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Seeking Archetype of Water Storages of Qeshm Island

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Abstract

Throughout history, water as one of the most important natural factors played an important role in human life. In dry and waterless areas, people have always been in difficulty to provide and maintain and distribute water, and over centuries, different strategies have been applied to use water. In this article, water storage as one of the principle strategies to use water which has cultural and social indicators and dimensions was studied. Water storage as an urban structure remained from the past, is a valuable experience of Iranian art and belief values that can be used as a cultural and natural capital. Persian Gulf Islands, because of the lack of water has numerous water storages with different architecture plans and water storage can be called as a sign of this province beside wind towers. Wind towers is a phenomenon derived from confirmation of cultural and technical characteristics of humans with the natural features of the surrounding environment. With regard to drinking groundwater tables, Qeshm Island is one of the most disadvantaged areas of the country and people could already solve some of the problems related to annual lack of water by using their natural aptitudes in building water storage and well. The building technique and the architecture method of water storage structure benefits a specific delicacy because the manufacturers of these units pay precise and discerning attention to major issues such as the level of pressure on the bottom and surface of the water storage, the problem of coverings inside the building, air conditioner, refining and preventing water pollution. Thus, in this article by analyzing water storage of Qeshm Island and categorizing them and their typology from their plans and tanks, we tried to determine the typology of water storage of Qeshm Island. According to the analysis made, Qeshm Island water storages were categorized in to main classes including water storage with circular plan and domed covering, longitudinal with rectangular tank plan and with sternum-shaped and ceiling track covering.

Key terms: water storage, Qeshm Island, formic typology

Introduction

Water as one the most important natural elements played an important role in creating human settlements. Formation of first urban modernization in Mesopotamia, Neil, Send and the like shows the importance of this vital material in the settling biology spaces. The issue of water in cities and villages of Iran has always determined the existence and survival of living creatures and the primary cores of human colony centers are created in places with sufficient rainfall and or watering by traditional methods like aqueducts, fountains and wells were possible. Dry and semi-dry weather of a large part of Iran deeply influenced the creation of different architectural phenomena in this land. In such conditions, in order to provide water and remove the mentioned crisis Iranians have created different approaches over the time, one of which is to use water storage (Niazi, 2007, p.193). The main purpose of this article is to introduce a part of unknown architecture of Iran that is less seen. Water storage is a building for storing water. In fewer countries, water storage was built with this scale. One of the most important issues in the architecture of water storages is the construction aspect which we pay attention to in this article. According to the analysis, we can state that we have

not observed any comprehensive research in the field of formic typology of water storage of Persian Gulf islands. Over all, articles and papers written in this field introduced buildings as literature review, plan printing and a number of pictures and less analyses were made. The present research, using descriptive-analytic research method by field study in form of direct observation of the researcher and library study in the area of water storage architecture was done and the research process can be described as follows: observation, comparison, analysis, deduction. In this article, the formal typology of water storage was done by analysis of the types of the water storages' posture, plan types, signs, levels and categorization based on entrances.

Water Storage

Definition of water storage

Water storage is the place for storing water, in other words, all water distributors in autumn and winter conduct water to the water storage. Because, in autumn and winter, farms need less water. Water storages are divided into two categories, public water storage and private water storage (Maserat, 2010, p.9). Pubic water storage occupies a specific place in this regard as it is sometimes seen that it occupies the most significant architectural work of an area (Molla Zadeh, 1990, p.13). Water storage is an engineering masterpiece. It is a structure that has the capacity for hundreds and thousands square meters of water, as when cement, iron and steel and concrete did not exist, Iranians created structures that did not even leak a drop of water and did not need repairing for decades. Undoubtedly, achieving architectural methods of water storage means achieving all knowledge of Iranian architecture because in this building all achievements of Iranian architecture were applied (Masarrat, 2010, p.10). Water storage is variably defined in Persian dictionaries. Moien dictionary defines water storage as "a shield in which drinking water is always stored, an underground place which is filled with water" (Moien, 1992, p.5). It also, means a place for storing water. Water storage, Pond, pool, Masnaeh and other similar names are underground water tanks made to meet people's need to drinking water in most areas of Iran and some other countries (Memarian, 1993, p.1). Water storage is one of the traditional public places. By traditional public places, we mean that this type of places were established by people in old times (Behrouz Far, 1977, p.89).

