The Tomb of Jam Nizam al-Din

DOCUMENTATION & CONDITION SURVEY

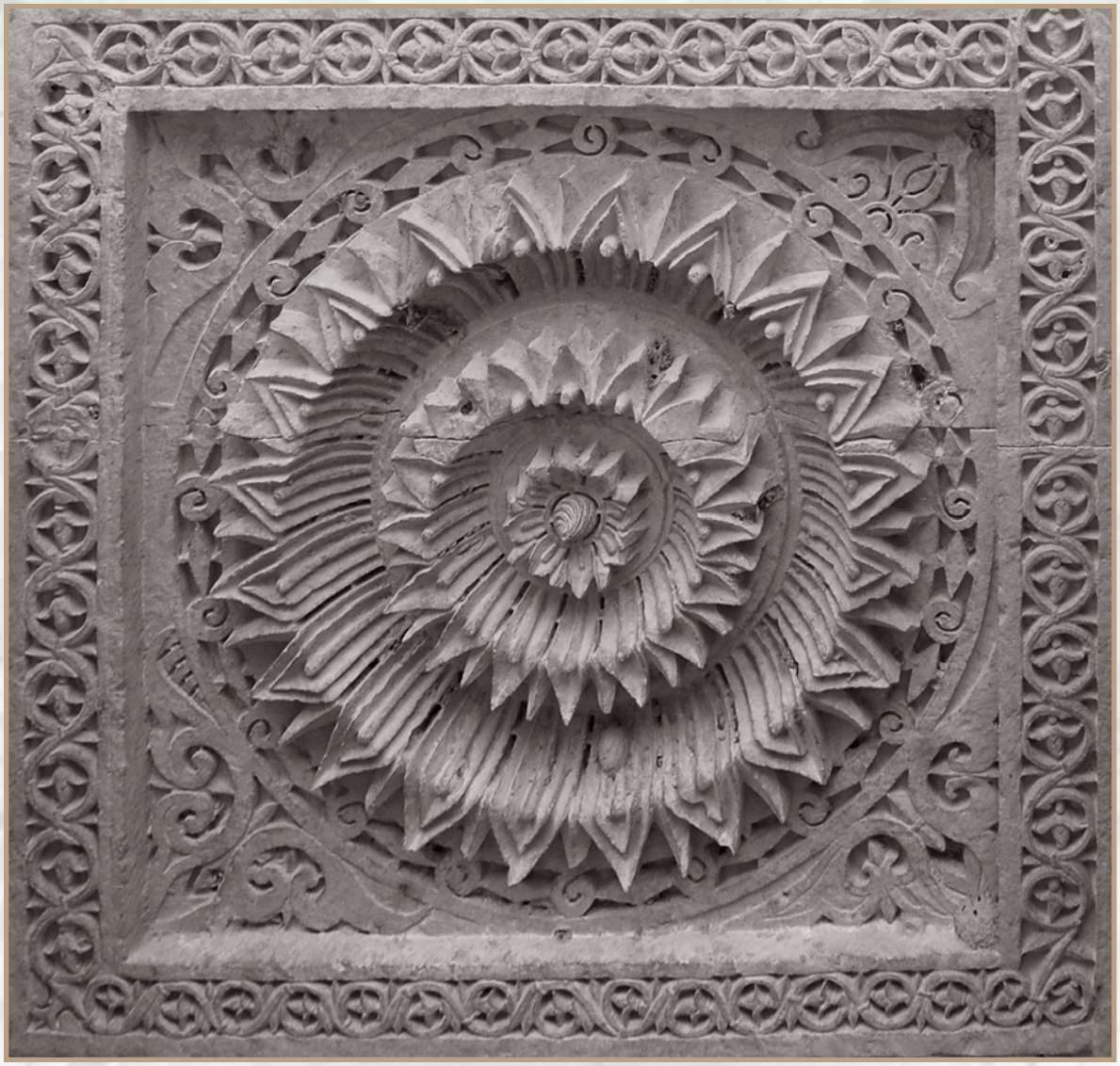

Image on cover: Soffit of lintol in East opening.
Image on back cover: Projecting Balcony at Level 3.

Detail of Jharoka above the Triple Mihrab.

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FOREWORD

The World Heritage Site of Thatta, spreads over an area of 10 km, and consists of 61 identified structures. The site, inscribed in the World Heritage List in 1981, presents a remarkable array of tombs, monasteries, mosques and enclosures situated at the ridge of the Makli Hill. The uniquely Islamic religious character witnessed in this 'city of dead', is a consequence of the grouping of princes' and rulers' mausoleums close to the tombs and *khanqahs* (hermitages) of saints revered by them.

The Saints or *Sufis* who arrived from Central and East Asia, preached the message of peace and togetherness for Muslims and non-Muslims alike. Over time Makli became a famous centre as an abode of some of the most significant saints of the subcontinent. The structures represent a culture of tolerance among people belonging to different religious orientations. Thus, the architectural characteristics present an eclectic mix, amalgamating diverse traditions of Muslim and Hindu cultures. Many are remarkable for devotional carvings of exquisite charm, presenting motifs drawn from Muslim inscriptions as well as Hindu imagery. The adornment of the necropolis by later rulers portrays the variations in architectural style which unfolded in other parts of the subcontinent under the Mughals.

However, amongst all others, the tomb of Jam Nizam al-Din holds great significance owing to its complex construction technique and unique architectural elements. Dating back to the early 16th century the tomb represents impeccable artisanship in stone carving.

The tomb of Jam Nizam al-Din had been a cause of great concern for UNESCO and its specialized partners, who, on more than one occasion proposed a comprehensive management and conservation plan for the Property in order to arrest the deterioration of almost all of the structures within the necropolis. Having examined the Jam Nizam al-Din tomb, experts were of the view that the structure is gradually slipping owing to soil erosion in the slope, along the east side.

Under UNESCO Islamabad's sponsorship, Heritage Foundation carried out extensive studies and structural analysis on the tomb of Jam Nizam al-Din, to identify the causes of deterioration and proposed remedies.

This was a big step taken with UNESCO's modest Regular Programme funds, as it helped to build up the desired momentum towards the conservation and safeguarding of this invaluable property. Soon after UNESCO's intervention came matching efforts from the Sindh Government for development of a Master Plan for Makli and Prince Claus Fund's offer for providing first aid measures for the site.

UNESCO hopes to reinforce this ongoing work with more funds from its Regular Budget, so as to strengthen the existing system with an on-site Centre for Documentation and Research and through building the capacities of concerned departments and personnel.

Dr. Kozue Kay Nagata
Director/Representative
UNESCO Islamabad

PREFACE & ACKNOWLEDGEMENTS

The tomb of Jam Nizam al-Din is among the oldest and most impressive funerary structures at the Makli necropolis. It is an architectural tour de force presenting a unique example of transitional architecture which represents a fusion of ancient Hindu imagery and early Islamic architectural vocabulary.

Even before the site was inscribed in the World Heritage List in 1981, there have been concerns regarding the cracks that appeared on the north and south facades of the monument. Since its inscription on the World Heritage List, these have been a cause of much apprehension to the international community. Various UNESCO missions have pointed out the need for detailed studies and search for appropriate interventions for the protection and safeguarding of this important monument.

The work carried out under the aegis of UNESCO for comprehensive recording of the monument and its present condition, best described 'as a snapshot of history' is in continuation to the detailed studies that Heritage Foundation first carried out on the monument in the 1980s. The earlier documentation formed the basis for a book *The Jewel of Sindh: Samma Monuments on Makli Hill.*

The vast number of photographs and drawings, prepared at the time and now part of Heritage Foundation Archives, helped in developing an insightful understanding of the site by HF Teams delegated to take on the present assignment. The appreciation of the complex structural fabric of the monument is reflected in the all-embracing detailed and meticulous record developed by the HF Teams.

The documentation and recording systems have been fine-tuned by us over the years which have also been used to carry out the present assignment. It is my hope that the present record that has been developed with great enthusiasm and zeal by the HF Team, will be the forerunner of future documentation and condition surveys prepared for heritage sites in Pakistan.

On behalf of Heritage Foundation I would like to place my profound appreciation to UNESCO for enabling us to undertake this seminal work. Our thanks are due to Dr. Kozue Kay Nagata, Director, for her interest

in Pakistan's heritage and for once again placing culture as an important part of the organization's agenda; to Farhat Gul, Cultural Officer, who devised the project and has provided us guidance over last so many years and to Jawad Aziz Project Officer (Culture), and Adnan Ahmad for their continued assistance.

Others who we would like to acknowledge are Engr. Atif Osmani and the field team for physical surveys to achieve accuracy; to Engr. Mushtaq Dawood for structural evaluation and to the geotechnical studies team organized by Engr. Jamshed Danish.

I would like to add my grateful thanks to HF Team members who carried out the work with diligence and passion: Historian Suhail Zaheer Lari for the historical context and helping to develop an understanding of the times and people of the period, and for use of his photographic collections; Ar. Mariyam Nizam for her excellent photography and Photoshop editing, sorting and compilation of vast amount of data and for finalizing the document, and to Ar. Wajiha Siddiqui for preparation of AuoCAD drawings based on Total Station field surveys.

Yasmeen Lari, *SI*
Hon. Project Director
UNESCO Jam Nizam al-Din project
Karachi, September 2011

1.0 SUMMARY

Executive Summary

The tomb of Jam Nizam al-Din, being among the first structures built at Makli and carrying unique architectural characteristics, is endowed with special significance located as it is among a large number of important monuments that date from the 14th to 18th century. The monuments have suffered degradation due to neglect as also due to excessive rains and the influx of displaced persons who sought refuge at the Makli Necropolis after the disastrous floods of 2010. By undertaking a Damage Assessment Mission, supported by Prince Clause Fund, Heritage Foundation has been able to catalogue 61 extant structures above ground. This is the first pictorial catalogue of WHS Thatta that provides basic information regarding the present condition of all the historic structures. The catalogue is based on the division of the entire site into four different clusters relating to four historic periods: the Sammas, the Arghuns, the Tarkhans and the Mughals. A numbering system has been devised that numbers each monument depending upon the historical period it belongs to.

The UNESCO project, undertaken from April to August 2011, for the documentation and condition survey report of the tomb of Jam Nizam al-Din, is in recognition of the need to prepare authentic data to help develop strategies for the safeguarding of one of the oldest and most impressive structures at the necropolis. The state of this historic monument has been of concern for a considerable time. In various UNESCO Missions and World Heritage reports, while recommendations have been made for general recording, conservation, maintenance and monitoring of the entire site, the tomb of Jam Nizam al-Din has received special attention for ensuring its stability.

The present work was greatly facilitated by the extensive documentation that had been carried out by Heritage Foundation in mid 1880s on the Samma cluster and particularly on the tomb of Jam Nizam al-Din. The research and documentation formed the basis for the book *The Jewel of Sindh: Samma Monuments on Makli Hill*, authored by Suhail Z. Lari and Yasmeen Lari and jointly published by Heritage Foundation and Oxford University Press. The data available in Heritage Foundation Archives thus became a valuable base on which further, more comprehensive and accurate information has been added. The information was synthesized in developing an understanding of the monument and its historical context.

Profusely decorated Triple Mihrab.

Projecting Balcony ensemble on West facade.

The format and process for detailed recording and comprehensive surveys leading to conservation interventions were established at the UNESCO Lahore Fort World Heritage Site by CEO Heritage Foundation Yasmeen Lari as UNESCO National Advisor (2003-2005). It is at that time that she also developed the numbering methodology which helped in systematic recording of all components and elements. These formats and processes have been subsequently used in several other conservation projects undertaken by Heritage Foundation.

From the inception of the project it was clear that the task must be undertaken with utmost devotion and sincerity to provide a scientific basis for conservation and stabilization of the multi- faceted historic structure. Regardless of the challenges of the complexity of the monument's structure, months of extreme heat, isolated location of the site and deteriorated law and order conditions, the HF Teams worked with dedication to develop detailed and accurate base line record, meticulous condition surveys and extensive field investigations.

As the work on the Project was begun, it soon became clear that where the 1980s documentation and other data would be useful for initial activities and planning of various tasks, extensive field work as well as data collection and analysis would have to be taken up anew. It was evident that in view of the availability of improved tools and computer software, manual drawings based on hand measurements of the past had to be substituted by Total Station measurements and drawings prepared in AutoCAD software. The digital images also needed to be edited using Photoshop software. This use of new tools and technology, that had become available during the intervening period, became vital in view of the precise and accurate information that was needed to effectively fulfil the objectives of the project.

Ever since the Tomb of Jam Nizam al-Din was constructed in the early 16th century, it is the first time that comprehensive data has been compiled that graphically and photographically records the damage, along with exploring the causes leading to its present deteriorated state. Detailed and meticulous recording has been carried out by Heritage Foundation Teams that were formed to collate and present the current condition of the monument. Accordingly, analysis of the present condition has been based on comprehensive graphic and photographic surveys, geotechnical studies and structural evaluation. The aim is to provide a scientific basis for conservation and stabilization of the historic struc-

View from Southwest.

ture. The findings are expected to assist custodians and conservators to determine future interventions for the safety of the monument.

The HF methodology of providing unique numbers to each component and element has ensured systematic recording of condition of each wall, squinch, openings, decorative features and even each one of the 3473 stones that make up the monument. The information has been marked on drawings and in the form of data bases. Due to its thoroughness the present data forms a benchmark against which condition surveys in the future can be carried out, thus making it possible to determine any deterioration in the condition of the structure.

View from Northeast.

Internal view looking West.

Internal view looking South.

Internal view looking East.

Internal view looking North.

All studies, investigations and data have been compiled in four volumes and DVDs of the report have also been prepared which are available on request from UNESCO and Heritage Foundation. The DVDs carry Pdf versions as well as drawings in AutoCAD format for ease of use and reference purposes. The following are the details of the entire report:

- Part I - Preface, Executive Summary, Summary of Findings, Recommendations/Remedial Measures, Site Drawings.
- Part II – Database Report, Folio Series 'P' (Preliminary Drawings from hand measured tools), Folio Series 'S' (Drawings after Physical Survey with Total Station), Folio Series 'PL' (Comparative Drawings between Hand-held tools and Total Station), Folio Series 'L' (Drawings showing Numbering of Elements), Folio Series 'IF' (Images).
- Part III – Condition Survey Report, Folio Series 'LI'(Drawings showing Numbering of Elements with Photograph Superimposition), Folio Series 'DE' (Architectural Database of Elements), Folio Series 'DC' (Drawings marking Major Cracks and Deformations), Folio Series 'DI' (Drawings marking All Damages), Folio Series 'DA' (Database relating the Types of Damage on each stone).
- Part IV – Investigations, Geo-technical Report, Structural Evaluation.

From the investigations it has been found that the soil on which the monument is resting is composed of sand and clay with gravel and cobble deposits along with silty shale compressed between two layers of sandy and nodular limestone followed by nodular sandstone. The main cause for the tilting is due to the loosening of soil and erosion in the slope occurring on the East side, on which side the maximum tilt of the wall is also recorded through Total Station measurement readings.

We believe that in view of the extensive studies that have been carried out, it will be possible to develop appropriate strategies for conservation in order to provide protection to the resting place of the earliest and the best-loved ruler of Sindh. Among the most important findings is the need to immediately stabilize the drop on the East side of the historic structure. Measures that stabilize the surrounding area will prove to be useful in determining the minimum intervention that may be needed in stabilizing the structural fabric of the monument itself. It is also our hope that the present all-encompassing report, that has set the methodology, template and standards, can be utilized effectively for all the 61 above-ground structures that have been identified and published by Heritage Foundation.

Findings

After studying various data the following results are being presented for devising future action:

- The South façade carries a prominent crack that begins from the ground level and reaches up to the roof level. This crack also appears on the internal wall as well. The route of the cracks for external and internal South wall is marked on Drg. No. DC(2-)001 and DC(2-)017 respectively.

- The North façade also has a prominent crack, which is visible in the route of the crack marked on Drg. No. DC(2-)003. This is reflected on the interior wall as well and has been marked on Drg. No. DC(2-)017.

- From the physical survey drawings, it has been determined that the entire building is subjected to a tilt of maximum 8" (200 mm) towards the East. The tilt is clearly visible if the South and North Elevations are examined. Thus, it is clear that differential settlement up to 8 inches has taken place. The survey data shows that the structure has tilted essentially towards East while East wall shows rotation which indicates an unstable slope on East side. The rotation of NE corner with respect to SE corner is found to be 5.5" (137.5 mm). As mentioned earlier, the East wall shows distortions up to 8" (200 mm).

- The Darshan Jharoka on the West also shows partial detachment from the façade that is especially visible on its junction of North side with the main Western face of the structure. The detachment is visible from Level 1 to Level 2, and some tilting at Level 3. This shows that although there is detachment at the lower level, and the Darshan Jharoka structure is leaning along with the main structure at the same angle.

- There is evidence of crack along the East wall in the floor which runs parallel to the East Wall. It is unclear whether the crack is due to erosion of soil or is a joint between the alleged retaining wall that is reported to have been built during the 1990s. In view of eroding soil as determined by geotechnical studies, this area needs to be stabilized to stop further erosion.

- The study of stones shows different kind of damage to the stone blocks. Although there is not much evidence of advanced stage of decay, there are some instances of spalling and other minor damage The Database Series No. DAe and DAi indicate the condition of all stones along with providing information regarding the interventions that were undertaken in the past.

Ornamental sculpture - Projecting Balcony ensemble seen from West.

Signs of stress. Top of North doorway.

Detachment at Northwest corner. Projecting Balcony Ensemble.

Detachment at junction of Southwest edge at base of Projecting Balcony.

- There are several parts with black crust deposits, soiling and water marks in the upper parts of the walls. Unless these are cleaned/removed, they will result in damage to the stone.

- The white powder deposits visible in the base of many parts of the wall clearly point towards effect of salts. The presence of sodium chloride in the soil is also shown by the laboratory tests conducted on samples. In view of the marine environment and salt being carried in the air, it clearly manifests itself in the form of the white deposits seen at the base of some of the walls.

