

ACCU Nara  
International Correspondent

# The Seventh Regular Report



(財)ユネスコ・アジア文化センター 文化遺産保護協力事務所  
Cultural Heritage Protection Cooperation Office, Asia-Pacific Cultural Centre for UNESCO (ACCU)

## ACCU Nara International Correspondent

The ACCU correspondents periodically send reports on cultural heritage protection activities in which they have been recently involved. This is a collection of thirteen reports submitted by international correspondents in the Asia-Pacific region.

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# The Seventh Regular Report





## 'Vajralepa' of the 9th Century (Pala Dynasty) Discovered in Bihar Dhap Temple in Bangladesh

**Mst. Naheed Sultana**, *Custodian*  
Department of Archaeology, Ministry of Cultural Affairs

The Buddhist archaeological site of Bihar Dhap is located about six kilometres away to the west of ancient Pundranagor city or Mahasthangarh in the district of Bogra in Bangladesh. The Chinese pilgrim, Huen-Tsang, reported while traveling in Bengal that he visited a vast 'shangaram' (monastery) called Po-Shi-Po and took part in religious activities. Sir Alexander Cunningham identified this archaeological site as Po-Shi-Po-Bihara as is told by the eminent traveler Huen-Tsang in his account.

As a result of Bihar Dhap excavation, relics of an ancient rectangular sized temple of Gupta Empire measuring 29.50 m × 29.00 m has been unveiled. Subsequently in the second phase, a comparatively smaller temple measuring 12.00 m × 9.70 m was built attaching to and conformity with that of the first phase. This attached building gave both the temple a new look and appearance which included plaster of the exterior walls of the temples with a novelty unknown in this region so far. In the last phase of construction, the well-wide concreted floor and the front wall with the height of 2.28 metres were found almost intact. All over the exterior parts of the front wall, use of the thick plaster was visible. On the body of the temples constructed in the first phase, no such a sort of plaster was used. Even when the attached smaller temple to the north of the old one was constructed, no plaster was used. The bricks used in the front wall of the first phase temples were made smooth at one end and panel-sized ornamental bricks with terracotta plaques were used for decorating and beautifying the temple. The overlap of

the smooth and beautiful front walls by plaster and some partial overlapping parts of the ornamental works on the walls lead to assume that the plastering of the walls were made sometime after the construction of the second phase. Probably it might have been done for making the construction long lasting.

Plaster is a mixture generally used for covering the body of the wall and mortar is used as binder to join bricks together. Sometimes, the same mixture of materials is used for both the work of plaster and mortar. In ancient times, mud alone largely served the purpose of mortar. In the construction of brick-made temples, a thin layer of mud was extensively used between two bricks for joining them firmly.

In ancient India, whether the temples were built of bricks, wood or stone, the construction works were done with high precision and skills. Bricks and stones would be laid and attached together very carefully. 'Sudhashills' and 'vajralepa', a sort of sticky cement plasters, were applied in the then architectural frame works, but very little is known about how the things were prepared. 'Vajralepa' is a mixture of some hard sticky substances like conch-shell powder or clay mixture with some other ingredients of a chemical compound.

Before we have a clear idea about the plaster prepared in combination with clay mixture and brick dust discovered in the temple of the Bihar Dhap, it is necessary for us



to go into a discussion about vajralepa in other words plaster as described in two books of ancient India, namely, Bratho Samhita and Visnudharmottara because at least four or five processes of preparing 'vajralepa' have been described respectively in those two books.

According to the description in Visnudharmottara, the principal ingredients of plaster are brick dust, clay mixture, sticky rajan, wax, molasses, and different vegetable substances. The mixture would be preserved for one month to become glutinous, hardened and thick. Then the mixture would be used as plaster in the walls. If it would be found not perfectly smooth, then again a compound of rajan and oil mingled with clay mixture would be added for obtaining the desired effect.

There are different kinds of lime plaster mainly made from powdered gravel and also of powdered gravel and conch shells with a proportion of sand to which the

sap of various milky trees (Asvattha, Butea, Frondosa, or Kodomba) mango juice or curd, milk, and coconut water, ghee, as well as ripe bananas, pulses and rice grains would be added.

In fact, the plaster was prepared in various ways in combination with different ingredients. Sometimes, the glue of the boiled buffalo skin would be collected for making plaster. When some glutinous materials are mixed with the plaster, the whole compound is called vajralepa. Vajralepa is also called 'diamond plaster' because of its high quality, smoothness and longevity. In fact, this plaster is a kind of vajralepa, which is a compound of clay mixture, brick dust and many other glutinous things of animal or vegetable substances or a combination of both. As a result, we can conclude that the use of this sort of plaster vajralepa was undoubtedly an innovation as a new construction material in the architectural arena of ancient Bengal.





## Construction of the Largest Sitting Buddha in the World

**Karma Wangchuk**, *Conservation Engineer*  
Department of Culture, Ministry of Home & Cultural Affairs

After having managed the conservation of Semtokha Dzong (fortress) from 2005 to 2008 (which I presented in my first report), I got another lifetime opportunity to work on the construction of 169 feet tall Buddha statue which I would like to share herewith. Though it is a new construction of cultural heritage, I have the opportunity to look forward and learn, compare the conservation knowledge and experience of Semtokha dzong, one of the oldest heritage structures of the country, which is around four hundred years old with the new construction of cultural heritage (Buddha statue) that should last another four to five hundred years from now.

### Background information

The Buddha Dordenma Project is the construction of a 169-foot-tall Shakyamuni Buddha statue (inclusive of lotus) seated on a 62-foot-tall throne in the Kingdom of Bhutan. As an extraordinary opportunity to fulfill the mission of Buddha, Buddha Dordenma (meaning Vajra-throned Buddha) symbolizes peerless virility to bestow blessings, peace, and happiness on the whole world. Constructed on an area of 650 acres, it will be known as Buddha Park after completion of the project.

The Buddha Park once completed will be a social welfare, non-profit organization based on the principle of Government's vision of Gross National Happiness and teachings of Lord Buddha. The social service provided by the organization can be availed by all people of the world for peace, happiness, spiritualism, enlightenment etc.

The construction of the Buddha statue was prophesied in a terma of Guru Padmasambhava and later discovered by Tertön Dorje Lingpa. Terma is a sacred treasure kept by Guru which has been destined to be revealed in the future time by tertons (treasure discoverers) for the benefits of future generations.

In the year 1954, Terda Lingpa of Tibet addressed a letter to His Eminence, the late Lam Sonam Zangpo, mentioning a series of ritual observances and installation of sacred objects to be undertaken in Bhutan, which would

contribute to peace and well being of the people, region and stability and security of the nation.

The construction of the largest sitting Buddha has been approved by the Royal Government of Bhutan in 2006 by providing 650 acres of Government land wherein the Dordenma statue will be built.

The 169 feet tall Buddha statue is made from alloy of tin (4%), zinc (8%) and copper (88%) and weights around 700 tons including steel frame structures. The statue will accommodate 100,000 Buddha statues of eight inches and 25,000 statues of twelve inches, made from copper and gilded in gold.

### Vision

The main objective is to create a unique and common place of worship and practice to fulfill the great wish of all living beings for peace and happiness and to liberate from the world of suffering by building the largest sitting Buddha in the world. Beside that it will also help in promoting and safeguarding the Buddha's teaching by creating an international Buddhist centre in Bhutan. It will also be a source of energy and peace, spiritualism, peace and happiness for all people who visit it.

The proposed 169 feet tall statue will function as an iconographic gateway to Thimphu, the capital city of Bhutan, as a major pilgrimage centre for the country and as a centre for meditation and retreat. It will generate auspicious energy over the nation and to all parts of the world. In addition to the erection of a massive statue, this complex project includes creation of a large meditation hall at the base; construction of the access, utilities service, emergency roads and parking; land development and landscaping.

### Conclusion

As of now, the fabrication and erecting of the main statue have been completed and it may take few years to complete the rest of the work before opening to the public.





Steel frame structures before fixing panels



Steel frame structures before fixing panels



Fixing Buddha's hair



Front view



Side view



Side view



Front view



Back view





## Preservation and Enhancement of Cultural Heritage: The Ancient Bridge Community Project

**Srun Teck**, *Archaeologist*, Archaeological Preventive Unit, Department of Conservation of Monuments in the Angkor Park and Preventive Archaeology, APSARA Authority

### INTRODUCTION

Nowadays, most of the organizations and researchers have focused only on the monument structures, history, arts, local communities' lifestyles and traditional customs. They do not pay much attention to the conservation, restoration and enhancement of ancient infrastructures (bridges and roads). During 2003-2004, National Road N.6 was redeveloped by Ministry of Public and Transportation, but this develop project did not take account on conservation and archaeology survey of Spean Preah Tœus (or Kampong Kdei Ancient Bridge). During development operation, there were many traffic and construction dirt on the bridge body. The two laterite layers of bridge body were removed and put back without any planning of restoration and conservation.

Right now, the ancient bridge is facing the worst dangerous situation because of rapid population increase. Among these people, some settled their houses on the part of ancient bridge and run their own business. Moreover, the modern foundations of business houses may destroy the foundation of bridge and archaeological remains. Furthermore, the landscape and environment surrounding the ancient bridge are on the verge of destruction from local community developments.

### LOCATION

The bridge in question named Spean Preah Tœus locates on the National road N.6 at Kompong Kdei commune, Chikreng district, Siem Reap province, about 70 km from Seim Reap town (figure 1). The bridge is the biggest on this line. In the 1930s, 22 bridges could be seen on this road section, but at the present time only 11 bridges still exist and 2 bridges were destroyed by road construction. Residents of this area call the bridge "Spean Kompong Kdei", also known as "Spean Preah Tœus", which is not very different from the name of a pagoda that locates approximately 500 meters to the southeast.

The project presents the importance of cultural heritage of Kompong Kdei community to its people and aims to the cultural heritage preservation and enhancement

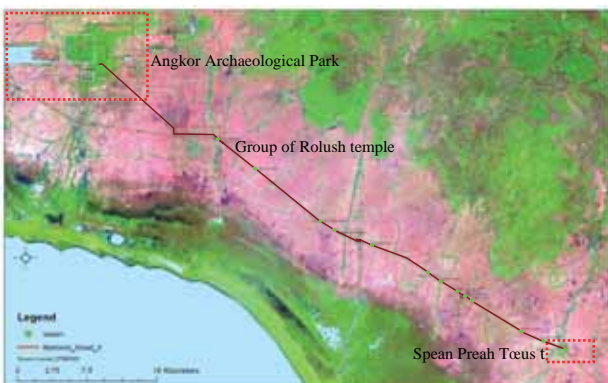


Figure 1: Location of the ancient bridge

through community tourism development.

### 1. HISTORY OF THE BRIDGE

#### 1-A. History of the building

We do not know exactly when it was built as this infrastructure has undergone repairs and decorations in each era. If we take into consideration of the latest style, it would have been constructed in the era of the King Jayavaraman VII (C.E. 1181-1220), but if the two poles and Naga head are take into consideration, it is said to be like the style of Bayon.

#### 1-B. Architectural history

The bridge was built of 98% laterite stone and 2% sandstone. The average dimensions of each block for the construction are 50 centimeters in width, 150 to 170 meters in length and 40 centimeters in thickness. The sizes of the bridge are 85 meters in length, 16 meters in width and 10 meters in high. The bridge's body is standing on 20 pillars and 21 corbelled arches. There are four wing walls (four retaining walls) used as stabilizer for the bridge and its foundation (figures 2 and 3).

#### 1-C. History of the intervention

Spean Preah Tœus was intervened two times by École française d'Extrême-Orient (EFEO). The first was in 1925, and the both Naga's balustrades were restored. The second was in 1964, which restored the north body of the bridge (upstream) and both Naga's balustrades headed by B. P. GROSLIER, director of Angkor Conservation from 1960 to 1973 (figures 4 and 5).

### 2. ISSUES OF THE ANCIENT BRIDGE

Presently, Kompong Kdei, the ancient bridge situates in the middle of communities and surrounded by 10 villages which situated in the compound of 1 square kilometer

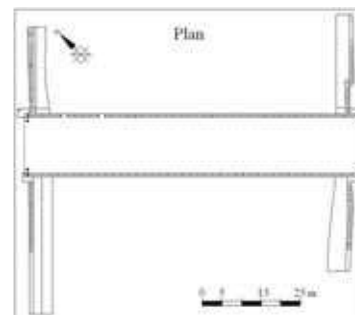


Figure 2: Plan in 2009

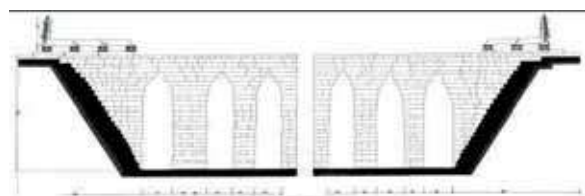


Figure 3: North-east elevation in 1964, EFEO archives

surrounding the bridge. Most of settlements of villagers have settled on the both side of the river bed. Thus the bridge suffers natural impact, development impact, tourist impact, local-villager impact and traffic impact. The bridge's condition has been becoming weak due to:

- It has been covered by bio-vegetation.
- Most of the columns are poor condition by water movement.
- Each drain is blocked by sediment.
- Both wing walls have been destroyed by erosion.
- The bridge's body is completely buried by newly accumulated soil.
- Some laterite blocks have been decayed and fallen.
- Both parts of the bridge is settled by people.

From the result of surveying, we found many issues such as restoration issues, natural issues, structural issues and accidental issues (figure 6).

**2-A. Preservation the ancient bridge**

Due to the condition of the weak bridge, we have to take the emergency measures: to bar the heavy vehicles (figures 7 and 8) and to propose a preservation project such as tying reinforcement and restoration of the highly dangerous points and Naga's balustrades.

**3. ISSUES OF THE CULTURAL HERITAGE OF THE COMMUNITY**

Facing with the growing number of new modern

buildings, traditional structures are also preserved within the whole community. They are, of course, wooden structures. Houses are built on stilts, where people live upstairs and animals (i.e. cow) are kept downstairs with oxcart. Generally, each house is surrounded by small trees, fruit trees or different kinds of flowers. Three different types of roofs have been identified. The first is covered by traditional ceramic tiles with brown colors. The second is covered by the sheet metal. And the third type is covered by the tree leaves (figures 9 and 10).