History of water storage

The history of building water storage (though with different plans) goes back to thousands of years. The oldest artifacts discovered in this case is the tank of city's water (Doravantash) Ilami near the Choqazanbil temple whose history goes back to 13 B.C. Water storages remained are all related to the Islamic era but since most of them are historical inscription, is not possible to determine how many of them goes back to the first Islamic centuries. The oldest water storages with inscription is Gonk water storage in Yazd dated 878 AH. After this date in Safavid and Zandieh and Qajar periods, numerous water storages were built, most of them still exists and a few are still used (Molla Zadeh, 2000, p.13).

Reasons for creation of water storages

Iran is located in a part of world in which the average rainfall is less than one third of world's average annual rainfall. In addition to the lack of rainfall, its spatial and temporal description is inappropriate. A large part of our country is dry and waterless (Kardovani, 1995, p.133) and this caused our ancestors by building and establishment and innovating dam, Qanat, well canals, and water storage largely overcome this problem. According to Mollahzadeh (2000), in hot and dry cities of Iran, water storage is an important urban building and its building with tall wind tunnels and huge domes from long distances are shown off as every neighborhood has a water storage that is established by the residents. Water storages were administered by the residents of that neighborhood

and nobody paid any money to use it and only repair and maintenance costs were paid for it (Ghobadian, 2011, p.298).

It seems that the first natural resources of water storage are natural ponds. Places where rain water are naturally saved for a period of year. If the first idea of storing water is known as an inspiration in these natural ponds, it can be said that the first water storages did not have any covering. These water storages are called Hotag, hole or pool in different areas of Iran. Hotag and hole are pits in which rainwater is stored. Samples of them can be seen in the east south of Iran and in the Baluchistan area. Pool is a more advanced example of Hotag that has no covering. Rainfall water pools are usually built in triangular or circular designs and their body is covered like body of water storage. The old type of these pools probably has no covering. Maybe in the process of evolution of water storages, pools have covering and the set of covering and the pool is called water storage. As a result, building a roof over the tank is helpful in preventing water esteem, pollution and warming, thus, new sun shine from mid-spring to the end of autumn, during the hottest months of the year in the southern and central areas of Iran cause that a part of the stored water with numerous problems is evaporated and wasted and on the other hand, this valuable essence should be avoided from pollution, therefore, building a barrier against sun shine is a necessity to build water storage in different areas of Iran, then we conclude that roof has a fundamental role in water storages of Iran (Masrrat, 2010, p.129).

Types of water storages

Cylindrical Tanks: the high pressure of water is equal at all levels of the water storage tank. And the walls are arranged in layers on each other and no gap exists among them. Lack of angle had more influence on it (Kazemi, 2011,p.7).

Cubical tanks*:* are triangular with small opening so that can be covered with Taqahang. There is the problem of crack or lack of proper implementation of angles. Angles are appropriate place for colony of algae (Kazami, 2011, p.7).

Triangular tanks: this type of tank was not typical, in these water storages, the tank is cross-shaped and their covering is triangular and is applied in the covering of Haj Agha Ali water storage of Kerman (Kazemi, 2011,p.7).

Compound tanks: these designs were not typical in water storages, rather a few were picked in Lar. In these water resources, a cylindrical tank was built in the middle and four triangular tank were attached to the central tank (Kazemi, 2011,p.7).

