

# **Creating Shade in Arid Climates: A Welcoming Landscape Based on Zoroastrian Beliefs for the Towers of Silence**

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## **ABSTRACT**

This study develops a landscape design, which demonstrates how to change the microclimate in a historical public space (Towers of silence, in city of Yazd, designated as World Heritage Site, in the heart of Iran).

The arid historic city of Yazd is getting hotter. The increasing temperatures make it more and more difficult to use the public space. Towers of silence inherited from Zoroastrianism are stone cylindrical structures located on top of the hills within infertile land located south east of the city of Yazd.

This historic site brings visitors from around the world every year but the microclimate of the site it is not welcoming. The current layout does not provide information about the rich culture it entailed, and visitors are not able to understand the meaning that is behind these structures.

This design aims to improve the current conditions of these magnificent towers and utilize techniques like historical plan analysis, comparative analysis and experimental design study. Using landscape architecture to address the climate issue the proposed design translates Zoroastrian's beliefs to visitors as well as creating a more hospitable environment.

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## **GENERAL AUDIENCE ABSTRACT**

All around the world people must deal with climate change and the effects of extreme weather. City of Yazd in the heart of Iran is not immune to such changes and has traditionally faced a harsh desert like climate. This study focuses on improving the climate surrounding a unique and magnificent historic site in city of Yazd called the Silent Towers (a designated UNESCO World Heritage Site). The design uses material and natural elements that are local to the site (stone, plants and trees) and infuse Zoroastrian and ancient Persian beliefs to bring about a more pleasant conditions (reducing the heat) for the visitors to this site. The outcome of merging tradition and natural elements to mitigate extreme temperatures brings about a layout that is inviting to visitors and hospitable to the local population without changing any of the values or the integrity of the main attraction: The Towers of Silence.

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## 1. Introduction

This study develops a landscape design, which demonstrates how to change the microclimate of a historical landmark in extreme heat and make it more comfortable and welcoming for its visitors at the same time providing information about the rich culture it entailed (World Heritage Site) in the city of Yazd in heart of Iran.

The arid historic city of Yazd is getting hotter. The increasing temperatures make it more and more difficult to visit and enjoy the Tower of silence in this city. It is estimated that annually up to 150,000 tourists from outside of Iran and roughly 1 Million domestic visitors come to city of Yazd<sup>1</sup>. This study looked at several architectural spaces in different arid cities around the world to learn how to better adapt or change the historic public space to make it more suitable for visitors.

There are three critical elements, solar control, wind, and water, for acclimatizing a space in an arid climate. This research aims to study these elements and their functions. Also, it will investigate traditional design solutions in response to such weather conditions and apply them where, due to social, cultural, economic, and environmental changes, they were forgotten or discarded as a foundation for design. The research will consider in depth the different applications which humans, as they evolved, have developed in response to arid climates globally.

In addition to creating an architecturally viable space, this study will look at Zoroastrian's belief in Persian gardens (before Islam) to understand the effects of their beliefs on design to create a garden-like structure in arid climate as a more hospitable place for tourists and visitors to the site. The special adaptations to climate realized from the case studies inform the landscape design of historical tower of silence site in Yazd.

Tower of Silence, unlike similar sites around the world, presents very challenging and unique environmental conditions as it is in a hot and dry climate. Ultimately, the vernacular design principles can provide a more efficient and sustainable architectural product, providing human comfort in city of Yazd and the Tower of Silence. Using landscape architecture.

The important research questions which this study covers includes: what are the limits of different types of architectural features in different cities with arid climates? Can these components be used elsewhere, separated from the special cultures that created them? How might we apply the principles of these structures to new designs that deal with climate change?

The proposed design enhances the utility of the site by adding a welcome center, more modern walkways, a porch and some waterways while respecting integrity of the towers and the Zoroastrian religion. The use of natural elements in this project is a clear method to highlight

<sup>1</sup> <https://www.tehrantimes.com/news/439214/Foreign-arrivals-in-Yazd-jumps-29-in-4-months-on-year>

Zoroastrian thought processes about the sacredness and purity of nature. The use of indigenous plants and trees that can withstand summer heat and the use of water through the site is an effective way to highlight the spiritual beliefs as well as improve the microclimate of the site through sustainable method.

## **2. Literature Review**

The landscape of this historic site (Towers of Silence outside of the old city of Yazd) is not only the symbol of the city, but the cultural performance. This urban landscape is of great significance to the inheritance of historical context and regional culture, and It is important to the quality of city.

Urban landscapes have both objective and subjective components. There is the objective, physical components, such as the quality of materials constituting the public space, the urban design and furnishings, the air quality and noise levels. Then there are the subjective components which involve the aesthetics, the individual perception of beauty, and one's pleasurable experience (Campos 2015).

The best outcome for the urban landscape comes from a mix of all visible and invisible elements, combining physical and preceptive beauty from these elements in a proper space and time.

The microclimate of urban open areas is defined by such parameters as urban form and geometry, urban density, amount of vegetation, water levels and the properties of surfaces (Balafoutis et al., 1998; Setaih et al., 2013). Combining overall climate and physical factors would achieve sustainable human comfort as thermal conditions changed. (Ragheb et al., 2015a, b).

### **2.1. Climate Parameters**

All cold arid desert regions have similar environmental characteristics that architects have interpreted differently over time. The cold-arid deserts face harsher habitat limitations due to the lack of water and the extreme temperature. Temperature in this area due to the lack of humidity is very different. Solar radiation reaches the ground without absorption and reflection where one experiences very long summers (more than 100 days) with very hot weather (more than 100F). The daily spring and fall temperature cycles between 30 to 50 degrees F (Trewartha 1954). High speed winds cause sand and dust storms in this area (Koppen-Geiger 2016).

## **2.2. Microclimate Parameters**

Climate and microclimate are main factors in landscape architecture. Architectural forms, that is, ways to shape the physical environment and use outdoor spaces, are the result of the Climatic conditions (Rezafar 2011). Therefore, climate works as a limiting and controlling, not a key factor in characterizing outdoor recreational activities (Rudel et al 2007).

Land use and urbanization affect climate characteristics. The paved, hard floors create a microclimate by affecting the temperature degree with its reflective properties. The heights, locations and roof shapes of the surrounding structures also influence the air circulation. Careful positioning, architectural design, landscape design and planting must be brought together to form a viable microclimate.

Because natural desert environments usually have large diurnal temperature differences, low humidity, and variable strong winds, they have great potential for UHI (Urban heat island) mitigation through urban form and design (Pearlmutter, Berliner, & Shaviv, 2007b). Extreme heat from direct rays of the sun during the summer and fluctuations of temperature during day and night (cold nights in a desert environment, moved with low winds, are the most important factors to be modified when enhancing outdoor thermal conditions with urban and landscape interventions.

## **2.3. Sun Orientation**

The angle of the sun changes during different times of day in different seasons (Yazd is not on the equator and enjoys 4 full seasons without extreme cold in winter). This is challenging factors in design along with the existence of wind and humidity which should be considered hand in hand along with the direct and indirect effects of the sun.

North facing rooms are ideal for providing illumination. Indirect illumination of the rooms is ideal for functionality; it limits direct irradiation, which can cause an uncomfortable glare.

South facing rooms have the advantage of heat penetration in winter and the disadvantage of not getting any wind during the year. Cool winds generally blow from the north in the northern hemisphere. Since it gets very hot in the summer, the inside can be protected by small overhanging shade. Northeast facing rooms get the sun's rays only from sunrise to noon, while the east and west façade has an ideal shade (Olgay 1963).

By calculating the sun's altitude and designing a building which accounts for the summer sun's angle of latitude and allows for sunlight to penetrate at a winter angle of latitude, one can incorporate the heat gain of the surrounding environment (Fathy 1986).

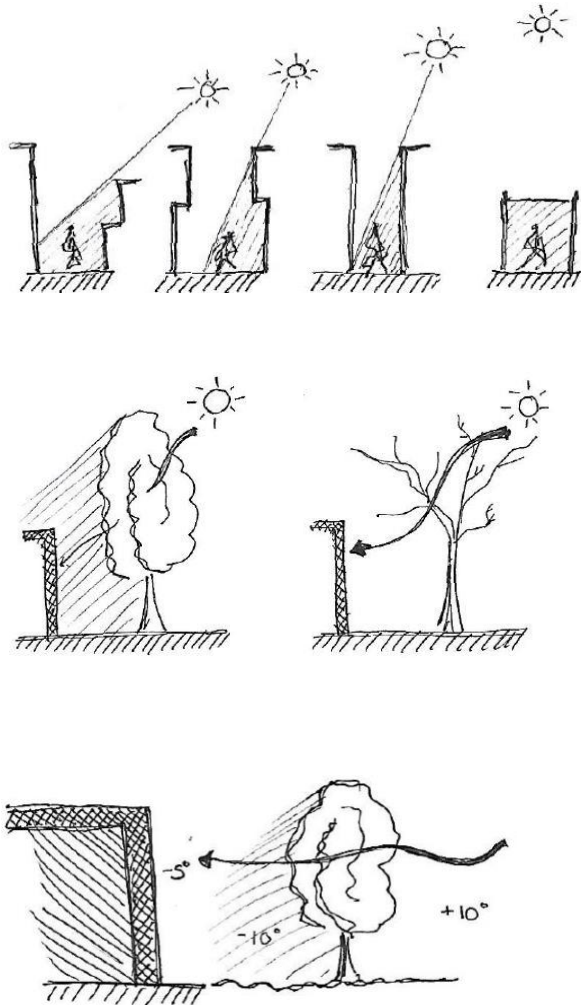


Figure 1. Sun Orientation & Shading Techniques

Source: [https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz\\_Ana\\_Spring%202017.pdf](https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz_Ana_Spring%202017.pdf) page 65-67

## 2.4. Wind Orientation

The angle in which the wind hits a building makes a big difference in the design. For example, if the building is an independent structure the best way to maximize the use of wind is to make sure it is perpendicular to the direction of the wind. On the other hand, if there is a dense environment the best way to utilize wind is to have a parallel structure to the movement of the wind.

To better use the wind movement inside a building a large opening for outgoing wind and a small opening for incoming wind gives the optimal outcome. This method will provide a proper ventilation inside the building.

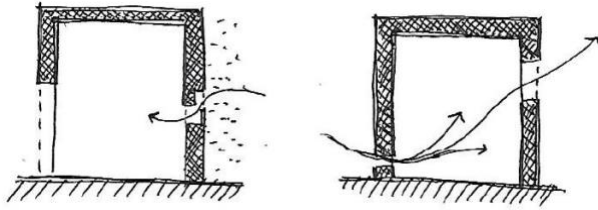


Figure 2. Wind Orientation

Source: [https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz\\_Ana\\_Spring%202017.pdf](https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz_Ana_Spring%202017.pdf) page 68

## 2.5. Water

In Yazd and other arid places in Iran, Qanats were used to bring water into the cities and populated areas. An ancient system of irrigation, Qanat was an innovative method for collecting subterranean water and bringing it to the surface. It took an enormous effort for people in hot arid environments to facilitate their water supply. Groundwater has always been life-giving in hot arid climates. (Water and Art of Irrigation 1976). Desert water has always been considered a sacred entity; in fact, Iran's ancient civilization was founded on a system of artificial irrigation (Kamiar 1983).

Landscape and architecture design despite of harsh climatic conditions in the arid and hot region integrates these elements into the whole complex of the city in ideal perfection and harmony with the environment.

## 2.6. The Role of Sun and Wind in Urban Arid Climates

Solar control, wind, and water are critical factors for acclimatizing a space in an arid climate which vernacular architecture tends to deal with. After insulating the building and structures the use of wind is the best way to create a desirable place for human habitation. It will take the heat away from the space. Adding a water structure will increase the humidity of the space and improve the thermal comfort of the location especially in dry climates.

## 3. Case Studies and Applied Design

In an effort to learn more of the characteristics of these elements I studied a series of Urban and Architectural Elements in Arid climates, which were designed to control microclimate. These cases are studies which highlights some of the ways that have been used to create more comfort for habitation in arid climates in urban design by using architectural elements.

### 3.1. Urban Structure Characteristics in Persian City

The main characteristics in an Iranian ancient city usually include a few elements. A citadel, the inner and middle part of the city, a central complex like a Bazar or a Mosque, water reservoirs,



main connection between parts of the city in a form of walkways and small streets, and finally an outer area of the city (Tavasolli 2016 and G.E. von Grunebaum 1961).

The neighborhoods in ancient and historical Iranian cities are integrated together but each used to have its own main characteristics. For example, some were the administrative unit of the city while other neighborhoods would have been the religious unit of the city. In some cases, each religious minority would have had their own neighborhood. This is still evident in the Armenian neighborhood in Isfahan, or Zoroastrian section of the city in Yazd. Think of these neighborhoods in the same style of neighborhoods in modern day western cities like Chinatown or Little Italy. Bazar served as the main hub for commercial and business activities in the cities (Frenchand, Hamilton eds 1979) and a grand mosque was the center of religious activities and ceremonies especially post Islamic-era (khaneha-yi khoda 1974).

Water reservoirs were a crucial element in an ancient and historical Iranian city as they were the lifeline in an arid and semi-arid environment. These reserves were dug between 10 and 20 meters (30 to 60 feet) deep and were covered with a dome shaped roof. These reservoirs were mainly used during hot summer months as the access to fresh water from rivers and wells declined (Zare et al. 2010).

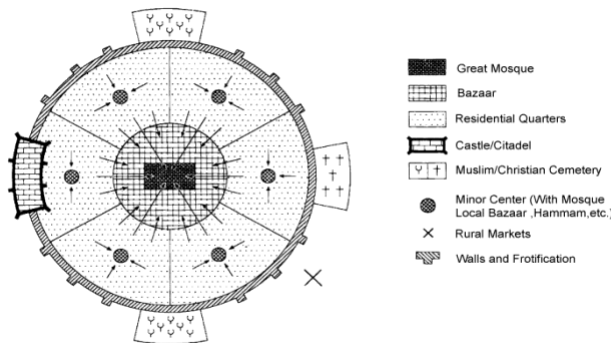


Figure 3. Typical Model of Islamic City Associated to The Iranian Cities S

Source: Eckart EHLERS and Willem FLOOR, *Urban Change in Iran, 1920-1941*

### 3.1.1. Case Study for City of Yazd

The Bazar area in Yazd has a dome-like roof which provides cooler air in hot summer days. Non-linear shaped Bazar in Yazd leads to the Great Mosque which has a central courtyard as a public space (Pirnia 1969) (Tavasolli 2016). One of the most significant parts of this city located in heart of the desert are the underground waterways called Qanat. Qanat is the main reason for the development urban life in Yazd (Ghoresihizadeh 1997).

Today, some of the branches of Qanat trace back to the 5<sup>th</sup> and 6<sup>th</sup> century. “Ab Anbar” or “Water Warehouse” is a traditional structure to store water. Located below the ground, the cooler water can be accessed by going down a stairwell.

