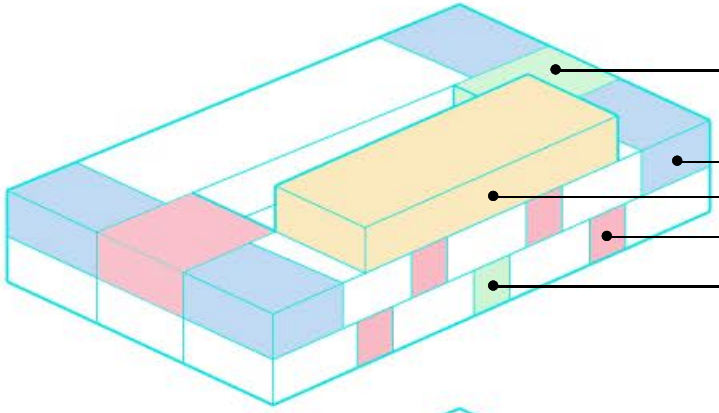


2-3) FORM

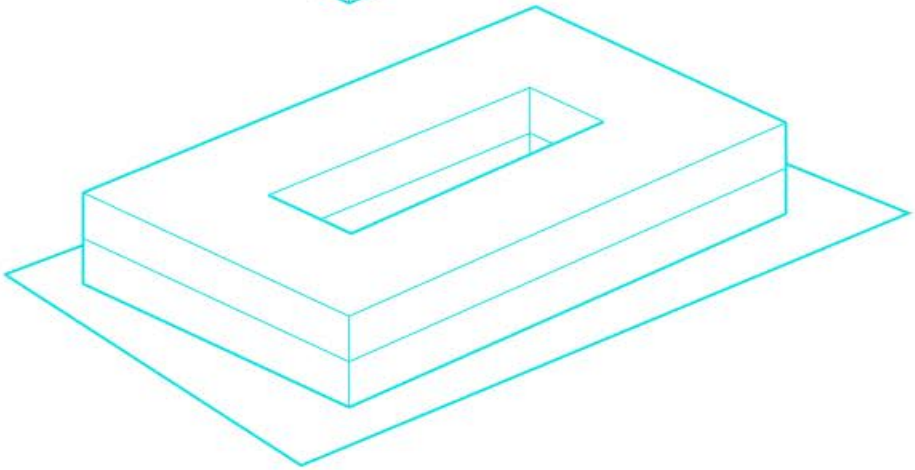
Final Shape



Adding Balconies (Trameh) for the Optimum Air Flow

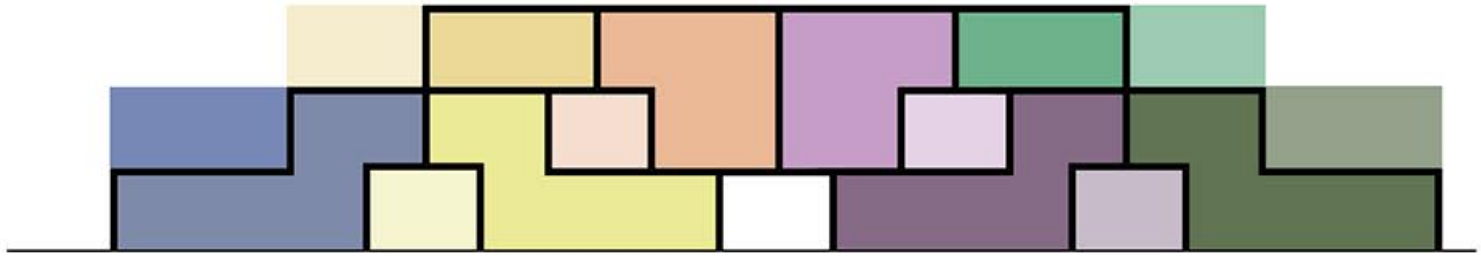


Most Common Shape in Bushehr Traditional

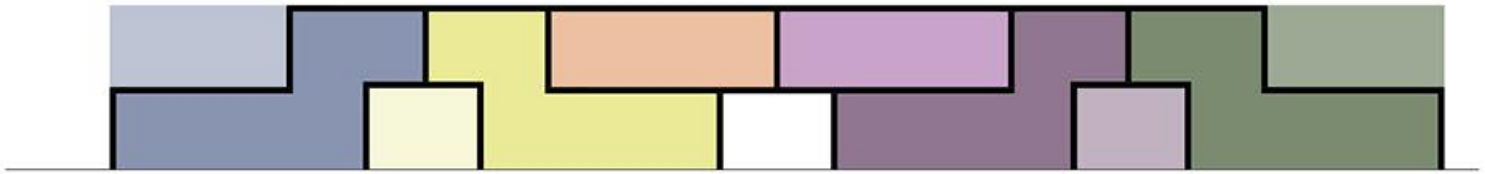


2-4) APARTMENTS PLACEMENT

This graph shows how each apartment is located within the building (south and north sides) with colors, each color shows an apartment and brighter colors are their balconies. The balconies are placed in a way that all of the apartments have a balcony except for two. Also, there are two entrances in the middle.



