

Evaluating the Effects of Modern Movement on Contemporary Residential Buildings in Iran's Capital City- Tehran

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ABSTRACT

In the late 19th and early 20th century, beside all rough and fast changes in European and American societies, architects, also started to abandon past styles toward a form of architecture that had regarded to functional concerns and had no roots in classic styles. After World War I, these new tendencies in architecture (Modern Architecture) were named as International Style that developed simple, geometric, figures and unadorned facades, and deserted any usage of historical references.

After extension of the Iranian's communication with western countries, during the 20th century, tendencies toward Modern Architecture reached to Iran. As the results, since the beginning of 20th century, beside gradual political, economical, cultural and demographic transformations that have happened in Iranian society, some of the dominant principles and characteristics of Iranian architecture began to be changed. This point was the inception for the new architectural tendencies, in Iran. Subsequently one of the most important Iranian architectural fields that were affected roughly was residential buildings.

This study was intended, to determine the influences and the effects of the Modern Residential Buildings characteristics, in respect to formal design issues like Free plan, Free designed façade etc. as well as functional issues like Separation of bedrooms for family members or Applying added toilet and bathroom together in house etc., in terms of contemporary residential buildings in Tehran. So, it was in the form of comparative study, among world Modern Residential Building characteristics, and Tehran Contemporary Residential Buildings, which helps to

determine those effects and influences, during the contemporary time (after 1925) on residential buildings in Tehran.

The study was based on three periods of contemporary residential buildings in Tehran, which were selected for analysis. Residences of first period were constructed during 1925 to 1941, Residences of second period during 1941 to 1979, and Residences of third period were constructed after 1979. Fifteen different residences were selected from each period, and totally, 45 residential buildings have been analyzed.

As a result of the study, it has been concluded that; during contemporary era in Tehran Residential Buildings, several characteristics and principles of the world Modern Residential Buildings were applied, including; having low or average house-area, changing the type of residential buildings (from villa to multistory and row housing type), applying and using industrialized method prefabricated elements in construction and applying skeletal system for houses construction, etc.

On the other hand, about other studied subjects like; rejecting application of decoration in houses or applying open plan type or using exposed structures, the results showed that; those characteristics were not applied more in Tehran contemporary residences.

Keywords: Modernization, Modern Architecture, Residential Architecture, Modern Architecture in Iran, Tehran.

ÖZ

19. yy'ın sonlarında başlayıp, 20.yy'ın başında Amerika ve Avrupa ülkeleri başta olmak üzere hem bilim hem de ekonomi, teknoloji ve sosyo-kültürel boyutta hızlı bir değişim yaşanır. Bu değişimin etkilerini, dönemin mimari eserleri üzerinde de görmek mümkündür. Modernizm ile birlikte, geçmişte kabul gören mimari üsluplar reddedilip, yerine işlev (fonksiyon) merkezli yeni bir mimari tarz benimsenmiştir. İşlev merkezli bu yeni anlayış, Modern Mimari'nin temellerini oluşturur. I. Dünya Savaşı'ndan sonra gelişen bu mimari eğilim, Uluslararası Üslup olarak da bilinmektedir. Basit geometrik formlar kullanıp, süsten uzak durması, bu üslubun başlıca özellikleri arasındadır. Yeni tasarımlara yönelen Modern Mimari, tarihi alıntılardan da uzak durur.

20. yy'da, İran'ın Batı dünyası ile iletişiminin artması ile Modern Mimari'nin etkileri bu ülkede de kendini göstermeye başlar. Yaşanan politik, ekonomik, teknolojik ve sosyo-kültürel dönüşüme paralel olarak, İran Mimarisi'ni oluşturan temel unsurlar üzerinde de bazı değişimler gözlemlenir. 20. yy'ın başlarında izlenen bu toplumsal değişim ve dönüşüm, aynı zamanda Modern Mimari'nin kendini yansıtmaya başladığı dönemdir. Söz konusu değişimin yansımalarını en bariz şekilde gözlemleyebileceğimiz mimari yapılar hiç kuşkusuz temel yaşama birimi olan konutlardır.

Buna bağlı olarak, bu tez çalışmasının başlıca amacı, İran'ın başkenti olan Tehran'da inşa edilen çağdaş konut mimarisi üzerindeki Modern Mimari'nin etkilerinin araştırılmasıdır. 20. yy. Modern Mimari ve konut kavramlarının temel

premsipleri ile İran Konut Mimarisi'nin karşılaştırıldığı çalışma genel anlamı ile mukayeseli bir çalışmadır.

Modernizmin etkilerinin İran'da görülmeye başlandığı 1925 yılı ile başlayan çalışma günümüze kadar gelmektedir. İran'ın başkenti Tehran'daki çağdaş konut mimarisinin incelendiği çalışma, belirtilen zaman dilimi içinde gelişen üç farklı dönem içerir. Bunlar; I. Pahlavi Dönemi (1925-1941), II. Pahlavi Dönemi (1941-1979) ve İslam Devrimi Sonrası (1979 ve sonrası) Dönemlerdir. Çalışmanın analizleri, belirtilen dönemlerin herbirinden rastlantısal olarak seçilen 15, toplamda 45 konut binası üzerinde yapılan saptamalar sonucu ortaya çıkmıştır.

Modern Mimari'nin etkileri, plan şeması, cephe düzeni, form, iç mekan, stürüktür sistemi ve bina malzemesi gibi mimarinin temel kriterlerine bağlı olarak analiz edilmiştir. Bunun sonucu olarak, her üç dönemde de, İran'da gözlemlenen politik, ekonomik, teknolojik ve kültürel dönüşümle birlikte değişen aile yapısı, ihtiyaçlar, gelir düzeyi ve yaşam tarzı ile beraber konut mimarisi de farklılık göstermektedir. 1925 yılında etkisini göstermeye başlayan Modern Mimari'nin İran Mimarisi üzerindeki etkisi gün geçtikçe artmış günümüze gelene kadar neredeyse evrensel boyuta ulaşmıştır. Bununla beraber, İran Mimarisi'ne kimliğini veren bazı temel unsurlara da raslamak mümkündür.

Anahtar Kelimeler: Modernizm, Modern Mimari, Konut Mimarisi, İran Modern Mimarisi, Tehran.

**To my dear parents (Samiyeh & Enayat) and my darling
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Chapter1

INTRODUCTION

The concept of the Modern Movement or Modernization, initially, can be described as rejection of traditions, and facing problems, from a new viewpoint, based on current and up to date ideas and techniques (Dinu, 2007). Modernism developed a period of experimentation, since the late 19th century, in Europe. In the late 19th century and in the beginning of the 20th century, architects also started to reject past styles, toward a form of a new architecture, which had roots in functional concerns. After World War I, these tendencies were identified as the International Style, which improved simple, geometric figures and unadorned facades, that abandoned any use of historical references, in design. Later than World War II, this style confirmed itself in clean-lined, unadorned glass and curtain wall high-rise buildings, and massive housing projects (Modernism, n.d.).

Residential building is one of the most important living spaces, in human society. From the Ancient Era till now, people try to promote their houses quality, according to their life style and latest needs.

Iran or earlier Persia, during its history, includes various dynasties, before and after Islamic Era. By passing time, some important principles were formed in Iranian architecture, and after that, Iranian architecture got well known, by them. After extension of Iranian communication with western countries in the beginning of 20th century, the waves of the modernism reached there and brought some political and social transformation there with itself. Following that, Iranian traditional

architecture began to change, under the effects of Modern Architecture. This point was the inception for the new design tendencies, in Iran. One of the most important architectural fields, which were affected from transformation there, was residential buildings, as a human basic living unit.

Consequently, Iranian residential buildings, gradually, were revolutionized under the influences of the Modern Architecture. These changes happened in various parts, from houses' plans schema to façade organization, space's quality, buildings' elements and materials and technologies. Even, the usage of ornamental elements, which were employed widely before in Iranian residential buildings, was affected by the transformation (Dehbashi & Diba, 2004). Nowadays, the spaces that Iranians currently live there were born during that process.

1.1 Problem Statement & Objective

Regarding to modern gradual political, economical, cultural and demographic transformations in Iran, during the 20th century, this study, intends to determine the influences of Modern Residential Buildings characteristics, in the case of contemporary residential buildings in Tehran, Iran.

So, it would be in the form of a comparative study, between World's Modern Residential Buildings characteristics regards to formal design issues like Free plan, Free designed façade etc. as well as functional issues like Separation of bedrooms for family members or Applying two or more bathrooms in house etc., in contemporary residential buildings in Tehran. This helps to determine those effects and influences, on some examples from contemporary residential buildings in Tehran.

The research question for this study is:

What are the effects of Modern Residential Buildings' characteristics on contemporary residential buildings in Tehran?

1.2 Methodology

The study is a qualitative one, and mainly focuses on the residential buildings, from 1925 to present time in Tehran. It would be a comparative analysis, regarding to Tehran's contemporary residential buildings which were built during 1925 to 1941 (First Pahlavi), 1941 to 1979 (Second Pahlavi), and, after 1979 till now (After Islamic revolution). The effects of World's Modern Residential Buildings characteristics regards to formal design issues as well as functional issues are determined on randomly selected examples of Tehran's residential buildings, as thesis case study's samples.

The case study's samples are the examples of residential buildings, which belonged to each of the mentioned periods (from each period, 15 samples are selected, randomly, among Tehran's houses). Then, each of those samples is evaluated according to modern residential buildings characteristics and principles regarding formal design issues as well as functional issues that were derived from literature survey and selected as indicators for this study which were gathered in the inventory forms.

Inventory, is developed into two parts. The first part of inventory includes figures and general information about houses like their locations, Plan schemes, Façades, Interior views, Special buildings elements and Ornamentation, and the second part of inventory includes assessment of the houses, in terms of modern residential buildings principles and characteristics.

The thesis is made of two major parts of data collections: through literature survey, and field studies. Literature survey and reviews on the sources, which are about the subject of the thesis: 1- Modernism and Modern Architecture and Modern Residences, 2- History and architectural background of Iran, 3- Iranian Contemporary Architecture.

Field study is consisted of observations, photographs, sketches and then analyzing of the plan scheme, façade arrangement, materials and building technology and interior elements. Evaluation of the results, are based on both the literature survey and analysis of inventory tables. Then more suggestions are discussed in the conclusion part.

1.3 Limitations of Study

This study is limited to the analysis of residential buildings. Tehran is selected as a case study, while, as capital of Iran, has undergone radical transformations during contemporary era since the last 80 years, and includes several examples from its contemporary time.

The study was done on three groups of residential buildings, which were selected, for analysis. The first group of buildings were constructed during 1925 to 1941, the second group from 1941 to 1979, and the third group after 1979. Fifteen different samples randomly were selected from each period. So, totally, 45 houses were analyzed. The criteria for selecting time periods, for this study, go back to some scholarly ideas (Mirmiran, 2004) about contemporary architecture time in Iran, which begins from the first Pahlavi era in 1925.

Meanwhile, any figures or tables in this study which doesn't have reference is taken or produced by researcher during research period.

Chapter 2

MODERNISM AND MODERN ARCHITECTURE IN THE WORLD

2.1 What Is Modernism?

During almost the last one hundred and fifty years ago, the term of Modernism or Modern Movement, have been applied in both art and literature field for joining to a strand of thoughts about historical relativism, in Europe. One important aspect of this relativism was criticism of the tradition (Calinescu, 1987).

Tradition and especially, religion were mainly criticized in renaissance era and Enlightenment period.

Consequently, generally, the ideas of Modernism goes back to the Renaissance, but mainly became more extended from Enlightenment period, when scientific discoveries released their views from past times and previous knowledge. Modern ideas gave the opportunity to intellectuals, for better development and progress in various fields, to consider future and its related concepts, instead of past (Crouch, 1999).

Releasing from past and looking toward future, inevitably, let the scientific attitudes; take the place of traditional, religious ways of thinking. Consequently, churches lost their place in society.

In this condition, regarding to theology, the church, gradually lost its dominancy and instead, scientific attitudes increased in European society. When science started to grow as opposed to "religion and metaphysics" then, "continuity

and tradition", which were used as dominant guidance for common and personal life, gradually were pushed away. Massive changes and motivation occurred in several fields such as politics, economy, science's various branches, art and literature, religion and morality. The transformation was slow in the beginning, but after the "division of labor and mechanization" through the "Industrial Revolution", it became fast. Under this transformation the "agricultural, face to face" societies turned into "industrial, anonymous" ones (Heynen & Henket, 2002).

Beside all these explanations, for The concept of the Modernism originally can be described as what Harold Rosenberg entitles in his book, "The tradition of the new"; as a rejection of tradition, and facing problems from a new viewpoint based on current and up to date ideas and techniques. Modernization has the function for rejection of legend and elimination of the past (Dinu, 2007).

Rejection of past and tradition as the concept of modernization, seems to be the best and the main concept of it. As it is, nearly always, emphasized, in all related references.

Malcolm Bradbury in "A Dictionary of Modern Critical Terms" emphasized that; the best focus on the Modernism is remain in body of several writers' works, who wrote in the decades before and after the twentieth century. Also, as leaders for modernism literary, historical and political concerns, he mentioned from, Conrad, Kafka, Svevo, Faulkner in fiction; Strindberg, Wedekind, in drama and Eliot, Rilke, Stevens in poetry. Their works are aesthetically radical, containing prominent technical novelty, involving a certain "dehumanization of art". They attempted to, cut off from past firmly, by offering absolute new methods.

