

# PREAH KHAN CONSERVATION PROJECT

HISTORIC CITY OF ANGKOR

Siem Reap, Cambodia

REPORT VII  
FIELD CAMPAIGN IV

## **APPENDIX A**

INCLUDING :

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Mission Report: *Structural Repair and Consolidation*, P. Gavrilovic

Mission Report: *Conservation of Stone at Preah Khan*, P. Pagnin

*Preah Khan Stele K 908* translation

Work Plan for October 1996 - September 1997, J. Sanday

April 11, 1997

The World Monuments Fund, New York

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#### **APPENDIX A**

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## **APPENDIX A, SECTION 1**

Preah Khan Conservation Project for the World Monuments Fund

REPORT VII  
FIELD CAMPAIGN IV

Mission Report: **Structural Repair and Consolidation**

Dr. Predrag Gavrilovic

Siem Reap, Cambodia

October - April 1996

## PREFACE

Presented briefly in this report are the activities in the field of structural stabilization done in 1996. This report should be incorporated in the final report.

## ACKNOWLEDGMENTS

The author wishes to express his gratitude to WMF for the entrusted work. He is also indebted to architect John Sanday, Project Director, stone-conservator Mr. Paolo Pagnin, and Cambodian architect-conservators Mr. Morin, Ms. Soma, and Poly for their cooperation.

## INTRODUCTION

Structural stabilization and conservation were intensively carried out within the reported period, applying the already adopted methods and materials presented in the previous reports. In this period, the new materials - polypropylene and fiber glass reinforcement have been used to a limited scope. For these materials, simple tests have also been carried out.

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## 1. STRUCTURAL REPAIR AND CONSOLIDATION

Presented briefly in this part of the report are activities on structural repair and consolidation carried out in the period October 1995 to April 1996. Some of the activities have partially been presented in the previous report. Presented herewith shall be some specifics in the process of reconstruction that shall be supplemented by the Director of the Project as to those activities that have been performed in the period April to October 1996 (e.g., Hall of the Dancers - east-south enclosure wall with the east door or the enclosure wall IV where activities are still being carried out).

### 1.1. Hall Of Dancers - East-South Enclosure Wall With The East Door

As found condition, analysis and diagnosis. As already mentioned in the previous report (Report 1995), survey of the south enclosure wall with the east door was done in October 1995. Based on analyses, this part was evaluated as highly critical because of two reasons: (1) the east door is unstable and it is situated on a main communication direction representing a threat for the visitors, and (ii) the inclination of the wall is such; that it is totally unstable and threatens to develop a progressive collapse of the whole part of the complex at any moment. Justification of the work to be done is that consolidation of a part of the wall (the corner) has already been done (south east section).

*Consolidation, repair and stabilization.*

The process of dismantling has been carried out further mainly between the two main vertical cracks, up to the floor level. In this phase, large deformations in soil have been observed leading to a decision to continue the process further by demolishing up to foundation level. Interventions on the foundation structure are necessary for stabilization and flattening which is a prerequisite for rebuilding of the wall in vertical position. During April - October, the wall was rebuilt and activities on the east door were resumed.

### 1.2 East Gopura IV- South West Portico

West part of the portico is collapsed, one single column is standing alone and another is connected by a lintel beam with the main structure. Part of masonry above the lintel beam was separated and unstable.

Consolidation, repair and stabilization. In October 1995 detailed record was done. A stable part of structure was dismantled and rebuilt with new connections to the massive, central part of the monument. In the process of consolidation, methods for re-establishing the connection between the cracked stones and part of wall were applied, steel anchorage and epoxy grouting inside (invisible) of wall were used.

### **1.3. East Gopura IV- North West Portico**

As found condition, analysis and diagnosis. General condition was good. On the north side the vertical gap was very large, producing horizontal pressure and local compression failure on the facade column.

Consolidation, repair and strengthening. Partial dismantled and rebuilding was performed on the upper part of the roof structure with consolidation using steel elements. On the floor level, consolidation was performed using polypropylene clamps.

### **1.4. Column And Corner Of The Central Tower**

Location and found condition, diagnosis: Ruins of the temple are located in east-west direction, east of the central tower. EFEO performed basic consolidation on columns and door lintels. The central column was repaired by cement mortar and classical reinforcement as clamps.

Consolidation, repair and strengthening: The process of repair and consolidation is shown on the Photo 1.4.4. Due to the specific type of damage, the column was reloaded and lifted-up, while consolidation and strengthening was made by steel dowels and epoxy mortar. After structural consolidation, repair and strengthening of column, upper part of the structure was rebuilt. In the same time the corner east wall was consolidated.

### **1.5. Enclosure Wall IV - North East Section**

In the Report VI - field campaign IV - present condition and location were presented, as well as recommendation for structural intervention. In October 1995 and January 1996, detailed design was performed on process on consolidation and stabilization with detailed analysis. Consolidation of the foundation and the first level of the wall was necessary and use of reinforced concrete in that part was reasonable. The process of rebuilding continues on stable base and with the same materials and way of construction.

### **1.6. Stabilization Of Garudas**

Methodology of stabilization of Garudas should be established due to the time of reconstruction. General principles have been recognized and pointed out according to the level of damage of the sculpture. For structural point of view, level of foundation should be consolidated and in the process of rebuilding, some connections between stone should be incorporated.

## 2. RECOMMENDATIONS FOR STRUCTURAL INTERVENTION

The critical structures requiring urgent action to prevent collapse were again inspected during October 1995, March 1996 mission. The buildings and zones of the site identified below are considered dangerous and require urgent intervention. A decision on the scope and level of protection (whether only remedial solutions or longer term interventions) should be made on the basis of funding availability.

### 2.1. The Dharmasala Hall

A detailed description of this structure and survey of its condition are contained in Report IV, Preah Khan Conservation Project, Field Campaign I, Appendix IV/C, as well as Chapter IV of this report. The structural stability of the Dharmasala Hall is in a critical state. In March 1993, vegetation was removed from within and around the structure and it was shored using timber props. Further inspection in March 1994 revealed that the shoring was insufficient and that further deterioration has occurred: fallen blocks in the central area, new cracks in wall and beams and separation of portion of the building, most notably its east facade.

As a first most urgently needed measure, carefully designed metal scaffolding was erected on the east and west sides to augment existing timber supports. The scaffolding was designed so that it can be used when the actual conservation intervention is undertaken. There is a good probability that the structure will collapse in the near future - during heavy monsoons - unless urgent measures are taken for its protection. In this report two alternatives have been proposed: repair, consolidation and conservation, or dismantled and rebuilt. A detailed design for repair and conservation of this structure must be developed before any long term conservation work is undertaken.

#### Alternative 1

Stabilization, Partial Reconstruction, Repair & Strengthening:

- \* Strengthening of foundations with reinforced concrete ring beams and slab.
- \* Partial dismantling of east and west parts and rebuilding.
- \* Consolidation and repair of all structure.

#### Alternative 2

Dismantling and Rebuilding of entire Monument:

- \* Dismantling entire monument including foundations.
- \* Building of a new foundation.
- \* Rebuilding of monument in original shape.

## **2.2. Hall Of Dancers - West North Part**

It is necessary to clear and consolidate all west north part of Hall of Dancers as a critical region of Hall of Dancers.

## **2.3. Hall Of Dancers - SW Corner Of Enclosure Wall With Portal Frame**

Urgent intervention is needed because of very unstable position of corner - stabilized by steel ties - which are not appropriate.

## **2.4. Beam - Column Joint In West Gopura IV**

Very critical beam column connection which needs consolidation after the failure of previous EFEO intervention.

### 3. NEW MATERIALS FOR CONSOLIDATION TESTING & RECOMMENDATION

Starting from January 1996 until April 1996, stone conservators used two kinds of new materials--polypropylene and fiber glass reinforcement. The use of new materials is acceptable, in principle whereat it is necessary to define the characteristics of the material (from the aspect of bearing capacity and elasticity) as well as the chemical-physical characteristics from the aspect of interaction with the original material which, in the concrete case, is stone.

#### 3.1. Polypropylene

Polypropylene straps composed of fibers with diameter  $d_{3D}$  20, 25 and 30 mm have been applied. They are of an Italian make (more details on the chemical composition and mode of preparation is given in the report by the stone conservator - Mr. Paolo Pagnin). Presented here will be the bearing characteristics as are the tensile strength  $t_{en}$  2000 kg/cm<sup>2</sup>, the elasticity modulus  $E_{3D}$  10 x 10<sup>3</sup> kg/cm<sup>2</sup>, and the bond capacity of cement mortar  $c_{cm3D}$  6 kg/cm<sup>2</sup>. From the above characteristics, it may be concluded that the material has a high tensile capacity and high elasticity capacity (low elasticity modulus).

The material has been used for connection of broken stones or stabilization of unstable stones and their connection to a stronger mass, simulating the "clamps" effect. In April 1996, simple field tests were done where cement and epoxy mortar were used as a bonding material field test of propylene clamps. The results show that the application of cement mortar is inefficient due to loose connection and the aggressive nature of cement. Better results were obtained when epoxy mortars were used. Therefore it is recommended that this bonding material be used with an anchorage length of  $3d$ , where  $d$  is the diameter of the strap. Another way of possible application of this material could be temporary stabilization from the outside - as a tie. These possibilities and the anchorage problem should be investigated during the next mission.

#### 3.2. Fiber Glass Reinforcement

Reinforcement with a diameter of  $d_{3D}$  10 mm (with no defined characteristics) has been used. A piece of such a reinforcement has been taken and tested in the laboratories of the University "St. Cyril and Methodius" in Skopje, Republic of Macedonia. A standard test under tension of  $t_{en}$  25.5 kN/cm<sup>2</sup> has been performed. The result has been a brittle failure and no ductility capacity. Due to the smooth surface, the bond capacity is low wherefore it is recommended that epoxy resin or epoxy mortar be used as a bonding material. Mass use is not recommended prior to detailed investigation. It is allowed that fiber glass be used as a dowel and for secondary (non-structural) elements.



#### 4. URGENT TEMPORARY CONSOLIDATION

Special plans made of the site by both the architects and the structural engineer denote the structures requiring urgent temporary shoring and repair. It should be noted that structural shoring using locally cut timber is only temporary and while in place it must be carefully monitored on a regular basis. Where the timely repair of these structurally unstable features of the site cannot be affected (due to the sheer number of problems) more durable supports should be installed until proper attention can be given to all of the pointed specially propped structures or components.

## APPENDIX A, SECTION 2

### REPORT VII FIELD CAMPAIGN IV

#### Mission Report: **Conservation of Stone at Preah Khan Temple**

Paolo Pagnin

Siem Reap, Cambodia

1/12/96 to 1/27/96

## **Introduction**

Within the complex project of temple restoration undertaken by the WMF, it is felt that there is a need to perfect the technique of bonding the broken stone element and above all to instruct a team of staff to carry out this kind of work. This mission was launched to satisfy this demand and lasted for 16 days from 1/12/96 to 1/27/96, on behalf of the WMF and directed by John Sanday.

The restoration project at Preah Khan is highly complex and varied, including many different types of activity: the control of vegetation, the consolidation of structures, the dismantling and reassembly of parts of buildings in danger of collapse, etc.

## **The Mission**

This report, the result of a two-week mission in the field, allowed the author to develop and teach proper methodologies for the restoration and presentation of the sandstone non-structural elements of the site. The main activities were:

- the survey, evaluation, and study of all activities at the site together with associates John Sanday and Dr. Predrag Gavrilovic
- the teaching of general principles of stone conservation to the permanent staff and other local architects
- the improvement of techniques of stone cutting and training in the use of appropriate tools
- testing of the proper texture to adopt in the case of the insertion of new stone
- testing and explanation of the technique of preconsolidation
- testing and explanation of the various techniques of filling stone fractures
- testing of the use of polypropylene materials for bonding and reinforcement of stone
- the initiation of a program for the survey and mapping of all surface decoration at Preah Khan, including polychrome renderings and painted stuccoes

Research and interventions were undertaken to address problems associated with the gluing of broken sandstone blocks and the use of lime mortars. For economic and practical reasons, only materials locally available were employed except for the fumed silica, fiberglass rods, and polypropylene rope which were carried by the author from Italy.

## Main Activities

Some work on the bonding of stone blocks was done in order to avoid any further movement after the reconstruction and to identify the most suitable techniques for this type of stone and architecture.

Tests were conducted as part of the training program, and once a preferred method is found all staff should be appropriately trained.

The materials used most in antiquity for bonding were iron and bronze; the Khmers used iron in the shape of an H inserted between two stones without any mortar. In other cultures, like the Greek and Roman, the clamps were made of iron or bronze in the shape of an [ and were often imbedded in molten lead. The bronze and copper had better performance characteristics because these materials do not expand when corroded, while iron will expand due to oxidation and thereby break apart stone blocks.

Our bonding tests were done using very modern polypropylene ropes embedded in a mortar. Due to the flexibility of the rope, we used short clamps to reduce the possibility of movement. Tests were carried out on two blocks of sandstone, and through each was drilled a small hole slightly narrower at the bottom than at the top, with an approximate diameter of 5 cm and a depth of 8 cm. A groove was carved between the two holes to permit the passage of the 3cm diameter rope. The rope was then inserted into the holes and fixed with cement and a sand-based mortar in a 1:3 ratio. In other areas, tests were conducted using epoxy resin filler.

Given the brevity of the mission and the length of time needed for the setting of the mortars, these tests were left to be assessed subsequently by Dr. Gavrilovic.

Techniques for the filling of fractured stone in situ were also examined during this mission. We noticed that in some cases the point of contact between large blocks of stone, such as pillars and lintels, was very small due to some movement within the building. We decided the instead of dismantling the structure, the gaps should be filled with some molten lead which was subsequently compressed to achieve correct load distribution. This method was included in the training program.

This technique was well known in antiquity, and it creates good contact between two large stone elements while avoiding undesirable friction:

- the fracture must be sealed with clay, molded so that there is a suitable opening at the highest point possible where lead may be poured into the gap; an exit channel must also be left so that air can escape during the pouring operation
- the lead must be melted down in a crucible and poured into the opening
- the stone and the tools must be dry before performing this operation

- the pouring of the lead must be carried out so that a single mass of metal is formed
- during the fusion and the pouring of lead, protective eyewear and leather gloves must be used
- the conservator must be upwind during the pouring and fusion of the lead to avoid inhalation of dangerous fumes
- when the lead has melted and is ready to pour, it is good to add some wax to reduce the possibility of the lead spurting

The general principles of stone conservation were discussed with the permanent staff, including the causes of decay, how to recognize and conserve ancient and original patinas and other elements of polychromy, techniques of preconsolidation, and many other conservation treatments relevant to these monuments. There have been new developments and improvements in the types and methods of moving large blocks of stone, such as the coating of implements with lead to avoid damage to stone surfaces during transit. Techniques for stone cutting have also been improved through the use of new tools and training in the basic tenets of the craft.

Working groups were set up so that the workers could become specialized in a single operation and work autonomously on complex conservation problems. Some general observations to be habitually applied on site by the permanent staff are detailed below.

### **The Basic Principles of a Good Bond**

The bonding of detached part. Bonding means the re-attachment of two or more detached parts of an object (in this case stone), creating a solid bond between them. In order to obtain this result it is necessary to use an adhesive and, in the case of larger pieces, the insertion of dowels.

The dowels should be made of an inert material such as stainless steel or fiberglass; iron must be avoided at all costs. There are numerous examples of the lethal effects of this material when in contact with stone: for example, the columns of the Parthenon in Athens have been cracked and sometimes literally burst apart as a result of the expansion during the oxidation of the iron dowels that were inserted during restoration carried out at the beginning of this century.

The best bonding agent, especially when static resistance has to be achieved, is Epoxy Resin. This is a bi-component resin which, after the reaction, catalyses into a solid mass with excellent mechanical properties. It is, however, irreversible.

Each epoxy has its own specific catalyst and the quantity of resin and catalyst varies from product to product. The mixing ratios and pot-life (workability) must be respected. This resin is particularly sensitive to ultra-violet rays and will tend to turn yellow with time when exposed to light. It is therefore good practice to leave the resin a few millimeters below the surface of the stone and to fill the remaining space with a lime based mortar.

Correct application of the resin should observe the following points:

- insure the stones are dry
- insure that the surfaces are thoroughly cleaned and that any loose fragments have been removed; the surface must be rough to provide a key
- to increase the holding power it is advisable that a stainless steel or fiberglass pin be fitted between the two parts being glued, and the use of iron pins should be avoided
- before gluing, the correct position of each individual element must be verified
- never prepare the resin in direct sunlight or in a small container; this will excessively accelerate the reaction
- the work area has to be clean and everything must be ready
- the resin/catalyst ratio and the pot-life must be respected
- the fluidity of the resin has to be controlled in order to avoid leaking
- the resin should be spread over the entire surface, and even contact should be maintained between the two parts; they have to be squeezed together to bring out the excess resin
- the holes, prepared for the insertion of the pins, must be filled with the resin, starting from the bottom to the top, in order to avoid trapping air inside
- glue residues must be removed from the surfaces and from the edges of the joint, so that the resin cannot be seen
- any gaps should be filled with lime based mortar and colored sands

## **The Epoxy Resin Available on Site**

It was first necessary to identify the characteristics of the epoxy resin available on site, Sika 731 and 752. Sika 731 is a quite thick, isotropic epoxy adhesive suitable for joints of some thickness. Sika 752 is a very fluid epoxy for injection.

