

A Study Of Royal Mughal Baths In Lahore (Case Study Of Shahi Hammam, Shalimar Garden, Lahore)



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LAHORE
SPRING, 2020

CERTIFICATE OF APPROVAL

Thesis presented to the Department of Architecture and Planning, University of Management and Technology,
Lahore in partial fulfillment of the required for the degree of

Masters in Architecture (M.Arch)

Date of Approval: 12th of Feb, 2019

Title: A Study Of Royal Mughal Baths In Lahore(Case study Of Shahi Hammam, Shalimar Garden, Lahore)


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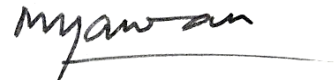
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ABSTRACT

A Study Of Royal Mughal Baths In Lahore

(Case study Of Shahi Hammam, Shalimar Garden, Lahore)

There is splendid royal bathhouses (hammam) in Lahore from Mughal era mainly belonging to Shahjahan's time period (1592 CE – 1666 CE). That is Shahi Hammam (1642 CE) located in the Shalimar Gardens, Lahore. This hammam was meant for private use of the Mughal royalty and nobility and was outlawed for the public use. Mainly patronized by Shahjahan this royal bathhouse was situated as part of a recreational garden complex away from the main city at its time of construction.

In design conception and execution these bathhouse borrowed features from earlier civilizations. Most prominently influences of Roman Thermae and Ottoman Hammam contributed in evolution of a Mughal bathhouse of Shahjahan's times as a distinctive architectural form. This research discusses nomenclature of a Roman Thermae and an Ottoman Hammam in their local context and elaborates how this architectural scheme was adopted and adapted by Mughals to suit their local paradigms.

There are many commonalities yet many contrasts in layout plan, finishes and functions of these Mughal bathhouse from early civilization. The aim of this dissertation is to analyze the architectural design details to find out why these bathhouse was similar in certain ways and different otherwise. Reinforced with available literature on the subject, graphic and photographic documentation of extinct and extant details of the royal bathhouse, this research would provide a comprehensive study of all the foreign and local influences establishing an evolutionary morphogenesis of these bathhouse.

Keywords: Bathhouse, Roman Thermae, Ottoman Hammam

UNDERTAKING

Use the following undertaking as it is.

I certify that research work titled “*A Study Of Royal Mughal Baths In Lahore (Case study Of Shahi Hammam, Shalimar Garden, Lahore)*” is my own work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged / referred.

Signature of Student

Rimsha Imran

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ACKNOWLEDGEMENT

*First and foremost, all praise and thanks to the **Almighty Allah**, the Exalted, the Lord of the universe, the Beneficent, the Merciful, and the Kind-full for endowing me with health, patience, and knowledge to complete this work. My all prays for my **Holy Prophet (P.B.U.H)**, May the choicest blessings and peace of Allah be upon him, who is always source of guidance and inspiration for me as well for whole humanity.*

I am thankful from the core of my heart to Dr Muhammad Yusuf Awan & Miss Faiqa Khilat for their guidance, patience and support during my course of study at this prestigious institution.

Special thanks to DG Archealogy Maqsood Ahmad shb for help whenever it was needed & provide help to regarding permission of multiply visits for a heritage hammam & buildings..

Heartiest regards to Ar.Ayesha Malik for her prompt and valid answers to my random queries.

I specially thanks to my beloved husband.It was all because of their conscientious support that I was able to produce this thesis.

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Chapter 1 INTRODUCTION

As commonly generalized bathhouse could be defined as, “ a building containing a complex of rooms designed for bathing, relaxing. therapeutic and cosmetic skin treatments and socializing”.

Bathhouses could be mainly categorized as:

- a) Public Bathhouses
- b) Private Bathhouses

Royal bath houses are the subcategory of private bath houses mainly linked with the usage of emperorship. Whether public bath systems are used for all the community.

Whereas architectural analysis could be defined as, "the detailed examination of a structure or its characteristic features. It focuses to analyse the nomenclature of a piece of architecture comprised of its design, construction techniques and materials used. It also throws light on the experiences gained in similar systems and the problems faced that domain to constrain the respective field"

In this dissertation Mughal era royal private bathhouses in Lahore are analyse for detailing features of their architectural design conception, execution, building materials and construction techniques. The finishing embellishments to enhance architectural aesthetics are also examined in depth. This research provides a compilation and analysis of the available text, graphical and photographic documentation of the private Bath in Lahore and their conservation issues.

1.1 RATIONAL OF THE RESEARCH

It is obvious from the previous studies that the architecture of any precise era, or the monument is inspired from its past rulers and it has commonalities with its origin. Archaeological records are the proof that architectural design is preserved at every possible stage and its values are extracted by the future generations. Physical features of form and function of a historical edifice are the tangible components of heritage while the sense of association and pride in terms of identity and

emotional attachment intangibly links the inhabitants of a certain area to their heritage. This dissertation will therefore help in restore the tangible and non-tangible heritage by revealing the eminence of royal bathhouses and the working systems they relied on.

Reinforced with documentation of detailed study of the royal bathhouses this research provides a comprehensive study of all the foreign and local influences in construction of these bathhouses through providing a platform to intervene into conservation or maintenance of these bathhouses in future.

Analyzing the historical bathhouses and studying their mechanism would certainly restore its legacy and characters for future endeavours in this area of knowledge. The comparative architectural analysis of these royal bathhouses would unveil the distinguished attributions of the former rulers along with their trademarks in their architectural styles and materials elucidating that how are these still glorifying the modern world in their ever-admirable epic form.

The exceptional therapeutic significance of these bathhouses would be noted to form a memorandum of existence of physiotherapy and cosmetic clinics in our pompous past with illustrious systems and medical acumen.

This would also promote appreciation of glory of our historical heritage and generate a stimulus to conserve it as a memoire of aesthetics, sophistication and grandeur of our flamboyant past.

1.2 OBJECTIVES

Purpose of this research is to find the significance of heritage building and how it can be preserved. Some of objectives of the research are as follows;

- Tracing historical roots of a generic morphology of Mughal bathhouses embedded in adoption and adaptation of Greco-Roman and Ottoman bathhouse traditions of earlier times.
- Creating awareness among the people about the importance of heritage and architecture.
- Analyze layout plans, finishes, form and function of Mughal private & public bathhouses as a unique entity.

- Understand the physical and metaphorical relationship of the selected bathhouses in close vicinity.
- Collect and publish any graphical documentation regarding architectural design details to lessen any errors and ambiguities and to safeguard original remnants of the site under analysis.
- Maintain the authenticity and values of the historical heritage.
- Build a discourse on potential need and use of these bathhouses in past.
- Critically analyze their commonalities and contrasts.
- Help in establishing a platform for future research and conservation of royal bathhouses.
- Promote sustainable conservation and enhance tourism.

Major Objectives

- ❖ To investigate , understand and compile the architectural and historic background and its significance of the building through literature study.
- ❖ Studying the building style and its existing condition through field survey, photography and documentation.
- ❖ Identification of the roots of the earlier ages hammam and notify its current damages and likely threats to the structure.
- ❖ To set our suggestions for recommendations for the conservation issues of the monuments.

1.3 SCOPE OF WORK

This study is based on comprehensive and analytical research of all the design aspects of royal bathhouses in Lahore. The study would explicate the areas of commonalities and differences between the bathing systems.

Furthermore, it will develop a discussion and appreciation of the implications of the natural hydraulic and thermodynamic systems of these bathhouses that required no complicated mechanical assistance. The layout plans, working principles and the materials shall be given a

thorough study by actual photography of the extant remains of the structures.

All of this would interpret the importance of the royal bathhouses to the rest of the world as the best constructed examples of the natural hydraulic systems working on sustainable principles. It would corroborate the authenticity and values of our cultural heritage to help in promoting tourism as well.

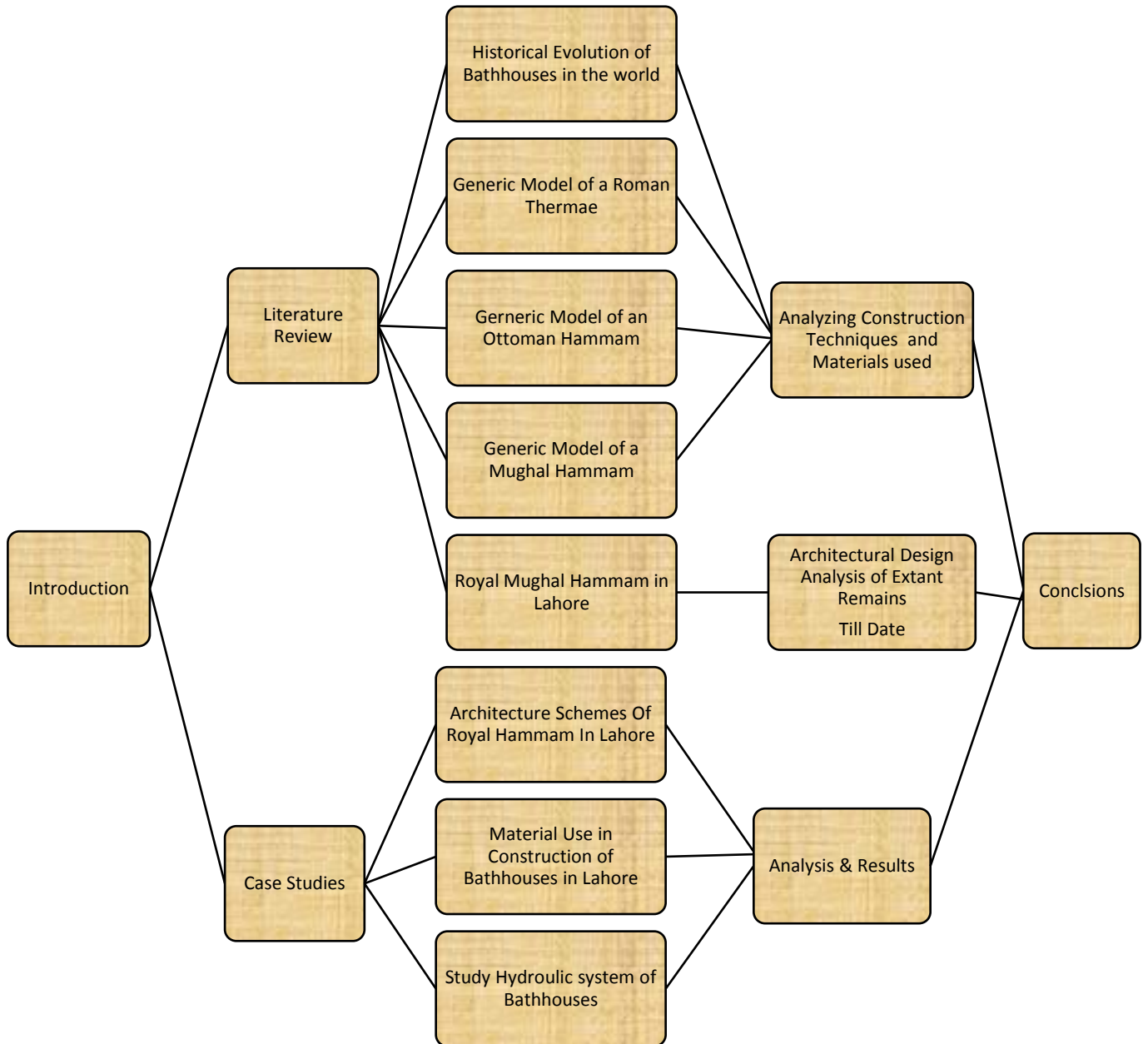
1.4 RESEARCH QUESTIONS

Following Research questions have been analyzed keeping in view the query to be solved:

- What was the origin of the Roman *Thermae* and Ottomman *Hammam* and their characters?
- How did Ottoman and Roman Bathhouses resemble each other's architectural styles yet keeping the differences?
- In what sense architectural style of a Mughal *Hammam* differ from the others?
- How do these complexes promote culture and traditions?
- What are the therapeutic values of these bathhouses that make them stand out?
- What were the working principles of these bathhouses and how do they display mastery over sustainable mechanisms in their epic forms?
- How developments in hydraulic systems revolutionized development in architecture?
- What are the other causes of decay and deterioration of a Mughal Hammams?
- How further decay and deterioration can be prevented?
- How the rich heritage fabric can be preserved and conserved & get attention of tourism all over the world?

1.5 RESEARCH METHODOLOGY

Following flow chart elaborates the adopted research methodology:



1.6 An Overview

The study has been roughly divided into following Parts.

- Part I: Introduction and Literature Review
 - a. Introduction
 - b. Brief History of Significant Hammams in history
- Part II: Materials and methods
 - a. *Shahi Hammam*, Shalimar Gardens, Lahore.
- Part III: Results and conclusions
 - a. Analysis & conclusions of Shahi Hammam in Lahore
 - b. Recommendations

Chapter 2 EVOLUTION AND DEVELOPMENT OF BATHHOUSES IN HISTORY

Bathing existed in human history as means of spiritual healing that cleanses the inner soul of a man. From Indus Valley's ritual bath to Christian baptism and further on to Islamic ablutionary cleansing of the whole body it has many varied forms and functions in different religions.

Not only that 7. Whether it's hot or cold water bathing it has its own distinctive therapeutic value.

Hot waters kill germs and relax sore muscles. Generally physicians recommend that patients with cough and cold, respiratory disorders, arthritis, joint pain etc. should bath with hot water while ones suffering from indigestion or liver disease should take bath for cold water.

2.1 HISTORY OF HOT SPRING AS REHABILITATION

There are many mentions of importance about hot water bath as a skin curing therapy. Some European historical accounts mention its existence in Iron Age.

Historical account of note is from the Holy Quran which says that Prophet Ayub (May Allah be pleased with him) suffer from a fatal skin disease. His parts of body were covered with nasty sores. He had many dreadful looking ulcers on his face and hands. The sore were full of worms. Hazrat Ayub (May Allah be pleased with him) prayed to Allah as it is mentioned in Quran as follows:

*"And (remember) Job, when He cried to his Lord, "Truly distress has seized me,
but Thou art the Most Merciful of those that are merciful"*

Allah curved to him with mercy. He was commanded to hit the earth with his foot. He complied with the instruct and water from the spiral gushed forth. He took a bath with the water and got cured from his evil infection.[Ali,A.(2001)]

So, it is inferred that hot water bath in history of mankind has a strong connection with skin healing therapeutic treatment. This is why many of the historic bathhouses were constructed on hot water springs.

Through Greek mythology it was specified that natural springs had healing powers bestowed upon them by Gods. They developed bathhouses around such sacred springs and pools so that diseased could be cured. Findings of some primitive form of vapour bath are seen in some bathhouses located in the palace complex at Knossos, Crete from 2nd Millennium BCE.

Scientifically a hot spring emerges from geothermal heated water from earth's crust. It holds many minerals naturally dissolved in it. Most prominently Sulphur for its skin healing properties is found in such hot water reservoirs from hot springs. These destinations are toured by people for their proclaimed medical value through folklore and serve as rehabilitation clinics for such diseases.

2.2 DEVELOPMENT OF BATHS FOR THERAPEUTIC BENEFITS

Idea taken from nature; historical bathhouses generally were thermo-therapeutic complexes of supplying nourishment to the human skin to ensure benefits like hygienic cleansing, remedy and cure. The two mediums used for this purpose were water and air at varied temperatures. Scientific techniques of thermal convection and radiation were deployed to achieve this purpose through an elaborate and intricate architectural design.