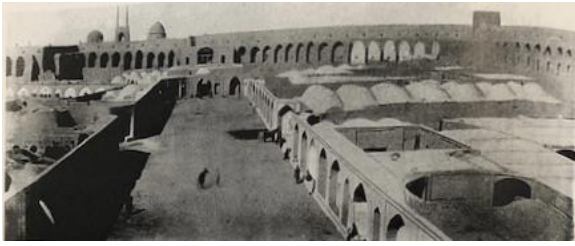


Figure 4. Yazd City Citadel, Completely Demolished

Source: *Urban Structure in Hot Arid Environment*, Mahmoud Tavassoli page 52



Figure 5. Bazaar in Yazd

Source: <https://sonyaandtravis.com/yazd-iran/>



Figure 6. a-Congregational Mosque b- Bazaar c- Madrasah d- Madrasah e-Meydan f- Hammam (Bath)

Source: *Urban Structure in Hot Arid Environment*, Mahmoud Tavassoli

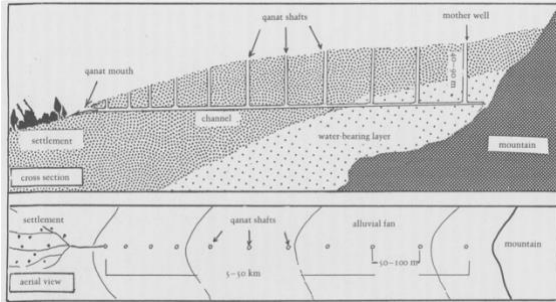


Figure 7. Diagram Section and Plan Of a Typical Qanat

Source: *Iranian Cities, formation and development*



Figure 8. The Entrance of a Water Reservoir Toward The Storage Tank

Source:

[https://pdfs.semanticscholar.org/7ed7/963b0171e05bebec3b4e68d47794873eeda2.pdf?\\_ga=2.15409910.116735333.1570563042-358701129.1570563042](https://pdfs.semanticscholar.org/7ed7/963b0171e05bebec3b4e68d47794873eeda2.pdf?_ga=2.15409910.116735333.1570563042-358701129.1570563042)



Figure 9. Amir Chakhmaq Complex in Yazd and Tekyeh

Source: <http://yazd.today/amir-chakhmagh-complex/>

### 3.2. Urban Block

#### 3.2.1. Case Study of Yazd

Integrated blocks make up the dense fabric of the city; courtyard houses, Ivans, domes, and wind catchers function independently in the historic part of the city. All elements of the city are connected by narrow arched streets; these elements work as a real organism, and the area

breathes through the wind catcher which is oriented toward favorable winds and central courtyards (Tavassoli 2016).

The central courtyard plays an essential role in any building and is one of the most important architectural elements in Iranian culture. In order to provide shade and protection from windstorms, the interior part of a Yazd house receives light and air circulation mostly from the central courtyard, which also provides privacy as it is hidden from the main entrance (Akhtarkavan, 2011).



*Figure 10 Historic City of Yazd (Islamic Republic of Iran)*

### **3.2.2. Case Study of Morocco**

The Draa Valley is located in Morocco. There buildings fit in perfectly with the arid climate. They use construction techniques that provide thermal comfort and ventilation inside the natural oasis and mountains. Ait Benhaddou has been a UNESCO World Heritage site since 1987 (UNESCO, 1987). This complex creates a dense urban fabric in which houses protect each other from heat and build tunnels within themselves to protect from heat and sandstorms (Baglioni 2009).



*Figure 11. Ait Benhaddou, Draa Valley, Morocco*

*Source: Scenic Beauty of Telouet & Ait Ben Haddou 2015*

### 3.3. Alleyways/Corridors

#### 3.3.1. Case Study of Yazd

The narrow and irregular streets in Yazd are environmentally sustainable and protect pedestrians from harsh wind and extreme heat. Zigzag alleys with high walls and extended roofs were built to provide shading for the pedestrians. Pathways are very narrow, surrounded by tall buildings. Daylight, which can be harsh, enters the street spaces but is kept to a minimum.



*Figure 12. Left: Shade Created by Arched Roofs. Right: Thick High Wall for Creating Shade*

Source: [https://curve.carleton.ca/system/files/etd/6548b746-5f55-48e8-8e6d-df2823d1b487/etd\\_pdf/236dace25c69ecef93a04634fd7c9d7c/mollayousef-localarchitectureusingtraditionalpersianelements.pdf](https://curve.carleton.ca/system/files/etd/6548b746-5f55-48e8-8e6d-df2823d1b487/etd_pdf/236dace25c69ecef93a04634fd7c9d7c/mollayousef-localarchitectureusingtraditionalpersianelements.pdf)

#### 3.3.2. Case Study of Casablanca

Casablanca, Morocco's largest city with 3.3 million population (2011) was built in the late 18<sup>th</sup> and early 19<sup>th</sup> century with traditional architecture. In the old Medina Qdima, streets are narrow and winding which helps to block the sunlight during the day (Bianca 2000).



*Figure 13. One of The Broader Streets in Medina Qdima, Showing the Amount Of Sunlight That Reaches The Streets in The Middle Of The Day*

Source: [http://www.hdm.lth.se/fileadmin/hdm/Ex-jobb/Moroccan\\_Architecture\\_traditional\\_and\\_modern.pdf](http://www.hdm.lth.se/fileadmin/hdm/Ex-jobb/Moroccan_Architecture_traditional_and_modern.pdf)

### 3.4. Covered Street

#### 3.4.1. Case Study of Yazd

Sabat is formed of linked arches between two walls which create a roofed alley. An important element of cities in arid climates. Sabat protects pedestrians from direct heat and creates shade to make the temperature more tolerable (Ahmadkhanimeki 2011). Roofed passageways in Yazd were constructed to help passengers cool off on the way back from the Sahara and to create a sense of neighborhood between its people (Ghoreishizadeh 1997).



Figure 14. Yazd Alleys Are Built to Keep The Most Comfort to The Pedestrians by Casting Shadows and Most of Times Oriented to Conduct The Wind Flows

Left Source:

[https://www.trekearth.com/gallery/Middle\\_East/Iran/East/Yazd/Yazd/photo1400810.htm](https://www.trekearth.com/gallery/Middle_East/Iran/East/Yazd/Yazd/photo1400810.htm)

Right source :

[https://www.trekearth.com/gallery/Middle\\_East/Iran/East/Yazd/Ardakan/photo1442662.htm](https://www.trekearth.com/gallery/Middle_East/Iran/East/Yazd/Ardakan/photo1442662.htm)

#### 3.4.2. Case Study Damascus

Damascus is the capital and largest city of Syria and it is in the southwest. "It is the oldest continuously inhabited city in the world, and it used to be fully surrounded by an oasis"(Al Ghouta). In the old part of the city majority of the streets and alleyways are extremely narrow.



*Figure 15. Typical Style for Streets in Old Damascus, Syria (Projected Upper Floors Increase Shade at Street Level)*

Source: <https://www.pinterest.com/pin/515662226055083060/?lp=true>

### **3.5. Courtyard Houses**

#### **3.5.1. Case Study of Yazd**

In vernacular houses in Yazd, the courtyard is the main space in the house designed to maximize the heat in the winter when the sun directly faces the rooms (Ghobadiyan 1986). In Yazd, almost all structures that have room openings pointed towards the courtyard are hidden. The difference between the central yard in this weather and that in a hot and dry climate is that it is not entirely closed off. There are high and wide openings; the porches are wide and overlook the lane spaces on the second and the third floor. If the windows and doors facing the courtyard and the outside, they create a natural two-sided flow of air that cools the interior of the rooms (Soflaee et al 2007).

Every space in the Yazd house faces a central courtyard that helps decrease the heat exchange between the inside and the outside and provides natural cooling and heating in the buildings. A sunken garden (Godal Baghche or Baghchal) is made below both the alley's building's surface and thus divides the courtyard into two surfaces. This space was created in extreme arid cities like Yazd (Ahmadkhanimalaki 2011).



*Figure 16. Sunken Garden in Yazd*

*Source:*

*[https://www.textroad.com/pdf/JAEBS/J.%20Appl.%20Environ.%20Biol.%20Sci.,%204\(3\)55-60,%202014.pdf](https://www.textroad.com/pdf/JAEBS/J.%20Appl.%20Environ.%20Biol.%20Sci.,%204(3)55-60,%202014.pdf)*

### **3.5.2. Case Study Cordoba**

Cordoba's courtyards are descendants of centuries of Moorish architecture and represent a building form and tradition developed in response to a hot-dry climate, a densely urban setting.



*Figure 17. Courtyard at Cordoba Traditional House*

*Source: <https://www.spain-holiday.com/Cordoba-city/articles/cordoba-patio-festival-fiesta-de-los-patios>*

### **3.5.3. Case Study of Tucson**

The courtyard was brought from Spain to central Mexico in the 1500s; it later came north to the area that is now the U.S./Mexico border region. In northern Mexico the courtyard house offered great flexibility.



The courtyard, a large outdoor room, is often the largest room in the house. Open to the sky, it brings fresh air into the interior of the house. Plants and shade both cool and filter the air as it sinks into the space and flows through the rooms.



*Figure 18. Cordova House, Tucson, AZ: View of Inner Courtyard.*

*Source: Bob Vint et al 2005:*

[https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW\\_Housing\\_Traditions.pdf](https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.pdf)  
page 59

### **3.6. Porch (Ivan)**

#### **3.6.1. Case Study of Yazd**

There is a semi-open living space within the body of a building. Closed on three sides as well as on top, it is connected to the courtyard by its open side (Foruzanmehr, 2015). (an open living room inside the house). A feature of vernacular architecture in many parts of the world, including Mexico and Spain (Moore, 1995, p.14) and the Middle East, it has a long history in Iranian architecture (Manzoor, 1989). Usually these spaces are oriented to the south. South and southeast oriented Ivans are very cool and provide shade during summer afternoons.



*Figure 19. Traditional House in Yazd*

*Source:*

[https://www.treearth.com/gallery/Middle\\_East/Iran/East/Yazd/Ardakan/photo1253030.htm](https://www.treearth.com/gallery/Middle_East/Iran/East/Yazd/Ardakan/photo1253030.htm)

### 3.6.2. Case Study of Cordoba

The arcades around the courtyard are used for many activities. There is more daylight in the arcades than in the rooms behind them, and the view across the courtyard is usually longer-range and content-rich than would be the case within any of the adjacent rooms. The arcades are usually wide enough for both circulation and for chairs, small tables, even small appliances like ironing boards and sewing machines (Reynolds et al 1996).



Figure 20. Traditional House in Cordoba, Spain

Source: <https://www.pinterest.com/pin/494551602804002118/?lp=true>

### 3.7. Roofing

#### 3.7.1. Case Study of Yazd

In the arid part of Iran, a dome was designed in response to the climate. With long spans covered by vaults, a flat roof was used for sleeping during the summer nights. One of the well-known elements of Persian architecture, the Dome roof solved the problem of thermal insulation. A hole at the top of the dome let enough light and heat loss during the night. The double dome is the best solution to the intense radiation as the space between the inner and outer dome acts as insulation. (Tavassoli 2016).



Figure 21. Dome Roof in Yazd

Source: <https://yazd.today/yazd-a-city-for-tranquility-with-caravan-routes-it-feels-like-going-back-in-time/>

### 3.7.2. Case Study of Bolivia

The Altiplano, or high-plain, is a flat land with cold winds. A Chipaya house follows the vernacular tradition in the hot-cold climate. The cylindrical shape of the houses provides stability against the strong winds (Oliver, 2003).



Figure 22. Chipaya Village, Bolivia

Source: [https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz\\_Ana\\_Spring%202017.pdf](https://scholarspace.manoa.hawaii.edu/bitstream/10125/55842/1/Molinar-Ruiz_Ana_Spring%202017.pdf) page 33

### 3.8. Wind Catchers

#### 3.8.1. Case Study of Yazd

Wind catchers are sustainable air circulation systems that create a comfortable climate inside the building through the courtyard of the vernacular Yazd house. A tall adobe chimney captures the hot and dry air; passing through the long chimney, this air becomes moist and cool. Part of the air is led into the basement and another part into the summer living room and the courtyard. First passing through the basement's canals under the courtyard, it absorbs moisture from the canal walls, then blows it on the surface of the courtyard. (Azami 2005 and Roaf 2005).

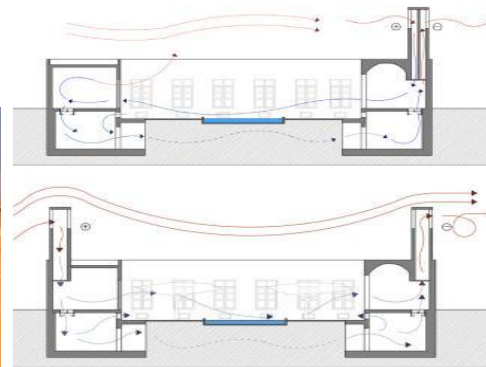


Figure 23. Left: Wind Catcher (badger) in Yazd

Source: Left: <https://irantourismnews.com/yazd-the-most-beautiful-desert-town-i-have-seen/>  
Right: Operation of two different type of wind catcher (Karizi, 2011)

### 3.8.2. Case Study of Cairo

The malqaf is a shaft rising high above the building with an opening facing the prevailing wind; it is constructed on the north porch. Trapping the cool air “like sails capturing the wind,” it channels that air into the interior of the building. The idea of the malqaf dates back to the early Pharaonic periods. Examples can be found in the fourteenth century Muhib Ad-Din or in the Ash-Shaf'i Al-Muwaqqi house in Cairo. (Dr. Abdel-moniem El-Shorbagy).

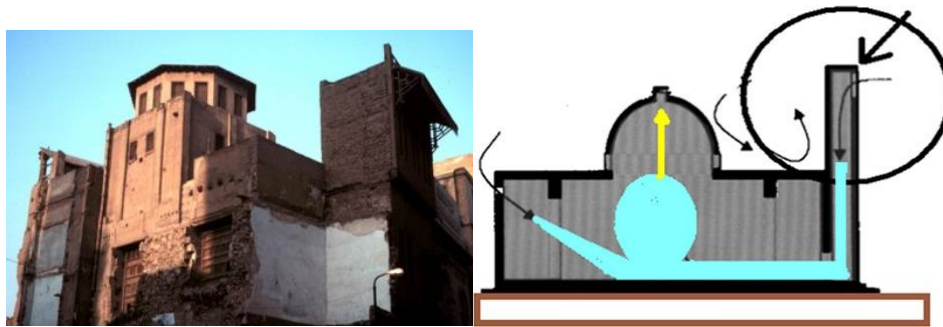


Figure 24. Left: Muhib Ad-Din Ash-Shāf'i, 1350, Cairo, Right: Arabic Windcatcher or Malqaf

Source: Left: <https://learning.knoji.com/the-architecture-of-the-traditional-arab-house/>; Right: Arabic windcatcher or Malqaf source:

[https://www.researchgate.net/publication/220004009\\_Review\\_of\\_Windcatcher\\_Technologies](https://www.researchgate.net/publication/220004009_Review_of_Windcatcher_Technologies)

### 3.9. Basement (Sardab)

Underground rooms such as the zir-zamin (basement) and the sardab (cellar) are a main component of a vernacular dwelling in Iran, used a family living area during the hot summer. Having a ceiling one meter higher than the courtyard, the basement in the summer quarters, a clerestory making it naturally lit and ventilated. A Sardab provided a cool place, with a pond and sometimes access to underground water pathways (Ghanat), the air often cooled by the wind catchers (Kheirabadi, 1991, p.36; Memarian and Brown, 2006, p.25), (Daiiallah 2014).

