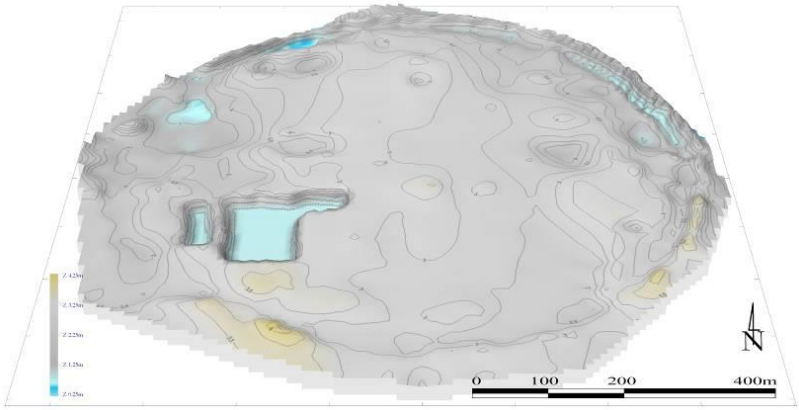
Royal Academy of Cambodia
Institute of Culture and Fine Arts

Cheung Ek Circular Earthwork
Archaeological and Cultural Resource Management Investigations



PHON KASEKA

September 2007

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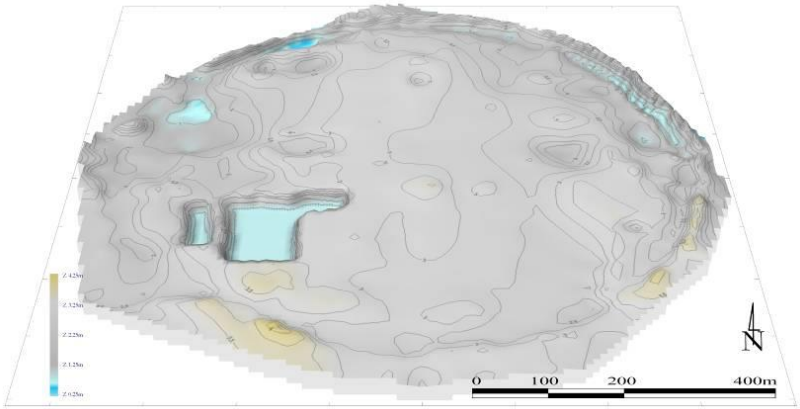

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ABSTRACT

The research has found 61 kilns; two of them are located in the area of the circular earthwork, 11 temple foundations, and some habitation mounds. The Cheung Ek circular earthwork with 770 m in diameter, surrounded moat and earthen wall, located west of the Cheung Ek Lake, was under investigation. Two pre-Angkorian temple foundations and three ancient water reservoirs were recorded and mapped.

The Cheung Ek circular earthwork is not an isolated site due to the evidence of lake, river which connect the site to the Bassc River. It has connection to the neighboring site such as Sre Ampil and Angkor Borei. People of the Cheung Ek circular earthwork developed their living settlement from round village into a normal village. The cultural layer is very thin. The habitation activity was not very long. People abandoned the round village and adopted the living which no longer lived in the round village.

The previous research of kilns based on a kiln profile cleaning and the 2007 kiln excavation inside the circular earthwork show that the kilns have rectangular oval shape with longer side at the north-south direction and short distance at the east-west. This shape is very similar with kilns at Tani Kiln Site in Angkor region, Siem Reap province. The stratigraphic profile shows the firing chamber at the north of the kiln.

The tradition of pottery making and firing the pot in kiln may have developed since pre-Angkorian to post Angkorian period. Khmer people maybe know how to fire pottery in the kiln since pre-Angkor period.

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Background:

Cambodia is a Southeast Asian country particularly rich in cultural heritage. Temple sites dating from 1500-500 years ago dominate archaeological and art historical research, as well as the tourism industry. A multitude of historic and prehistoric sites have been documented throughout the country.

Recently, a large circular earthwork site has been recognized in the Cheung Ek site, five kilometers south of Phnom Penh. Cheung Ek is more popularly known as the "killing fields", although the archaeological evidence clearly demonstrates that it was an important habitation, commercial and production area in historic and prehistoric times. To date, however, this site has not been professionally surveyed and recorded in detail. Dense vegetation growing on the site has made inspection difficult, although Phon Kaseka and other colleagues have made many site visits and preliminary surveys that verify a high potential for scientific archaeological research and CRM/tourism training and development.

The primary site is round, with a diameter of approximately 770 meters. Some parts of the site are being destroyed due to intentional and natural land transformation caused by water erosion. A moat is still visible in some areas. This is also verified by aerial photography. Much prehistoric and historic pottery was found at the site including kiln remnants.

Initial research was conducted in 2004, funded by Naga Research Group and Motor Ford Company. The research entailed site survey and mapping as well as public education. Surveys resulted in the identification of 59 kilns, 31 habitation mounds and 11 brick foundation mounds that are possible temple/shrine remains. Aerial photography has revealed a circular earthwork in Cheung Ek commune (Bruguier, 1993). Subsequent site inspection also identified a ruined foundation at Wat Chœung Ek with architectural elements (lintel, columns, moonstones, pedestals, *linga* and an inscription) (Parmentier, 1927; Cœdès, 1924).

Villagers and local authorities are not aware of the archaeological sites (circular earthwork and kiln sites) in Cheung Ek. Destruction of many sites has already occurred and continues. In the 1960s, a Sino-Khmer community began using the sites for Chinese style cemetery mounds, as the area is a good location for physical manifestations of Chinese funeral traditions.

During the Khmer Rouge period, a particular section of land was used for mass burials, popularly known as the killing fields. Recently, more destruction has continued with development and increasing land alterations for local building and agriculture. Due to increasing land value, local people are selling land to affluent people from Phnom Penh who wish to develop and change the site into a modern development project.

As a result, this circular earthwork site will soon disappear. Immediate research is necessary as it is a rather rare and unusual site that deserves more attention. It will help professionals understand Cambodian history and heritage as well as aid international education, awareness and even the tourism industry.

Objectives of the Research:

The main objectives of the research are:

- To scientifically document the existing circular earthwork through modern survey and remote sensing techniques.
- Documentation through excavation, mapping, surface collection, analyses, etc. related to understanding key questions concerning settlement, settlement evolution, industrial activities (e.g., pottery kilns), economics, ecology and interaction.
- To conduct small test excavations related to specific archaeological and historic hypotheses.
- Transmission of the results to villagers and local authorities. The local people seem generally unaware of the existence of the circular earthwork or its historic importance. Results of this research, including maps and photographs, could help villagers to better understand, appreciate and protect their cultural heritage. Minimally, the research will alert the authorities to pay closer attention to archaeological sites and provide better recommendations to the Ministry of Culture and Fine Arts to ensure site preservation.

We proposed to the American Embassy to investigate the circular earthwork by conducting small test excavations related to specific archaeological and historic hypotheses and other activities as above mentioned.

During the first week of the investigation we found a ceramics kiln located in the northeastern part of the circular earthwork, which was partially cut by a dike (the dike was dug to identify the boundary of the land property). Moreover, the pottery scattered near the kiln had similar characteristics to the pottery from Angkor Borei. The research team decided to investigate this kiln despite a limited budget. The coordinator was obliged to readjust budget expenses in order for the the project to go ahead and the kiln's structure be examined. The collection of this information was vital before its inevitable disappearance, together with the associated pottery data.

Methodology:

Gathering the necessary data to fulfill the initial objectives included the following:

- Determine exact site location using Global Positioning System (GPS) and Global Information System (GIS) technology. Topographic and archaeological maps would be created.
- Record identified circular earthwork(s) and other sites using standard techniques (e.g., tape and compass surface measurements added to vertical topographic and stratigraphic measurements).
- Collect surface pottery and other artifacts for inter-site and intra-site analysis.
- Document the present site condition.
- Research development plans (both large and small scale) and determine the impacts.
- Comparative analyses with other archaeological sites.

Field Procedures:

The research team included the principle investigator and eight assistants. Fieldwork was conducted over a period of 30 working days. Consultants, volunteers, foreign volunteers and students participated, although they were self-funded. Necessary field equipment was purchased in Cambodia. Fieldwork included standard archaeological survey, collection and post-project assessment. This included production of interim and final reports made available to granting agencies, relevant ministries and the public.

The tasks conducted in the field were as follows:

1. Excavation of a trench in the middle of the circular earthwork. The identification of the middle point of the circular earthwork is based on Hand GPS Garmen 76.

2. Excavation of the eastern part of the circular earthwork. The three trenches were dropped near an ancient pond (*Trapeang*). Surface collection around the trenches was conducted before the excavation. A dike was present near the *Trapeang*. Pottery was scattered on the profiles of Trapeang.
3. Excavation of the northeastern part of the circular earthwork, where water collects during the rainy season. Three trenches were dug along the north south direction.
4. Excavation of the northeastern moat of the circular earthwork. The 13m long trench was cut in the moat.
5. Excavation of the gate (Tvea Banteay) of the circular earthwork. Villagers informed the team that the area used to serve as the eastern entrance of the circular earthwork.
6. Excavation of a trench along the northern wall of the circular earthwork.
7. Excavation of a kiln structure: The kiln was identified during the 2006 survey. At that time, the kiln could be recognized by the presence of fired bricks and pottery on the surface. During this field investigation, the kiln was clearly visible. A dike which was dug to identify the land property boundary cut through the kiln from the east-west direction. The dike completely destroyed the middle part of the kiln, leaving intact the southern and northern parts. The purposes of the kiln excavation were to identify the structure, including its shape, the wall, floor, roof, fire box, supporting columns, artifacts and charcoal for dating. The excavation proved to be complicated due to the presence of hard soil. It was decided that the profiles of the dike would be cleaned first to identify the width of the kiln.

8. Cleaning of profiles of the western part of the circular earthwork. The profiles were the walls of the dike dug to identify the land property boundary.
9. Cleaning of the profile in the northeastern part of the circular earthwork. The profile resulted from the dike dug to identify the land property boundary. This dike was a continuation of the dike that cuts the kiln.
10. Coring: We decided to do coring at the points of grids identified for mapping the site. Fifty meter grid points were marked in all eight directions.
11. Surface collection: Systematical surface collection was conducted to understand the accumulation of the site.
12. Mapping: We produced a topographic map and a three dimensional position of the site (3D).
13. Training students: Theoretical methodology is taught to students at university. To be a good archaeologist, students need to have practical theories for their future career. The project invited students from Level 2, Level 3 and Level 4 of the Faculty of Archaeology, RUFA to attend the investigation. This provided them with an opportunity to practice and learn more in the field.
14. Take aerial photo: The project hired an expert from the Geo-Informatics School to take the aerial photo of Cheung Ek to show the changing landscape with the comparison with the previous aerial photo taken in 1992.
15. Site visit by the Dean and Vice Dean of the Faculty of Archaeology, Royal University of Fine Arts.

Laboratory Methods:

The pottery analyzed from the site includes that collected from the excavations both at the kiln site and trenches in the circular earthwork as well as surface collection. Cambodian experts and trainee students from Level 2 of the Faculty of Archaeology were involved. Preliminary cleaning of artifacts was conducted in the field for practical purposes. The artifact assemblage consisted primarily of ceramic sherds. Laboratory procedures at the Department of Archaeology, Institute of Culture and Fine Arts, Royal Academy of Cambodia in Phnom Penh involved additional cleaning of the ceramic assemblage for accurate recording of metric and non-metric attributes and, when possible, reconstruction of vessel forms. Pertinent attributes were recorded and entered into a multivariate database for statistical manipulation; its objective was to isolate potential diagnostic traits in order to ultimately contribute to defining discrete spatial and temporal ceramic traditions, assemblages and technologies, etc. Nine complete vessels have been considered for reconstruction by the Ceramics Conservation Lab, led by **Mr. Tep Sokha,** which will be performed in the even that funding becomes available.

The charcoal sample will be sent to a laboratory in New Zealand for analysis, to be conducted by Dr. Nancy Boven.

REGIONAL CONTEXT

Geography

Cheung Ek site is located in Cheung Ek commune, Dangkor district, Phnom Penh. Cheung Ek site previously belonged to Kandal province until this region became incorporated into Phnom Penh capital in 1985 (Fig.1). Its eastern boundary borders with Chak Angrei Krom, Mean Chhay district and with Ta Kdol commune, Ta Kmao district, Kandal province. Its southern boundary borders with Prek Tnoat river (Fig.2).

Cheung Ek site is a flat area. The area comprises a large water resource, Cheung Ek Lake, providing a lot of economic potential for the villagers living in the vicinity. Fish is the villagers's main production during both dry and rainy seasons. During the wet season, water floods the areas near the lake. When the water recedes in the dry season, villagers are able to subsist from rice production. Cheung Ek Lake is accessible by a waterway called Prek Steung Chrov, connecting it to the Basak River.

Demographics and Current Subsistence Economics:

According to a census of The Ministry of Planning in 1998, the population in Phnom Penh capital consisted of 999,804 people. The population of Cheung Ek commune had a population of 5,170 (Statistic Institute, 1999). According to the census of Cheung Commune Police in 2005, the population in Cheung Ek commune had risen to 5,771 people (Statistic of Cheung Ek Commune Police, 2005).

Now most people in Cheung Ek are living on rice production, farming of water convolvulus (Trakourn), *Neptunia Oleracea* (KagnChhet) a kind of aquatic grass (called Plov Kangkeb) and small scale fishing. Farming of such vegetables as cucumber, tomato, big cucumber, green bean etc. is on the decline due to lower levels of available rain water necessary for their production. Planting of water convolvulus (Trakourn), *Neptunia Oleracea* (KagnChhet) and Plov

Kangkeb were introduced to this area in the 1980s (Fig. 3 and 4). This product is delivered to almost all parts of the country. Cheung Ek Lake has since become a primary production zone for water convolvulus in Cambodia.

Rice crops can only be harvested in fields near the lake during the dry season, whilst paddies further afield are cultivated in the rainy season due to local flooding.. Rice production varies from 2 to 2.5 tons per hectare.

