



ANALYSIS OF DOMES IN TOMB ARCHITECTURE OF DELHI: EVOLUTION AND GEOMETRICAL TRANSITION

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ABSTRACT

The dome is a vital element and a prominent building feature in Islamic Architecture. This paper analyzes the geometrical and philosophical approach to the transition of two types of domes, i.e., square and octagonal base domes. The timeline and region selected for the work are from the 1420s to 1630s of the Indian subcontinent. During the period, it covers three dynasties: Sayyid Dynasty, Lodi Dynasty, and Mughal Dynasty, and their change of approach toward the shapes of domes according to the needs and availability of construction techniques at hand and other factors. Based on the comparison of the domes of four buildings, the evolution of domes and their need for transition is to be presented in this work.

KEYWORDS:

Domes; Square; Octagonal; Sayyid Dynasty; Lodi Dynasty; Mughal Dynasty; Sultanate Period

INTRODUCTION

The dome is one of the dominant features of Islamic architecture like minaret, mihrab, pulpit, etc, although, Domes were first used in the churches and temples, like in the Roman Pantheon. Historically, the construction of a roof was not a problem, but the problem was to build a roof that covers large spans. Over the period, the dome evolved from a roof to cover large spans to the king of roofs. As a roof, a dome not only covers large spans but also represents power and provides identity to the building. In Islamic architecture, the dome has played a prominent role since the early beginning of the Islamic era. The Umayyad ruler built the Holy Dome of the Rock Abdol Malek ibn Marwan between 687 and 691 A.D in Jerusalem, which may be the oldest dome in Islamic architecture [1]. Inspired by the dome, Muslims started to implement the dome as an element in major buildings like mosques, mausoleums, palaces, and more. Within the Indian region, the subject of this present work, there is a prominent evolution of dome form, from the style of perfect octagonal base domes of the Sayyid Dynasty to the perfect square base dome of the Mughal Dynasty.

RESEARCH METHODOLOGY

In this paper, a descriptive qualitative research method has been employed. The research methodology comprises observation, mapping, documentation, and referring to published documents. The study has been validated by the case studies. Further, an analysis of domes' evolution and design metamorphosis concerning geometrical transition in

tomb architecture in Delhi, India, has been presented.

EVOLUTION OF DOME IN ISLAMIC ARCHITECTURE

Domes in pre-Mughal India have a traditional square circular shape, with a lotus design and bulbous vertex at the top, derived from Hindu architecture. Because the arches are not involved in Hindu architectural traditional design, so, to achieve the design of the dome, the flat corbels were used to transition from the corners of the room to the dome, rather than squinches [1]. The typology of the mausoleum is intricate in itself. Still, the most basic idea of the mausoleum is that it provides a covered place over the grave. Covering has the chhatri, a single dome supported on pillars; those covering a square or octagonal area are the commonest, although the hexagonal plan is known [2]. In variation to Persian and Ottoman domes, the domes of Indian subcontinent tombs tend to be more bulbous in shape [3].

PHILOSOPHICAL APPROACH

Shapes play a prominent role in Islamic architecture, and each shape reveals its nature of work. The major role of Indian monuments in the Qur'anic references to paradise found in Islamic architecture has yet to be explained [4]. In the same manner, what is known or considered in the context matters the most? For instance, the star is regarded as a symbol of the spread of Islam. Similarly, the circle is considered a symbol of heaven based on the shape of the base of the dome of the Rock, where the Prophet Muhammad (PBUH) ascended to heaven.