Both resins have a long pot life of 60 minute and an initial set time of 24 hours with a final set time of 7 days.

The methods of application are varied and the problems encountered included excessive fluidity of the 752 and the excessive density of the 731. Resin 752 was thus modified to the required density using fumed silica. Fumed silica is a light inert powder which, according to the quantity added to the resin, renders it more or less dense without altering the mechanical properties too much and above all without creating bulk.

## **Insertion of the Pins**

The pins, as already described above, serve to increase the adherence and the surface of contact between the two elements. Often, the problem is locating precisely the meeting point of the two holes in order to insert a pin; one method is, when making the first hole, to insert a piece of chalk in it and to then place the element to be stuck exactly in the desired position in such a way that the chalk leaves a mark where the second hole will be made. In addition, it is necessary to find the exact inclination of the two holes to be made; one technique is, to bring together the two elements to be stuck and mark both, in pencil on two sides, (for example, the north and to the east) with the axis of the hole to be made. During the drilling, two people (to the North and to the east) must assist in controlling that the axis of the drill bit is the same as the line previously marked on the stone.

Another very important point which dictates not only the success of the exercise, but also that a good bond is achieved, is the complete filling of the hole with resin: this is particularly significant when the dowels also have an important static function, as with broken lintels. In this case the resin must be sufficiently dense in order to allow flow. The technique to employ is injection of resin with a large syringe (such as the brass ones used by mechanics for injecting oil into car engines) and insuring that the filling will start from the bottom of the hole in order not to trap air bubbles inside which otherwise, at the moment when the dowel is inserted, would push out the epoxy and leave pockets in the internal cavity. In the event of very deep holes it is necessary to add a rubber tube to the syringe in order to reach the bottom of the hole. In addition it is necessary to remember that it is not useful to completely fill the hole with resin as the dowel also assumes some volume.

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## **The Injection of Epoxy**

This method is adopted when you do not want to or cannot remove the broken element. However, it should be noted that this type of bonding is more complicated and less secure than others. The most suitable technique in this event is to:

- check first the existence of parts about to fall and fix them or remove them, documents them and reattach them.
- manually clean the crack of dirt, roots, etc. and using compressed air free the cavity of other debris (the compressed air must always be controlled and carefully regulated);
- point up the whole crack with a mortar made with lime and inert aggregate in a proportion of 1:3 (this will contain the resin and avoid seepage);
- it is necessary to decide from where to insert the resin, which in this case will be very fluid. Prepare little holes in plastic pipes along the crack at suitable points in inject the resin, using ordinary syringes and it is good practice to begin filling from the bottom (in the event of large vertical fractures, they can be filled from above);
- the cracks, once pointed, must be checked for an appropriate period to insure a good resistance against leaking;
- in the event of leakage, it is necessary to immediately intervene to block the discharge of resin using the same mortar with the addition of a few drops of acrylic resin (Primal AC33) or a vinyl emulsion (white wood glue);
- use of these resins, which increase the adhesive properties of the mortar, must be restricted to this operation and must be cleaned off at the end of the process since these resins are easily attacked by micro-organisms;
- in the case of the leakage of resin on to the surface of the stone, it must be immediately cleaned with alcohol.
- if the joints must have a great static resistance, it is useful to also insert dowels (this process must be carried out last and the hole made possibly towards the base so that the resin can set without problems of leakage and without bulking out the resin)

## Pointing in Mortar

The pointing serves to disguise the epoxy resin and, when necessary, to prevent the ingress of water. The pointing must have an appearance similar to the stones, but must also be distinguishable from the stone. In certain cases, it may be decided to keep the level of the pointing below the surface level so that it can be easily seen where the stone finishes and the pointing begins.

The great difficulty is that of color matching (the stone is a gray color with shades of ochre). Following various attempts, the mix which was nearest to the original was made up of lime, coarse and fine powder, cement, soils, and a little ash in a ratio of:

1 - 1 - 5 - 1 - 1 - 0.5

The mix required for pointing of the laterite was not yet defined; other tests must be made. The most similar mix found to date is one with lime, coarse and fine laterite powder, in a ratio of : 1 - 1 - 2. It is necessary to try the addition of brick powder to give a redder tonal quality. To carry out good pointing it is necessary to prepare a mix which is not too wet dampen the surface of the pointing, tamp the mortar well with the spatula, clean the surrounding edges well, and avoid it drying out too quickly.

## Conclusion

All these techniques were demonstrated and applied to some fractured sculptures, for example: the “draper”, the mythical guardian on the east gopura, to which were reattached various pieces (more than 15) found in the vicinity, so successfully and completely reconstructed a right arm and a staff; on the Garuda to the East and many other elements.

These processes were always carried out with local personnel and with the intention of forming a team able to operate autonomously. More detailed explanations and discussion of the problems of conservation at these sites was conducted with the three architectural students, the assistant architect Mr. Morrin, the head of personnel Mr. Arung, the architect Caroline Schweyer, and Mr. John Sanday, director of the project.

It is important to note that the staff is very quick to learn, that they work with great enthusiasm, and that each of them has an outstanding attitude and a great ability, as does the chief of the workers, Mr. Oak Somun.

## **Future Goals**

Due to the quantity of work carried out within this project and given the high standard attained by the personnel, I believe that it is important to develop and to perfect some aspects of the conservation with more attention to detail. On this subject I suggest some development for the future:

- check, develop and perfect the technique of bonding, further with the use of other adhesives which may speed up the work
- check, control and increase the understanding of mortars
- perfect the technique of fixing with the use of new materials such as Polypropylene rods or copper bars
- initiate the local consolidation of severely altered stone with ethyl silicate, checking the results and teaching the staff the technique
- instruct all personnel in the importance of the aesthetic presentation of interventions, with more attention to detail
- study the opportunity of making a mortar or finding an alternative material to take up the surface of the stone during minor reconstruction and the consequent distribution of static stress
- continue to check the results of the cleaning with a biocide so as to have, when necessary, objective data and products fit for use
- study the action of rain water in relation to the phenomena of micro-biological attack and attempt, if possible, to slow down growth, especially in the sculpted areas within the temple, hopefully using only the drip stones and the physical barriers
- study how to isolate the eventually cement sub-foundation, using the non-capillary properties of the laterite and avoiding the impermeable barriers such as those in plastic
- study and define the philosophy and methodology of intervention in cases where it is necessary to integrate where stones are missing (materials, methods, texture)

- check all the data held to present to a congress to sensitively focus attention on this project and to demonstrate that the approach of minimal intervention is actually the most appropriate philosophy of restoration
- the sufficient study of materials and methodology does not exist in these countries and therefore, the philosophies and methodologies of restoration are so disparate that I believe it is truly necessary to address the various experiences in an international congress, hopefully in Cambodia
- enroll the assistant architect, Mr. Morrin, in an intensive course of architectural conservation at ICCROM in Rome in order to complete his development

## Preah Khan Stele

### K 908

REQUIRES FURTHER EDITING (PJS)

## INTRODUCTION

The great Preah Khan Stele was discovered on the thirteenth of November 1939 by Maurice Glaize and was published in the *BEFEC* XLI, 1941, by Georges Coedes (pp. 255-301). It is worth noting that the article also presented reproductions of the stampings. One should also notice that G. Coedes did not include this edition in his "Etudes cambodgiennes." The introduction, to be seriously revised today, is particularly long, filling in pages 255-270.

## TRANSLATION

### FACE A

Note: the first 18 stanza are identical to the Ta Prohm Stele, with the exception of the Stanza XV, which is slightly different: *cf.* the notes to the same Stanza of the Ta Prohm Stele about this matter.

I. "The one who is the Blessed of whom the body of "enjoyment" and "transformation" as well as the body of *dharma* come out with the abundance of the "provisions"<sup>1</sup> and who is (therefore) shared, who is sensitive<sup>2</sup> for the ones who participate in the body of Jina and the sons of Jina, to This One, the Buddha, the refuge of beings, homage to Him!"

II. "I salute the indubitable<sup>3</sup> Path [Way?] towards the Bodhi "without superior", unique "eye"<sup>4</sup> without screen for the vision of the Reality, the Dharma, who must be saluted by

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<sup>1</sup> "provisions": *Cf.* Coedes' note (n. 2, p. 27). "The provisions of good actions (*punyasambhara*) and of knowledge (*jnanasambhara*)."

<sup>2</sup> "sensitive": here, *gc* = *indriya*, therefore *gocara* is "perceptible by the senses and the knowledge" (Bhatt's note). G. Coedes had understood: "which is the domain of ...", other possible meaning, but maybe less good in the present case.

<sup>3</sup> "indubitable": *nirutara*, "unquestionable" (Bhatt). Literally "without higher". G. Coedes' "supreme" is very satisfactory.

those who must be saluted by the Immortals<sup>5</sup> known in the three worlds, the sword which lacerates the group of the six interior enemies<sup>6</sup>."

III. "Although having completely relieved her contact with what block the path of Release, she continually maintain her contact with the righteousness [**Good, Well, Well-being, bien?**] of others; teaching to others the precept of Jina sang together<sup>7</sup>, the Community, which goal is the birth of the Righteousness [?], let Her protect you!"

IV. "Unique source of the creation of the desired fruits by the three worlds, of which the branch-arms are decorated with twig-pieces [**ramilles-bouts?**] of fingers, of which the body is surrounded with a young [**liane-le cordon d'or?**], Lokesvara is victorious, Parijata alive!"<sup>8</sup>

V. "The one who walks at the front of the Dharma of the King of the *muni*, rich with "qualities", the one who must be observed<sup>9</sup> by the ones who are well-advised thanks to the eye of the Science, the one who has completely rejected the net of the Illusion, with "love", the Mother of the Jina[s?], salute [**bow to?**] her!"

VI. "There was a king who shall be honored by the kings of the earth carriers [**bearers?**] of the entire stick [**pole?**] of Manu, the best of the wises, son of Srutavarman<sup>10</sup>, the king

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<sup>4</sup> "eye": *drsti* which also means "doctrine"; but in our *pada*, everything is put on a visual level (cf. *darsana* and *niravarana*).

<sup>5</sup> *vandyavandya*: one could also understand it as a frequentative. However, Bhatt has pointed out to me that *amaravandya* means "Buddha" [it is not in the Monier-Williams nor in the *Sabdakalpadruma*] and that one can thus more simply translate "who must be saluted by the Buddha[s?] known in the three worlds."

<sup>6</sup> G. Coedes quote that the "six interior enemies" are Desire (*kama*), Anger (*krodha*), Cupidity (*lobha*), Disorder [**deviation?**] (*moha*), Pride (*mada*), and Envy (*matsarya*).

<sup>7</sup> The emphasis on the word *sanga* probably comes from *sangha*.

<sup>8</sup> G. Coedes proposes a double meaning in which I hardly believe (note 3, p. 27). Theoretically the pun is probably possible, but I don't see why one would refer to the paradise of Virasaiva in the context, despite the given explanations.

The reference here must be to the figure of Lokesvara with 8 arms which could quite well figure a tree.

<sup>9</sup> G. Coedes translates *niriksyam* by "can not be conceived," giving the usual negative meaning to the prefix *nir-*; in fact, this one first has the meaning of "outside of" and *niriks-* never has, according to M.-W., a negative meaning. This negative meaning would in fact not be suitable at all here and one sees it well by G. C.'s commentary which he has thought necessary to add as a note about *adhyatrnadrsa*, which he translates "meditation turned towards the personality," where as M.-W. proposes for this expression: "knowing the Supreme Spirit" [in English in the text]. The pandit Bhatt has proposed to me "by the sight of Knowledge" [**in English in the text**].

<sup>10</sup> Srutavarman apparently appears here, for the sole beauty of the verse and to make a pair with *srutavatam*. We also know that this word means "[**savant?**]".

Sri Sresthavarman, the best by his brilliant deeds [acts?] of glory, origin of a lineage of immaculate kings."

VII. "He who was a sun in this firmament which is the line of Sri Kambu<sup>11</sup>, born in this eastern mountain which is Jayadityapura<sup>12</sup>, He has awoke the lotuses of the hearts of the alive, treasure of splendor, supreme King of Sresthapura."

VIII. "Born in the ocean of Her maternal<sup>13</sup> family where the moon shined -- Her fame never blamed<sup>14</sup>, she shined like Laksmi, she who walked at the front of the good women, Kambujarajalaksmi."

IX. "Husband of the Earth at Bhavapura, Bhavavarman Deva<sup>15</sup>, Him of which the shining beauty has charmed his kingdom [or of whom a shining sparkle illuminates the disk], full of skills [or full of *kala*], was the author of the birth of a family of kings, (and), like the One-of-immortal-ray, propitiate [alleviate?] the suffering of His subjects [or the warmth of creatures].<sup>16</sup>"

X. "The one who had conduct, spark, valour irreproachable in all, who is born of the line of this one, who created a position for all sorts of people<sup>17</sup>, the king Harsavarman<sup>18</sup> was

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<sup>11</sup> In K 958 ([jamb of Prasat Kok Cak, St. II [IC vii, p. 141]), Srutavarman is presented has the own son (*putra*) of Kambu, qualified as Brahmarshi.

<sup>12</sup> Jayadityapura: nothing indicates that this city (-State?) was located to the east of the Khmer empire.

<sup>13</sup> Logically, bringing together the given of the Baksei Camkron inscription K 286, where Kambu is the husband of Mera, with the ones of K 958 [the two inscriptions date from the reign of Rajendravarman], the maternal family of Sresthavarman should be the one of Mera.

<sup>14</sup> "never blamed": one must understand *an-avagita*. G. C.' translation, "praised without respite" is difficult to understand.

<sup>15</sup> The question of knowing of which Bhavavarman it is about here can be asked: we do not know the name of the kingdom of Bhavavarman III, but the two first ones reigned over Bhavapura, we know it now. Given their personalities, one is firmly tempted to chose the first one.

<sup>16</sup> Here is a stanza with a double-meaning, yet common in Khmer epigraphy. But the two previous stanza have brought quite many historic mistakes, following a wrong interpretation by G. Coedes: not knowing what to do with the previous queen, he made her the wife of Bhavavarman. Followed a series of speculations starting from the Fou-nan and the Tchenla and Chinese given [facts?]. It was simply bad thinking of the plan of this section, yet clear, as we will see, and without any difficulties. Furthermore, Kambujarajalaksmi would be a flagrant anachronism in the VIth century, as P. Dupont had already underlined it.

<sup>17</sup> Translation indicated by Bhatt, but I still do not understand *janina*.

<sup>18</sup> The big problem is to understand here of which Harsavarman it is about, or more precisely if it is about Harsavarman III, the only one known in this period. G. Coedes first refused it, naming him Hasavarman IV in the publication of the Ta Prohm stele; but he revised his position and has absolutely accepted it, as far as in the *Etats hindouises*.

Yet, given each ones dates, considering that the here praised king was the grand-father of Jayavarman VII, it seems impossible to accept this thesis: Harsavarman III died at the latest in 1080 and this date is thus the ultimate possibility for the birth of Jayavarman VII's mother; this would have given



the destructor of the Joyce of the enemies in the battles (and) had the mass of His glorious acts spread by the mouth of cardinal points."

XI. "By this king in this<sup>19</sup> queen<sup>20</sup> was conceived Sri Jayarajacudamani, as well as Gauri (was conceived) by the *guru* of Gauri [Himalaya] in the supreme Devi, she who is white of the moon ray of her glory."

XII. "This one was like Vagisvari by the excellence of her words, like Dhatri by her firmness, like Kamala by her beauty, like Arundhati by her blameless [= irreproachable] conduct, like Maitri incarnated by her generosity, etc."<sup>21</sup>

XIII. "Having obtained the supreme royalty at Srimant Yasodharapura, the king Jayavarman-deva (VI), after having defeated the stream of its enemies, stuck in all directions until the sea pillars of renown, him of whom ancestors resided at Mahidharapura."<sup>22</sup>

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her at least 40 years old in 1120, which would seem an ultimate date for the birth of Jayavarman VII. One sees that this would make this latter arrive quite old on the throne...

Thus a Harsavarman IV must have existed, which one exert to see as a minor king; but the praise brought here make me seriously doubt of it. Going back backwards, if Jayavarman VII was born in 1145 (last possible date due to his action in 1166), his mother could have been born at the earliest around 1125, and his grand father around 1105. One could thus think of one of the two kings eliminated by Suryavarman II, the other one being, we know it, Dharanindravarman I.

<sup>19</sup> *tasyam*: here is the word forgotten by G. Coedes, which gave way to the mistranslation on Kambujarajalaksmi. *Mahisyam tasyam* can only refer to this woman, who simply was the maternal grand mother of Jayavarman VII. There is not any anachronism anymore.

<sup>20</sup> "great queen" in [chez?] Coedes translates *mahisi*.

<sup>21</sup> Maitri is the wife of Dharmā; Arundhati is the one of Vasistha, rsi of the [vedique] legend; Kamala is Laksmi; Dhatri means "earth", but I have not found anything about a mythological figure of this name.