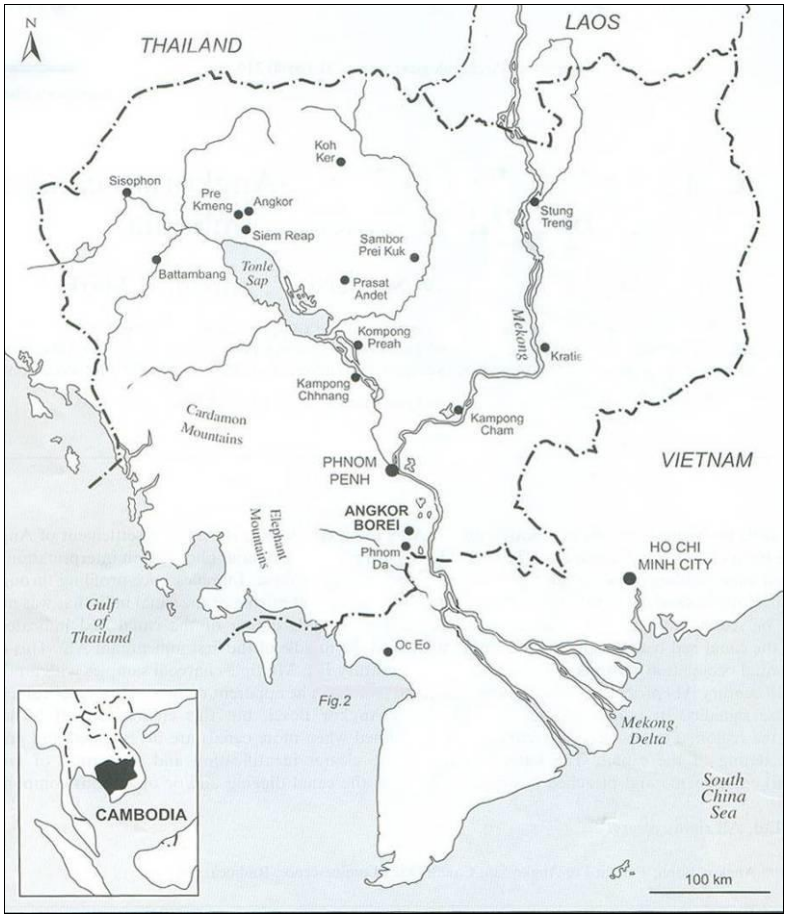
People normally raise cows to sell, plow the rice fields with and for transportation of goods.. Rearing cows provides a good source of income due to their rapidly increasing price in the international market. Each family owns two to three cows.

Traditionally, people also raise domestic livestock such as ducks, chickens and pigs as a source of protein. In the dry season, those with the necessary capital raise ducks on a large scale after the rice harvest. This season could provide places and more food, for ducks. However, some people do not generate enough income from raising ducks, and therefore they choose to plant water convolvulus (Trakourn), *Neptunia Oleracea* (KagnChhet) and Plov Kangkeb instead.

From 1975 to 1979 villagers in Cheung Ek were evacuated to Battambang, Pothisat province and other areas in Cambodia. During this period Cheung Ek became a massive grave site of victims of the Khmer Rouge regime. The Khmer Rouge tortured people in S21 (Toul Sleng Prison) and took them to kill at Cheung Ek, due to its short distance from there. After 1979 people came back to live on their land and reoccupied their homes. The government provided 0.25 hectares to every family for agricultural production. Now the price of land in Cheung Ek area is increasingly expensive, and many people have already sold their land to wealthy people from Phnom Penh. This has created a shortage of arable land for some, leading many to sending their children to work in garment factories. People who have a better standard of living are able to send their children to study at university rather than having to send them to work at an early age.

Geographically, Cheung Ek area is located on the outskirts of Phnom Penh, but people's lifestyles and standards of living remain

similar to that in the countryside. They retain some traditions inherited from their ancestors. For example, every year people hold a ceremony called Da Phum (Village Ceremony). Sometimes they also conduct a ceremony to ask for rain whenever it is dry. There is a remarkable tradition of ox-cart racing that is held annually in this area.



Map 1: Map of Cambodia highlighting the area of Phnom Penh. (Source: <*OSL and Radiocarbon Dating of a Pre-Angkorian canal in the Mekong Delta, Southern Cambodia*> in Journal of Archaeological Science 31 (2004) 320).

Fig. 1: *Neptunia Oleracea* (KagnChhet) in Cheung Ek Lake

Fig. 2: Water convolvulus (Trakourn) in Cheung Ek Lake

General Aspect of Cheung Ek site

Art objects found at the site, comprising architectural elements of Khmer temples, such as inscriptions, lintels, columns, moon-stones, linga and temple foundations have been identified as objects made in the Pre-Angkorien period, probably in the 7th century AD. The presence of these objects provides evidence of previous settlement at this site.

- Lintel

Historical periods can be identified through the evolution of architectural elements and decorations on temples. Lintels are one of the most important elements by which to study Khmer styles. P. Stern had conducted such research (J. Boisselier 1966).

The lintel found at Cheung Ek Pagoda is 200 cm long, 55 cm wide and 25 cm thick. There are some cracks but its style can still be analyzed. This lintel is in Kompong Prah style from the 8th century AD (Fig. 6).

Fig. 3: 8th century Lintel found at Cheung Ek pagoda

- Column

Columns are used to support the lintel in Khmer temples, and are usually made of sandstone. We did not find any column at the Cheung Ek site. The column analyzed in this report is being displayed in the Phnom Penh National Museum, and was brought from the Cheung Ek pagoda (H. Parmentier, 1927). This column is round and small, in the style of Sombo Preikuk (7th century AD). (Fig. 7)

Fig. 4: Column displayed in the National Museum originated from Cheung Ek site

- Statue basement

A statue basement is used to support a statue. There are different types of basement, its size correlated to the size of the statue. Some Angkorian period basements have the same characteristics as pre-Angkorian ones, distinguished by their lack of decoration (J. Boisselier, 1966). The two statue basements found in the Cheung Ek pagoda lacked any decoration and probably belong to the pre-Angkorian style. (Fig. 8)

Fig. 5: Statue basement in Cheung Ek pagoda

- Moonstone

Moonstones are normally placed in front of a door of a temple. The style of the moonstone has developed throughout art history. Moonstones in the pre-Angkorian period had two rings, apparent since the 6th century AD (J. Boisselier, 1966). There are two moonstones in Cheung Ek pagoda. One moonstone is 140 cm long, 100 cm wide and 20 cm thick and the other one is 182 cm long, 80 cm wide and 30 cm thick. These two moonstones have two rings and budding lotus shapes at the end. These characteristics confirm its pre-Angkorian style. (Fig. 9)

Fig. 6: Moonstone in Cheung Ek pagoda

- Door sill

A door sill is one the decorative elements of a temple. Door sills in the pre-Angkorian period were usually made of schist (L. Palmer Briggs, 1951). There are two door sills made of schist found in Cheung Ek pagoda. One is 110 cm long, 48 cm wide and 5 cm thick. The other one is 84 cm long, 24 cm wide and 8 cm thick. These doors sills are possibly from the pre Angkorian period. (Fig. 10)

Fig. 7: Door sill in Cheung Ek pagoda

- Inscription

Inscriptions are a potential source for studying the history of Cambodia. Khmer inscriptions were written in three languages; Sanskrit, old Khmer and Bali and consist of 1150 (Claude Jacques, 1998) and was found since 6th to 14th century AD. Khmer inscriptions mention the governance of old Khmer society and other topics such as temple construction, the district, new settlements, the religious conduct of aristocracy and Acarya (an knowledgeable old person like a priest, but not a monk), community development and donations, such as land, rice fields, servants, cattle and jewelry to religious temples via the priest or Acharya (Long Siem, 1997).

Besides architectural elements described above, an inscription was found in Cheung Ek pagoda and is being stored in the National Museum (H. Parmentier, 1927). The inscription is made of sandstone, its dimensions 76 cm long, 45 cm wide and 7 cm thick. (Fig. 11)

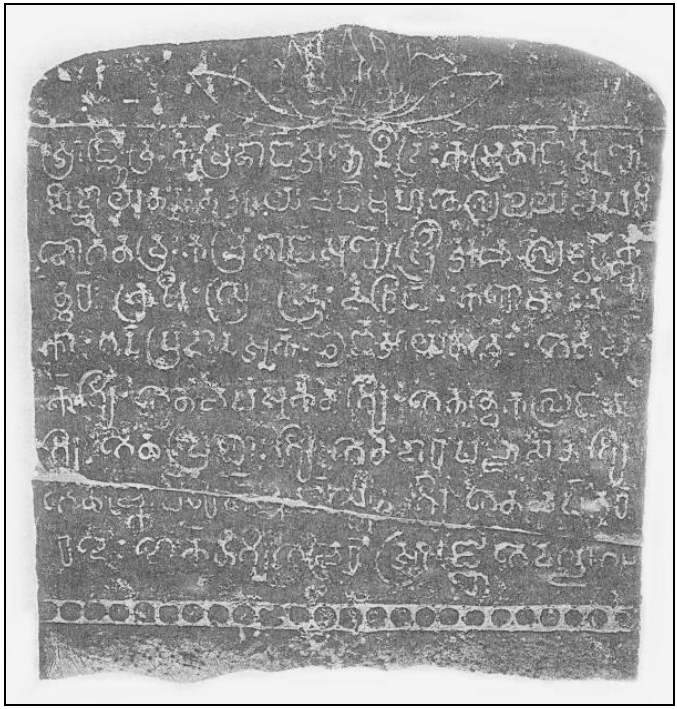


Fig. 8: Inscription K 426 stored in the National Museum
Source: Corpus des Inscription du Cambodge, Vol. II, Planche LVII, Paris, 1926

The translation of the Inscription K. 426:

- From the first line to 5th line: the order of a district chief (Prah Komratang) at Chung Mush region to the villager to make donations such as servants, cows, buffaloes, rice fields, rice production, flat land, elephants, farms and boats to a priest named ***Achalesvara***.

- From 6th to 9th line: those who take servants out, those who come to the area, and those who steal ox carts, cows and boats must have punishment, according to the order.

According to the inscription, the governor of the region or district ordered villagers to contribute donations in order to support the temple construction, the maintenance and running of the temple. In order to protect those donations, the governor also made a regulation for those who stole donations to be punished. The inscription mentions a term "***Flat Land***" and a phrase "…donation such as ***servants, cows, buffaloes, rice field, elephants, flat land, farm, and boats*** to a priest…" It also mentions a region called "***Chung Mush***" which means "***end of nose***". This region could be a spot of land that projects into a lake. According the terms mentioned in the inscription Chung Mush is flat area near a lake or a river.

The inscription K. 426 originated in Cheung Ek site. The term "***Cheung Ek***" is contemporarily named after the Cheung Ek pagoda, built later in the middle period (15th to 19th century). Old villagers state that Cheung Ek is so called because there is a foot step left in the pagoda. Cheung means "foot" and Ek means "one". Cheung Ek is a flat area near a huge lake. Boats could be used as vehicles to exchange goods in this area. Its geography and attributes are the same as those mentioned in the K. 426 inscription relating to Chung Mush. This suggests that the name Cheung Ek may have been Chung Mush at the time the inscription was produced.

The K. 426 inscription mentions a term "***Prah Komra Tang***" which means a title with high excellence. This term is used to identify Gods in Brahmanism or Buddha in Mahayana Buddhism. This term is also used to identify a king, as he is a representative of God. This term was used in the pre-Angkorian period, and the characteristics of the Cheung Ek inscription are comparable (Long

Siem 1996). This argument could support the claim that the K.426 inscription belonging to the pre-Angkorian period. George Cœdès argues that the K. 426 inscription was written in the 7th century AD (George Cœdès, 1964).

The art objects described above, such as the lintel, column, moon-stone, statue basement, door sill and inscription comprise the decorative architectural elements of a Khmer temple. The column and inscription were taken to the National Museum in the 1920s (H. Parmentier, 1927). The lintel, moon-stone, statue basement and door sill are still present at Cheung Ek pagoda.

- **Temple Foundation**

11 temple foundations were recorded. A temple foundation can be identified with a mound surrounded by a water channel, or moat (Fig. 12). There are some remaining brick and sandstone fragments scattered on the mound. The temple foundation is referred by villagers as ***Toul Ang*** or ***Toul Nek Ta***. Architectural elements such as lintels, columns, and moonstones were not found.

The aforementioned architectural elements must have been taken from these temple foundations to keep in a secure place. The presence of arts objects in a pagoda does not mean that there used to be a temple at that site. Khmer people usually bring these objects to keep in pagodas because they believe they are unusual objects. This presence of temple art in a pagoda could potentially cause confusion among researchers. By a short look, no temple foundation in Cheung Ek pagoda was identified. According to statements made by monks and Acharya at this pagoda, the modern Vihara building is being built on a temple foundation. Temple bricks were reused for a floor at the monks'living quarters. H. Parmentier mentions that there was a ruin whose inscription and lintel were brought to the National Museum (H. Parmentier, 1927).

Base on the above mentioned evidence, the temple foundation in Cheung Ek pagoda is one of the 11 temple foundations recorded by the research team. Some of the art objects in the pagoda were brought from the other 10 temple foundations.

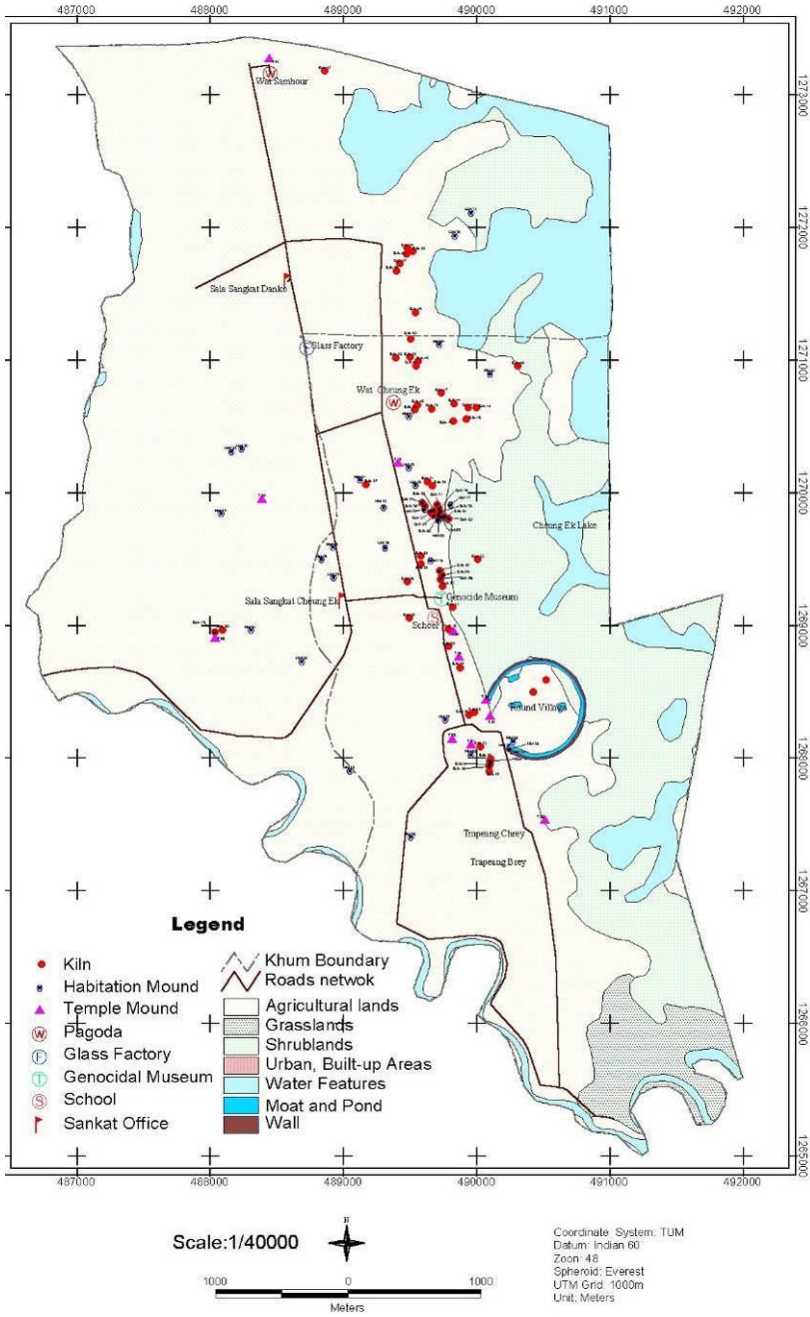
Fig. 9: Temple foundation in Srok Chek village, Cheung Ek site

The only art object found in Cheung Ek pagoda was a Linga. This Linga is not a complete one. The bottom half is broken (Fig. 13). The linga in the pre-Angkorian period is round and cylindrical. Lingas in the Angkorian period develop from one shape into three shapes. The bottom part is rectangular, representing the Brahma God. The middle part is octagonal, the representative of the Visnu God. In addition, the top end is cylindrical, representing the Shiva God. Only the middle and top parts of the linga remain at Cheung Ek, distinguished by a God face. This kind of Linga is known as *Mukha Linga*, and belongs to the Angkorian period.

