

Humayun's Tomb Complex

Conservation Works undertaken during 2008-14



Nizamuddin Urban Renewal Initiative

a *People* Public | Private Partnership

Archaeological Survey of India | South Delhi Municipal Corporation | Central Public Works Department
Aga Khan Foundation | Aga Khan Trust For Culture

N I Z A M U D D I N

URBAN RENEWAL INITIATIVE

Largest Public Private Partnership in India

The Urban Renewal Initiative demonstrates a prototype for urban revitalization with a not-for-profit Public-Private Partnership model. An enhanced level of partnership between the Public and Private Parties in their mutually shared objectives of carrying out a model project leading to conservation based development, improved quality of life for local communities and improved access to basic urban facilities.

Further Information:

www.nizamuddinrenewal.org

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Nizamuddin; the name carries the flavour of a heritage rich in history and culture. The importance of its legacy and the environs are not lost on the people of Delhi or indeed, India. The area is visited by millions of tourists and pilgrims from across the world each year.

Since the 13th century the Hazrat Nizamuddin Area has boasted of a superior living culture that not only led to the construction of grand mausoleums, mosques, step-wells, enclosed garden's here but also the creation of cultural traditions of music, poetry, food, rituals that have defined

both Hindustani culture and Sufi traditions.

Today, recognized as the densest ensemble of medieval Islamic buildings in the country, the area is home to a significant resident community of which a number of families trace their descent to the revered Sufi saint, Hazrat Nizamuddin Auliya, whose Dargah remains at the heart of the settlement.

Humayun's Tomb and several other grand garden-tombs have been built here for 700 years but especially in the 16th century reign of emperor Akbar as it is considered auspicious to be buried near a saint's dargah.



Humayun's Tomb
1572 A.D

**Muhammad Shah
Saiyyad's Tomb**
1443 A.D

**Ghiyas-ud-din
Tughlaq's Tomb**
1325 A.D

Sikander Lodhi's Tomb
1518 A.D

Isa Khan's Tomb
1547 A.D

Sultan Ghari
1231 A.D

HERITAGE CONSERVATION

The **Humayun's Tomb - Nizamuddin Area** is one of the densest ensembles of medieval Islamic buildings and 16th century tomb - gardens in India. It is inhabited by a vibrant local community being visited by millions of tourists and pilgrims each year.

Conservation works being undertaken on the monuments in this area are in adherence with the established Indian and international conservation philosophy and principles. It stringently maintains authenticity of the original design in both form and material by employing hundreds of master craftsmen working with traditional building materials. All conservation work is preceded by archival research, high definition surveys, structural assessments and peer review. The **Aga Khan Historic Cities Programme** projects promote the conservation and re-use of buildings and public spaces in historic cities in ways that can spur social, economic and cultural development.

HAZRAT NIZAMUDDIN BASTI

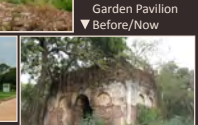
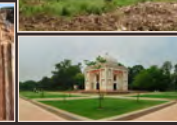
SUNDAR NURSERY

BATASHEWALA ENCLOSURE

Bara Batashewala Mahal
During Conservation

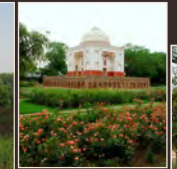


Sundarwala Mahal
During Conservation



Sundar Burj
Before/Now

Garden Pavilion
Before/Now



Lakkarwala Burj
Before/Now



HUMAYUN'S TOMB COMPLEX



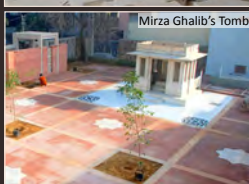
Nizamuddin Baoli



Chausath Khamba



Mirza Ghalib's Tomb



Bu-Halima's Garden-Tomb



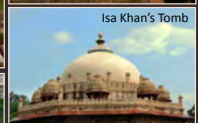
Nila Gumbad



Baradari



Isa Khan's Mosque



Isa Khan's Tomb



Humayun's Tomb

ISA KHAN'S GARDEN - TOMB

The aspiration have been very high, standards have been set high in order to develop the best documentation possible, so that the decisions that would be made could really be looked at from all perspectives and angles.
Mark Weber,
World Monuments Fund, 2010

Isa Khan's tomb pre-dates the building of Emperor Humayun's tomb and the structure is significant for the profuse ornamentation – glazed tiles, plasterwork, stone elements such as finials and lattice screens – that adorn the building.

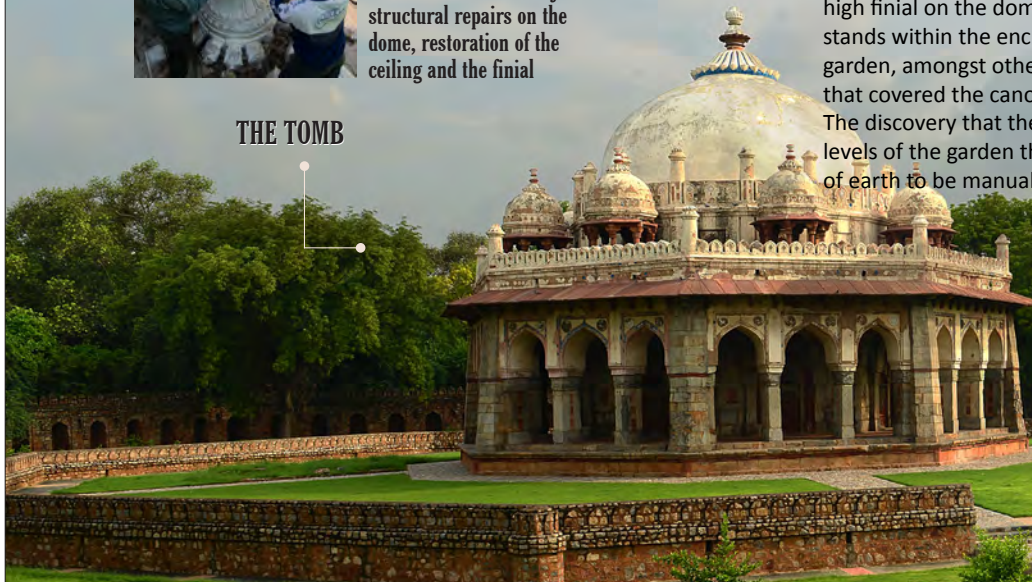
Conservation works in the Isa Khan's garden tomb enclosure, have included reconstruction of the collapsed portions of the gateway; structural repairs to the garden retaining wall; restoration of the 2.5 m high finial on the dome; major structural repairs to the Mosque that stands within the enclosure; de-silting of a well discovered within the garden, amongst others. Stone finials to the canopies as well as the tiles that covered the canopy are to be restored.

The discovery that the outer garden was originally four feet below the levels of the garden that surrounds the tomb required 125,000 cubic feet of earth to be manually removed to restore historic levels.



