

Phnom Bakheng Progress Report July 2010

World Monument Fund - Conservation Program at Angkor

1. Introduction



Fig 1: Reassembling NE corner level F

Since the last progress report submitted to the State Department in January 2010, work on the first phase of the restoration at the lowest terrace of the Northern half of the East Elevation at Phnom Bakheng has continued. After presentation of a full scale mock-up of the most practical long term solution to the UNESCO Ad Hoc Experts during their review of the project, and the formal approval of the methods and materials recommended by World Monuments Fund (WMF) at the ICC meeting in December 2009, the reassembly of the lowest terrace of the Northern half of the East Elevation at Phnom Bakheng is underway.

A conservation and stabilization workshop that focused on the surrounding brick shrines at Phnom Bakheng took place from June 1 – June 4th 2010. The workshop was organized by WMF in collaboration with the APSARA Authority and with support from ICCROM. Results will be published on the WMF web side in the fall of 2010.

The archaeological excavation related to the removal of the dirt ramp in front of the South side of the East Elevation has continued and is in its final stage. WMF and the APSARA National Authority are working in collaboration with international Archeologists at Angkor to review findings and complete the final documentation and interpretation.

In order to address the long term holistic needs of the site WMF and the APSARA National Authority are planning a Site Management Workshop that focuses on the larger scale questions of archeology, water management, site erosion, landscaping, interpretation and one of the most serious threats to the site tourist management. Initial meetings with the APSARA National Authority have taken place to identify the most suitable strategy to ensure that all details are addressed and a holistic approach is taken.

WMF believes that the workshop should be divided into two phases. Phase one will take place in February 2011. During this phase the major stake holders will meet to define major issues and challenges, and to identify what international specialists would be required to assist in Phase two. After the successful completion of phase one, which is expected to result in a set of comprehensive recommendations that outline major objectives and required tasks and means, the stake holders will agree on a phase two schedule.

2. Reassembly and structural repair of the North East façade

Following the approval of the mockup which presented the design of potential waterproofing, stabilization and material conservation options to address the present material decay threats to the central temple, the WMF team has begun to repair bedrock where necessary and to reassemble the wall. Activities include the set up of a reference wall, the in kind replacement of failed laterite foundations, and the resetting of repaired sandstone units and new sandstone replacements under provision of laterite blocks. The laterite is cut to fit exactly into the gap between sandstone wall and bedrock to provide structural stability. Smaller pockets are filled with gravel. In addition, fibre reinforced plastic rods are installed in selected locations to work against lateral pressure to the wall by potential water and soil infiltration.



Fig 2: Repaired foundation



Fig 3: Reassembly of NE corner wall level F



Fig 4: New laterite fills and sandstone units



Fig 5: North elevation reference wall

New sandstone blocks and pavers are prepared to be installed where original units are missing. Finally, the team has begun in-situ documentation of the next level in preparation of disassembly, and site logistic planning for extending the storage area.



Fig 6: Preparation of new sandstone units



Fig 7: Installation of FRP cable

3. Stone Conservation

Stone conservation measures include, documentation, cleaning, desalination, structural consolidation of broken blocks, and reattachment of fragments using adhesives. WMF supported a testing program to develop an appropriate mortar repair system. The first portion of the on-site testing program has been completed and samples are currently being examined in the laboratory. Results are expected to direct the formulation of the best suited stone repair method and materials. The results will be presented to the Ad Hoc Experts of the ICC and the APSARA National Authority for their approval. Once this work is completed and the system is approved, it will be useful for our work at Phnom Bakheng as well as other sites within Angkor.



Fig 8 : Documentation and assessment



Fig 9: Stone conservation - Desalination

4. Brick Shrine Stabilization and Conservation Workshop

In an attempt to stabilize and conserve specific brick shrines surrounding the central temple, WMF in collaboration with the APSARA Authority and with support from ICCROM conducted a brick conservation and stabilization workshop from June 1 – June 4th 2010. Two brick shrines (G10 and G4) were chosen to be the focus as they represent brick shrines that are in several conditions. To protect them from any additional loss both limited shoring and protection from direct exposure to the environment was carried out in January 2010. Probes have been carried out to determine the stability of the ground on which the shrines rest and limited tests of the condition of the laterite foundation base stone were implemented.

In addition, small scale samples of brick, stucco, mortar and pigmented washes were taken for testing and a weather station was installed. A detailed condition survey of the chosen shrines has been undertaken to complete documentation of existing conditions prior to the workshop. Information acquired in advance to the workshop is compiled in a booklet that will be made available to the public on the WMF website.

