

2013

# 08 ARAB SARAI GATEWAY

## THE MAIN DOORWAY

This 48' high (equivalent to a five storied structure) gateway served as the southern entrance of the 'Arab Sarai' – said to have been built in the 16<sup>th</sup> century to accommodate Persian craftsmen building Humayun's Garden-Tomb. Large portions of the gateway were in a state of collapse and the facade leaning by over two feet. The original wooden door survived though in a friable state and requiring conservation.

### ACTION TAKEN:

- The monumental gateway covers an area of 35 m x 9.5 m with a prominent central archway measuring 7.62 m X 6.1 m. The historic doorway stands within the archway and is built of thick wooden planks secured together with iron clamps.
- This original wooden door had suffered structural failure and deterioration due to dampness and inadequate maintenance over the years.
- Since wood is hygroscopic in nature, its unprotected surface tends to absorb moisture and to swell during humid and rainy weather, and to lose moisture and shrink in periods of dry weather. This has led to the change in dimensions which eventually resulted in the gaps between the planks. This significantly disfigured the functionality of the doorway.
- Also portions of the gateway suffered weathering which has changed the colour of the wood into silver grey. However, as the weathering continues, the wood fibers become partially loosened and if weathering is permitted to proceed further, the surface develops larger and deeper gaps, which become visible. This, combined with the abrasive effect of rain, wind-borne particles, etc. caused the wearing of the surface layers and a roughened appearance of the surface.
- The doors were taken down and wooden members were assessed in detail to check the condition. The wooden doors were then repaired by replacing decayed wooden members with new members as per original material, sectional specifications etc.
- All the loosely fitted members were tightened to maintain full bearings.
- All new and old wooden members were then treated with double boiled linseed oil.



(Top) The original wooden door had suffered weathering, dampness and deterioration due to inadequate maintenance over the years;

(Bottom & Right) The doors were taken down and assessed in detail and repaired by replacing decayed wooden members with new members as per original material, sectional specifications etc.





## THE STONE FACADE

The outer facade of the gateway largely comprises of ashlar stone blocks with sandstone edging. The sandstone edging at the lower end had deteriorated significantly.

### ACTION TAKEN:

- Documentation of the condition of each stone was done individually, as a precursor to any repair/ replacement as part of this conservation project.
- The condition of the individual stones of the entire façade is marked on the images and the drawings. Following the condition assessment each stone to be replaced has been marked itself for evaluation, discussion and site preparation works.
- The major defects identified are de-lamination, erosion and splitting of the stone members. At other places the stones are replaced to ensure long term preservation by replacing damaged stones or those used inappropriately in 20<sup>th</sup> century repairs. Stones which are replaced are mainly severely decayed stones which are beyond repair, single stones replaced with multiple stones and inappropriately repaired stones such as wrong sectional specifications and material.
- A minor proportion of stones, under 5% of the total stones are proposed to be replaced with new stone as these stones were considered to be beyond repair. Furthermore most of these stones replaced in the late 20<sup>th</sup> century by inappropriate sized pieces.
- The 19<sup>th</sup> century repairs done in *lakhori* brick are kept intact as a layer of history showing the historic repairs.
- The hard cement mortar was raked out and was replaced with lime mortar pointing.
- Rusted iron clamps binding the sandstone to underlying masonry were replaced with new stainless steel clamps.
- Following a stone-by-stone documentation, stones have been replaced on the lower part of the façade.

### NEXT STAGE:

Stone replacement would be completed by February 2014.

The conservation works including cleaning, stone replacement, consolidation and lime plastering will be carried out on the projected *jarokhas*.