Conservation works on the tomb have included major structural repairs on the dome, restoration of the ceiling and the finial

THE TOMB



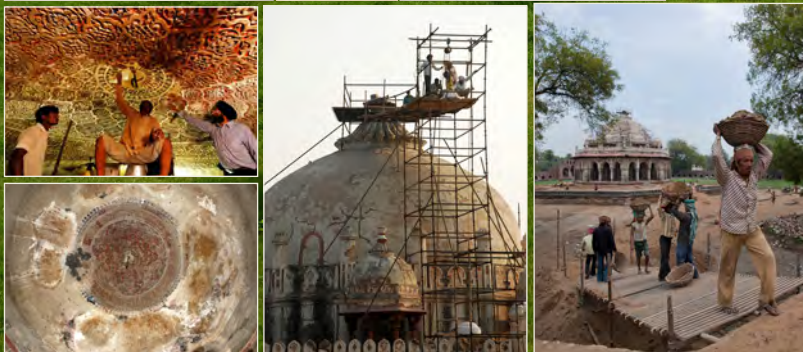
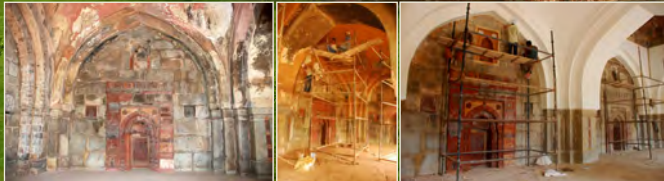
THE MOSQUE

The interiors of the mosque also required cleaning of the stone surfaces and re-plastering with lime mortar following the removal of cement plaster

THE GARDEN

- Restoration of the earliest known/ surviving sunken garden and in turn the original/ historic setting of the mausoleum
- Revealed several hundred terracotta objects, in addition to architectural elements that have been reused.

11,440 Sq.m of Garden restored
3,25,000 Cu.ft. of earth removed





Isa Khan's Enclosure Gateway





Isa Khan's Garden-Tomb



Restoring Ornamental Plasterwork

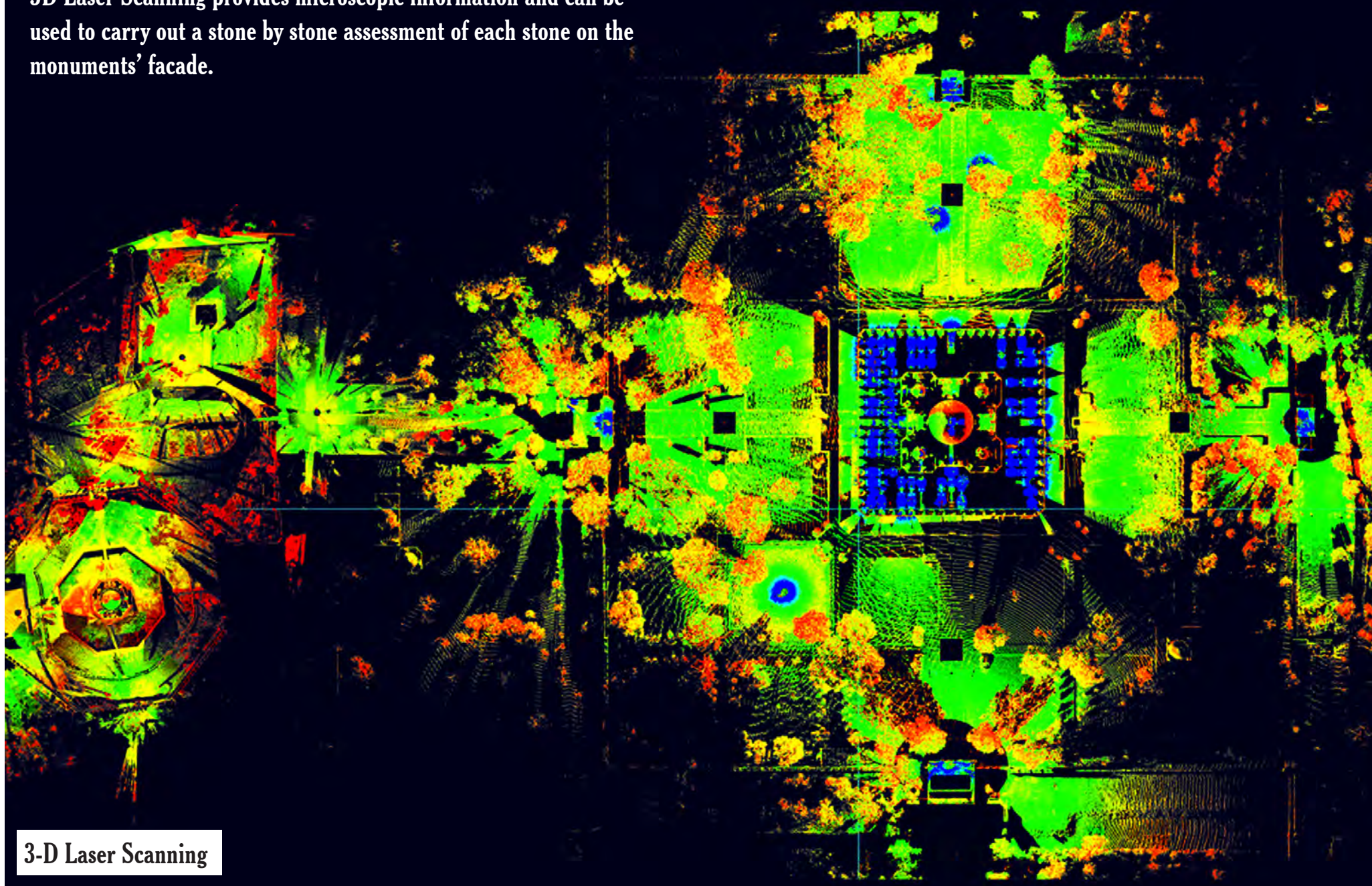


Restoring Internal Ceiling



Isa Khan's Mosque

3D Laser Scanning provides microscopic information and can be used to carry out a stone by stone assessment of each stone on the monuments' facade.



3-D Laser Scanning



Bu-Halima Garden



Bu-Halima Gateway



Arab Sarai Gateway



Arab Sarai Gateway



Humayun's Tomb Enclosure Wall



HUMAYUN'S TOMB

CONSERVATION

Working on a World Heritage Site where integrity and authenticity had been compromised by past repairs posed a significant challenge as did the need to reconstruct collapsed portions of structures that had been left unattended for a century.



Scan the code to know more about Humayun's Tomb's Conservation

With the Mughal details uncovered, conserved, restored where these had been obliterated by 20th century repairs, the Mughal grandeur has been once again revealed in parts. Similarly, major works have been undertaken to halt the accelerated deterioration that had set in as a result of past repairs with modern materials.

Million kilos of concrete was removed from the roof, 200000 square feet of lime plaster restored, 40,000 square feet of stone paving lifted and reset on the plinth and similarly on the sandstone platform, wooden doors used as firewood in 1947 restored to the mausoleum and damaged stone on the facade repaired or replaced with stone blocks prepared in the manner of the Mughal builders.



HUMAYUN'S TOMB THROUGH THE AGES

The dome of the tomb chamber is enriched with gilding and enamel; from the centre a tassel of gold lace once depended
Major Archer, AD 1828

Built in the 1560's, the mausoleum of Emperor Humayun, was venerated and a place of pilgrimage for the Early Mughals. Built as a family tomb, over 160 mughal family members continued to be buried here until the mid 19th century. With the decline of the Mughal empire, neglect set in and the gardens were used for agriculture in the 18th and 19th centuries. Following the arrest here of Bahadur Shah Zafar, the last Mughal emperor, the British interest increased and a European garden was super-imposed here in the 1860's. In the early 20th century Lord Curzon instructed for the Mughal layout to be restored. In 1947, the tomb was used as a refugee camp and decline once again set in. In 1993 the garden-tomb was inscribed on the World Heritage list and in 1997, Aga Khan Trust for Culture commenced the garden restoration. AKTC commenced conservation of the mausoleum in 2007 with funding support from the Sir Dorabji Tata Trust and in partnership with the ASI. In 1997, the Aga Khan Trust for Culture commenced a major programme, to source archival material related to Humayun's Tomb and its setting. Study of Mughal chronicles and research at worldwide archives has revealed significant information that has informed both the garden restoration and the conservation of the mausoleum.

