

DOCUMENTATION AND CONSERVATION OF WAZIR KHAN MOSQUE, LAHORE, PAKISTAN

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Abstract:

The Walled City of Lahore is one of the most important historic cities in the sub-continent. Although much altered by recent development, it still retains considerable original character. Within the confines of the city are a number of important monuments, many of which are in urgent need of conservation. In 2007 Aga Khan Cultural Service Pakistan (AKCSP) started a programme¹ as a strategic partner with Government of the Punjab to link many of monuments in the Walled City of Lahore along a historic route, the Shahi Guzargah, or so-called Royal Route, starting from the Dehli Gate and culminating at the Lahore Fort. One of the most significant monuments along this route is the Wazir Khan Mosque.

As a major conservation initiative in the whole programme and in the absence of any previous base documentation, it was important for AKCSP to start and demonstrate the best standard practices in documentation of architectural heritage in Pakistan. Therefore, the 380 years old Wazir Khan Mosque was carefully documented using REDM and rectified photography techniques and this paper will present the outcomes and issues of documenting an outstanding example of Mughal monument for the first time in the Walled City of Lahore.

In a situation where heritage conservation has always been regarded as non-development sector and facing lack of resources and expertise, this partnership with the Government provided AKCSP an opportunity to apply the best practices in urban regeneration and conservation planning in Pakistan. It was intended to create local base and build capacities of professional people in the partner institution in reviving traditional construction and craft techniques, architectural documentation and topographical surveys.

During the documentation REDM has been used to produce plans, sections and elevations. Additionally, it has been used to monitor the cracks in walls, settlements in the floors and the precise leaning of the four minarets. All major details of the highly decorated elevations with rare building craft techniques of the mosque have been documented with the help of photo rectification technique. Deteriorated glazed tile work (kashikari) on the facades has been documented using the photo rectification and the damages were mapped on piece to piece basis (fig. 22 & 23).



Figure 1: Panoramic view, from the top of southwestern minar, covers the entire mosque complex and the neighbourhood from east to west



Figure 2: A 1970's photograph of Wazir Khan Mosaeue



Figure 3: A view into the eastern section of the mosque from the north side

1. HISTORY AND LOCATION OF THE MOSQUE

Located on the western side of Wazir Khan Chowk (square) about 260 meters from Delhi Gate (fig. 4), and surrounded by the thick urban fabric of the Walled City, the Wazir Khan Mosque was built by Hakim Aliuddin (sometimes also referred to as Ilmuddin) in 1634 (1054 AH). Wazir Khan Mosque complex is the centre piece of an historic urban ensemble. This ensemble including the Chowk Wazir Khan and the shops on the northern side of the mosque complex. Historically, as part of the royal thoroughfare connecting Delhi Gate and the Lahore Fort, the Wazir Khan Mosque together with its square formed a singular and very important element punctuating the urban fabric of the Walled City.



Figure 4: Plan shows the locations of major thoroughfares and monuments on the Shahi Guzargah

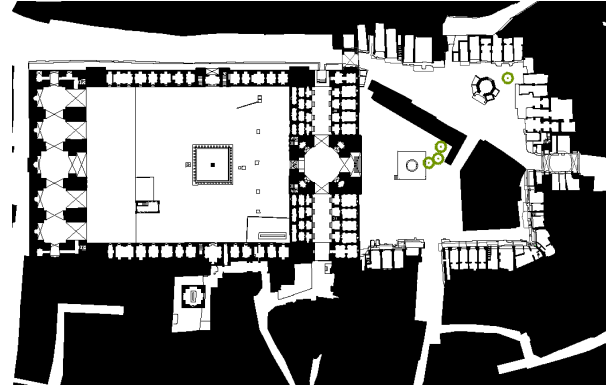


Figure 5: Plan of the entire mosque complex with Chowk

2. ARCHITECTURAL LAYOUT OF THE MOSQUE

The structure of the mosque can be divided into three horizontal planes. Level 0 comprises the shops on the eastern and northern side. Level I occupy the maximum area of the mosque, comprising all the major spaces in the mosque. Level II defines the spaces which can be accessed from level I via staircases. The layout of the mosque is rectangular in plan, measuring 86.17 x 50.44 m on its extreme limits. The four imposing minars define the corners of the main courtyard. The main prayer chamber, courtyard, hujras (meditation rooms), vestibule and bazaar (fig. 5) constitute the main elements of the mosque complex.