**3-A. Landscape issues**

- Disordered settlements or other settlements may spoil river water and destroy the value of the ancient monument.
- Modern construction methods are not controlled by construction regulation in the cultural zone, which will deprive the cultural landscape of its ancient authenticity.
- Some traditional wooden houses are decayed, but owners can not afford the maintenance charge.

**3-B. Alignment and height issues**

In general, the Khmer traditional wooden houses were built on the alignment with the same height (figure 11). But the new modern buildings do not respect the existing alignment and height (figures 12, 13, 14 and 15).

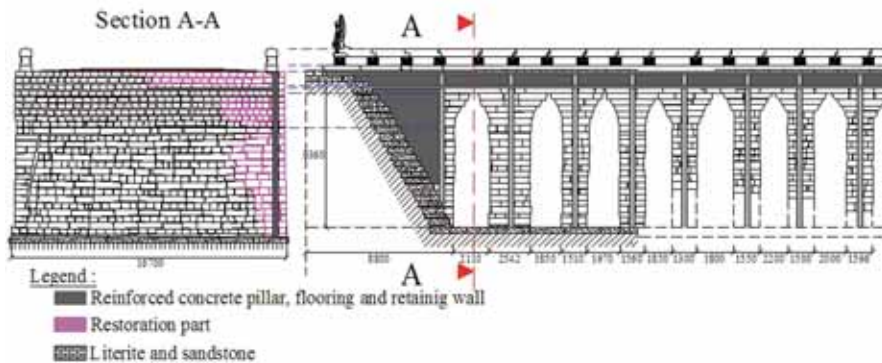


Figure 4: Restoration section



Figure 5: Restoration work in 1964, EFEO archives

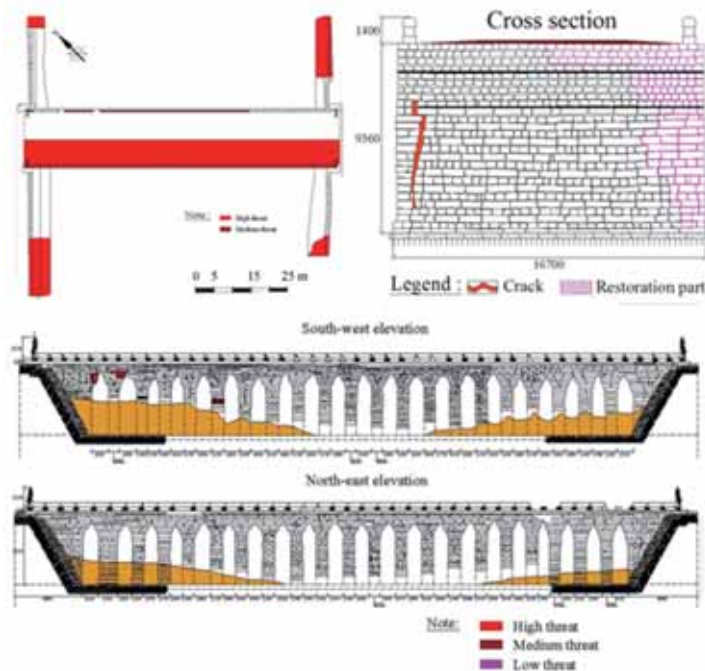


Figure 6: Pathology map

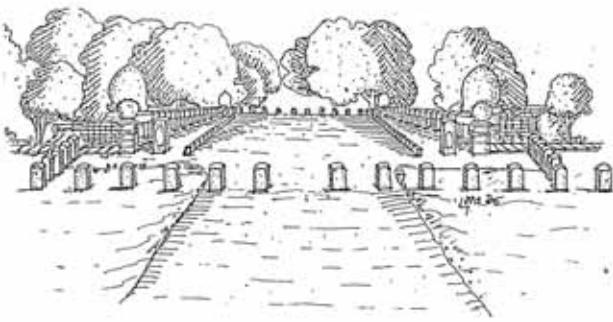


Figure 7: Principle of access closing by sandstone posts

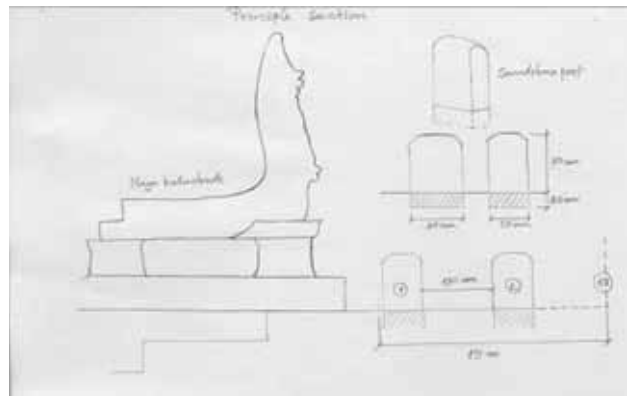


Figure 8: Principle section of sandstone posts

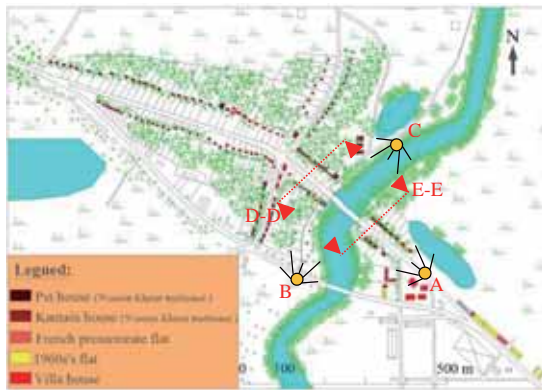


Figure 9: Village map

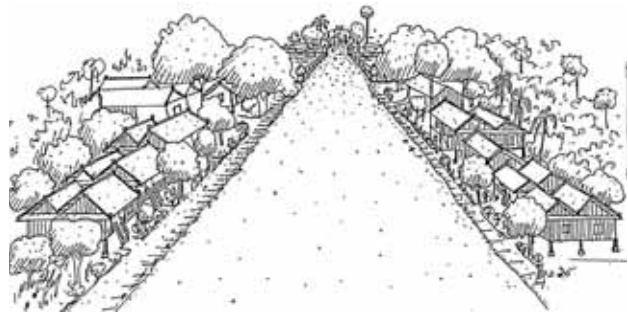


Figure 10: A. Village view

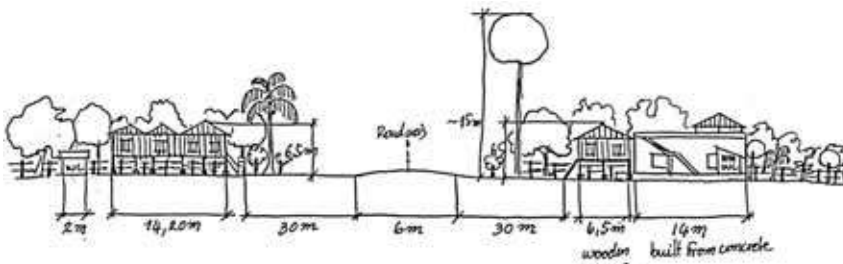


Figure 11: Alignment in the 1960s

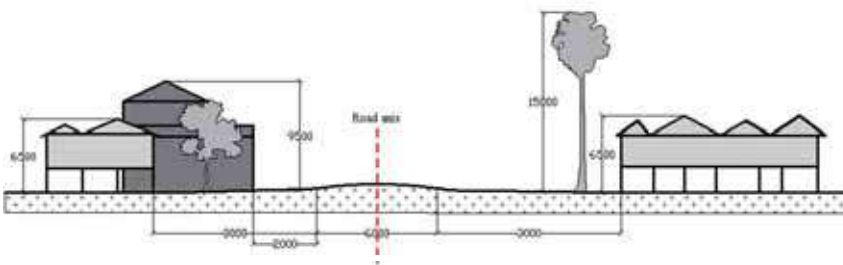


Figure 12: Section D-D, Alignment and height issue

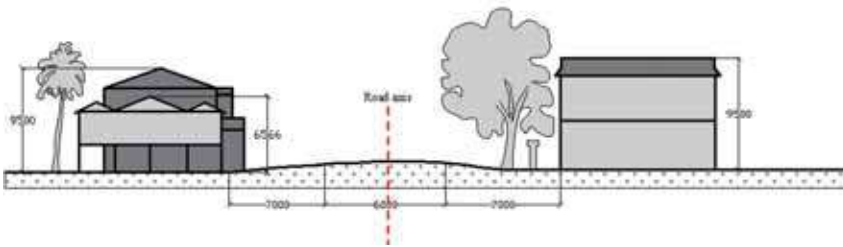


Figure 13: Section E-E, Alignment and height issue



Figure 14 : B. Village elevation



Figure 15: C. Village elevation

### 3-D. Preservation of the cultural heritage in the community

For the cultural heritage zone, in particular, we have to insist that it is the most important community to be conserved, and its presentation is very important to the public. So that, the houses in the cultural heritage zone should be preserved as follows:

- 1- To move all houses which are not aligned to the existing alignment line
- 2- To change the façade of the house
- 3- To modify the roof
- 4- To lower the height of the house
- 5- To apply dark iron color for the façade
- 6- To plant vegetation or domestic plants in front of the house

## 4. CULTURAL DEVELOPMENT PROJECT: PRESERVATION AND ENHANCEMENT

The site should be zoned in three protected zones (Zone I: Monumental site, Zone II: Protected Cultural Landscapes and Zone III: Socio-economic and Cultural Development Zone) (figure 16). They require intensive management and protection with strict constructive permission. The owner gets free consultation for the heritage architectural management.

**4-A. Zone I** (~3 ha): Monumental site is an area which contains the most significant archaeological site, traditional settlement with very high architectural values. Therefore, it deserves the highest level of protection and should be managed properly.

**4-B. Zone II** (~4 ha): Protected cultural landscapes are areas with the characteristics of a landscape that should be protected on account of its traditional appearance, land use practices, varied habitats, historic buildings and man-made features from the past. Protected cultural landscapes are subject to regulations controlling harmful or disruptive activities.

**4-C. Zone III** (~12 ha): Socio-economic and cultural development zone: this region covers the whole Chikreng District. Guidelines will be provided in order to encourage sustainable development and assessment of its impact on the environment, with a view to preserving the cultural and natural heritage.

### 4-D. Proposal of the Khmer traditional wooden houses in protection zone

In order to preserve the values of Angkorian public infrastructure and community cultural heritage, the protected zone should identify the types of Khmer traditional wooden houses: Pet house, Kantain house, Rondol house, etc. (figure 17, 18 and 19)

### 4-E. Proposal for enhancement and tourist development

In order to preserve, enhance the site and develop life of communities by tourist development, Zone I, II and III need intensive management and protection because modern mass tourism may cause incalculable destruction to the cultural heritage. The circuit tourist framework is the most important for this site. Thus the site should be set up the Parvis, facilitates for tourists (Parvis is a French word which contains parking, information center, rest rooms, souvenir shops, restaurant...). One is about 1 km to the West of the bridge and the other is about 0.6 km to the East of the bridge (figure 20). From each Parvis, the visitors can get a local horse-cart, an oxcart or by walk to the heritage site.



Figure 17: Pet house

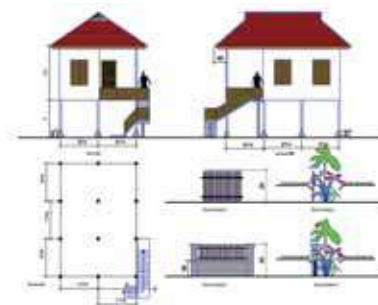


Figure 18: Rondol house



Figure 19: Kantain house

Drawing of the long term project of BANTHEAYCHMAR SITE, 2007-2008.



Figure 16: Zone I, II and III



Figure 20: Circuit tourist map



## Recent Conservation at Tughlaqabad Fort

**Vasant Kumar Swarnkar**, *Deputy Superintending Archaeologist*  
Archaeological Survey of India

Tughlaqabad fort (Lat. 28°30' N to 28°31' E and Long. 77°15' N to 77°16'), the third city of Delhi, was built by Ghiyasu d-Din Tughlaq, the founder of Tughlaq dynasty, is situated on Mehrauli-Badarpur road, about 13 km (5.01 miles) from Qutub Minar in New Delhi. The construction of this massive fort was commenced in the year 1321 CE and completed in 1323 CE within a period of two years, which was a great achievement.

The beginning of the Tughlaq dynasty as well as its ending was marked by tragedy. The dynasty was founded as a result of utter uncertainty and anarchy after the death of Alau d-Din Khilji, when Tughlaq Ghazi Khan (Ghiyasu d-Din Tughlaq), the warden of the marches' against the Mongol inroads had to be requisitioned to restore law and order. The roots of Indo-Islamic culture and tradition had gone deep into the Indian soil by then. Between 1320 and 1388 CE, most of the northern and central India was ruled by three mighty rulers of Tughlaq dynasty who had successfully established the strongest and the most effective state in the history of Delhi Sultanate.

### Architecture

Tughlaqabad fort measuring 12.5×4.8 km stands on rocky outcrop. The center part can be divided into citadel and the city with its high fortification wall. The construction was mainly made of random-rubble and hammer-dressed quartzite stone set in lime mortar. The arches were without any cross-beam support except at the secondary gate having a vaulted passage extant in front of Ghiyasu'd-Din's tomb. This feature indicated that the cross-beam at springing line started from Ghiyasu'd-Din's tomb onwards and may thus belong to a period subsequent to the construction of the fort. The art element in Tughlaq architecture may be visualized in the form of inscribed borders and medallion in spandrels, often executed on plaster or stucco. The dull look of the plain masonry mass was further relieved by coloured tiles, which appear to have been introduced in the Tughlaq period for the first time.

### Citadel

The citadel was perched on the highest rocky outcrop dominating the entire area around and overlooking the main city, palace area and open spaces on the south and east. Surrounded by high fortification wall with one major entrance gateway opening into the palace area, except a high terraced structure, which is used as a watch tower and popularly known as Bijay Mandal or Badee Manzil (wonderful mansion) and a baoli, hardly any significant structural remains were visible. However, an enclosure with traces of an entrance gateway, a small mosque and a number of roofless structural remains belonging to much later late-Mughal period could also be seen. The only significant structure within the citadel complex was an underground corridor flanked by series of cells. The

citadel while in use for the pleasure of the Sultan, was known as Jahan-numa.