(Above) Degeneration of stone at various points in the facade (Right) Condition assessment of the facade prior to stone replacement process (Extreme Right) Conservation of the facade by matching stone in all its geological and sectional composition to the original



## THE ENTRANCE CHAMBER



*Following the collapse of the dome, the southern half of the gateway had largely collapsed and portions required to be reconstructed on the basis of the northern portion that had remained standing.*

### ACTION TAKEN:

- Over the last century the portions of this lofty gateway had collapsed including the domed entrance chamber thus severely compromising the structural stability of the remaining standing structure.
- The existing remains of the walls, dome and the arches were analyzed carefully to work out the original structural details of the partially collapsed chamber.
- The collapsed two arched alcoves are reconstructed as per existing alcove's design and profile using traditional materials and techniques.
- Clearance of earth was carried out to expose the original foundation of the collapsed wall of the south façade. Missing masonry wall was reconstructed over the original foundation using similar materials and construction techniques.
- The missing arch of the south façade is reconstructed to match the northern arch.
- The two missing arched alcoves on the east and west sides are reconstructed as per existing two alcoves on the same façades. Existing profile of the alcoves were traced and transferred to the new construction to maintain the original architectural detail.

### NEXT STAGE:

The existing alcoves will be repaired including removal of the cement plaster and other cement works. Layers of cement and inappropriate repair works would-be dismantled carefully. The arches will be lime plaster as per original profiles and shapes.

*(Below) Reconstruction of the partially collapsed entrance chamber as per existing alcove's design and profile using traditional materials and techniques*



## THE VAULTED CHAMBERS

The monumental gateway includes two vaulted chambers on either side of the principal entrance chamber, both of these in an advanced state of deterioration requiring major conservation works.

### ACTION TAKEN:

- The arched chambers on both the sides of the entrance chamber were in extremely dilapidated condition posing a great threat to the structure above.
- The external arched chambers had collapsed over the years due to a combination of vegetation damage, neglect, and structural failure.
- The wall surfaces were cleaned to remove later repair-works and other deposits. The cement and dead pointing works were raked out and replaced with lime mortar. The consolidation of the existing masonry was done using the lime based grouting.
- The structural repairs include stitching of the cracks, grouting and anchoring took place.
- The inappropriate past preservation works on the southern façade was carefully dismantled followed by reconstructing the arched profiles on each of the six bays. The wall surfaces were built on the original foundations that required to be strengthened by grouting of lime mortar.
- The red sandstone flooring is now provided in the chambers. The flooring works will be completed by the end of February.

### NEXT STAGE:

Repairs including rebuilding of collapsed vaulted portions have been completed. Lime plastering on the wall and the ceiling surfaces.

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### 16<sup>th</sup> century tools giving facelift to Mughal gateway

*Times of India, September 10, 2013*

... Once upon a time, 300 Persian craftsmen travelled to India to build a tomb for the emperor Humayun. According to historians, the craftsmen were housed in a Serai adjoining this tomb—said to be the precursor to the Taj...

(Left) Condition of chambers prior to the conservation works

(Right) Internal chamber during conservation works





## THE UPPER CHAMBERS

*The structure on the second and third floor levels had almost completely disintegrating thus all supports to the ornamental facade were lost. Conservation works on the upper chambers have aimed at restoring support and structurally tying the facade to the chambers here.*

### ACTION TAKEN:

- The Arab Sarai gateway consists of two upper levels. The arched openings on both the sides of the entrance chamber have staircases leading to the first level. The central chamber rises till the upper level where the external walls of this chamber is punctured with the arched niches.
- The original profiles of the upper chambers were determined on the basis of the archival images, existing remains of the walls, domes and arches.
- It was found that a vaulted corridor runs around this wall on both the sides where there is a staircase in the end giving access to the second level. Detailed documentation of the first level was carried out. The cement concrete flooring was then removed to expose the remains of the walls that once existed, over which the reconstruction of the vaulted chambers will be undertaken.
- Partially collapsed chambers would be completed to the extent that it provides structural stability to the monument as well as to revive the lost architectural integrity of the monument.
- The existing staircase, arches, walls etc. have been conserved. The construction of parapet is complete.
- The terracing works on both the levels will require complete removal of cement concrete and laying a traditional lime concrete terracing to original slope.

### NEXT STAGE:

The existing remains of the central dome will be repaired to the possible extend as per original construction details and profiles to provide the structural stability to the monument. Red sand stone water outlets would be provided at appropriate locations.

