

# EXCAVATION OF A KHMER CERAMIC KILN SITE: REPORT OF THE INVESTIGATION OF KILN B1, TANI KILN COMPLEX<sup>1</sup>

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## 1. Introduction

Remains of ceramic kilns are situated to the east of the Angkor monumental complex within the Angkor region, located northeast of the Tonle Sap lake in Siem Reap Province, northwestern Cambodia. The Tani kiln complex lies seventeen kilometers east of the Bayon, the monument at the heart of Angkor Thom. It is six kilometers northeast of the Northeast Stele of the East Baray. It lies three kilometers north-northeast of the low, freestanding hill known as Phnom Bok. The Bakong kiln complex is located nine kilometers west-southwest of the Tani kiln complex. The existence of a kiln site within Cambodia atop Phnom Kulen, the mountain range located thirty to forty kilometers northeast of the Angkor monuments, has been known since the late nineteenth century, but its actual circumstances remain unclear.<sup>2</sup> The discovery of a kiln complex on the plains between the Phnom Kulen and the Angkor monuments is of great historical significance. The purpose of the Sophia University Angkor International Mission Tani project is to work in collaboration with the APSARA Authority and other local and international partners to clarify the situation and structure of the Tani kilns through ongoing archaeological investigations. Thus far, four research missions have been carried out, in 1996, 1998 and 1999.

## 2. History of the investigation of the Tani kiln complex

Area A and Area B of the Tani kiln complex are located atop a long, low dike built of sandy earth and running north-south. The northern portion of the kiln complex, designated Tani Kiln Site Area B, contains vestiges of seven kilns. Five are clustered close together, but not overlapping, while a low mound standing separately at a little distance to the north of that group holds two more. The five are clustered close

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<sup>1</sup> This is a revised version of a report kindly translated from the Japanese by Louise Cort and published under the same title in *Renaissance culturelle du Cambodge* 16, Institute of Asian Cultures, Sophia University, Tokyo, 1999, pp. 271-7.

<sup>2</sup> See the Nara/APSARA report in the present journal.

kiln in the fuel combustion chamber (layer 2). Their original positions are unclear. Did they divide the ware chamber into sections, or did they serve as a flame-baffle between the fuel combustion chamber and the ware chamber? Both are possible explanations. This point will also require careful observation during future excavations.

### **3) Fuel combustion chamber**

The fuel combustion chamber had a semicircular form. The rear wall of the fuel combustion chamber in the new kiln rose vertically from the more or less level floor surface to a height of 90 to 110 centimeters, merging into the steeply-sloping portion of the ware chamber floor. The lower portion of the side-walls is nearly vertical, while the upper portion does not survive. The rear wall of the fuel combustion chamber of the old kiln has not yet been excavated, but the floor level was lower than the fuel combustion chamber of the new kiln, and the angle of the back wall was gentler than that of the new kiln, curving as a continuous surface into the floor of the ware chamber. The floor of the fuel combustion chamber is divided into surfaces a1-a, a1-b, and a2 representing differences in time. The height of the lowest level, surface a2, to the fire-passage hole in the rear wall is 100 centimeters, while that of the uppermost level floor a1-a, is 90 centimeters. The width of the rear wall is 250 centimeters. The upper surface of floor a1-a is a thin blackish layer including ash and in certain areas forms a hard black surface. Beneath this are clumps of fired clay, and the lowest portion includes brownish-red clay. Charcoal fragments are mixed in floor a1-b. The surface of floor a2 is not very clear. The lower level of floor a2 consists of the same red and white clay of which the mound is constructed.

