

# **The Versatility Approach in the Formation of the Underground Architecture in the Second Pahlavi Era<sup>1</sup> (Case Study: Quran Museum) and Its Utilization Necessity in Sustainable Development of the City of Tehran**

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## **1. Abstract**

With the rapid development in the last decades, Tehran has encountered many problems including air pollution, visual pollution, environment pollution, traffic issues, lack of public transportation and green spaces, energy loss, security requirements and need for Infrastructure developments. Sustainable urban development is one of the new methods in urbanism. Use of underground spaces progress could play an important role in sustainable city development in dense cities. This article describes the versatility approach in formation of the underground architecture of the Quran museum in the second Pahlavi era, the aspects and benefits of using these spaces and its utilization necessity in future and current development of the city of Tehran. After proposing the question and its importance, the concept of versatility and features of the underground architecture in the second Pahlavi era and the reasons for the formation of the museum in underground are represented. The Study results show that in addition to restore the historical buildings and cultural heritage, the versatility approach in formation of the underground architecture observing principles of sustainability could be effective in solving urban issues, even in one building.

*Keywords:* Underground architecture, versatility approach, sustainable development, Quran museum, second Pahlavi era architecture.

## **2. Introduction**

Using underground spaces in Iran is a new subject, few related researches have been done in this context mostly on traffic issues. Due to valuable potentials and capacities of underground spaces, the need for exploring the use of these spaces has been revealed more than ever. Therefore, to develop and use these spaces optimally in contemporary urbanism is considered by many architects and urban designers as a solution of urban issues.

This article will investigate the underground architecture position in the second Pahlavi era and reasons to use it in the Quran museum, especially in relation to environmental adaptability. The productivity of underground spaces is then addressed in order to achieve certain goals including green space development, promotion of the identity of historical spaces, solving physical issues on the scale of architecture and urbanization in that era and adapting current conditions of the city of Tehran and necessity of its sustainable development. Generally this article is going to address two questions; the

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<sup>1</sup> 1941-1979

reason of using underground spaces in the past and ways to use the technology of underground spaces in future and current sustainable development in the city of Tehran.

### ***2.1 History of the underground architecture in the world***

The underground spaces have multiple usages, including storage (food, water, oil, industrial goods, and waste products), industry (power houses), transportation (railways, roads, and pedestrian tunnel), welfare services and communications (water, sewage, gas, and electricity cables), general applications (shopping malls, hospitals, civil defense structure) and personal use (parking), (Bobilev, 2009). Using underground spaces begun with the caves where were used as a shelter or food storage, (Carmody, Striling, 2009). In 1930 Edward Otojian, the French American architect, brought up the idea of vertical detachment of urban operation. In 1937, in order to develop underground spaces, he offered “The International committee of subsurface planning and technology”. Otojian is known as the father of underground urbanization, (Benser, 2002). In 20<sup>th</sup> century, underground development in its modern concept in the format of multi-story passages and transmission of traffic, facility networks and shipping of goods, is expressed by Eugène Alfred Hénard. USA, China and Malesia are among the leading countries in this context. Scandinavian countries, west Europe countries and Japan benefit from use of underground spaces as well.

Underground city is a potential which could have huge impact on sustainable city development if it is managed perfectly. If 20<sup>th</sup> century was the time of high rise buildings, 21<sup>st</sup> century would be the century of underground buildings (URL1). Although Iranian native architects have used underground spaces properly and perfectly, in contemporary era Iranian architects haven't been able to have the same impressive achievement.

### ***2.2 History of the underground spaces in the city of Tehran***

In addition to transportation –which is being used nowadays- , use of underground public spaces in Tehran could include other usages, such as recreation, commercial, office and services. In this case many of urban management problems of Tehran could be solved.

