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## THE YEMENI ARCHITECTURE INFLUENCED THE CULTURE IN THE TOWER HOUSE IN BAB AL YEMEN, SANA'A

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### Abstract:

This paper study on the traditional tower house in Old City Sana'a as known as Bab al Yemen. It focusing how the local context with lifestyle and culture determine the traditional architecture and design in Bab al Yemen and different regions of Yemen and Arab regions, according to nature, climatic conditions, culture, traditional values, and native knowledge. Overview for architecture and design during the twentieth century, civilisation and the Islam perspective in the Arab region, and selected the traditional tower house in Yemen as a case study. In addition to the analysis the traditional tower house form and layout in Sana'a city, the design and elements of the house; spatial organization, construction systems and building materials, and window openings included ornaments patterns. The study summarises the aspects of lifestyle and culture in the traditional house as an ancient traditional knowledge for character of architecture and design. In conclusion, the traditional tower house in Bab al Yemen, designed according to the local context and indigenous traditional knowledge, have influenced traditional tower house architecture; the house elements and design satisfies the lifestyle and culture aspects. This includes design aspects related to the house layout, the application of traditional design, the traditional building material, the Islamic values in house design, the exterior appearance of the house and lifestyle aspect. heritage and indigenous traditional knowledge toward sustainable architecture.

### Keywords:

Tower House; Bab Al Yemen; Ornaments Pattern; Architecture; Islamic Value

## Introduction

The Tower House in Old Sana'a as known as with a strong character in architectural building, an impressive identity, deep cultural understanding, and environmental harmony that includes a local culture and religion. The ancient city of Old Sana'a has been in existence for more than 1,000 years. This ancient city has more than 14,000 of tower houses that have existed for a long time and can be seen until today. The great architectural structures in each tower house rise up between 6 storey six and 9 storey high with the amazing decoration towers an interior of tower house. The traditional tower houses of Yemen define the social life and structure of the community as the way the house is built. The technique of building tower houses has been passed down from one generation to the next. Uniquely the tower houses have managed to create an inventive solution in the utilization of space component and natural lighting system.

## Background

In the Yemeni tower house architecture, the most attractive component is the window composition. The element consists of two parts namely the lower part meant for viewing and ventilation, while the upper part is to serve as a fan-light, filled with alabaster or stained-glass layer to heave light inside the room. The other part, called '*Shubaq*', is a perforated box structure used as store jars to keep drinking water and foodstuffs cool. Most of the tower houses in Old City Sana'a (Figure 1) have ventilation holes doubled as loopholes to shoot unwelcomed people. Most of the opening systems in the tower houses are decorated with pre-Islamic design motifs and elements such as half circles and arches. Other elements found-in the opening systems are rectangular and coloured-glass windows, probably of foreign influence.

The history of the Old City Sana'a is threaded over with mystery, legends and deviating accounts. With the indication of early human activity in the area, based on archaeological research, has been dated back 1.6 million years, to the Paleolithic period. The construction of the city began with Shem, the son of Noah (Baydani, 2005) even though no historical data were record this narrative (Saad Yusr, 2013). From other source, Sana'a is a Sheban city, built by Halk Amr, king of Sheba and Dhu Raydan, in the years 140-150 of the Sheban calendar, or 1070-1080 BC (Al-Farah, 2004). According to UNESCO, the exactly of dates the cities was founding over 2,500 years ago.

Nowadays, the Old City Sana'a is a heritage building of the city's history. The building was had maintained in the urban historic and architecture – its residential and religious buildings, its markets, streets and squares – the city offers a bright illustration of Islamic cities of the Middle Ages.



**Figure 1: View at Old City Sana'a**

Source: Gelbart, 2021

The Old City Sana'a history was built in three (3) phases development and construction since a long time ago. Table 1 shows the phases of development of Old City Sana'a.

**Table 1: The phases of Development and Construction in Old City Sana'a**

Period Phases	Description
<i>First phase:</i> <i>The Pre-Islamic period (910 BC – 525 AD).</i>	In the 1 <sup>st</sup> century BC, the Ghamdan Palace was built in the Old City of Sana'a. A clay wall was built around the city between 115 and 80 BC, with four main entrances: Bab al- Yemen, Bab Shaoub, Bab al-Sabah and Bab Satran. Subsequently,
<i>Second period:</i> <i>The Islamic era (627 AD-1229 AD).</i>	Building recommenced and Sana'a sustained to expand thru the Umayyad and Abbasid periods. In 6 Hijri (627 AD), the Great Mosque was built.
<i>Third period:</i> <i>The Ottoman era (1547 AD -1629 AD).</i>	A new neighbourhood, Bir al-Azab, was built at the western part of Sana'a, and occupied by employees of the Ottoman Empire. The Ottomans built a wall around it, complete with towers, and resembled the walls of the original Old City.