Nature has designed human skin with numerous functions. Firstly, it covers and protects the surface of the entire body, and the various soft and sensitive innards that lie immediately beneath it. Secondly, it senses touch. Thirdly, it acts as a regulator of the heat in the body. Fourthly, with its many efferent ducts i.e. millions of sudoriferous sweat glands it performs the duties of a great excretory that carries off and out of the body an extensive quantity of effete matter, which, if retained in the blood, would toxic-ate it, and therefore would make it unfit for the healthy performance. Fifthly, it is to a little extent an organ of respiration.

Physiologists and physicians from ancient times were convinced of the Hydro-phatic system as a means of increasing the coetaneous exhalation from human skin to enormous amount. The deleterious substances present in blood that give rise to gout, rheumatism, etc., are drawn off from

the skin pores faster and more certain in this way than in any other.

Elizabeth Williams comments on history of bathhouses as follows:

“The Hammam has a long history in the Mediterranean, which can be traced to Roman Thermae. Baths were common throughout the Roman Empire in a geographic range stretching from Europe to North Africa and the eastern Mediterranean”.[Williams,E]

2.3 MOST SIGNIFICANT BATHS IN HISTORY

2.3.1 MOHENJO-DARO BATHS

The Great Bath become placed in the historic city of Mohenjo-Daro. Its remains are many of the maximum famous ancient systems of the antique civilization of the Indus Valley location of Pakistan’s’ Mohenjo-Daro. in line with archaeologists, the structure dates back almost 5000 years. it is extensively seemed as the earliest public pool or reservoir in the pre-modern global. the bath is a part of the greater citadel complicated according to excavations that lead to to its discovery in the 1920s.



Figure 1 Brick Platforms surrounding the Great Bath Image:
[Wikimedia](#)

2.3.1.1

THE GREAT BATHS

DIMENSIONS OF

The Bath measures 38.97 by means of 22.99 ft with a depth measuring about 7.97 feet. It was built using particularly great bricks. Two large staircases were used to access the citadel with one on the northern facet while the other being on the southern side; there are two gaps at the edge of the 2 stairs that are believed to have had wooden treads. On the cease of the stairs, there is a 4.5-foot mound whilst on one end there has been a hole that may have served the motive of draining water into the bath. The water that became used within the bath got here from a huge well in a nearby room although proof shows that rainwater may additionally have been accumulated for this reason. [Butt, A, 2018]

2.3.1.2 A TANK

To keep the bath watertight the floor was made of a sawed brick which was set using special mortar made from gypsum and reinforced using a bitumen sealer to sandwich the bricks and prevent leaking. Mud was also laid on edges using plaster that was also applied to the walls. On the edges of the pool, specifically the northern, eastern, and southern ends, were large columns presumed to have held window frames.

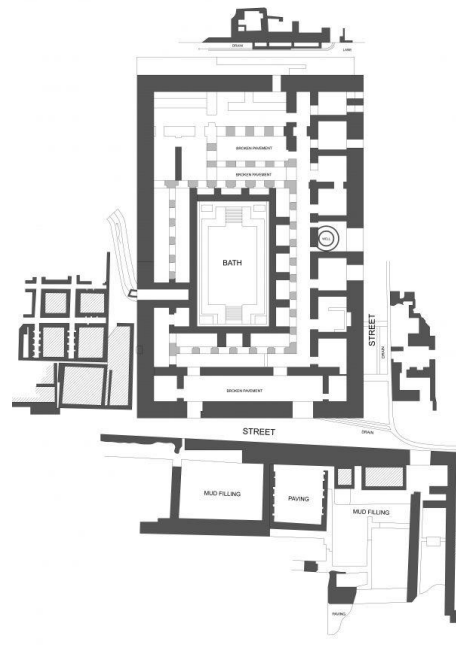


Figure 2 Detailed Annotated Plan of the Great Bath at Mohenjo-daro Drawing: Anosh Nadeem Butt

2.3.1.3 FUNCTIONS OF GREAT BATH

The Great Bath of Mohenjo-Daro could have served for some spiritual functions as the water could have been used to cleanse and perhaps to renew the health of those who bathed in it.

2.3.1.4 PRIEST TRAINING

The adjacent street from the bath has a huge building that had several rooms, verandas, and a series of staircases on both sides that led to the roof and the top floor. Given the nature and function of the bath, the building is said to have been the residence of the priests who were there to oversee functions and rituals in the Great Bath. Therefore, it was referred to as the training place of the priests.

2.3.1.5 SIGNIFICANCE TO THE PEOPLE OF PAKISTAN

The Bath of Mohenjo-Daro is one of the oldest structures in the ancient world and civilization of Pakistan and it is believed to have been built 4500 years ago. The structure became one of the earliest sites to be listed as UNESCO World Heritage Site in South Asia. The bath remains relatively well preserved after its discovery in 1926. It is believed Mohenjo-Daro was abandoned in 1900 BC, at the time when the civilization in the Indus Valley began to decline rapidly. However, nobody knows what for certain what ended the Indus Valley civilization.

2.3.1.6 ARCHITECTURE OF THE GREAT BATH

Architectural references include a very symmetrical plan of the internal bath due to the two broad staircases from north and south. There are smaller socket upon the boundaries of the stairs, which are believed to clutch wooden planks. At the ending of the stairs it is widely recognized that the tiny ledge has brick edging as a coping

that extends to the entire pool. This causes the striking concept to exist that the people in that occasion could actually let-down the stairways by this ledge without stepping into the pool itself. Some very finely laid burnt brickwork layered with gypsum is a display due to these complex joinery details. Brick columns surrounded the Great Bath and provide as platforms. The water for the bath was provided by a well in an adjoining room and nearby to the bath there was porticos, sets of rooms and a staircase primary to the upper storey.[4]

2.3.2 ROMAN BATHS

Romans were the first ones to make a true arch. This construction unit revolutionized their architecture to give rise to huge structures of aqueducts supported on true arches which have quality of transferring structural loads to the ground without collapsing. Now that they had more than enough water supplies for domestic, agricultural and industrial usage they could easily consume it for their leisurely pursuits. Roman engineers could not measure specific temperatures though they incorporated temperature of steam as a standard for building hot bathhouses. The advent of hypocaust system was yet advancement in technology which enabled them to develop an extravagant bathing culture. Though in the beginning Romans emulated Greek bathing traditions but they surpassed them in size and technology incorporated in establishment of a bathhouse. Under Roman Empire bathhouses were constructed in Europe, North Africa and Middle East.

2.3.2.1 Development of a Generic Model of Roman Thermae

Roman bathhouses started with simple structures but developed into exceedingly elaborate complexes (Figure 3).

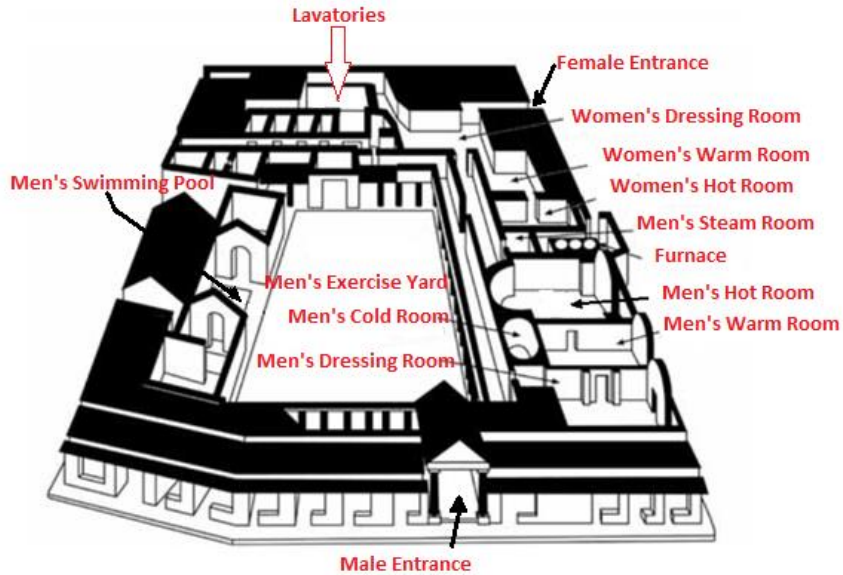


Figure 3 A Typical Roman Bathhouse Complex

Sizes, plans and ornamentation varied from complex to complex. Mostly men's area was bigger than the women's area in the wider complex. A visiting bather had to gradually expose himself to increasing temperatures to allow an excessive sweating. Rooms of the bathhouses were laid in such a manner that they got hotter progressively. Roman architect Vitruvius discussed design of *Thermae* in his book *De Architectura*. [The Ancient Roman Baths, 2018]

It is said that:

“Such was the importance of baths to Romans that a catalogue of buildings in Rome from 354 AD documented 952 baths of varying sizes in the city”.

Most commonly the complex consisted of:

- i. *Apodytarium*: A room just next to the entrance and was meant for dressing, undressing and storing clothes and other precious belongings.
- ii. *Notatio*: A swimming pool
- iii. *Palaestra*: An open garden courtyard for exercise outlined with an elaborate colonnade.
- iv. *Frigidarium*: Cold room with a pool for cold water plunge.
- v. *Tepidarium*: Warm room allowing immersion in luke warm water.

- vi. *Calidarium*: Hot room that offered hottest bath with arrangement of cold water basins where bather's head was washed before leaving to avoid excess head temperature for medical reasons.
- vii. *Laconicum*: It was not a bath but only a private sweating room where temperature was the highest.
- viii. *Praefurnium*: The furnace space

Bathhouses of Caracalla typically show this arrangement in their symmetrical plans with all the above-mentioned compartments as these are numbered (Figure 4 and 5).

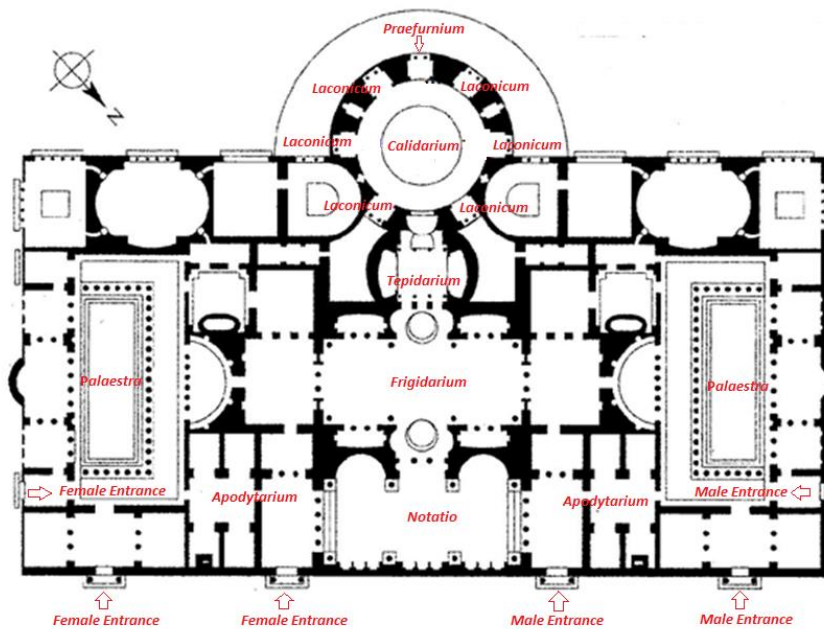


Figure 4 A Bathhouse Complex of Caracalla showing a Generic Layout Plan

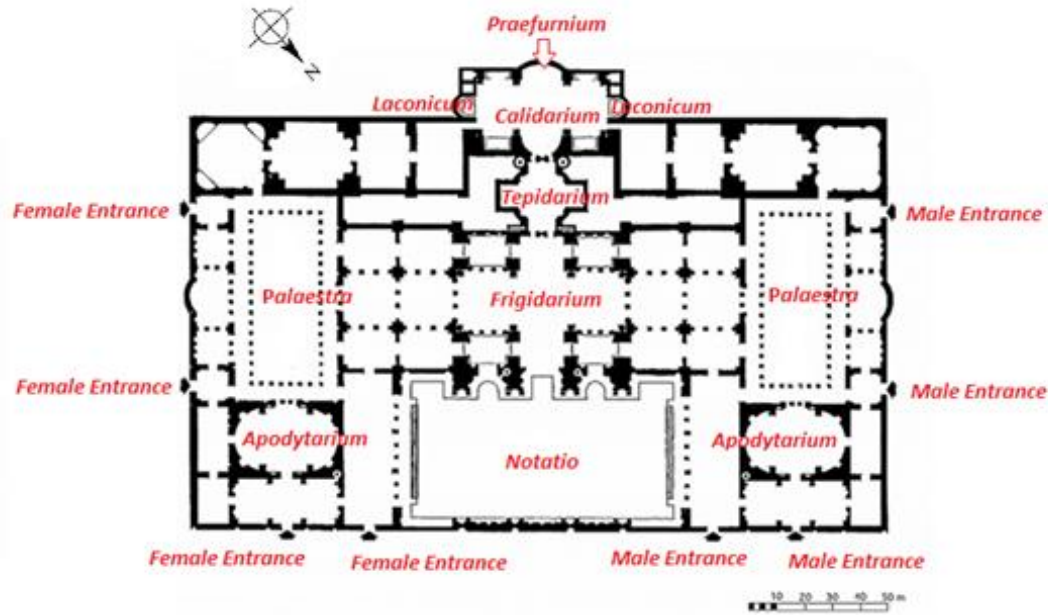


Figure 5 Another Bathhouse of Caracalla

After going through series of these sweating and immersion baths bather eventually returned back to the *Tepidarium* for oil massage, scrapping of dead skin, aromatic skin treatments, hair dying or shaving.

Another architectural feature of note was the way entrance was planned. Mostly they had three separate entrances: one for males, one for females and one for slaves. Façade were mainly designed with symmetrical details as was a common fashion of Greco-Roman/Classical Architecture. As ancient Roman society had a patriarchal pattern therefore area allocated to females' compartment was mostly much smaller than the males compartment.[Moss,P.1999]

Later on, mixed bathing took fashion in republican areas and by 1st century there were such mixed gender bathhouses found in Martial, Pliny, Juvenal and Quintilian. However, Emperor Hardrian restored back the gender separation.[Forbes,R.1966]

In addition to bathing ritual bathhouses housed many other amenities like food stalls, bars, and perfume selling booths, libraries, reading rooms, theatres and stadiums.

“The universal acceptance of bathing as a central event in daily life belongs to the Roman world. Apart from their normal hygienic functions, they provided facilities for sports and recreation”.[Caskey,J.1999]

Romans also relieved their suffering from rheumatism, arthritis, and overindulgence in food and drink by use of hot water immersions.

Walls were frequently adorned with stucco work and fresco paintings of flora and fauna and pastoral imagery. Domes on the interior were painted with sky blue colour and celestial scenes. Fountains and statues were a regular feature of the landscaping. Taking advantage of the natural hot water springs in their colonies Romans constructed many bathhouses on the same pattern. Archaeological findings noted that:

“Among the more notable are the Roman baths of Bath in England as well as the Baths of Caracalla, of Diocletian, of Titus, of Trajan in Rome and the baths of Varna”. [The Ancient Roman Baths, 2018]

2.3.2.2 Heating Systems

Metallic receptacles for burning charcoal were used to heat water in early bathhouses in Rome but from 1st century BCE a very developed and sophisticated under floor system was adopted commonly called Hypocaust. The system was fuelled by wood burning in a furnace i.e.

