The 6th Survey of Tani Kiln Sites (March 25 to April 7, 2000) Abstract

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2. The 6th Survey of Tani Kiln Sites (March 25 to April 7, 2000) Abstract

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Concerning Tani Kiln Group B, Site 4 (Mound 4)

Considering the arrangement of the kilns in the B group, and the relationship between Mound 4 and Kiln B1, Mound 4 which is adjacent to Kiln B1 is in an important position. We thought it was important to search for a practical way of preserving the whole of the Tani kiln site by solving questions such as whether they had a common workshop, whether the kiln structures were similar, whether the products were different and whether the ages were different.

Therefore, in the course of investigating the remains of Kiln B1 in August 1999, the position and existence of the kiln was confirmed by putting a small trench into the north side of Mound 4, a little below the top. As a result, we were able to calculate the approximate main axial direction of the kiln and we confirmed that the condition of the remains of the kiln in the trench was better than that of Kiln B1. The kiln is possibly long and narrow and it seems similar to the initial kiln sites of northeast Thailand. The kiln construction is possibly somewhat different from Kiln B1 and we presumed that on further investigating its relationship with other kilns within and around the Tani Kiln Site, it would prove to be an important kiln. After a trial excavation, sandbags were laid inside the trench and covered with earth to restore the original condition.

The main objective of the kiln excavation in March 2000 is to clarify the structure of Kiln B4.

1. General Shape (Figures 1 and 2)

In plan view, the body of Kiln B4 is a single-chambered rectangle, slightly enlarged across the middle section. We think it was made up of four sections, a flue section, firing chamber, flame passage hole and combustion chamber, but no trace of the flue section remains. The ceiling section is no longer there but it appears that it was supported by several clay columns as is the case with Kiln B1. The combustion chamber is low and the floor of the firing chamber is inclined. The floor appears to have been repaired by an application of clay. There is a big step between the combustion chamber and the firing chamber, the combustion chamber being much lower than the firing chamber. Since the two floors are above and below, the upper one was called Floor a and the lower one was called Floor b. Re-examination may show that the floors belong to separate kilns as in Kiln B1, in which case the names may be changed to Kiln B4A and Kiln B4B.

The maximum width inside the chamber of Kiln B4a is about 2.3 m and the length of the kiln body (from the combustion chamber to the flue section) is estimated to be 8 m. The internal area of the kiln is estimated to be 15 to 18 m^2. This is broken down into 12 to 14 m^2 for the firing chamber including the flue section, 0.84 m^2 for the flame passage hole section and 2.4 to 2.7 m^2 for the combustion chamber section. It is now clear that the main firing chamber floor now has two surfaces. There are two stoking ports on the left and right at the front of the combustion chamber. In the center at the bottom we can see a part of a remaining structure that we think may be an air hole. The floor of the firing chamber has been plastered with clay to provide an almost constant slope as far as the combustion chamber.

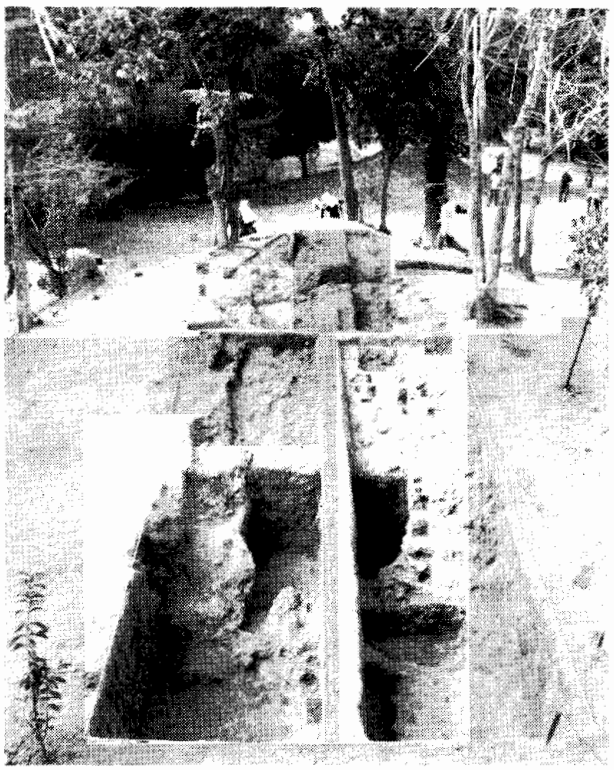

Fig. 1 B4 Kiln in Tani, Angkor, 5 April 2000

2. Firing Chamber

(1) Shape

The perimeter of the firing chamber is confirmed by the greater part of Floor a of Kiln B4 and a portion of the upper part of Floor b of Kiln B4. The upper part of the perimeter including the flue is not clear. The sidelines show a slight swelling near the center but is almost rectangular. The bottom end is a straight line parallel to the back wall of the combustion chamber.