In addition, with release from the idea of living under the divine supervision, individuals gradually set themselves on an "equal footing" with God. So the main

pattern of Modernism related to theology, is focused on the idea of the "god-man, the genius". About political consciousness in society, Modernism was characterized by rejections of "conservatism" and "liberalism" and shaping various, fundamental, "the right and the left" political movements. In general, the essential developmental tendencies influenced all aspects of life after Modernism, including "the technological and industrial revolutions", "the politics ideologies" and the extension of scientific perceptions in community (Heynen & Henket, 2002). As it can be seen, in general words because modernism changed the way of thinking and looking to issues, as a result, societies were changed, from political, cultural and etc. points of view.

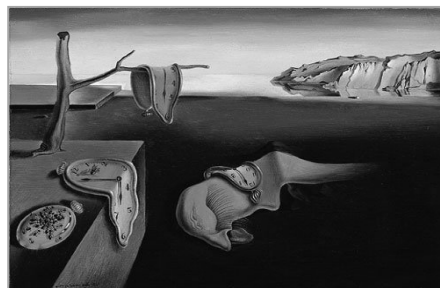
All of those aspects, had an important effect on new view of the "self and the world". Under Modernism waves, the "Scientific-Philosophical View of the world" that had been found since Enlightenment period became widespread in communities. Also, clarification of human being and rejecting the divine origin of humankind begun in this era, by some scholar's directorial thoughts, Such as Darwin's theory, "The Origin of Species", that was continued by the economic and social theory of Karl Marx, "Das Kapital", about the connection between human and the particular economic relations (Bocola, 2000). In both of those theories, the Darwin's and the Marx's, the idea of rejecting traditional and religious thoughts, can be found clearly.

Frequently "Modern" word has been used to point to the avant-garde, radical, progressive or even revolutionary movement since World War II. It also has included the term "contemporary" sense while transforming from meaning of "now" to "just now" (Williams, 1989). Consequently, the definition of "modern" got widened, as result of the mentioned transformation.

Modernism is applied to characterize a period, style, genre, or combination of them. But from the point of Etymology, as a word, its origin is a term from the Latin word, “Modo”, meaning “current” and including various definitions. For example in late fifth century, the Latin “modernus”, related to Christian present opposed to the Roman past, and modern period in literature, was described since the sixteenth century, although this meaning has been changed nowadays. Anti-historicism and attack on previous experiments introduce the other sides of Modernism. As an art term, Modernism includes many avant-garde styles that grew quickly under the name of Expressionism, Imagism, Surrealism, Futurism, Dadaism, Formalism and, Impressionism (Fig.1). Modernism proposed that, an object exists, regarding to its function. According to this idea, “a house” would be a “machine for living in” (Le Corbusier) and a poem, "machine made out of words" (William Carlos Williams). This idea emphasized on culture changing, according to the new machine age atmosphere (Childs, 2000). Again, new look at life’s aspects and issues, is easily noticeable, here.



(a)



(b)

Figure 1: (a): Umberto Boccioni, Street Comes into the House, 1911, Futurism; (b): Salvador Dali, the Persistence of Memory, 1931, Surrealism (Bocola, 2000, p.304, 344).

Regarding to architecture, the concept of Modern Architecture, includes the modern buildings, which were built with usage of technologies and materials that are related to modern architecture. It originated in the United States and Europe, and

then, extended to the rest of world. The characteristics of Modern Architecture are defined in, buildings' concrete and steel usage in construction, its smooth design, and it's less ornament and unadorned form (Wolf, 1981). This subject will be discussed with more details in next section (2.2 Modern Architecture in the World).

In urbanism, the Modern Movement interests in a fast development through urban and rural landscapes, compressing spaces and creating a deeper sense of time in urban life. It focused on the city and its technological promotions joined to radical stylistic improvement (Fig.2). Modernism comprises the appearance of the novel technological changes, emerging of the Labor party, the appearance of factory-line mass production and etc. The social effects of these changes are theorized by some intellectuals, such as Emile Durkheim and Max Weber that mentioned to the gradual shift from interrelations of cohesive rural society "Gemeinschaft", to variation and unclerness of urban society "Gesellschaft" (Childs, 2000). The transformation from cohesive rural society to unclear urban society can be considered as the social effect of Modern movement.

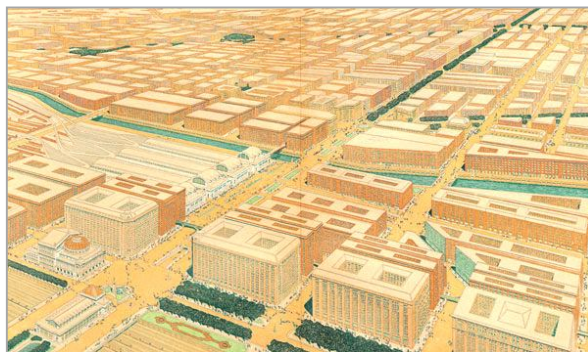


Figure 2: Daniel Burnham and Edward Bennett, city plan for Chicago 1909 (Colquhoun, 2002, p.48).

Darwin, Freud, Marx and Nietzsche ideas were as philosophical supports for this movement and they were the intellectual leaders of Modernism. Regarding to Modernism, Modernity described the way of living and life's condition under the changes, that, developed by industrialization, urbanization and reformation, rapid

Table 1: Summary about different aspects of Modernism or Modern movement.

Summary about Modernism or Modern Movement	
<p>Modernism most important Historical, Scientific, Social aspects and influences are:</p>	<ul style="list-style-type: none"> • It arose in art and literature field in one hundred and fifty years ago in Europe. • Refusing (the dominance) of religious believes. • Technological developments (electricity, cinema, radio, globalized communications and transportation systems) • Growing capitalism and materialism. • Development of cities, industrialization, immigration and multiculturalism. • Innovative Artistic Movements like: Expressionism, Cubism, Futurism, Dadaism, and Surrealism and etc.
<p>Modernism Philosophical Backgrounds are:</p>	<ul style="list-style-type: none"> • Darwin's, Freud's, Nietzsche's, Marx's thoughts.
<p>General characteristics and features of Modernism:</p>	<ul style="list-style-type: none"> • Anti-Romantic • Anti-historicism • Restructuring (according Modernism principles) • Dehumanization of art. • Technological promotions and technical experimentations • Radical stylistic innovation, industrialization, urbanization, internationalization in Architecture and Engineering.

2.2 Modern Architecture in the World

At the end of the 19th and the beginning of the 20th century, regarding to Modern Movement in western societies, architects also started to abandon past styles and began to work on subsequent form of architecture, which had roots in functional concerns. After World War I, these tendencies were named as International Style, which developed simple, geometric figures and unadorned facades that deserted any use of historical references. After World War II, this style proved itself in clean-lined, unadorned glasses and curtain walls, in high-rise buildings and large-scale housing projects (Modernism, n.d.). Obviously, rejecting past styles, is again noticeable in this part.

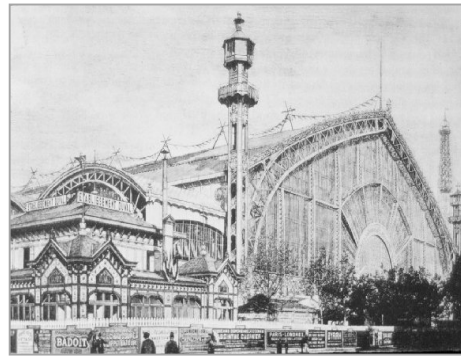
When the pioneers of Modern Architecture abandoned the "forms of the past", it was not just about some motifs or ornamental elements but also, some general old space notions like, "linear perspective of the Renaissance" or, the patterns of the Baroque style. Particularly, they conflicted with "academic" composition of official architecture of nineteenth century in Europe. Because, design elements of such type of *démodé* layouts, could not deal with the new form of life in an open world, properly. After rejection of previous "styles", the initiating of the "new language of forms", according to new life's conditions, was necessary. The general purpose and the axial slogan for Modern Architecture was "Design for life". So, following to rising up the new world, by human new need for "orientation and identification", architecture also tried to gratify this need of him by means of Modern Architecture (Schulz, 2000). "Designing for life", can be considered as the new look of Modern Architecture. As it was mentioned before, modern movement generally looks at issues of life, from a new view point.

2.2.1 Origins of Modern Architecture

According to some architecture scholar's idea, the Modern Architecture primarily was driven by technological and engineering developments, and using new materials such as iron, steel, concrete, and glass, to create new techniques for building construction as a part of the industrial Revolution. So, the Crystal Palace by Paxton in Great Exhibition of 1851, Galerie des machines (Fig.4) by Dutert and Eiffel Tower (Fig.5) by Gustave Eiffel in Paris Exhibition in 1889, also Louis Sullivan's steel skyscraper, Wainwright Building in Missouri, US around 1890, showed the first attempts toward Modern Architecture, clearly (Frampton, 1992).



(a)



(b)

Figure 4: (a): Guaranty Building, (b): La Galerie des machines (Benevolo, 1971, p.111, 236).



Figure 5: Eiffel Tower (Benevolo, 1971, p.118).

Modern Architecture is also supposed to be a reaction to some styles of the Victorian era and later Art Nouveau which includes many ornamental details and elements at the end of 19th century. The Bauhaus School, instituted by Walter Gropius, played the main role in the beginning of Modern Architecture. The Bauhaus was considering rationalization in design. "Form follows function" was an architectural motto which included the goal of the Modernists, to shift the main point of architecture, to Constructionalism and Functionalism (Fleming J., Honour H., Pevsner N., 2000). In addition, many other architects can also be considered as the leaders of Modern Architecture.

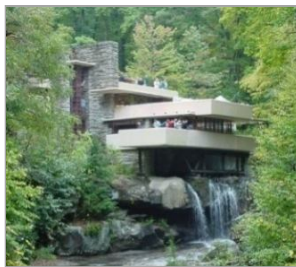
Frank Lloyd Wright is one of the most Modern Architecture pioneer. Some of Wright's most famous designs are; the Chicago Robie House, Falling water in Pennsylvania, and the Guggenheim Museum in Manhattan (Fig.6). Another pioneer of modern architecture was Mies Van der Rohe. Like many architects of the Bauhaus during Nazi regime escaped and settled in Chicago and then designed the Farnsworth House and the Seagram Building, there (Larkin, n.d.).



(a)



(b)



(c)

Figure 6: (a); Robie House, (b); Manhattan; Guggenheim Museum, (c); Falling water (Great Buildings Collections, n.d.).

The final leader of Modern Architecture was Le Corbusier, which in urban scale, the Modern trend developed mainly by his ideas, especially in Chandigarh and Brasilia city projects. Finally, those trends and doctrines were promoted as a movement by the International Congress of Modern Architecture (CIAM) that had been established in 1928, as an international platform of the Modern Movement (Colquhoun, 2002).

Modern architecture, introduced a "different way of being between earth and sky". That was totally different from its previous styles, so, this new relationship was proposed in an innovative approach in architecture, and firstly manifested its avant-gardism specially in two types of buildings, the large unitary "hall", and high rise "skyscraper", in United States, then in Europe and the whole world (Schulz, 2000).

These kinds of buildings, which were manifestations of new architecture, obviously, needed new definitions and points, which will be discussed in the following part.

2.2.2 Major Characteristics of Modern Architecture

In 1914, Le Corbusier, one of Modern Architecture's pioneers in 1914, designed a skeletal structure for his Domino houses, with the aim of "librating space from the slavery of load bears walls" and creating a good combination between interior and exterior parts of building. This type of thought and tendency in design was a beginning for a great jump toward to a new architectural style. With his five points for new Architecture in 1926, he proposed definite explanation of the new ideas. One of those points was "free plan", which emphasized on continuity, transparency of place. This idea had essential importance for theory of Modern Architecture. In relation to free plan, he pointed to "free façade" also, which emphasized on interaction between interior and exterior, and their relation to nature

as well, rather than a conventional composition that existed before (Schulz, 2000). These ideas are considered as the new architecture's points. As it will be mentioned later, there are some other points for it.

The other points of new architecture, which Le Corbusier prescribed, were: "pilotis", "the roof garden" and "the horizontal window". Each point presented freedom that was achieved by use of modern technology and decoding the new Architecture's Principles (Colquhoun, 2002).

In brief, they are (Fig.7):

- 1) *Les pilotis* - foundation posts/columns, allowing the garden to stretch below and under the building
- 2) *Les toit-jardins* - roof gardens, made possible by the reinforced concrete
- 3) *Le plan libre* - the open plan
- 4) *La fenêtre en longueur* - the continuous string of windows
- 5) *La façade libre* - no limitation in the free design of the façade (Danielson, 1996).

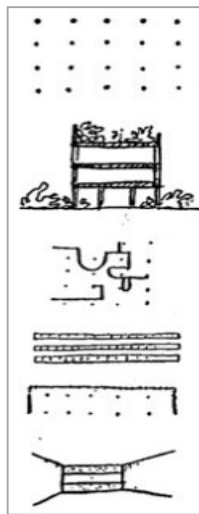


Figure 7: Le Corbusier - five basic points of the new architecture (Danielson, 1996).

According to the lack of dimensional standardization as a serious obstacle in the building industry in that time, Le Corbusier exemplified the Modular system, as an ideal basis for universal standardization. To improve the function of his new

Architecture with rectangular ground plan, elevation and inner structure, those were closely approximate golden rectangles (Corbusier, 1954).