### Palace Area

The excavations carried out could explain that the structural remains exposed in the palace area were built in two distinct structural phases during Tughlaq period. The complex was connected with another large complex, which again had high enclosure wall with an entrance gate on the south. On a portion of the enclosure wall, evidence of overhead water channel was noticed which spoke of elaborate water distribution system within the palace complex.

The complex had a fairly large baoli excavated deep into the bedrock. To give it a proper shape, masonry retaining walls and staircases were provided. While the outer face of the masonry was of ashlar, the core was of random rubble set in lime mortar. Evidence of a projected platform built on the northern retaining wall for drawing water from the baoli may still be seen. Since stone for the construction of the fort had been quarried locally, depressions caused may have served as water reservoirs for use in lean seasons when there was a shortage of water. Quite interestingly, the gate on the southern fortification wall of the citadel was connected with Ghiyasu'd-Din Tughlaq's tomb through a causeway supported on a series.

The city of Tughlaqabad spread in an area of about 300 acres (121.40 hectares) enclosed with a fortification wall. The gateway complexes was quite elaborate since group of four, six or eight circular chambers about 8 m (26.24 ft.) in diameter and about 10 m (32.81 ft.) in depth were provided to store grains for emergency. These grain silos are specific to Tughlaqabad fort. The city had well laid grid-plan of roads which connected the gateways from one end to the other. The housing blocks were planned along the roads. Entry into the citadel was through the city. The city was also connected with another fort known as Adilabad fort through a fortified causeway supported on arches. The open area between Tughlaqabad fort and Adilabad fort was originally a lake wherein water was brought in by several channels and rivulets used to be discharged, which justifiably explains the need for causeways connecting Tughlaqabad fort with Adilabad fort and Ghiyasu'd-Din Tughlaq's tomb.

### Fortification

The fortification walls were directly raised over the rocky outcrop with sides sloping gently to accommodate masonry up to the base. The walls were as thick as 10 m, including the outer galleries. The height of the fortification wall thrown around the city measured 10 m to 15 m while those around the citadel were about 30 m. There were large bastions at intervals and gateways at convenient

points. Defence was of three tiers, carried all round the walls and bastions: the lowest tier forming an external gallery; the next higher tier forming a mural gallery; and the third forming the walkway behind the battlements on top of the wall. The internal wall of the mural gallery was largely damaged. The parapets of the first and third tiers were pierced with two rows of loopholes. The loop holes of mural galleries were relatively wide. These were 15 cm wide by 3.20 m high and provided in horizontal registers. The fortification walls were provided with semi-circular bastions at regular intervals to provide strength to the wall which ran to a length of about 6.5 km (4.03 miles). The bastions are sometime double storied. The parapet was heavily battlemented and accommodated sloping sides perforated by innumerable outlets for archers.

### Gateways

The Tughlaqabad fort is said to have as many as fifty-two gateways, most of which are now in ruins, except a few on the south. The gateways are steep and rocky. The gateways are formed by corbels and lintels but some of them had arched openings too. Some of these identified are Delhi Gate, Nimwala Gate, and Dhoban Gate on the west, Chaklakhana Gate on the north, Bhati Gate, Rawal Gate, and Bindaoli Gate on the east and Andheri (dark) Gate and Hatya (Hathiya or elephant) Gate on the south.

### Conservation Work

The visible part of the Tughluqabad Fort, which every passerby moving on Mehrauli- Badarpur road has been taken up first for the conservation. Before conservation scientific excavation was carefully done to expose the hidden part of the Fort. The evidences studied and documented in detail by photography then the structural conservation work has been taken up. The Delhi

Quartzite Stone in lime mortar was originally used for the construction and veneering of the fort. The fallen material has been cleared and many of the original stones were collected at the site itself and they all are used in the conservation work. The inner part of the bastions and the wall are made of random rubble masonry so that the same has been reconstructed with the same mortar combination which was used during its construction. For the conservation work the old photographic documentation has also been considered since that is the only source for the old view of the wall and bastions of the fort. The fortification wall has been strengthened by pointing with lime mortar. During the conservation the all archaeological norms were followed and all reference was studied before commencement of work. The original dressed stones which were found in the cleaning of debris at the site are used in the veneering; no new single stone is used in the outer facing.

The archaeological excavations were carried out in the habitational area to expose the buried structures. Few house complexes such as granary, path-ways and a bazaar (market) street were exposed and preserved at the site. Interestingly, successive lime floors were also encountered during the excavation and they were also preserved. All the structures were cleared and documented properly then conserved carefully. A damaged step well was also taken up for the conservation. The walls of the step well were fallen and damaged and its steps were buried under debris. Scientific excavation work was undertaken by the archaeologists and all fallen stones were collected and reused in the conservation. Its steps were restored as per the original and walls of the well were strengthened by the pointing.

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Tughlaqabad Fort, General View



Gate, before conservation



Gate, after conservation



Bastion, before conservation



Bastion, after conservation



Bastion, before conservation



Bastion, after conservation



Stepped well (Baoli) in damaged condition



Stepped well, during conservation



Bastion, before conservation



Bastion, after conservation



Entrance, in damaged condition



Entrance, after conservation



## Borobudur Temple Conservation after the Eruption of Mount Merapi

**Mohammad Nastsir Ridwan Muslim**, *Head of Section*  
Directorate of Archaeological Heritage, Ministry of Culture and Tourism

The eruption of Mount Merapi, which occurred on 26 October 2010 in Yogyakarta, caused not only casualties, the destruction of public property, damage to infrastructure facilities and economic and social activities, as well as the environment, but also caused serious damage to cultural properties in Yogyakarta Province and Central Java Province. After the eruption on 26 October 2010, Mount Merapi was still spouting out volcanic materials. On 4 November 2010, Mount Merapi erupted again with greater force than the last one. Volcanic ash materials from the first and subsequent eruptions fell to the west and covered in particular the temples in Magelang Region with volcanic ash, such as Borobudur, Pawon and Mendut.

### 1. Impact of the Eruption

Borobudur Temple, one of the World Cultural Heritage, is located on the west of Mount Merapi with a distance of approximately 37 km (Photo 1). Borobudur Temple was covered in volcanic ash by the eruption. The monitoring conducted by the Office of Conservation of Borobudur Heritage revealed that the thickness of the volcanic ash ranged from 2 - 3 mm. The volcanic ash covered the entire surfaces of the temple and spaces in the cavities of the stupa of the temple. The volcanic ash on the horizontal surfaces of the temple, such as floors, stairs, and the flat surface of the main stupa were the thickest. The Office of Conservation of Borobudur Heritage analyzed the ash and identified the nature and ingredients of materials that surrounded the temple. The volcanic ash varied depending on weather changes that occurred during the eruption of Mount Merapi (Photo 1).

The volcanic ash in the eruption that occurred on 26 October 2010 can be identified as follows:

- Volcanic ash was granulated so soft and it smelled like sulfur and rather stinging.
- Volcanic ash was acidic with a pH between 4 and 5.

Meanwhile, the volcanic ash in the eruption that occurred on 4 November 2010 can be identified as follows:

- Abu volcanic sand contained sulfur.
- Volcanic ash was acidic with a pH between 4.52 and 4.78.

Laboratory test results indicated that the acidic nature of volcanic ash would accelerate stone weathering (Photo 11). Moreover, volcanic ash that attached to the stones would go into the gaps between the stone temples and interfere with the drainage system of the temple if not immediately cleaned (Photos 2-5).

### 2. Step-by-step Treatment

The cleaning of volcanic ash was carried out by dry and wet methods. Dry cleaning technique was applied to remove the volcanic ash from rock surfaces; sweeping them with a broom stick, broom palm fiber, and a palm fiber brush. Then, the cleaning continued with vacuuming

the ash still attached on the surfaces of rocks and crevices of the stone with a vacuum cleaner. The cleaning finished with wet cleaning technique, spraying steam on the stone surfaces with a steam cleaner (Photos 6-9).

The cleaning mainly focused on 72 stupas in the Arupadatu level. The stupas which had open spaces and housed Buddha statues inside were given high priority. The cleaning was performed on the floor, wall fence ledge, and other parts (Photo 4). The volcanic ash continued falling until 12 November 2010. Concerned that the cleaned temple would be covered by volcanic ash again, it was decided to cover up significant parts of the temple with plastic wrapping (Photo 10).

To handle the impact of volcanic eruptions, Office of Conservation of Borobudur Heritage as the responsible authority for the preservation of Borobudur Temple consulted with other stakeholders for their corporation. Currently, visitors (tourists) are allowed only to see the Borobudur Temple up to the courtyard around the building, since the temple is still in the process of cleaning and conservation. It is planned that visitors can climb to the building up to the plateau floor (7th floor) in mid December 2010 (Photo 14).

### 3. Community Awareness

After the temple was covered by volcanic ash, local people have been very enthusiastic to help clean up the volcanic ash from the temple. Volunteers, consisted of Indonesian National Army, followers of Buddhism, tourism organizations, colleges, and non-governmental organizations; and individuals participated in this clean up activity. The community involvement in cleaning the temple was coordinated by Office of Conservation of Borobudur Heritage and limited only to the courtyard and ground floor (undag) of the temple. Meanwhile, the main cleaning activity of the temple was carried out by the technical workers from the Office of Conservation of Borobudur Heritage (photos 12-13).

### 4. Conclusion

The alert status of Mount Merapi was lowered to be dormant on 3 December 2010, as is the threat level of volcanic ash; however the process of cleaning and conservation of Borobudur Temple is still being conducted. The hazard map of Indonesia was released in July 2010, and showed that the Indonesian territory was vulnerable to the earthquake, particularly the island of Sumatra, Java, Sulawesi and Papua. Based on this map, the damage by natural disasters on cultural properties should be more considered and better managed.

Photographs: Courtesy of Office of Conservation of Borobudur Heritage





Photo 1. The location of Borobudur Temple and Mount Merapi (source Google map)



Photo 2. Borobudur Temple after the eruption of Mount Merapi, October 26, 2010



Photo 3. The Buddha statue and stupas after the eruption of Mount Merapi, October 26, 2010



Photo 4. The floor covered with volcanic ash



Photo 5. Stupas and gaps in walls covered with volcanic ash



Photo 6. Dry cleaning on the main stupa



Photo 7. Dry cleaning on stupas



Photo 8. Wet cleaning on the main stupa



Photo 9. Wet cleaning on the main stupa



Photo 10. The cleaned stupa covered with plastic



Photo 11. Laboratory analysis to identify composition of volcanic ash



Photo 12. Volunteers helped clean up the volcanic ash on the floor (undag)



Photo 13. Volunteers helped clean up the volcanic ash on the temple courtyard



Photo 14. Installation of a prohibition sign to the temple building



## Restoration of the St. George's Church, George Town, Penang, Malaysia

**A Ghafar Bin Ahmad**, *Deputy Commissioner of Heritage*  
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### Introduction

Located in the historic city of George Town, Penang, Malaysia; St. George's Church is the oldest Anglican Church in Southeast Asia, and one of the most extensively documented in old paintings and archival photographs. Built in 1816, the church portrays the Georgian Palladium architecture, a hybrid of Georgian and Grecian architectural styles. The church is also known for its Francis Light Memorial and Mahogany tree situated in its spacious compound. The church counts as one of the most beautiful heritage landmarks of Penang, attracting local and foreign tourists. Due to its immense historical, social and architectural significance, the church was listed as the National Heritage of Malaysia in 2007 under the National Heritage Act 2005. In 2010, the church has received an amount of RM 1,841,027 (USD 526,007) from the Federal Government through the Department of National Heritage for the repair and restoration works. The restoration works took place over a period of eight months from the 1st of April until the 11th of November 2010.

### Historical Background

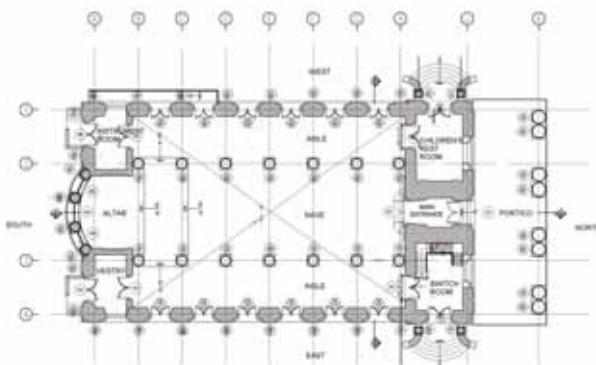
The St. George's Church was built in 1816 using convict labourers and was completed in 1818 when Colonel J.A. Bannerman was the Governor of Penang. Designed by Captain Robert N. Smith of the Bengal Engineers, the church was constructed at a cost of 60,000 Spanish dollars. This was a huge sum, considering the British paid only 10,000 Spanish dollars per annum to the State of Kedah for occupying its territory, Penang; and also 60,000 Spanish dollars when they bought Singapore a few years later. Upon completion in December 1818, the church held its first service on Christmas day under Reverend J.R. Henderson. The marriage of Janet, daughter of Governor Bannerman, to William Edwards Philips was held at the church in 1818, marking the church's first significant event. On the 11th of May 1819, the church was consecrated by Reverend Thomas Fenshaw Middleton, the Bishop of Calcutta, India. In 1885, Mahogany trees were planted in the church compound followed by the erection of the Francis Light Memorial built in 1886 to commemorate the 100th anniversary of the founding of Penang by Sir Francis Light.



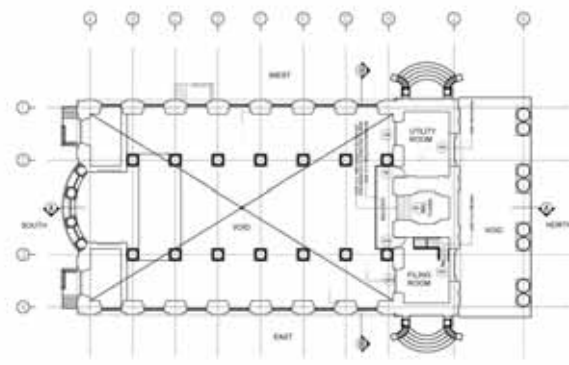
The St. George's Church portrays the Georgian Palladium architecture, a hybrid of the Georgian and Grecian architectural styles



The St. George's Church is known for its Francis Light Memorial and Mahogany tree situated in its spacious compound



The ground floor plan showing the portico, nave, aisles and altar with the huge round columns



The upper floor plan showing the utility room, filing room and balcony

On the 12th of December 1941, during the World War II (WWII), six bombs were dropped by the Japanese in the compound of the St. George's Church. The pitched roof and interior of the church were severely damaged. This had resulted in looters carting off memorial plaques, furnishings and marble figures from the building. Some trees including the Mahogany planted in the compound were burnt down due to the bombings. The one still remaining today is the survivor from the destruction wreaked by the WWII. After the fall of the Japanese Empire, the church services were resumed. The church's pulpit, pews and pipe organ had to be replaced during its restoration in 1948. After nearly 50 years, in 1995 the church had undergone extensive re-plastering works. Unfortunately, a new material Portland cement, instead of lime plaster, was introduced and used inappropriately to render the exterior walls. The use of cement had caused problems to the building as it did not allow the building to breath as compared to the lime plaster.