Fig. 10: Door sill in Cheung Ek pagoda

No other evidence of t ng Ek site apart from this Linga, suggesting it could have been brought from somewhere else. Thus the evidence to prove settlement in the Angkorian period remains poor.

Map 2: **General View of Cheung Ek Site**



Research on the post-Angkorian period is considerably less than that of the Angkorian period due to lack of archaeological evidence. No evidence to proove the settlement of people in Cheung Ek was found during this period, except the presence of the kilns and pottery.

The author bases the period of the kilns and pottery on the analysis of pottery shape and decoration. This assumption can be verified after C14 dating analysis is conducted in the future.

A number of surveys on kiln sites in Cambodia and the region have been conducted. In 1883 Etienne Aymonier discovered a kiln site, Sompov Thlay, on Kulen Mountain (Roxanna Brown, 1988). In northeast Thailand kiln sites were found in Sisaket, Sorin and Boriram province. In Angkor region 5 kiln sites have been found: Anglong Thom kiln site, Sorsey kiln site, Tanei kiln site that is under the survey of the Nara National Properties Research Institute and Sophia International Angkor Mission, Bakorng kiln site, and Khnapor kiln site (EA Darith, 2000).

The kiln sites mentioned above are from the Angkorian period. Ceramics production was enormous, with numerous kiln sites having been found. There was also huge ceramics production in the pre-Angkorian period but kilns have not yet been discovered. It seems the pottery was not fired in a kiln. Limited research has been carried out on kiln sites or ceramics in the post-Angkorian period. Where was pottery produced for the supply of people in the post-Angkorian period? Cambodia is full of natural resources, especially forestry resources that people could exploit. In modern times Cambodians use forest resources to make tools like buckets, baskets etc. However, based on current practices, that ceramic tools would still be required for such purposes as storing liquid and other uses.

People in the Angkorian period already had knowledge of producing pottery. This knowledge must have been transmitted to younger generations. People in the Angkorian period knew how to fire pottery in kilns for mass production. So this knowledge would also have been transferred from one generation to the next. The result of this transmission could vary from better or worse than before.

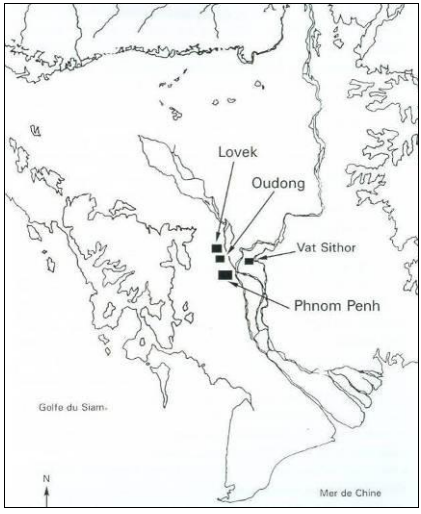
It is believed that the king abandoned Angkor city in 1432

(Lawrence Palmer Briggs, 1951). The founder of Phnom Penh city was The King Ponhea Yat. Phnom Penh became a capital city in the 15th century AD. In 1505 the King moved the royal capital to Lovek (Bernard Philippe Groslier, 1962). In 1594 the King moved the city again to Srey Santhor, northeast of Phnom Penh. In 1620 the King Chey Chettha II (1619-1627) moved the royal city once more to Udong, northwest of Phnom Penh (Van Molivan, 1999). (Fig. 14)

There are four royal cities in the post-Angkorian period, all quite close to one another. These cities could be reached by river. People in that period must have produced pottery that was fired in a kiln. Pottery must have been produced somewhere outside the city, where there would have been resources like clay, wood for firing and a good location for transportation, so that pottery could be traded over long distances.

Where was the pottery production area for the need of people in post-Angkorian period?

Was Cheung Ek a center of ceramic production in post-Angkorian period? This is the mysterious question needs to be answered by conduction more scientifically research.



Map 3: Map of Royal cities in post-Angkorian period
Source: Van Molivan, ***Les Cités Khmres anciennes***, JSRC printing house, Phnom Penh, Cambodia, p. 128

- The Kiln at Cheung Ek Site

The kiln in Cheung Ek site was found by a Cambodian researcher, although a French scholar, H. Parmentier provides some argument for an archaeological site at Cheung Ek. However he did not mention any kiln site, suggesting he may not have been aware of its existence.

The kiln looks like an earth mound, hence it could be named a kiln mound. A kiln mound or kiln is referred by villagers as ***Toul Eth***, which means a mound with bricks or ***Toul La***, which means a mound with kiln. ***59 kilns*** are recorded for this site. (Fig. 15, 16, 17)

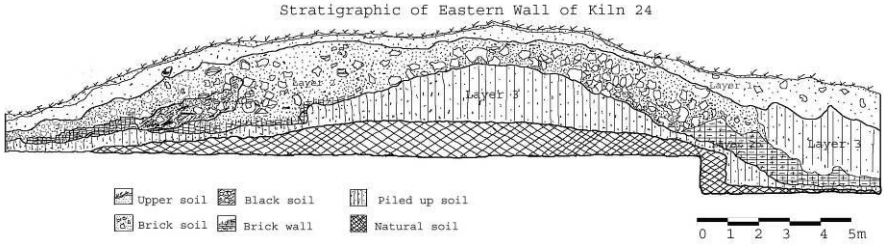
Fig. 11: A kiln mound in Cheung Ek site

Fig. 12: A kiln mound in Cheung Ek site

- The General Overall Shape of Cheung Ek Kiln

Apparently Cheung Ek kilns have an elongated oval shape. After measuring the exterior of the kiln mound, the kiln is long in the north south direction and short in the east west direction. These measurements were the only means by which the research team could identify the overall shape of the kilns. However the destruction of the kilns in that area provided a chance to clean up the profile of two kilns. The two stratigraphic profiles show the floor of the kiln is not flat. The firing chamber lies at the north of the kiln. The floor rises up from the firing chamber and slopes down in the middle to the back of the kiln. One observation of a kiln that was partly destroyed by a policeman, who collected the soil from the kiln and sold to people, reveals the presence of wall-supported columns and air holes.

The similarities of Cheung Ek Kilns and Tani kilns in the Angkor region, Siem Reap province have been identified through observations and stratigraphic profiles.



- Cheung Ek Pottery

Potsherds, collected from the kiln site, are both small and large but no entire bodies were found. Potsherds are mostly mouth rims, bases, shoulders, necks, spout and body sections. Potsherds are divided into two categories: the first category is earthenware fired to a temperature of 800 degree centigrade, not of good quality and not transparent. The second category is stoneware fired to a temperature of 1,200 degrees centigrade that do not allow transmission of water

(sometimes a little water is absorbed and the sherds are not translucent; some are with glaze, others are without) (Fig. 18, 19). Close examination revealed that the ceramics from Cheun Ek site were produced by using the wheel. All potsherds from Cheung Ek are wasters, which is the reason a large number of wasters were found near the kilns. This is normal practice, as potters usually discard deformed vessels near the place of production. The characteristics of Cheung Ek pottery are: laterite grains contained in the texture and air bubble usually exists in the texture of the pot. These characteristics reveal the carelessness of potters during their work with clay. Potters did not carefully select small particles from the clay that existed in the soil. The clay resource may have been selected from this area as the present soil contains a lot of laterite grains in the surface (Fig.14, 15).

Fig. 14: Earthen ware vase

Fig. 15: Stoneware lid with glaze

INVESTIGATION TASKS

The research team, trainee students from the Faculty of Archaeology and local labors conducted survey and investigation as mentioned below:

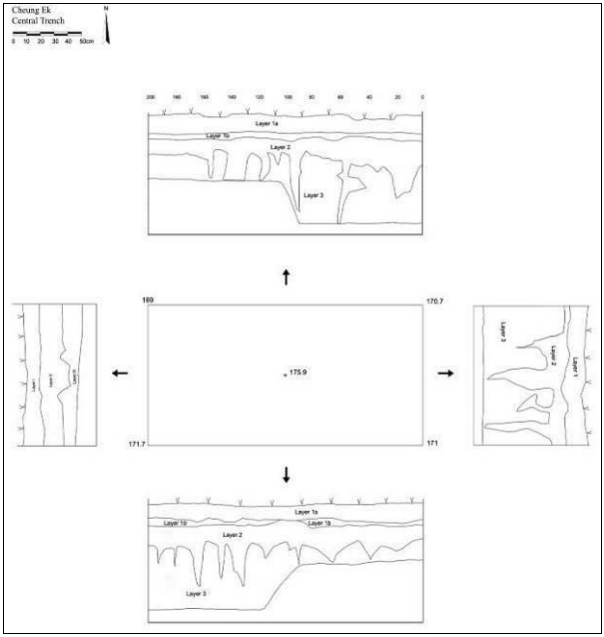
1. Central Trench Excavation

The trench set by 1m x 2m (north-south) was dropped in the middle of the circular earthwork. The identification of the middle point of the circular earthwork is based on hand GPS Garmen 76. The purpose of the excavation was to understand the stratigraphy and culture layers in the ground. The artifacts were not found in the trench.

Fig. 16: Ground view of Central Trench

The profile of the trench appears 3 layers. Layer Ia (7.5YR 6/6, Reddish Yellow): it is the layer containing soft grained sand and rare laterite chip (grain). Organic consists in this layer created by plowing and yearly rice production in the area. The soil is soft from the result of the yearly plowing. Layer Ib (7.5YR 6/6, Reddish Yellow): This layer is similar to Layer Ia but harder. Sticky clay appears with more laterite grains. Layer II (7.5 YR 6/4 Light Brown): sandy soil with sticky clay. More laterite grains appear. Layer III (5YR 5/8 Yellowish Red): Natural soil. The soil is very sticky. The soil of Layer II penetrates in this layer looking as stalactite. During dry season the soil become dry and cracked. When rainy season comes the rain water fill sand into the crack. This is the reason of Layer II similarly look like stalactite.

Human occupation was not set in the area of the middle of the circular earthwork. This spot could be used as rice field and other purposes of gardening.



2. Eastern Trenches

Excavation was set at the eastern part of the circular earthwork.. Surface collection around the trenches was conducted before the excavation. There is a dike cut near the *Trapeang*. Pottery also scattered on the profiles of Trapeang.

Three trenches were dropped near an ancient pond (*Trapeang*). 2m x 2m size with east west direction was set for each trench. The purpose of the excavation was similar to the

Fig. 17: Ground view of Eastern Trenches

middle trench. Habitation would be around Trapeang as it is convenient for the living.

Pottery was found and collected separately by each trench.

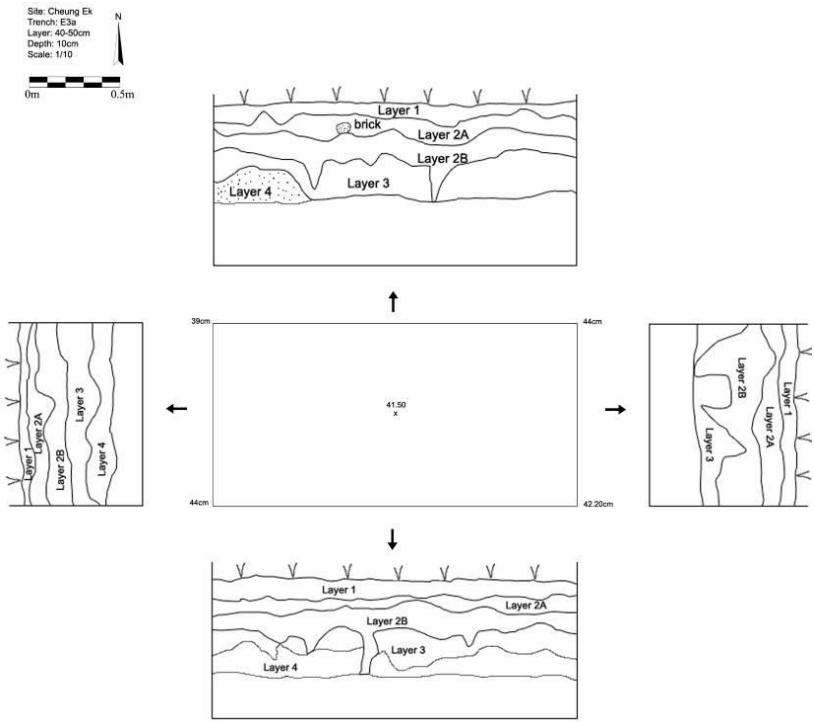
No	Object	Square	Piece	Weight
1	Pottery	E3a	71	889
2	Pottery	E3b	72	805
3	Pottery	E3c	205	1697
	Total		348	3391g

Table 1: Quantity and weight of pottery of the eastern trench

The stratum of the soil consists of 4 layers, Layer I, Layer IIa, Layer IIb, Layer III and Layer IV.

- Layer I (7.5YR 5/6, strong brown): The layer contains sandy soil.
- Layer IIa (7.5 YR 6/4, strong brown): it is sandy soil containing laterite chip and grass root.
- Layer IIb (10 YR 5/6, yellowish brown): it contains so much sand with sticky clay and laterite chip.
- Layer III (10 YR 5/8, yellowish brown): it is sandy soil with mud and more laterite grains.
- Layer IV (10 Y/R 6/8, brownish yellow): it is sandy soil with mud and laterite chip.

The excavation area was the habitation. The pottery accumulation in the layer showed the evidence of settlement. People picked the location where they could easily access the water. Trapeang was playing very important role in the ancient society. Even though the circular earthwork is much closed to the lake people preferred to dig Trapeang for their daily use.



3. Northeastern Trenches

Excavation was set at the northeastern part of the circular earthwork where water could reach in rainy season. Three trenches (1m x 2m) were dug along the north south direction.

Pottery was missing in these trenches.

Four layers could be identified in the trench.