Generally Modern Architecture is characterized by:

- Rejection of historical styles as a source of architectural form and design
- An adoption to the machine aesthetic. some modernist architect considered architecture as a device to express "sleekness", "energy of machine" and their aesthetic observed function's matter, in all "forms" of their "design".
- A rejection of ornament
- Form's simplification and elimination of excessive detail in design
- Exposed structure , sleek/smooth form, flat roof
- Building's concrete or steel construction system
- More usage of glass in façade or concrete façade as façade texture
- Modernist architects were accompanied that, architect as a designer, should design all those necessities for buildings, from textile to furniture for building's interior part (Millais,2009).

Sir John Summerson (1941), an architectural historian, denoted some overviews about Modern Architecture:

1. It arises from an accurate analysis of the needs of modern society;
2. It represents the logical solution of the problem of shelter
3. Achieved by the direct application of means to end
4. It expresses the spirit of the machine age;
5. It is the architecture of industrial living;
6. It is based on a study of scientific resources and exploitation of new materials
7. Finally it is organic (p.195).

Other features for Modern Architecture can be described as; more usage of white or gray color in the building's façade by increasing the usage of new materials like concrete, etc (Fig.8).

The other one is emphasis of horizontal and vertical lines in façade design of the modern buildings (Le Corbusier; Leader of the International Style, n.d.).



Figure 8: Applying white color and emphasis of horizontal line in façade of one modern building (Corbusier, 2001).

2.3 Modern Residential Architecture

Residential architecture is a discipline in the architecture fields that concentrates on design of residences, varied from particular family homes to apartment complexes. Some of the famous modern architects in the world are well-known for their works on residences like Frank Lloyd Wright (Smith, n.d.).

Residential building is one of the most important living spaces in human society. From ancient era to present time with changing the functions which were done in primitive dwellings (Table 2) and its occupancy offeness (Table 3) with 3 or 4 generations occupant (grandfather, grandmother, mother, father, children and sometimes grandsons) to functions which are done in modern dwelling (Table 4) with different occupancy offeness (Table 5) and 1 or 2 generations occupant (mother and father and children), human tries to promote the quality of his dwelling and updated it according to his upcoming necessities and life styles standards.

Table 2: Functions in Primitive dwelling

Production (agricultural and bestial)	Cooking	Housework
Sleeping	Recreation and Eating	Parenting

Source: (Teige, 2002, p.15).

Table 3: Oftenness of home occupancy in Primitive dwelling (Teige, 2002, p.58).

Occupants	Morning	Afternoon	Night
Male (grandfather, father)	At home or Farm	At home or Farm	At home
Female (grandmother, mother)	At home	At home	At home
Children	At home	At home	At home

Table 4: Functions in Modern dwelling.

Cooking	Sleeping
Recreation and Eating	A part of Parenting

Table 5: Oftenness of home occupancy in Modern dwelling.

Occupants	Morning	Afternoon	Night
Husband	At work, office, or factory	At work, office, or factory	At home
Wife	At work, office, or factory	At work, office, or factory	At home
Children (if any)	In school	At home	At home

"Home" may mean the same as dwelling, residence, house, abode, accommodation, lodging, and includes many kinds, from elementary shelters, like Catal Huyuk houses in Turkey to recent high-rise apartment (Fig.9) buildings (What is House?, n.d.).

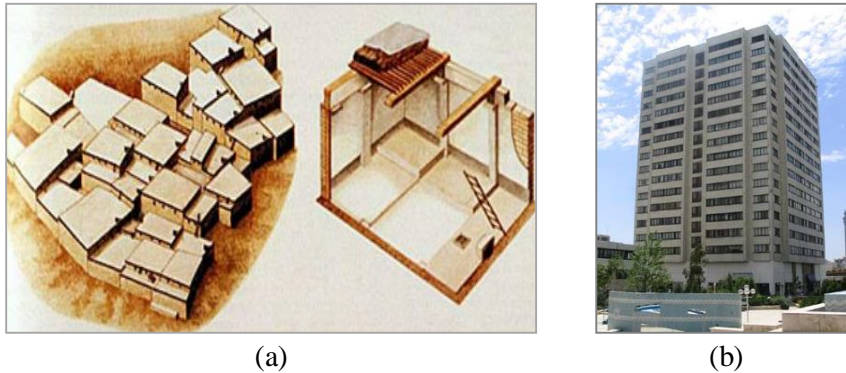


Figure 9: (a): Catal Huyuk, Turkey (Bloom, n.d.), (b): Vanak park high-rise apartments (Vanak park Co., 1978).

2.3.1 Beginning of Modern Residence

Originally, when Modern Architecture introduced itself by buildings such as Galerie des machines and Eiffel Tower, a need for a new type of dwelling, which would match to high technological achievements, or, clearly, a need for Modern dwelling type, was felt to be introduced, in societies (Scully, 1971). The need of new dwellings, for fulfilling new life-style of human being, led the society toward a new form of architecture.

Generally, when the previous identification of human has become problematic in the new world, the previous integrated, secure, environments have cracked. Then, according to new social and technological structure, the new forms of comprehension were required in societies. Modern architecture, was one of these new forms, and tries to provide for the modern man, new “dwelling”. The new dwelling should response to modern man identification, and the new type of relation, between him and environment that he lives in it (Schulz, 2000). As mentioned before, responding the modern man’s identifications and relations, was the goal of Modern architecture.

Through the 19th century in Europe and United States, academic architecture started to reject traditional and historical elements in design and, totally dedicated

itself to the service of “Industry” and “Commerce”. According to Modern culture and Modern society, the attempts towards Modern dwelling or housing reform, took place under the western society’s economy growing up and financial resources amplitude. Private single-family villa (dwelling type) became the primary nominee for modern developments in architecture there. So it was a starting point for testing new materials, new methods of house construction and new furnishings which were practiced by some architects’ works like Wright, Gropius and Mies van der Rohe (Teige, 2002). As it can be seen, the new architecture, also, allowed new materials and furnishings, to be tested, in parallel with application of this type of architecture and so, many new materials and furnishings, were introduced.

Therefore changes in ornamentation, decoration and façade design, were followed by some efforts, to loosen up the rigid organization of the traditional floor plan, so, especially in dwelling design, the pseudo-Renaissance floor plan model was abandoned and layout of dwellings, turned out to be more “flexible, lively and spatially malleable”. The “English garden city movement” and the “traditional Japanese house” beside “Mediterranean summer house” design patterns, with development of construction technology, influenced the progression of modern villa design (first modern single family home) and changed it fundamentally (Schulz, 2000). Consequently, the new materials and ornamentation, released the dwellings from traditional styles. This release was led by some architects roles, such as Wright and Le Corbusier.

Primarily, the works of Wright had a directorial role toward modern house design. His radical revision of domestic floor plan, developed “horizontal direction” with the combination between open and closed spaces. His floor plans were asymmetrical, and developed freely to their site and joined with their surrounding

gardens and at the same time, gratifying to the functional needs of modern living as well. His houses characterized, integrated system of rooms and terraces, and profound suspended roofs with organic system of balancing spaces, like for example Robie House (Fig.10) in 1908 (Teige, 2002).

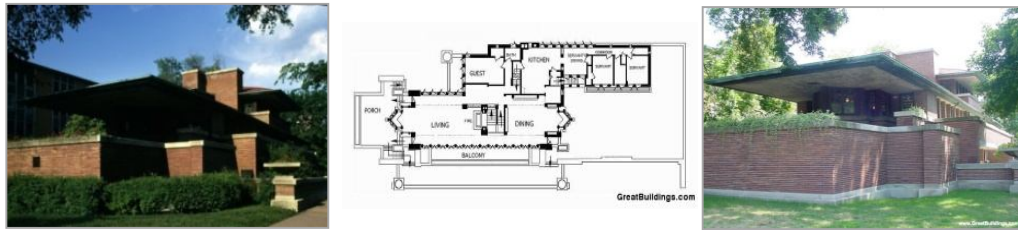


Figure 10: Robie House, 1908 (Great Buildings Collections, n.d.).

Another radical reformist of Modern Architecture that his works on the modern villa were remarkable is Le Corbusier. He followed the logic of Wright's ideas and his designed villa, were also as example of "organized spaces" which articulated them, both horizontally like Wright, and vertically too (Schulz, 2000). Villa Savoye, Poissy in 1929 (Fig.11), is the famous sample of his works which is the collection of his ideas in design (five modern architecture principles that were explained in section 2.2.2).

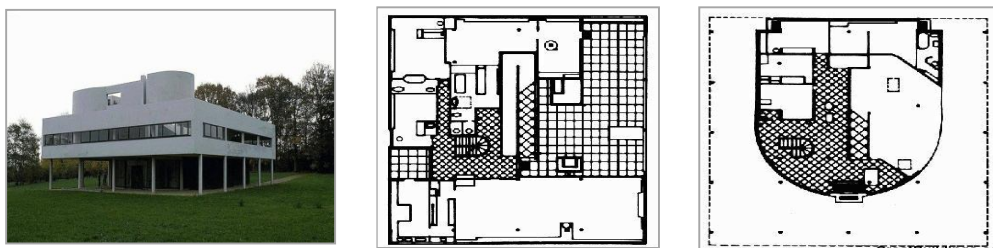


Figure 11: Villa Savoye, 1929 (Colquhoun, 2002, p.151).

2.3.1 Characteristics of Modern Residence

Le Corbusier' Modern villas (villa was as primary nominee for modern dwelling type developments in architecture) had free, open spaces without any ornaments. Their floor plan was arranged mainly on a central hall or living room

which all dwelling functions were performed around it and all rooms were open to that space, without applying “solid walls” in outside and inside, to keep floor plan’s senses of freeness and openness as it is possible. In them, furniture becomes as a part of structure, for example, with its built-in storage closets. So, generally, in his design, there was minimum furniture like carpets, drapes, etc. and he tried to unify them with space itself (Schulz, 2000). The five points of Le Corbusier’s summarized ideas, can be seen in his work.

As mentioned before, Le Corbusier summarized his ideas about Modern Architecture and Residence transformations in his famous five points:

1) The pilotis (supporting columns) (Fig.12): The skeletal system gives us the pilotis. The house is up in the air, far from the ground: the garden runs under the house.



Figure 12: Pilotis (supporting columns) (Corbusier, 2001).

2) The roof gardens (Fig.13): the garden is also over the house, on the flat roof of house.



Figure 13: Roof gardens (Corbusier, 2001).

3) Free plan (Fig.14): In previous time, load-bearing walls were forming the ground floor and the upper stories, up to the eaves. The layout was a slave to the supporting walls. Skeletal system in the house provided a free plan. The floors were no longer divided by partition walls and were free.



Figure 14: Free plan (Corbusier, 2001).

4) The horizontal window (Fig.15): window is one of the essential elements of the house. Skeletal system provided a revolution in the usage of the window. Windows could run from one end of the facade to the other.



Figure 15: Horizontal window (Corbusier, 2001).

5) The free façade (Fig.16): in modern house, columns set inside the house, behind from the facades. The facades were the light skins of insulating walls or windows and were free (Corbusier, 2001).



Figure 16: Free façade (Corbusier, 2001).

Le Corbusier declared the problem of house, as the main problem of modern era that balance in societies depends upon it. Then, he described that:

“Architecture, has for its first duty, in this period of renewal, that of bringing about a revision of values, a revision of the constituent elements of the house” (Le Corbusier, 1986, pp. 227).

His Immeuble-Villas (Fig.17) which were villa complexes project, could be considered as a starting point to “residential hotel-type dwellings” with apartment’s area of 150 m². After World War I, beside “industrialization of construction”, and high demands in the housing sector, constructing new housing in large amount and scale, rapidly became essential. On the other hand, high and quick interest chance in housing sector caused the investments growing up in it. Mostly, housing developments and progress toward modern dwelling type can be observed by following the “new housing exhibitions” practices and their results (Teige, 2002). In those exhibitions, besides showing modern dwelling types, the procedure of their modernization can be observed. Some exhibitions will be named and described in following paragraphs.



Figure 17: Le Corbusier, Immeuble-Villas (Vi, n.d.).

The 1923, International Exhibition of Architecture, that was arranged by Bauhaus in Germany, under leadership of Walter Gropius, was the first type of practical exhibition, in relation to housing subject (Bauhaus1923, n.d.).

After it, in 1927, there was Stuttgart Werkbund Exhibition associated with “experimental housing colony”. It was an important exhibition that committed to improve last decade’s housing, toward new form of it and Mies van der Rohe had a directorial role to organize that exhibition. The Stuttgart-model housing colony was commissioned to build thirty-three houses that constructed with modern materials and regarding to industrialized methods of construction. Although, the major type of housing in Stuttgart Exhibition was freestanding single family villa with various apartments’ areas, but also, there were represented two rental multistory apartment houses (Fig.19), with living room, bathroom, kitchen, and two or three bedrooms. Also, in Mies van der Rohe designed one (which he designed for this exhibition) (Fig.20), it included, storage rooms and laundries and roof gardens in their upper floor (Sharp, 2002).

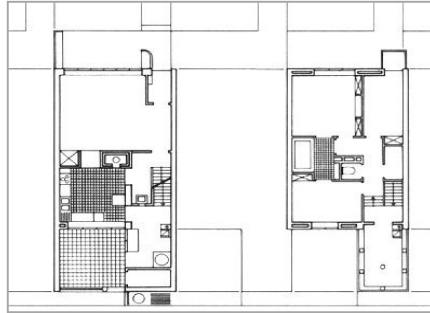


Figure 18: J.J.P. Oud, 1927. Stuttgart Exhibition plan types (Stuttgart – Architektour, 1996).