### Architectural Significance

The St. George's Church was built with clay brick, stone, lime plaster, timber, marble and terrazzo. It has decorative elements on walls including lime plaster swag, rose and garland motifs on the upper parts of the walls and portico. Praying hall (nave), aisles, altar, vestry, instrument room, switch room and children's rest room are found at ground floor. Utility room, filing room and balcony are located at the upper floor. Apart

from its main entrance at portico, the church can be accessed through side entrances which are flanked by Roman Doric columns and framed with entablature and pediment.

Built in the Georgian and Grecian architectural styles, the St. George's Church has high ceiling with big openings to adapt to the warm and humid climate of Penang. The church's most striking feature is the huge Roman Doric columns lined below pediment at the portico. Huge Roman Doric columns are also found inside the church. These interior columns are of fine quality and unique as they are bowing at the column shaft. The column shafts were finished with chunam (quicklime) which had been polished with soapstone and calico. The architectural design of the St. George's Church reflects the St. George's Cathedral in Madras (Chennai), India built in 1815. Both churches feature high ceiling, huge classical columns at portico, bell tower, balustrades at parapet walls, openings, pilasters and cornices at building facades.

The St. George's Church was originally built with flat terraced roofs including its portico. Due to roof leakages in the building, in 1864 a pitched roof was constructed above the nave leaving the portico, apse and aisles with flat terraced roofs. Indian V-shaped tiles were then used for the pitched roof before they were replaced with Marseilles tiles in 1907. After the WWII, all flat terraced roofs, particularly above the apse, aisles and portico were



The condition of the pitched roof, balustrades, bell tower and spire before restoration



The interior view of the church showing the nave, aisles and altar with two rows of Roman Doric columns during restoration



Throughout the restoration work, temporary roofing was installed above the existing pitched roof to ensure that the roof structures were protected from severe rainfalls



The existing Marseilles tiles were brought down to the ground where each tile was inspected, cleaned and salvaged. The cleaning process involved both dry and wet cleaning techniques

covered with pitched roof using Marseilles tiles. These pitched roofs remain until today.

Another unique feature of the church is the clocks located at the spire above the bell tower. The clocks, each facing north, south, east and west, were shown in watercolour paintings done by LT. Walford Thomas Bellairs in 1846 (The English Church at Pulo Penang-St. George's) and Turnbull Thomson in 1848 (English Church, Pinang). In late 1880's the clocks and their hood mould were removed but one clock facing north remained at the spire. During the WWII bombing at the church, the clock was destroyed and later removed, leaving the clock face blank and empty.

### Restoration Work

Prior to the restoration of the St. George's Church, a dilapidation survey was conducted by conservation consultants to determine the nature of building problems and defects. Findings from the dilapidation survey had confirmed the generally poor condition of the church. Building diagnoses showed numerous problems including rising damp, salt contamination, termite infestation, defect plaster walls and renderings, harmful growth, peeling paint and roof leakage. The restoration works concentrated mainly on roof structures, existing Marseilles tiles, balustrades, rainwater downpipes, walls, columns, beams, ceilings, staircases, floors, bell tower and spire. The restoration works also involved removing existing

cement plaster on the external walls, termite treatment, salt desalination, restoring door panels, repainting; and electrical and mechanical works, where new ceiling-mounted air-conditioning units and lighting fixtures were installed.

Throughout the restoration work, temporary roofing was installed above the existing pitched roof. This was to ensure that the roof structures were well protected from severe rainfalls, particularly when Marseilles tiles were removed and brought down to the ground. Once at the ground level, each tile was inspected, cleaned and salvaged. The cleaning process involved both dry and wet cleaning techniques. In the dry cleaning process, all dirt and dust found on the Marseilles tiles were carefully removed using soft brush and scrapping tools. Any damaged roof tiles were discarded and replaced with new or salvaged tiles of similar profile, size and material. After the dry cleaning, the roof tiles were soaked in clean water for wet cleaning. All cleaned tiles were then carefully stacked on wooden planks to dry before applying chemical sealer for anti fungus.

All timber trusses were inspected for any defects or termite attacks. The Malaysian Timber Industry Board (MTIB) was sought for timber verification and grading. Any new timber trusses must be of the same species, grade or group strength to retain the authenticity of the building fabric. All timber structures and elements



Crumbled lime plaster had to be removed from the lower part of the walls and at the base of the columns which were infected with salt attack and rising damp



Salt attack was treated through the salt desalination process using a poultice technique called Cocoon before carrying out the injection of a chemical damp-proof course



The new clock consists of aluminum minute markers, stainless steel Roman numerals; and stainless steel hour and minute hands which were all gilded with 23.5-carat gold leaf



A working replica of 1.27-meter clock was fixed onto the north side of the spire

were treated with a preservative to improve the timber's resistance to attack by destroying fungi, insects and termites. New doors were tagged using metal plate with special coding system for future references.

Since the lower part of the walls and columns were infected with salt attack and rising damp, the restoration works involved a salt desalination process through the poultice technique called Cocoon; and the injection of a chemical damp-proof course (DPC). The Cocoon method involved the application of a damp-absorbent material, a mixture of pharmaceutical fibre and distilled water that dried out whilst drawing the salts from the walls and columns. After a few weeks, the poultice was removed from the affected areas, taking salts together with it. The process was repeated for a second time to reduce the salt concentration to an acceptable level. On the other hand, the injection of chemical damp-proof course was to provide barrier in the walls and columns to prevent future rising damp. The DPC had to be applied before the second treatment of Cocoon.

The restoration works also involved the installation of new clock at the spire. Based on evidence from old paintings and photographs, a working replica of 1.27-meter clock was fixed onto the north side of the spire. With the exception of its clock motor which was imported from Switzerland, the clock was locally made using aluminum plate powder coated to black colour on both sides and polished on the front side. The aluminum minute markers, stainless steel Roman numerals (15.5 cm); and stainless steel hour (53.5 cm) and minute hands (74.8 cm) were all gilded with 23.5-carat gold leaf. This electrical master-slave clock is controlled by the Global Positioning System (GPS) with the accuracy of one millisecond or equivalent to gain or lose one second in 1,000 years. The church bell is controlled by the clock system. The clock has given a new image to the church since it was last removed from the spire after the WWII.



The Francis Light Memorial was erected in 1886 in the church compound to commemorate the 100th anniversary of the founding of Penang by Sir Francis Light

The St. George's Church and the Francis Light Memorial were later painted in white with light grey at the column base of the church portico as well as at the lower part of the Memorial.

### Conclusion

Funded by the Federal Government through the Department of National Heritage, the restoration of the St. George's Church posed many challenges among consultants and contractor. The tasks of conducting research on the church's history and carrying out dilapidation survey required substantial time and collaboration during the early stage of the project. Determining building defects and conservation techniques involved elaborate discussions and detailed analyses. The contractor had to engage experienced and skilled labourers to carry out restoration works which include documenting the conditions of the church before, during and after restoration. The restoration of the St. George's Church has underlined the importance of communication and collaboration among all parties including the federal government, local authorities, architect, building conservator, engineer, quantity surveyor, building contractor, building suppliers and the church committee. The Department of National Heritage has played an important role in ensuring the St. George's Church, the National Heritage, remains in good condition and lasts for the next decade.

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View of the church and the Francis Light memorial showing their new coat of paint and the working replica of clock at the spire



## Inventory Preparation of Monuments of Nepal

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 Department of Archaeology, Ministry of Culture & State Reconstructing

### Background

Nepal is well known for its natural beauty and cultural heritage as well. There are numerous cultural properties scattered all over Nepal, which are important heritage of the human genius and are the medium of the human culture. These properties are the heritage of human beings in the universe. These all cultural heritages were created in the different periods of time and context that represented the certain events, period, history, culture and so on. To keep these properties in their original condition is the responsibility of all human beings, which must be preserved for the next generation.

Among these heritages, some of the monuments were created in the era before Christ and later. There was no exact data of these monuments remained or scattered in all over Nepal. However, since Department of Archaeology (DoA) was established in 1952, all of the sole authority went under it on cultural heritages of Nepal. There were only incomplete records or inventories prepared in different ways by various governmental and non-governmental agencies. So, DoA has launched a “Three Years Program” for preparing an inventory of monuments which were scattered in all over Nepal and classifying them based on the provision of Ancient Monument Preservation Act 1956, which is the major legislation to guide DoA for preservation of cultural heritage in Nepal.

### Inventory Preparation

It is already mentioned that there was no exact official data of monuments of Nepal. Once, DoA had published an inventory of all monuments of Nepal as a result of survey report (Preliminary Survey Report) in 1985/86, which was also not completed and not updated yet. So, DoA has carried out this three year program for the preparation of inventory of monuments in Nepal aiming to collect the complete data and to classify them under the legislative provisions, which can be useful for the future preservation and conservation work to keep them in their original authenticity, integrity and value.

The three year program was started in FY 2007/08 and targeted to complete collection or preparation of inventory of all monuments within 18 districts of Far Western Development Region and Mid Western Development Region. DoA is only a major and sole authority of Government of Nepal regarding to the cultural heritage conservation and management with a limited number of experts and staff. So, DoA organized a training program for the freelancer experts including with some DoA staff, to prepare inventory from the entire districts. This type of training program was held two times during the whole three years program and it developed 35 cultural experts for the inventory preparation of tangible cultural heritages.



Bhurtika Dewal (22 temples), in the tentative list of UNESCO World Heritage Site, Dailekh, Mid Western Development Region (16th / 17th century A.D.)



Kakre Vihar (13th - 15th century A.D.)  
 Surkhet, Mid Western Development Region



Firing Bays in the Fort, Rasuwagadhi  
 (A Medieval Period Fort)

At first, DoA nominated 10 staff (archaeological officers or who got master's degree in the related subjects) and invited applications through advertisement (requirements were the master's degree in Nepalese history, culture and archaeology degree holder and some experiences in preparing cultural inventory or any other documentation fields) and selected 25 individuals from out of department. DoA introduced a course for inventorying the monuments for 15 days. After the completion of the training, they had to go in the field at least 45 days for inventorying all of the cultural monuments to submit detailed reports with recommendation. Then the Ancient Monument Preservation Surveying and Classification Committee (formulated as per the national legislation) classified the listed monuments on the basis of criteria.

The second year of the program in FY 2008/09 prepared the monuments inventory in 20 districts of Mid Western Development Region and Western Development Region. Then in the third and last year in FY 2009/10, all targeted objectives were recorded on the monuments inventory in 34 districts of Eastern Development Region and Mid Development Region. The program did not include the inventory of three districts of Mid Development Region which are Kathmandu, Lalitpur and Bhaktapur, considering that the inventory of these districts was already prepared by DoA which was most complicated and time consuming as well.



Bhagawan Chaitya, Listikot, Sindhupalchowk  
Mid Devt. Region



Lamjung Durbar (The Palace of 15th - 16th century A.D.), Lamjung,  
Western Devt. Region

In this way, DoA finished the inventory of all monuments in Nepal and classified them through the Committee for the Survey and Classification of Ancient Monuments, based on the provision of Ancient Monuments Preservation Act 1956. The inventory of monuments was prepared many in number but all did not eligible for the classification. There was the criteria for classification of monuments and the committee decided to classify them as Category 1 or A (monuments which are of national importance and international as well), Category 2 or B (regionally important) and Category 3 or C (locally important).

### Conclusion

Heritages were created in different periods of time and context that represent the past events, period, history and culture, which are the heritage of human beings of the universe, not only of the local people but of the entire world. So, any types of heritages or monuments must be preserved for the next generation. Inventorying such monuments is the big and most important step for the preservation and conservation of them. So, this is the great achievement for the conservation and management of the cultural heritage of Nepal.

Achievements of this program can be pointed out as follows:

1. Succeeded for identifying and preparing complete inventory of all scattered monuments and sites in Nepal and updating previous inventories;
2. Succeeded for classifying the inventoried monuments of Nepal which is very important for preservation, conservation and management of heritage;
3. Development of cultural experts regarding to the preparation of inventory

It is the great achievement, however, preparing inventory and classifying monuments are not over even after the program finished, which is an ongoing process and everyone should continue to think and consider it. DoA must get knowledge from this for the future updating of the inventory of heritage/monuments.



Pindeshwor Temple Complex, Dharan  
Sunsari, Eastern Devt. Region





## Bullendale Site of New Zealand's First Industrial Use of Hydroelectric Power: Protection & Preservation of an Internationally Important Cultural Heritage Site

**Matthew Schmidt**, *Regional Archaeologist, Otago/Southland*  
The New Zealand Historic Places Trust

### Introduction

The Otago Goldfields of the mid to late 19th century not only provided significant monetary wealth for New Zealand but also saw New Zealand become of world leader in gold mining technology. Innovations in hydraulic sluicing and gold dredge design were exported from this remote British Empire colony to the international market. New Zealand gold miners also embraced new technology to make the extraction of gold more efficient and profitable which led to the use of equipment and machinery which were on the cutting edge of industrial technology for the day. At Bullendale, this cutting edge technology was the use of a hydroelectric power station to power electric motors which drove gold stampers and mine shaft winding gear. The plant began operation in 1886 and was New Zealand's first industrial use of hydroelectric power.

This report describes how the Bullendale site is to be protected and preserved to ensure that this important cultural heritage site is conserved for future generations. Presented below are a brief description of the site and an explanation of why this site is internationally important in terms of early hydroelectric power generation schemes during the 19th century. Next, the two Stages of how the Bullendale Project Team will protect and preserve the site is described, first looking at how the recognition and legal protection of the site will be enhanced, and secondly at what steps will be taken to preserve the remaining hydroelectric power scheme components and electric motor.