Similarly, the octagon is considered close to

heaven as something in ascending phase; on the other hand, the square is considered to be more of worldly nature and materialistic. The idea of these shapes comes into play when these shapes are applied to a building. Mosques of the Indian subcontinent used star shapes in their jail work and arabesque patterns that show Islam's spread in the sub-continent during that period. Similarly, most of the tombs before the Mughal dynasty had a dome with an octagonal base, like the tomb of Mubarak Shah during Sayyid Dynasty. Since the Mughal Dynasty, there has been an evolution in the shape of the base of domes from the previous shape, the octagonal base. The buildings during the Mughal period used square shapes; in the Humayun Tomb, the base is square, but the all-over plan resembles an octagon which even adds deeper meaning to it. The Mughal architects are believed to use the astrolabe (an instrument formerly used to make an astronomical measurement) for site surveys, site analysis, and measurements of building heights during the whole process of construction [5]. As the timeline moved further, the Mughal moved to a perfect dome with a square base platform in the tomb of Itmad-Ud-Daulah.

GEOMETRICAL APPROACH

In architecture, the dome is a vaulted roof having a circular, polygonal, or elliptical base [6]. From the architectural point of view, many types of domes were used frequently almost in the Indian sub-continent like a spherical dome, onion dome, onion pointed dome, shallow pointed, perfect hemispherical pointed, and perfect hemispherical dome. Mathematically, every dome is 3600 rotations of a segment through its periphery (Figure 1). In the case of Mubarak Shah, the shape of the dome is perfect hemispherical pointed, while the Humayun tomb is a double dome. The double-shelled domes are the type in which the span between the two shells of the dome is slighter, and they are usually attached up to the place of praying. Iranian architects could make this structure at the beginning of the fifth century with their innovation that evolved later in the seventh and eighth centuries [7]. However, the shape of the double-shelled dome is Bulbous from the outside and the inside; it is an incomplete hemisphere in the case of the Humayun Tomb and tomb of Itmad-Ud-Daulah. It has an entirely different dome shape that is somewhat near the square.

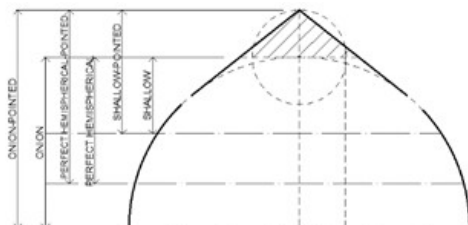


Figure 1. Geometrical classification of Domes (Authors)

MATERIAL APPROACH

The material is an important aspect of achieving the shape of the dome [8]. In the case of Mubarak Shah, the material used is entirely red stone.

In the case of the Humayun Tomb, the material for the inside of the dome is the red stone to achieve proportionate height concerning the surroundings, while to achieve a full semicircle from the outside, marble cladding is done from the outside as it is also known as double dome and the first building in Indian subcontinent to achieve complete semicircle. In the case of the tomb of the Itmad-Ud-Daulah, the material used for the dome is marble inside and outside so that the shape of the dome achieved is near the square in appearance.

TRANSITIONAL ZONE APPROACH

The transitional zone is where the dome is rested, also called the drum, and it is one of the problems faced by the architects of the old days of how to transform the square top of the cube into the circle where the dome is rested [9]. As the dome evolves more and more, the solution is evolution, because of aesthetic reasons, the architects hollowed the transitional zone by applying two basic techniques: squinches and pendentives. Squinch is a technique to carry support across the corner of a room under a superimposed mass, which allows the architect to change the square plan of the transitional zone to octagonal. The pendentive is a concave triangular member which supports the dome from the bottom over a square shape so that the dome can achieve its circular shape. The reason behind the evolution of domes in the Mughal period is because architectural space and decoration seem to have been flexible commodities in early Mughal buildings, adaptable to many and diverse purposes [10].

CASE STUDY 1: TOMB OF MUBARAK SHAH, NEW DELHI, INDIA

The Tomb of Mubarak Shah was constructed in 1434 AD; it is known as one of the finest examples of the Sayyid Dynasty architectural styles that depict octagonal-shaped designs, which can also be seen in the design of the tomb of Adham Khan (Figure 2). Mubarak Shah's Tomb was once surrounded by a wall enclosed by an octagonal-shaped courtyard flanked by gates. However, today only the southern and western gates survive while the walls have disappeared. The entrance is survived by the southern gate only, which invites into an octagonal-shaped hall pierced with arched openings on three sides as the fourth side, which is the western portion, is depicted with a 'mihrab' showing the qibla