Causes of Wall Distortion

- The analysis for the South Wall crack is provided by structural consultant Engr. Mushtaq Dawood:

"*Land mass on the East side is sloping at approximately 2:1. The layer of Shale is therefore exposed as shown in drawings of geo-technical studies. It can undergo change in its physical properties. As a consequence East wall can settle. The mass of the South wall is not uniform and towards East it's heavier. There is a potential of cracking over last 500 years. East wall is reported to have settled/leaned.*"

- The analysis of causes of distortion of wall is provided by Engr. Jamshed Danish who carried out the geotechnical study:

- The tomb is founded on rock formation; which is considered to be "*competent to support the load of the present structure from Bearing Capacity consideration.*"

- Since the Tomb is located at the edge of the rock slope (Eastern side), there are very clear signs of continued weathering and erosion which has destabilized the slope over period of time.

- The position of foundation is undesirably close to the present slop, thus the building structure is prone to distortions.

- The pattern of differential settlement and angular distortion (as evident from the field survey data) suggests cracking in North, South, and East Wall, which has also been observed at site.

- The erosion of soil has resulted in the tilting of the East wall.

Recommendations/Remedial Measures

On reviewing the data and condition survey documents the following is recommended as initial measures. The emphasis should be more on improving the conditions around the site, with minimal interventions within the structure itself.

- As a first step correct contour survey of the slope is necessary. The drawing in the Report shows contours as recorded in the 1980s. There has been severe erosion since that time and therefore it is essential that contour survey depicting the latest condition is prepared.

- Mitigation measures are required to stabilize the slope on the East side. For this purpose a concept has been developed by Structural Consultant Engr. Mushtaq Dawood, and is shown in Drawing No. SK-1, in Part IV of the main Report:

The recommendation consists of construction of a deep retaining wall, tangent piles that are anchored and grouted, along with new infill for stabilization purposes.

- Although conceptual drawings have been prepared, further structural studies are required. Further detailed drawings based on new contour survey maps and in the light of the geotechnical studies and recommendations made in the Report, should be prepared in order that work on stabilizing the slope could be undertaken.

- 'Crack Mon' or similar devises should be installed in existing cracks (instead of the crude tell-tales that are presently placed by the Federal Department of Archaeology). Monitoring and crack recording should be carried out on a monthly basis for at least one year so that the data could be analyzed. This mechanism should be continued for a few years for a conclusive judgment.

- Surface water drainage should be provided internally and externally to avoid collecting water inside or in the surrounding area.

- After carrying out stabilizing measures on the East side slope, plantation of suitable plants on the slope should be undertaken to provide a soft edge to the ridge.

View of East facade showing damage to projection above doorway.

Crack in the base of Projecting Balcony ensemble on South.

View of East facade showing condition of masonry.

Repairs to stone lattice aperture on East facade.

Maintenance Procedures

The following preliminary measures for maintenance are recommended:

- Gentle scientific cleaning of the entire structure externally and internally.
- Re-pointing in joints with matching mortar where the gaps are indi cated in the Database document Series DAe and DAi.
- Removal of loose mortar and re-pointing.
- Regular cleaning of stone surfaces to remove white deposits, black crust and water marks.
- Regular removal of water, debris, garbage and other matter from in side the monument.
- Regular cutting of bushes, and removal of plants from the surrounding areas.

Internal view of Northeast, showing the phases of transition and squinches at two levels.

View of the Makli Hill ridge. The tomb of Jam Nizam al-Din is on extreme right.

2.0 HISTORICAL CONTEXT

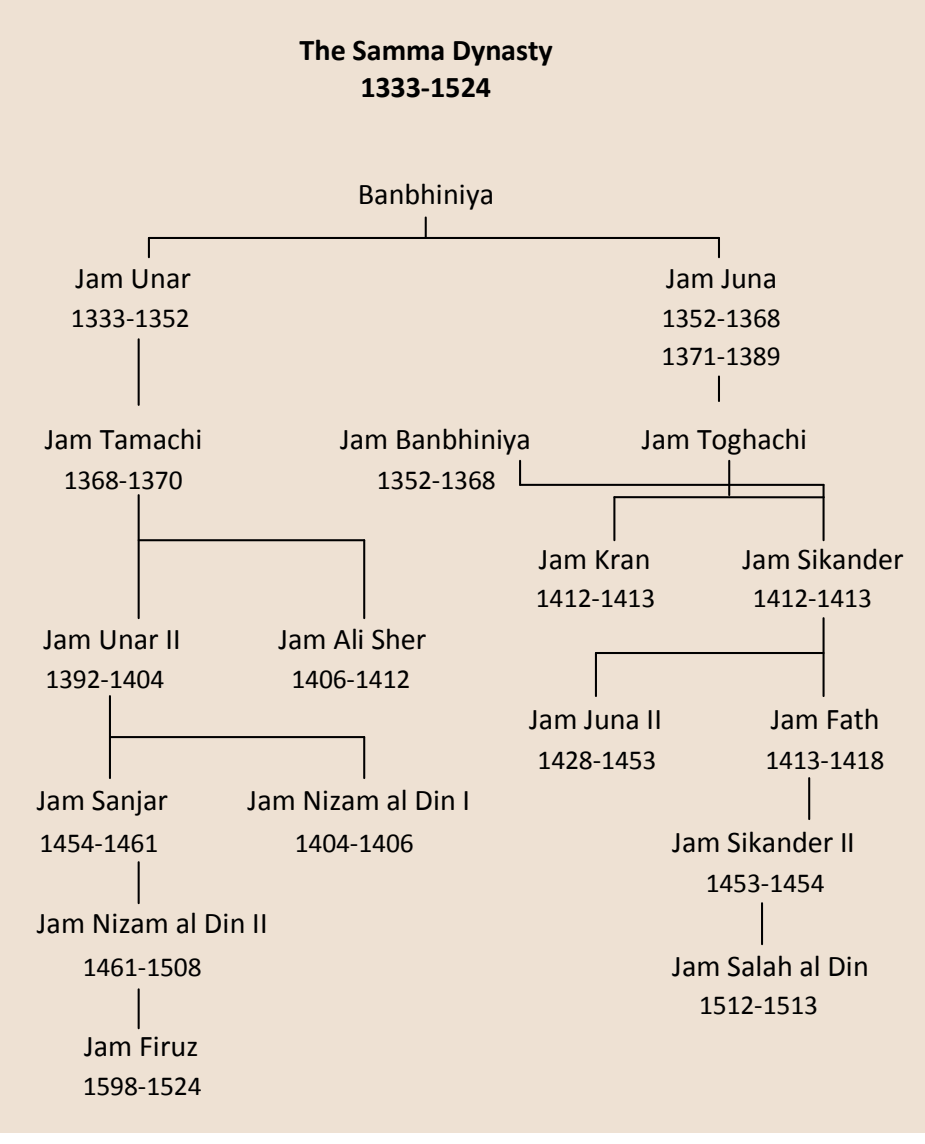
The Sammas

Mir Muhammad Masum Bhakkari writes in Tarikh-i-Masumi in 1001/1592 that the Sammas came from Kach and settled in Sindh (Bhakkari 1592:84). Mir Ali Sher Qani Thattavi states in Tuhfat al-Kiram in 1181/1767 that the Sammas were once owners of land throughout Sindh, and formed the majority of the population of Sindh (Thattavi 1767:100). When the Soomars came to power in Sindh, they oppressed and ill treated the Sammas who left Sindh and took refuge in Kach. The ruler of Kach treated them kindly and at their request gave them the land for cultivation, but the Sammas tricked their benefactors, seized their castles, and became the masters of Kach (Beg 1902:39).

The main body of the Sammas grew strong enough in Kach to make a come-back in Sindh. They gradually extended their rule over the whole of Sindh. The Sammas ruled in Lar (Lower Sindh) until 931/1524, when the last Samma king fled from Sindh before the victorious army of the Arghuns.

Many theories have been put forward regarding the origin of the Sammas. According to Thattavi some genealogists consider the Sammas to be the children of Sam, the son of Umar, son of Hashim, son of Abu Lahab, an uncle of the Prophet Muhammad (PBUH). Yet others believe that Sam was a descendant of Abu Jahl, another uncle of the Prophet Muhammad (PBUH).

According to Thattavi, it is also possible that they derive the name from, and are offspring of Sam (Shem), the eldest of the three surviving sons of Prophet Nuh (Noah). The famous fourteenth century traveler, Ibn Battuta, who did not distinguish between the Sommaras and the Sammas, wrote that their ancestors came with the army of Muhammad bin Qasim. Due to this some people believe that the name 'Samma' is a corruption of the word 'Shami' (Syrian) who formed the elite corps of the Umayyad army which invaded Sindh in 93/711. However, according to Thattavi, since as rulers, they used the title of Jam, it would be more correct to say that they are the descendants of Jamshid, the legendary King Jam of Persia who could in his wine cup – the Magical Jam – see events happening



Genealogical table of the Samma dynasty.

in the remote corners of his kingdom and is credited with the building of the Persepolis. Those who search for the roots of the people of Sindh in Indian soil consider the Sammas to be Rajputs of the Yadava stock. Others consider the Sammas to be the progeny of Krishna, the Hindu God who was born in Mathura in India, and was called Shyam by his *gopis* because of his handsome dark complexion. Thattavi reproduces a genealogy which makes the Sammas the decedents of the Hindu God Rama.

It is believed that the Sammas lived on the lower banks of the river Indus in 325 BC, when Alexander the Great came to Sindh. Sambus, mentioned by the historians of Alexander, is believed to be a Samma. His capital Sindhimana is thought to be the present Shewan and the Kafir Quila (Fort) there is considered a reminder of Alexander's visit to Sindh.

Sambus sought the favor of Alexander the Great while he was still busy pacifying the Punjab, and Alexander was pleased to confirm him the territories he governed in Central Sindh. Alexander's invasion of Sindh by land and river was conducted with such speed that Musicanus who ruled over northern Sindh, had no option but to submit to Alexander. Sambus fled on learning that Musicanus, who was his rival, had been received well by Alexander. Alexander was incensed by the fickle behavior of Sambus. He invaded his country, plundered and destroyed the cities, and enslaved or put to sword more than 80,000 persons. King Sambus escaped into the desert country beyond the Indus.

The Sammas were next mentioned in Chahnama which recorded the conquest of Sindh by the Muslim army led by the young Muhammad bin Qasim in 93/711. The Sammas received the Muslim army by ringing bells, beating drums and dancing. When Muhammad bin Qasim asked. 'What noise is this?' he was told that it was customary for the Sammas to rejoice and welcome a new king with frolic and merriment (Chachnama 1212:312).

This is the beginning of the Samma rule of Sindh starting from 734/1333.

[Extract from pp 2-4 from The Jewel of Sindh – Samma Monuments on Makli Hill by Suhail Zaheer Lari, published by Heritage Foundation, 1997]

View of medallion in arch on the side of the dupola over mid-landing of South staircase.

View of ornately carved rosettes on the north side of the first mihrab of Triple Mihrab.

View of staircase incorporated in South wall. View from mid-landing looking down.

Jam Nizam al-Din: The Glorious Reign

Sultan Jam Nizam al-Din Shah, known as Jam Nindo, ruled from 866/1461 to 914/1508. His reign was not only the longest lasting - spanning about half a century – but is considered to be the most glorious in the history of Sindh. He was a wise and just ruler under whom *madrassahs* and mosques flourished, and people enjoyed a long period of peace and prosperity. Jam Nizam al-Din was fond of literary pursuits and often spent time in his library.

Jam Nizam al Din took steps – soon after the accession – to stop the persistent inroads into Sindh of Baloch tribes who were, as usual, pillaging in northern Sindh and displacing Sindhi peasants from their prime land. Jam Nizam al Din stayed for over a year in Bhakkar, and took punitive action against the Baloch tribes. He strengthened the defences of the fort of Bhakkar, filled it with provisions, and left his slave, Dilshad, in charge of the fort to guard his northern borders. He tried gifts and diplomacy to mend his relationship with the Langah of Multan who had given shelter to the Samma nobles who had been expelled from Sindh.

Sultan Mahmud Beghara of Gujarat invaded Kach in 877/1472. His ostensible purpose was to convert its population to the true faith. Jam Nizam al Din did not take any chances. He sent his daughter with presents to Sultan Mahmud Beghara, as a token of his gratitude to the Sultan for subduing the rebels on his eastern borders.

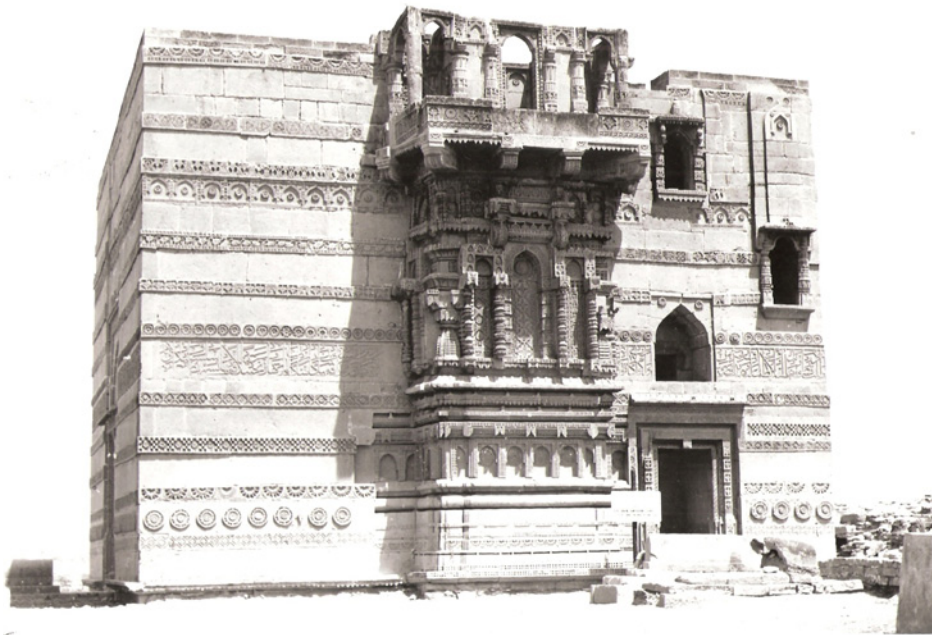
Jam Nizam al Din had to also face a new orthodoxy within his realm from a growing number of scholars and religious leaders who had taken refuge in Sindh from the political and religious upheavals that were taking place in the west. Pir Murad the 'pole star' of the age, was born in Thatta to a refugee Sayyid from Shiraz who had married into the powerful Abbasi Qazi family of Thatta. The Shiraz Sayyids were not the only immigrants who made their presence felt during the reign of Jam Nizam al Din. The famous Sayyid Muhammad of Jaunpur in India came to Thatta in 901/1495 on his way to Mecca. He came back in 1504 proclaiming himself to be the Mahdi (Messiah). Jam Nizam al-Din expelled him from Sindh and Haider of Sann, on the instructions of Makhdum Bilawal, tried to drown Sayyid Muhammad and his followers by making hole in the boat by which they were crossing the river.

But before this most famous religious figure of his age, known by his followers as Miran Mahdi, left Sindh he made many important converts including the famous general Mian Mubarak Khan and Qazi Qazin. Another important convert was Zun Nun Beg Arghun who was appointed Governor of Qandahar by the Timurid ruler of Khurasan, Sultan Husain Mirza Bayqara, in 884/1479. Shah Shuja Beg son if Zun Nun Beg Arghun, captured Siwi/Sibi from Bahadur Khan who held it from Jam Nizam al Din. In 895/1490, Jam Nizam al-Din sent a large force under the command of his adopted son Darya Khan, who defeated the Arghuns and killed their teenage commander, Muhammad Beg, the younger son of Zun Nun Beg. This victory made Darya Khan, the Dullah (hero) of Sindh, whose deeds of valor are sung all over Sindh to this day.

Jam Nizam al-Din died in 914/1508. On his death bed he entrusted to Darya Khan (now Mian Mubarak Khan) the care of his kingdom, of his family, and his son Sultan Nasir al Din Abu al Fateh Firuz Shah II, known as Jam Firuz, who ruled from 914/1508 to 931/1524-5.

[Text from pp 11-13 from The Jewel of Sindh: Samma Monuments on Makli Hill by Suhail Zaheer Lari and Yasmeen Lari, published by Heritage Foundation and Oxford University Press, 1997]

According to the inscription on the northern entrance, it was Jam Firuz who built the celebrated tomb of Jam Nizam al-Din.



View from West. Archival photograph from Suhail Z. Lari Collection c. 1980s.

Site Plans of the Makli Necropolis. Above. Samma Cluster highlighted. Below. Arghun Cluster highlighted.

3.0 WORLD HERITAGE SITE

The Monuments at Makli Thatta

The United Nations Educational, Scientific and Cultural Organization (UNESCO) during its seventeenth convention defined cultural heritage as "groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;" (Convention Concerning the Protection of the World Cultural and Natural, Paris, 16 November 1972)

Under this Convention, the Organization recognized that the natural and cultural heritage is threatened not only by traditional causes of deterioration but also by changing social and economic conditions. The disappearance or decay of these heritage sites was seen as a loss for not individual countries but the entire global community. UNESCO established 21 member Party States that would ensure that all natural/cultural heritage sites would be passed on to future generations by collecting international and national collaboration for the identification, protection, maintenance, preservation, conservation, and safeguarding of said sites. These Party States would form the basis of the World Heritage Committee. As of 2011, the World Heritage Committee has enlisted 936 properties.

These include 725 cultural, 183 natural and 28 mixed properties in 153 States Parties.

The Historical Monuments at Makli, Thatta were inscribed in 1981 on the World Heritage List under Criteria III with Reference No. 143. The site is spread over approximately 12 km. The brief description refers to it as "The capital of three successive dynasties and later ruled by the Mughal Emperors of Delhi, Thatta was constantly embellished from the 14th to the 18th century. The remains of the city and its necropolis provide a unique view of civilization in Sind" (UNESCO World Heritage Centre).