The Bullendale Project Team consists of the New Zealand Historic Places Trust, Wakatipu Office of the Department of Conservation, Queenstown & District Historical Society and goldfields archaeologist Peter Petchey.

### Location of Bullendale

Figures 1 & 2 show the location of Bullendale in relation to Queenstown which, during the 19th century, was a small inland town dependent on the gold mining and pastoral economy. The rugged, mountainous and dangerous terrain of this Lakes District was sparsely populated in the 19th century with much of the population being transient gold miners who came and went with the various gold strikes which brought them inland. The mainstay of the population in the later 19th century were those people involved in large scale gold mining or dredging operations and those running businesses which these populations depended on. Bullendale was one of a handful of isolated mining townships in this area which relied on gold mining directly and which then ceased to exist when the gold venture either failed or the gold ran out.

Access to Bullendale was through steep country via pack track which travelled through native Mountain Beech

forest and tussock land. One of the important historic aspects of Bullendale was the exceedingly difficult and arduous terrain which had to be traversed to reach the gold mines and township. All the equipment for the power scheme, mines and town had to be taken in either by foot or pack horse making the establishment of a hydroelectric power scheme in such an isolated environment in the 19th century a momentous feat.

### Bullendale historic records and archaeological remains

Occupation at Bullendale dates from 1862 to 1907 and therefore spans the period of gold mining history from the first gold rush to this area to the decline of hard-rock gold mining in the Lakes District of Otago. Written historic records and some key photographs of the township, Phoenix (Achilles) Battery and hydroelectric power scheme from the time of when electrical power was first used in 1886 is available (see Figures 3 to 6). Considering the isolation of Bullendale, these records illustrate the significance of the event for New Zealand industry at the time. The images of the power scheme (see Figures 18 & 19 below) and the Phoenix (Achilles) Battery it powered have been a crucial tool in interpreting how the electrically driven mining operation functioned.

Archaeological evidence at Bullendale is extensive and was the subject of a thorough archaeological survey in 1996 by goldfields archaeologist Peter Petchey (2006). The publication of Petchey's (2006) survey can be downloaded at [www.doc.govt.nz/upload/documents/science-and-technology/sap237.pdf](http://www.doc.govt.nz/upload/documents/science-and-technology/sap237.pdf)

The inaccessibility of Bullendale has meant that much of the archaeological evidence of the mining, settlement and power scheme is well preserved for an Otago goldfields site, even though fossicking for easily removed items, particularly bottles, has had an impact. In addition, the removal of metal and wooden structures/items from the site during World War I, for example, due to a shortage of raw materials in Otago at the time, has meant that only three standing built structures are left at the Bullendale, these being two huts and a bakers oven (Petchey 2006:18). However, given this lack of standing built heritage, the building terraces from the township can still be seen as well as exposed timber and stone foundations and artefacts scattered amongst the ruins and in re-generated forest (Figures 7 to 10).

The mining heritage which survives is wide-spread and consists of the remnants of the hydroelectric operation, open mines with rail lines intact, stonework/timberwork for mining structures, the foundations of battery sites with their stampers, timber and mortar boxes present, various water power generation equipment such as pelton wheels and Whitelaw turbines, cableway remains, a rock crusher, rock drills etc (Figures 11 to 17). Other evidence

relates to the main pack track, small access tracks and the telephone/power line.

### **Hydroelectric Power Scheme remains**

As noted above, it is because of the inaccessibility of Bullendale that the key components of the original hydroelectric power system have survived in-situ, these being the two original Anglo-American Brush Corporation Arc Dynamos and an Anglo-American Brush Corporation Electric Motor.

At the dynamo site, evidence of where the penstocks came down the steep rock face can still be seen by the iron supports still present (Figure 18). The dynamo equipment is in its original position after being lifted back onto new timbers in 1986 to preserve the equipment (Figure 19). The original location was established through a 19th century photograph of the powerhouse and sketch of the dynamos, and after excavation of the site in 1985 to confirm the location of the powerhouse (Petchey 2006:12 & 40-42). Other archaeological features present include one of the pelton wheels to drive the dynamos, flywheels, the water race leading to the penstocks and the tailrace leading away from the powerhouse. The 'Dynamo Hut' which can be seen at this site today was constructed ca. 1917 from timber and corrugated iron taken from the powerhouse (Petchey 2006:40).

The dismantled remains of Anglo-American Brush Corporation Electric Motor, embossed with the manufactures name Anglo-American Brush Corpn. Ld. Electric Light is located at the New Main Shaft (Figures 6 & 20). Here the motor ran the winding equipment for the mine shaft. Petchey (2006:42) notes that the cast iron motor was probably dismantled to remove the valuable metals inside, but the main body is complete and other parts lie discarded around the site. More parts are probably also hidden under the re-generated Beech forest.

During a site visit in November 2010, it could be seen that the native Beech trees had grown through the gaps of the dismantled motor, illustrating how long ago the site was abandoned, and the various parts recorded by Petchey in 1996 were still in-situ. The remains of the winding house winding gear structure the electric motor powered are also essentially intact (Figures 21 & 22).

### **International Significance of Bullendale**

The international significance of Bullendale lies in the completeness of the remains of the hydroelectric power scheme and the industry it powered, the in-situ nature of the tangible cultural heritage, and the remoteness of the power scheme in world terms in the 19th century. Although the sites of other early power schemes are known, Bullendale still has the generation equipment and one of its motors in-situ alongside the other components of the hydroelectric power system and the archaeological evidence of the mining operation it powered.

Petchey's (2010:60-61) research on Bullendale considered what evidence of early 19th century hydroelectric power schemes remained around the world and what components had survived at such sites. He found that the Bullendale scheme is "remarkably early" for such an

isolated hydroelectric project in a time where the new electric generation technology was being established in the main population centres in Europe, America and Australasia. Petchey (2006:61) also notes that although the 1885 Cragside installation is more complete and in better condition, this scheme was in the heart of the British Empire in the 19th century and represents the history of industrialised Britain. Bullendale was remote and on the edge of the Empire and "...represents the movement of new technology into outlying areas, and is therefore of considerable value not only as an early power scheme, but also as a superb archaeological example of technology transfer from industrialised Britain and Europe out into the world." (Petchey 2006:61).

### **Stage 1: Increased Recognition and Legal Protection of Bullendale**

Although Bullendale is known to be an archaeological site of national and international importance, its level of recognition and legal protection does not currently reflect this.

#### ***Historic Reserve Status***

Bullendale is located on the Mount Aurum Recreation Reserve which is land managed by the Department of Conservation ("DoC") and which is freely accessible by the public. Being located on DoC land does give the site protection in that the site is protected and managed by the Government on behalf of the New Zealand public rather than being located on private land where this would be difficult. However, as the site is part of a larger 'Recreation Reserve', this does not give the site the elevated protection and management status that it would have if the site was attributed 'Historic Reserve' standing. Historic Reserve status would increase the ability for the site to attract funding specifically for highly significant cultural heritage sites.

#### ***NZHPT Registration***

The Phoenix Dynamo site and the Bullendale Settlement site are on the New Zealand Historic Places Trust ("NZHPT") Register as separate Category II registrations. This Register recognises important cultural heritage sites throughout New Zealand. The Registrations for these sites (Reg. No's. 5601 & 5602 respectively), however, are poor in their description and do not recognise the importance of the whole settlement, power and mining complex. The core problem with the Registrations is that the sites are Registered as separate entities and therefore do not tell the complete story of Bullendale. The Bullendale Settlement registration, for example, does not even including the related mining sites.

Registration of the hydroelectric power scheme, mining heritage and township as one entity and elevating the level of registration to Category I, making Bullendale a place of national importance, is required. Although this would not provide immediate legal protection for Bullendale per se, proper recognition of cultural heritage sites on a national level does provide crucial 'social protection' through acknowledgment by a society of what is important to it.

***'Gazettal' of the 20th century hydroelectric, mining and settlement heritage as an archaeological site***

Section 2 of the Historic Places Act (1993) (“HPA”) defines archaeological sites as “any place in New Zealand that:

- (a) Either –
- (i) Was associated with human activity that occurred before 1900; or
  - (ii) Is the site of the wreck of any vessel where that wreck occurred before 1900; and
- (b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand.”

Archaeological sites are legally protected under Section 10 of the HPA. This means that any person damaging, modifying or destroying any pre-1900 structures, features, artefacts etc at Bullendale can be prosecuted. As noted above, Bullendale was occupied into the early 20th century with late 20th century attempts at mining also being undertaken. Historic heritage remains from these 20th century activities are located in areas where 19th century activity also took place, but the 20th century mining heritage is not legally protected. This creates difficulties in adequately protecting Bullendale from fossicking, for example. This is because to successfully prosecute a fossicker caught with artefacts from the site, it would have to be proven that such artefacts were not from the early 20th century but from the late 19th century. Prosecuting a person for fossicking damage may also be difficult for a location where both 19th and 20th century activity took place.

Under Section 9(2) of the Historic Places Act (1993), the New Zealand Historic Places Trust may declare by notice in the New Zealand Gazette that a post-1900 historic site receive the same protection as an archaeological site as defined in Section 2(a) (see above). This process is often described as Gazetting and would mean no confusion or debate would arise on whether a person discovered fossicking at Bullendale was undertaking this activity illegally or not. Such greater legal protection would be a deterrent to fossickers.

The aim of Stage 1 of the Bullendale Project is therefore to:

- Change the DoC Reserve status from ‘Recreation’ to ‘Historic’ for the whole Bullendale hydroelectric power, mining and settlement complex.
- Review the NZHPT separate Phoenix Dynamo and Bullendale Settlement sites Registrations to create one Registration that reflects the international importance of the site.
- ‘Gazette’ the 20th century cultural heritage remains of Bullendale to provide these with the same legal protection as the pre-1900 archaeological heritage.

The proposed increased recognition and legal protection can be achieved through DoC’s and NZHPT’s own respective legislations. As DoC and the NZHPT are part of the Bullendale Project Team, Stage 1 of the project should be achievable.

### **Stage 2: Preservation of the Dynamos, Electric Motor and the New Main Shaft winding structure**

The aim of Stage 2 of the project is to preserve the key components of the hydroelectric power scheme. Ideally,

the mining features/structures powered by the scheme would also be preserved or stabilised, but possible limitations on funding has meant that the most significant of Bullendale’s features are the focus of the current project.

At the Dynamo site, the dynamos, flywheels and pelton wheels are currently exposed to the natural elements and the timbers from the 1986 reconstruction are now rotten. The rotten timbers will be replaced and to further protect the hydroelectric scheme and increase the longevity of the new timbers, a protective building or shelter may be required to be constructed over the power scheme remains. Originally a building did cover the dynamos, flywheels and pelton wheels etc. as shown in Figures 18 & 19, and so a new building or shelter will not be out of place for the site. The new building/shelter, however, may not be as large as the original building so as not to intrude on the isolated and abandoned ambience of the site. These heritage works will be guided by a Conservation and Works Specification Plan.

At the New Main Shaft where the electric motor is located alongside the winding gear structure it powered, archaeological excavation of the electric motor and the area surrounding it will be required to determine how much of the motor is still present. Once this is completed, whether the motor can be reconstructed will then be able to be determined and, if reconstruction is possible, how this will occur. It is possible the motor may have to be temporarily removed off site for reconstructive and preservation works and then returned. The winding gear structure will require stabilisation of the stonework and also possibly the replacement of the rotten support timbers for the winding drum with the drum then lifted back into place. Due to the collapse of the support timbers, the weight of the winding drum now rests directly on the stonework causing two of the stone walls to bow. Vegetation may also need to be cut and cleared from the site to preserve the archaeological remains from further vegetation intrusion. Clearance of vegetation will also allow more detailed recording of the site to be made. These works will be guided by an Archaeological Research Strategy and a Conservation and Works Specification Plan.

Stage 2 of the Bullendale Project will require the project team to raise funds to implement the preservation of these key components. The completion of Stage 1 will benefit any applications for funding by ensuring the significance of the site is understood. Funding options may not be restricted to applications for funds to Government, local government, the Lotteries Commission or Community Trusts, but may also come from other project partners or sponsors who recognise the benefits of being associated with a highly significant cultural heritage preservation project.

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Figure 1. Location of Bullendale near Queenstown in the South Island of New Zealand ((Sourced from Land Information New Zealand. Crown Copyright Reserved).



Figure 2. Location of Bullendale near Queenstown (top). Location of the Phoenix Company's hydroelectric power scheme where the two dynamos are located today, and the location of the remains of the electric motor which powered the New Main Shaft winding house (bottom) (Sourced from Land Information New Zealand. Crown Copyright Reserved).



Figure 3. Bullendale probably pre-1907 (source: Petchey 2006:18 and Lakes District Museum, Arrowtown). The Bakery Flat settlement above the New Main Shaft is circled (see Figure 6).



Figure 4. Phoenix (Achilles) Battery ca. 1887 when its stampers were powered by electricity (Source: Petchey 2006:32 & Hocken Library, Dunedin). Compare with Figure 11. The rock crusher is the top of the photograph and the remains of the battery house in the foreground.

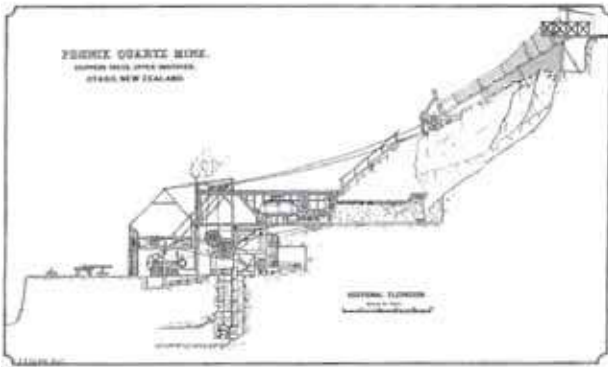


Figure 5. Elevation plan of the Phoenix Battery from 1887 relating in detail how the battery and rock breaker system functioned and was powered (source: *Handbook of New Zealand Mines*, 1887).



Figure 6. New Main Shaft ca. 1900 (?). Location of the Anglo-American Brush Corporation Electric Motor which powered the winding gear (Source: Petchey 2006:25 & *Hocken Library, Dunedin*).