(2) Scale

The scale of the firing chamber can be estimated from Floor a of Kiln B4. From the remaining parts of the side walls it is 2.3 m wide. The length, including the flue section, is estimated to be 6 m. The internal floor area is estimated to be 12 to 14 m^2.

(3) Floor

The floor of the firing chamber is mostly made of whitish-gray clay. The parts that have been heated are red and because they have been away from the fired surface the color gradually fades from orange to white. Repairs that have been plastered over with clay can be seen overlying the hard red fired floor. The floor of the firing chamber slopes almost uniformly to join the top edge of the back wall of the combustion chamber. The slope of Floor a of the firing chamber is about 18 degrees and the slope of Floor b of the firing chamber is 18 to 20 degrees. The floor of the main part of the firing chamber is brittle only where it has been burnt to a red color. The floor of the firing chamber is about 6 cm thick.

(4) Side Walls

Much of the side wall that has been confirmed is associated with Floor a but there is also one part that is associated with Floor b. At the top left part of the firing chamber, Floor a has been laid over the side wall associated with Floor b. It is possible that the position of the side wall is somewhat different. The side walls are estimated to be 20 to 30 cm thick. The present condition of the side walls remaining in the firing chamber is that they are low in height and most of what little remains of them is standing perpendicular to the surface of the floor or leaning slightly outwards.