Figure 19: J.J.P. Oud, 1927, Stuttgart Exhibition (Evert Marinus van Ojen, 2009).



Figure 20: Residential quadruplex, Mies van der Rohe, 1927, Stuttgart Exhibition (Teige, 2002, p.194).

Karel Teige (2002), in “Minimum dwelling”, explained the program of Modern Architecture, as for signifying a new dwelling type that was more improved and advanced than previous housing types. Avant-garde architects, have chosen minimal area and maximal livability (mini- max dwelling concept) as a practical formula for minimum dwelling design as a new dwelling form to answer all the particulars of the ongoing “housing crises” in that time. International Congress of Modern Architecture (CIAM) in Frankfurt, Germany, in 1929, also has mentioned

the housing problem with its concern for the “Minimum dwelling” and discussed about some subjects, like the importance of “mass housing” on its schedule.

Stuttgart Exhibition program was continued, by the 1929 WuWa Breslau Exhibition that nowadays is situated in Poland. In this exhibition, the housing colony in Gruneeche, which was group of thirty-six houses, were represented, although, that group was less advanced than previous Stuttgart’s model. In this exhibition, the main emphasize was on the problem of “minimum dwelling”, and mainly, it has been tried to represent the smallest possible form of dwelling. The whole dwellings’ groups had central heating system, by a separated heating plant, a bit far from them. Another feature of this exhibition’s colony, was concerning to other types of dwelling’s inhabitants requirements, rather than a usual family, such as singles, or childless couples (Fig.21), with representing boarding-house type of kitchen, or apartments which included just a small corner for cooking. Also, there were numbers of common services, like a restaurant, café, meeting hall and also the particular children’s home that was a reasonable complement for that type of dwelling, to free children from the prison of their small family apartments (International Congress Construction History, 2009).

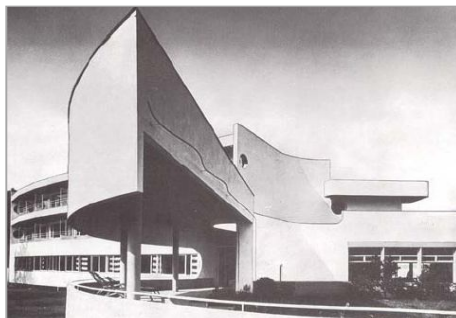


Figure 21: house for single people and childless couple, WuWa Breslau Exhibition, 1929 (International Congress Construction History, 2009).

Another exhibition, with similar character, was Dammerstock settlement in Karlsruhe in 1929. Row housing was main type of design, which was used in

Dammerstock colony. Walter Gropius' two-row, four-story houses were prominent examples that were presented there. After Karlsruhe exhibition, the program was continued by some other exhibitions like WoBa Exhibition in Switzerland in 1930, Stockholm and Dresden Exhibition in 1930, Berlin building Exhibition in 1931 and the Vienna Exhibition in 1932, then finally, the Purge Exhibition of housing in 1932-1933 (Teige, 2002). During these exhibitions, the procedure of Modern Architecture can obviously be seen, besides noticing each exhibition's features.

With results and products of those exhibitions, under new societal and technological conditions and people's new requirements, the program of modern dwelling and housing development, stepped up gradually.

For example, in dwelling design, some approaches like, adding toilet and bathroom spaces together for minimizing the apartment area, or considering exercises space for house and etc., represented other innovations during exhibitions toward reaching to an optimum model of dwelling type. So, step by step, modern architecture realized a strand of important reforms on dwelling design, from dwelling primarily freestanding villa type transforming to later row housing and multistory apartment type (Fig.22) and regarding to its construction process, its plan and furnishing (modernization of dwelling's windows, doors, lighting, etc.) and mechanical installation (Jones & Tilse & Bartlett & Stimson, 2008). These mentioned characteristics, in addition to the following ones, constitute the characteristics of Modern Residential Buildings.



Freestanding villa type (single detached) house (Colquhoun, 2002, p.151) Rowhousing (Evert Marinus van Ojen, 2009) Multistory apartment type (Teige, 2002, p.194)

Figure 22: Modern Housing types.

Also, in relation to dwelling's functional characters like sleeping, cooking, bathing and etc., and their corresponding spaces and equipments, the modern dwelling, encountered with some crucial changes about those spaces arrangement.

For example:

- The individualization of spaces, for example, only living room and dining space in kitchen remain, as a common spaces in modern apartment, the other spaces are individualized.
- With regard to hygienic manner, there might be more than one bathroom in modern dwelling, particularly, for parents and other family members.
- In modern dwelling, each occupant should have his or her own bedroom, or at least, bedrooms should be divided between adults and children. Also, the dimensions of bedrooms changed distinctly and even sometimes reduced to a "sleeping cubicle".
- Moreover, the kitchen size reduced significantly but the living room area was tried to be increased as much as possible (Teige, 2002).



Figure 23: Modern kitchen & Modern living room (Interior Design, n.d.).

So, briefly, the main changes regarding to modern houses spaces occurred in:

1- Kitchen and laundry parts 2- Sanitary spaces like bathroom and lavatory 3- Living room or hall and bedrooms.

As conclusions, the characteristics of Modern Residential Buildings can be described as;

- Minimal area and maximal livability (mini- max dwelling concept)
- Increasing the number of Rental ownership within modern dwelling.

Types of Residence:

- Modern dwelling type was transferred from primarily Freestanding villa to later Row housing and Multistory apartment type.

Plan:

- Free plan or the Open plan/Spaces; Skeletal system in the house provided a free plan without divided by partition walls and were free.
- Modular system as an ideal basis for universal standardization/ dimensional standardization in houses designs were used there (new dimensional standard according to human body proportions and golden ratio).
- With regard to hygienic manner, there might be more than one bathroom in modern dwelling, particularly, for parents and other family members.

- In modern dwelling, each occupant should have his or her own bedroom, or at least, bedrooms should be divided between adults and children.
- The individualization of spaces in modern dwelling, for example, living room and dining space are as common spaces in modern dwelling and the other spaces are individualized.
- Applying apartment sized small kitchen/ Built in kitchen
- The dimensions of bedrooms changed distinctly and even sometimes reduced to a “Sleeping cubicle”.
- Applying added toilet and bathroom together in house
- Modern dwellings included specific storage rooms and laundries.
- Considering exercises space in modern dwelling

Interior Part:

- Applying central heating system in house
- In modern dwelling, furniture became as a part of structure, for example applying built-in storage closets
- Applying new type of furnishing material; doors and windows, etc.

Form Issues and Facade Organization:

- Rejection of ornaments
- Rejection of historical styles
- More usage of White or Gray color in facade (with applying material like concrete)
- More usage of glass in façade or concrete façade as façade texture
- Pilotis or foundation posts/supporting columns; the house is up in the air, far from the ground.

- Dwelling form's simplification (sleek/smooth form) elimination of excessive detail in design.
- Free façade, no limitation in the design of the façade/ the facades were the light skins of insulating walls or windows and were free.
- The horizontal window the continuous string of windows/ Windows could run from one end of the facade to the other.
- Emphasis of horizontal and vertical lines in façade design
- Flat roof
- Roof garden/ the garden are also over the house, on the flat roof of house.

Building Technologies (Structural System and Building Materials):

- Librating space from the slavery of load bears walls (abandon the usage of Load-bearing system).
- Skeletal structure which include, applying:
 - Reinforced concrete skeletal (Frame) system
 - Steel skeletal (Frame) system
- Industrialization of construction method for dwelling construction
- Exposed structure; honesty of materials, in which, materials like steel and concrete, are visible.
- In Modern dwelling application of new materials like Steel, reinforced Concrete, etc. increased (Table 6).

The Table 6 contents are developed into two parts of inventory in chapter 4, for analysis of the examples (see chapter 4; part 4.1).

Chapter 3

GENERAL CHARACTERISTICS OF IRAN AND ITS ARCHITECTURE

The country of Iran, the land of the Aryans, or earlier Persia, has priceless rich cultural background. For more than three thousand years, Persia played an important role in demographic movements, between Asia (East) and Europe (West). The history of Iran is long and complex, and determined by rising and falling of successive dynasties, occasionally with break of chaos and confusion. The Medes, Achaemenid, the Sassanians and the Arabs, the Seljuks and the Mongols, the Timurids and the Safavids, then the Qajar and the Pahlavi, all governed there, consecutively. After the conquest of Iran by Muslims in 637-651 AD, the Sassanid Empire was destroyed and, it was led to declining of the Zoroastrian religion in Iran, ultimately (Mackey, 1998). After that, most of Iranian population (Persians) became Muslim and the Islamic governments were initiated in Iran. However, the achievement of the previous Iranian civilizations partially remained in society

3.1 Geography and Climate

Iran is the 18th largest country in the world and is located in Middle East. It has land border with Azerbaijan (432 km/268 mi) and Armenia (35 km/22 mi) in the northwest; Turkmenistan (992 km/616 mi) in the northeast; Pakistan (909 km/565 mi) and Afghanistan (936 km/582 mi) in the east; Turkey (499 km/310 mi) and Iraq (1,458 km/906 mi) in the west (Fig.24). The Caspian Sea

is located in its north side and the Persian Gulf and the Gulf of Oman are located in the south side of it. Iran's area is 1,648,195 km² and, most of its area is situated on the plateau of Iran, except the Caspian Sea coast and Khuzestan region. Iran is a mountainous country and its two main mountains ranges are Alborz Mountains and Zagros Mountains that are covered by several rugged peaks. The eastern part mostly consists of desert land like the saline Dasht-e-Kavir and the Dasht-e Lut, as well as some salt lakes. Except for some small regions, these deserts are uninhabited.



Figure 24: Map of Iran (Mara, 2007, p.5).

Iran's climate is generally arid or semiarid, with exception of the Caspian coast in northern edge of the country. Iran's average summer temperatures exceed to 38°C. Annual rainfall is between 680 mm to 1,700 mm in north coastal land and in arid part, rainfall is less than 200 mm. The coastal lands of the Persian Gulf and the Gulf of Oman in southern Iran have mild winters, and very humid and hot summers with annual rainfall ranges from 135 to 355 mm (Iran - Geography and climate, 2007).

3.1.1 Iran's Capital City, Tehran

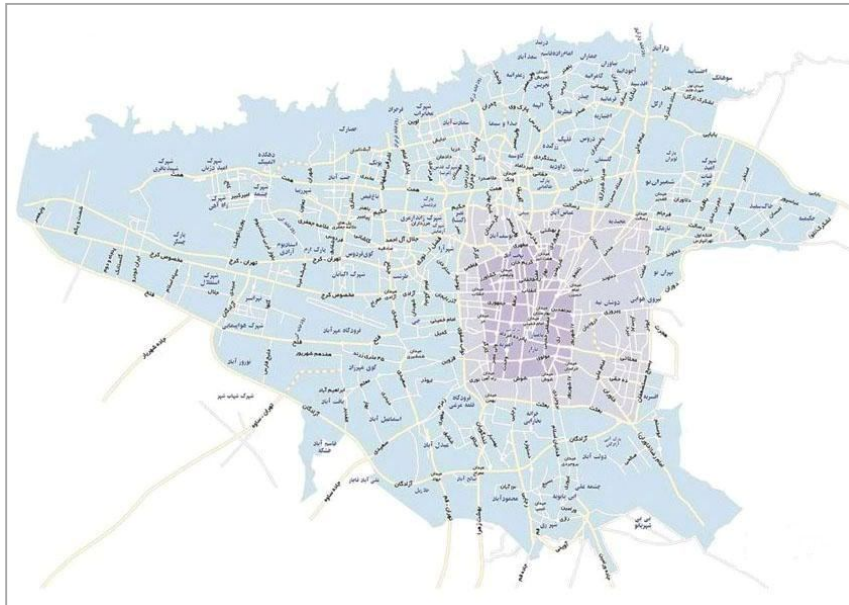


Figure 25: Map of Tehran (ketabeavval, 2010).

Tehran is the Capital of Iran had a population of about 11 million people at the time of the last official census in 2006 (Tehran Political situation, 2010). It is situated in south of the Alborz Mountains and north of the plateau of Iran with about 1,200 meters above sea level (Fig.25). Teheran has dry climate with warm summers and cold winters, often with snow. Its average temperature varies between -7°C to 39°C and its Rainfall is 200 mm annually. The Jajrud and the Karaj rivers run on two sides of the city (Tehran's Introduction, n.d.).

The city of Teheran is also the economic and administrative center of Iran. The economy of the city is based on food-processing, textiles, cement, bricks, sugar, chinaware, pottery, electrical equipment, pharmaceuticals and cars assembling. Also, Teheran is the administration center of the Country's oil industry (Tehran oil refining co., n.d.).



Figure 26: view of Tehran (Tehran, n.d.).

About half of the manufactured goods of Iran are produced in Teheran. The organization form of the city was modified during the Pahlavi's sovereignty (1925- 1979), while most of modern Teheran, new public constructions and houses were built. The major landmarks of Teheran are the Sepah-salar Mosque, the Baharstan Palace (today uses as parliament building), the Shams ol-Emareh, the Niavaran Palace and the Azadi (Shahyad) Tower (Fig.27). Tehran is linked by roads and railways to all major cities of Iran. There is also, one international airport and two other smaller airports (Ardakani, 2009).



Figure 27: Azadi (Shahyad) Tower, Tehran (Ardakani, 2009).

