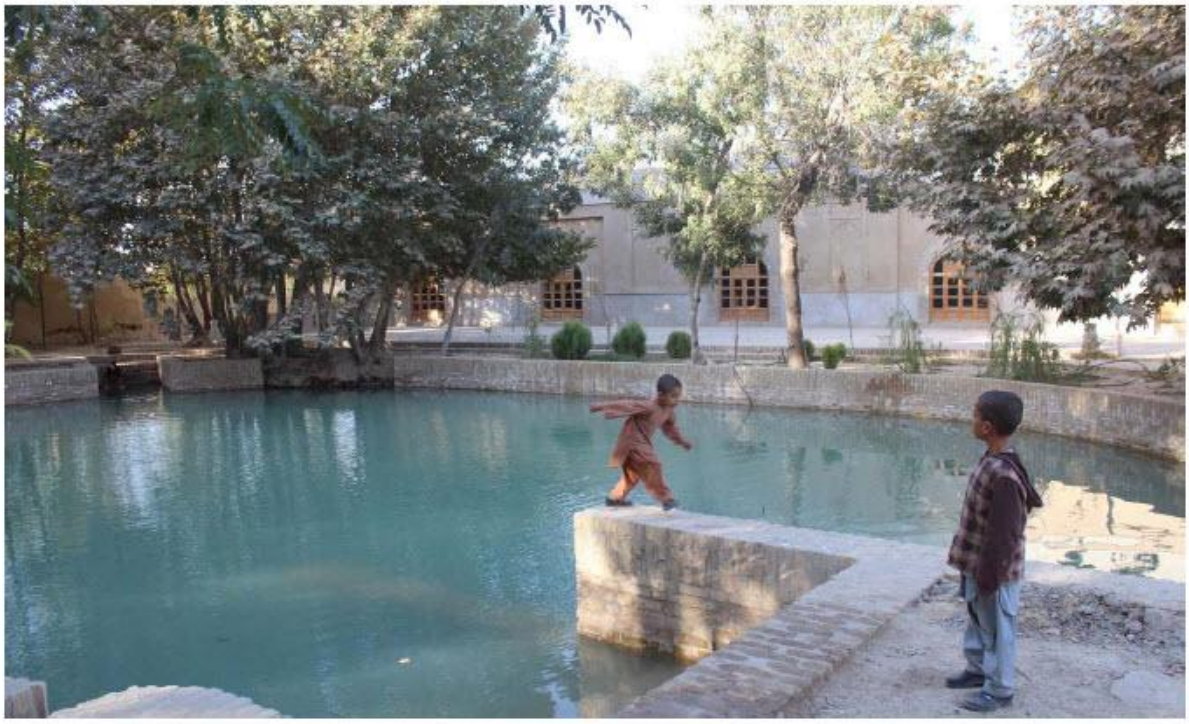
AGA KHAN CULTURAL SERVICES - AFGHANISTAN

FINAL NARRATIVE REPORT



RESTORATION OF DEHDADI MOSQUE, BALKH

Contents

1. SELECTED HISTORICAL BACKGROUND

The Dehdadi mosque was built in what we believe to be two distinct periods. The wooden veranda with intricate decoration seems to hail from the 18th century, while the masonry brick domed and vaulted range of rooms was built in the early part of the 19th century. The mosque and the *khanaqa* was built by Mirza Mohammad Yousuf, a Sufi mystic who distinguished himself as a scholar and poet. The Mirza made the Hajj pilgrimage to Mecca, but fell ill on the way and died in Kuwait, where his disciples built a shrine bearing his name. The Dehadadi mosque or *Khanaqa* (place of Sufi worship) was built in two distinct phases and architectural styles using highly intricate wood carved elements and floral stucco decoration. The large site includes a large reflective water pool and an open-plan madrassa used for religious education and mass prayer. Remaining historic structures in Balkh consist mainly of mosques, shrines, and madrassa, reflecting the deeply religious nature of these communities and the sustained religious donations (*zikat*) that are made towards the maintenance of these structures. In addition to worship and religious education, such communal spaces are often used by the residents of the area to hold council, discuss community matters and at times for large gatherings aimed at finding resolutions to shared problems. As such they represent important spaces of prayer, teaching, communal and social interaction.