I recall that it is about Jayarajacudamani, daughter if the king Harsavarman (IV?) [the question mark relying to the fact that he could be considered as the "supreme king" or not, as the habit (?) is to only number those kings.

The stanza appears, to us in any case, as pure *prasasti* and there does not seem to be any allusion to a real fact utilisable for history.

<sup>22</sup> We are here completely changing lineage [in other inscriptions, this would be underlined by a word such as *atha*] and one sees that the poet has totally neglected here the paternal origins of Jayavarman VII, except for telling us in a quite vague way that the "ancestors" of Jayavarman VI came from Mahidharapura. One has here something very much comparable to what we have in Yasovarman's genealogy, with the emphasis on the early maternal lineage and the fluffy paternal origins. There should not be a law driven out of it, but could one see there the indication of the fact that princes of badly assured lineage searched wives better "born" than themselves? It is yet a ground where one should be extremely cautious, as one most often has the impression that in the inscriptions one did not weary oneself very much about justifying by their birth the taking of power of the Khmer princes. Jayavarman VI is presented here as the first "supreme king" of the lineage.

Moreover this stanza guarantees that Jayavarman VI indeed reigned in Angkor, despite what one can say. But where was Mahidharapura located?



XIV. "The son of the sister<sup>23</sup> of this one [Jayavarman VI], splendid of modesty, was known under the name of Sri Mahidharaditya<sup>24</sup>, him who, younger brother of Sri Suryavarman (II)<sup>25</sup>'s mother, defeated the mass of its enemies."

XV. "Illuminated by this torch of a valuable and pure lineage, who is known for its excellent conduct, Rajapatindralaksmi was the one whom maternal lineage resided in Sri Suviravati."

XVI. "This (prince) and this (princess) [Mahidharaditya and Rajapatindralaksmi] had a son who honored the kings of the *dvija* [= Brahmans], who had the impetuosity [impulsiveness] of the king of the *dvija* [= Garuda] and the beauty of the king of the *dvija* [= Soma, the moon]<sup>26</sup>, of whom the perfume of extraordinary fame [renown?] (spread) in the circle of the horizons, who was the supreme king Dharanindravarman (II)."

XVII. "He himself drank the moon's nectar to repletion -- the instructions<sup>27</sup> of the Sakya --, he entirely gave the essence of his prosperity to the bhiksu, to the Brahmans and to his subjects in need, he sought to extract the quintessence<sup>28</sup> of the body without quintessence, impure residence, him who constantly bowed to the feet of Jina<sup>29</sup>."

XVIII. "This daughter of Sri Harsavarman<sup>30</sup> gave birth, from this king<sup>31</sup>, to a hero, the king Sri Jayavarman (VII) of flamboyant energy, as well as the goddess Aditi made, of

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<sup>23</sup> Affirmation here of the importance of the maternal lineage.

<sup>24</sup> *Mahidharaditya* = "Sun of Mahidhara".

<sup>25</sup> This is all what will be said about Suryavarman II in this inscription: he is thus quoted only by accident in some ways and is only qualified as *avanipala*, that is to say mere *raja*, with nothing else. This is very little for the founder of Angkor Wat, who reigned almost 40 years! One even notices a strong contrast with Mahidharaditya, who, him, is entitled a small praise, which in fact very much looks in the present case a padding. But he is not qualified as a king.

<sup>26</sup> Why this play on the word *dvijendra*? If there are not any specific allusion of historic interest (one can think of a fact of pure anecdotic interest), then one sees that the poet does not have anything of importance to say about this king, and the next stanza devoted to him hardly adds anything. And thus one can ask himself whether *adhisvara* should be understood in its strict meaning?

<sup>27</sup> *sasana*- is translated by G. Coedes "religion" which is not wrong, but seems to me to precise.

<sup>28</sup> Insistence on the word or the components of the word *sara*-, which is a game of the poet without any particular meaning.

<sup>29</sup> In the 2e *pada*, note the form °*sakṛta*°; with an *a* unnecessary for the metre and giving a non certified form in the dictionaries. "Entirely giving" meaning proposed by Bhatt.

The change of metre is probably explained by the presentation of the Buddhist profession [declaration] [profession de foi] of the king Dharanindravarman II.

<sup>30</sup> That is to say Jayarajacudamani, mentioned in the Stanza XI and XII.

<sup>31</sup> Dharanindravarman [II], celebrated in the Stanza XVI and XVII.

the *brahmarsi*<sup>32</sup>, the King of the gods who, observing the good Dharma for protecting the earth [or living in the Sudharma<sup>33</sup> to protect the cow<sup>34</sup>], killed in a fight the chiefs of the enemies by the way of millions of arrows [or by the way of the weapon "which has a hundred cutting edges"]<sup>35</sup>.<sup>36</sup>

*The original text thus starts at Stanza XIX*

XIX. "Having assembled the beauty of the egg of Brahman sprinkled with *amṛta* and having placed it with the good signs in the palace which is its receptacle, the Creator created him with love following his own genius, certainly because intended to make an "emperor" with blameless qualities."

XX. "Laksmi, from whom one says she is unstable, linked by the insurmountable qualities of her soul, he has immobilized her in the Gynaecium of his politics; having adorn her friend the Renown who moves in the directions, this one lead away to the end of the world the family of the king of the enemies."

XXI. "In love with what is correct, well known as experienced (old) for his prosperity and his good qualities, making good things, of whom the customs and the castes are well educated, destroying the enemy, having to be revered by the sovereigns<sup>37</sup>, he was known from his childhood as a Panini."

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<sup>32</sup> The *brahmarsi* is here Kasyapa, son of Marici, the eldest of the spiritual sons of Brahma. He had from Aditi the 12 *Aditya* and 21 others, *dixu* Vettam Mani [this 21 should be the 11 *rudra*, the 8 *vasu* and the 2 Asvin, but I am not sure the legends correspond; Indra is the eldest if these 33 sons and became the chief of the *deva*.

<sup>33</sup> Name of the assembly room of the gods.

<sup>34</sup> Kamadhenu-Surabhi; it is because she was crying due to the drought Indra had made and continued to make rain.

<sup>35</sup> Indra's weapon, the *vajra* (?), is called *satakotī*, according to Monier-Williams; but one does not find this name in Vettam Mani.

<sup>36</sup> The comparison of Jayavarman VII with Indra appears to me rough [**approximate**]; I have put a plural to the number of the enemies of the king, because I do not think there is a reference to the fight against Jaya-Indravarman IV of Champa, or at least not only: Jayavarman VII must also have conquered the supreme throne over other Khmer kings.

<sup>37</sup> Double-meaning: "Loving the pure tongue, making good names by the *guna*, the *vṛddhi* and the *vṛaddha*, making suffixes *kn*, which arranged the pronunciation of the Sanskrit letters, considering *durhṛa*-as irregular, for whom Shiva must be adorned, ..."

XXII. "With love, he himself gave to the Dharmaraja<sup>38</sup> 13,500 *grama*<sup>39</sup>, but the son of the Dhrtarastra<sup>40</sup>, even instigated by Krsna, did not even give five."

XXIII. "Aurvanala in the ocean of the enemy's army, fire of bush in the forest of weapons, moon for the blue lotuses<sup>41</sup>, which are the kings of the leaning enemies, his eagerness had indeed the splendor of Narayana's<sup>42</sup> weapons."

XXIV. "The enemies, who had observed in the fight the extraordinary and invincible aspect of him when he was carrying his weapons<sup>43</sup>, who closed the eyes<sup>44</sup> and from whom the snake-arms had let their weapons fall, used now, I think, the weapon called "flight", which they had forgotten for a long time<sup>45</sup>."

XXV. "The kings, having seen from front and side his black sword which he rendered marvelous in the fight, white from gold and red from blood, as frightened by the harm caused by Indra's<sup>46</sup> bow, dropping their weapons, prostrated themselves."

XXVI. "Like the pond - field of battle was corrupted, inaccessible, of which the formidable [**redoutable?**] emplacement [**location?**] was hidden by tight rains of weapons, Laksmi was becoming like a bee, describing circles in her flight around the full-blown lotus of her palace<sup>47</sup>."

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<sup>38</sup> Despite Georges Coedes opinion, it seems to me impossible that here Dharmaraja would not be the Buddha.

<sup>39</sup> One will retrieve this number in the St. CLXXVII. Starting at St. XXIII, it is the war that is described and I wonder why it mentions so soon the "donation of 13.500 *grama*" to the Buddha before talking about this war: indeed, one will come back soon to the generosity of the king and it is a fact that they are not generally described so soon in the poem. Yet, one finds the same number of *grama* in St. CLXXVII, which correspond to the total of the *grama* of St. LXXIII and CXLI. But it must be underlined that one is here in the *prasasti* and that it does not say the truth, because the indicated stanza specify that the villages were given "by the king and the owners of *grama*". I do not understand the place of this stanza, but one has further on, St. XXX, a stanza of at least as unwonted place.

<sup>40</sup> "It is about Duryodhana and his refusal to follow Krsna's advice which bounded him to share the power with the five Pandava (MBH, V, 124-128)." (G. Coedes' note 6, p. 286).

<sup>41</sup> Which flower at moonrise.

<sup>42</sup> For Bhatt, "no connection, only beauty!" [**in English in the text**]; but I would still like to find a relationship between Narayana's weapons and what is said here (cf. *Mahabharata, Dronaparvan, Narayanastramoksaparvan*, SORENSSEN, p. 511, P. C. ROY, vol. VI, pp. 455-494).

<sup>43</sup> Cf. previous stanza.

<sup>44</sup> Dazzled and frightened.

<sup>45</sup> Manifestly there is here an historical hint.

<sup>46</sup> The rainbow. For the legend of Indra's bow, see P. V. KANE and *Sabdakalpadruma*.

<sup>47</sup> Laksmi, unable to land on the pond, arrives in her palace: therefore, the war is over, as one furthermore sees it in the next stanza.

XXVII. "To his many warriors, he gave the royal residences of the enemies' kings<sup>48</sup>, resplendent from very high palaces; to the wild animals haunting his own forests, he gave, I think, the enemy's forest<sup>49</sup>; to the war prisoners, he gave his own forest, generous and showing his moral equilibrium<sup>50</sup>."

XXVIII. "To the wise men he had favored with wealth, this "political stay"<sup>51</sup> gave his own daughters, attractive by their beauty<sup>52</sup>; but the king of Cedi (did it) to Hutavaha [Agni] only after receiving as payment a portion of him<sup>53</sup> (and) Gadhi (did it) to Rcika (only after receiving as payment) numerous horses<sup>54</sup>."

XXIX. "Rama and himself have both accomplished tasks for the gods and the men: both had hearts entirely dedicated to the good of their father, both defeated a Bhargava<sup>55</sup>; the first made a road out with stone in order to allow monkeys to cross the ocean, while the second made one out of gold<sup>56</sup> to allow men<sup>57</sup> to cross the ocean of existences."

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<sup>48</sup> One sees well this way that it is about Khmer enemies, as he would not have given far abroad the properties of his enemies.

<sup>49</sup> One has here a realistic detail: the prisons were installed in the forests.

<sup>50</sup> This stanza clearly marks the end of the war, as the king is at this stage distributing rewards to his faithful companions.

<sup>51</sup> One sees well here why he is giving his daughters: even if it is a well-known fact for the kings and practiced well elsewhere than in ancient Cambodia, one observes here that the epithets are not casually distributed.

<sup>52</sup> Coedes' interpretation, bringing *dhimatsu* to *nitinilayo*, is also possible, but would render less well the opposition I further on underline. Grammatically the two are possible. Yet, if one pushes the opposition with what follows, one notices that not only do they not ask for dowry, but that his daughter are given in addition to donations of his part. One should yet maybe even translate: "despite he had honored them with richness...", a little as G. Coedes does.

<sup>53</sup> The story as it is here suggested is difficult to locate. The *Mahabharata* tells the story of Sudarsana, daughter of Nila (*alias* Duryodhana, king of Mahismati), of whom Agni fall in love with and whom he married; his father had yet required from Agni that he always stood next to him. Yet this king, as G. Coedes underlines it, was not king of the Cedi. Was there another existing version of this story available to the Khmers?

<sup>54</sup> Ghadi was the son whom Kusanabha obtained his wife from, l'*apsaras* Ghrtaci, after having had 100 daughters (VETTAM MANI, under *Gadhi*; cf. *Mahabharata*, III, 125).

Ghadi had a daughter, Satyavati, who Rcika, a famous wise man, wanted to marry. The father required the donation of 1000 horses with black hears. Rcika made a sacrifice to Varuna, who helped him and made the 1000 horses come out of the Ganga. He gave the horses, married Satyavati then took her to the forest (VETTAM MANI, under *Rcika*).

G. Coedes says that Rcika was son of Bhrgu; in VETTAM MANI, he is only his grand grand son. But there does not seem to be here any allusion to the fact that he was a Bhargava (one would indeed probably have underlined it). Rcika was the father of Jamadagni and the grand father of Parasurama.

<sup>55</sup> Historical reference; cf. G. Coedes. The *bhargava* defeated by Rama is Parasurama, incarnation of Vishnu in order to destroy the *ksatriya*. The story of the defeat imposed by Rama is told in diverse forms.

<sup>56</sup> That is to say with his generosities (or with the Preah Khan temple? cf. multiple references).

<sup>57</sup> Notice here the opposition point by point: stone/gold, monkeys/men, ocean/ocean of existences.

XXX. "The two golden "Lords of Dance" which they had had placed in front of the golden Snake were like the two Raghava<sup>58</sup> immediately liberated from the ties of the snakes due to the fall of the arrows of Indra Victorious<sup>59</sup>."

#### PREAH KHAN TEMPLE

XXXI. "Rama and Bhisma, as one knows, have obtained a glorious praise from their father descended in a hurry<sup>60</sup> from the sky; but him, which (praise has he not received from his father), honored without respite as Svayambhu, the "rich of the four arms" and Lokanatha<sup>61</sup>."

XXXII. "In this receptacle of the enemy's blood where he had taken away Jayasri<sup>62</sup> in the fight, he founded a town [city?] given this name, which shines, changing the color of a part of the soil with his precious stones, his lotuses and his gold, as if today still it was coated with blood.<sup>63</sup>"

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<sup>58</sup> Rama and Laksmana.

<sup>59</sup> References in G. C. (*Ramayana*, VI, 44 sq.).

There is not any indication on the location where these statues were erected. In any case they must not have been in the Preah Khan, of which one only speaks later on. As the text says that these statues are of gold (or gilded bronze...), they may not have been very big. On the place of this stanza, cf. *supra*, St. XXII [?].

Cf. also BHATTACHARYA, *Religions*, p. 85-86: "It is difficult to say whether the Natyesvara which the Jayavarman VII's Stele at Preah Khan, Angkor, names refer to Shiva or to Hevajra".

BEFEC LXX, p. 71-72: J. Filliozat's article, "On Shivaism and Buddhism in Cambodia, about two recent books". He answers Bhattacharya and gives interesting details, proposing to recognize in the two "Lords of the Dance" Shiva and the Goddess. As for the "golden Snake", it would be Patanjali. I am not sure, because J. Filliozat does not present any *ensemble* of Natyesvara with Patanjali; on the other hand, the evoked dance, "terror of the snakes", badly correspond to what is presented to us (with a snake which does not seem "terrorized"), but it is certain that the question of the note 6 by G. Coedes is simply funny.

<sup>60</sup> I refer here to the *Gayamahatmya*, because I know it well: for Rama, chap. VII, St. 74 to 78 (p. 246-249); for Bhisma, chap. VII, St. 71 to 73 (p. 244-245).

<sup>61</sup> Cf. G. C.'s explanations BEFEC XLI, p. 288 n. 2; but one finds here the three gods Lokesvara, Vishnu and Shiva (here named Svayambhu) from St. XXXIII.

<sup>62</sup> His victory plus his throne, not necessarily taken back by the Chams... Cf. yet Stanza CLXIX, where it is the Preah Khan *baray* which is compared to a lake of blood.

<sup>63</sup> I understand this Stanza as indicating that the last fight against the Chams (and perhaps a few Khmers...) took place in the Preah Khan domain, and more precisely of the one of the temple. From there I deducted, and this still very much appeal to me, that Tribhuvanadityavarman's palace (and before it, with other arguments, Yasovarman II's) stood there.

XXXIII. "To Prayaga, one must go because of the presence of two *tirtha*<sup>64</sup> where one does good actions for the purification of men; what **[is there?]** to say about the city of Jayasri, rich of the *tirtha* of the Buddha, of Shiva and of Vishnu!<sup>65</sup>"

XXXIV. "This king Sri Jayavarman has opened the eyes of the Lord of the world<sup>66</sup> named Sri Jayavarmesvara, in "*veda* - moon - moon - form"<sup>67</sup>, under the features of his father."

XXXV. "All around the noble Avalokitesa which is in the center, he has installed 283 divinities<sup>68</sup>."

Here starts a list of divinities which, added to the indications of the "small inscriptions", allow to have a precise idea of the temple's organization.

XXXVI. "This king has installed on the east side three divinities, of which the first is Sri Tribhuvanavarmesvara."

FACE B

XXXVII. "In the south region, he has installed 20 divinities plus twelve<sup>69</sup>, which start with Sri Yasovarmesvara."