Not only the ware chamber but also the fuel combustion chamber underwent major reconstruction. Floor a2 represents the surface before reconstruction, while a1-b and a1-a are post-reconstruction surfaces. The floor surfaces a1-a, a1-b and a2 of the fuel combustion chamber do not necessarily correspond exactly to the replastered surfaces a1-a, a1-b, and a2 of the ware chamber floor, but each was extensively redone one time. It is probable that the floor of the ware chamber was replastered in spots as required. But major repairs to the two areas occurred at the same time. However, it is clear that the areas of the wall around the fuel ports in the fuel combustion chamber of the new kiln were also replastered several times. The surface of the floor is hard and black, but in disturbed areas clay of the same red and white color as that of the clay forming the mound is visible, indicating that the fuel combustion chamber was also built on top of the artificially-constructed mound. It appears that a baffle wall stood on the steeply-sloping floor at the divide between the fuel combustion chamber and the ware chamber. On that surface, at the mid-point between the two side walls, can be seen traces of a cylindrical clay column. The cylindrical clay column broke and fell onto the flame-hardened floor of the fuel combustion chamber, and the longest surviving portion measures 70 centimeters. The narrowest section is 36 centimeters in diameter. Since about 10 centimeters of the column survives in place on the steeply-sloping floor, the original column was a minimum of 80 centimeters high. The surface of the cylindrical column is gray and not very thoroughly fired. We can estimate that the distance from the floor of the fuel combustion chamber to the upper portion of the cylindrical column was more than 170 centimeters. Viewed from the fuel combustion chamber, this created two openings large enough for a person to pass through. This column also served as a flame-dividing pillar. But since this passage was well above the surface of the fuel combustion chamber floor and extremely difficult to enter, we should not reject the possibility of a separate entrance into the ware chamber where the pottery was fired.

In the right rear corner of the fuel combustion chamber, a portion of the rear wall surface, reaching a height of about 26 centimeters above the surface of floor a2, consists of the unaltered old rear wall.



The rear wall of the fuel combustion chamber of the new kiln rises more or less vertically from this point, or is even plastered so as to overhang the old wall, such that the rear wall of the old kiln cannot be seen under present conditions. Judging from the portion of the rear wall of the old kiln visible in the right rear corner, its slope rose rather gently to the height of about 26 centimeters, suggesting that it formed a continuum with the floor (floor a1-b) of the old kiln. Accordingly, it is highly likely that the original form and the final state of the fuel combustion chamber in this kiln were different. These two states will be taken into special consideration when we reach the preservation, and presentation stage of our work.

The surface of the rear wall of the fuel combustion chamber of the new kiln bears numerous fingerprints. They are traces left by smearing on clay in a diagonal-downward to the left or upward to the left. The rear wall is nearly vertical, but a portion of the right side is overhanging. Some small firing stands are attached beneath the flame-passage holes in the interior wall—that is, in the angle of the rear wall that meets the floor surface of the ware chamber. On the left side is a single row of only the square portions, but on the right side several rows are lined up extending into the interior. Some have already come off, but their traces are visible. Since this area received the direct impact of the flames, it would not have been a good place for stacking wares. Were wares really placed here or not? Probably they were, but they would not have fired successfully.

A portion of the right-hand sidewall of the fuel combustion chamber of the old kiln was replastered. At the point where the side and the rear walls meet, it is clear that the rear wall was also replastered. On the left-hand side, only the lower portion of the old wall survives. The new floor (floor surfaces a1-b, a1-a) was built on top of it, and the left-hand wall of the fuel combustion chamber of the new kiln was rebuilt rather than replastered. It appears that the fuel combustion chamber had one fuel port moved somewhat to the left. The area in front of the fuel combustion chamber has not yet been investigated, however, and it will be necessary to confirm whether two fuel ports really existed. Floor a2 of the fuel combustion chamber of the old kiln is at approximately the same level as the level beneath the clumps of fired clay lying outside the chamber at the kiln front. Floor a1-a of the fuel combustion chamber in the new kiln lies above the layer of fired clay and other material outside the chamber, indicating that the new floor surface and the surface outside the chamber were approximately the same.

#### 4) Smoke passageway

Only one portion of a surface covered by scorched red clay that can be assumed to be the floor of the smoke passageway survives on the uppermost surface of the mound. It was constructed at the peak of the artificial mound made of balls of clay containing red and white sand. The slope of the smoke passageway at the tip of the mound is almost level, and the portion that seems to slope down to the floor of the ware chamber has a gradient of about 36 degrees. There was no evidence of major renovation to this area such as that conducted for the ware chamber and the fuel combustion chamber.