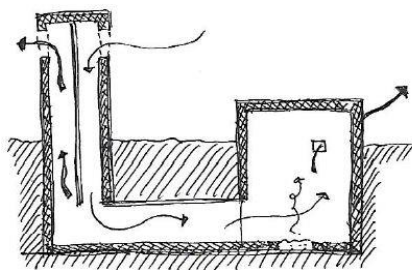


Figure 25 Water Integration

Source: *Cold-Arid Deserts: Global Vernacular Framework for Passive Architectural Design* page 69.

### 3.10. Vegetation

Vegetation is a common and effective method to enhance the comfort level of the outdoor pedestrian. Increasing green spaces in urban regions mitigates heat stress and relaxes people. (SKAT 2016). One of the great advantages of planting and tree cover is the cooling effect. The joint impact of evapotranspiration and canopy shading is the great advantage of cooling the air with more plants and tree cover. (Setaih et al 2013). Plants increase relative humidity and provide shade from the sun. (Ghobadiyan 2006). Plants ventilate naturally, cool the air, and provide escape from the heat.

If the courtyard is planted with trees, flowers and shrubs, it provides comfort and beauty as well as shade. Increasing the humidity, it cools the dominant climate in Yazd. The use of plants and proper covering can improve a courtyard's function, reduce energy consumption, and lower the overall temperature of the house (Soflaei, F.; Shokouhian, M.; Mofidi Shemirani, S.M.). The density of the leaves.

The density of the leaves, the type of tree and the height of the leaves is very important in absorbing the solar radiation and reducing the temperature in the immediate surrounding area. (Oliveira, S.; Andrade, H.; Vaz, T.) In addition to reducing the heat trees can filter sand and dust and reduce the effects of unpleasant winds.

#### 3.10.1. Case Study of Yazd

In the city of Yazd, the use of trees, shrubs and flowers is pretty common in the courtyard. As previously mentioned, increase in humidity of a structure of space in arid places will have a direct impact and reducing the hot temperature and creating a pleasant climate. The vegetation in the courtyard will act as an aesthetically pleasing element in addition to reducing the temperature of the surrounding area.



Figure 26. Traditional Courtyard in Yazd

Source: [https://www.tripadvisor.com/Hotel\\_Review-g303962-d938876-Reviews-Hotel\\_Laleh\\_Yazd-Yazd\\_Yazd\\_Province.html](https://www.tripadvisor.com/Hotel_Review-g303962-d938876-Reviews-Hotel_Laleh_Yazd-Yazd_Yazd_Province.html)

### 3.10.2. Case Study of Guadalajara and Jalisco

Along the U.S./Mexico border are deserts with intense summer heat and mild winters. Vernacular houses mitigate the heat by including a courtyard which serves as an oasis, a central garden. Evaporation forms from the plants and fountain and fills the air. The felt heat is thus reduced by the humidity (Vint et al 2005).



*Figure 27. Guadalajara, Jalisco: Courtyard Provides Evaporative Cooling with Central Fountain and Vegetation*

Source:

[https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW\\_Housing\\_Traditions.pdf](https://www.huduser.gov/Publications/pdf/SouthwestHousing/SW_Housing_Traditions.pdf)  
page 60

### 3.11. Pool

The Pool serves as a gathering place in the Courtyard. Often shallow, these pools can be divided and extended so that wind passing above them can cool the residents in warm summer days (Nayebi 2002). Occupants often see the Pool as a symbol of Heaven on earth, their silence and stillness foster meditation on the secrets of nature (Mor 2002).



*Figure 28. Left: Traditional Courtyard in Marrakech*

Source: [http://www.vivivillas.com/index.php?article\\_id=113&clang=1](http://www.vivivillas.com/index.php?article_id=113&clang=1); Right: Pool in Mortaz traditional house in Yazd source: <https://gotoyazd.com/place/56/mortaz-house-faculty-of-arts-and-architecture-of-yazd-university/>

### 3.12. Material

#### 3.12.1. Case Study of Yazd

It is very common to see the use of clay in the majority of the structures in the old part of Yazd. Clay is locally produced and can absorb a lot of the heat from direct sunlight. The light color of clay in Yazd can reflect the sunlight as well and help reduce the impact of direct sunlight.

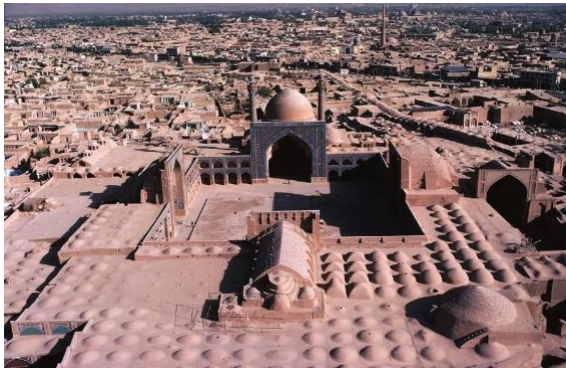


*Figure 29. Skyline of The City Made of Clay and Mud Brick*

*Source: <https://www.lianaparvaz.com/en/Tourist/Yazd>*

#### 3.12.2. Case Study of Isfahan

The type of materials that has been used in Naghshe Jahan, including clay, mud and bricks as structural materials in it, fully correspond to the climatic conditions prevailing in the city of Isfahan in the warm and dry regions. Also, the use of bark color (cream) and its adaptation to the angle of radiation and reflection of the sun and the high temperature of the air seems appropriate.



*Figure 30. Skyline of Isfahan*

*Source: <https://www.pinterest.com/pin/512425263845277894/?lp=true>*

### 4. Design Objectives:

The goal of this project is to select a well-known site with strong cultural history which lacks a proper microclimate. Through a process of design one can transform this site into a place where function, culture, beauty and comfort come together.

This selection is based on understanding the importance of microclimate in hot arid climates and the importance of cultural effects in design. The specific design objectives were:

- To retrofit an existing site by creating shade bringing aesthetic, comfort and respecting the cultural aspect of the site; and
- To create a new experience that is equally compelling in terms of comfort and spatial experience for the visitors and viewers to this site.

## **5. Site Criteria**

People of Yazd have adapted to their desert surrounding in a resilient way throughout many years and have created a unique style of Persian architecture. Yazd has an arid climate and a strong cultural background. I had always wanted to work on an open public space in Yazd with its strong cultural heritage which has a potential for an improvement to its microclimate. These conditions defined the site selection criteria:

- A monumental site which is visited by variety of people
- Significant need of shade to improve the microclimate
- Strong historical and cultural heritage
- Lack of proper programming and usage of the site

## **6. Landscape to Mark a History**

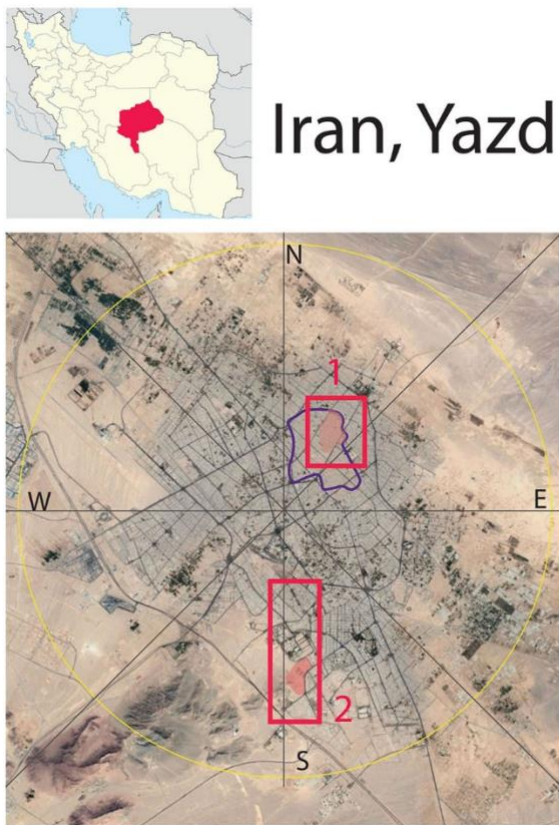
Yazd is located in the middle of the Iranian plateau, close to the Spice and Silk Roads. It is a living testament to the use of limited resources to survive in the desert. Water is supplied to the city through a qanat system which draws from underground water. The old part of Yazd has escaped modernization, retaining its traditional districts, the qanat system, traditional houses, bazars, mosques, synagogues, Zoroastrian temples and the historic garden of Dolat-abad. Since 2017, the historical city of Yazd is recognized as a World Heritage Site by UNESCO.

The plateau plains are located mainly in central and eastern Iran, the two regions of Dasht-e-Kvir and Kavir-e-Lout. Yazd has a semi-dry and arid climate with very low rainfall. It has temperate summers and cold winters due to the surrounding desert-like conditions. High temperatures in the days during hot season, with a big gap between the day and night temperatures, extreme radiation from sunlight, and relative dryness of atmosphere constitute the average climate of Yazd.

The urban and architectural features of Yazd have created a lifestyle meeting spiritual and cultural needs of indigenous people through adaptation with the Arid climate situation. The nickname for the city of Yazd is "bride of the desert", a well deserving statement for a city that is constrained by many natural restrictions and lacked use of modern technologies in its past. Through learning by doing and studying their surroundings the inhabitants of this city have



come up with many creative methods to challenge the harsh climate and create a livable space in the middle of the desert.



*Figure 31. Part 1 Old Part of The City. Part 2 It Used to Be Suburb but Now It's Part of The City Of Yazd.*

I began by looking at some historical maps from the past and created a map of all tourist attractions in the city, specifically the historical sites that bring many visitors every year. I realized that most of the historical sites located in older part of the town which already were designed in a way that created the best possible microclimate for the habitant. Narrow and zig zag alleys, tall walls, covered streets, and covered bazar were the most effective traditional architectural approach to create a pleasant microclimate for visitors in these sites.

I landed to south east of the city, with two beautiful mountains erected highly in a vastly dry landscape. Tower of silence is a remainder from the Zoroastrians burial tradition and are located atop of these mountains. These burial sites are no longer in use due to social and hygienic reasons. However, they bring many tourists from around the world to this city.

Taking a closer look at the tower of silence I realized the site does not have a complete reflection of the historical and cultural value that it carries also, it doesn't have a pleasant microclimate to invite tourists to explore more and see what it has to offer.

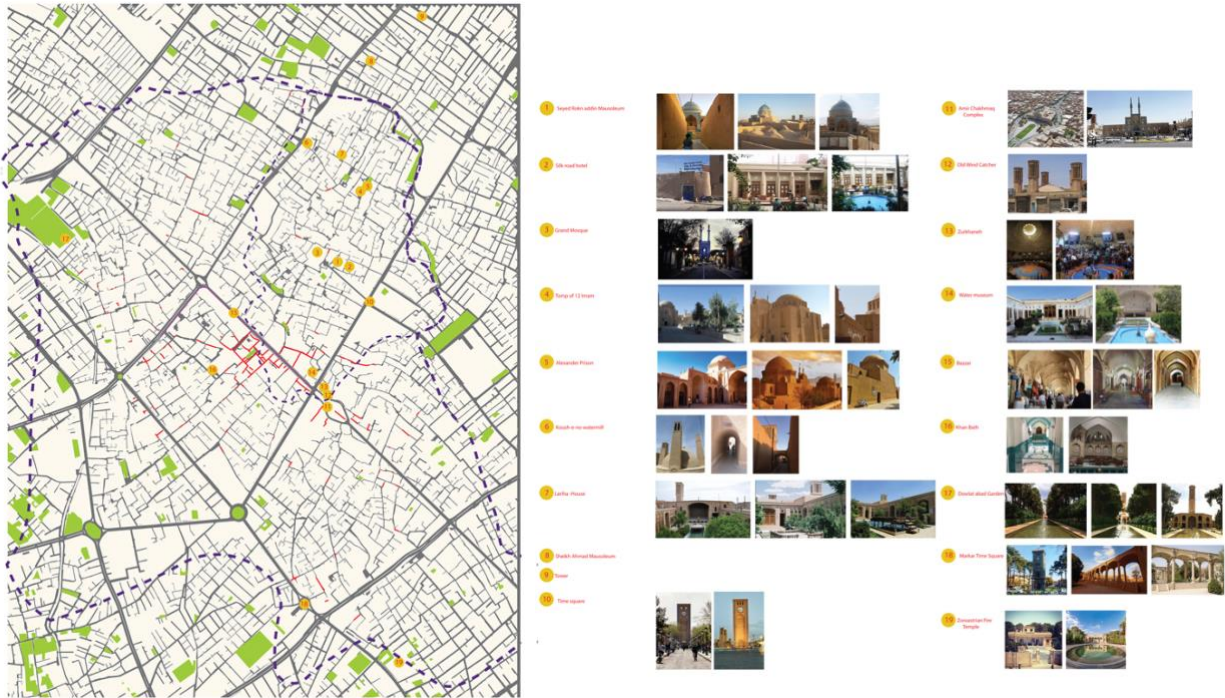


Figure 32. Location of Tourist Destination in Old Part of The City

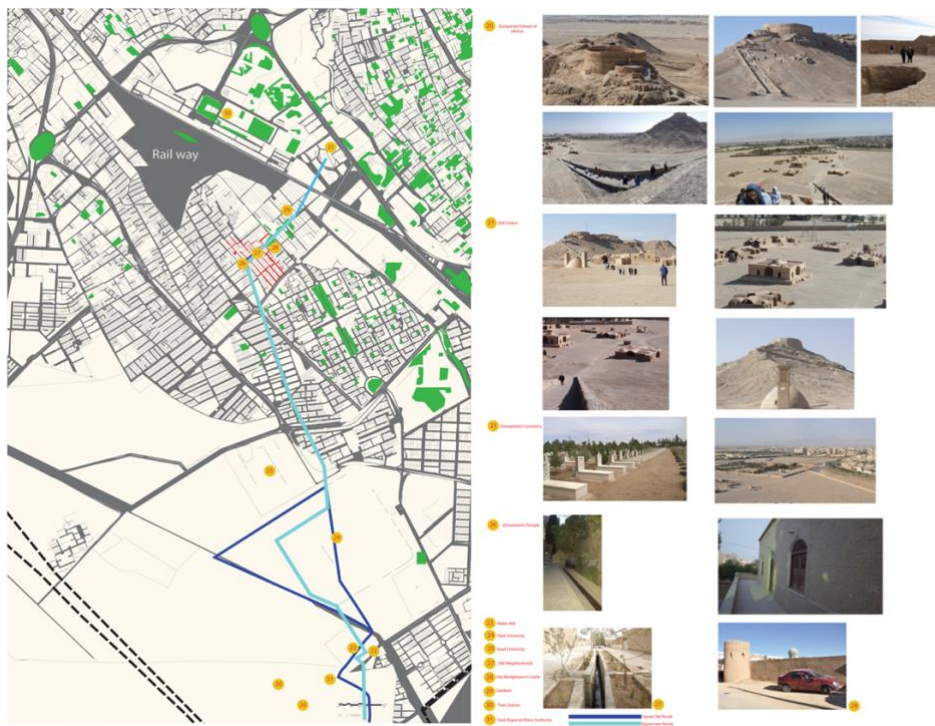


Figure 33. Tourist Destination

## 7. Historical Analysis of the Site

### 7.1. Tower of silence

Tower of Silence, Yazd, Iran

The city of Yazd is home to some of the remaining Zoroastrians' historic tower of silence. There are two towers in south west of Yazd city that attract many tourists to this area. Architectural design aspect of Tower is very well connected to the Zoroastrian funeral rituals.