Among the architectural elements and decorations of the Wazir Khan Mosque which represent influences from the pre-Mughal era and from neighboring regions like Persia and Central Asia, one special feature is the formal “bazaar” which constitutes a key element of the entrance system to the courtyard of the mosque itself. This bazaar comprises two rows of shops facing each other and traversing the entire width of the site. It is quite unique that the principal entrance façade of the mosque is also the façade of two layers of shops that form the calligraphers’ bazaar, and not of the enclosure of the mosque proper. Half way along its length, the linear axis of this bazaar crosses the axis of the entrance to the mosque. This crossing is marked by an octagonal dome. This is the first example in the subcontinent (and not widely emulated elsewhere), of a purpose built bazaar in an adaptation of a Central Asian charsu. However, in this ensemble only two bazaars lead off from the dome of the charsu, the remaining (two or three) bazaars having been replaced by the entrance system to the mosque².

3. ARCHITECTURAL DECORATIONS

Artistically, the mosque displays some of the best examples of Mughul architectural ornamental and decorative techniques, surpassing others in its delicacy and comprehensive decorative scheme. Most of the other Shahjahani era monuments - Dai Anga Mosque, Asif Khan Tomb, Gulabi Bagh entrance in Lahore also have a combination of kashikari (glazed tiles work), naqqashi (frescos) and tazakari (faux brickwork) as architectural décor but the enormous scale of these decorations in the Wazir Khan Mosque certainly makes this mosque conspicuous in its artistic quality.



Figure 6: Detail of fresco work in one of the archways



Figure 7: Rectified photograph of Arabic calligraphy



Figure 8: A rectified photograph of kashikari work with a floral pattern



Figure 9: Brick floor pattern in the upper level of the courtyard

4. CONDITION OF THE BUILDING AND ITS FABRIC

The mosque is built with brick masonry and lime mortar and generally, the condition of the building fabric of Wazir Khan Mosque is satisfactory. The credit for this goes largely to the materials with which the mosque was constructed. The lime mortar has the tendency to become stronger with the passage of time due to progressive carbonation of the lime, and in the case of the Wazir Khan Mosque lime is the basic binding material. Lime mortar in historic buildings also has relatively low compressive strength and higher flexibility than other forms of mortar, and absorbs movement and protects the bricks from the effects of settlement and expansion and contraction.

Detailed inspection reveals that the structure of the mosque has been suffering from serious damage due to neglect and lack of maintenance. Most of the shops at Level 0 on the northern side are rented out for commercial activities and have been converted into stores as a result of additions built out into the street to cope with the raised street level. The structure at Level I show the majority of damage is in the form of cracks, subsidence and leaning. The cracks in the main arches of the main prayer chamber adjacent to the two minarets have a direct relationship with the leaning pattern of the minarets. Although it is not confirmed when these cracks developed, the major restoration phase in 1971-78 noticed these cracks (fig. 11). Rising damp in the walls of level 0 shops and level I hujras have damaged the surface lime plaster and in certain locations it has eroded the lime mortar constituting the masonry work.

The intricate and delicate surface embellishments of the mosque are vulnerable to weathering, and prone to damages caused by environmental and man-made factors. All the floors in the mosque are made of brick and have a variety of geometrical patterns, particularly in the courtyard and the main prayer chamber (fig. 9). Most of the past restoration efforts were focused on the protection and conservation of these surface decorations. Almost all surface decorations, except the frescos in the main prayer chamber and entrance portal, are directly exposed to the weather conditions. The presence of hundreds of pigeons in the mosque exposes the glazed tile work to the chemical effect of bird droppings, leading to rapid deterioration of the surface of glazed tiles. This issue becomes critical when the rain water mixes with the nitrate-rich excreta and runs down on the surface decorations³.