Figure 7. Occupation terraces at the Bakery Flat settlement above the New Main Shaft. Compare with Figures 3 & 6. Building platforms etc. can still be seen and extensive archaeological remains lie beneath the surface and in the surrounding Beech forest.



Figure 8. The bread oven on Bakery Flat. The dimensions match those at the 19th century Bendigo Bakery excavated in 2009 (see The 5th International Correspondent Report by Matthew Schmidt) (Photo: Matthew Schmidt).



Figure 9. Stonework from a building located on one of the occupation terraces at Bullendale. The building is now surrounded by Beech forest and artefacts are scattered around the site (Photo: Matthew Schmidt).



Figure 10. Evidence of fossicking at Bullendale (Photo: Matthew Schmidt).





Figure 11. The Phoenix (Achilles) Battery site. Compare with Figure 4. The rock crusher is the top of the photograph and the remains of the battery house in the foreground (Photo; Matthew Schmidt).



Figure 12. Archaeologist Peter Petchey standing next to part of a Whitelaw Turbine (Photo: Matthew Schmidt).



Figure 13. Remains of Southberg's Battery showing mortar boxes, timbers and stampers now overgrown by Beech forest (Photo: Matthew Schmidt).



Figure 14. Author with Cornish rock drill still located next to the mining drive where it would have been used (Photos: Peter Petchey and Matthew Schmidt).



Figure 15. Ore bucket. These buckets are scattered in the bush and in Murdochs Creek (Photo: Matthew Schmidt).



Figure 16. Cableway winding drum(?) with drum timbers intact (Photo: Matthew Schmidt).



Figure 17. Old mining equipment from the Phoenix (Achilles) Battery is present in the Right Branch of Skippers Creek, in Murdochs Creek and along their banks.

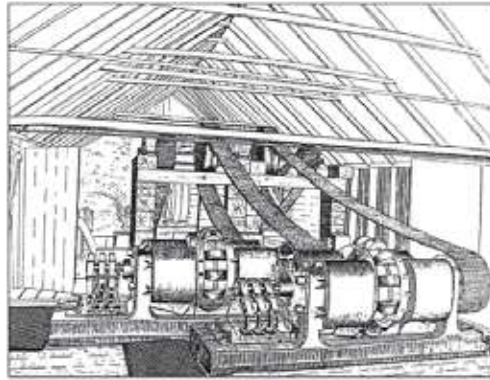


Figure 18. The hydroelectric power scheme at Dynamo Creek photographed in ca. 1900(?). The penstocks can be seen as well as the powerhouse building (Source: Petchey 2006:39 & Lakes District Museum, Arrowtown).

Figure 19. The Dynamos for the hydroelectric power scheme. Top: as drawn and published in the *Appendices to the Journals of the House of Representatives* in 1886; Bottom: as photographed by Matthew Schmidt in 2010.



Figure 20. The Anglo-American Brush Corporation Electric Motor at Bullendale. Top: as one of the electric motors looked in 1886 (Source: Petchey 2006:15 & Lakes District Museum, Arrowtown); Bottom: the dismantled motor at the New Main Shaft. The parts are in good condition. Note the native Beech trees which have grown through gaps in the discarded motor parts (Photo: Matthew Schmidt).



Figure 21. The winding gear structure at the New Main Shaft. Gearing has slipped off the rotten support timbers and onto the structural stonework causing the stonework to bow.

Figure 22. Mining equipment from the New Main Shaft is scattered along the terrace the operation was built on (see Figure 6). (Photo: Matthew Schmidt).



## Documentation and Conservation of Wazir Khan Mosque in Lahore

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### INTRODUCTION

The Walled City of Lahore is one of the most important historic cities in the sub-continent. Although much altered by recent development, it still retains considerable original character. Within the confines of the city are a number of important monuments, many of which are in urgent need of conservation. In 2007 a programme<sup>1</sup> has been launched by the Government of the Punjab with the assistance of the World Bank and Aga Khan Trust for Culture (AKTC) as a strategic partner, to link many of these monuments along a historic route, the Shahi Guzargah, or so-called Royal Route, starting from the Dehli Gate and culminating at the Lahore Fort. One of the most significant monuments along this route is the Wazir Khan Mosque.

Aga Khan Trust for Culture (AKTC) has proposed an area development project which includes (1) the conservation of the Wazir Khan Mosque and (2) planning assistance towards the re-organization of the space in front of the mosque (Chowk) following the removal of a limited number of commercial encroachments within immediate proximity of the monument's principal façade. It is part of a local development framework comprising the rehabilitation of the surrounding urban fabric and the open space. The objective is to improve the quality of the urban environment for both residents and visitors, relocate unsightly infrastructure underground and return the mosque to its original urban setting.

A programme for the conservation of the mosque is being evolved and will be implemented over several stages. In the first stage structural and architectural investigations have been carried out. Geotechnical investigations of the foundation structure and a detailed electronic documentation of the building have been carried out and are being used to analyze the damage and to assess the quantum of structural interventions and conservation measures. The structural damage that has occurred will be rectified by repair and stitching together of the

masonry fabric. Careful monitoring of the behaviour of the building will be mandated thereafter. Pilot restoration initiatives on the various kinds of surface decorations will be carried out first, before expanding these to a larger scale.

### HISTORY AND LOCATION OF THE MOSQUE

The Wazir Khan Mosque was built by Hakim Aliuddin (sometimes also referred to as Ilmuddin) in 1634 (1054 AH). Hakim Aliuddin came from the town of Chiniot on the banks of the river Chenab, and had been employed as a court physician by Shahzada Khurram (later Emperor Shah Jahan). He rendered good service to the prince during various campaigns, remained one of Shah Jehan's most trusted aides in the earlier years of his reign and who appointed subedar of Punjab.

Located on the western side of Wazir Khan Chowk (square) about 260 metres from Delhi Gate (fig. 4), and surrounded by the thick urban fabric of the Walled City, the Wazir Khan Mosque is the centre piece of an historic urban ensemble. This ensemble including the Chowk Wazir Khan and the shops within the mosque complex and on its the northern side. Historically, as part of the royal thoroughfare connecting Delhi Gate and the Lahore Fort, the Wazir Khan Mosque together with its square formed a singular and very important element punctuating the urban fabric of the Walled City.

### ARCHITECTURAL LAYOUT OF THE MOSQUE

The structure of the mosque can be divided into three horizontal planes. Level 0 comprises the shops on the eastern and northern side. The floor level inside these shops is now lower than the street level. Level I occupy the maximum area of the mosque, comprising all the major spaces in the mosque. Level II defines the spaces which can be accessed from level I via staircases from different locations. The layout of the mosque is rectangular in plan, measuring 86.17 m x 50.44 m on its extreme limits. The four imposing minars define

<sup>1</sup> In June 2006, the World Bank released funding for the current Punjab Municipal Services Improvement including a significant Cultural Heritage Component. This programme represents an unusual opportunity to apply the best practices of urban regeneration and conservation planning in the context of historic cities in Punjab, starting with the Lahore Walled City project as a base case. The Aga Khan Trust for Culture will be joining this initiative as a strategic partner.



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



Fig. 2: A 1970 s photograph of Wazir Khan Mosque.

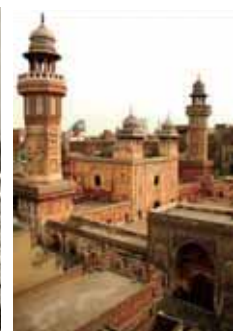


Fig. 3: A view into the eastern section of the mosque from the north side.



the corners of the main courtyard. The main prayer chamber, courtyard, hujras (meditation rooms), vestibule and bazaar (fig. 5) constitute the main elements of the mosque complex.

Among the architectural elements and decorations of the Wazir Khan Mosque which represent influences from the pre-Mughal era and from neighbouring regions like Persia and Central Asia, one special feature is the formal “bazaar” which constitutes a key element of the entrance system to the courtyard of the mosque itself. This bazaar comprises two rows of shops facing each other and traversing the entire width of the site. The shops forming the two legs of this diminutive bazaar arrangement could with some conjecture be said to be the shops intended free of rent for calligraphers and bookbinders of the Quran in the waqf deed included in Abdul Latif Lahori’s book<sup>2</sup>. It is quite unique that the principal entrance façade of the mosque is also the façade of two layers of shops that form the calligraphers’ bazaar, and not of the enclosure of the mosque proper. Half way along its length, the linear axis of this bazaar crosses the axis of the entrance to the mosque. This crossing is marked by an octagonal dome. This is the first example in the subcontinent (and not widely emulated elsewhere), of a purpose built bazaar in an adaptation of a Central Asian charsu. However, in this ensemble only two bazaars lead off from the dome of the charsu, the remaining (two or three) bazaars having been replaced by the entrance system to the mosque<sup>3</sup>.

## ARCHITECTURAL DECORATIONS

Artistically, the mosque displays some of the best examples of Mughal architectural ornamental and decorative techniques, surpassing others in its delicacy and comprehensive decorative scheme. Most of the other Shahjahani era monuments - Dai Anga Mosque, Asif Khan Tomb, Gulabi Bagh entrance in Lahore<sup>4</sup> also have a combination of kashikari (glazed tiles work), naqqashi (frescos) and tazakari (faux brickwork) as architectural décor but the enormous scale of these decorations in the Wazir Khan Mosque certainly makes this mosque conspicuous in its artistic quality.

## CONDITION OF THE BUILDING AND ITS FABRIC

The mosque is built with brick masonry and lime mortar. Detailed inspection reveals that the structure of the mosque has been suffering from serious damage due to neglect and lack of maintenance. Most of the shops at Level 0 on the northern side are rented out for commercial activities and have been converted into stores as a result of additions built out into the street to cope with the raised street level. The business of steel fabrication in the shops on the mosque’s eastern side is a major threat to the structure of the mosque. The fabrication of steel products in these shops not only destroys the overall ambiance of the mosque’s front and creates noise, pollution and occupation of the public square for production activity, as many of the steel products being made have unwieldy dimensions.

<sup>2</sup> Latif, op. cit.

<sup>3</sup> Kanhaiya Lal mentions the term “char soo” for this arrangement at the Wazir Khan mosque, in his *Tarikh-e-Lahore* (1884). Calligraphers’ and bookbinders’

<sup>4</sup> Not to speak of the masjid Mian Muhammad Salah Kombob and the now destroyed (through rebuilding) Chiniyan Wali Masjid within the Walled City itself.

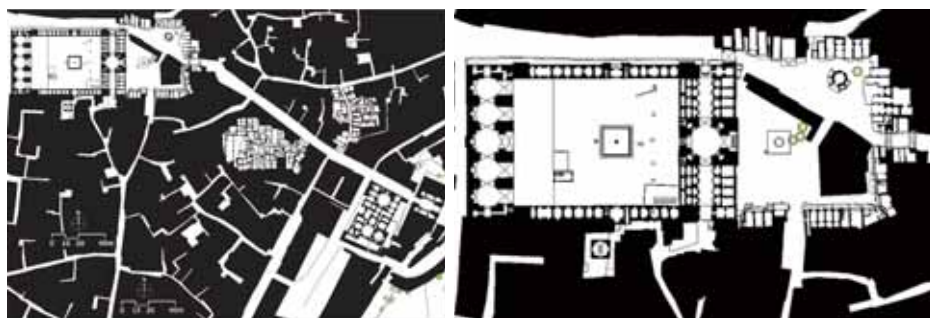


Fig. 4 Left: Plan shows the locations of major thoroughfares and monuments on the Shahi Guzargah.  
Fig. 5 Right: Plan of the entire mosque complex with Chowk.

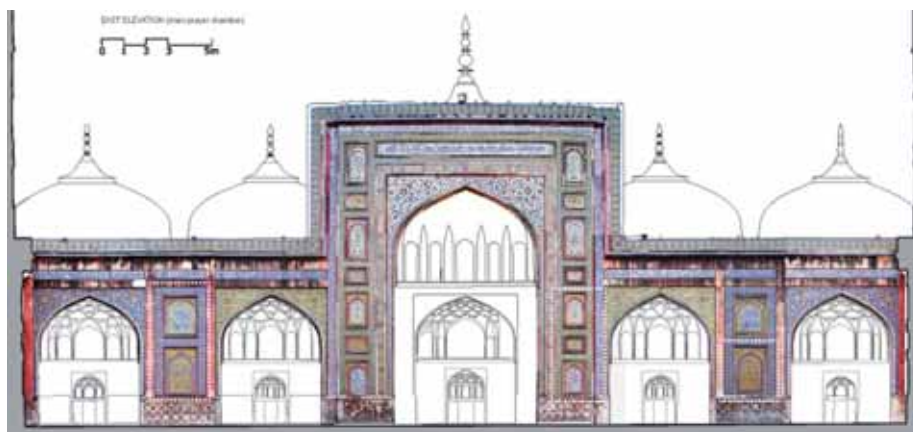


Fig. 6: A photo-mosaic of the eastern elevation of the main prayer chamber. This image is produced with the help of image rectification and is plotted to scale.



Fig. 7: The southern face of the southeastern minar shows the detail of kashikari and exposed brick work. Detailed investigations show the major damages to the kashikari towards the north side.

The structure at Level I show the majority of damage is in the form of cracks, subsidence and leaning. The main prayer chamber at the western side of the mosque shows this kind of structural damage; the cracks in the main arches adjacent to the two minarets have a direct relationship with the leaning pattern of the minarets. Although it is not confirmed when these cracks developed, the major restoration phase in 1971-78 noticed these cracks.

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

The major components of the building fabric such as the foundations, walls, roofs (flat and domed), floors, doors, windows etc. have various degrees of damages. The thickness of brick wall varies from small rooms to the domed spaces, depending on the span of the space. Most of the walls are covered with surface decorations. The only visible sections of the brick masonry are the west façade and the masonry on the minarets. Rising damp in the walls of level 0 shops and level I hujras have damaged the surface lime plaster and in certain locations it has eroded the lime mortar constituting the masonry work.

All the floors in the mosque are made of brick and have a variety of geometrical patterns, particularly in the courtyard and the main prayer chamber. The existing condition displays the extent of damage as a result of settlement in the floor and an intentional act to hide the services conduit in the floor.

### DAMAGE CONDITION, CAUSES AND THREATS

The mosque has never been as exposed to the pressures of rapid development as it is at present. These pressures range from environmental factors like the pollution generated by vehicles, to man-made pressures such as illegal encroachments in the form of shops and houses. Most of the present damages in the mosque are caused, significantly, by man-made factors.