Copyright : Freer Gallery of Art, Smithsonian Institution, Washington, D.C



1849 A.D

The Earliest Photograph

1910 A.D

Restoration works done by Lord Curzon



1858 A.D

Agriculture in the walled garden

1947 A.D

Refugee Camps during the Partition



1864 A.D

British landscaping of western/ entrance zone of the garden

1997 A.D

The garden, before the 1997-2003 restoration



1880 A.D

The River flowing on the Eastern Edge

2013 A.D

Humayun's Tomb after conservation





View of Humayun's Tomb Garden 1997



View of Humayun's Tomb Garden 1997



India's first garden restoration project involved:

- 3000 trucks of excess earth manually removed
- 4 kilometres of water channels repaired
- 3.5 kilometres of pathway edging reset
- Over 3 kms of sandstone hand-chiselled
- 2500 fruit, flower bearing and sweet smelling plants favoured by the Mughals planted
- 250,000 square feet of pathways restored
- 30 acre garden completely regressed
- An exhaustive rainwater harvesting system introduced; this includes 128 ground water recharge pits, 3 wells discovered and desilted, rainy wells provided
- Historic structures in the garden conserved
- Wheelchair access provided
- 40 sandstone benches placed in the garden
- Use of traditional materials, tools and techniques
- High level of documentation with each stone on the pathways and each plant recorded
- Compilation of a photographic record spanning 150 years

The red-white contrast of the façade is the predominant architectural feature of the mausoleum.
The pattern of the stonework is carefully worked out to emphasize the significant parts of the building.

STONE FACADE

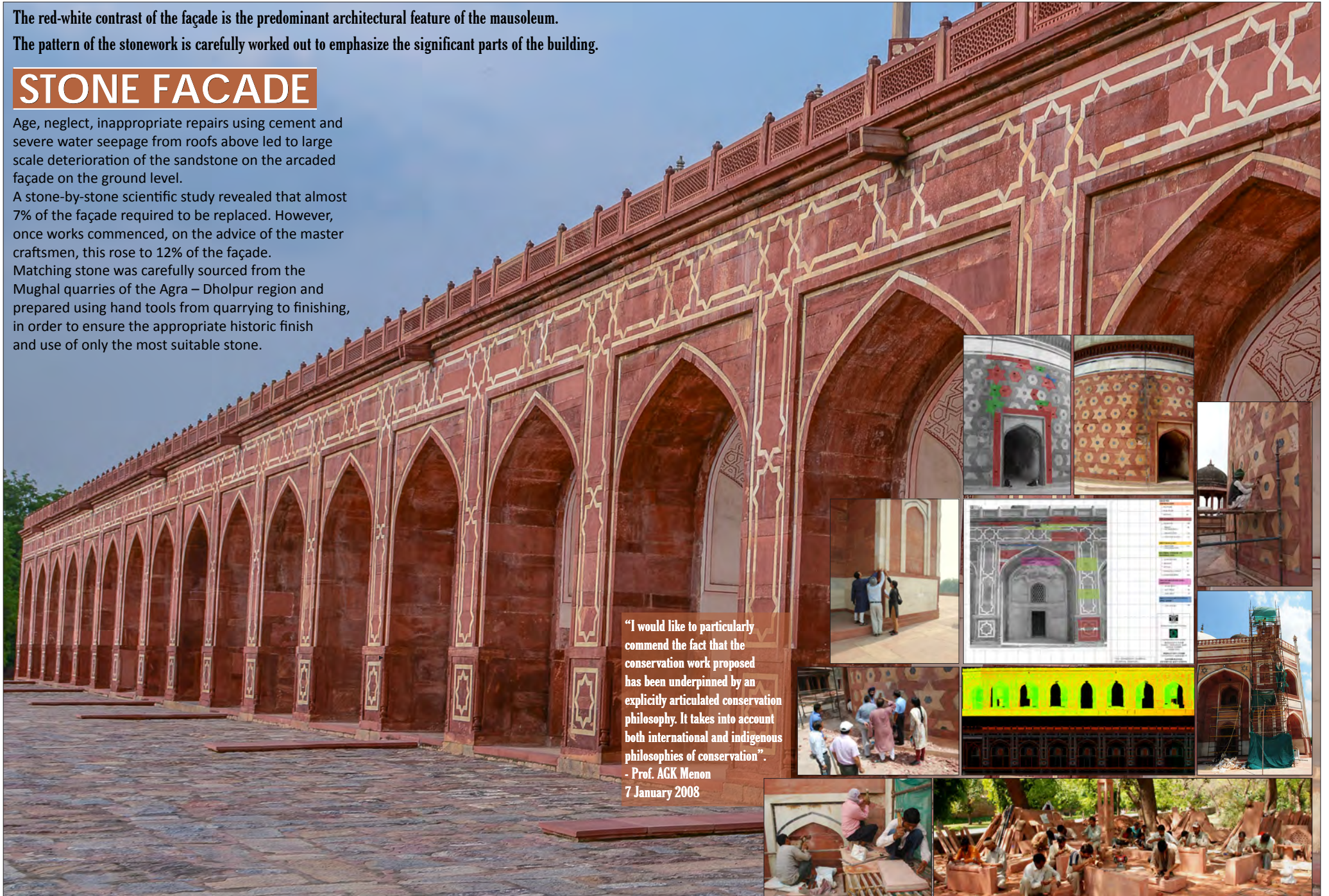
Age, neglect, inappropriate repairs using cement and severe water seepage from roofs above led to large scale deterioration of the sandstone on the arcaded façade on the ground level.

A stone-by-stone scientific study revealed that almost 7% of the façade required to be replaced. However, once works commenced, on the advice of the master craftsmen, this rose to 12% of the façade.

Matching stone was carefully sourced from the Mughal quarries of the Agra – Dholpur region and prepared using hand tools from quarrying to finishing, in order to ensure the appropriate historic finish and use of only the most suitable stone.

“I would like to particularly commend the fact that the conservation work proposed has been underpinned by an explicitly articulated conservation philosophy. It takes into account both international and indigenous philosophies of conservation”.

- Prof. AGK Menon
7 January 2008





Humayun's Tomb- Lower Plinth-
Original Delhi Quartzite



Humayun's Tomb- Lower Plinth-
Concrete layer added later



Humayun's Tomb Lower Plinth
Before Conservation

BEFORE CONSERVATION



Restoring Ornamental Plasterwork

On each façade of the mausoleum are 17 arched openings, and one each of the four corners. Though the facing of this spectacular arcade is clad in sandstone with marble inlay, the 'half-domed' wall surfaces are plastered with ornamental star shaped patterns. Water percolation from the terrace led to most of the original lime mortar disintegrating and then replaced with cement plaster in the 1990's, obliterating decorative plasterwork where traces of this had remained.

The principal conservation challenge was to restore the ornamental plasterwork of the 'half-domed' surface which comprises less than 1% of the façade yet is a prominent architectural feature.