Source: Al-Ahnomi, 2021

## Literature Review

### Definition of House Design

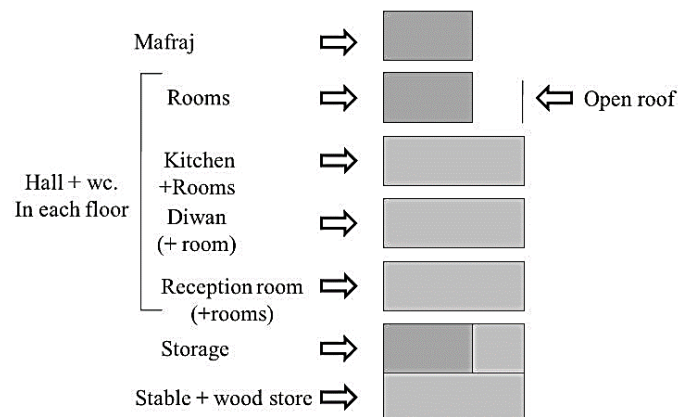
In Arabic dictionary *Al-Munjid* (Al-Balabki, 1987), house is defined as a place (*Al-Sakan*) which is "...to settle down, relax, become calm, calm down, reside in a place, and house unit". According to *Oxford Dictionary* (Allen, 1987), it defined a house as "...a building for human habitation". The United Nations (United Nations, 1977) also defines a house not only as a shelter but its designing for community's environment in terms of the organisation and the allocation of living space areas are required the space planning and function design. According to Caudill (1978), the layout designing must be aware the current and the future needed depending to cost, size and building design to ensure the physical environment that the residents interact within the spaces. However, the layout and design need fulfil the needed to occupied and ability of the designer to designing the spatial space.

### Opening Components

In designing a house, possibly integrated with a small yard where it practices at the lower levels with the less of number window at store rooms, to elevate the living space above from the smells and noisy from the streets and to provide a secure barrier against intruders. In the traditional house in Old Sana'a city, basically the first or second storey was is integrate with the yard area and the kitchen area is located. Why the kitchen is located at that storey? The purpose is to secreted the sight from the men of the house and guests. Another part space, a toilet basically designing through a channel or hole in the stone floor where to make easy the for the sewage system go out to through the drainage into a hole in the ground in the yard or directly into the street. For the water sources, the system is designing where is the water drawn from a well and carried by the women to the kitchen or by pump to a storage tank on the roof.

The attractiveness of the traditional tower house Yemeni window comes from five components which are combined with all the functions and elements of view, lighting, ventilation,

protection, and privacy. However, these functions would be controlled by the occupants depending on their social and environmental condition. As previously mentioned, the Yemeni tower houses have a lot of windows. The four (4) main components of the Yemeni windows are subdivided into the lower part (*Taqah*), the fan-light (*Qamariyyah*), the wooden external overhang (*Konnah*) and the small vent (*Shaquos*) in Figure 2. Although the fan-lights provide natural lighting during the day-time, the lower part component can be reduced the heat warmth and exteriors shutters can be closed without using artificial lighting.



**Figure 2: The Activities for Each Level Inside the Yemeni Tower House**

Source: Ronlad Lewcock, 1986

The Yemen ancient people usually kept their animals, goods, vegetables, fruits, wheat grains and wood this level. Some goods they also kept on the next level. The next floor, they are having rooms for reception, *Diwan*, kitchen and personal room include bathrooms in each room. At the sixth level, there are has open roof. Usually they will chew '*qat*' and take rest. The upper level is called '*maffraj*' for rest area, meeting friends and event such as wedding ceremony. The '*maffraj*' ceiling and walls are white colouring with the plaster and carving with fully patterns around the doors and windows. The nice part is at the top of windows, where has a curving decoration with the colourful glass is called '*al-qammariah*'. Generally, the carvings at the top of windows will portray from the Quran, natural forming or wall-panels in Arabic script. The window also covered with around and facing at the north part of wall of the '*maffraj*' with form semi-circular openings tracing coloured glass. When the sun through inside the interior space, the natural light will be going through the windows and reach down close to the floor to guide the guests to the seating on floor-cushion. The '*maffraj*' is furnished together the lower sitting is called '*majlis*' and carpet in colourful with the contrast to the plain whiteness in the room.