In second Pahlavi era, and with Tehran's rapid growth, many new buildings appeared in this city. Aluminum building in Jomhuri Street, Hilton hotel building in Shemiran and the current building of Agricultural Jihad in Keshavarz Boulevard are in this group. In this pattern, buildings are constructed in extensive land with low building area which is found in residential and office buildings of this era like Hormozan towers in Shahrake Gharb, ASP towers in north Yousef Abad, Parc de Prince Complex, Eskan towers, Ekbatan residential complex, Sasan building in Keshavarz Boulevard and Saman towers in south Shiraz street. Service spaces in these buildings like mechanical room, parking and stores are located in underground levels. In central library of Tehran University, office building is formed in underground spaces with the use of natural slope of Tehran and the proper lighting ability. In Central Bank of Iran building, supporting services department like treasury and museum are located in underground spaces. Because of advanced ventilation, modern lighting and open environment surrounding, Quran museum is one of the few underground spaces that technology has a huge impact on.

Nowadays, Tehran's underground master plan is a starting point of studies about using underground spaces. In 2007, the necessity of a monolith look to underground public spaces development and the possibility of construction in Tehran's underground was mentioned in the master plan, this approach

has continued until 2016 in strategic studies of Tehran underground spaces development which is a turning point for Tehran underground public spaces development.

### 3. Utilization of underground spaces in the city of Tehran

Generally, utilization of underground spaces can be classified in three groups; social, traffic and services. Social type of underground spaces include all spaces where social activities like cultural, commercial, sports and offices are being done in and usually couple with pedestrian movement. Traffic type underground spaces are spaces which are created in order to simplify the flow of pedestrians and riders including parking, pedestrian and rider tunnels and urban and interurban railways. Service type includes data centers, stores, urban facilities (like aqueduct, equipment and gas, water, electricity and telecommunication lines), refineries and depletion of surface water channel, offensive and defensive military centers, military stores, shelters and flood disposal equipment. It must be considered that many underground spaces could have different usages, (Alalhesabi, Riahi Esfahani, 2016).

### 4. The concept of versatility

The word “versatility” generally means the quality of being adaptable, the ability to make yourself adaptable or potential compatibility, this also means compatibility and commensurability with different goals, (Schneider, Thiel, 2005). Versatility, particularly in architecture means a space which could provide different type of activities without changing or organizing.

#### 4.1 Effective factors on the formation of versatile architecture

In order to adapt spatial, behavioral and psychological needs, versatile spaces use geometry, dimension, form, meanings and organization. Generally, these features could be classified in 3 groups; physical, spatial and functional and they can be divided into sub sections as shown in fig. 1.

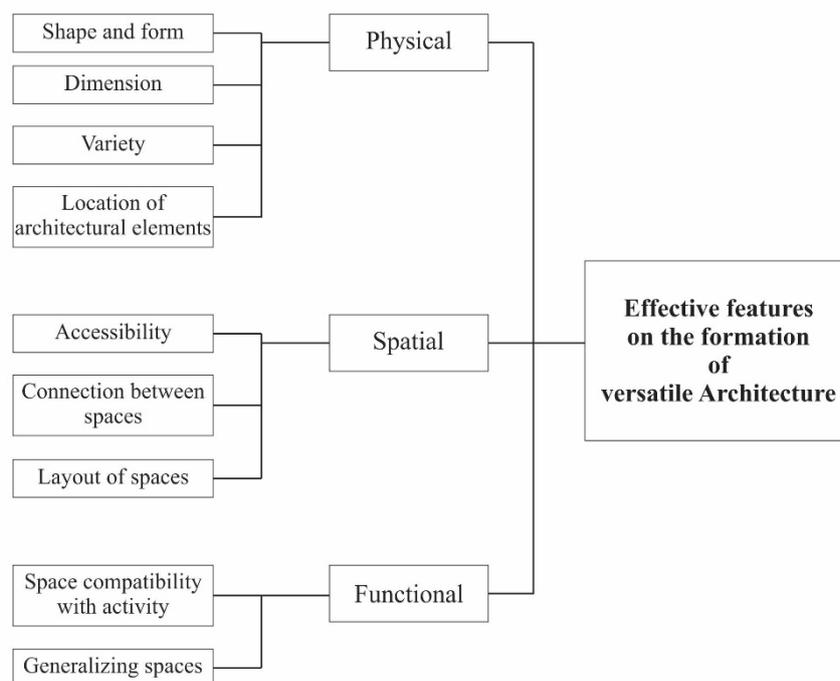


Fig 1. Effective features on the formation of versatile architecture (Samanian, 2013)

## 5. Case study (Quran Museum)

In the years 1974-76, by the Farah Diba office<sup>2</sup>, it was decided to establish a cultural center around Valiasr and Imam Khomeini Street. By creating a link between the new and the existing old buildings (Marble Palace and Negarestan Garden building), the idea of using underground spaces along north-south axis of Marble Palace and using east-west axis of entrance yard of Negarestan as an entrance the cultural center was found to be an option of realizing the idea of creating a great cultural complex including all 3 buildings. In 2005, as the only Quran professional museum in Iran, this cultural building was transformed to Quran national museum. At the same time, there was an idea to use underground spaces in designing of Azadi tower complex.