Internally, the Dehdadi mosque itself has finely carved doors and painted stucco decoration on the upper parts of the arches, domes and the mihrab, resembling similar religious buildings in Bukhara from the 18th and 19th centuries. In the oldest section of the mosque, the wooden pillars stand on unique cylindrical bases, and its main walls are covered in finely carved plaster floral motifs resembling the ‘tree of life’. Following an initial survey of the

khanaqa together with the DoHM in 2009, AKTC has monitored the condition of the monument since commencing conservation works in Balkh in 2011. Continued erosion coupled with extensive damage caused by rain and snowfall has resulted in the destabilization of the structure to the extent that urgent conservation works are required in order to safeguard the mosque.

2. PROJECT OBJECTIVES

The objective of the project was to undertake essential repair and restoration works on an important historic monument in Balkh, employing local craftsman and daily labourers ensuring that the trained personnel can assist with future maintenance of the site. Additionally, the project aimed to make the site safe and accessible for use by the community as a religious and social space. This project will also provide a platform for continued development of Afghan professional capacity and training for skilled craftsmen. The mosque, as both a historic monument and a place of worship, remains an important part of social adhesion for the surrounding community. Any work undertaken would enjoy their support and that of local authorities and the various departments of the Ministry of Information and Culture. Furthermore, the project aimed at increasing public awareness towards the importance of preserving Afghanistan's built heritage.

3. PROJECT ACTIVITIES

3.1 ROOF AREA

3.1.1 Removal of Earth:

In order to access the brick masonry structure of the domes to carry our repairs and consolidation activities, several layers of accumulated earth needed to be removed from the surface of the roof of the Mosque. The method for water-proofing the roof of the mosque entailed applying seasonal layers of mud-straw plaster. Under regular

conditions, every few years the accumulated layers of mud-plaster is removed before a new layer is applied. As the Mosque has not been maintained regularly, the constant accumulation of the mud straw plaster continued to add weight to the fragile masonry structure. In addition to this, the thick layer of mud could not easily allow the evaporation of moisture that had seeped into the roof, resulting in sustained water and moisture damage to the structure. As an initial step of the restoration process, more than 437 cubic meters of earth and mud-straw plaster was removed from the roof where it had accumulated in depths of up to one meter in areas.

3.1.2 Cleaning of masonry joints:

Following the removal of accumulated earth and the cleaning of the surface of the masonry, which was constructed with a mixture of baked and adobe bricks, the construction joints between layers of brick masonry were carefully cleaned by hand and the loose mud-mortar was removed from the roof. This work was carried out by semi-skilled labourers and helped prepared the structure for consolidation activities undertaken by skilled masons. In total an area covered 800 square meters of masonry was cleaned in this manner.

3.1.3 Structural repair of domes:

While most of the domes were built from a composite of adobe bricks (unbaked) and baked bricks using mud-mortar, it was discovered that three of the main western domes were built only using unbaked adobe bricks. It was not a coincidence that these domes all suffered extensive cracking and structural problems. Based on standard conservation techniques, masons undertook to stitch the damaged domes using locally produced adobe bricks and a mud-mortar. Once the stitching of the domes was complete, the domes were strengthened further by retrofitting glass fiber

mesh material to built a “belt” around the sections of the structure where the most tensile forces would converge. The glass fiber mesh was laid in a thick mix of composite gypsum mortar. In total an area of more than 300 square meters was consolidated in the manner described above.