Figure 10: Northwestern corner of the mosque shows the level of commercial encroachments



Figure 11: Major crack in the wall above the northern most archway of the prayer chamber



Figure 12: Rising damp in the main prayer chamber has damaged the fresco paint



Figure 13: Deposits of soil and dust on the rendered and glazed surfaces of main prayer chamber facing north



Figure 14: Efflorescence on the rendered surface (tazzakari) of the wall in the southern section of calligrapher's bazaar

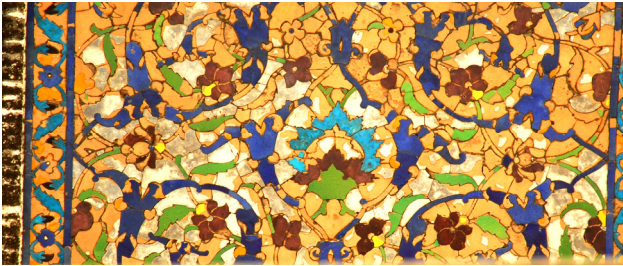


Figure 15: Exfoliation of glaze from the terracotta body of the tile is the most common damage type on the glazed tiles



Figure 16: Fading of surface render (tazzakari) on the northern façade of hujra walls in the courtyard



Figure 17: Loss of bond between the tile and the mortar



Figure 18: Sanding of mortar in brick masonry

6. DETAILED DOCUMENTATION AND INVESTIGATIONS

6.1 REDM survey and related matters

The earliest available architectural documentation of the mosque was carried out in 1875 by Farid Baksh, a student of the Mayo School of Arts Lahore⁴. Most of these drawings are in the custody of the Federal Archaeology Department at the Lahore Fort.

The current conservation project of the mosque demands a very precise and detailed documentation programme of the mosque complex, not only for purposes of studying the structure and its decorations but also as a basic requirement of international charters and conventions of ICOMOS and UNESCO. At the same time it is also very important for us to use this opportunity to demonstrate the highest standards of recording buildings. This would lay the precedence for a new trend in the documentation and conservation of monuments in urban settings in Pakistan.

In the absence of any other recent documentation efforts, the current documentation programme was devised as a combination of REDM survey with a total station, in combination of real time CAD and image rectification software. The documentation process has some main objectives:

- Gather detailed information of the Wazir Khan Mosque and its surroundings in the form of base drawings.
- Provide a strong investigation and monitoring tool for recording the extent of damages and structural deformations in different parts of the monument.
- Detailed recording of the as-found state of the monument to allow us to propose conservation measures.
- Disseminate and build capacity in recording techniques with REDM.

- Establish an architectural survey which would be available for researchers and experts in future studies.
- After conservation, this documentation will provide us the basis for management, monitoring and maintenance of the site and monument.