Table 1. General specifications of Quran Museum (Sharestan Consulting Engineers, 1998)

Location	North to Pastour Street and presidential organization, east to Valiasr Street, west to Palestine Street and south to Imam Khomeini Street.
Architect	Behrouz Ahmadi
Date of formation	First phase: 1974-76. Second phase: 1995-98
Client	First phase: Farah Diba office, Executive contractor: Ros Company (Mr. Pour Fathi) Second phase: Ministry of road and urban development, Executive contractor: Mr. Jalal Sadeghi
Site area	14000 m <sup>2</sup>
Building area	10000 m <sup>2</sup>
Dimension of complex	30mx60m and 14m underground in 3 levels



Fig 2. Marble Palace and Quran Museum  
(Google earth)



Fig 3. Cultural center environment  
(Sharestan Consulting Engineers, 1998)

<sup>2</sup> Farah Diba office served 4 functions; education, healthcare, social welfare and culture and art. Building Quran museum served one of the functions of this office.



Fig4. Interior and exterior of Quran museum  
(Sharestan Consulting Engineers, 1998)

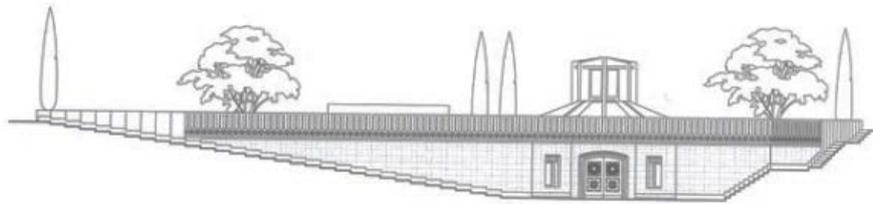


Fig 5. Entrance Yard section  
(Sharestan Consulting Engineers, 1998)

The amphitheater and the entrance hall are the main elements of the complex. The entrance hall in the first level is the main entrance space of the complex, in the second level is the waiting room of the amphitheater and in the third level is the exhibitions venue. (Qamami, 1998) According to the skylights on the roof of the complex in this building, it is possible to have natural light in all the levels and air conditioning systems and artificial lights have provided desirable conditions in this complex, (Mousavi, 2009). Other important elements in the complex are:

- Library where is placed in the south of entrance hall in three levels.
- Complex of museums including Quran museum where is in east side.
- Galleries, where have occupied the west side in order to communicate with Negarestan museum.
- Administrative department and stores where are placed in north side because of the need for distinct entrance and direct access to the parking.

Providing the necessary height for the amphitheater and the need for the safe distance to the ground water level are factors in determining the height of excavation. This height which is equivalent to three levels, has provided the access to all the levels of the complex without using elevators and the possibility to have natural light in the lowest levels, (Qamami, 1998). Effective factors in the versatility and formation of Quran museum are:

Table 2: Effective factors in the versatility approach in Quran museum (writer)

<b>Effective Factors in the Versatility Approach in Quran Museum</b>	
<b>Physical</b>	<ul style="list-style-type: none"> <li>- Digging in a new building in front of the monuments, which are a part of the contemporary political history of Iran, as a sign of curtesy and modesty;</li> <li>- Changing the design and exterior view of cultural center in order to organizing outdoor;</li> <li>- Showing the architect being tied up to the existing building in organizing the roof of cultural center;</li> <li>- Using discipline, geometry, symmetry and specific structures in the building.</li> <li>- Using traditional and modern materials combination together;</li> </ul>
<b>Spatial</b>	<ul style="list-style-type: none"> <li>- Main entrance of the complex in the western south of the cultural center, has an open area in the south of Negarestan Palace, which has stairs and the low yard complex and a view of the main entrance of the building;</li> <li>- In order to invite audiences to the building, the architect has lowered down the yards in the west entrance;</li> <li>- Using traditional architecture of Iran inside;</li> <li>- Creating physical and visual communication between levels and spaces around them and a view to important elements of the complex;</li> </ul>
<b>Functional</b>	<ul style="list-style-type: none"> <li>- In addition to exhibition, the entrance hall can be used as the waiting room of the conference hall;</li> <li>- Outdoor amphitheater in the north of the skylight on the roof of the cultural center.</li> </ul>