South Side



North Side

2-5) PLANS

1 - Living Room
2- Bedroom
3- Kitchen
4- Bathroom

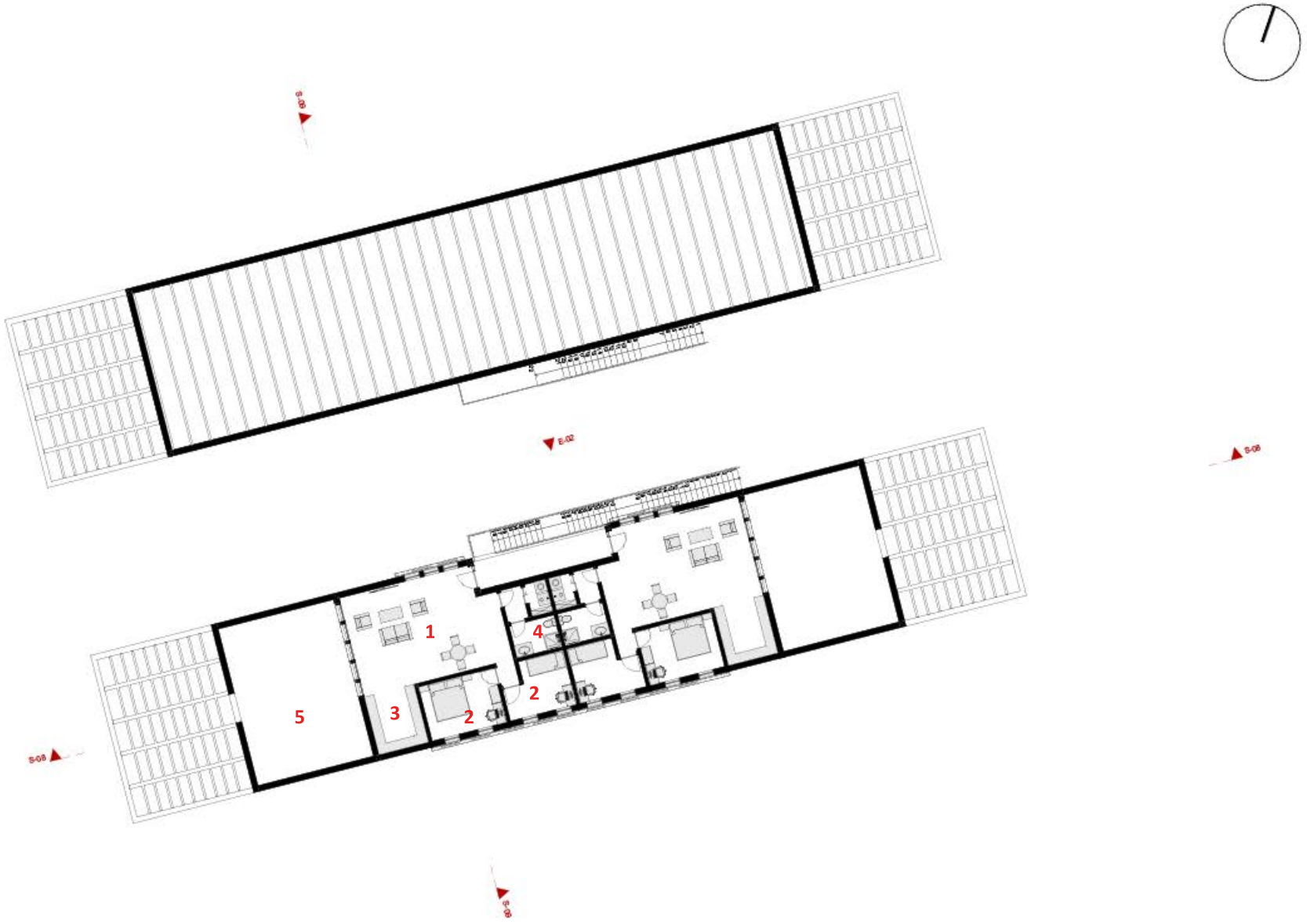
Ground Floor Plan

PLAN