The highly decorated winter Mosque, located parallel to the eastern summer Mosque and directly beneath the roof where structural improvements were being carried out, contained some of the most exquisite painted and plastered decoration that can be found in northern Afghanistan. As part of works to repair and stabilize the domes, gypsum grout was injected into areas of the masonry that supported large sections of the internal decoration. In this manner, the decoration within the winter mosque has been stabilized and preserved.

3.1.4 Construction of secondary masonry shell:

As the masonry construction of the roof was built using unbaked mud-brick (adobe) material, it was not possible to directly apply suitable water-proofing materials (lime concrete). In order to ensure that the roof could be permanently protected from water build-up and penetration, it was decided that a secondary light-weight baked brick dome, essentially constituting a “shell”, would be constructed above the existing mud-brick masonry domes. The thin masonry shell built above the original mud-brick domes would also enable the design of a cavity between the two structures. Vents designed into the new masonry shell will enable air to circulate in the cavity, leading to the rapid evaporation of water that may penetrate the baked brick shell in the future. The new baked brick masonry shell was built using 23cm x 23cm bricks and lime mortar and constructed at a distance of 20cm above the original mud-brick domes. In total 59 cubic meters of new brick masonry was used in the construction of

the “shell”.

3.1.5 Reconstruction of collapsed domes:

Simultaneous to the construction of the baked brick masonry “shell” structure, teams of masons worked to reconstruct three large domes located at the western perimeter of the building. As the rooms beneath the domes were essential to the functioning of the mosque, the domes were rebuilt using backed brick masonry with a composite gypsum and mud mortar. In total more than 18.8 cubic meters of baked brick masonry was used to reconstruct these domes.

3.1.6 Back filling:

The triangular spaces between the newly constructed masonry domes (squinches) of the Mosque were backfilled with new masonry constructions, allowing for a network of ducts that would enable the regular flow of air through the perimeter of the domes. This innovation in the design of the roof will enable the natural ventilation of the masonry construction, preventing the build-up of moisture that would otherwise cause severe problems in the mud-brick construction. The final surface of the spaces between the domes war s leveled to include appropriate slopes for the redirection of water away from the domes and into newly built spouts. More than 241 cubic meters of masonry was used to fill the squinches and to construct the ventilation ducts.

3.1.7 Lime Concrete & Water Proofing:

In order to ensure that rain water and snow melt did not seep into the newly restored roof; two separate treatments of water-proofing were applied to the surface of the roof. The first, involved the application of a 2.5 cm thick special lime concrete aggregate made of lime, sand, and brick powder. “Bulrush” fiber was also added to the mortar for its adhesive qualities and in order to reduce cracking of the lime concrete during the curing and drying process. The lime concrete was compacted using a plastic hammer for a period of three days and left to cure over a 2 week period, during which the materials was kept wet by a layer of damp straw sacks. Once the lime concrete had set and dried, a layer of water-proof polymer insulation paint was applied to the surface of the lime concrete. While sealing the surface of the lime concrete against the penetration of water, this flexible layer of polymer paint also serves the purpose of allowing water vapors to evaporate away from the masonry dome. In total an area of 1182 square meters on the roof was covered by lime concrete and received an application of the polymer paint.

