Investigation of Traditional Dwellings in Four Middle Eastern Cities in terms of Strategies for Coping with Climatic Factors and Privacy

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the Degree of

Master of Science
in
Interior Architecture

Eastern Mediterranean University
July 2015
Gazimagusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

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ABSTRACT

Due to the shortage and difficult access to energy resources designers have forced to make the best of nature. Passive heating and cooling strategies are the most famous design patterns in almost all historical architecture sites. The track of privacy values is also clear in the traditional architecture. We can observe different design patterns in regions with similar climate which is induced mainly by privacy and climatic issues. This study has investigated the harmonizing features of traditional and contemporary architecture in relation with Environment and privacy. Climatic issues and privacy factors have been studied which influence the design of houses in different regions having similar religion and climatic conditions.

The study has initiated by definitions of housing, traditional houses, discussion of traditional dwelling beside Koppen climate classification and also discussion on contemporary house design. It has been also applied to the chosen field studies as Kashan (Iran), Mukalla (Yemen), Riyadh (Saudi Arabia), and Bagdad (Iraq) which all their housing interior elements were defined comprehensively. In each and every case, design strategy under the impact of climate issues beside the privacy has been investigated and compared with the contemporary dwelling cases in the same region. Data have been collected based on qualitative procedure including: literature survey as well as the observation.

Keywords: Traditional architecture; Contemporary architecture; Climate issues; Privacy

ÖZ

Enerji kaynaklarında yaşanan erişim zorluğu ve eksikliği tasarımcıları doğayı en iyi şekilde kullanmaya zorlamıştır. Pasif ısıtma ve soğutma stratejileri neredeyse tüm tarihi mimari yapılarının tasarım desenlerinde yer almaktadır. Özel yaşam değerlerin izlerine geleneksel mimaride açıkça rastlanmaktadır. Aynı iklim koşullarında farklı tasarım desenlerinin görülebilmesinin en büyük nedeni özel yaşam ve iklimsel özelliklerin etkileşimi olduğunu gözlemleyebiliriz. Bu çalışma özel yaşam ve çevre ile ilgili geleneksel ve çağdaş mimarinin bağdaştırıcı özelliklerini araştırmıştır. Özel yaşam ve iklimsel özellikler bakımından bu çalışma benzer kültür ve iklim koşullarına sahip farklı bölgelerdeki evlerin tasarımını etkileyen faktörler irdelenmiştir.

Bu çalışma konut tanımları, geleneksel yapılar, Koppen iklim sınıflandırması yanında geleneksel konut özelliklerinin tanımı ile başlamıştır ve çağdaş konut tasarımlarının görüşlerini içermektedir. Geleneksel konutlar üzerinden Rapoport yaklaşımı kullanılarak araştırma yapılmış ve BWH iklim sınıflandırmasına göre incelenmiştir. Aynı zamanda tüm konutların iç unsurları kapsamlı bir şekilde tanımlandı ve Kashan (İran), Mukalla (Yemen), Riyad (Suudi Arabistan), Bagdad (Irak) calışmalarına uyarlanmıştır. Her durumda; özel yaşam dışında, iklimsel özellikler, tasarım stratejisi incelenmiş ve aynı bölgede çağdaş konut olguları ile karşılaştırılmıştır. Veriler, literatür taraması ve gözlem ile nitel prosedüre dayalı toplanmıştır.

Anahtar Kelimeler: Geleneksel Mimari; Çağdaş Mimari; İklimsel Konular; Özel Yaşam.

ACKNOWLEDGMENT

"The most effective strategy for successful living is really no strategy at all. It is, rather, to be real, to be honest, to be authentic, to be you.

-- *Ralph Marston“*

I would like to admire my dear father and mother (Farhad and Rozita) for generosity to bring the opportunity of study master in interior architecture in Cyprus. Also I want to thank my dear brother Nariman for his support.

I also extend appreciate to my dear supervisor Associate Prof Dr Kağan Günçe for his invaluable advice and patient.

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INTRODUCTION

From the very beginning of history, it has been always an issue for human beings to struggle with how to live harmonically with nature. Conversely, the irregularity in nature comprises limitations on human activities which they have to take in order to adjust with different natural conditions. Primary needs such as clothes and asylum forced people to confront several restrictions due to their distinct to remain alive. As a respond to different environmental conditions, people attempted to compete with nature and shatter the barriers. During the whole of history, humans have been living in a surprisingly enormous variety of climatic conditions by developing shelters or as it is known in contemporary life 'homes'. Hence, from the ancient time, they always try to consider the local climatic conditions and characteristics in designing the traditional houses (Ozay, 2004).

In this study, we investigate harmonizing features of traditional architecture in relation with climatic factors and privacy. In the past, shortage and difficult access to energy resources forced designers to make the best of nature. Throughout the history, Passive heating and cooling strategies and also privacy are the most important design patterns in the traditional houses. We can observe different design patterns in regions with similar climate classification and also similar Islamic religion.

Nowadays, Contemporary architectures have forgot these matters as energy and other resources such as water are available everywhere. Efficient energy consumption is not the main concern anymore for designers and it results in unsustainable construction. However, environmental issues are becoming more and more important in all aspects of our lives. Rush in fossil fuel consumption, global warming and increased waste materials are some well-known environmental complications. In this thesis, different characteristics of elements and spaces in traditional house designs are inspected in four regions in Middle East such as Kashan, Mukalla, Riyadh and Baghdad. Climate-related features are advantageous to serve as patterns for our contemporary architecture style.

In addition, by viewing traditional architecture from privacy aspect, it would be clear that privacy values were more considered in the past. This issue is directly related to the convenience of a home. In Islamic traditional architecture, privacy of women is taken into consideration by designing special kinds of entrances and openings. While in contemporary design there is no such specific design because the relationship between men and women in contemporary life has been changed.

In this research, four different geographical sections are chosen to be inspected. Traditional architecture in these regions with similar climate conditions which inspected to analyze the effects of climatic factor and privacy attributes in their design. Kashan district located in Iran, Mukalla region which is located in Yemen, Riyadh located in Saudi Arabia and finally Baghdad restrict in Iraq are the cases to be explored and studied in this research. All these four regions are located in geographical area with almost the same climatology while the design features of metropolitan contextures and traditional architectures are completely different.

Consequently, we will inquire the explanations behind the differences and the similarities according to climatic factor and privacy in the specifications of the houses' architecture among the four different regions with almost the same local climate conditions. We also aim at investigation on how convenience is accomplished in interior spaces without high energy expenditure.

1.1 Background of the Study

Traditional houses that are adjusted to the climate are known as the best examples in indigenous architecture in light of providing comfort ability and sustainability in living places. In the procedure of designing a building, there are several problems that could be solved by observing the history of traditional architecture concisely and recognizing the distinctive properties in designs of traditional houses in various climates. In traditional houses, effective cooling and heating tactics are implemented in a passive way, mainly in desert climate areas. In addition, protection against solar exposure during the summer and gaining from the sun in winter are two of the most considerable aspects of traditional houses' design. Accordingly, the design characteristics of these houses have been affected by mentioned approaches in order to attain a contented indoor space (Zandi, 2006).

In traditional architecture, for designing a traditional house the initial steps are to recognize the key factors in climate-related challenges as well as adaptation schemes in the selected geographical region. To achieve this, it is necessary to inspect climate data and bio-climate graphs in the proposed region. In order for providing a contented indoor space for occupants, the influence of the local climate on the design of buildings should be inspected (Pourvahidi, 2010).

The city of Kashan is located in the central region of Iran in Isfahan province. We stated previously that the type of climate in central part of Iran is desert climate. The weather in this district is mostly hot and dry and the temperature changes significantly from day to night (Behbood, 2010).

"Although there are several methods of climatic divisions in the world, which have been based on climatic data, most of the scientists accept Koppen's method. Koppengieger was the first researcher who classified the climate around 1900 (with some further modifications by him, remarkably in 1918 and 1936). He did it according to the vegetation, air temperature and air humidity. He classified the climate into tropical-rainy climate, dry climate, temperate climate, cool-snow-frost climate and polar climate (Pourvahidi, 2010, p 7)." "In B climates, the lowercase letter h identifies a subtropical location where average annual temperature is above 18°C (64°F). Cooler mid-latitude Dry Climates are distinguished with a lowercase k. Thus:

- BWh – Dry Arid Low Latitudes

BWk – Dry Arid Mid-Latitudes" (Michael Pidwirny, 2011, p 1)

In desert climate regions like Kashan, the annual rainfall is negligible. The climate of this area is categorized by Köppen-Geiger as BWH. Some information regarding Kashan local weather is as follows. The average temperature is 19.5 °C and annual rainfall is nearly 128 mm (URL 1).

Almost all of the buildings in Kashan are orientated to the South-East direction and are situated in accordance with the incline of a dale of the city. Detached and queue

houses are built so that they never shade the other houses behind or opposite them in this city (Leylian, 2010).

Leaving behind the routes through the old region of Kashan, the traditional design of the houses adapted to the local desert climate is noticeably recognizable. The configuration, partition and decorations of these traditional houses-known as four season houses, are formed to satisfy the requirements for desert climate (Eskandari, 2011).

In Kashan, the houses have all at least one open yard with the rooms and other closed spaces positioned around it. As almost all closed spaces have an opening to the yard, the role of courtyard in a house is to bind different spaces (Karimi, 2012).

"Iranian family both needs to have privacy as well as social contact with neighbors'. In order to achieve this aim, the hierarchy of spaces starts with a public space and it continued with a semi-public space, semi- private and at last a private space." (Karimi, 2012, p 5)

The summer-living section of the traditional houses in Kashan usually benefits from wind catcher. Wind catchers in public room's helps airflow circulate easily in the building. They are also connected with the humidity suppliers like planted area, garden, walls in the underground part and Payab[1] to recompense the lack of moisture. Consequently the wind Catcher technology provides fresh air and a nice place for residence through the unbearable hot summers of desert climate regions (Azami, 2005).

[1] It is a water storage section in old traditional Persian houses

The second city is Riyadh, the capital city of Saudi Arabia. Riyadh is also located in the central part of country. The Kingdom of Saudi Arabia is located in the Arabian headland and it shares borders with both Persian Gulf and Red Sea. This region has desert climate with hot and dry weather. The two main recognizable seasons are summer and winter.

The temperature in summer is extremely hot in Riyadh and its climate is categorized as BWH climate by Köppen-Geiger system. In July, the average high temperature reaches 42.6 °C. The winter season is almost warm but cold winds flow during the nights. In general, the climate in Riyadh is dry, as there is very little rainfall, particularly during the summer. But in March and April the city experiences a reasonable rainfall. The dust storms are also frequent in Saudi Arabia and the dust in the air is so dense that the visibility is decreased to 10 meters (URL 2).

The style of the traditional houses is one or two floor with an open yard located in the center and quadrangular rooms around it. There are a few openings from the buildings to the street but all closed spaces have openings to the central yard. Obviously, people tried to isolate their houses form the public roads as much as possible. So, the noticeable characteristic of this traditional architecture is contracted dark streets and massive constructions (Akbar, 1980).

The next city which consider in this study is Baghdad. It is the capital city of Iraq and is Located near a River named Tigris. Regarding the climate, humidity is low in Baghdad. Low humidity is more vital in temperatures above 48.8˚C (120˚F). In fact, no spring exists there and the weather gets extremely hot in summers. Köppen system classified Baghdad climate as BWH. But there is a fair amount of Rainfall in

fall season. Baghdad is also known as one of the hottest cities in the world (Mandilawi, 2012).

When it comes to the traditional architecture in Baghdad, again the design contains a courtyard in the center of the house, known as the 'Fina'[2] or 'Hoash'[3]. Living internal spaces are placed around the central yard. So the courtyard role is to expand the residence sections to the outer area via 'Tarma' and 'Talar'. Actually, there are very few openings from the house to the street. Tall dense fences enclose the house and provide maximum privacy for inhabitants. Therefore, all rooms are opened into an isolated the courtyard. Courtyard is the private open space that connects all living spaces and provides them with natural air flow and sunlight (Warren & Fethi, 1982).

Mandilawi (2012) stated that the typical shape of the yard is rectangular traditional houses of Baghdad. But, as the form and the dimension of the land vary, there are some different shapes of courtyards. Ideally, a traditional Baghdadi house has a yard with two openings known as 'Talar'. 'Talar' is a living space in the entrance of the house which benefits from one to three air scoops and two long 'Ursi'. Air scoops, also called "Bad-Geer" are vents fronting each other through the central. 'Ursi' is an internal living room for family which is used mostly during the room in winter. Windows facing the central yard separate 'Talar' and 'Ursi'.

The outer walls of the main living places face the external space through special kind of windows called 'Shanasheel'. These continuous windows overlook the street over

[2] فناء: The original Arabic name of Fina
[3] حوش: The original Arabic name of Hoash

the walls of the ground floor. Over the external walls of the first floor, the roof terrace is planned at top story (Mandilawi, 2012).

The last case is Mukallah in Yemen. This city is located in the Coastal region of Hadhramout, facing the Arabian plateau from the north and the Indian Ocean from the south. The length of the shoreline is about 350 km. Currently, Mukallah is known as the central and largest city in Hadhramout coastline region (AL-MAASHI, 1998).

Located in Arabian Peninsula, the local climate of Mukallah is almost the same as the other districts in this area which has desert climate. The city of Mukallah experiences almost no rainfall annually. The climate of this region is gain categorized as BWH by Köppen-Geiger system. Some facts about the weather in this town are as follows. The average temperature is 26.9 °C and the mean precipitation in a year is about 45 mm (URL 3). In summers the weather is very hot and extremely humid. There are some days when the temperature reaches 40 °C and above. Winters are short with few amounts of rainfall and a more pleasing weather. In a ten years period, it might be some heavy rains which ensue in very disturbing consequences. The dominant wind in this district flows from North-Northeaster or South-Southwester directions (AL-MAASHI, 1998). The major feature of Muslim societies is sex separation which is represented distinctively in design of traditional houses of Mukalla. In the traditional houses of Mukalla the privacy is goes to the sex separation (Ingram, 1936).

1.2 The Problem Statement

Climate and privacy values are one of the most important factors affecting design of the building. Considering these conditions bring ability to study specific characteristics of the buildings related to them. The facts behind the patterns of traditional architecture are harmonizing the design with surrounding environment, efficient energy consumption, and also considering privacy issues. Recognition of these features would be advantageous in contemporary design to provide more comfort and adaptability with nature.

Specifically, in all four regions considered in this research i.e. Kashan, Mukalla, Riyadh and Baghdad, privacy and climate conditions are one of the factors which establish the traditional architecture. One of the key factor in traditional architecture schemes employing sustainable energy consumption relying more on renewable sources such as sun, wind, hydro and geothermal energy to provide the most convenient living space for people.

The available information about Kashan, Mukalla, Riyadh and Baghdad in literature mostly involves general data. However, in the available resources there is an important issues is not investigated: How Privacy issue and the climate issues affect the characteristics of traditional house design. Particularly, in the traditional architecture of the houses in these four restricts the passive strategies like naturally performed ventilation, preparing cooling spaces and protection against solar heat are the critical aspects because of the desert climate conditions while the privacy aspects are still of great importance. This study tries to explain possible answers to the following questions. How do the similarities and variations in traditional house

architecture of the four regions are influenced by these characteristics? Why do the similar or different characteristics in traditional houses' design exist among four regions with the same Muslim religion and the same weather conditions? Why the passive cooling and heating systems in traditional houses in these four regions are not existed anymore?

1.3 Aims of the Study

As mentioned before, this study analyzes traditional architecture features in four areas looking for design strategies which enhance sustainability and comfort. This research contains investigations on the characteristics of traditional architecture in four different regions including Kashan, Mukalla, Riyadh, and Baghdad. Besides, this study discusses Climate issues and privacy issues which influence the design of traditional houses in four regions with identical climate conditions.

In this study, the question to be answered is 'how the privacy issue has impact on the traditional house design in each of the four restricts?' Moreover, the aspects of climatic factor issues or privacy issues which had a considerable effect on the traditional house architecture of the four geographic zones should be studied and then the reasons for every single issue ought to be explained. The descriptions regarding these factors are the facts of design that can be implemented in modern architecture.

1.4 Limitation

There are some limitations in the area of this study. Limitation can be categorized into practical and theoretical issues. From the practical point of view, the first limitation is related to the traditions for each case study and which is supposed to have effect on indigenous architecture. This item will not be investigated and

analyzed in this thesis. The last limitation is that this study is focused on four district regions in Iran, Yemen, Saudi Arabia and Baghdad with desert climatology and the whole desert region will not be surveyed. Accordingly, selected regions in each of the four countries will be analyzed in this research including Kashan from Iran and Mukalla from Yemen and Riyadh from Saudi Arabia and Baghdad from Iraq.

Theoretical limitations are mostly related to the information to be collected. Climate classification is different according to different resources. There are also a limited number of case studies and it is not possible to consider several regions and investigate them from all aspects. The study is conducted in a limited geographical area and it is not possible to expand it all around the world. This constraint brings another limitation which is variation in the culture. It is not possible to cover several cultural aspects as we are restricted in a specific region with Islamic culture. Finally, 'house form' is the matter that is concerned for inspection. Other architectural designs such as public places are not studied.

1.5 Methodology of Study

In this work, the research is conducted based on the following steps. Firstly, the study is organized according to the aim of the research. Investigation of the problem needs recognizing information resources and the ways to collect them. Afterwards, data are collected based on qualitative procedure. Literature review is completed based on books, scientific journal articles, thesis proceeding and websites. Field study in Kashan is analyzed based on the observation and the author's personal impressions and also data's which is written before. Finally, the collected data are analyzed, compared and discussed regards the purpose of study.

1.6 Literature Survey and Data Collection

In this study, data is collected by reviewing available documents to configure the speculative framework. All literature documents including scientific journals, papers and reports are used to attain information. After collecting resources, detailed study and analysis is performed. Theoretical fundamentals of the topic are inspected by interpreting information. Four cities belonging to four different countries are selected as case studies. The cities are Kashan in Iran, Mukalla in Yemen, Baghdad in Iraq and Riyadh in Saudi Arabia which share the same climate known as BWH. In each city, a number of traditional designed houses are studied. Design elements in relation with climate, and privacy are considered for each house. For Kashan city, majority of information is collected via observation performed by the author. Several photos are taken from famous traditional houses in Kashan which are used afterwards to attain information. On the other hand, for three other cities information is attained from reliable resources and documents.

Accordingly, data required for analysis of traditional architecture elements is collected for all case study cities. Further analysis and interpretation of information is performed to identify design characteristics of each specific region. Design features are studied in relation with environmental conditions and inhabitants' needs.

In this thesis, three stages are taken to complete the process. Firstly, the general framework of traditional design is studied. Then, based on available information architectural features in each city are recognized and described in details. Fundamental features of traditional architecture are inspected in some specific

traditional houses located in each region. In final step, design characteristics of traditional houses and contemporary houses are analyzed in all four regions.

1.6.1 The Field Study

The field study in this research consists of collection of information and analysis. Four cities located in the desert climate regions have been picked to be studied including Kashan, Mukalla, Baghdad and Riyadh. In these four cities, different types of houses in traditional architecture will be explored.

In addition to the data collected via literature survey, Kashan restrict is visited in order to perceive and experience the ambience. Fundamentally, in this region the data is collected by visiting some traditional houses and taking some photos. So, the data analysis procedure in Kashan restrict is based on observation as well as photos.

For Mukalla, Riyadh and Baghdad cities, data is mainly collected via reliable documents. As a result, the information related to typical features of the design in indigenous architecture as well as the passive strategies for cooling will be accomplished by doing observation in Kashan restrict. It is also applicable for studying the influence of socio-cultural specifications. Generally, all four cities are studied profoundly in terms of their traditional architecture and the design of traditional houses.

The procedure of this study is classified into three steps. In the First stage, the theoretic outline of traditional houses will be interpreted. The factors forming the design in indigenous architecture will also be identified in this step relying on credible documents. Moreover, this study will point to the general climate conditions. Secondly, Kashan, Mukalla, Riyadh and Baghdad will be briefly

described in terms of their traditional houses design and the features principally formed the generic indigenous architecture of every restrict. Finally, dissimilarities and similarities in the architecture characteristics of traditional houses and contemporary houses will be considered in each region providing some clarifying examples in each region. In addition, this study will conclude the reasons for similarities and differences which exist in four typical traditional architectures.

1.7 Importance of the Study

Considering issues related to Environment and the necessity to find solutions for them, the significance of this study is precious in contemporary architecture. Additionally, the adaptation configurations which exist in traditional architecture could be an inspiration for contemporary houses. Regardless of being phased out, old-style accommodation designs have been planned with great respect to the environment. The respect to the environment more than anything else, made passive cooling and heating strategies more considerable in the architecture features of traditional houses. There are also obvious footprints of privacy consequences in indigenous architecture patterns. For that reasons, the four regions represented in this study are worth to be investigated as examples of design characteristics in terms of passive ventilation mechanisms aiming at accomplishing a comfortable internal space. Subsequently, these features are also good example patterns for contemporary design which brings ideas on how to supply convenience for inhabitants by effectively using natural resources of energy as well as respecting the socio-cultural matters.

Chapter 2

TRADITIONAL HOUSES IN SPECIFIC BWH CLIMATE CLASSIFICATION

In this chapter, firstly the different classification of climate in the world will be explained and also climate categorizations based on Koppen classification is then introduced in order to define the climate conditions in the region that this study is focused on. The focus of this study is on the hot and dry regions or BWH climate. The term ‘home’ is introduced from different aspects. Then, the architecture of the houses in terms of traditional and vernacular is explained.

2.1 Climate Classification in the World

There are several factors for classifying climates of different region. While, the districts situated in a macro climate region share some similar characteristics of climate, there are still various differences in the amount of yearly rainfall, the intensity of relative humidity, hotness and coldness, and polar perspective. Consequently, the macro climates are categorized into smaller classes called Meso climates. Typically, two or more Meso climate areas are included in one macro climate region. As an example, relatively cold and very cold climates are both cold climates. The Meso climate regions are categorized into teenier local climate regions. Furthermore, various characteristics in these climates like geographical location; ecological features, underground water supplies, local flora, etc. result in several differences. There is also a term called ‘micro climate’ in a city for instance which refers climate variations in a smaller scale. For instance, in a building with summer

and winter divisions, climate conditions are different amongst the rooms located in winter section which are exposed to sunlight and the rooms placed in summer section on the reverse direction (Tahbaz, 2008).

Obviously, variety of climates all around the world induces different specifications in architecture and design. There are various methods based on climatology information for classification of climates in the world, but the most accepted one is the method introduced by Koppen Gieger (1900). As the first researcher who categorized different climates, Gieger presented climate classes at 1900 and then performed modifications on his work in 1918 and 1936. His work was based on the temperature, humidity and flora of each region. According to his primary work, there are five type of climates including polar, cool snowy, moderate, rainy tropical and dry. In the following paragraphs, the main characteristic of each type of climate is explained.

A. Tropical rainy climates: This climate is recognized by high yearly rainfall which surpasses evaporation with mean monthly temperature of above 18 and no winter season.

Af. Tropical rain forest climate: In these regions, even the driest month of the year has more than 60.96 mm of precipitation.

Am. Monsoon variety of Af: This subcategory of Af has a short period of dry season and in driest month fewer than 60.96 mm rain falls.

Aw. Tropical savanna climate: There is a distinct dry period during which a month with less than 60.96 mm precipitation definitely exists.

B. Dry climates: In dry climate, rainfall is less than vaporization. Thus, there is almost no superfluous water.

BS. Steppe climate: This is considered as a semi-dry region with grasslands. As the average temperature varies, the average yearly rainfall fluctuates between 381 and 762 mm.

BW. Desert climate: The main feature in this arid climate is that there is less than 381 mm of average rainfall during the year.

"In B climates, the lowercase letter h identifies a subtropical location where average annual temperature is above 18°C (64°F). Cooler mid-latitude Dry Climates are distinguished with a lowercase k. Thus:

- BWh – Dry Arid Low Latitudes
- BWk – Dry Arid Mid-Latitudes" (Michael Pidwirny, 2011, p 1)(URL 4)

C. Temperate climate: Summer and winter seasons are clearly distinctive. The temperature is moderate and in the coldest month it falls below 18 $^{\circ}$C.

Cs. Mediterranean climate: This climate is recognized by moderate humidity. Summers are dry and winters are humid with considerable precipitation.

D. Cool-snow-frost climate: In regions with cold climate, precipitation is mostly snowfall. In general, the ground is covered with snow in most of the year. Mean temperature fluctuates between -3 to 10 $^{\circ}$C in the coldest and hottest months of the year.

E. Polar climates: This climate type is characterized by the fact that it has no hot season. This is exactly contradictory to rainy equatorial climate which has no cold season. During the hottest month, the mean temperature is fewer than 10 $^{\circ}$C (Koppen, 1936).

In summary, the climate map in Figure 1 illustrates different climate regions all around the world based on Koppen Gieger's classification system.

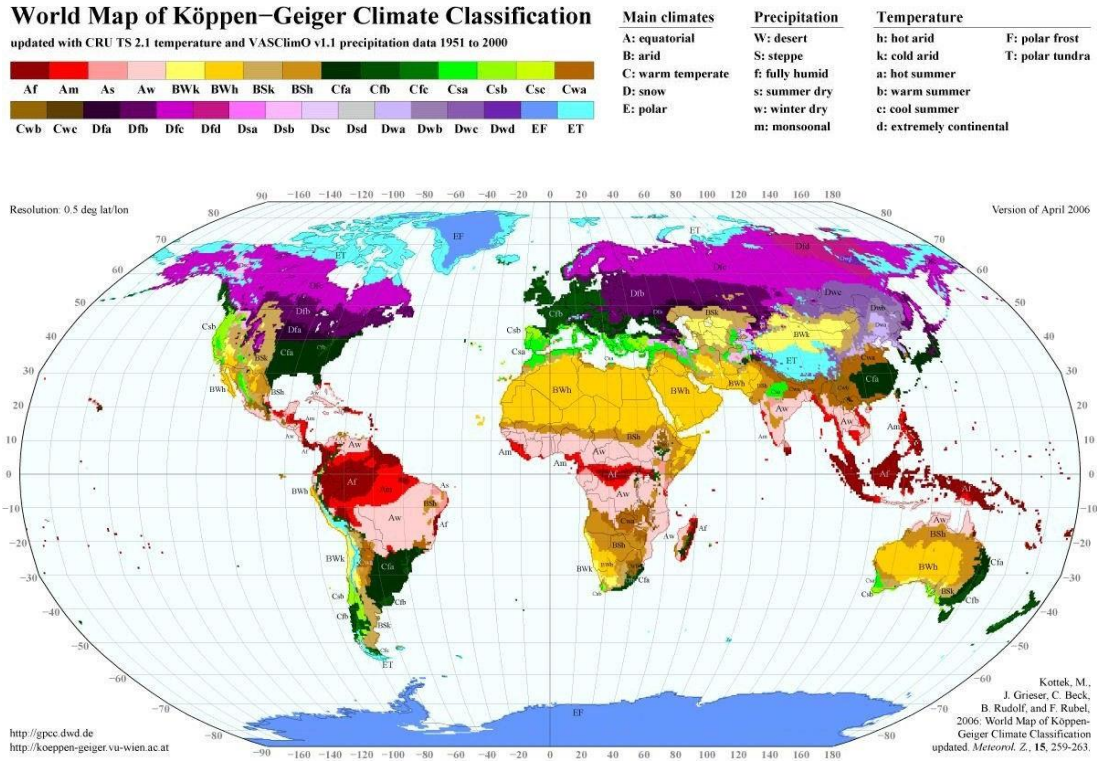


Figure 1: Classification of Koppen-Geiger climate, map of the World (Koppen, 1936)

Besides Gieger, there are several other researches who worked on climate classification. Olgyay offered an architectural-basis scheme for climate categorization in 1963. In his method there are four climate types including cold, moderate, warm and humid, and hot and dry climate. The climatic classes proposed by Szokolay in 1980 were similar to Olgyay as he made this according to building types. Additionally, Ozdeniz (1991) modified Olgyay climatic categories into more detailed classes. He defined seven climate types as follows. These are cold, moderate and arid, moderate, moderate and humid, hot and humid, hot and arid and lastly composite climate which defined to represent the weather in Turkey and some regions in Middle East (Ozdeniz, 1991).

There is another nine-category classification introduced in literature which is in accordance with the effects of climate on architecture of the region (Oliver, 1997). The climatic classes in this system are polar climate, semi-polar climate, continental climate, arid or desert climate, oceanic climate, rainy climate, Montana climate, subtropical climate and finally tropical or hot and humid climate. The primary need for providing a protective shelter against extreme climatic conditions is the reason that architectural style and materials are affected by local climate. As mentioned before, Koppen-Geiger, Olgyay, Vitruvious, and Dollfuse are the most famous researchers who proposed important information in that field (Szokolay, 1980).

2.1 Definition of the House

An ecological approach, as Henny Coolen (2005) mentioned emphases on how individuals deal with evocative specifications of the environment in their ongoing actions. The concept focuses on the intentionality of transactions of people. The mutual interactions between the people and the environment and how the people

benefit from the nature are the key factors in ecological approach, so it could be investigated in diverse stages of arrangements. Consider accommodation for example as a primary need for a mankind in the nature which itself avail many services like providing awning, safety, confidentiality, stability and control (Coolen, 2006).

In vernacular architecture, the design of traditional houses is one critical realization of ecological approach that should be conferred and studied from different points of views. For this matter, it is needed to firstly define what exactly a 'house' means before doing surveys on the design of it. Furthermore, the significance of different interior and exterior areas and how the spaces are related to each other in a building might be studied and analyzed in details.

In fact, the origin of accommodation and residency gets back to the early days of history. From beginning human beings valued a shelter which is now transformed into House. All the civilizations have been formed under these shelters. Human residences have been affected by surrounding environment, climatology of the region and the cultural aspects. If the senses of comfort and appurtenance exist in a house, it becomes a home. In summary, according to Shabani (2011) a house is entitled as a home provided that the inhabitants feel appurtenance, convenience, and memorability.

Moreover, building and accommodation have inherited a lot of features from the culture. It is another important topic that needs to be studied deeply. In contrary, the controversial idea is presented by Heidegger (1951) who states that residence and

house are the structures formed only by human conception regardless of the external concerns such as location, civilization, and the time.

In 2000, the expression ‘home’ was defined by Mary Douglas as a residence for inmate where they manage the recourses and develop the ceremonial costumes. So, home is a primary form of civic society according to Douglas as a sociologist and economist (Douglas, 2000).

There are three main goals behind the idea of constructing a home: feeling convenient, appertain and confidentiality. Hence, from early history architects have always had concerns on how to design a building considering the relations between the house and the residents. Religion and culture are two of these issues representing mostly as privacy in houses. Particularly, planning of the close and barefaced areas as well as partitioning the home into spaces was formed based on confidentiality matters.

On the other hand, the interaction between the culture and privacy has another aspect. Confidentiality brings up in different levels outlined by cultural record and individual believes. In this thesis, Islam is the main religion in the countries of issue. Therefore, privacy degrees are specified by Islamic believes and the design of buildings is characterized by these apprehensions. It is worth mentioning that there are also some features in architecture of the houses like patios which had been formed before the Islamic period (Eskandari, 2011).

The design of the building and arrangement of its different areas is influenced by the actions of inhabitants as well as environmental conditions. As a result, in literature

several declarations are presented on the key features which have impact on the general form of a house and its characteristics. In 1999, Izgi stated that obtaining figurative, epic features along with functionality are the most essential aspects in house architecture.

The effective aspects in house design are listed in Izgi study as below:

- Topographic features
- Convenience
- Local weather
- Cultural and religious aspects

On the other hand, Rapoport (1980) mentioned concept, area, relations and time as four essentials to be managed in building design. It is also mentioned in his study that regardless of the scale, to design a building the actions, beliefs and intentions of the residents should be considered at the same time. Denotation extends simply by obvious and robust reasons which make it possible to be repeated time by time (Rapoport, 1980).

Summarizing several thought in analyzing the most impacting aspects in design of the building, it could be conclude that culture of the region and climatology are the factors which are directly related to management of the space.

There are different types of climates all around the world. Accordingly related to the climate, several styles exist for building design in each specific geographic region. In dry and hot plains of Iran for example, architecture of houses partakes identical features. This study, is investigated the design characteristics associated with

accessibility and arrangement of the spaces for the buildings situated in desert region or BWH climate.

It is contributory for modern architecture to get advantage from the ideas in vernacular architecture. For this purpose, the characteristics of traditional houses are needed to be analyzed. According to Banham (1975) in modern architecture there is no geographical or cultural boundary as it is a set of globally used utilizations and amenities.