*(Left) Image showing collapsed vaulted chambers  
(Right) Vaulted Chambers after the conservation works*



2014

# 05 Arab Serai Gateway

This 48' high gateway served as the southern entrance of the Arab Serai - built to accommodate the 300 Persian craftsmen whom Hamida Banu Begum, had brought with her on her return from pilgrimage to Mecca. These craftsmen were involved in the building of Humayun's Garden-Tomb. The integrity of the whole complex is now disturbed as the major portion of the Arab Serai is today the Industrial Training Institute and is inaccessible to visitors. Over the last century the portions of this lofty gateway had collapsed including the domed entrance chamber thus severely compromising the structural stability of the remaining structure like front façade, portions on the upper levels etc. The collapsed portions of the gateway suggest that half of the entrance chamber was not able to bear the load of the dome which should be uniformly transferred to the piers. Conservation works includes conservation of the main wooden doorway, conservation of the Stone façade, reconstruction of the partially collapsed entrance chamber, conservation of the chambers at ground floor, reconstruction of the upper chambers and providing adequate flooring.

In keeping with the conservation policy of the Nizamuddin Urban Renewal Project master craftsmen, using traditional materials, tools and building techniques have undertaken conservation works. The conservation works when completed will significantly enhance the historic character of the World Heritage Site.



*Arab Serai Gateway: after conservation. Conservation works on the Arab Serai Gateway were undertaken with a grant from the **German Embassy**.*

## The Stone façade

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### Action Taken:

- Documentation of the condition of each stone was done individually, as a precursor to any repair/ replacement as part of this conservation project.
- The condition of the individual stones of the entire façade is marked on the images and the drawings. Following the condition assessment each stone to be replaced had been marked itself for evaluation, discussion and site preparation works.
- The major defects identified are de-lamination, erosion and splitting of the stone members. At other places the stones are replaced to ensure long term preservation by replacing damaged stones or those used inappropriately in twentieth century repairs. Stones which are replaced are mainly severely decayed stones which were beyond repair, single stones replaced with multiple stones and inappropriately repaired stones such as wrong sectional specifications and material.
- A minor proportion of stones, fewer than five per cent of the total stones were proposed to be replaced with new stone as these stones were considered to be beyond repair. Furthermore most of these stones replaced in the late twentieth century by inappropriate sized pieces.
- The hard cement mortar was raked out and was replaced with lime mortar pointing.
- Rusted iron clamps binding the sandstone to underlying masonry were replaced with new stainless steel clamps.
- Following a stone-by-stone documentation, stones have been replaced on the lower part of the façade.
- Stone replacement is now complete. The conservation works including cleaning, stone replacement, restoration of tiles and lime plastering is also complete on the projected *jharokhas*.



*(Right) Following a stone-by-stone documentation, decayed sandstone was replaced by new stone pieces by carefully matching the original.*





## Entrance Chamber

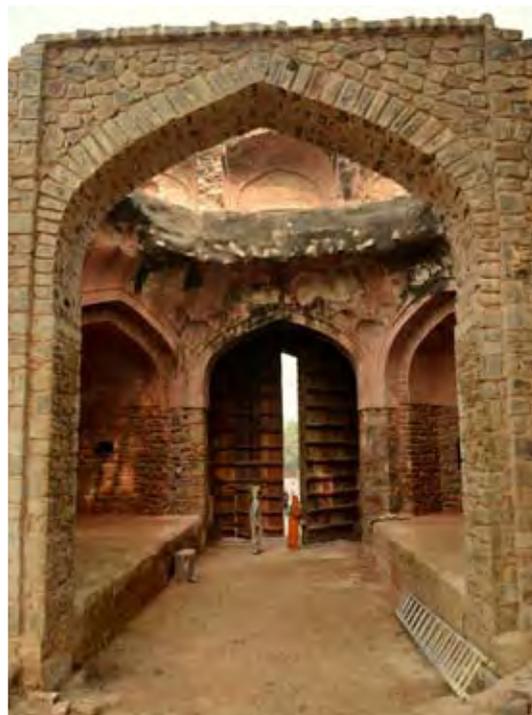
### Action Taken:

- Over the last century the portions of this lofty gateway had collapsed including the domed entrance chamber thus severely compromising the structural stability of the remaining standing structure.