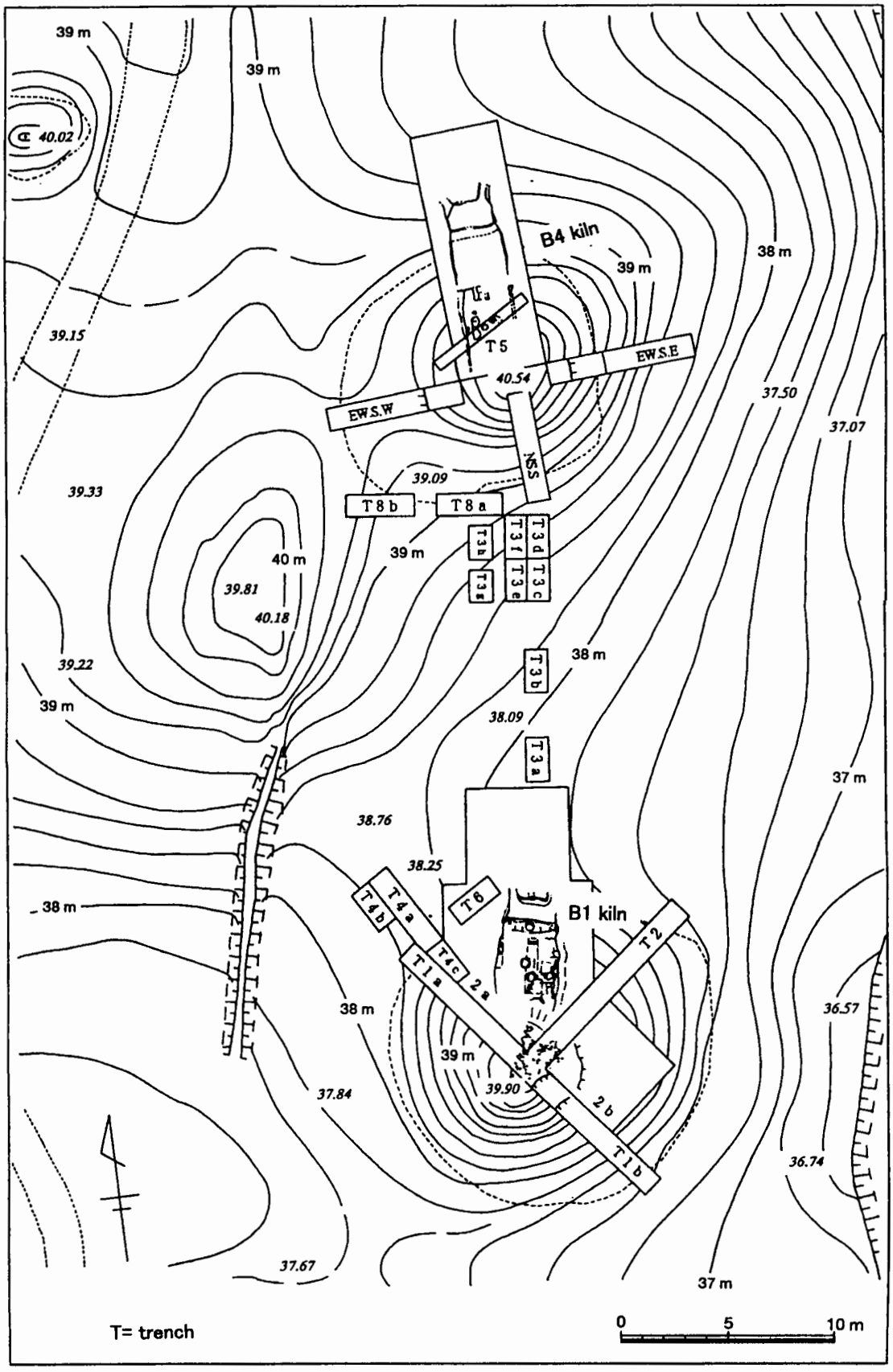

Fig. 2 B1 and B4Kilns

(5) Cylindrical Clay Pillar

A cylindrical pillar made of clay has been confirmed on Floor b of the firing chamber. We can see that as in Kiln B1 the ceiling was supported by a cylindrical clay pillar. The diameter of the pillar that has been confirmed is estimated to be 30 to 40 cm and this remnant measures about 14 cm high from the base. The surface of the top cross section of the cylindrical clay pillar has been fired. It was probably fired when Floor a was fired. We can see that the cylindrical clay pillar does not belong to the kiln at the Floor a stage and Floor a was built after this cylindrical clay pillar was broken.

(6) Other

We were unable to discover any sign of an entrance or exit but the stoking ports would be too narrow for access and since we discovered a layer (which?) of earth at the side of the mound that contains charcoal, we think that there may have been an entrance in the firing chamber.

3. Flame Passage

The flame passage hole is a section at the boundary between the combustion chamber and the firing chamber. The flame passage hole associated with Floor a of Kiln B4 is about 2.1 m wide and 0.4 m deep with a floor area of about 0.84 m^2.

4. Combustion Chamber

(1) Shape

In plan, the combustion chamber is a rectangle wider than it is long. Stoking ports, one on the left and one on the right, are provided opposite the back wall where it continues into the firing chamber and we can see signs of an air hole between the stoking ports. The back wall rises almost straight up from the level floor to join the flame passage hole above.

(2) Scale

The width of the combustion chamber of Kiln B4 is about 2.1 m at the back wall. The length of the wall with the flame passage hole is about 1.0 m. The line joining the centers of the two stoking ports is about 1.7 m long and the depth at the center is about 1.1 to 1.3 m. The internal area is 2.4 to 2.7 m^2. The combustion chamber is narrower than that of Kiln B1 but the depth is longer.

(3) Floor

The floor of the combustion chamber is almost level. It is made of whitish-gray clay and is blackened in places. On the left side (east side) of the combustion chamber, many unglazed pottery fragments were unearthed and there was a layer of yellow sand deposited on the floor. We think this may have flowed in from outside after the kiln was emptied.

(4) Back Wall and Side Wall

The back wall of the combustion chamber is about 100 to 120 cm high. It rises almost perpendicularly from the floor and at the top it overhangs towards the front. The remaining part of the side wall is about 100 cm high at the place where it is best preserved and it continues to the side wall of the stoking port. The side wall on the right side is particularly well preserved and it continues to the ceiling of the stoking port.

(5) Stoking Ports

There is a stoking port at each end of the wall at the front of the combustion chamber. The directions of the stoking ports are arranged so that they open slightly to the left and right. The floor is almost level and the sub-floor foundation is whitish-gray clay. Here and there it is blackened with charcoal and soot. The stoking ports are about 40 cm wide and the internal height is estimated to be about 40 cm.

(6) Air Hole

The sign of an air hole can be seen in the middle of the wall at the front of the combustion chamber. It is located centrally between the stoking ports. A section embankment remains in the middle of the combustion chamber but the details are not clear as it has not yet been investigated.