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

### ACTION FRAMEWORK

It is evident that in order to draw up a medium to long-term conservation plan for the mosque complex, several strategic decisions are required to be made that pertain to the following broad areas of consideration:

- 1- Problems and issues pertaining to the neighborhood of the mosque complex;



Fig.8: Detail of fresco work in one of the archways of the main prayer chamber



Fig.9: Enlarged and ortho-corrected photograph of Arabic calligraphy.



Fig.10: A rectified photograph of kashikari work with a floral pattern on the main prayer chamber



Fig.11: Brick floor pattern in the upper level of the courtyard

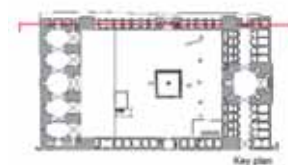


Fig. 12: Longitudinal section of the mosque through the northern most section of minars, hujras, shops at level 0 and main prayer chamber

- 2- The problem of encroachments and past lack of municipal control and regulation of a heritage site.
- 3- Infrastructure issues; the infrastructure conditions, in particular water supply, rain water drainage and waste water disposal; Improvement of existing municipal utility services.
- 4- Issues of conservation per se of the mosque complex. Problems and issues pertaining to the conservation work to be carried out within the limits of the mosque.

These strategic issues are inter-related and must be thought of in an integrated way. Actions emanating from any strategies adopted must ensue from them in a coordinated manner.

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Fig.13: Northwestern corner of the mosque shows the level of commercial encroachments which pose many risks to the building fabric.



Fig.14: Major crack in the wall above the northernmost archway of the main prayer chamber facing



Fig.15: Rising damp in the main prayer chamber has damaged the fresco paint.



Fig.16: Deposits of soil and dust on the rendered and glazed surfaces of main prayer chamber facing north.



Fig. 17: Efflorescence on the rendered surface (tazzakari) of the wall in the southern section of calligrapher ' s bazaar.



Fig. 18: Exfoliation of glaze from the terracotta body of the tile is the most common damage type on the glazed tiles.



Fig. 19: Fading of surface render (tazzakari) on the northern façade of hujra walls in the courtyard.

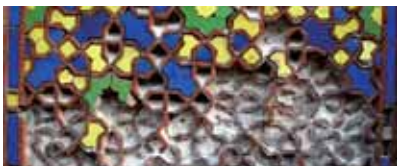
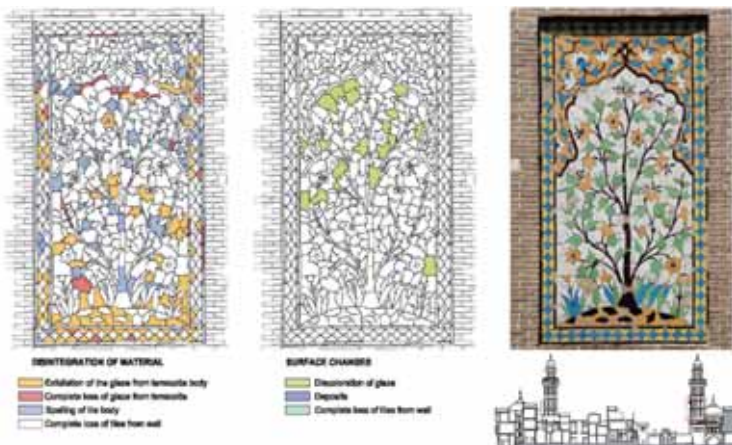


Fig. 20: Loss of bond between the tile and the mortar



Fig. 21: Sanding of mortar in brick masonry



# Papua New Guinea



## Maintaining Cultural Heritage through Yams

**Naomi Faik Simet**, *Dance Researcher*  
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Traditional ceremonies in Papua New Guinea (PNG) provide the platforms for many of the country's cultural heritage to be revived, preserved and maintained for future generations. Main ceremonies practiced in PNG are 'rites of passage' such as mortuary, marriage and initiations. More spectacular ceremonies include harvest. Recently a harvest ceremony took place in Waikakum village in the Abelam area of Maprik in the East Sepik province. The ceremony featured the harvesting of yams and was held from 10 to 12 December 2010. A total of twelve yams were harvested and displayed during the occasion.

The harvesting and displaying of yams is a common practice amongst the Abelam people. It is a tradition performed in the past and continued into the present. The first part of the ceremony begins with the planting of yams and the gestation period involved. Certain taboos are strictly observed during this period. Only older men with skilled knowledge perform the necessary rituals that are required for the planting and gestation period. Traditional knowledge possessed by the elderly men is an important form of the intangible cultural heritage component that is significant to the tangible form of the yam. If these rituals are not observed properly then the yams harvested during the ceremony will be of poor quality and will cause embarrassment to the individual or family responsible for growing the yam. It is an occasion where statements are made publicly to ridicule or praise one's efforts in the growing and planting of yams.

The Abelam people of Waikakum village expressed concern over the need to preserve this important part of their heritage and as a result invited the Institute of Papua New Guinea Studies to record the three-day festival for posterity purposes. The festival began with an all-night performance of music and dance celebrating the successful harvest of the yams. There are three main dances associated with yams which are (1) kangu (longest yam, which is only performed by men), (2) bire (shortest yam, which is performed by men and women) and (3) minjah bul (performed only by knowledgeable during the yam ceremony). The displaying of yams took place over the next two days which also culminated with a reconciliation ceremony amongst the people of Waikakum and the neighbouring villages. Large amounts of food were exchanged to instil peace in the community. Although the festival was aimed at showcasing the yams, it also provided the occasion for public statements to be made emphasising the socio-political relations of the different clan groups.

Yams continue to remain an important cultural icon in this part of PNG where there is immense cultural diversity. It is only during such occasions like the Yam festival that certain cultures of the people of PNG is maintained and preserved.





2010 Yam Festival, Waikakum village, Maprik, East Sepik



## Mural Painting Conservation in Sri Lanka with Special Reference to Kandy

**Sujeeva Kaushalyani Peiris Deraniyagala**, *Conservation Supervisor*  
Central Cultural Fund

Sri Lanka has a rich legacy of painting tradition with every temple in the island having at least one wall or ceiling painted with incidents and stories associated with the life of Lord Buddha. Mural Paintings play an integral role in transforming the interiors of buildings while they give inspiration and messages to the devotees in different ways. Sri Lankan Buddhist paintings developed through the centuries and reached its zenith in the 6th to 12th centuries and then underwent some difficulties and declined until Kandyan period, where there occurred a renaissance.

Mural paintings of Kandyan period has characteristic features and colours that distinct them from earlier paintings in Anuradhapura, Sigiriya and Polonnaruwa. Kandyan tradition of paintings was developed around the painted caves of Dambulla, which boasts about more than 20,000 m<sup>2</sup> of painted surface. Singularly because of their magnificence, the Dambulla Painted Caves were declared as a world Heritage Site in 1991 and was the largest painted surface in the Asian region. Lankatilaka Vihara, Gadalaeniya, Degaldoruwa Raja Maha Vihara, Hindagala Vihara are among other major works during the period. Due to various reasons the tradition underwent difficulties and then again during the early 15th century the paintings revived with sudden awakening of Buddhism led by most Venerable Welvitia Sangha Raja Thero, who was instrumental in bringing upasampada [ordained monks] back to the island. Renaissance of this Buddhist art and traditional painting resulted in transforming whole interiors of the temples filling it with vibrant colours that were symbolic to the period. That tradition continued until the 20th century, when maestro George Keyt introduced Sri Lankan neo classical style.

Kandyan style painting can be identified by their bright reddish back ground; flat figures portraying the side view rather than the front and the use of painted strips without

breaking the scenes. They used various floral patterns and flowers to signify the end of a scene. During the latter period, various other factors affected the Kandyan murals. European invasions and final submission of the Kandyan Kingdom to the British in the early 19th century was a major factor that changed the style. During that time the artists drew depicting European themes, popular figures – kings and queens, flora and fauna such as the fleur de lis, grapes, roses and horses.

The Central Cultural Fund carried out restoration of



Image House at Sellavalie Vihara after restoration



Rare mural at Sellavalie Vihara depicting Lord Buddha in Cobra hood



A mural at Sellavalie Vihara before restoration

paintings in two Kandyan temples which are in total contrast in terms of painting style and colours recently. One is Sellavalie Raja Maha Vihara in Udunuwara, Kandy and Gallengolla Raja Maha Vihara, Pilimatalawa, Kandy. The former is having two painted shrines; the older one is smaller and built using stone slabs according to Hindu architecture and its paintings belong to the 15th century, which represent the original Kandyan style. It also has another shrine built in A.D. 1820 with murals. Gallengolla is at the other extreme and belong to the waning period of the Kandyan art. These two temples gives best opportunity to observe the differences in painting traditions during the early and latter Kandyan Period, which are varying in style, pigments and themes. The murals at Sellavalie Raja Maha Vihara boast about the tradition true to the classic style of the period while those at the Gallengolla Raja Maha Vihara murals clearly show the European influence.

During the exercise at the Sellavalie Raja Maha Vihara, it was evident that the murals were painted over and again on several occasions. When cleaning the surface a layer of older paintings were surfaced and these were restored.

The whole exercise was a great experience to the CCF conservators, in which they had an ideal opportunity to study variations in art traditions during the Kandyan Period. This restoration process was highly successful in terms of research aspects and some revelations were remarkably coincided with the history of the temples.

**Photo credits:**

Mr. Dias Wagachchi  
Head, Mural Painting Conservator  
Central Cultural Fund



A restored mural at Sellavalie Vihara



The painted arch at Gallengolla Vihara before and after restoration



A painted door at Gallengolla Vihara



The elaborately painted chamber at Gallengolla Vihara



## A Study on Historical Buildings on Chareon Krung Road in Bangkok

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Office of Archaeology, Fine Arts Department, Ministry of Culture

Chareon Krung Road has been one of important historical roads in Bangkok since early Rattana Kosin period. In 2010 (B.E.2553), Chareon Krung Road celebrated 150th anniversary and being the oldest Western style road in Bangkok.

Chareon Krung Road was the first Western style road in Bangkok built in 1861 (B.E.2404) by the inspiration of His Majesty the King Rama IV and King Rama V. The design and construction was in the western style. It was used for transportation in the country reform policy. At the beginning of Rattana Kosin period in 1782-1850 (B.E.2325-2393), travelling in canals was the major transport used in Bangkok. There were a few roads in the central area. Most public roads had narrow pathway. Some brick roads surrounding the royal palace were built solely for the royal ceremony occasions. King Rama IV articulated that foreigners used clean and convenient roads in their country. He proclaimed to construct a new road in Bangkok and called it New Road, which was changed to Chareon Krung Road later. He also proclaimed to build western designed buildings similar to those in Singapore for princes and princesses along Chareon Krung Road.

Chareon Krung Road and historical buildings have been part of Bangkok history especially architecture, city planning and commerce in the early Rattana Kosin period. The buildings on Chareon Krung Road were built for commercial and residential purposes. It was the first commercial road in Bangkok and the area became the commercial central district of Bangkok for both Thais and foreigners at that time. And Thai way of live for transport was changed from canal to road.

Chareon Krung Road construction was also part of the Royal developing country policies and the King's vision on fostering national commerce. Improving the country to Western style was His Majesty the King's strategy for the country to survive the Imperialism and colonization. The community along Chareon Krung Road is a good example to illustrate good relationships between Thais and foreigners in adjusting to live together. The historical buildings have outstanding tower style and were built by bricks. The architecture imitated a classic European pattern and palace style but the proportion was distorted from the original. The paths connect to each other as shown in the England City Planning developed by Sir Stamford Raffles since 1813 (B.E.2356) and similar to Singapore. The historical buildings on Chareon Krung

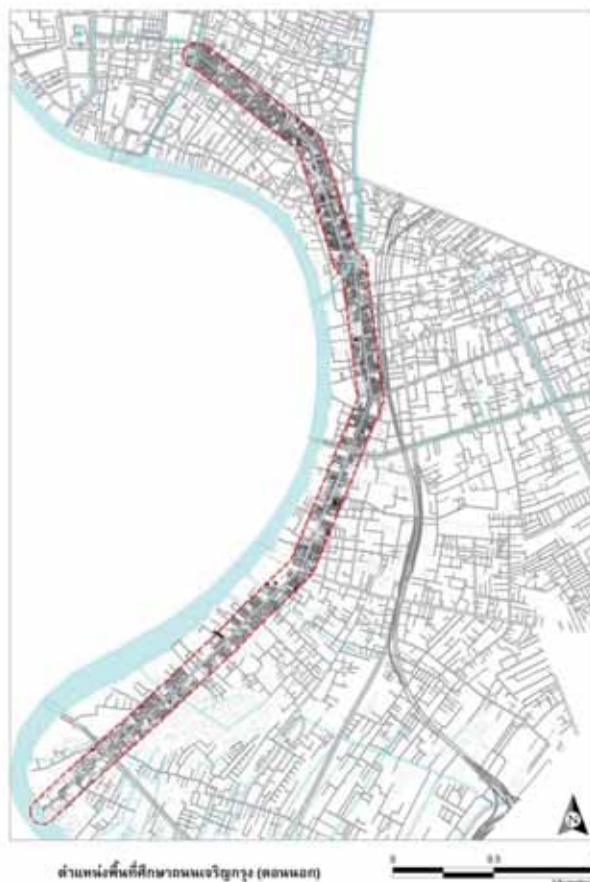


Figure 1: Comparative GIS mapping layer location of historical building area on Chareon Krung Road with an old map produced in 1921 (B.E. 2464)



Road are still the commercial central district in Bangkok nowadays. Old business such as a pharmacy, a printer, an Asian shop, a Chinese herbal shop and a Westerner shop, keeps continuing.

The project was run by the Monuments Registration and IT Group, Office of Archaeology. It aimed to study historical buildings on Chareon Krung Road and their evolution by a field survey using GPS to locate the

buildings map the data in map database. The researcher interviewed people, residential and business owners and local community for data description. Literature reviews from books, thesis, archives and antecedents etc., were documented to analyze data. GIS overlay mapping method was used to describe the building value. The results will be used for planning and developing an appropriate conservation for historical buildings.