The tower of silence has a circular plan design which is a symbol of infinity in circle starting and ending point is one and that shows humans are equal to God.

The towers were built in a dry, infertile land on a hill facing opposite direction of the wind to keep all the pollution from dead body far from the city. Near the entrance there is a small round hole, light absorption valve, that is facing east because the sacred fire (town fire temple) is in the east guarding the soul. As “they believe that when a person dies, his soul stays present for up to three nights after his death. On the fourth all his deeds will be counted on the CHINOD bridge” (K. Mazdapor 2004).

The towers are made with tall solid walls and the entrance door is located on the tower. There are 7 steps that go up at the entrance. Looking inside the tower there is a slope going towards the center of the tower and a circular well in the middle. There are three sets of rings on this circular down sloping platform. Outer ring is for burial of men, the middle ring for women and the inner ring for children. These rings have many rectangular shaped frames that the dead body is placed upon. The face of the deceased looking up to the sky, the feet towards the well and the head towards the outer wall. This open surface allows vultures to consume the deceased and the sunlight to cleans the remainders and dry the bones (Court Jiji Bae Irani).

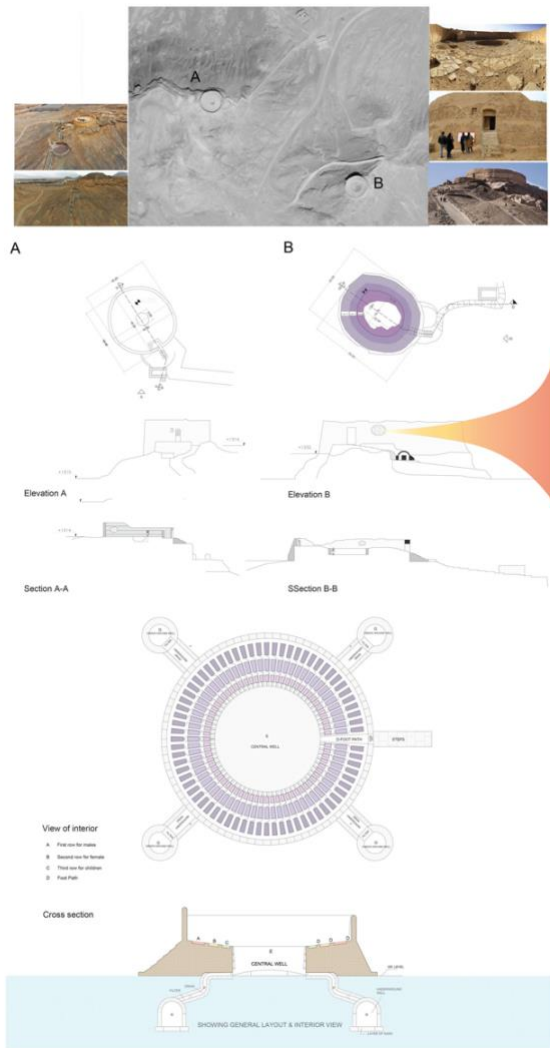


Figure 34 Structure and Architectural Design of Tower of Silence

Source: *Research in Zoroastrian's tower of silence* Authors Roya shini Gholampour, Darush Heydari bani, Mohamad mehdi Karim nezhad

## 7.2. Zoroastrian Beliefs

'Good thoughts, good words and good deeds', these words are the motto and principle guidance based on the beliefs of Zoroastrians. This ancient religion is deemed one of the first monotheistic religions in the world. The holy book was lost and destroyed after Alexander the Great conquered Persia and the book was rewritten during the Sassanid Empire. The influence of this religion on Persian kings, dynasties, architecture and way of thinking before Islam is profound. One of the most important consideration under this religion is purification of the soul and body (Cohen J 1983).

This religion was founded some 4,000 years ago in ancient Persia and currently is followed by a small number of people around the world (approximately 150,000). The majority of the

followers of this religion are in India and some 12,000 Zoroastrians reside in Iran (Shahin Bekhradnia 2008).

Zoroastrian religion involves religious acts and rituals along with traditions and rules. The root of the religion is based on the belief in duality in the world. It believes that “Ahura Mazda” is the creator of the world and the soul is a separate entity than the body. They do believe, like religions, in eternal prosperity or damnation based on actions that the body takes in this world (Prods Oktor Skjærvø 2012).

The pillar of Zoroastrian religion is to purify the body and soul. A passage from Avesta (Sacred book for Zoroastrians) highlights this fact along with the importance of thinking to get closer to god : “O creator, I learned you well when my good nature came to be and taught me the best way to acquire knowledge, which in fact thinking in quiet” (Chin WW 1997).

### **7.3. Applied View of Zoroastrian in Creation of Their Gardens**

An Iranian (Persia) garden is a well-known structure and creation around the world. The garden is a prominent national and cultural symbol representing paradise. The identity of these gardens come from religious views on nature and heaven.

Some of the earliest Persian gardens were discovered around the Palace area in Pasargadae which dates back to 66 B.C. The gardens clearly divided into 4 parts resembling the four seasons or four elements (Karimi-Hakkak 1998).

Based on the beliefs of Zoroastrians and some of the previous religions before them in ancient Persia the world was divided into 3 segments: upper, middle and lower worlds. Upper world being the heavenly side representing light and happiness, lower world representing darkness and sorrow. The Middle world was a “purgatory-like” segment that connect the upper world and lower world together (Barati 2012).

#### **7.3.1. Single Axial Pattern in Persian Garden**

As discussed before based on Zoroastrian beliefs and other previous religious beliefs in Persia and surrounding territories the world was divided in the three segments: Upper, Middle and Lower.

The axial pattern of Persian gardens moves the audience from darkness into light. The entrance is generally lower than the pavilion and the patio or porch is located is slightly elevated overlooking the garden (N.Barati 2011).

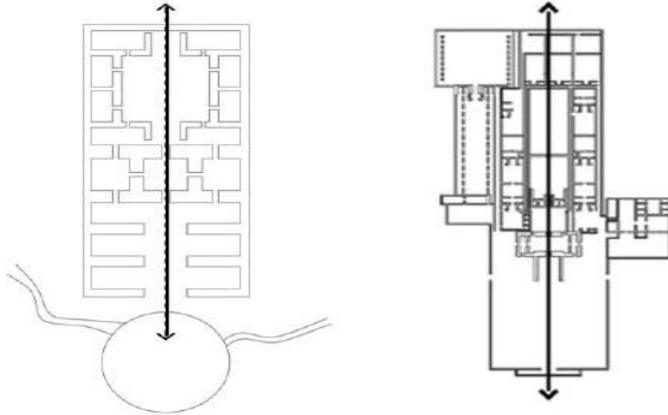


Figure 35. Left-Single Axial of Sarvestan Palace. Right-Single Axial of Khosrow Palace

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

The courtyard is the symbol of first level, the hall is the second level and the porch which is attached to the hall (palace) is the third level. Finally, the garden represents the level where god and the creator himself lived.

paradise,Ahuramazda Top level (fourth)	Garden
Good deeds Third level	Porch
Good words Second levels	Big Hall
Good thoughts First level	Inner courtyard
Purgatory	
Bad thoughts First level	
Bad words Second levels	
Bad deeds Third level	
Hell,Ahriman	

Figure 36. Zoroastrian Belief in "Upper World Hierarchy" Their Relation to Creation of Persian Garden

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

### 7.3.2. Dualism

Dualism in Zoroastrian is very important, the existence of evil and goodness as two contrasting forces in the world is very visible in all practices and rituals of the religion. The goodness and kindness in the world are created by “Ahura Mazda” rivaled by evil and darkness created by “Ahriman”. The emphasis of the religion is for one to choose the righteous path by conscious choice. Those whose good deeds through life outweighs their evil acts will be rewarded with eternal light and everlasting happiness.

During the Achaemenid period the gardens are the depiction of paradise promised to the good doer in the world and their construction were a direct order by high priests of Zoroastrian religion at the time. “Anyone who builds this garden will connect with the light of Ahura Mazda” (Benoist M 1975).

The division of Sassanid Gardens into two parts is rooted in the belief that the world has a balance. The balance between night and day, happiness and sadness, good and evil.

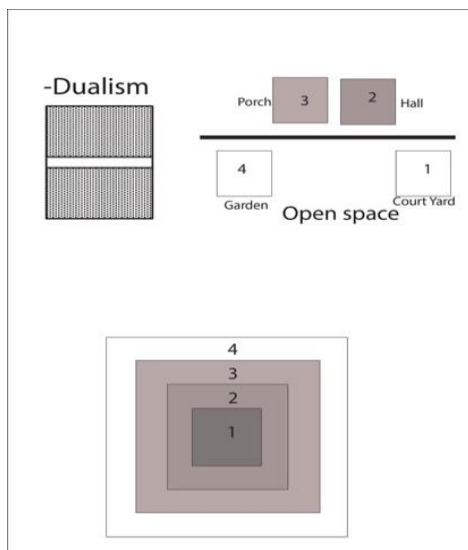


Figure 37. Duality in Persian Garden Before Islam

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

### 7.3.3. Introspect

In Zoroastrian meditation thinking about God is a way to knowing him. Thinking is a way to ascend to the level of God or the creator Ahura Mazda (Tafazoli 1976). Most Sassanid palaces are inward looking and are separated from the outside world by thick walls. The only connection between these buildings and the outside world is a porch that overlooks the garden. An example of this case is Sarvestan palace, however, this palace has much stronger introverted dimensions than extraversion aspects.

On the contrary the Zoroastrian style gardens surrounding the palace have open bounds and are rather unrestricted without any walls. They tend to blend towards the nature on the outside and create a harmony with the environment.

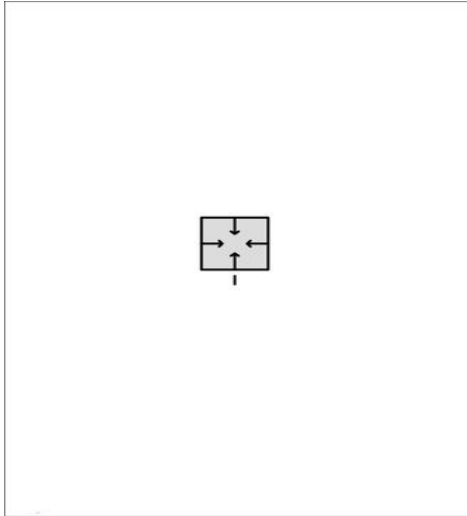


Figure 38. General Patter of Sassanid Inward-Looking Garden with a Small Viewing of The Outside Surrounding

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

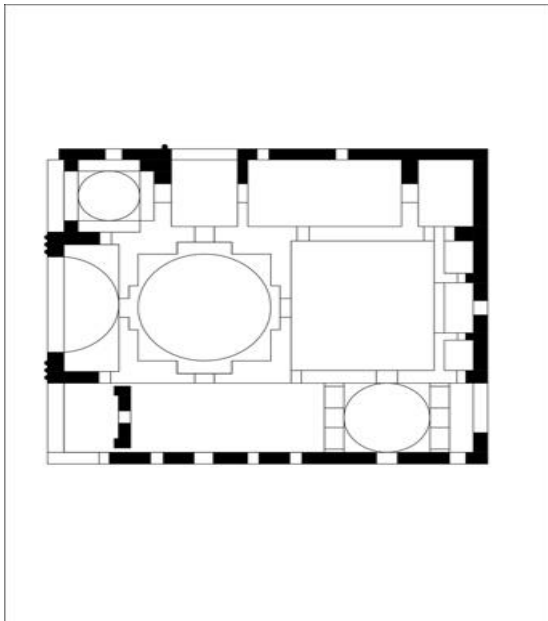


Figure 39. Sarvestan Palace with Small Openings to The Outside

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>. Lionel Bier, *Astudy in Iranianan Architecture earth's Architectural collection the Rise of Islam*. 2004. Translated by Amir Hossein Soltani



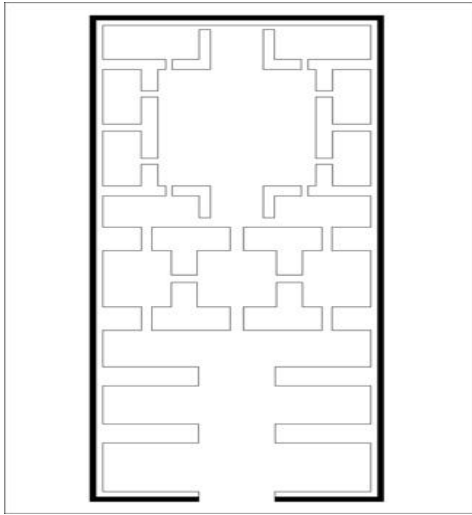


Figure 40. Firouzabad Fire Temple: Solid Walls Surround This Temple and Its Garden, Only One Opening Towards Outside

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

#### 7.3.4. Elements and Logistics of Gardens

Zoroastrians strongly believe nature is sacred. Any artificial tempering with nature is frowned upon. They also believed in four holy elements (Fire, Earth, Water and Wind) as these were considered the pillars of nature. Either the gardens are comprised of these four elements or are surrounded by them.