1st Floor Plan

1 - Living Room
2- Bedroom
3- Kitchen
4- Bathroom
5- Balcony

PLAN

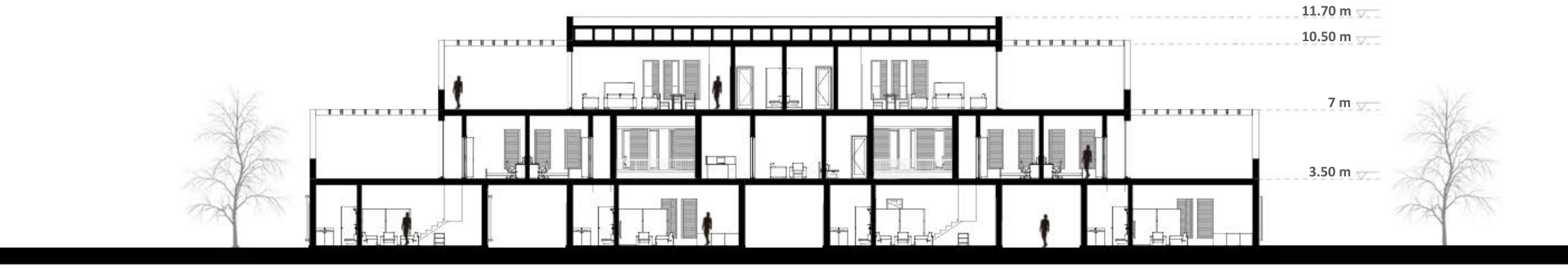


1 - Living Room
2- Bedroom