The four centuries that comprise the golden age of Thatta have left their traces on the form of monuments of high quality in stone and brick. Among those in stone are the tombs of Jam Nizamuddin, who reigned from 1461 to 1509, and those of Isa Khan Tarkhan the Younger and of his father, Jan Baba, both of which were constructed before 1644. Among the edifices in brick and glazed tiles are the mosque of Dabgir, that of Shah Jahan (1644-47) and numerous mausolea, and tombs of which the most colourful is that of Diwan Shurfa Khan (died 1638) (UNESCO World Heritage Centre).

Site Plans of the Makli Necropolis.
Above. Tarkhan Cluster highlighted.
Below. Mughal Cluster highlighted.

Left. Aerial view of the Makli Necropolis. Archival photograph from Suhail Z. Lari Collection, c. 1980s.

Top to Bottom. Total Station Surveys and Documentation by HF Teams in progress.

4.0 INTRODUCTION TO THE PROJECT

The UNESCO project, undertaken from April 2011 August 2011, for the documentation and condition survey report of the tomb of Jam Nizam al-Din, is in recognition of the need to conserve one of the oldest and most impressive structures at the Makli Necropolis. The state of this historic monument has been of concern for a considerable time.

In various UNESCO Missions and World Heritage reports, while recommendations have been made for general recording, conservation, maintenance and monitoring of the entire site, the tomb of Jam Nizam al-Din has received special attention for ensuring its stability.

Due to the above concerns the present project has been devised by UNESCO Islamabad and implemented by Heritage Foundation.

The scope of the project is as follows:

Development of Base Line information

This includes graphic documentation, preparation of AutoCAD drawings, marking location of all cracks and other signs of stress visible on superficial examination, comprehensive photography of all parts of the monument, and photographs highlighting cracks, signs of stress and high degree of damage.

Comprehensive Condition Survey Report

Assigning name and unique number of elements, photography of each element, present status of conservation, signs of interventions, signs of stress, possible remedial measures (if any).

Geotechnical Studies

Carrying out boreholes at suitable locations, field testing as required, laboratory testing, analysis and report based on boreholes and tests, including evaluation of soil and its impact on settlement of foundations.

Research

Research into historical sources.

Left. Elaborately carved cupola at mid-landing of staircase incorporated in South wall.

5.0 STRUCTURE OF THE REPORT

To carry out the assignment HF formulated teams to undertake various activities. The Report, encompassing the entire work, including the field work, investigations and evaluation of the present condition has been divided into the following sections:

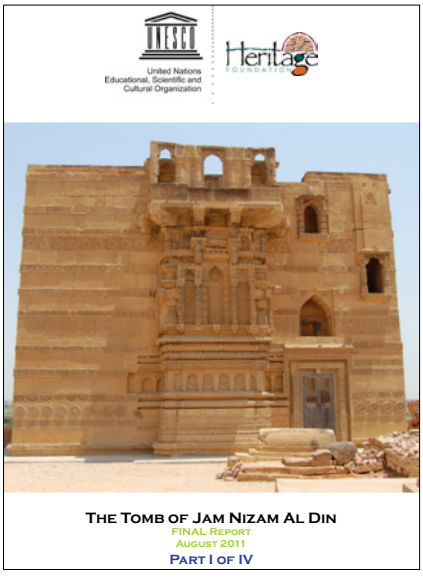
Part I - Preface, Executive Summary, Summary of Findings, Recommendations/Remedial Measures, Site Drawings, consisting of 9 pages.

- Part II – Database Report, Folio Series 'P' (Preliminary Drawings from hand measured tools), Folio Series 'S' (Drawings after Physical Survey with Total Station), Folio Series 'PL' (Comparative Drawings between Hand-held tools and Total Station), Folio Series 'L' (Drawings showing Numbering of Elements), Folio Series 'IF' (Images), consisting of 114 pages.

- Part III – Condition Survey Report, Folio Series 'LI' (Drawings showing Numbering of Elements with Photograph Superimposition), Folio Series 'DE'(Architectural Database of Elements), Folio Series DC (Drawings marking Major Cracks and Deformations), Folio Series DI (Drawings Marking All Damages), Folio Series 'DA' (Database Relating the Types of Damage on Each Stone), consisting of 164 pages.

- Part IV – Investigations, Geotechnical Report, Structural Evaluation, consisting of 45 pages.

Below. Cover of Part I of four-volume Final Report incorporating complete data.



Above and Below. Archival photographs from Suhail Z. Lari Collection c. 1980s.

6.0 THE TOMB OF JAM NIZAM AL DIN

Statement of Significance

The political or historic importance of the structure is rooted in 14th-15th century history of Sindh. Jam Nizam al-Din was among the most celebrated rulers of the Samma dynasty, a local Muslim rule that governed the entire region and is a historical marker evoking the golden age of Sindh.

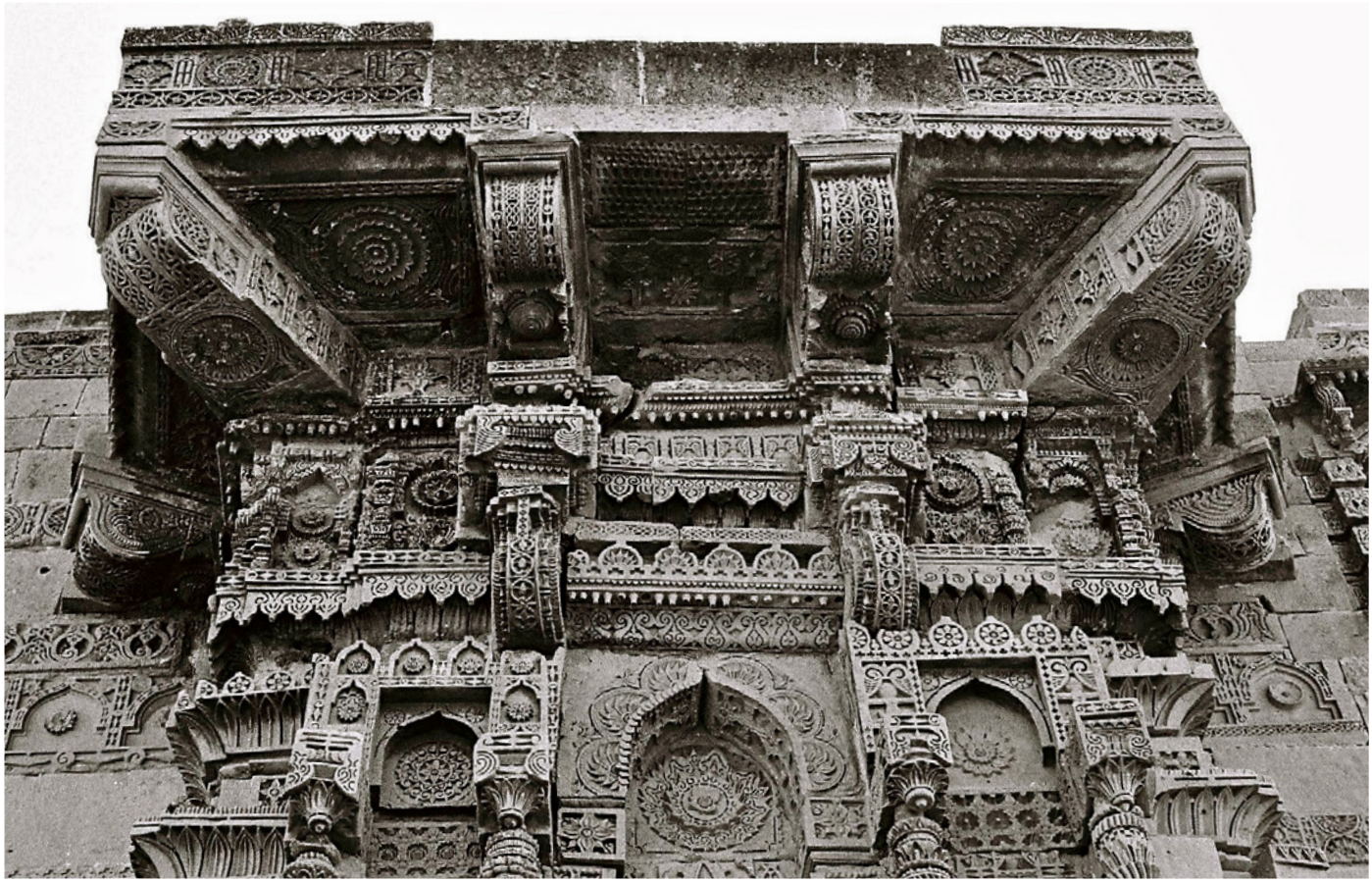
Culturally the tomb carries great significance due to its construction techniques and use of skilled artisans to transform a simple cuboid structure into a feat of complex structural *tour de force*, at the same time creating a fusion of original Hindu imagery with Muslim architectural characteristics. The entire structure represents the coming together of two strong cultural streams into a unique illustration of transitional architecture in the subcontinent.

Spiritually the tomb is endowed with connotations of reverence and religious fervor. As the resting place of a highly acclaimed and popular ruler who is venerated as a saint, the sepulcher evokes admiration and devotion, and continues to draw a stream of devotees and admirers.

Aesthetically, the monument is an illustration of impeccable artisanship. The carving in the most complex elements was clearly carried out with devotion and fervor – so that all of it could be termed "devotional carving." The introduction of profusely embellished Darshan Jharoka externally and restrained decoration of the Triple Mihrab internally as strong architectural elements are unique in their rendering, endowing the structure with special significance.

Thus, the monument carries special import due to its various attributes and adds special meaning to not only the Samma Cluster but the entire Makli necropolis. It is critical to stop soil erosion on the East and to stabilize the slope as soon as possible to bring to a closure the threat to the integrity of this special historic structure.

Above and Below. Archival photographs from Suhail Z. Lari Collection c. 1980s.



Description

The tomb of Jam Nizam al Din (also Nizam ud din) was built in the name of the most revered ruler of the Samma period. It was built by his son and this is where the remains of the celebrated Samma king are interred.

The structure is an enclosure built as a cuboid, a square plan footprint of size 11.17m x 11.27m with 1.25m wall thickness. The tomb itself is one of the most copiously decorated structures at Makli. The carving in stone is carried out in the form of bands on its external and internal facades. The highly decorated balcony projection (Darshan Jharoka) and the inner Triple Mihrab (multiple prayer niche), are carried out with great finesse and abound with the most amazing embellishment, referred to as devotional carving by Lari. Where the renderings in stone have been executed with extraordinary skill and dedication, bordering on religious fervour, bestowing the carved stone surfaces with extraordinary and unique characteristics, the structure itself is highly complex. The handling of struc-

Above. View of squinches on top phase of transition showing loss of mortar in joints.

tural members, while transforming a square plan into first an octagon and finally into a hexadecagon or a 16-sided form, displays remarkable skill of local artisans. The squinches echo arched forms which are not based on arcuate but trabeated system of construction. The unique architectural form and treatment of its elements endows this transitional structure with some of the most remarkable attributes – presenting the advent of Islam and its associated architectural elements by local artisans skilled in executing Hindu motifs and imagery.

Thus, the entire monument with its multifaceted attributes and intricate stone renderings required meticulous and detailed planning along with exactness in execution. Methodologies needed to be worked out that would fully capture the inimitable and exceptional characteristics of the historic monument. Alongside, the investigations for causes of settlement and damage were explored, that have been grounds of concern expressed by international community from the time that the Necropolis was placed on the World Heritage List. The overall planning of the project thus had to take into account many diverse factors, each of which

was considered essential in presenting comprehensive Condition Survey Report, which could accurately portray all aspects of the monument for use by custodians and conservationists alike. A great deal of exertion was expended in collecting the field data, while much effort went into developing and combining AutoCAD drawings and edited Photoshop images to present as realistic and accurate a picture as possible of each part of the structural fabric of the monument. The numbering system devised for the purpose, enabled the recording of the current condition of each and every element.

In carrying out various task, all Heritage Foundation teams worked with great zeal and commitment, mindful of the fact that all studies must present authentic information. Since future interventions would depend upon their findings, it was clear to all of us that It will depend upon the meticulously compiled data of the present studies to devise strategies for minimum intervention. Additionally all team members were fully aware of the responsibility of preparing all-inclusive "snap shot" surveys of the current status as that would provide the basis for future comparisons and further action in safeguarding this unique heritage site.

Below. View of Tomb of Jam Nizam al-Din from the Northwest with Pavilion Tomb of Nuri and Jam Tamachi seen on left.

7.0 DOCUMENTATION PROCEDURES

In order to prepare a full documentation, the entire structure was de-segregated into the following divisions:

- Primary Elements being the main structural elements.
- Secondary Elements being the openings and apertures etc.
- Decorative Elements being the features carrying stone carving, low relief and high relief in a variety of patterns, figures and also refined Arabic calligraphy.

Primary Elements

The first task was to determine the different kinds of primary elements that made up the structure. The complexity in the structure is amplified in view of the addition of features e.g. the Darshan Jharoka and the Triple Mihrab placed on the external and internal face of the west façade respectively. The construction of the Samma structures, including that of Jam Nizam al Din, is trabeated in nature, where all arch forms are achieved by over-sailing stones, placed one above the other, and carved to simulate the form of an arch. This was a particularly difficult exercise when the same methodology was used to create squinches, in order to transform the square into an octagonal base to receive the dome. In the case of the tomb of Jam Nizam al Din, research shows that a dome was never placed to cover the tomb, and the tomb remains open to the sky and elements.

The following Primary Elements were identified:

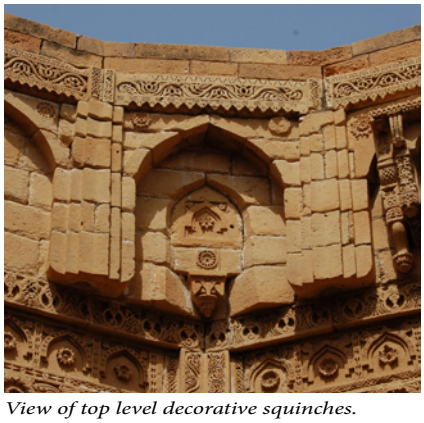
- Walls, forming the square plan footprint, rising to a height of 30 feet, consisting of north, south, west and east walls.
- Insertions within walls e.g. staircases, although only one is usually visible which leads up to the external Darshan Jharoka, on deeper examination it has been found that another one leads up to the roof that is also built within the south wall.
- A prominent, profusely decorated Darshan Jharoka balcony on the west that is placed on a massive carved base placed on the ground floor, rising to a height of 24 feet.
- A profusely decorated mihrab niche (prayer niche) consisting of a Triple Mihrab, with its own structural columns and dome built within the thickness of the west wall, accommodated within the thickness of

View of the void seen from inside the sepulchre from below.

View of the South squnches. Phases of transition seen from inside the sepulchre.

View of East squinch in the first phase of transition. Staining of stones due to water ingress can be seen.

View of triangular stone bracket supporting a semi-vault at lower level transition.



View of top level decorative squinches.

the projecting base of Darshan Jharoka. This is a highly complex intervention placed within the thickness of the centre of the west wall. Lari divides this feature into five stages, the comparatively plain base, and the decorated console, the projecting portion of *mihrab*, the balcony with carved brackets, and top most darshan jharoka.

- A small *jharoka* projecting into the chamber placed in high level central squinch.
- Squinches formed through the use of lightly carved over-sailing stone pieces; occur at 13 feet height to transform the square into an octagon.
- The second level of squinches formed in a similar manner as those below; occur at a height of 24 feet to transform the octagon into a 16-sided base.

Secondary Elements

The secondary elements consist of various openings occurring at different levels. Each had to be identified as there are some that seem to have been filled at a later date. The secondary elements are defined as under:

- Door openings providing access to the tomb.
- Window openings including any trellis or fretwork jali on the ground floor that provide ventilation and view from the funerary chamber.
- Window openings on the upper levels including any trellis or fretwork jali.
- Niches in various walls.

View of soffit of lintol in East opening.

View of North facade of Tomb of Jam Nizam al-Din with Pavilion Tomb of Nuri and Jam Tamachi in the foreground. The tilt in the structure towards East is clearly visible.

Decorative Elements

The most significant elements that also contribute to the complexity of the structure are the decorative features that endow the structure with its special character. Some of the stone pieces are carved so profusely that there is not an inch of space without carving. The ornamentation ranges from medallions and pierced carving to wonderfully executed calligraphy and bird figures.

- External decorative horizontal bands.
- Internal decorative horizontal bands.
- Stone carved door architraves and chiselled thresholds.
- Medallions placed in the centre of squinches.
- Carved Triple Mihrab: decorative posts, mihrab edges, walls in between the three mihrabs and back wall, decorative ceiling and cupola.
- Carved Darshan Jharoka with various levels of carved and moulded base courses, decorative fancy pillars, panels, etc. balcony columns and balcony lintels and arches.

Photographs of field survey in progress.

8.0 FIELD SURVEY

Although basic dimensions were available in view of the surveys carried out during the 1980s by Heritage Foundation; however, the surveys had been carried out for the purpose of the book *The Jewel of Sindh: Samma Monuments on Makli Hill*. For the present assignment, it was decided that the project demanded accuracy above everything. Where the original hand drawn drawings would be extremely valuable as a basis for the work, however, the confirmation of all dimensions by surveying the entire structure was essential to present accurate 'as built' drawings. For this purpose, a surveying firm that was willing to undertake the arduous task was located. Although several firms were contacted, however, the complexity of the historic structure, the isolated location far away from Karachi, and above all the poor law and order situation, deterred many to undertake the assignment. After a great deal of negotiations and encouragement the noted firm Osmani & Co. agreed to depute their survey staff to assist us in this venture.