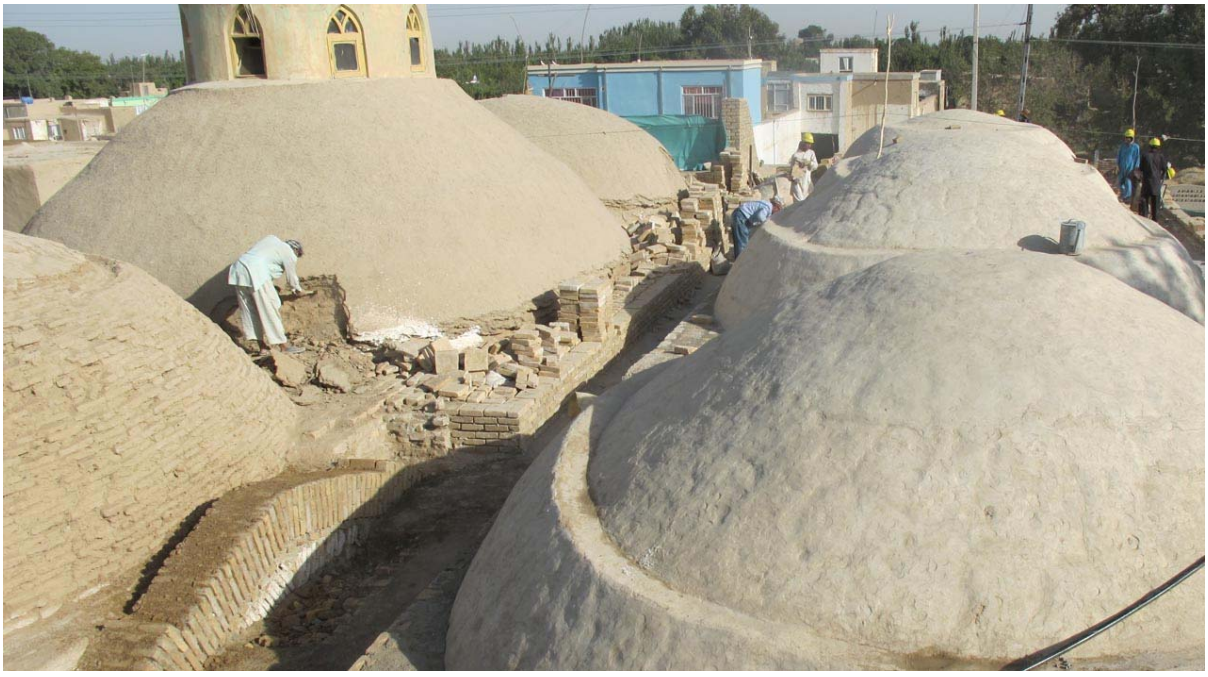
3.1.8 Baked Brick Paving & Pointing:

In order to protect the surface of the polymer paint against damage caused by the build-up of ice and direct exposure to the sun, a durable layer of brick paving was laid across the whole surface of the dome. Newly ordered baked bricks were cut to size and applied with lime mortar over an area of 1043 square meters. The paving was laid to appropriate falls in order to redirect rain water and snow melt in the direction of water spouts.

3.1.9 Spouts & Drainage:

Eleven timber water spouts covered with galvanized steel sheets were constructed and installed at key points where water converged. The spouts ensure that water can

be re-directed away from the building quickly. The spouts were installed above the lime concrete and polymer paint and beneath the final layer of brick paving. The perimeter of the spouts was sealed against the penetration of water through the application of a thin layer of tar.



3.2 INTERIOR

3.2.1 Removal of built-up earth:

Previous work to the Mosque included the application of concrete paving on the immediate external eastern elevation of the building, directly opposite the large water reservoir. Over time and as the concrete paving prevented the evaporation of built up moisture in the ground, the level of water rose in the immediate vicinity of the Mosque resulting in serious water logging problems. As a result of the rising water levels, the internal floor and walls of the mosque became damp and plaster finishes were damaged. Consequently, with each instance of water damage to the mosque, the community increased the levels of the internal flooring by backfilling the surfaces with earth. As to be expected, not only did this not work to resolve the rising damp but in fact it exacerbated the problem as earth backfill became a good conductor for water into the Mosque. As a last resort, the community laid a thin layer of concrete flooring inside the mosque, which simply worked to redirect the rising damp even higher into the walls, in places up to 2 meters, causing extensive damage including settlement in the structure.

As part of the restoration, up to 60 cm of rubble and earth backfill was carefully removed from inside the summer mosque. In total 135 cubic meters of earth backfill was removed from the eastern summer wing of the Mosque.