Figure 2. Tomb of Mubarak Shah at New Delhi, India (Authors)

HISTORY

The founder of the Sayyid Dynasty was Khizr Khan (1414-1421) [11]. Mubarak Shah was an accomplished emperor of the Sayyid Dynasty. He planned to build a city known as Mubarakabad on the bank of the river Yamuna. Unfortunately, on the same site where he was constructing the new town, he fell victim to a conspiracy under the leadership of wazir – Sarwar-Ul Mulk and was murdered in 1433 A.D. The sultan's body was moved to Kotla Mubarakpur and was buried inside a tomb named after him as his tomb is similar to his son, Muhammad Shah, situated in the Lodi Garden. The buildings during the Sayyid Dynasty are mainly the tombs of the departed rulers. It was carefully designed and conscientiously constructed.

Architecture during the Sayyid Dynasty is apprehended and defined as the quality of art and craft that prevailed during that period. The construction of monuments was eased during the Tughlaq dynasty. Due to the inheritance of a greatly weakened state treasury, they were not able to construct monumental buildings. Because of that, their desire for architectural construction was approached in small tombs and mausoleums built throughout Delhi. The architecture pattern during the Sayyid dynasty was therefore restricted to tombs and sculptors only. The architecture during Sayyid had little influence on the cities where they ruled. Whatever they created replicated the broken spirit of the rulers of both the dynasties. No famous building arts, capital cities, imperial palaces, and fortresses were named under their regime at Delhi. Not only that, but they were also not ascribed to any mosques or colleges. During the entire rule of Sayyid, they constructed several monuments as memorials of the dead. This architectural period of tomb construction during the Sayyid Dynasty was known as the period of the macabre (probably derived from maqbara in Arabic). A large number of tombs were constructed around the capital during this period. The three royal tombs of Mubarak Sayyid and Muhammed Sayyid reflect the architecture during the Sayyid Dynasty. Apart from the tomb of Mubarak Shah, other monuments of the Sayyid and Lodi Dynasties in Delhi are Bara Khan Ka Gumbad, Chota Khan Ka Gumbad, Shish Gumbad, Bara Gumbad, Tomb of Shihab-Ud-Din Taj Khan, Poli Ka Gumbad and Dadi Ka Gumbad [12].

PLANNING

The Sayyid Dynasty introduced the concept of octagonal form plans moving from the square plans under the Tughlaqs. The tomb follows the octagonal plan and has a double wall. The outer wall of the tomb chambers serves as the inner wall of the verandas. There are seven openings in the middle of each side except for the west, which is closed for the mihrab. These openings are framed by pilasters supporting brackets and lintels that support the arches. While the southern opening serves as an entrance to the tomb chambers, the rest have beautifully carved jaalis (Figure 3). The space between the lintel and the apex of the arch is also filled with jaali.

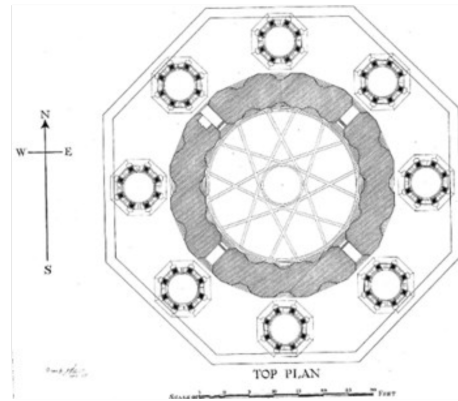


Figure 3. Top Plan of Mubarak Shah's Tomb [12]

Above the door, the plan changes from octagon to Hexa-decagon by using arches framed in rectangular panels (Figure 4). Four of them serve as the arched windows in stone openwork, and over them are bands of inscription and other decorative motifs. All these elements contribute to a subtle transition of a plan from octagonal to circular, then the dome. Its decoration is pretty much like the tomb of Feroz Shah Tughlaq. The dome's soffit is plastered and adorned with intersecting arch motifs (Figure 5).