The interior spatial of the tower houses is based on a vertical sub-division around a central staircase. The ground and first floors are slightly dark and modest which is to use as stables and storage areas for food, timber and other materials. The space of the interior is depending of the house sizes, the actual living areas develop from the third floor, and can be at the eight storeys in height. Even though, the private rooms are huge space at the third and fourth floors and locate the reception and business room for guests and a diwan as a room reserved for special occasions and family celebrations. The top level of the house is usually designing for the male residents and their guests, providing an absolute view of the city. The inspiration interior is from the space of Ottoman influence, known as the mafraj, are lavish open terraces. The kitchen is underneath the top floor, enabling the service in both directions – up to the top floor or down for principally family use.



According Table 2, it shows the activities in tower house in Old City Sana'a. Each floor has function based on the house owner to design their layout and space. Most of interior tower house was created with unique spatial area and amazing colorful decorative. The types of furniture selection also very nice and high quality.

**Table 2: The Activities for Each Level in Tower House**

Level	Function
The Ground Floor	The main entrance hall (Dihleez) and stables (Ahrer, singular Harr), used for animals or as a storeroom for firewood.
1 <sup>st</sup> Floor (Mezzanine)	The level used for grain, mills, storage (Ahghob).
2 <sup>nd</sup> Floor	The largest room in the house (Diwan). The Diwan is the reception room for special occasions such as weddings, births, and funerals.
The Upper Floor	The sleeping rooms, sitting rooms, dining areas, bathrooms, and kitchen, which are the most private zones. Kitchen are the most uncomfortable places; due to their poor finishing and continuous ventilation.

Source: Rasha Shaia'a, 2010.

According to Figure 3, it shows the activities in Yemen traditional tower house which there are three parts of the activities of religious, cultural and social. To sustain the elements of Yemen traditional houses, the owners and architect's role is important to maintain the design characteristics and elements. All the activities in Yemen in the house are very important to sustain tradition in their respective roles. The ground level was located for stable and wood store.



**Figure 3: The Types of The Activities Inside the Traditional Tower House.**

Source: Abd Hamid and Abdul Razak, 2012.

### ***The Tower House Form***

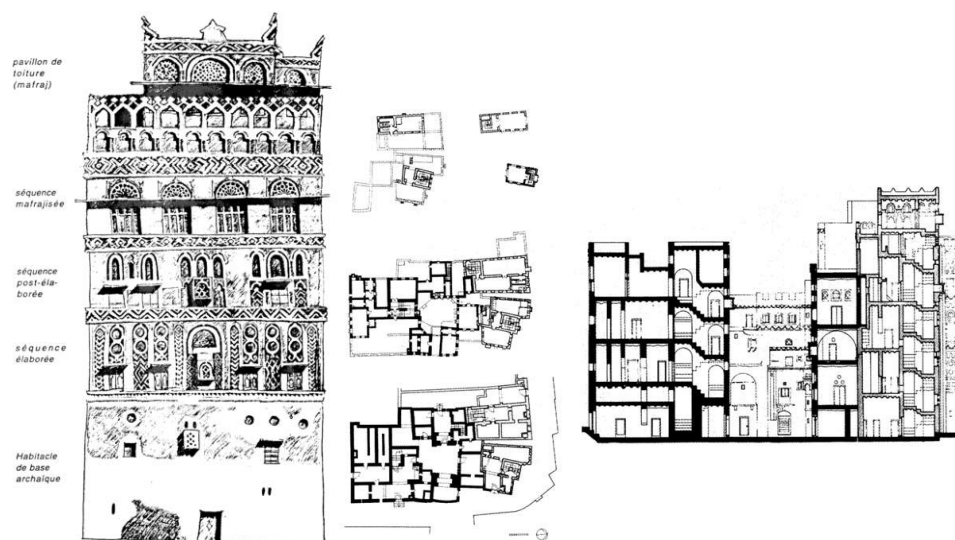
The culture in Yemen were incredible with lifestyle and harmonies. The architectural character and exterior structures of house are distinctive and sustain follow by time line. Lots of house architecture in Old Sana'a city are high rise more than 6 storeys. The house goes up with the vertical staircase and passage does not go too linked with the living area. This maze of rooms is creating mix-up because sometimes the space has many numbers as sixty in all. Irregularly, the guest also confuses with the path area and layout in level between the corridors and doors, is very mysteriously with the variation place. Talking about the living room, is was huge space because some activities where be held here and depending the needed of the moment or the style of the householder.