2.2 Traditional and Vernacular House

The concept of traditional house is likely to be clearly defined if the term ‘tradition’ is clarified in the first step. Different meanings for tradition are provided in the literatures performed by sociologists and art specialists. These descriptions can be categorized in two classes. In the first category, basic ideas, regulations and approaches associated with the inherent beliefs and religion of the people are depicted. The second class of definitions mostly reflects the factors and causes forming the traditions. Actually, socio-cultural materials have affected the configuration of traditions as the ideas, beliefs, regulations and approaches are aggregated during the history.

It is clearly specified by Ahadi (2011) that ‘tradition’ and ‘traditional’ have some differences. Traditional is explained as the restrictions inspired from of the history while traditions are steadiness (Ahadi, 2011).

Tradition in design includes a set of progressively formed specifications, configurations, regulations, schemes and materials in the field of architecture. This progressive historical procedure comprises an active manner in designing the spaces

which is basically planned according to the conditions in the local environment and then it is affected by surrounding elements like socio-cultural issues (Soltanzadeh, 2006).

This study can explain traditional characteristics with respect to the environmental conditions. So, relations between the environment and all customary forms and design patterns of a certain district are illustrated as the traditional architecture (Oktay, 2002). 'Traditional Environment' is also referred as monuments and indigenous dwelling or any other construction which adjusts with local environmental conditions and at the same time represents the cultural facts of the region (Oliver, 2002).

In the encyclopedia of indigenous design it is mentioned that the world 'vernacular' emanates from the term 'traditions' The main difference between vernacular and traditional architecture is in their constructors. Vernacular buildings are created by native ordinary individuals to satiate their primary need for having a protective shelter against extreme climate conditions. So, functionality is the priority and there no sign of architectural and aesthetic knowledge in the design. However, traditional buildings are planned by architects and design experts. In this architecture scheme which includes construction of monuments, houses and holy buildings, both functionality and aesthetic aspects are taken into account (Mashhadi, 2012).

Conversely, in Cavacanty's book (1996) another expression is introduced as 'vernacular tradition'. When cultural beliefs together with imagination, passion, inspiration and creativity are directly converted into a somatic realization without self-conscious, the resulted item is called vernacular tradition (Cavalcanity, 1996).

In vernacular architecture, the buildings are constructed by ordinary owners or by the community employing traditional skills and local resources to conform the environmental conditions as much as possible. So, meeting particular requirements, imputing the valences, and noticing economic and life-style of the people are all reflected in the forms of vernacular architecture.

Oliver also presented another description on the concept of ‘vernacular design’. He stated that vernacular architecture contents all the materials which are recognized and are inherited in the field of housing, construction, or habitation. The communal intelligence and knowledge of a people and the customs established in the society are involved in this type of construction (Oliver, 1997).

This procedure of development begins with a model and progresses by implementing adaptations and deviations. Nowadays, the residences are built by construction industry. But in vernacular design there are no architectural or aesthetic considerations as the initial models are adapted based on the climate, culture and economic conditions of the region (Baker, 1996).

Archi-Speak are a manual for architectural expressions provided by several architecture specialists including Tom Porter. In this guide, the term vernacular is described as the common language or idiom of a district. So, when it is combined with the word ‘architecture’, it mostly refers to conventional, ordinary constructions than the grand architecture. Vernacular is a traditional scheme of architecture, constructed generally by anonymous ordinary people using traditional technology and regional resources like mud, rock, lumber and hay in order to fit regional climate, local issues, and particular needs. Therefore, vernacular houses do not

contribute much in conventional building style or established concepts in architecture science (Porter, 2004).

The word Vernacular in the field of design and architecture implies the popular constructed buildings and it is recalled in some studies as 'the architecture of the people'. Vernacular architecture refers to the constructions built by ordinary lower class people in the society. The related built environments included in this category share the identical scale and pattern which are recognized as dwelling or artifacts (Dincyurek, 2002). The main discriminative feature of vernacular architecture compared with other constructions is in the existed inception in the procedures of perceive, design and construction of the building (Rapoport & Oliver, 1997).

Another explanation for vernacular architecture is rendered by Bruce Allsopp in his book titled 'A Modern Theory of Architecture'. It says that vernacular architecture was derived from folk construction in general which can be viewed as progressive natural design of a district. This architecture pattern is formed based on the local weather, cultural aspects and available resources. However, folk design is naturally restricted to the characteristics that are possible to be represented as vernacular. It possibly refers to mystical, epic and functional buildings with some constraints on the decency and decree, while the scale is also matters. Vernacular design features affability to publics as well as sympathy to the environs (Allsopp, 1977).

In general, Climate conditions are defined in different ways by the specialists. This study is relying on Koppen's climate categorization scheme. According to this scheme, the four regions that are studies have all BWH climates. It could be concluded that in different architectures periods in the history, definition of the house

was changed. In vernacular, traditional architecture, designers have different attitudes in building design. Educated architects have different ideas compared with the experimental architects which use mostly their experience in design. The focus of this study is based on traditional houses.

Chapter 3

THE ANALYSES OF FACTORS WHICH IMPACT ON FORMATION OF THE TRADITIONAL HOUSES

The focus of this chapter is on the Rappaport's description on the design aspects of traditional architecture. Privacy factor and climatic factor which have impact on the pattern of traditional architecture are explained. Factors which are related to the design of traditional house base on Rapoport approach is classified as a table in which is mentioned below (Gunce, 2007).

3.1 Rapoport Approach

"Shelter is of supreme importance to man. It is the prime factor in his constant struggle for survival. In his efforts to shelter himself against the extremes of weather and climate he has, over the ages, evolved many types of dwellings, one of which is the court house." (Rapoport, 1996, p 19)

Rapoport (1969) stated that traditional historical monuments are constructed in order to have impression on the community. These constructions are built to expose the supremacy of the supporter, the ingenuity of the designer or the insight of the sapient from the patron. On the other hand, the vernacular tradition is explained as an explicitly physical realization of cultural beliefs, ethics and requirements. There is also an attitude on a smaller scale which declares that idyllic living space for populaces is in buildings environments constructed by ordinary people without architectural or artistic constraints. It is also notable that the contribution of the

designer in forming a building is to some extent a debatable matter. The vernacular tradition is in a closer relation with the folk culture and current life-style than monuments tradition characterized by the ethos of a selected class in the society.

Regarding the differences between vernacular and grand design, Amos Rapoport (1969) compares folk traditional architecture with grand architecture in his book (Rapoport, 1969).

“In traditional dwellings, environmental and socio-cultural factors that determine the design of dwellings should be taken into account. There is a transformative relationship between the design of traditional dwellings and these factors. In other words, traditional dwellings can be analyzed as an agent for the user to express his geocultural background.”(Rapaport, 1996 cited in Gunce, 2007 p 2)

“Factors that determine the design of a traditional dwelling include the topography offered by the geography, materials and techniques found in the surroundings, and the climate of the region. Environmental factors include the means and methods of production and social affluence level, family structure (relatives) and relations with neighbors, religious beliefs, lifestyles as well as sociocultural factors.”(Gunce, 2007 p 2)(Table 1)

Table 1: Factor that define the design of a residential (Gunce, 2007)

Factors that define the design of a residence[a]	
Factors defining the traditional residential architecture	
Natural and built environmental factors	Climate
	Topography
	Environmental texture
	Materials and building techniques
Socio-cultural factors	Style of living
	Economic structure
	Family structure
	Relations with relatives/ neighbours
	Beliefs
	Traditions
	Social cultures values
	Ideology

[a]Developed based on Rapoport.

3.2 Climate Responsive Design Strategies

In our world, the requirements of inhabitants and their lifestyle defines the traditional architecture in each district. In a specific zone, the effective conditions on the design of buildings are geographic features, climate, local materials and cultural issues (Izgi 1999, Rapoport 1980, Eldemery 2000). From architectural point of view, climate and cultural issues have profoundly affected the arrangement and links of internal and external spaces.

Obviously, style, material and alignment of a building are all affected by climatic features such as the direction of wind flow and sunlight, amount of precipitation, humidity, temperature level and air pressure (Yaldiz, 2009).

The sunlight is considered as the main reason of heat in hot climate regions. Thus, it is needed to manage the location and position of the building according to the sun

direction. It is also desirable to consider the direction of dominant hot winds in designing a site. These two issues are important both during the intolerable hot season and the cold nights of the cold season. A well-oriented house consumes less energy for heating and cooling (Zandi, 2006).

As previously stated, selection of the construction material is related to the climate condition. Conversely, the choices are limited by locally available resources. Thus in each region, the available materials adapted to its specific climatic condition should be selected. Thermal resistance and thermal capacity of the substances are two main physical features to be considered. In different climates, extreme frequent weather conditions are known as critical periods. In desert climate for instance, hot days are critical seasons. So, in these regions the materials should be well-adjusted to hot weather during the day in such a way that indoor air is not affected by high temperature air of the outside.

In BWH climate, temperature varies a lot between the day and night. Therefore, dense substances should be utilized to build the envelope of internal spaces mostly used during the day. Conversely, low heat capacity light materials are better to use for the spaces mostly occupied during the night. Stone materials according to their profound thermal capacity and resistance are proper in desert climate zone (Ghobadian, 2006).

According to thermodynamics, heat always transmitted to colder places. Actually, in desert regions the walls get warm during the day and the heat is gradually stored in the stones. During the night when the interior begins to get cold, this heat is transferred into the internal space. Consequently, the inhabitants are provided by

comfort as the interior walls are cool during the day and warm during the night (Zandi, 2006).

In traditional design, two general characteristics are observed in the selection of materials. One of them is solar and thermal efficiency of the walls and finishes. The other one is how the applied materials are self-efficient.

In general, widely used materials in traditional architecture of hot/arid climate are stone, adobe, muck, soil and muck blocks. All these materials share some thermodynamic features that make them beneficial for constructions in desert climate with hot days and cold nights. High thermal capacity, high heat isolating characteristics are all advantageous there. The light color of substances like mud is also beneficial to reflect the sun radiation during the day and does not let the interior heat radiate out during the night (Azami, 2005).

Furthermore, energy consumption and efficiency of an architectural object is affected by the climate conditions. In sustainable design, which has considered as an environmental friendly scheme several climate-based issues are imperative. These issues are included efficient energy consumption, and organized use of natural resources and providing comfortable, healthy and sustainable house as well (Hui, 2000).

Fundamentally, climate influences both vernacular and traditional architectures. In different historical periods, human beings have tried to build their houses as much adapted to climate as possible. Hence, the characteristics of architecture have been always directly related to the climatic conditions (Oktay, 2001).

There are some important factors which define the thermal convenience of internal spaces and at the same time energy efficiency of a building. These factors are design style, spaces between houses, envelope design and efficiency of materials, natural light management, and thermal characteristics of the envelope. House envelope separates indoor spaces from external area so, the envelope design may be considered as the most important issue. On the other hand, all these factors are closely related to each other and in an optimal design all of them should be planned and implemented together considering climatic features (Behbood, 2010).

It is crucial to investigate the history of sustainable building and what our intimates did in order stay coherent with nature by considering both climate and environment. By ignoring these aspects several sustainable design strategies according to nature and environment will fail to implement (Barnett, 1995).

Normally, if the climatic knowledge gets involved in design, lots of energy efficient and environment friendly characteristics will be implemented in the plan. For example effective air ventilation configurations, utilization of sunlight, and protection against natural hazards to reach climatic convenience are some important strategies.

In order to build a new construction sustainably, there are two crucial factors including climatic conditions of the area as well as environmental effects of the construction on region (Edwards, 1996).

Solar housing is one the most ancient strategies in sustainable architecture. Our ancestors learned to design houses to take the most energy of sunlight in cold

seasons and to elude its heat during the hot seasons. Sunlight direction in different seasons is a factor influencing the orientation of buildings in a site. In Greeks, ancient builders implement windows in southern direction to capture the sun heat, because they knew that the sun crosses through the south in a low path during the winters. On the other hand, roof projection shaded the building to avoid the heat produced by sun which paths across a higher arc. Stone, as the major material of the ancient buildings stored the sunlight heat (Oktay, 1999).

3.3 Impact of Privacy on Design Strategies

Different cultures forces distinctive characteristics in the interior design. One of the important elements of socio-cultural aspects is religion which significantly alters forms of the buildings. As Osivand (2013) stated, "The categorization of construction culture shapes based on the factors such as: Human's primary needs such as sleep, food, marriage, need to private and public spaces, social interactions, family structure, Patriarchal, female dominance and cultural issues of non-defensible areas."(Osivand, 2013, p 1)

The notion of privacy has different definitions based on different cultures but in general it can be defined as controlling the relationship between residence of the house and strangers and vice versa (Gazzeh, 2009).

Therefore architecture is affected by privacy issue. In the architecture of these four regions, the user has always been taken into account based on culture and religious issues. For instance privacy is provided by dividing the house into different parts. Uniting encompass and open spaces is done in professional way using space division. Two different types of privacy are concerned by these four region

architecture: ‘privacy from outside the house’ and ‘privacy from common spaces in the house’.

In summary, this study is talked about Rapaport approach on traditional houses and also classified of his approaches in a table which is mentioned above. Also this study is talked about climate factors and their Subcategories impact on traditional houses in BWH climate classification on the other hand also talk about impact of privacy on the Established form and also Space division in the house.one of the most impact factor on privacy could be religion which these four region has the same Islamic religion.

Chapter 4

DESIGN STRATEGIES USED IN TRADITIONAL ARCHITECTURE IN BWH (DESERT CLIMATE AREA)

In this chapter, different architectural elements in interior and exterior part of the house in traditional architecture are investigated in four regions located in Iran, Iraq, Yemen and Saudi Arabia. The selected regions share the identical climate condition which is hot and dry (BWH climate) as well as the same Islamic religion.

4.1 Kashan

An area of approximately 9,647 km2 is covered from geographical point of view. This sub-province is called Isfahan and it is extended from Karkas Mountains on the west to the Central Desert on the east (Jaʿfari, 1989).Kashan is one of the cities in Isfahan.

Figure 2: Kashan city map (URL 5)

4.1.1 Description of Traditional Architecture in Kashan, Iran

In ‘residential architecture’ of Iran, elements are implicated in a manner conforming to two important factors, namely call and affinity with environs. The house structure and ‘house branches’ are examples of this implication. The former is older in terms of architecture since it belongs to ‘Stone Age’. Inhabited houses comprise various units such as entry, courtyard (Hayat), room, Tareqe, Shanasheel, Pishborn.

A central courtyard is almost a constant part in Old Iranian houses. This element is a four sided space around which living rooms are located. The house is dividing to a ‘Biruni’ and ‘Andaruni’. This way, instead of opening the door of the house at once to the courtyard or the interior, the door was opened into another area called ‘Hashti’ and then it was from the Hashti, one could reach ‘Biruni’ and ‘Andaruni’ parts. Therefore first a slender path called Dalan must be passed to reach the interior part. This separation of house parts conceals the inhabitants from being seen. This design is called ‘courtyard housing’ in which ‘Andaruni’ rooms only to Maharem (family members) and ‘Biruni’ is employed for hosting guests (Moradchelleh, 2011).

Although the greater space of the house was devoted to the ‘Andaruni’ part but the ‘Biruni’ part was playing a significant role both in the sense of architecture and decorations. These kinds of houses usually include a big room which is built toward Gheble. This room was named ‘Panjdari’ or ‘Shahneshin’ due to having 5 to 7 windows. The decoration of this room, including the windows was done with various materials such as latticework, woodcarving, mirror work, plaster and painting. Paintings, plaster and mirror work could have been found on the ceilings of these rooms (Ghobadian, 2006).

Entrance: An overdoor invitation exists on house entry in different shapes. An overdoor invitation can be simple or complicated. In both forms horizontal and vertical signs like arches are used to show the reception for entrance. In general, either the courtyard entrance was located after the door of the house .The corner or middle of the front was a suitable place for the house entrance. This way, more than one entrance could exist. Regarding to different obstacles in the way, the lane between outside of the house and the courtyard is designed in several forms naming direct, two crossing paths or spiral. In the first type, which is the simplest a direct line starts from Dalan or Tarme (Living room) and ends at the courtyard. In two crossing form, the path goes down through Dalan or Tarme. The spiral form divides to simple and complex type. Moving in this type of path included both Dalan and Tarme (Figure 3) (Moradchelleh, 2011).

Figure 3: Entrance of Tabatabaee house in Kashan (taken by author, 2012)

Hashti: The indoor space to be linked with the outdoor is assumed to be employed as a place for rest and a mean of ‘spatial division’. In other words, encompassed spaces are reached to Kuche which is a sort of public passage (Moradchelleh, 2011). The exact location of a Hashti is after the entrance of the house and it is just linked to the

outer space of the house (Figure 4). In general this area it sited exactly next to the entrance and this way, it separates the ‘entrance area’ to two or more directions. Therefore, the inner yard could be reached from this space and due to its spiral corridors the presence of strangers wouldn’t intrude the sacred privacy of the family since they only see the exterior yard. Thus, broadly speaking a place to pause in, separating spaces and a waiting room are some of the roles of this element. The design of ‘Hashtis’ covers are various and beautiful (Osivand, 2013).

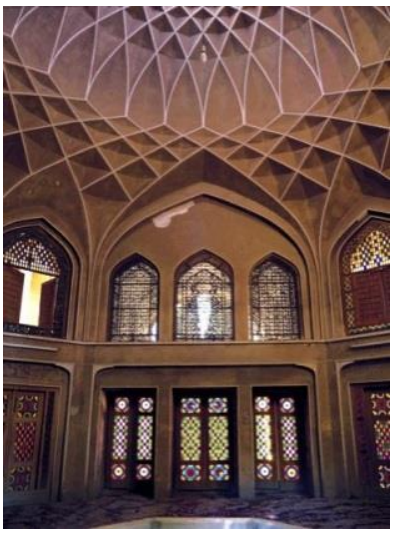


Figure 4: Hashti in Tabatabaee house in Kashan (taken by author, 2012)

Dalan (Corridor): It is the most ordinary element of the entry space. The main role of this space is to link two other parts of the house to each other. However, another role can be considered as well which is about privacy of the family or Mahramiat which is resolved by altering the length and direction of this lane. Corridors of Dalan can be in various lengths. From the architectural point of view, Dalan must be design in a way so that it can be used as a crossing path (Figure 5).

Figure 5: Dalan of Abbasi house in kashan (taken by author, 2012)

Courtyard: In Dehkhoda Dictionary the courtyard is defined as a space which enclosed with walls in the house. Other names of the courtyard are Sahat, Sahn, Miansara, Sahnsaray. Since most of the Iranian houses include a courtyard, functionality and characteristics of this element is explained in following sections (Figure 6) (Eskandari, 2011).

Figure 6: Inner Courtyard of Tabatabaee house with fountain pool (taken by author, 2012)

Functions of Courtyard: The courtyard has different roles. One is to connect residential sections and the open space within the walls. Another is that majority of inner space units reaches to courtyard. Generally speaking the courtyard

functionality includes ownership border, joining and connecting parts of the house which link different spaces to each other, providing a green delightful environment, natural chilling of house using the wind, significant item for organizing different parts and a safe and secure place for family gathering purposes. It is obvious then that the houses in which the courtyard doesn't exist, these functionalities don't exist as well. For instance the word Dalan doesn't exist in morphology of the houses with no courtyard. According to what has been explained up to this point, traits of a courtyard house are categorized in to two cases:

First there is no straight visual connection of the inner spaces with the outer spaces. In other word, courtyard is used to organize various parts of the house. For example open spaces as well as closed ones reach to them. In primeval form of designing house with courtyard the role of the courtyard was limited to separating the outer environment from the inside of the house in order to keep the safety of the family and make the physical environment more distinguishable, but it was just after rampant of Islam in Iran that Iranian architectures decide to detach the sacred atmosphere of the family from the visual connection of strangers by designing one or two courtyards. These architectures started to build the prominent houses with few courtyards and called them 'Biruni' and 'Andaruni' courtyards (Moradchelleh, 2011).

Courtyard Components: A courtyard consists of different components. These components function based on the requirement and the type of the house. Flowerbed, water well, pool and a small water reservoir are the principle elements of a courtyard in a house not so big (Memarian, 1996).

Room: Rooms are constituted by taking into account the arrangement of other parts of the house and summer or winter usage of them. The number of gates, the direction of doors and windows considering the position of entrance and yard and the type of scale, shows the functionality of rooms (Figure 7) (Moradi, 2008).

Figure 7: Room in Manuchehri houses in Kashan (taken by author, 2012)

Three-door room: “In this space, bedroom has been designed in a complete humanistic scale, the proper light depth, and avoiding the waste (as one of the 5 principles of Iranian architecture) and accessible through the opposite corridor.”(Figure 8) (Osivand, 2014, p 4)

Figure 8: Three-door room in Broujerdi house in Kashan (taken by author, 2012)

Five-door rooms: family gatherings are happened in such rooms. These rooms are sketched based on principals of ‘golden proportion’. Generally two corridors are located in two sides of this room. There is a small recess in this room which is placed a little upper than floor level. This recess is called Shahneshin and it is used for hosting the prominent guests or older members of the family (Figure 9) (Memarian, 1995).

Figure 9: Fiver-door room in Broujerdi house in Kashan (taken by author, 2012)

Talar (Hall): It is a wide space which receives light in direction of sun during the winter and back to the sun during summer. Center and lateral spaces are tried to be balanced well in size (Figure 10).

Figure 10: Talar in Ameri house in Kashan (taken by author, 2012)

Iwan: “Iwan is a platform, a smaller space than Talar which is usually located in front of the room. It has a ceiling but is an open space without door or window.”(Osivand, 2013, p 4) Iwan is defined as ‘a semi-open space that is mostly closed from 3 sides and is facing an open space from one side’. The main function of Iwan is as a mean of entry and exit access. Also they prevent direct sun light. It is also interesting to mention that while an Iwan is an open space without any door or window, it has a ceiling. One of the upheavals of the Iranian architectures is the design of Iwan to not only make the building more effective but also to adorn the house environment beautifully. It was used during the overruling of ‘Ashkanid civilization’ that Iwan was built-in the houses for the first time but the main idea was provoked by Siah Chador and tent (Kheime). (Figure 11) Another type of Iwan is called Focal. It is used for ornamentation. One thing which is common among all sort of Iwan is that they are all encompassed within ‘wall arcades’ in order to adorn them by refraining from ‘mono-construction’. The vault arcades were built in square or rectangle forms (Moshtagh, 2008).

Figure 11: Iwan in Abbasian House in Kashan (taken by author, 2012)

Walls: Because of special climate in BWH regions, walls have a very significant role. ‘Huge walls have approximately thickness of about one meter’. Conveying and spreading out is done though these walls at night. This way the average temperature stays low during the day. Therefore, it brings relief for residents (Pourvahidi, 2010).

Windows: Small windows are sensible characteristic of architecture in BWH regions. In general, windows are in great number on internal walls facing the yard; however it is not the case about external walls. In addition to Badgir which helps to circulate the wind, these windows help to pass the wind from yard to internal spaces.

Orosi: It’s a high ceiling window which locates in main spaces of the house. In other word, Orosi is a ‘full-wall window’. The whole window is covered by lattice. The opening method of this type of window is different from the usual one since a vertical rail is used to open it. ‘Orosis’ have meshed wooden lattice work. In order to receive proper light and view, these wooden meshes are less concentrated at the lower parts. By using the colorful glasses the harshness of the sun light is inhibited and a beautiful sparkle produced by lattices, covers the interior space. Therefore, the light and privacy are restrained by using lattice. Heat and unnecessary light was limited by utilizing colorful glasses and lattice wooden frames. The light eradiate deep in the room without overheating the hall since the window is tall enough. However when high temperature of summer started to annoy the residence they hanged a white piece of fabric on an Orosi façade to prevent unwanted heat and light. Another way to overcome hot days of summer was to make a shade by constructing a balcony in front of Orosi. Houses which have Orosi were inhabitable both in summer and in winter. In summers opening the lower windows of Orosi cause the wind to flow freely and make the room chilly. In winters, closing the

shutters helps to keep the room warm and cozy because of ‘greenhouse effect’. In hot, arid, moderate and humid areas, to provide fresh air and horizontal and suction ventilation the Orosi was embedded.

Characteristics of Orosi can be described as follow: providing a beautiful vista, protecting privacy of family, scattering the light deep into room, preventing heat, freshening the air, hindering harsh light and conserving the beauty.(Figure 12)(Tahbaz, 2014)

Figure 12: The window in Kashan house (taken by author, 2012)

Wind Tower: People living in hot regions of Iran found out by experience that the unendurable heat is due to ‘land reflection’. It means the land reflection caused ‘hot & brand air’ accumulate in the lower levels of land. Thus, they created a tall ‘air vent’ which has at most 8 wings within the houses. These tall air vents are called Badgir or wind-catcher. Badgir is an element of BWH architecture and it is exploited as a way of cooling of internal spaces.

Badgir structure is complicated. It works by drawing in & drawing away. The main idea which lies behind this structure is as follow: it sucks the fresh air to the internal

spaces of house, using the wind blowing. As a reaction to this process, hot air moves from inside to outside. When the wind contacts with walls of ‘internal wings’ of Badgir inescapably it moves downward and goes into different parts of house, on the other side the vents of Badgir which are located on the opposite lateral of wind blowing sucks the hot air of house and then give it to the wind Talar is placed right after this place in order to direct the chilling wind which passes through it. (Figure 13) (Azami, 2005)

Figure 13: Wind tower in Kashan house (taken by author, 2012)

Sardab: It’s a basement in which water well is excavated under the Badgir channel. First, the wind osculates to the well and water surface. Then it moves along a horizontal channel which ends to the surface of the basement. This is called a Badgir or wind-catcher basement. This method is exploited as a water cooler system in basement spaces. Such basement is called Sardab (Figure 14) (Moradchelleh, 2008).

Figure 14: Sardab in Broujerdi house in Kashan (taken by author, 2012)

Tanabi: It exists only in bigger houses and it is in a cross shape. Normally, it is located right after the wind tower. Actually it is a space between Talar and Badgir. It is used for resting and reposing (Zomorshidi, 2006).

4.1.2 Impact of Climate Issues in Traditional Architecture in Kashan, Iran

To stabilize the temperature inside the house and decrease variation of it during the day and night, several architectural strategies were implemented in Kashan's traditional houses. Main material is mud mixed with straw and adobe which were used to build thick heavy walls. The walls absorb solar energy during the day and transmit it during the night. Thick and tall walls surrounding the courtyard provide shading for the internal space. The pond and plants are responsible for cooling and increasing the humidity of the air flow. Thus, ventilation is performed as the air is cooled down by passing through the yard over the porch and trees (Ghobadian, 2003).

Courtyard is the heart of the buildings in this hot and dry climate with diminutive foliage. Typically the courtyard was built in a lower level than ground level. The water in pond at the center of courtyard is for cooling the air as well as aesthetics. Kashan is located in a dry region and availability of water resources is an important

factor in the design of the house (Nassiri, 2008). For this reason there is a need to dig the ground for water resources. It is also possible to direct the air over the pond or cistern to provide moisture as well (Figure 15).

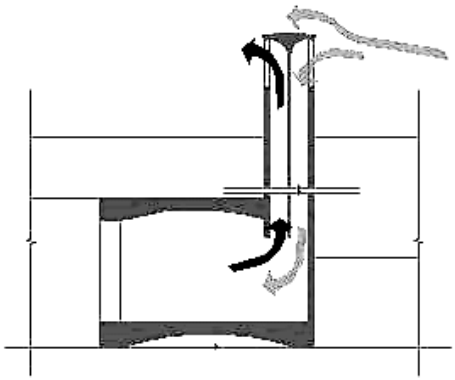


Figure 15: Traction and suction in wind catcher (Azami, 2005)

1.2 The function according to temperature difference. The question is ‘how wind catcher works when the wind blows slowly?’ In fact, the temperature difference between two sides of the opening induces air flow. Sun exposure to southern face of wind catcher makes it warmer than the air in veranda space. Hence there is a kind of vacuum in the space under the wind catcher which draw out the hot air. Therefore, an air flow is produced to compensate for this which brings the cool air on the northern side into the house (Figure 16). At night, the weather begins to get cold in the outside. Cold air flows down and makes the walls cool as long as there is a temperature difference between the outside air and the walls. But usually before reaching this balance, the day begins and wind catcher starts to act as it supposed to do (Azami, 2005).

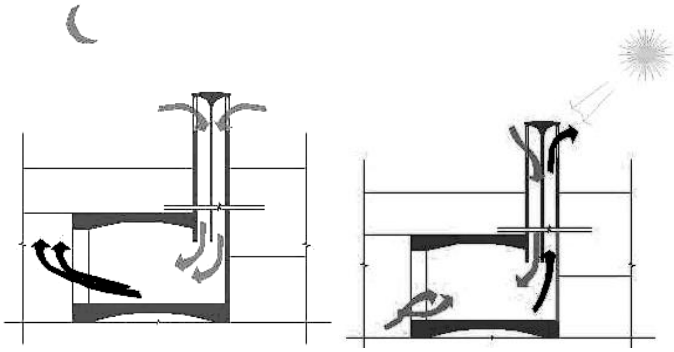


Figure 16: Function of wind-catcher in day and night (Azami, 2005)

Another cooling strategy in Kashan traditional houses is vault roof with pileus. This structure also functions according to pressure difference and intakes out the warm air inside the house (Figure 17).

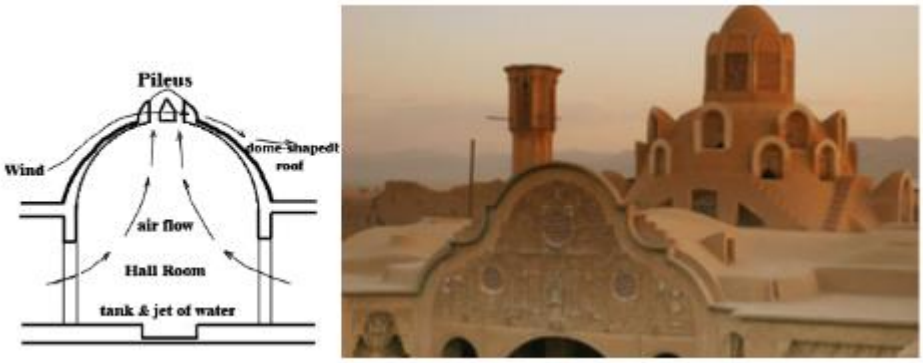


Figure 17: Natural ventilation in Broujerdi House in Kashan (URL 6)

4.1.3 Privacy in Traditional Architecture in Kashan, Iran

Iranian traditional architecture is affected significantly by Islamic culture in aspects such as privacy and hospitality issues (Memarian, 2011). House residents in Iran desired both privacy and at the same time contact with their neighbors. As a result there is a hierarchy in privacy of the spaces when designing a house. There are private spaces in houses as well as public spaces. But to reach the private space one ought to pass semi-public and semi-private spaces as well. Hence the house is partitioned into different spaces featuring different accessibility characteristics.

Designing entrance, interior space and exterior differs for these spaces. In Iranian architecture, entrance is built in such a way that no one has sights from outside to inner parts. 'Hashti' or foyer is served as a greeting room before entering the guest room. Men visitors were allowed to enter this area (Memarian, 2006). In fact, the reception room is one of the well-decorated spaces in Iranian traditional houses. 'Andaruni' of the building is the most private spaces that nobody except the family can have access to. Reception room is connected to semi-private area via a hallway. There is also a longer hallway connecting semi-private room to private space. This structure is designed intentionally to provide as much privacy as possible while hospitality and social contact is also considered (Pirnia, 2008).

4.2 Mukalla

'Yemen is located at the southern part of the Arabian Peninsula'.North Yemen and South Yemen were two separate countries; they unified on the 22nd of May 1990 under the name of Republic of Yemen. Since then Hadhramout is the largest province of Republic of Yemen. This city is situated in the southern part of the country. Also, Coastal Hadhramout is located between the Indian Ocean in south and the plateau in north. Mukalla is placed there. The coastal belt is over 350 km long. Over years, Mukalla is turned to be the largest and the most important city of the coastal Hadhramout (Al-Mashi, 1998).

Figure 18: Mukallah City (Al-Mashi, 1998)

Figure 19: Yemen Mukalla map (URL 7)

4.2.1 Description of Traditional Architecture in Mukalla, Yemen

White painted houses and buildings which are a mixture style taken from Arabic, Yemeni and Indian patterns, dominate the structure of Mukalla. The unique architectural design of the 18th and 19th centuries can be seen easily in this city.

