

A Comprehensive Study of Evolution of Domes in Indo- Islamic Architecture

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Abstract—*Indo-Islamic architecture is the architecture of the Indian subcontinent produced for Islamic patrons and purposes. Both the Delhi Sultans and the Mughal dynasty that succeeded them came from Central Asia via Afghanistan, and were used to a Central Asian style of Islamic architecture that largely derived from Iran. The types and forms of large buildings required by Muslim elites, with mosques and tombs much the most common, were very different from those previously built in India. Islamic buildings initially had to adapt the skills of a workforce trained in earlier Indian traditions to their own designs. Unlike most of the Islamic world, where brick tended to predominate, India had highly skilled builders very well used to producing stone masonry of extremely high quality. As well as the main style developed in Delhi and later Mughal centres, a variety of regional styles grew up, especially where there were local Muslim rulers. By the Mughal period, generally agreed to represent the peak of the style, aspects of Islamic style began to influence architecture made for Hindus, with even temples using scalloped arches, and later domes. This was especially the case in palace architecture. A dome is an architectural element that resembles the hollow upper half of a sphere. The precise definition has been a matter of controversy. There are also a wide variety of forms and specialized terms to describe them. The paper talks about the evolution of domes in Indo-Islamic architecture.*

Keywords: *Indo-Islamic architecture, local material and builders, dome, evolution.*

1. INTRODUCTION

In the seventh and eighth centuries CE, Islam spread towards Spain and India. Islam came to India, particularly, with Muslim merchants, traders, holy men and conquerors over a passage of six hundred years. Although by the eighth century CE, Muslims had begun to construct in Sind, Gujarat, etc., it was only in the early under the Delhi Sultanate, established after the Turkish conquest of northern India. By the twelfth century, India was already familiar with monumental constructions in grandiose settings. Certain techniques and embellishments were prevalent and popular, such as trabeation (brackets, pillars and lintels) to support a flat roof or a small shallow dome. While arches were shaped in wood and stone, these were unable to bear the weight of the top structure. Now, however, the archuate form of construction was introduced gradually in which arches could support the weight of the

domes. Such arches needed to be constructed with voussoirs (series of interlocking blocks) and fitted with keystones. The domes, resting on pendentives and squinches enabled spanning of large spaces leaving the interiors free of pillars.

A noteworthy aspect of these migrations and conquests was that Muslims absorbed many features of local cultures and traditions and combined them with their own architectural practices. Thus, in the field of architecture, a mix of many structural techniques, stylized shapes, and surface decorations came about through constant interventions of acceptance, rejection or modification of architectural elements. These architectural entities or categories showcasing multiple styles are known as Indo-Saracenic or Indo-Islamic architecture. Muslims thought of only one with Muhammad as their Prophet. Muslims, forbidden to replicate living forms on any surface, developed their religious art and architecture consisting of the arts of arabesque, geometrical patterns and calligraphy on plaster and stone. In spite of the obvious Saracenic, Persian and Turkish influences, Indo-Islamic structures were heavily influenced by prevailing sensibilities of Indian architectural and decorative forms. A lot depended on the availability of materials, limitations of resources and skills and the sense of aesthetics of the patrons. Although religion and religiosity were very important to people of medieval India, as elsewhere, they borrowed architectural elements liberally.

2. CATEGORIES OF STYLES:

The study of Indo-Islamic architecture is conventionally categorized into the Imperial Style (Delhi Sultanate), the Provincial Style (Mandu, Gujarat, Bengal, and Jaunpur), the Mughal Style (Delhi, Agra, and Lahore) and the Deccani Style (Bijapur, Golconda). In all these styles of architecture the major feature of architecture was Dome. During the period of time of various rulers the Islamic dome got its form and proportions. This style of construction incorporated not only certain new modes and principles but reflected also the religious and social needs of the Muslims. The Muslim style of construction was based on arches, vaults and domes, on

columns and pyramidal towers or slender spires, called *trabeate*.