Lime plaster, applied in layers, then incised to bring out the desired patterns transformed the character of the mausoleum, from ruinous to splendour. The final 1 mm thick layer of lime-marble dust plaster not only served as a protective layer for the underlying plaster but the Mughals used it to mimic white marble. The ornamental patterns in incised plasterwork were once again emphasized with red lime plaster obtained by the traditional additive of geru powder.



DURING CONSERVATION





Humayun's Tomb Arcade Plasterwork



Wherever original lime plaster layers had survived, these were retained and additional lime plaster carefully matching the original in composition restored to missing portions only.



Humayun's Tomb Inner Chambers



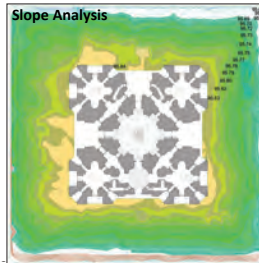
RESTORING MUGHAL PLATFORMS

Overlooking the Char Bagh, a 21 m deep sandstone terrace, surrounds the principle tomb structure. Persistent archival research revealed a plan, prepared in AD 1880, of the sandstone plinth indicating the exact paving pattern prior to all 20th century repairs.

Though many of the sandstone slabs still bear the mason marks of the Mughal masons, almost the entire paving had been altered during past repairs which had also altered the slopes leading to significant water seepage to the chambers below.

Almost 70% of the 5800 sq.m. of the sandstone plinth required to be lifted and reset with only stone pieces beyond repair replaced with new stones - matching the original in size – and in the process of restoring adequate slopes, also restoring the Mughal paving pattern.

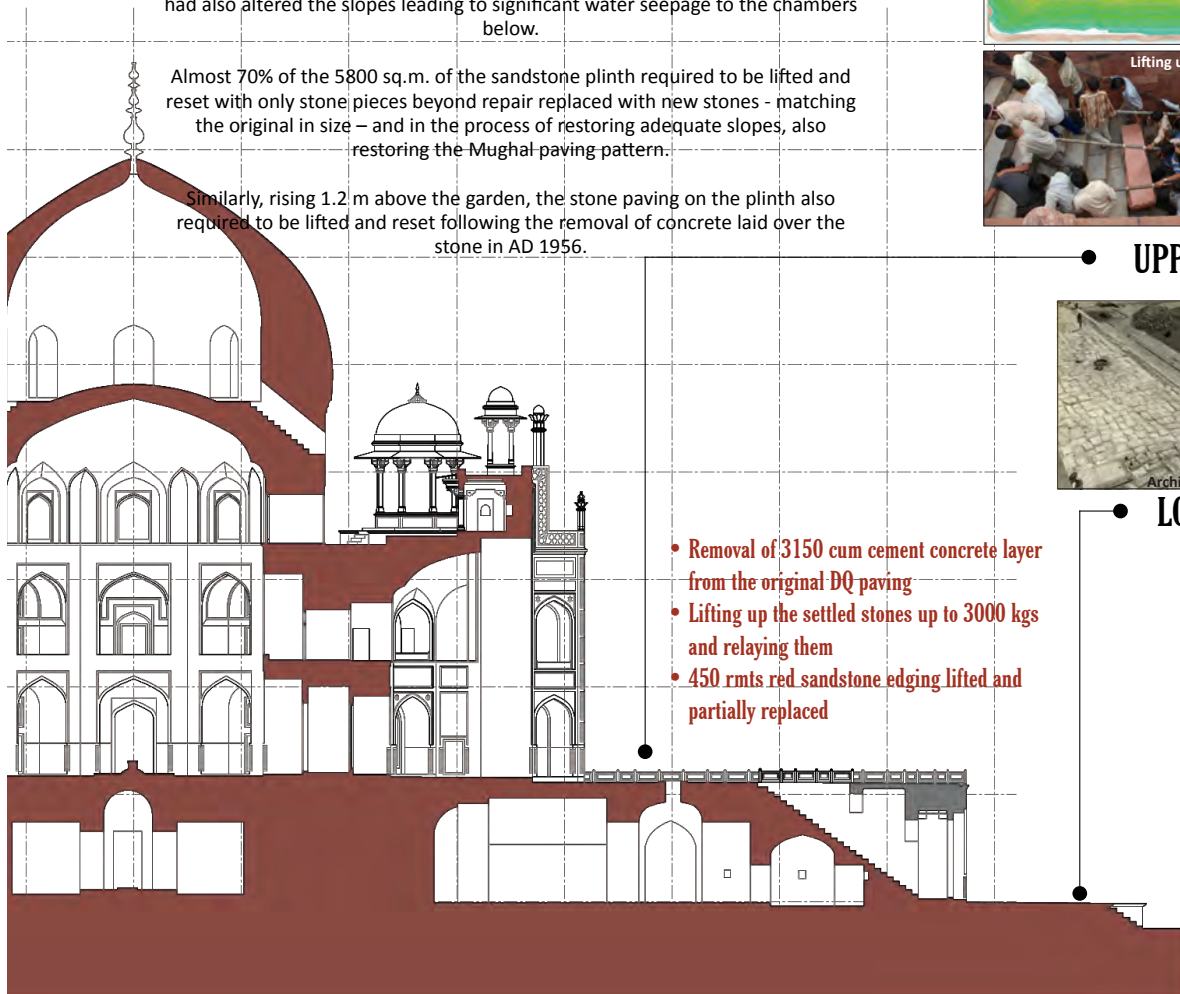
Similarly, rising 1.2 m above the garden, the stone paving on the plinth also required to be lifted and reset following the removal of concrete laid over the stone in AD 1956.



- Original stones with mason marks were documented, conserved and re-laid in position
- 5800 sq.m upper plinth restored with appropriate slopes as per 19th century surveys



