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Hydrology and Tradition of Building Construction: a case study of Mughal Garden at Pinjore

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Hydrology is basically the "science and study of water, including its physical and chemical properties and its occurrence on earth. Most commonly, hydrology encompasses the study of the amount, distribution, circulation, timing, and quality of water. It includes the study of rainfall, snow accumulation and melt, water movement over and through the soil, the flow of water in saturated, underground geologic materials (groundwater), the flow of water in channels (called stream flow), evaporation and transpiration, and the physical, chemical and biological characteristics of water." [1] Hydrology, as subject, is very significant for people and their environment which treats all phases of the earth's water. Its practical applications "are found in such tasks as the design and operation of hydraulic structures, water supply, wastewater treatment and disposal, irrigation, drainage, hydropower generation, flood control, navigation, erosion and sediment control, salinity control, pollution abatement, recreational use of water, and fish and wildlife protection."[2]

Water has been an integral part of traditional and popular cultural ceremonies in India. Utilization of water as means of power and luxuries could be better experienced in the Garden of Fidai Khan, popularly known as Mughal Garden at Pinjore on Chandigarh-Kalka highway. Foundation of this great specimen was laid down by Muzaffar Husain, entitled Fidai Khan Koka[3], in 17th century. Fidai Khan was the foster brother of Mughal

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1 *Environmental Encyclopedia*, *Volume 1 & 2*, (third edition), edited by Marci Bortman, Peter Brimblecombe, Mary Ann Cunningham, William P. Cunningham, and William Freedman, Thomson and Gale, Michigan, 2003, p. 741

2 Van Te Chow, David R. Maidment and Larry W. Mays, *Applied Hydrology*, Singapore, 1988, p. 1

3 C. M. Villiers Stuart, *Gardens of the Great Mughals*, Delhi, 1983 (first edition 1913), p. 202; Sylvia Crow, Sheila Haywood, Susan Jellicoe and Gordon Patterson, The *Gardens of Mughal India: A history and guide*,Delhi, 1973, p. 185*;* Ebba Koch, *Mughal Architecture: An Outline of Its History and Development (1526-1858)*, Oxford University Press, New Delhi, 2002, p. 126.

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Emperor Aurangzeb and among his few reliable whom the Emperor really admired.[4]According to the traditions, there was an ancient garden at the spring of Panchpura. Panchpura is the old name of this location and according to the legends this was belong to five *Pandavas* of the great epic Mahabharata.[5]Earlier there was a garden which was destroyed by Timur and the site remained desolate until Fidai Khan selected this for his project.[6] Fidai Khan had got enough knowledge and experience of building construction in Lahore region, where, he constructed some buildings during his appointment. He extensively utilised that experience in constructing the garden. He did not live here for long time to enjoy the beauty of his creation. After some time, the garden passed into the hands of Raja of Bhiwana and then to the Raja of Sirmaur. The Patiala State bought the garden along with a huge area from Sirmur for Rs. 60,000.[7] During British period, the Viceroy used it as a resting place to enjoy the cool shade and running water on their relaxed progress to their summer capital in the hills.[8]

The garden of Pinjore, which is basically influenced from the Shalimar Garden of Lahore, was a halting place for the royal camp on their way to Kashmir. Laid out on a natural slope, the site is beautiful which looks through a luxuriant gorge rounded by hills. This garden is laid out in six terraces in rich tradition of other Mughal Gardens. Being a terrace garden, the natural gravitational force have been used in each terrace in providing water to the various parts of garden along-with the principle of Boyle's law. No information is available on the actual date of the construction of this terrace garden, however "its pavilions with cusped arches supported on baluster columns, reserved in Shah Jahan's reign solely for buildings intended for the emperor and his immediate family, suggest that the garden was built in Aurangzeb's time".[9] This place was once surrounded

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4 Fidai Khan was grand master of the artillery at the time of war of succession. He supported Raushan Ara Begum at the time when she formed a party in favour of Aurangjeb. Francois Bernier, *Travels in the Mogul Empire, AD 1656-1668*, English translation and annotated by Archibald Constable, (second edition revised by V.A. Smith), New Delhi, 2011 (first pub. 1934), p. 124; C. M. Villiers Stuart, *op. cit.*, p. 202

5 *ibid*, pp.199-200

6 Sylvia Crow, Sheila Haywood, Susan Jellicoe and Gordon Patterson, *op. cit.*, p. 187

7 *District and States Gazetteers of the undivided Punjab (Prior to Independence), Vol.IV, Ambala District*, Delhi, 1985 (reprinted), p. 63 (139)

8 C. M. Villiers Stuart, *op. cit.*, p. 205

9 Catherine B. Asher, The *New Cambridge History of India 1:4, Architecture of Mughal India*, Cambridge University Press, Cambridge, 1992, p. 272

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by many water tanks. Fidai Khan dug a canal at the foot of the neighbouring hill and led it to the garden for numerous functions which enhanced the splendour of the place.[10]

The garden is set out on six terraces and is divided into two major portions; the upper or eastern portion includes *Sheesh Mahal* and *RangMahal* or *Rani Mahal;* whereas the lower or western portion comprises*Jal Mahal* as major structures. The garden is not a wealthy structure in terms of architectural characteristics and building techniques. However, it is full of water channels and appears that the main objective of the builder was to provide abundant supply of water to *Jal Mahal* as well as trees and flowers through the efficient management of water channels which have been distributed in the whole garden.

