

A Comparative Study to Compare the Wind Catcher Types in the Architecture of Islamic Countries

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ABSTRACT

The wind catcher are one of the historical architecture of Iran which are a sample of engineering masterpiece engineering of Iran; the exact history of them in Iran are not clear because their structure are put in the high sectors and they are in the risk of being destroyed. But what is certain is that wind catcher building is common in Iran at least over thousands of years, and it seems that this structure was invented in Iran and have gone to lands of far or near of Iran like the other elements of Iran architecture. The study is done to recognize the history of wind catcher in the world and the introduction of the wind catcher types of Islamic countries and it seeks to consider wind catcher of other countries with library studies and finally compare the wind catcher of Iran and other countries of Islamic countries with comparative studies.

KEYWORDS: wind catcher, comparative study, types, Islamic countries architecture

1. INTRODUCTION

Wind catcher is an example of engineering masterpiece of Iran for which no innovator and designer can be determined. It's over thousands of years that this mechanical engineering masterpiece brought comfort to home and residential areas of people in hot summer by establishing a flow of warm temperate in warm areas of Iran and kept it cool by creating a stream of breeze on public water storage for the use of the people, especially in summer (Bahadori Nezhad and Dehghani, 2008, p. 1).

Wind catcher is one of the architectural elements which is established with the climate approach in the vernacular architecture of the warm and dry as well as warm and humid of Iran, and is represented in some cities like a vertical channel. Wind catcher architecture and their function which were effective in the natural cooling of buildings in these areas have shown the genius of the architects involved in their design and manufacturing (Mahmoodi and Mofidi, 2008, P.26).

Arabs also have been familiar with the wind catcher and are already using it. In fact, it seems that the same structure of them has been used from the Pharaohs, and Babylonians in the ancient monuments of the Middle East, including Egypt. Widespread use of Persian word "Badhanj" and "badanj" (Badahng), in Arabic literature and massive construction of this structure in architecture of Arabic lands, especially in Egypt, shows that wind catcher like many other architectural elements of Iran has gone to distant lands (Bahadori Nezhad and Dehghani, 2008, p. 222).

1. History of wind catcher in the world

Also, searching of archeologists do not have far excavated because their findings of each building is nothing except lower walls and building bases, some information of upper parts of the buildings or that little information would be get (Mahmood and Mofidi, 2008,p. 26). One of the evidence which can be utilized is paintings which are left and some of them which specify the history of using wind catcher in other countries will be mentioned.

The simplest example of wind catcher is found among the Indians of Mochica in Peru. They were ventilated their homes by using wind catcher. The witness of this claim is a muddy pot that an image of it shows three ranches equipped with numerous wind catchers. This sample itself is an evidence of the existence of wind catcher, but the lack of continuity of it in Peruvian construction industry throughout the history has led to uncertainty of these evidences.

A sample of wind catcher is drawn in Egypt maps from 1500 BC which have been drawn on papyrus. Two triangular wind catchers can be seen in these maps that are put on top of a luxurious house of the New Kingdom. Roaf also noted that the wind catcher with two recipients of the wind existed behind the royal halls of Babylon (600 BC.).

The basic concept similar to the wind catcher can be known as simple vents on primitive tents in Sri Lanka that the structure f these tents are so that the weight of the tent is tolerated by a piece of wood protruding from the tent

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and while the tent is set and the side facing the wind is closed; there is a small opening at the top it which is able to direct the air flow to the center of the tent.

One sample of wind catcher is seen in a painting of the walls of the Amun tomb, one of the Middle Egyptian kings, and these elements may be the staircase leading to the roofs according to what Roaf has been mentioned (Mahmoodi, 2009, p. 17).