• UPPER PLINTH

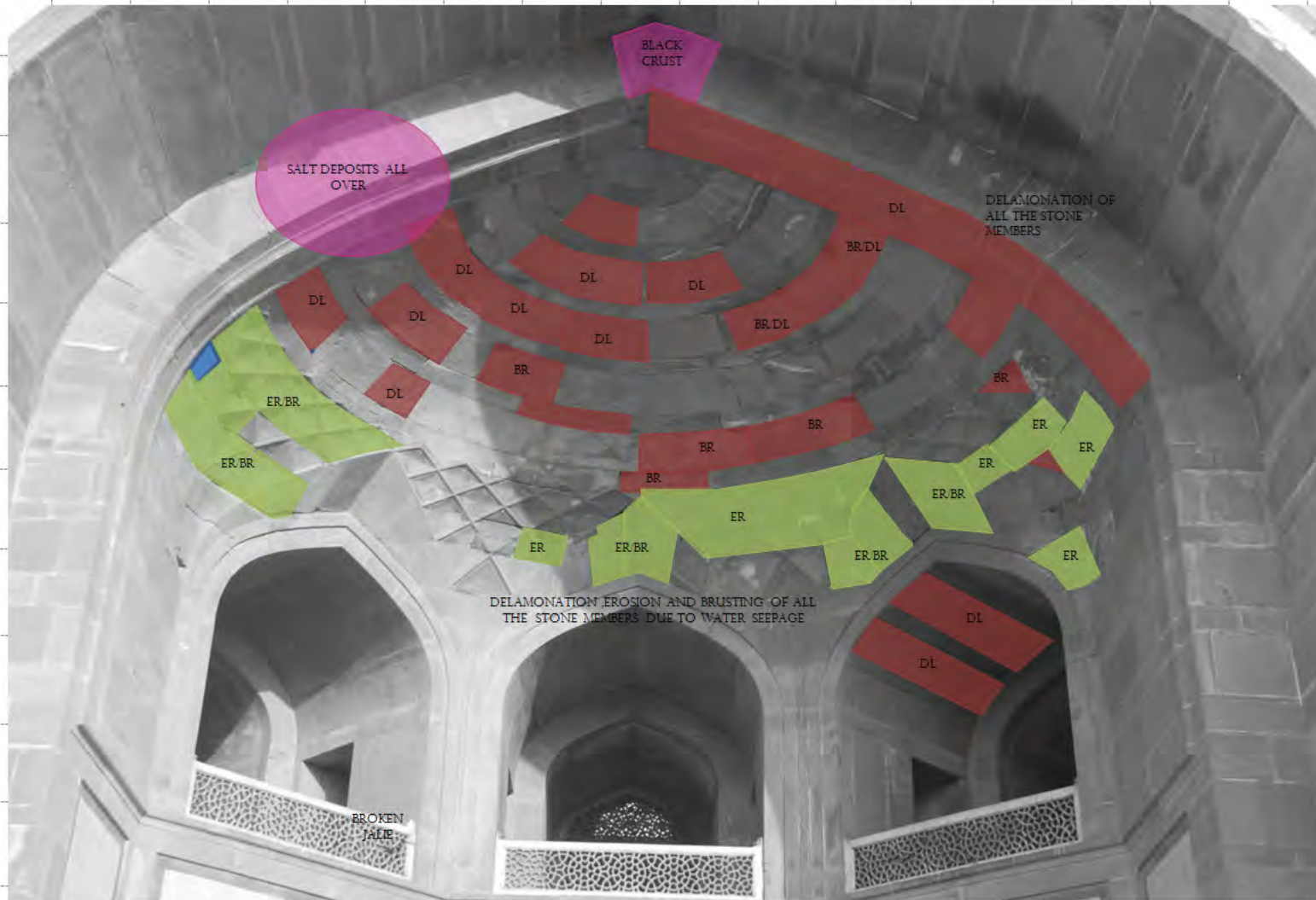


• LOWER PLINTH

- Removal of 3150 cum cement concrete layer from the original DQ paving
- Lifting up the settled stones up to 3000 kgs and relaying them
- 450 rmts red sandstone edging lifted and partially replaced



In order to restore the architectural integrity of the lower plinth – an important interface between the garden and the mausoleum – it was necessary to lift nearly all of the 120,000 sq feet of heavy quartzite paving. The larger stones required over 15 craftsmen to lift and reset them in level.



LEGEND:

DEFORMATION

FRACTURE	F
HAIR CRACK	HC
SPITTING	SP

DETACHMENT

BURSTING	BR
PEELING AND BLISTERING	PB
DELAMINATION	DL
CONTOUR SCALING	CS

DISINTEGRATION

GRANULAR DISINTEGRATION	DI
-------------------------	----

FEATURES INDUCED BY MATERIAL LOSS

ALVEOLIZATION	AV
EROSION	ER
PITTING	P
MECHANICAL IMPACT	MI
MISSING MEMBERS	MM
CHIPPING	CH

DISCOLORATION AND DEPOSITS

BLACK CRUST	BC
SALT CRUST	EC

RECENT INTERVENTIONS (PRE 2008)

NEW STONES	NS
FILLED WITH MORTAR	R
REPLACED WITH MULTIPLE STONE	MR



ARCHAEOLOGICAL SURVEY OF INDIA



THE AGA KHAN TRUST FOR CULTURE
 HUMAYUN'S TOMB
 HAZRAT NIZAMUDDIN BASTI
 SUNDAR NURSERY
 DELHI, INDIA

HUMAYUN'S TOMB
 CONDITION ASSESSMENT

EXTERNAL ELEVATION
 UPPER PLATFORM

Humayun's Tomb: Condition Assesment

W4- CONDITION MAPPING ,
 INTRADOS

Conservation works aimed at restoring original slope to ensure no water percolation to chambers below takes place, restoring the pattern as documented in the 1880's as well as replacing inappropriate stone (on account of thickness, finish, texture and colour) with stone matching the original



Humayun's Tomb: Upper Platform

A 3D laser scan survey of the sandstone terrace revealed that past repairs – of which the most intrusive were those carried out in 2003-5 had also reversed the slopes and created a shallow drain along the edge of the mausoleum. Furthermore once works commenced it was discovered that many stones had been reused during past repairs by reversing the stone and chiseling it down – thus resulting in a stone which was of a thin section and thus inappropriate to use.