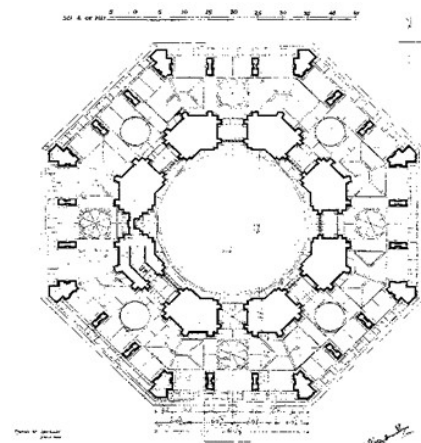


Figure 4. Plan of Mubarak Shah's Tomb [12]

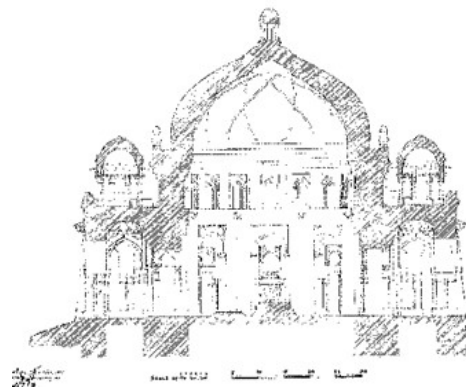


Figure 5. Section of Mubarak Shah's Tomb [12]

MATERIAL USED

The main material used in the tomb of Mubarak Shah is red sandstone. The cladding is done mostly with red sandstone and black marble. These materials have also been used for ornaments purpose. The Inscriptional arts, paintings, and calligraphy are done with colored marble or painted plasters. Red bands on the ceiling of the tomb chamber, incised plaster ornamentation on the verandah ceiling, and red sandstone jaalis. The walls are Random rubble masonry; the floor and roof have stonemasonry.

ARCHITECTURAL ELEMENTS

The Mubarak Shah Tomb is built in the Indo-Islamic style of architecture. The tomb is a fusion of the Tughlaq Dynasty showing architectural features resembling the dynasty. It has buttresses like that of the Tughlaq Dynasty, as each buttress can be found on each vertex of the octagon. Also, the guldastas are constructed on the corner along with chajjas stone. Chhatris are present on the roof at the angle of the tomb.

CASE STUDY 2: TOMB OF SIKANDAR LODI, NEW DELHI, INDIA

The Tomb of Sikandar Lodi was constructed in 1518 AD. It is known as one of the finest examples of the Lodi Dynasty architectural styles that depict octagonal-shaped dome platform designs, which can also be seen in the design of the tomb of Mubarak Shah. Sikandar Lodi's Tomb is surrounded by a square garden enclosed by high walls. In this enclosed precinct, an honored setting is created with a wall mosque on the west and the south, a gateway with outwork (Figure 6). The mausoleum is considered the first garden tomb in the region, and also, the tomb is India's pilot surviving enclosed garden tomb.



Figure 6. Tomb of Sikandar Lodi at New Delhi, India (Authors)

HISTORY

The founder of the Lodi Dynasty was Bahlul Khan Lodi (1451-1526), when he replaced the Sayyid Dynasty [13]. Sikandar Lodi is the second son of Bahlul Khan Lodi; He was an accomplished ruler. He founded many cities and townships during his reign, including Agra, which was later directed towards shifting the capital from Delhi to Agra. The tomb of Sikandar Lodi

was built by his son Ibrahim Lodi during 1517-1518 [14]. Sikandar Lodi, during his reign, was the Sultan of Delhi, and after his death, his son commemorated the tomb of Sikandar Lodi, inspired by the tomb of Mubarak Shah.

PLANNING

The Tomb of Sikandar Lodi was an octagonal tomb like those of the previous Sayyid Dynasty, Muhammad Shah and Mubarak Shah, surrounded by a verandah and an octagonal chamber in the center. Each side of the verandah was pierced by three arches, and the angles were occupied by sloping buttresses (Figure 7). The visible difference between the tomb of Sikandar Lodi and Mubarak Shah is that the chhatris over its roof have disappeared.