Research which has been done on the history of wind catcher in the world will definitely bring it back to B.C. but this that who have invented them for the first time makes it a little bit difficult. Due to the fact that the images of Egyptian papyrus belong to 1500 years before Christ, so as to refer to the explorations in the Flint Hills, the background of wind catcher construction in Iran refers back to 4000 years B.C. according to stated reasons on research in north of Shahrood. This fact can be a reason for the Iranians claim for the invention of wind catcher in the world because such a record does not exist for the use of wind catcher anywhere in the Middle East. But about the Iranians use of wind catcher before the Arabs it would certainly be emphasized and also two reasons are enough for this claim. First, in ancient Arabic poetry which are presented in the lyrics part, the words Badhanj words, Badahanj, Bazehanj are used and although these are Persian words and the considered literature are of the fifth century A.D onwards, it can be said that the way it has been built also brought to Persian Gulf from Iran and they are called Bajir which are the short of wind catcher according to the application of Persian word for this structure. Second, the wind catchers of Emirates are in Bastak areas which are predominantly Iranian region in UAE that Iranians were the first inhabitants. Points discussed in this paper suggest the Iranian use of a ventilator before Arabs in the Persian Gulf which is a sign of creativity and ingenuity of Iranian architects, thus it can be said that the Iranians have been the source of inspiration for other countries in the field of wind catcher design as well as other innovations in the field of architecture (Mahmoodi and Mofidi, 2008, p. 32).

Wind catcher is used in Iran from many years ago and it can be said from its ancient and diverse names as Vatghar, Badhanj, Batkhan, Khyshud and Khyshkhan that it is not a new phenomenon. Wind catcher has various samples and has been established in diverse shapes according to the base of wind and weather (climate) and wind direction across Iran (Memarian, 2011, p. 538).

Wind catcher has constantly been defined as a traditional air deflector structure across the Middle East, from Pakistan to North Africa with different names and forms (Yarshater, 1989, p. 368). Wind catcher has been made from the earliest times in different parts and its structure and design were different from place to place and has lots of variety. What is important is that they all have the same function despite all the different structures, it means that all of them move favorable prevailing winds into residential spaces.

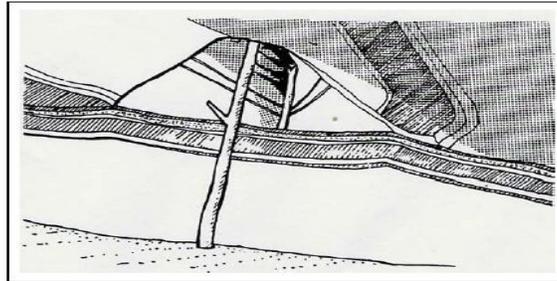


Figure 1. The basic idea for using tent and wood to trap wind and tents air conditioning (Roaf, 1988, p. 3)

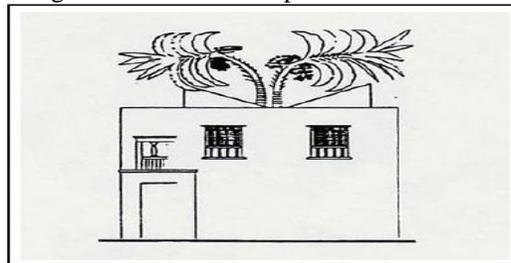


Figure 2. Found image on papyrus in Egypt new kingdom tomb (Roaf, 1988, p. 5)

2. Wind catcher use in other countries

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Except in Iran, wind catcher has been seen in Egypt, Pakistan, Afghanistan, Iraq and the United Arabic Emirates. "Also, few wind catcher has been seen over the Mediterranean buildings such as Syria, Lebanon, Palestine or Israel or Turkey and the island of Mesopotamia". This architectural element has been known as "mokalaf" in Egypt and as "badkhor" in Pakistan (Mahmoodi, 2009, p. 18).

3. Wind catcher in Afghanistan

Wind catcher can be seen in areas with warm climates of Afghanistan. Wind catcher in Heart of Afghanistan is a very simple wind catcher which is generally located on the domed roof of all rooms and its maximum height is 1.5 meter. These wind catchers of a crater on one side are made on the prevailing wind, which usually blows from the north. Their plan form is a square with dimensions of 1 x 1 meter and has ceiling sloping angle of approximately 30 degrees. Wind catcher of Afghanistan is very similar to short wind catcher with one side of East, Northeast and Southeast Iran (Bahadori Nezhad and Dehghani, 2008, p. 265).