Coverings

Building a covering over the useful working tank prevents water evaporation, pollution and warming. Severe sunshine from the mid-spring to the end of October in the hottest months of year in the central and southern parts of Iran cause a bit of water stored with difficulty to be evaporated and wasted. Consequently, building a barrier against sunshine is a necessity in various areas of Iran. On the other side, this valuable essence should be prevented from pollution. In this case, covering plays a significant role. It seems that the first natural resource of water storage is natural ponds. Places where rainfall water is naturally stored in it for a period of year. If the first idea of water storage can be considered as an inspiration of natural ponds, it can be said that first water storages had no covering. These water storages in different areas of Iran are called Hotag, hole, or pool. Hotag and hole are pits that rainwater is stored in them very easily. Examples of them can be seen in the south east of Iran and Baluchistan. Pool is more advanced form of Hotag with no cover. Rainwater pools are usually built in triangular or circular designs and their bodies are covered like body of water storage. The old type of these pools had probably no cover. A sample of these uncovered pools can be seen along Zeinodin Rabat along Kerman-Yazd road. Interesting examples of it can be seen in Koushir villedge behind Neyestanak Mountains. Persepolis's water storage is a stone example of

these uncovered pools. Perhaps in the process of water storage evolution, pools are covered and the set of pool and or its cover is called pool and or water storage (Memarian, 2009, p.129).

Types of water storage covers

Dom cover: a dome is simple and applicable on a circular base, because there is no need to round and turn triangular to circle (Kazemi, 2011, p.7).

Conical Cover: another cover in Larestan is cone, which is implemented on a circular plan and the manufacturers' interest is taken into account. When the tank's diameter exceeds a certain amount, the con is applicable easier, it impacts water temperature for the high altitude (Kazemi, 2011, p.7).

Quartet cover: it is rarely applied in the tank covering because of hardness of implementing the ceiling. Implementation is with cross –sectional plaster patterns which reduces the speed of the work. Pashir covering of some water storage is also quartet (ibid).

Colonbo cover: appropriate ceiling for water storages are columned. It covers square intervals and is like a small dom. The ceiling is robust and fast implemented. Water storages made by plus tanks are usually covered by Colonbo (ibid).

Structure and elements of water storages of Qeshm Island

Knowing the physical rules of water and understanding its rule in human's life, architects involved water in architectures. Architecture of water storage in different areas is influenced by local architects. Water storages of Qeshm have been mostly made with square and circular designs and are typical simple and undecorated. The building of water storages is different with regard to the architecture styles appropriate for that area's weather (Namayeh, 2001, p.2). The building of Qeshm water storages can be described as follows: *Tank:* the place for storing water and the main element in formation of water storage. The most important factor in the variety of the shape of water storage tanks is the method to use it in form of desert or urban and rural area. In order to prevent water pressure on the body, the tank is inserted into the earth and its depth from road, alley or street sometimes reaches to 15 meters. The tank's floor is insulated with Sarooj mortar (a mixture of ash, water, limestone, clay, Louie and egg white) to prevent waste of water. Sometimes in order to empower the tank floor and prevent its deformation, a layer of lead was poured on it (Niazi, 2007, p.199). *Cover:* covering water storage roof to prevent water evaporation and pollution and warming.

Typology of water storage

Because of the restriction of elements of water storage architecture, their analysis and comparison looks very hard. Access to water was possible through aqueduct and rainwater and pipes and by establishment of coastal. Providing water is also a work done by every neighborhood residents. One of the oldest solutions is to use cold water wells. Probably, water storages from 9th century afterwards developed in urban and rural context. Water storages are paid attention to with regard to their applications whenever necessary in cities, villages and roads etc. and the type of covering and decorations (Memarian, 2011:15). The oldest water storage of the world is the water storage of Oar city built on Ziggurat platform in 2150 B.C. by the order of Oar king. Another water storage was built in 6th century B.C. by the order of Yous Tianous, East Roman emperor in Constantinople. This water storage has two tanks and 1001 columns and as a result is known as "1001 columnar". The floor of the two tanks is about 3500 square meters. There is another water storage in Turkey with marble 356 columns of 12 meters in 28 rows whose name is Porbatan Sara of underground palace. Iranians had to store water because of dryness and hotness of more areas of the country for a long time. This issue was not just limited to hot and dry areas and along Persian Gulf, southern islands and even some northern cities such as Sari and Gorgan similar solutions were applied (Memarian, 1993, p.1).