Historically, the word of Tehran can be found in some books, which date back to the 10th century. In far past it was just a village and included numerous gardens. Tehran became an important region in the Safavid era (1501-1736 AD). Shah Tehmasp, the king of Iran from 1524 to 1576, was attracted to Tehran's mild climate and ordered to construct many buildings, including caravansaries and many towers around it. After Tehran was chosen as the capital of Iran in Qajar era (1776-1925 AD), it developed rapidly. In that period, twelve gates and a large square which now is called Tupkhaneh with its surrounding buildings were built around the city (Fig.28). After Qajar period in Pahlavi era (1925-1979), two architectural trends developed there: an imitation of Western styles that had little relevance to Tehran's climate and its cultural conditions and the other trend was trying to renew local design methods. Reza shah Pahlavi started a wide development of the country's capital, then; this movement was followed by his son, the next shah of Iran (Ghobadian, 2004).



Figure 28: Tupkhaneh Square, Tehran (Haeri, 2009, p.86).

Gradually many changes occurred in Tehran. For example; with growing Tehran's population and increasing constructions, the city expanded. This expansion was both toward northward and westward of the city. Also by passing time, the

ownership type of Tehran's houses has been changed. The private ownership rate decreased and the rental ownership type increased. Other changes took place in the area of houses and about their height. The area of houses in Tehran was decreased gradually, in parallel, the construction of High-Rise Residential Building increased (Tehran, Housing & Town-planning, n.d.).

After Islamic revolution in 1979, Tehran's expansion rate got faster and some satellite towns also were constructed in its environs. Nowadays, area of Tehran is 707 km² with 22 municipal districts, each with its own administrative centers. Briefly, a city which was merely, a town 100 years ago, has now become almost a modern metropolis, according to its governmental centralization and improvements in social welfare (Tehran political situation, n.d.).

3.2 Demography and Culture

Iran's population increased dramatically during the latter half of the 20th century, reaching about 72 million by 2008, the number of households stood at 15.3 million (4.8 person/household). With the 77% in 2002 literacy rate, more than two-thirds of the population is under the age of 30; one quarter is 15-year-old or younger. Iran, ethnically and linguistically, contained diverse groups and are composed of: Persians 51%, Azeris 24%, Gilakis and Mazandarani 8%, Kurds 7%, Arabs 3%, Lurs 2%, Baluch 2%, Turkmen 2%, other 1%, with their own independent own local languages, but Farsi, is the official language of the country. About country's religious issue, 98% of Iranians are Muslims and 2% Non-Muslim minorities include Zoroastrians, Jews, Baha'is, Mandeans, Christians and Yarsan. Also, Iran exhibits one of the fastest urban growth rates in the world. According to 2005 estimates, approximately 67% of Iran's population lives in urban areas, which

was 27 percent in 1950 (Fig.29). The five most populous cities of Iran are Tehran, Mashhad, Isfahan, Tabriz, Karaj, Shiraz (Crane & Lal & Martini, 2008).



Figure 29: Crowds in Tehran Street.

Regarding to Iran's old civilization, its culture is one of the rich ones in the world. Its wealthy literature with thousands of poets and writers, glorious and remarkable architecture, its traditions that sometimes back to over 3000 years ago, beside other unique characteristics of this country emphasize on its old unique cultural background. Some of Iranian old festivals that still being celebrated are, Norouz, Charshanbeh Suri, Sizdah Bedar, Yalda Night and Haft Sin (Miller & Vandome & McBrewster, 2009).

Another prominent feature of Persian culture is Persian art. Persian well-made carpets, marvelous soulful classical music, excellent tile work, old significant architectural style, all are famous in the world. Persian or Farsi is one of the oldest languages in the world. It is one of the Indo-European families of language, which still is spoken nowadays. Persian poems with masterpieces of Saadi, Hafiz and Omar Khayyam, are well known around the world. One more art is related to preparation of Persian foods and traditional confectionaries which some of them

still are being cooked and baked according to their old recipe there (Persian Culture, 2010).

3.3 General Architectural Background

Iranian or Persian architecture is corresponding to the architecture of ancient Iran, which is rooted in the history from thousands years ago to the present time. Its samples spread over a large area from Syria to India (Pope, 1971). Persian buildings types are various, from farmer Cottage to tea houses, garden pavilions to some of the most magnificent structures like mosques and palaces (Fig.30).



Figure 30: Naghshe Jahan Square, Isfahan, Iran, Safavid period (in Islamic Era) (Kateb, 2005, p.39).

Iranian architecture has a great variety, in both structural and aesthetic subjects and has developed gradually, regarding to both earlier traditions and architect experiences. Some of its dominant features are:

“A marked feeling for form and scale; structural inventiveness, especially in vault and dome construction; a genius for decoration with a freedom and success not rivaled in any other architecture” (Pope, 1965, p.266).

Traditionally, the main, influential idea of Iranian architecture has been its divine symbolism " by which man is brought into communication and participation with the Powers of heaven” (Ardalan& Bakhtiar, 2000).



Figure 31: Taq-i Kasra, Ctesiphon, Arabic Al-Mada'in, Iran pre-Islamic era (before 650 AD) (Kateb, 2005, p.25).

This theme could be seen in most of Iranian traditional buildings and has given the sense of unity and continuity to them. Also, it was a main source of Persian architecture's emotional characters, as well. Those features have placed Iranian architecture, in accurate meaning of the word, indeed, as the supreme Iranian art that its supremacy, applies to both pre and post-Islamic periods (Pope, 1971).

According to Pope (1965), in Iranian architecture:

There are no trivial buildings; even garden pavilions have nobility and dignity, and the humblest caravanserais generally have charm. In expressiveness and communicability, most Persian buildings are lucid-even eloquent. The combination of intensity and simplicity of form provides immediacy, while ornament and, often, subtle proportions reward sustained observation (p.10).

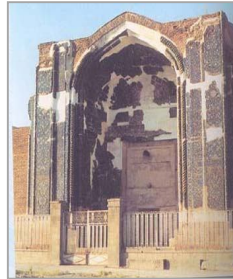
Also, his study on some available samples of buildings indicated various types of materials that were prevalent in Iranian architecture before contemporary period. Like clays that were on hand almost in everywhere and later than were applied in the form of molded mud in buildings and another material was lime mortar, which helped the development of brick later (Pope, 1965).

The characteristics of Iranian architecture were based on some essential features like: 1. Introversion, 2. Structuralism, 3. Homogeneous proportions (in accordance to modular units) and considering to human body proportion in design, 4. Symmetry and Anti-symmetry, 5. Minimalism or avoiding from any trivial

detail in design. Generally, the development of Iranian architecture during the history can be categorized into following parts: Pre-Islamic architecture of Iran, Post-Islamic architecture of Iran, and Contemporary architecture of Iran (Fig.32) (Pirnia , 2005).



The ziggurat of Chogha Zanbil, Pre-Islamic architecture of Iran (Kateb, 2005, p.63)



Kabud Mosque Tabriz, Iran, Post-Islamic architecture of Iran (Poorhabib, 2007)



Al Javad Mosque, Tehran, Contemporary architecture of Iran

Figure 32: Samples about Iranians architecture different categories.

3.3.1 Pre-Islamic Architecture of Iran (3000 BC to 650 AD)

The pre-Islamic styles represent 3 to 4 thousand years of several civilizations' architectural development within the Iranian plateau. Each of the periods of Elamites, Achaemenids (Fig.33 (a)), Parthians, and Sassanids were the creators of great architecture that has spread widely during the history. Some substantial remnants of the Elamite or proto-Elamite period are the Tappe Zagheh, the Ziggurat of Chogha Zanbil (Fig.33 (b)), and Shahr-i Sokhteh. The Achaemenids gathered artists and materials, almost from all territories of the country and they built large scale buildings. Pasargadae, along with Susa, and Persepolis, are some samples of the architecture of Achaemenids period. After them, with the emergence of the Parthians and then Sassanids, some innovations came up, to Iranian architecture. For example, during Sassanids periods, massive barrel-vaulted chambers, solid masonry domes, and tall columns were employed in buildings. Some significant samples of those periods of Iranian architecture are; the ruins of Ctesiphon, Firouzabad palace, Anahita Temple (Mirrazavi, 2009).



Figure 33: (a); Pasargadae, Achaemenids era (Pasargadae, n.d.), (b); the ziggurat of Chogha Zanbil, Elamite era (Kateb, 2005, p.63).

3.3.2 Post-Islamic Architecture of Iran (650 AD to 1925)

The falling of the Persian Empire by invading Islamic forces, led to the creation of another Remarkable period in Iranian Architecture, Arts such as calligraphy, stucco work, mirror work, and mosaic work, brickworks in the form of different motifs, and sometimes plasterworks over bricks were used in architecture of Iran in the new era. Beside them, applying human portrait lithography that was common before decreased. Various structures such as bazaars, bridges, mausoleums, different palaces and specially mosques, were constructed in this period of Iranian architecture. Buildings which were built during this period can be divided to some classes like; Seljuk, Ilkhanid, Timurid, Safavid, Zand and Qajar classes. The monuments from Seljuk architecture emphasize on the importance of the Seljuk period as revival period of Islamic art and civilization in Iran. Some Samples that remain from this era are Jamé Mosque of Isfahan, Seljuk minaret in Damqan. Later than, Iranian architecture in Ilkhanid era followed the common characteristics of the Seljuk times. The Ilkhanid architecture had the prevalent usage of tile works with new bright-colored tiles. As an example, the Soltanieh dome is the most significant one for this period (Mehrabiy, n.d).

During the Timurid, Iranian architecture applied a combination of bright and dark monochrome glazed tiles for façades. The influences of the Chinese art beside the usage of tile works in buildings' decoration with various designs and calligraphy are other aspects of this era architecture. As samples for this era, Goharshad Mosque in Mashhad and Sheikh Ahmad-I Jam Shrine Complex in Torbat-i Jam, could be mentioned (O'Kane, 1987).

Safavid architecture tried to reach splendor in scale, for example, Isfahan's Naghsh-i Jahan Square and Shah Mosque (Fig.34), from this period, emphasizing on this concept, obviously. In this time the knowledge about tall buildings with vast inner spaces increased, and symmetry principle was implemented in an official and splendid way. Certainly, colors and decorations were the main concerns of architects in the Safavid era, and tiles, covered larger surfaces of buildings, in comparison to the previous eras. The Zand Architecture promoted an architecture that essentially referred to the sources of the Safavid, Seljuk and pre-Islam architecture. It was influenced by Indian and European architecture. Usually buildings in this period were covered with almost pink glazed tiles, which named as Zand tile.

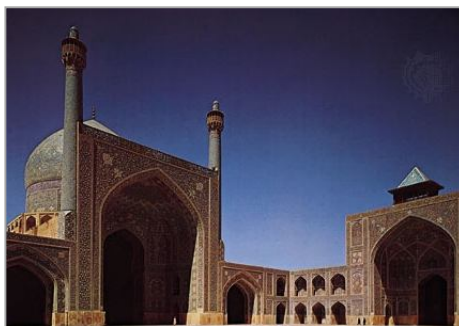


Figure 34: Shah (Emam) Mosque, Isfahan, Iran (Masjed-e-Emam, n.d.).

As an example for this period, Karim Khan Citadel can be noted. Finally, in Qajar Architecture, lots of Safavid architecture characteristics repeated in the buildings again. Also, some new forms were introduced in Iranian architecture,

like a deep courtyard. Qajar monuments, were various from palaces, pavilions, and traditional houses to some decorated entrance gates for some cities. Generally, in Qajar Architecture, decorations were like previous architecture, but sometimes were influenced also by the western and the Sassanid art. Also, magnificent decorated ceilings and walls with mirror works were promoted in architecture during this period. As examples for this period, Narenjistan Palace in Shiraz and Tabatabaie Residence in Kashan could be mentioned (Mehrabiy, n.d).

As a result during post Islamic era, various forms of buildings which mostly were royal or public types were built in Iran. In addition during Qajar period (1776-1925AD) we can see some significant samples of Iranian traditional residential buildings. Because of the importance of that subject in this study, the characteristics of Iranian Traditional Residential buildings will be discussed in next section separately.

3.3.2.1 Iranian Traditional Residential Buildings

Iranian's traditional residential architecture includes the category of some principles and characters, elements that employed by Iranian old architects -"Me'mar"- and craftsmen, to construct Iranian traditional houses. Those characters and elements were mainly drawn, from Iranian cultures and architectural elements, from both Islamic and pre-Islamic times. Most of Iran's remaining traditional houses are from the Qajar period (1776-1925AD). According to geographical situation of Iran, which is being situated on the edge of deserts and arid regions and typically has hot summers, cold and dry winters, the most important characteristic of Iran's traditional houses was concerning to their climatic conditions (Pirnia, 2005).

The existence of hundreds of traditional houses with perfect designs (regarding to Iranian cultural, local and climatic, etc. conditions) shows, a deep heritage of Iranian traditional Architecture.

Iran's old cities' fabric, are made-up of narrow twisting streets named “Koocheh”, surrounding with high walls of adobe and clays. Sometimes there are roofs on top of the walls too. This form of Iranian common urban design is regarding to desert region climatic features, to reduce the effects of dust storms and hot weather in summer with increasing the daytime shades which helps also to keep warmth in urban area in severe winter conditions. Religious beliefs beside climatic problem and security reasons encouraged traditional Persian architects to create inward form designs for houses within those narrow “Koocheh”. These types of houses had local arrangement for protection; they all had enclosed gardens with high degree of privacy, preventing any view into the house from the outside world. Hence, while residential architecture in Iran, was designed in a manner of providing maximum protection for residents specially women and children, at the same time, was trying to furnish this protected inner as “paradise garden” (Fig.35) (Soltanzadeh, 1989).