XXXVIII. "To the west, he has installed 30 divinities, starting with the image<sup>70</sup> of Sri Campesvara; to the north, 40, starting with a *Sivapada*."

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<sup>64</sup> Note the surprising lack of religious knowledge of the author: if indeed there are two *tirtha* at Prayaga / Allahabad, the one of the Ganga and the one of Yamuna which meet there, one always add the underground Sarasvati, thus the name Triveni "Triple flow" given to the place and this is in all the Indian manuals; cf. Monier-Williams. [Question: Is the Triveni already known in the *Mahabharata*?]

<sup>65</sup> One take up again here the affirmation, already found in above Stanza XXXI, of the "pantheon[-like?]" aspect of Preah Khan; but one does not speak of the kings' temple (located South).

Furthermore, the list of the 3 *tirtha* given by G. Coedes (explanation p. 257) can not be supported: it is not about the site of Angkor, but of Jayasri.

<sup>66</sup> Note that *Lokesa* could be the equivalent of the Khmer *kamraterijagal*.

<sup>67</sup> 1113 *saka*, thus 1191/92 A. D.

<sup>68</sup> It is compulsory to count within this number Jayavarmesvara of St. XXXIV. Cf. St. XLIII which gives the total of gods.

<sup>69</sup> 20 + 12: Khmer way of counting with the twenty.

<sup>70</sup> Campesvara is a name of Vishnu. Cf. with the name of Campesvara, the word *kanti* in K 293 (18) and K (BC 12). Cf. my thesis, p.



XXXIX. "a divinity in the rice shop and ten in the "passages"<sup>71</sup>, four in the "resthouse"<sup>72</sup> and three in the hospital<sup>73</sup>;"

XL. "at the doors of the four cardinal points<sup>74</sup>, there are twenty four divinities; and these gods all together form a total of four hundred thirty."

XLI. "In the island of Rajyasri, with a "thousand *linga*"<sup>75</sup>, there are fourteen of them; in the two small reservoirs and in the Yogindravihara, there are sixteen of them in each;"

XLII. "in the *caitya* and the *valabhi* of Gaurisrigajaratna, on the margin of Jayatataka<sup>76</sup>, there are twenty two divinities;"

XLIII. "and a god named Visvakarman in the house of the *aya*<sup>77</sup>. All together form a total of five hundred fifteen."

XLIV. "Essential<sup>78</sup> daily shares of the *puja* of all these gods, starting from Lokessvara<sup>79</sup>: white rice good to be cooked<sup>80</sup>, 75 *khari* and 1/2 *drona*;"

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<sup>71</sup> *Cankrama* is formed on the intensive of the root KRAM- and means "promenade". G. Coedes translates by "ambulatory" and proposes the galleries I and II (taken over by C. Hawixbrock). The difficulty is that one probably did not "stroll about" in the galleries, closed with doors. Furthermore, this would suppose that the "rice shop" was inside the galleries (which in fact is maybe not impossible). Dagens [*Mayarnata*] only gives the form *cankramana* giving the meaning of "courtyard, covered playground [*preau*]".

<sup>72</sup> *Upakarya*: litt. "(location for the assistance", thus, maybe, "royal tent" or "caravanserail"; one sees that the "house with fire", considered as *dharmasala* or "resthouses", are other sanctuaries.

<sup>73</sup> The number 3 is awaited for a hospital (even though the total of divinities given by the Ta Prohm St. CXVII, thus [soit?] 798 gods for 102 hospitals, give an average of 7,82 gods per establishment). Furthermore, one has not found, to my knowledge, the characteristic chapel of the Preah Khan hospital, neither, of course, the stele which should mark its location.

<sup>74</sup> It is about the doors of the town [city?] and the "small inscriptions" confirm this number.

<sup>75</sup> One must probably understand that the "thousand *linga*" is comprised in the number of fourteen divinities.

<sup>76</sup> It is not sure that it was the temple of Gaurisrigajaratna that was "on the margin" of the Preah Khan *Baray*; if it was the case, one can think of several sanctuaries, in particular Ta Som.

<sup>77</sup> Cf. BEFEC LXX, p. 96-97.

<sup>78</sup> *Angani* is opposed to [conflict with] *upakarani* of Stanza XLIX.

<sup>79</sup> Thus [soit?] 515 (cf. previous stanza which makes indeed the total; partial totals in the St. XXXV and XL).

<sup>80</sup> Compare to the ration given at Ta Prohm; St. XXXVIII: 73 *khari*, 2 *drona* and 2 *prastha* of husked rice for 263 divinities. One is surprised that the quantity indicated for Preah Khan is only slightly superior to the one of Ta Prohm, despite almost twice more divinities at Preah Khan.

Note that the quantities can in any case appear enormous: [*grosso modo*], for Ta Prohm, 7 tons divided by 263 = 26,615 kg per divinity; in reality, the quantity allotted to the Preah Khan gods, 13 kg per day, already represents lots of white rice!

XLV. "sesame, 1 *khari*, 5 *prastha* and 2 *kuduva*; beans, 2 *drona*, 4 *prastha* and 2 *kuduva*;"

XLVI. "ghee, 1 *ghati* and 13 *prastha*; [lait caille?], 1 *ghati*, 14 *prastha* and 2 *kuduva*;"

XLVII. "milk, 30 minus 1 *prastha* [thus [soit?] 29] and 2 *kuduva*<sup>81</sup>; honey, 21 *prastha*, but of melasse, 20 [*prastha*] minus 1 [thus 19];"

XLVIII. "sesame oil, 6 *prastha* and two *kuduva*; but grease of tree fruit, 2 *prastha* and 2 *kuduva*, counting what is added to the bath (water of the divinities)<sup>82</sup>;"

XLIX. "as to the accessories of the *puja*, in particular the fruits and vegetables, we will not indicate anything here, because it is very well known: take some in suitable<sup>83</sup> quantities." [qu'on en prenne en quantité convenable?]

L. "Fabric: red and white woolen<sup>84</sup> blankets and clothes good for the divinities, with the seats, the beds, etc.: 645<sup>85</sup>;"

LI. "unfolded due to the mosquitoes and placed on the feet of Lokesa and the other divinities, 56 pieces of China<sup>86</sup> fabric;"

LII. "Furthermore, the liberality<sup>87</sup> for those who live here, masters and students: white rice, 22 *khari*, 2 *drona* and 14 *prastha* every day;"

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<sup>81</sup> Counting 3 liters for one *prastha* and 3/4 of a liter for a *kuduva*, it requires:  $(299 \times 3) + 1,5 = 88,5$  liters of milk for 515 divinities, thus roughly 17 cl. of milk per divinity; one sees well that for a Khmer, milk is less essential than rice.

<sup>82</sup> Cf. St. LX for the interpretation of *taruphalanam sneba*.

One sees by this list that the essentials elements (*angani*) of the gods' *puja* are: white rice, sesame, beans, ghee, [lait caille?], milk, honey, melasse, sesame oil, and vegetal grease.

<sup>83</sup> Cf. the stanza of the Ta Prohm Stele exactly comparable.

<sup>84</sup> Bhatt did not hesitate in front of the word *kambala* = "woolen blankets" [in English in the text] (G. Coedes translates by "flannel"; I would yet be surprised if there were sheep in Cambodia in ancient times (?). TANDART (*Dict. français-khmer*) gives a periphrases for "wool", thus [soit?] "sheep's hair" (*momih jyem* or *roma jyem*). Furthermore, I wonder if *satika* "a strip of cloth" [in English in the text] according to MW, must not be considered separately as well.

<sup>85</sup> This stanza and the following only speak about fabric, in between two groups of verse indicating quantities of daily food. For the fabric, nothing indicates the frequency of the donations and the total is difficult to explain.

<sup>86</sup> Some silk. It would be interesting to know who where the lucky beneficiaries [recipients] of these luxurious fabrics, of the number of 28 maybe... Most probably they were only placed at some occasions.

<sup>87</sup> Note the word *sattra*, and cf. G. Coedes' note, p. 291, n. 1.



LIII. "every day, these (quantities) joined to the ones of white rice for the gods'<sup>88</sup> *puja* make 997 *khari*, 3 *drona* and 6 *prastha*."

LIV. "The fifth, eighth, twelfth, fourteenth and fifteenth day of the two fortnight, as well as for the eighteen *utsava* and the *sankranta*,<sup>89</sup>"

LV. "will be put in addition every year: 5.388 *khari* and 10 *prastha* of white rice good to be cooked<sup>90</sup>,"

LVI. "74 *khari*, 3 *drona* and 2 *kuduva* of sesame; of beans [*feves?*], then, 3 *drona* 13 *prastha* more;"

LVII. "of *ghee*, 75 *ghati* and 9 *prastha*; of [*lait caille?*], 68 *ghati*, 1 *adhaka* and 2 *kuduva*;"

LVIII. "79 *ghati*, 2 *kuduva* and 7 *prastha* of milk; of honey, 75 *ghati* and 1 *prastha*;"

LIX. "of melasse, 60 *ghati*, 2 *kuduva* and 4 *prastha*; but 53 *ghati* and 10 *prastha* of sesame oil;"

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<sup>88</sup> Cf. above, St. XLIV: 75 *khari*, 1/2 *drona*. Redoing the addition, one can notice that 16 *prastha* are necessary to make 1 *drona*.

<sup>89</sup> Cf. Stanza XLVI, Ta Prohm's parallel. One notices that it counted each month only the 8th, 14th and 15th days of each fortnight, and thus that the 5th and 12th are not present. Here one has 5 feast-days per fortnight, which is a lot (of course they are not days off!)

For the *sankranta*, following Bhatt, I had said that one should count 12 of them. *Sankranta*, is the "step", in other words the "passage" and it is true that one can count it as the passage from one month to the other or just one year to the other. After thought, it appears to me that, in a moon-solar year as it was followed in Cambodia, the 15th day is in reality a *sankranta* and thus that there is no reason to celebrate it apart. One could answer me that the passage from one year to the other fall under the same case, but yet one can still suppose a special feast (specially if it lasted 3 days, as nowadays the *chaul chnam* or the *phimai*).

This way, one still comes up to  $(5 \times 12 \times 2) + 18 + 1 = 139$  feast-days in the year (this is a maximum, as many "feasts" must have fallen the same day).

<sup>90</sup> In opposition to the acse of the "ordinary" [*prestations?*], one sees here that these additional [*prestations?*] are much more important here than in Ta Prohm (even with the 4 days less per month), where there are of 1,015 + 68 *khari* and 1 *drona*.

Added to the number of "feast-days" (forgetting the *drona* put for the good measure), this gives to Ta Prohm:  $1,083 : [(3 \times 2 \times 12) + 18 + 1 \text{ thus } [\text{soit?}] 81] = 13.37037$  per day.

For Preah Khan,  $5,388 : 139 = 38.762589$ . From 13... to 38..., one has much more than the proportion from 263 to 515 gods! Once more, the numbers are difficult to interpret.

LX. "ointment [**unguent?**] [**liniment?**] (coming from) the fruits of plants, suitable as accessories for baths<sup>91</sup>: 13 *ghati* and 4 *prastha*."

LXI. "Each year, the "essential part" to the gods' *puja* totaled, then doubled to make some more<sup>92</sup>, comes from the mass of the donations of the villages<sup>93</sup>;"

LXII. "(thus) 146,891 *khari* of paddy<sup>94</sup>."

LXIII. "7,848 *khari* of white rice during Magha, Sraddha, (.....?), etc.<sup>95</sup>"

LXIV. "of sesame, 433 *khari*; of beans, this minus 10 *khari* and 1 *drona* all together;"

LXV. "of *ghee*, 545 *ghati* and 7 1/2 *prastha*; but of [**lait caille?**], 700..."

LXVI. "*ghati* and 78, as well as 10 *prastha*; of milk moreover, a count of 639 [*ghati*] and 6 *prastha*;"

LXVII. "454 *ghati* and 5 *prastha* of honey; of melasse, (the same quantity) minus 3 *ghati*;"

<sup>91</sup> One thus has here (St. LV to LX) the same list of *angani* as in the St. XLIV to XLVIII. But one sees that the expression for this latter product is different (this is why I have translated by a word to word [mot a mot?]), in so far as in St. XLVIII the use for the bath seems to come in addition from a culinary use not appearing here; I am tempted to suppose that the expression of the St. XLVIII is clumsy and that the meaning is the same there as here. I in fact have put in my translation words in parenthesis that may simply be scratched.

<sup>92</sup> Cf. the Ta Prohm Stele, St. LII.

<sup>93</sup> It is thus the *grama* that furnished the totality of the *angani*. Another interpretation in G. Coedes, p. 291, note 5.

<sup>94</sup> Thus [**soit?**] following the Ta Prohm calculations,  $146,890 : 4 = 36,722.5$  *khari* of white rice.

If one minuses to this number the quantity given in the St. LV, 5,388, one comes to: 31,334 for the ordinary days, thus moreover: 2,005,376 *prastha*.

The daily share (St. LIII) being of 97 *khari*, 3 *drona* and 6 *prastha*, thus [?] 6,262 *prastha*. One thus comes to: 320.24528 days. One can neglect the decimals, but if one adds the 139 "feast-days", one comes up to a number of days much too high for one year!

<sup>95</sup> I do not see what this refers to, to such an extent that I wonder whether there is not a missing part in this stanza without a verb. Further more the very clear lesson *apanadisu* is hardly acceptable (and yet one finds it again in St. CXXX): *apana* means "commerce, market"; Bhatt proposes *ayana*, which designates the points of the equinoxes and the solstices, which would be more suitable. One would then have the indication of the periodicity of these donations. There are not any corresponding stanza in the Ta Prohm Stele; but cf. the hospitals Stele, [St. XII, p. 27]:

<i>prativarsan tv idam grahyam</i>	<i>triskrtvo bhupater nidheh</i>
<i>pratyekari caitrapurnamyam</i>	<i>sraddhe capy uttarayane</i>

"Here are the shares one must take from the king's storehouses, every year three times each: for the full moon of Caitra, for the *sraddha* and for the summer solstice."

LXVIII. "of sesame oil, 315 *ghati* and 3 *prastha*; of vegetal grease, 119 *ghati* and 8 *prastha*;"

LXIX. "22,680 pairs and 2 pairs of pieces of fabric for the gods' clothes, etc."

LXX. "1 *tula* and 92 *pana* of *taruska*; of *srivasa*, 1 *bhara*, 2 *tula* and 10 *katti*;"

LXXI. "of eagle wood, 1 *bhara*, 3 *tula* and 13 *katti*; of wax, 10 *bhara*, 2 *tula* and 11 1/2 *katti*;"

LXXII. "423 He-goat; pigeons *kapota*, peons and pigeons, as many of each, 360<sup>96</sup>."

FACE C

LXXIII. "5,324 *grama* were given by the king and the proprietor of *grama*<sup>97</sup>, with devotion."

LXXIV. "There are there<sup>98</sup> altogether, men and women, 97,840 people [**persons?**];"

LXXV. "There was: their chiefs, 444 men; of cooks, etc."

LXXVI. "... 4,606 men; of servants, 2,298; of dancers, ..."

LXXVII. "... 1,000 amongst them; then 47,436 persons giving [what is necessary **[needed, required?]**] for the gods' *puja*, etc."

LXXVIII. "Each year, one must take in the king's granary 1,328 *khari* and 2 *drona* of white rice;"

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<sup>96</sup> There are certainly not *pujanga*; this might have been use for worshipers food, certainly not for the gods (unless there were bloody sacrifices). The note is inspired by Bhatt; I believe now that the last hypothesis is not left aside.

<sup>97</sup> One sees well here that the king was not the only proprietor of the land, at least in the facts; further on, one even realizes that he has a relatively modest share in the temple's donations.

<sup>98</sup> *Tatra*, "here, in this temple" [or, "in these *grama*"?], as I have translated in the parallel section of Ta Prohm, St. LXIII, corrected in this direction by Bhatt. In fact, I think one should translate *tatra* by "in this town".

LXXIX. "57 *khari* and 3 *drona* of beans; of sesame, 29 *khari*, 3 *drona* and 4 *prastha*;"

LXXX. "of liquid butter, 23 *ghati* and 6 *prastha*; of [**lait caille?**], 30 *ghati*, 9 *prastha* and 2 *kuduva*;"

LXXXI. "of milk, 31 *ghati*, 6 *prastha*; of honey, 386 *ghati*, 6 *prastha* and 2 *kuduva*;"

LXXXII. "of treacle, 16 *ghati*, 6 *prastha* and 2 *kuduva*; of sesame oil, 6 *ghati* and 4 *prastha*;"

LXXXIII. "3,712 pairs of clothes for the gods and other clothes; 113 beds;"

LXXXIV. "but 323 mosquito nets made out of China fabric [**material?**] and 22 cushions;"

LXXXV. "then 23 "beds of China made with some herb"<sup>99</sup>. Then, 1 *khari* and 12 *prastha* of peper;"

LXXXVI. "of wax, 2 *bhara*, 2 *tula* and 11 1/2 *katti*; of salt, 4 *khari* and 2 *drona*;"

LXXXVII. "of sandal, 1 *bhara*, 5 (*tula*), ...; and of *srivasa*, 1 *bhara*, 3 *tula*, ..."

LXXXVIII. "of eagle wood, 1 *bhara*, 6 *tula*, 3 ...; of camphor, 3 *katti* 1/2, 2 *masa*, ...;"

LXXXIX. "6 *katti*, 10 *pana*, ... of ...; of silk thread (?), ....."

XC. "*gobhiksa* and golden ring, ...; 2 *masa*, 3 *pada*, 12 ...;"

XCI. "small boxes, cups, pots, ..., made of ..., 8 *pana*, 3 *pada*, ... and 8 *bimba*;"

XCII. "vases, etc. in copper, 1 *tula*, ... *katti*, ..., then of ..., 5 *pana*, 2 *tula*, 5 *katti*;"

XCIII. "Then<sup>100</sup>, 520 boxes of China and a brown cow with golden horns and hoofs and provided with a blanket;"

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<sup>99</sup> Mattings.