There were several meetings with the Survey Team headed by Engr. Tariq Hassan, who after studying the project and the drawings prepared for the purpose, were not sure if hand surveying with simple rudimentary tools of measuring tape and plumbs etc. will provide the degree of accuracy we were looking for. Also, the height of the building, insufficient working space, and above all the difficulty in placing any scaffolding etc. in order not to damage the structure, were factors that had to be taken into consideration. For a time it was considered whether the use of ladders and planks to be able to reach the highest portions would be feasible, but was dismissed as being too risky. Another factor that had to be taken into consideration was the strong wind. Because of its exposed position on the ridge, strong western wind made it well nigh impossible to maintain one's balance, especially if you are armed with the surveying gear or even simple note pads etc. Everything, from clothes to hats to pens and paper seemed to fly off. Thus, those climbing the ladders and reaching the upper heights would be in extreme danger.

The excessive heat during the summer months was also a discouraging factor. The only time work could be carried out would be in the early morning hours or from late afternoon onwards. It was decided that the teams would leave early in the morning, carry out the work until noon and then head back to Karachi. This travelling time was excessive; however, it provided peace of mind in view of the law and order situation in

the area, as it ensured safety of the people. At the same time, the data being generated in the field was being regularly fed into the computer so that corrections in the drawings could be made within a few hours of obtaining the relevant dimensions. The survey work was tedious and took much longer than expected because of unfavourable site conditions. As the deliberations and coordination with the surveyors were proceeding, the work on AutoCAD was being carried out at the HF Head Office.

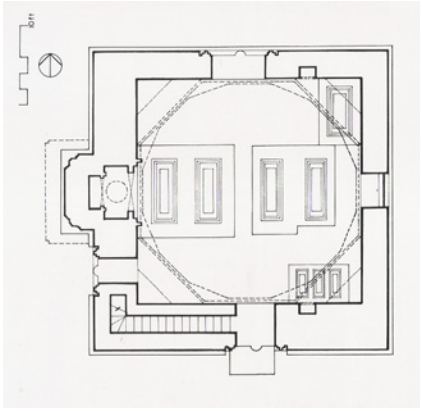
The availability of drawings c. 1980s, which were not necessarily meticulous in their accuracy, nevertheless made the task of planning the entire project and surveying easier. Therefore instead of waiting for the accurate dimensions, the AutoCAD drawings were prepared, when measurements had been carried out with hand tools. In fact by the time that the survey could start, almost all basic drawings, numbering of all primary and secondary elements, external elevations and plans had been completed. It was thought that these could be corrected once the field dimensions would be received.

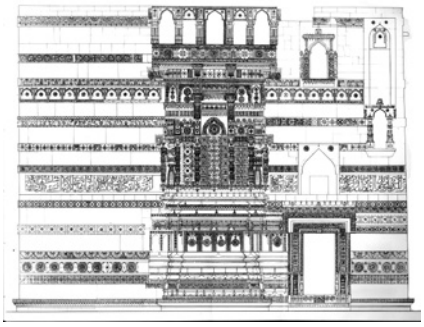
However, this proved to be an optimistic thought. As the final dimensions that had been taken with the Total Station began to arrive, it became clear that new drawings based on the latest dimensions would have to be prepared. Thus, for the first time accurate drawings based on carefully taken field dimensions were prepared.

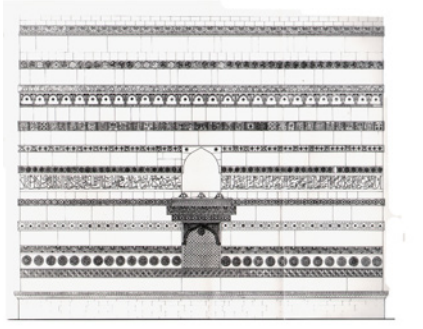
This was essential to ensure that no elements were missed out. Based on hand drafted dimensions and photographs both old and recent ones, the AutoCAD drawings being prepared were quick to find gaps or elements that had been missed out by the field team. The numbering system that had been adopted was an essential component of the drawings. If details of any of the elements were missing, the head office team was quick to point that out, and get the field team to provide the missing data.

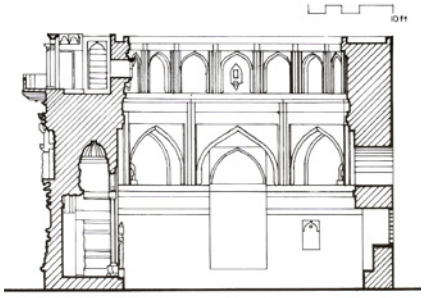
The field team had been asked to establish datum lines and all the various levels according to the levels established by the Head Office team. Thus, the checking and cross checking could be carried out to achieve a high degree of accuracy.

The establishment of datum pillars at site also meant that not only were the levels all related to the datum levels, in future if anybody wishes to re-check or ascertain any other data, they would be able to do so on the basis of the datum levels established at the site.









Top to Bottom. Drawings from The Jewel of Sindh: Samma Monuments on Makli Hill, *by Suhail Z. Lari & Yasmeen Lari, 1997.*

View of mid-level window on West facade.

View of South entrance facade of Tomb of Jam Nizam al-Din with Jamia Masjid on left.

View of crack in spandrel of archway seen in picture below.

View of upper structure of Projecting Balcony ensemble from South.

9.0 FINAL DRAWINGS

The drawings of 1980s vintage which had been surveyed by simple tools and were hand drawn became a valuable resource in order to develop AutoCAD drawings. It was decided that in order to develop a comprehensive data which would be easily retrievable, the use of technology was essential, and hand drawn drawings could only be used for reference purposes. It was therefore decided that all drawings should be re-drawn in Auto CAD as well as several extra drawings would be prepared which would provide information regarding the entire structure and all its elements.

The complexity of the structure of Jam Nizam al-Din is such that the standard drawings would be insufficient to convey the various facets of its structure. Where it was important to fully convey the construction of the squinches, the fact that a transitional structure – when the Samma builders were struggling to build arches and vaults to conform to Muslim architectural expression, they had no training and understanding of arcuate construction, required innovative approach for presentation. Since, instead of using voussoirs, here arches and domes were built that utilized trabeated construction, which facets required also to be captured.

An additional difficulty was the portraying of profusely decorative features. The decorative bands that occur in the horizontal stone courses were comparatively easier to portray, however, the profusely carved projecting Darshan Jharoka and the internal Triple Mihrab composition with their intricate and multipart treatment required in-depth study to work out ways to present it in a precise and authentic manner.

The challenge was to ensure that the portrayal of all parts and elements was carried out in a faithful and realistic manner. Another imperative was that all portions were not only fully recorded but also presented in a manner to enable future conservation planning to be carried out based on precise and comprehensive information. The work has required considerable expertise in not only drawing in a manner to reflect all aspects of the structure but also to be meticulous in detailing so that no aspects would be left un-recorded.

Plans

The entire structure was divided into four main levels numbered Level 1, Level 2 etc., to which six sub levels have been added where any change in profile has been noted. Thus plans were prepared of all the levels and sublevels. The preparation of a large number of plans resulted in portraying not only the squinch detailing as well as all protruding elements set within the barrelled squinch insets for example, medallions, jharoka etc.

Elevations

It was important to record all facades and accordingly four elevations would be prepared. However, the west façade required extra effort in view of incorporation of the Darshan Jharoka balcony and its console base. Further complication is added to this element since the surfaces are extensively ornamented, in addition to various structural elements composed of slender carved columns, *mihrabs*, projecting brackets of the balcony, and the Darshan Jharoka itself.

Sections & Internal Elevations

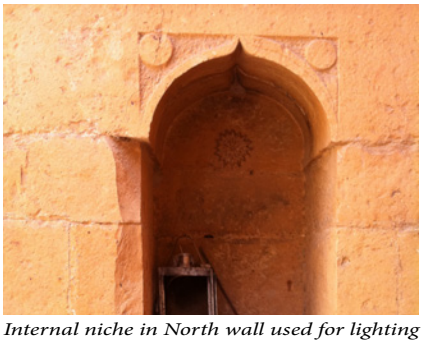
In view of differences in each internal elevation, it was decided to prepare sections which would show all the internal elevations. Accordingly four sections showing internal elevations would have to be prepared. On review however, it was found that four sections/internal elevations were insufficient to capture the entire structural repertoire consisting of lancet arched barrel squinches at two upper levels which transformed the square chamber first into an octagon and at the top-most level into a 16-sided polygon. Drawings were prepared to capture the transformation, at the same time ensure that continuity of the structure is maintained. It was finally decided that due to the importance of viewing each and every part of the structure from inside, a fold out drawing would have to be prepared that showed in detail all facets of the interior. This portrayal of the complex structural elements thus provided faithful rendering of the structure itself, which has not been attempted before.

Triple Mihrab Configuration

Where it was possible to present all parts of the internal structural configurations, the *mihrab* in the west wall presented another challenge. Among the most impressive Triple Mihrab arrangements, the receding mihrab surfaces set within the west wall were also required to be prepared as extended or fold-out elevations so that each element from the columns, the lancet arches and the successively receding surfaces as well as the back wall would be available in a coherent form in Auto-CAD.

Upper part of podium in Projecting Balcony.

View of Southwest corner squinch in lower level transitional phase.



Internal niche in North wall used for lighting oil lamps.

Threshold at the bottom of staircase.

Intricately carved ornamental pilaster in Triple Mihrab arrangement.

New Drawings After 2011 Survey

Thus, from simple AutoCAD drawings that were originally envisaged, the drawings turned into a complex venture if all the different facets of the amazing structural and architectural tour de force were to be adequately and faithfully presented.

As mentioned earlier the preparation of AutoCAD drawings based on the HF 1980s drawings helped in checking dimensions on site and filling in missing field gaps in measurements. However, it was clear that the final drawings would have to be based on Total Station readings for accuracy. It was expected that there would be differences in measurements; however, as the field record began to flow, it was imperative to prepare new sets of drawings based on the current field data that had been meticulously gathered through the use of Total Station. Due to the accuracy of measurements, for the first time, the tilt in the walls and the extent of the tilt at various points of the monument have been recorded.

Further, since the number of drawings and the different facets that were now being drawn, had not been dealt with before, the dimensions obtained through the use of Total Station provided the information necessary to prepare detailed drawings of all aspects. As it came to pass, because of differences in the drawings based on 1980s measurements and the Total Station readings of 2011, completely new sets of AutoCAD drawings had to be prepared.

Centre lines

Using the convention of 'as built' or construction drawings, a system of grids on plans was established. These grids would be used to tie up all the dimensions and would help field surveyors to ensure that all dimensions would tally with each other. Accordingly, the grid lines were projected defining all centre and edge lines horizontally as well as vertically and were numbered accordingly.

These centre lines were projected on the drawings of all facades both externally and internally, thus ensuring that all parts could be checked for alignment.

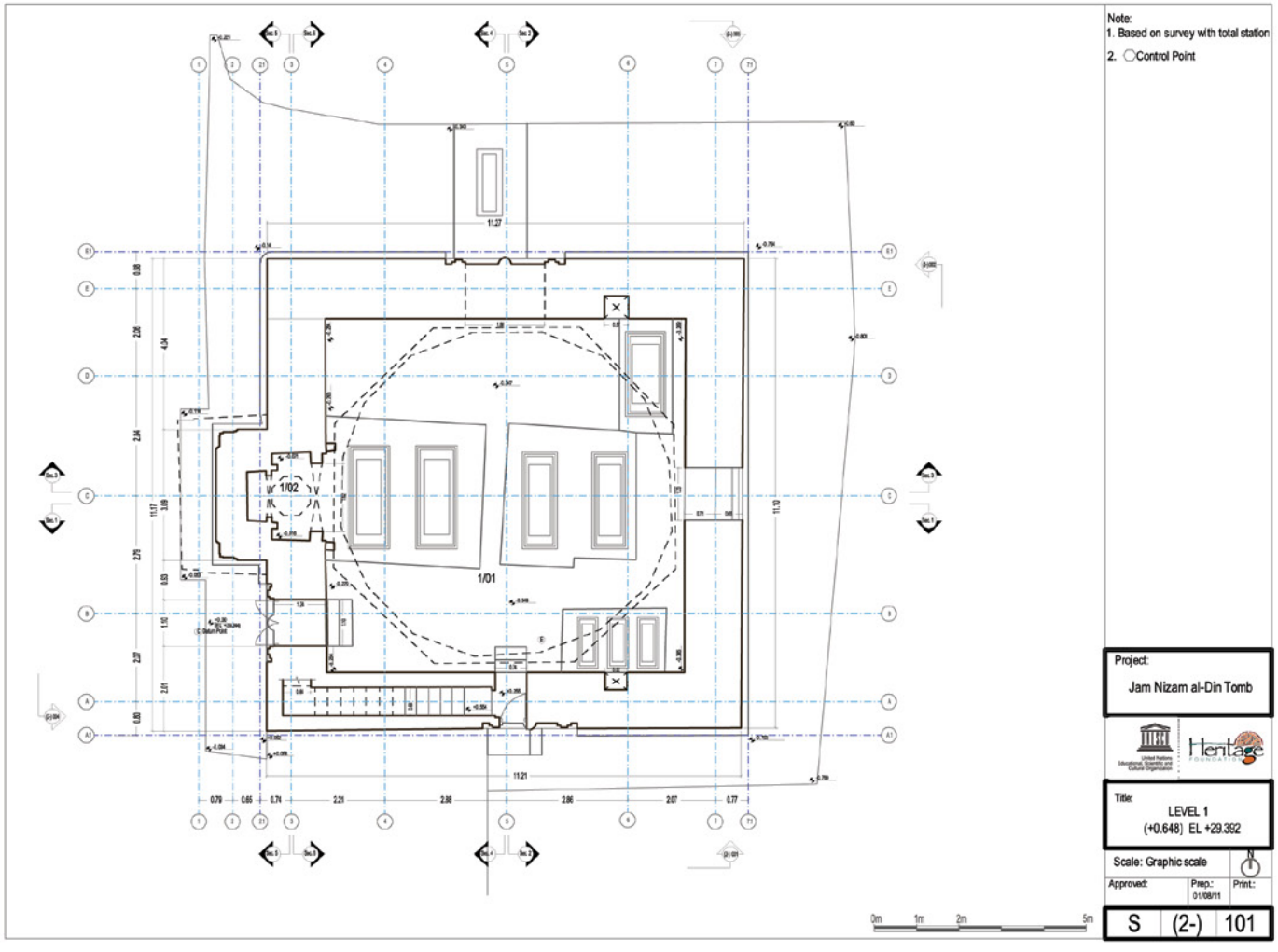
Indication of Decorated Surfaces

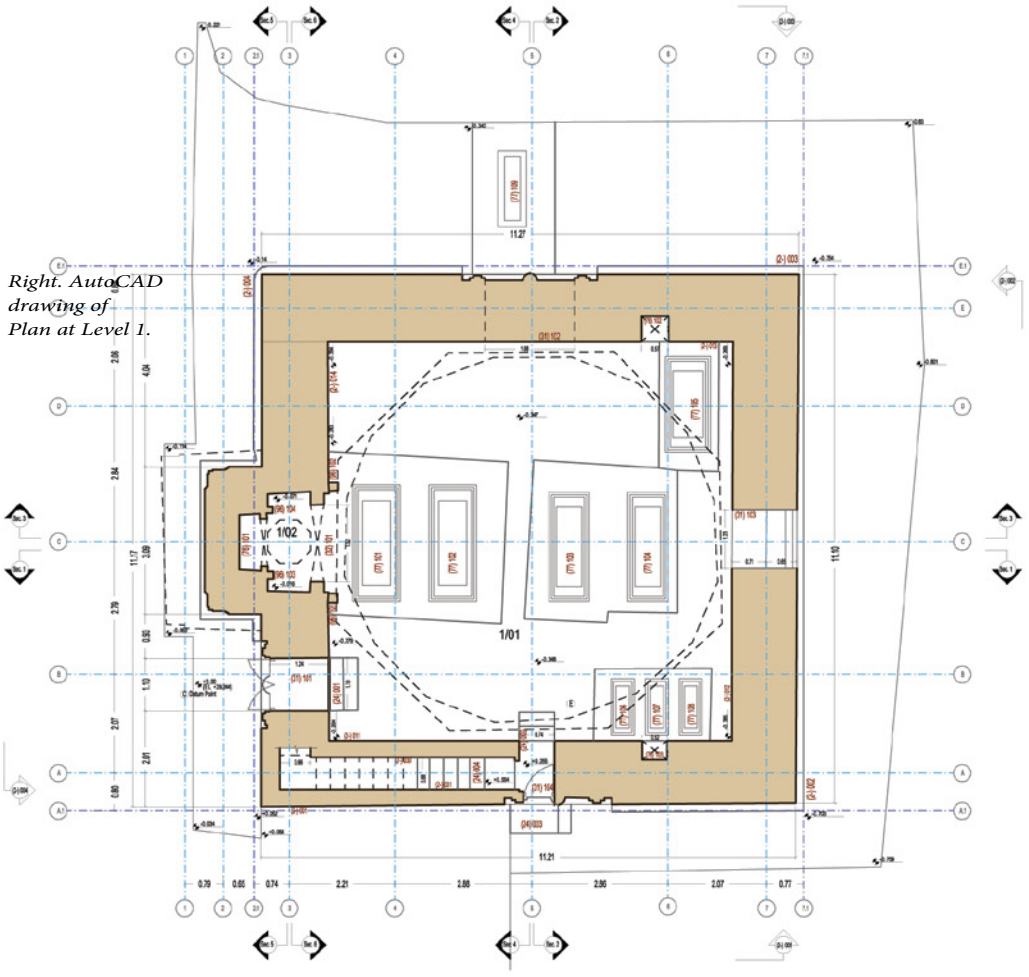
In the case of the hand drawn 1980s drawings by Heritage Foundation, a remarkable collection of drawings were prepared which showed each carved element. However, for the present assignment, it was decided that through extensive photography the same information could be transmitted by placing the photographs which would be

aligned with the drawings. Since the drawings were being prepared in layers, the superimposition of the images of corresponding areas would provide the relevant information in a composite presentation of drawings and superimposed photographs.