#### 5) Kiln furniture

Several types of kiln setting tools were excavated, but both varieties and quantity were extremely limited, and all were types of stacking supports made from clay. During the third investigation we had excavated only shallow round bowl-shaped setters and cylindrical tubular setters; likewise, the fourth investigation produced very few kiln tools: only a small quantity of stacking devices. These included round, flat disks with diameters of 11, 9, 7, or 5 centimeters, of which the middle size with a diameter of 9 centimeters were most numerous. In most cases, the disks were round in plan; in cross-section, with the upper surface more or less level, the edge was slightly mounded and the lower surface graded to match the slope of the chamber floor. When the disks were placed on the sloping floor of the ware chamber, the upper surface

would be level. A few pieces were almost dish shaped. We found several rows of small stands with diameters of about 5 centimeters attached directly to the floor, starting at the angle where the wall at the rear of the fuel chamber changed to the ware chamber. Scars on the chamber floor showed where others had been removed. Round scars filled the upper surfaces of all the supports, with the perimeter slightly mounded from pressing down the round object on the stand.

#### **6) Artifacts (See Figures 7 - 14)**

The excavated artifacts consisted of ash-glazed pottery, unglazed pottery, and unglazed tiles. Among the ash-glazed pottery, lidded boxes were most numerous; there were also some bowls. The fourth investigation revealed a limited number of small bottles with dish mouths remaining within the kiln. Of the unglazed pottery, jar sherds were numerous. Of the tiles found, ornamental eaves tiles were very few in number; most were semi-cylindrical in form.

Artifacts were recovered in the following locations. Sherds of grayish-black unglazed pottery were found in the layer between floor surface a1 and floor surface a2. From the third layer of the fuel combustion chamber a sherd of grayish-black unglazed pottery fused to a sherd of ash-glazed pottery was recovered. Also from the third layer of the fuel combustion chamber we recovered the lid of an ash-glazed box with a knob in the shape of a four-petal flower.

During the earlier investigation of the upper half of this kiln, we had uncovered numerous tiles from the interior of the kiln (layer three), but the latest investigation of the kiln's lower half revealed very few tiles. Possibly the type of object fired varied with the location in the kiln.

The clay in the layers of the floor of the fuel combustion chamber consisted of balls of fired clay and red fired clay of a sandy consistency. Very little other material was mixed in, although some setting tools and fragments of pottery were recovered.

Characteristics of the excavated artifacts were relatively uniform, with many of the grayish-black unglazed pottery jars (or vats) bearing everted mouth rims. The same type of rim was found on many jar sherds that were underfired and still soft.

#### **7) Samples for radioactive carbon dating**

Carbon for use in dating was collected from three locations:

1. A small quantity from the layer between floor a1 and floor a2 of the ware chamber.
2. A large quantity from the layer of carbonized material immediately below floor a1-a. This material resulted from combustion at the time of the final use of floor a1-b.
3. A small quantity from the third level in the fuel combustion chamber.

#### **8) Dating**

This investigation focused on the kiln. Excavation of the waste heap remains to be done. Accordingly we are not yet at a point where we can make a judgement concerning the dating of the artifacts. According to B.-Ph. Groslier, ash-glazed pottery made its first appearance (in excavated sites) in the last quarter of the ninth century, while it became quite rare from the beginning of the twelfth century onward. Furthermore, Tsuda Takenori proposes that, based on similarities with Chinese ceramics, the early ash-glazed pottery from the Tani site is no earlier than the second half of the tenth century, and (based on Groslier's opinion) no later than the second half of the eleventh century.

## Participants

August 1996:

Prof. Yoji Aoyagi, Prof. Tatsuo Sasaki, Ms. Etsuko Miyata, Ms. Masako Marui, Ms. Chan Kanha, Mr. Keo Kinal, Ms. Hor Sokuntheary, Mr. Nhim Sotheaven.