*(Above) Over the last century the portions of this lofty gateway had collapsed including the domed entrance chamber thus severely compromising the structural stability of the remaining structure like front façade, portions on the upper levels etc. The façade was recorded to be dangerously tilting.*

- The tall façade was found to have a significant tilt – leaning outwards – and possibly on the verge of collapse as has occurred in the Sher Shah Gateway west of Purana Qila. It was thus considered necessary to reconstruct some of the collapsed portions to tie the façade back into the masonry.
- Following the collapse of the dome, the southern half of the gateway had largely collapsed and portions required to be reconstructed on the basis of the northern portion that had remained standing.
- The existing remains of the walls, dome and the arches were analyzed carefully to work out the original structural details of the partially collapsed chamber.
- It was determined that the battlements of the enclosure wall of Bu Halima's Garden - Tomb, to the west of the Arab Serai gateway were visible even below the Arab Serai Gateway walls indicating an earlier date for the Bu Halima's garden enclosure. This would negate the belief that the Arab Serai was built to house Persian craftsmen who came to build Humayun's Tomb.
- Clearance of earth was carried out to expose the original foundation of the collapsed wall of the south façade. Missing masonry wall was reconstructed over the original foundation using similar materials and construction techniques.
- The missing arch of the south façade is reconstructed to match the northern arch.
- The two missing arched alcoves on the east and west sides are reconstructed as per existing two alcoves on the same façades. Existing profile of the alcoves were traced and transferred to the new construction to maintain the original architectural detail.
- The existing alcoves are also repaired including removal of the cement plaster and other cement works. Layers of cement and inappropriate repair works are dismantled carefully. Also the arches are lime plastered as per original profiles and shapes.
- The raised platforms of the entrance chamber have also been provided with the sandstone flooring.

*(Right) The east and west sides are reconstructed as per existing two alcoves on the same façades. Existing profile of the alcoves and transferred to the new construction to maintain the original architectural detail.*