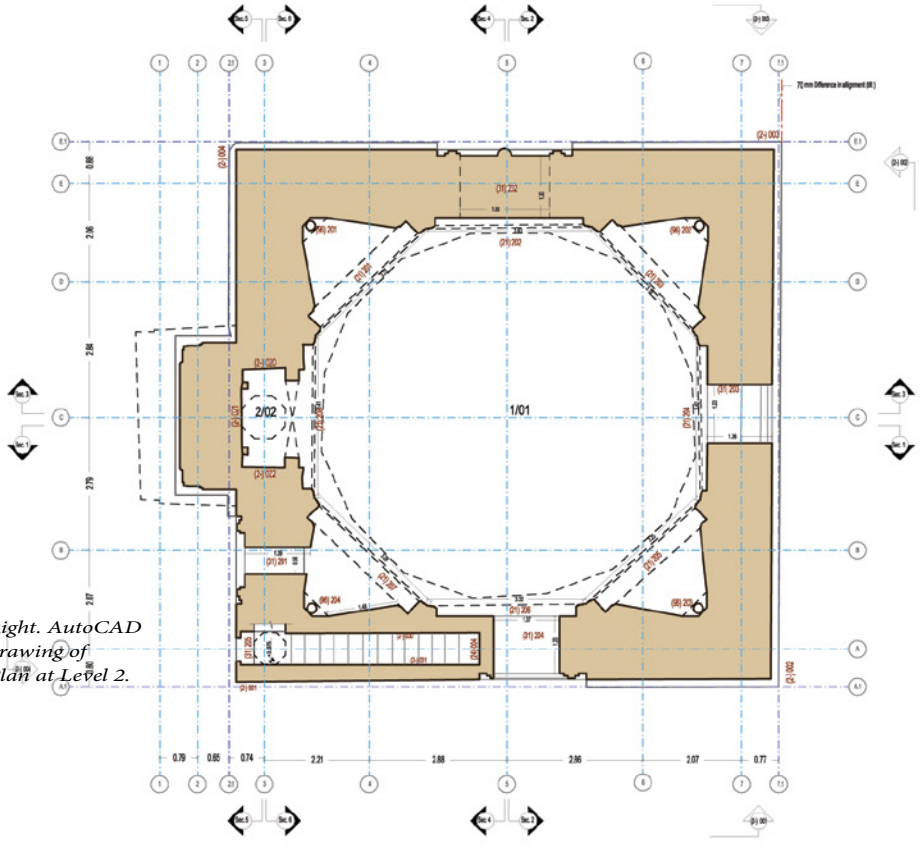
It was decided that in order to convey the difference between plain courses of stone and those carrying decorative, carved features, the relevant courses would carry a separate, distinguishing number. This would provide indication of carved and untreated plain stone surfaces.

AutoCAD drawing of Level 1, based on Total Station Survey.

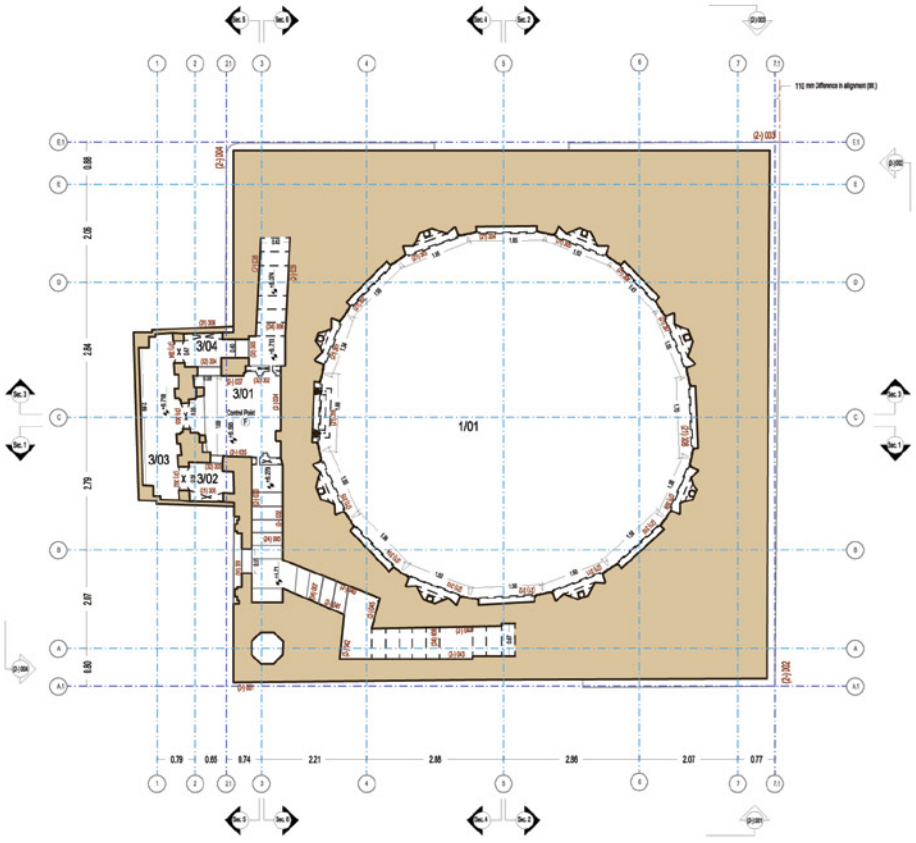




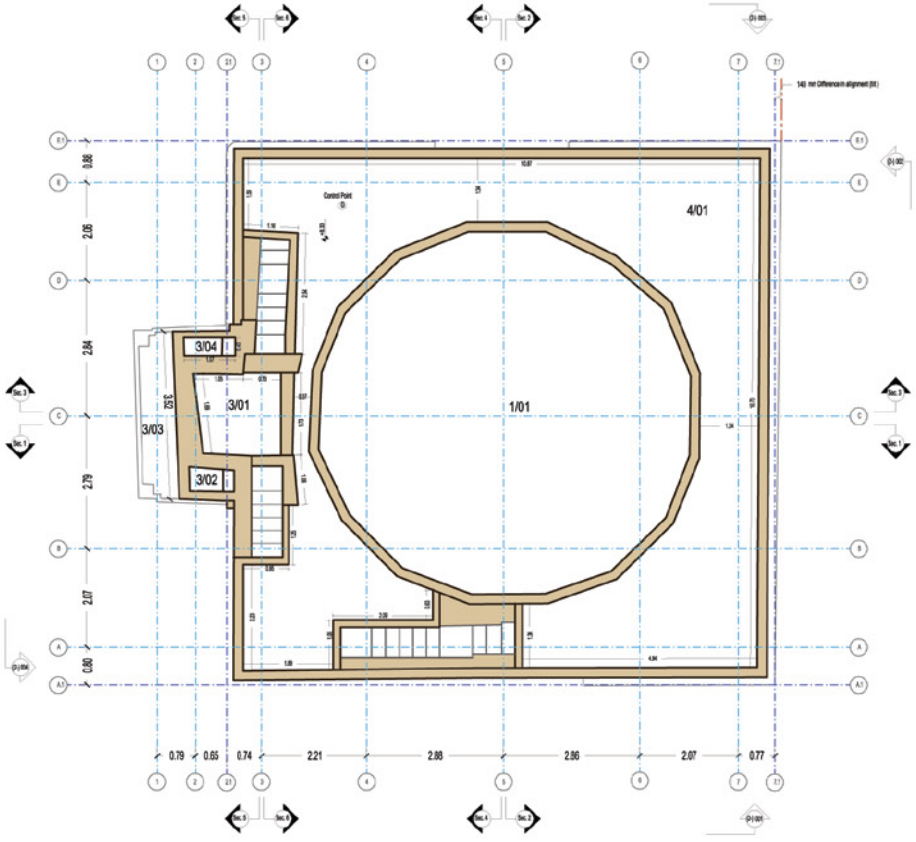
Right. AutoCAD drawing of Plan at Level 1.



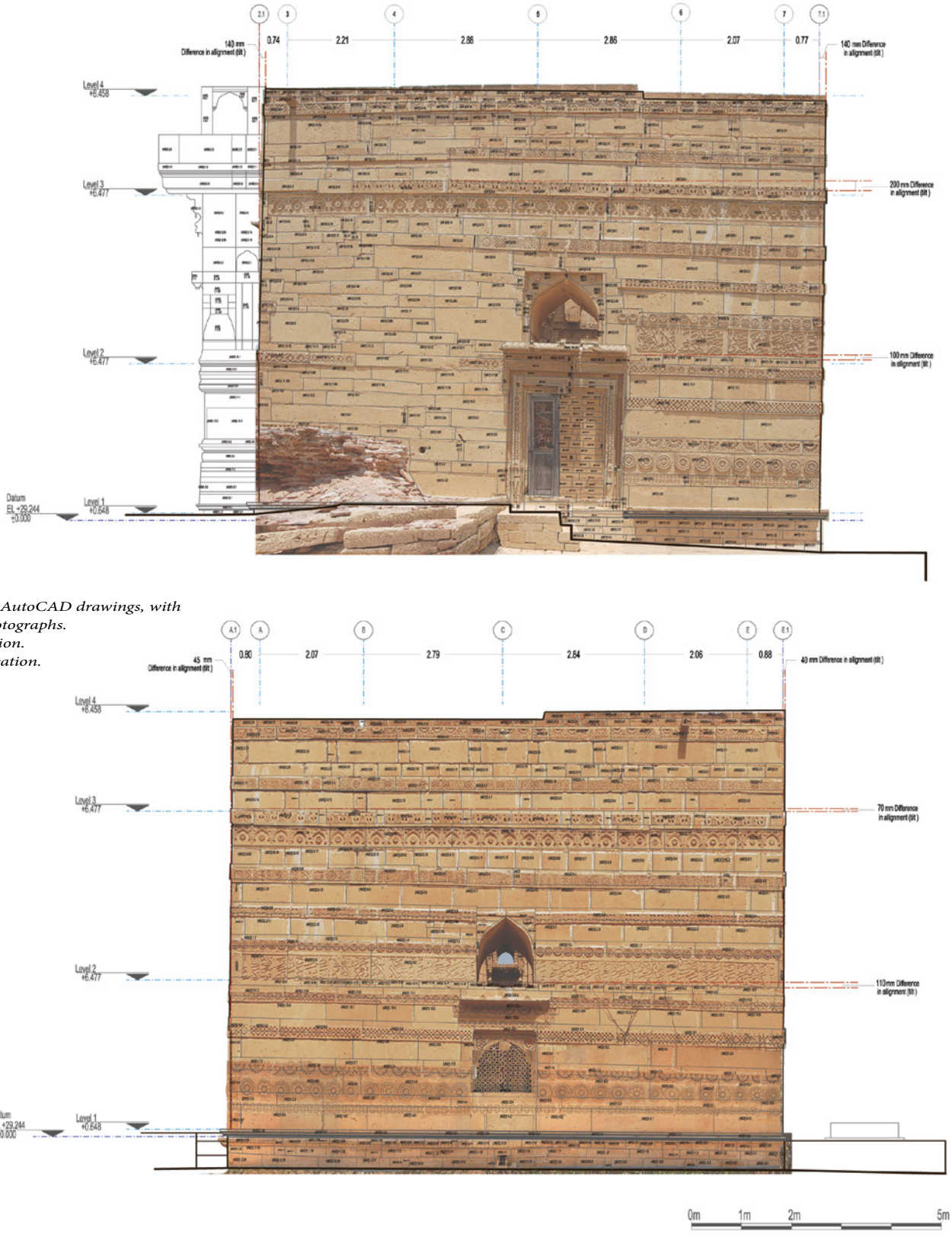
Right. AutoCAD drawing of Plan at Level 2.



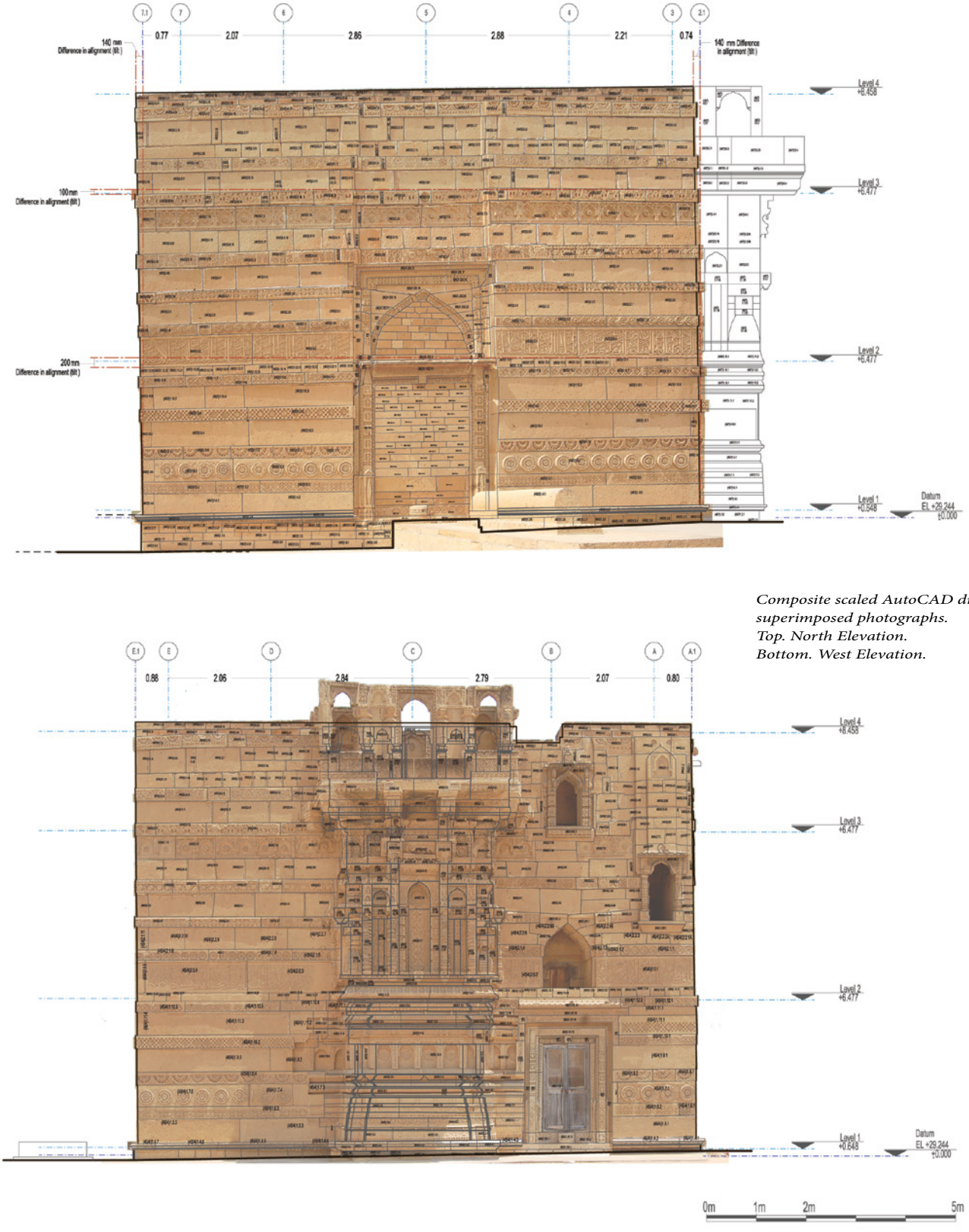
Left. AutoCAD drawing of Plan at Level 3.



Left. AutoCAD drawing of Plan at Level 4.



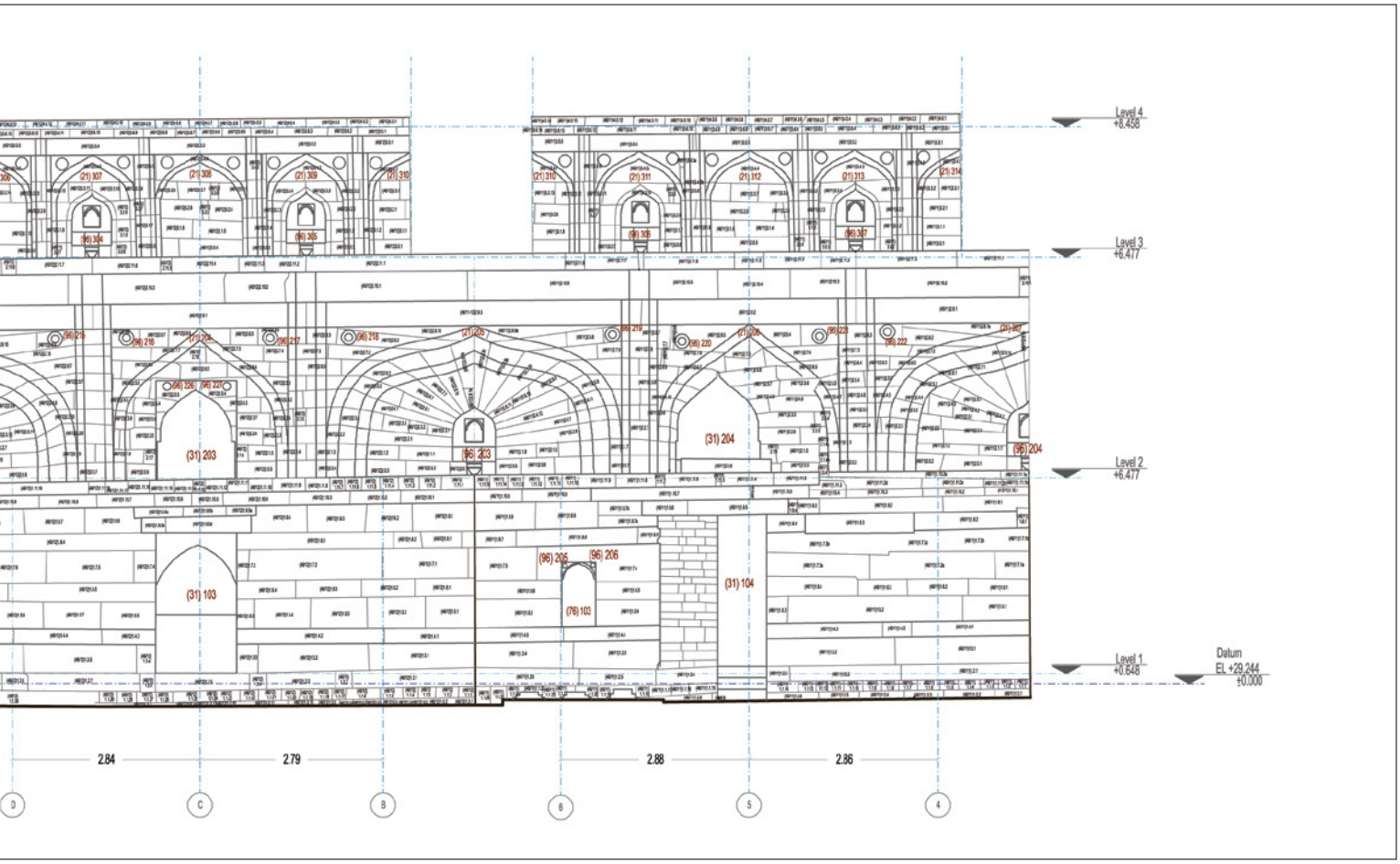
Composite scaled AutoCAD drawings, with superimposed photographs.
Top. South Elevation.
Bottom. East Elevation.