Islamic rule introduced domes with iron dowels and cramps. Centering was made from timber and bamboo. The use of iron cramps to join together adjacent stones was known in pre-Islamic India, and was used at the base of domes for hoop reinforcement. The synthesis of styles created by this introduction of new forms to the Hindu tradition of *trabeate* construction created a distinctive architecture

Domes in pre-Mughal India have a standard squat circular shape with a lotus design and bulbous finial at the top, derived from Hindu architecture. Because the Hindu architectural tradition did not include arches, flat corbels were used to transition from the corners of the room to the dome, rather than squinches. In contrast to Persian and Ottoman domes, the domes of Indian tombs tend to be more bulbous.

The earliest examples include the half-domes of the late 13th century tomb of Balban and the small dome of the tomb of Khan Shahid, which were made of roughly cut material and would have needed covering surface finishes. Fig. 1 shows the Alai Darwaza, a gate in the Qutb complex built in 1311, has the first dome in India made of finely dressed stone cut into *vousoir* blocks. Arches transition a square chamber to an octagon, which transitions to a sixteen-sided polygon through the use of corbelled brackets. The cut stone dome over the tomb of Ghiyath al-Din Tughluq uses alternating rings of shallow and deep stones to produce a better bond with the core material. The use of finely cut stone *vousoirs* for these domes suggests the migration of masons from the former Seljuk Empire.

Domes from the late 14th century use roughly shaped stones covered in render, due to the dispersal of skilled masons following the movement of the capital from Delhi to Daulatabad and back again. Examples include the Khirki Masjid (c. 1375) and the tomb of Firoz Shah (d. 1388). The domed tomb of Khan-i-Jahan Tilangani (1368) is generally referred to as "the first octagonal tomb in Delhi with the domed central chamber surrounded by an ambulatory verandah with three arched openings on each facet", although it is predated by the tomb of Zafar Khan.



Fig. 1: Dome at Alai Darwaza

Lodi Dynasty: Under the Lodi dynasty there was a large proliferation of tomb building, with octagonal plans reserved for royalty and square plans used for others of high rank, and the first double dome was introduced to India in this period. There are multiple candidates. The tomb of Sikander Lodi was built from 1517 to 1518 and is cited, although the tomb of Sikander Lodi clearly has a double dome, with a distinct space between inner and outer shells, the earlier tomb of Shihab-ud-din Taj Khan (1501) has "an attempt in this direction". Although double domes had long been used in Persia, Iraq, and western Asia, Indian domes prior to this time domes had a single shell of stonework. Afterward, most of the large domes were built with two shells in order to preserve good proportions in both the interior and exterior. Fig. 2 shows the tomb of Mohammed Adil Shah (d. 1656) in Bijapur is one of the largest masonry domes in the world. Called the Gol Gumbaz, or Round Dome, it has an internal diameter of 41.15 meters and a height of 54.25 meters.

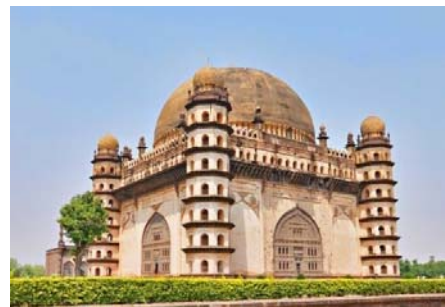


Fig. 2: Dome of Gol Gumbaz, Bijapur

The dome was built with layers of brick between thick layers of mortar and rendered on both faces, so that the dome acts as a concrete shell reinforced with bricks.

Mughal Dynasty: The first major Mughal building is the domed tomb of Humayun, built between 1562 and 1571 by a Persian architect. The central dome likely has a core of brick, as can be seen in the later stripped tomb of Khan-i-Khanan. The central dome is faced with marble blocks in attached to the core by alternating wide and narrow layers and there is evidence of the use of iron cramps to secure them. Iron cramps may also help form a tension ring at the base of the dome. The central double dome covers an octagonal central chamber about 15 meters wide and is accompanied by small domed *chattri* made of brick and faced with stone. Smaller domes were widely made with rectangular bricks beginning in the 16th century, the necessary curvature being created by tapering the mortar joints.