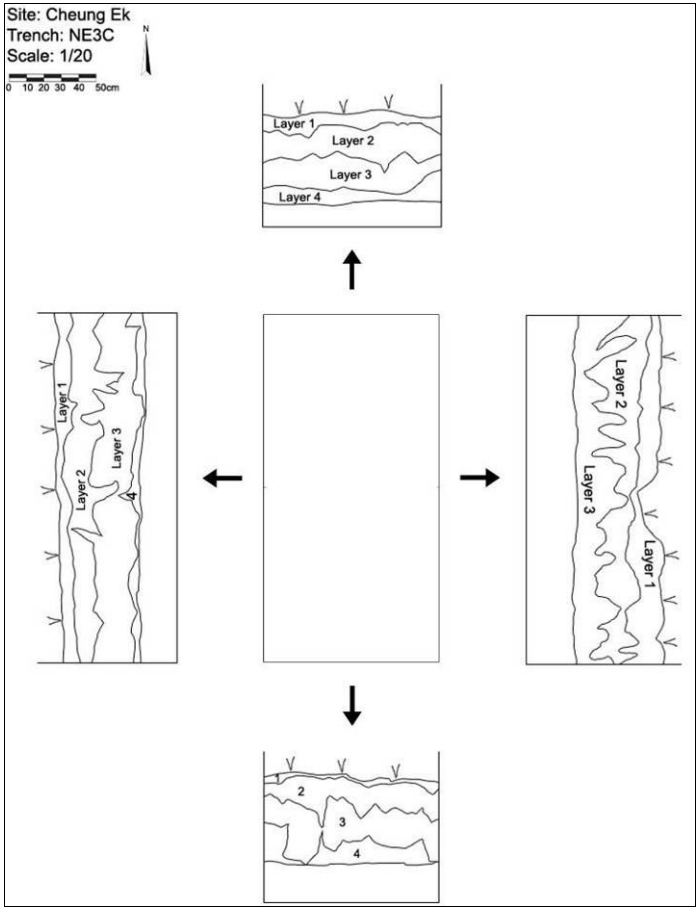
- Layer I (7.5YR 5/2, brown): It is alluvium soil

Fig. 18: Ground view of Central Trench

containing organic which remains from the water in rainy reason.

- Layer II (7.5YR 5/6, yellowish brown): It is sandy soil with clay. Less organic remains.
- Layer III (10YR 6/6, brownish yellow): Laterite grains present in this layer. Clay also increases.
- Layer IV (10YR 7/6): This layer contains more clay and the clay is very sticky.

Stratigrapy and missing pottery show the evidence of none settlement around the trenches. During rainy season water rises up and fills in the area becoming flooded area.



4. Northeastern Moat Trench

Excavation at the northeastern moat of the circular earthwork was conducted to understand the relationship of the moat and the wall. The 13m long trench was cut in the moat. A piece of pottery identified as base of pot and a stone tool were found in the trench. Three samples of soil were collected from Layer IV, V and VI. 7 Layers were identified in the stratigraphy of the moat.

stratigraphy shows the work of the wall and the moat. They dug the moat and brought the dirt from the moat to build the wall of the circular earthwork. Bottom of Layer V was the bottom of the moat after they stopped taking dirt from the moat. The soil belongs to Layer V is deposited. The deposited soil contains in Layer I, II, III, IV and V. The deep of the moat is relatively less than two meter. The wide of the moat is at least 10 meters. The pottery found in the trench was the pottery discarded after the moat was dug. A stone tool, collected in layer V is supposed to be a grinding stone, is presumably dated back to pre-Angkorian time.

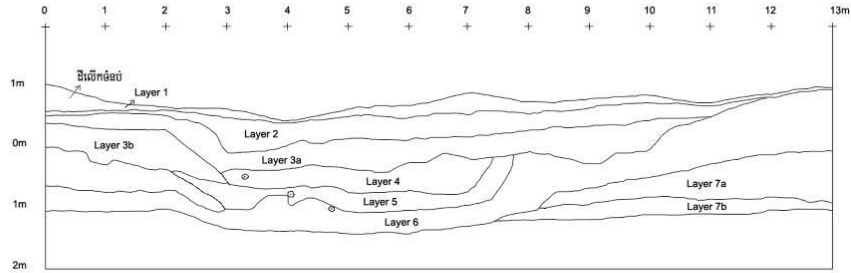
Table 2: Quantity and weight of artifacts collected form moat trench

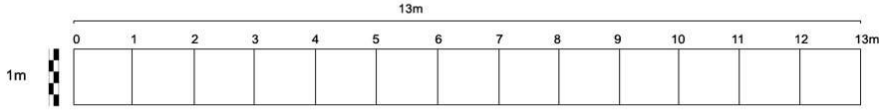
No	Object	Square	Piece	Weight
1	Pottery		1	160
2	Stone Tool		1	390
	Total		2	550g

Fig. 19: Ground view of Northeastern Moat Trench

Fig. 20: Grinding stone in the Northeastern Moat Trench

Site: Cheung Ek
Trench: Northeast canal
Profile: Northern Wall
Scale: 1/40





-Layer 1: 7.5YR 3/2 Dark brown ជាដីល្បាប់ចាក់បង្ហុរក្នុងតូទឹកមានសមាសធាតុច្រើនដូចជាឈូសឆៅ និងស្លឹកឈើចាក់បង្ហុរ។

-Layer 2: 10YR 4/3 Dark brown ជាដីអង្កូរមានសមាសធាតុច្រើន (ធ្យូង) និងមានជាតិដែក។

-Layer 3a: 10YR 4/3 Dark brown ជាដីល្ហុបប្រភេទដូចគ្នាតែមានធ្យូងកាន់តែច្រើន (យកធ្យូង)។

-Layer 3b: 10YR 4/4 Dark yellowish brown ជាដីធ្យូងពិតប្រាកដ។

-Layer 4: 10YR 4/3 Dark brown ជាដីអង្កូរដែលទៅមានដីល្បាប់ពណ៌ខ្មៅ ភក់បានតូទឹក (1st Tube Soil Sample) ។

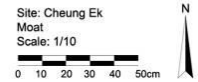
-Layer 5: 10YR 3/3 Dark brown ជាដីអង្កូរពណ៌ខ្មៅ មានលាយធ្យូង (2nd Tube Soil Sample) ។

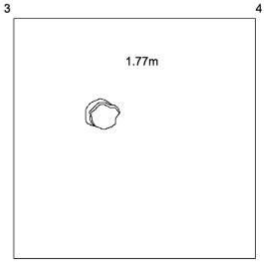
-Layer 6: 10YR 5/4 Yellowish brown

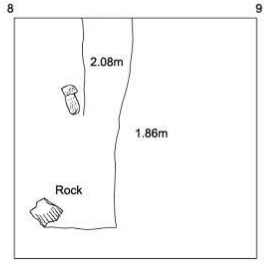
-Layer 7a: 7.5YR 6/6 Redish yellow ជាដីមានពណ៌ប្រហាក់ប្រហែលនឹង Layer 7b មានខ្សាច់តិចជាង។

-Layer 7b: 7.5YR 5/6 Strong brown ជាដីអង្កូរលាយខ្សាច់។

Site: Cheung Ek
Moat
Scale: 1/10







5. Tvea Banteay (Citadel Gate)

One excavation was conducted on the citadel gate (Tvea Banteay) of the circular earthwork. The gate is located at the east of the circular earthwork. Villagers told the area used to serve as the eastern entrench. In rainy season when water fills the moat boats could access in the circular earthwork by this gate. To store rain water in the moat the citadel gate was filled in. A cement drain was set up to navigate the water of out the moat into rice field out site the circular earthwork. Two cement drains were made in different time. The bottom one was probably built in the 1970s and the upper one should have built recently in the 1980s. According the stratigraphy the two drains were built out of the citadel gate.

Layers could be divided below:

- Layer I (7.5YR 5/4, brown): The layer contains sandy soil and clay with various organics. This layer was refilled to close the citadel gate.
- Layer II (7.5YR 4/4, light brown): It consists of sandy soil. Small laterite grains appear. Organics in Layer II has than one Layer I).
- Layer III (10YR 4/4, yellowish brown): It is sandy soil with laterite grains.
- Layer IV (10YR 5/6, Yellowish brown): It is similar to Layer IV, but clay appears.
- Layer V (10YR 5/6, yellowish brown): It is sandy clay with less laterite grain.
- Layer VI (10YR 6/4 light yellowish brown): It is sandy clay. This layer was filled by erosion.
- Layer VII (10YR 3/4 dark yellowish brown): This layer contains more clay and charcoal presents. Layer VII contain so much organics. The thickness of layer VII varies form 15cm to 20 cm.
- Layer VIII (10YR 4/4 dark yellowish brown): This layer is similar to Layer VII, but charcoal is absent.
- Layer IX (10YR 5/8 yellowish brown): It is sticky clay with laterite grain.

- Layer X (10YR 6/3 pale brown): This layer changes. It contains so much sand. This is the result of erosion. The sand was brought by rain water filling in this layer.
- Layer XI (10 YR 5/9 yellowish brown): It is sticky clay with big laterite grains.
- Layer XII (10YR 6/4 light yellowish brown): It is natural layer which laterite exists.

The deep of the gate is relatively 2m and the wide is at least 10m long. The northern end of the gate is visible via profile, but the southern end is in the profile. The level of the gate is higher than the moat. Rain water could be stored in the moat. After the moat is filled in by annual deposition less water could be only be stored for any demand in cultivation and other use. People in later period started to close the gate whenever less water preserved.

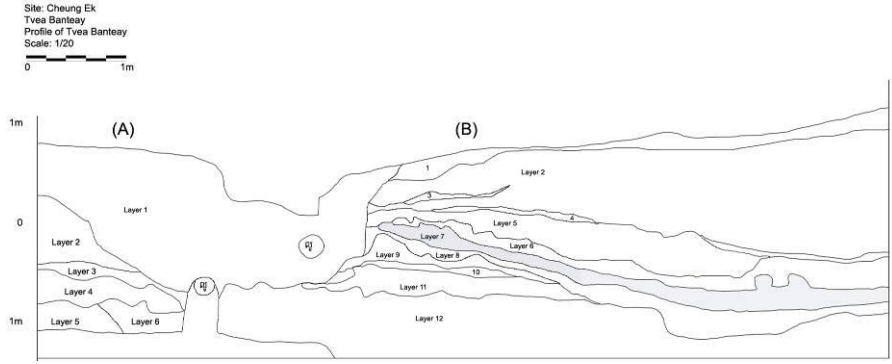
Layer VII is the layer of citadel gate when it was functioning. The black clay is the result of plants and other organics. Annual accumulation made this layer thick varying. Three soil samples were collected for future dating the age of the citadel gate when it functioned.

Table 3: Quantity and weight of pottery of Tvea Banteay

No	Object	Square	Piece	Weight
1	Pottery		7	369
	Total		7	369

Fig. 21: View of training activities of RUFA students at Tvea Banteay

Fig. 22: Piphal collects soil sample from Tvea Banteay



6. Northern Wall Trench

Excavation a trench on the northern wall of the circular earthwork was conducted to look at the habitation on the wall during rainy season. The trench was set 2m by 2m. Pottery was collected.

Fig. 23: Ground view of Northern Wall Trench

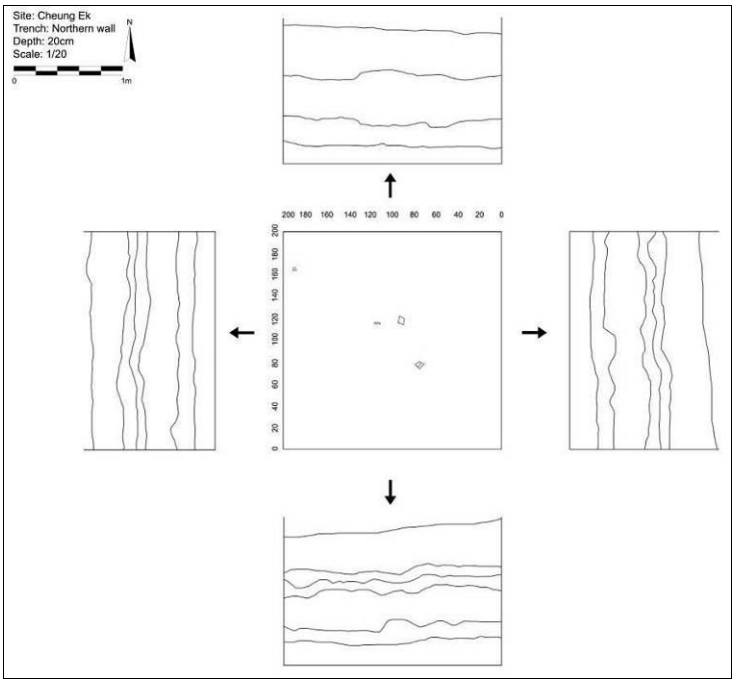
Table 4: Quantity and weight of pottery of northern wall trench

No	Object	Square	Piece	Weight
1	Pottery		59	836
	Total		59	836g

Stratigraphy on eastern profile is divided:

1- Layer I (7.5YR 5/6, strong brown): This layer contains sticky clay, less sand. Laterite grains appear more.
2- Layer IIa (7.5YR 4/6 strong brown): It is clay consisting of more sand than in layer I. Laterite grains remain but fewer.
3- Layer IIb (7.5YR 5/8 strong brown): This layer contains more sand, and less laterite is noticed.
4- Layer III (7.5YR 5/6 strong brown): It is sticky clay. The sand is less presented.

Pottery was collected from all layers. The characteristic of the soils in all layers has similarity. The soil was brought from the moat when the wall was constructed. It could be interpreted that the settlement existed before the circular was built.



7. Kiln Structure Excavation

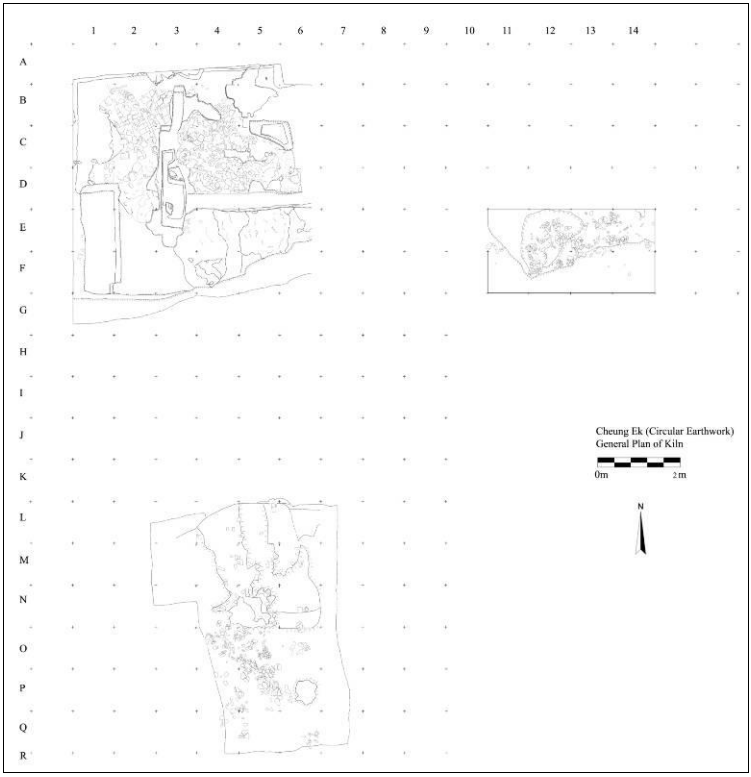
Excavation at a kiln structure was conducted. The kiln was identified since 2006 survey. By that time, the kiln could be recognized by fired bricks and pottery appearance on the surface. During this field investigation, the kiln was clearly appeared. A dike which was dug to identify the land property boundary cut through the kiln from east west direct. The dike completely destroyed the middle part of the kiln. The remaining parts were southern and northern parts. The purposes of the kiln excavation were to identify the structure include shape, wall, floor, roof, fire box, supporting

columns, artifacts and charcoal for dating. The excavating was complicated. The soil is hard. We decided to clean the profiles of the dike first to understand the wide of the kiln.