3.2.2 Plastering:

As a result of rising damp within the building, more than 216 square meters of plaster had become eroded and in places detached from the masonry walls. Once the internal level of the flooring had been restored to the original levels and the masonry walls had been left to dry, these sections of plaster were carefully removed and re-plastered with gypsum. A section of the wall – up to 80cm above the level of the flooring – was refinished with durable baked bricks in order to prevent future damage

to the plasterwork as the damp walls continued to dry. Sections of the walls in smaller rooms (*Chelle Khana*) flanking the Mosque were re-plastered using traditional mud-straw plaster.

3.2.3 Flooring:

Once the built-up earth and rubble had been removed, the remaining area of internal flooring was compacted and a durable layer of baked brick paving was applied using lime mortar. In total 193 square meters of brick flooring was laid and the joints were pointed and sealed.

3.3 EXTERNAL ELEVATIONS

3.3.1 West Elevation: Strengthening of breast wall:

The 32 meter long western wall of the Mosque, behind the main *mihrab* niche, had been badly damaged due to settlement problems. In 2008, the Department of Historic Monuments had carried out remediate works to strengthen this wall yet settlement problems persisted. As part of consolidation works, the previous intervention was assessed and new designs for structural supports were prepared. The design called for the extension of an incomplete breast support wall built parallel to the original damaged wall. The work was carried out using more than 52 cubic meters of baked brick masonry applied with lime mortar. Following the construction of the breast wall, all exposed surfaces of the masonry were pointed using lime putty.

3.3.2 East Elevation: Removal of damaged plaster finishes:

The recently applied cement plaster finish of the eastern wall was carefully removed in order to assess the condition of the brick masonry beneath. Sections of this plaster had been badly damaged as a result of rising damp. Once the plaster was removed it

became possible to design additional structural interventions in order to stabilization the eastern wall. In total, more than 212 square meters of cement plaster was removed.

3.3.3 East Elevation: Repair and stabilization of damaged arches:

Plaster finish was used to cover over serious structural problems and settlement in the arches of the main elevation of the building. The deformed or broken arches could not be repaired without lowering the load bearing wall located above the arches. As this was not possible, an innovative solution was found whereby new arches were built beneath the existing arches in order to help support the damaged structure and transfer lateral forces and weight. Once these secondary support arches had been constructed, the original arches were consolidated in place through the injection of gypsum grout into large cracks. More than 15.8 cubic meters of new baked brick masonry was laid with lime mortar in order to build the support arches.

3.3.4 Doors and Windows:

The eastern section of the building was originally built as an external covered summer mosque. As additional congregation space was required during colder months, the summer Mosque was sealed and new doors and windows were built using local pine wood. Due to the poor quality of the wood used and exposure to direct sunlight, the joinery had become deformed and thus could not function properly resulting in the formation of large gaps through which air would circulate in winter months. Due to this and the fact that new masonry structural supports had to be build beneath the original arches, in which the previous joinery had been installed – modestly reducing the size of the openings – it was decided that new doors and windows needed to be constructed and installed on this elevation. High-quality archa (juniper) wood was procured and 39 square meters of new joinery was constructed as per traditional designs and installed in the arched openings.

3.3.5 External Plastering:

The exposed brick surface of the eastern elevation was re-plastered using a combination of lime-based and mud-straw plaster. The section of wall immediately above the floor level and most exposed to rain and snow, up to a height of 80cm, was plastered using durable lime mortar. Similarly, the section of wall immediately below the level of the roof was plastered in a similar manner due its exposure to the elements. The remaining section of wall in between these two areas was finished using durable mud-straw plaster. In total more than 212 square meters was re-plastered in the manner described above. The southern elevation of the Mosque, which was built with unbaked adobe brick, was finished using more than 148 square meters of mud-straw plaster.