Fig. 3 shows the most famous dome is at Taj Mahal Agra. The central double dome covers a diameter of 22 meters. The inner dome is three meters thick and over 30 meters below the outer dome. The outer dome rests upon drum walls five meters thick. The fusion of Persian and Indian architecture can be seen in the dome's shape: the bulbous shape derives from Persian

Timurid domes, and the finial with lotus leaf base is derived from Hindu temples. The inner dome has a decorative triangulated pattern modeled after plaster mold work, but here carved in marble.



Fig. 3: Dome of Taj Mahal, Agra (Onion dome)

The last major Islamic tomb built in India was the tomb of Safdar Jang (1753–54). It is a brick structure clad in sandstone and marble stripped from the earlier tomb of Khan-i-Khanan (d. 1627). Shallow brick domes cover the perimeter chambers of the building, and the central dome is reportedly triple-shelled, with two relatively flat inner brick domes and an outer bulbous marble dome, although it may actually be that the marble and second brick domes are joined everywhere but under the lotus leaf finial at the top.

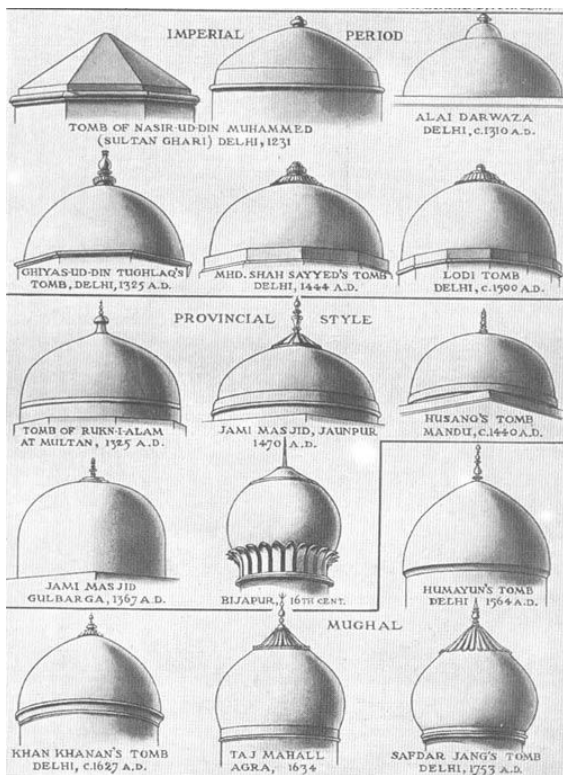


Fig. 4: Evolution of domes

Evolution of dome involved various decorative elements which were added to dome to give different architecture character to it. Fig. 5 shows the dome at Taj Mahal Agra decorated with lotus decoration and finial at the top.

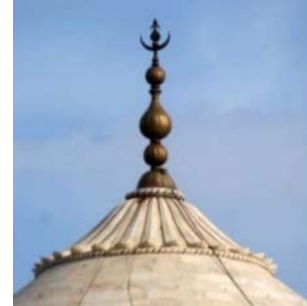


Fig. 5: Dome with finial and lotus decoration at Taj Mahal, Agra

Most mosques in India also feature one or more domes, called qubba in Arabic. While not a ritual requirement like the mihrab, a dome does possess significance within the mosque—as a symbolic representation of the vault of heaven. Thus, the dome in Indo-Islamic architecture has evolved during years of experimentation. It started with small brick domes from imperial style to double domes of Taj Mahal with inner and outer domes. These years of development gave a huge impact in the techniques and form of dome. Thus, giving a different architecture style as a whole in India.

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