Pottery was collected from the whole kiln excavation. Most of potteries are discarded fragments and nine complete pots. All the complete pots will be reconstructed by the team of Ceramics Conservation Lab of RUFA.

Table 5: Total quantity and weight of Pottery from kiln excavation

No	Excavation area	Object	Piece	Weight
1	Northern Kiln	Pottery	2927	40730
2	Southern Kiln	Pottery	950	9379
3	Eastern Kiln	Pottery	1700	35798
	Total		5577	85907g



A. Northern Section of the Kiln

Fig. 24: A rim found in the northern section

Remaining part of the kiln is at the north section and the south. Bulldozer cut the middle part of the kiln to make a dike. The dike divides the kiln into two sections.

The surface of the northern section was cut. Fired clay and brick displays after removing the disturbed layer. The fired clay and brick could be wall or roof of the kiln. Few pottery was found in this section.

The investigation at the kiln took so much to understand the structure of the kiln. However the kiln was badly destroyed by dike construction and weathering. Structure of the kiln is hardly identified.

Fig. 25: Northern section of the kiln after excavation

Floor is partly destroyed by bulldozer. The whole structure was completely destroyed. The remains of the kiln lay almost the same level of the floor. The roof and wall may have collapsed after it was no longer use.

The northern section could be another end of the kiln and fire box where fire could be burnt at the most end of the kiln. Black soil contains charcoal was identified in the most end north of the kiln.

This is the soil commentary of the western profile of the northern section of the kiln:

-Layer 1a: 5YR 3/4 Dark reddish brown ជាប្រភេទដីតង្កៀជាយ មានក្រួសខ្សាច់ច្រើន។

-Layer 1a': 7.5YR 4/4 Dark brown ជាប្រភេទដីតង្កៀរឹង មានក្រួសធំនិងតូច, ជាប្រភេទថ្មជាយក្រៀម និងមានឫសឈើ និងកម្ទេចកម្ទីថ្ម។

-Layer 2a: 7.5YR 4/3 Dark brown ជាប្រភេទដីតង្កៀមិនស្អិត មានខ្សាច់តូចៗ និងកម្ទេចកម្ទីឥដ្ឋ។

-Layer 2a': 10YR 4/4 Dark yellow brown ជាប្រភេទដីឥដ្ឋទន់ មានខ្សាច់ក្រួសតូចៗ មានបំណែកថ្ម និងឫសឈើ។

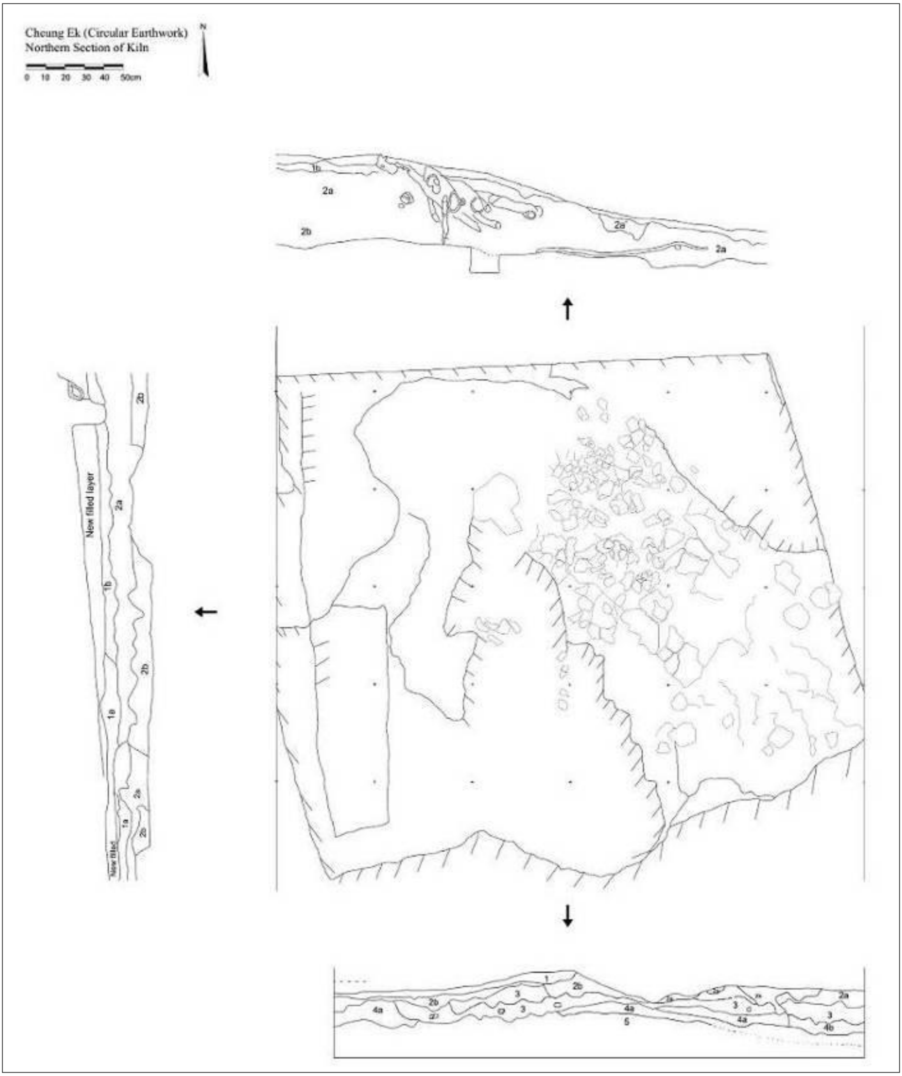
-Layer 2b: 10YR 4/3 Dark brown ជាប្រភេទដីឥដ្ឋស្អិតខ្លាំង មានគ្រាប់ខ្សាច់តូចៗ មានកម្ទេចកម្ទីឥដ្ឋ និង ឫសដើមឈើ។

-Layer 2c: 7.5YR 4/4 Dark brown ជាប្រភេទដីឥដ្ឋមិនស្អិតខ្លាំង គ្រាប់ខ្សាច់ម៉ត់ មានកម្ទេចកម្ទីដីឥដ្ឋមាន Earthernware.

Table 6: Quantity and weight of pottery of Northern Kiln

No	Object	Square	Piece	Weight
1	Pottery	A3	70	588
2	Pottery	A4	20	234
3	Pottery	B3	238	2023
4	Pottery	B5	1	14
5	Pottery	B6	117	1548
6	Pottery	C3	239	2979
7	Pottery	1/2C4,C5	32	335
8	Pottery	D3	233	1658
	Total		950	9379g

Fig. 26: View of northern section of the kiln before excavation



Cheung Ek (Circular Earthwork)
Northern Section of Kiln
0 10 20 30 40 50cm
N
1b
2a
2b
2a
2a
New filled layer
2b
2a
1b
2b
1a
2a
1a
2b
New filled
1
2b
3
2b
4a
3
4a
5
4a
3
2a
3
4b

B. Southern Section of the Kiln

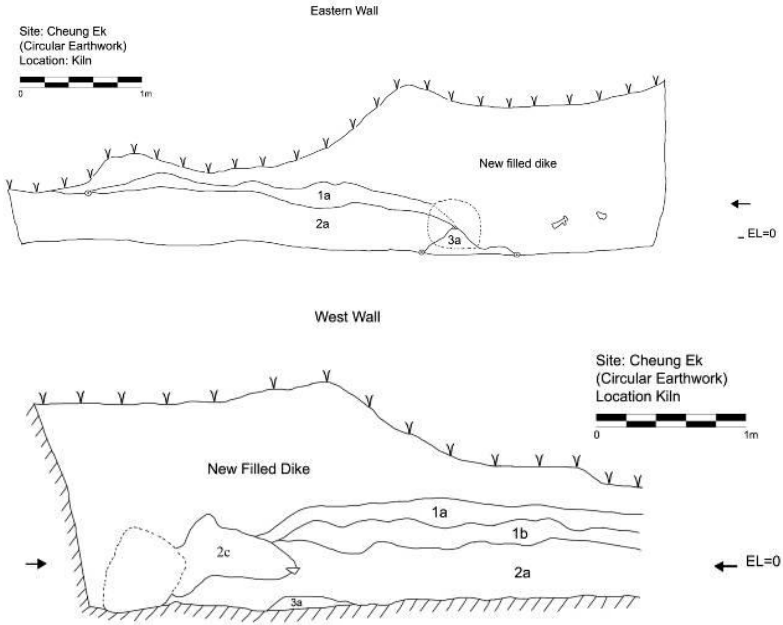
The southern section could be an entrance where fired pot could be transported out of the kiln. The kiln structure is visible only the floor.

Most pottery was found from this section. Two series of ceramics accumulation were collected one by one. Glass fragments, beads, fauna bone, snail shell were present with the pottery. This evidence could be interpreted the section as a habitation before the kiln existing. Anyways, all archaeological finds in this section were intact in the same condition and layers. The cultural activities happened all most at the same period of time. People may have used this area as working, living, cooking and eating at the same time.

Table 7: Total quantity and weight of pottery at southern kiln

No	Object	Square	Piece	Weight
1	Pottery	M3	96	591
2	Pottery	M4	162	1068
3	Pottery	M5	9	100
4	Pottery	M7	46	827
5	Pottery	N3	49	363
6	Pottery	N4	107	726
7	Pottery	N6	64	1390
8	Pottery	N7	10	62
9	Pottery	O3		970
10	Pottery	O4	176	1825
11	Pottery	O5	282	11818
12	Pottery	O6	165	1822
13	Pottery	O7	17	181
14	Pottery	P4	185	1457
15	Pottery	P5	130	7321
16	Pottery	P6	37	750
17	Pottery	Q4	60	408
18	Pottery	Q5		625
19	Pottery	Q6	1	2367
20	Pottery	Q7	7	107
21	Pottery	Other	97	1020
	Total		1700	35798

Fig. 27: View of southern section after excavation



Profiles of eastern and western wall of southern section after excavation

This is the soil commentary of the eastern and western profile of southern section of the kiln.

-Layer 1a: 10YR 5/4 Yellowish brown, silty-clay 80% of silt, a little bit sticky. This was the upper layer before the new dike was built. Lots of brick particles come from collapsed kiln, very few chorcoal components.
-Layer 2a: 10YR 5/4 Yellowish brown silty clay (80% of clay), stickey when wet and hard when dry. Lots of charcoal components and lots laterite grains (Fe_2O_3, Fe_3O_4). This layer compass of 2 series of potteries concentration.
-Layer 3a: 5YR 6/4 Light reddish brown sand, soft compose of few laterite grains. This layer also contains ceramic.
-Layer 1b: 7.5YR 6/4 Light brown, silty clay 80% of silty, hard when dry not sticky. Similar to 1a.
-Layer 2c: 10YR 3/3 Dark brown, some characteristic with 2a. The difference is that it compases of cash from the kiln.

Fig.28: First series of ceramic concentration Fig.29: Second Series of ceramics concentration

Fig.30: Tep Sokha holds a complete pot taken from southern section


Cheung Ek (Circular Earthwork)
Southern Section of Kiln
General View of First Serie of Pot Concentration
N
0
1m
2a
2d
2a
2a'
2a'
4
2d'
2d''
4
2a'
Kiln Floor
2c
Layer 2a
Kiln Floor
2c
2a

C. Eastern Section of the Kiln

Eastern section of the kiln was identified as E11-E14 and F11-F14 Grids. The excavation area was at the east of the kiln. It was not part of the kiln structure, but the area could be a workshop for the pot after pot was fired. This area could be drying place before pot was fired in the kiln.

Pottery exposed below the upper layer which is the deposited soil. The upper layer is approximately 10 cm deep. Huge amount of pottery appeared in high density. Two complete *Kandis* are found. The *Kandis* will be reconstructed by Ceramics Conservation Lab.

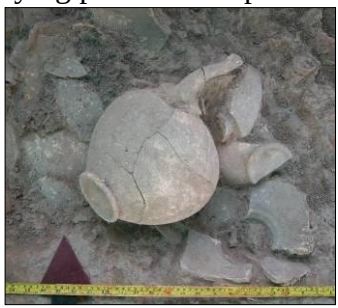


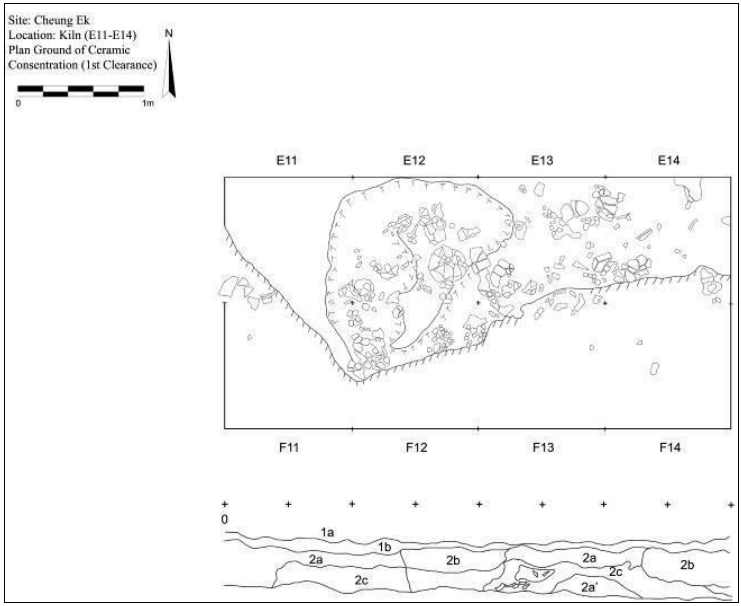
Fig. 31: *Kandi found* at eastern section

Glass fragments and glass beads were found. Glass fragments are very rare in Cambodia. Beads are often found in burial sites in Cambodia.