Culture, values and lifestyles of the Hadhrami people affect the plan of traditional houses in Mukalla. Since the privacy has the highest priority in their culture, the space division is affected by this value. At the same time they try to accentuate the

importance of ‘community intimacy’ like ‘Seasonal feasting’ which is a cultural activity (Baeissa, 2011).

Entrance: In Mukalla entrances are always built upper than ground Level. The logic behind this is because of ‘flooding problems’; besides it helps to have fresh air in bottom floor (Al-Mashi, 1998).

Corridor: the main entrance is designed large enough to control the traffic flow of inhabitants around the house. A narrow passage which leads to a staircase is located right after the entrance. Then there is a corridor which directs the pedestrian to other parts of the house. Therefore, architectures consider enough space for all parts of the house in the layout. In order to construct the stairs an enormous pillar is used at the entrance of the house (Al-Mashi, 1998).

Diwan: Diwan is a space located in front of traditional houses of Mukalla; therefore it is used only by males. This way, private spaces of the house are set apart from Diwan where strangers may present. Therefore Diwan has a significant effect on the design and organization of house. According to a survey, Diwan is considered almost in every house plan. It is interesting to mention that not all of the internal areas of house are named by conventional labels. Some of these spaces such as Diwan or dining room are named by their real activities which go on in that space. Kitchen and Toilet are exceptions of naming by usage.

A distinct and anomalous life style is going on among people in Mukalla. As a matter of fact, in traditional houses of Mukalla, it is the civic functionalities who rules over the design of house in general. There is also another Diwan which is on

the first floor. This one is used for hospitalizing the visitors related to their genders. There exists an isolated Diwan for females in which they don't need to cover themselves since strangers won't see them. Neighbors can rent the first floor rooms in order to hold on a ceremony. Using less house appliance and furniture in customary houses has made the Interior space more flexible. Oversetting the room with lots of furniture not only changes the room to a single application space, but also it causes the room to look small and tumultuous (Baeissa, 2011).

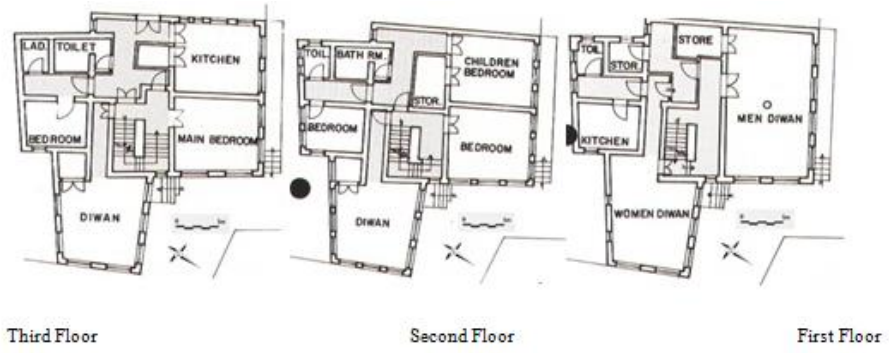


Figure 20: Traditional house in Yemen (Baeissa, 2011)

Elderly people and the relatives live in second floor. Rooms of this floor were used for various functions during different hours of day. For example women may spend the day in a room which is going to be used as a bedroom for other people at night. The bedroom of the owner of the house and his wife is located at third floor to be entirely private. Intimate friends of the wife can meet her at this room privately; also some rooms are devoted to children at this floor; but the important point is that children are not isolated and they can go anywhere in the house. There exist a corridor in which strangers will wait in the case they were expected. If visitors are female, males should leave the Diwan or even the house (URL 8).

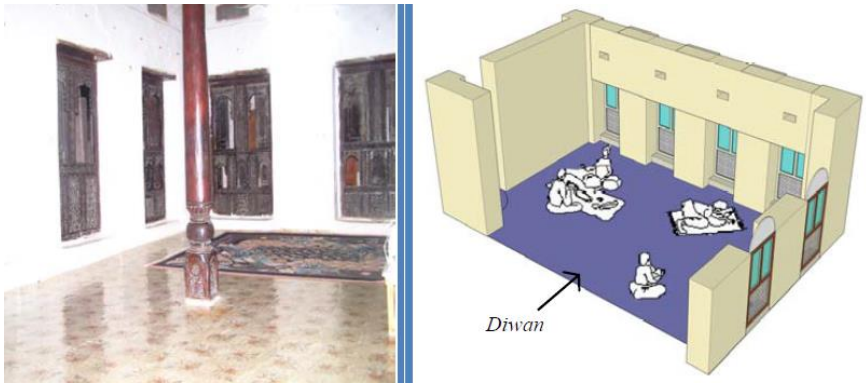


Figure 21: Interior Space and Axonometric layout of Diwan in Mukalla (Al-Mashi, 1998)

The second floor is devoted to children but women use the Diwan in this floor during the day. The third floor is devoted to parents. ‘This floor keeps its original function (bedroom) all day long.’ There is a foot bridge at the first floor which links the house to the next ‘mid-rise’ house but it is not used any more. There exists an unrestricted space on terrace of top floor room. This area is designed to sleep outside the room in hot days of summer. Ornamentation such as wooden sculpture of terraces makes the traditional houses unique and beautiful.

Composition of the room layouts: Two factors are important in deciding about the location of rooms. These are the space between each pair of rooms and next, the rate of motion between them. Doors, windows, walls, floors, and ceilings are the elements that must be taken into account in the layout. Storage spaces are usually built in ground floor. Social activities are held on first. This composition is used in order to provide easy movement of residences as well as meeting their daily requirements (Baeissa, 2011).

Bathrooms: Existence of conventional sewage system in old areas allowed inhabitants to have isolated bathrooms and toilets for male and female members of the family inside the house.

Window: Windows depict culture and functionality. The most used material for windows is wood. Wood of the windows or the created ones are imported from India since both the quality of construction and also the wood quality and artistry of these windows are very good in India. In this case, people bought the Indian windows and the constructor installed them. In some cases, the wood, itself, was imported and then fabricated by constructors in Mukalla; but the artistic work on the windows wasn't as good as Indian ones. A normal window has two elements; the screens and the shutters .The screen, allowed privacy and continuous wind flow which was controlled by sizes of the screen openings. The shutters were used for freshing the air and justifying the light (Figure 22) (Baeissa, 2011).

Figure 22: Mukalla windows of house (Baeissa, 2011)

Doors: The door has a similar value but in much smaller scale. Doors were made abroad. They were wooden decorated by ‘iron nailing’. Different shape and sizes of the doors was reflecting the identity a house (Figure 23) (Al-Mashi, 1998).

Figure 23: The door in Mukalla house (URL 9)

4.2.2 Impact of Climate Issues in Traditional Architecture in Mukalla, Yemen

In Mukalla, traditional architecture focuses on functionality and adaptation to culture and primary needs of residents. Some of the main design characteristics are as follows. Balconies were designed to provide a cool private place for the family to sleep during warm nights of summer (Figure 24). There is also special space for celebrations. In addition, to keep the heat and smoke produced during the cooking away from other parts, the kitchen is located on the highest stair (Baeissa, 2011).

Figure 24: Roof Terrace in Mukalla (URL 10)

Openings or windows are induced on the walls of rooms as many as possible with 30 to 60 feet distance from each other. The length of windows in vertical direction is about 182 cm and they are placed at height 30 cm above the ground floor. These huge openings allow air to flow easily into the building. Small gaps in windows are deigned to ease the ventilation (Figure 25). As the warm air goes up, it drawn out via these small openings and there is always an incessant flow of air (Figure 26).

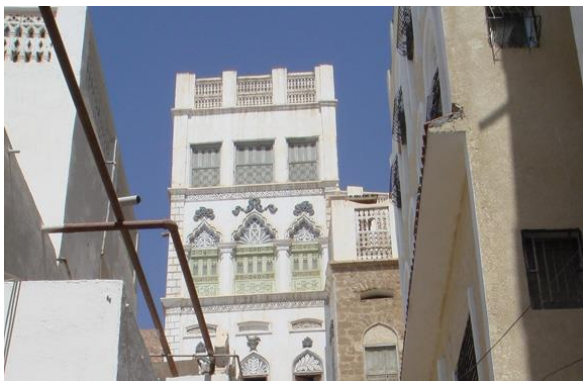


Figure 25: Openings over windows in Mukalla traditional houses (Baeissa, 2011)

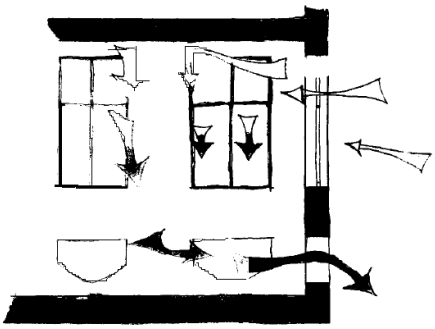


Figure 26: Air Circulation in Mukalla traditional window (Baeissa, 2011)

Selection of material and the style of utilizing them in the building were also performed considering the hot weather condition. Stone is used because it can store the heat energy and its heat conductivity is low. Walls are constructed in a thickness of 30 to 60 cm especially in lower floors. As a result, during the hot days less amount of heat cumulates in interior spaces. In addition when it gets cold during the night,

thick stone walls prevent internal heat from escaping out the building (Baeissa, 2011).

4.2.3 Privacy in Traditional Architecture in Mukalla, Yemen

Like other regions with Islamic cultures, Mukalla local architecture is shaped by socio-cultural aspects. The major feature of Muslim societies is sex separation which is represented distinctively in design of traditional houses of Mukalla. In fact, in all four case studies, separate spaces were constructed in the building for men visitors. Women in the family were not allowed to enter that area. Particularly in Mukalla traditional houses, the guest space usually consists of one sitting room and a toilet. But sometimes, a guest bedroom and a kitchen may be attached. The family is treated as sanctified and not to be conquered to any guest's inspection (Ingram, 1936). There is no social connection between men and women unless they are family relatives.

The ground floor of the building is not an appropriate place for family to reside in. The heat and the bad smells came from the busy streets made this floor an unpleasant space for living and it was usually used as storage. Religion issues are clearer as we look at houses in the city as a whole. The mosque is the central point in the town and all houses have frontage facing the mosque.

Vertically stretched windows with more than two meters height let the female residents of the house to have a free sight into the busy life of outer street during the day (Figure 25). This structure provides a private one-directional sight for women members of family. In fact, siting in comfort and watching the street through the

windows has been a frequent social activity in Mukalla especially for household females (Baeissa, 2011).

4.3 Riyadh

The city is situated 530 miles from Jeddah on the Red Sea and 240 miles from Dammam on the Arabian Gulf. The capital of Kingdom of Saudi Arabia is Riyadh which has a great population. This city situates in Najd. Najd is residual fiord with 600 meters altitude above sea level. Despite the dry clime of this area, it is very prolific due to the fine underground water (Ragette, 2003).

Figure 27: Riyadh Map (URL 11)

4.3.1 Description of Traditional Architecture in Riyadh, Saudi Arabia

Entrance: The high value of entrance is often stressed out by generous decoration of the door. A door with heavy weight draw a distinct line between inside and outside of the house. The door is open on to a blank wall to hinder the strangers from seeing the inside. In order to pass along upper floors a bridge was built over the street for neighboring women to meet without exiting the house. The entrance is usually sited

at a point which gives the inhabitants maximum privacy. The rooms across the entrance are used knowingly to build a frame. The entrance is built narrow and deep enough to reduce the noise.The entrance length is choosed based on one of these rules,a passageway plus a staircase length, a passageway plus a staircase width plus W.C. , or a passageway plus the reception room width (Akbar, 1980).

Reception: The men's reception room is designed to be approachable straightly from entrance. At least one large reception hall exists in any house to host visitors. In houses with no guest room grandfather's room is used as reception room. The guest room may have separate toilet. Sometimes there is a staircase going toward terraces to rest there in summer nights. A special space is considered for making tea or coffee. If so it usually is in a corner while lots of cabinets are located around. This room depicts the financial status of the family. No room is more decorated than the guest room. Reposing, relaxing and debating are some of its applications.

In Islamic rule, guests are meant to gather as a group so that they can see and hear each other. There is step in the guest room which divides the room into two parts, one for the guest to slip of his shoes as soon as entering the room and the other which is located upper than the first part, to seat and talk. Sometimes a special hall is located next to guest room to give and take dishes. The guest room is elongated and parallel to the street (Akbar, 1980).

Courtyard: privacy and ventilation are controlled directly by interior courtyards. The association of this area and its height is different based on the region and the wealth of house owner. Generally the courtyard is square or rectangular. Wealthy owners often accept to have a personal garden in the courtyard. These gardens consist stone

or tile roads and passages are adorned with plants. A fountain or pool is located at the center if water is available. Even poor owners may implant some trees.

Children can use the courtyard as a safe playground while their mother supervises them directly. Therefore, it is a suitable place for daily activities of family members. Rooms and paths encircle the courtyard. Every room has direct access to courtyard, except for the mail quarters.

Open living: The ground or the first floor has a space which is topped with a covering. This space is used like living room all the year except in winters. Only necessary and movable furniture are placed in this room. Arabs use to sit and eat on a spreading knap on the floor (Akbar, 1980).

Kitchen: The equipment of the kitchen is not very modern. For instance there is no stove or sink, but long narrow channels are embedded in walls for dishes. Corners are usually used for this purpose. Grain and foods are preserved in storage on ground floor.

Bathroom: The design and hygienic of bathroom isn't as ideal as possible. A lifted open tank keeps the water. The bathroom in the other countries which have Islamic religion consist of two In other Islamic countries the bathroom consists of two section, they were called first bath and second bath. Changing clothes and a short rest after the bath is done in the first section. The second section is used as bath. This section has two taps; a tank is located at the roof which supplies cold water for the first tap; a heater is installed outside the bathroom which supplies hot water for the second tap. This way less water is used. In the contemporary bathroom, one has to

fill the basin with water and wash one's body with the same water. Bathroom is also used for washing and cleaning clothes.

Toilet: In order to respect sanctity of mecca the position of toilets must not be in parallel with mecca. The toilets of traditional houses do not follow this rule because of water problems. Also from the religious point of view the body of one who is in the toilet should not make contact with the walls. Sometimes despite the tank of the house is inflamed, still it is used. "Toilets are usually located in the corners." People wash their hands before eating therefore a basin is situated near the dining and reception rooms (Akbar, 1980).

Roof: During summer nights, inhabitants sleep at the roof terrace. Wedding ceremonies, birthdays or "annual religious feasts" are celebrated either in the courtyard or the roof. In order to separate male and female, the roof is dividing to two or three levels. A store-room is located on the roof for bedding. The roof is enclosed by defensive walls or parapets.

Staircase: Two staircases are available at the house; one is located next to entrance space and it is for men and the other is for all family members and located at back of the house. Staircases are near or on top of the kitchen, toilet or storage. This way the space under the staircase is used applicably. Surrounding walls are used as protection bars or handrails; if the guest room is in second floor, the staircases of entrance guides the guest right away to reception room. The terrace roof is not accessible from the ground floor by staircases; it means first they run from ground to the first floor and then the position can be changed. 'Visual and acoustical' claims may be the reason of this modeling (Ragette, 2003).

Openings: Most of the openings to exterior spaces are located on the upper floors. The only room which is situated on ground floor and has window is the guest room. A simple wooden box for defensive application is placed at the top of entrance. Windows are in the form of rectangle and they have two separate wood panels. The architect may use slates instead of wooden lattice. Steel bars are occasionally employed to provide security. A white gypsum wash is usually seen around the window. Flowing of fresh air is controlled by embedding 'small triangular openings' close to the ceiling. The windows breadth is between 40 cm and 90 cm and the height is 150 cm for upper floors. A 15cm height is taken to account for openings which circulate the air. More than two triangular perforations are located in between the openings (Ragette, 2003).

Window: In some Islamic areas a special kind of window called 'Mashrabias' were used. They had two functionalities; filtering the light, protecting people from being seen. Because of traditional rules, females must not be seen from outside, therefore they used these windows to watch over the street without being visible to outsiders. In the other hand, in Islamic rules it is an uncivilized act if men look upward to see upper floors. One could not view the street from windows of ground floor since they are very close to street. They were guarded by steel bars to provide privacy and security. The windows of second and third floor had view on street (Akbar, 1980).

Multiuse space: In western countries each room has a specific usage based on the activities; but in Arabic houses divisions are done based on social accessibility. Interior spaces are not designed for specific functionality; functionality of rooms can change from one activity to another. This becomes more obvious when inconvenient furniture like tables and chairs are absent. Using chests is common among people.

They use floor, carpets, rugs, mats, and cushions to sleep on; sit on and eat on; all of these materials can be folded and collected when not in use. Cabinets are installed in to the walls and usually they are adorned with a specific feature (Ragette, 2003).

4.3.2 Impact of Climate Issues in Traditional Architecture in Riyadh, Saudi Arabia

In Riyadh, the courtyard inside the house functions as an important factor for enhancing the weather and providing privacy. The level of significance of the yard and its relational height and area usually depends on the region and the designer.

Traditional houses of Riyadh benefited from roof-top porch at hot nights of summer to sleep comfortably. There is usually an open area on the first floor which is used as a living room during spring, summer and autumn.

For cautious reasons, a timber platform is constructed above the entrance of the house. Near the ceiling of this structure small wedge-shaped openings are induced to help ventilation.

Exterior walls are high for privacy matters and the alleys are narrow. This configuration results in a ditch-formed structure providing the maximum shade. The sunlight is intensive and thus there is a large difference between the temperature in shaded and uncovered areas (Akbar, 1980).

4.3.3 Privacy in Traditional Architecture in Riyadh, Saudi Arabia

One the most distinctive features of Riadh traditional houses is the heavy entry door. This strong seperation between private inner life and public outer life is common on Islamic designs.But there might be a second door specifically for female residents and guests. The main door is opened to a wall which is for blocking the sight from

outside to the private space inside the house. Then it leads to a hall. Another interesting feature is bridges between the spaces located on the upper floors. The upper floors of houses across the street are sometimes connected by these bridges. Again the main purpose is privacy for women. Through these bridges the women memebers of neighbor families can go to each other's houses whithout going to the outside area. Sometimes the enterance is positioned at the farthest point of the house with minimum access to inetror spaces (Ragette, 2003).

In each house there is at least one long greeting hall with decoration to entertain the guests.

The main advantageous of courtyard as for other three case studies is enhancing the climate and privacy. The yard might be large or small depends on the region the house is located and depends on the designer's attitude. All rooms are positioned in row with access to the yard to receive daylight and ventilation except for the guest room. Typically, the courtyard is encircled by several paths for air circulation.

The central courtyard and the roof veranda are used for family gathering and celebrations such as wedding or birth parties, religious feasts, etc. sometimes; there are different rooftop verandas at different levels separately for women, men and guests.

The upper floors are accessed via two stairways. The women staircase is located at the back of the house to be private. The other stairs are positioned next to the entrance and they are used by men and visitors (Akbar, 1980).

The only openings of first floor to the outside are implemented for the guest room for privacy reasons which is next to the entrance. These windows filter the sunlight and provide a one-directional insight to the street. These down level windows did not let the resident to have a view on to the daily life of the street because they are so close to it. However, for privacy or security reasons the ground floor windows sometimes kept closed or they were guarded by steel rods. Women members of family were usually permitted to lookout the street from upper level openings. Through these windows the daily life in the street was watched. According to Islamic customs, it is considered impolite for the men to look upside into the upper floors. Women should not be seen by the strangers in the street as well. There are windows on the second and third stairs which let the inhabitants to look down the street without being seen (Ragette, 2003).

4.4 Baghdad

The land of Baghdad city is plain. The city is at low altitude above the sea and it has a sedimentary orderly. “The city is located on a vast plain bisected by the River Tigris. The Tigris splits Baghdad in half, with the eastern half being called ‘Risafa’ and the Western half known as ‘Karkh’. The land on which the city is built is almost entirely flat and low-lying, being of alluvial origin due to the periodic large floods which have occurred on the river.” (URL 12)

Figure 28: Baghdad map (URL 13)

4.4.1 Description of Traditional Architecture in Baghdad, Iraq

Natives of Baghdad believe that traditional houses of this city are precious treasures. The whole city, including inhabitants, is the outcome of lengthy course of evolution; In fact, experience, innovation, climatic conditions, Islamic life style and traditional handicrafts form the city. The oldest house which is built using traditional architecture rules date back to 100 years ago (Warren & Fethi, 1982).

Al-Azzaawi, 1994 says: Traditional courtyard houses can be grouped into four categories:

- One-Courtyard Houses: This type of courtyard has a space called Haram where only family members are allowed. Most of the Baghdadi houses have this characteristic. The houses of this category are vast in size and have one or two guest rooms (Mandilawi, 2012).

- Two-Courtyard Houses: In addition to ‘Haram’, another area called ‘Diwan-Khana’ exists. This area is dedicated to guests. Also a kitchen complex named ‘Bayt al-Matbakh’ exists.

- Three-Courtyard and Four-Courtyard Houses: ‘Haram’; ‘Diwan-Khana’, ‘Bayt al-Matbakh’, and an ‘Istibil’ are the elements of this group of courtyards.

If one look at a multi courtyard house, he will see one large house. Miscellaneous elements are distinguished either externally in plan or by merging them as a single object; but from inside all four parts are physically separated and recognizable from each other.

In a four-courtyard house, a courtyard is built for each part of the house. This means each courtyard has its proprietary spaces. Courtyards are in different sizes.

Houses with two or more courtyards belong only to wealthy or dignified people. These kinds of houses are large in terms of number of rooms, size of area and number of inhabitants live in each floor.

An example of the ground floor plan in Bab al-Sheikh is given below. In this house the exterior courtyard is actually an entrance court. A separate entrance or a common lobby called ‘Ma’bain’ is built in when the ‘Diwan-Khana’ and the ‘haram’ are far from outer court (Figure29) (Warren & Fethi, 1982).

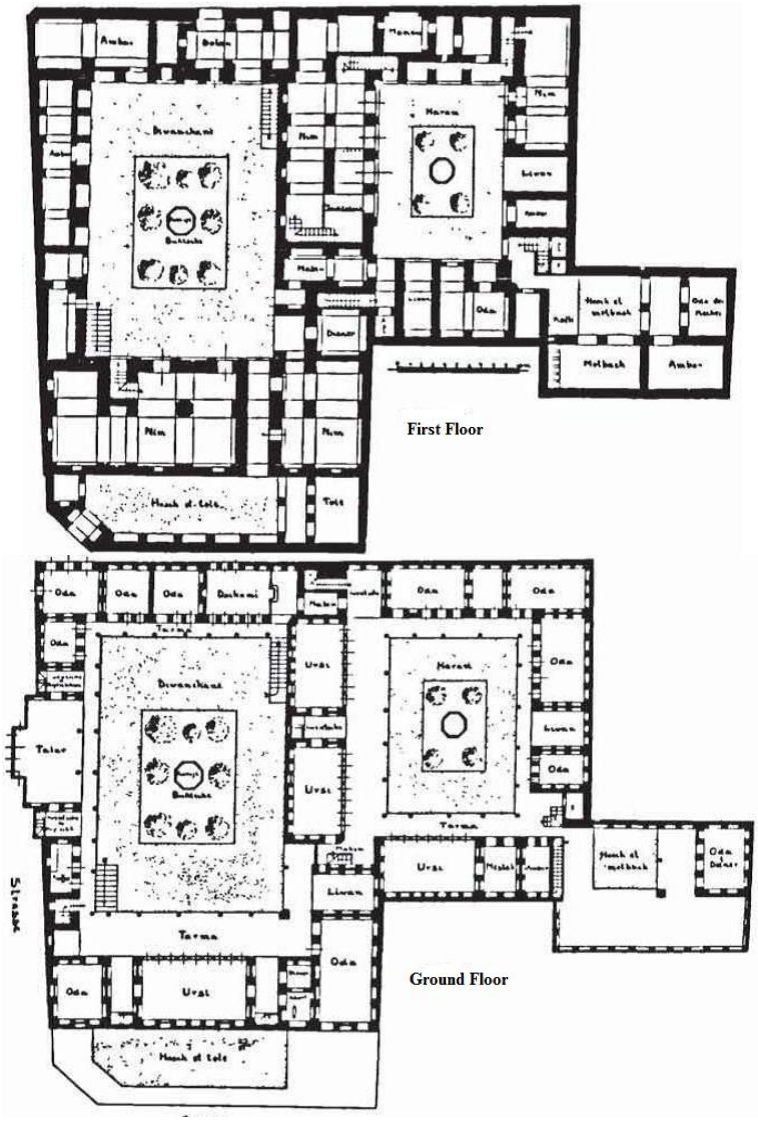


Figure 29: A four-courtyard house in Baghdad (Reuther, 2005)

Entrance (Mejaz and Dolan): As soon as one enters the house, a narrow corridor called ‘Mejaz’ is met. This corridor guides the person to the outer courtyard. The entrance is geniculate or separated from courtyard by a curtain so that domestic life inside the house would not be sensible by strangers in the street (Figure 30).

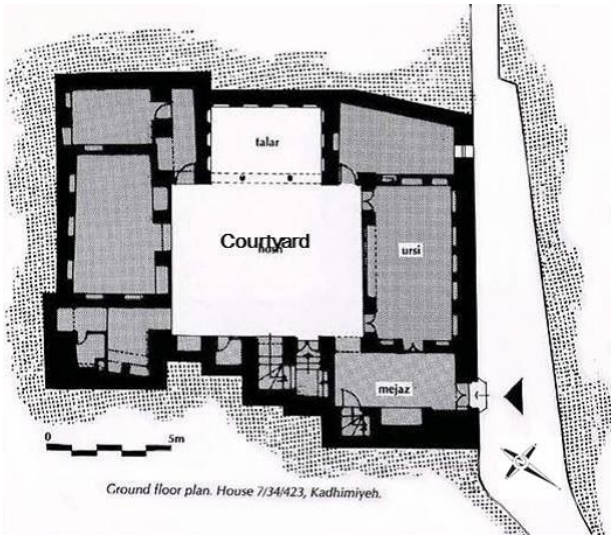


Figure 30: Mejaz and Dolan and Courtyard in Baghdadi Traditional House (Warren & Fethi, 1982)

Interior spaces have a higher priority comparing to exterior ones. Thus the street is merely a narrow passage encompasses by the solid walls (Warren & Fethi, 1982).

In larger houses, the entrance is very important because it guides the guest directly into a ‘square or octagonal domed area’. Sometime a room was built in the lobby for the door keeper (Figure 31). “The entrance vestibule ‘Dolan’ Close to the domed atrium a staircase would lead up to the continuous colonnade around the courtyard. Masonry benches ‘Dakka’ were incorporated within wall niches, providing seats for the door keeper and the visitors servants.” (Reuther, 2005) (Figure 32)

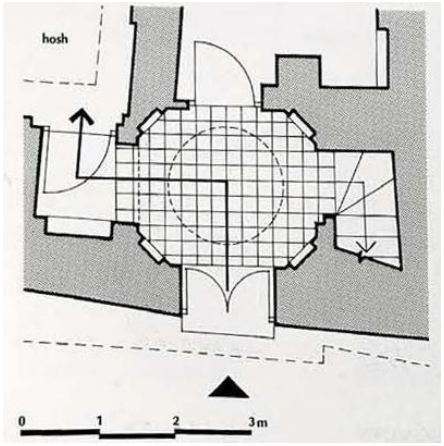


Figure 31: ‘Dolan’ in Baghdad traditional house (Warren & Fethi, 1982)


Figure 32: wooden entrance door in Baghdad traditional house (Warren & Fethi, 1982)

Courtyard (Talar, Ursi, Tarma, and Iwancheh): Almost in every Baghdadi house a central open courtyard exists. Then residential compartments such as rooms, ‘Tarma’ and ‘Talar’ surround this courtyard which is called ‘Hoash’ or ‘Fina’ .Eminent and tenacious walls provide privacy as well as a soundless environment. This way introversion is perceived and sunlight, daylight, ventilation and physical communication is prepared for different parts of the house.

Courtyard is the center of a Baghdadi house. Because of necessity of privacy, the court of no house has view into the court of another. This characteristic is taken from culture (Figure 33, 34) (Reuther, 2005).

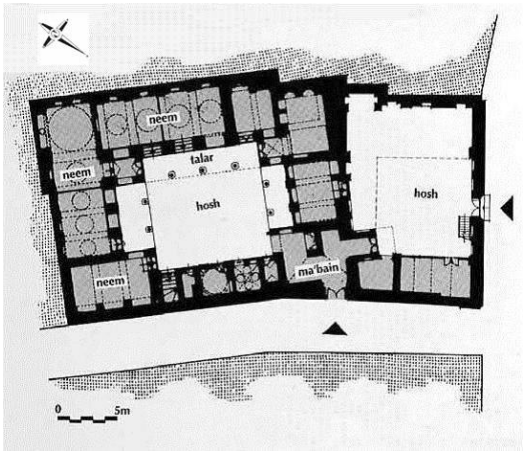


Figure 33: Ground floor plan in Baghdad courtyard house (Warren & Fethi 1982)

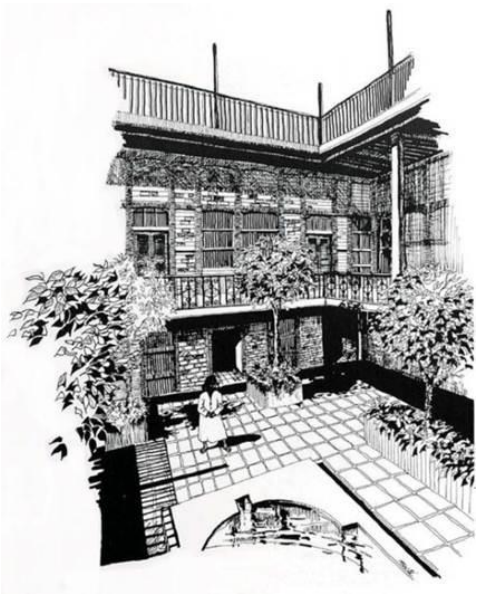


Figure 34: The courtyard of Baghdadi house (Warren & Fethi 1982)

Different shape and size of the land necessitate different forms of courtyard .In the best case scenario, the courtyard would have two central openings surrounded the courtyard; A ‘Talar’ which is an interior residential porch with two or three ‘Badgir’

facing each other across the courtyard and two long ‘Ursi’ which is a domestic room uses in winter with windows opposing the courtyard in between them.

In this picture, the ‘Ursi’ of ground floor with its colorful glass and wooden patterns has the view of the courtyard. As shown in the figure, it is shaded by the timber column of first floor. ‘Muqarnas’ which is a colonnaded octagonal timber column can be seen from all sides of the courtyard on the first floor (Figure 35).

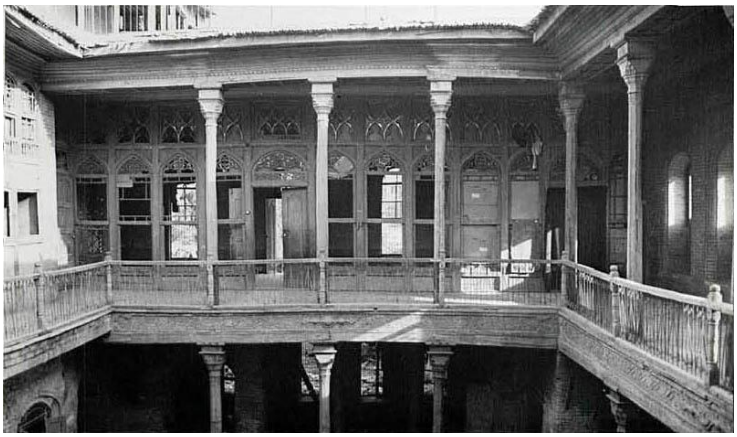


Figure 35: The ‘Urusi’ in Baghdad house (Warren & Fethi 1982)

The design of an ideal ground floor of a traditional Baghdadi house is depicted in figure 36. The figure shows the relationship between the ‘Ursi’, ‘Talar’ and the courtyard (Warren & Fethi, 1982).