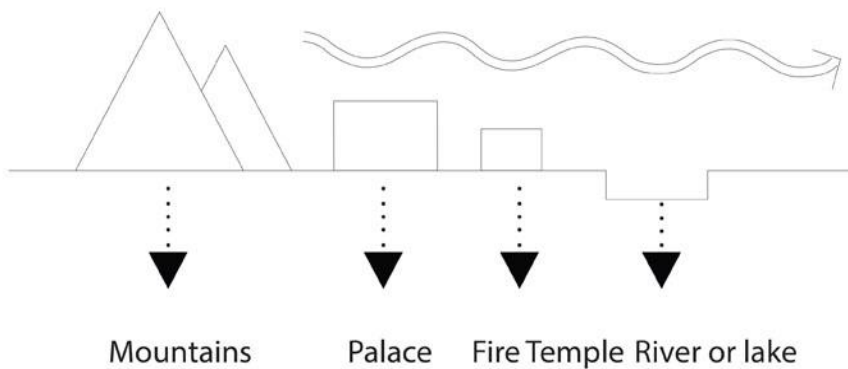


Figure 41. Palace with The Garden Inside Surrounded by 4 Holy Elements

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

As discussed earlier the gardens are depiction of paradise. So, when a viewer is standing on the porch (3<sup>rd</sup> level), they can observe the Paradise (4<sup>th</sup> level) and all the elements that goes into making it. Seeing an element of fire wind water and earth is essential to the design of these gardens.

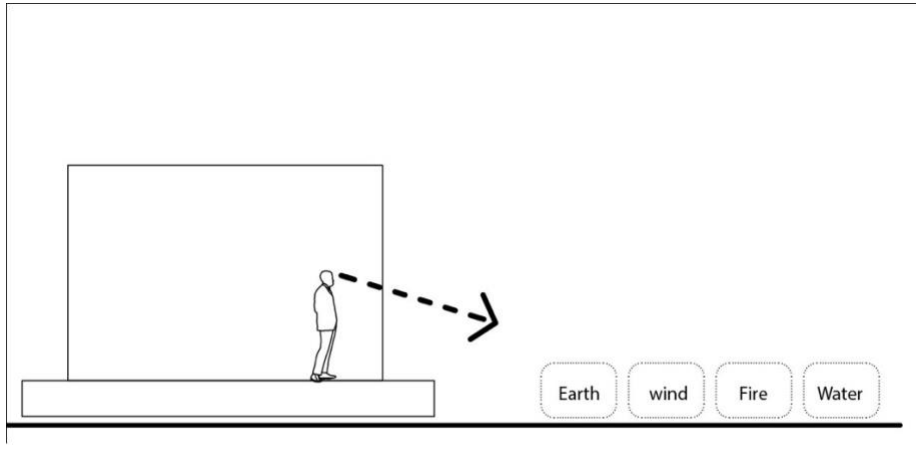


Figure 42. View Towards the Garden (Internal View) with 4 Elements Present

Source: <http://jias.kashanu.ac.ir/article-1-447-fa.pdf>

8. Analysis of The Topographic, Orientation, Shade and Wind of The Site



Figure 43. Existing Site

### 8.1. Topographic:

From the entrance of the site to the tower of silence it's a slight change of topography as it's shown on the sections.

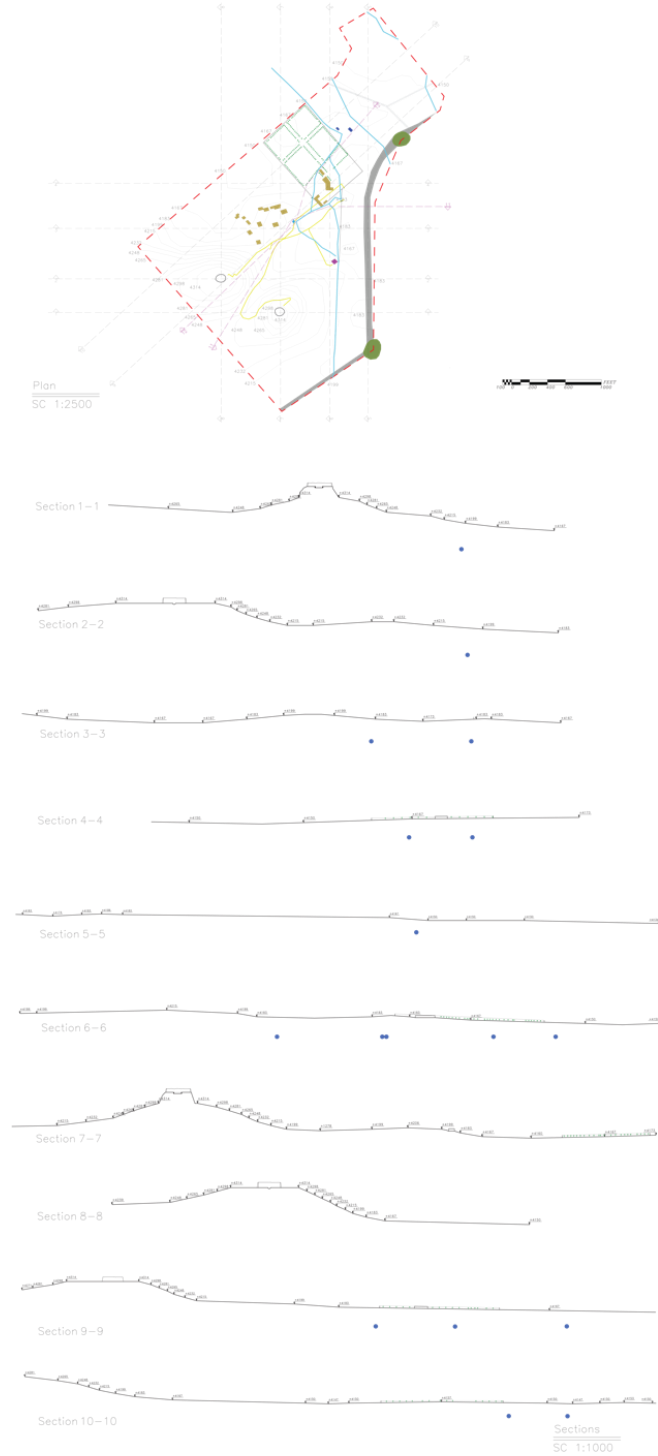
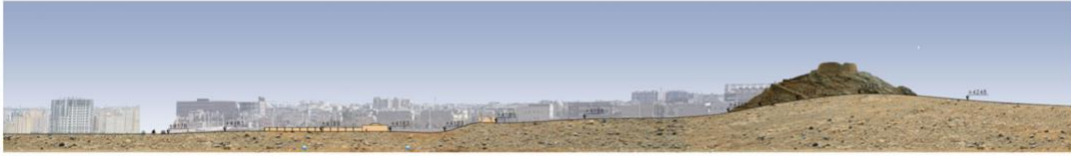
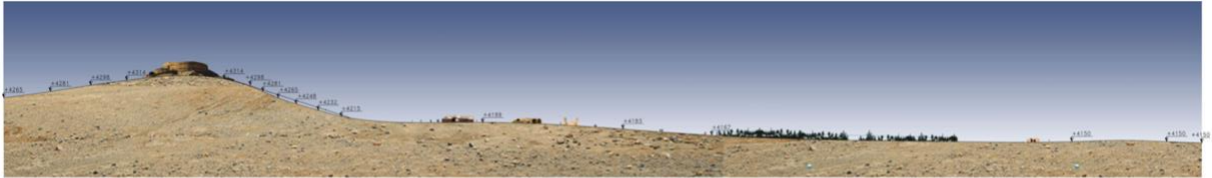


Figure 44. Sections of Existing Situation



Section11-11

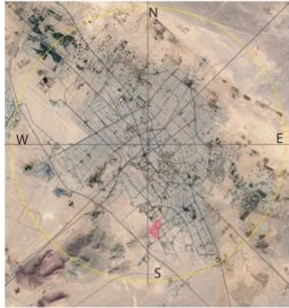


Section12-12  
SC 1:500

*Figure 45. Section11&12 of Existing Situation*

## **8.2. Orientation:**

There is an old Zoroastrian neighborhood at some distance to the site. The relationship between the orientation of the cemetery and old neighborhood is clear. The Zoroastrian neighborhood had slightly different orientation compare to the rest of the town and it faced to the holly fire in the Zoroastrian temple. This fire has been burning for many years without it being put off.



Yazd, Iran



Figure 46. Zoroastrian Neighborhood Marked with Orange Circle. Orientation of The Zoroastrian Cemetery Follows the Orientation of Neighborhood That is Different from Muslim Neighborhood

### 8.3. Shade and Wind:

-Shade:

A unique shade is created at the site due to its location in south west of the town. During the time of the year as it's shown in figure below during the afternoon the site is mostly shaded from November to February, however this time of the year it's very cold and dry that shows the site does not have comfortable microclimate.

-Wind:

The tower is in the opposite direction of the main wind to keep the pollution of the dead body away from the town.

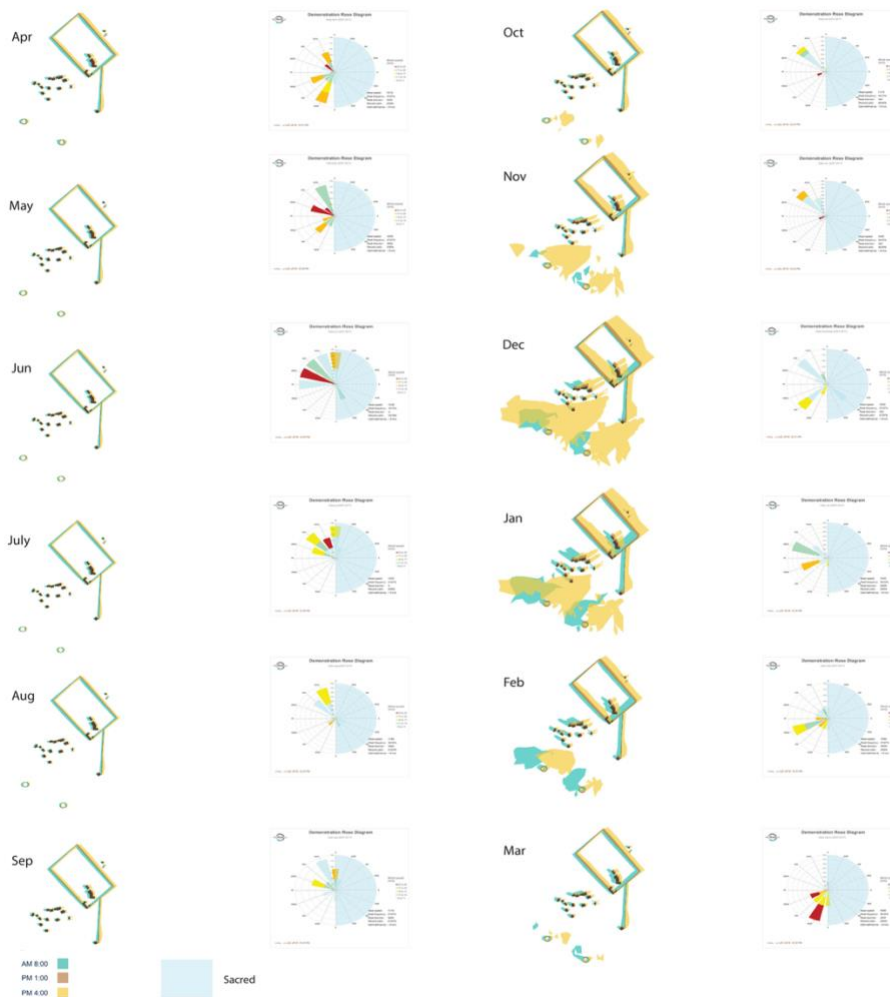


Figure 47. Shade and wind analysis during the year

## 8.4. Duality:

Zoroastrians believe in seven creations in the world of the living: first the sky, then came water, followed by earth, the plants, and cattle. Man is the sixth creation. Fire is the seventh emanating from the endless light. (Prods Oktor Skjærvø 2012).

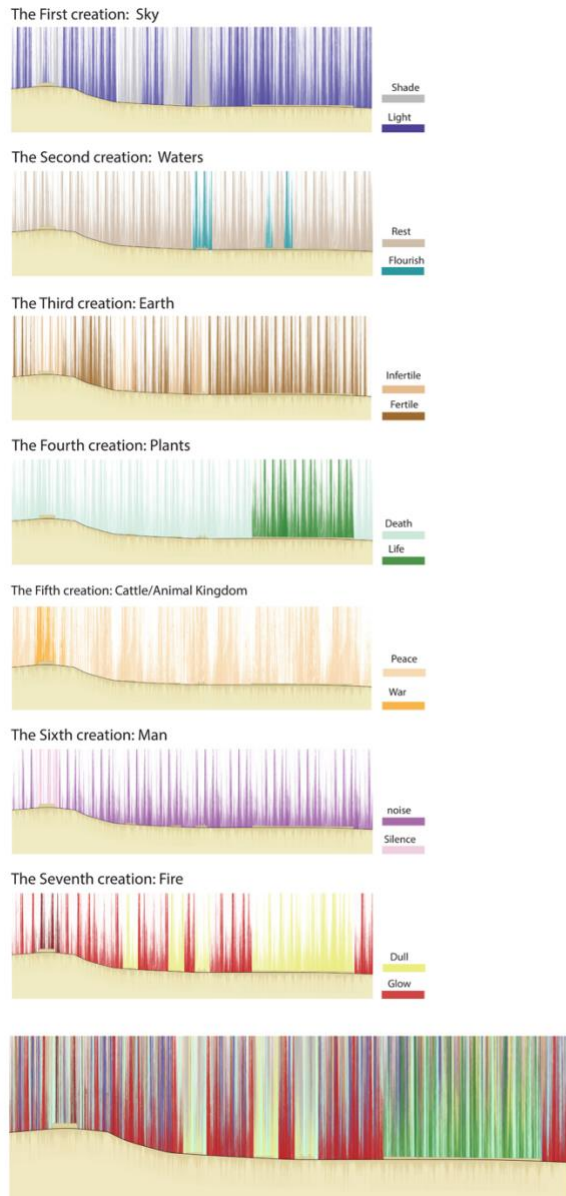


Figure 48. Conceptual Drawing of Existing Site Base on Duality of Seven Creations



## **9. Design Objectives:**

Tower of silence is one of the UNESCO World Heritage sites. These towers are located in the hot arid climate of the central Iran, and it's a popular national and international tourist destination. The current visitor's center design and microclimate of the site is rather inhospitable and doesn't allow visitors spend enough time to know and appreciate the historical cultural values of this site. Visitors have to go up a steep set of stairs to get to the top of the tower but during most months of the year they encounter extremely hot or rather cold temperatures that act as disincentives for them to make this journey atop of the towers.

After careful analysis of the tower of silence site, design objectives emerged:

1. To explore options for redesigning the visitors center.
2. To create a space introducing visitors to the beliefs of Zoroastrians and give them a chance to understand the Zoroastrian through landscape design.
3. To increase the utility of this site beyond a typical touristic attraction and create an oasis where locals can enjoy it as a place to gather and relax.
4. To respect the spirit and grandeur of the Tower of Silence and religious and cultural belief.