Table 8: Quantity and weight of pottery of Eastern Kiln

No	Object	Square	Piece	Weight
1	Pottery	E11	347	8267
2	Pottery	E12	339	7512
3	Pottery	E13	778	9886
4	Pottery	E14	731	6632
5	Pottery	F11	31	2410
6	Pottery	F12	701	6023
	Total		2927	40730

Fig.32: View eastern section of the kiln after excavation



-Layer 1a: 7.5YR 5/4 Brown ជាប្រភេទដីខ្សាច់ម៉ត់ដែលសំបូរទៅដោយសារធាតុសរីរាង្គមិនទាន់រលាយនៅមានលាយឫសស្មៅ។

-Layer 1a': 10YR 4/2 Dark grayish brown ជាប្រភេទដីឥដ្ឋលាយខ្សាច់ លាយក្រួសថ្មបាយក្រៀមច្រើន។

-Layer 1b: 7.5YR 5/4 Brown ជាប្រភេទដីខ្សាច់ម៉ត់ដែលមិនសូវសំបូរសារធាតុសរីរាង្គដែលមានលាយឫសស្មៅតិចជាង Layer 1a.

-Layer 2a: 10YR 5/3 Brown ជាប្រភេទដីខ្សាច់លាយដីឥដ្ឋ លាយក្រួស។

-Layer 2b: 10YR 4/2 Dark grayish brown ជាប្រភេទដីខ្សាច់លាយដីឥដ្ឋ លាយក្រួសតូចៗតិច។

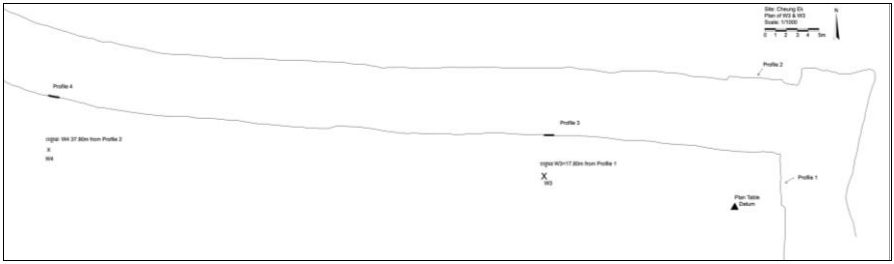
-Layer 2c: 10YR 3/3 Dark brown ជាប្រភេទដីឥដ្ឋ លាយខ្សាច់តិច លាយធ្យូង។

All layer cultural layers contains ash resulted from the fire and charcoal from the kiln fire box. The texture is very hard. It seems that the soil was pounded. Pottery fragments were found in small pieces.

The eastern section was the workshop place where potters stored pottery after they were burnt. The reason of pottery fragments were abundant, potter used the deformed pottery to put on the workshop place and pounded in order to flatten the ground which was convenient for displaying.

8. Western Profiles

Profiles of dike dug to remark land property in the area of western circular earthwork were cleaned to study the stratigraphy and soil components. Four profiles of the same dike were cleaned to study the stratigraphy.

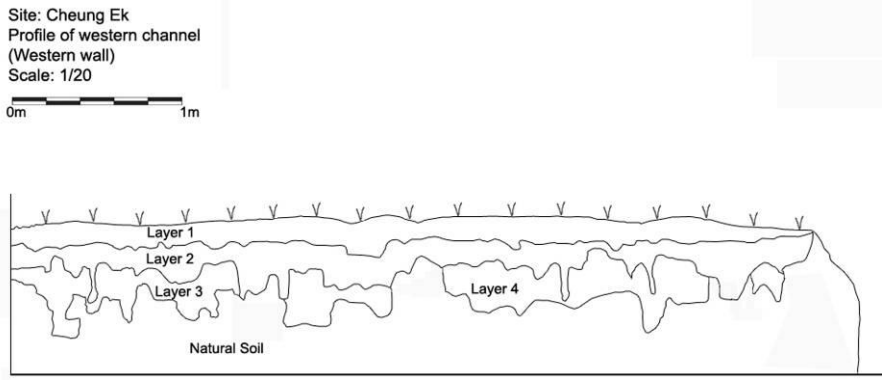


A. Profile I

Profile I (5m long) was set at the west of the dike.
Four layers are identified:

- Layer I (7.5YR 6/4 light brown): It is the upper most of the soil which contain grass roots and organics. The layer consists of sandy soil and laterite grains.
- Layer II (10YR 6/6 brownish yellow): This layer contains soft sand and sticky clay. Bigger laterite grains appear.
- Layer III (10YR 5/6 yellowish brown): The soil contains clay and less laterite grains.
- Layer IV (10YR 6/6 brownish yellow): Sticky soil exists much than other layers, but laterite grains becomes less and less.

Fig.33, 34: View of Profile I, on the western dike, during work and after cleaning

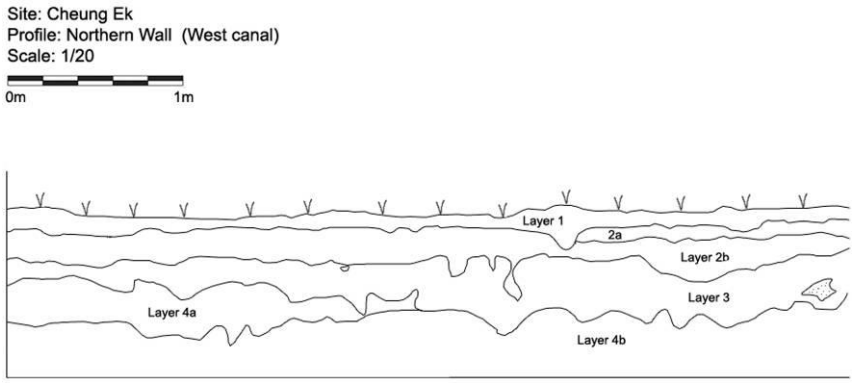


B. Profile II

The profile (5m long) was set at the north of the dike. The layers of the profile are identified as below:

- Layer I (7.5YR 5/6 strong brown): Soft sand and grass root appear in this layer.
- Layer IIa (10YR 5/6 yellowish brown): It is sandy soil containing with laterite small grains.
- Layer IIb (7.5YR 5/6 strong brown): Soil is very similar, but laterite grains increase.
- Later III (10YR 5/3 brown): It contains sand and clay. More laterite grains present.
- Layer IVa (10YR 6/4 light yellowish brown): More laterite grains and sandy soil with clay are still present.
- Layer IVb (10YR 6/6 brownish yellow): It is sticky clay with less sand.

Fig. 35, 36: View of Profile II, on the northern wall of the dike, after cleaning



C. Profile III

Profile III is located a long the dike of Profile I and II. It is at the south wall of the dike. The test of cleaning was to see the stratigraphy of the western area of the site. Layers were identified according colors and composition of the soil.

- Layer I (7.5YR 6/6 reddish yellow): It is soft sandy soil with grass roots. It is the upper layer deposited by erosion.
- Layer II (10YR 6/8 brownish yellow): The layer contains clay, sand and laterite chip.
- Layer III (10YR 6/6 brownish yellow): It contains clay and sand.
- Layer IV (10YR 5/8 yellowish brown): The layer contains more clay. The clay is sticky.

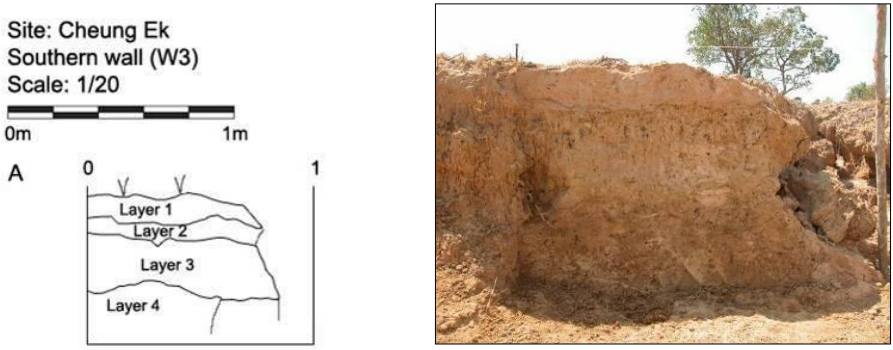


Fig. 37: View of Profile III, on the southern wall of the dike, after cleaning

D. Profile IV

Profile IV is at the west of Profile III. Cultural layers are observed. The characteristic of the stratigraphy of the western profiles are quite similar.

- Layer I (7.5YR 6/4 yellow brown): The upper layer contains sand and grass roots.
- Layer II (7.5YR 5/4 brown): The layer contains sand, clay and laterite grains.
- Layer III (10YR 5/6 yellowish brown): Sand clay is still exists in this layer. Laterite grains are present.
- Layer IV (10YR 4/6 dark yellowish brown): The layer contains sticky clay.

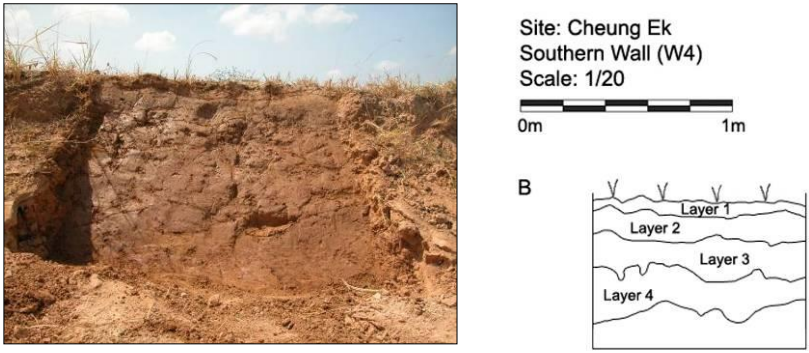


Fig. 38: View of Profile IV, on the southern wall of the dike, after cleaning

9. Northeastern Profile

Cleaning a profile at the northeastern part of the circular earthwork was also conducted. The profile was the result of the dike dug to identify the land property. This dike continues from the dike that cuts the kiln.

The upper layer is the deposited soil resulted from the flood in rainy season when water partly fills in the circular earthwork. Annual flooding with the combination of vegetation made the soil become alluvium. The soil is black.

The lower layer has similarity with other profiles at the western dike.

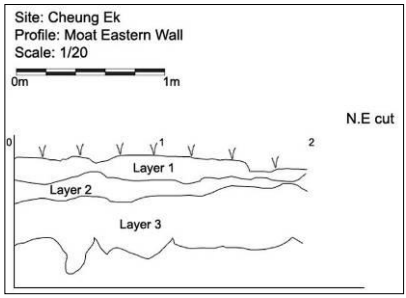


Fig. 39: View of Profile V, on the western wall of the dike, after cleaning

10. Coring

Coring was included. We decided to do coring at the points of grids identified for mapping the site. Fifty meter grid point was marked on all the eight directions.

Fig. 40: View of coring activity by a trainee student, Sokh Sovannarith

11. Surface Collection

Systematical surface collection was conducted to understand the accumulation of the site. Pottery is not exposed on the surface. The result of using the area as rice filed for many years make the pottery expose mostly in the soil. Some potsherd appears on the surface. Anyways they are not originated in the circular earthwork. They are brought from outside.

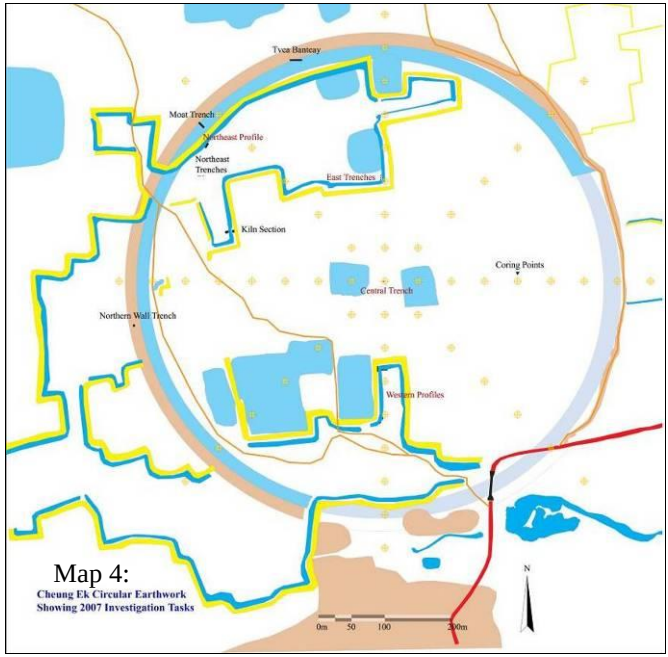
The pottery appears mainly at the southwest and northwest and the northern area of the circular earthwork. The most surface collection collected from places where dikes are cut. The dikes were constructed at the west and north of the site.

Table 9: Quantity of surface collection of Cheung Ek

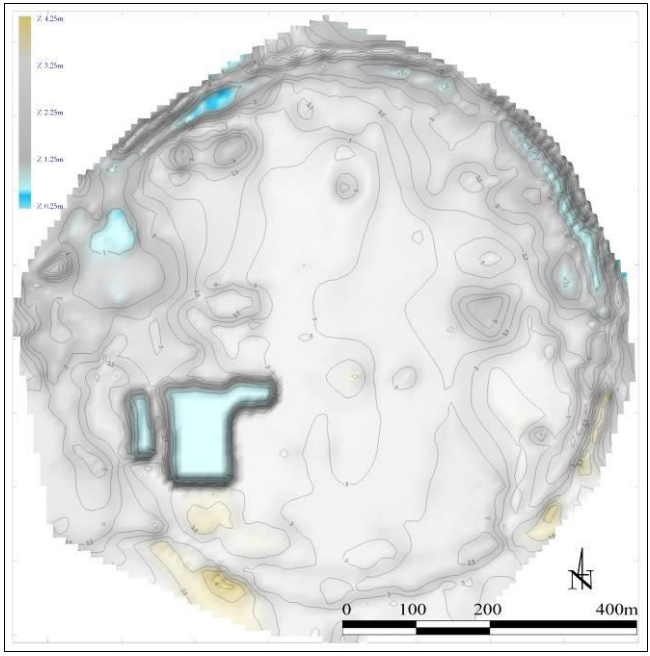
No.	Excavation Site	Piece	Weight
1	Surface Collection	387	5736
2	Surface Collection with grid	1179	15274
3	Kiln surface collection	321	3913
4	Western Profile's moat	54	391
	Total	1620	25314g

12. Site Mapping

Topographical map and three dimension position of the site (3D) were made. Mapping the area of excavation needs to be done to understand a small area around the excavation units. Three dimension picture of the circular earthwork is needed. The picture will show the elevation of the site as well as the present condition. The detailed topographic map was made to show the investigated area such as kiln excavation, unit excavations, Tvea Banteay excavation, profile cleaning and coring.



Map 4:
Cheung Ek Circular Earthwork
Showing 2007 Investigation Tasks



Map 5: 3D of Cheung Ek circular earthwork


Fig. 41: Sovicheatra maps the site using eye leveling machine


Fig. 42: Chakrya maps the site using plan table machine

13. Taking Aerial Photo

The previous aerial photo of the circular earthwork was taken in 2002. The site was preserved. Less destruction appeared.