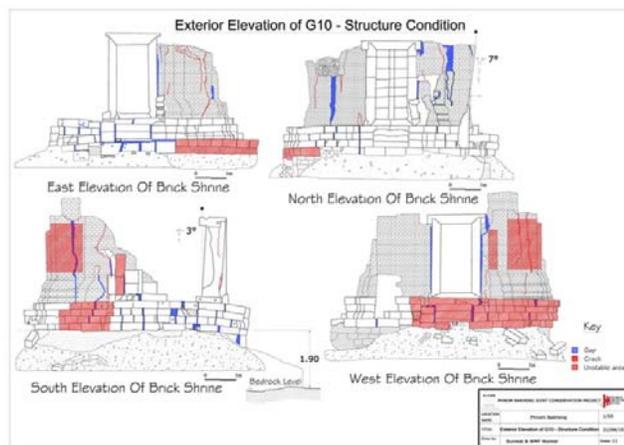


Fig 10: Structural Condition Survey of Brick shrine G 10

The workshop brought together UNESCO Ad Hoc Committee members, local experts, international experts who have had expertise in this subject at Angkor as well as international experts specializing in the field of brick monument stabilization and conservation who have never worked at Angkor before. The goal of this workshop was to review and prioritize the threats to the brick shrines at PB and begin to develop potential options for the in situ structural stabilization and coordinated material conservation issues.



Fig 11: Brick shrine Stabilization and Conservation Workshop
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Fig 12: Site visit to Phnom Bakheng during workshop

The team made site visits to previously restored brick shrine sites within the Angkor Park and evaluated how previous techniques applied might or might not be of use at PB. The team also visited a kiln near Angkor to observe how bricks are made today to explore sustainable repair options.

As a preliminary outcome of the workshop major topics to follow up on were identified:

- Examination and prioritization of past and present mechanisms of structural/material deterioration.
- Determine if any additional material analysis/ testing/ monitoring may be necessary to understand or target the above mechanisms.
- Discuss overlapping issues for structure and materials conservation, impacts and management.
- Design potential treatment options.
- Design potential small scale pilot projects (mock ups) to help refine and decide final treatment options.

WMF will be pulling together all the information generated and with the APSARA National Authority determine what additional testing, site investigation and field work will be required to begin this most important work at PB. It is anticipated to begin to implement pilot projects in representative locations with both local and international professional and craft experts in order to fine tune methods and materials end of 2010. Results of the workshop will be published on the WMF web site and will be distributed to all international team members.

5. Emergency Consolidation of Figurative Carvings at Central Shrine



Emergency consolidation and partial stone conservation of the Apsaras and figurative carvings at the central shrine have been completed in March 2010. The intervention included documentation of the existing condition, the structural reintegration of areas in advanced state of deterioration with the use of fiberglass pins, structural adhesives and fills, and the careful documentation of all interventions. The project has been executed successfully in collaboration with the APSARA National Authority Stone Conservation Unit and resulted in the stabilization of the figurative carvings and Apsara reliefs.

Fig 13: Central Shrine APSARA relief after Emergency Consolidation

6. Archeological Excavation

The archeological excavation in the field in front of the South side of the East elevation in collaboration with the APSARA National Authority has been completed. After careful documentation of findings the excavation trenches in front of brick shrine G4 have been backfilled to protect the archeology that will remain in-situ. At current excavation continues along the north elevation to a location that is a responsible termination point of this phase of work. The main objective of this excavation is to unearth fallen off stone blocks that are to be returned to their original locations in the wall during the restoration of this section, and to open natural water drainage ways as an initial intervention towards improved water management at Phnom Bakheng.



Fig 14: Fallen off stone blocks at the West Facade

In the view of the planned site management workshop WMF in collaboration with the APSARA National Authority conducts a condition survey of the bedrock level of the entire hill plateau.

The APSARA archaeologist who works with WMF at Phnom Bakheng is currently reviewing his findings with international experts to complete the final report. The unearthed objects are inventoried, documented and analyzed. Amongst artifacts are some interesting Chinese ceramics that have been presented to experts working with other groups in Angkor. Results of these consultancies are currently being processed and will be presented in the final report of the archaeological intervention within the restoration project. Furthermore, we hope to select some of the pieces for further study and publication as a contribution to the research on Post-Angkorian settlements in the Angkor Park.