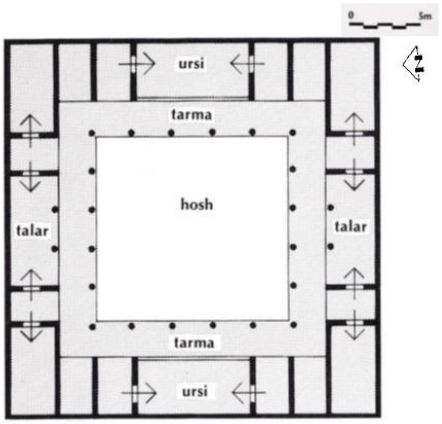


Figure 36: Ground floor plan in Traditional houses (Warren & Fethi 1982)

Figure 37 shows the circulation and relationship between rooms in a traditional Baghdadi house. Symmetry can be seen in the organization of main Urusi. The basic design of balcony or ‘Tarma’ reflects the arrangement of porch with two rooms at each side of it. Four remarkable space open on ‘Tarma’, namely the ‘Iwan’, the ‘Talar’, the ‘Ursi’ and the ‘Iwancheh’ (Mandilawi, 2012).

Usually first floor is planned so that it overlooks the courtyard of ground floor; this design leads to appearance of an access corridor called ‘Tarma’ at first floor.

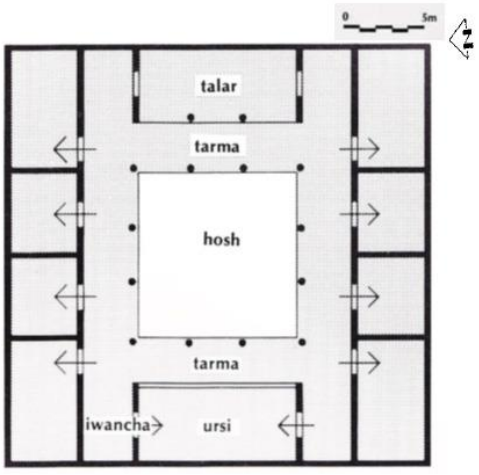


Figure 37: Relationship between the rooms on first floor (Warren & Fethi 1982)

The colonnades of upper floors are built higher than ground floor. They are almost twice as high. The applied material in the constructive mass is usually brick with alternating solid and voids which strengthen the structure (Figure 38) (Reuther, 2005).

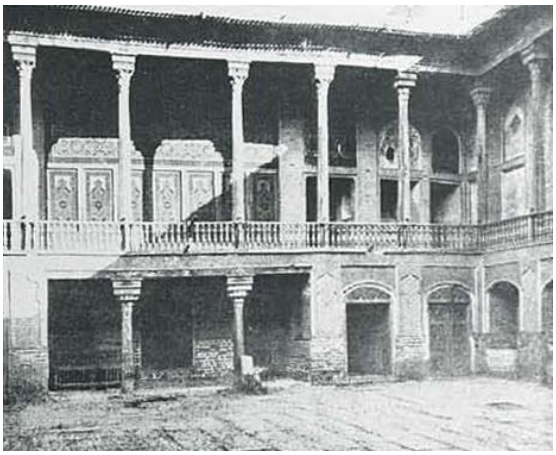


Figure 38: The colonnade (Reuther, 2005)

Life communication takes place in courtyard. Surrounding rooms of courtyard fall into several distinct categories. Lavatories, kitchens and stores are at ground level with least concerns because they are functional rooms. The reception rooms overlook the courtyard, with subtle railings and high timber colonnades.

Commonly, courtyard is at ground floor. This open space is encircled from two, three or four side by other rooms. These rooms communicate through courtyard, either directly or indirectly, using ‘Tarma’.

According to Reuther, all the rooms, from cellar to attic, have seasonal or daily applications. For example, in summer, the pattern to change the application was between two periods of sleeping. In afternoon cellar was used for sleeping but in

early freshening hours of morning, the roof was used. At other seasons, the rooms of the first floor were always used for sleeping (Mandilawi, 2012).

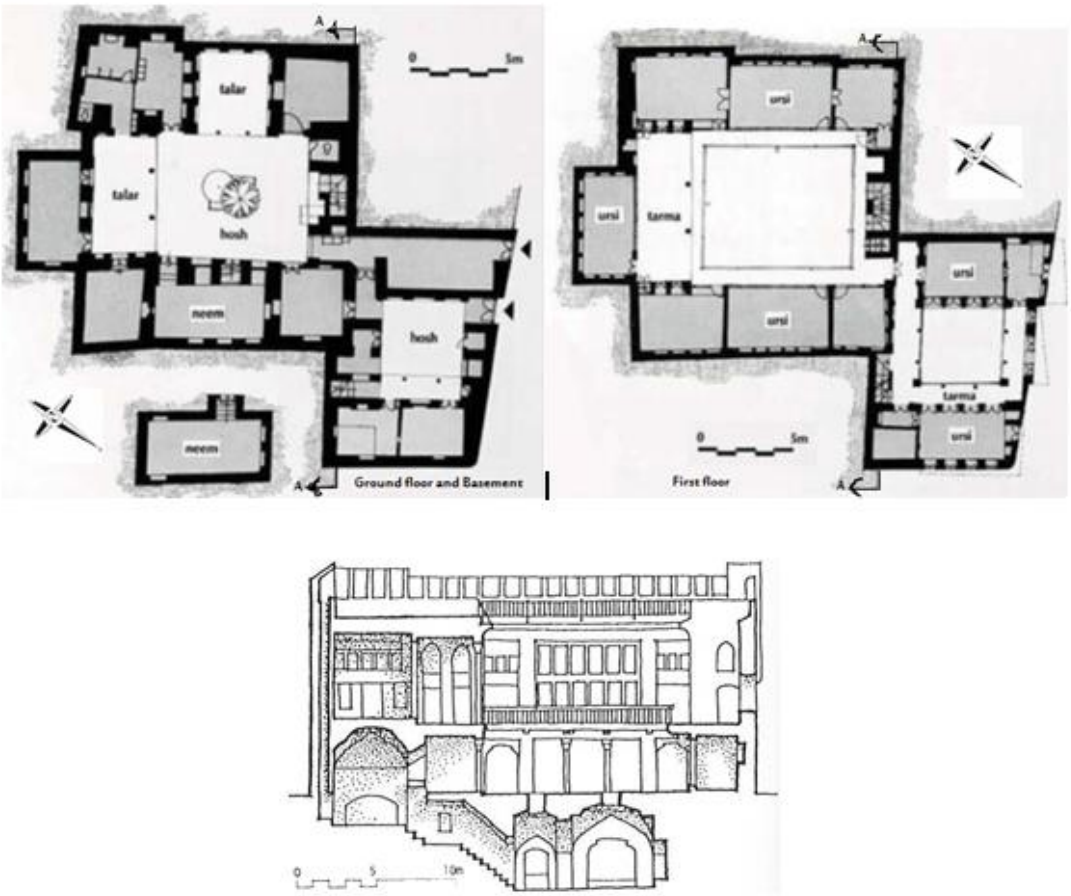


Figure 39: Basement, Ground, First floor and section plans (Warren & Fethi, 1982)

Diwan-Khana and Haram: While ‘Diwan-Khana’ is a male guest room, ‘Haram’ is for women. These two spaces reflect the social and spiritual division in house (Mandilawi, 2012).

Sardab and Neem Sardab: Al-Azzawi says: ‘The traditional courtyard house most of the time had an underground level known as Sardab’. This space has one residential room located under the courtyard; also there exists a semi-underground level known as ‘Neem Sardab’. This space includes one, two or three residential room and cellar

and it is placed around the courtyard; the height of ‘Neem Sardab’ may be double, where its floor is at aqueduct level. Both of these spaces were brick-vaulted rooms and both receive light and air from the courtyard.

The Cross-section of a traditional Baghdadi house is shown in figure 40. Semi-underground level ‘Neem Sardab’ is observable (Warren & Fethi, 1982).

Figure 40: Sardab and Neem sardab in traditional Baghdadi house (Warren & Fethi, 1982)

A good and reasonable solution for the high temperature of outside was the basement. Especially in days when the temperature augmented up to 48.8˚C (120˚F); the residents use this place for afternoon nap. These rooms are colder because of the effect of their thick retaining walls and the surrounding ground.

Shanasheel: In this study mentioned earlier the ‘Ursi’ room is located on the flank of the house. In fact, it is exactly between the courtyard and the street. A first floor window connects this space to the outside word. These windows are known as ‘Shanasheel’ and they belong to Islamic world and Baghdad. In addition to providing fresh air and view of the street for habitant of this room, these windows were used to communicate across the street. In other word ‘Shanasheel’ was a window for sitting in and overlooking the street life. It was capable of both being closed and opened. The later situation caused the air flow freely from three sides (Figure 41) Overhanging screened and balconied windows are the specific characteristic of ‘Shanasheel’ (Warren & Fethi, 1982).

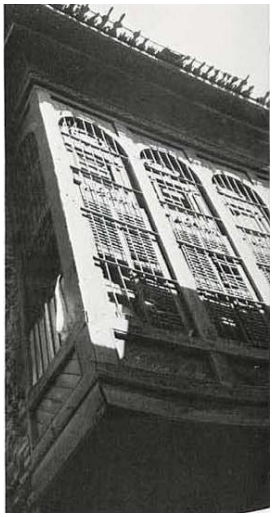


Figure 41: The ‘Shanasheel’ in Baghdadi house (Warren & Fethi, 1982)

In small houses, rooms surrounded the court only from two sides, generally north and east. This way the rooms were always shaded. Rooms of the first floor are wide, high, and light. Decoration of interior spaces is elaborated. Pieces of glass are glued by plaster to form beautiful mirror work on ceiling. This way they look like a diamond (Mandilawi, 2012).

Alleyways: The exterior walls of the main rooms at first floor reflect outside in an almost continuous bay. Inhabitants overlook the alleyway through ‘Shanasheel’ windows; the terrace at roof has the same functionality by projecting at attics level outward beyond the external walls at first floor. Therefore, the alleyways are large at ground floor and narrower as it goes toward roof terrace. Thus alleyways was wide enough in accordance with movement of pedestrians; also cross-ventilation and natural daylight at first floor was provided using this method; a small gap is considered at the top of the roof so that the sunlight pass into alleyways. This crack is very narrow; sometimes opposite houses touch each other at attic level. The buildings had equal height. In some cases, they shared walls (Figure 42) (Warren & Fethi, 1982).

Figure 42: Gap between Houses in Baghdad traditional house (Warren & Fethi, 1982)

Another important characteristic of alleyways is chamfered corners when two of them reach to each other; sometimes rounded corners were used instead. Chamfered or rounded, these corners prevent crashing between pedestrians who walked along alleyways at right angles and attain to each other at corners as they go forward on the

line of their vision. Al-Azzawi says: “the organic unspecified and harmonious development of these alleyways, their narrowness, unpaved surface and chamfered or rounded corners were also known in antiquity in the Sumerian residential areas of Ur in the south of Iraq in about the year 1800 B.C. (Figure 43).”

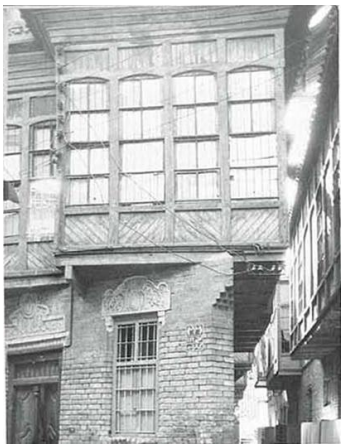


Figure 43: ‘Muqarnas’ in traditional house of Baghdad (Warren & Fethi, 1982)

4.4.2 Impact of Climate issues in Traditional Architecture in Baghdad, Iraq

In vernacular Baghdadi’s houses, thermal convenience is achieved by efficient arrangement of spaces and proper selection of materials. The central courtyard is responsible for providing sunlight and fresh air flow. Daily activities such as kids’ playing were taken place in the courtyard. In extreme weather of Baghdad which is characterized by long hot days in summer, very high temperature, wide range of fluctuation in daily temperature, and low humidity courtyard prospered in modifying the inner microclimate of the house.

In fact, the yard works as the regulator of temperature. Generally, in hot and dry climate courtyard plays an important role in decreasing the inner space temperature during the summer. It functions based on thermal procedures of convection and radiation. The porch and the floor of the courtyard perform as mediators between the

cold sky and the hot interior, where the coldest part arises at the highpoint. The family usually immigrated from one division to the other as the season changed because two different microclimates were produced inside the house. Courtyard is the breathing structure of the house which regulates the temperature and provides ventilation. There are usually sunshades or often trees to provide shade in the yard. Ponds and fountains also exist to provide moisture in dry summer days (Warren & Fethi, 1982).

South-faced ‘Iwans’ and ‘Tarma’ (types of porches) were used in winter as the sunlight made them warm. These sections are useless in summer and instead the family moves to the cooler sections like basement.

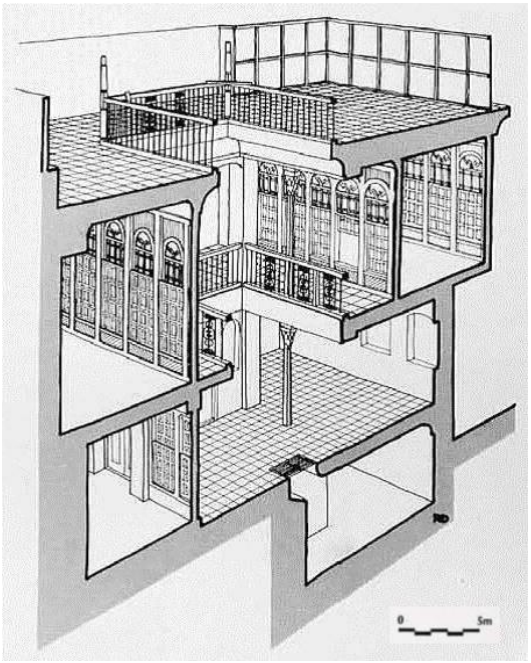


Figure 44: The courtyard in Traditional Baghdadi house (Warren & Fethi, 1982)

According to Warren & Fethi (1982), there is a large difference in temperature between the ridge and ground level of courtyard. As a result, the courtyard functions as a perpendicular ventilator for all stairs. During the summer, the upper levels are

warm and inconvenient. Residents move to cold basement which benefits from a water storage cistern or ‘Sardab’. Although the rooms preaching that positioned towards north-east are favored to those directed to south- west, ‘Talar’ and ‘Ursi’ areas oriented south or west were not occupied even at the courtyard level because the afternoon sun exposed and made these areas unbearably hot.

The ‘Shanasheel’ are capable of letting outside air to flow in. when the sliding belts are opened air moves freely across the window. Another effective cooling function of shanasheel can be explained as follows. As these windows are from wood, the sunlight exposed the wood would increase the temperature of the air close to it. This heated air rises and drawn out from the room which is an efficient natural cooling mechanism. As a matter of fact, the ‘Shanasheel’ are not only large openings to provide the daylight, but also fresh air suppliers (Warren & Fethi 1982).

Exterior walls of ground floor facing the street are mainly built with lumber. They also have glazed and latticed ‘Shanasheel’ and ‘Ursi’ as well as internal panels. Thus the heat conductance of these walls is high and the rooms in this floor were not usually used in summer but in winters (Reuther, 2005).

The houses are dense and attached together from three frontages. In between them there is a narrow passage provides an abundant shade on the frontage of the house facing the street. The masonry walls have a great impact on regulating inside of the house temperature (Warren & Fethi, 1982).

During the hot summers of Baghdad, shading is very important temperature regulator. Mainly, the courtyard of the houses was covered with canvas sunshades.

This strategy cools down the yard in few degrees in the middle of hot summer days. (Figure 45) (Reuther, 2005).

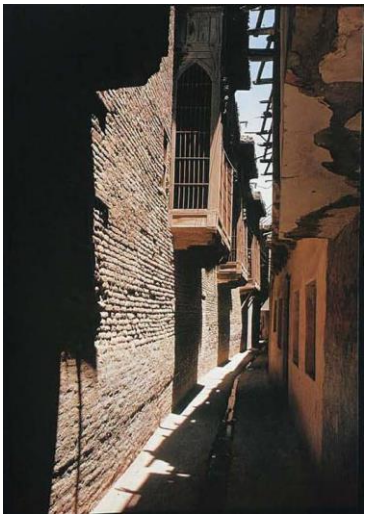


Figure 45: Shanasheel in Baghdad traditional house (Warren & Fethi, 1982)

Another temperature enhancing system is ‘Tarma’ which is a high columned awning placed around the rooms of the ground floor. This structure prohibits vertical sun exposure from entering the room in summer while not affecting the low angled winter sunlight (Figure 46) (Warren & Fethi, 1982).

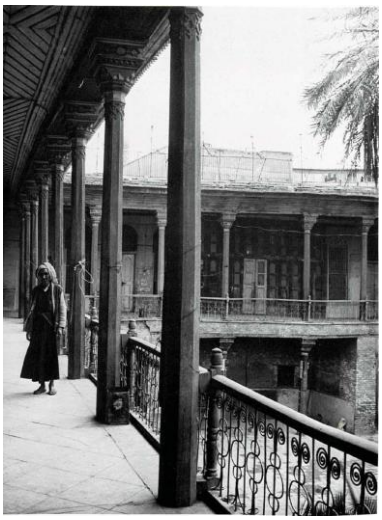


Figure 46: Tarma in traditional Baghdad house (Warren & Fethi, 1982)

Ventilation or providing air movement is also an important factor in providing comfortable weather inside the house. Ventilation is implemented by shades, openings and lattices. But there is another effective mechanism for efficient ventilation which is called ‘Badgir’ or air-scoops. In traditional Baghdadi houses, ‘Badgir’ is an important discriminative item. This item has been specifically designed to capture the dominant north-western winds in Baghdad region. The air is vacuumed down to the room through a tube. This air has been cooled when it passed this shaft before reaching the down. Although the temperature would be greater than the air temperature of the basement and this is less humid, still waving out the air from the room will take out the exhausted air and improves the atmosphere. Without Badgir the rooms in the basement are cold and unpleasant during the winter. But, the shutters of ‘Badgir’ which are openings to the outside air carry warmed air into the space and enhance the temperature of basement space (Reuther, 2005).

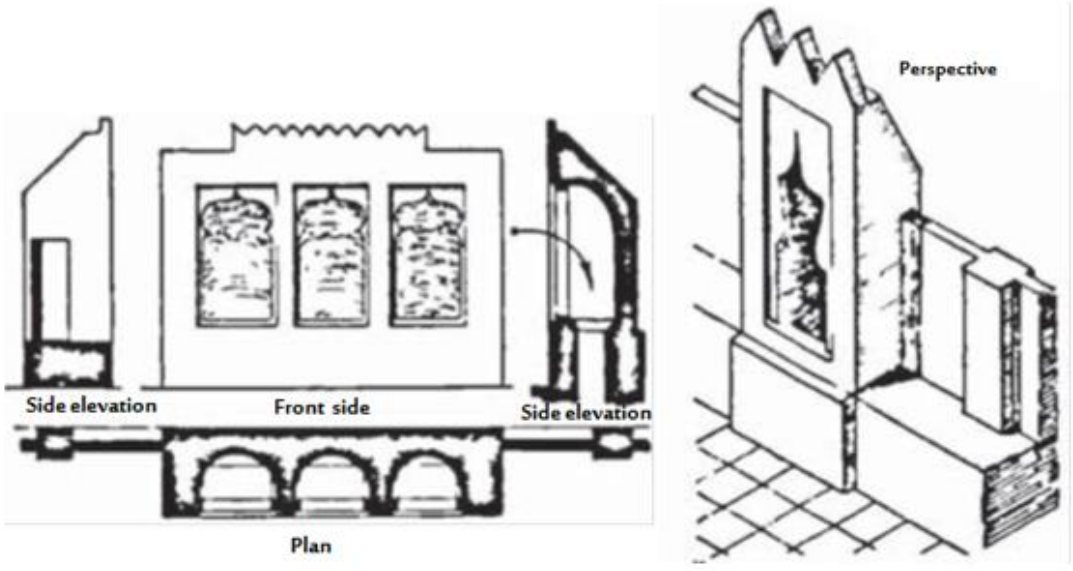


Figure 47: ‘Badgir’; perspective, plan, section and front and side elevation in Baghdad (Al-Azzawi, 1984)

As mentioned in previous section, Baghdadi traditional houses benefit from ventilation mechanism called ‘Badgir’. Fresh air flow for both basement and semi-basement sections is provided by these air scoops. This architectural item is characterized by a vertical duct with thick external. The vertical shaft has an inlet at roof-top merged into the bulwark wall. The outlets of the scoop are opened into basement and semi basement as well as to Talar. As Talar is a large space it may have more than one air-scoop.

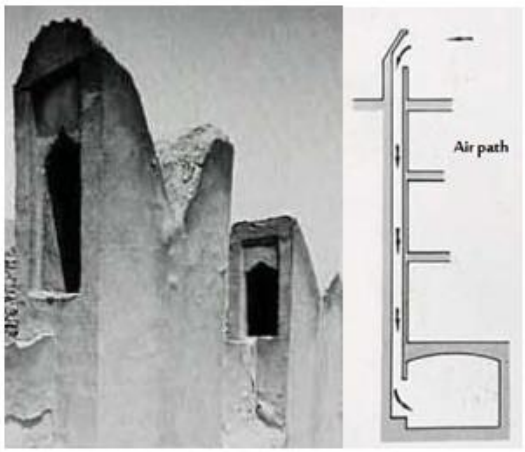


Figure 48: Bricks of the ‘Badgir’, Air path in ‘Badgir’ in Baghdad (Warren & Fethi 1982)

“The air drawn down through the ‘Badgir’ was warmer and dryer than the air in the basement, this condition helped to alleviate the basement humidity.” (Warren & Fethi, 1982) Sometimes, a container of water was placed at the bottom of air-scoops to provide humidity for the onward air flow. ‘Badgir’ are effective systems to enhance the weather in basement and semi-basement during hot summer days (Figure 49).

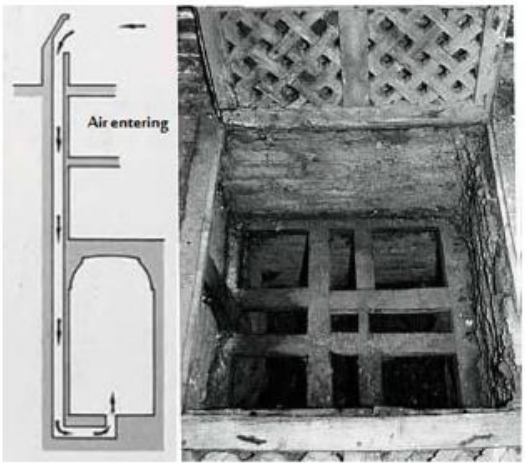


Figure 49: Air entering to the ‘Sardab’ ground outlet in Baghdad (Warren & Fethi 1982)

When the summer begins or when the autumn ends, a section called ‘Takhta-Boosh’was served for taking afternoon nap. Particularly, inhabitants enjoy the coolness of ‘Neem Sardab’ or semi-cistern when sitting in ‘Takhta-Boosh’. In other times this part was used as a general storage (Figure 50).

Figure 50: ‘Badgir’ opening in a ‘Neem sardab’ in Baghdad traditional house (Warren & Fethi 1982)

Figure 51: ‘Takhta-Boosh’ in Baghdad traditional house (Warren & Fethi 1982)

Three main climate regulating factors in design of the house are shading, selection of material and ventilation. Direction of the house is important as it helps producing micro-climates in different sections of the house that family can move to as the season changes. Living place is changed in around September or around April. The family moved in September to south facing rooms with more sunlight heat as the winter starts. On the other hand, in April or May, they moved to northern rooms (Reuther, 2005).

During the summer, daily living space and sleeping space are also different. Family used the lower floor spaces till evening and at night they moved to the roof-top porch.

So, roof is served as the bedroom during hot summer nights. Besides, the houses are connected from three frontages which is a heat buffer (Figure 52) (Warren & Fethi, 1982).

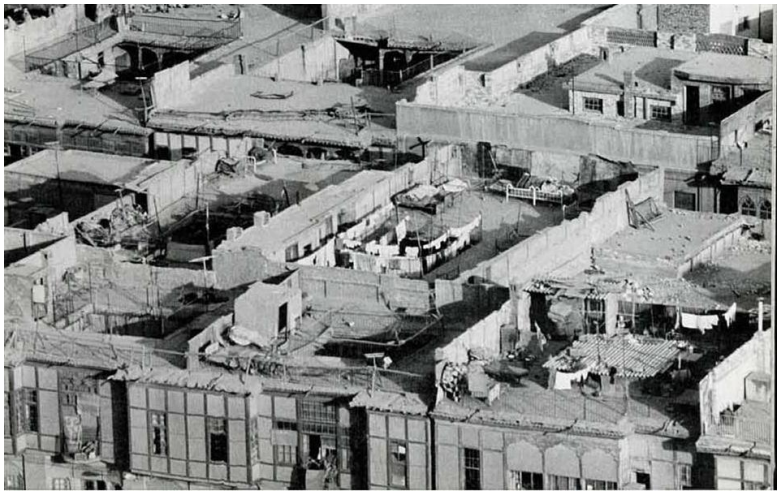


Figure 52: Roof of Baghdadi House (Warren & Fethi 1982)

Walls of the basement are constructed from masonry, a special type of stone with high low heat conductivity. ‘Neem-Sardab’ or semi-cistern walls and vault are also from masonry. These materials help preserving the coldness in the basement (Figure 53) (Warren & Fethi, 1982).

Figure 53: Ceilings in ‘Neem Sardab’ in traditional Baghdad house (Warren & Fethi 1982)

In the courtyard of traditional Baghdadi houses usually there is a pond with fountain or ‘Shithirwan’ in the center. ‘Shithirwan’ also works as a liquid cooling system and provides humidity in hot and dry summer. Size of the pond depends on size of the

yard. Big or small, the fountain helps cooling the air flow which comes to the interior spaces by evaporation (Figure 54) (Reuther, 2005).

Figure 54: ‘Shithirwan’ in traditional Baghdad house (Warren & Fethi 1982)

When the courtyard is medium or larger, people plant trees and plants there. Trees provide shadow on walls and floor of the yard and so reduce the heat absorption by exposure of surfaces to sunlight. Moisture is also increased by plantation in the yard and increased relative humidity decreases the temperature as well (Figure 55) (Warren & Fethi 1982).

Figure 55: The courtyard in Baghdad House (Warren & Fethi 1982)

The courtyard's floor is covered with a special traditional tiling block called 'Farshi'. These tiles absorb and preserve the moisture. Therefore the courtyard is usually washed daily during the summer before noon and then the water is plashed on the floor time to time during the afternoon. This procedure decreases the temperature of yard floor and increases the humidity. The air near the courtyard floor is cooled down by vaporization cooling mechanism and other layers of air are cooled consequently (Mandilawi, 2012).

4.4.3 Privacy in Traditional Architecture in Baghdad, Iraq

In Baghdad traditional design, the houses were reclusively enclosed. Heavy thick walls with almost no opening provide privacy to residents and it prevents the noise to enter the house. Rooms and internal spaces have windows which are opened into a private courtyard. Sunlight, air flow, sight and communication media are all provided by this open yard.

Islamic culture spirit is reflected in Baghdad houses in the division of spaces. All houses have two distinct places for male and female residents and guests. 'Diwan-Khana' is the part of the house which is used for men visitors. On the other hand, 'Haram' is the term which is used for the female space. In Haram, women members of family, servants and female guests resided (Warren & Fethi, 1982).

Privacy is also considered in the design of entrance. This part is usually shut by a door or blocked by a curtain to evade form the direct sight form the street. As a result there is no way for people in the outside to have sight to the family life.

The vestibule as the entrance of the house is built as bent hall again to provide more privacy for inhabitants of the inner space.

Special types of openings called ‘Shanasheel’ are responsible for bringing daylight into the room as well as fresh air flow. The ‘Shanasheel’ is a window for women residents of the house to sit comfortably in front of and watch the street. These windows featured three openings and they could be blocked completely if needed. Face to face communication across the street is also possible via close distance windows (Mandilawi, 2012).

In summary this chapter talked about description on design strategy in traditional houses of four regions Kashan, Mukalla, Riyadh and also Baghdad and also the function of the spaces in the houses of these four regions. In the following the impact of climate on the formation of the elements characteristic of the houses have been discussed. The other part is related to the important factor which is called privacy in each region has been studied.

Chapter 5

ANALYSES OF TRADITIONAL HOUSES IN KASHAN, MUKALLA, RIYADH AND BAGHDAD

Chapter 5 represents the features of four case studies in detail. These cities are Kashan, Mukalla, Riyadh and Bagdad located in Iran, Yemen, Saudi Arabia and Iraq respectively. In each city, three different houses belong to traditional architecture period are inspected. Photos and plans are used to make the issue more clear.

5.1 Analyses of Examples (Traditional houses) in Kashan

A. Tabatabaee House

House of Tabatabaei family is one of the historical houses located in Kashan city in Iran. This 4730 m^2 building was constructed in 1880 for the wealthy family named Tabatabaie. Persian traditional architecture is clearly obvious in the design of the house as it features ‘Andaruni’ and ‘Biruni’ as well as four courtyards. Windows are made of supple blemished glass and the walls are painted with wonderful paintings. ‘Andaruni’ which means the ‘inner part’ in Farsi is the private section of the building. It was built specifically for the female residences and except for the lord and his sons; no male was permitted to get into this part of the house. In contrast, ‘Biruni’ which means the ‘the outer’ part is the public section of the house with no restrictions for coming into. The designer of Tabatabaeis' House was Ostad Ali Maryam who later designed the house of Broujerdi-ha for married daughter of Tabatabaeis (URL 14).

In Tabatabaee house, ‘Adaruni’ consists of a simple living room surrounded by two courtyards at two sides. There are also two basements with sardaab and wind catcher. The courtyard located on west-north is bigger and it has more rooms in addition to its living room. The basement located under the central living room has specific features which makes it quite cool during the summer. These features are including having wind catcher, a semi cylindrical-shaped vault, and specific material for building double-glazed walls. The basement level is 8 to 10 meters below the alley and all this characteristics let cooled air current to flow from the pond in courtyard towards the basement. As a result, the basement is 15 to 20° C cooler compared with the outside in summer.

‘Biruni’ section consists of a large ‘Talar’ (alcove) at the center with reticular colorful windows and double-glazed side windows which are opened and closed vertically. ‘Talar’ room features elegant wall painting, mirror decoration and delight stucco carving which seems like a fine mesh. Two rooms were built at two sides of alcove and in front of it there is a veranda with amazing stucco carving and mirror decoration. There are also two symmetric courtyards and openings surround the courtyard (URL15).