Præfurniæ. Though it was not a new idea by Romans as Greeks also employed such a system in their baths but Romans made substantial improvements to exploit it to maximum efficiency. Air heated by huge fires in the furnace circulated in hollow space under a raised floor i.e. *Suspensuræ*. The floor/*Suspensuræ* stood on an arrayed arrangement of pillars i.e. *Pilæ* leaving a hollow space below. The pillars were either hollow terracotta cylinders or monoliths of solid stone or constructed by piling up polygonal or circular bricks (Figure 6).

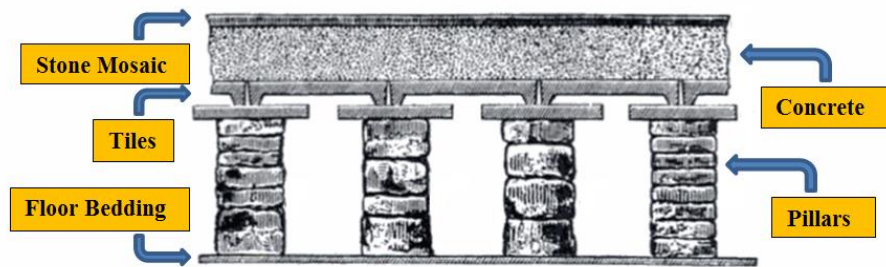


Figure 6 Detail of the Suspended Floor/Suspensurae

These pillars were covered by a layer of square tiles i.e. *Bipedals* generally and then a concrete layer was laid.

Texts on the subject say that:

“Roman concrete consisted of just three parts: a pasty, hydrate lime; pozzolan ash from a nearby volcano; and a few pieces of fist-sized rock”. [Moore, D. 1995]

On the top decorative (Figure 7) floors of stone mosaic were laid to finish.



Figure 7 Roman Bathhouse Floor, Butrint

There were hollow rectangular tubes i.e. *Tubuli* (Figure 8) inserted in the walls to facilitate heating by circulating hot air supplied by the furnace.

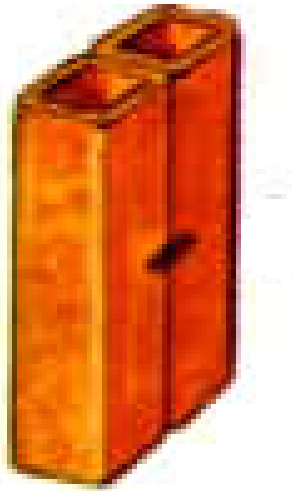


Figure 8 Hollow Bricks/Tubuli Embedded in Walls of Bathhouses

Use of special bricks i.e. *TegulaeMammatae* was also common. Such bricks had bosses at one sides to trap hot air on the surface to lessen heat loss (Figure 9).



Figure 9 Special Bricks/ Tegulae Mammatae

Thus, hot air circulated under the floor and through walls (Figure 10) to make the whole setup warm to the required degree.

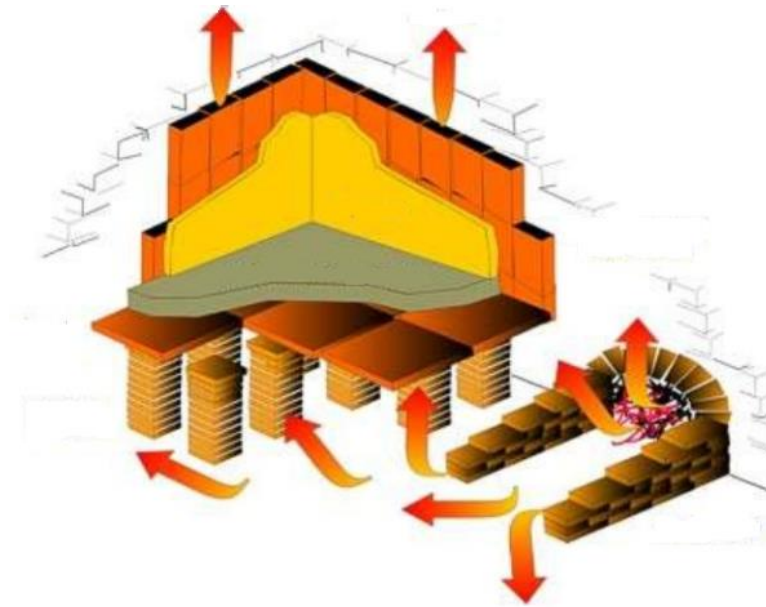


Figure 10 Schematic Diagram Showing Hot Air Circulation in the Structure of a Bathhouse

2.3.3 OTTOMAN HAMMAM

Bathing culture corresponding to Roman *Thermae* was experienced in *Hammams* in Middle Eastern Islamic environs. Etymology of *Hammam* is derived from Arabic language meaning “Spreader of warmth”. *Hammam* culture flourished after 600 CE when Prophet Muhammad (peace be upon him) suggested sweat bathing to his followers.

“The hammam became paired with mosques to satisfy the needs for hygiene and purification, which are significant in Islamic regulations”.[Yegul,F. 2010]

Bath or *Gusul* is considered to be a regular daily and weekly activity following the Islamic doctrine. Quran and Hadith both put an emphasis on cleanliness as a religious ablutionary duty especially before prayers.

It is established in the Quran:

“For Allah loves those who turn to Him constantly and He loves those who keep themselves pure and clean”.[Muslim,S.2018]

Ottoman Empire started in Anatolia after it fell to Muslims. Constantinople was captured by Sultan Mehmet Fatih from the Byzantines in 1453 CE and was renamed as Istanbul. 16th Century marks

the heyday of classical architectural developments of Ottoman Empire. Most prominently this time frames the architectural contributions of architect Sinan, a famous courtier in the capital Istanbul. Ottoman *Hammams* built after 1453 CE in Istanbul by architect Sinan (1490 CE -1588 CE) provide the typical pattern of the bathhouses of the classical Muslim era and are focused in this study.

Ottoman *Hammam* shares many commonalities with its precedent Roman *Thermae* yet it has many contrasts from it on the basis of Islamic traditions.

Historically bathhouses emerged as an annex to the mosque in Islamic society since Ummayad Dynasty for the reason that it was mandatory to enter the mosque after either an ablution or a bath. As it is mentioned in Surah Maida in Quran:

“O ye who believe! when ye prepare for prayer, wash your faces, and your hands (and arms) to the elbows; Rub your heads (with water); and (wash) your feet to the ankles. If ye are in a state of ceremonial impurity, bathe your whole body. But if ye are ill, or on a journey, or one of you cometh from offices of nature, or ye have been in contact with women, and ye find no water, then take for yourselves clean sand or earth, and rub therewith your faces and hands, Allah doth not wish to place you in a difficulty, but to make you clean, and to complete his favour to you, that ye may be grateful.”.[Ali,A.2001]

Having taken inspiration from Islamic principal purifying oneself before prayers in a mosque Ottomans annexed bathhouse with the mosques. These mosques were mostly built as part of *Külliyeye* which was a big charity centre which also housed schools, kitchens and many other buildings of note. It is quite a similarity with the Roman *Thermae* as it used to be part of a greater complex of buildings.

The contrasting features are rooted in the Islamic way of life though. Islam dictates many prohibitions on the conduct of a person going to *hammam* as follows:

- i. Islam abhors total nudity which is in high contrast to Roman bathhouse culture where human body was openly and fully shown and admired for its nude beauty. A visitor of Islamic *hammam* is abided to hide the private parts of the body well under cover in public.
- ii. Swimming pools disappeared in *hammams* which were an important feature of a Roman *Thermae*. It was due to the reason that according to Islam running water is

preferred over stagnant water for cleanliness as it is considered to be pure and suitable for ablution or bathing.

- iii. *Palaestra* of Roman *Thermae* is not seen in Ottoman *Hammam* since no physical exercises were attached to their bathing culture.

Furthermore, *hammam* was generally not as greatly decorated as a Roman *Thermae* in contrast. In short, the spaces in an Ottoman *Hammam* display some different meaning and function and are not merely an imitation of preceding civilization in totality.

The morphogenesis of an Ottoman *Hammam* is very beautifully summarized in the following script:

“One should be able to see the Ottoman Hammam as something which has truly exemplified Turkish culture: this institution was an crucial part of Ottoman-Islamic complex Külliye, played an important role in fulfilling religious requirements and created a social communication platform especially for Ottoman women. From an architectural point of view Hammams represented Ottoman-Islamic monumental features and aesthetics. Turkish baths are a witness of an important epoch in Ottoman-Islamic history”[Smolijaninovaitė,K.2007]

2.3.3.1 Generic plan of an Ottoman Hammam

Kristina Smolijaninovaitė describes the nomenclature of a typical Ottoman *Hammam* as:

“Turkish Hammams consist of a firm number of rooms. The main spaces are Soyunmalık, the undressing room; Soğukluk, a cold room (literal translation frm Turkish) that in winter can be used as a dressing room. Soğukluk is situated between Soyunmalık and Sıcaklık. The next section, Sıcaklık or ‘inner hammam’ is a hot room of a bath. This section of the bath has a large dome often decorated with small glass windows (so called the elephant’s eye glass) that produce a half-light. Halvet is a very hot small bathing cell with adjustable steam lids. It is a place where a visitor can bathe in private if desired. No door partitions this secluded area;therefore, a bather hangs a Peştamal (a special towel for bathing) over the entry and thus indicate that a Halvet is occupied. In Halvet one can also find basins for washing. The secluded space of Halvet in fact also indicates an Islamic religious influence on privacy, of not showing a naked body to others. Külhan, a space for heating, is a room kept apart from the other sections of a Hammam. The Külhan has a separate entrance from outside”.[Smolijaninovaitė,K.2007]

It is inferred that following successive rooms commonly found in an Ottoman *Hammam* corresponding to Roman *Thermae* but adapted in the local context:

- i. *Soyunmalık*: The dressing/undressing room

- ii. *Soğukluk*: The cold room
- iii. *Sıcaklık*: The hot room
- iv. *Halvet*: The private bathing cell
- v. *Külhan*: A furnace room

An Ottoman *Hammam* could commonly be classified in the following two types in terms of its architectural appearance:

- i. Single bathhouse: It was designated for gents primarily but it would temporarily be open to the ladies during day time for a very short duration.
- ii. Doublebathhouse (Fig 11 and 12): This type accommodated two separate sections; one for males and other for females and both genders could enjoy bathing.

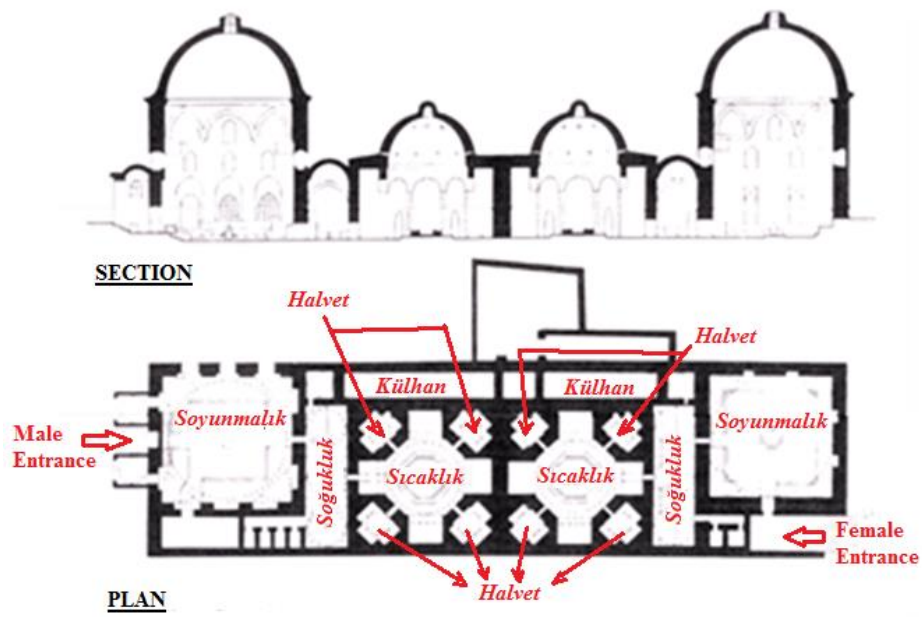


Figure 11 Haseki Harem Hammam, Istanbul

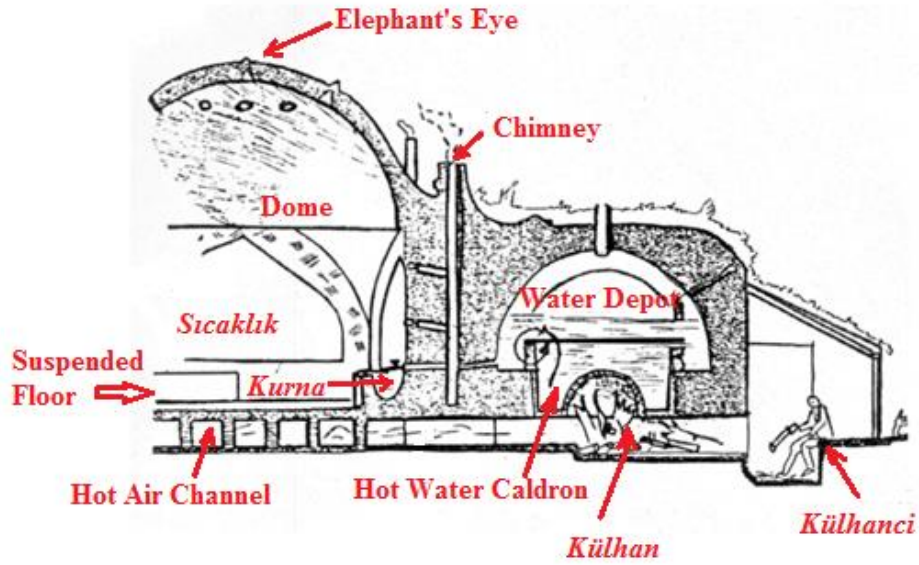


Figure 12 Külhanci (the Furnace Operator) Operating Külhan in Ottoman Hammam

Soyunmalık or the dressing room was predominantly the biggest compartment of the Ottoman *Hammam*. Quite often with a central fountain and elaborate tea arrangements this section served for communication and entertainment in addition to dressing/undressing. Bathing or massaging was done in *Sıcaklık* or the hot room. Rubbing off of the dead skin with a special craggy glove called *kese* was another famous skin treatment offered there. There was a special marble piece of square or octagonal shape called *göbektaşı* would be placed in the hot room so that the bather could lie down to get massages, rubbing or scraping.

An account of famous Ottoman *Hammam* given by Turkish Cultural Foundation is:

“A list dating to 1886-87 gives the names and districts of 75 baths within the city walls of Istanbul. In the second half of the 19th century, private ownership of baths began to be established. However even after the baths passed to private hands, some of the traditions common to the charity baths were continued, or at least the local and central authorities tried to ensure that some of the former practices were maintained. Today there are 57 working historical baths in Istanbul and their clientele is well under 200 per day. Famous examples of historical baths in Istanbul are; Eski Hamamı (15th century) in Üsküdar, Çardaklı Hamamı (1503) in Kadırga, Küçük Ayasofya, Hürrem Sultan Hamamı (1556) in Ayasofya, Sultanahmet, Kılıç Ali Paşa Hamamı (1583) in Tophane, Çemberlitaş Hamamı (1584) in Çemberlitaş, Galatasaray Hamamı (1715) in

2.3.3.2 Common Procedural Activities

A common visitor was given a pair of *nalın* and *pestemal* on entering the bathhouse. *nalın* (Figure 13) were the wooden foot ware or bathing clogs customarily worn inside the bathhouse.