3- Kitchen
4- Bathroom
5- Balcony

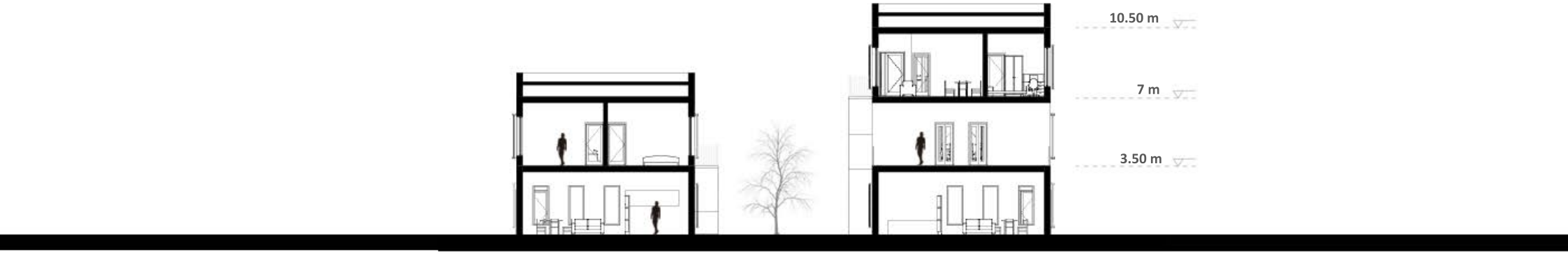
2nd Floor Plan

Courtyard Perspective

2-6) SECTIONS

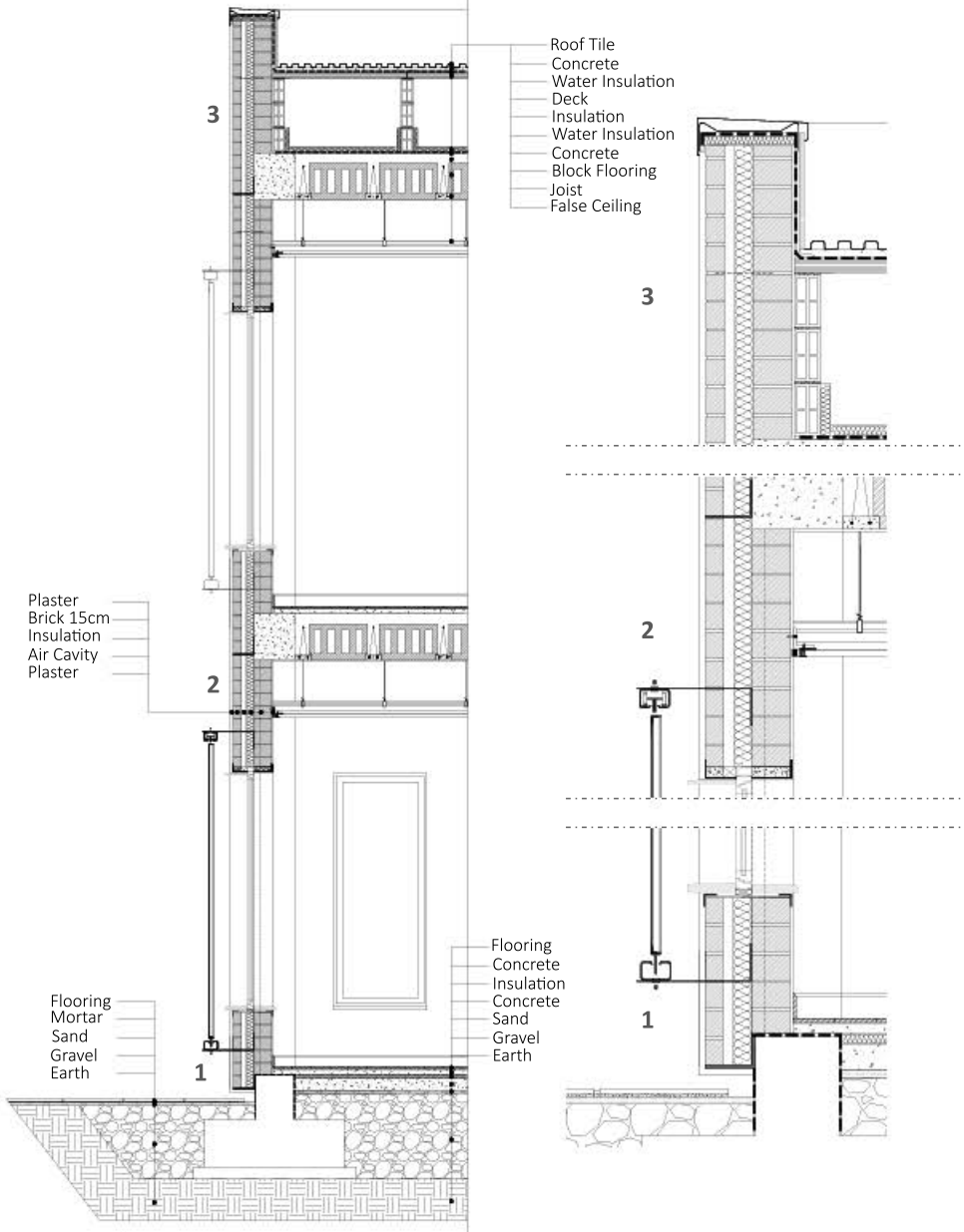