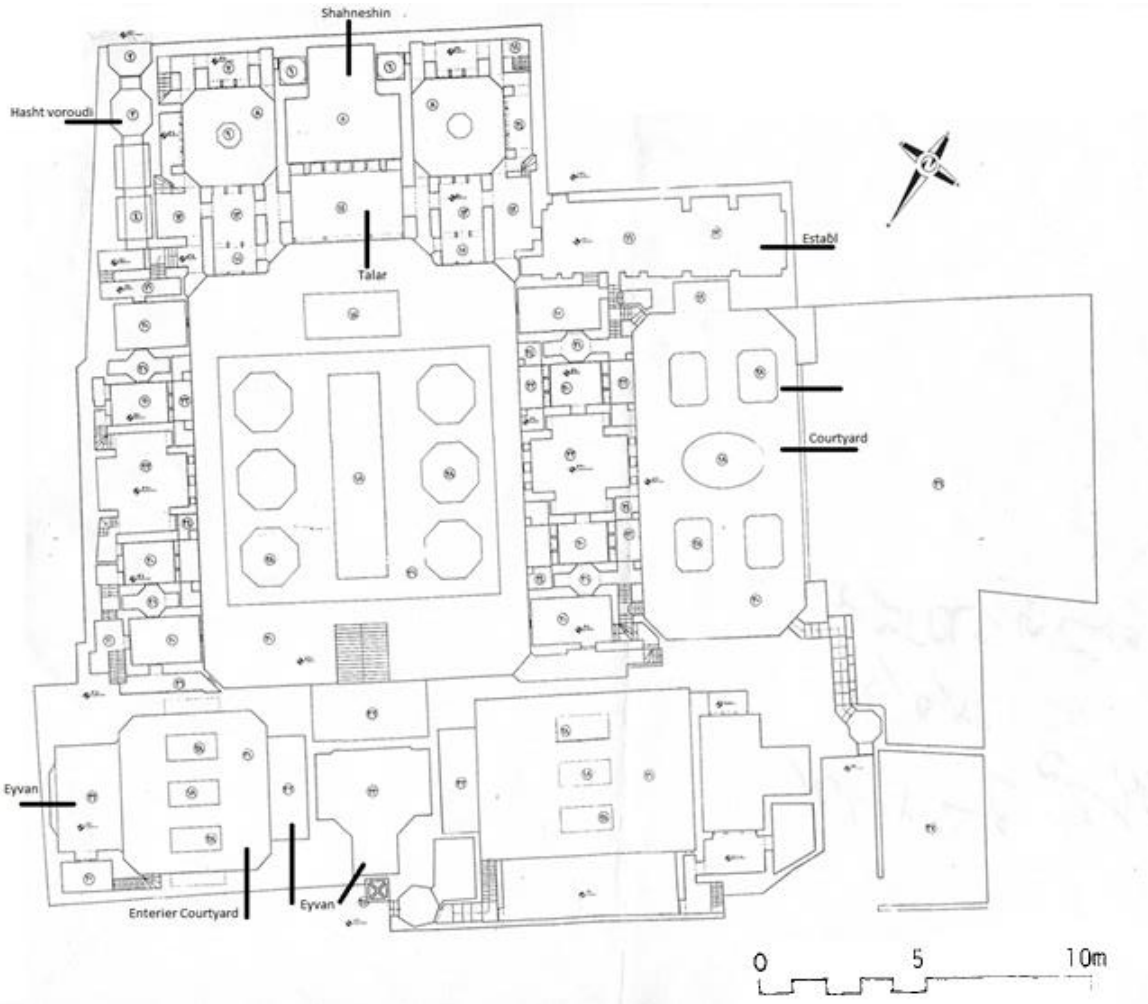


Figure 56: Tabatabaee House (Basement Floor Plan) Kashan (URL 16)

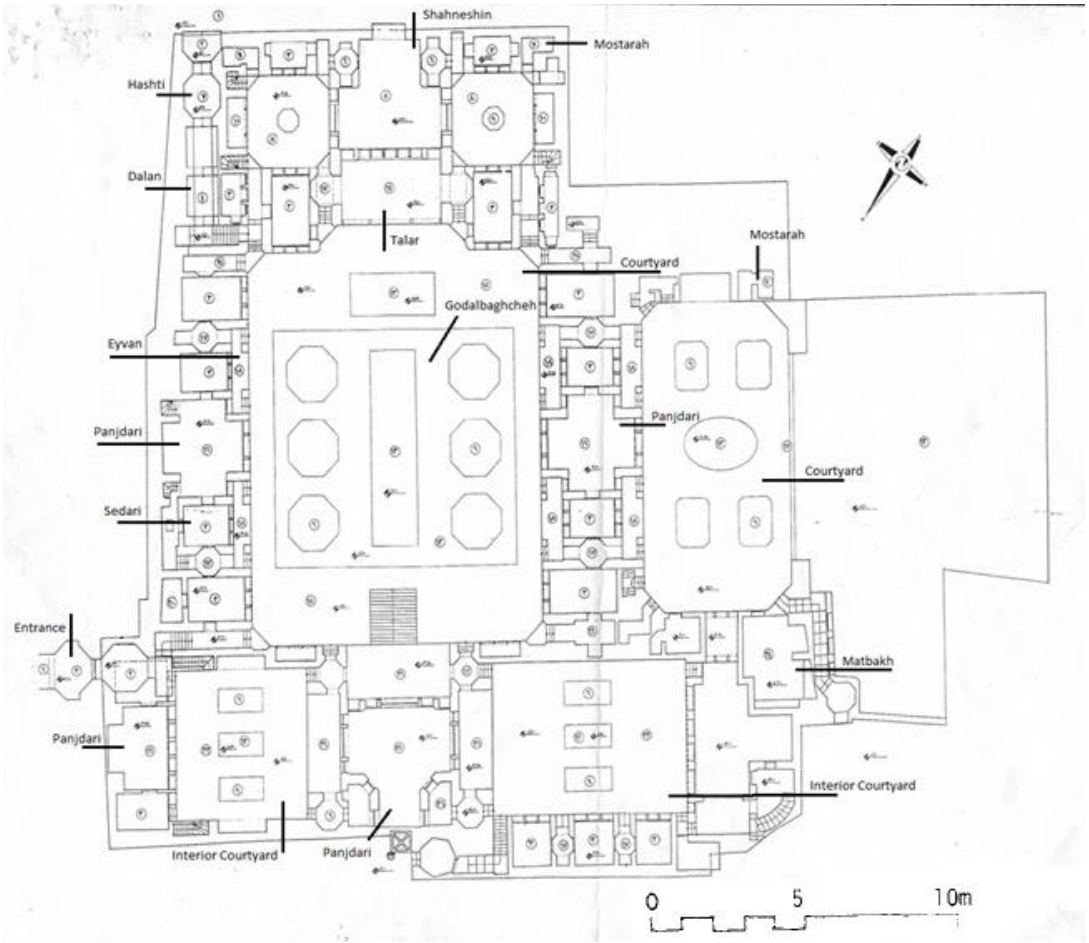


Figure 57: Tabatabaee House (Ground Floor Plan) Kashan (URL 16)

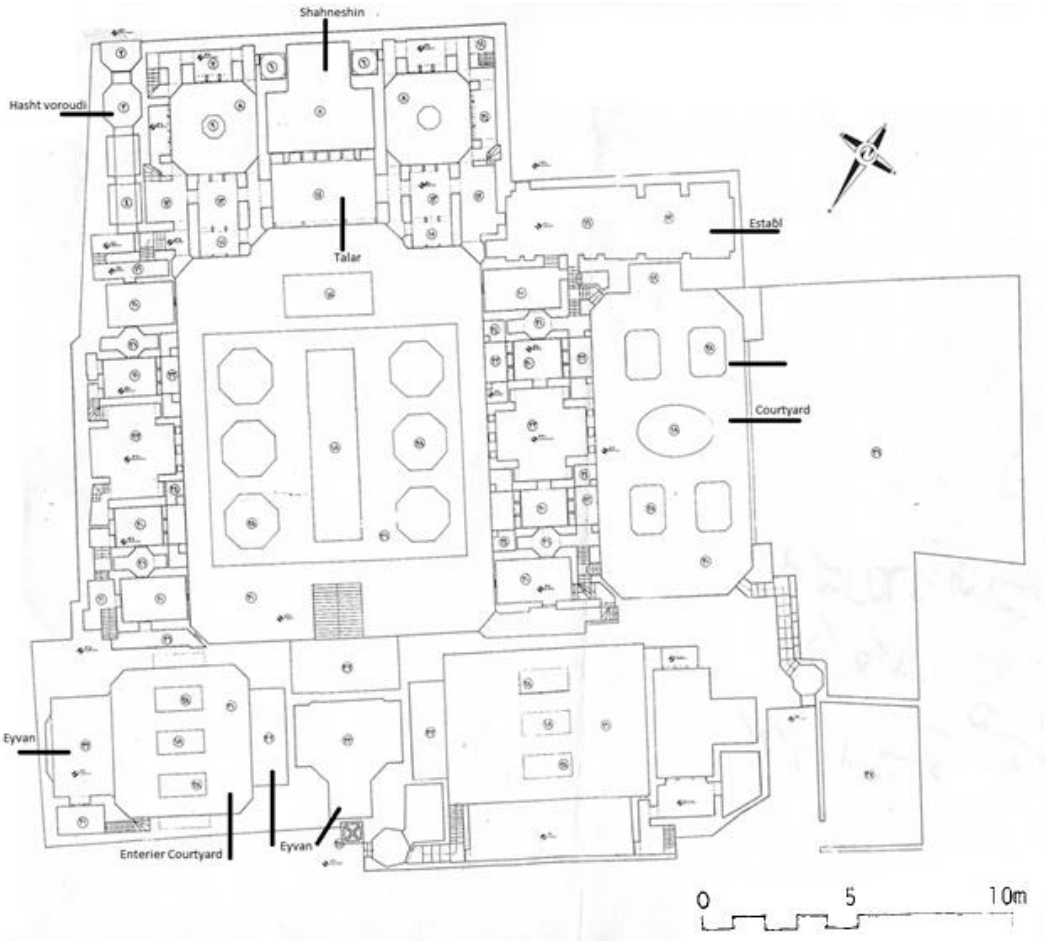


Figure 58: Tabatabaee House (First Floor Plan) Kashan (URL 16)

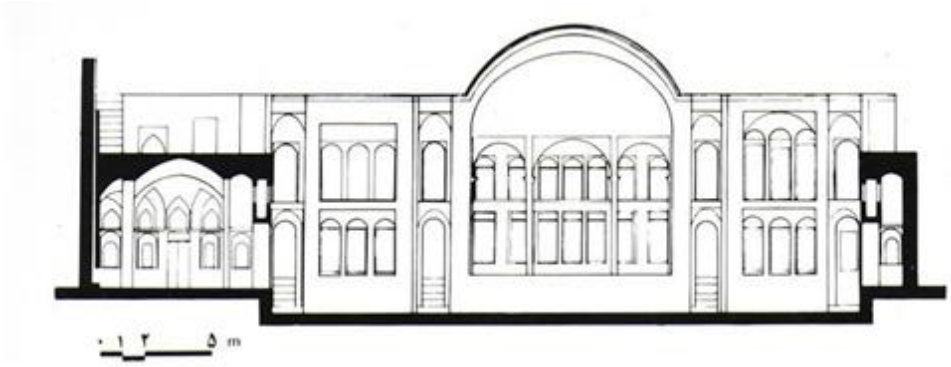


Figure 59: Tabatabaee House (Section A_A) Kashan (URL 16)

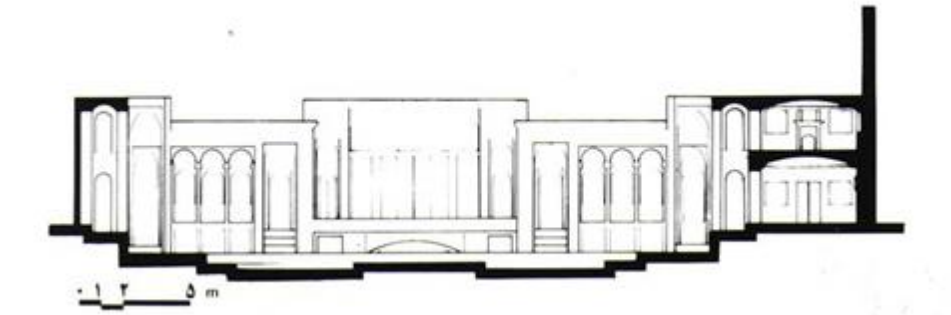


Figure 60: Tabatabaee House (Section B_B) Kashan (URL 16)

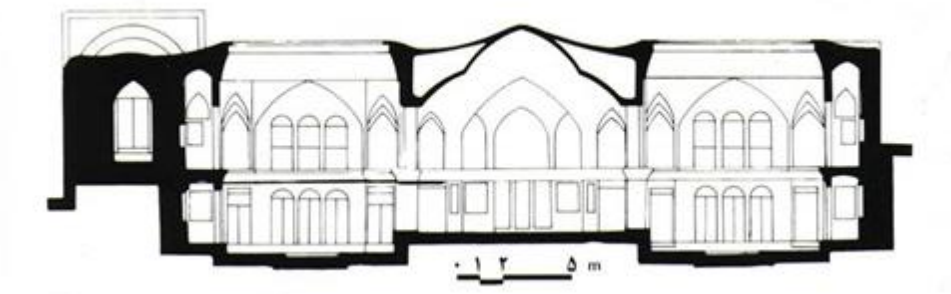


Figure 61: Tabatabaee House (Section D_D) Kashan (URL 16)

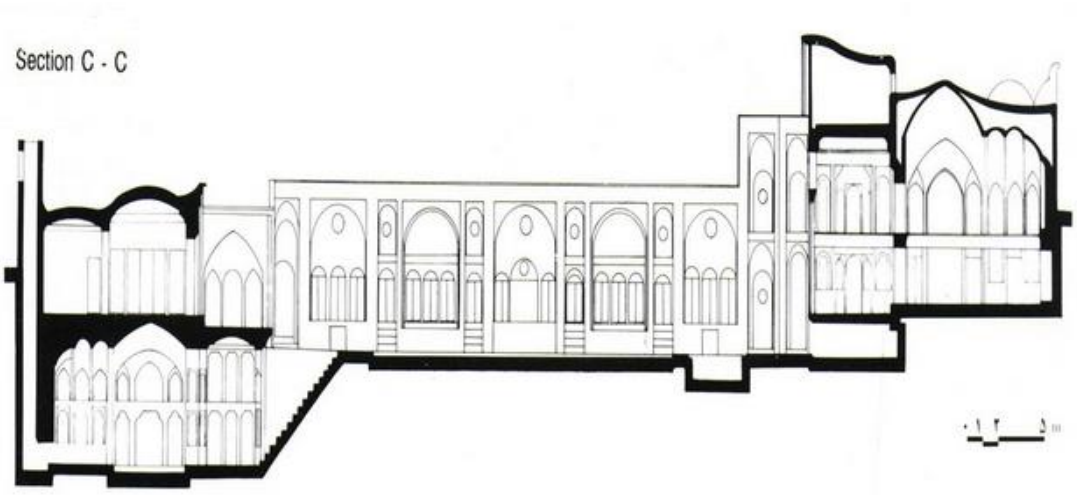


Figure 62: Tabatabaee House (Section C_C) Kashan (URL 16)

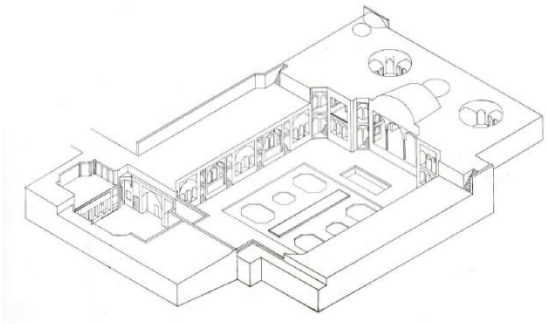


Figure 63: Perspective of Tabatabaee house (URL 16)

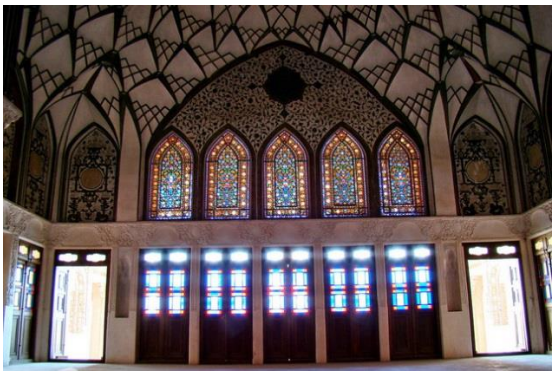


Figure 64: Panjdari in Tabatabaee house in Kashan (taken by author, 2012)

Figure 65: Major Courtyard in Tabatabaee House (taken by author, 2012)

Figure 66: Entrance of Tabatabaee house in Kashan (taken by author, 2012)

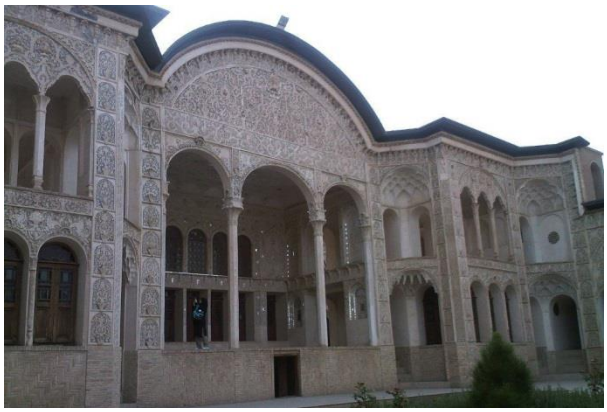


Figure 67: Eyvan of Tabatabaee House in Kashan (taken by author, 2012)

B. Abbasi House

One of the most fascinating examples of Kashan's traditional houses is Abbasi house. There are various spaces in this house which makes it different compared with other houses in the city of Kashan. Abbasi house features two main entrances positioned at the southern and northern parts. The south entrance consists of two halls, two foyers (Hashti) and an open yard. The northern one contains only one hall and one foyer in addition to an open yard. Courtyard of the house is small and located at a higher level. The greeting halls are located at southern-western and northern-eastern parts of the building. The veranda is higher compared with the other parts and it features a specific traditional decoration titled Yazdi-bandi and it. (Ranjbar, 2009 Citec in Eskandari, 2011)

The most important part of the building is the porch with a large greeting hall formed as a cross. Located in the southern-eastern section there are two rooms called 'se-dari' at the same level of the yard. These rooms are connected via a woody door decorated by colorful glass. Keeping the doors between these three spaces open, there would be a large area space. Beyond this space, there are two other se-dari rooms as well as a panj-dari room separated by a porch. On top of the porch, there are two narrow openings receiving the light from the open yard.

There are two greeting halls at the west-side part at the level of ground. The smaller one is linked from the back to the bigger hall. Beyond this area, there is another panj-dari surrounded by two porches on sides and one podium in front. An arch was built on the center of the panj-dari frontage at the highest level compared with other parts of the building (Eskandari, 2011).

However, the north-eastern section of the house is totally different. The frontage is precisely analogous to the one facing it but it is lower than the yard's level. Beyond this part there is se-dari room with two spaces called kafsh-kan which is a room to put the shoes before entering. There is also a greeting hall at the higher level.

Howzhkhane or pond house is a part of the house located at the corner of western part. It is an elevated area surrounded by two main spaces. From the inner view, the ceiling of this part has a vault surrounded by drum vaults. This specific roof design is also visible from the outside.

There is a special decorated space located on the eastern corner of the house. Decoration style of the ceiling is called rasm-bandi. This space is connected via an orosi door to two a se-dari. Yazdi-bandi decoration is performed on the ceiling of most of the rooms. In greeting halls mirror decoration and colorful stucco carving is also visible. One interesting thing about this house is that there are some half-floor spaces shared with the neighbor buildings. This is because some close relatives of the Abassi family lived there (Ranjbar 2009, Cited in Eskandari, 2011).

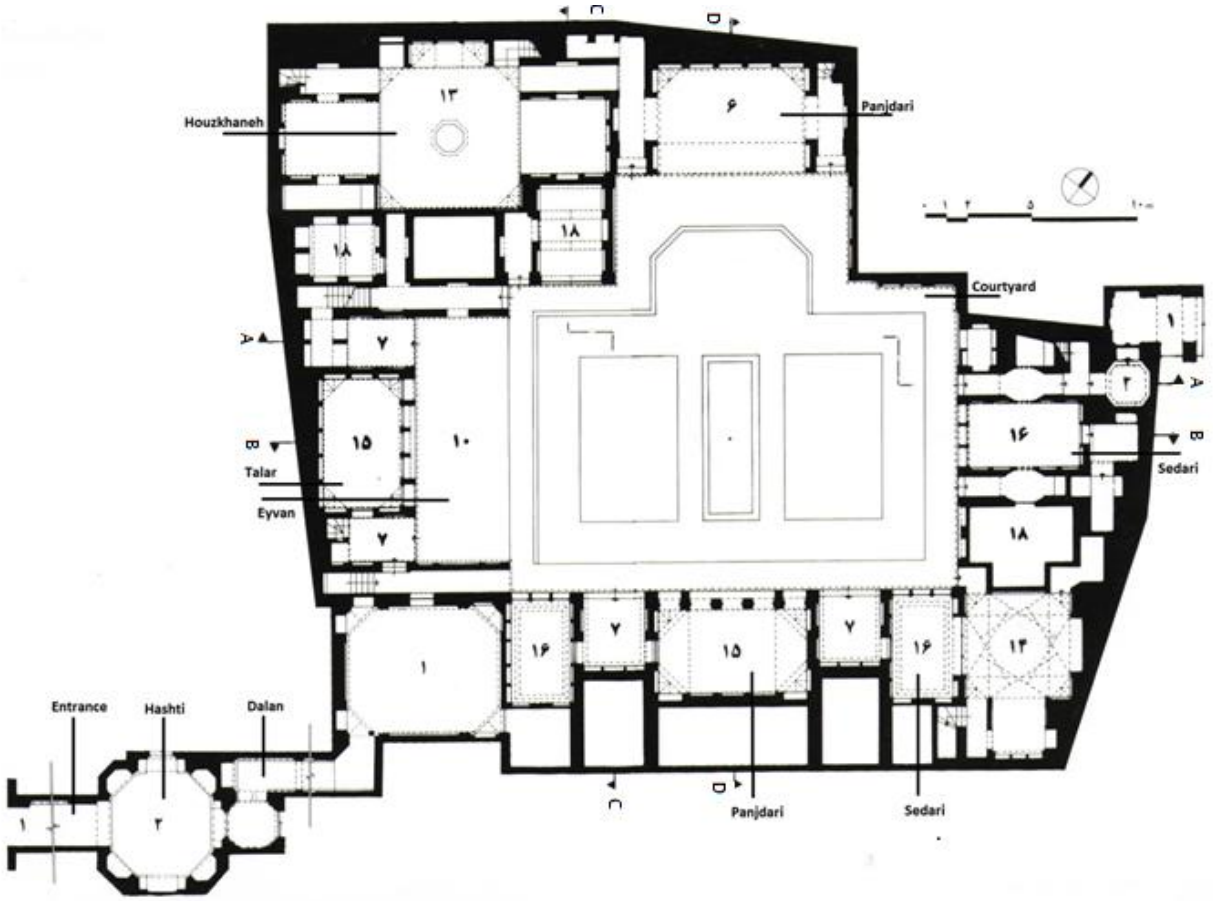


Figure 68: Abbasi House (Ground Floor) Kashan (URL 17)

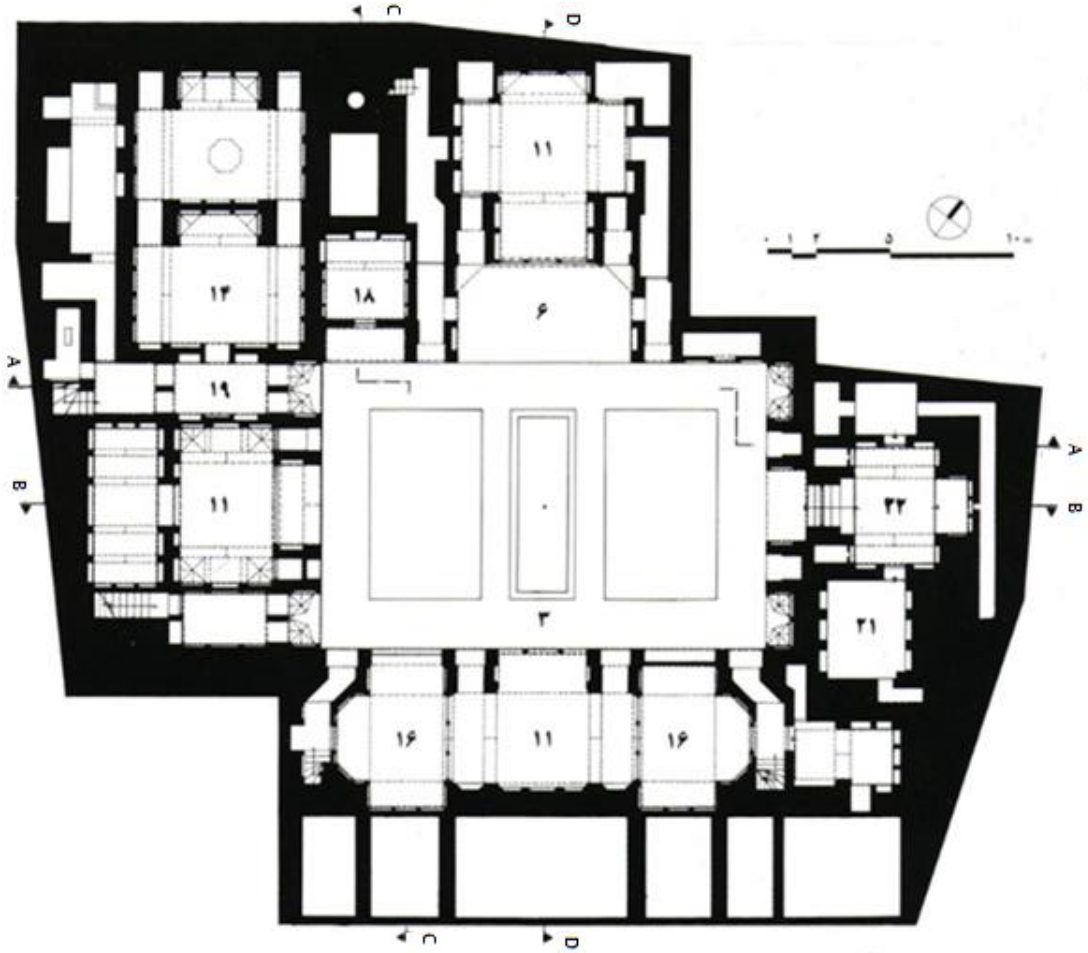


Figure 69: Abbasi House (First Floor) Kashan (URL 17)

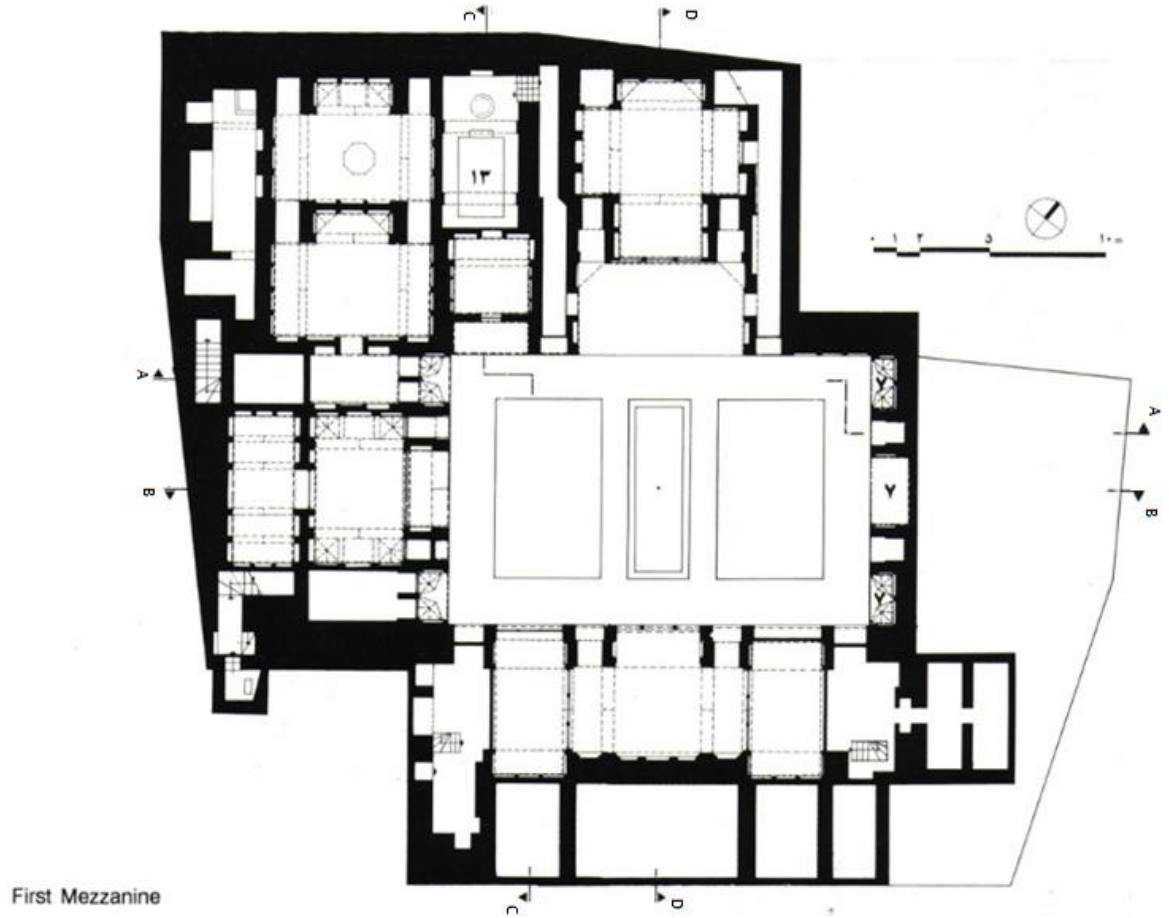


Figure 70: Abbasi House (First Mezzanine) Kashan (URL 17)

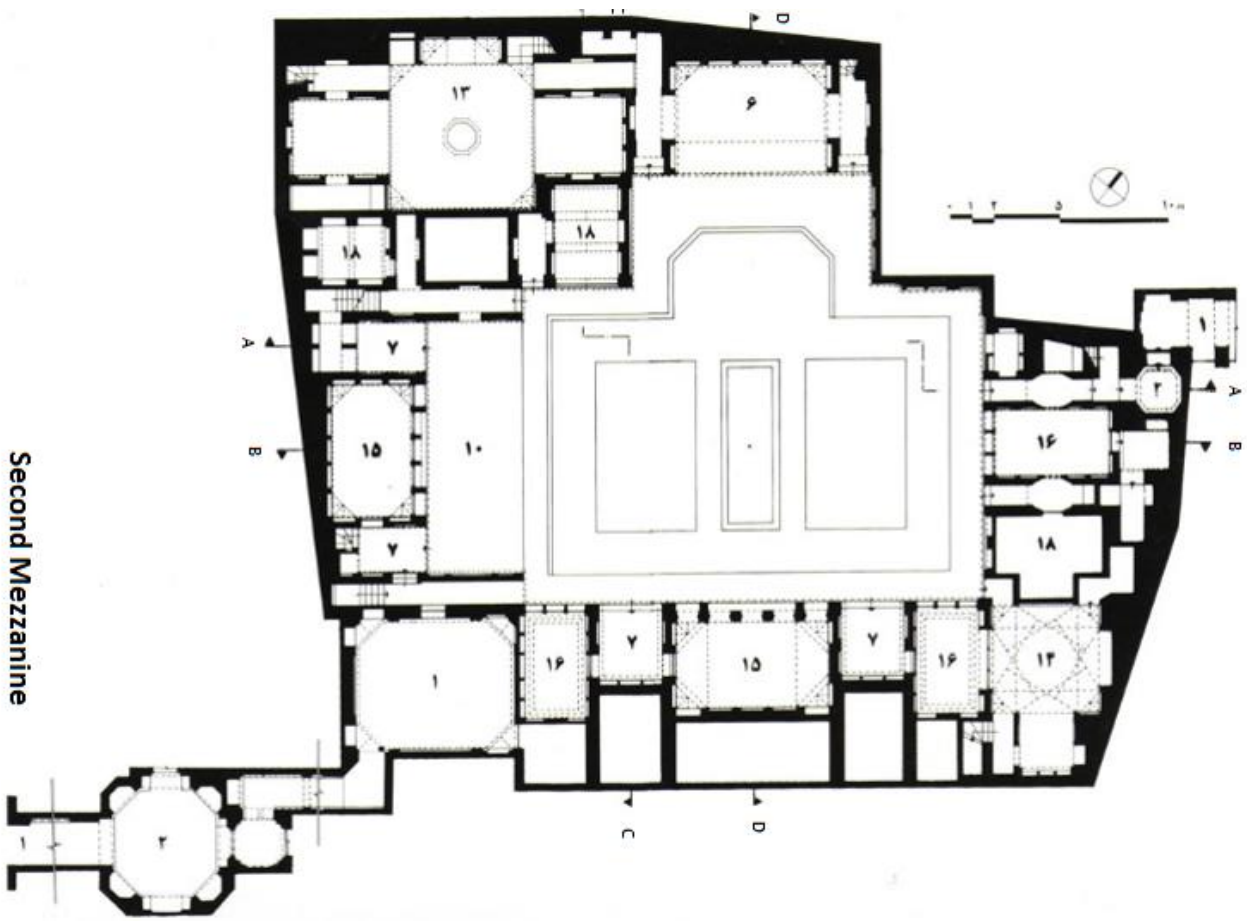


Figure 71: Abbasi House (Second Floor) Kashan (URL 17)