The purpose of taking the new aerial photo is to show the changing of the whole area in the circular earthwork.

The excavated trenches are visible in the photo.

Map 6: Aerial photo of circular earthwork taken in 1992

Map 7: Aerial photo of the circular earthwork at Cheung Ek taken in March 2007

14. Training Program

Theoretical method is given to students at university. To be a very good archaeologist, students need to have practical theories for their future career. The project invited students from Level2, Level3 and Level4 of the Faculty of Archaeology, RUFA to attend the investigation.

The levle2 students are educated in the field such as site mapping, excavation and doing systematical surface collection. For the long run project, we will propose to the Levle2 students to attend the investigation for their future career. In the future they would become archaeological experts. International experts are planned to join the training program (In case the next research proposal is funded) to share experiences to Khmer archaeologists as well as the training students. This will benefit Cambodia in term of education enhancement.

Fig. 43: Heng Piphal gives lecture to training students from Level2, 3, 4 of the Faculty of Archaeology, RUFA

Archaeological Finds

Pottery

Pottery is the most cultural material found at the site. Surface collection in side of the circular earthwork is the most prominent although trenches and kiln excavation were conducted. Most of the potter is fragmented. There are nine complete pots taken from the excavation at eastern and southern sections of the kiln.

Earthenware is the only type found in the site, except very few amount of stoneware collected from the surface collection in side the circular earthwork. Complete fine paste *Kandi* and its spouts were found on surface collection and kiln excavation. Flat foot and long neck are common for the Kandi found at Cheung Ek. A small red color pot was collected. Small cups (2cm height and 3cm wide) were collected at the kiln excavation. It is a question what is its function? Small cup could be probably used as a mould for metal work. The same cup were also found at Sre Ampil site during 2006 savage excavation before building a local museum in the campus of the Sre Ampil pagoda (Kaseka et all, 2006).

Not many complete pots are not ye found at the site. Morphology of pottery at the kiln is hardly studied. Some of the pots could be classified as below:

- Small pot (*Krala Toch*): It is small and used as a liquid storage for cosmetics such as body oil. It can be used as ceremonial object.
- Big pot (*Krala Thom*): It is big. It can be used as fermented fish (*Brahok*) storage or water and grain storage.
- Cup (*Pegn*): It is small, but very unique for Cheung and Sre Ampil sites. It is used to store metal related to the metal work.
- *Kandi*: It is big. It is mainly used for ceremonial object. *Kandi* found elf where all over Cambodia.
- Jar (*Kratin*): It is big. *Kratin* is used as liquid or water and grain storages.

- Cooking pot (*Chhnang*): It can be big or small. It is used as cooking container.
- Bowl (*Chan*): It is small. It is commonly used for serving meal.

These are the types of pottery from the Cheung Ek circular earthwork, which identified by rim shapes.

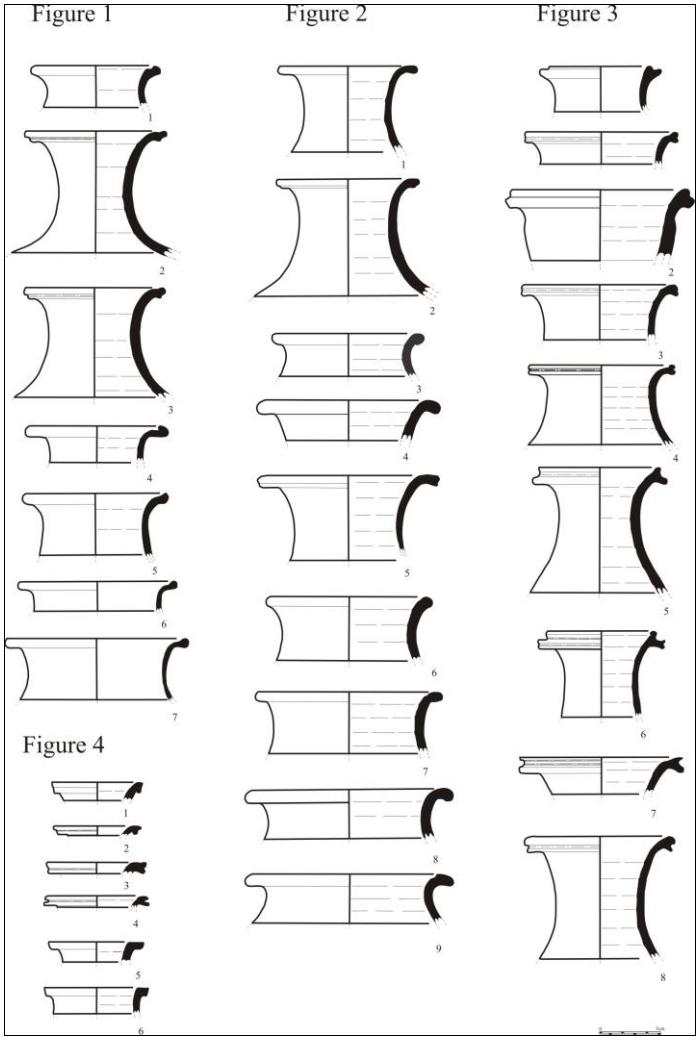


Figure 5

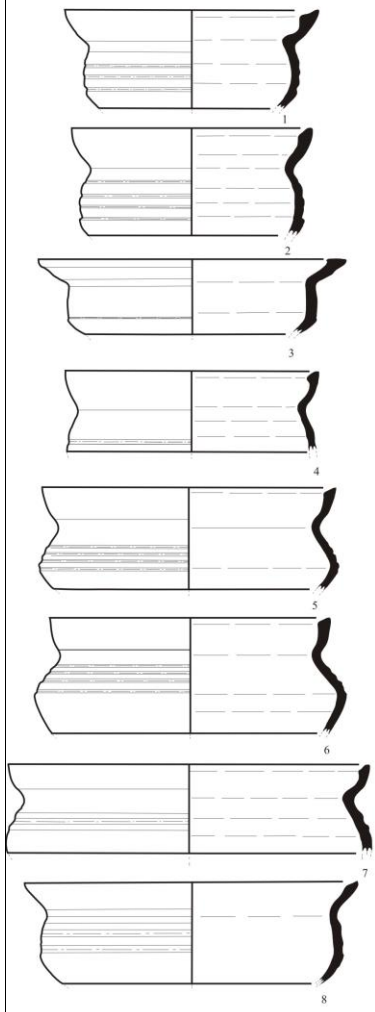


Figure 6

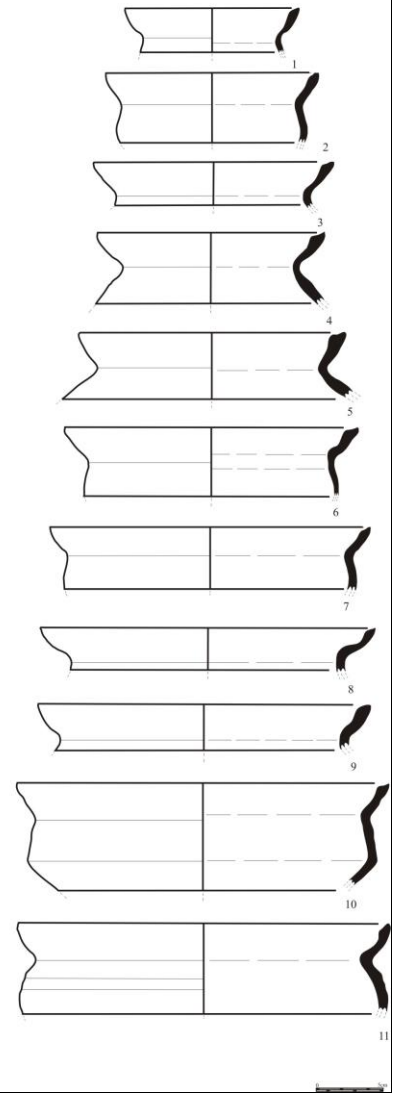


Figure 7

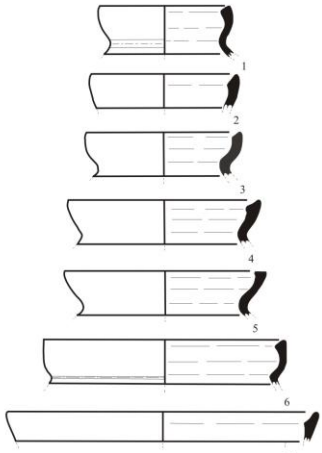


Figure 8

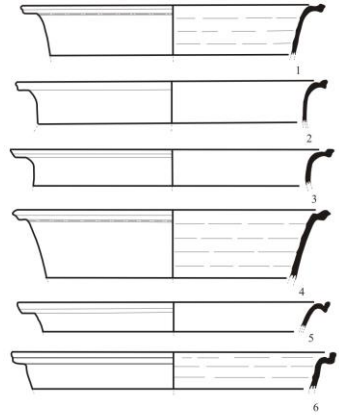


Figure 9

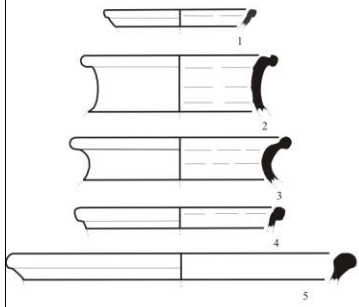


Figure 10

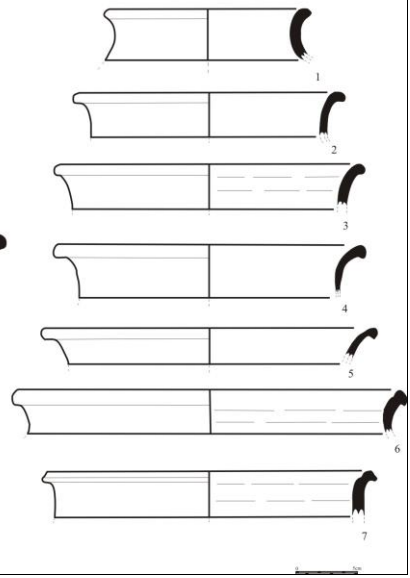


Figure 11

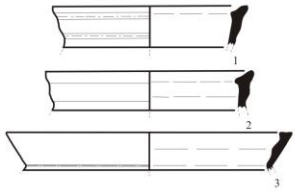


Figure 12

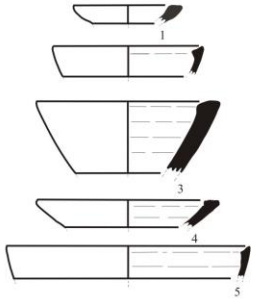


Figure 13

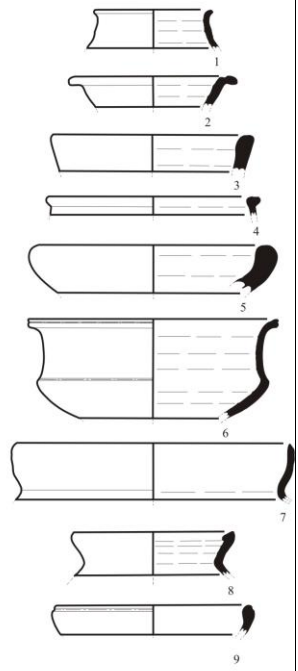


Figure 14

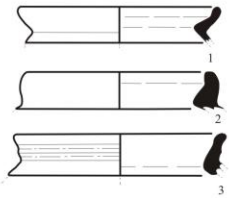


Figure 15

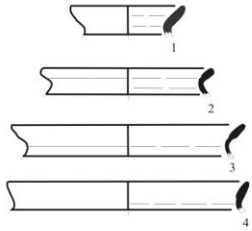


Figure 16

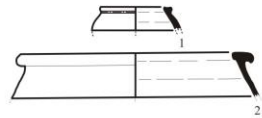
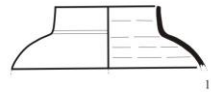


Figure 17



These are the foot shape of the pots found at the site:

Figure 18

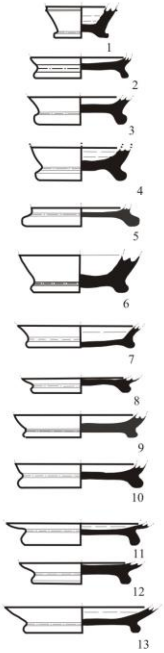


Figure 19

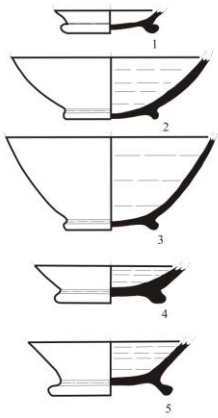


Figure 20

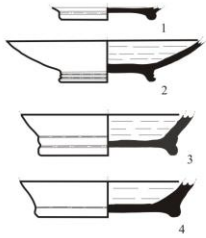


Figure 21

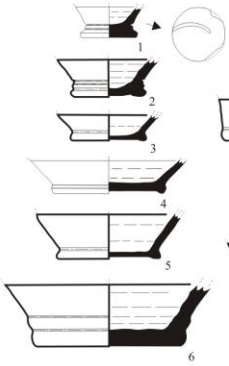


Figure 22

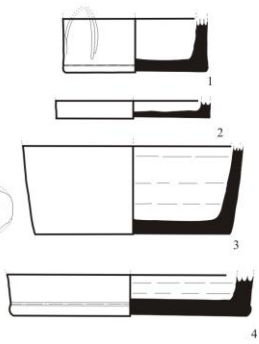


Figure 23

Figure 24

Figure 25

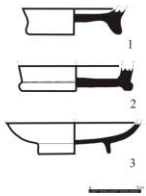


Table 10: Total quantity and weight of pottery collected during 2007 investigation

No	Area	Object	Piece	Weight
1	Kiln	Pottery	5577	85907
2	Kiln Surface Collection	Pottery	1180	10368
3	Collection on Surface of Cheung Ek Circular Earthwork	Pottery	1617	21366
4	Trench Excavation	Pottery	416	5146
	Total		8790	122787g

Fig. 44

Fig. 45

Fig. 46

Fig. 47

Fig. 48

Fig. 49

Fig. 50

Fig. 51

Fig. 52

Fig. 44-52: Pottery collected from Cheung Ek circular earthwork

Fig. 53: Small cups (*Pegn*)

Grinding Stone

Fig. 54: a fragment of grinding stone

This grinding stone was collected from the moat trench excavation in the deep of 208cm in Layer V. It was a discarded object which was thrown away by the reason of breaking apart. The neighboring site, Sre Ampil site which is dated back to pre-Angkorian period, remains this grinding stone. This artifact should be dated back in pre-Angkorian period.

Glass

Glass found mostly at the southern and eastern section. It is thin, green color. White color substance appears on the surface of the glass. This type of glass is not a local product. It was presumably imported from Middle East.

Fig. 55: Pieces of glass with white substance

Glass Beads

Only three beads were found during 2007 investigation. One is green, red and the other one is white bead. 2007 investigation, burials were not found. Cheung Ek is not identified as a burial site, but the settlement site. Beads are usually found in burial.