5. Waste Heap

A waste heap section that may be associated with Kiln B4 was already investigated in the 5th Survey and confirmed by trenches 3 c, d, e and f but during this, the 6th Survey, we carried out further investigations by putting in trenches 3g and 3h, each 1 m wide and 1.5 m long, parallel to trenches 3e and 3f and spaced at intervals of 50 cm to the west. The results confirmed the same basic depositional conditions as were confirmed by the 5th Survey. That is to say, the deposits beneath the surface layer are Layer 2a consisting of 20 to 50 cm of brown earth containing lumps of fired soil and Layer 2b consisting of 20 to 40 cm of brown earth containing large lumps of fired soil. Below that is Layer 3 containing numerous fired supports. The manner of placement of the fired supports in this layer, which is 60 to 70 cm thick, is extremely dense and numerous so that there is scarcely room for any soil between them. Also, products such as ash glazed tiles, small round and tubular lidded bowls can be seen among the fired supports. Layer 4 below that is a layer of black-brown earth 10 to 20 cm thick that slopes slightly from south to north and is thinner towards the north. Is also contains carbonized material. Layer 5 was excavated to a depth of 20 cm without reaching the bottom. This layer is brown earth containing a large quantity of jars.

6. Mound

From trenches established along the main axial section (north-south central section NS S.) and the east-west section at right angles to the main axis (EW S. or EW S. E and EW S. W), we are able to estimate the extent of restoration of the shape of the mound that is the foundation of the kiln. EW S. E confirmed the elevation of the natural hill to be 36.7 m and the height differential to the top of the mound is about 3.8 m. We think the slope of the kiln body was made to suit the inclination of the kiln. Both sides of the kiln (east and west) are cut away at a steep angle facing the natural hill. The slope angles are estimated to be 65 degrees on the eastern side and 55 degrees on the western side. The eastern side is cut away from about 4 m east of the central axis of the kiln and the western side slopes sharply at a position about 2 m west of the central axis. We were not able to determine the back of the kiln (south side) during this excavation.

The circumstances of the deposits around the mound are explained by the circumstances of the deposits in each of the trenches established in NS S. S, EW S. E and EW S. W. On the natural ground in EW S. E there is a layer of sand mixed with charcoal and small fired blocks. These strata are also detected in EW S. W. Then, in either case, they are overlain by a black-brown colored deposit containing much charcoal. In EW S. W, large quantities of fired support blocks are being unearthed from that layer. Above the black-brown colored earth layer there is a thick deposit containing many fired earth blocks that are thought to be kiln wall fragments and above that is another dark gray colored earth deposit containing much charcoal, kiln tools and products. The condition of these deposits is also basically the same in NS S. S where there are alternate deposits of earth containing many fired blocks and earth containing charcoal. We think this deposit of earth containing large amounts of charcoal and kiln tools can be seen as a waste dump. Then we can take the layer of earth containing many fired earth blocks as being associated with the rebuilding of the kiln. If we interpret the condition of these deposits as being the circumstances from when the kiln was constructed until it was scrapped, first a mound was built on the natural hill then the kiln was constructed. Next, the waste dump was formed. The materials applicable to this waste dump are probably the black-brown colored earth detected near the natural hill. It is possible that the charcoal contained in large quantities is not only from the firing of the products but also from associated with the time the kiln was built. This is because we can envisage a method of kiln building using bamboos and wood as props and slapping clay on top but when those bamboos and wooden props were burned charcoal would be

produced in great quantities. Then when the kiln was rebuilt, discarding wall fragments from demolishing the old kiln would result in the deposition of reddish brown colored earth. Even the investigation of the body of the kiln has revealed floors with new-old relationships in the firing chamber and side walls with new-old relationships in the combustion chamber that confirm the fact that the kiln was rebuilt. Then the rebuilt kiln was put into operation and another waste dump was formed over the red-brown colored earth layer. This is the dark-gray colored earth above the red-brown colored earth layer. Finally, it is reasonable to suppose that the fired earth blocks were deposited as the scrapping of the kiln approached. Looked at in this way, we can believe that the shape of the mound we see by observing the present-day ground surface reflects the circumstances of forming waste dumps that contain deposits associated with the rebuilding of the kiln body rather than kiln construction.

7. Other Relics

A pit (Pit 2) of about 190 cm north-south at a depth of 30 to 45 cm from the upper surface of Layer 4 that was discovered in Trench 3d by the 5th Survey was confirmed. The east-west width of the part that was discovered is about 80 cm but we believe this pit is also expanded on the west side. The bottom of the pit is tilted towards the north and is 70 cm long and 30 cm wide. The earth cover shows progressive deposition from the bottom layer and is divided into three layers. Layer 1 is a dark-brown colored sand layer estimated to be 30 cm at the thickest part. Many artifacts are included, large jars being particularly plentiful. Layer 2 is yellow-brown colored sand containing many relics. This is about 10 cm at the thickest part. Layer 3 is gray-yellow-brown colored sand with less artifacts than the upper layers. It measures 16 cm at the thickest part. Also, parts of a black earth layer 26 cm long and 16 cm wide intermixed with carbonized matter was seen at the interface between Layer 1 and Layer 2. Furthermore, the bottom of a large jar was confirmed standing obliquely from the floor in the southeast corner.