XCIV. "4 thoroughbred horses and 4 elephants, two women-slaves and two buffalo: here is what the king must have given [**doit faire donner?**] every [**each?**] year."

XCV. "Golden objects, *prasada*<sup>101</sup>, etc., 253; but, of the karanka type, 18,000 objects..."

XCVI. "... plus 160; gold necessary [**needed, required?**] for their fabrication: 300 *bhara*, 12 *tula* and 3 *katti*, ..."

XCVII. "14 *pana*, 1 *pada*, 2 *masa* and 2 *bimba*; silver (necessary [**needed, required?**] for their fabrication): 137 *bhara* and 2 *katti*;"

XCVIII. "gems (necessary [**needed, required?**] for their fabrication): diamonds, [oeils-de-chat?] and rubis: 35,837;"

XCIX. "112,000 perles as well; of copper (necessary [**needed, required?**])

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<sup>100</sup> One might have here, as often when *atha* is at the front of *sloka*, the indication of a subdivision or the opening of a new heading. But this "brown cow" mixed with the boxes give me some worry and it would thus rather be the following *tatha* which would mark the new heading.

<sup>101</sup> Probably small altars as the ones found with the bouddhique triad for instance.

## THE CONSTRUCTIONS

CLIII. "There are 514 *prasada* and *valabhi*<sup>102</sup>; 2,006 sections of stone construction;"

CLIV. "and also 16,490 spans of the arms<sup>103</sup> [**brasses?**] of laterite enclosing walls;"

CLV. "24,628 spans of the arms of moats' perimeter<sup>104</sup>;"

CLVI. "93,507 spans of the arms of basins<sup>105</sup> perimeter, Jayatataka, etc."

CLVII. "1,512 *kuti*<sup>106</sup>; there are all together 2,989 residents and students."

The annual feast [**festivity?**].

CLVIII. "Here, every [**each?**] year, during the month of Phalguna, one must expose<sup>107</sup> the following divinities: the King of the Muni of the East<sup>108</sup> and Sri Jayarajacudamani<sup>109</sup>;"

CLIX. "The Jaya-Buddha-Mahanatha of the 25 countries<sup>110</sup>, the Sugata Virasakti<sup>111</sup> and the Sugata of Vimaya<sup>112</sup>;"

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<sup>102</sup> The *prasada* are the towers-sanctuaries; the *valabhi* must be low buildings. The "sections of stone construction", literal translation of *silavesmakhandas*, can be found [**guessed, manifested, se laissent deviner?**] between the *valabhi* and the enclosing walls.

The word *valabhi* is almost ignored in Dagens' *Index general, Mayatana*, cf. p.564, which refers to *niryuhavalabhi*, (*niryua*- "prominence, projection") which means "penthouse" [**auvent?**] (but the reference must be erroneous).

<sup>103</sup> Thus about (with 1.80m for 1 span of the arms): 31,331 meters! If we could only have the detail...

<sup>104</sup> Compare to the length of the laterite walls. The Gopura are not enough to explain the difference from about 2 to 3.

<sup>105</sup> 168,312 meters, still counting 1.80 m per span of the arms. The Jayatataka approximately measures 3500 x 900 m, thus[**soit?**] a perimeter of 8,800 m. Almost 20 are necessary to reach the count [**il en faut presque 20 pour faire le compte**].

<sup>106</sup> This *kuti* must have been of wood.

<sup>107</sup> G. Coedes: "bring"; I improperly analyze *adhyesya*, one does not find anything in the dictionaries.

<sup>108</sup> see above; G. Coedes thought it was the main divinity of Bantay Kdei; I rather think of the one of the great [**grand, big?**] Preah Khan or of Ben Mala (but without absolute certitude...)

<sup>109</sup> The main divinity of Ta Prohm. One will observe that the Ta Prohm Stele does not mention that the Preah Khan divinity was present at its own feast, which shows that the inscription was written before the foundation of Preah Khan, on the other hand one found there Virasakti, therefore probably founded during the first five years of the reign of Jayavarman VII.

<sup>110</sup> Notice that the number of Jaya-Buddha-Mahanatha founded by Jyavarman VII is of 23 only according to St. CXX. Again something difficult to explain: one could suppose that two of these divinities were not founded by Jayavarman VII; but it is preferable to suppose that two new Jaya-Buddha-Mahanatha were created between the writing of St. CXX and this one, and that one did not think of correcting the first one.

CLX. "The [gods] Bhadresvara<sup>113</sup>, Campesvara<sup>114</sup>, Prthusaillesvara<sup>115</sup>, etc.: these ones which all together are 122<sup>116</sup>, with their entourage;"

CLXI. "Here is what one should then take from the King's shops as part of the *puja*: gold, 4 *pala*, 2 *katti*; silver:..."

CLXII. - CLXIII. "14 *katti*; white tin: 4 *tula*; 459 pairs of pieces of fabric [**material?**] for the gods clothes, etc.; of white rice to cook, 100 *khari*<sup>117</sup>; 143 perfume boxes;"

CLXIV. "ghee, honey and treacle [**melasse?**]: 1 *ghati* and 10 *prastha* of each; 1 *tula* and 5 *katti* of bee wax;"

CLXV. "of *srivasa* and eagle wood, 5 *tula* of each; of milk and *dadhi*, 1 *ghati* and 10 *prastha* of each."

CLXVI. "The Brahmans, with at the lead Sri Suryabhatta<sup>118</sup>, the king of the *Java*<sup>119</sup>, the Lord of the *Yavana*<sup>120</sup> and the two kings of the *Campa*<sup>121</sup> will carry every day<sup>122</sup> with piety [devotion] the ablution water<sup>123</sup>."

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This could give an indication on the way the poem of this inscription was composed. Further more what is the difference in [?] *desa* and *visaya*?

<sup>111</sup> The Buddha of Vat Nokor, near Kompon Cam. He is already mentioned earlier on in St. CXII, where one precise that this *Sugata* is a creation of Jayavarman VII. Virasakti is also invited to the annual feast of Ta Prohm (cf. St. LXXXV).

<sup>112</sup> Already mentioned in St. CXXIII, as reference-town [city?] of "fire houses". But it is not Jayavarman VII who had it consecrated.

<sup>113</sup> Several ancient sanctuaries carried this name; it probably refers here to the great temple of Vat Phu in Laos. It was a sanctuary dedicated to Shiva.

<sup>114</sup> I have proposed (unpublished) to see in this temple Krol Romas, at the top of the Phnom Kulen cascade. It was in any case a Vishnu temple."

<sup>115</sup> Prthusaila = Phnom Run in Thailand; form of Shiva.

<sup>116</sup> It is noticeable that these three divinities, of which the name ends in °*Isvara*, are all *Hindu*. Further more, what does this number correspond to? It is difficult to say, all the more as one precises that the "gods of the entourage" are here comprised and that it is thus illusory to try to know how many main gods they were. Further more it is probable that this total comprise all the divinities since the St. CLVIII. By the [**prestations?**] offered by the king, one can suppose that the gods were much less numerous than in Ta Prohm.

<sup>117</sup> At Ta Prohm, the royal [**prestition?**] is of 630 *khari*; but it is specified that one should "feed (on this occasion) 1000 erudite persons [**scholars?**] [**savants?**], *bhiksu*, Brahmans, etc." (St. LXXXIX).

<sup>118</sup> As indicated by G. Coedes (p. 267), this title is an hapax [?] of Khmer epigraphy: but K 692 (Prasat Tor Stele, IC I, p. 227-249) quotes very similar names: Suryapandita (St. L, LI, LVII, LVIII and LX) or Suryasuri (St. LXI and poem's last). It could thus be here this personality; in addition one should notice that this title does not correspond to his duties: first of [**amongst?**] the Brahmans, this Suryabhatta should be considered as a sort of "chief of the *bakou*".

## CONCLUSIONS

CLXVII. "The hunter Ajitendra, for having given only one wooden plank to the Buddha, has reached in the sky of sovereignty and his called Bhairavasura<sup>124</sup>; what [is there?] to say about this king who abundantly and with respect to the Sambuddha and the others

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<sup>119</sup> For G. Coedes (*Intro.*, p. 267), this king must be (considering the date of the inscription) either Kamesvara II, or Srnga, king of Kediri. This is maybe forgetting that *Java* is the name of a people not at all as precise as he seems to say: cf. what one says about him at the time of the accession to power of Jayavarman II. In the present case, I wonder whether we do not rather have a Malays king here.

<sup>120</sup> The *Yavana* are the Vietnamese. For G. Coedes (p. 267), it is Long-can, son of Li Anh-ton, who ruled from 1175 to 1210. I hardly can imagine this independent king coming yearly to offer his water tribute to Angkor.

<sup>121</sup> G. Coedes (*ibis.*): "The two kings of Champa are the king of Vijaya (Binh-dinh) Suryajayavarmadeva, Jayavarman VII's brother in law, and the king of Panduranga (Phanrang) Suryavarmadeva, former prince Vidyanandana, Jayavarman VII's favorite. The division of Champa in two kingdoms only lasted from 1190 to 1192. In the absence of the date 1191 given in the stanza XXXIV, the reference to the *two* Champa kings would have been enough to date the Preah Khan Stele within a year": once again I can not entirely agree: on the one hand I can not consider Champa as an "empire"; the Chams seems to have been even more divided than the Khmers all along their history (which by the way largely remains to be done), and there probably must have been more than two Cham kingdoms. On the other hand, I am not so sure that the Preah Khan stele was engraved as quickly as G. Coedes proposes, even though it is true that of the two kings named by G. Coedes one was quickly defeated, and the other soon turned against Jayavarman VII. It would thus be safe not to propose any names here as well.

<sup>122</sup> Of course "every day (of the feast)", that is to say every day of the month of Phalguna (February-March, last month of the year). I do not know which king it is about, but such a treat represented for sure an important availability on their side...

<sup>123</sup> The water tribute was a sign of allegiance. Cf. the water donation by the king of Fire, found in an ancient charter of Sambor. (for instance, *Etudes cambodgiennes*, n. 4, Oct.-Dec. 1965). Cf. also A. LECLERE, *Recherches sur le droit public des Cambodgiens*, Paris, 1894, 2nd part, chap. V, "L'eau du serment", p.133 to 139.

This water was used for the *abhiseka*, says N. R. Bhatt. One can wonder whether it is about a royal *abhiseka*, that is to say a kind of annual reconsecration of the king. But this might be to be revised: it seems to me that if it was really about royal *abhiseka*, there would be the word *abhiseka*!

However, one could think that this ritual is to be linked with the origin of the city of Preah Khan and its very name Jayasri: the Preah Khan temple must have been used as a king's capital and the temple could have been a kind of temporary pantheon, waiting for the "opening" of the Bayon. The detail of Jayavarman VII's activities is here greatly missing.

The comparison with the Ta Prohm feast - where in fact the feast only lasted one week "from the eighth day of Caitra to the full moon at the end of the same month" - clearly shows that it is not about the same type of feast and that here, independently from the specifications of this stanza, the royalty and the empire were much more implied: the invited gods were much more numerous, it seems, and came from the entire empire, as the presence of the "Jayabuddhamahanatha of the 25 countries" witnesses.

<sup>124</sup> One does not know the legend which recall of one of a *Jataka*, to which the poet refers here. Ajitendra is unknown in the lexicons which I was able to consult (it has as well slipped away from G. Coedes): should one think of a unique Khmer legend? Bhairava, "the terrible" is a well-known form of Shiva, but it is an *asura* here and I do not understand well why his good gesture has transformed him in a such unpleasant divinity (it is true that tantric Buddhism is susceptible of such things)... However this *asura* is not archived in the *Introduction à l'iconographie du tantrisme bouddhique* by Marie-Therese de Mallmann (Paris, 1975).



(Buddhas) gives, to the divinities, to the twice-born, etc., to the ascetics, *prasada* and thrones, gold, jewels, elephant kings' tusks<sup>125</sup>!"

CLXVIII. "In front of<sup>126</sup> the plait (Sri Jayasri) of hair (Her meritorious acts) gathered **[joined?]** together of Its queen (the Earth) brilliantly ornate with good taste, (plait) illuminated of precious stones, of gold and garlands, this king has placed a mirror, the Jayatataka, full of beauty."

CLXIX. "This mass of water, reddened by the light of the golden temples and painted with the color of lotuses, shines **[is resplendent?]**, taking the aspect of the blood pond created by Bhargava<sup>127</sup>."

CLXX. "Inside this (reservoir), there is<sup>128</sup> a small island agreeable by its basin<sup>129</sup>, which groups (in a location) unique the waters of [all] the tirtha<sup>130</sup>, (small island) excellent which erases the mud and the faults of the ones who touch it, which is used as raft to cross<sup>131</sup> the ocean of existences<sup>132</sup>."

<sup>125</sup> The indication of donation of throne could suggest, as Sunseng Sunkimmeng pointed out to me, that the plank given by Ajitendra could allow the Buddha to seat. In absence of written testimonies, it might be useful to search in the Khmer iconography of the Bayon whether there could be an image recalling this legend.

<sup>126</sup> G. Coedes had as normally translated this locatif by "in"; yet it leads us to a wrong meaning, as it is difficult to say that the basin of Jayatataka is "in" Jayasri. The meaning I am here adopting, conformably to the topography, is proposed by Louis RENO in his *Grammaire sanscrite*, p. 309, paragraph 223 a). In fact one places a mirror rather "in front" than "in".

<sup>127</sup> That is to say the king of the Chams, Jaya-Indravarman IV. Cf. previous St. XXIX and XXXII. These stanza have lead me to think that the final defeat over the Chams happened in this location, from which I deducted that it must have been the location of the royal palace of Tribhuvadityavarman and of Yasovarman II. Excavation (in particular underneath the temple, during its restoration) could confirm this fact.

<sup>128</sup> Notice that the creation of the small island is not directly attributed to the king, as if a sacred site had preexisted even at the Jayatataka. Of course it is Neak Pean, formally [in olden days] called, it seems, Rajyasri (St. XVI), name one might be surprised not to find here, knowing the number of stopgaps used in this stanza. Likewise one can be surprised not to find the name of the Anavatapta lake (if it is really about this one). Cf. also *Pour mieux comprendre Angkor* and "Le symbolisme de Nak Pan" by G. COEDES and L. FINOT, *BEFEO* XXIII, p. 401-405.

<sup>129</sup> Perhaps would it be better to say "its basins"; like G. Coedes.

<sup>130</sup> As the receptacle is unique, the *tirtha* must be multiple. Notice that G. Coedes has forgotten to translate all the beginning of the compounded word, *tirthajalaikarasi*! This omission is probably important for what is said here, which is not without interest, was ignored by him in his comments, then by J. Boisselier.

<sup>131</sup> Notice the accusatif *taranam* to mark the goal.

<sup>132</sup> It is legitimate to ask oneself what this stanza about Neak Pean is doing in this part of the poem, in the conclusions. It is probably a "transition" towards the idea of general liberation of the beings indicated in the following stanza. At the same time one emphasis on the ensemble, of which the current interpretation of the Anavatapta lake is far from giving me satisfaction. The objections are given by Boisselier himself in his article (absence of the name Anavatapta in particular; the name of Rajyasri is an incomprehensible substitute of it!); I will add that the basins are in no case source of rivers: on the contrary they are affirmed

CLXXI. "Having constantly realized meritorious, excellent, incommensurable acts, in favor of all the alive beings, this King, nevertheless doing these things appropriate in particular by excellent devotion towards his father<sup>133</sup>, pronounces this prayer:"

CLXXII. "Thanks to these meritorious acts<sup>134</sup> which spread the rays of Knowledge and of the Sun (and) that have suddenly dissipated the Darkness<sup>135</sup> which hid one and the other, the Bodhi who the other can not reached, shall My father enjoy it to allow the beings to cross the ocean of existences."

CLXXIII. "And, having fixed for a long time according to the Writings the stability of the Dharma broken by the other<sup>136</sup>, which is a bridge for the excellent Goal, this King, who is the guide of those who protect stability, tells this to the future kings who will protect the stability:"

CLXXIV. "When spouses and children have been dead for a long time, even if they were as dear [beloved] as one's own life, and (as soon as) others (spouses or children) are alive, there is absence of suffering in men [**mankind?**]; but when father and mother have gone to [**towards?**] the death even since a very long time, as there can not exist other ones, the misfortune is without limit."