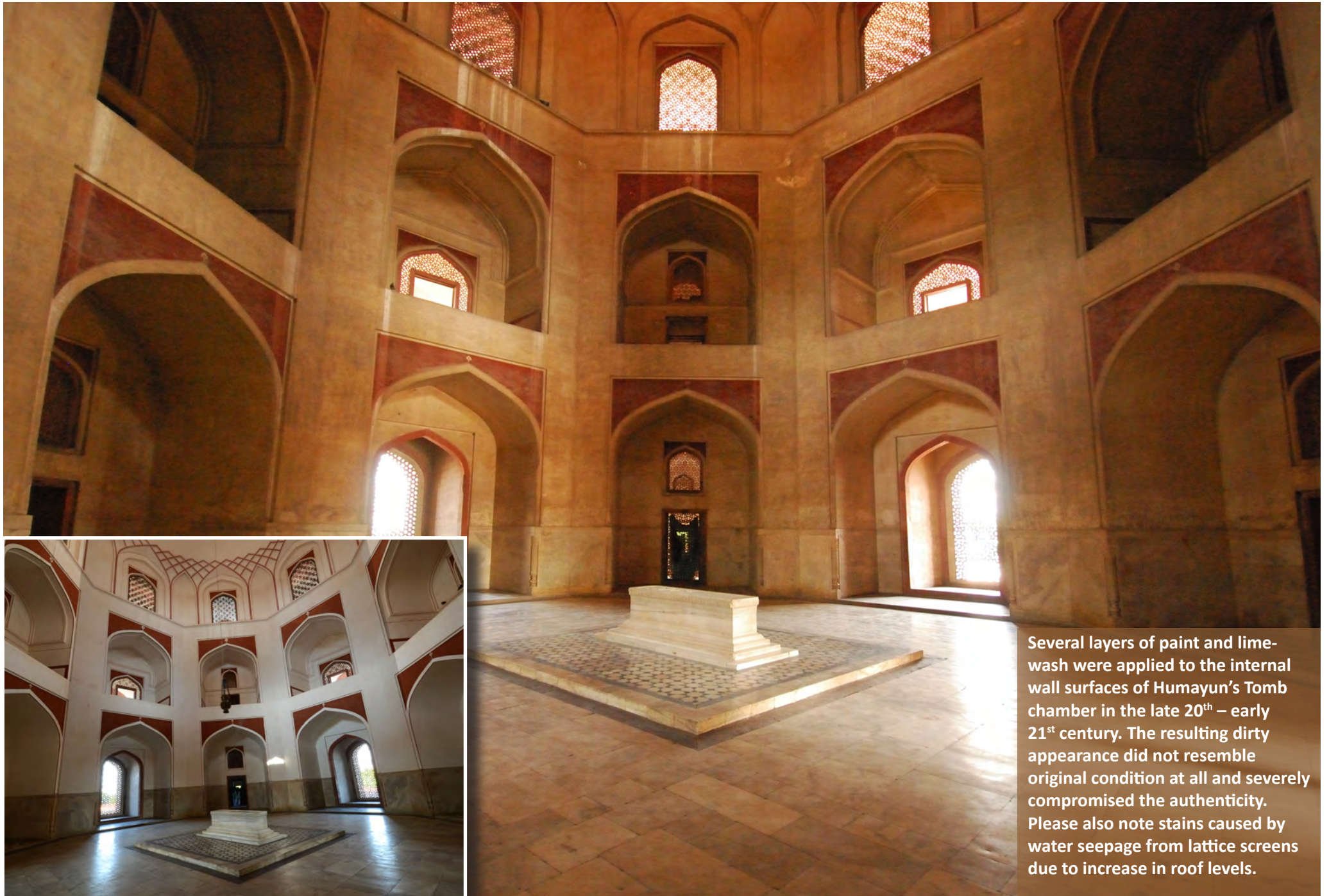
Entrance Chamber Ceiling



Humayun's Tomb Main Hall



Humayun's Tomb Main Hall



Several layers of paint and lime-wash were applied to the internal wall surfaces of Humayun's Tomb chamber in the late 20th – early 21st century. The resulting dirty appearance did not resemble original condition at all and severely compromised the authenticity. Please also note stains caused by water seepage from lattice screens due to increase in roof levels.

RESTORING HISTORIC TILEWORK

Though tile fragments were visible on the canopies, it was only after a careful scientific study that original patterns could be determined. These tiles represented an important intention of the Mughal builders and thus remained a focus of the AKTC conservation project.

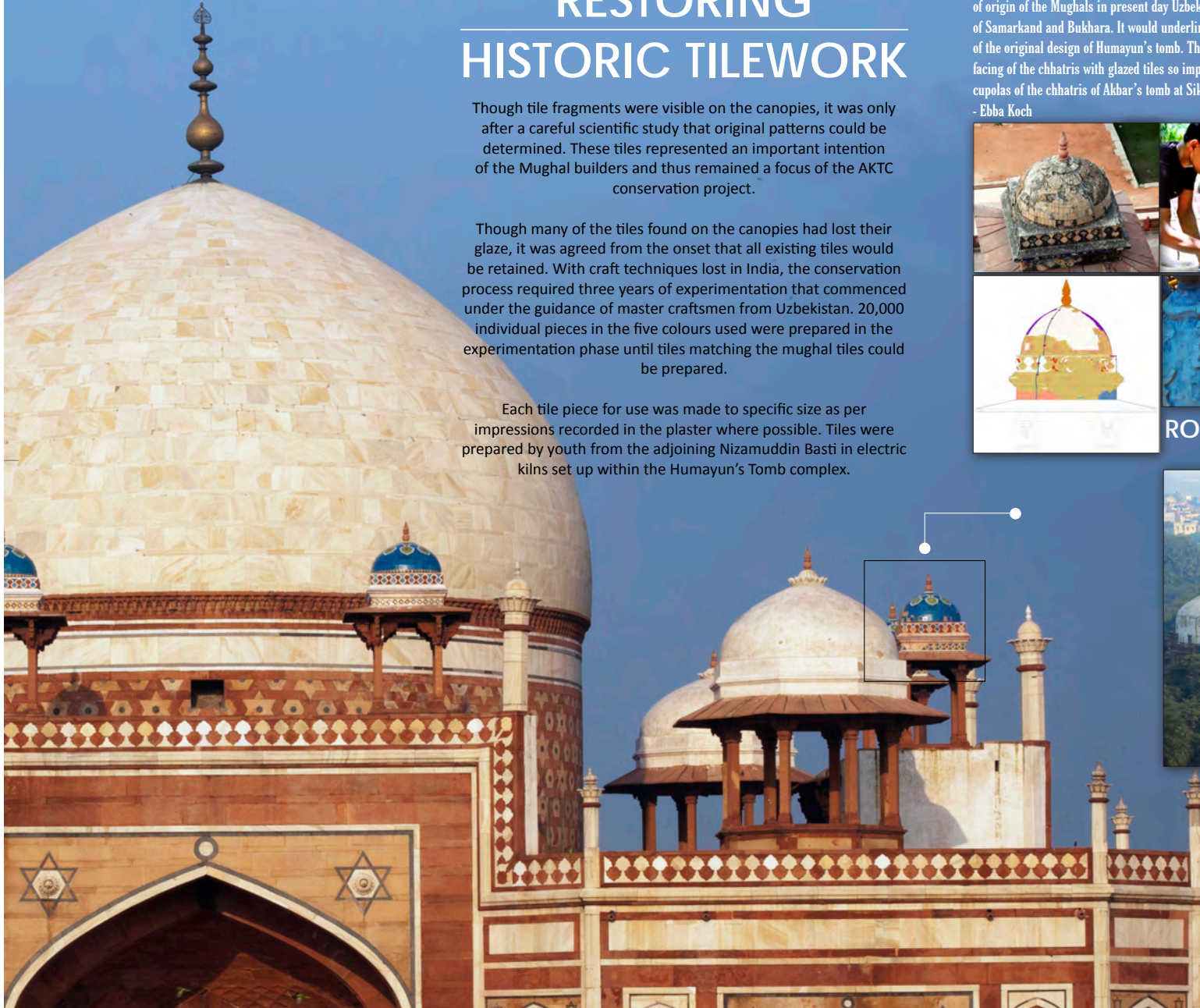
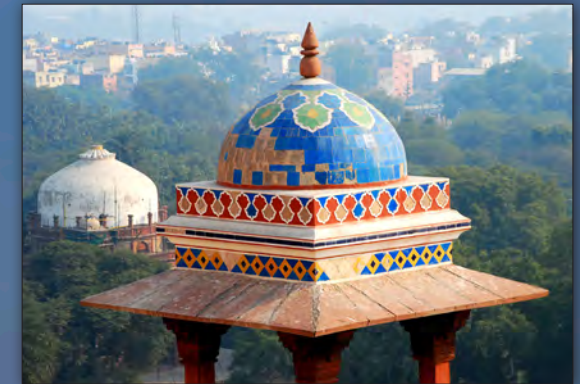
Though many of the tiles found on the canopies had lost their glaze, it was agreed from the onset that all existing tiles would be retained. With craft techniques lost in India, the conservation process required three years of experimentation that commenced under the guidance of master craftsmen from Uzbekistan. 20,000 individual pieces in the five colours used were prepared in the experimentation phase until tiles matching the mughal tiles could be prepared.

Each tile piece for use was made to specific size as per impressions recorded in the plaster where possible. Tiles were prepared by youth from the adjoining Nizamuddin Basti in electric kilns set up within the Humayun's Tomb complex.