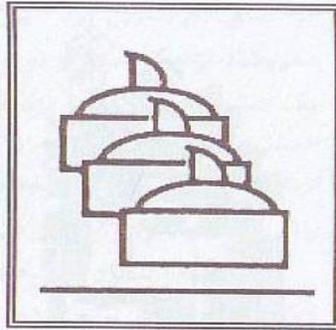


Figure 3. Afghanistan Wind catcher (Mahyari, 1996, p. 96)

4. Wind catcher in Pakistan

One wind catcher (badkhor) can be seen on the roof of each house in the old part of the city of Hyderabad in Pakistan's Sindh province, on the roof of the house. So that Mrs. Roaf has such a sense of wind catcher of this city "A still forest of wind catcher is out there, on the houses of the old part of the city." Wind catchers of Hyderabad in Pakistan have at least 500 years old. In 1815, Patinger, an English tourist, has said about Hyderabad: "All the houses of the government palaces to the humble cottages, have wind catchers".

This wind catcher was fixed in its position so that the pulled in the prevailing winds in the afternoon guides into any of the rooms of multi-storey buildings. Although the appears of these delicate cooling equipment look considerably different from cooling equipment in other areas, these equipment are considered as alternative solutions or replacement to meet the environmental needs of the region.

Wind catcher plan of Pakistan is a shape of a square that is surrounded by two vertical sheets and its dimension is a square like wind catcher in Afghanistan. Cover on the roof is a ramp surface with an angle of 45 degrees. Wind catchers are covered with wood and plaster and metal sheets are placed on this cover in the new models. The average size of wind catcher is approximately one square meter and their height is upper than 5 meters. One pillar is separated from the main pillar in houses with more than one story and the main pillar continually goes down (Bahadori Nezhad and Dehghani, 2008, p. 266).

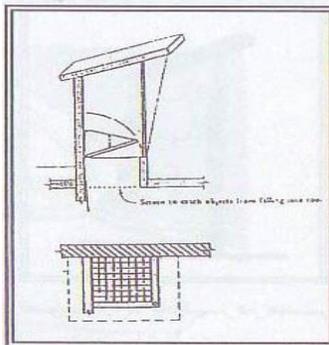


Figure 4. Wind catcher in Pakistan (Roaf, 1988, p. 6)

5. Wind catcher in Egypt

Mokalaf (which literally means the receiver of wind), has been used by the ancient Egyptians around 1300 years BC and has been one of the important factors in local architecture of Egypt for a long time. Mokalaf has been used for building of Egypt in hot and dry areas, and is an appropriate factor in natural ventilation. The use of large windows for natural light into the building is not suitable in these areas because it causes the entrance of the air and sand into the building. There are different samples of Molaghaf in Cairo houses. In a big house in Cairo, sometimes Molaghaf is placed on top of the summer staying part of the house which is connected its lower room due to its long chamber. In Cairo, there are also some Mokalaf related to the 19th century in which the openings (vents) are directly connected to the lower chamber by a hole in the roof. Mokalaf "Qaa" is one of the excellent samples which is one of the architectural works of Mohebodin shafiol Movakel in Cairo which is built in the year 1350 AH.

Wind catcher plans of Egypt are like rectangular which are placed over the flat roofs. An Egyptian Molaghaf includes a long column on top of a building and an opening into wind which is often located to the northwest winds. Roof angle is of 30 degrees which enables better penetration into the building (Mahmoodi, 2009, p. 18).

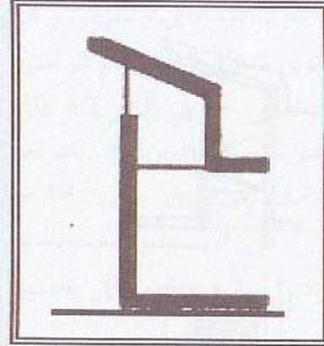


Figure 5. Wind catcher in Egypt (Mahyari, 1996, p. 96)

6. Wind catcher in Iraq

In Iraq, wind catchers are simply a hole in the thick mud brick or adobe walls on the roof for the summer living rooms and are built to the northwest in order to take the prevailing air and make the air cooler. Vertical pillars which are placed in these walls are the connecting openings (fans) of the roof with the basement (Bahadori Nezhad and Dehghani, 2008, p. 268).