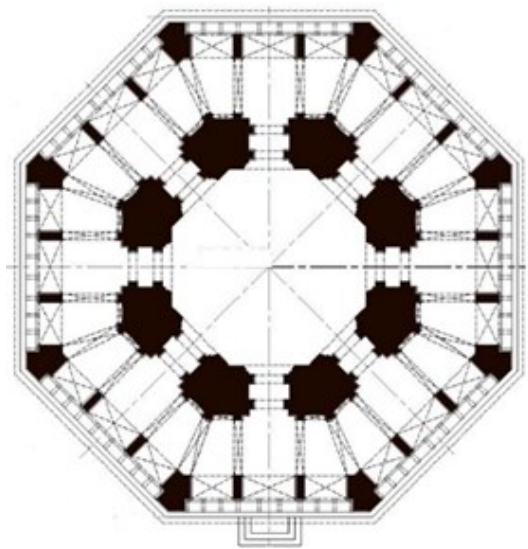


Figure 7. Plan of Sikandar Lodi's Tomb [15]

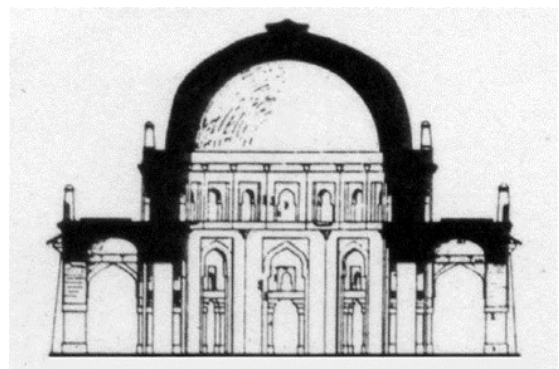


Figure 8. Section of Mubarak Shah's Tomb [16]

As noticed in the section, the dome of Iskandar Lodi's Tomb is composed of a single shell [17]. Although some historians also consider the tomb of Sikander Lodi to be the first double-shelled dome which can be seen through the hole in the dome in Figure 8, the current documentation does not consider this, and the loftiness in the dome is also not shown through current documentation [18]. Maybe it is also

the damage brought upon the monument over time. Also, the dome is crowned with a lotus finial at the top.

MATERIAL USED

The main material used in the tomb of Sikandar Lodi is red sandstone. Also, the inner and outer shell of the dome is done with brick masonry. It is also decorated with various colors of glazed tiles.

CASE STUDY 2: TOMB OF ITMAD-UD-DAULAH, AGRA, INDIA

The tomb of Itmad-ud-Daulah is located on the right bank of the Yamuna River. A mausoleum is placed in a large cross-shaped garden crisscrossed by water courses and walkways. The mausoleum covers about 23 m² and is built on a square base of about 50 m² and about one meter in height. On every corner of the mausoleum, there are hexagonal towers, and each hexagonal tower is about 13 meters tall (Figure 9).



Figure 9. Tomb of Itmad-Ud-Daulah (Authors)

The tomb walls are made up of white marble from Rajasthan that is decorated with a semi-precious stone. Light probe into the tomb's interior through delicate jali screens of artfully carved white marble. The interior decoration of the tomb is contemplated by many to have inspired that of the Taj Mahal, which was built by her stepson, Mughal emperor Shah Jahan [19]. Many of Nur Jahān's relatives are buried in the mausoleum. The unbalanced feature of the entire complex is the memorials of Nur Jahān's father and mother have been set alongside one another; a formation is also transcribed in the Taj Mahal.