Restoration of tilework adds a so far unknown dimension to the Indian red and white philosophy of the monument, namely an architectural reference to the country of origin of the Mughals in present day Uzbekistan, to the blue and green domes of Samarkand and Bukhara. It would underline the architectural universalism of the original design of Humayun's tomb. The Mughal builders considered the facing of the chhatris with glazed tiles so important that they repeated it for the cupolas of the chhatris of Akbar's tomb at Sikandra (completed 1613).
- Ebba Koch



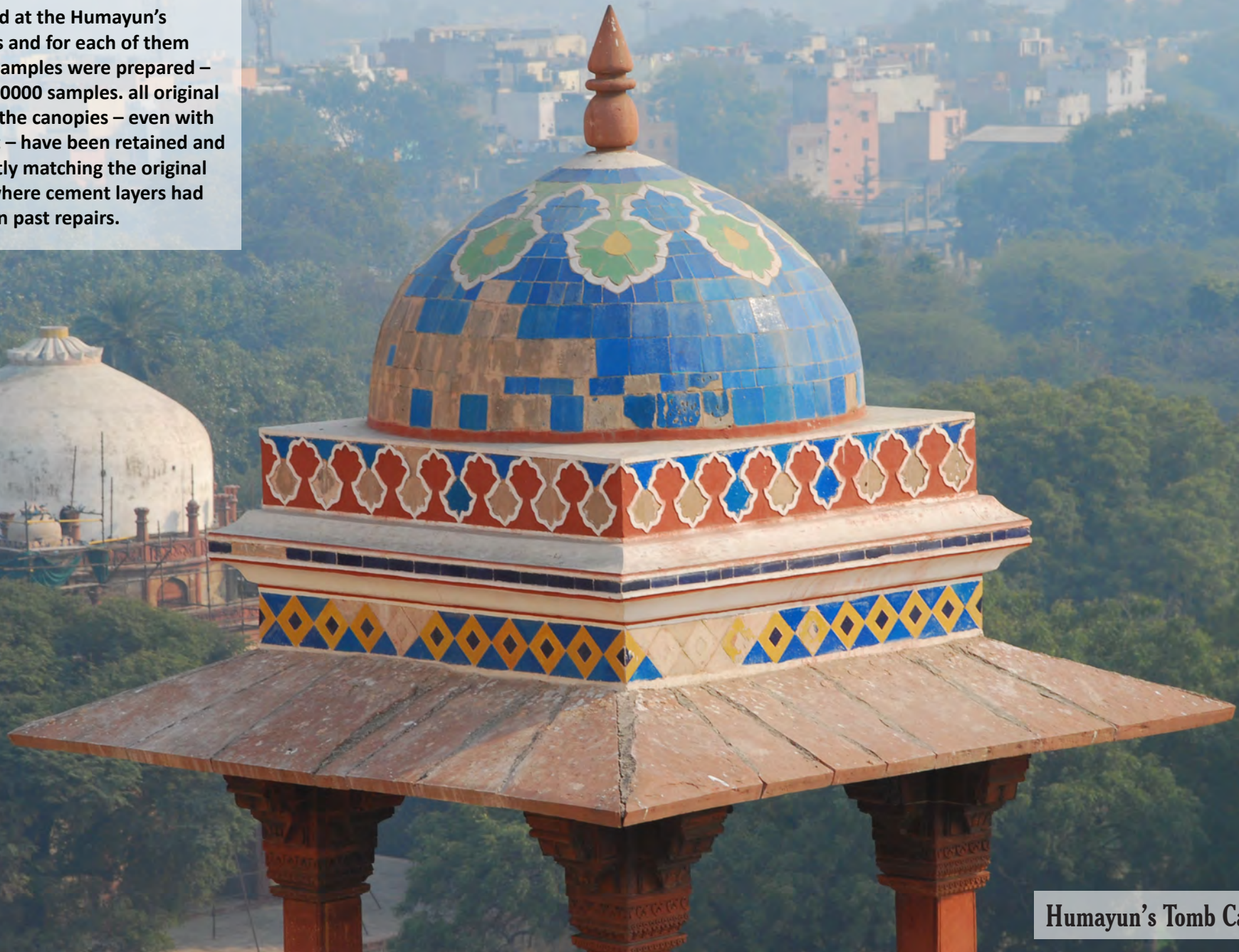
ROOF CANOPIES





Restoring Tilework on Canopies

Five colours of tiles were found to have been used at the Humayun's Tomb canopies and for each of them thousands of samples were prepared – totaling over 20000 samples. all original tiles found on the canopies – even with their glaze lost – have been retained and new tiles exactly matching the original applied only where cement layers had been applied in past repairs.



Humayun's Tomb Canopy

I am able to write of being inspired. inspired by the potential for the recovery of the Monuments precinct. Half a lifetime's work ahead – but time to be well spent.

Herb Stovel, April 19, 2008

The Humayun's Tomb boasts of a grand double dome of a scale never before seen in India. The condition assessment revealed that the outer dome was leaking and the plaster on its inner surface had been completely lost. Conservation works required careful removal of cement from the joints of the marble dome and then filling the joints with lime mortar.

Preliminary studies revealed 40 cm of concrete was laid on the roof in the 20th century. Removing over 1 million kilograms of concrete without any vibrations that could cause damage to the masonry posed a significant challenge. The removal commenced with a thin and deep cut using a diamond edged blade on a grid pattern. Specially imported low vibration tools then widened the cut to allow stone-carvers to remove the concrete using traditional hand tools, in a yearlong exercise. A layer of lime concrete matching the original in composition of brick aggregate, sand, brick dust and traditional additives such as fruit pulp, molasses, was then laid over the roof to original slope.