S-08 Section

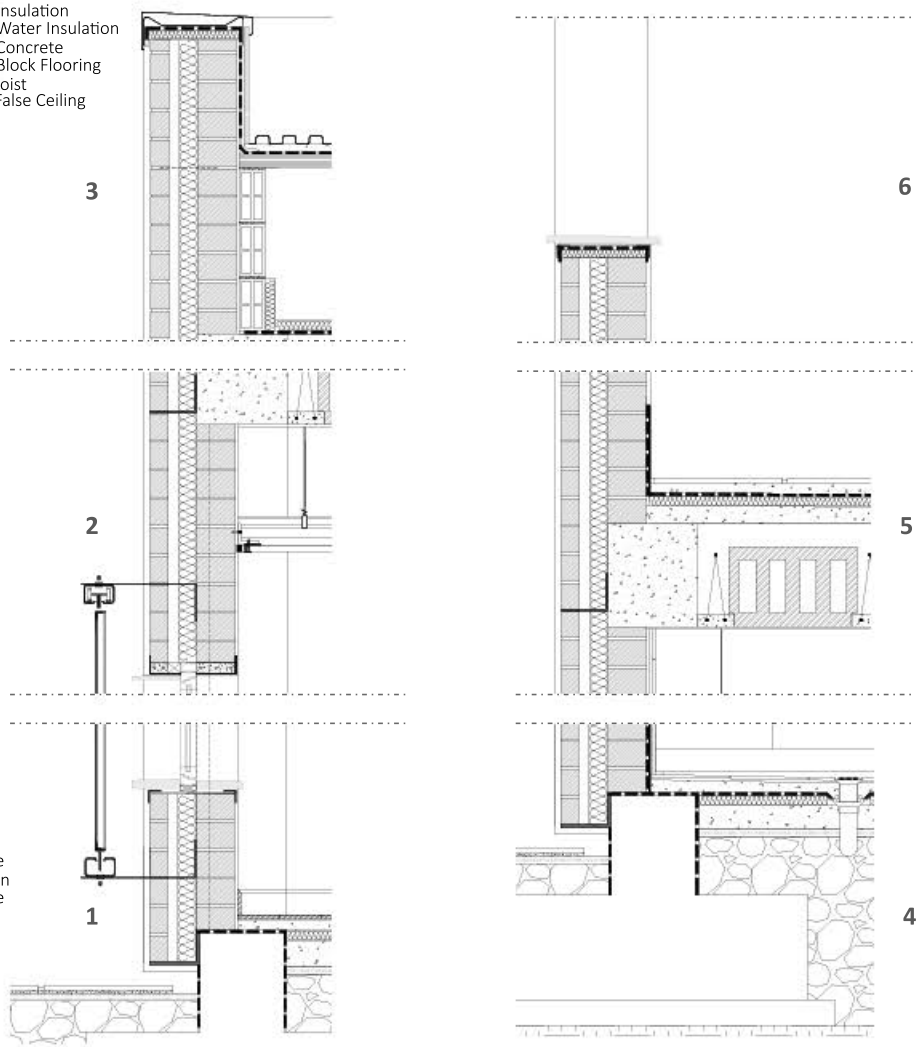


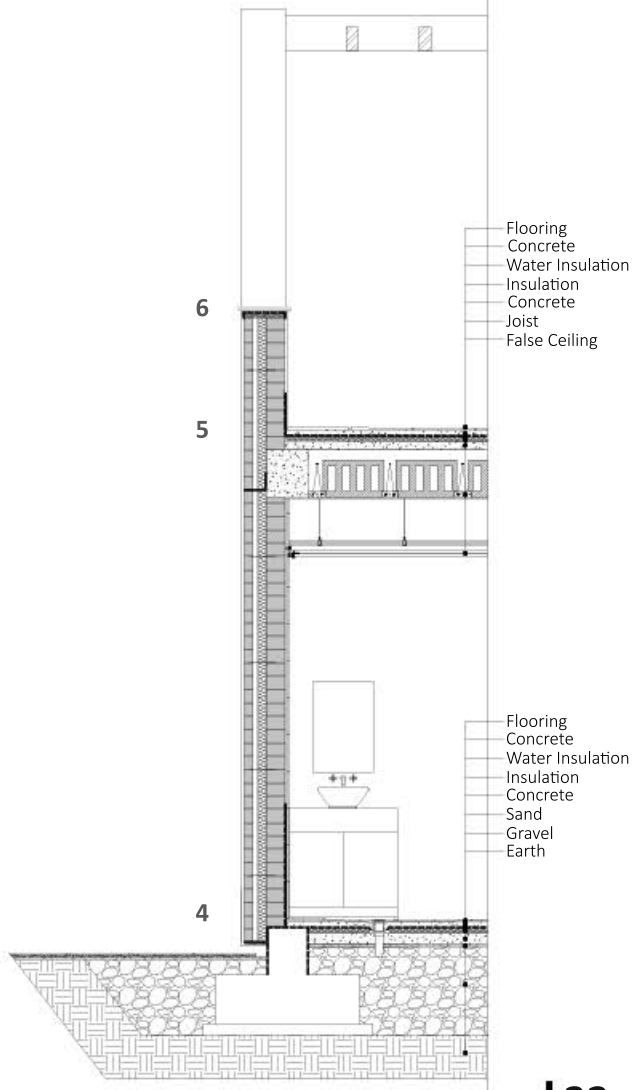
S-09 Section

2-6-1) WALL SECTIONS