Figure 35: View from old Tehran (Iran / Iranian Historical Photographs Gallery, 2010).

In relation to ornamentation which was applied in Iranian traditional house, stucco work was the most widespread one for decorating Persian houses (Fig. 36). Other artistic works that were applied there, were colored windows and mirror works, paintings, wood work, niches and also the vegetal ornamental form, frescoes and Muqarnas, and tile works (Kateb, 2005).



Figure 36: Stucco work in Iranian traditional house, Kashan, Iran.

The major parts and characteristics of Iranian traditional residential buildings are:

1. Portal: as mentioned above, usually Iranian traditional house had inward form design, so, the visible exterior layer of traditional house, was too simple, for example, just a pure high clay wall. So, the portal was as main element of exterior façade of house, and usually decorated by some ornamentation.
2. Hashti and Dalan-e-vorudi: the entrance part, that contains usually a small octagonal shape plan space which were called Hashti, and, a narrow hallway that is linked to it and to the house's main courtyard, that were named Dalan-e-vorudi (space number 1 in Fig.37).

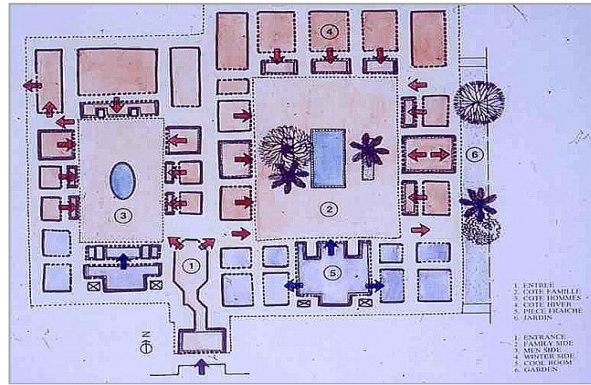


Figure 37: Sample of an Iranian traditional house plan (Rabbat, n.d.).

3. Spaces essential divisions in house, to exterior (Biruni) (Fig.38), as common part for guests and unknown peoples and the interior (Andaruni), private part of house for family members, women and children.



Figure 38: Biruni (common part) of an Iranian traditional house in Kashan, Iran.

4. A central courtyard, with a central pool, surrounding gardens, containing trees and flowers.
5. Iwan; is defined as a roofed hall or space which is walled on three sides and one end entirely, opens to a central courtyard, and have been employed in both public and residential buildings.
6. Talar and Shah Neshin; the main parts in common sections of house (Biruni) that were applied for guests reception and adorned by various type of ornaments and decorations.

7. Rooms: rooms were the important and main parts of Iranian traditional houses. Two types of rooms according to usage of them were built in Iranian traditional houses which were named as “Se Dari”, three-door rooms (Fig.39) and “Panj Dari”, means five-door rooms. “Se Dari” was a smaller room that usually was used for sleeping and resting, and “Panj Dari” which was a bigger one, was used as living room.



Figure 39: Se Dari (three door room) of an Iranian traditional house in Kashan, Iran.

8. Doors and Windows: in traditional house, doors and windows were other important elements. Doors usually had two pieces and sometimes were decorated by paintings and drawings. Windows in Iranian traditional house, most of the time were used for spaces' lighting (Fig.40). They usually were opened vertically and ornamented by wood work and colored glasses.



Figure 40: Window of an Iranian traditional house in Kashan, Iran.

9. The house service parts: these spaces, like kitchen, stable, storage room and sometimes bathroom (because traditional house occasionally didn't have bathroom and inhabitants were using public bath of neighborhood), were placed at the back of main parts of house, usually, in another small courtyard, and toilet were placed also in the corner of courtyards that was accessible through one short passage.

10. Usually, the orientation of Iranian traditional house was north-south direction, match to seasonal condition. The winter part that situated in northern side, face to south for maximum usage of sunshine in winter, and summer part situated in south side, face to north side to decrease the sunshine effect in summer.

11. Applying symmetry principle in design: this principle is another important characteristic of Iranian traditional house, from various spaces arrangement around courtyards to façade design in house (Molla Zadeh, 2007).

Furthermore mostly in central Iran, an ingenious system of wind catchers which provided cool temperatures in the lower levels of the traditional houses in summer, were designed. Also, thick massive walls were employed to prevent the sun's heat in the summer, while retaining the internal heat in the winters in houses.



Figure 41: Wind catcher of one Iranian traditional house in Kashan, Iran.

Briefly the major parts and characteristics of Iranian traditional residential buildings are summarized in next table (Table 7).

Table 7: Major parts and characteristics of Iranian traditional residential buildings.

Major parts and characteristics of Iranian traditional residential buildings.	
Portal	Talar and Shah Neshin
Hashti and Dalan-e-vorudi	Rooms: includes “Se Dari”, three-door rooms and “Panj Dari”, five-door rooms.
Spaces essential divisions in house: Andaruni, Biruni	Traditional Doors and Windows
A central courtyard with pool, surrounding gardens	The house service parts
Iwan	House symmetric design
North-South orientation of Iranian traditional house	Applying thick massive walls
The usage of wind catchers system, mostly in central region of Iran	

3.3.3 Contemporary Architecture of Iran (1925-Present)

The confrontation of Iran with Western Civilizations that mainly began with the Qajar Reign (1776-1925AD) caused severe political and social transformation in Iran after it. This subject, naturally, created a revolution of architecture and ultimately, the rise of a novel architecture in Iran. Nowadays, the architectural spaces that Iranians, are living there currently, were born in this process (Dehbashi and Diba, 2004).

In this atmosphere, some of the dominant traditional principles began to change and, this point was as an inception for new tendencies in various fields, within Iranian society. Specially, in the first Pahlavi period (after Qajar period), some movements, such as woman freedom and veil removing, academic foundation and new educational system, modern judiciary or court system, new armed forces organization, industrial developments and etc. emerged in Iran’s society. Regarding to these movements, some of Iranian intellectuals’ ideas like Akhundzadeh, Malkam

Khan Nazemodolleh, Agha Khan Kermani, Talebof, were as intellectual support for those transformations (Ajoudani, 2007).

Contemporary architecture in Iran begins with the advent of the first Pahlavi period in the early 1920s. During this era, Tehran, as capital city, have been changed and formed to a modern, industrial city, under some political, social and economic transformations. Regarding fast urban development, the old city walls, and some old neighborhoods, were demolished and new modern streets; new neighborhoods were organized, there. Consequently, the city lost its pervious old form and appearance, and went toward a new form of urbanization and identification. Some of Iranian modern design pioneers were Vartan Hovanesian, Gabriel Gevorkian, Taherzadeh Behzad, Mohsen Foroughi and Ali Akbar Sadegh. Vartan mentioned in one of his papers, that, when social modernization removed ladies veils and gave them freedom, modern architecture with steel and glass and new construction technology, did something like this with Iranian traditional buildings and unveiled them by removing their massive load baring clay walls. Gradually, the usage of modern material for building went forward and widespread and materials like Concrete, Joist, Steel and machine-made brick were used largely in construction (Bani Masoud, 2009).

Some of the important samples, for Iran's Contemporary Architecture are: Sepah Bank (Tehran bazaar branch) and Tehran railway hotel by Vartan, Iran Foreign Ministry and Industries Ministry buildings by Gevorkian, Iran Melli Bank (Tehran, Ferdowsi St.) and Senate house by Mohsen Foroughi and Heydar Ghiai. The first high-rise building in Iran with elevator was designed about 1950 by civil engineer, Huoshang Khan Shaghaghi in 10 stories with reinforced concrete structure.

After that, in 1961 a 16-story steel structure Commercial Building that named Plasco Building (Fig.42) was built by Israeli designers (Bani Masoud, 2009).



Figure 42: Plasco Building, Tehran.



Figure 43: Figurative explanation about traditional and modern lifestyle in Iran society (Bani Masoud, 2009, p.182).



(a)



(b)



(c)

Figure 44(a); Sepah Bank, Tehran bazaar branch, (b): Iran Industries Ministry buildings, (c): Iran Senate house (Bani Masoud, 2009, p.224, 225,235).

In 1938, the first group of painters and architects, who were educated in Europe, established an architectural institution in the name of School of Architecture. In 1939, the organizers of the School of Architecture, founded the first architectural school within the University of Tehran, called it Fine Arts School (F.A.S.). The F.A.S. was founded for the architecture and painting programs. In 1940, 64 students in the architecture program and 14 students in the painting program were studying in Fine Arts School. Finally, the Iranian Parliament agreed with development of the Tehran University's faculties from six to nine. One of those new faculties was the Faculty of Fine Arts. The Faculty of Fine Arts was established in 1949 and included two academic programs, Architecture and Painting (Zargari Nejad, 2007).

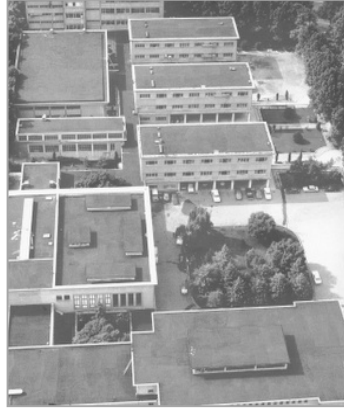


Figure 45: View from Faculty of Fine Arts (Memari Va Farhang serial, 2002).

Tehran University's Faculty of Fine Arts (Fig.45), was the first academic institute in Iran, in the form of university faculty, for architecture program. After that, Iranian contemporary architecture was followed by the second generation of graduates from academic centers, like Huoshang Seyhoun, A.A.M. Farman Farmaian, Kamran T.Diba, Nader Ardalan, Hossein Amanat, etc.

According to Bani Masoud (2009), most of them, tried to follow a new tendency in their design with combining the Iranian Traditional Architecture principles & motifs with International Modern Architecture principles and features. The new tendency was named Semi Modern style. This subject is obvious through their designs and monuments, for example like Azadi (Shahyad) Tower, by Amanat in 1971, Omar Khayyam mausoleum by Seyhoun in 1963, and Shushtar New Town by Kamran T.Diba in 1977 (Fig.46). During this time, "Iranian Society of Consulting Engineers" was founded by A.A.M. Farman Farmaian, who considered more to construction subject in architecture field. According to his view, true architectural design is the one, which is performable and can be constructed easily. Also the success degree of an architect is related to his/her "constructed work" as well, not just his/her figurative forms on the papers.

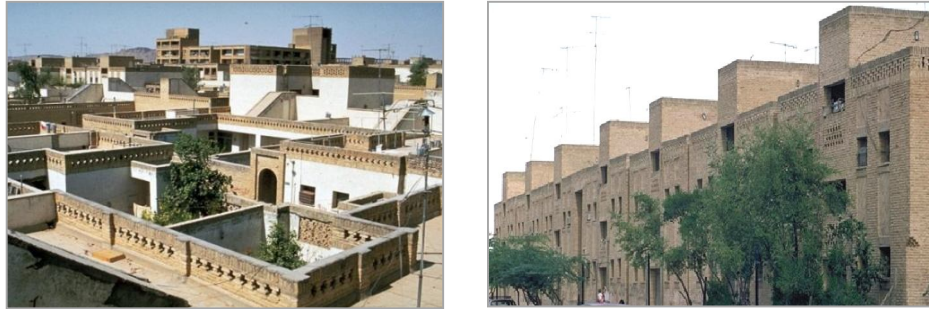


Figure 46: Shushtar New Town, Iran (Shushtar New Town, n.d.).

Nowadays, the contemporary architecture and current designs in Iran could be divided in some categories:

1. Returning to Iranian traditional architecture, this could be seen in religious centers design like Imam Khomeini mausoleum by Mohammad Tehrani.
 2. Copying from western designs and imitating form western architects' works, especially western postmodern or deconstruction samples.
 3. Continuing the pervious Semi Modern style, (Semi Modern style: the tendency that emerged in second Pahlavi era and was a combination between Iranian Traditional Architecture principles & motifs with International Modern Architecture principles and features).
 4. Tendency to high-tech or echo-tech design.
 5. Following the principles and characters of modern architecture, in design, merely.
- For example, it could be considered in some residential buildings, high rise buildings and some other official and public buildings' design.

As examples, for recent designs; Bandar Abbas city amphitheater building by Mohammad Reza Jodat in 2003, Mahestan Residential Complex in Kish by Darab Diba in 2006, Dezful Cultural Center in Dezful by Farhad Ahmadi in 1995 and finally Armita (Bokharest) office Tower (Fig.47) in Tehran by Behrooz Ahmadi in 1994, could be considered (Bani Masoud, 2009).



Figure 47: Armita (Bokharest) office Tower in Tehran (Bani Masoud, 2009, p.476).

According to what mentioned above about design tendencies it could be said that; under effects of modernization, Iranian cityscapes and architectural spaces that people lived in them, have been changed. Nowadays rarely we can find respect to Iranian traditional architectural characteristics in architectural works. Respect to Iranian traditional architecture features in design doesn't mean superficially imitating from Iranian traditional architecture works for example by copying from their decoration style. Instead, it means, considering to Iranian traditional architecture deep principles in design. Such as respect to privacy and regard to climatic condition or vernacular approach, etc., which have roots in Iranians' culture, traditions and identifications during the history.