CLXXV. "This is why, remembering them and the numerous priceless services [**favours?**] they have accomplished, I must do<sup>137</sup> these good actions with a piety without

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as the reunion of the *tirtha*. Furthermore no one has never said what the central sanctuary was doing there, never mentioned in a description of the lake (it is an objection by J. Boisselier) that the group of the Balaha horse, supposed to pull out the Indian merchants from the charms of Raksasi living in the island of Tamradvipa. One hardly emphasis the destination location. In any case, it is unlikely that the, so sacred, Anavatapta lake has carried such a dangerous island... [cf. Victor Goloubew, *Le cheval Balaha* in *BEFEO*, XXVII, p. 223-237].

<sup>133</sup> One could as well understand "his parents"; yet it seems that it is here precisely the father, and that one should probably understand *kusalani* according to this meaning.

<sup>134</sup> The *kusalani* acts which are mentioned in the previous stanza, in particular addressed to the father's memory.

<sup>135</sup> G. Coedes gives as subject of this absolutif the king himself: I do not see how to justify it! Yet refer to G. C.'s explanations on the Knowledge and the Sun, notes 4 and 5.

<sup>136</sup> G. Coedes did not translate the word *parasya*, which appears to me important; it must have been here his predecessor, the king Tribhuvanadityavarman, the "Usurper", or rather the Cham king (*para* = "foreigner") particularly shamed by Jayavarman VII, Jaya-Indravarman IV.

<sup>137</sup> I thus make *kuryam*, present optatif, apparently hortatif: cf. Louis RENOUE, *Grammaire sanscrite.*, p. 411, paragraph 292.

moderation; these ones, it is enough for the gratefull<sup>138</sup> [thankfull?] kings to protect them to obtain more fruits than the one that makes the Dharma."

CLXXVI. "And the kings fix the rule of necessary protection, even without my request, because they are charged with by the rule; even I knowing this, [o] king, I beg you to be insatiably eager yourself to protect my foundations."

CLXXVII. "That the men and women who are there present<sup>139</sup>, with the Campa and the Yavana<sup>140</sup>, as well as the people of Pukam and of Rvan, be protected - they are here 306,372<sup>141</sup> - as well as the grama numbered [au nombre de?] 13.500<sup>142</sup>, and that all under the service of the gods, in wood, in precious stone, etc., be preserved undamaged [intact?]."

CLXXVIII. "And that for those who are here, there should be without mistake every year, counted as a sacrifice to the gods, 400,126 *khari* of white rice<sup>143</sup>; [...]"

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<sup>138</sup> Grateful of what? Probably to be protected by their predecessors.

<sup>139</sup> In all the foundations celebrated in this stele.

<sup>140</sup> Normally they are the Vietnamese. But it is interesting to note that in Thailand, the word *Yavana* designate the people of Lan-na (observation by Kannika).

<sup>141</sup> Cf. Stanza LXXIV and CXLII, where one has respectively 97,840 and 208,532. Notice the precision of the number, as well as the way of writing 72: *sastir dvadasa*, thus 60 + 12, Khmer way of counting.

<sup>142</sup> Cf. Stanza LXXIV and CXLII, where one respectively has 5,324 and 8,176 *grama*. One thus has in men as well as in *grama* the whole of what is recorded in this Preah Khan Stele., as if the whole of the [pies?] actions enumerated were forming a whole.

<sup>143</sup> If one calculates the average per men, one finds 1.3060136 *khari* per year (not even 150 kilos), which is not very much: the men thus had other mean of subsistence.

One should still find how the author reaches this enormous number of white rice: 400.126! Indeed for the Preah Khan temple, one needed 146.891 *khari* of paddy (St. LXII), thus, according to Ta Prohm, 146,891 : 4 = 36,722.75 *khari* of white rice. [...]

## **APPENDIX A, SECTION 4**

Preah Khan Conservation Project for the World Monuments Fund

REPORT VII  
FIELD CAMPAIGN IV

**Work Plan for Field Campaign V: October 1996 - September 1997**

Dr. John Sanday, Project Manager

Siem Reap, Cambodia

## THE PREAH KHAN CONSERVATION PROJECT

Each year as a record of the work, the WMF team of consultants, in close collaboration with the WMF's head office in New York, prepare a detailed field report of the work completed during the recent field campaign. The report (of which this report is the second volume), contains a description of the work undertaken, a write up of technical details and copies of selected survey and technical drawings prepared.

In accordance with the requirements of the International Coordinating Committee for Angkor, APSARA and the Royal Cambodian Government, World Monuments Fund submits herewith a list of its proposed interventions at Preah Khan.

### WORK PLAN FOR OCTOBER 1996 - SEPTEMBER 1997

#### INTRODUCTION

The following is a list of the interventions that the World Monuments Fund proposes undertaking during Field Campaign IV between October 1996 and September 1997. The assessment has been broken into a brief **Summary** of the proposed project. An assessment of its **Present Condition** based on an initial visual inspection; the proposed **Repair Recommendations** outline in brief the extent of the proposed intervention, often quoting examples of previously executed works. Next follows the **Workplan** which indicates the approximate commencement date and the time that needs to be allocated to the project.

The **Workforce** identifies the number of teams required to execute the work outlined above. A workforce team consists of about seven men under a sous chef de chantier - a group foreman. The work force at Preah Khan is made up of three stone working teams, three labourer/clearance teams, a carpentry team and a blacksmith team.

The **Budget Allocation** gives a rough indication of the funds required to finance the work identified for a particular project and consists of an arbitrary allocation of funds for consultants, assistants, the work force, local and imported materials, and an allocation for overall administration and management.

# **1 West Gopura III, West Portico - Structural Repair**

## **Summary**

The northern lintel is losing its bearing as a column capital supporting it has fractured and is structurally unsound. As a result the portico vaulted roof is in danger of collapse and therefore requires urgent intervention.

## **Location**

The Portico is on the main axial west/east running visitor route giving access into the principal East Gopura IV and to the temple complex from the West.

## **Present Condition**

The North West Lintel spanning between two columns in turn supports the corbelled vaults that form the roof to the portico. The capital to the central column supporting this lintel has split free from the column due to shear stresses and the lintel has almost no sound bearing. As a result there are signs of structural movement reflected in the settlement pattern of the vaults above and in the way the fractured segment has shifted. A temporary metal strap has been placed to give support to the defective capital and temporary vertical shores have been placed beneath the failing lintel. A study of the present condition of the portico indicates that the EFEO found it in a seriously failing condition and there is evidence of some heavy interventions using reinforced concrete. However, it is not clear whether the current failure is the direct result of the earlier failures or has happened subsequent to the EFEO intervention.

## **Repair Recommendations**

It is essential that repairs are undertaken as soon as possible to consolidate this structure as it is on the principal visitor route to the temple complex. It is also essential to check out the repairs undertaken by the EFEO too ensure they are still structurally sound. For example, the main west facing fronton is supported off a heavy reinforced concrete lintel which is set into the capitals of the west columns - a far from satisfactory solution. It may be feasible and to remove this unsightly lintel and repair the original by drilling, doweling and gluing it with epoxy resin. A working steel scaffolding needs to be erected around the defective structure. The scaffolding should be designed to support the lifting gear and to carry the roof vaults and the defective lintel so that repairs can be undertaken on the scaffolding rather than having to lower the stones to ground level. The defective vault stones should be removed and stored on the scaffolding. The lintel should be lifted and also placed on the scaffolding. The columns should be checked and if necessary reset vertically. The fractured section of the capital should be drilled doweled and glued in its original position using epoxy resins. Similarly, if any of the corbels are damaged, they should be repaired by drilling, doweling and gluing with epoxy resin. The structure whole

should be checked; any stones out of true should be moved back into place and if necessary clamped using stainless steel cramps. The lintel should be replaced on its correct alignment and the corbelled vault stones correctly reset.

### **Work Plan**

### **Three Months**

This activity will be assessed in January 1997 when the consultants will all be at site and work will commence shortly after. It will be one of the main activities of the winter season and will take about two months to complete.

### **Work Force**

### **2 Teams**

This will be one of the principal interventions during this field campaign. Following a careful close up structural evaluation in January, this intervention will be undertaken by the most experienced stoneworkers team that previously repaired the East Gopura IV. The team will be assisted by a laborer's team as required. The work will be monitored by the consultant engineer and will be supervised full time by an assistant architect who will organize for students to record the repairs as the work proceeds.

### **Budget Allocation**

### **\$12,500**

The amount required to complete this intervention will be above the average required because of the uncertainty related to the possible repair to the West lintel supporting the heavy fronton. The funds allocated range between \$12,500 to \$15,000 depending of the amount of work required.



## **2 Buddhist Complex - SW Courtyard Tree Damage Repairs**

### **Summary**

On 8th June 1996 two large trees fell into the south West courtyard of the central Buddhist complex causing a certain amount of damage to several of the individual shrines. An emergency work force was immediately set to work to clear the trees and to assess the damage. Following this assessment, it is proposed to reinstate the dislodged stones, to repair the damaged decorative stones and to reconstruct and make structurally sound the sections which were damaged.

### **Location**

The small shrines and the vaulted circumambulatory passages are located to the South West of the Central Tower. The shrines are placed in the open courtyard. The damaged circumambulatory passages are in the South West sector.

### **Present Condition**

On the 8th June at approximately 19:00 hrs, following a small amount of rain, a large "Fromagere" (*tetrameles nudiflora*) uprooted itself and fell across the South West sector of Enclosure Wall I and Enclosure Wall II. It fell in a north-easterly direction hitting a second large tree that was growing around the vaulted roof structure of Enclosure Wall II. Both trees crashed onto the vault of Enclosure Wall I causing surprisingly minimal damage to the vault itself. Two large holes were punched through the vault but the section onto which the tree trunks fell did not collapse. The branches of both trees caused some superficial damage to the two large free standing shrines and to two of the smaller shrines attached to the South West sector of Enclosure Wall I.. The upper section of the tree fell miraculously between the two free standing shrines and almost the central tower. The amount of damage to the whole area was thankfully small compared to the damage that it could have caused had the tree fallen a few degrees further to the North or the South. An initial examination of the damaged sections shows that most of the disturbance to the stonework was superficial.

### **Repair Recommendations**

At present the trees are being carefully disentangled from the structures and removed. A detailed assessment will then be made of the damaged structures to check on their structural integrity. Detailed surveys are being undertaken to record the structures as they stand, to identify the dislodged stones and to plan for any structural interventions. All the broken pieces of stone have been collected and where possible are being pieced together and glued. A full structural assessment will be undertaken in November to ascertain the extent of damage and to plan and prepare a detailed work program. Once the recording is complete and the structural assessment undertaken, it is proposed that the damaged sections are reconstructed following instructions provided by the



consultants. The extent of work will cover the structural repairs to the three damaged shrines, the consolidation of the vaulted passages and partial reconstruction. The careful repair and consolidation of the sculpted West facing fronton is being undertaken so as not to lose fragments of the decoration. Further consolidation may be necessary after consultation with the materials conservator, before the fronton is replaced in its original location.

### **Work Plan**

### **Two Months over Six Month Period**

The survey work, the structural assessment and the actual conservation interventions will take place over a time period of at least six months. However, the intensity of work will vary according to the stage reached. It is anticipated that the survey work will be completed at the end of October. Consultants will prepare a detailed assessment of the structural condition of all damaged sections in November and the actual work will be fitted in sometime in the second half of Field Campaign IV. The reconstruction process will take about six weeks.

### **Work Force**

### **Three Teams over Six Months**

The work force will vary. Initially there will be two teams working on the clearance of the trees and under the supervision of an architect, students will help record the plans, sections and elevations of all the damaged structures. The main reconstruction work will commence once Projects 1:00 and 2:00 are complete in February.

### **Budget Allocation**

**\$10,000**

The budget for this extended work program spread over at least six months will amount to \$10,000. Most of the funds are dedicated to the survey and recording procedures and the lengthy time it will take to remove the fallen trees.

### **3 Hall of Dancers - Repairs to SW Section of Enclosing Wall**

#### **Summary**

It is planned to continue the repair and consolidation works to the Hall of Dancers as an on-going priority. Similar to the work just completed in the South East Sector, a new program is planned for the South West sector as the enclosing wall is threatening collapse and the associated structures including an already damaged 'Apsara' lintel are structurally unstable. Interventions to repair and consolidate this sector will follow the procedures and technology already developed in the Hall of Dancers.

#### **Location**

The section of enclosing wall up to and including the 'Apsara' lintel in the South West Sector. The Repair and consolidation program will also include associated structures that are immediately threatening collapse.

#### **Present Condition**

This activity is associated with the shrine enveloped in the tree and structural movement to this wall could be associated with the tree roots. where the walls meet at the corner, they have separated and show signs of movement. Both walls are out of vertical and threaten collapse. Early attempts were made to reinforce the walls using metal straps to tie back the wall. The finely decorated southern 'false' door jamb has been supported on a concrete pillar. Movement along the West wall is also affecting both the stability of the pilaster and the Apsara' lintel. The lintel has fractured in the center of its span and was propped in its fallen position using reinforced concrete, by the EFEO in the 1950's. The stability of the lintel is suspect as the bearing ends of the concrete support are minimal.

#### **Repair Recommendations**

Temporary support has been provided. However more permanent consolidation is required urgently to prevent the collapse of the wall. The architects have already prepared detailed drawings of plans sections and elevations of this area ready for the repair work to commence. A strong scaffolding will be required for the lifting and removal of the stones as well as for their storage. After referencing the stones blocks forming the wall should be carefully dismantled only removing wall sections that are structurally unstable. Once a suitable level has been decided upon by the consultants the wall will be reconstructed and stones will be linked to provide a satisfactory bond using polypropylene rope reinforcement where suitable and stainless steel clamps. The Apsara lintel will be carefully removed and disengaged from its concrete support. After the necessary cleaning and consolidation the lintel will be pinned with stainless steel dowels and glued using epoxy resin before being replaced in its original position. Prior to replacing the lintel, the associated structures will be checked and consolidated as necessary ensuring proper bonding using steel clamps.

**Work Plan****Three Months**

Work on this intervention, which will be one of the principle activities during Field Campaign IV, can only begin once work on the East Gate to the Hall of Dancers is completed. It is planned to get the work started in November and for it to be accomplished within three months.

**Work Force****2 Groups**

The stoneworkers team at present engaged in the Hall of Dancers will move from the East Entrance to the Hall of Dancers once completed to commence this work. They will be assisted by a laborers group as necessary. The activity will be planned in detail by the consultants during their visit in November and a full time assistant architect will be supervising the work with a student in attendance.

**Budget Allocation****\$15,500**

The anticipated budget for this intervention will amount to \$15,500 accounting for the services of two teams of workers and the necessary detailed recording and technical supervision. It also allows for the importation of necessary materials and chemicals required to repair the lintel.

## **4 Hall of Dancers - Structural Consolidation of NW Sector**

### **Summary**

The Hall of Dancers is considered one of the most significant structural complexes of Preah Khan. Therefore WMF's efforts are being concentrated on consolidating both its structure and fabric. The recent disengagement of this sector has shown up many structural inconsistencies which require immediate attention to prevent further deterioration.

### **Location**

The North West Sector of the Hall of Dancers occupies the whole of the North West sector of the Hall of Dancers and is enclosed by a standing wall.

### **Present Condition**

The whole sector has recently been disengaged from the accumulate debris and fallen stone. The stones have been located on survey drawings and the location of all the identifiable stones has been established. The structural condition of the remaining standing stones is very poor. Many of the columns and lintels are out of alignment and have been propped to stabilize them thus preventing immediate collapse. Areas of the remaining quarter vaults are threatening collapse which will result in the loss of further important structural elements and the damage of stonework.

### **Repair Recommendations**

A more in depth structural assessment is required and detailed recommendations will be provided by the WMF consultants for the structural consolidation and repair of this sector. The techniques required for repair have already been well tried in other parts of the Hall of Dancers and should not pose any problems for the stoneworker team. The enclosing wall will also require careful analysis and any structural consolidation required will be undertaken in a similar manner to that recommended for the structural repair to the South West sector.

### **Work Plan**

### **Three Months**

This intervention will continue in sequence after the work to the South East Sector and is planned to commence in February 1997. The expected duration will be about three months.

### **Work Force**

### **2 Groups**

The work force at present engaged in the Hall of Dancers will move from South West Sector to undertake this work. They will be assisted by a laborers group as necessary. The activity will be planned in detail by the consultants during their visit in November

and a full time assistant architect will be supervising the work with a student in attendance.

**Budget Allocation**

**\$12,500**

The anticipated budget for this intervention will amount to \$12,500 accounting for the services of two teams of workers and the necessary detailed technical recording and supervision.

## **5 Hall of Dancers - Consolidation of SE & NE Apsara Lintel**

### **Summary**

The eight Apsara lintels are one of the unique and principal architectural features to be found in Preah Khan. Over the centuries several of these have fallen to the ground and the South East Lintel is one of these. The WMF team plans to repair the lintel and replace it in its correct position.