3.4 WATER RESERVOIR

3.4.1 *Draining and cleaning of reservoir:*

The large oval water reservoir located approximately 13 meters to the east of the Mosque, has been the cause of many structural problems for the building. At the same time, the historic reservoir is one of the unique architectural elements of the site and supplied the community with potable water. As such, it was necessary to reconstruct the perimeter walls of the reservoir in order to prevent further eroding of the surrounding earth and reduce seepage of water towards the Dehdadi Mosque.

When consolidation works commenced, the only section of the reservoir that contained traces of its historic construction was a section of baked brick staircase on the northern edge of the pond that descended into the water. The remaining 71 meter long perimeter of the reservoir was made of irregular earth banks. The precarious condition of the reservoir presented further dangers for young children and worshippers who frequented the Mosque or collected water.

In order to prepare the reservoir for consolidation works, it was drained of all water using mechanical water pumps and more than 255 cubic meters of sludge and water born vegetation was removed by hand.

3.4.2 Construction of new foundations:

The edge of the oval reservoir was defined and 36 cubic meters of earth was removed in order to prepare the site for the construction of stone masonry foundations. Stone foundations were laid using lime mortar at 150cm thickness and with ranging heights of 50-100cm. In total more than 26 cubic meters of stone masonry was constructed as foundation for the reservoir.

3.4.3 Construction of retaining wall:

Following the construction of the foundation, a brick masonry retaining was designed with three steps leading from the level of surrounding landscape to the level of water within the reservoir. At each step the retaining wall decreased in thickness by 50cm, from 150cm at its base to 50 cm at ground level. When construction works were complete, the original oval shape of the reservoir had been restored using more than 258 cubic meters of baked brick masonry, increasing the capacity of the pool from 768 to 1040 cubic meters. As the final measure, the new brick masonry was pointed and the reservoir was made ready for refilling with river water.

3.4.4 Water filter:

A historic man-made channel connects reservoir to its source at the Balkh River. Due to seasonal flooding of the river and the nature of top-soil in the area, the channel also carries fine river silt and deposits the material within the reservoir. Aside from polluting the water of the reservoir, this led to an increase in the level of the pool and decrease in its capacity. As part of the construction works, a simple water filtration tank was constructed on the southern edge of the reservoir and attached to the surface channel that brought water to the pool. The filter was designed to reduce the amount of silt deposited inside the reservoir by changing the speed of water flow. This results instead in the sedimentation of silt within specially designed tanks from where it can be easily cleaned.

3.5 LANDSCAPE

3.5.1 Removal of concrete and sub-layers:

Landscaping works around the Mosque mainly entailed the removal of large areas of cement concrete paving and repaving with baked bricks, leveling and earthworks, and planting of new trees, flowers, and shrubs. The platform immediately to the east of the Mosque was paved with cement concrete in order to be used for worship and prayer in warmer months of the year. Part of previous construction works, the effect of the cement concrete paving was similar to that in areas within the building, resulting in build-up of moisture and rising damp. As a result, more than 138 cubic meters of concrete and sub-layers of soil and gravel was dismantled and disposed off site.

3.5.2 New Brick Platform: Paving & pointing

Upon the demolition of the large cement concrete platform, the area was paved with 278 square meters of baked square bricks above a lime concrete substructure. The newly constructed platform will serve as an important area for prayers.

3.5.3 Planting:

In addition to leveling the site in order to enable better gravity fed irrigation to existing plants and trees, an additional 110 difference species of shrubs, saplings, and flowers were planted around the site of the Mosque. A further 24 cubic meters of earth was removed from the site during landscaping works.

4. PROJECT DATA

Total man/days of employment generated: 9,200

Total man/days of skilled employment: 3,120

Total man/days of unskilled employment: 5,980

Total personnel trained as masons and carpenters: 8

Total number of local architects, draftsmen and surveyors: 2

Total number of support personnel employed in the project: 4

5. ANNEXES TO THIS REPORT:

Annex 1: AKTC Project Panel

Annex 2: Project Photographs

Annex 3: Project Drawings and Surveys