Composite scaled AutoCAD drawings, with superimposed photographs.
Top. North Elevation.
Bottom. West Elevation.

Internal Elevation folded out and extended to show entire interior, complete with numbering of stones, but without image superimposition.

Internal Elevation folded out and extended to show entire interior with partial image superimposition. Incorporates numbering of all stones according to HF Numbering System.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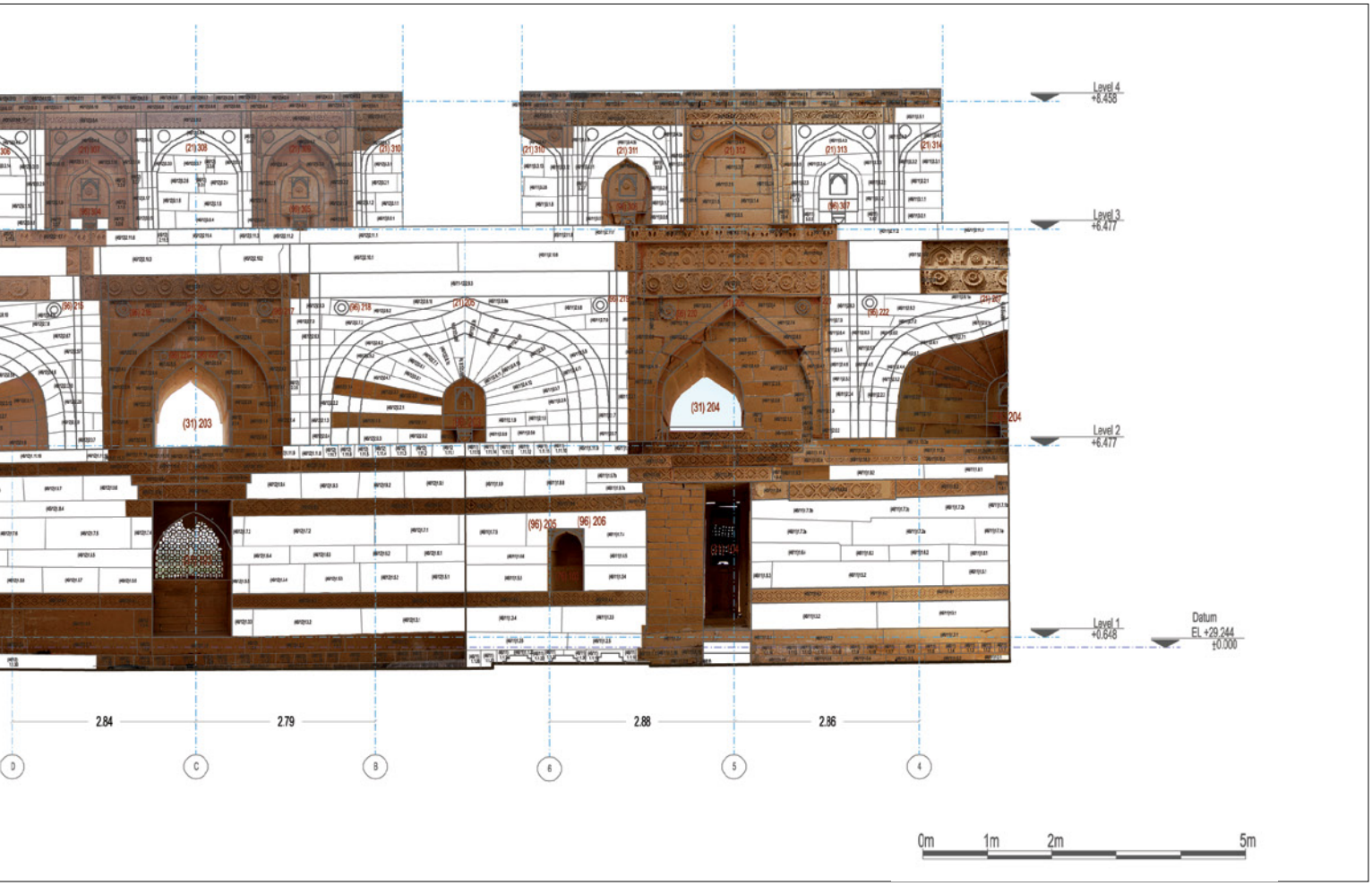
4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Level 3
+6.477
Level 2
+6.477
Level 1
+0.648
Datum
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(21) 307
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(96) 204
(31) 103
(96) 205
(96) 206
(76) 103
(31) 104
2.84
2.79
2.88
2.86
D
C
B
6
5
4
0m
1m
2m
5m

Composite drawing with superimposed image of Projecting Balcony centre portion.

10. NUMBERING SYSTEM

Heritage Foundation has devised a numbering system which can relate to various elements and provides a unique number to each element. In most cases numbering major elements, for example, primary structural elements, secondary elements consisting of openings etc. and simple decorative features is sufficient. However, in the case of the tomb, it became essential to work out the numbering which would reflect the different levels in the structure, various protruding elements and the huge variety of decorative features. It was finally decided that the numbering system must also provide a unique number to each and every piece of stone that is utilized in the historic structure.

The numbering system on the one hand leads to identification of each stone, but is also an indicator to the location of that particular stone in the building. Accordingly, the building was divided into portions and the elevations marked based on their locations, i.e. South (001), East (002), North (003), West (004) etc. with drawing numbers indicating the number of each elevation.

Each course or 'band' of stones on internal and external elevations has also been numbered, resulting in a variation of 29 to 30 bands on external facades and internally from 33 to 35 bands, consecutively numbered. This procedure had to be carefully tallied to correspond with the plans marked on different levels or the internal elevations.

In order that the references of elements and stones could relate to the drawings, the building was divided into different levels. Thus, several plans were drawn to show all the different levels and sub-levels. These systematically drawn and numbered drawings help in conveying and understanding the intricacy of the structure.

Thus, Level 1 presents the ground level; Level 2 takes off at the base of the squinches that formed the octagon, while Level 3 presents the level where octagon is converted into a sixteen sided polygon and Level 4 at the roof. The courses in stone masonry that divided the plans also correspond to the numbering system. All bands have thus been divided into four parts, where Level 1 incorporated the most number of bands followed by Level 2 and so on.

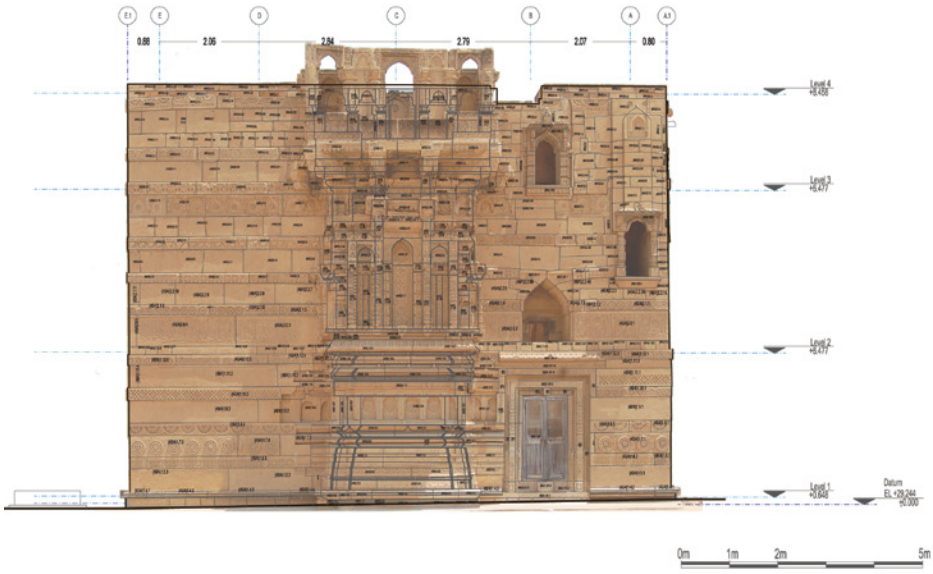
For the sake of clarity, the decorative and plain bands had to be separately numbered, thus decorative bands carry a prefix (45) while external plain bands read with a prefix of (46).

This led our unique numbering system for each stone to be marked as (45/1)1.2.3 shows that the stone is a decorative stone seen on Elevation 1 (South), and it occurs in Level 1, in Course or Band No. 2 and is the third stone in the band:

- (45/1) indicates that it is a decorative band (45) on Elevation 1 since 001 being South Elevation.
- 1.2.3 denotes Level 1, Course or Band No. 2 and Stone No. 3.

All the primary and secondary elements carry their own unique number in the relevant series. Thus, all arcuate/trabeated structural components have been numbered beginning with (21); External openings with (31); internal openings as (32) while Niches are designated number (76). The tomb of Jam Nizam al-Din is also interspaced with decorative columns and medallions. These decorative elements have been identified as separate components with number (96) while all infill stones added later have been numbered (95).

Since each element carries a unique number, a database of Architectural and Decorative Elements has been prepared to encompass and include each and every element of the monument and records the condition of each one of them.



Left. Composite drawing with superimposed image of West Elevation, incorporating numbering of elements according to HF Numbering System.

Bottom. Sample of database of stones showing location, stone number and type of damage. The database covers condition of all visible stones.

S. no	Location	Dwg No	Stone No	Type of Damage/Intervention
188	(L)004	(2-)004	(45/4) 3.0.11	General Blurring, Loss of Sharpness, Spalling
189	(L)004	(2-)004	(45/4) 3.0.12	General Blurring, Loss of Sharpness, Spalling
190	(L)004	(2-)004	(45/4) 3.0.13	General Blurring, Water Stains and Discoloration (Black Crust)
191	(L)004	(2-)004	(45/4) 3.0.14	General Blurring, Water Stains and Discoloration (Black Crust)
192	(L)004	(2-)004	(45/4) 3.0.15	
193	(L)004	(2-)004	(46/4) 3.1.1	Not Visible
194	(L)004	(2-)004	(45/4) 3.1.1	Not Visible
195	(L)004	(2-)004	(46/4) 3.1.2	Not Visible
196	(L)004	(2-)004	(45/4) 3.1.3	Powdery Surface/Salt Material, Minor Cracks and Deformation
197	(L)004	(2-)004	(46/4) 3.1.3	Powdery Surface/Salt Material
198	(L)004	(2-)004	(46/4) 3.1.4	Powdery Surface/Salt Material
199	(L)004	(2-)004	(46/4) 3.1.5	Not Visible
200	(L)004	(2-)004	(46/4) 3.1.6	Not Visible
201	(L)004	(2-)004	(46/4) 3.1.7	Minor Cracks and Deformation, Water Stains and Discoloration
202	(L)004	(2-)004	(46/4) 3.1.8	Water Stains and Discoloration (Black Crust)
203	(L)004	(2-)004	(46/4) 3.1.9	Water Stains and Discoloration (Black Crust), General Blurring
204	(L)004	(2-)004	(46/4) 3.1.10	Water Stains and Discoloration (Black Crust), General Blurring
205	(L)004	(2-)004	(46/4) 3.1.11	Water Stains and Discoloration (Black Crust), Requires Repointing
206	(L)004	(2-)004	(46/4) 3.1.12	Water Stains and Discoloration (Black Crust), Requires Repointing
207	(L)004	(2-)004	(46/4) 3.1.13	Water Stains and Discoloration (Black Crust)
208	(L)004	(2-)004	(46/4) 3.1.14	Water Stains and Discoloration (Black Crust)
209	(L)004	(2-)004	(46/4) 3.1.15	Water Stains and Discoloration (Black Crust)
210	(L)004	(2-)004	(46/4) 3.1.16	Water Stains and Discoloration (Black Crust), Spalling
211	(L)004	(2-)004	(46/4) 3.1.17	Water Stains and Discoloration (Black Crust), Spalling
212	(L)004	(2-)004	(46/4) 3.2.1	Not Visible
213	(L)004	(2-)004	(46/4) 3.2.2	Not Visible
214	(L)004	(2-)004	(46/4) 3.2.3	Not Visible
215	(L)004	(2-)004	(46/4) 3.2.4	General Blurring and Loss of Sharpness
216	(L)004	(2-)004	(46/4) 3.2.5A	Water Stains and Discoloration (Black Crust), Spalling
217	(L)004	(2-)004	(46/4) 3.2.5B	Spalling
218	(L)004	(2-)004	(46/4) 3.2.5C	Spalling
219	(L)004	(2-)004	(46/4) 3.2.6A	Water Stains and Discoloration (Black Crust), Spalling
220	(L)004	(2-)004	(46/4) 3.2.6B	Spalling
221	(L)004	(2-)004	(46/4) 3.2.6C	Not Visible
222	(L)004	(2-)004	(46/4) 3.2.6D	Not Visible
223	(L)004	(2-)004	(46/4) 3.2.7	Partial Holes (Small), Water Stains and Discoloration (Black Crust)
224	(L)004	(2-)004	(46/4) 3.2.8	Water Stains and Discoloration (Black Crust)
225	(L)004	(2-)004	(46/4) 3.2.9	Water Stains and Discoloration (Black Crust)
226	(L)004	(2-)004	(46/4) 3.2.10	Water Stains and Discoloration (Black Crust), Spalling
227	(L)004	(2-)004	(46/4) 3.3.1	Not Visible
228	(L)004	(2-)004	(46/4) 3.3.2	Not Visible
229	(L)004	(2-)004	(45/4) 3.3.3	Powdery Surface/Salt Material
230	(L)004	(2-)004	(45/4) 3.3.4	Powdery Surface/Salt Material, Spalling
231	(L)004	(2-)004	(45/4) 3.3.5	Not Visible
232	(L)004	(2-)004	(45/4) 3.3.6	Not Visible
233	(L)004	(2-)004	(45/4) 3.3.7	Partial Holes (Small)
234	(L)004	(2-)004	(45/4) 3.3.8	General Blurring and Loss of Sharpness
235	(L)004	(2-)004	(45/4) 3.3.9	Not Visible
236	(L)004	(2-)004	(45/4) 3.3.10	Not Visible

Interior view of lattice in East window.

View of rear wall at the top of jharoka seen from an arched opening.

View of West entrance from inside.

11.0 PHOTOGRAPHY

As in the case of other records, the photographic record has been developed with the objective that the purpose of an archival record of a heritage place or object is to document a heritage item for future generations (Getty:2006).

In the case of the historic tomb, photography is being used "as a tool for archaeological investigation." The data will provide extensive record of the present condition of the site and will help in determining the extent and reasons for deterioration, damage or stress. The following considerations were kept in mind while photography was undertaken:

- There was considerable hazard in developing the photographic record. The East facade could not be photograph without negotiating the huge drop on the East. Parts of the site were also found to be extremely dangerous. The views taken from the top of the heritage structure carried their own challenge due to unguarded spaces and extreme wind pressure. Not only the team members had to take care of their equipment, taking care of themselves, without having an accident was a major challenge.

- Since the size of the heritage structure is not very large and some parts are very confined, it has been difficult to photograph all areas. Internal spaces are particularly restricted, for example the Triple Mihrab, the stair case areas and the top of the Darshan Jharoka and balcony area.

- There are adverse environmental and weather conditions e.g. extreme heat and huge wind pressure. The exposed condition of the site and extremely hot weather provided extremely challenging conditions. The wind pressure itself at times was difficult to counter and created hazardous conditions. Lack of vegetation meant that the wind carried a lot of dust, which would get into the eyes of the team members as well as into their equipment.

- The location itself is remote and safety precautions were required, in order not to expose the team to any danger. This meant that the teams could not stay in Thatta but had to travel from Karachi to the historic site during the entire field work.

- In view of the unkempt state of the site, especially bushes surrounding the area, all precautionary measures were necessary.

- Precautions were taken to carry hats, walking shoes etc. during the field visits.

- In order to ensure that correct markings of the photographs were made to ensure correct identification, it was important that in addition to cameras, all relevant drawings as well as laptop computers were carried to the site, along with notebooks, pens, pencils and GPS etc.

There was sufficient capacity on the memory cards to be able to hold record images until after the field visit. In addition, a computer was available in order to download the images in case it was required. The Photography Team was well aware of all plans and documentary evidence, including its history and requirements of the project. The team was also fully familiar with the site and its many attributes. The photographers carried with them all the latest drawings that had been drawn. Since all elevations and elements are numbered, the record of photographs was maintained accordingly. As an individual building, and due to the importance of recording the condition of all stone masonry pieces, each external and internal façade has been photographed carefully, and in a manner to avoid distortion.