Chapter 4

ANALYSIS OF CONTEMPORARY RESIDENTIAL BUILDINGS IN TEHRAN-IRAN

According to Modernization and industrialization, during the 20th century most of the cities around the world have been undergoing a radical transformation. House, or generally, residential building, was one of the important parts that was influenced by some essential changes, too. In Iran, the first and the major transformation among the cities, has been observed in Tehran, capital of Iran. Contemporary houses in Tehran since 1925, encountered with significant changes under the effects of modern residential buildings characteristics and principles regarding formal design issues as well as functional issues, which gradually transferred there. For example, they were affected in various aspects from their plan and spaces arrangement to their method of construction. Nowadays, Iranian houses are the results of those changes, and have fewer similarities with Iranian traditional houses, which were lived in before.

This study will evaluate the effects of modern residential buildings characteristics and principles concerning formal design issues as well as functional issues, on some examples which were selected randomly from Tehran's residential buildings from three periods. This study will mainly focus on the residential buildings from 1925 to present time in Tehran. It is a comparative analysis in the course of contemporary residential buildings, among first Pahlavi (1925-1941), second Pahlavi (1941-1979), then, comes up to present time (after Islamic revolution

in 1979 to present), which helps to determine the transformations and influences on contemporary residential buildings in Tehran. Thus, Tehran is selected as the case study and modern residential buildings characteristics and principles regarding formal design issues, as well as functional issues, are selected as indicators, to assess the effective factors on the case study's examples (Tehran's residential buildings). The assessment will be done on five subjects including; Plan schemes, Interior part elements, Form Issues and Facade Organization, Building Technologies (Structural System and Building Materials) and finally Type of residence. Accordingly, all examples are planned to be analyzed through the modern residential buildings characteristics, as indicators.

4.1 Method of Analysis

This research is qualitative and descriptive one, following to the theoretical sections. The analysis has been developed for assessment on case study's examples. Analysis, which has been carried out, consists of three major parts:

- Tehran is selected as case study, as it has been undergoing radical transformations, mainly, during the last 80 years. The examples are chosen randomly regarding to their period of construction, in the region of Tehran.
- The case study's examples are the three categories of residential buildings. First group was from 1925 to 1941 period (First Pahlavi era), which was the beginning of the contemporary architecture in Iran. Second group of houses were constructed during 1941 to 1979 (Second Pahlavi era) and third group, were after 1979 (After Islamic Revolution). Fifteen different residential buildings were selected from each period. So, totally 45 residences have planned to be analyzed.

- Inventory developed in accordance to indicators which are derived from modern residential buildings characteristics and principles which were studied and defined in literature survey part. Inventory has been developed in two parts; the first part (Table 8) includes general information about residence, from its location, plan scheme and façade to interior view and the second part of inventory (Table 9) includes the assessment of residence, in terms of modern residential buildings characteristics and principles.

4.2 Case study

4.2.1 Analysis of Contemporary Residential Buildings in Tehran- Iran in Term of Modern Residential Buildings principles

In total, 45 residential buildings have been selected to be analyzed, which were constructed in different periods, since 1925 until now. The first fifteen houses were constructed during 1925 to 1941 (First Pahlavi Era), which was the beginning of the contemporary architecture in Iran. Second group of houses were constructed after 1941 till 1979 (Second Pahlavi Era) and finally, the last 15 houses was selected from those that were constructed after 1979 (After Islamic Revolution) till now.

Assessment of the first, second and then third group of houses in terms of modern residential buildings principles, will be interpreted one by one in five subcategories as mentioned before; Types of residence, Plan, Interior part elements, Formal design issues and Facade organization, Building Technologies (Structural System and Building Materials).

4.2.1.1 Types of residence

Assessments of the results in this part show that;
From fifteen examples of each period, in the first period, thirteen houses, in the second period, six houses and in the third period, one house, were Single detached (villa) type (Fig.48).



(a)



(b)



(c)

Figure 48: (a): Single detached (villa) type in first period (Tehran Cultural Heritage Organization Documentation Center, n.d.), (b): Single detached (villa) type in second period (Tajeer Architects and Urbanists, 1975), (c): Single detached (villa) type in third period (Sharifi, n.d.).

Again from fifteen examples of each period, in the first period, there is no multistory apartment house. But, in the second period, seven houses and again in the third period, seven houses were Multistory Apartment house type (Fig.49).



(a)



(b)

Figure 49: (a); Multistory Apartment house in second period (Vanak park Co., 1978) (b); Multistory Apartment house in third period (A.S.P Construction Company, n.d.).

In addition among examples of each period, in the first period, two houses, in the second period, again two houses and in the third period, seven houses were Row housing type (Fig.50).

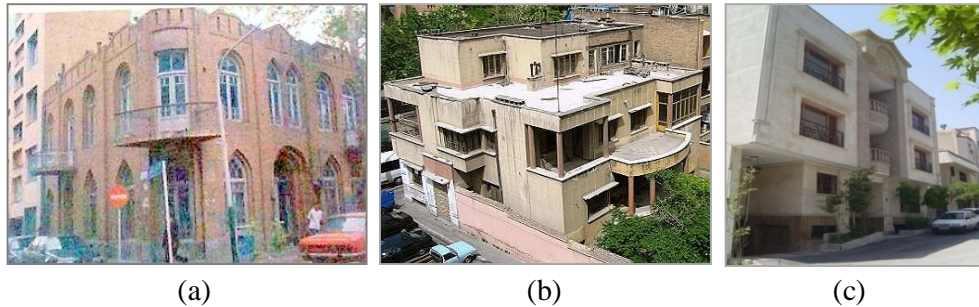


Figure 50: (a): Row housing type house in first period (Tehran Cultural Heritage Organization Documentation Center, n.d.), (b): Row housing type house in second period (Moosavi, n.d.), (c): Row housing type house in third period (Persian Parsa Company, n.d.).

As in the beginning of contemporary time, people in Tehran, mostly were living in single detached type (Villa) house, regarding to save their traditional extended family type (with many members from different generations) and also save their traditional life style and customs beside the influences of social, economical and technological transformations that have been started in society. As this subject also, can be seen within examples of the first period here. By passing time and gradual changes in family type, from extended to nuclear type and increasing the population of Tehran as mentioned before, the usage of multistory apartment and row housing type of residences (as modern type of residence) increased in next periods (second and third period), (see chapter 3; part 3.1.1). Meanwhile the usage of single detached type of houses (villa) decreased as well. This approach also can be traced within examples of second and third period here as well.

4.2.1.2 Plan

In this part, the assessment revealed that;

From fifteen examples of each period, in the first period, three houses had Free, Open plan/Spaces. But in the second and the third period, there were no house which had Free, Open plan/Spaces (Fig.51).



Figure 51: Free, Open plan/Spaces house in the first period (First Pahlavi Era (1925 – 1941)), (Me'mar Magazine, 2002).

Within fifteen examples of the first period, no house had applied two or more bathrooms in it (especially between adult and children). But in fifteen examples of both second and the third period, there were four houses from each period which had applied two or more bathrooms in them.

Among examples of each period, almost all of them had Employed separated bedrooms for family members (especially for adult and children).

Also within examples of each period, in all examples, dining room or living room (TV room, hall) were employed as houses main common spaces.

Among examples of each period, in the first period, there was no house with added toilet and bathroom. But in the second period, twelve houses and in the third period all examples had added toilet and bathroom.

In the first period (1925-1941), at the beginning of contemporary time, there were some characteristics and spaces in some of Tehran houses which were affected by world modern residential buildings characteristics and principles, formal design

issues like; open plan, or functional issues like; applying dining room or (hall) as main common spaces in house, employing separated bedrooms for family members (adult and children) in houses. Most of those characteristics and spaces were new ones and have entered to Iranian residential Architecture since this period. This subject is emphasized by examples of the first period here as well.

Then in the second period (1941-1979) and the third period (after 1979) by increasing the regarding to modern residential buildings characteristics in Tehran houses design, gradually, more new ideas from world modern residential buildings characteristics, entered to residential buildings design field there. As it can be seen also within examples here, other functional issues like; applying two or more bathrooms (separately for adult and children), adding toilet and bathroom together, which have been applied in Tehran residences, since this period.

4.2.1.3 Interior Part Elements

Regarding to applying Modern mechanical/ electrical installation; central heating/ piping system /etc. in house;

From fifteen examples of each first, second and third period, nearly all houses had employed Modern mechanical/ electrical installation; central heating/ piping system/ /etc.

Within examples of each period, all of them had built-in furniture; storage closet/ wardrobes/etc.

About six houses from examples of first period and almost all examples of second and third period had new type of furnishing material; doors and windows, etc. (Fig.52).

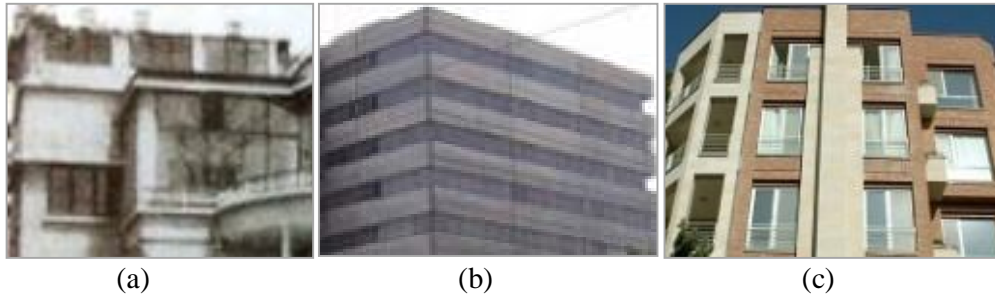


Figure 52: Applying new type of furnishing material (windows) in house, (a): In first period (1925 – 1941), (Me'mar Magazine, 2002), (b): In second period (1941- 1979), (Ekbatan Renovation & Development Co., n.d.), (c): In third period (after 1979), (Sharifi, n.d).

Modern house's functional issues like; Modern mechanical/electrical installation and piping /lighting system, also, applying new types of furnishing materials, doors and windows, etc., built-in furniture like; storage closet/ wardrobes, etc. were used widely during contemporary era. This subject emphasized by examples of three periods here as well.

4.2.1.4 Form Issues and Facade Organization

Among fifteen examples of each period, in the first period, there were five undecorated houses. Then in the second period, eleven houses and in the third period again five houses were undecorated.

Regarding to rejection of any refer to historical styles in house; from examples of each period, in the first period, five houses, in the second period, eleven houses and in the third period, ten houses, had rejected having any historical styles .

Within examples of each period seven houses from examples of first period and eight houses from second period and six houses from examples of third period had white, gray and black color in their façades (Fig.53).

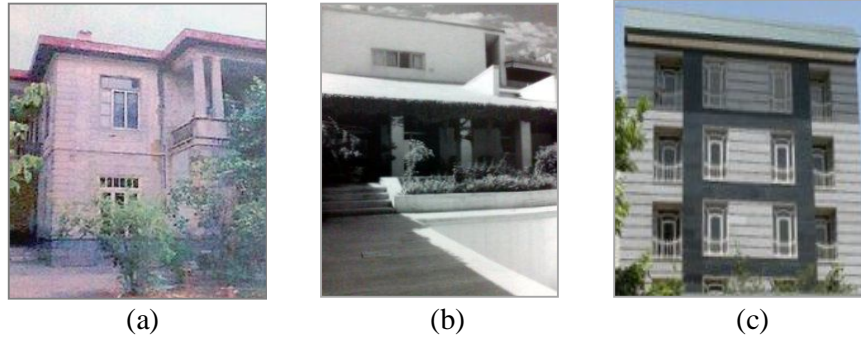


Figure 53: Applying white, gray and black color in houses' façade, (a): In first period (1925 – 1941), (Tehran Cultural Heritage Organization Documentation Center, n.d.), (b): In second period (1941- 1979), (Bavand Consulting Engineers, n.d.), (c): In third period (after 1979), (Persian Parsa Company, n.d.)

Among fifteen examples of each period, almost twelve houses in each period had more usage of glass or concrete in façade as façade texture (Fig.54).

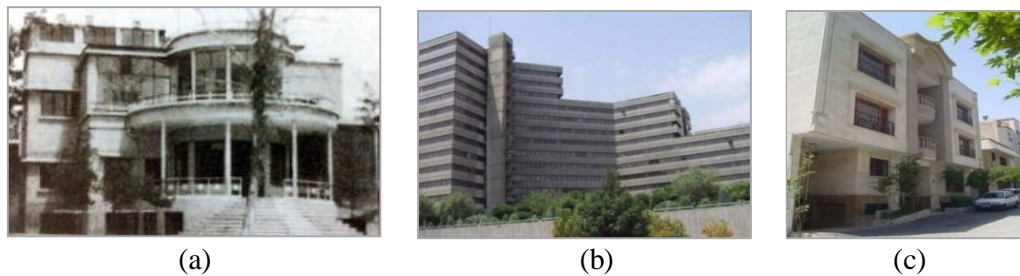


Figure 54: Applying glass or concrete in façade as façade texture, (a): In first period (1925 – 1941), (Me'mar Magazine, 2002), (b): In second period (1941- 1979), (Ekbatan Renovation & Development Co., n.d.), (c): In third period (after 1979), (Persian Parsa Company, n.d.)

About applying Pilotis or foundation posts, there was no example in the first period which had Pilotis or foundation posts. But within the second period examples, there were eight and in the third period, nearly all examples had Pilotis or foundation posts.

Within fifteen examples of each period, nearly all of them in all periods had simplified form (Fig.55).