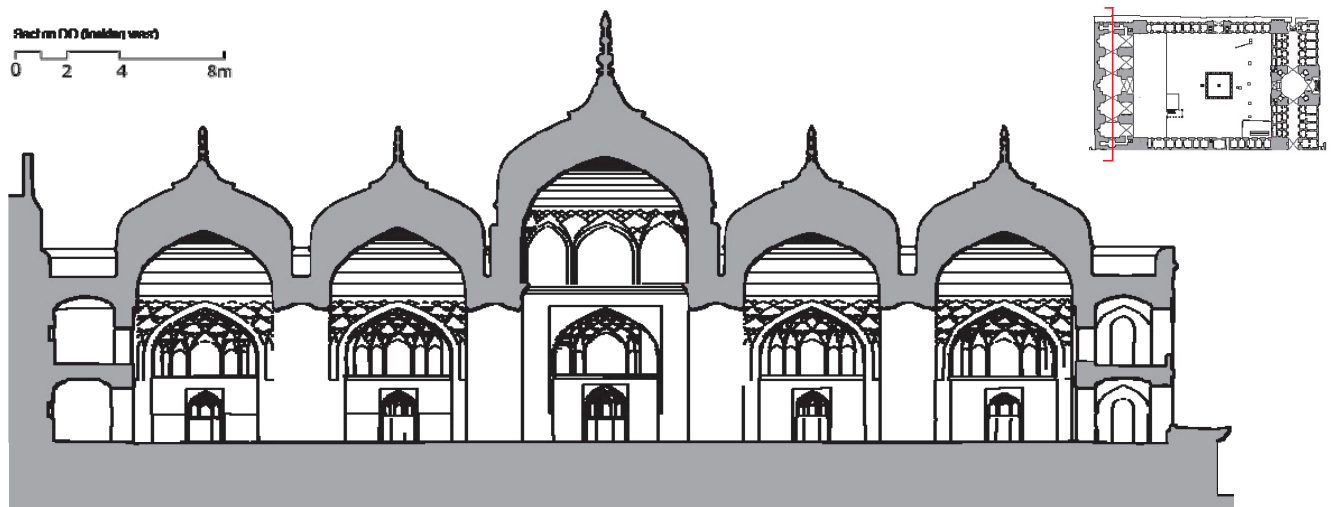


Figure 19: A sectional elevation of the main prayer chamber



Figure 20: Longitudinal section of the mosque through the northern most section of minars, hujras, shops at level 0 and main prayer chamber



Figure 21: Longitudinal section through the neighborhood on the south side of the mosque.

6.2 Mapping of threats and damages

Inadequate care and maintenance threatens this world class monument in a variety of ways. A significant amount of natural and man-made damage has already occurred. It is important for the project to identify all these threats and map the weathering forms and damages to the structure both at a macro and micro scale (fig. 22-24).

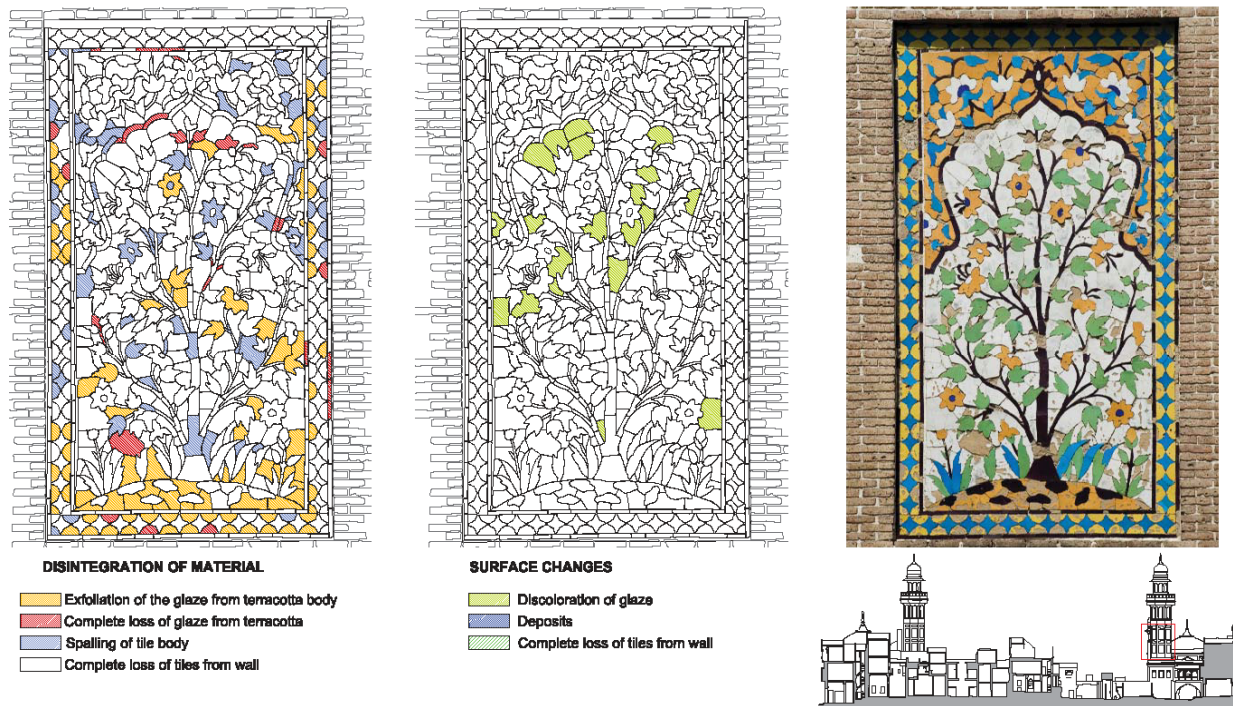


Figure 22, 23 & 24: Classification of weathering and damage forms of glazed tiles in one of the panels of south-eastern minar of the mosque. The rectified and digitized elevation of the glazed tiles panels provides accurate and precise information about the damaged areas