Figure 2: GIS mapping overlay presenting historical building layer in 1921



Figure 3



Figure 4



Figure 5



Figure 6

Figures 3 - 6 Historical buildings on Chareon Krung Road



## Little-known Findings of Antefix from Khalchayan (South Uzbekistan)

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The Study of Khalchayan settlement began in the 1960s by "The Uzbek Fine Arts Expedition" headed by G.A. Pugachenkova of Fine Arts Institute of Academy of Sciences of Uzbekistan. As a result of archaeological excavations, it was found that in the past in place of these hills there once was the ancient city (1). According to investigators, the occurrence of early settlements on this territory can date back to the middle of one millennium BC; the formation of a large city was in the 4th to 3rd centuries BC; and development of it was during the Greco-Bactrian Kingdom, Saka-Kushan and Yuechzhyskogo time. Life on the mound faded in the Kushano-Sassanian period (3rd to 4th century AD). But in the early Middle Ages on the territory of the ancient settlement, its human habitation was marked.

This original ancient city had a citadel (Karabagtepa) of a foursquare shape, surrounded by defensive walls and moats, neighborhoods with intensive planning structures (Khanaka-tepa), and major architectural buildings such as palaces as well as residential buildings in the gardens and fields, river banks. One of the major constructions was Khalchayan palace, built in Kushan period (the first century BC) and used as the "House of Reception". By the assumption of archaeologists, it became known as the "House of Ancestors", i.e. Temple (2, p. 27), associated with the dynastic cult. The building (35 m×26 m) consisted of three parts; the central part was a living room, the front, and treasury and arsenal areas in its side. The front part consisted of a six-columned ayvan (terrace), a hall with sufa (pise-walled low sitting) and a two-column space. The interior was decorated with wall paintings and reliefs sculpted friezes.

Originality of Khalchayan buildings is the combination of the Greco-Roman architectural elements (terracotta roof tiles and antefixes) with traditional planning structure of the East with details such as, for example, merlons (parapets). The latter were found in the ruins of the palace and the hills around it during the archaeological excavations (1, p. 136, fig. 80). After completing this field work in 20 - 30 years, several dozens of antefixes were accidentally discovered, which were in the museum of local school 41. They have not yet known to public. In this article the author first studied and analyzed antefixes found on Khalchayan.

Antefix is an antique architectural detail in the form of palmetto and acanthus leaves or a shield with the embossed or ornamented with the image of a fantastic creature. It consists of a flat board, tapered at the top, and calipter at the back side, a long groove which in section has the shape of a semicircle. Its face is usually stamped by kalybov (the matrix), and the rear part is fashioned by hand, then connected to the face and fired, because they are called terracotta. Sometimes they are

made of marble, plaster or stone (mainly limestone).

Originally antefixes were used in ancient temples and, in fact, had several meanings. Firstly, performing a constructive function, they were placed on the edges of the roof along the front of the building and served as drains, closing the seams of flat tiles (solon) from water. Secondly, they had decorative value, reviving the look of buildings, and besides, reproducing images of mythological creatures such as demons, a kind apotropaic-preserve, protecting the home of deities from evil forces. Such antefixes were found in the architecture of the Etruscan temples of the 6th and 4th centuries BC (3, pp. 144-151, 196, fig. 84-89, 114). In the territory of Bactria, similar antefixes were found, for example, in Zindantepe. An anthropomorphic image of them was crowned with a high crown in the form of antefix, decorated with plant shoots (4, pp. 76, 80, fig. 1e; with. 93, fig. 85). The antefix with palmetto in combination with sima (horizontal frieze with alternating ornaments) was also used in temples korinfizirovannyh based on Ionic order styles of continental Greek (e.g., in the temple of Artemis on an island of Corfu at about 600 BC) (5, with. 61-62, fig. 21). The genesis and evolution of an antefix are a separate subject for study. Khalchayanskies antefixes based on composite types can be divided into several groups.

The first of these are samples drawn on the panel; antefixes with curls and bents downwards. One of them is almost completely preserved, only  $\frac{3}{4}$  of calipter has been lost, while others are found in fragments, retaining only the front part. It is obvious from the first antefix that front guard has been molded with the matrix, but it lacks the front lower limb and a hole in which water passes. On the shield of the central vertical streak is almost not noticeable, but differ in side curls (Fig. 1 a). In other broken fragments of the central vein with relief borders, curls go vertically to middle lanes, then sharply down (Fig. 1, b). Similar antefixes with less rounded curls were among previously published findings, found on Khalchayan (1, Fig. 80-4).

Fragments of the second group have the opposite arrangement of curls, as compared with the above, ie they swirl directed upward, and the vertical veins of these boards perform the function of borders, oval frame surrounds the main image. Curls like "grow" from the border (Fig. 1 c). One of the fragments differs from the previous, not only completed a vaulted shape, but also schematized broad simplistic curls, filling the plane shield, drawn along the edge of the curb. Here, the central vein passed very smoothly and clearly. Such a track is found on fragments found earlier, but the earliest examples of the central vein are almost absent (1, Fig. 80-7).

The third group consists of antefixes with more

complex compositions, arranged on a plane, lined with a single or double border. The vertical vein loses its meaning and its place is occupied by three almond shapes with a separate frame, divided by horizontal "belt" on which the edges of both sides shows curls, ending with a sharp leaf. Here the leaves are very sketchy, which makes them not like palmettos. This design brings them closer to the plant ornament. One of the samples stored on a  $\frac{3}{4}$  part and on the other there was only the upper front part (1, Fig. 80-9).

Three samples of the fourth group differ not only from the above, but also from each other. At one of the surviving fragments is shown at the bottom of the zigzag frieze above it is a broad vertical vein in the form of spikes on either side of it depicts a spiral curls, and under them or almond-shaped decoration, framed with a thin border. This ornament is still used in folk arts and crafts (such as skullcaps, suzane, etc.) and has a symbolic meaning. Since ancient times it was believed that they would protect us from evil spirits.

The Khalchayan antefix design is characteristic for their schematized motifs: palmettos and acanthus leaves. Despite of differences in their ornaments, they are the same type of architectural decoration based on the same functions and semantic meaning. Their fragmentary condition makes it difficult to establish the exact size. But with the help of reconstruction methods, we can estimate the size (20 - 25 cm), which is close to the present one (Fig. 2).

Antefix decorated with palmettos and acanthus leaves, were found not only in Khalchayan, but also on other monuments of the Kushan Bactria, for example, Dalverzin-tepa, Kul-tepa (South Uzbekistan), as well as the sites of North Afghanistan, Dilberzhine and Ai-Khanum. One such artefact was found in the ruins of the administrative palace building in the third century BC on Ai-Khanum. Its details are stocky and expanded to the edges. Unlike Khalchayan, they are not monolithic silhouette, and curly. Central veins and leaves ending in curls are back from the base. Researchers of Ai-Khanum described them as the Greek-Asian hybrid (6, pp. 42; with. 137; with. 641-644, fig. 34-36).

Terracotta antefixes of Dalverzin-tepa differ from other specimens found there with its larger size and elegantly modeled palmettos. Researchers confirm that the design of such antefix palmettos bring it closer to Hellenistic models, but not identical to them. In addition, the complex where that antefix was found belongs to the second to the beginning of the first century BC judging by the ceramics and coins (7, pp. 83-84, Fig. 4).

The Greek samples besides constructive functions and magnificent decorative effect met the requirements of classical canons of architecture. Probably, Bactrian masters wasn't simulated by those classical samples but considered panorama distance in a combination to merlon approaching creatively to their application in traditional reproduction and also with characteristic simplicity and restriction from superfluous decoration for

local architecture. Such creative approach of reproduction proves to be true also a variety of their decoration in a combination to ancient east elements gives the chance to assume that merlons and antefixes were applied in syncretic combination here.

Thus, the large number found on the territory Khalchayan antefix suggests that during this period, they were widely used here in construction. One of their features is a synthesis of different traditions in the ancient architecture of Bactria. Khalchayan antefixes are an original source for the study of relationships and cultural ties with the traditions of ancient Bactria art schools nearby and distant in historical and cultural regions.

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Antefix from Ai-Khnom



Antefix from Zindan-tepa



Fig.1. a. New antefix from Khalchayan



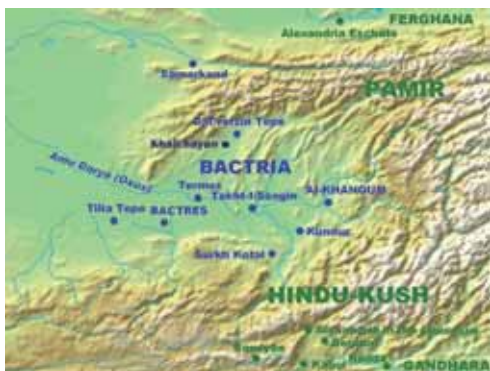
Fig.1. b. New antefix from Khalchayan



Fig.1. c. New antefix from Khalchayan



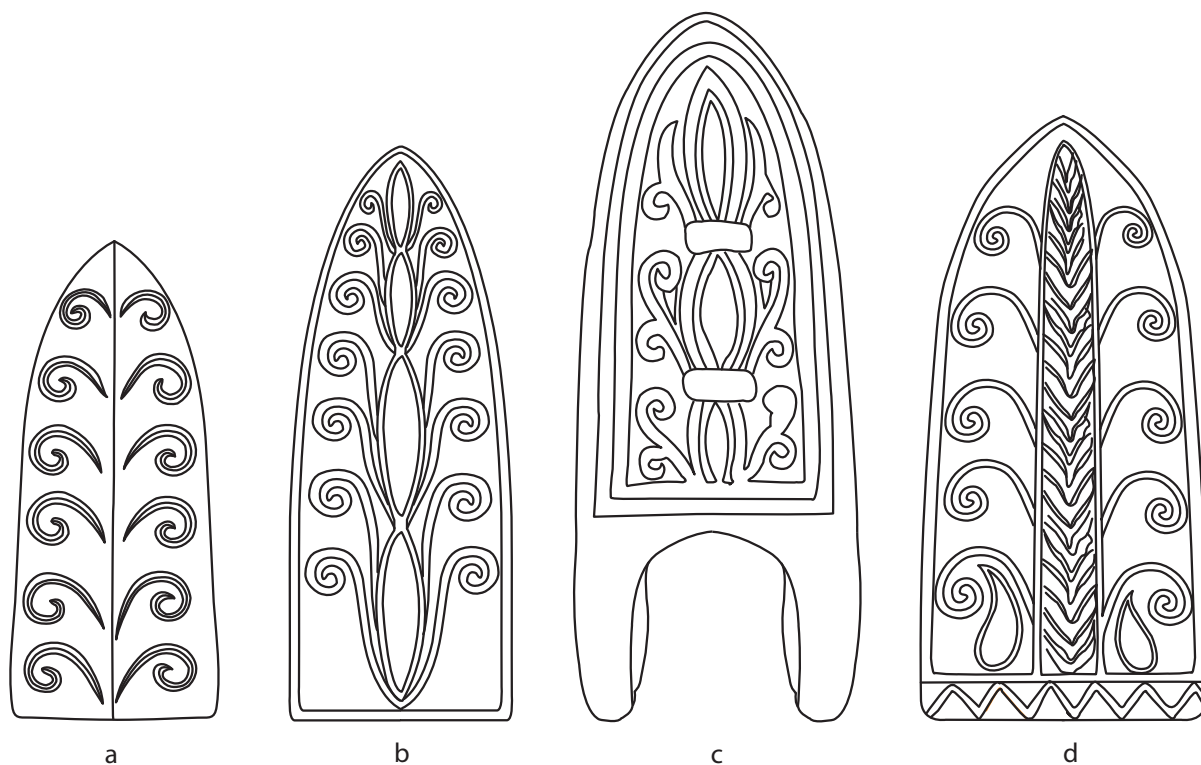
Fig.1. d. New antefix from Khalchayan



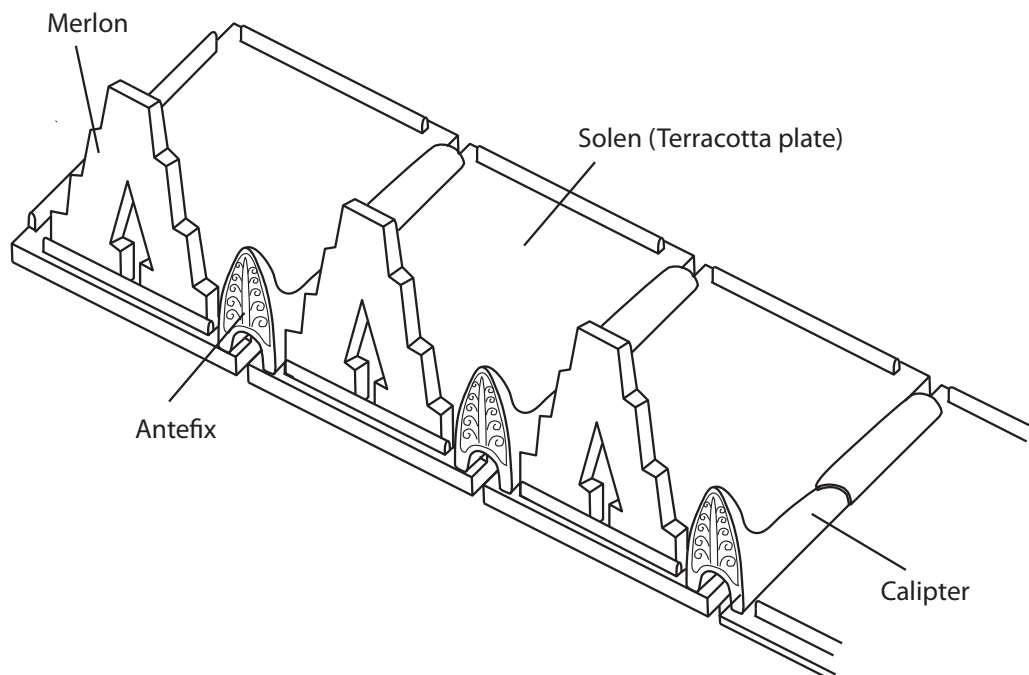
Map of Bactria



Palace of Khalchayan, 1st century BC



Reconstruction of antefixes



Reconstruction of antefixes in combination with merlons

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Published by

Cultural Heritage Protection Cooperation Office,  
Asia-Pacific Cultural Centre for UNESCO (ACCU)  
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Asia-Pacific Cultural Centre for UNESCO (ACCU) 2011

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