Figure 1. A view of the old context of Giahdan village

Figure 2. A view of the old context of Giahdan village

Qeshm Island

Introduction to Qeshm Island: Qeshm Island is the biggest island in Persian Gulf. This island is parallel to the northern coast of Persian Gulf with a north east-south west direction and separates from Iran by Clarence bottleneck. The length of island is about 115 km and its width in the widest part from the bulge of long slopped edge in the southern part of the island is about 35 kilometers and in the narrowest place of the Basaeedo Nose is about 10 km and the whole area is about 1628 km (Blobashi, 2001, p.11). Rainfall rarely happens in the island and therefore the southern coastal area is considered as hot and dry. The average rainfall in the island is calculated 299.01 (Dehghan Nejad, p.167).

Architectural context of Qeshm Island: Giahdan village context was studied that most of water storages under study are located in that area. The old context consist the primary core of the village formation. It has a long history and is formed mainly in heights with old materials and in

small pieces. The old context of Giahdan village is not the valuable and… of the same and … body and according to analysis of it's appearance we can emphasis the importance of this natural collection more than ever and all bodily values and potentials of this village is not summarized in its artificial context although its artificial context has its specific value and place. The typical appearance of Giahdan has a dark orange-colored scene with a compressed context and narrow allies that certain elements of locating homes on the mountains attract the attention. The role and value that natural phenomenon show in Giahdan is in such a way to represent a pretty natural appearance and scene to this collection and provides the possibility that adds to the impact and beauty of it and thus, in Giahdan the natural and artificial scene mix with each other which consequently becomes a valuable and unique combination (Figure 1 & 2)