### **Location**

The Lintels' original location were spanning the openings into the North East and South East Sector of the Hall of Dancers. The lintel were found at ground level close to their original locations.. Following their recording, they have been moved to a safer location ready for work

### **Present Condition**

The lintels were found on the ground in a damaged state lying under rubble and debris against the East enclosing wall not far from where they originally spanned the opening to the South East Sector. The lintels are broken into several parts, and they are deteriorating as a result of exposure to direct rainfall, due to the position in which they have laid after falling and the accumulated debris around them. Their collapse was probably due originally to the leaning outward of the South East sector of the enclosing wall, (at present under repair) and due to the collapse of the corbelled vaults above them.

### **Repair Recommendations**

As these lintels are some of the most significant examples of decorative sculpture in Preah Khan, it is strongly recommended that the South East and North East lintels are repaired, consolidated and replaced in their original positions. A careful assessment is required of the condition of the sandstone. Both lintels will require careful cleaning, some consolidation and very precise structural repair aligning the fractured stones. These repairs will be undertaken using stainless steel or glass fiber dowels and epoxy resin glues. A structural scaffolding will need to be designed and erected taking into account the loading it will need to carry. The structural supports, the pilasters/door jambs to the East and the columns to the West will require careful realignment and consolidation prior to the resetting of the lintels in their original positions. The weathering details on the upper part of the lintels should be checked and if necessary new weather strips may be required to protect the carved details.

### **Work Plan**

### **Three Months**

The work on the repair and consolidation of the lintels at ground level will be carried out under the careful supervision of the consultant stone conservator. This work will commence in January and should be completed in two months. The re-positioning of the

lintel will take place in march under the supervision of the consultant engineer. The actual time of work required will be easily contained within the planned missions of the consultants. The repair and consolidation work will take most of the time. The placement of the lintels will be sandwiched into the work plan of other activities taking place in the Hall of Dancers.

**Work Force****2 Groups**

Work on this lintel will be undertaken by the Consultant and the specialist stone team over a period of three months. The work will not necessarily be constant but will be dovetailed in with the paired lintel (North East) and other activities as required.

**Budget Allocation****\$8,500**

The funds required to complete an exercise of this nature will be in the region of \$12,500 because of the need for more specialist inputs and the need for imported materials and chemicals.

## **6 E. Gopura III E. Portico - Consolidation of Lintel & Column**

### **Summary**

There is failure in the structural integrity of this portico where it meets the principal Gopura. The pilaster is fracturing and the lintel has insufficient bearing which indicates potential structural failure. Although collapse appears unlikely, it is important that this structural failure is consolidated as soon as possible.

### **Location**

The principal entrance from the East into the temple complex. The defective lintel and pilaster capital are on the North side.

### **Present Condition**

Like in the West Gopura III there is evidence of structural failure to the north east lintel and its east pilaster. The Gopura and portico had undergone repairs by the EFEO and it is possible this earlier intervention has caused loss of structural integrity. This failure has again caused serious movement in the corbelled vaults above. There are signs of differential settlement in the foundations in this area of the temple complex possibly

### **Repair Recommendations**

Following a more detailed structural assessment, repairs will be undertaken following similar interventions to other porticos. With their previous experience of working on these porticos, the structural procedures and techniques are well understood by the work force. These procedures are described in detail in previous WMF reports.

### **Work Plan**

### **Two Months**

This activity will be undertaken once the work force are available to undertake this work sometime in October. It will take about two months to complete.

### **Work Force**

### **2 Teams**

This intervention will be undertaken by the experienced stoneworkers team that has previously repaired the East Gopura IV. The team will be assisted by a labor team as required. The work will be monitored by and will be supervised full time by an assistant architect who will organize for students to record the repairs as the work proceeds.

### **Budget Allocation**

### **\$9,000**

The amount required to complete this intervention will be based on previous similar interventions. The funds allocated are \$9,000 inclusive of materials and equipment.



## **7 North Gopura IV Central Gateway North**

### **Summary**

The instability of the heavy north facing fronton has caused the outer section of the wall end/pilaster to fracture due to uneven pressure and for the lintel to shift. Collapse appears unlikely, but it is important to insure the structural integrity of this lintel and column construction as it is on one of the axial routes leading into the temple complex.

### **Location**

This Gopura is the main access route from the North and is often used for the shorter tours. The defective section of the gateway is on the northern side.

### **Present Condition**

Like many of the Gopuras which have heavy frontons, the supporting columns or wall end are buckling due to the shift of the structure and eccentric loading on the outer stone blocks. As the blocks are laid dry, there is no give and the result is dramatic spalling of the outer surface caused by pinching of the outer edges of the stone. This failure in turn causes further weakness to the eccentric loading and could eventually precipitate the collapse of the fronton - this has occurred at Preah Khan in the distant past.

### **Repair Recommendations**

It is important to re-establish the structural integrity of the gateway by realigning the stone blocks and resetting as much of the fronton as is necessary. This procedure has been described above and in WMF's field reports.

### **Work Plan**

**Two Months**

This intervention is planned for implementation as one of the first repairs to be undertaken in this field campaign, starting around the beginning of October.

### **Work Force**

**2 Teams**

It will be necessary to train up a third work force to undertake this type of intervention. The new team will be a spin off of the other team specializing in portico repair - two of the workers will be upgraded to lead the new team of workers taken from the labourer team. The work will be supervised and monitored by the Preah Khan staff and students.

### **Budget Allocation**

**\$9,000**

The budget require will amount to \$9,000 and this will cover the extra time required for the training process.

## **8 SE Portico, East Gopura II - Consolidation of SE Portico**

### **Summary**

Recent movement has been observed in this Portico and associated structures. Temporary supports have been put in place but it is considered urgent that proper remedial action is taken to prevent further damage.

### **Location**

The South East Portico is located just south of the principal Gopura I and provides a secondary access directly to the later constructed laterite Enclosure Wall II and the vaulted circumambulatory.

### **Present Condition**

During the last few months structural movement has been detected in the North East Column and the lintel is fractured. The column is inclining to the East and this movement can be traced through the fronton above. There is also movement in the vaults over the circumambulatory which is accessed through this portico. Many of the vaults and their supports are structurally unsound and in danger of falling. The movement in both cases could be caused by a similar fault. The structural movement should be carefully checked.

### **Repair Recommendations**

Immediate temporary support has been provided and detailed survey drawings are being prepared ready for work to begin on consolidation. This procedure has been carried out on several similar defective lintels on the East Gopura IV complex.. The procedures have been described in Section 3:00 the West Gopura III West Portico.

### **Work Plan**

#### **Two Months**

The repairs to this section can begin immediately upon receipt of approval. This type of procedure is familiar to the work force and the time required to complete this activity will be two months. Work is planned to commence by mid-October.

### **Work Force**

#### **1.5 Teams**

One stoneworkers team will be required to undertake this work. One architect will be in charge of supervision and responsible for the survey with the help of two architectural students.

### **Budget Allocation**

#### **\$4,500**

The budget required to complete this project is in the region of \$4,500 which will cover the costs of survey, labor and materials.

## **9 Hall of Dancers - South Promenade**

### **Summary**

Recently it was decided to open up the raised promenade to the south of the Hall of Dancers as it would expand the visitor experience and also provide another access route around the Hall of Dancers where work was in progress. Once cleared of vegetation it was found that many of the stones forming the raised promenade had been dislocated and a section of the paving had been damaged by a falling tree. This route has become popular with visitors and it has therefore been decided to repair and maintain it properly.

### **Location**

The raised open promenade runs from East to West linking the East Gopura IV with East Gopura III. along the South side of the Hall of Dancers. It also provides access through a South doorway to the Hall of Dancers.

### **Present Condition**

The raised promenade is generally in reasonable condition, but many of the edging stones have been disturbed and a section at the eastern end has been damaged by a falling tree. The base of the now fallen tree which has a dramatic root structure and a large amount of fallen debris blocks the path through to the south doorway of the Hall of Dancers. The supporting elements to the doorway itself have partially collapsed depositing the fronton stones on the ground which are now covered in debris. The lintel over the doorway has fractured and was repaired using a reinforced concrete sub lintel.

### **Repair Recommendations**

Work is in progress to form a passage between the remaining sections of the trees root structure and to clear the debris and identify the fallen stones in front of the South doorway too the Hall of Dancers. Survey drawings providing plans, sections and elevations are being prepared of the whole area. It is recommended that once the promenade has been properly cleared of vegetation and earth that the dislodged stones are carefully replaced and consolidated; the damage to the platform by the fallen tree is repaired and the South doorway to the Hall of Dancers is consolidated and possibly reconstructed, following instructions from the consultants.

### **Work Plan**

#### **One Month**

The ongoing clearance work should be completed before the end of October. The repairs and reconstruction of the doorway should be commenced in the middle of October to enable visitors to use another access route as much of the Hall of Dancers will have restricted access during the 1996/97 Field Campaign. The structural work to repair the

doorway will take a maximum of one month. Work relating to the resetting of the promenade will be undertaken to suit the rest of the program.

**Work Force**

**One Team**

A clearance team will continue to remove the above ground debris under the supervision of an archaeologist and an architectural student who will also record the location of all stones uncovered from the debris.

**Budget Allocation**

The funds required to complete this work which will include supervision and recording will amount to \$2,500.

## **10 Hall of Dancers South - West Shrine**

### **Summary**

The shrine is engulfed by a tall Fromagere tree. Recently there is evidence denoting the tree is causing further structural damage to this shrine as a stone lintel has fractured and there is movement through the stone joints. This tree is a hazard threat to the structure and it is recommended that it is cut to about mid level which will limit the movement of the tree in heavy winds and reduce the potential level of damage to the shrine and nearby structures.

### **Location**

The shrine is located and attached to the outside of the enclosing wall on the South West corner of the Hall of Dancers

### **Present Condition**

This small shrine is dominated by an enormously tall Fromagere tree (*tetrameles nudiflora*) which is growing from and around the western end of the small shrine. The shrine itself is in a fairly dilapidated state due mostly to the tree growth. It appears that the swaying of the tree is now producing further visible damage to the shrine as it has caused the lintel over a small south facing window to fracture.

### **Repair Recommendations**

This tree is a threat to the structure it is growing around, but more importantly to the surrounding structures. If it were to fall it could cause extensive damage to the Hall of Dancers. It is strongly recommended that the tree should be cut down at least to within 10 meters from above the vaults of the shrine. The tree cannot be removed from the structure itself until it is dead and rotted. It will therefore be necessary to wait and see if it continues to grow or whether it dies before a further decision can be relating to the future of the structure itself. Temporary support will be provided beneath the fractured lintel.

### **Work Plan**

### **Two Months (Approx.)**

The First step will be to remove the tree for which permission will be required from the Governor's office, the Conservation Office and APSARA in Siem Reap. Work can only commence on the cutting of this tree sometime after February. The process will take less than one month. The structural repairs can only take place once the tree's future is decided. During Field Campaign IV it is unlikely that any major interventions will be made.

**Work Force****Special Work Force**

A special workforce will be required to remove this tree. WMF is exploring the possibility of bringing in specialist lumberjacks.

**Budget Allocation**

The Funding required for tree removal has not been fully ascertained. A budget of \$2,000 has been allocated to cover the local Preah Khan work force's activities.

## **11 Vishnu Temple Complex - West Elevation**

### **Summary**

The Vishnu Temple complex appears to have been restored or updated after the generally accepted date for the abandonment of Angkor. During a period of the rebirth of Hinduism in the 16th Century it appears that a new facade was added across the complete western elevation - the original entrance to the temple complex. This added facade was poorly attached to the original structure and as a result of time and neglect it fell. During the 1992 Field Campaign I WMF consultants, assisted by the students, reassembled the architectural elements partly in reality and partly on drawings ready for a later program of reconstruction.

### **Location**

The West facing elevation of the Vishnu Temple complex that spans either side of the East/West Axial route.

### **Present Condition**

The added facade has fallen and was buried in rubble and debris which was not even cleared by the EFEO when they were working at Preah Khan. It was only in 1992 that the WMF team cleared the courtyards and exposed the later facade which has been partially reassembled in the courtyards. Most of the original stonework is intact. However, the corbelled vaults forming the roofs and the complete central tower have collapsed

### **Repair Recommendations**

WMF considers this later addition to be a unique feature of Preah Khan and is recommending the structural repair and partial reconstruction of this interesting facade. It is proposed that, because of the unique significance of this section of Preah Khan, the collapsed elevation is re-erected in its original position. It is also recommended that the vaulted connecting passages and over the north and south shrines are also reconstructed - the two latter shrines did not have towers over them. At present it is not recommended to reconstruct the central tower. The decorative elements of the main facade have been identified and located. (See drawings in Preah Khan Field Report III 1991 -1992). Their location against the existing facade can be easily identified as indentations, 'shadows', are clearly visible on the original stonework. Following recommendations made by the Consultant Engineer, it will be necessary to tie back the second facade to the original by the careful placement of stainless steel ties or dowels for which anchorages will be drilled and the metal will be fixed using epoxy resin glue.

**Work Plan****4 Months**

The length of time required to undertake this work will be about four months. Work can only start following the consultant engineer's visit in October to recommend necessary structural interventions.

**Work Force****2 Teams**

Following the consultants recommendations, there will be a need for a special stone team plus a labourer team for the full three month period. Supervision will be undertaken by one of the assistant architects plus two students who will undertake all the necessary recording and archival drawings.

**Budget Allocation****\$12,500**

This will be one of the major undertakings of Field Campaign IV



## **12 Buddhist Complex, NE Sector - Access to “Laxmi” Shrine**

### **Summary**

Over the last few years a one and a half meter image in haute-relief, hidden in the middle of the Buddhist Monastic complex has become a significant image of worship known as Laxmi. This Hindu divinity is the wife of Vishnu and considered the goddess of fortune. The image now being worshipped is one of the more beautiful ‘devatas’ that decorated the walls of one of the shrines. Access to this part of the temple is perilous and it is important therefore to provide a suitable and safe access route to this new shrine.

### **Location**

The new shrine is located in the North East Sector of the Buddhist Complex in a collapsed section of the Enclosure Wall I. Present access is from the northern axial path along the east west running North Enclosure Wall I. At present access is across some insecure stone blocks under East Gopura I tower, through a small window opening.

### **Present Condition**

The existing access route is dangerous and, despite efforts to close the access to visitors, people will continue to visit the site by a number of different routes. Most ways lead across structures require people to clamber over fallen stone blocks and to pass through areas that are structurally unsound. One section close to the East Gopura I Tower is very perilous as the vault stones have very little sound bearings. Once in the newly formed ‘shrine’ the fallen stones seemed to have locked themselves into a state of equilibrium and are not threatening collapse.

### **Repair Recommendations**

The most satisfactory way of resolving this access dilemma is to create a ‘safe’ passage to the new shrine. It is therefore proposed to establish a controlled access point via the north passages from the East Gopura I by moving some of the fallen stones, checking the condition of the overhead corbelled vaults and consolidating them where necessary and creating a structurally sound tunnel of timber frames and planking to the Laxmi shrine along this route. Timbers can be cut from fallen trees identified within the project area and used to construct this passage. All other access points will be blocked and signs will be posted to prevent people from climbing on the structures. All guides will be informed that this will be the only access route to the shrine.

### **Work Plan**

### **One Month**

Once approved, the passage will be erected in October before the start of the main tourist season and should be completed within one month.

**Work Force****1.5 Teams**

The carpentry team will be assisted by a labor team as required. The work will be supervised by an architect. Once in use the passage will be checked on a regular basis as part of the maintenance program.

**Budget Allocation****\$1,500**

If timber can be used from fallen trees within the project area costs can be minimized to about \$1,500. Otherwise timber will have to be purchased from the market, doubling the required costs.

## **13 West Gopura III, Dvarapala Sculpture - North**

### **Summary**

During the last Field Campaign III a WMF consultant in stone conservation and repair developed appropriate technology and trained a team to undertake the skilled repair techniques required for sculptural repairs. It is proposed to continue this work on the other of the pair of Dvarapalas at West Gopura III.

### **Location**

The Dvarapala sculpture is the northernmost of a pair of over life size guardians that originally stood sentinel at the West Entrance to West Gopura III, and it stands directly in front of the West Portico.

### **Present Condition**

The Dvarapala or guardian which was a monolithic sculpture is like its companion, headless. Other missing parts of the sculpture consist of the guardians club and the lower sections of both left and right arms. The sculpture was previously repaired using reinforcing steel bars as armatures to refix broken sections which were placed in grooves cut into the stones which were later covered with a cement sand mortar. Since this previous repair, several sections including the club and lower sections of the arms have become separated again but most of the missing sections have been found buried in the jungle close-by.

### **Repair Recommendations**

At the beginning of this year, a program for sculpture repair and conservation was initiated on the southern Dvarapala, where special techniques and mortar mixes were developed to demonstrate techniques appropriate to this kind of repair. These repairs are described in detail in the main body of the 1995-96 Field Report VII and should be followed as the appropriate methodology and technology for the repair of the northern Dvarapala.

### **Work Plan**

**1.5 Months**

The anticipated overall time required to complete the repair of the northern Dvarapala is about one month. Work on this project can start during the period when the stone consultant will be at Preah Khan again in January 1997.

### **Work Force**

**1.5 Teams**

There will be the need for one specialist stone team with assistance from a labor/work force for lifting and moving the stone pieces.