The houses in Old Sana'a city was built from the stone, brick or mud-block, and constructing of all three. The construction may be made from the specialist craftsmen or by the householder himself, even the quarry also from his own stone and mould his own mud-blocks and cheaper, high quality and less maintenance required. Furthermore, the technique and materials of construction in Yemen are well-suited with the climate here where high daytime temperatures

and often bitterly cold nights are. The good quality and selection of material for walls and roof are to make sure when the day's heat for night-time use can sustain from the inside the house and comfortable temperature without the use of heating or ventilation systems.

The vertical forms of vernacular architecture of Yemen is known for its strong character, remarkable identity, and deep cultural meaning (Al-Sallal, 2004). A previous study showed that the vernacular house in Sana'a provided better thermal comfort than the modern house (Al-Sallal *et al*, 1995).

Usually, the opening systems in the tower houses are designing with pre-Islamic design motifs and elements such as half circles and arches. Other elements found in the opening systems are rectangular and coloured-glass windows, probably of foreign influence. Normally, in a single building, several multi-sized window openings of different shaped are installed at every storey. This is to ensure the ventilation system is operational in supplying fresh air and natural lighting in its entirety in Figure 4.



**Figure 4: Typical Façade of Tower House (Left) and Cross-Section of Tower House Building (Right)**

Source: Ronlad Lewcock, 1986

According to Al-Sallal (2001), the vernacular Sana'a house's harmonious synthesis of form and space was employed as the primary tool for reducing the impact of the climate and meeting cultural needs. All of Sana'a's residents were aware of and adhered to a set of conventions that were used in both the city's vernacular architecture and urban planning. These traditions have a lengthy history and were created over the course of Sana'a's existence to meet the sociocultural demands of people and to adapt to the city's climatic and environmental conditions. Due to sociocultural factors like the activities and traditions of the community, the vertical spatial arrangements varies.

The typical house in Sana'a is called the 'tower house', and is built using earth, stone, baked brick, or a combination of these materials with an interior staircase that allows vertical expansion as more space is needed (Soltanzadeh *et. al*, 2015). Due to Islamic beliefs on the male and female hijab, the public and private areas of every tower home are divided from one another. As an illustration of this tradition, Sana'a homes have a dedicated floor designated for

women and thus the vertical form of the tower is a reflection of how culturally the spatial arrangements is architecturally influenced.

### ***Importance of Socio-Cultural Designs of Sana'a Buildings on Cultural Identity for Tourism***

With the consent of the Council of Ministers, a Constituent Declaration was published on May 8th, 1979, to improve some of its earlier acts and to expand and focus more on Sana'a's Old City in support of its rich culture and architecture.

The conservation principles and criteria essentially called for maintaining the original standard and fabric of the house's outer façade. A maintenance handbook is also included with the recommendations. The Act has mentioned the changes of the initial use (Article 5-10), "creating new openings as commercial or non-commercial reuse are not allowed." Article 5-11 prohibits any change of building usage without legal permission. Non-compliance to the Acts will be charged with penalties (Haidar *et al*, 2014).

### ***Islamic Culture on The Formation of Sana'a Architecture***

Yemeni lands has at least three thousands history and because of ancient civilization in trade part was a link ring between India, China, Africa and the Mediterranean and it was one of the richest regions of the Old World (Amirdehi, 1388).

Because of valuable urban and urban development resources of Sana'a, it is known as a city with a high level of architectural and urban culture, which is cited in some published books and scientific articles. Studies indicate the cultural studies and its relationship with the physical form of the city (Homafar, 1392). It is obvious that the introduction of Islam in the first century AD caused a profound alteration in Sana'a's form, shape, and architecture. All the activities are focused by the mosque, as the other Islamic cities (Soltanzadeh *et. al*, 2015).

A community that is centred on a mosque and has a market and restrooms is said to be a "Islamic City" The separation of religion divided several areas of the Islamic city. The city has specific architecture and is surrounded around the mosque because of security reasons (Fatemi, 1392). Because of the unique beliefs of Yemenis that are influenced by Islamic culture, one significant cultural axis is established in addition to the fundamental components of Islamic towns such the big mosque, market, and schools.