August 1998:

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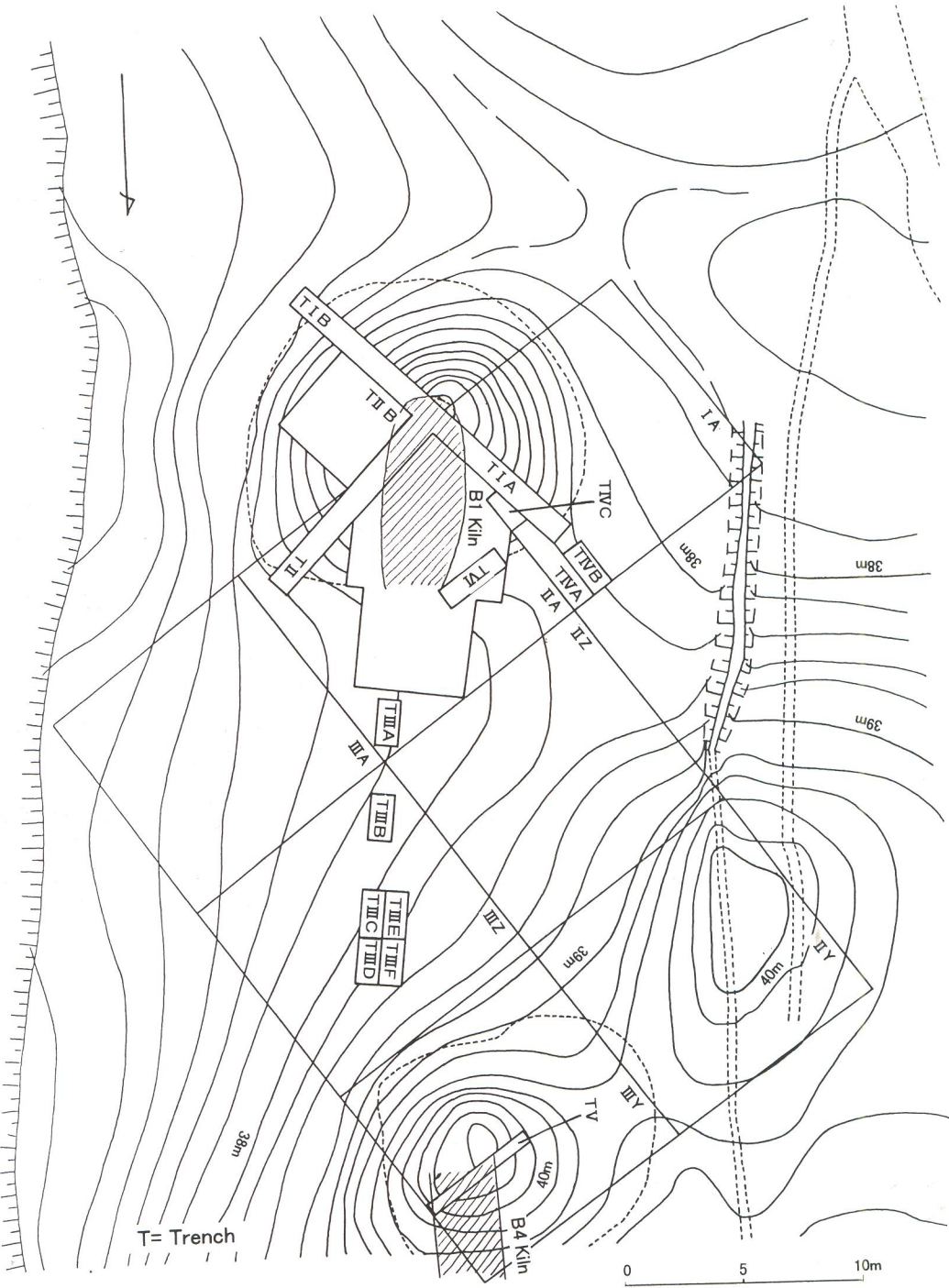
March 1999:

Prof. Yoji Aoyagi, Prof. Tatsuo Sasaki, Mr. Takenori Nogami, Mr. Kazuhiko Tanaka, Ms. Masako Marui, Ms. Tokiko Sumida, Mr. Keo Kinal, Mr. Nhim Sotheaven, Mr. Som Visoth, Mr. An Sopheap, Mr. Siyon Sophearith.