### **9.1. Preliminary Design Idea:**

The preliminary design idea was to create a shaded path from visitor center all the way to the towers with conceptual approach of Zoroastrian belief and their way of creating garden with a use of landscape elements. Primary concept of Zoroastrian belief is summarized as:

1. Good thought, good words and good deeds are their way to get to the source of the light (God).
2. Duality/Dualism in the world (Good vs. Bad, Kind vs. Evil).
3. Freedom (freewill) to choose the righteous path that leads to purity of soul and body.

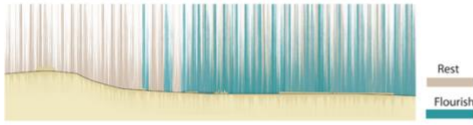
#### **9.1.1. Final Design Proposal:**

In summary, the final design aims to (1) recognize the existing potential of the site and respect the significant architecture elements such as cistern and historical path and ritual building, (2) introduces a new design for the pathway as well as recognizing historical integrity of the site, (3) recognizes the role and importance of Zoroastrian beliefs in their garden design and try to respect and follow them, (4) incorporates areas for sitting along the path enabling opportunities for visitors to rest and/or take photographs and/or have conversation, and (5) plant trees to create, shade, texture, color, and introduce wildlife to the site.

The First creation: Sky



The Second creation: Waters



The Third creation: Earth



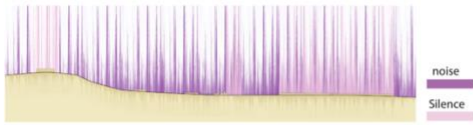
The Fourth creation: Plants



The Fifth creation: Cattle/Animal Kingdom



The Sixth creation: Man



The Seventh creation: Fire

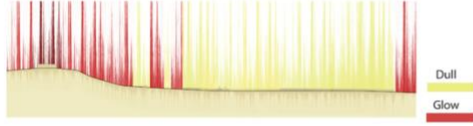


Figure 49. Proposed Conceptual Design Base on Duality

**10. Proposal Plan:**

The plan is divided into 3 major parts: The courtyard, the long pathway and finally the porch.

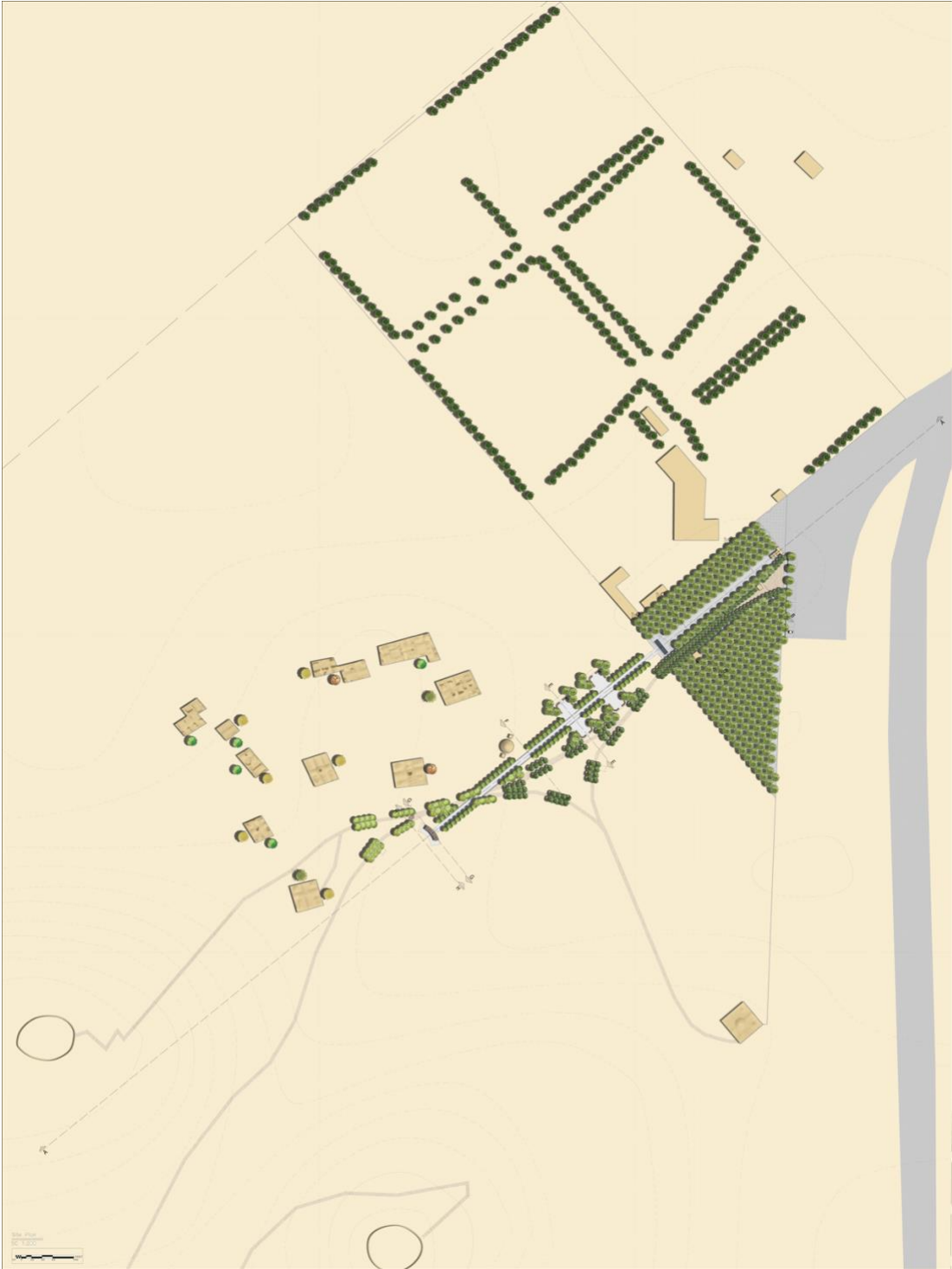
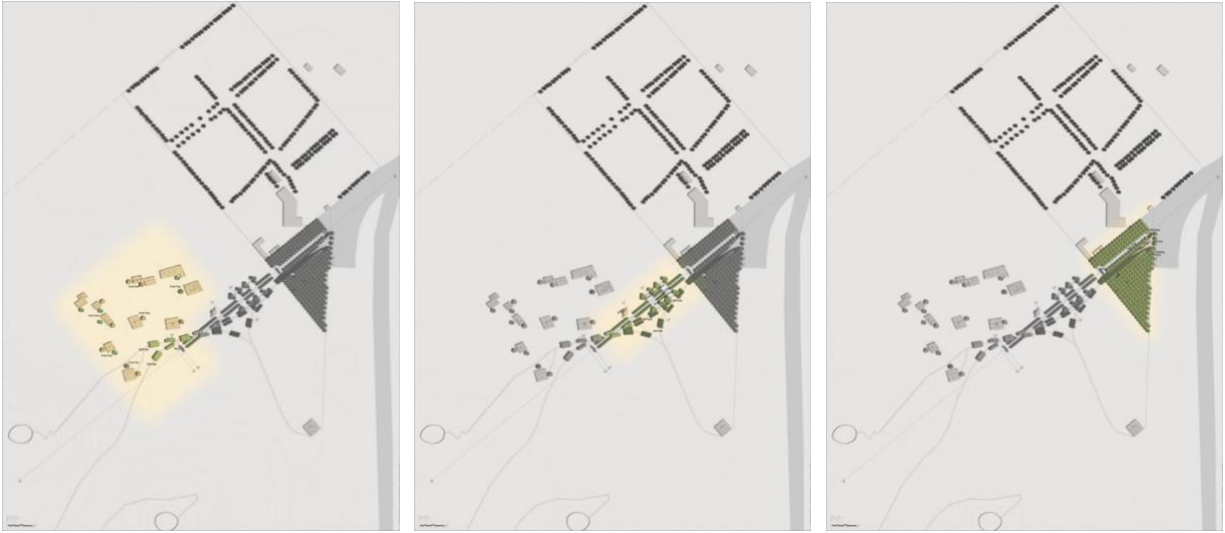


Figure 50. Proposed Plan



Part 3-Porch and beyond

Part 2-Long pathway

Part 1- Entrance Courtyard

Figure 51. Proposed Plan in Three Parts



Figure 52. Trees Legend in Plan and Section

### 10.1. Courtyard:

1. Introduces visitor center
2. Creates shade (which is one the primary way to create a more habitable microclimate in arid climate) with the help of trees
3. Places a shallow pool at central path in entrance courtyard in order create suitable microclimate
4. Creates entrance courtyard for visitors as well as local public to come and enjoy the shade in a pleasant improved microclimate
5. Provides ticket office, cafe and washroom at entrance courtyard
6. Creates wider and brighter central axis path
7. Enhances the old winding pathway by planting Persian Olive Trees (Senjed) on both side of it. This tree is a symbol of wisdom in ancient Persian beliefs which is tied up to Zoroastrian traditions
  - a. [https://en.m.wikipedia.org/wiki/Elaeagnus\\_angustifolia](https://en.m.wikipedia.org/wiki/Elaeagnus_angustifolia)
8. Creates landing between entrances courtyard and long path
9. Provides doors and doorways to give access to the adjacent cemetery
10. Creates designated space to act as a storage for maintenance equipment that is not obscene and could be camouflaged by greenery and vegetation around it.

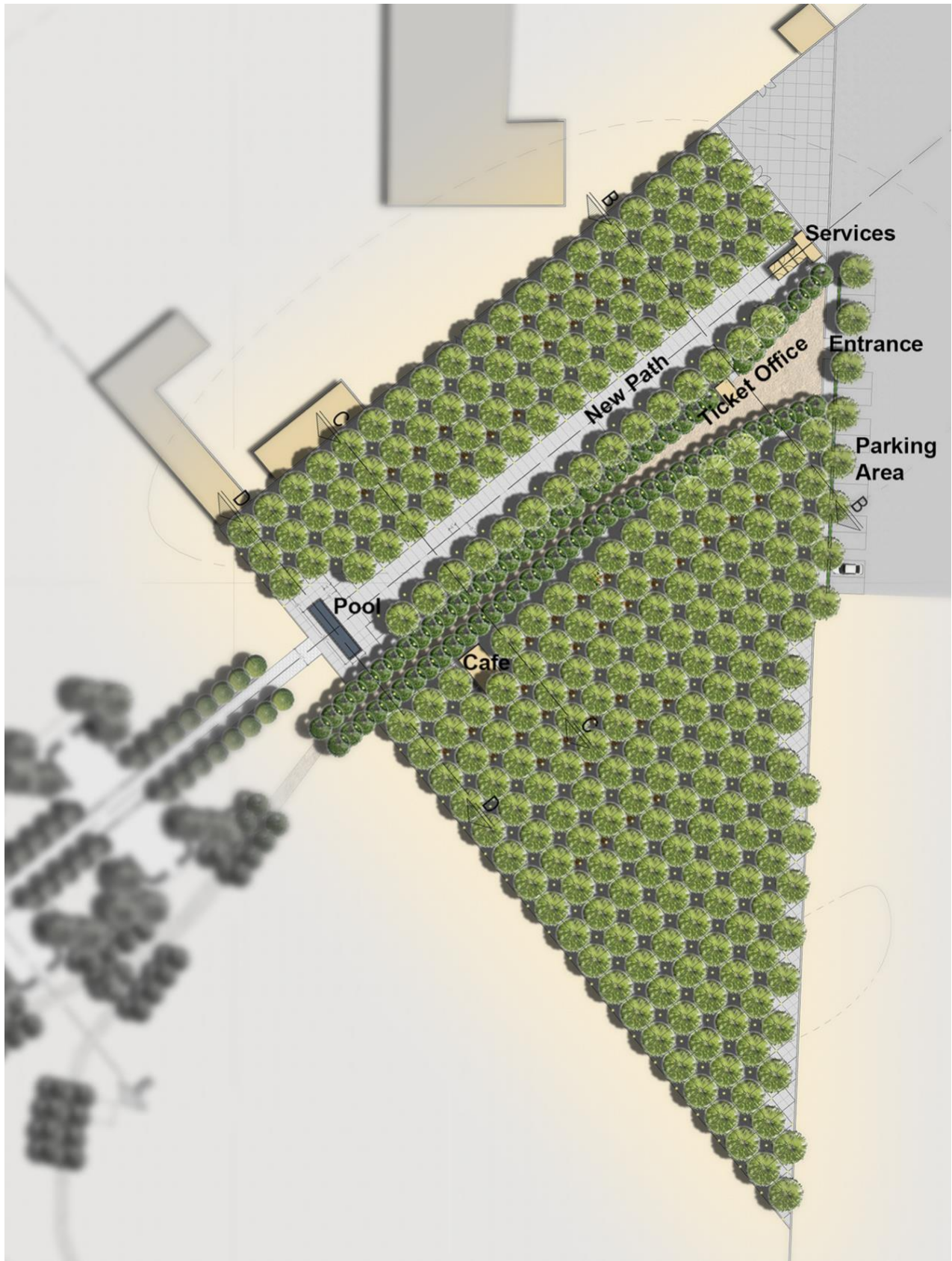
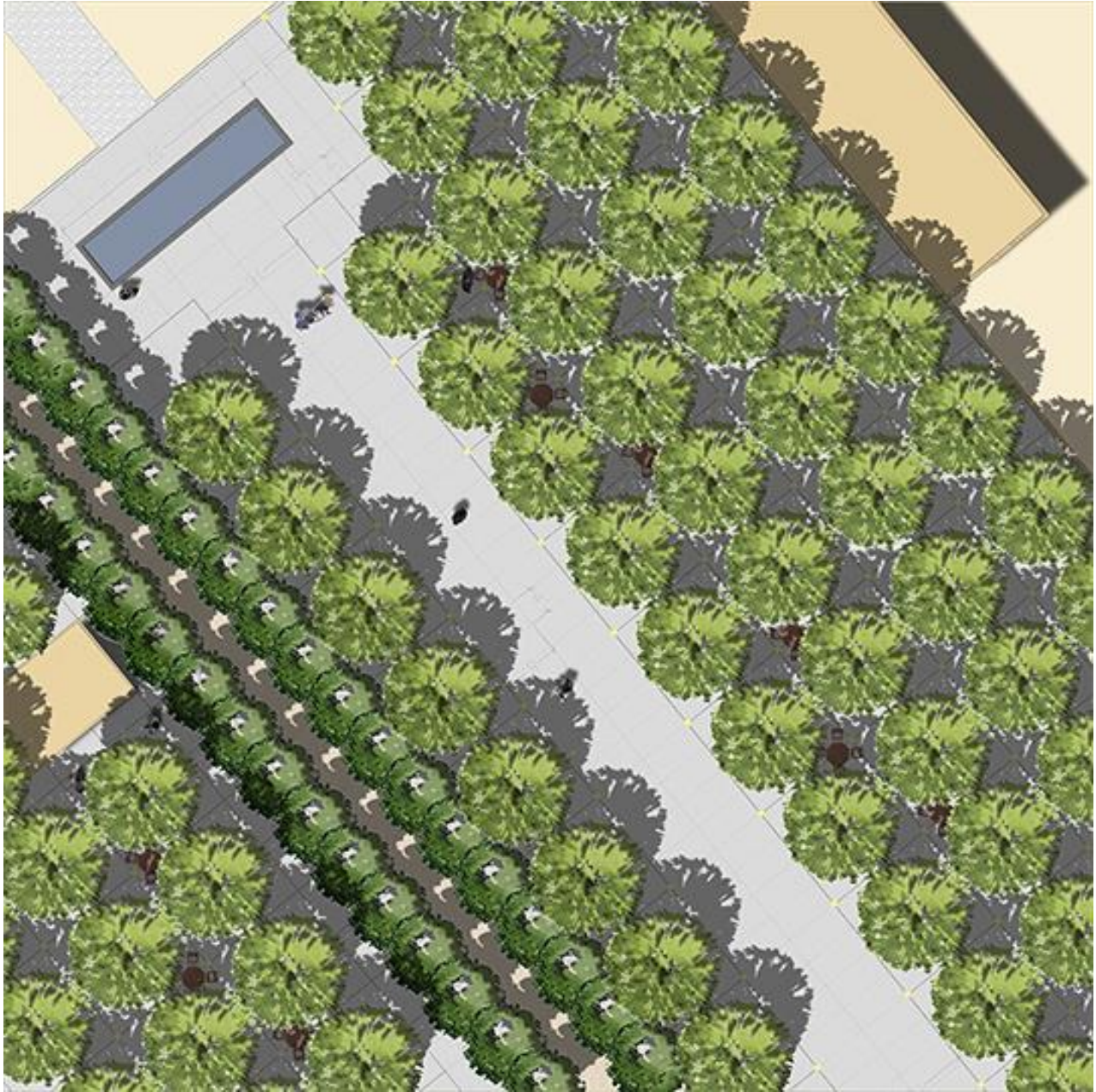
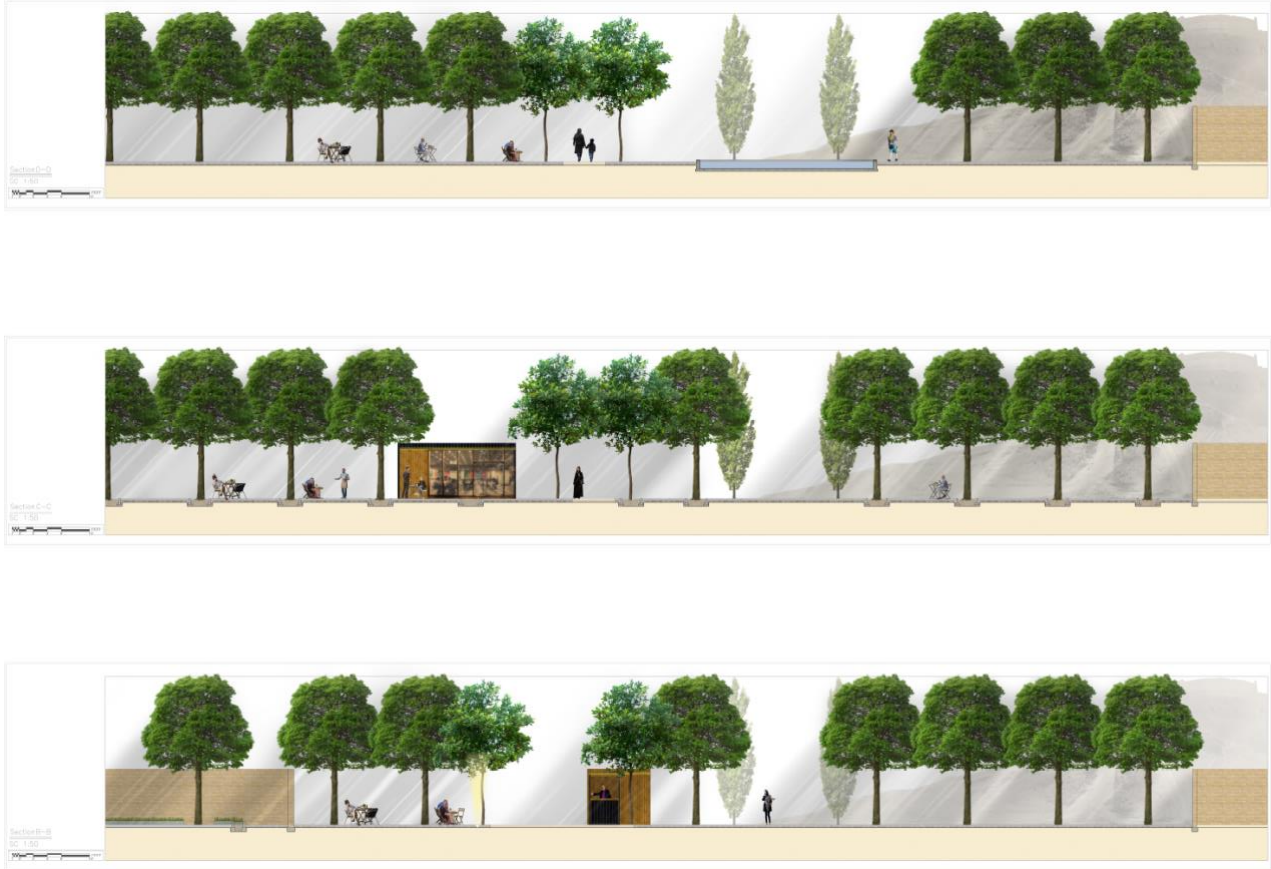