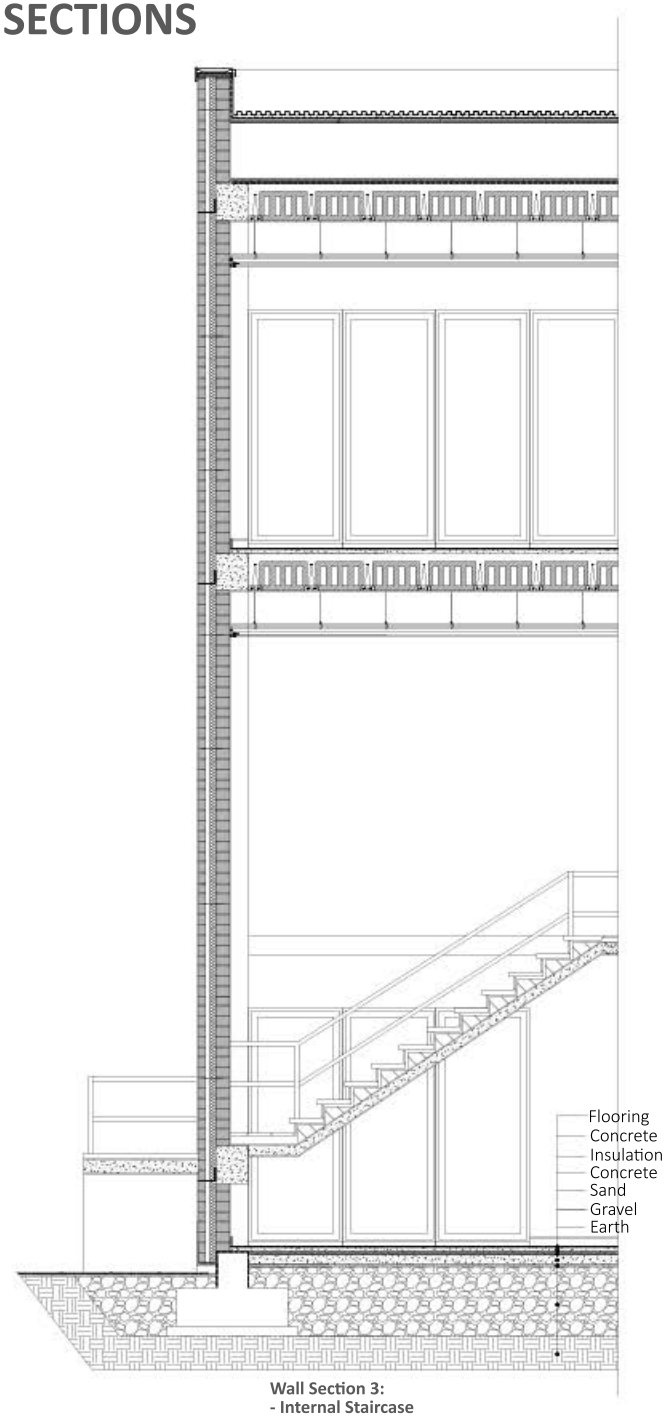
Wall Section 1:
- Sliding Shade Connection to the wall
- Foundation
- External Wall Layers
- Double Layer Roof