Figure 13 A Pair of Traditional Footwear called Nalın

These were crafted with high heels so that feet could be protected against soapy and dirty water and also from burning from the heated floor.

A *pestemal* was considered to be a Turkish speciality in bath towels traditionally made with Turkish linen or cotton that is woven with hand-tied fringe or silk. A bather had to wrap it around the body after undressing.

Generally, a bather after being undressed and accessorised with *pestemal* and *nalın* would proceed to the cold apartment so that his body could get accustomed to the heat since he had to get more hot and humid in the successive sections with higher temperatures. When the body is enough steamed the specially trained staff would massage the bathers. They would wash and rub the skin as desired.

2.3.3.3 Special Features of an Ottoman Hammam

Apertures called elephant eyes (Fig 14 and 15) were among some peculiar architectural features of an Ottoman *hammam*.



Figure 14 Hammam Domes with “Elephant Eyes” in the Foreground, Kastamonu (Turkey)

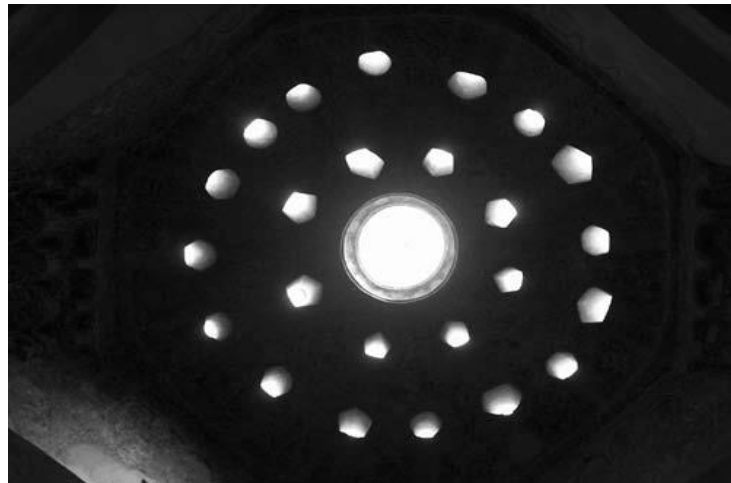


Figure 15 Light Openings in the Central Dome of the Hot Chambers in Bey Hammam, Turkey

These were windows of approximately 15-20 centimeter diameter.

These were made in a special bell shape with thick glass to catch daylight from all directions at different times of the day.

These invited a beautiful array of light beams from ceiling over the perspiring bathers on the platform below.

The *kurna* was a special wash basin with two faucets; one for cold running water and another for hot for a desirable mixing of two. Inside of this stone basin was smoothed and finely finished while outside was decorated with beautiful carvings.

Last but not the least signature domes of Mimar Sinan are frequently seen in Ottoman bathhouse

architecture.[*Godfrey Goodwin,1971*]

2.3.3.4 Heating and Water Supply System

There was not any prominent difference from a Roman *Thermae* in hypocaust system of heating under floors and water supply depending on aqueducts but was almost a replication.

2.3.4 MUGHAL HAMMAM

Roman *Thermae* were a globally famous scheme through millenniums before advent of Mughals in east. Also, that Mimar Sinan's era (c. 1488/1490 CE – July 17, 1588 CE) belonging to Ottoman style of architecture ended well before Shahjahan's time period (5 January 1592 CE – 22 January 1666 CE) it could be explicitly proclaimed that Shahjahan espoused both Roman and Ottoman styles and later on both bathhouse traditions were very finely synthesized to adapt to the local requirements of the Mughal *Hammams* under his patronage in Lahore. By doing so a very simplistic scheme displaying a very adroit and sophisticated culmination of its precedent architecture is formulated.

This research elaborates the eventual emergence of a distinctive Mughal style *Hammam*.

Since *Badshahnama* and *Aml-i Saleh* are the two main sources of local vocabulary of those times, different apartments are studied by names mentioned by the writers of these books.

On this basis successive rooms typically found in a Mughal *Hammam* were:

- i. *Rakhtkhana*: The dressing/undressing room
- ii. *Sardkhana*: The cold room
- iii. *Garamkhana*: The hot room
- iv. *Khilwat*:The private bathing cell
- v. *Aatishdaan*: A furnace room

Hammams, Baolis, and Serais are among the distinguishing features of cities constructed by Muslims rulers. Usually they were constructed near the city entrances. Public baths or Hammams

were built at strategic locations for travelers, which come on horses and camels from distant regions. Human body was exposed to water vapors or hot dry air for the purpose the cleanliness and medication. These were the main purposes of the Hammam construction.

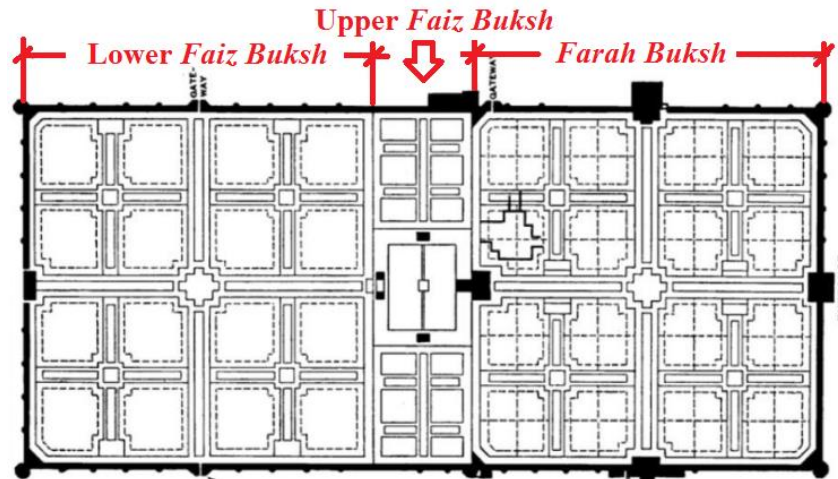


Figure 17 Plan Showing Terraces of the Shalimar Gardens

3.2 LOCATION INSIDE SHALIMAR GARDEN

Mohammad Saleh Kamboh elicits the location of *Shahi Hammam* in his book as follows:

“A bathhouse has been constructed on the east of this bagh which is fully decorated and adorned with inlay work. The bathhouse has no comparison in its beauty”.

Shahi Hammam is situated along the eastern wall of the Shalimar Gardens, Lahore and appears as an outward protrusion (Figure 19) from the eastern boundary wall.

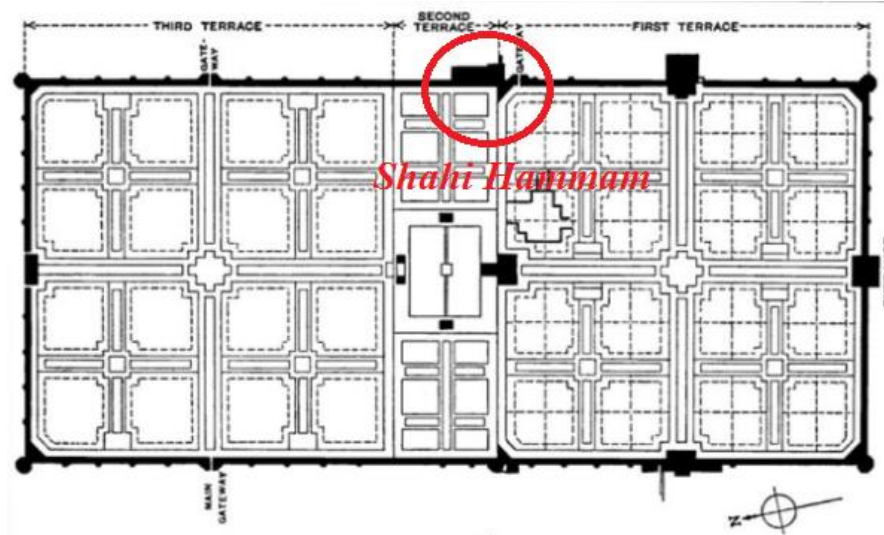


Figure 18 Map Showing Location of Shahi Hammam in Shalimar Gardens, Lahore

From interior its façade is flushed with the perimeter wall and visually seems to be a part and parcel of it. It does not disturb the internal symmetry of the layout plan or elevation.

The symmetric scheme could be seen in a painting done in c.1880.

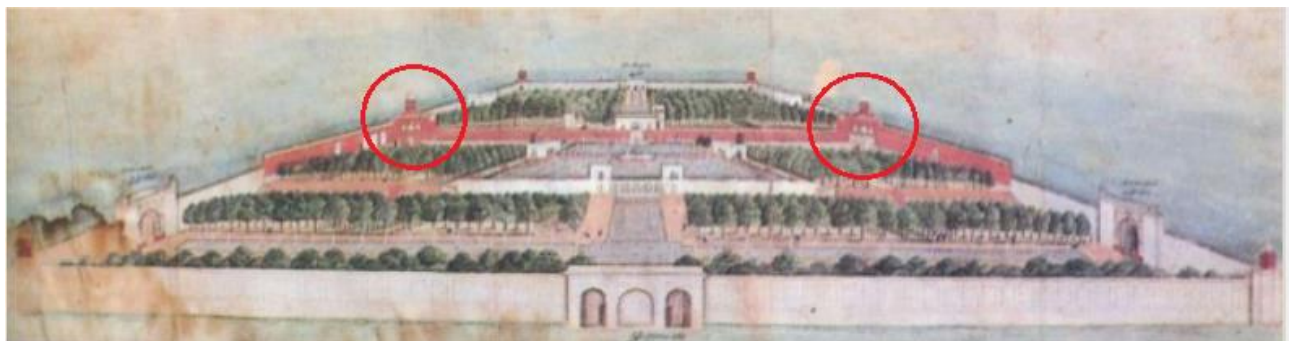


Figure 19 Identical Façades on Both Sides to Maintain Symmetry

3.3 DATE OF CONSTRUCTION

It was built with Shalimar Gardens in 1642 CE as an extended part adjoining upper and middle terrace of this grand garden complex.

3.4 PATRONAGE

Abdul Hamid Lahori in his book *Badshanama* gives a description of the bagh and the *Hammam* corroborating the fact that it was built under the royal patronage of Shahjahan.

He writes:

“The center terrace that's the primary level of the Faiz Buksh Bagh, is 330 yards in length and ninety six yards in breadth. The water after flowing like a cascade from a seven yards rectangular cistern already defined, falls right into a canal, 12' in length and 8' in width. in the center is fixed a marble seat with Chinikhanas on all four sides, thru which water is thrown up and in the front of that's constant a marble throne. (The water) then flows to the reservoir within the center of this stage 72 yards in period and seventy two in breadth, with 152 fountains. inside the middle of the eastern and western sides of the reservoir two Aiwans of crimson sand stone are built. On two sides of the middle of the northern facets are two marble Aiwans. The water after passing below the center of these two Aiwans and having cut up itself into three cascades, flows to the decrease terrace cistern, 10 yards in length and identical to the breadth of each of the other two cascades. The Chinikhanas of these cascades are much like the Chinikhanas of the cascade of the Farah Buksh garden. on the eastern facet of this terrace there may be a hammam (tub suite), having superbly sensitive inlaid ornamentation, and comprising a warm rest room, cold toilet with going for walks water, and a huge dressing room”.[Lahori,A. and Elliot,H.1875]

3.5 SKYLINE

Owing to the vast expanse of the walled garden building blocks appear to be scattered far apart and the wall makes a very low rise horizontal skyline mostly.

In this straight running skyline of overall garden complex, façade of the bath breaks out vertically establishing its own exalted look.

An octagonal domed chamber protrudes out giving it a vertically higher skyline



Figure 20 Façade Showing a High Skyline

3.6 USAGE

It is not a double bath but a single type used intermittently by males and females at different times of the day.

Lundkhwar explains the usage in his paper as:

“In Plan, the Hammam is a single and private bath, approached by two entrances one from the first and other from the second terrace. It suggests that the Hammam was also used by the royal ladies, as one entrance opens into the upper terrace exclusively meant for the Royal Harem”.

3.7 ARCHITECTURAL PLAN OF THE HAMMAM

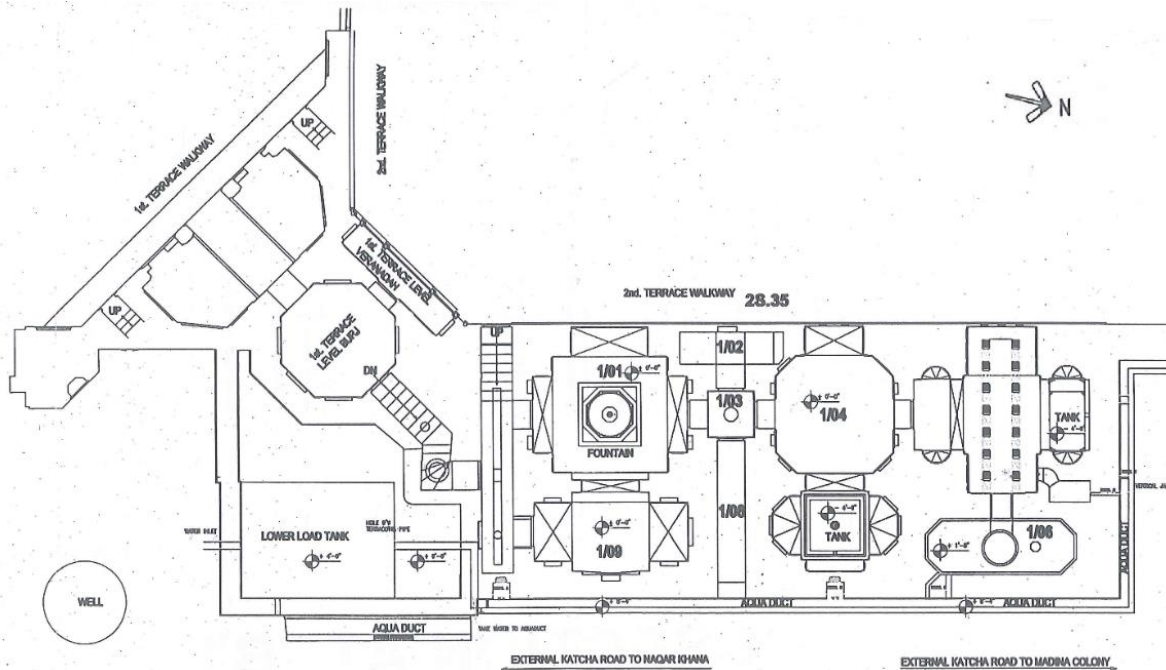


Figure 21 Layout Plan of Shahi Hammam, Shalimar Gardens Lahore

3.7.1 ENTRANCE

Royal
upper and
separately



Bath is accessed through flight of stairs both from
middle terraces



Figure 23 Flight of Stairs Showing Elevated Floor Level of the Bathhouse from the Middle Terrace

There is an octagonal chamber surmounted by a dome on the exterior, topped on the main foyer that leads into a chamber of the bathhouse.