Figure 53. Part One of Plan (Entrance Courtyard)



*Figure 54. Zoom in Plan - Part of The Courtyard*



*Figure 55. Section BB Ticket Office -CC Café -DD Pool Creating Shade and Soothing Space*

## **10.2. Long Pathway:**

- 1-Provides continuous central axis towards the newly constructed porch at the end of the pathway.
- 2- Offers planted row of Cypress trees which is tied up to Zoroastrian traditions to provide shade along both side of the central pathway.
- 3- Creates groves along the path to incorporate areas for sitting along the long pathway.
- 4- Irrigates the newly planted trees along the pathway with narrow rocky channel that will also help the microclimate.
- 5- Creates an opening on the pathway close to cistern to create an opportunity to better explore that area in the site.





Figure 56. Long Straight Shaded- Recognizing The Historic Path Zoom In



Figure 57. Creating Shaded Path Toward The Tower and Also Creating Sitting Area Along The Path Section EE Sitting Area Alongside of The Path -Section FF Showing New and Old Path Next to Each Other

**10.3. Porch and Beyond the Porch**

- 1- Provides porch at the end of the long central pathway to give the visitors opportunity to stand under the shade and view the towers before heading to the site which lacks shade and is dry/hot during summertime.
- 2- Recognizes a historical point on the old pathway and placing a red marble rock at the fork part of the old path.
- 3- Plants local fruits tree (Peach, Apricot, Apple, ...) near the ritual buildings at the site to bring more shade and a lively and pleasant atmosphere to this part of the site that bears fruits during different times of year.

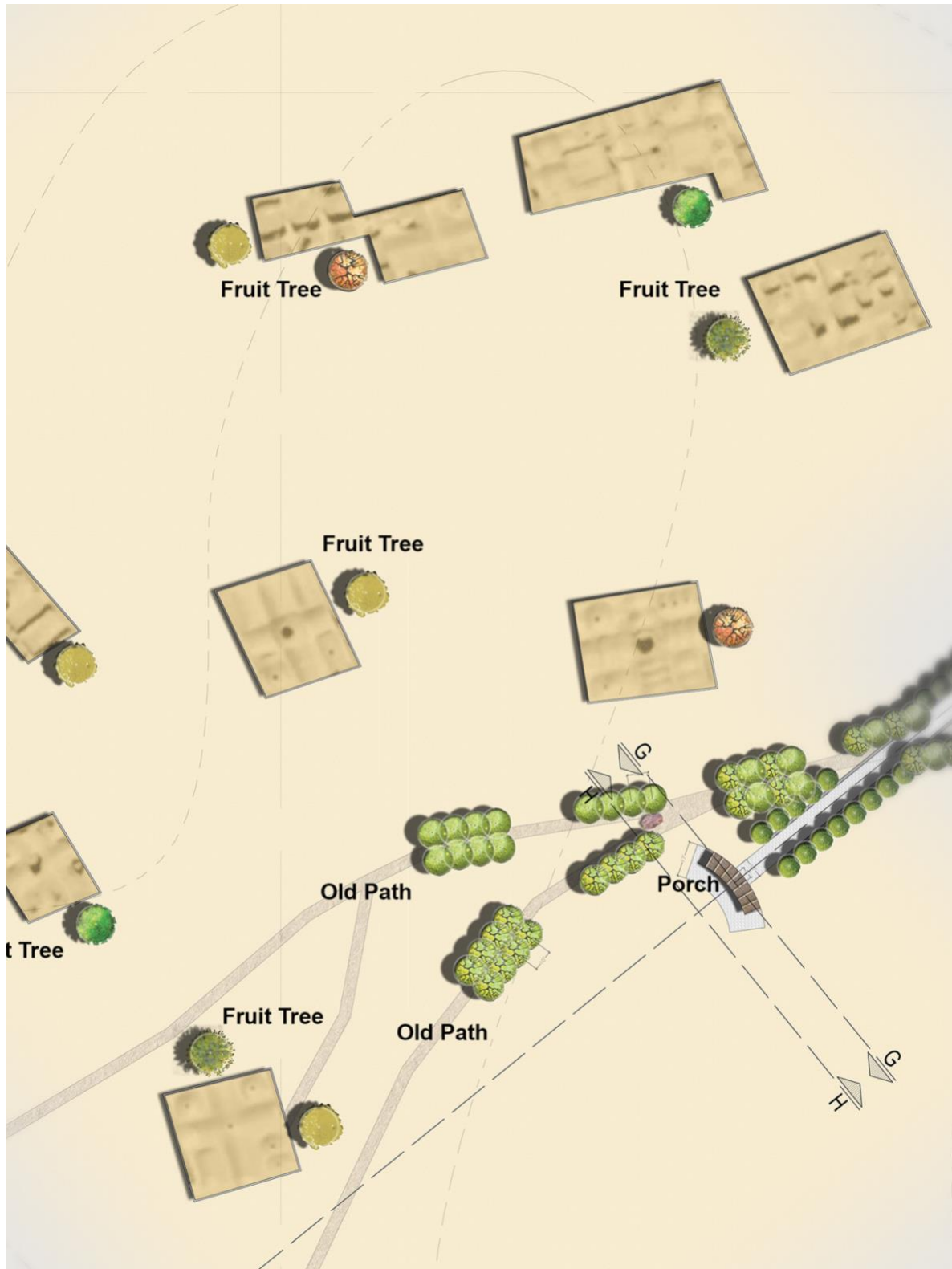
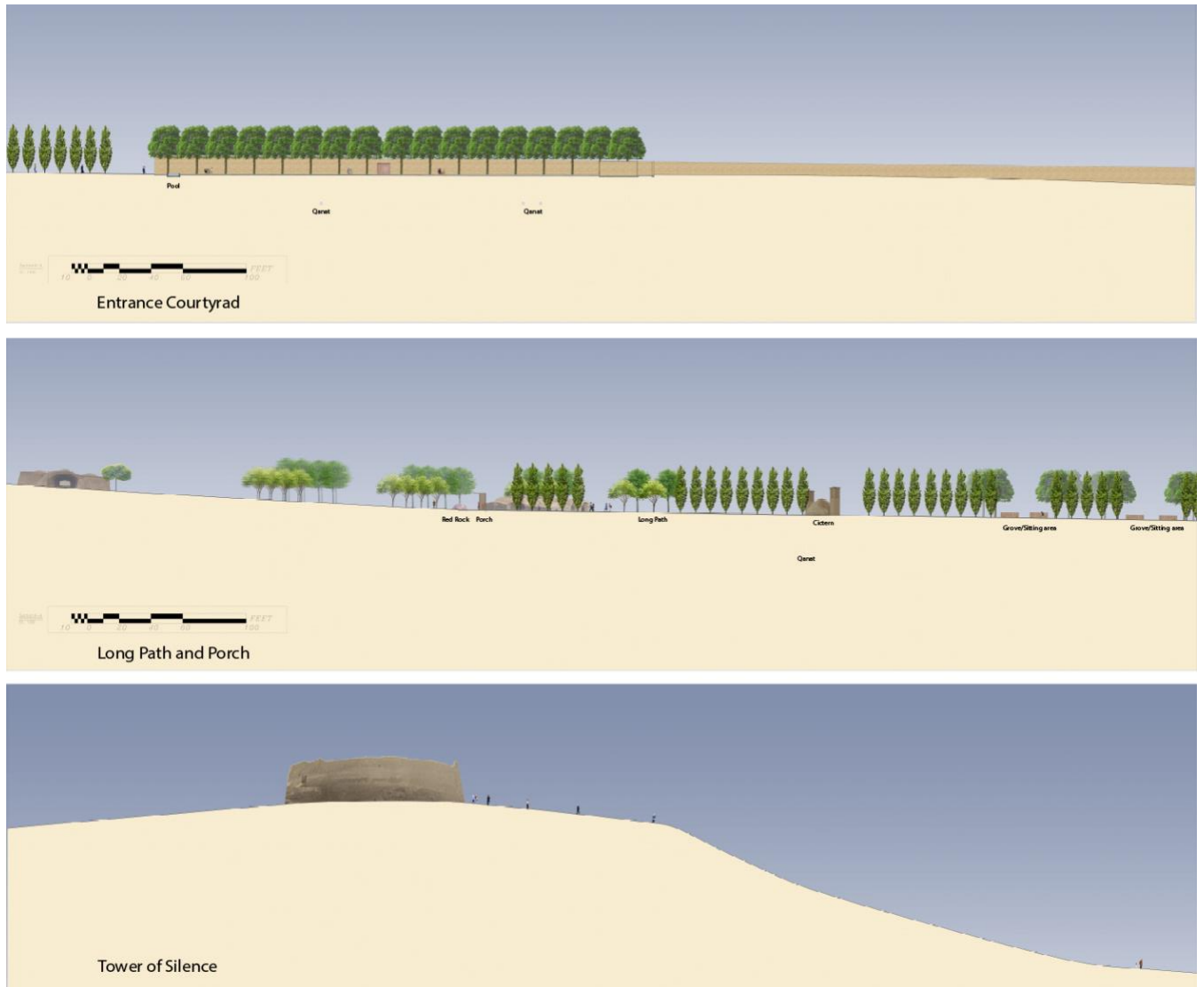


Figure 58. Designing Curved Shape Porch to Follow The Design Of The Towers to Created Shaded Space for Visitors to Stand Under The Shade and Enjoy The View -Planting Fruit Trees to Created More Attraction and Encouragement for Visitors to Visit The Ritual Buildings



*Figure 59. Section G and H Looking Toward The Towers and Looking Back on Path -Red Granite Rock From Local Quarry to Emphasize A Fork Part on The Old Path -A Deciding Moment to Choose to Continue One of The Tower to Visit*

**Long Section:**



*Figure 60. Almost Flat in Entrance Courtyard -Steady Slope from Pool to Porch and Steep Slope to The Towers*

## 11. Design Analysis

Creating three different environment and experience with landscape elements to provide shade and create a more welcoming and comfortable microclimate for visitors and also at the same time try to bring landscape design to help understand the fundamental Zoroastrian belief.