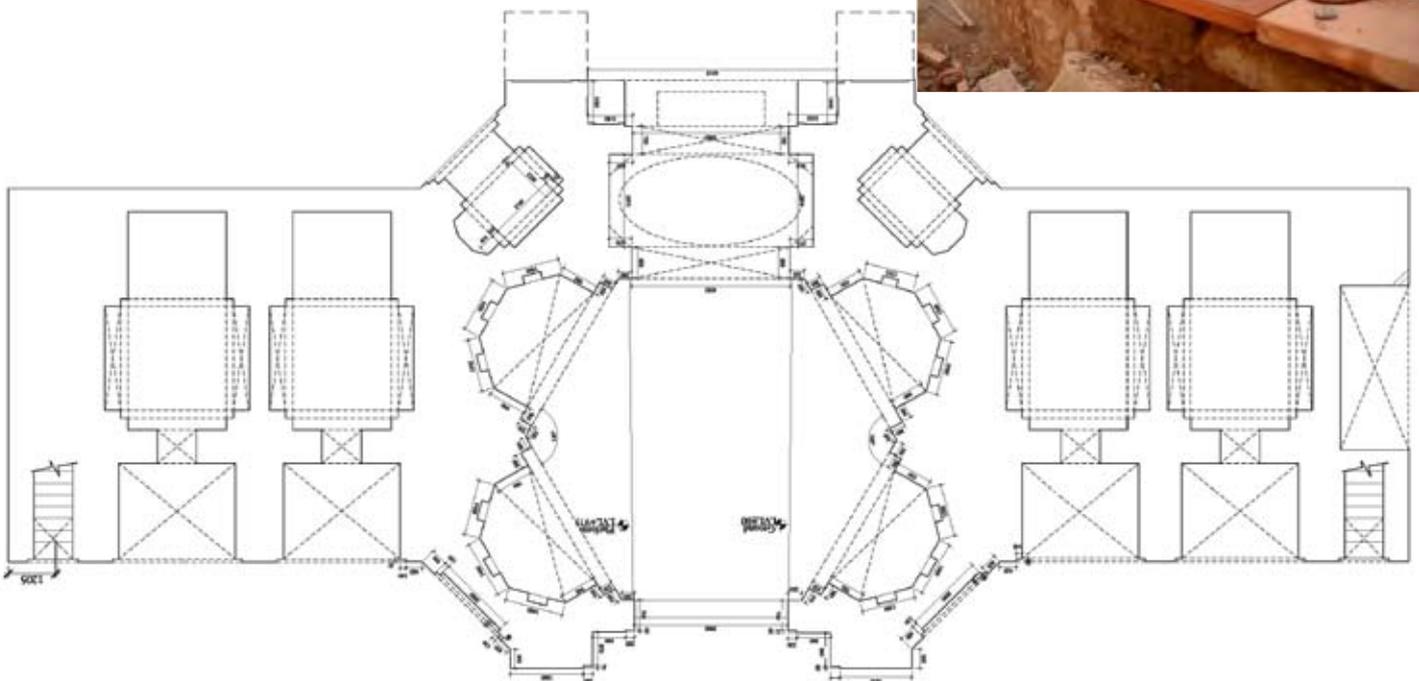
## Vaulted Chambers

### Action Taken:

- The monumental gateway includes two vaulted chambers on either side of the principal entrance chamber; both of these were in an advanced state of deterioration requiring major conservation works to repair collapsed portions of the vault..
- The arched chambers on both the sides of the entrance chamber were in extremely dilapidated condition posing a great threat to the structure above.
- The external arched chambers had collapsed over the years due to a combination of vegetation damage, neglect, and structural failure.
- The wall surfaces were cleaned to remove later repair-works and other deposits. The cement and dead pointing works were raked out and replaced with lime mortar. The consolidation of the existing masonry was done using the lime based grouting.
- The structural repairs include stitching of the cracks, grouting and anchoring took place.
- The inappropriate past preservation works on the southern façade was carefully dismantled followed by reconstructing the arched profiles on each of the six bays. The wall surfaces were built on the original foundations that required to be strengthened by grouting of lime mortar.
- The red sandstone flooring is also provided in the chambers.
- All the conservation works have now been completed using lime plaster.



*(Above) All chambers on the eastern and western side of the main gateway were in various states of collapse; (Right Top) Architectural documentation of the Gateway*



## The Upper Chambers

### Action Taken:

- The structure on the second and third floor levels had almost completely disintegrating thus all supports to the ornamental facade were lost. Conservation works on the upper chambers have aimed at restoring support and structurally tying the facade to the chambers here.
- The Arab Serai gateway consists of two upper levels. The arched openings on both the sides of the entrance chamber have staircases leading to the first level. The central chamber rises till the upper level where the external walls of this chamber is punctured with the arched niches.
- The original profiles of the upper chambers were determined on the basis of the archival images, existing remains of the walls, domes and arches.
- It was found that a vaulted corridor runs around this wall on both the sides where there is a staircase in the end giving access to the second level. Detailed documentation of the first level was carried out. The cement concrete flooring was then removed to expose the remains of the walls that once existed, over which the restoration of the vaulted chambers were undertaken.
- Partially collapsed chambers were completed to the extent that it provides structural stability to the monument as well as to revive the lost architectural integrity of the monument.
- The existing staircase, arches, walls etc. have been conserved. The construction of parapet is complete.
- The terracing works on both the levels required complete removal of cement concrete and laying a traditional lime concrete terracing to original slope.
- The existing remains of the central dome is now repaired to the possible extent as per original construction details and profiles to provide the structural stability to the monument.

*Due to the collapse of portions of the gateway, its top member had become structurally unstable. With the chajja tilting on the facade, this would have resulted in toppling of the entire gateway towards the frontal lean. As part of the conservation efforts, when the arcade and chamber was restored (Below) on the upper floor, they also provide much needed additional support and tie-in to the gateway from rear side. Restoring the corner chambers also resulted in the decrease of the slenderness ratio of the structure, lending the Gateway more stability*