These three beads were found in the kiln excavation. It is a question why the beads are present in the kiln area? Why they are not exposed in settlement area where trench excavations conducted?

Fig. 56 Fig. 57 Fig. 58

Fig. 56-58: Glass bead, green, orange and white color

Bronze

Four pieces of bronze collected from the southern section. They are maybe fragments of a bell.

Fig. 59: Pieces of bronze bell

Fauna Remains

Human bone is not found from the site. The fauna remains were collected from eastern and southern sections of the kiln. Snails were found at the southern section. It is a typical area where lake is existed. Snail lives in water, especially in lake. Potters must have collected snail from the Cheung Ek lake and eat near the kiln.

Fig. 60: A snail shell

The total weight of the bone is only 70g. The bones are fish bone, turtle and small fauna. Most of the bone found at the southern section of the kiln. Some bone was in the pot. Potters may have eaten food near the kiln and threw the bone around. Potters could have cooked their food using fuel from the kiln fire.

HYPOTHESES DEVELOPMENT AND DISCUSSION

- Kiln

Kiln in the interior of the circular earthwork of Cheung Ek site is built on flat land. It is similar to some kilns at Tani Kiln Site in Angkor area, Siem Reap province. Conversely, kilns on Thnal Mrech are mostly built on dike by exploiting its physical updraft structure (Miksic et all, 2007). The structure of the kiln in the interior of the circular earthwork of Cheung Ek site is not clearly identified caused by damages and old ages. Anyhow the remains evidences of floor could be presume the form of the kiln which has more or less elongate over shape. The direction of the kiln is north-south. The fired box may be placed at the north section and the fore-structure should be put at the south section. Pottery drying area may have set at the east of the kiln where sun rises with enough light and heat to dry the pot. At the same time, workshop area may have picked at the east as well.

Human activities around the kiln could be noticed. Potter would work on making pottery, cutting woods, getting clay, molding, drying clay, firing, transporting fired pots out of the kiln, cleaning the kiln, and even reconstructing the kiln before the next firing. However other activities of potters had created around the kiln. Potters should have lived near the kiln, they cooked and ate near the place they worked.

It is reasonable to speculate that kiln location was selected to the resources, especially clay and water. Clay is findable inside the area. Moreover water could be reached very close. Wood for firing pottery was available through period of time. The Cheung Ek Lake produces not only species in the water but also flooded forest. Potters could easily find woods in the area.

Pottery from the kiln has similar characteristics with pottery found at the Sre Ampil site, about 30 km southeast of Phnom Penh in Kandal province. Anyways, the Sre Ampil site was not yet systematically dated. Archaeological finds, such as 7th inscriptions with names of pre-Angkorian Kings could date the Sre Ampil site

back pre-Angkorian period (Kaseka et all, 2006). The comparison of the pottery from Cheung Ek kiln with pottery from Angkor Borei which studied by Dr. Bong Sovath could be reasonably compared. *Kandi* and other pots with orange color and fine paste ware are found both sites. The third stage of the cultural layers of Angkor Borei dated back from 200 AD or 300 AD to 600 AD (Bong, 2003). The pottery belongs to the third stage consists of *Kandi*, and buff and fine ware. It is possible that pottery of Chueng Ek kiln may date in pre-Angkorian period.

If the pottery of Cheung Ek kiln dates in pre-Angkorian period, the kiln possibly date back in pre-Angkiran period.

AMS dates will be coming out soon in December 2007. If the AMS dates come out in pre-Angkorian period, the kiln surely dates in pre-Angkorian period which becomes a new hypothesis that Khmer people fired pottery in the kiln since pre-Angkorian time, before Angkorian period. It will be clear that the texture and temper of the pot is strong enough that pot must have fired in kiln to upgrade the hit for firing.

- Settlement of the Circular Earthwork

The Cheung Ek circular earthwork has round shape. The surrounded wall was made from the dirt from the moat. Only one inner moat was built. The inner area is flat. The wall is not visible at the west of the site. It would be destroyed by water erosion and even village road built exactly right on the wall. The southern wall is not as high as the eastern wall. Present villagers are using the southern as a road connected to Prek Long village. Some circular earthwork (Round Village) in Angkor area share similarity with the one in Cheung Ek. The sites are formed by a moat surrounding an inner flat form, but the wall is absent (Louis, 1959). The absence of the wall shows a big different with the site in Cheung Ek, even though the sites in Angkor region have 600 meters in diameter. The presence of the wall appears at the Memot site, Kompong Cham province and Cheung Ek site, shows the similarity of both sites. The size of both sites is different. The circular earthwork at Memot sites is slightly

sloping down to the center (Thuy, 2002). The circular earthwork at Cheung Ek is slightly sloping down from the east to the west and from the south to the north.

The Cheung Ek circular earthwork is closely located in low area region, west of the Cheung Ek Lake. People who built the site intended to stay near the water in order to exploit the Lake resources such as water, fish, water species, fertile soil resulted from flood and organic deposition. The eastern and northern wall of the site is adjunct to the Lake. In dry season, water from the lake reaches the foot of the eastern and northern wall. Rain water could fill in the moat. More than that, water could flow in the moat trough the eastern gate (*Tvea Banteay*). At the western area, a dike, which is not sure a manmade or a natural one, exists from the circular earthwork and connected to Prek Tnoat River at the south. Water from the moat and from the Lake could flow to Prek Tnoat River by this dike. This is probably a technique to release water out of the circular earthwork avoiding the over flooded all over the inner area. From this phenomenon, the wall could be interpreted that it was probably made to partly protect the flooded water into the circular work. The moat may function as water reservoir. Present Phnom Penh capital city shares similarity of water management. Water is preserved by natural lakes in the city to absorb water from rain and river. On the other hand, there are dikes to release the water out of the city; otherwise it will flood the whole city.

Two pre-Angkorian temple mounds were recorded in the area of the circular earthwork at the western side since 2004 investigation, but one of them was completely destroyed by a bulldozer for the land development. Three ancient water reservoirs, *Trapeang*, were also recorded in the inner area of the circular earthwork. Unknown date of the circular work makes a question which one (temple or circular earthwork) existed earlier? Another question could be raised, was the temples built at the same time as the kiln?

If the kiln was built at the same period of the temples, people who owned pot trading business and potters would have worshiped the temples.

According to the observation and the presence of the pre-Angkorian period grinding stone in the moat, the circular earthwork was presumably built earlier before kilns, temples and *Trapeang* were put in.

CURRENT SITE DESTRUCTION CONCERNS

Research is being conducted while archaeological site destruction continues. However, the Royal government is trying to stop destructive activities. Unfortunately they have limited capacity.

Religious influences accommodate site destruction due to a desire for renewal and renovation. Theravada Buddhism in Cambodia is based on building religious/sacred sites next to or on preexisting sacred sites. This is probably due to a belief that the ancient sacred sites have protective or important powers. Many of the Brahmanistic and Mahayana temples of the past are still used for Theravada and synchrotized traditional beliefs today. Some ancient Brahman temples are even transformed into Buddhist "Stupas." The Siva Linga and Yoni are sometimes replaced by Buddhist statues. The belief in renovation as a necessary practice many times outweighs concerns for preservation.

Natural erosion by water, wind, etc. is a destructive factor. Nevertheless, ancient temples, destroyed by natural causes (e.g., collapsed and eroded structures), frequently become sacred mounds. Thus, natural erosion and human reuse are destructive elements.

War is another destructive factor. Criminals and desperate people seek treasures from archeological sites. They loot mounds, temples and burial sites. Also, bombs and other explosives as well as bullets destroy sites. There is plenty of evidence of this in Cambodia. Khmer people also have a tradition to bury precious objects in sacred mounds when war breaks. As a result, habitation mounds, temple foundations, temples and kilns are looted only to leave large trenches and pits.

Many times burial sites are looted for beads and pottery while human bones and other artifacts are tossed away. Current looting is a common problem in Cambodia. It has been increasing in the last decade. Sites are difficult to protect and corruption plays a significant factor. Local poverty and overseas demands also add to the problem.

Villagers and local authorities are not aware of the archaeological sites in Cheung Ek. The destruction of the sites has continued for a long time. For instance, in the 1960s a Sino Khmer community used sites as cemeteries. The area has a good location for Chinese funeral traditions. There is a lake at the east of the area. Traditionally a Chinese tomb is located west of a water resource.

Also, during the Khmer Rouge period, 1970-75, the Khmer Rouge used a block of land for burials. Two kilns were completely destroyed. The mass graves, which currently attract the most tourist and international interest, need little further comment. It's a shame that Cheung Ek could not be respected for its archaeological and historic contributions, rather than only being known as the Killing Fields.

Immediate categories of site threat and destruction:

Land Development:

Many villagers sell their land to rich investors from Phnom Penh. The new owners subsequently develop the land for various purposes. One owner built a new road which destroyed a few ancient kilns. Also, many landowners build small channels to identify property boundaries. Many channels have destroyed parts of kilns and habitation sites. Additionally, kiln and other archaeological mounds are mined for soil used for house building and other purposes.

The circular earthen-walled site is unique. Compared with circular earthworks in Kampong Cham and circular sites in Thailand, this site is vastly larger; 730 meters in diameter. Unfortunately this site is rapidly being destroyed by developers. A large water reservoir has been dug in the middle of the site for collecting road construction soil. They are building a large road across the western part of the site. This activity is unchecked by the relevant authorities.

A site, identified as a Funan period site, is located 40 km from Cheung Ek. A temple foundation was completely destroyed by a

developer who purchased the land from villagers. The villagers protected the mound in the past. Local villagers believed in powerful spirits existing at the mound. They sold the mound. This allowed the new owner to clear the mound. As a result the mound was destroyed. The aftermath left “literally” tons of bricks spread over an earthen pile. The archaeological and cultural history has been permanently destroyed. The villagers were partially aware of the consequences.

Similar local beliefs exist elsewhere. The villagers of Phum Prasat, north of Sambor Prei Kuk, actually protect sites. There are pre-Angkorian and Angkorian remains as well as 12th-15th century pottery from China, Cambodia, Thailand and Vietnam scattered everywhere. Remains indicate a long occupation from pre-Angkor to post-Angkor periods. It also protects a forested area. Trees cannot be cut. Archaeological remains that were stolen from the site were reportedly the cause of unnatural and untimely deaths of the thieves. This may not be the actual cause, but this is what the local people believe and why they protect the site. The higher Cambodian laws governing protection sites are fairly solid. The knowledge, training, money and capacity are lacking.

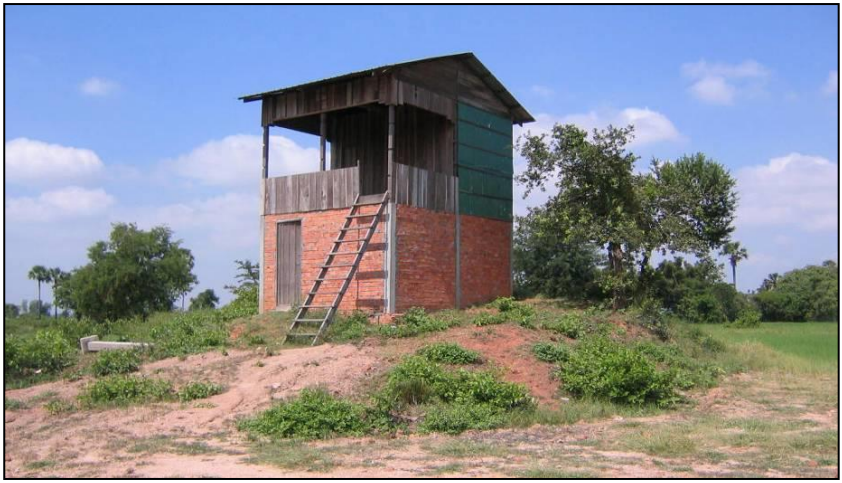


Fig. 61: a storage house built on top of kiln

Population Increase:

With growing population, new families are developing new tracts of land for house construction. Sites may be altered or destroyed for soil mining and construction; including mining for soil construction material outside of the immediate site area. Phnom Penh is approaching or exceeding 2 million people. With increased attraction to the city's presumed benefits and increasing problems with squatters and homeless, the people will likely move to and manipulate land outside of the central city (e.g., Cheung Ek). Proper planning and investment will likely increase local, government and foreign interests.

Fig. 62: View of a new extended village put on two kilns

Sino-Khmer Cemetery:

Sino-Khmer have been using sites for tomb construction since the 1960s (see above). This activity continues unchecked. If the people knew what the problems were and had support the destruction would likely decrease. During Pot Pot period, 1970-75, Khmer Rouge used a block of land for burials. Two kilns were completely destroyed for the burials.

Fig. 63: Khmer-Chinese tombs built on a kiln

Farming:

This is the smallest scale of destruction, but still has a significant impact. Sites are cleared to provide soil elsewhere or are leveled to increase agricultural holdings. Farmers simply do not know what they are destroying or the economic benefits outweigh the concern for heritage sites. It is possible, but will take effort, to make preserving a site more economical than destroying it for other purposes.

Looting:

Currently, this is not a large problem at Cheaung Ek and Sre Ampil. Depending on future finds it could increase rapidly. Recently, sites in NW Cambodia and even an important site in Prey Veng have been intensively looted. The government and RUFA have made significant efforts to conduct salvage archaeology in the last few years, including a shipwreck off the coast of Koh Kong. Sadly, the rate of looting still outweighs the efforts of the government and foreign interest groups. Lack of time, lack of money and lack of trained professionals are a large part of the problem.

CONCLUSION

The previous research found 61 kilns, two of them are located in the area of the circular earthwork, 11 temple foundations, and some habitation mounds. The previous research of kilns based on a kiln profile cleaning and the 2007 kiln excavation show that the kilns have rectangular oval shape with longer side at the north-south direction and short distance at the east-west. This shape is very similar with kilns at Tani Kiln Site in Angkor region, Siem Reap province. The stratigraphic profile shows the firing chamber at the north of the kiln. It is reasonable that ceramics production was conducted in dry season that is so convenient for drying the fired woods and drying wet potteries that were ready to put in the kiln. If the kiln was not sheltered by a roof, the potteries would be fired during dry season because it might be not interfered by raining water. Some kilns were abandoned and left over without any potteries in the kilns. Some were left over with potteries, which were already fired, in the kiln.

The tradition of pottery making and firing the pot in kiln may have developed since pre-Angkorian to post Angkorian period. Khmer people maybe know how to fire pottery in the kiln since pre-Angkor period.

The Cheung Ek circular earthwork is not an isolated site due to the evidence of lake, river which connect the site to the Bassc River. It has connection to the neighboring site such as Sre Ampil and Angkor Borei, even some sites outside of Cambodia. Presence of glass and glass bead are the source of trade interaction with foreigners.

People of the Cheung Ek circular earthwork developed their living settlement from the round village into a normal village. The cultural layer is very thin, which could be concluded that the habitation activity was not very long. People abandoned the round village and adopted the living which no longer lived in the round village.

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