6.3 Monitoring of structural behaviour

6.3.1 Crack monitoring

The cracks in the critical areas of the mosque have been identified and monitored periodically with the help of total station and Vernier digital calipers. The outward leaning of the western minar, which were recorded precisely with the help of total station, has produced some major cracks in the apex of the northern and southern arches of the main chamber. Six locations of major cracks were identified in the main prayer chamber of the mosque and each location was later equipped with a group of three stainless steel studs in a triangular formation. A detailed monitoring scheme has been set in place where the distance between each stud is recorded with the help of calipers and which can be periodically compared with recordings done at a later stage.

6.3.2 Measurement of subsidence and deflection

Detailed documentation of Minars

The REDM survey firstly provides us with an opportunity to document the tilt in the minars of the mosque. Secondly, it helps in identifying the effects and relation of tilting with major cracks in critical locations like the arches adjacent to the western minars. Thirdly, it serves as a monitoring mechanism to track the rate of structural damage such as cracks and deflections more generally. Lastly, it helps in identifying the extent and nature of the periodic settlement of the brick floor in the south-eastern corner of courtyard and its effect on the eastern minarets.

In respect of the minars, it was decided to draw four sections of each octagonal shaped minaret. In order to find the relation between subsidence and deflection in the structure, the information gathered with this survey was analyzed in reference to the results of the geo-technical investigation of the cultural fill and natural sub strata of the mosque.

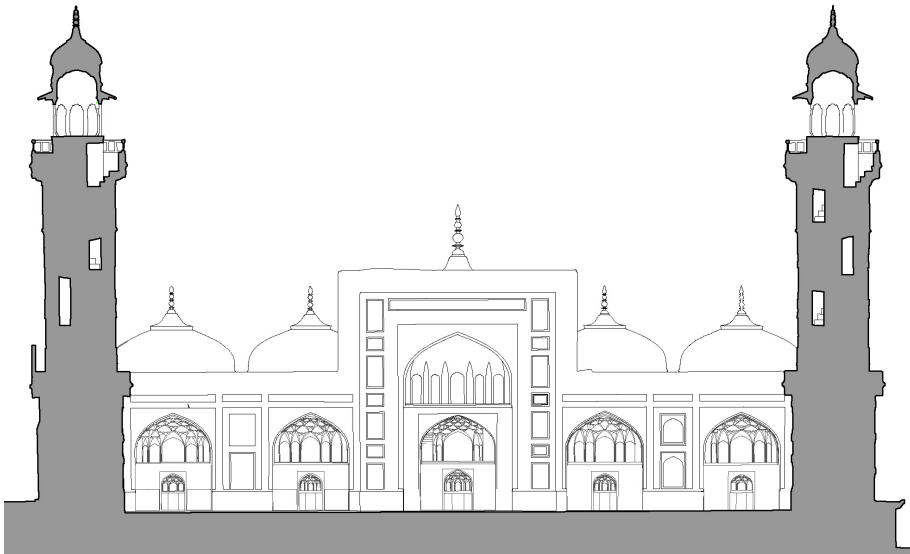


Figure 25: Drawing show the sectional elevation of the main prayer chamber through the two western minars

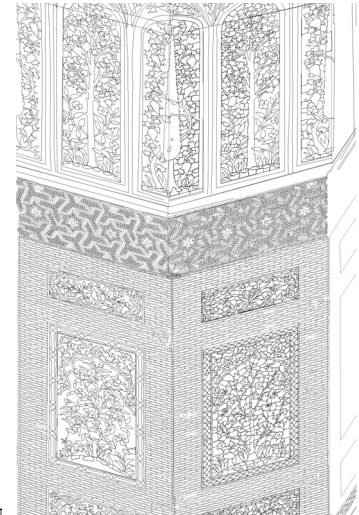


Figure 26: Drawing shows the level of detail drawn from rectified images of bricks and tiles of SE minar