All external facades were photographed, with a great deal of care, in order to capture all details including carving, thresholds, cornices, projecting areas, etc. However, detailed photography of each element has also been undertaken. Details were captured from a distance as well as at close quarters.

Where internal elevations are complex in most buildings, the ones in the Jam Nizam al-Din's tomb are of greater intricacy. All parts that were projecting or were recessed had to be photographed in a manner to show the condition of all stone features. Among the most difficult portions to photograph requiring special effort, have been the roof level area, the projecting Darshan Jharoka and the Triple Mihrab.

For the historic tomb, photography has been carried out as extensively as possible, thus recording all facets and elements. The photographic record has helped in determining the various courses of stone blocks, along with decorative features and their numbering. The numbering system devised helps in ensuring that no element of the historic structure is missed out. Thus, photographic recording has formed the basis for determining the damage and stress areas as well as those where interventions have taken place.

View of innermost Triple Mihrab.

View of elegant inscriptional mural in tympanum of the first Triple Mihrab arch.

View from the top of roof void looking into the sepulchre.

Decorative lattice window at the top floor of the Projecting Balcony.

Image 1. Image of upper part.

Image 2. Image of lower part.

Image 3. Merging of Image 1 and 2.

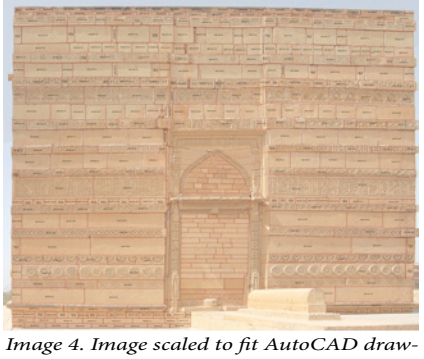


Image 4. Image scaled to fit AutoCAD drawing.

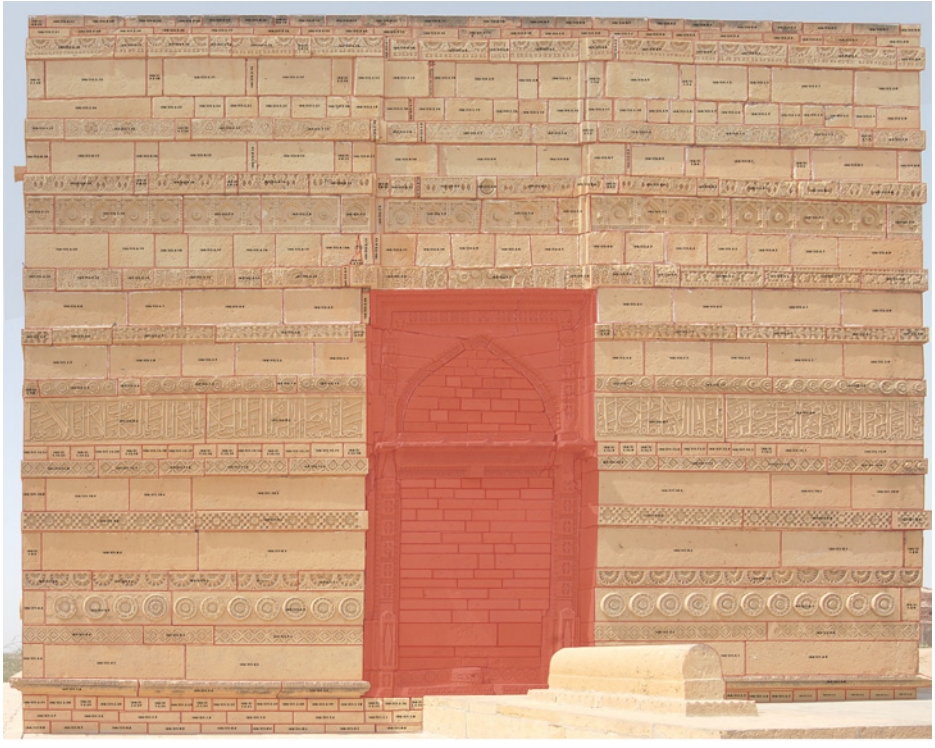
Top to Bottom. Sequence of photographs showing corrections carried out through photo-editing and cnverted to scale.

12.0 SUPERIMPOSITION PROCEDURE

The superimposition of the photographs on AutoCAD drawings has been accomplished on all external facades. Due to the complexity of the internal faces, photographs could be superimposed only on limited areas. All effort however, was made to superimpose areas where damage or signs of stress were identified. The photographs required a great deal of editing for the process of superimposition and Photoshop skills were extensively used by the team members.

The following options were considered:

- Using the numbers of each element to develop the database, according to the usual HF methodology. This method could be sufficient as by making a reference to the database the condition could be ascertained; however, with this mechanism, when looking at the drawing, the sense of its exact condition would not be conveyed.



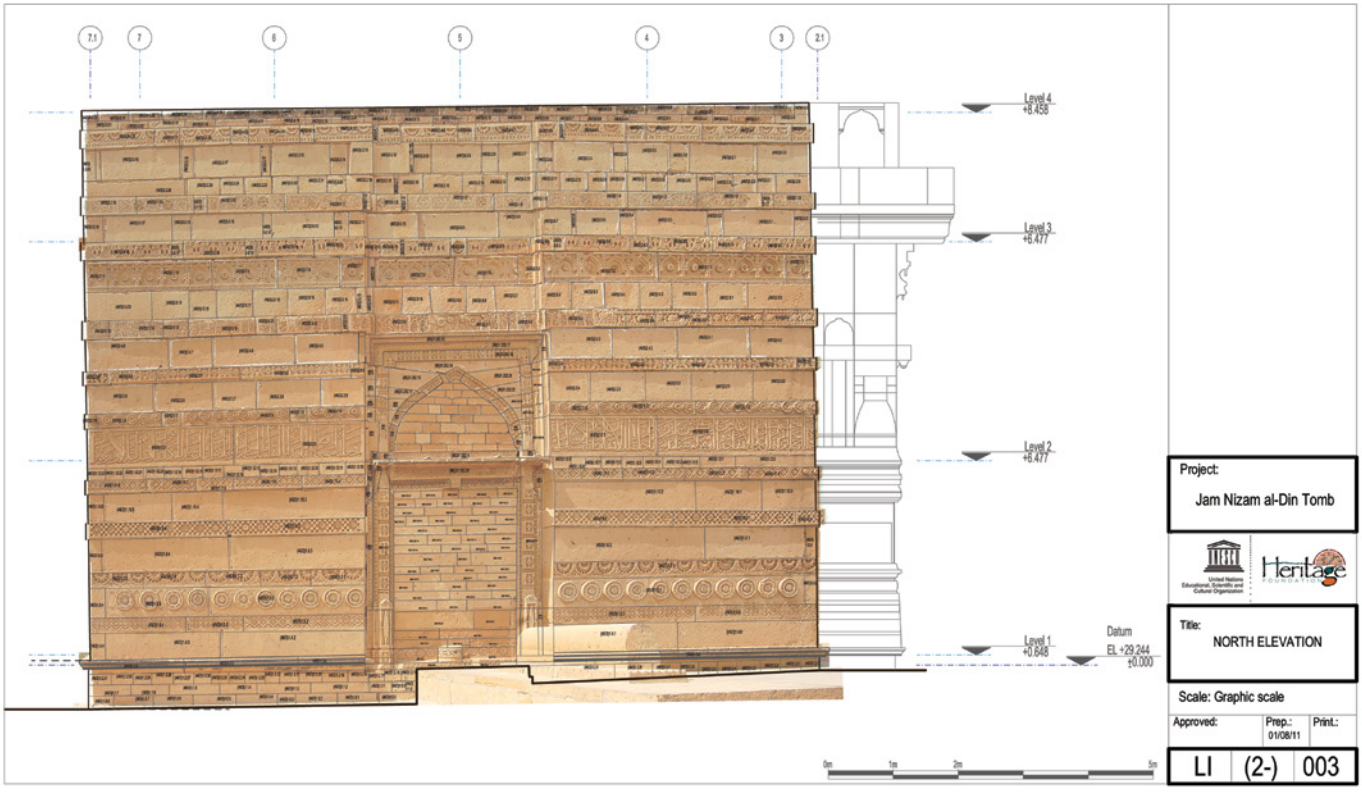
Above. North Elevation. Edited photograph brought to scale for superimposition on AutoCAD drawings. The centre portion highlighted to indicate separate numbering sequence.

- Presenting an image of the façade marked with unique numbers of all elements. This appeared to be a comparatively easy solution, since it would visually present the condition at the present time, and through cross referencing with the database, would provide the necessary information. However, such an image would not be to scale, thus falling short of the standard set by HF for presentation of all data in a scientific and professional manner.

- Preparing a combination of AutoCAD drawings with superimposed image. This option was considered to be the most appropriate in presenting the facades which would also be to scale, and thus fulfil HF's own standards for presentation of scientific data.

Sets of AutoCAD Drawings with superimposed images of facades required a great deal of thoroughness. The tasks consisted of using different software to achieve the results. This also required careful photography of all facades that could be then used as superimposed image on the AutoCAD drawings. Since there is always distortion in a photographic image, a great deal of care had to be taken to correct the distortion and for the images to carefully fit the scaled drawings.

Below. North Elevation. Composite drawing with superimposed image, showing the lay-out of drawing and HF numbering system.



The activities were carried out in the following manner:

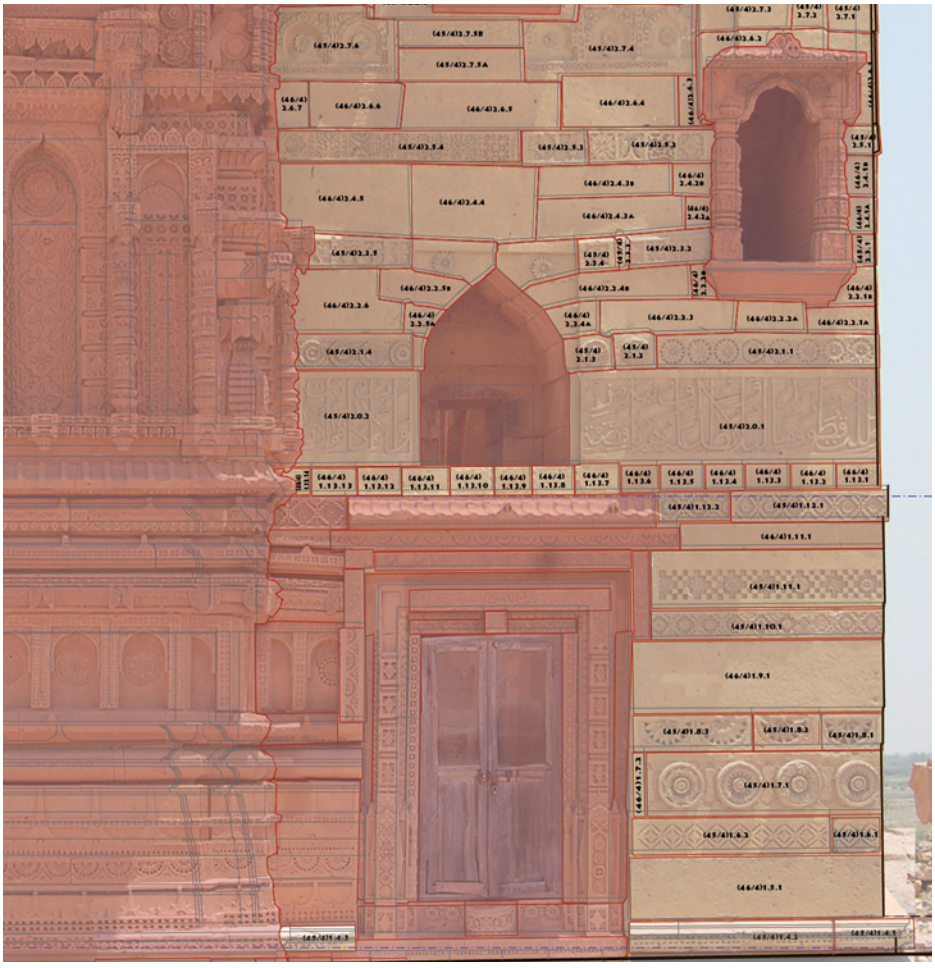
i. Finalization of the AutoCAD Elevations along with numbering of elements.
ii. Conversion of the AutoCAD drawing into an image through Photo shop.
iii. Placement of the image of the same façade to fit the Photoshop image of the AutoCAD drawing.
iv. Tweaking the image of the façade to fit correctly on the Photoshop image of the AutoCAD drawing.
v. Transferring the combined Photoshop image into AutoCAD.
vi. Re-fixing the scale of the image to AutoCAD, to ensure the correct scale of the combined façade.
vii. Transferring the numbers of elements and stone to appear on top of the image for ease of readability and identification.

South Elevation. Composite drawings drawn in AutoCAD and superimposed with edited images.

East Elevation. Composite drawings drawn in AutoCAD and superimposed with edited images.

North Elevation. Composite drawings drawn in AutoCAD and superimposed with edited images.

West Elevation. Composite drawings drawn in AutoCAD and superimposed with edited images.



Composite drawing of West Elevation. Shows superimposition with edited image to show the actual condition of the facades.

Due to lack of sufficient information regarding interventions carried out by the Federal Department of Archaeology in the past, that it was considered essential to carry out investigation of the soil conditions in the area.

The structure of the tomb suffers visible deformity due to a settlement along the North-east corner. A detailed subsoil study was undertaken by Consolidated Engineering Services to investigate the prevalent conditions. It was decided that drilling of four boreholes up to a depth of 15m would be carried out. After careful considerations it was decided that three of the boreholes would be drilled at the level of the tomb, while one would be drilled at the foot of the hill.

Rotary Drilling method was employed to advance the borehole to the required depths, where Standard Penetrating Tests were conducted. The samples of subsoil materials were preserved for further testing. A program of laboratory tests was performed and selected representative samples were tested to determine the physical and engineering characteristics of various subsoil materials encountered at the site. Ground water was not encountered in three of the four boreholes.

The Laboratory tests concluded that sand and clay with gravel and cobble deposits were found in the top soil. This gave way to silty Shale compressed between two layers of sandy and nodular Limestone followed by nodular Sandstone. The physical characteristics determined through the tests demonstrate that the shale lacked cementation or cohesion. Such formations when exposed to the atmosphere may be prone to degradation and slake to form soil like formations. The materials were also tested for Sulphate and Chloride content which were found to be moderate to high.

Among the findings listed the Geo-technical engineer assessed that the tomb at the time of construction may have been further away from the edge of the slope, and due to the constant weathering and erosion of the shale and the consequent collapse of the top layer of limestone has caused the settlement of the structure.

Recommendations included the use to 'crack monitors' or tell-tales, the extension of the extant pedestal while incorporating a safe finished slope as well as the construction of a retaining wall that will prevent the structure from further degradation.

Top to Bottom. Images showing Geo-technical studies in progress and collection of samples in boxes.

Collection of images showing record of condition of elements and interventions carried out by the concerned department.

14.0 CONDITION SURVEY

The Baseline information that was developed was put together in as detailed and meticulous a manner as possible. The combination of AutoCAD drawings and photography provides the basis for analyzing all elements and preparing a concerted evaluation of the structural fabric, architectural elements and decorative features. As we began to prepare the documents, we were highly conscious of the fact that the conditions survey being prepared was not only for use in the present but encompassed data that is developed for posterity. Accordingly, we have taken the work of condition surveys as being of utmost importance that has been undertaken with dedication and commitment.

As has been noted by conservationists, "Condition surveys are intended to produce condition information, which can then be used for strategic and tactical planning, and to provoke some 'action' i.e. an intervention in the building fabric." However, it is also clear that the condition surveys do not necessarily lead to major interventions – a well conducted condition survey will lead to methodologies of minimum intervention, which is among the most important objectives of conservation. The surveys are expected to be equally valuable for monitoring purposes, as well as identifying the needs for re-inspection of the entire structural fabric or identified parts of it.

Accordingly, we believe that more comprehensive, detailed and authentic the survey, the more is its usefulness for determining the vulnerability and need for interventions. This in-depth information will help in working out appropriate strategies which are expected to lead to the decision to provide least intervention to retain the value of the significance of the monument.

Thus, the base line information that has been compiled points out the potential threat to the significance and value of the site. By pointing out the vulnerable areas, it is expected that proper conservation, management and maintenance strategies will be developed for this unique site. And, evaluation of the condition of the site is undoubtedly a pre-requisite before further action can be taken.

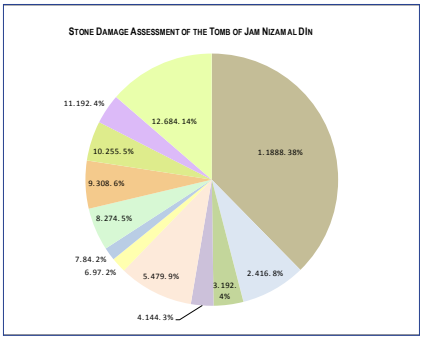
Because of the complexity of the tomb of Jam Nizam al-Din it was decided that the data must present all of the structure as a combination of drawings and photographs. For the most crucial areas, where the damage had to be shown, as mentioned earlier a methodology of superimposition

DATABASE OF ELEMENTS - Primary							
S. no	LOCATION	REF. DWG.	DESCRIPTION	STATE			PHOTOGRAPH
ELEVATIONS							
1	(L-)001	L(2-)001	**External Elevation SOUTH**	G	F	D	
			Decorative Bands: 14		√		
			Non-decorative Bands: 16				
			Openings: 2				
2	(L-)002	L(2-)002	**External Elevation EAST**	G	F	D	
			Decorative Bands: 14	√			
			Non-decorative Bands: 15				
			Openings: 2				
3	(L-)003	L(2-)003	**External Elevation NORTH**	G	F	D	
			Decorative Bands: 14		√		
			Non-decorative Bands: 15				
			Openings: 1				
4	(L-)004	L(2-)004	**External Elevation WEST**	G	F	D	
			Decorative Bands: 14				
			Non-decorative Bands: 16	√			
			Openings: 5				
			Darshan Jharoka				

Sample page of extensive Condition Survey Database prepared for each element, numbered with HF Numbering System.

of images on AutoCAD drawings has been developed. Additionally, in order to provide detailed information, a Database of each and every element has been compiled, along with a Database of condition of all stones, each one of which carries a unique number for ease of identification.