**Budget Allocation****\$3,850**

The funds required to cover the costs of the repairs to the Dvarapala amount to \$3,850 which is a small sum for the work achieved. Funds have been allocated for the work force, consultants, supervision and special materials.

## **14 Vishnu Complex - Frontons on East-West Axis**

### **Summary**

Two exposed decorated frontons, the west facing depicting the legend of Krishna holding up the Mount ? to prevent a flood and the East facing fronton depicting Brahma. Both frontons are exposed to the elements and the delicate carved images are being eroded and damaged due to such exposure. there are few such frontons at Preah Khan and it is considered therefore a matter of urgency to protect and consolidate these two examples.

### **Location**

The location of the frontons is along the west/east axis passage at the east end of the Vishnu complex just before passing through the Enclosure Wall II West. The frontons face one another across a short passage which may once have been open to the elements.

### **Present Condition**

Both the Frontons are suffering from exposure to the elements. The sandstone is becoming friable eroding and loosing its detail. The eastern fronton is structurally unstable and is propped to prevent collapse.

### **Repair Recommendations**

Both the frontons need to have a careful assessment made of their structural integrity and material condition which will be undertaken by the consultant engineer and the stone conservation in January 1997. Following their detailed assessment, it is planned to undertake minimal intervention by providing suitable structural support, protection of the fronton against the rains and some localized stone conservation and consolidation.

### **Work Plan**

#### **One Month**

This conservation project can only be commenced after January following inspection by the consultants. It is anticipated that the repair and consolidation work will be carried out in situ and will not require an intensive work plan. It is estimated the whole activity can be completed within one month and the work is planned for the month of February. The activity may overlap into a second month depending on availability of work force.

### **Work Force**

#### **1.5 Teams**

Following recommendations from the consultants, the stone conservation team will be required to undertake this conservation project with support from a stoneworkers team.

### **Budget Allocation**

#### **\$4,950**

The funds required to undertake this procedure will cover the consultants, the stone conservation team, the supervision and provision of special materials.

## **15 Buddhist Complex - E. Gopura I - Cleaning Interior Walls**

### **Summary**

During Field Campaign II WMF consultants specializing in materials conservation studied the growths on the stones of Preah Khan. Following their research, it was generally decided to leave most of the stonework as found. However, the one area where there was apparent damage to the surface decoration of the sandstone was in the interiors of East Gopura I. It was therefore recommended to undertake cleaning and protection.

### **Location**

The Interior of the Central Tower of East Gopura I on the principal east west axial route. The Gopura will also serve as the access point to the Laxmi Shrine.

### **Present Condition**

The walls to the tower which are delicately inscribed with images of the Buddha are presently covered with a thick growth of lichen completely obscuring the decoration to the wall. The reason for this growth appears to be the presence of a micro-climate within the tower, caused by dampness and some sunlight which penetrates through the damaged and fallen upper section of the tower. During periods of high humidity and penetrating sunlight, the growths are rapid and completely obscure the decoration on the stonework. During the dry periods the growths tend to dry out and shrink at which time tension to the surface of the stonework can cause damage.

### **Repair Recommendations**

Consultants have studied the growth over several years now and have ascertained that the growth is causing some damage to the interior wall faces and, if the walls can be treated against regrowth are recommending that the walls are cleaned. Earlier tests to clean and treat have proved reasonably successful. Cleaning is simple. Clean water is applied with soft bristle brushes to remove the growth and then left to dry. Once dried, an application of diluted copper sulfate is applied to the walls. During the initial stages of cleaning and treatment, it may be necessary to apply several treatments of copper sulfate based on observation of recurrence. It may also be necessary to temporarily cap over the tower to prevent sunlight penetrating the interior of the tower.

### **Work Plan**

### **One Month**

The actual process of cleaning and the application of the treatment is not very time consuming. The whole process can be completed in one month. The best time to undertake this work will be in January under the guidance of the Materials Conservator.

**Work Force****1 Team**

The stone conservation team will be responsible for this work under the supervision of an architect. The progress of the work will be carefully monitored, documented and recorded for future comparative studies.

**Budget Allocation****\$1,500**

The funding requirement for this intervention will be minimal. The budget of \$1,500 allocated will cover the costs of the conservation team, a supervisor and a limited amount of chemicals.

## **16      Garuda Program**

### **Summary**

The “Adopt a Garuda” program is one of the principal ways of generating funds to support the overall conservation program at Preah Khan. Therefore a continuous program of Garuda repairs is planned and implemented each year.

### **Location**

The sculpted sandstone Garudas which stand over 2.5 meters high are placed at regular intervals around the outer laterite Enclosure Wall at intervals of about 35 meters. They are the protectors of Preah Khan.

### **Present Condition**

The Garudas have been the subject of a detailed photographic and condition survey which was reported in detail in the WMF’s Report V. The main defects to the Garudas can be summarized as follows: The laterite plinths on which the Garudas are placed have settled due to the heavy dead load. The turning effect of the wall itself has caused the sculptures to tilt. Subterranean termites who have chosen to build their nests between the wall and the sculpture, has, in many instances caused the blocks to be displaced. In a few cases the sculptures have collapsed totally but, fortunately only very few stone blocks have gone missing altogether. The condition of the stone is generally very good, although some of the stones’ edges have spalled due to there being no matrix on which to bed the stones. There are also a few cases of delamination. The general patina of the stone is good and no major problems result from the growths of algae and lichens.

### **Repair Recommendations**

A set of detailed repair recommendations is set out in the accompanying drawings and Report VII which provides a record of all the work undertaken during the 1995/6 field campaign. Three Garudas in different stages of disrepair have undergone rehabilitation and the work undertaken provides a full spectrum of repairs required for the remaining sculptures.

### **Work Plan**

#### **1.5 Months per Garuda**

The work plan is dependent on the adoptions achieved during the previous years fund raising campaign. WMF plans to have a sequence of repairs being undertaken each year with at least one example of repair in progress throughout the year.



**Work Force****One Team per Garuda**

There is one stone workers team that has been trained to undertake this exacting work. It is planned to split this group and form a second team to work on the Garudas. The specialist stone conservation team will also be required for repairs to damaged stones and for consolidation of delaminating stones.

**Budget Allocation****\$5,000 per Garuda**

The average costs for repairing a Garuda ranges between \$5,000 and \$3,000 per sculpture dependent on its condition. Work can only be started once an adoption has taken place. The remaining funds raised over and above the cost of repair are transferred to the overall running of the project and the annual maintenance program.

## **17 The North East “Dharmasala” Structure**

### **Summary**

This unique structure is threatening collapse and is only still standing due to the temporary support provided by structural scaffolding. WMF is campaigning to raise the total figure required to complete the repair program in a single stage before any work commences. The work proposed is summarized below.

### **Location**

The Dharmasala often referred to as ‘bibliothèque’, the temple of the Sacred Flame or more commonly the Dharmasala is an individual structure located in the eastern sector between the outer Enclosure Wall IV and Enclosure Wall III along the East West axial path. It was until recently completely hidden in jungle undergrowth

### **Present Condition**

This unique independent stone structure with its western tower encapsulates nearly all the structural problems found in a Khmer monument. Detailed studies in the form of survey drawings, a structural and condition survey together with recommendations have been written up in the WMF’s Field Report V. In summary, the main defects are a failure in the foundations which are slipping due to the thrust of the corbelled vaults. The corbelled stones have slipped and locked themselves into a new stable position. Earlier attempts by the EFEO to stabilize the tower appear insufficient. The two end walls to the East and West are very unstable and have separated from the main structure. The whole structure is presently encased in scaffolding to prevent further collapse.

### **Repair Recommendations**

A series of detailed reports have been prepared on its condition and repair recommendations. The WMF team has considered at length the most suitable stabilization program for the Dharmasala. Consideration was given to undertaking the process of anastylosis, but it does not meet with WMF principles and procedures adopted for its program at Preah Khan. However, should it be decided at a much later stage to adopt this procedure the structural stabilization and repairs proposed can be easily adapted to suit this alternative. It is recommended that the present status of the structure is maintained by the placement of support foundations enclosing the existing inadequate foundations by underpinning as required. The remainder of the structure above ground will be repaired and consolidated as needed by the careful realignment of stone blocks and the insertion of structural bonding elements of either reinforced concrete ring beams around the base of the tower or the careful linking together of stone blocks with stainless steel ties to form a structural ring. In some cases, especially on the northern side of the structure, it may be necessary to replace some of the missing structural stones. On the interior at floor level there will be below grade reinforced

concrete beams which will tie the new concrete foundations together. The outward appearance of the structure and fabric of the Dharmasala will remain unchanged.

### **Work Plan**

**18 Months**

This sub-project is identified as a one off activity which will be undertaken in its entirety from start to finish as one exercise. The sub-project can only be commenced once all the required funding has been allocated. It is estimated that the work will take about 18 months from start to finish. It is planned to begin the work before the end of 1996.

### **Work Force**

### **Special Workforce**

Once clearance has been given to start this sub-project, it will be necessary to augment one of the stone workers teams to be able to undertake the work. The sub-project will be planned, set up and implemented alongside the general maintenance and repairs program described within WMF's program for the forthcoming field campaign 1996/97.

However, some adjustments to the extent of other projects that can be implemented will need to be made.

### **Budget Allocation**

**\$200,000 Approx.**

The amount of funds required to implement the repair and consolidation of the Dharmasala is in the region of \$200,000. This amount must be allocated for this sub-project before any work starts.

## **18 Archaeological Investigations - E. Jetty, N. Baray**

### **Summary**

No below ground archaeology has been undertaken at Preah Khan. The Jetty is a separate entity from the temple complex and can be worked on without any major interference to the temple complex proper. A recently qualified archaeologist and long time team member of the Preah Khan team has recently returned to the project from training in the USA and it is planned to begin a small archaeology program at Preah Khan starting with the Jetty.

### **Location**

The East Jetty is located at the far East end of the Processional Way leading into Preah Khan. It is between the bund and the Northern Baray or reservoir and served as the point of embarkation and disembarkation for the temple known as Prasat Neak Pean which is located in the middle of the Baray.

### **Present Condition**

Recently the Jetty area and part of the Baray have been disengaged from undergrowth as the jetty area is used as the starting point for many of the in depth guided tours of Preah Khan. Although no below ground excavation has taken place, it is possible to see the outlines of the original structure which consists of sculpted sandstone over a laterite core. The original structure has been disturbed by the growth of several small trees and shrubs but it appears that there is sufficient evidence to be able to re-establish the basic format of the original structure.

### **Recommendations**

It is proposed to undertake a thorough archaeological excavation of this section of the site. WMF plans to include an archaeologist in its team during the forthcoming field campaign who will be assisted by a Cambodian archaeologist who has recently returned from further training at Hawaii University. It is proposed that a full-scale archaeological program is initiated with training opportunities for archaeological students and for a specially selected team from the work force.

### **Work Plan**

### **6 Months**

The work plan will be set up by the archaeological team following approval of the basic proposal which will be available at the end of September. However it is anticipated that the program will run throughout the dry season.

**Work Force****Special Workforce**

A special archaeological work force will be trained by archaeologists to undertake archaeological excavations at Preah Khan. It is hoped also to attract scholars from abroad to participate in this program

**Budget Allocation****\$10,000**

A budget allocation of \$10,000 will be earmarked for the archaeological program at Preah Khan. It is hoped that some funding will be provided by scholars from abroad.

## **19 Survey and Removal of Hazardous Trees**

### **Summary**

WMF is very aware of the hazards posed by many of the fast growing trees within the monument complexes. In previous field reports WMF consultants have identified trees that are a dangerous threat to the historic structures and have recommended their removal. In some cases trees have been removed, but for many of the larger trees the Preah Khan team are daunted by the task of removal. No local workers are capable of undertaking the work

### **Location**

Please refer to the Hazardous Tree plan attached or contained in Field Report VI, p. 139

### **Present Condition**

Over the last several years the WMF consultant forester has studied the tree species in Preah Khan and has made several recommendations especially relating to the hazardous trees. It is however, difficult to assess the root patterns of many of these trees as for example the recent tree to fall was a healthy specimen but it had a very shallow root structure and it fell without warning on a calm and dry day. Trees that are entwined with the stone structures are for the most part sound, but limbs of these trees tend to break off without warning due to old age. Such conditions prevail throughout the forests of Angkor.

### **Recommendations**

As this is a universal problem, WMF is pleased to assist with searching out expertise to undertake the difficult task of removing hazardous trees in Preah Khan and elsewhere in Angkor. WMF recommends that a special workforce is trained by specialists in the techniques of tree and branch removal and that this team is made available to all project teams working in Angkor. WMF will in the meantime assist in the search for a suitable expert to survey and implement a program for removal of hazardous trees.

## **20      General Maintenance Program at Preah Khan**

### **Annual Program**

It is proposed that the general maintenance program is continued at Preah Khan and the following activities are undertaken on a regular basis.

- Continue regular checking of the structures throughout the temple complex against structural movement or collapse and provide temporary support as necessary.
- Check and replace as necessary the temporary emergency supports placed to prevent structural failure.
- Careful control of vegetation around the site. No further new disengagement is envisaged during the coming year but the continued clearance of the exposed areas must be undertaken on a regular basis.
- Treatment of wall tops and structures against vegetation using a systemic herbicide (Updown which is available in Thailand)
- Planning and implementation of stormwater drainage to prevent unnecessary standing water within the temple complex.
- Reset stone paving along the causeways to prevent channeling of rainwater and remove all tree roots and vegetation growing between the paving .

All these activities are ongoing and recommendations for procedures have been described in previous WMF field reports.

## **21 Training of Staff**

The WMF plans to continue its training program for both the professional staff and for the workers. The following is the intended program.

### **Professional Staff:**

Following the success of WMF's first trainee at the Frank Lloyd Wright School of Architecture, further applications have been made to send two more of the Preah Khan team to study at Taliesin. It is planned to send these students for one year to start their training in April 1997 at the end of the field campaign. Negotiations are also in hand with the Institute of Advanced Architectural Studies at York University UK for a student to be sent on a three month architectural conservation course in the near future.

### **Specialist Teams:**

WMF consultants will continue to train specialist teams on site. Extra teams to work on the Garuda Program and structural stone repairs will be required during this campaign. These teams will be formed by splitting the existing teams and providing new team members who will undergo site training and experience.

### **Assistance Program for Faculty of Architecture:**

WMF has set up and will continue to run a program assisting the Faculty of Architecture at the University of Fine Arts in Phnom Penh. At present WMF is funding one of the assistant architects to spend one week each month at the Faculty of Architecture to assist in the development and teaching of a workshop on architecture. It is planned to extend this assistance in 1997 when the trainee at present at Taliesin returns to Cambodia. A similar arrangement to send him for a week per month will also be arranged.



## **22      Preparation of the WMF Site Interpretation Center**

### **Summary**

WMF has plans to reorganize the Preah Khan Information Center and turn it into a fully fledged interpretation center describing the work that WMF is undertaking at Preah Khan. It is planned to prepare a series of 'before and 'after' photographs of the work completed; sets of survey and engineering drawings; as well as an illustrated narrative of the history and development of Preah Khan. All of WMF's field reports on Preah Khan together with other relevant information will be available as well for visitors to study.

### **Workplan**

WMF plan to provide assistance for the development of this facility from its newly created Gift Shop program at WMF's headquarters. Consultant staff will be sent to Angkor to prepare recommendations for the facility which will be implemented as and when possible during the forthcoming season. WMF also plans to send a designer to Preah Khan to develop a line of unique costume jewelry which will take its inspiration from original Khmer motifs and patterns. The jewelry will be sold at the site and all proceeds will benefit the project.

## WORK PLAN FOR OCTOBER 1996 - SEPTEMBER 1997

### Proposed Budget

The following identifies the anticipated costs for each intervention :

	ACTIVITY	BUDGET
1	West Gopura III, West Portico - Structural Repair	\$12,500
2	Buddhist Complex - S.W. Courtyard Tree Fall Damage Repairs	\$10,000
3	Hall of Dancers - Repairs to S .W. Section of Enclosing Wall	\$15,500
4	Hall of Dancers - Structural Consolidation of NW Sector	\$12,500
5	Hall of Dancers - Consolidation of S. E. & NE Apsara Lintel	\$8,500
6	East Gopura III East Portico Consolidation of Lintel & Column	\$9,000
7	North Gopura IV Central Gateway North	\$9,000
8	S. E. Portico, East Gopura II - Consolidation of SE Portico	\$4,500
9	Hall of Dancers - South Promenade	\$2,500
10	Hall of Dancers South - West Shrine	\$2,000
11	Vishnu Temple Complex - West Elevation	\$12,500
12	Buddhist Complex, NE Sector - Access to New "Laxmi" Shrine	\$1,500
13	West Gopura III, Dvarapala Sculpture - North	\$3,850
14	Vishnu Complex - Frontons on East-West Axis	\$4,950
15	Buddhist Complex - East Gopura I - Cleaning Interior Walls	\$1,500
16	Garuda Program	N/A
17	The North East "Dharmasala" Structure	N/A
18	Archaeological Investigations - East Jetty, Northern Baray	\$10,000
19	Survey and Removal of Hazardous Trees	N/A
20	General Maintenance Program at Preah Khan	N/A
21	Training of Professional Staff	N/A
22	Preparation of the WMF Site Interpretation Center	N/A