Wind catchers in Iraq are very similar to Cairo Mokalaf. Some are designed in one-way rectangular plan. Wind catcher has a rectangular plan shape in Iraq. The width of wind catcher pillar is between 15 and 60 cm. Wind catcher channel does not rise far above the roof and wind catcher vents begin from floor and do not go higher than a height of about 0.5 m to 1.20 meters. The difference between them is that the channel roof is made of 45 degree curved shape while the roof of Mokalaf is not curved. Iraqi wind catcher place is generally on the edge of the roof and service their basement space (Mahmoodi, 2009, p. 20).

Pillars are often terminated in inside shells of basement walls. The hot and humid wind that comes into the wind catcher flows in a variety of indoor space, and goes out from openings which are like open metal, small windows in basement which are located into the yard (Bahadori Nezhad and Dehghani, 2008, p. 262).

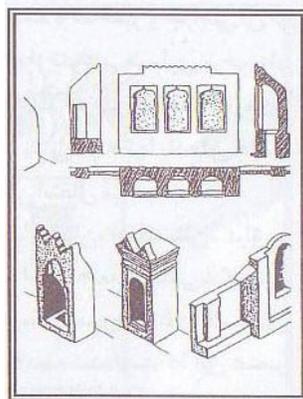


Figure 6. Types of Wind catcher in Iraq (Roaf, 1988, p. 6)

7. Wind catcher in United Arab Emirates

Wind catchers were made in the islands and cities which are located in the area of the Persian Gulf like Kuwait, Bahrain, and UAE. Some samples of wind catcher has been seen in an area called Bastak that is now located near the modern city of Dubai. Actually, Bastak is the name of an area near the Bandar Lengeh and Sunnis of Bastak moved to the other side of Persian Gulf in today's Dubai after the struggle between Sunnis and Shiites in 1262 AD. (1889 CE) and started to construct structures which were similar to those they had in Iran in where they have been settled and that place was named Bastak.

Dubai Wind catcher is likely to be built by Iranian who were in Bastak. Available wind catcher in south countries of Iran which have warm and humid climate are much more like the Iranian wind catcher which are in warm and humid climate like the Bandar Lengeh, Kong, Qeshm and etc. Therefore, the wind catcher of these areas has a square plan and are placed on top of the flat roof and with dimensions of 2.5 * 2.5 m and they receive wind from all the four sides, and they do not get too high because of enjoying the breeze of the sea and land blowing down (Mahmoodi, 2008, p. 20).

Table 1. *The comparison of types of wind catcher of Islamic countries (The author)*

Exclusive Features	Ventilation space by Wind catcher	The roof shape of Wind catcher	Wind catcher height (m)	Wind catcher Dimension (m)	Wind catcher Plan	Wind Direction	Climate area	Countries
Wind catcher with circle, hexahedron, octagon, square, rectangular plan can be seen in Iran. Wind catcher with circle plan is a scare type of it in Iran. A wind catcher with triangular shape is not known in anywhere of The Middle East.	Living room and Basement	Flat	3-5	0.5 * 0.8 0.7 * 1.1	Square Rectangular Hexahedron Octagon	North-West North- East North	Hot and Dry	Iran
It is very similar to one-side wind catcher of East, Northeast, and Southeast of Iran.	All rooms	Inclined surface with an angle of 30 degrees	1.5	1*1	square	North	Half hot and semi-arid	Afghanistan
There are wind catcher with wood and plaster cover which are different from wind catcher of Iran.	All rooms	Inclined surface with an angle of 45 degrees	5	1*1	square	Southwest	Hot and humid	Pakistan
Molakaf (which literally means the receiver of wind) is an appropriate factor in air ventilation instead of using big windows.	Living room and one room	Inclined surface with an angle of 30 degrees	One floor above the roof	-	Rectangular	North- west	Hot and humid	Egypt
It is very similar to Molakaf of Egypt. The place of wind catcher is generally at the edge of the roof.	Basement	Inclined surface with an angle of 45 degrees	2	0.6*0.15	Rectangular	Northwest	Hot and Dry	Iraq
Wind catcher of Dubai is built by Iranians who lived in Bastak and are very similar to wind catcher of Iran in warm and humid climate (Bandar Lengeh, Kong, Qeshm, ...)	Living room and other rooms	Flat	5-3	2.5*2.5	Square	Receiving breeze	Hot and humid	United Arab Emirates

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