In order to verify the west side of P2, trenches 3g and 3h as well as 8a and 8b were established and investigated in the 6th Survey but the excavation did not reach the relict surface of P2 and this has been left as a subject for a future survey.

Although not associated with Kiln B4, the base of Mound M2 or its demolished remnants was exposed in the west side of trench 8b.

8. Kiln Tools

A number of types of shapes of kiln tools were unearthed but as in Kiln B1 almost all of them are cylindrical clay firing supports. Large quantities were unearthed from remains that are assumed to be a waste dump and from inside the combustion chamber. Many of these are round in plan and in section the top is almost flat while the bottom is slanted to match the slope of the firing chamber floor. By using kiln tools such as these it was possible to keep the products level even though the firing chamber was sloped. Few firing supports show signs of having been used several times and we can assume that most of them were used once then discarded. But we also discovered some that have signs of products at both ends of the firing support. However, it is difficult to judge whether two kiln tools were attached *and used* repeatedly. Also, rectangular parallelepiped shaped lumps of clay were used as firing supports for tiles.

Traces remain of half-round tiles having been placed on lumps of clay in rows. In one part there were broken pieces of split tiles remaining. We are also unearthing a tool for pushing bowl lids into lumps of clay. This may be a tool for firing or a mold for shaping.

9. Products

Products include glazed and unglazed ceramics as well as glazed and unglazed tiles. Glazed ceramics include many lidded bowls as well as cups, shallow bowls and small **open mouthed [?]** bottles. Unglazed ceramics included many fragments of jars and pots. Both glazed and unglazed tiles were seen, most were half round tiles and plain round tiles.

10. Sample for Radiocarbon Dating

A small quantity of carbonized material was taken from Layer 3b in the north wall of Trench 3h for radiocarbon dating.

11. Protection of Kiln Sites

After completing the dig for the 6th Survey, the site was reburied and protected by piling up earth over the body of the kiln and covered it with sandy soil to restore the shape of the mound. In the future, the kind of protective measures to take with respect to excavated kiln sites and protective measures for public access will probably be determined in discussion involving the results of investigating the whole of the Tani kiln site, the awareness of local landowners and the APSARA monuments protection system.

12. Extent of Survival of Kiln Sites

As with Kiln B1 there has been conspicuous destruction of the sloping face of the mound in later periods. On the other hand the combustion chamber etc. buried under the level face of the present land surface has been handed down in good condition.

The fact that we confirmed the existence of two floor surfaces, a younger and an older, in the firing chamber, as well as finding old side walls below the floor of the most recent stage in the combustion chamber, tells us that as with Kiln B1 there is more than one kiln overlapping here. In that case, we believe that the old kiln was partly demolished when the new kiln was built but it is highly probably that there was no further destruction after that and the conditions for survival are good.

13. Age

Kiln construction, scale, products, kiln tools and so on are not much different from those of Kiln B1. We believe they are not far apart in time. Probably 11th century.

14. Future Issues

The results of this survey have enabled up to understand the shape, structure, scale, etc. of Kiln B4. Consequently, together with Kiln B1A and Kiln B1B, the three kilns of the B group have been investigated. Then, although there are some differences in detail, we have been able to confirm that basically they are the same shape. It is probably satisfactory to conclude that this shape is the basic shape of the Tani kiln site, at least for the B group of kilns.

On the other hand, this time too we were unable to achieve confirmation of the entrance and exit or clarification of the flue section and top structure, which were the purposes of this survey. Therefore we can not say other than that these issues remain. Also in excavating this time, we left a belt in the main axial section in order to carry out a survey of the soil strata along the main axis of the kiln. For that reason we have not yet investigated with respect to clay columns supporting the ceiling and air holes in the combustion chamber that were seen in Kiln B1. Since these are parts that are involved in the basic structure of the kiln, that additional survey also remains as an issue.

Then, one of the remaining major issues that was left is to consider changes in the products or the age of the period of operation. Concerning the latter in particular, it is absolutely essential to investigate the circumstances of the unearthing of the products of the Tani kilns in consumption sites. Moreover, it is also important to make comparative studies with the northeastern Thai kiln remains where comparative research is progressing.

Finally, in order to obtain basic materials for the preservation of the whole of the Tani kiln site, it is also important to make comparative studies with kilns in sections other than Section B. We believe that we now need to study these matters comprehensively and, having clarified all the subjects, to plan preservation activities.