ABSTRACT

The minaret is one of the first creations of man's architecture, which dates back to the prehistoric pillars on which were inscribed the codes of various cultures. The term minaret is derived from the Arabic manāra, or manārat (or manār as the root for minar), which in turn is taken from nār (fire). The term thus means a lighthouse or place where fire burns or light shines. In Persia the term mīl was used instead of manāra. Monumental round pre-Islamic mīls, and later Islamic minarets, in Persia were significantly different from the room-like towers that evolved in the Mediterranean and European countries. Persian round minarets prevailed as the standard form of minaret in territories that were under Persian influences. East Persian minarets assumed a combination of a cylindrical superstructure and a square or polygonal lower basement. Finally, the cylindrical form alone became commonest in Persia. Persia minarets were the first to be crowned with a balcony. Different construction materials, mainly brick masonry, were used for the minarets. A minaret is generally made up of three parts, basement, body and crown.

In this paper, the historical development, structural systems and construction technology and materials of Persian minarets are described.

Keywords: Minaret, Structural system, Construction materials, History, Iran

1. HISTORICAL DEVELOPMENT

It is hard to investigate all the minarets in a country with a discovered history of building from 10,000 years ago. At present it is unlikely to find ancient existing minaret-like buildings because many of them were built of unfired brick or were structurally subjected to destructive factors. The fire tower in Firuzabad (circa 200 A.D.) is the only complete minaret from the pre-Islamic period. It is made of stone and gypsum and has a spiral staircase around it. It was originally 33 m high and 11 m square at the base (Fig. 1) [1-3].

During the beginning of the Islamic period in Iran minarets were made of sun-dried brick. The minaret of Masjid-i-Jami (the Jami mosque) in Susa belongs to the seventh century A.D. and it is one of the first minarets to be built as a part of a mosque. It is a cylindrical minaret with a spiral staircase inside. Another minaret was built in the Tari-Khana of Damghan in the eighth century A.D., which no longer exists. The first brick minaret came into existence in the ninth century A.D. It is likely that the Maydan-i-Kuhna minaret of Qumm built in 922 A.D. is the first existing brick minaret. It has a cylindrical form with an inner spiral staircase. The oldest complete brick minaret is Arsalan-i-Jazib near the eleventh century A.D.

In the eleventh and twelfth centuries A.D. a large number of minarets were constructed especially in Isfahan, Central Iran. The oldest dated minaret is of Masjed-i-Surkh in Saveh built in 1061 A.D.
Furthermore, a few among many can be enumerated such as Pa-Minar of Zaware (1068 A.D.), Barsian (1097 A.D.), Chehel-Dukhtaran (1107 A.D.), Ghar (1121 A.D.), Gaz (1126 A.D.), Sin (1131 A.D.), Ali (eleventh to twelfth century A.D., Fig. 2), Sariban (1155 A.D.), Ziar (eleventh to twelfth century A.D.) and Rahravan (eleventh to twelfth century A.D.).

![Fig. 1 The minaret in Firuzabad, circa 200 A.D.](image)

The pair of minarets surmounting the entrances of ivans of the mosques or tombs have been built since the twelfth century A.D. The majority of minarets built since the fourteenth century A.D. were pairs (Fig. 3). An important pair of minarets built in this period is that of the Masjid-i-Jami in Oshtorjan (1315 A.D.). The concept of minarets flanking an iwan appeared in the fourteenth and fifteenth centuries A.D., of which the mosque of Gawhar shad (1418 A.D.) in Mashhad is very interesting.

![Fig. 2 Ali minaret, Isfahan, eleventh to twelfth century A.D.](image)  
![Fig. 3 Dar-az-Ziafah pair of minarets, Isfahan, fourteenth century A.D.](image)

In the sixteenth to eighteenth centuries A.D. the pair of minarets rose at mid-height in a semi-flanking movement. Minarets were decorated with tile and mosaic faience. The Imam mosque (1612-38 A.D.) and the Chahar-Bagh madrassa (1706-14 A.D.) in Isfahan represent the most beautiful minarets of this
period (Figs. 4 and 5). Structurally, an important pair of minarets is the Minar Junban, the shaking Minarets, which was built probably in the early eighteenth century A.D. (although the main porch was built in the fourteenth century A.D., Fig. 6). Since then a few remarkable minarets have been built, such as those of Hazrate-i-Masuma, Hazrat-i-Abdulazim, and Pa-Minar and Masjid-i-Imam in Tehran [4].

Fig. 4 Pair of minarets semi-flanking the outer portal, the Imam mosque, Isfahan, 1612-38 A.D.

Fig. 5 Minarets, the Chahar-Bagh madrassa, 1709-14 A.D.
2. STRUCTURAL SYSTEMS

A minaret is generally made up of three parts, basement, body and cowl or crown (Fig. 7).

For constructing the basement, earth must be dug into the rock or firm soil. The basement, upon which the minaret stands, is then constructed with stone or brick in a square or polygonal shape. The basements of the Rahravan minaret and the Khusru-Gird minaret in Sabzevar are square, and those of the Ghar, Sin and Ziar minarets are octagonal. Some of minarets are built without basement, such as the Barsian, Ali and Sariban minarets.

The shape of the body can have three forms, cylindrical (the minaret in Gulpaygan, Fig. 8), conical (the Sariban and Ali minarets, Fig. 9) or prismatic (the minaret in Masjid-i-Jami in Nayin). The body comprises the central column, the spiral staircase and the outer shell. The body of the minaret may be tapered decreasing from the base to the crown. The outer shell can have a constant thickness or be tapered. The tapered central column has a circular or polygonal shape often with a cross-section of about 1.5 m in diameter at the bottom. The spiral staircase rotates counter-clockwise around the central column (Fig. 7). A small number of minarets like those in Gulpaygan (twelfth century A.D., Fig. 8), the Masjid-i-Jami in Yazd (fourteenth century A.D.) and the Madrassa-Khan in Shiraz (seventeenth century A.D.) have two independent spiral staircases.
The crown on the top looks like a nenufar with a height of up to 2 or 3 m. The total height of a minaret is sometimes up to 50 m [4].

In Fig. 9 the dimensions of some of the most important single brick minarets in Isfahan, the city of minarets, are shown. The height varies from about 20 m to over 50 m. The outer diameter is from about 2.5 m to 6 m at the base, and from 2 m to about 5 m at the top. The thickness of outer shell varies from 0.4 m to 1 m at the top. The diameter of central column is from 0.3 to 1.6 m [5].
3. CONSTRUCTION MATERIALS

Stone was the material used in the construction of minarets before Islam. During the early Islamic period in Iran builders used sun-dried brick. Then fired brick became the main structural component of minarets and it was also used for ornaments. In general, the outer shell is usually made of brick with clay mortar or lime concrete (Fig 10). For surface decoration, tile and mosaic faience are used.

Fig. 10 Construction materials, Chehel-Dukhtar minaret, Isfahan, 1107 A.D.

4. CONCLUSIONS

Minarets in Iran have a history of many centuries. They have different shapes but the cylindrical shape is dominant. The structure of a minaret consists of a central column, a spiral staircase (some times twin staircases) and the outer shell. A minaret comprises a basement, a body and a crown, with a variety of dimensions in height, diameter and thickness. Minarets can be single or pair. Their main construction materials are brick and clay mortar. Minaret are impotant elements of Perian traditional architecture.

REFERENCES