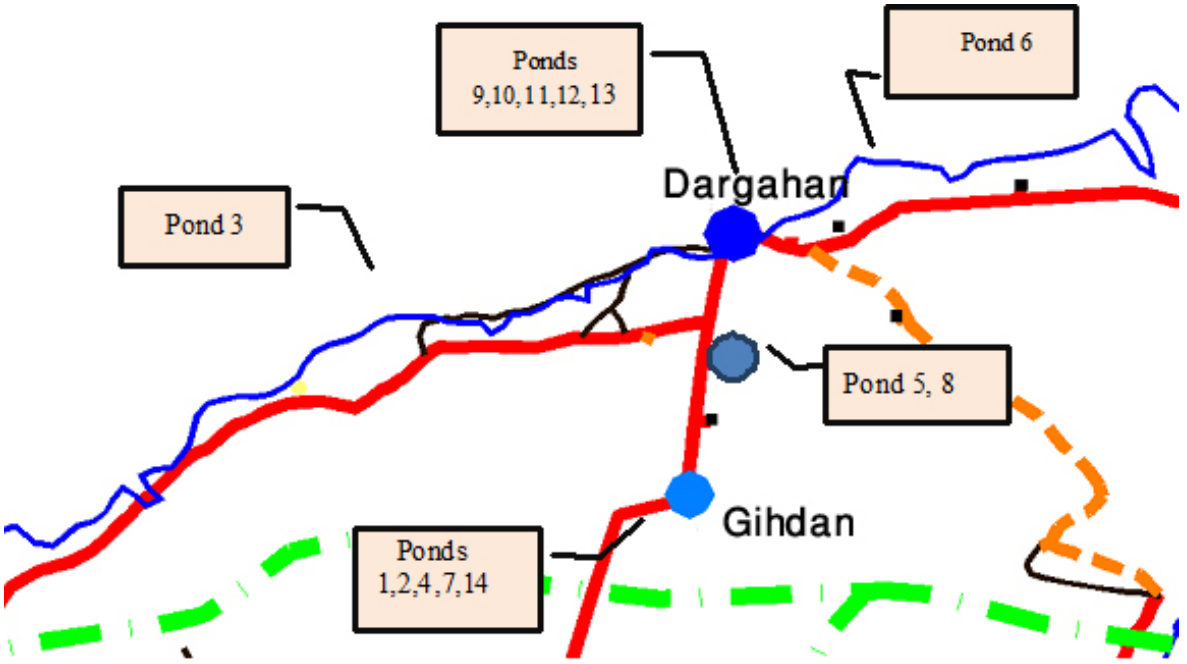


Figure 3. A view of ponds of Giahdan village

Figure 4. Structural perspective to water storages

Finding the location of water storage studied in Qeshm Island

The ponds under study are located in the north west of Qeshm Island, in Giahdan villages and in Gahan and in roads to Dargahan Giahdan, Dargahan Koveie and Qeshm Dargahn.

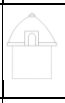
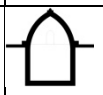
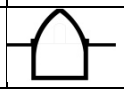
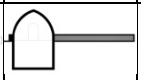
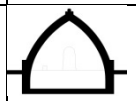
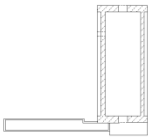
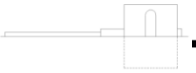
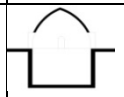
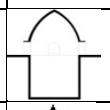
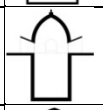
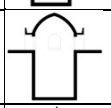
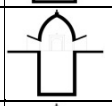
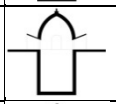
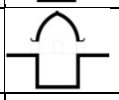
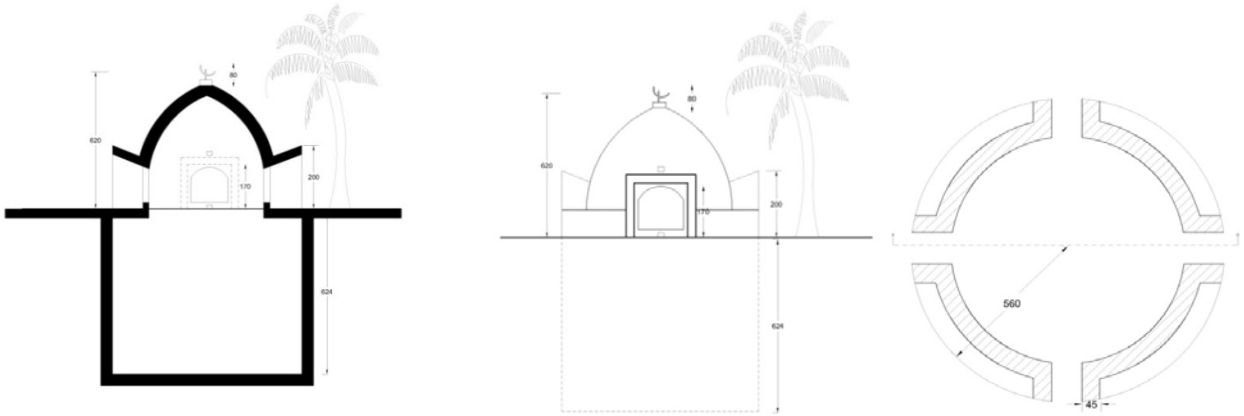
		Tank			Linear		
		Plan	View	Cut	Plan	View	Cut
One entrance	1						
	2						
	3						
Two entrance	4						
	5						
	6						
Four entrance	7						
	8						
	9						
	10						
	11						
	12						
	13						
Six entrance	14						

Figure 5. In search of archetype

Case study analysis of tank archetype

The building under study is located at the center of Gahan, the north of the main east-west road which cross the middle of the village. The building's plan is circular and the water tank is cylindrical shape with 5.6 diameter and 6.24 depth. The capacity of the tank of water storage equals to 614 square meters. In the main four directions, four entrances and above each entrance a triangular conditioner was inserted. The internal height of entrances is 1.7 meter and from outside its height is 2 meters. The ceiling covering is dome-form with 6.2 meters. In the four main directions, four entrances with chamber dome can be seen, above every entrance, a triangular air conditioner is inserted. The height of the internal entrance is 1.7 and from outside is 2 meters. The ceiling covering of the pond is dome-shaped with 6.2 meters at the center of which a vertical bar and an arc attached to it can be seen. The materials to make this pond are stone, sarooj and plaster (archive of the documents of cultural heritage and tourist administration of Hormozgan province) with regard to geometrical shape of tank water storage with pointed arch covering is Chafdeh Chamaneh and uni-skinned dome.