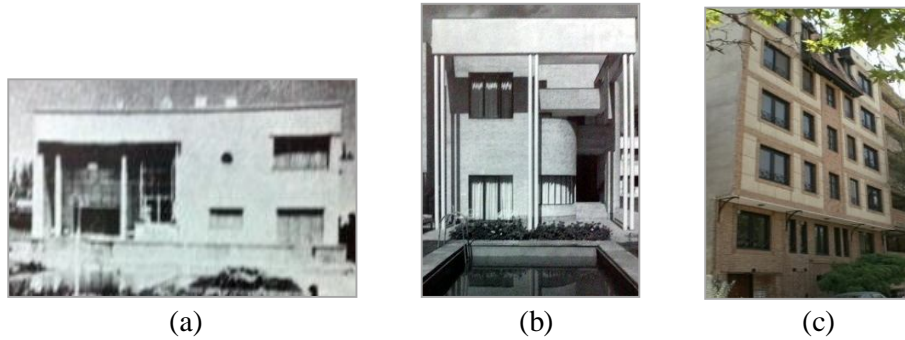


Figure 55: Dwelling form simplification, (a): In first period (1925 – 1941), (Me'mar Magazine, 2002), (b): In second period (1941- 1979), (Tajeer Architects and Urbanists, 1975), (c): In third period (after 1979), (Persian Parsa Company, n.d.)

From fifteen examples of each period, in the first period, four houses had free designed façade. But in the second and the third period, almost all examples had free designed façade, which is the result of the development of the building's construction technology with applying skeletal system instead of previous load bearing system in construction.

About four houses from examples of the first period, nine houses from examples of the second period and seven houses from examples of the third period had horizontal windows or continuous string of windows in façade (Fig.56).

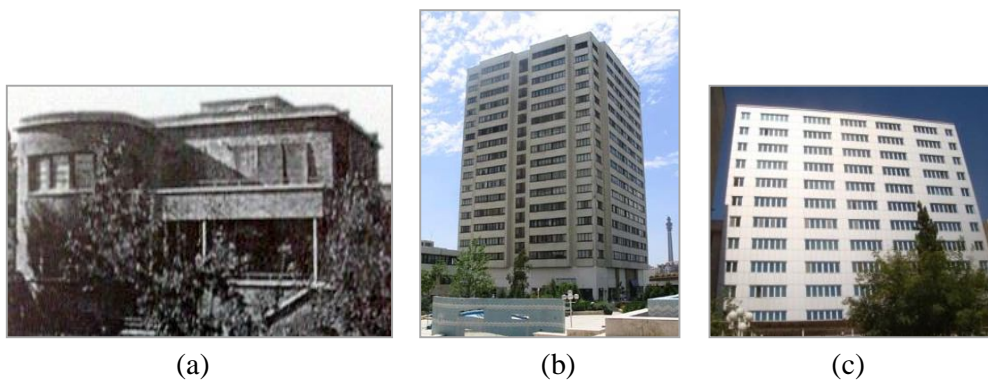


Figure 56: Applying horizontal windows or continuous string of windows in façade (a): In first period (1925 – 1941), (Me'mar Magazine, 2002), (b): In second period (1941- 1979), (Vanak park Co., 1978), (c): In third period (after 1979), (Mes Residential Complex, n.d.)

Within examples of each period, in four houses from examples of the first period, in thirteen houses from the second period and in all houses of the third

period, horizontal and vertical lines in their façade design had been emphasized (Fig.57).

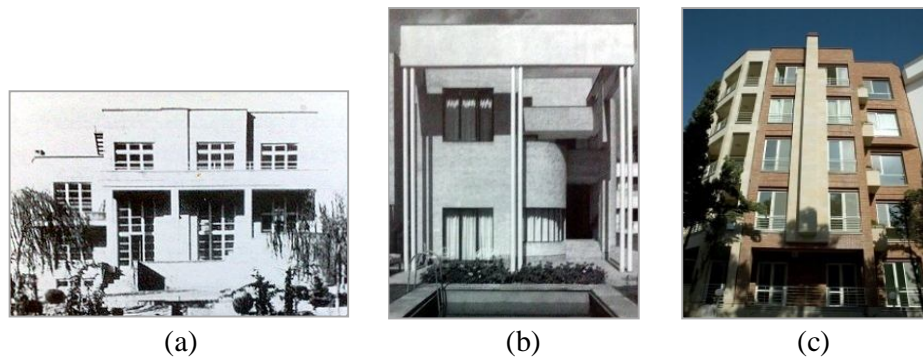


Figure 57: Emphasis of horizontal and vertical lines in façade design, (a); In first period (1925 – 1941), (Me'mar Magazine, 2002), (b): In second period (1941- 1979) (Tajeer Architects and Urbanists, 1975), (c): In third period (after 1979), (Sharifi, n.d.).

Among fifteen examples of each period, there were no examples within examples of each period that had flat roof with roof garden.

In the first period (1925-1941), second period (1941-1979) and the third period (after 1979) most of residences in Tehran, were applying ornamentation and decoration and had elements from historical styles. Also usage of formal design issues like; building form simplification, façade free design, applying continues windows in façade, more usage of glass or concrete in façade as façade texture, emphasizing on horizontal and vertical lines in façade design and using white or gray and black color, as façade color could be considered as the effects of world modern residences characteristics on Tehran residential buildings in this period. These approaches can be seen also within examples of these periods as well.

In addition Pilotis or foundation posts as another modern formal design issue, has been applied in Tehran residences since second period (1941-1979) in Tehran residential buildings. This approach also could be traced within examples of second and third period too.

4.2.1.5 Building Technologies (Structural System and Building Materials)

Within examples of each period, four houses from examples of the first period, seven houses from the second period and five houses of the third period, had reinforced concrete skeletal system.

From examples of the first period no house, but, from the second period, seven houses and the third period, ten houses had steel skeletal system.

Among fifteen examples of each period, in the first period, there were eleven houses with load bearing system. But almost in second and third period there were no house with load bearing system.

About using industrialized method, prefabricated elements in construction, there was no example in the first period which had used industrialized method, prefabricated elements within construction process. But in the second period examples, there were six and in the third period, seven examples had used industrialized method, prefabricated elements in their construction (Fig.58).



Figure 58: Usage of industrialized method, prefabricated elements in construction, In second period (1941- 1979) (Vanak park Co., 1978).

Within examples of each period, four houses from examples of the first period, eight houses from the second period and one house of the third period had exposed structure (Fig.59).



Figure 59: Usage of exposed structure, In second period (1941- 1979) (Ekbatan Renovation & Development Co., n.d.).

Assessments of the results about materials which were applied in Tehran houses during contemporary time show that;

From fifteen examples of each period, in the first period, in no house, in the second period, in seven houses and in the third period, in ten houses, steel was used.

Among examples of each period; in four houses of first period, seven houses of second period, five houses of third period, reinforced concrete was applied. Also, glass was used widely in all examples of each period, during contemporary time.

With development of the technologies in houses construction, the new kinds of structural systems like; reinforced concrete skeletal system and exposed structure as well as some new materials like glass and reinforced concrete have been applied from first period (1925-1941) in Tehran residential houses. In parallel the rejection of load bearing system as traditional skeletal system of buildings in Tehran houses started from that time. This subject emphasized by examples of the first period as well.

In the second period (1941-1979) and third period (after 1979) some other characteristics including; applying steel skeletal system, using industrialized method/ prefabricated elements in construction and applying steel as another new building material exposed structure, have been applied in Tehran residences, since this period. Also applying load bearing system has been rejected in houses construction from this period. These approaches can be traced also in the examples of both second and third period as well.

4.2.2 Evaluation of the Assessment Results

As summary it could be said that:

- Most of houses in the beginning of contemporary period, were low rise and rarely even reached to 3 story level, but by passing time and after a short time, in the second and then the third periods, the number of mid-rise (between 3 to 6-story) and high-rise (above 10-story) houses increased fast(see chapter 3; part 3.1.1). On the other hand, the number of low-rise houses decreased there. In parallel, about type of residence, single detached (villa) type of residence which was popular in the beginning of contemporary period, changed in the second and the third period and became multistory apartment and row housing type, which Tehran's people, nowadays are living in them. The results of the evaluation of these topics are also in accordant to what was mentioned before in chapter three (see chapter 3; part 3.1.1) and this approach can be traced in the examples of three periods here too.

- A gradual reduction of houses area since the beginning of contemporary period has happened in Tehran. This result, in parallel to previous mentioned researches about this topic, is emphasized by examples here as well (see chapter 3; part 3.1.1).
- About formal design issues like; applying open plan type for houses, by passing time, having this option was not popular during contemporary era, in houses, which this approach can be traced within examples here too.
- In addition, as it can also be seen in examples of three periods, applying separated bedrooms for family members, dining room/living room (TV room, hall) as main common spaces in house and modern mechanical/ electrical installation in house, built-in furniture; storage closet/ wardrobes, which were the functional issues of modern houses were used widely since beginning of contemporary era in Tehran residences.
- Meanwhile, applying two or more bathrooms, new type of furnishing materials like, doors and windows, applying added toilet and bathroom together, were other modern functional issues in houses, which gradually increased, in Tehran houses during contemporary period. These topics are emphasized by studied examples as well.
- During contemporary era, decoration and ornamentation or referring to historical styles were used in Tehran contemporary houses. This approach can be traced in the examples of three periods too.
- Glass or Concrete façade were used as façade covering material in façade texture. Also white, gray and black, were used as residences' façade color in Tehran, during contemporary era. These topics also are emphasized by examples here as well.

- Regarding other formal design issues, like applying pilotis/foundation posts or, employing horizontal window/ the continuous string of windows in façade or using industrialized method, prefabricated elements in houses construction, had an increasing trend during contemporary era. These approaches also can be traced within examples here too.
- Simplification of the form of houses, façade free design, emphasizing on horizontal and vertical lines in façade design, as formal design issues increased by passing time in Tehran houses. As this topic can also be seen in examples of houses as well.
- About houses structural system in the first period, load bearing system was the most popular structural system for houses. Then in the second and the third period, the usage of load bearing system in houses decreased sharply, and in parallel, applying reinforced concrete and steel skeletal system in houses increased. This topic can also be traced in examples here too.
- Adding to all above, applying exposed structure in houses construction, were used mostly in second period (1941-1979) as it can also be seen in the examples of second period.
- About the use of new material in houses construction, from first period (1925- 1941) during contemporary time, the use of reinforced concrete, steel and glass, as modern construction material, increased. These results are emphasizing on the previous mentioned researches and can be traced in the examples of three periods, here, too (see chapter 3; part 3.1.1).
- By passing time the houses ownership have been changed from private to rental within Tehran houses during contemporary time. This topic also is

mentioned before (see chapter 3; part 3.1.1) and evaluation of the examples here emphasized on it once more.

- Since First Pahlavi period (from 1925) the city (Tehran) expansion mostly, had been started from central part and by passing time, in next periods, the city widened to northern and western part. This topic already were mentioned before in previous researches (chapter 3; part 3.1.1), and in the studied examples this approach also can be traced too.

Chapter 5

CONCLUSION

During contemporary era, beside all changes that had happened in Iranian society like, industrial developments, woman freedom, veil removing, the establishment of modern educational system and etc. (Ajoudani, 2007), also, Iranian life style and living places have been changed widely, from cities to residential buildings. Tehran, as the Capital of Iran, like many other cities, has undergone severe and quick alterations, under the modern movement, during contemporary era from 1925. As a result, Tehran's people's lifestyle, as well as its cityscape, and residential buildings, changed. Nowadays, Tehran's population lives in residential buildings that majorly, are the results of those changes, which have happened during the last 85 years, there.

Therefore, this study, after statement of the problem, is intended to find out, how world modern residential buildings characteristics, influenced Tehran's residential buildings' designs during contemporary era, since 1925. So, modern residential buildings characteristics were defined, as indicators, to question and determine those effects and influences, during the last 85 years, on the case study's examples (some of Tehran's contemporary residential buildings which randomly were selected).

Assessments of Tehran residential buildings' examples were done in three periods during contemporary era, in terms of modern residential buildings characteristics, under some subheadings including; Types of residence, Plan, Interior

Part Elements, Formal design issues and Facade Organization, Building Technologies (Structural System and Building Materials).

To sum up, there are some main conclusions, for this study:

- The studied examples show that; in the first period(1925-1941), in the beginning of contemporary era and applying modern houses characteristics, although some of the examples from Tehran houses were affected by some of those feature and principles, but, they were not most popular in that time. (This period could be considered as transitional period from traditional to modern residential buildings in Tehran).
- In the second period (1941-1979) during contemporary era, it has been achieved that, studied examples of Tehran houses were influenced deeply by the modern houses characteristics. This term could be considered as a massive transformation for those examples and their detachments from the previous principles and characteristics.
- About the last period (after 1979), it has been revealed that, the studied examples of Tehran houses still are affected by modern houses principles and characteristics. They are renewed by passing time and have become more distant from their original and previous characteristics during contemporary era.
- Finally, although the studied examples of Tehran houses were affected widely by modern residential buildings' characteristics, but few formal design issues of modern residences including; Free/Open plan, or applying Exposed structure or Flat roof with Roof garden, were not used widely in them, during three periods there.

It is also believed that, this study could be seen as an approach to clarify some of the effects of modern residential building's characteristics regards to formal design issues as well as functional issues on some of the examples of Tehran contemporary residences and can be a guide for other researchers and architects related to this topic.

As a further study, related to this research, settlers' satisfaction from living in current residential buildings (toward the optimization of house's spaces), and how those residences are matched with their needs (cultural and psychic, etc.) can be studied.

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APPENDIX