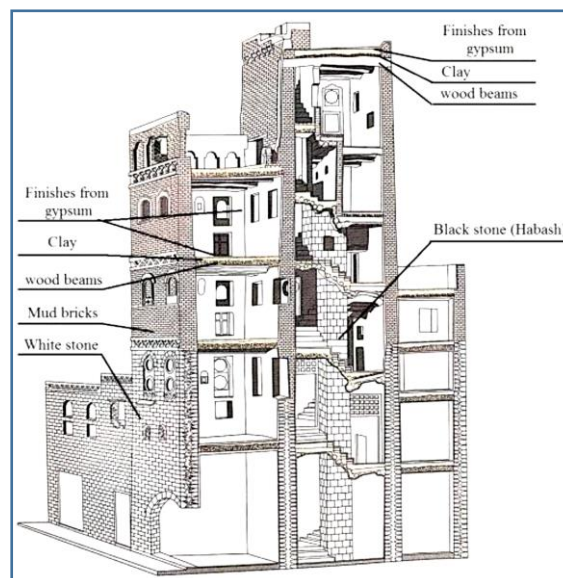
It is connected the most important south gate of the city (Yemen Gate) to the main north gate of the city (Shaub), and different kinds of activities are done in this route (Soltanzadeh *et. al*, 2015). Sana'a's architectural setting has been preserved throughout several Islamic eras, which contributes to its significance as a piece of world cultural heritage. Although the ancient palaces constructed prior to the advent of Islam were destroyed, their restoration in various eras has continued and the original shape and characteristics of the city has been related to the old principles (Soltanzadeh *et. al*, 2015).

It has strong identity, belonging and cultural meaning and considers socio-cultural needs such as privacy and sociability. It is environmentally sustainable and resilient, integrated with natural resources of energy, vegetation, and water. The design of built-form configurations, placement of interior areas, facade design, and window design are examples of socio-cultural influences on Sana'a tower houses. With a focus on privacy and safety, visual connection, solar

design, and ventilation, the socio-cultural and environmental values included in the Sana'a tower house's design are examined.

Three different social classes correspond to three different architectural styles. The majority of Sana'a's public spaces are located in the eastern section of the city, where there are also several mosques and markets. The core area of the city is where the palace and gardens are. Yemenese architecture is shaped and influenced by social and culture aspects. In addition to the fundamental components of Islamic towns, such as the big mosque, the market, and the schools, one significant cultural axis is established as a result of Yemenis' unique beliefs, which are influenced by Islamic culture. It links the city's most significant south gate (Yemen gate) to its most important north gate (Shaub), and various activities take place along this route.

The tower house is well-known in the Old City of Sana'a, and considered as one of the most significant iconic of the city, where the buildings created and developed as incessant block forming the sky rise in harmony with the surrounding nature characteristics, and these tower houses were built from 4-9 floors according to the need (Figure 5).



**Figure 5: The Building Materials Section for The Traditional Sana'ani Building**

### Research Methodology

The study was based on a case study of the Abuoluhum Tower House as a private ownership house. The research method was made with several phases to identify the building architecture characteristics in Yemeni tower houses design with the measurement on-site, building observation, building spatial measurements and secondary data collection from various sources. On-site observation and building spatial measurements on the Abuoluhum house were carried out in several visits within according to the schedule to observe condition, design, function of spatial building and decorative elements in tower house. This process was obtained from both *primary* and *secondary data*. The primary data includes interviews among the tower houses residential, site observations, physical measurements, sketches and drawings. The secondary data was gathered from several sources namely books, journals, proceedings and other materials. Both the processes are needed to ensure that all data is pertinent to the research findings and analysis.



## Findings

### *Case Study: Abouluhum Tower House*

The Abouluhum tower house is also known as Muhsen Ma'aedh (*Sinan Abu luhum*). The house is located on the east of *Aserar (Al-abhar)* facing the Middle Eastern side, which overlooks the Square (*Sarha*) on a large southern side. The square is separated from the *Al-abhar* mosque through a road by 19.40m width. The northern and western side of the building is adjacent or joined to the neighbouring buildings. The building, which belonged to one of the imams, was constructed in 15 A.D/9H later shifted to the Muhsen Ma'aedh. This tower house had undergone several renovations and reconstructions under the stewardship of Muhsen Ma'aedh.

The first construction of the building belongs the construction of the Abhar mosque and its bath year (1374 / 776) or at the same time of the construction the building has been through lots of renovation and maintenance proves the last one has been done by this ownership of this properties as moved since its first construction many times it was first under the ownership of *Muhsen Ma'adh* before 11 last transformation to *Abouluhum* family 1962-1382.