Some of the features of the Quran museum are: using advanced air conditioning system and modern lighting, cultural spaces outdoor of the complex and creation of this underground space in the busiest part of the city of Tehran. Building these kind of underground spaces is effective in the sustainable development of the city.

## **6. Programming the development and management of using underground spaces in the city of Tehran**

The city of Tehran has many facilities built on ground and the capacities and facilities which are provided by underground spaces for development, is considered to be a new way to expand the city and reduce the problems on ground. In order to program use of underground spaces in Tehran, it has been put on agenda to locate and extend the apt areas, and to integrate the management of these spaces through the use of common criteria.

Table 3. Problems in the city of Tehran and development capacity of the underground spaces (strategic plan for underground spaces development in the city of Tehran, 2016)

<b>Problems in the city of Tehran</b>	<b>Planned development capacity of the underground spaces</b>
Unbalanced growth and high construction density in some parts of the city and harming visual and functional quality of Tehran	Supporting the decrease in construction density in dense areas of the city through the use of the underground spaces development
Lack of qualified open spaces due to the high value of land and increasing construction density.	Helping to reduce the lack of urban open spaces by transferring some usages to underground and releasing ground level spaces
Lack of green spaces and plants and deficiency of balanced distribution of available green spaces in the city	Helping to reduce the lack of green and recreational spaces by moving some usages to underground, releasing ground level spaces and transferring green spaces to underground through modern technologies
Traffic issues, vehicle congestion and interference between pedestrians and riding path	Improving traffic and transportation inconvenient condition by decreasing the interference between pedestrians and riding path in busy areas and building underground riding roads
The problem of air pollution and the outbreak of harmful phenomena to the health of the citizens	Reducing air pollution by increasing green spaces, decreasing population density, transferring traffic paths to underground and enlarging open spaces of the city
Losing positive social features in some parts of the city and urban cultural problems	Reducing social instability and cultural problems by transferring some usages to underground, creating open and efficient spaces and making great opportunities for social activities
Serious danger of natural disasters especially earthquake in the city and the need of crisis management including predicting and preparation to deal with the crisis, reducing damage caused by incidents and reverting to normal situation and rebuilding and restoration of the effects of the crisis	Utilizing underground spaces in the crisis management process, making safe and secure underground spaces against natural disasters, building underground relief places, transferring some usages like stores, military facilities and volatile materials to underground and removing them from the living environment

## 7. Conclusion

In the urban development of Tehran in the second Pahlavi era it was considered necessary to utilize underground spaces. This method has been forgotten by architects and urban planners for a while. It is necessary to reuse this natural gift again in order to develop the city. (Fortunately, the study underground spaces in the city of Tehran has completed gradually over recent years. On use of the study began in the Tehran master plan in 2007 and has been continuing until 2016 the strategic study of the Tehran's underground development.)

The problem in this case is most of the important spaces were located in the areas with new and worthless buildings, which cause many problems such as visual pollution, environment pollution, traffic issues, lack of public transportation, lack of public green spaces, energy loss, security requirements and the increasing need for infrastructure expansion. In this regard, utilizing the technology which is adapted to underground spaces development can be helpful in providing for need of urban spaces, supplying underground spaces, releasing occupied areas by worthless buildings and developing green public spaces. Due to the development of Tehran, many historical valuable monuments have been surrounded by new high-rise buildings. Therefore developing underground spaces provides an opportunity to demolish some of these asymmetric spaces around the monuments. As a result, not only the land between filled and empty spaces is provided through urbanization, but also many anomalies caused by unknowing and quick decision of the city administrators and lack of green spaces and clean air could be solved.

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