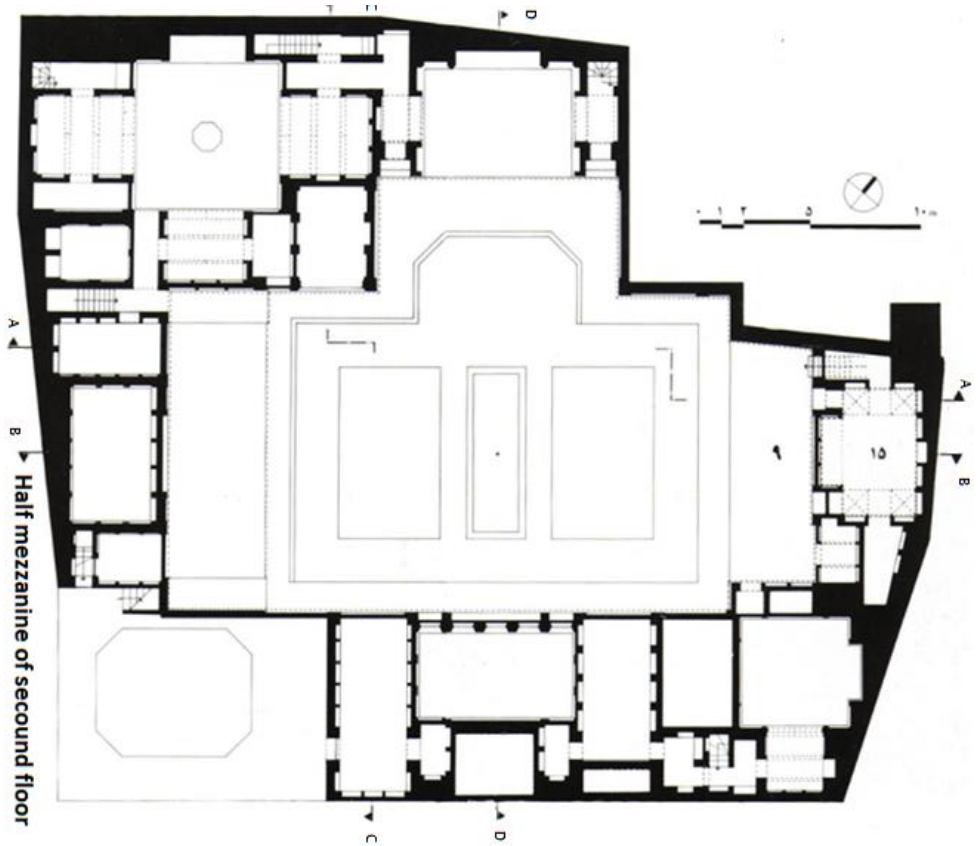


Figure 72: Abbasi House (Half mezzanine of Second floor) Kashan (URL 17)

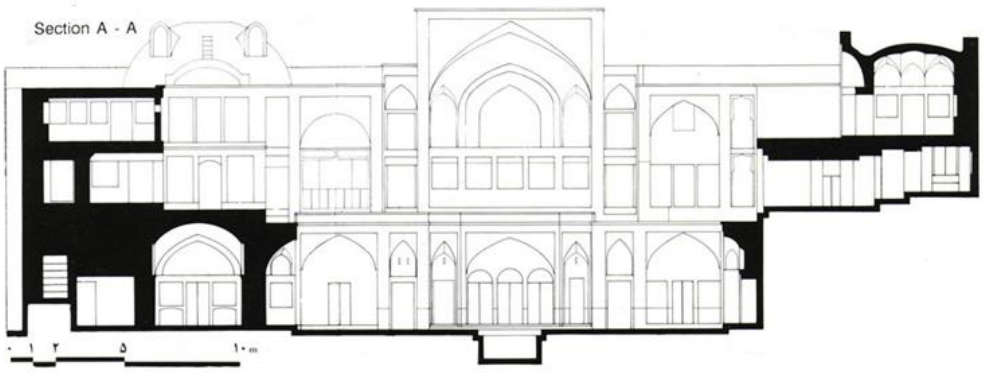


Figure 73: Abbasi House (Section A_A) Kashan (URL 17)

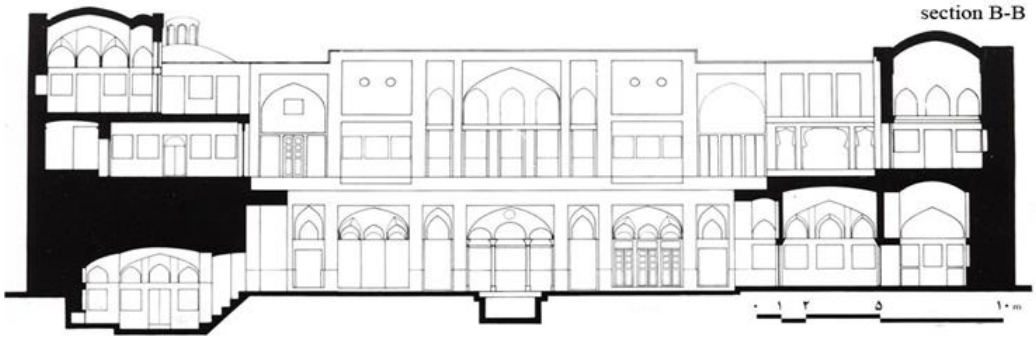


Figure 74: Abbasi House (Section B_B) Kashan (URL 17)

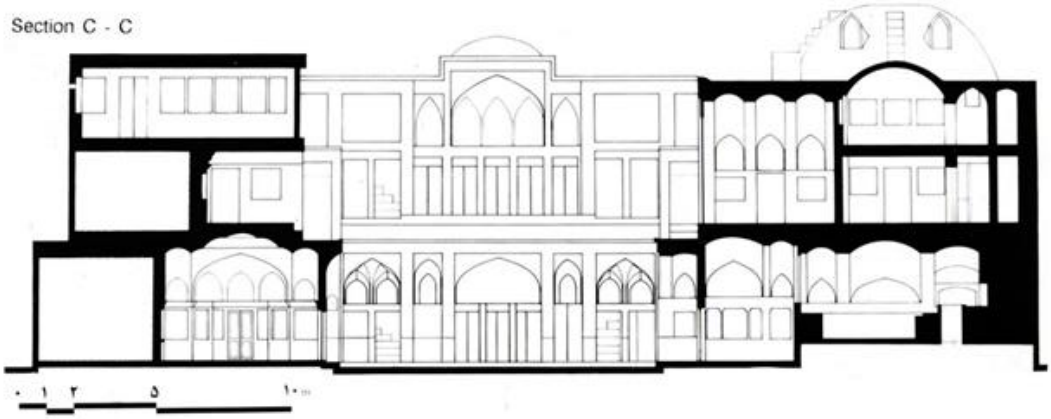


Figure 75: Abbasi House (Section C_C) Kashan (URL 17)

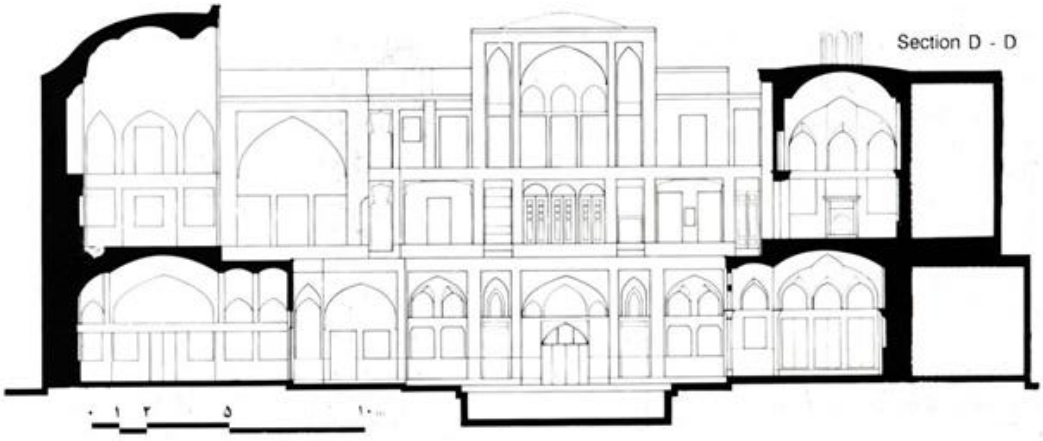


Figure 76: Abbasi House (Section D_D) Kashan (URL 17)

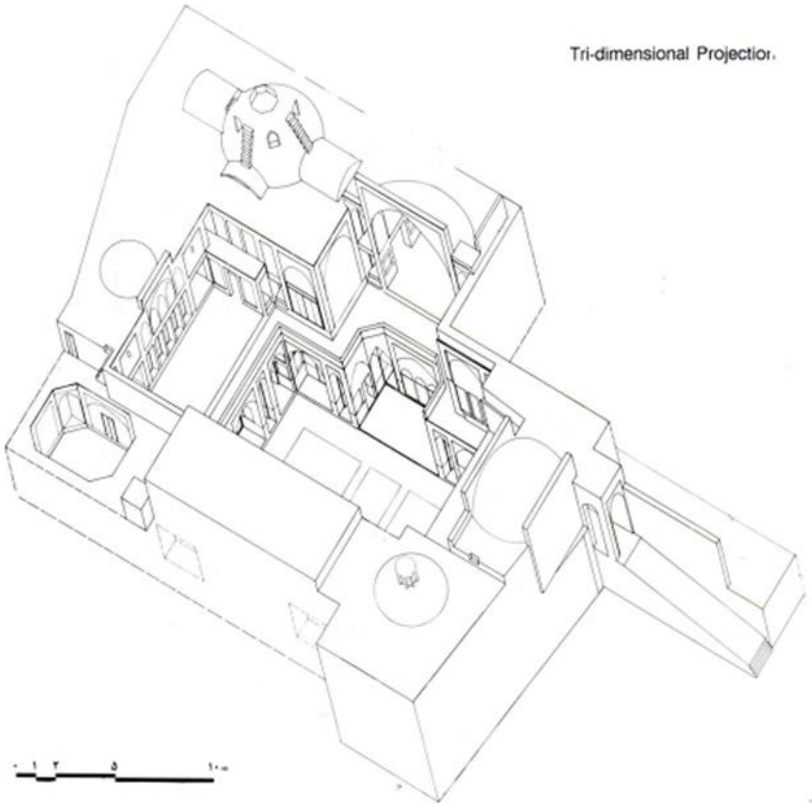


Figure 77: Abbasi House (3D) Kashan (URL 17)

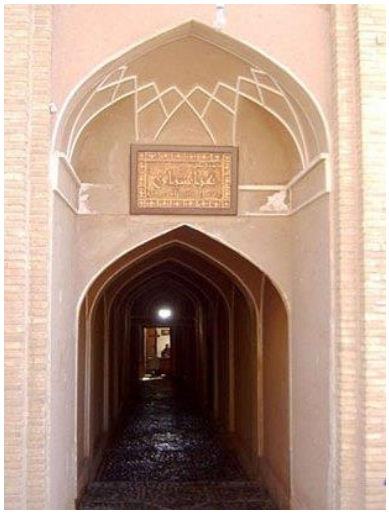


Figure 78: The entrance of Abbasi House in Kashan (taken by author, 2012)

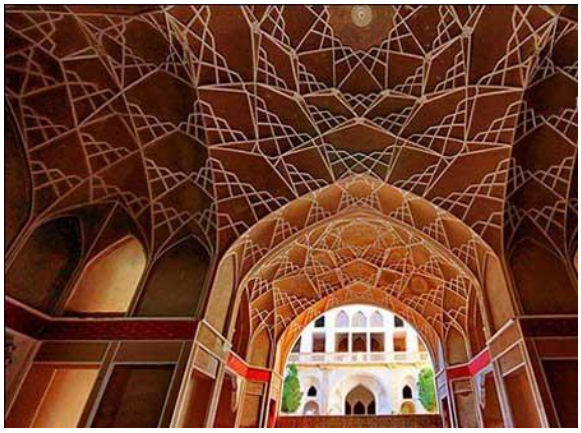


Figure 79: Hashti in Abbasi house of Kashan (taken by author, 2012)

Figure 80: Panjdari in Abbasi House of Kashan (taken by author, 2012)

Figure 81: Courtyard in Abbasi House (taken by author, 2012)

Figure 82: Courtyard in Abbasi House (taken by author, 2012)

Figure 83: Orosi in Abbasi House (taken by author, 2012)

C. Broujerdi House

House of Broujerdiha is another example of Kashan's traditional architecture. Construction of this building gets back to 130 years ago. Nowadays, the house is officially served as the cultured heritage. As mentioned before, the house was designed by Ostad Ali Maryam (Ghobadian, 2009).

This house features a large open yard and only one opening to the outside. All other openings are opened to the courtyard. To reach to the courtyard from the outside, one should get in through the entry door; pass through a circular vestibule, then a lengthy hallway. Winter and summer living sections are discriminated in the design of this house and located on north and south respectively. In addition to the ground floor, this house contains a basement which was commonly used in hot afternoons during the summer. Construction materials are mainly clay blocks. The interior walls are covered with stucco.

The house benefits from wind towers for ventilation. Wind towers direct the wind into the building and when there is no wind the chimney effect causes a vertical flow which keeps the house cool during the hot season. Winter living part, located at the north absorbs heat from sun light during the winter. On the other hand, the southern part is shaded during the summer. Hence, it was usually served as the summer living space. Central open yard is surrounded by other part of the building. This structure protects the yard from the dust storms which are common in Kashan. Courtyard has a pond with fountain as well as florae and trees. The residents mainly did their daily activities in the courtyard during the summer as this part is cooler than the interior spaces. There are also some wooden boards in the yard for evening gathering of the family (Eskandari, 2011).

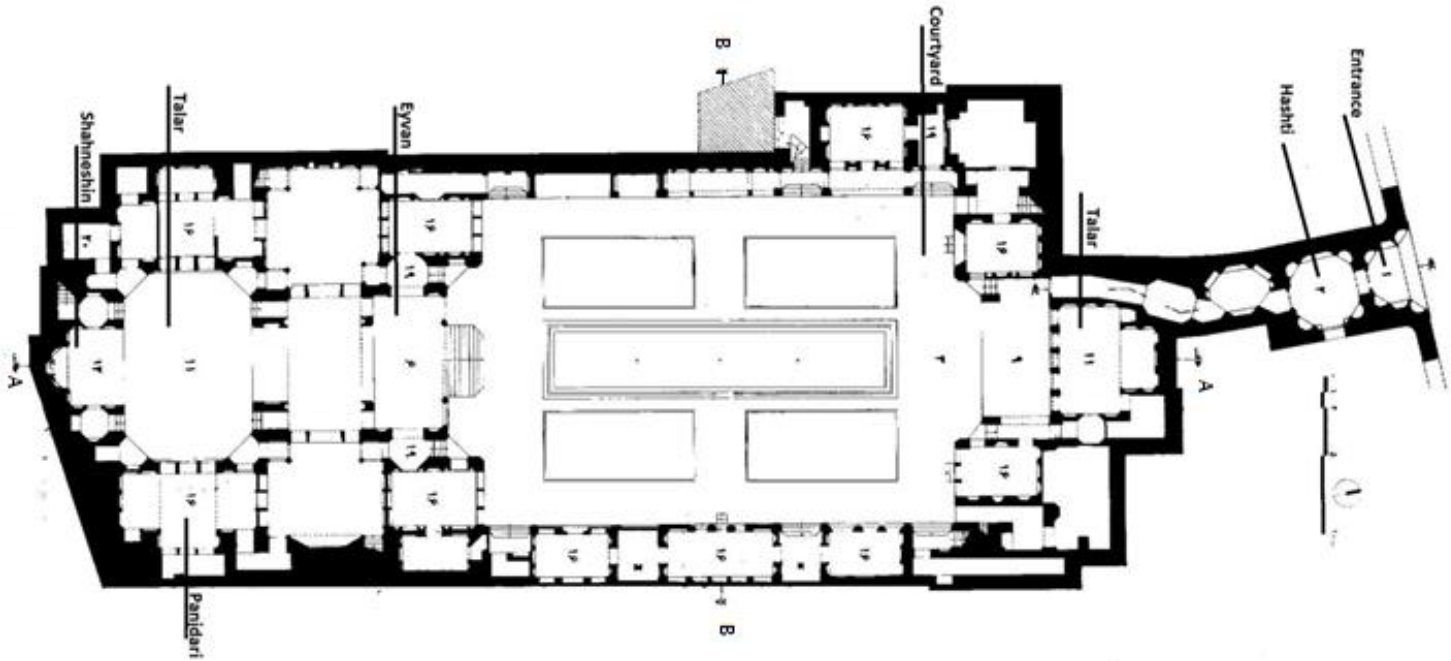


Figure 84: Broujerdi House (Ground floor) Kashan (URL 18)

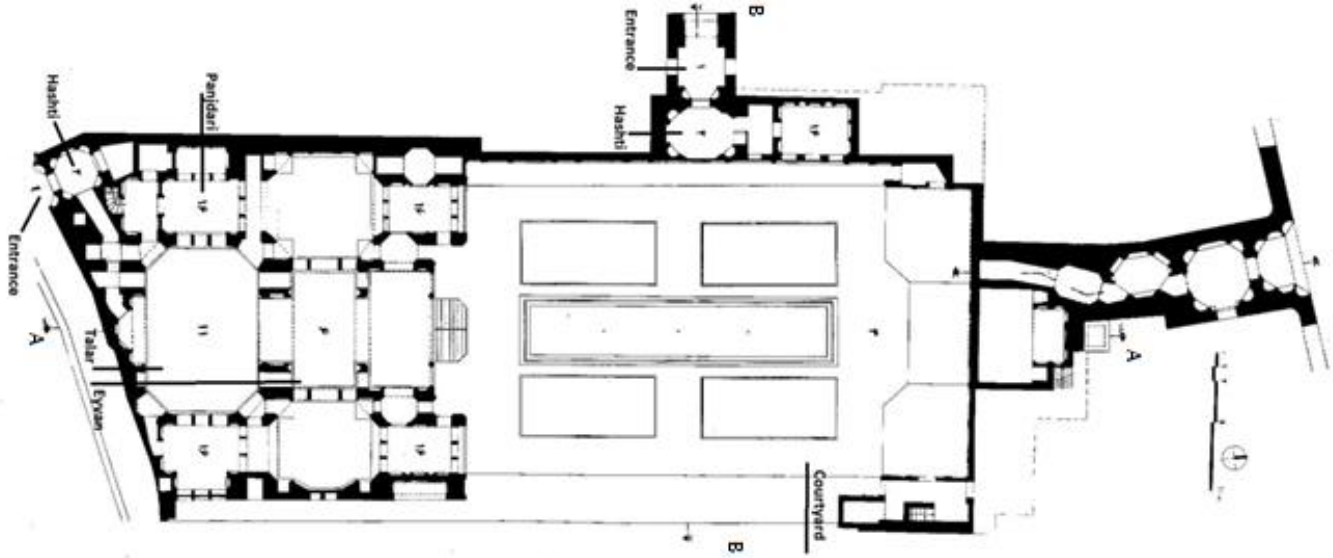


Figure 85: Broujerdi House (First floor) Kashan (URL 18)

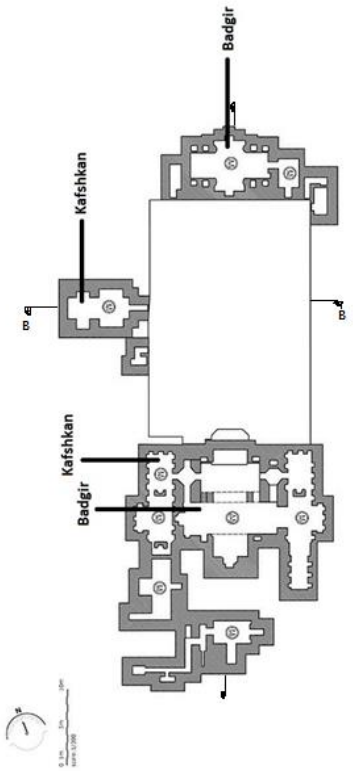


Figure 86: Broujerdi House (Basement floor) in Kashan (URL 18)

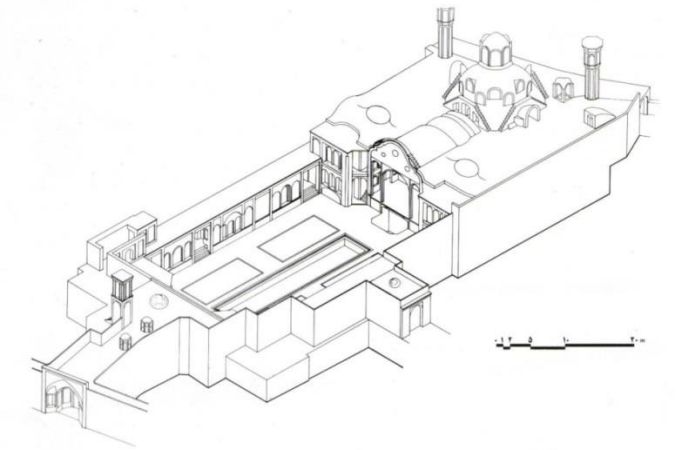


Figure 87: Broujerdi House (3D) Kashan (URL 18)

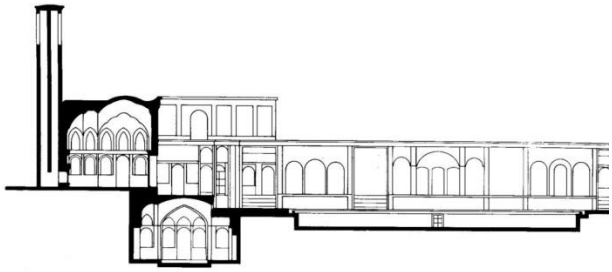


Figure 88: Winter Part Section (Section A_A) in Broujerdi house Kashan (URL 18)

Figure 89: Sumer part Section (Section A_A) in Broujerdi house Kashan (URL 18)

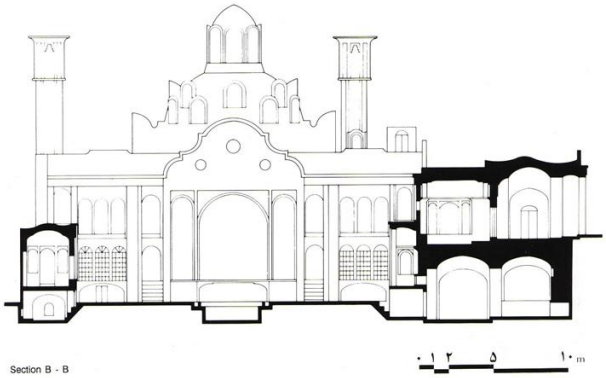


Figure 90: Broujerdi House (Section B_B) Kashan (URL 18)

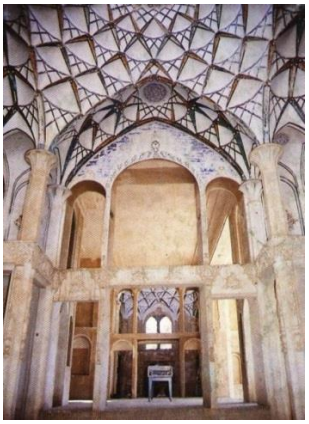


Figure 91: Talar in Broujerdi house in Kashan (taken by author, 2012)

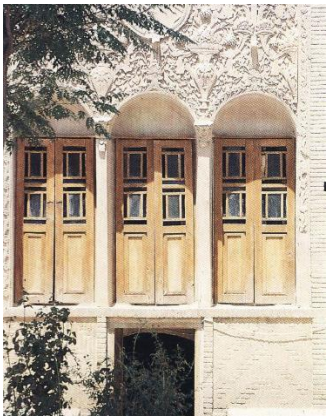


Figure 92: Sedari in Broujerdi Housein Kashan (taken by author, 2012)

Figure 93: Shahneshin in Broujerdi House in Kashan (taken by author, 2012)

Figure 94: Courtyard in Broujerdi house in Kashan (taken by author, 2012)

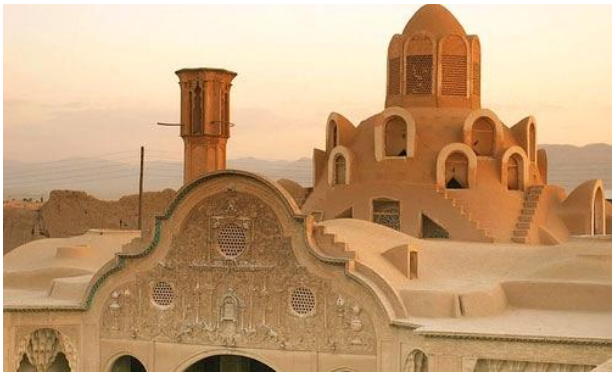


Figure 95: Badgir in Broujerdi House in Kashan (taken by author, 2012)

Figure 96: Courtyard in Broujerdi House in Kashan (taken by author, 2012)

5.2 Analyses of Examples (Traditional Houses) in Mukalla

A. Bamansur House

Al-Maashi (1998) described the house of Bamansour was originally a two level building. Then, it has been made larger during 1940 as some new spaces were attached to it. Form the thick walls of the first and the second level; it is quite

obvious that the primary designer intended to build more than two floors. The first level which has access to the street contains five storage areas and a big open corral for keeping animals. This corral is an unusual space in the house because there should be some air openings from the interior spaces to the yard.

In the primary construction, there are guest room and a room for aunt on the second floor. The kitchen was originally a small room next to the guest room which later on served as a bedroom. Then guest room for men added to the building with its private bathroom. Majles room for females is located on the third floor and it differs from Sheik Abu Bakr's house. There is also a small hall space for fewer numbers of guests. At the southern-west plan in second floor, family room is located with a small preparative kitchen. Fourth floor plan includes a living space for grandparents, the main kitchen and a porch (Al-Maashi, 1998).

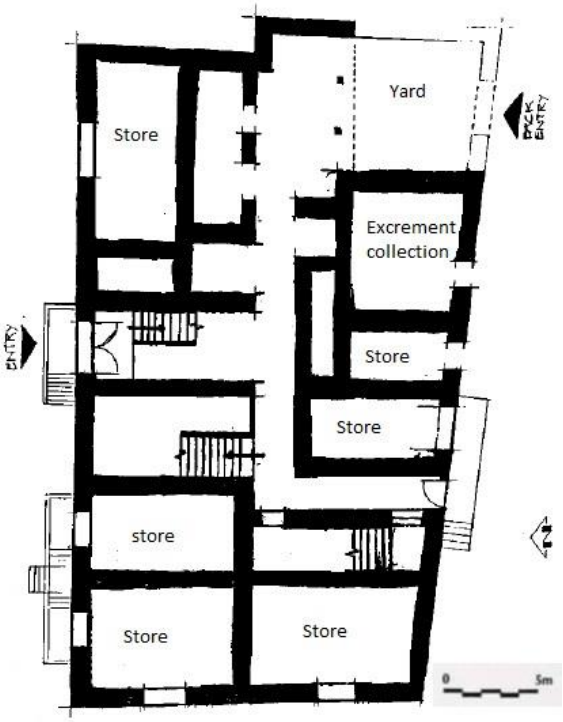


Figure 97: Bamansur House (First Floor) Mukalla (Al-Maashi, 1998)

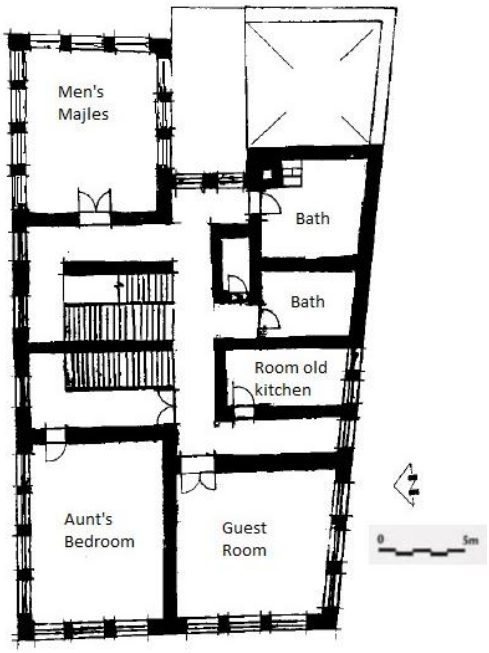


Figure 98: Bamansur House (Second Floor) Mukalla (Al-Maashi, 1998)

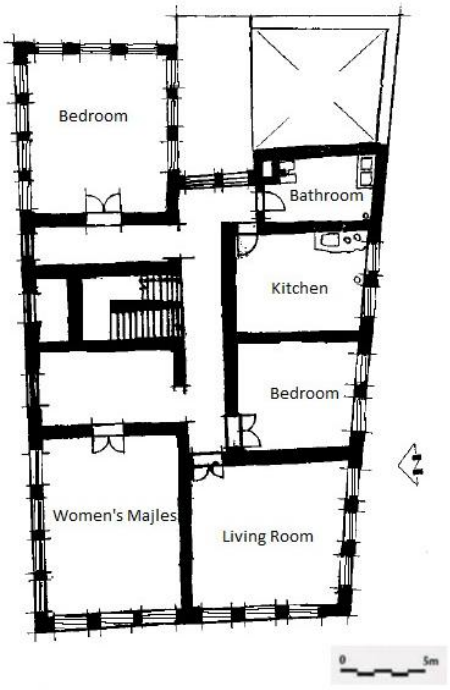


Figure 99: Bamansur House (Third Floor) Mukalla (Al-Maashi, 1998)

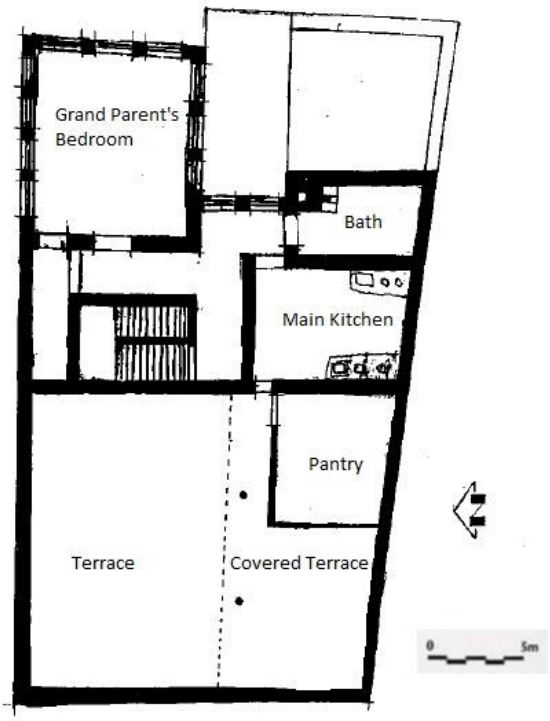


Figure 100: Bamansur House (Fourth Floor) Mukalla (Al-Maashi, 1998)

B. Beit el kaf

Beit el kaf is a traditional house which is located in the bazaar nowadays. The first floor's storage area is rented and used as shops and coffee shops. On the second floor there are three guest rooms or majles. The second level has three different majleses. It is also shown in Figure 99 that the third level also features two majles rooms. At one side there is a large male majles with a semi-open porch in front of it. The roof of this veranda is the floor of the hallway in the higher level (Figure 100). Hallway is called sala. Both kitchens and restrooms were built at the most northern corner of each floor (Al-Maashi, 1998).

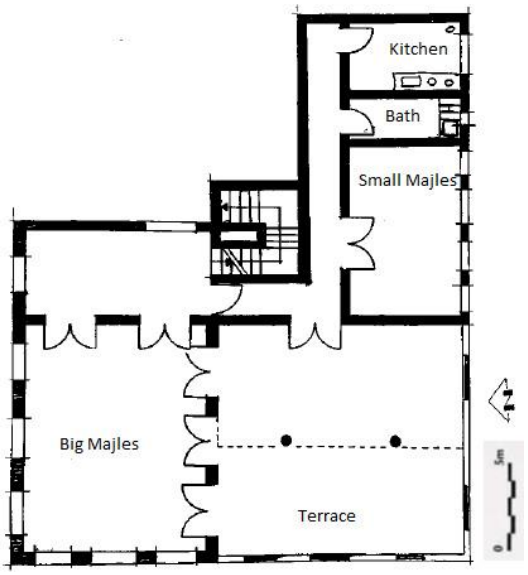


Figure 99: Beit Al Kaf House (Third Floor) (Al-Maashi, 1998)

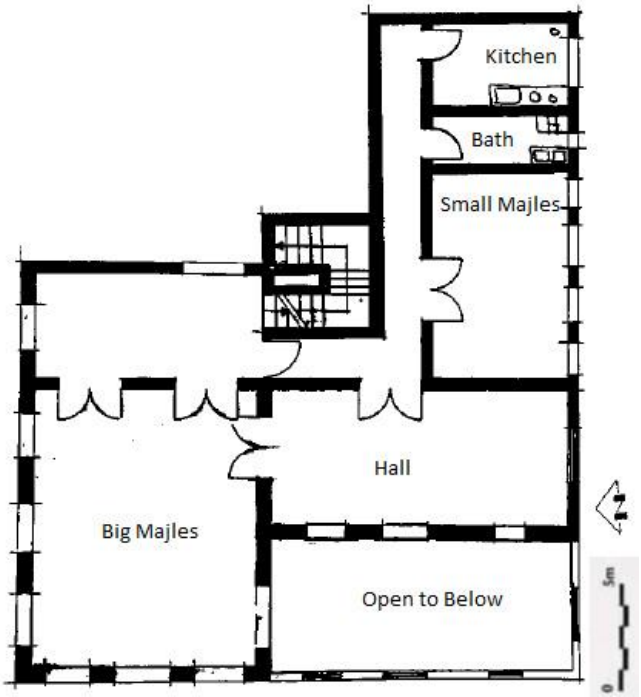


Figure 100: Beit Al kaf House (Fourth Floor) Mukalla (Al-Maashi, 1998)

C. Sheikh Abu Bakr

House of Sheik Abu Bakr was constructed in five different levels. The first one which was mainly used as the storage is about one meter higher than exterior alley level. At the top floor, there is a verandah and living spaces are in the second and

third floors (Figures 101, 102). The house has a main entrance with a door called ‘seda’. Near this door the stairs to the upper floors are placed. Majles or guest room for males is located in the second floor. Majles is the largest interior space of the building. There is also another Majles for women guests at this floor. But both rooms could be got into separately form the stairs with no contact (Figure 101). There are also walk-in or kafsh-kan areas in guest rooms. There is small room at this floor which might be used by a male member of the family like a single son or might be served as the guest bedroom. There is a restroom located on the second floor as well.