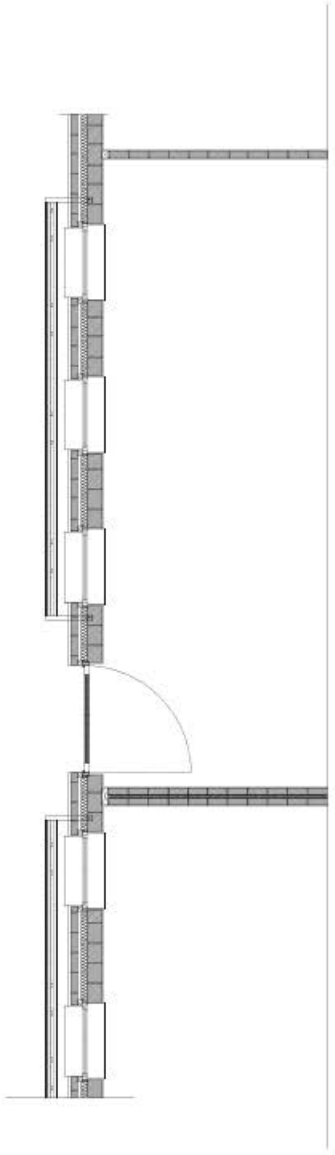


Wall Section 2:
- Bathroom Floor and Wall Insulations
- Floor of the Balcony

WALL SECTIONS

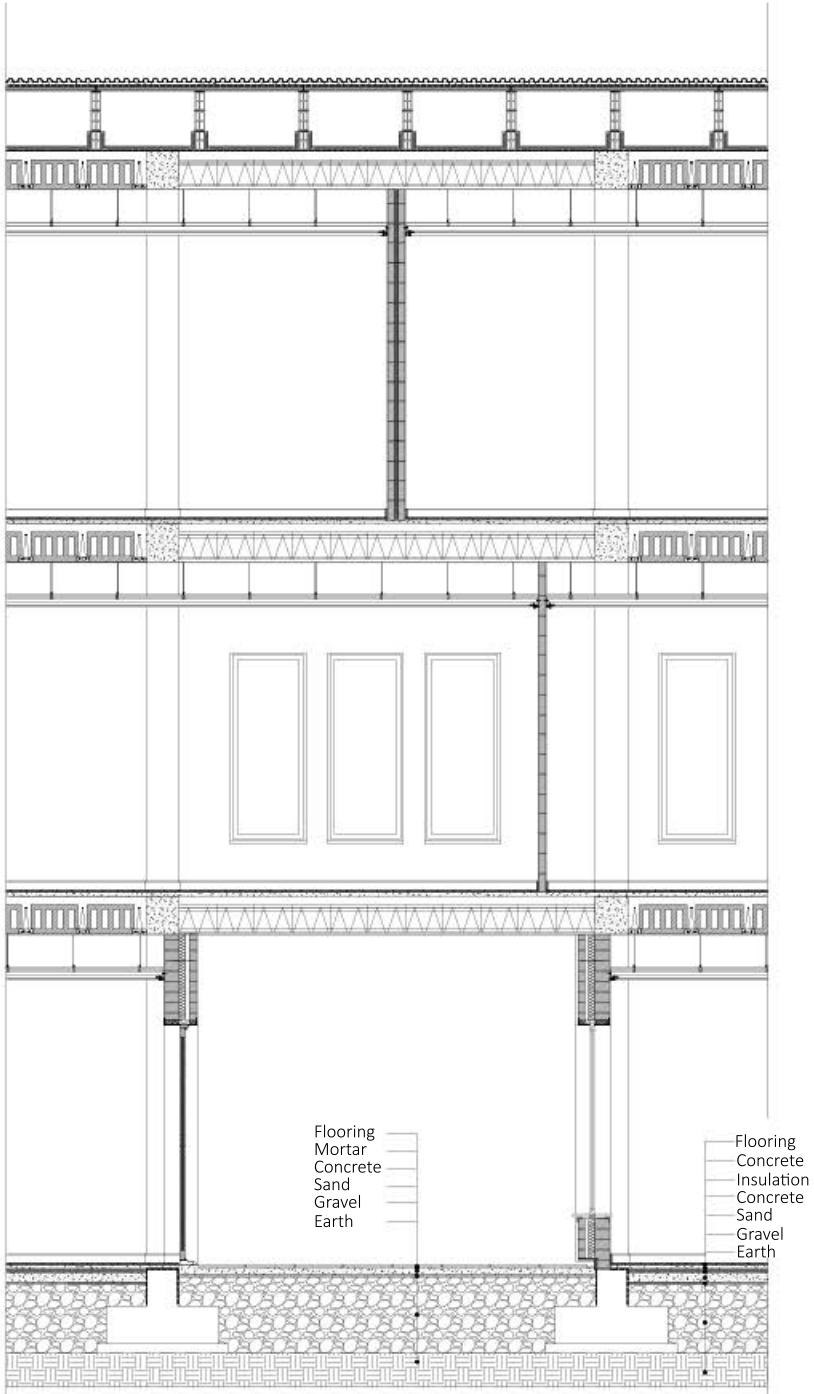


Wall Section 3:
- Internal Staircase
- External Staircase



Horizontal Wall Section:
- Double layer wall Seperating Two Apartments
- Door and Window Connection to the Wall
- Sliding Shade

WALL SECTIONS

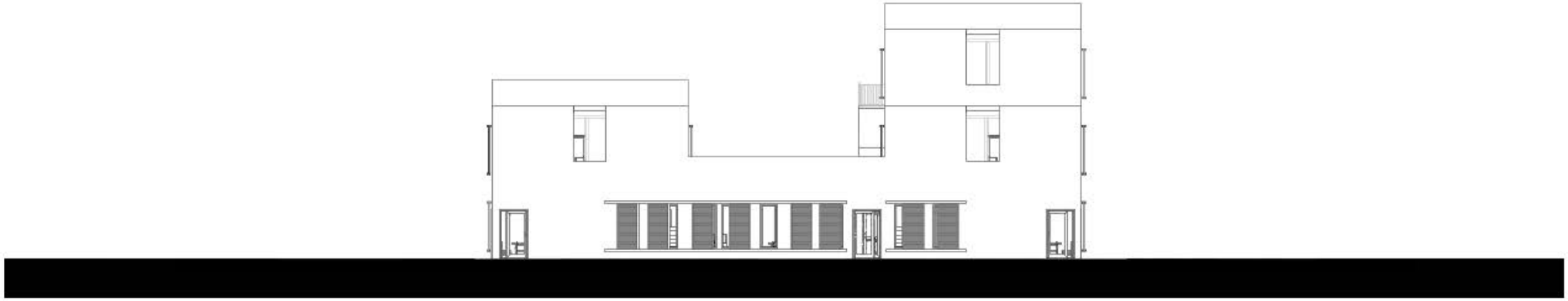