HISTORY

Itmad-Ud-Daulah has a special place in the annals of both histories as well as architecture. This is precise because Itmad-Ud-Daulah is the first tomb in India entirely made out of marble. The Tomb of Itmad-Ud-Daulah is a mausoleum that overlooks the River Yamuna. It is a tomb of Mir Ghiyas Beg, a minister in the court of Shah Jahan. The tomb of Itmad-Ud-Daulah is designed as interesting as the person's life for whom it was built. Mirza Ghiyas-ud-din (later known as Itimad-Ud-Daulah) was a poor merchant and lived in Persia (modern-day Iran). His wife gave birth to a daughter whom he wanted to renounce for as he had no money to feed her but the persistent wails of the infant changed his heart. The baby girl brought good luck to her parents, for Ghiyas Beg found a caravan that took him to the court of the great Mughal Emperor Akbar.

After Akbar died in 1605, his son Jahangir became the Mughal emperor, who, as an emperor, made Ghiyas Beg his chief minister or wazir. Ghiyas Beg was also honored with the title of Itmad-Ud-Daulah, or the pillar of the state for his work.



Figure 10. Entrance to Tomb of Itmad-Ud-Daulah (Authors)

Jahangir fell in love with his widowed daughter, who possesses an aura of unspeakable beauty. She was later known as Noor Jahan. She went down in history as one of the world's most beautiful and artistically gifted women. Noor Jahan ordered the tomb after her father's death in 1622, later known as the Tomb of Itmad-Ud-Daulah. Itmad-ud-Daulah's Tomb is a pure white and elaborately carved tomb that shadows the Islamic style of architecture [20]. Indo-Islamic architecture becomes prominent in the region because of the fusion of this tomb's architectural styles (Figure 10). While the use of arched entrances and octagonal-shaped towers signifies the Persian influence of the building, on the other hand, the absence of a circular dome and the presence of a square shaped closed kiosk on top of this building, and the use of canopies talk about the possible Indian influence. From the outside, when you take a birds-eye view, Itmad-Ud-Daulah looks like a jewel box set in a garden. This reposeful, small garden located on the banks of the Yamuna was to inspire the construction of the Taj Mahal in the later years.

PLANNING

The square tomb, measuring approximately seven meters per side, has four round turrets crowned with chhatris (small domed kiosks) rising from engaged octagonal bases at each corner. A square pavilion above the roof having finely perforated marble screens forms the upper story. Remarkable for the charm and harmony of its design, the tomb is an architectural achievement of a high order. Still, its architectural character is overshadowed by its exquisite pietra dura in precious stones over its whole surface [21]. Along the roofline of this story, between these turrets, was placed a carved marble balustrade to enclose the created roof terrace. The square planning of tombs is followed under Tughluq's. The main mausoleum is in the center, and other than that, there are four other mausoleums placed at for corners of the square (Figure 11).

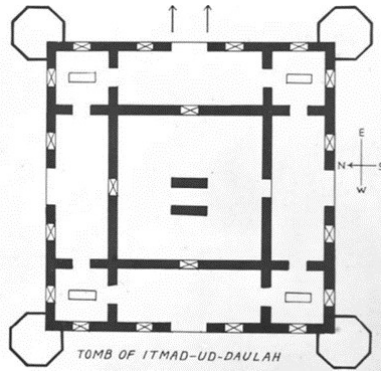


Figure 11. Square Plan of Tomb of Itmad-Ud-Daulah [22]

MATERIAL USED

The main material used in the Itmad-Ud-Daulah is White Marble, Black Onyx, and Semi-Precious Stones Marble. The base of the tomb is of red stone.

ARCHITECTURAL ELEMENTS

The tomb, situated on the eastern bank of the river Jamuna, is planned in the center of a Char- Bagh (four quartered garden) with the usual enclosing walls and side buildings. The main tomb of white marble is precisely set in the center of this garden. It stands on a plinth of red stone about one meter high and a lotus tank with corners in the middle of each side, facing the central arch. The most important aspect of this tomb is its peculiar ornamentation. The beautiful floral emblematic arabesque and geometrical designs have been depicted on the whole exterior in inlay and mosaic techniques, in various pleasing colors. The tomb of Itmad-ud-Daula is a masterpiece of the new dome class of Mughal Tombs. The first building is finished with white marble and marks the transitional phase from red stone to white marble (Figure 12).