Dargahan, eastern entrance

Dargahan, western entrance

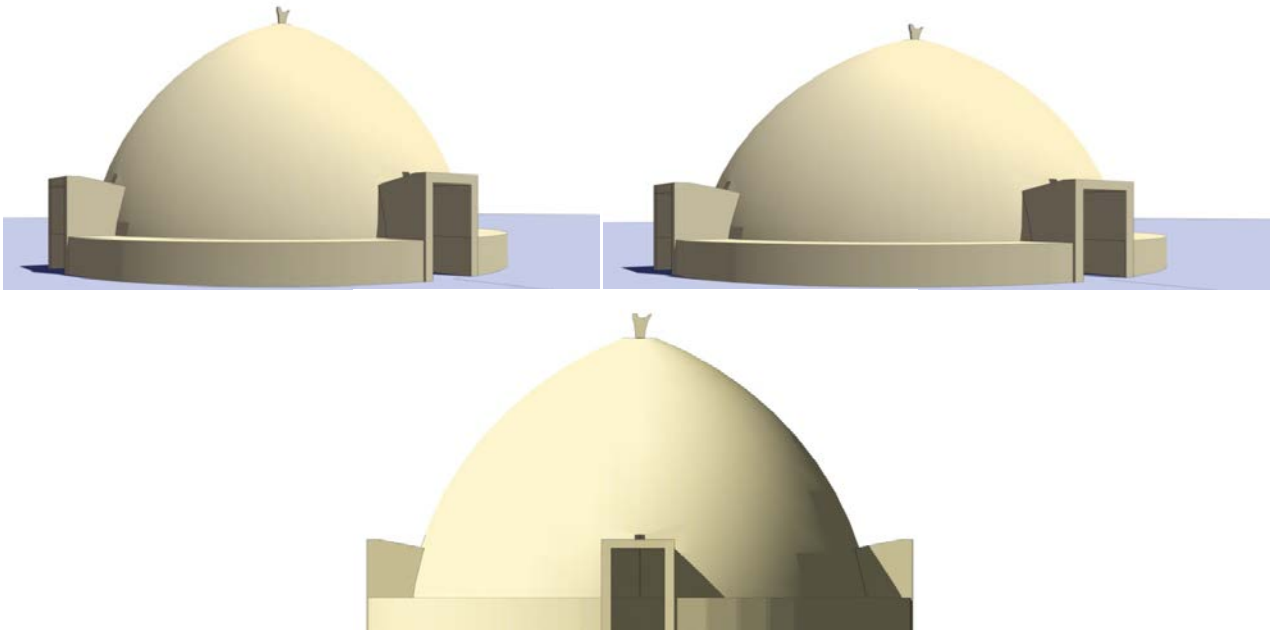


Figure 6. Tank archetype

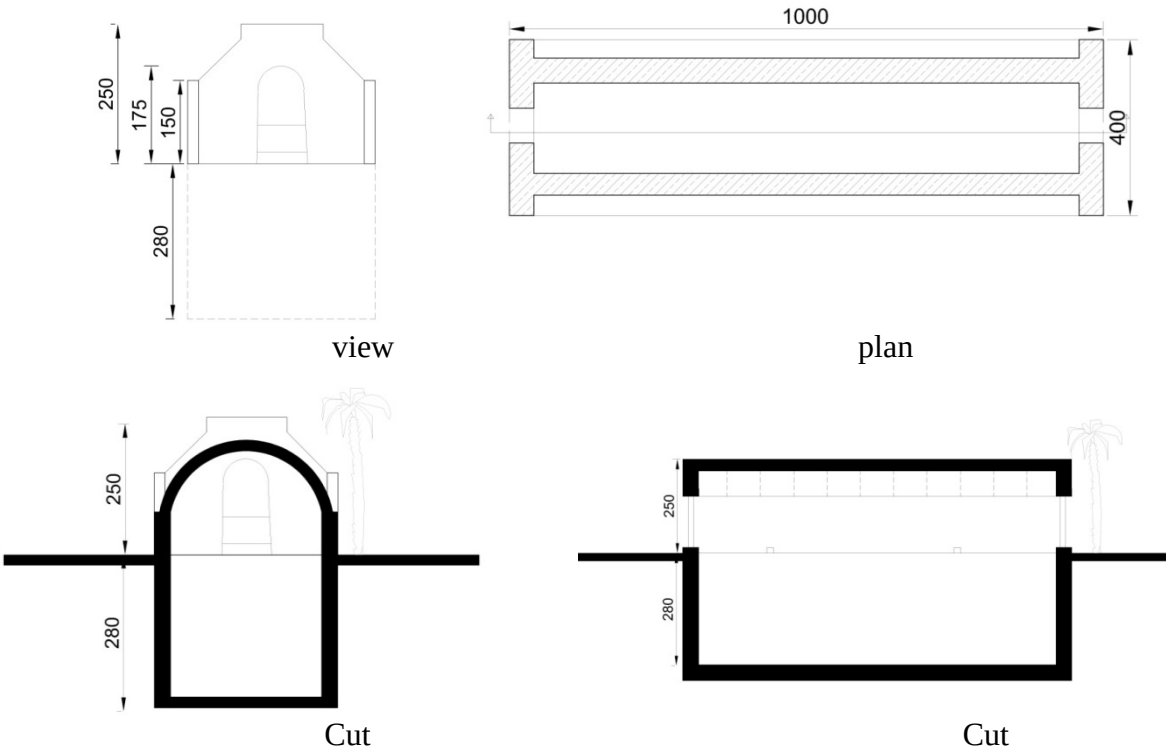


Figure 7. Linear archetype

Case study of linear archetype

The building under study in Qeshm-Dargahan direction from north is located in 20 meters from the residential complex and from south is located 20 meters from Qeshm-Dargahan road, east and west of the open area. The construction material of this pond is stone and sarooj. The building's plan is triangular with 4*10 m dimensions, thickness of pond's well is about 30 cm. The water tank

of the pond is cubic with 2.8 m depth and its capacity is 112 m^3. At the center of eastern and western sides, entrances with arch ceiling were inserted which allows entering to the tank. In the eastern entrance sight, some channels for water input to the tank were inserted. The height of entrance equals to 1.5 m and the height of building from ground to the top of the building equals to 2.5 m. with regard to the geometrical shape, linear storage is with mazedar arch and slow Holochin Chafdeh and Tagh Ahang.

Conclusion

The south of Iran is located in dry area with regard to the weather and its level of raining is too low. And water as a valuable element in addition to having life value is considered a vital factor in economic development. Water storage is one of the indexical elements of Kish Island which plays a significant role in people's daily life. Therefore, this need provides the ground for Iranian innovators to innovate tanks in order to collect water with regard to the conditions of each area. People of Qeshm Island and the area around it because of the specific condition of the area along Persian Gulf which is a dry and waterless area have always been faced with lack of provision, maintenance and distribution of water and thus the strategies they applied to use water were new and scarce strategies and methods and these methods were mixed with culture and architecture of the people of this island and thus, in this article by collecting samples of water storages of the island, their typology were studied that the results show that according to the samples collected, the above categorization and the table is the archetype of tank water storage in Qeshm island, tank water storage with four entrances with pointed arch cover, Chafdeh Chamaneh and umni-shel dome and linear double-entrance water storages with Mazeh dar arch cover, Holo Chin Chafdeh and Tagh Ahang.

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