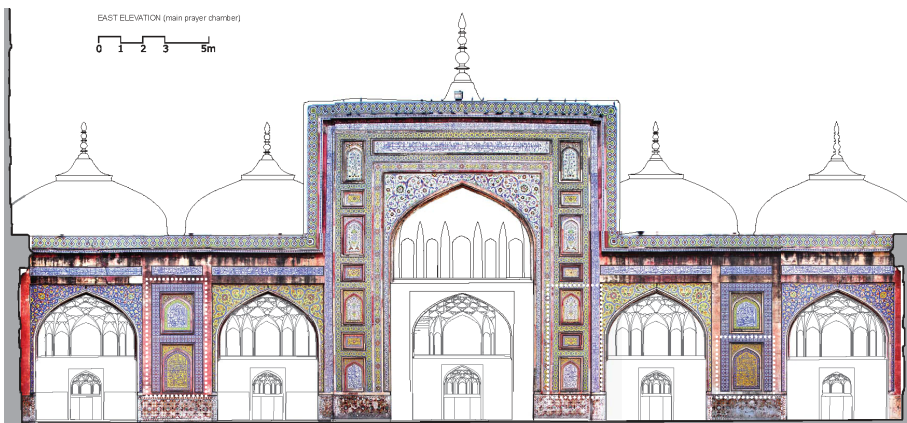


Figure 27: A photo-mosaic of the eastern elevation of the main prayer chamber. This image is produced with the help of image rectification and is plotted to scale



Figure 28: Section through the courtyard of the mosque shows the rectified north elevation



Figure 29: The southern face of the southeastern minar shows the detail of kashikari and exposed brick work

6.3.3 Geo-technical investigations

The geo-technical investigations carried out by AKTC-AKCSP mainly addresses the investigation of the condition of the bearing strata in the cultural fill and natural soil formations. According to the geotechnical investigations, the causes of the structural cracks in the super structure could be attributed to the succession

of earth-quakes the mosque has experienced over its life. Additionally, it has provided important information in respect to the depth and width of the foundations in different locations of the mosque.

It appears from the geo-technical investigations that the sub grade is actually “cultural fill” material that goes down to about 7 meters (22.96 feet) from the level of the courtyard of the building. Natural strata start beyond that and are stated to be good foundation soil. The foundations of the leaning minars are borne by the natural soil strata below the cultural fill, and therefore the minars have been thought to not be under any threat from subsidence owing to the poor bearing quality of the cultural fill.

The bottom of the minar foundation was then explored by drilling a 10 meters (32.80 feet) deep angle borehole through the foundation masonry of the southwest minar. The depth of the foundation came out to be 7.73 meters (25.36 feet) below the floor level of the courtyard. Based on the steps found during the excavation of a test pit, the team suggested that the total width of the foundation in the bottom could be 9.05 meters (29.69 feet).

7. CONCLUSION

A serious heritage documentation process started in 2005 on a vernacular monument is now getting pace in the urban areas of Pakistan and it is very encouraging to see such progress for the first time on a Mughal monument. As an integral part of conservation process, heritage documentation is a continuous process combining surveys, monitoring and maintenance. In the case of Wazir Khan Mosque project the opportunity was used not only to document and monitor the mosque as an important prerequisite but also used to document the thick urban fabric, historic house and bazaar facades of the Walled City of Lahore. Additionally, the process has been used as a tool to involve and train more people in documentation from the project area

A programme for the conservation of the mosque is being evolved and will be implemented over several stages. In the first stage structural and architectural investigations have been carried out. Geotechnical investigations of the foundation structure and a detailed electronic documentation of the building have been carried out and are being used to analyze the damage and to assess the quantum of structural interventions and conservation measures. The structural damage that has occurred will be rectified by repair and stitching together of the masonry fabric. Careful monitoring of the behavior of the building will be mandated thereafter. Pilot restoration initiatives on the various kinds of surface decorations will be carried out first, before expanding these to a larger scale.

7. REFERENCES

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