The large non-residential buildings thereto facilities complementary services assistance. The building of residential buildings in Old Sana'a inspiration for his money from the values of historical architectural and decorative. The building can be classified in terms of size, function, character and identity. The tower house is defined as a large residential building consisting of six floors, including the mezzanine. The formation of the space follows the architectural and decorative structure in Figure 6.



**Figure 6: Main Entrance (Left) and Façade (Right) of Abouluhum Tower House.**

Source: Abd Hamid and Abdul Razak, 2012.

### *Spatial Architecture and Interior Elements*

The research discovered that interior space elements of the building reduce indoor temperatures even though the condition outside is intense. The utilization of thick, high quality stone bricks absorbs the heat thus making it cooler indoors especially during summer.



**Figure 7: Mafraj Entrance (Left) and Interior Space (Right)**

Source: Abd Hamid and Abdul Razak, 2012.

### ***Ventilation in The Staircase and Lobbies***

Sana'a tower house architecture employs a unique sustainable design. Most of the tower houses do not require sophisticated mechanisms such as fans, air-conditioners and coolers. The tower houses were planned to reduce cost and excessive energy consumption. In the Yemeni tower house, the best natural ventilation can be experienced in the staircase and lobby areas. Both these areas have masonry cooling boxes which help facilitate air flow throughout interior space with the natural air flow from stairwells provides fresh, clean air into other parts of the house, the lobby provides cool and pleasant indoor environment in summer months. Consequently, shutter doors are used and manually closed during cold or windy weather (Figure 8).



**Figure 8: Main Lobby (*Dihilize*) (Left), Step to Food Storage (Middle) and Cooling Boxes (Freezer) (Right)**

Source: Abd Hamid and Abdul Razak, 2012.

### ***Ventilation Inside the Rooms***

The placement or direction of rooms is determined by the air flow and low temperature side, whichever is better, to increase the level of thermal comfort inside the rooms. In addition, the function of each room or space is also taken into deliberation to allow proper ventilation throughout the area. Hence, several types of ventilation openings are provided for these spaces. For example, at the entrance lobby in the ground floor, the space is ventilated by small openings called '*Shaqous*' located at the top of the entrance door. However, for the lobby of other floors, windows called '*Shubak*' with a huge fan-light to let air flow into the rooms are employed. Additionally, ventilation for granary rooms was provided by small openings facing one another to allow smooth air flow. In living rooms, however, the street direction establishes the

placement of windows and small openings (*Shaqous*) for best ventilation (Figure 9).



**Figure 9: Skylight (*Al-Manwar*) (left) and Stairwell (right)**

Source: Abd Hamid, and Abdul Razak, 2012.

### **Results and Discussion**

The research revealed that preservation of traditional Yemeni tower houses in the Old City of Sana'a is vital in order to sustain the effectiveness lifestyle based on the architectural characters. This study also found the Yemeni lifestyle not depending on the cultural, but it depending to the how they designing their house. Almost all the tower house was created to ensure they adapt and appreciate the architecture elements into their lifestyle. Even though, the tower house almost built high rise building, they are still willing to stay inside to ensure their legacy sustained from the time.

This study is about the activities of Yemeni people which effects the layout plan of the traditional tower houses in Old City Sana'a, more on to relate the activities to the plan and study the spatial organization at the same time to determine the social, cultural and religious activities of the Yemeni occupants.

### **Conclusion**

From the research, the tower house was designing for better lifestyle according to the architecture character. Every element in the tower house has their own function for spatial design and housing layout. The division of spaces in the tower house has been cleverly planned to allow each area to receive natural ventilation throughout the year. With good ventilation, residents can live in a much better environment. Thus, it is imperative the preservation of its architecture and the environmental design of the tower house be sustained in creating a constructive environment for future consumption.

Based on the observation, it clear that the tower house spaces have been changed according to the need of the space, for example; the *Al- Kurs* room where the (animals stable) was located, most of the tower houses has turn it to storage. Also, in some levels they rearranged the spaces and turn it to a complete apartment to suit their needs, and that just happened if there is more than one family live in that house. As well as the size and the quantity of spaces in the tower house are different from one house to another depending on the family economic situation.

The justification on the lifestyle and culture the Yemeni tower house design were achieved according to the study in this research. The architecture tower house was the role to influenced

the lifestyle and the way of the Yemeni people live in the tower house. In the future, this study hopefully consist with continues with another research on the culture and lifestyle the Yemeni trend in according to the architecture inspiration.

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