Figure 12. Front view of Tomb of Itmad-Ud-Daulah (Authors)

CASE STUDY 3: HUMAYUN TOMB, NEW DELHI, INDIA

Humayun's tomb is the tomb of the second Mughal Emperor Humayun in Delhi, India. The tomb was commissioned by Humayun's first wife, Empress Bega Begum, in 1558 and designed by Mirak Mirza Ghiyas and his son, Sayyid Muhammad, who are Persian architects chosen by her. It was the first garden tomb on the Indian subcontinent and is located in Nizamuddin East, Delhi, India, close to Purana Qila (Old Fort), which Humayun found in 1533. The Humayun Tomb is a massive red-stone and white marble structure built around a rubble core that rests

on a large plinth, made up of fifty-six cells containing more than one hundred gravestones, in the center of an enclosed garden [23]. The central dome has a core of brick, which is present in the later stripped tomb of Khan-i-Khanan [24]. The plinth of the structure is 6.5m tall and 99m wide. The elongated drum and dual drum of the monument tower are 42.5 m above the ground (Figure 13).

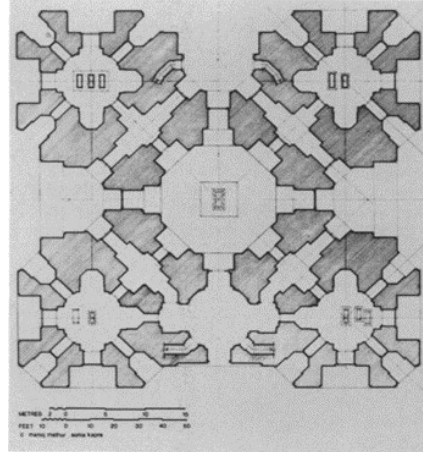


Figure 13. Humayun's Tomb First-floor Plan [6]

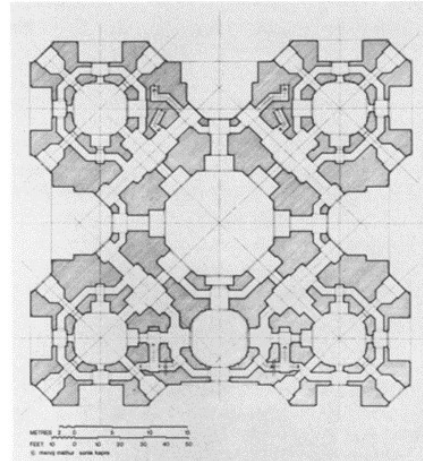


Figure 14. Humayun's Tomb Second-floor Plan [6]

PLANNING

Although the tomb is essentially square, its corner is chamfered to appear to be an irregular octagon. The mausoleum comprises four unique octagonal units separated by four recesses, one of which, in the center of the southern facade, is the entrance. From the outside, the monument appears as a large series of flat surfaces punctuated by recesses of varying sizes organized around a central dome (Figure 14). Other than the Humayun Tomb in the whole history of Mughal Architecture, the most outstanding and ingeniously planned octagonal building is the mausoleum of "Anarkali" at Lahore, completed in 1615 [7].

MATERIAL USED

White Marble, Red Sandstone, Persian Glazed Tile on Chatri Domes, Marble Jali Screens, and Iron Clamps are used in Humayun's Tomb [25]. Along with

red and white stone, grey stone with all edges in red stones is used on the entries.

ARCHITECTURAL ELEMENTS

Size is not the only symbolic aspect of the mausoleum. Its radially symmetrical plan, double dome, high drum, complete semi-circular shape from the outside, and construction materials also have important associative functions. An arch to a gateway is shown with two piers of bricks and a timber lintel to support the centering used to construct the structural arch [26]. The double dome of Humayun's tomb was chosen for two purposes. The inner dome was selected for the graceful appearance of the building. Besides, the outer dome looked at the huge view of the building (Figure 15). Placed on a high plinth, the mausoleum is set at the center of Charbagh Garden [27]. The focal octagonal chamber lodging the false tombstone over this fundamental funeral home is an octagonal structure ascending on the top of the second stage, at around 14.1 meters [6].