Figure 24 Octagonal Chamber over the Balcony

From this octagonal chamber a very beautiful panoramic view of the successive terraces of Shalimar Gardens could be enjoyed; an additional attraction on the way to bathhouse.



Figure 25 View of Shalimar Gardens from the Chamber

An excerpt from the book Conservation of Shalamar Gardens explains it as:

“This verandah was possibly the royal access for the ladies as the Upper Terrace was specifically for use of the Royal Haram. The veranda leads into the octagonal chamber of 15’-6 ¼” in diameter. This chamber being the main entrance room of the zanana royalty must have had decorative features, however, today only some Ghalib-kari is visible in the domed ceiling”.[Lion Press,L.2009]

A stairs leads down to a congested passage from the octagonal chamber. The passage runs in an east-west direction. From this passage another flight of stairs opens out to the middle terrace/*Faiz Buksh*.



Figure 26 Male Entrance from the Middle Terrace Faiz Buksh

The door opens in a bay in front of the eastern dressing room.

Females used to enter from the upper terrace *Farah Baksh* though.



Figure 27 Female Entrance from Upper Terrace Farah Baksh



Figure 28 Male entrance in blue circle & in red female entrance

3.7.2 LAYOUT DESIGN

In the book Conservation of Shalamar Gardens it is written:

“This relatively small Hammam with a simple plan, has four chambers one of which is on the Upper and remaining three on the Middle Terrace”.

Shahi Hammam mainly comprises of the three successive apartments as one enters through a passage on the southern side as mentioned above.

The whole scheme of layout is in north-south direction with three sections:

- i. Rakhtkhana: Dressing/Undressing Room*
- ii. Sardkhana: Cold Room*
- iii. Garamkhana: Hot Room*

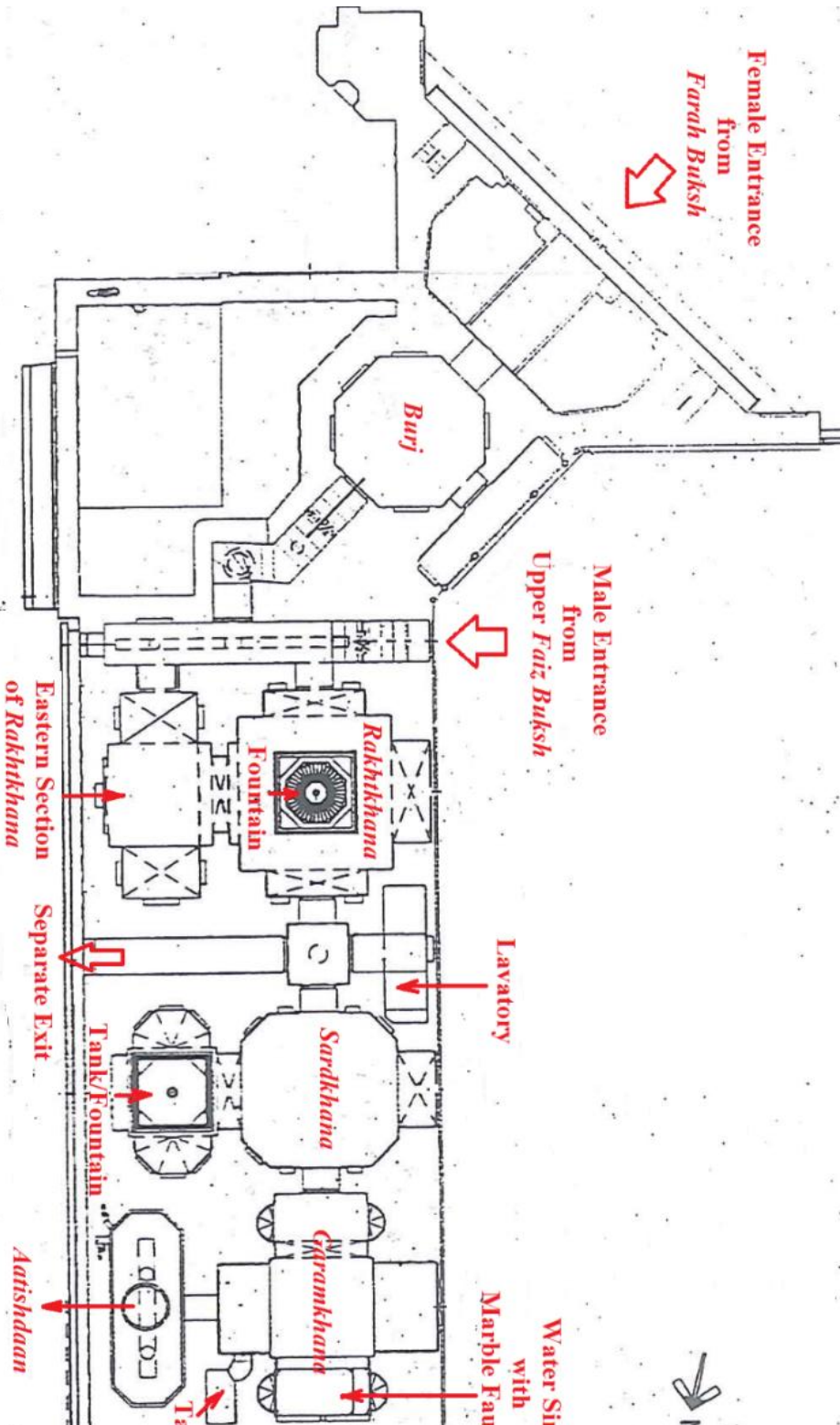


Figure 29 Plan Showing Different Rooms of Shahi Hammam

Lundkhwar observed:

“Each of this division has a front hall and an attached chamber for a fountain or water tank for having a dip by the bathers”.

The three main apartments are aligned successively one after the other on a central axis and are connected through rectangular openings with wooden doors .



Figure 30 A Wooden Door between Sardkhana and Garamkhana

3.7.3 RAKHTKHANA

This apartment corresponding to *Apodytarium* of Roman *Thermae* or *Soyunmalik* of Ottoman *Hammam* used for change of clothes as desired. *Rakhtkhana* is entered from a passage to the eastern part which is a rectangular space measuring 20'-6"x 10'-6".



Figure 31 Entrance to Rakhtkhana from the Entrance Passage

This section was mainly used for dressing/undressing. It is a huge cruciform hall measuring 15'-6" x 15'-6". In Conservation of Shalamar Gardens its layout is described as:

“This square chamber has four small bays on four sides with additional niches in the walls of the bays. On the east is an adjacent chamber with two deep bays on the north and south with a door connecting it to the entrance alley”.

This part is a subsidiary space to *Rakhtkhana* possibly for refreshments before and after the bath, chitchatting or massage. Niches in the bay walls were provided to keep clothes and other belongings of the visitors.



Figure 32: Niches in the Walls in the Eastern Chamber of *Rakhtkhana*

An octagonal fountain stands in the middle of this room.



Figure 33: Octagonal Fountain of *Rakhtkhana*

Next to this section is a long vaulted passage laid in east-west direction. On the western side it terminates into a dead end with two small rooms; one on north and another on south used for latrine/*Bait ul Khala*.



Figure 34: Latrine of *Shahi Hammam*

Current research assumes that the rooms on the west were latrines and separate entrance on the east was to assure efficient janitorial services to keep it clean and odourless. Another end on the east had a separate opening/exit which is now blocked.



Figure 35: Blocked Entrance on the Eastern Side

3.7.4 SARDKHANA

Next room is the cold room with colder bathing facilities mentioned by the title *Sardkhana* by

historians. In *Shahi Hammam* of Shalimar Gardens it is the central apartment of the complex. This apartment again consists of two separate parts like the *Rakhtkhana*. The chamber in east is bigger in size and square in plan with chamfered corners. It occupies 16' x 16' in area. This room has two arched recesses on eastern and western sides.

From the eastern side this recession opens into an oblong octagonal chamber with longer axis in north-south direction.



Figure 36: Eastern Wall of *Sardkhana* with Water Tank in Front

In the middle of this part is a square tank 8'x8'x4'-3" (Figure 93) that could be filled with hot or cold water as desired.



Figure 37: Square Tank of Eastern Part of *Sardkhana*

3.7.5 GARAMKHANA

A rectangular opening from *Sardkhana* leads to the last apartment of the royal bathhouse called *Garamkhana*.



Figure 38: Entrance to *Garamkhana*

This middle part of this section is a rectangle of 9'-6" x 24' with two arms in northern and southern sides making a cruciform shape.

A smaller water tank in the north eastern of the apartment was a cold water reservoir so that cold water could also be supplied in case the hot water is unbearably hot and there is a need of cold water addition in it for a desirable temperature.



Figure 39: Reservoir for Water of Desirable Temperature

This sink/tank embedded in the alcove has marble water jets of lions head shape on three corners with one probably missed due to vandalism of such edifices.



Figure 40: Marble Water Jet in Lion's Head Shape

A room with *Aatishdaan* on the eastern side of the *Garamkhana* was to accommodate a huge water reservoir place over the furnace for. It is in an oblong shape where reservoir was filled with water from the terracotta inlets bringing water from the aqueducts and was boiled over the fuel burnt in the furnace to supply steam to the adjacent chamber through an aperture in the wall in-between.



Figure 41: The Furnace Room for Heating Water

This part was a source of supply of water to the pipes in walls to carry it to the bathing spots just like *Külhan* of an Ottoman *Hammam*.



Figure 42: Terracotta Pipes Embedded in Walls

3.8 HEATING SYSTEM

There is an opening on the floor level of passage separating *Rakhtkhana* and *Sardkhana* which shows a level difference of 3'-7" between the suspended floor over piers and the ground level finish establishing that a hypocaust system is employed for heating of the *Shahi Hammam*.

The source of heating of the overall system is in the outer wall of Shalimar Gardens on the eastern side next to the chamber is *Aaatishdaan* revealing a furnace in the floor making it a part of the *Garamkhana*.

The fuelling duct could easily be seen in the rear wall from where coal was added and ashes were removed.



Figure 43: Fuelling Duct of the Furnace from the rear wall

It might have vertical flues running in the walls for heating the interior as are found in other bathhouses of the same genre.

Presence of an elaborate hypocaust system is endorsed by researchers as:

“Evidence of a metal rim along the top circumference of the pit indicates that a cauldron or a cover was placed on this pit to retain and direct the heat for circulation towards the under floors. Another large opening in this pit leads to a series of ducts under floors of the chambers of the Hammam. These ducts either circulated steam or hot air under the floors. They run under the Garamkhana and also appear to run under Sardkhana. The fact that heating was produced in this room is further corroborated by the evidence of coal found in the bottom of the pit that burning of some fuel took place here”.

3.9 WATER SUPPLY

Water to the *hammam* was supplied through one of the best designed hydraulic systems of those times with three different sources so that water could never be insufficient for bathing.

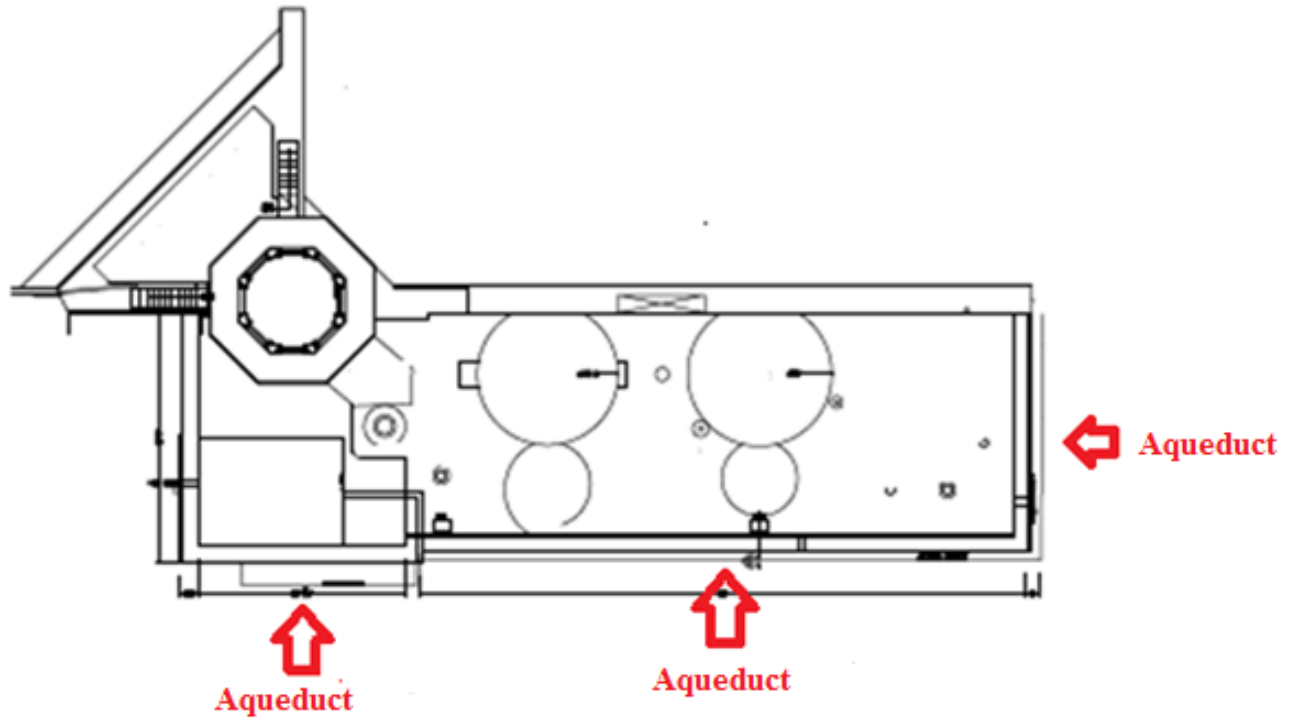


Figure 44: Roof Plan Showing Aqueducts Running on the Eastern and Northern Side Wall

Aqueducts run on the eastern and northern wall of the bathhouse.