Visitors have multiple opportunities to experience different environments and will enjoy their surroundings while immersing the cultural richness that the Tower of Silence and other sites surround the towers offer.

### 11.1. “Good Thoughts, Good Words, Good Deeds”

#### 11.1.1 Good Thoughts

Entrance courtyard has a design large enough to accommodate the visitors and at the same time give them enough space to relax their mind and prepare for the spiritual journey through this site.



Figure 61. View of Courtyard – Soothing Place for Good Thoughts-



Figure 62. Material of Surface -Light Gray Concrete Slab with Gravel in Between

### 11.1.2. Good Words

Single long axis provides a straight shaded pathway for visitors with several groves at both sides to create a shaded room for visitors to give them an opportunity to exit and experience walking on site (no path) or sitting and socializing and viewing out from -both sides and photographing their surroundings.

Running water and the sound that it will make going over the rocky channel will create a soothing sound as nature talks to the visitors and promises them a relaxing time. Creating different lengths and direction of shade with Cyprus tree on the ground during a day is a presentation of communication between trees land and sun.



Figure 63. Bird View of Sitting Area and Grove -Placing to Communicate

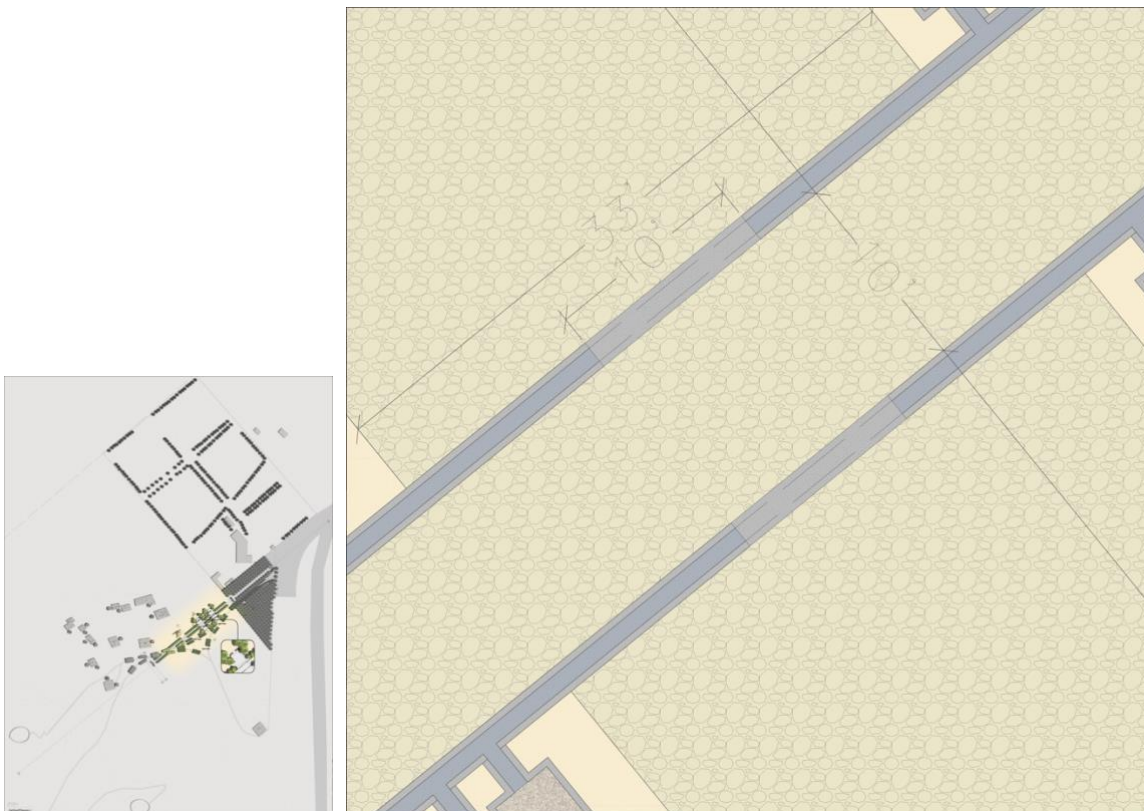


Figure 64. Material Gray and Light Brown Gravel -Making Sound While Walking on it





*Figure 65. View from Pool to The Towers-Communicating Trees Shadow on The Ground*

### **11.1.3. Good Deeds**

Results of good thoughts and good words will lead to good deeds. At the end of the pathway there is a porch which will give the visitors the final chance to stay under the shade and look at the vast plain and get ready to take the journey on the stairway towards the top of the Tower of Silence.

As a reward for the visitor's good deeds they might be able to pick a piece of fresh fruit from the trees (apple, orange, pear) planted at the end of this pathway.

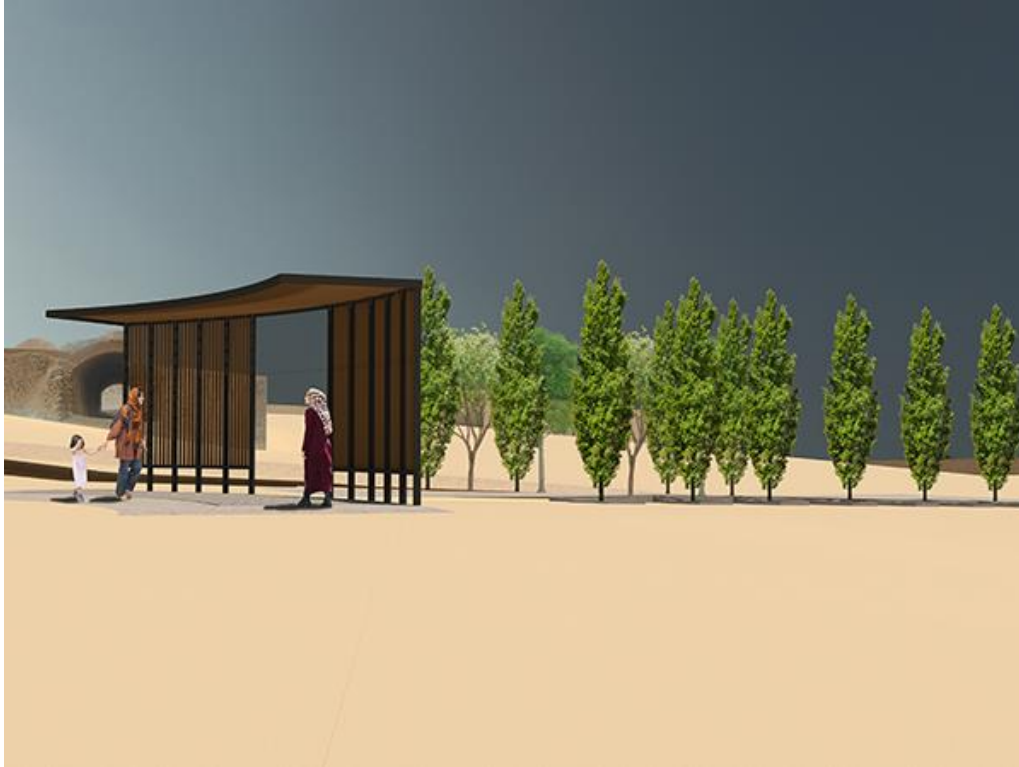


Figure 66. View of The Porch. Taking an Action to Choose The Sun Or Stay In Shade or Go Toward The Fruit Trees

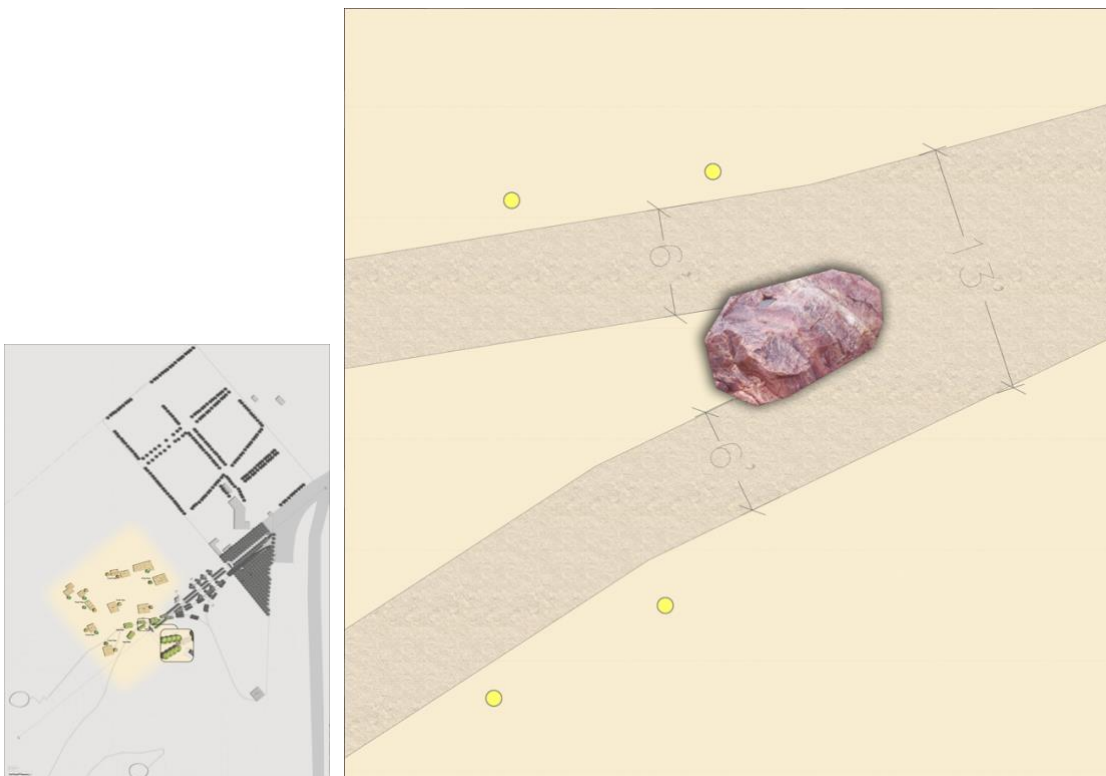


Figure 67. Material Original Earth Which is Light Yellowish-Brown Soil

## 11.2. Dualism and Duality in Design

1. To have a large piece of green space in the middle of desert land has a concept of duality associated with it. Coming into this oasis like courtyard after a busy day of work and life in a hot city of Yazd can be seen as a duality as well.
2. This design uses uniform and orderly grid-line structure to create a calming environment. This design is in contrast with the chaotic and messy daily life that visitors will leave behind and forget after visiting the pathway and the oasis-like atmosphere around the Towers of Silence.
3. Placing a pool symbolizes purity and washrooms both ends of the main path.
4. The sun shines on the courtyard and creates a bright opening on the ceiling of the main path at the courtyard but the duality between shade and light and also between ground and sky will be visible at this part of the pathway.



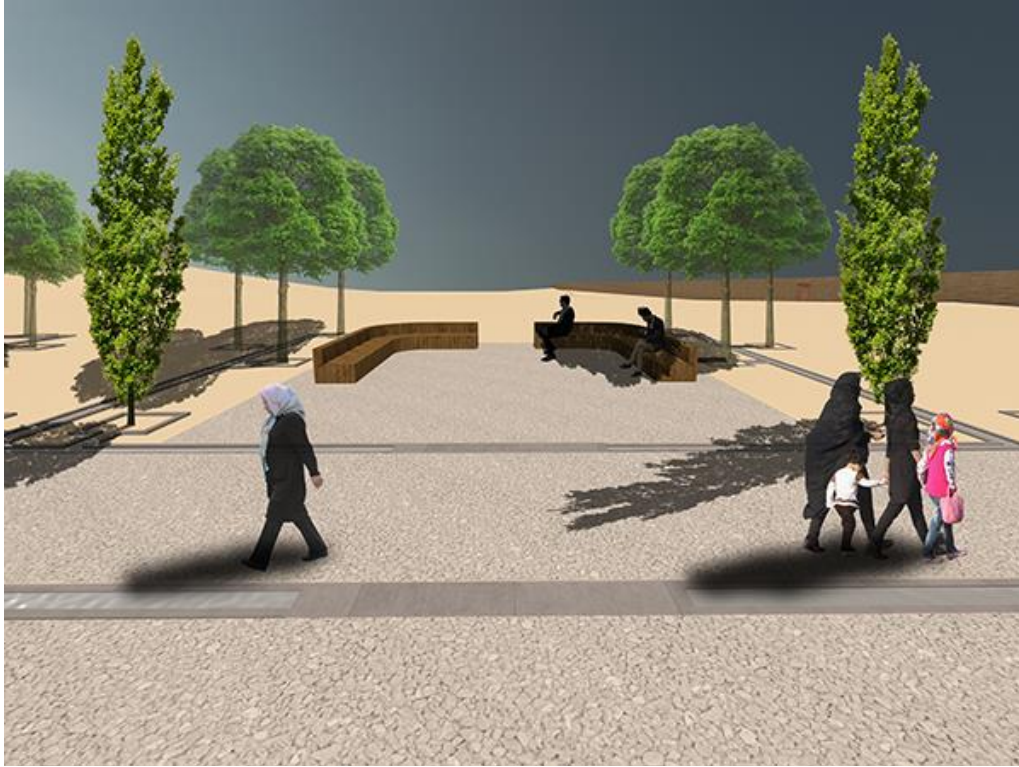
Figure 68. Bird View of Courtyard-Duality of Trees in Desert



*Figure 69. View of Courtyard -Duality of Sky and Ground / Hot and Shade*

### **11.3 Freedom of Choice**

Along all of the pathway from the courtyard to the porch every visitor has a choice. They have a choice to spend time in a courtyard or head out to the mountains and the Tower. They are presented with a choice to go on a newly constructed straight pathway with a lot more shade or to take the old pathway that is winding and has less shade. Finally, they have the choice to pick any fruit from the trees that are planted around the porch.



*Figure 70. View of The Shaded Sitting Area – Choice Between Saying or Continuing Our Way or Heading Back*



*Figure 71. Choice -Continue to walk on one of the path*

## **12. Conclusion**

In this study the focus is using traditional and classical architecture that respects the historical significance of the site and gets its inspiration from the Zoroastrian beliefs along with designs of pre-Islamic gardens.

The focus of this project is to use traditional and classical architecture and use of elements from the landscape that will improve the microclimate of the surrounding area. The conclusion was that using trees, water and creating shades will result in a comfortable setting for the visitors while immersing them in the values and richness that this site has to offer them.

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