All sub-structures, constructed in the garden, have been modified and repaired many times and do not pose any significant construction techniques. The main entrance of the garden is on the east and the whole garden is surrounded by a raised wall containing octagonal towers in each corner and gateways at regular intervals.[11] With the help of pathways and water channels each terrace and portion has been designed in *chaharbagh* style. The first terrace ends with a rectangular structure having two small side openings towards *Rang Mahal* or *Rani Mahal*. This rectangular structure is full of small mirrors and thus known as *Sheesh Mahal.*[12] It is also mentioned as *baradari* in old references.[13] In recent times, however, this building has been modified and does not resemble a *baradari.*

The channel which is leading towards the *Sheesh Mahal* and which is 12'3" wide and 2' deep gradually narrows allowing Boyle's law. Here, the principal attraction lies in the running water which underneath the '*Sheesh Mahal'*[14]falls over a projecting ledge towards the *Rang Mahal*.[15] The wall comprises 90 small niches in 15 rows (up to down) where each row has 6 ledges. These small niches were used for placing earthen lamps for lighting during nights. There is sharp slope in the channel where water used to release beneath the *Sheesh Mahal* and from the eyes of an artist it is really amazing to see falling water at the height of 8'3" and "when the little earthen lams are lit, they twinkle through the shining falls of water like green glow worms: while the rosy warmth of lights within the white pavilion gives the illusion of some huge transparent shell, poised above the

10 Bakhshish Singh Nijjar, *Panjab under* the *Great Mughals, 1526-1707 A.D.*, Bombay, 1968, p. 202
11 Plate 20 A
12 Plate 20B
13 C. M. Villiers Stuart, *op. cit.*, pp. 210-211
14 Plate 20 C
15 Plate 20 D

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waterfall, its curving back showing dimly against the twilight sky and the darker blue of the mountains beyond."[16]

The second terrace is almost 14' lower than the first. At that time this portion was known as *pardah* garden.[17] There is a huge simple structure at the edge of this terrace with five huge archways on both sides, known as *Rang Mahal or Rani Mahal*.[18] The measurement of the channel, leading towards *Rang Mahal*, remains same as was in the first terrace. The walls of this building touch the outer walls of the garden proceeding towards the north and south which mark the end of first portion of the garden. Adjoining *Rang Mahal*, towards *Jal Mahal*, we have a rectangular pool measuring 45'9" from north to south and 29'1" from east to west with depth of 2'6".[19] A fountain has been erected in the centre of this pool. In this pool, water falls from the height of 13' and here also 117 small niches have been projected[20] for lighting and the same scene could be visualised here as noticed in *Sheesh Mahal*. Pool is surrounded by a water channel having width and depth of 9" to release the excess water. Adjoining the pool is a platform which measures 67' from north to south. Further, through linear spaces, water used to release from the tank and fall into a channel from the height of 16' through a severe and artistically rich slope.[21]

With this third terrace the lower portion of the garden begins and as per Boyle's law, the width and depth of water channel gradually narrows down so that pressure and flow of water could be increased. There is no structure at this terrace except a sloping ledge[22] at the edge which looks like a waterfall with side stepped ways down towards the next terrace comprising *Jal Mahal.* Here, water falls from the height of 11'. A water channel comprising width of 12'2" and depth of 2' connects it with *Jal Mahal.*[23]

The most significant structure of the garden is *Jal Mahal*[24] which is situated at the fourth terrace. The beauty and significance of this lower complex of the garden lies in the fact that with which skill water has been delivered to the *Jal Mahal,* specially its fountains.This structure is connected to the water channels on all sides. Major source of

16 *Ibid*, p. 212
17 *Ibid*, p.211, Bianca Maria Alfieri, *Islamic Architecture of the Indian Subcontinent*, Laurence King Publishing, London, 2000, p. 272
18 Plate 20 E
19 Plate 20 F
20 Plate 20 F
21 Plate 20 G
22 Plate 20 H
23 Plate 20 I
24 Plate 20 I

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water supply for this structure is a canal which enters from the north corner of the *Jal Mahal.*[25]With the help of channels[26], on all sides except west, it provides water to the *Jal Mahal.* In the middle of the *Jal Mahal,* on a raised platform, a small structure stands which do not possess any unique feature of erection. This central structure, along with pool, is adorned with water channel on all sides.

From *Jal Mahal,* water channel leads towards west and fall into a channel through an artistically adorned ledge from the height of 6' into a channel which marks the beginning of fifth terrace.[27] In the beginning the depth of the channel is 18" which gradually decreases and become 2" at the end, while the width remains same. At the end of this terrace, this channel falls from the height of 13'6" through a sloping wall into a channel.[28]Here, also, depth of water channel, like other parts, gradually increases from 22" to 30". This sixth and last level subsequently ends with the garden[29] and the flow of water diverted towards garden area for watering the trees and flowers.

Fidai Khan's garden at Pinjore is the example of terrace garden which was developed by adopting natural gravitational forces. In such gardens where the artificial terrace were created, the use of waterfall provided the uniqueness and splendour to the garden. Here water was not lifted from the well. The rain water used to collect first in a tank built on the hill and then received in the garden, with the help of a canal. Since the slope of the hill is very steep, the water from the canal must have reached the garden very fast. In the whole garden, with the help of natural gravitational forces, the principle of Boyle's is adopted. Each terrace is lower than the earlier and the last level of the garden is almost 75' lower than the first terrace. Recently this garden has been modified with additional construction. This is also done with the closing of some structures. These modifications are like obstacles in terms of understanding these structures in real historical context.

[25]Plate 20 J, Plate J a
[26] Plate 20 K
[27] Plate 20 L
[28] Plate 20 M
[29] Plate 20 N

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PLATE 1A

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