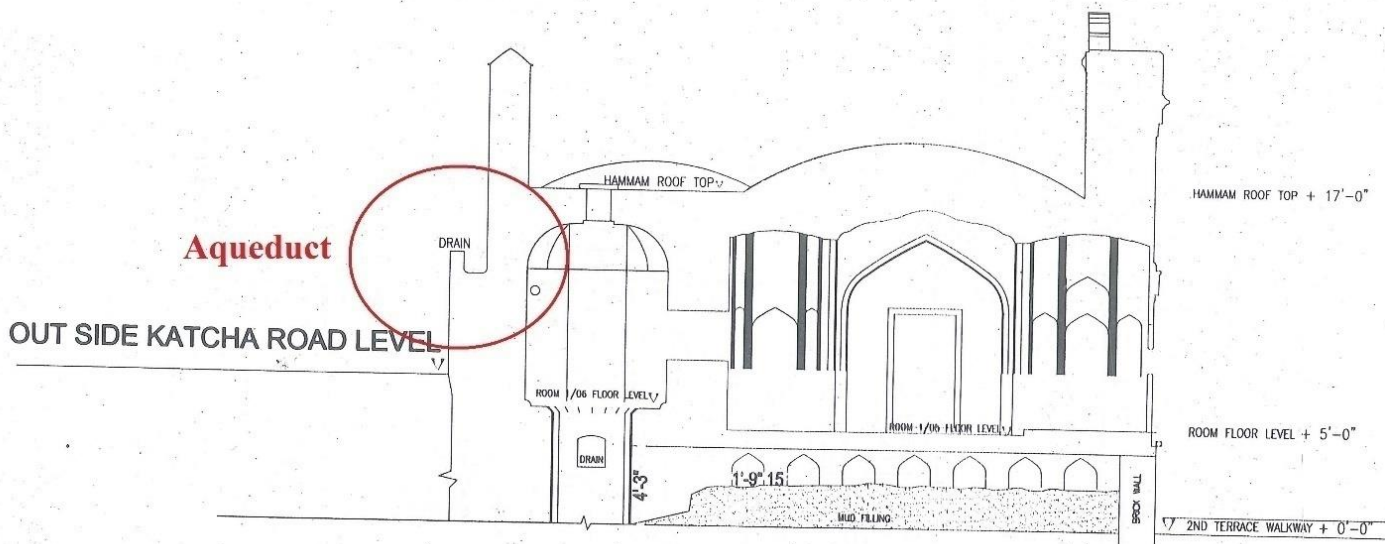


Figure 45: Section of *Shahi Hammam* Showing Aqueduct on the Eastern Side

First source was a well dug in the east of the first terrace. Lunkhwar describes the supply of water from this well as follows:

“The eastern well supplied water to the bathhouse by means of a masonry

channel. The masonry channel, running along the eastern wall of the Bathhouse, not only supplied water to the Tepidarium reservoir but also to a spacious water tank in the south-eastern part of the Hammam. As the masonry channel is above ground level, it was approached at two places by flight of steps. The steps and the circular well, shown in the plan of the Hammam After feeding the Hammam, the masonry channel takes its course on the top of the peripheral wall and reaches the lowest terrace, similar to the Bara-Harta on the west”.

The flight of stairs and eastern well mentioned by Lunkhwar are not extant anymore.

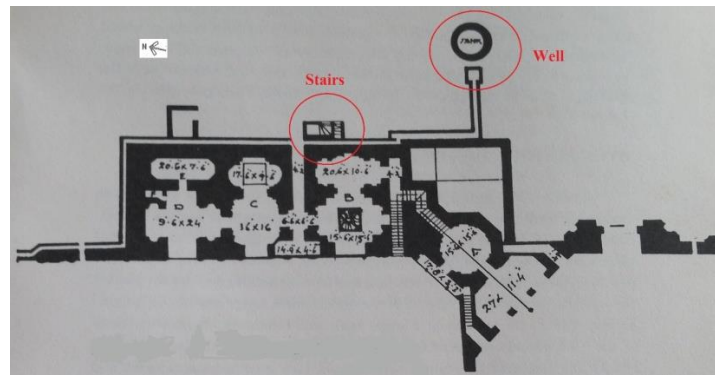


Figure 46: Extinct Well and Stairs on the Eastern Side

Second source was 100 miles long canal called *Shah Nahar*. It was especially dug for supplying water to Shalimar Gardens from a village Rajpur/Noorpur under supervision of a renowned canal engineer named Ali Mrdan Khan and an expert in hydrology named Mullah Ala-ul-Mulk Tuni.

From this canal water comes to the upper most terrace of Shalimar Garden from the south. The water gradually descends towards the lowest level to be supplied to *Mahtabi Bagh* there.

The water is brought to the tank of *Shahi Hammam* from the first terrace through a water channel running parallel to the eastern boundary wall of the garden.

There is yet another source of water from a huge well on the west named *Bara-Harta*, about which Syed Muhammad Latif writes in his book:

“The well is greaterl, and from its huge size, greater resemble as a tank than a well. The circumference exceeds two hundred ft and the depth is very exceptional. within the period of Mughals, a grating of iron turned into constant at a few depth under the floor of the water with the object of facilitating the packing out of the earthen pots (Tinds) with which water is drawn”.[Latif,S.2005]

Today the great hydraulic works are in ruins across the road from Shalimar Gardens and highly endangered by recent insensitive developmental interventions.

Rahat driven by cattle was a common system of lifting water to higher levels. [Fauzi, M. 2018]

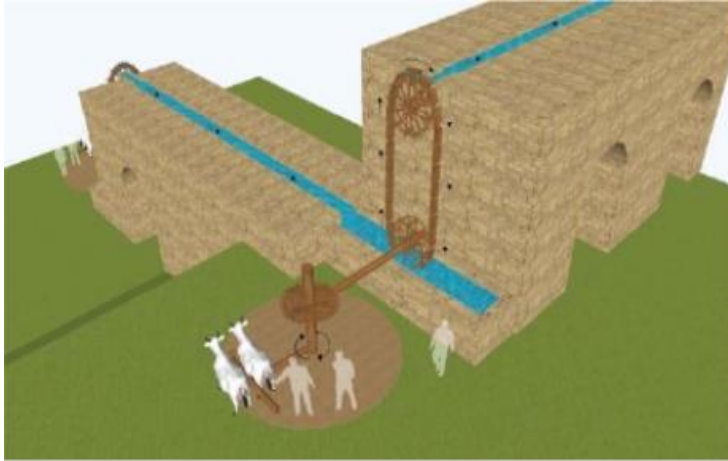


Figure 47: Illustration Depicting Persian Wheel/ *Rahat* driven by Cattle to lift Water to Higher Ground

Detailed study and analysis of the gigantic hydraulic works of Shalimar Gardens is yet another topic of a huge research and is beyond the scope of this dissertation.

3.10 BUILDING MATERIAL & CONSTRUCTION TECHNIQUES

Best building material of the time was chosen and the building technique specially designed by expert engineers and supervisors was incorporated to build this classical edifice. Use of brick masonry and concrete of the cotemporary time made this edifice durable enough to pass the test of times through centuries.

3.10.1 SMALL SIZED BRICKS

Masonry is done in small sized terracotta bricks and *Kankar* lime specific for Shahjahan's times; a thinner application as compared to earlier construction.

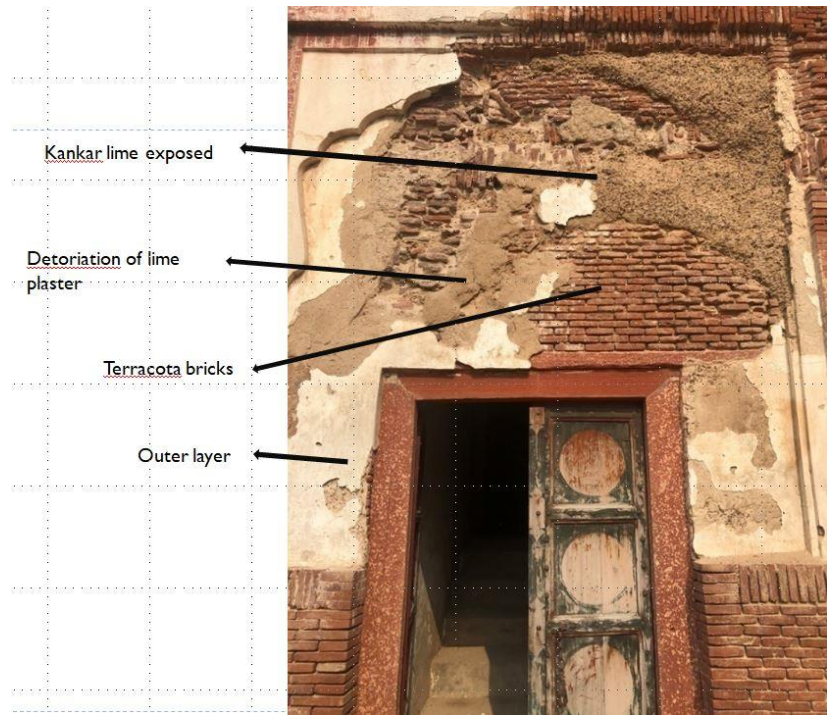


Figure 48: An Eroded Section of *Shahi Hammam* Revealing Brick Masonry with *Kankar Lime*

3.11 DOMICAL ROOF

All the apartments are covered by domes on the top.

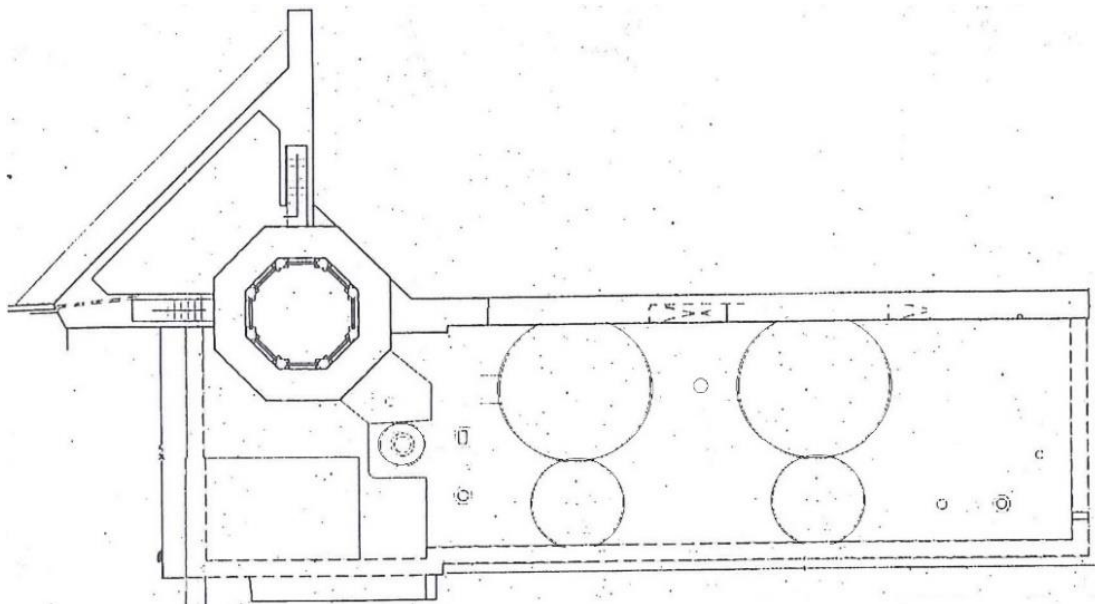


Figure 49: Roof Plan of *Shahi Hammam*

Domical roofs are constructed in arcuated system of masonry in radiating courses (Figure 106) of bricks.



Figure 50: Arcuated System of Brick Masonry for Domical Construction followed in Shalimar Gardens

The biggest span is over the *Rakhtkhana* which is covered by It rests on stalactite pendentives and squinches in the interior.



Figure 51: Pendentives and Squinches under the Domical Ceiling

Domes of the other two apartments are simple in construction without any pendentives. Domes are not very lofty but are low rise.



Figure 52: View of the Domes and Apertures in Roof

3.12 EXTERIOR FINISHES

From the exterior the façade of the *Shahi Hammam* has been treated as a symmetrical counter part of the western wall of the whole Shalimar Garden.

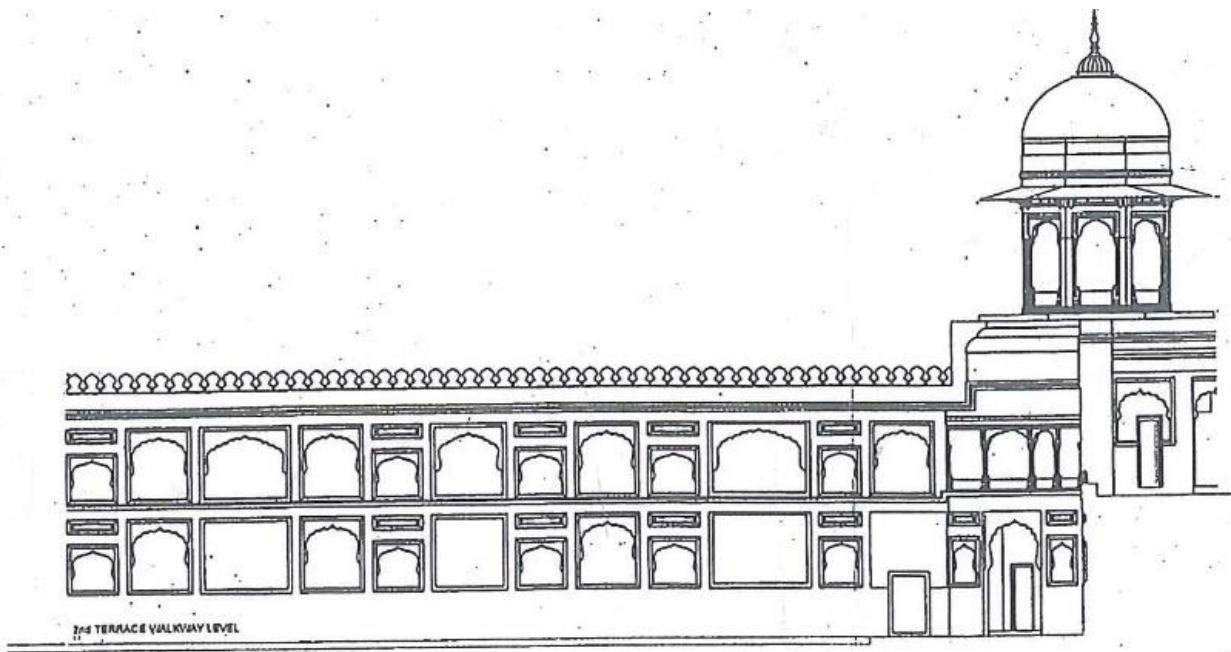


Figure 53: Front Façade of Shahi Hammam

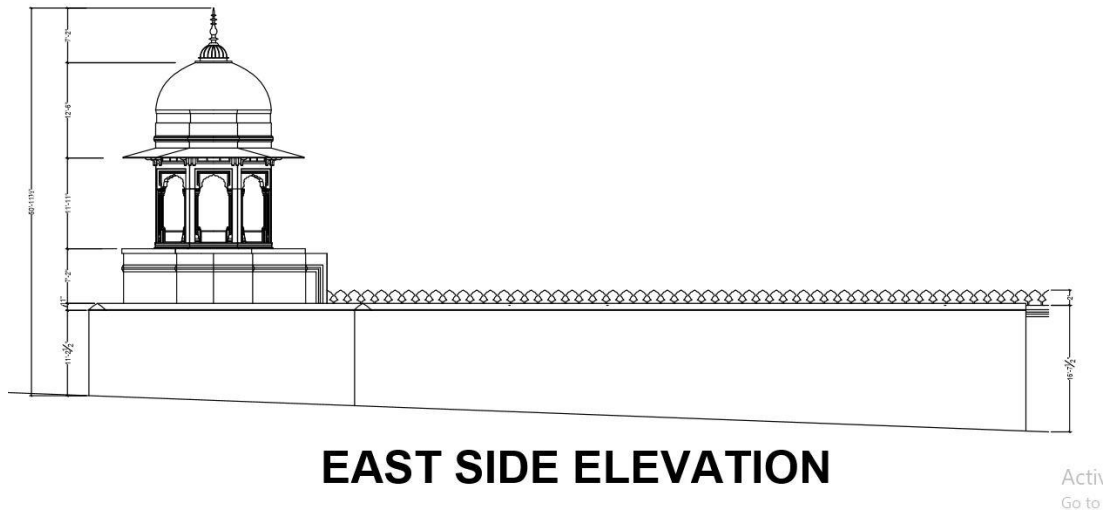


Figure 54: Side Facade of shahi Hammam

The perforated terracotta lattice work and slits in the exterior wall of the *hammam* make a difference from the other side though.