Wall Section 4:
- Door to External wall Connection
- Entrance Section
- Courtyard Floor
- Double Layer Wall

Courtyard Perspective

2-6-2) ELEVATIONS

Courtyard Elevation-Section

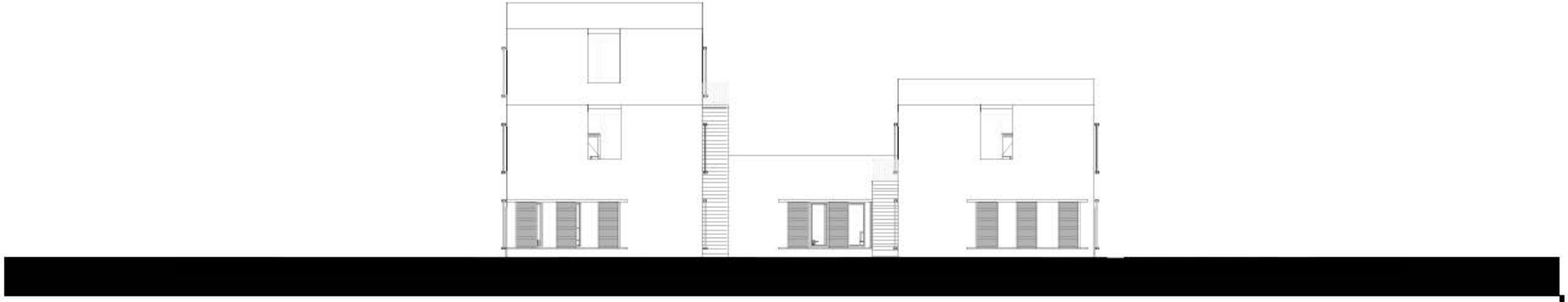


West Elevation- Street View

ELEVATIONS

North Elevation

South Elevation



East Elevation

Courtyard Perspective

LIST OF FIGURES

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