Figure 15. Humayun's Tomb in New Delhi (Authors)

DISCUSSION

APPLICATION OF DOME IN INDIAN SUBCONTINENT

In the Indian sub-continent, domes were majorly used for the roofing tombs. However, many dome mosques in the sub-continent spread the idea of the dome in the Indian region to represent religion. Due to that, it is mostly applied to the tombs. The tomb in itself is considered not only a holy place in the Indian region but also represents a final resting place of an important person and the power of the person.

EVOLUTION OF DOMES

The earliest monumental example of having a dome roof suggests that the dome requires heavy continuous circular walls for support, for example, the pantheon; because of these heavy walls, engineers were able to create niches in the wall. Similarly, with the advancement of technology among the architects of the Islamic era, the definition of load and achieving the perfect shape of the dome also changes. From heavy pillars provided in the octagonal dome of the tomb of Mubarak Shah to the loftiness in the dome of Sikander Lodi and double-shell dome of Humayun Tomb, and the square shape of the dome in the tomb of Itmad-Ud-Daulah, domes evolve. As in the

timeframe of the work, all four domes have hollow internal for an aesthetic reason also to achieve the circular shape, and height, pendentive, and squinches are also used.

COMPARATIVE ANALYSIS OF DOMES

Below is a table that compares the domes of Mubarak Shah, Sikandar Lodi, Humayun Tomb, and the tomb of Itmad-Ud-Daulah based on characteristics such as base shape, dome shape, the material used, and completion year to understand the evolution. Comparative analysis needs to understand the basic differences between different typologies (Table 1).

Table 1. Comparative Analysis of Domes in Tombs of Delhi (Authors)

Character-istics	Mubarak Shah Tomb	Tomb of Sikandar Lodi	Humayun Tomb	Itmad-Ud-Daulah Tomb
Base Shape	Octagonal	Octagonal	Square	Square
Dome Shape	Three centered	Three centered	Bulbous	Square
Dome Shell	Single	Single	Double	Single
Material	Red sand-stone	Mostly Red sandstone	Red sand-stone & marble	Marble
Comple-tion Year	1434	1518	1570	1628

REASON BEHIND THE EVOLUTION OF DOMES

The main reasons behind the evolution of domes in the Indian sub-continent over almost 200 years are materials is achieving the perfect shape, using the less internal column to make large space inside, and many more. For instance, the tomb of Mubarak Shah has only red stone and requires heavy pillars for the support of the sanctuary. On the other hand, the tomb of Sikander Lodi is the first step and initial representation of a double dome, although it is not achieved in it. While the Humayun Tomb has the first dome which achieves a complete semicircle in the region, it uses different materials on both sides to achieve proper internal spaces. The tomb of Itmad-Ud-Daulah has no internal column because of less load. The dome is complete of marble and achieves a square shape, which is also the fusion of two architectural styles and is beautiful from an architectural perspective.

CONCLUSION

There are many methods to cover a space. The dome is one of the oldest and most distinguished methods. Although it is an ancient technology, it continues to evolve more and more. And because of this evolution, the span of space pans from a few meters to a few hundred meters. For many years, architects have faced the problem of how to transform

the shape of the base, also known as the transitional zone, to create a better proportionate area inside, and fewer load walls are to be used for support. The dome in the Indian subcontinent faces evolution in shape, size, and appearance of the dome. As in India, some domes are perfect onion-shaped, complete semi-circular, which are very difficult to find in many regions. However, the evolution is not only limited to shape, size, and appearance but also changes the functionality of the building. Although modern material and construction systems can allow various methods for supporting a dome, architects still prefer the old way of squinches and pendentives in the traditional zone, even if it's constructed with new material like concrete.

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