Figure 55: Perforated Terracotta Lattice Work on Exterior Wall of Shahi Hammam with Pacca Kali Plaster

Wall is decorated with low relief blind arches in an interesting sequence. The wall is divided into two tiers; one till dado level and other above separated by a corniced line running throughout the length.

Cusped arches and dado line are patterned in bricks especially moulded for a decorative assemblage. The top is done in battlemented merlons. Lime plaster covers the wall to give it a uniform look which is mostly eroded now.

The other part of the façade comprises of a beautiful recessed arch entrance flanked by blind arches on either side and topped by the sandstone balcony and the cupola/*Burj* behind. Use of red Agra sandstone gives it a unique virtuous look.

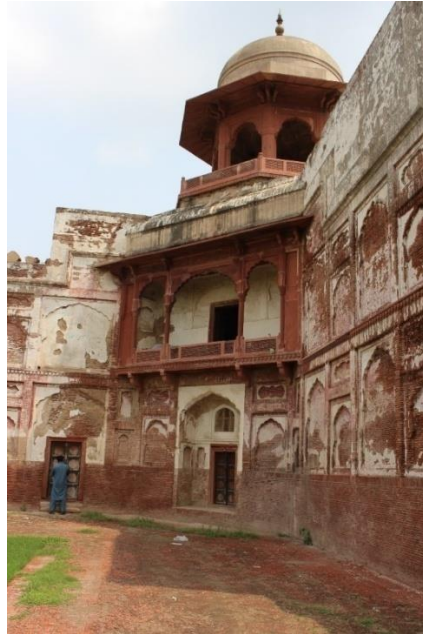


Figure 56: Part of Façade with Cusped Arches, *Jharoka* and *Burjin* Red Agra Sandstone

The octagonal chamber is beautifully clad in sandstone .



Figure 57: The Octagonal Chamber in Agra Sandstone

The octagonal veranda leads to a balcony (*Jharoka*) on the exterior overlooking the middle terrace

of the Shalimar Garden. The balcony including the floor and the ceiling is fully constructed in Agra sandstone in red colour.



Figure 58: Cantilvered *Jharoka* with Perforated *Jalli*

The façade of the *Jharoka* consists of three arches on four pillars. The floor is cantilevered 4' outwards supported on four sandstone brackets. The three arches are multi foiled and a perforated sand stone railing or *jalli* is installed for protection.

3.13 INTERIOR FINISHES

i. Plaster

The whole complex is plastered with thick layer of *chunan* and *kankar* lime finely covered under a layer of *Pucca Kali*.

At places this *Pucca Kali* plaster also serves as a base for further interior embellishments like fresco paintings.



Figure 59: *Pucca kali* Finishing Layer

ii. Fresco Work

Interior must have been profusely painted in fresco. Traces of arabesque kind of floral patterns in squinches, pendentives and spandrels of the arches in vivid colours could frequently be observed.

This fresco work is attributed to Sher Singh the famous son of Ranjeet Singh.



Figure 60: Fresco Work on the Pendentives



Figure 61: Fresco Work in the Squinches

Goffers or lacunars of squinches are concave and painted. All borders are painted too.

Conservationists of *Shahi Hammam* proclaim:

“The inner side of the Hammam was adorned with Percheenkari which all but one scholar have translated as stone inlaid decoration or, Pietra-dura. All traces of this Percheenkari has by now vanished. Instead, there are now cheaper and gaudy wall paintings done during Sikh regime (1764-1839)”.

iii. *Ghalibkari*

The soffits are done in *Ghalibkari* with *Pucca Kali* lime plaster in pattern of lozenge shape.



Figure 62: *Ghalibkari* in Soffits of Domes



Figure 63: *Ghalibkari* on Spandrels of Arches

iv. Flooring

Presently terraced drabbed flooring is seen in the bathhouse and is probably from Sher Singh's times. Originally floor was laid in variegated marble arranged in tasteful layout. Another feature of special note is the fountain basin of *Rakhtkahna* which must have been done in stone inlay work originally but now only eroded base is left showing the base patterns.



Figure 64: Picture Showing Finished Floor and Fountain Basin of *Rakhtkhana*

3.14 DAY LIGHTING ARRANGEMENTS

Skylight apertures (Figure 65) are found in the passages to receive day light.



Figure 65: Apertures in Roof of the Passage for Daylight Illumination

Some oculi in centre of the domes could be seen.



Figure 66: Oculus in the Domical Roof

These apertures are a high luminosity source of light for interior during the day time.



Figure 67: Aperture in the Centre of Dome to Invite Daylight

Other than the openings in roofs there is perforated screen of terracotta lattice work with five slit openings in the western wall of *Rakhtkhana* for catching fresh air, light and views into the building.



Figure 68: Slits in *Rakhtkhana*

A perforated *jalli* is installed in the exterior wall in *Sardkhana*.



Figure 69: Perforated Terracotta *Jalli* of *Sardkhana*

Another five slits serving the same function are left in the exterior wall of *Garamkhana* .



Figure 70: Five Slits in Exterior Wall of *Garmkhana*

Chapter 4 ANALYSIS AND CONCLUSIONS OF ROYAL MUGHAL SHAHI HAMMAM

Muslims bath architecture evolved similarly as in Islam amazing cost is connect to the use of water, no longer only for spiritual and ablutionary purposes, but also in metropolis and social life. Baths, fountains, reservoirs and aqueducts of great beauty have been constructed throughout the Islamic global. Baths or Hammams of many Muslim dynasties are nevertheless intact and throw sufficient light on architecture at extraordinary instances and in diverse areas of islamic international. In baths of the Seljuk period at Konya, the Ottoman duration at Istanbul, or the mughal duration at Delhi an Agra. The valuable plan is greater or much less the identical with a disrobing room, a heat heat room and a Roman hypocaust method.

The terraced and walled Shalamar Gardens laid at the order of the Emperor Shah-Jehan, 1642 A.D. , includes a hammam which lies at the eastern side of the middle terrace alongside the enclosure wall. An in depth description of the constructing inside the Bagh is given through Abdul Hamid Lahori in his Badshahnama and through Mohammad Salih Kamboh in his Amal-e-salih. Abdul Hamid Lahori describes the center terrace at the occasion of the first kingdom go to of Shah Jehan to the bagh after its finishing touch. The center balcony, that is the primary degree of the Faiz Bakhsh bagh, is 330 yards in the period & ninety six yards in breath. The water, after running like a waterfalls from a seven yards, drops into a canal, 12` long and eight` in span.

4.1 ARCHITECTURE DESCRIPTION

Projects outward within the eastern wall of the second terrace, close to its south-eastern corner, lies the royal bath. as the internal surface of the eastern wall additionally serves the facade of the hammam, consequently the structure can't be detected effortlessly although it is an architectural decoration. it's far a single storey structure designed approximately the longitude axis and plenty less lofty which will make use of the heat to higher benefit. In plan, the hammam is a single and personal bath, approached by two entrances one from the primary and the from the second terrace.

It shows that the hammam was additionally used by the royal ladies, as one entrance opens into upper terrace solely intended for the royal Harem. the entrance to the Hammam from the Farak-Bakhsh or royal Harem, is thru a semi-octagonal alcove which leads into an octagonal chamber. With a projecting balcony over-searching the center terrace. This room is in the north-eastern octagonal tower of the Farak Bakhsh, surmounted by a sand stone pavilion and approached by way of flight of steps on either aspect of the alcove. similar octagonal towers with sand stone pavilions exist at each corner of the primary and north-east and north-west corners of the terrace. The octagonal room of the primary terrace leads via stepping into a slender way meandering in course and having an entrance into the middle terrace. doors lead from it to the primary apartment of the hammam.

The bath include the three primary apartments walking from south to north. the first or the southern most space turned into the Rakht Khana, the area for dressing, additionally known as Jamakan, the condominium wherein clothes were removed, similar to the apodyterium of the Roman Thermi. it is consist of elements. The western component, cruciform in shape, consists of a square fountain basin within the middle. This domed chamber with the five present day rectangle slits inside the western wall for mild, fresh air and an outer view, was for refreshment earlier than and after bathing. The eastern square component, with an unbiassed starting from the passage, is the dressing room. The Rakht Khana is a separated from the subsequent rental by way of a vaulted space, starting outdoor the garden at the east and now blocked. The western give up of this passage terminates in a slender square room and become for the control of the hammam and for renovation and cleaning with the washing machine coming to the attention of the residents inside the garden. The next or principal apartment, similar to the tepidarium of the Roman tub, additionally consist of components. The western component is a square chamber (see plan) with chamfered inner angles and arched recesses on the eastern and western aspect. The eastern rectangular octagonal element with an arched recess inside the eastern wall, carries a rectangular water tank inside the middle. This tank could be used for hot or cold baths as preferred. 5 current square slits in the western wall, as within the first condominium, served the cause of get entry to to mild, sparkling air and for a view of the second terrace. A square opening leads from it to the closing apartment of the hammam which conforms to the caldarium of Roman Thermi. it is cruciform in form along a rectangular tank inside the northern arm. The tank has a marble jet at every nook, besides in the

south east, moulded in shape of a lion's head. This apartment has two water reservoirs of which the eastern and large reservoir is in rectangular octagonal shape with two terracotta feeding pipes, comparable in shape and function to the reservoir of the hammam of the Shah Jehan length in the Lahore fortress already mentioned. It has a circular establishing within the floor covered with the aid of a metal sheet to keep cold water. through blending hot and bloodless water of favored temperature, it turned into acquired within the tank.

The hammam of architectural design yet have many contrasting differences during the different period like roman, ottoman and in mughals. So Commonalities and contrasts are discussed in detail in the following paragraphs.

4.1.1 LAYOUT DESIGN

There are many common features of layout design. Shahi hammam of Shalimar garden follow more or less the same basic planning same as practice in mughals periods but it has contrasting features from roman and ottoman. Romans practicing more different spaces regarding their cultural and religious practice. By the time ottomans have less spaces than romans and in mughal there are normall five spaces in generic layout plan. As we can see it in Shahi hammam Shalimar garden. Hammam have *Rakhtkhana*, *Sardkhana* and *Garamkhana*. A separate enclosure is provided for furnace space or *Aatishdaan* . Also, the *Rakhtkhana* is the biggest and most decorated apartment of the bathhouses.

4.1.2 USAGE

Mughal hammam basically built to cater for the bathing facility of emperorship, the notable nobles, friends and foreign ambassadors of the court and were not open for general public of that particular period but some of them also built for community., these served different function

owing to their immediate connection to their locale. As *Shahi Hammam*, Shalimar Gardens, Lahore was constructed on a recreational resort away from the city and was more of a leisurely facility. It was a single story bathhouse serving females and males at different scheduled times. It was totally design only for leisure and pleasure facilities. But early ages hammam construction pattern was also similar to please the emperor and public but there is no restriction in their religion. So both male and female usage of baths at the same time but when it comes into ottoman because there were muslims that's why entrance and exist were separated as later on in Mughals.

4.1.2 DAY LIGHTING ARRANGEMENTS

Shahi Hammam, Shalimar Gardens, Lahore is an arrangement to invite more daylight. Terracotta lattice work *jallis* and rectangular slits in exterior wall above sightline from the exterior served this purpose. It was also to create a dramatic light effect through beams of light somehow same as the effect created by elephant's eyes in an Ottomam *Hammam*.

4.2 ACQUEDUCT ARRANGEMENT

The primary deliver to the garden became made by using the a hundred miles long Shah Nahar (Royal Canal), delivered from a factor near the village of Rajpur (Noor Pur), Extra supply turned into obtained from large wells one to the west and the alternative to the east of the first terrace. the one to the west, called Bara-Harta (Twelve wheeled). The eastern properly provided water to the Hammam via a masonry channel. The masonry channel, strolling along the eastern wall of the hammam, no longer only supplied water to the tepidarium reservoirs but additionally to a spacious water tank inside the south-eastern a part of the two locations with the aid of the stairs. the steps

and the round properly, proven within the plan of the hammam, The masonry channel takes its direction at the top of the peripheral wall and reaches the lowest terrace, much like the water channel of Bara-Harta at the west.

4.3 HYPOCAUST

Traces of the hypocaust system exist inside the hammam at Shalamar garden. it is within the eastern wall of the calidarium underneath the new water reservoir with the opening outdoor the garden, now nearly buried within the debris. The hypocaust became comparable within the feature and method to that the ground of the hammam and the floor are 3'7" apart. The hanging ground might have been supported by using brief piers at ordinary intervals.

4.4 MATERIALS AND DECORATIONS

4.4.1 MATERIAL OF HAMMAM

The royal hammam is constructed of small size bricks, the constructing material utilized in almost all of the Mughal duration structures. The tremendous use of brick is because of the non-availability of any form of stone around the metropolis. Kankar line is the bonding material. It has no independent western facade and the interior face of the eastern wall represents it. Above the dado, the façade has been divided through a cornice in panels, capped by way of battlemented merlons. Sunk in cusped arches of four unique dimensions in square panels beautify the higher panel. The lower panel, except the cusped arches, also includes four rectangular panels with rectangular slits for mild and clean air to the apartment. The square panels containing the ones slits have decorative terracotta lattice paintings. The attractive facade is unlike the extremely grim face of the hammam inside the Lahore fortress.

Now a days the whole indoors is lime plastered with strains of portay, in homosexual hues, that is the portayss of Sher Singh, the reputed heir of Ranjit Singh, who repaired those hammam but with reasonably-priced fabric.

The western parts of the three flats are blanketed with low spreading domes. the primary apartment

is domed in radiating guides of brick work on stalactite pendentives. The last two are easy form of domes, pendentive and domes are part of the equal sphere. The soffits of the chamber are completed off into small lozenge form and slightly concave goffers or lacunar popularly referred to as Ghalibkari work. Some of basic building materials are:

- I. Basic construction is done in small sized terracotta bricks.
- II. Roofs are domical with a very low profile.
- III. Passages have vaulted roofs.
- IV. Mortar used is *Kankar* lime.
- V. Surface plaster is *Pucca Kali* or lime plaster.
- VI. A part of the façade comprises of a beautiful recessed arch entrance flanked by blind arches on either side and topped by the sandstone balcony with perforated stone railing and the octagonal chamber behind. All of this composition is done in Agra red sandstone.
- VII. Perforated terracotta lattice work *Jallis* are installed in the exterior wall of *Rakhtkhana* and *Sardkhana* of *Shahi Hammam*, Shalimar Gardens, Lahore.
- VIII. Facets of cold and hot water inlets are hand carved in marble in lion head form, a beautiful sculptural form but there is no such virtuosity seen in the other bathhouse complex of mughals.

4.4.2 EXTERIOR DECORATIONS

Shahi Hammam, Shalimar Gardens, Lahore mainly plastered with is embellished with *Pucca Kali* it also has a vivid and aesthetically very rich exterior by addition of many other materials to add to visual pleasure. Exterior wall decorated with paneled blind arches, cornices, battlements,

merlons, terracotta lattice work *jallis* and Agra red sand stone part of façade make it much more aesthetically pleasing as compared to the other royal hammam.