At the third floor, most of the daily activities of family happened (Figure 102). This part is also used at nights by the kids for sleeping. Father or the elder married son used the biggest bedroom. The main bedroom is intended for the father or the eldest married son. There is also a small kitchen, a restroom and a bathroom or ‘*hammam*’ in the third level. A series of connected porches are located on the highest floor. This part is mainly used for family gatherings and celebrations during the summer time. Average area of the rooms is about 12 m^2, but it is doubled for men’s guest room (Al-Maashi, 1998).

Figure 101: Sheikh Abu Bakr House (Second Floor) Mukalla (Al-Maashi, 1998)

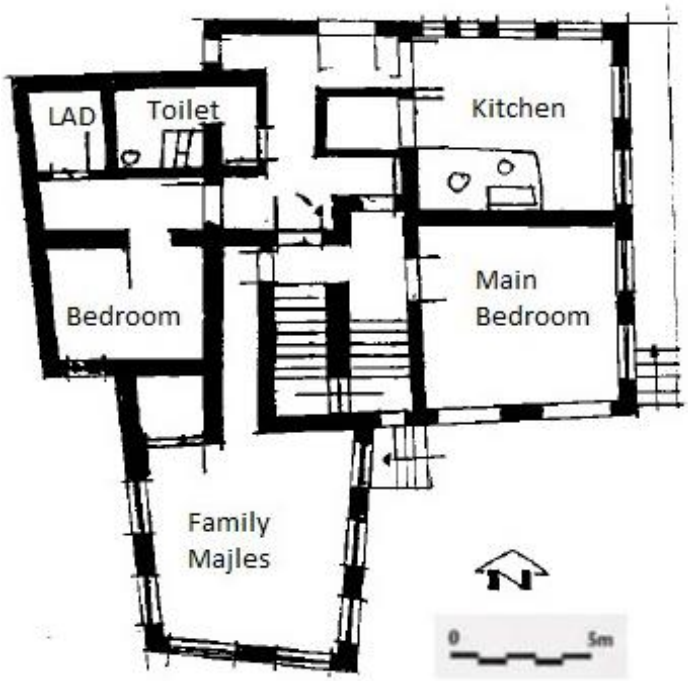


Figure 102: Sheikh Abu Bakr House (Third Floor) Mukalla (Al-Maashi, 1998)

Figure 103: Sheikh Abu Bakr (Fourth Floor) House (Al-Maashi, 1998)

5.3 Analyses of Examples (Traditional Houses) in Riyadh

A. House 1

The house 1 is containing three floors. In the first floor which is called ground floor after entering the house there is a reception which is used by male and the guests of the house. Also there is a dining room and one bedroom which they are on the east side of the plan which is used by guests. There is a private kitchen bath and storage which is for family members. On the other side of the plan they are three bedrooms which belong to family members. These spaces located around a courtyard which brought privacy and thermal comfort for the users. In the second floor there is a separate reception for the guest and they are not allowed to enter to the other part. There are four bedrooms and a bathroom for the family members. The third floor the roof floor, there is a place which is multifunctional. One of the functions is for sleeping in the hot summer and the other is for living room. There is storage on the

roof floor. In this house there are two separate staircases one of them is for family and the other is for guests (Akbar, 1977).

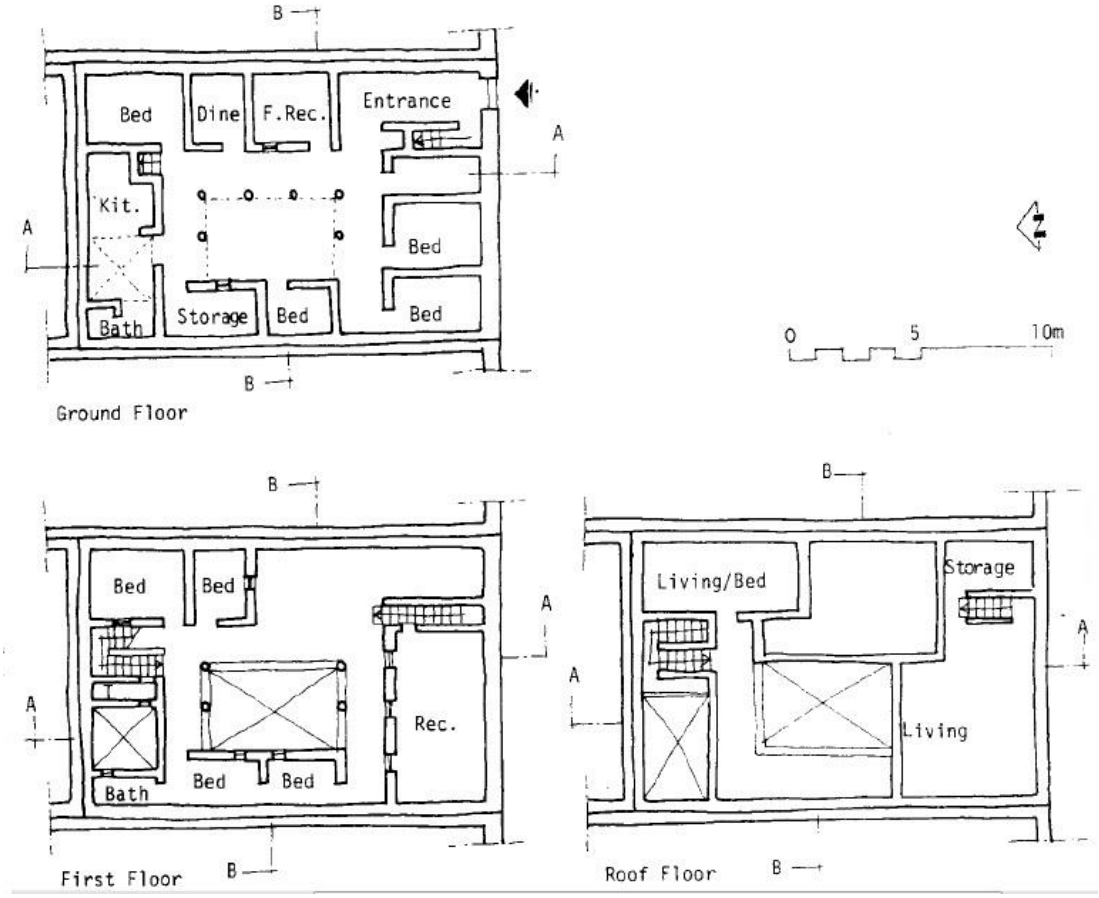


Figure 104: House 1(Ground, First, Roof Plan) Riyadh (Akbar, 1977)

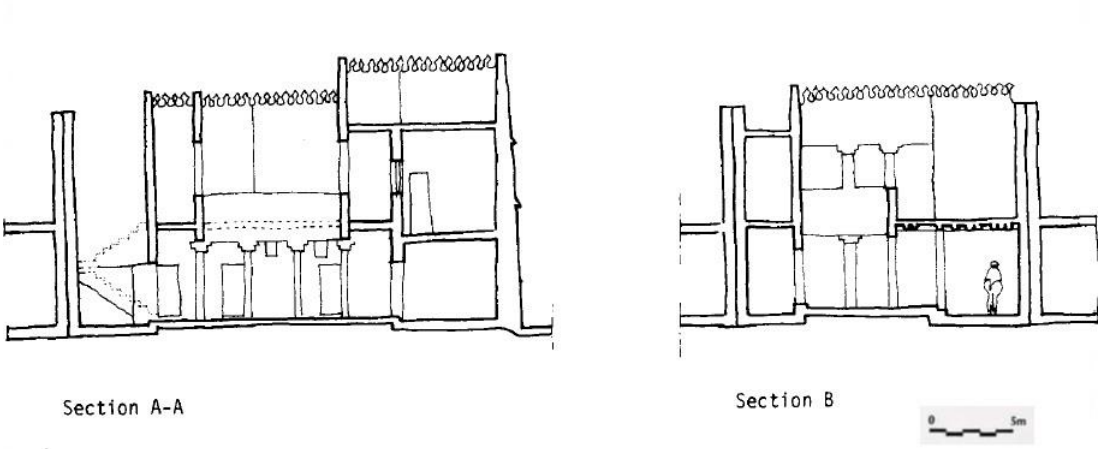


Figure 105: House 1(Section A_A, B_B) Riyadh (Akbar, 1977)

B. House 2

In the house 2 there are three floors. In the first floor which is the ground floor there is staircase which is designed for the guests and let them go to the reception room. There is a bath which is used by guests. When you enter deeply in the first floor there are private spaces for the family members. These spaces contain two bedrooms, a bathroom and a living bedroom which has multifunctional users. In the middle of these parts there is a private stair case for the family members to go to upstairs. In the first floor there are two different reception rooms which one of them is for female and the other is for male guests. These two areas are located on the west side of the house, on the other side there are two bedrooms, a living room and also a bath which is for family members. On the roof there is no covered place design of for sleeping or seating. It is just roof with a big storage (Akbar, 1977).

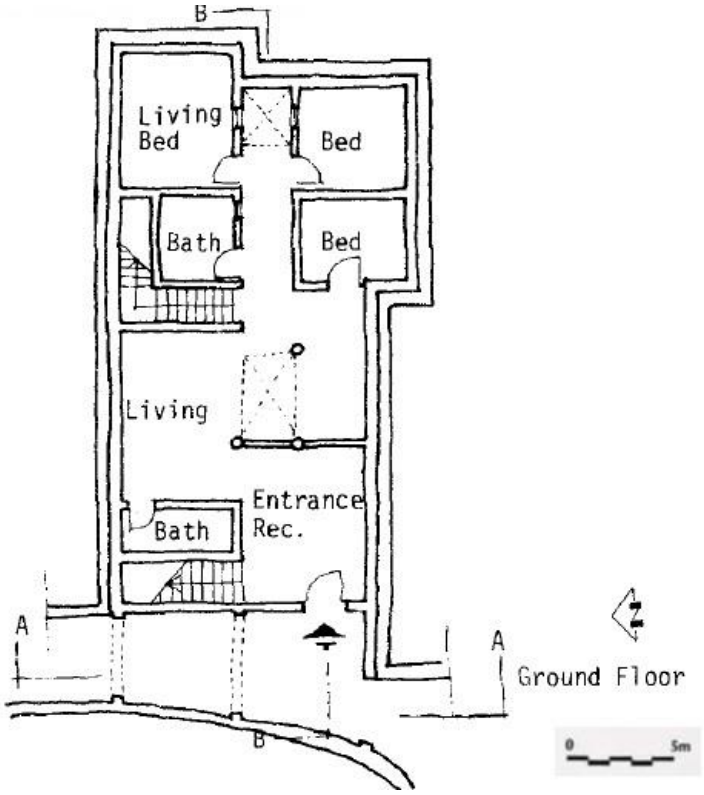


Figure 106: House 2(Ground Floor Plan) Riyadh (Akbar, 1977)

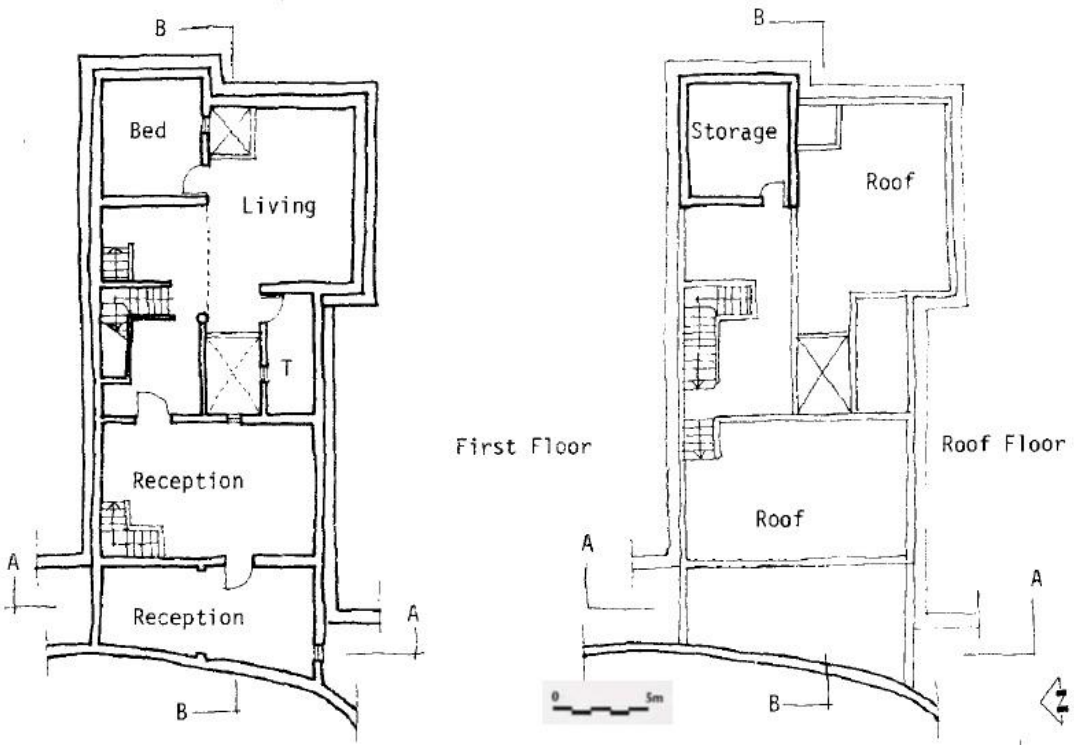


Figure 107: House2 (First floor and roof floor) Riyadh (Akbar, 1977)

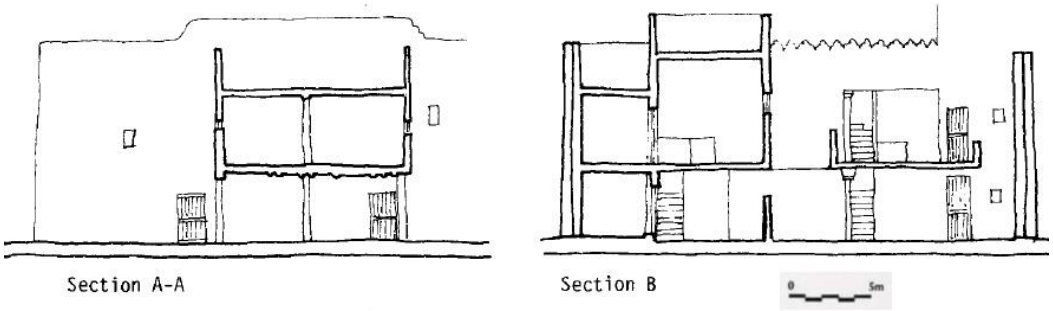


Figure 108: House 2(Section A_A, B_B) Riyadh (Akbar, 1977)

C. House 3

In the house 3 there are two floors. In the ground floor after entering from the main entrance the house there is a reception space and a dining room space for the guest. These two spaces are on the west side of the house. There is another entrance for women which are directly goes to private part of the house. After entering from female entrance there is a small kitchen and beside the kitchen there is a private staircase for family members. Beside the private staircase there is a private bedroom.

In the ground floor next to the reception area there is staircase which is going to upstairs to two other receptions for female and male guests separately. In the first floor there are a toilet and also a bedroom for the guests which are near the reception. In the first floor in the private part there is another kitchen. In the first floor also there is a bedroom and bed-living room toilet and living area which belong to family members (Akbar, 1977).

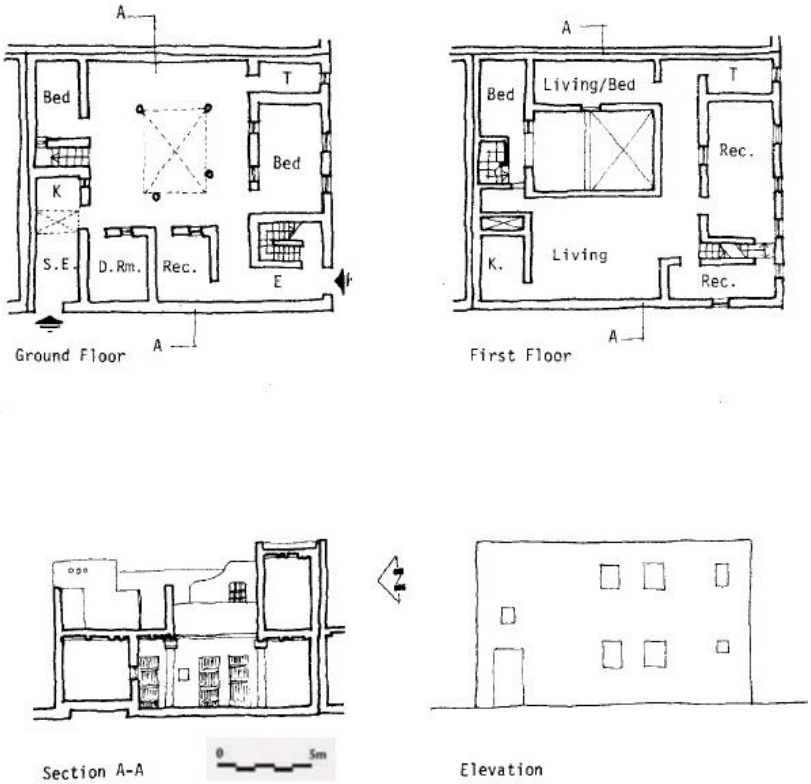


Figure 109: House 3 in Riyadh (Akbar, 1977)

5.4 Analyses of Examples (Traditional Houses) in Baghdad

A. House 72

In the house 72 there is just one courtyard. After entering from entrance there is a reception on the left. All the spaces located surround the courtyard in front of the entrance on the other side of courtyard. There is an ursi in the ground floor. There is

a sardab in basement to make the area cool in the summer days. In the first floor there is two different big ursi in two side of the courtyard (Warren & Fethi 1982).

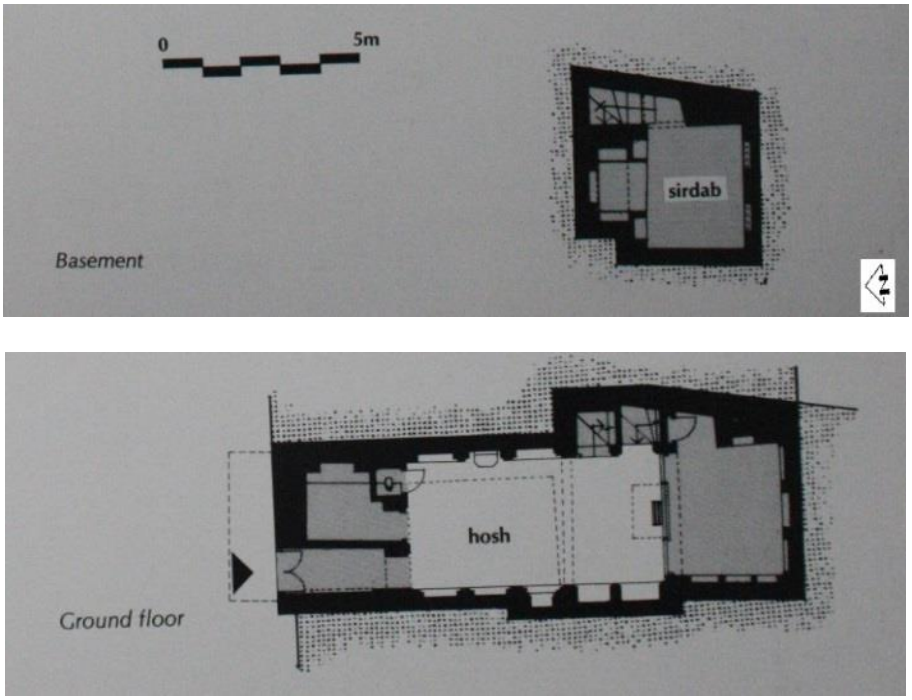


Figure 110: House 72 (Basement, Ground) Baghdad (Warren & Fethi 1982)

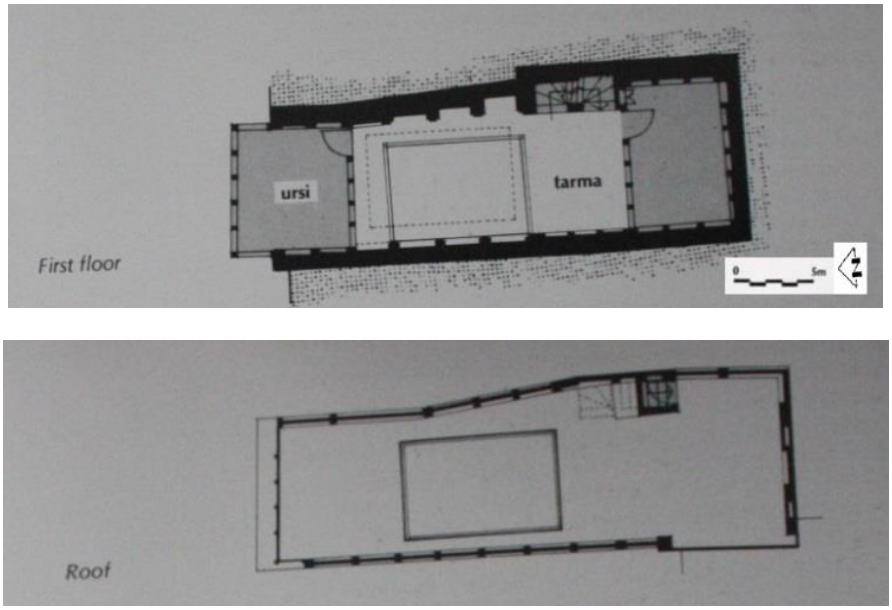


Figure 111: House 72 (First, Roof Floor Plan) Baghdad (Warren & Fethi 1982)

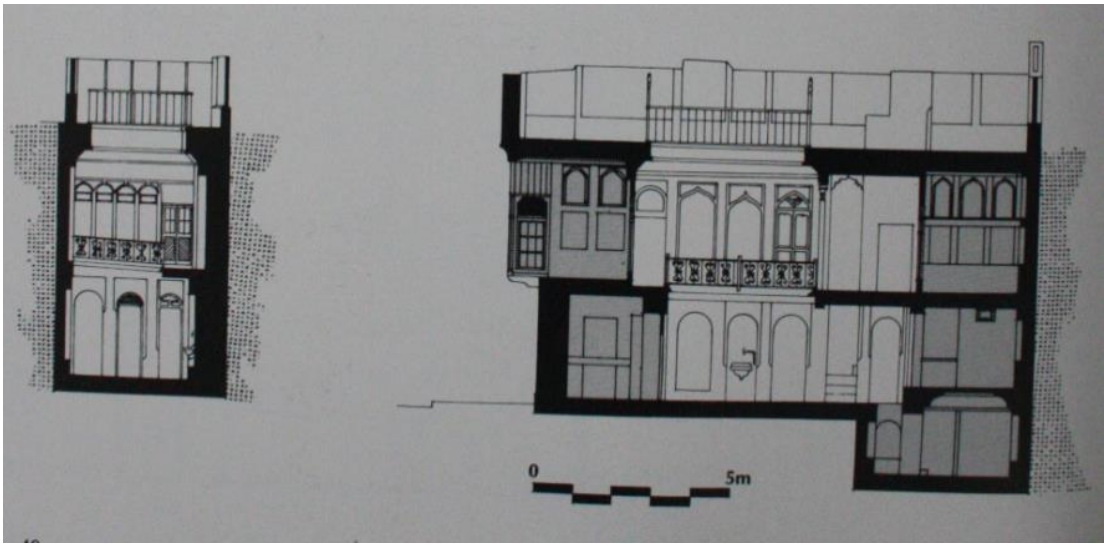


Figure 112: House 72 (Section A_A, B_B) Baghdad (Warren & Fethi 1982)

B. House 47

In the house 47 there are two courtyards. In the ground floor after entering the house one side goes to one courtyard the other goes to another courtyard. On the left is the small courtyard which consists of two urusis. The other courtyard side consists of two big talars and two big urusis. There is a staircase which leads the family members to neem sardab. There is three big ursis as well in that floor. In the first floor there are five big urusis which three of them are located in the big courtyard part; the other two rests are located in the small courtyard part. There is a big tarma in the big courtyard part in the first floor on the contrary there is a small tarma in the small courtyard part. In the second floor and second mezzanine in the small courtyard part there are two urusis. But in the big courtyard part there are four kabishkan.

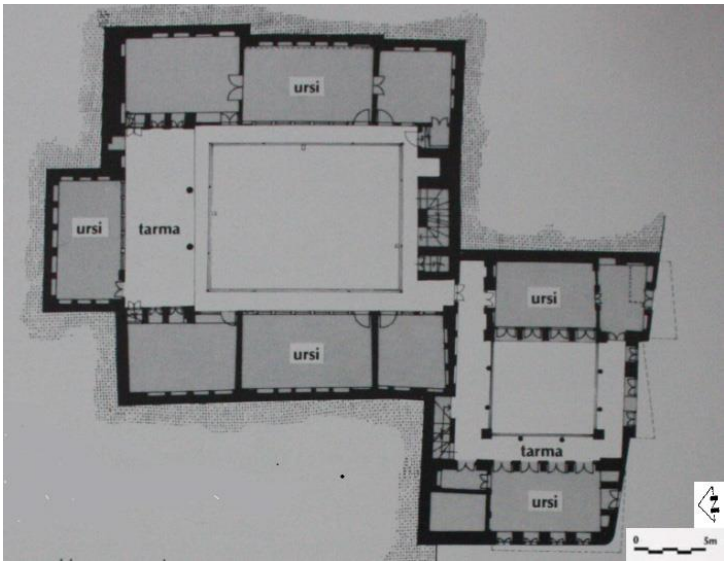


Figure 113: House 47 (first Floor Plan) Baghdad (Warren & Fethi 1982)

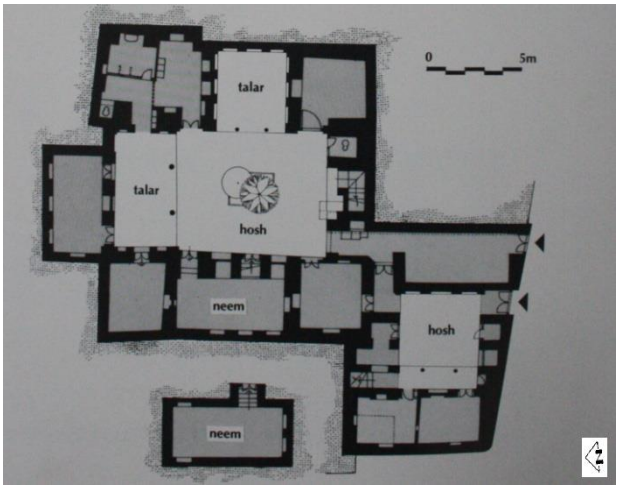


Figure 114: House 47 (ground Floor Plan) Baghdad (Warren & Fethi 1982)

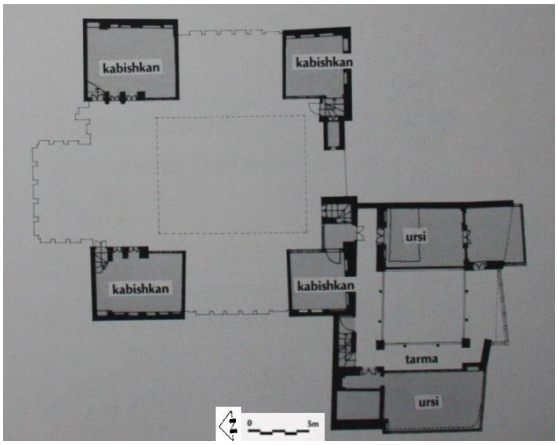


Figure 115: House 47 (Second Floor, Second Mezzanine) (Warren & Fethi 1982)

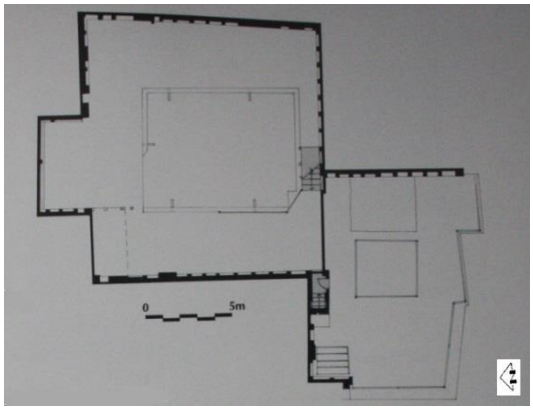


Figure 116: House 47 (Roof Plan) Baghdad (Warren & Fethi 1982)

In the summary of this chapter, for each region some examples of traditional houses have been selected. In each example the characteristic of the elements and also the function of the spaces described. For each region there are some pictures and also plans, section are available for better representation of traditional houses. This chapter is just an analysis of traditional houses.

Chapter 6

A DISCUSSION ON CONTEMPORARY HOUSES IN KASHAN, MUKALLA, RIYADH AND BAGHDAD

6.1 Discussion on Contemporary House Design in Kashan

In twenties century, Iranian architecture has altered to contemporary design and adaptation features was lots. Today, inhabitants' needs and socio-cultural values are not taken into account in house design. Traditional strategies are totally disappeared in contemporary buildings' architecture (figure117).

Figure 117: Contemporary Facade house in Kashan (taken by author, 2014)

Shortage of construction lands forces designers to plan homes in small area typically with rectangular shape. Separate private houses are replaced by dwelling centers, flats and apartments. Due to small land size, houses are built whether north-faced or south-faced .According to government rule for construction, only 60 percent of land is allowed to be closed space and the remaining should be left for open yard

(Arjmandi, 2010). As a result, houses span vertically converted to high rise apartments. Therefore, private courtyards are substituted with shared yards for all apartments in a complex as shown in figure118.

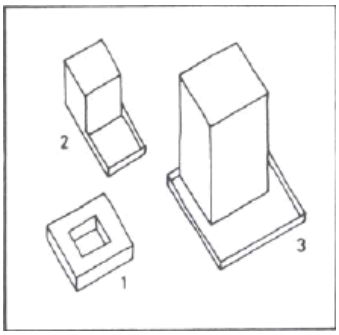


Figure 118: The changing pattern of the courtyard (Nabavi, 2011)

In contemporary architecture, contemporary amenities provide more convenience for residents. In contemporary homes privacy is forgotten in design. Because of shortage of construction land, average area of houses decreased to less than 80 m^2 forcing designers to discard some necessary spaces in the plan and build multi-function rooms. On the other hand the relationship between the men and women is different in the contemporary period and also the relationship between the Family members (Arjmandi, 2010).

Small size of the house dictates that spaces are close together. For instance, kitchen is positioned near living areas as well as bathroom (Figure119). Rooms get smaller in size with lots of electrical and mechanical facilities which consume energy in an inefficient way.