Since the Condition Survey will be used as a 'diagnostic tool' several types of investigations have been included, which comprise archival research, geotechnical studies for soil condition and its impact on the structural fabric as well as structural evaluation to assess the condition of the structure.



15.0 ASSESSMENT OF DAMAGE

The Tomb of Jam Nizam al-Din is a stone structure. Built with Gizri sandstone, its stone blocks are in a fair state of preservation. In order to make an assessment of the condition of each stone, it carries its unique number.

The Database for each stone has been developed in order to determine the kind of damage that has been suffered by the various stones. The data base has been compiled after the study and evaluation of the existing state. The data base is based on the study at site of the condition on various faces of the historic structure. In addition the superimposition of the images on facades drawing in the AutoCAD has allowed examination and identification of all types of damage.

Due to lack of availability of 3D laser scanning or fluorescence LIDAR (light detection and ranging) and resources, it has not been possible to measure the severity of decay, or the use of tools to probe below the surface. However, a through and careful visual examination has been carried out. Through this painstaking and meticulous examination various kinds of damage have been noted, and the nature of damage has been recorded in the accompanying database of stones. Due to the exhaustive survey of the state of damage of all stones, and the highly structured

Diagram Above and Table Below show kind of damage found in stones. All visible stones carry a unique number according to HF Numbering System.

Elevation	No. of Stones		Decorative		%	Plain		%	Not Damaged		%	General Blurring		%	Cracks		%	Failure of Carvings		%
South 001	487		141		28.95	346		71.05	215		44.15	79		16.22	28		5.75	22		4.52
East 002	416		143		34.38	273		65.63	223		53.6	33		7.93	3		0.72	4		0.96
North 003	516		179		34.69	337		65.31	193		37.4	99		19.19	46		8.91	18		3.45
West 004	291		135		46.39	156		53.61	114		39.18	57		19.59	9		3.09	22		7.56
Jharoka 005	147		141		95.92	6		4.08	121		82.31	9		6.12	4		2.72	11		7.49
Jharoka 006	49		47		95.92	2		4.08	17		34.7	0		0	0		0	16		32.65
Jharoka 007	52		49		94.32	3		5.77	10		19.23	0		0	17		32.69	13		25
Complete Jharoka		248		237			11			148			9			21			40	
Total External		1958		835			1123			893			277			107			106	
South 011	298		50		16.77	248		83.22	192		64.43	7		2.34	33		11.07	4		1.34
East 012	313		45		14.38	268		85.62	220		70.28	28		8.95	8		2.56	1		0.32
North 013	316		36		11.4	280		88.61	181		57.28	23		7.29	30		9.49	7		2.22
West 014	267		63		23.6	204		76.4	182		68.16	39		14.61	14		5.24	12		4.5
Internal Wall 015	105		7		6.67	98		93.33	62		59.05	18		17.14	0		0	0		0
Internal Wall 016	64		11		17.19	54		84.38	47		73.44	10		15.63	0		0	0		0
Mihrab 018	152		112		73.68	40		26.32	111		73.03	14		9.21	0		0	14		9.21
Total Internal		1515		324			1192			995			139			85			38	
TOTAL documented		**3473**		**1159**	**33.33**		**2315**	**66.66**		**1888**	**54.36**		**416**	**11.98**		**192**	**5.53**		**144**	**4.15**

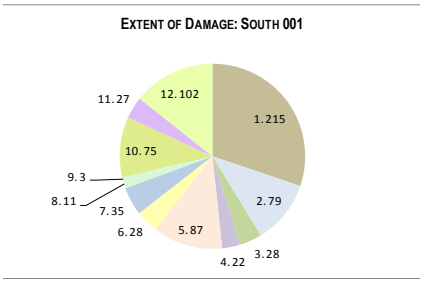
data that has been assembled, it now presents an extensive record at this particular time. The record also presents the damage that is visible after 500 years of its life. Any surveys that are carried out in the future can compare them with the present record and will be able to appraise and measure if a series of inspections are arranged over next years.

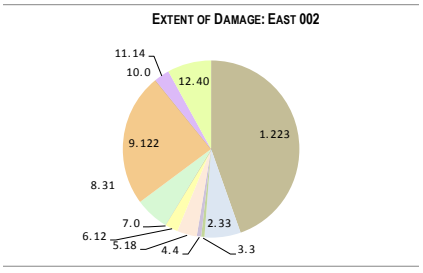
All possible effort was made to record the damage through extensive photography. Even though the light conditions varied photographs were taken under strong sun and over a period of three months, they all present clarity of view. Thus, in our opinion, the photographs coupled with visual examination in the field, are the best mechanism for capturing the condition of the stone and the damage that has been caused.

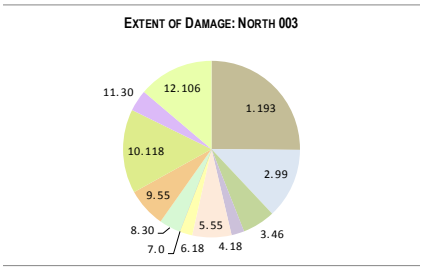
The numbering system that provides a unique number to each stone, allows ease of identification. If the same system is adopted in the future, the custodians will be able to immediately identify further damages caused and the rate of damage of stones that have been already identified.

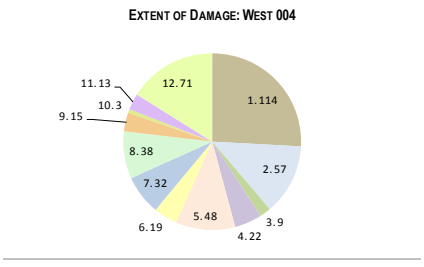
This detailed study and the database will allow assessments regarding kind of remedial measures to be taken. The comparison with the database and drawings prepared at this stage will form the basis for examination and comparison of the record with future conditions. In deciding the urgency of any action, the present evaluation of the condition of stones will point towards any action and the time frame of the action.

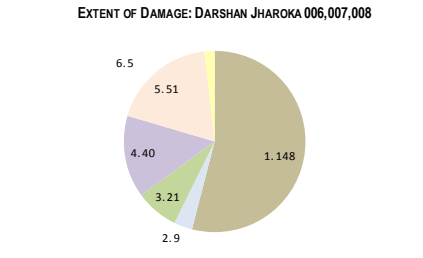
Spaling		%	Partial Holes		%	Re-pointing		%	Water Stains		%	Powdery Surface		%	Infill Stones		%	Blistering Bubbles		%	Multiple Damage		%
87		17.86	28		5.75	35		7.19	11		2.23	3		0.62	75		15.4	27		5.54	102		20.94
18		4.33	12		2.88	0		0	31		7.45	122		29.33	0		0	14		3.37	40		9.62
55		10.66	18		3.49	0		0	30		5.81	55		10.66	118		22.87	30		5.81	106		20.54
48		16.49	19		6.53	32		11	38		13.06	15		5.14	3		1.03	13		4.47	71		48.3
20		13.6	4		2.72	5		3.4	38		25.85	0		0	0		0	0		0	21		14.29
18		36.73	1		2.04	3		6.12	10		20.41	0		0	0		0	0		0	16		32.65
13		25	0		0	0		0	17		32.69	0		0	0		0	0		0	13		25
	51			5			8			65			0			0			0			50	
	259			82			75			175			195			196			84			369	
28		9.4	2		0.67	8		2.68	9		3.02	27		9.06	13		4.36	28		9.4	44		14.77
48		15.34	6		1.91	0		0	17		5.43	25		7.99	1		0.32	23		7.35	62		19.81
52		16.46	5		1.59	1		0.32	9		2.85	49		15.5	36		11.39	24		7.59	75		23.73
64		20.25	2		0.75	0		0	14		5.24	12		4.49	9		3.37	1		0.37	69		21.84
18		17.14	0		0	0		0	16		15.24	0		0	0		0	25		23.81	34		32.38
10		15.63	0		0	0		0	7		10.94	0		0	0		0	7		19.94	17		26.56
0		0	0		0	0		0	27		17.76	0		0	0		0	0		0	14		9.21
	220			15			9			99			113			59			108			315	
	479	**13.79**		**97**	**2.79**		**84**	**2.42**		**274**	**7.89**		**308**	**8.87**		**255**	**7.34**		**192**	**5.53**		**684**	**19.7**











Extent and kind of damage on stone shown through pie charts related to each facade.

A great deal of effort has been expended on determining the kind of damage that has occurred in the stone blocks used to build the historic structure. In order to identify the kind of damage that is visible, through its unique number, it is distinguishable whether it is part of a decorative course or plain stone blocks and its exact location in the structure.

Several kinds of damage have been noted and each type of damage has been noted for each stone block. They are as follows:

- Partial holes, small and large
- A white build-up of powdery surface/salt material on the surface
- Partial failure of projecting mouldings and carvings
- Blistered bubbles
- A general blurring and loss of sharpness
- Water stains, and discolorations
- Spalling
- Cracks and deformations

This data base also highlighted the interventions that have been carried out over time as well as areas which require re-pointing. The following aspects have been indicated:

- Re-pointing
- Need for re-pointing
- Cracks infill with mortar
- Stone infill with small pieces of stone

Among the causes of concern in the Tomb of Jam Nizam al-Din, the appearance of cracks on the Southern and Northern external and internal facades has been recorded. Where the cracks in internal facades are of comparatively less severe; however, those on external facades, are of a more serious nature. Since the cracks have been of apprehension to heritage conservationists for the last several decades, a set of drawings was prepared especially to mark the location of all cracks.

A set of AutoCAD/Photoshop Combined Drawings, through superimposition of façade images clearly shows the extent of cracks that have been set to scale. Although it is unclear as to the period in which these cracks were developed, some being of the view, that they probably appeared at the outset, there is no data that can confirm the extent of movement in the last couple of decades. The rudimentary tell-tales that have been placed by the Federal Department of Archaeology being unsatisfactory

due to lack of recorded data since they were placed. The present set of drawings now clearly shows, to scale, the extent of the cracks.

Through proper recording and re-surveys after a few years, as well as placement of tell tales, on the basis of the accurately surveyed drawings prepared in AutoCAD that have now been prepared, it will be possible to take the readings over the next couple of years, which would clearly indicate if further movement in the structure is taking place.

Coupled with the cracks, is the closeness of the tomb structure to the sudden drop where soil continues to erode. This has been considered as one of the causes for the leaning of the structure. Other structures in the vicinity, particularly the pavilion tomb of Nuri and Jam Tamachi are also endangered, being close to the edge of the ridge and its structure also suffering from settlement.

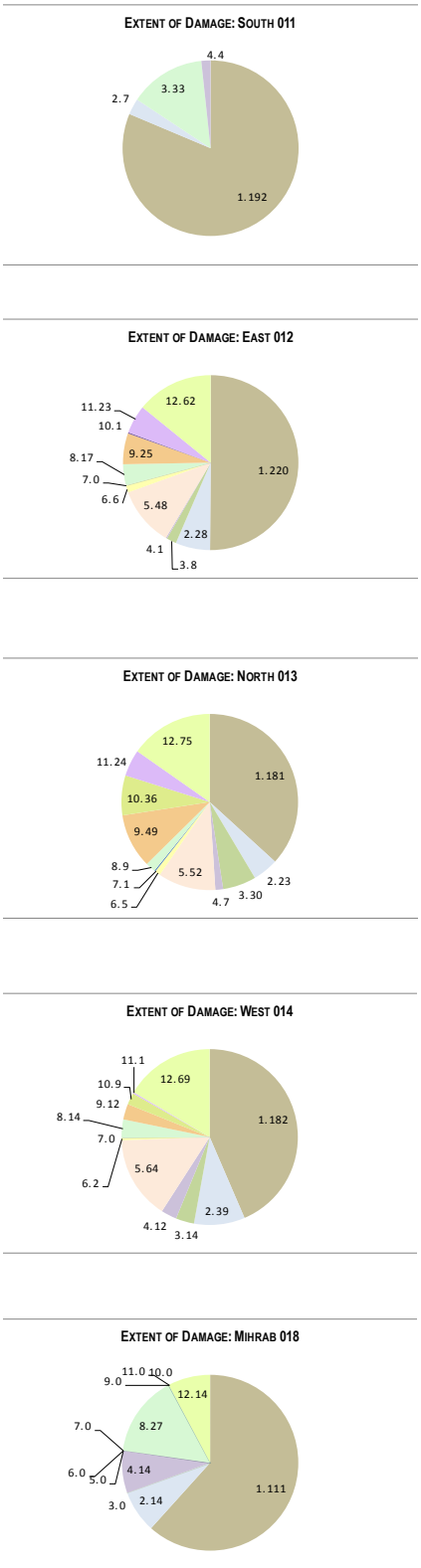
Although several interventions appear to have been made by the Federal Department of Archaeology; however, in the absence of recorded information, it has been difficult to study the extent of damage or degradation. According to the officials of the present Directorate of Archaeology, who have earlier served in the Federal Department, an attempt was made during the mid-1990s to erect a retaining wall, which was taken to a depth of 15'0". However, when drilling was carried out to investigate the soil conditions for the present assignment, it was found that excavating the soil up to 15'0" depth would be impossible, since rock was encountered just a few feet below the ground surface. Some form of retaining wall seems to have been built, which from all indications, has failed to serve the purpose.

Extent of Damage on Stones

The extent of damage has been studied in different components and elements of the structural fabric. The kinds of damage have been recorded in the Database of Series DAe and DAi.

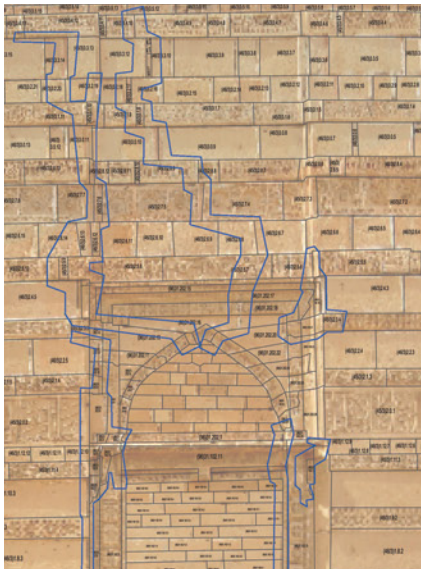
Most damage has been noted on the north façade possibly due to its exposed condition, where in addition to a major crack the stones themselves are found to have greater defects than other sides.

Primary Elements: On examination of external and internal facades, as mentioned earlier, cracks are marked on Drawing Nos. DC(2-)001,



Extent and kind of damage on stone shown through pie charts related to each facade.

North Elevation showing marking of kind of stone damage e.g. spalling etc.



North Elevation showing marking of cracks due to stress or settlment.

DC(2-)003 and DC(2-)017. Two major cracks appear on north and south facades occurring throughout the height of the structure at the openings placed almost in the middle of the wall.

Minor cracks also occur at all corners at junctions of upper level squinches resting on lower level squinches.

Some stones are also found to contain hairline cracks.

Displacement has been noticed in the base of Darshan Jharoka along the north façade.

Secondary Elements Damage: Due to the cracks in the walls, the openings occurring on the two facades have also been damaged.

Decorative Features: Major carved elements occur in the Darhsan Jharoka and Triple Mihrab. In addition carved and decorative features also found in stone bands on all internal and external facades.

There are a total of 3,473 dressed and carved stones that have been documented internally and externally.

Out of the 3,473 stones, 1,159 stones carry carvings and other decorative features.

Out of the decorative stone 144 stones have been found to have damaged carving which is 12.42 percent of all decorative stone features.

Total percentage of damaged carved stone constitutes 4.15% in all elements and bands occurring on internal and external facades.

POSTSCRIPT

At Heritage Foundation we feel greatly privileged to have been tasked by UNESCO to carry out documentation and condition survey of such a significant landmark as the early 16th century Tomb of Jam Nizam al-Din. Many monuments are documented and their condition surveys prepared, but there are few that are of such complexity and elaborate detailing as the one under discussion. Challenging as the task was, it was also among the most rewarding experiences for all of us who participated in this exciting venture.

Whether the sites are elaborate or simple, it is imperative that detailed records of all heritage assets are prepared on an urgent basis. Last year, as a result of constitutional amendments all heritage sites, including those in UNESCO's World Heritage List, were transferred to the provinces by the Federal Government. These sites are in addition to those that were already in the custody of provincial governments, thus further adding to their responsibility of stewardship.

Clearly, at this critical juncture, all organizations and institutions whether public or private, international or national, must join hands in order that the rich heritage of Pakistan is adequately protected and conserved.

Heritage Foundation is working towards this goal by developing guidelines and formats, standard operating procedures and training programmes for various levels of safeguarding in order to engage as large a spectrum of stakeholders as possible. Where on the one hand, it is important that highly trained professionals take on the most critical aspects, at the same time, it is essential to encourage communities, interested public and students to participate in safeguarding activities without damaging the sites in any way. Under proper supervision, the more people get involved in clearing and cleaning, writing and researching, and providing help during conservation, the more stake they will develop in protecting and saving our invaluable heritage.

It is my wish and hope that by devising innovative strategies, communities, particularly women, will be engaged in protection of heritage assets. Only when heritage become a source of livelihood for the underprivileged will it foster pride among communities who will strive to protect it, perhaps more effectively than the current system.

Yasmeen Lari, SI
Editor