4.4.3 INTERIOR DECORATIONS

Shahi Hammam, Shalimar Gardens, Lahore had used many variety of material at the time of construction as far as interior finishes are concerned. These are listed as given :

- I. *Pucca Kali* plaster is applied to the walls on the interior .
- II. Interior is painted with fresco work .
- III. Lozenge shaped stalactite work or *Ghalibkari* is seen on pendentives and soffits of domes .
- IV. Flooring was done in variegated marble patterns but unfortunately original flooring is not extant presently.
- V. Pendentives of domes, panels above dado and soffits of domes are profusely painted in fresco work.
- VI. Fountain basin is much more decorated.
- VII. Terracotta lattice work panels on the western wall are another distinctive feature of the overall interior.

4.5 SWOT ANALYSIS

STRENGTH	WEAKNESS
	<ul style="list-style-type: none">• Poor state of conservation & maintenance of building

<ul style="list-style-type: none"> • High cultural significance of hammam as reflected by world heritage status • Popularity with local & national visitors reflected in visitor numbers • National & international experts interested to proposed conservation improvement of building 	<ul style="list-style-type: none"> • Lack of on going research • Problematic management & funding procedure • Insufficient trained staff • Lack of community involvement in custodianship of hammam • Lack of economic benefits to the community from tourism
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> • Controlled use of site as an educational & performance venue • Research potential in building • Availability of local youth as guides 	<p>THREATS</p> <ul style="list-style-type: none"> • Insufficient custodial care • Environmental issue • Insufficient allocation & delayed release of funds

Chapter 5 RECOMMENDATIONS

It is recommended that in order to bring back the magnificence of Shahi Hammam the entire study has been conducted and the following conservation recommendations have been proposed in accordance with the ICOMOS charters. Guidelines have been taken from the International Charter for the Conservation and Restoration of Monuments and Sites (Venice Charter 1964) and International Cultural Tourism Charter (1999) for the promotion of tourist activities in the Shahi hammam Shalimar Garden, Lahore.

Restoration and conservation is a strategy that makes sure a longer existence for architectural inheritance. It is important to recognize the challenges on collective basis and possible solutions for the development of this process should be made to attain the aims of restoration and conservation. It is understood from the above discussion that conservation is a time taking process and immediate change will never happen. This research may result in further improvement in other historic hammam and will influence the authorities in a positive manner. Further study can be carried out to formulate the conservation strategy for the development of decaying old structures of hammam.

It is also recommended that for the promotion of heritage building after conservation building should be reopened for the visitors and building structure should be used for useful purposes. As in Lahore fort, royal kitchen recently conserved and used for different research meeting and conferences. As in Delhi gate, Shahi hammam used to exhibit culture of mughal and display of mughal discoveries during the excavation of the heritage building of hammam. So the Shahi Hammam of Shalimar garden re-opening could be economically beneficial for country too, as now in 2020 Pakistan also becomes great attraction for international visitors.

There are following key points on which basic, building will be in working condition for future approach.

There need to be planned keeps for the preservation and to prevent in addition decay of Shahi hammam, Shalimar garden. After understanding the reasons of deterioration of the constructing

the positive problem can be solved with in time by means of the intensity of the loss of the building. Work of maintains can be divided into five prominent points:

1. Immediate (few weeks)
2. Urgent(3 months)
3. Necessary (2-5 years)
4. Desirable (when Adequate funds are available)
5. Monitor (invariably)

5.1 IMMEDIATE (FEW WEEKS)

Cleaning of the monument Should be done promptly and the debris accumulated in the basement should be removed. Spider web, bird's nest and bee hives in monument should also be eradicated to restore the condition of the monument. Vegetation should be eliminated by spraying herbicides which not only destroy the Plants but also kill the seeds. Hence allowing no future plant growth in the near future.

Empty mortar joints should be cleaned of dust and dirt, then filled with Situation mortar by grouting .Loose marble pieces should be re-fixed using suitable mortar. The missing pieces can be replaced with new ones of tie same color and quality. Cracks and factures should be noted and recorded. Narrow cracks may be filled with hydraulic lime grout. wider may be filled With lime concrete.

5.2 URGENT (3 MONTHS)

source Of seepage in basement is capillary action from the NSL (natural soil level). The soil is directly intact with the wall Of the monument. In ancient structure there is no concept of DPC (damp-proof course) to resist moisture. Water-proofing treatment can be applied to prevent further seepage. By doing this, algae and salty patches on the walls of the basement can also be rectified ana controlled. Moreover, new pumalas should be provided appear. The wooden ceiling in the ground floor should be opened up and its internal condition should be notified and rectified

accordingly. Termite attack may have caused

internal damage to the ceiling which cannot be seen from the floor.

The removal of stickers, graffiti and other stains should be removed. Iron clamps and dowels should be periodically coated with epoxy.

Proper drainage system Should be installed to prevent accumulation of water in hammam.

5.3 NECESSARY (2-5 YEARS)

Rusting nails create expansion contraction problems which should be removed and the effected portion should be treated with suitable chemicals. Damaged jalties on the parapet of top floor have to be replaced and restored. In case of small pieces, gluing can be done.

Relative humidity (RH) at a given temperature is the percentage of moisture in the form of water vapor that is held in the air related to the maximum when air is saturated. Relative humidity are damaging to the contents of a building. It is higher in the basement & sub-basement. Humidity above 65% causes moulds and fungal rot. Humidity below 45% causes shrinking of timbers and brittleness. Thus, humidity level has to be maintained in

between these percentages. Special precautionary measures should be taken in monsoon season (July-September) as the humidity level approaches peak levels approaches peak level. Dehumidifiers based on electric power can be installed for this purpose.

Polymers are added to the cement binder in the ceiling of the basement in order to strengthen it. Cement mix is made containing Hi-bond (universal) and water for roof screenings. This mixture also the contains polymers. Deteriorated concrete cover can be repaired using this cement mix. Likewise, water proof Hi-bond (sealer) coating can be applied on the roof top floor to fill in the cracks and repair purposes.

5.4 DESIREABLE (WHEN ADEQUANTE FUNDS ARE AVAILABLE)

The damaged mirror work on the ceiling of the central room of the ground floor should be assessed and the missing mirrors replaced with new ones. The ceiling should be revitalized to its former

elegance and grace.

The inlay work need to be repaired With splendid care in an effort to ensure that the new stones in shape precisely and the edges of the prevailing work isn't scraped or chipped off. The broken designs of fish on the floor of podium can be repaired through this.

5.5 MONITOR (INVARIABLE)

Conservation treatment is not the final treatment of he monument. It is important that regular maintenance should be ensured and any problem observed should be removed on the spot otherwise it will create a big problem and possibly the original fabric will be lost.

Good watch and ward system can minimize pasting stickers and graffiti over the monument, which will either eliminate or reduce human vandalism activities to a great level.

The wooden ceiling in the ground floor not attended in the past need to be attended properly and it will ensure the removal of birds having nests there.

An inspection team should be formed which would regularly visit all the areas of the hammam and identify any further causes of decay. Moreover, it will also ensure that monument is impeccably maintained i e, cleaning, water drainage and debris removal from the building.

REFERENCES

1. Ali,A.(2001)*The Holy Qur'an*,,Hertfordshire:Wordsworth Editions ltd,(2001),21:83.
2. Williams,E. “Baths and Bathing Culture in the Middle East: The Hammam”, *The Met: Heilbrunn Timeline of Art History*.
3. Butt,A.(2018,September 7).*The Great Bath of Mohenjo Daro*,<https://www.gounesco.com/the-great-bath-at-mohenjo-daro/>.
4. Butt,A.(2018,September 7).*The Great Bath of Mohenjo Daro*,<https://www.gounesco.com/the-great-bath-at-mohenjo-daro/>.
5. (2018,July 21). “The Ancient Roman Baths”,<http://www.crystalinks.com/romebaths.html>.
6. Moss,P.1999, *Oxford History for Pakistan*,London:Oxford University Press.
7. Forbes,R.(1966). *Studies in the Ancient Technology*.Fagan:2002.
8. Caskey,J.(1999). "Steam and “Sanitas” in the Domestic Realm: Baths andBathing in Southern Italy in the Middle Ages," *Journal of the Society of Architectural Historians*.95-170.
9. (2018,July 21). *The Ancient Roman Baths*”,<http://www.crystalinks.com/romebaths.html>.
10. Moore,D.(1995). , “The Riddle of Ancient Roman Concrete” ,<http://www.romanconcrete.com/docs/spillway/spillway.htm> .
11. Yegul,F. 2010,*Bathing in the Roman World*. New York: Cambridge University Press.
12. Muslim,S.(2018,October 5) *The Book of Purification (Kitab Al-Taharah)*,” Hadith: 1, SUNNAH.COM, <https://sunnah.com/search/?q=Cleanliness+is+half+the+faith>.
13. Ali,A.(2001)*The Holy Qur'an*,,Hertfordshire:Wordsworth Editions ltd,(2001),5:6.
14. Smolijaninovaitè,K.(2007). , *A Study on Historic Hamams in Istanbul: Changing Aspects of Cultural Use and Architecture*,Cottbus.
15. Smolijaninovaitè,K.(2007). , *A Study on Historic Hamams in Istanbul: Changing Aspects of Cultural Use and Architecture*,Cottbus.
16. (2018,March 23).*Turkish Cultural Foundation*,<http://www.turkishculture.org/architecture/turkish-bath-96.htm>.
17. Godfrey Goodwin, *A History of Ottoman Architecture* (London: Thames and Hudson, 1971).
18. Ahmed,C. and Ali,S.(1964). *Tahqiqat-e- Chishti*.P.P.663-70.

19. Kamboh, M. and Yazdani, G. (1976). *Aml-e-Saleh*, Lahore: Majlis-i-Taraqi-i-Adab.
20. Murry, J. (1911) *A Handbook for Travellers in India, Burma and Ceylon*, London: J Murry .
21. Lahori, A. and Elliot, H. (1875). *Badshahnama*, trans. Henry Miers Elliot (Lahore: Hafiz Press, 1875).
22. Kamboh, M. and Yazdani, G. (1976). *Aml-e-Saleh*, Lahore: Majlis-i-Taraqi-i-Adab.
23. Latif, S. (1892). *Lahore: Its History, Architectural Remains and Antiques* (Lahore: Snag-e-Meel Publications).
24. Lahori, A. and Elliot, H. (1875). *Badshahnama*, trans. Henry Miers Elliot (Lahore: Hafiz Press, 1875).
25. Lion Press, L. (2009) *The UNESCO-Getty Foundation-Government of Punjab project, Conservation of Shalamar Garden*, 138-139.
26. Latif, S. (2005). *Lahore: Its History, Architectural Remains and Antiques* (Lahore: Snag-e-Meel Publications).
27. Fauzi, M. (2018, October 2). *Coupling thermal mass and water systems as urban passive design in hot climate*, [https://www.researchgate.net/publication/319352559_Coupling_thermal_ma
ss_and_water_systems_as_urban_passive_design_in_hot_climates](https://www.researchgate.net/publication/319352559_Coupling_thermal_mass_and_water_systems_as_urban_passive_design_in_hot_climates).

BIBLIOGRAPHY

- Ali, A. Y. (2001). *The Holy Qur'an*. Hertfordshire: Wordsworth Editions Ltd.
- Arquhart, D. (1850). *The Pillars of Hercules*. New York: Harper and Brothers.
- Bāqir, M. (1963). *Lahore, capital of the West Pakistan: an illustrated guide to places of interest with map*. Lahore: Panjabi Adabi Academy; [sole agents: Indus Pub. House].
- Caskey, J. (1999). *Steam and "Sanitas" in the Domestic Realm: Baths and Bathing in Southern Italy in the Middle Ages*. *Journal of the Society of Architectural Historians* , 95-170.
- Chaudhry, N. A. (2004). *A guide to Lahore fort*. Lahore: Sang-e-Meel Publications.
- Conservation of Shalamar Garden: The UNESCO-Getty Foundation-Government of Punjab project 2008-2009*. (2009). Lahore: Lion Press (Pvt) Limited.
- Fagan, G. G. (2002). *Bathing in Public in the Roman World*. Michigan: University of Michigan Press.
- Geoffrey (of Monmouth, B. o. (2007). *Historia Regum Britanniae*. Rochester: Boydell & Brewer.
- Goodwin, G. (1971). *A history of Ottoman architecture*. London: Thames and Hudson.
- Kamboh, M. S. (1967-72). *Amal-i Salih*.
- Khan, M. I. (1974). *Lahore Fort*. Lahore: Department of Archaeology & Museums, Government of Pakistan.
- Khan, M. W. (1973). *Lahore and Its Important Monuments*. (3, Ed.) Lahore: Department of Archaeology and Museums, Ministry of Education, Government of Pakistan.
- Koch, E. (2001). *Mughal Art and Imperial Ideology: Collected Essays*. Oxfordshire: Oxford University Press.
- Lahori, A. H. (1871). *Badshanama*. (H. M. Elliot, Trans.) Lahore: Hafiz Press.
- Latif, S. M. (2005). *Lahore: Its History, Architectural Remains and Antiquities*. Lahore: Sang-e-Meel Publications.
- Lundkhwari, A. M. (1974-1986). *Mughal Period Hammams in the City of Lahore*. *Pakistan Archaeology* , 10-22, 251-286.

Milstein, R. K. (1999). *Stories of Prophets: illuminated Manuscripts of Qasas al-Anbiya (Islamic Art and Architecture Series) (Vol. 8)*. Mazda Publishers Inc.

Moore, D. (1995). *The Riddle of Ancient Roman Concrete*. Retrieved August 18, 2018, from Romanconcrete.com: <http://www.romanconcrete.com/docs/spillway/spillway.htm>

Morris Hicky Morgan, V. P. (2015). *Vitruvius, the Ten Books on Architecture*. Bibliolife DBA of Bilibio Bazaar II LLC.

Rao, J. (2018, August 20). *Hot Water Bath Vs Cold Water Bath – Which One Is Better According To Ayurveda?* Retrieved October 4, 2018, from <https://www.stylecraze.com/articles/hot-water-bath-vs-cold-water-bath/#gref>

Rauh, C. R. (n.d.). *Roman Baths: Baths of Trajan*. Retrieved from CLCS 181: Classical World Civilizations: http://web.ics.purdue.edu/~rauhn/roman_baths.htm#stabian

Sahih Muslim: *The Book of Purification (Kitab Al-Taharah)*. (n.d.). Retrieved October 5, 2018, from SUNNAH.COM: <https://sunnah.com/search/?q=Cleanliness+is+half+the+faith>

Sajjad Kausar, M. B. (1990). *Shalamar Garden Lahore: Landscape, Form & Meaning (1 ed.)*. Department of Archaeology and Museums, Ministry of Culture.

Smolijaninová, K. (2007). *A Study on Historic Hamams in Istanbul: Changing Aspects of Cultural Use and Architecture*. Cottbus.

Taşçıoğlu, T. (1998). *Türk hamamı*. Istanbul: Unilever.

Turkish Cultural Foundation. (n.d.). Retrieved March 23, 2018, from <http://www.turkishculture.org/architecture/turkish-bath-96.htm>

Wescoast, J. (-B. (Ed.). (1996). *Mughal Gardens: Sources, Places, Representations, and Prospects*. Washington, DC.: Dumbarton Oaks.

Williams, E. (2012, 10). *The Met: Heilbrunn Timeline of Art History*. Retrieved 01 21, 2018, from https://www.metmuseum.org/toah/hd/bath/hd_bath.htm

yegül, F. (2010). *Bathing in the Roman World*. New York: Cambridge University Press.