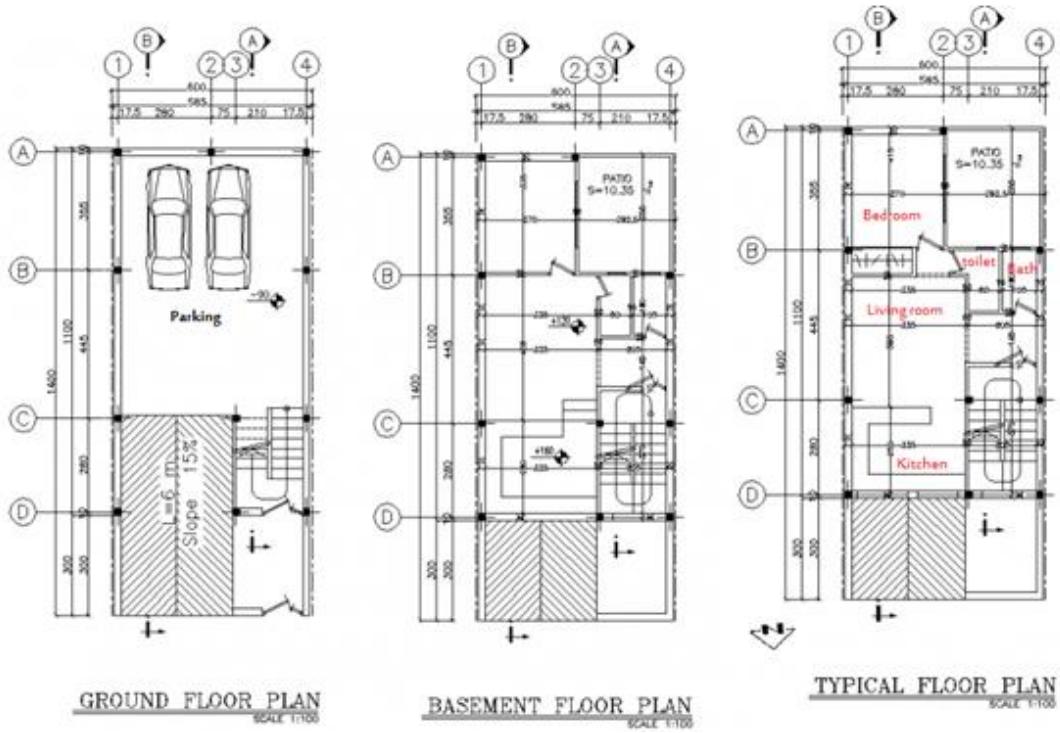


Figure 119: Typical Plan in Contemporary apartment in Kashan

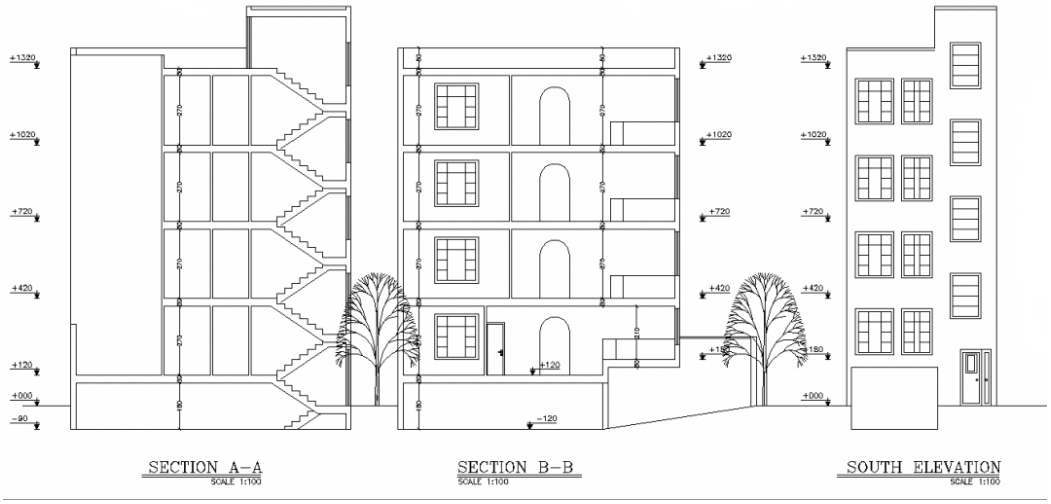


Figure 120: Section of contemporary apartment in Kashan

Soltanzade (2005) The Contemporary era led to significant changes in socio-cultural values in Iran. Nowadays, women do not spend majority of their tie inside the house as they are working and taking part in social activities. Kids also spend they daily life in schools and kindergarten institutes. So, there is no need to plan spaces for children pleasure. Parents have to work long hours outside the house so, home is a

place mostly used for sleeping. Contemporary life style dictates that no family gathering space and visitor room is needs in homes. Modern electrical and mechanical facilities provide more comfort but passive lighting and ventilation strategies are totally forgotten in contemporary design. In conclusion, the way contemporary design is preceded homes will get even smaller in size and will be converted into shelters for sleeping instead of being a comfortable area to reside in.

6.2 Discussion on Contemporary House Design in Mukalla

In the cities this improper layout is clearly observable and it causes physical complications to the buildings as well as psychological issues for the inhabitants. It seems that cultural aspects of Islamic religion are not considered in the contemporary architecture. Providing privacy for woman or position of the house with regard to Kible are two instances of this problem. Furthermore, apartments in contemporary architecture induce the sense of isolation for the people of Mukalla. The spaces are small in size and the functionality of these small areas is poor according to inefficient distribution (Figure 121). As mentioned before, the rooms have no specific function. For example a diwan room would be served as living room or guest room. Instead of separate kitchen and dining area, there is only a small kitchen or maybe a balcony is used as the dining area. Master bedrooms replaced conventional bedrooms with no difference for men and woman residences (Beissa, 2011).

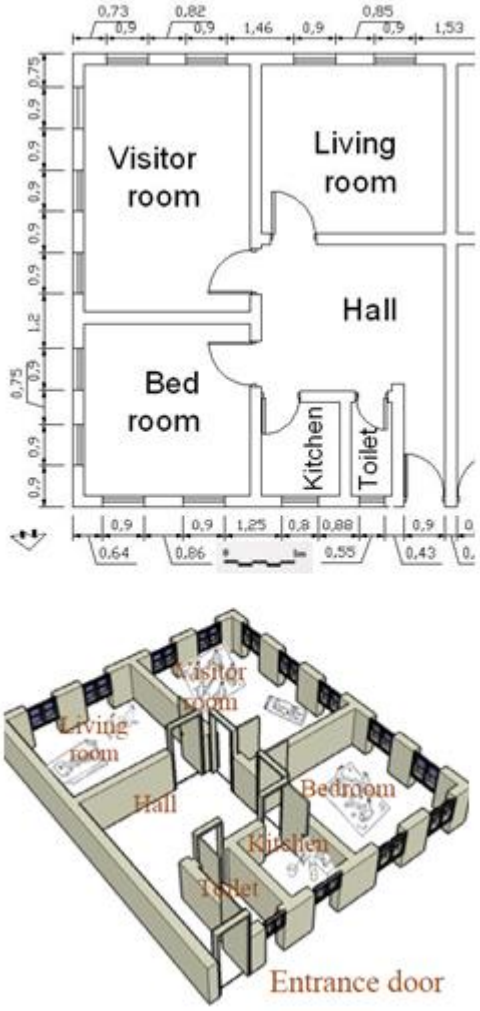


Figure 121: Plan and Axonometric of a small unit contemporary apartment for Low-Income Group in Mukalla (Beissa, 2011)

In contrast, the family's daily activities inside the house spaces are still unchanged in Mukalla. Unlike contemporary houses with massive furniture which divide space and decrease its usability.

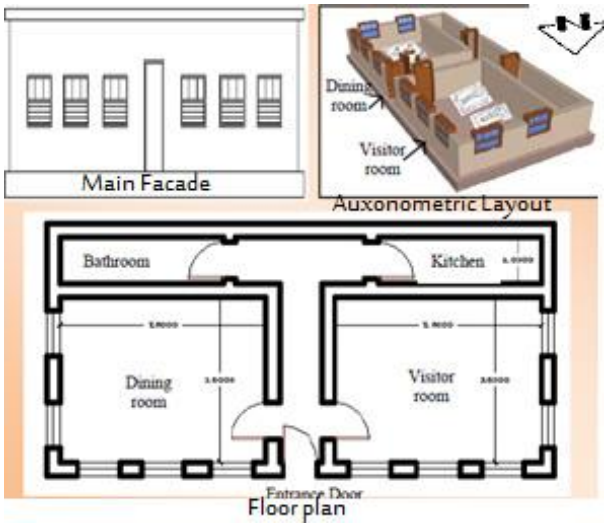


Figure 122: Absence of a Diwan in Low Income contemporary House (Beissa, 2011)

In contemporary architecture, old houses are divided into small apartments for several families as the price of land increased. One of the main problems with these small houses in that there is no space functions as Diwan. In fact, they lack multi-functional flexible spaces and this is definitely and issue for convenience of inhabitants (Figure 122) (Beissa, 2011).

In contemporary design, bathroom is shared by men and women in the house. The reason for this configuration is shortage of construction land and its high price. On the other hand, the relationship between the men and women in the contemporary age has a lot of difference compare to traditional relationship between the family members. In contemporary houses waste water sewerage system is shared with other buildings. In addition, because of small area of the house no basement or storage exists (Mukalla Master Plan, 1982).

Position and arrangement of rooms is dictated by the rooms' function and rate of movement between adjacent rooms. Again due to shortage of land in contemporary architecture, the position of the rooms in plan is very poorly designed (Beissa, 2011).

6.3 Discussion on Contemporary House Design in Riyadh

The effective role of courtyard in Riyadh traditional design is not well understood by foreign architects. It is also not known by some Saudi Arabian architects and they begin to built contemporary style closed buildings. This new style of design is not adapted to Islamic culture as well as environmental condition. Instead of courtyard, contemporary houses are surrounded by gardens with low walls. As a result, the outside live have insight to the interior spaces and the garden is not a private area. Mainly the people who sit in the porch during the afternoon can overlook the neighbor house which is not acceptable in Saudi Arabian culture leading to tension between the neighbors. Moreover, low walls can not provide shading for the garden and extreme heat makes this space useless (Akbar, 1980).

Akbar(1980) described that the Majority of contemporary houses are detached or semi-detached and as result they are exposed to sunlight. Unprotected openings are another design issue for both privacy and climatic matters. Hence the windows are almost useless and residents rely on fans and ACs for enhancing the interior temperature. In addition to aesthetic issues, this method is both expensive and inefficient and only higher class families are able to benefit from AC-cooled houses. Furthermore, contemporary architects do not pay attension to oreintation of the houses. In fact, there is no concern to provide natural and passive ventitaltion. Streets seperating the houses are becoming wide in contemporary architecture.

In Saudi Arabia, government is responsible for management of the land to be used for construction.

In mass construction of contemporary architecture the identity element is lost. In contemporary houses, spaces are specifically designed and furnished which is not efficient. Privacy is decreased for inhabitants as there are less open private areas. Social level of the family forces some design issues as well . In contemporary design, massive trasportaion needs streets and alleys to be wide and there is no such public to semi-private hierarchy (Akbar, 1980).

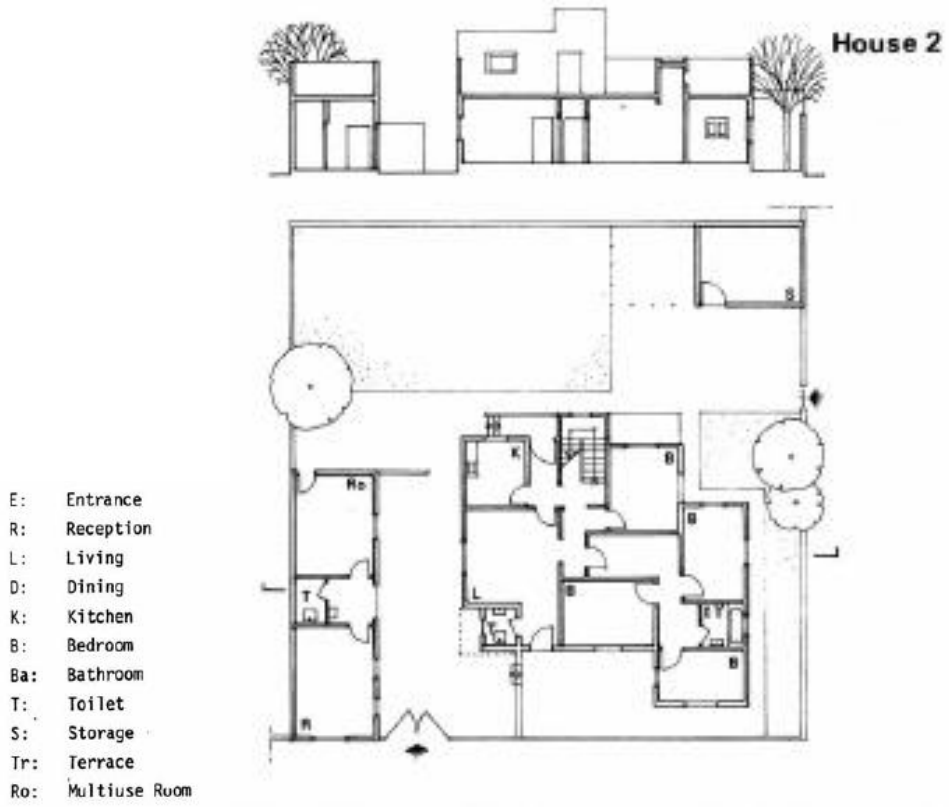


Figure 123: Contemporary house in Riyadh (Akbar, 1977)

6.4 Discussion on Contemporary House Design in Baghdad

Contemporary houses with no yard are brought into Bagdad architecture either by foreign architects or by local designers study abroad mostly in the U.S., U.K. and Europe. The concept of contemporary houses without further investigation and analysis is established. In this concept, a special type of connection between different

living space exists which fits the cultural facts. On the other hand, passive thermal convenience is not considered. In contemporary houses, all features of the design have been changed. The privacy in the contemporary houses has been changed. The reason of this change is goes to the relationship between the men and women in the family. Contemporary relationships are so different from traditional families. For a house to fulfill inhabitants' needs a special type of material, a specific plan, size and elevation is necessary. All these features differ in contemporary houses of Baghdad compared with traditional ones.

The shape of contemporary houses in Bagdad is rectangular. There is a garden in front of the house or may be at two or three sides. Some houses are surrounded by a garden from all sides and in this case the whole building is affected by the plot. The main plan of the house is of any kind such as detached, semi-detached or balcony house. While there are houses with one or two floors, mainstream houses are built in two floors.

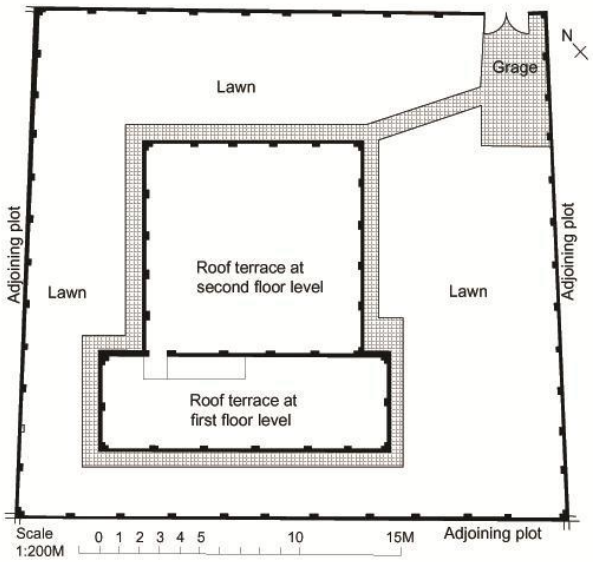


Figure 124: A contemporary house in Baghdad (Mandilawi, 2012)

In the first floor there are two spaces which are connected together, family living room called “Hall” and guest dining room. Guest room is designed as a long room in with the reception and dining area are attached together. Usually the kitchen is positioned in front of the house with a frontage faced to drive way. Often kitchen is located near the family dining room. The position of service room such as storage and toilet is different from other main spaces. If the house is medium or large, there would be one or two bedrooms at ground floor. The ground floor is served as the winter living are during the day and afternoon. It is also used by the inhabitants as the summer daily living space. In the first floor there are bedrooms and sometimes a roof top balcony surrounded by walls. The first stair is served for living only during the night in winter. Sometimes during the day and evening the bedrooms in this floor are used for studying. Below there is a sample of contemporary house plan, section and façade for better representation of this kind of houses (Mandilawi, 2012).

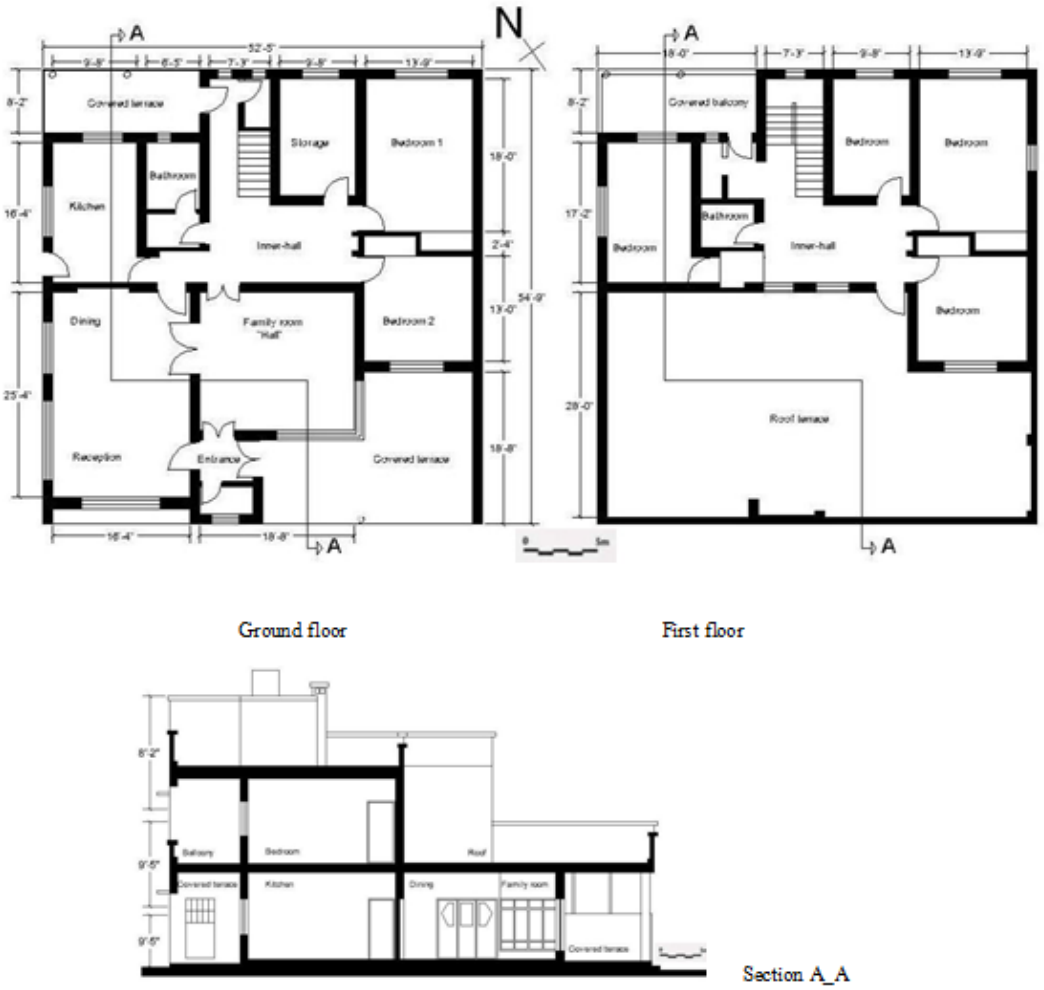


Figure 125: Ground and first floor plan and section of Mandilawi house in Baghdad (Mandilawi, 2012)

Roof view

Front facade view

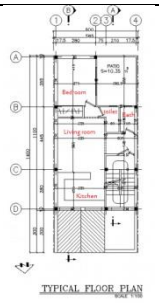
Back facade view

Figure 126: 3D drawing of Mandilawi house in Baghdad (Mandilawi, 2012)

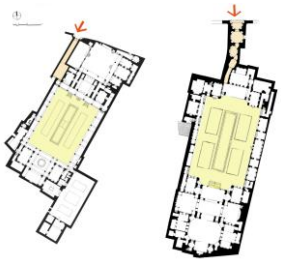
6.5 General Discussion on Houses of Kashan, Mukalla, Riyadh, Baghdad

In this part the general features of traditional and contemporary houses in the four studied region are compared in table form. The plan, elevations, sections and some elements of the houses are compared to give a general idea about how the house designs in these regions have changed in time.

Table 2: Indicate Traditional and Contemporary house examples in Kashan (Visuals)



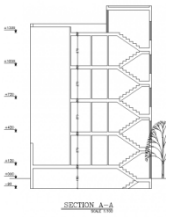
Contemporary plan in Kashan



Traditional plan in Kashan

Contemporary Facade in Kashan

Traditional Facade in Kashan



Contemporary building section

Traditional building section in Kashan

Contemporary Window

Traditional window in Kashan

Contemporary door

Traditional door in Kashan

Table 3: Discussion of Traditional and contemporary houses in Kashan (Data)

Traditional houses in Kashan

Feature related to climatic factor

1: Water and trees and mud brick for evaporative cooling in courtyard

2: Shaded areas in courtyard

3: Surrounding the courtyard with high walls reduced the floor warmth

4: Using open areas during the day

5: Summer and winter room's

6: Using Badgir as an element for cooling

Feature related to privacy

7: Main entrance is open to a Hashti

8: Andaruni (the zone for family) and Biruni (the zone for guests).

9: Bed rooms are sedaris and panjdaris *are* for the living rooms

Contemporary houses in Kashan

Feature related to climatic factor

1: contemporary Buildings has no specific orientation

2: Using mechanical and electrical systems for cooling and heating and also makes located kitchen near living spaces but in small size

Feature related to privacy

3: Apartments and residential complex replaced with Individual houses

4: Front yard which exist in contemporary house replaced instead of central courtyard

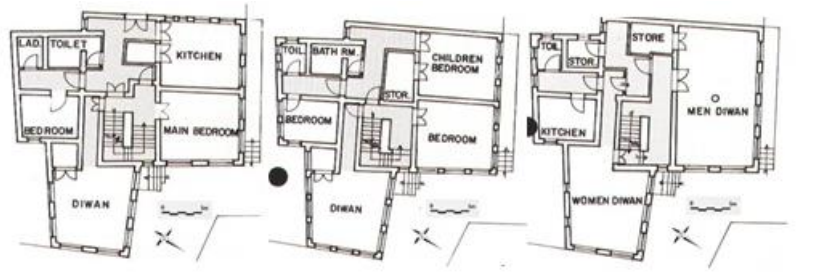
5: The front yard in each building belongs to all apartments in the building

6: The land size of the buildings reduced and they are shapes as rectangular form

7: In contemporary building there is single function for the living spaces instead of multifunctional spaces in traditional houses

8: There is no Special part in contemporary houses which belongs to guest

Table 4: Indicate Traditional and contemporary house examples in Mukalla (Visuals)



Third Floor Second Floor First Floor

Traditional Plan Mukalla

Contemporary Plan Mukalla

Table 5: Discussion Traditional and contemporary houses in Mukalla (Data)

Traditional House in Mukalla

Feature related to climatic factor

1: Main material is stone and there are wooden grids

2: Roof terrace for sleeping in hot summer

Feature related to privacy

3: There are Separate bathrooms for females and males

4: There is enough space for staircase and entrance hall

5: A separate storage and also basement

6: A Diwan in the first floor for visitors

7: *A Diwan* in the first floor for male guest

8: A Diwan specify for women

9: A bedroom for head of the family located in the third floor

Contemporary house in Mukalla

Feature related to climatic factor

1: The main material for contemporary construction is reinforced concrete

2: Using electrical and mechanical system for cooling and heating

Feature related to privacy

3: There is only one bathroom uses by men and women

4: The staircases and Hallways are dark and small

5: There is no basement or storage

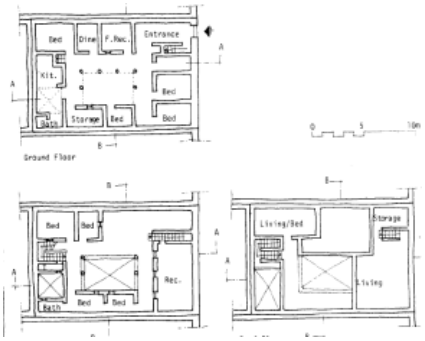
6: The organization of the plan for the rooms are so poor designed.

7: A diwan room would be served as living room or guest room

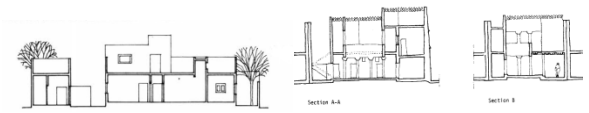
8: There is only a small kitchen

Table 6: Indicate Traditional and contemporary house examples in Riyadh (Visuals)

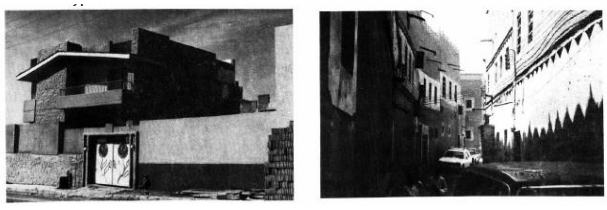
Contemporary plan in Riyadh



Traditional plan in Riyadh



Contemporary section in Riyadh Traditional section in Riyadh



Contemporary Façade in Riyadh Traditional Façade in Riyadh

Table 7: Discussion of Traditional and contemporary houses in Riyadh (Data)

Traditional House in Riyadh

Feature related to climatic factor

1: Traditional house has private courtyard for thermal comfort

2:The houses are close to each other

3:The streets are so narrow to protect from the straight sunlight

4:The windows are protected and called Mashrabieh

5: Roof-top porch at hot nights of summer is used for cooling

Feature related to privacy

1: The space design is general purpose and related their needs are multifunctional spaces

2:The windows are protected and called Mashrabieh

3:There is no insight in to interior part of the house

Contemporary houses in Riyadh

Feature related to climatic factor

1: They are semi-detached or detached building and exposed to sunlight

2: The openings are not protected which is against the rules for climatic matters

3: Design of the window is useless and they use mechanical and electrical elements such as fans and AC's for termal

Feature related to privacy

1: The garden in contemporary houses are surrownded with low walls

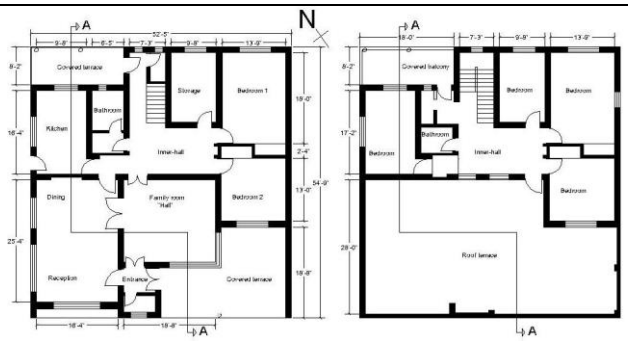
2: The insight of the building can be seen from outside

3: Garden is a public area for the building

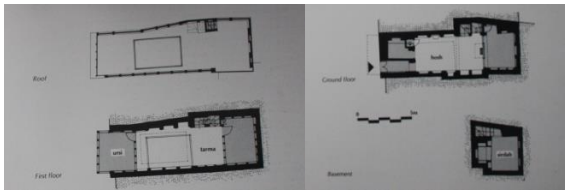
4: The spaces for living are specifically designed In contemporary houses

5: The openings are not protected which is against the rules for privacy

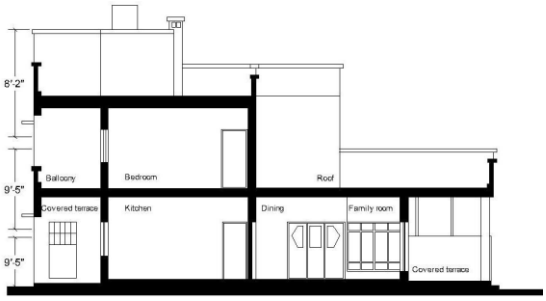
Table 8: Indicate Traditional and contemporary house examples in Baghdad (Visuals)



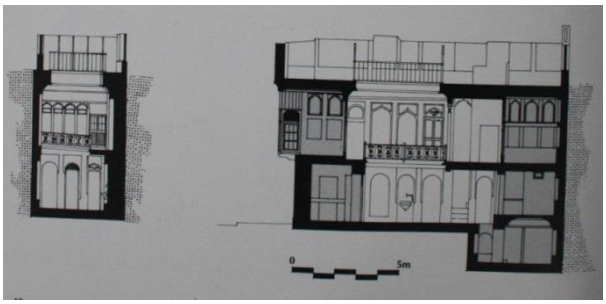
Contemporary plan in Baghdad



Traditional plan in Baghdad



Contemporary Section in Baghdad



Traditional section in Baghdad

Table 9: Discussion of Traditional and Contemporary houses in Baghdad (Data)

Traditional house in Baghdad

Feature related to climatic factor

1: The house separate in summer part and winter part

2: Courtyard has the thermal function in the house

3: Takhtaboosh, tarma, is for thermal comfort in traditional houses

4: Badgir is an element for cooling the basement for summer

5: Roof terrace for summer sleeping

6: Mashrabieh is using for cooling

Feature related to privacy

1: The spaces are multi-functional

2: Courtyard has the privacy function in the house

3: Mashrabieh is using for privacy

Contemporary Houses in Baghdad

Feature related to climatic factor

1: In front of the house is a garden which is surrounds the house from one or two or three side

2: The contemporary houses cooling and heating is by a ceiling fan, a liquid-cooling system or an AC

3: Large windows without any protection

Feature related to privacy

1: Contemporary houses in Bagdad are rectangular

2: There is no privacy between outside and inside because of the large openings

3: Each room and part has a specific function

4: In front of the house is a garden which is surrounds the house from one or two or three side

In the summary of this chapter it is described that the contemporary houses in four regions such as Kashan, Mukalla, Riyadh and Baghdad are changed from the traditional one. This information is explained through the pictures, plans and also bullets based on two different categories such as climatic factor part and also privacy part.

Chapter 7

CONCLUSION

In this study, traditional features of traditional houses were inspected focusing on passive strategies for cooling and heating as well as analysis of privacy in interior pat and exterior part of the house. This study limited to four countries including Iran, Iraq, Yemen and Saudi Arabia. In each country a special city with hot and dry climate was selected. These cities are Kashan, Baghdad, Mukalla and Riyadh, all sharing BWH climate according to Koppen. In addition, all case studies are located in the Middle East with the same Islamic religion.

Traditional architecture of these regions has been transformed to contemporary construction. This design typology does not match the weather condition of these four cities. In the past, gender separation and privacy for women residents of the house was considered in the design, while it is not of any concern in new constructed buildings. This different has a result base on the relationship between the man and women which has been changed in contemporary life. Passive heating and cooling strategies are also overlooked in contemporary architecture. Efficient designs such as implementation of different spaces as cool and warm sections are not observed in contemporary homes. As a reason, ventilation in contemporary homes needs a lot of energy which is obtained by fossil fuel resources. These days the natural fossil fuel resources are being faced to be finished. It could bring a big problem for the humans in the world for living.

Our analysis declared that in traditional example houses of these cities, natural resources were effectively used for heating and cooling. In examples of traditional houses of Kashan and Baghdad which is analyzed before, summer and winter living spaces are implemented. These sections have different orientations regarding the sun which makes them cool during the summer or warm during the winter. In contemporary architecture examples which are explained before, there is no specific solar-oriented space.

Another important characteristic is wind towers. Wind tower uses a passive mechanism to flow the cooled air into the interior spaces of the building. Conversely, in contemporary homes this ventilation is performed by air conditioning system by utilization of energy and so spending money which is not affordable for all people. In addition, central courtyards in examples of traditional houses which are described in previous chapter were served as private spaces for women residence to keep in touch as well as a place for kids to play around.

Furthermore, in the examples of traditional houses of Mukalla and Riyadh feature also roof spaces to be used at night in summer for sleeping. Basements in Kashan traditional example and Baghdad traditional example have ponds and they are used as cool spaces during the summer. As mentioned before, privacy is also considered by traditional designers. For instance, in Mukalla traditional houses example there are separate bathrooms for men and women, while there is no such an item in contemporary buildings. In fact, there is no specific male or female space in contemporary homes. Another issue in privacy of the house is having sight to the outside without being seen by strangers. This issue is not considered in contemporary apartments which are congested in a small area and all have sights together.

Finally, it could be concluded that both climatic factors and privacy issues were considered in design of traditional houses in the past. However, the pattern of contemporary homes is almost identical in all regions without taking into account such matters. People in contemporary period need to reconsider our design style by using traditional design characteristics as the benchmark.

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