DOME & TERRACE





Manual removal of 1 Million kilos of concrete from the roof

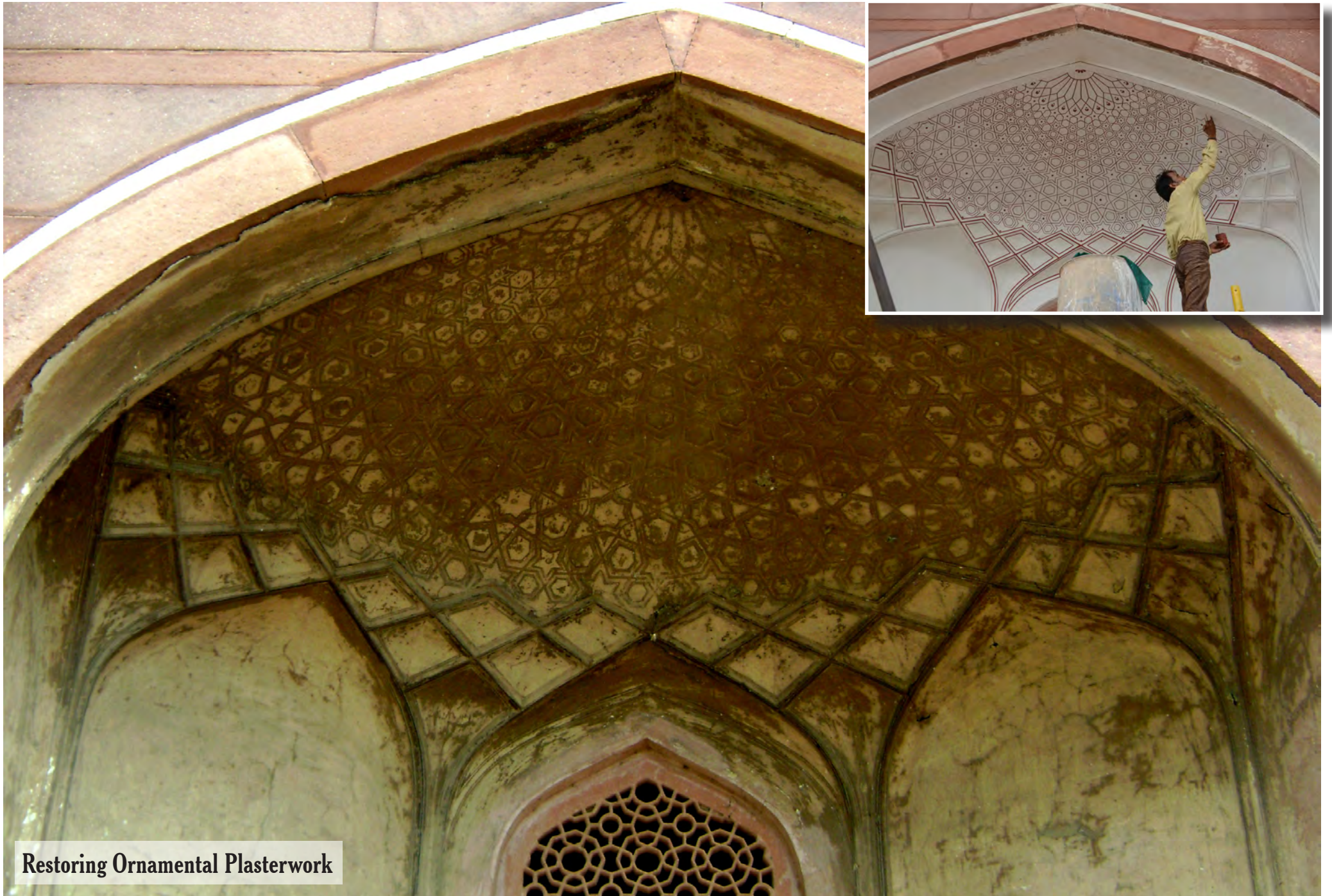




The marble joints have been cleaned and re-pointed



South Gateway



Restoring Ornamental Plasterwork

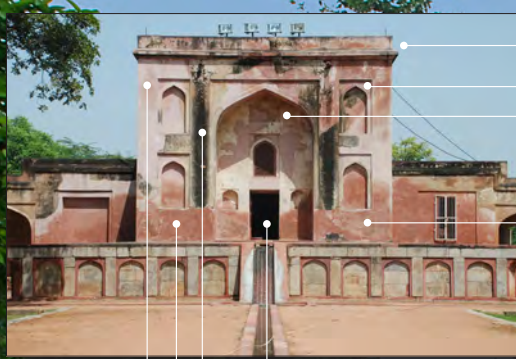


Barber's Tomb: Before Conservation



PAVILIONS

Unlike the gateways, the northern and eastern pavilions were built in rubble masonry and finished in plaster – red and white – matching the contrasting colour scheme of the mausoleum. Besides required structural repairs, restoring the missing sandstone door frames, the wooden doors and the lattice screens, the most prominent conservation measures on these pavilions required the removal of all cement plasters – of which at least four different hues were found on the structure. As with the roof of the mausoleum, concrete required to be removed from the roof and replaced with lime concrete laid to adequate slope. Also, on the eastern pavilion, many of the sandstone slabs supporting the roof of the eastern arcade required to be replaced.



- Kangura Missing
- Polychromy Missing
- Ornamentation Obliterated
- Damp Related Damage

- Broken Door Frame
- Water Drainage
- Cement Plaster
- Cement - Surkhi Plaster



HAMAAM / NORTH PAVILION



BARADARI / EAST PAVILION



How ambitious, this scheme to restore the dignity of one of the outstanding monuments of the world. To remove tones of concrete and to match the standards of the time of the origin of the monuments. A new standard for conservation emerges for South Asia.
Niles Gutschow, 14 November 2009



North Pavilion: Before Conservation

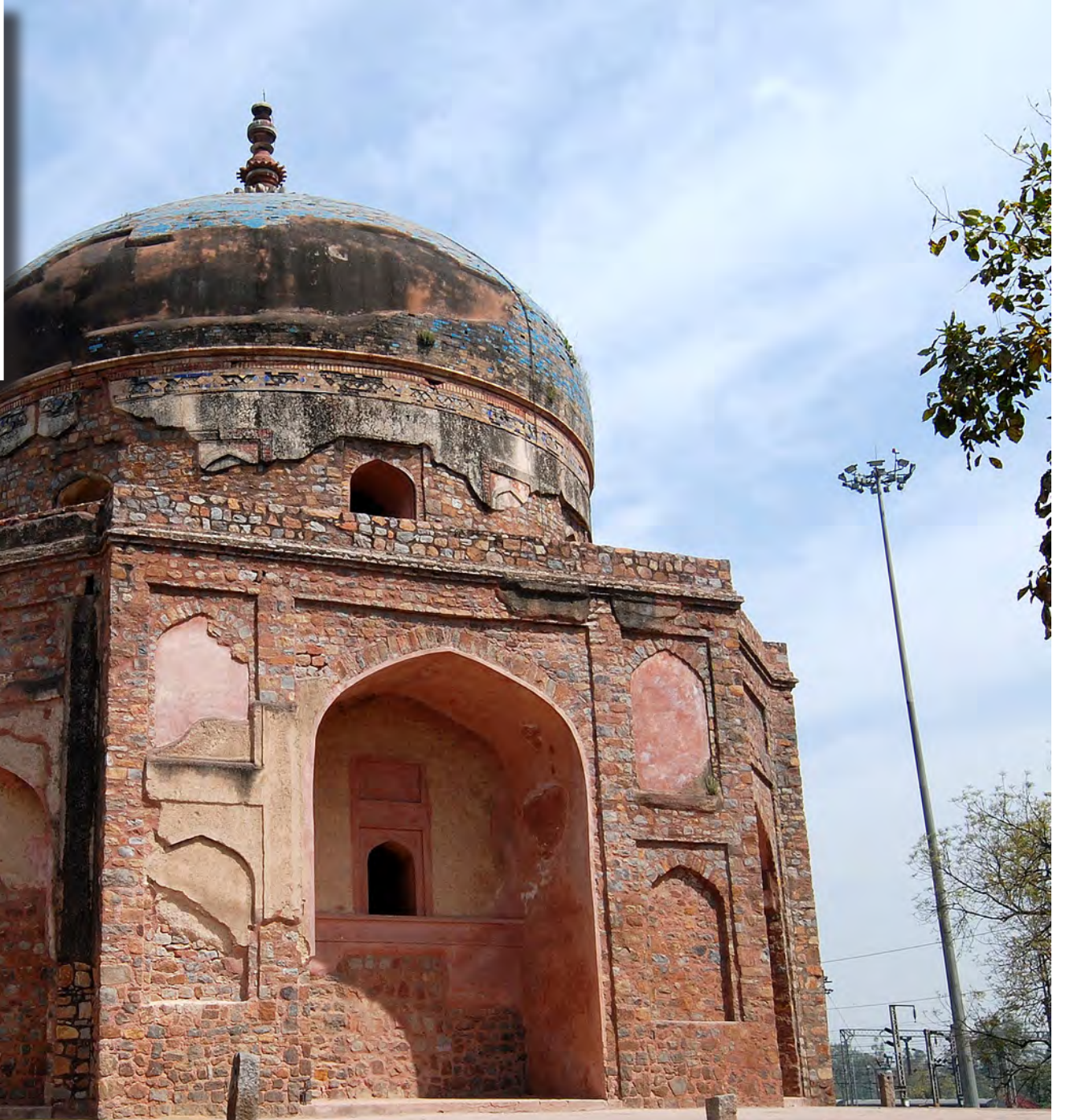


Baradari / East Pavilion: Before Conservation





Baradari / East Pavilion: Before Conservation



Nila Gumbad: Before Conservation



Nila Gumbad: Internal Ceiling