August 1999:

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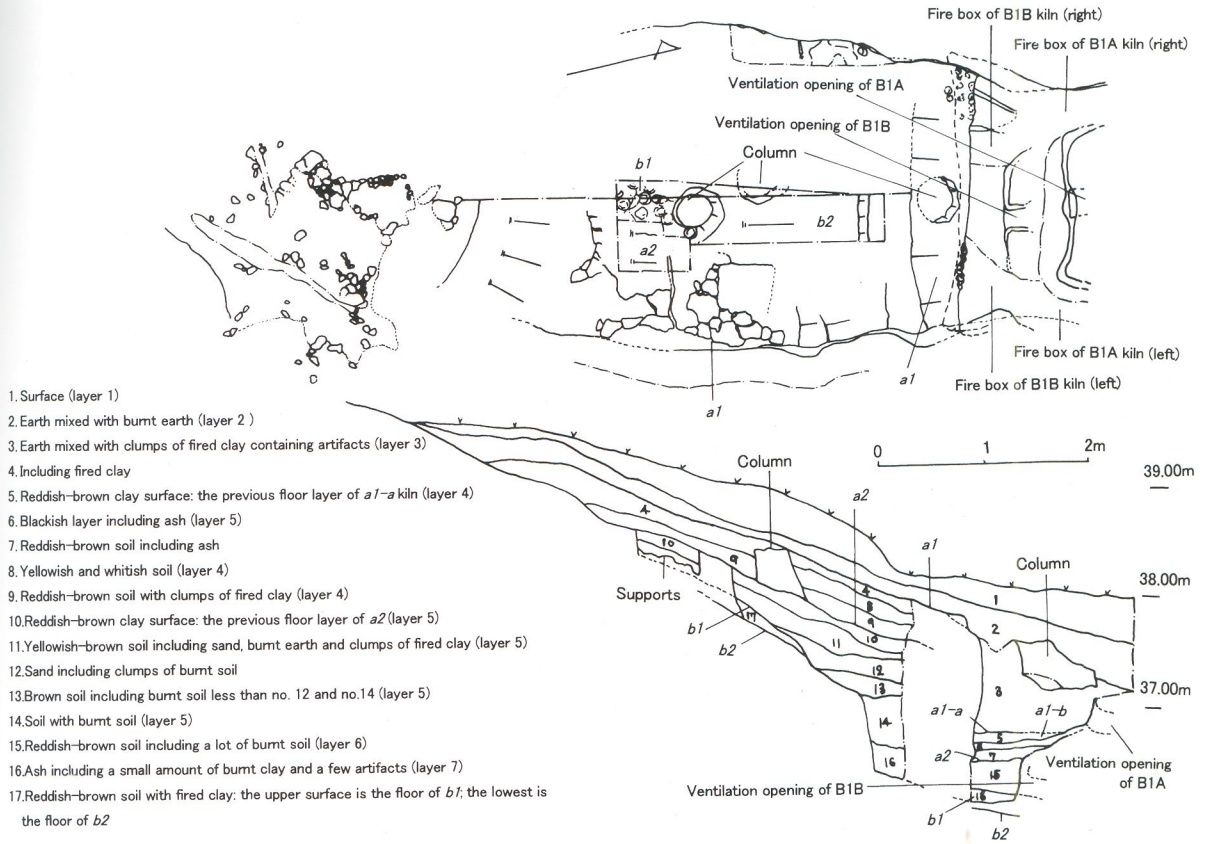


Figure 2. Plan and Section of B1 Kiln

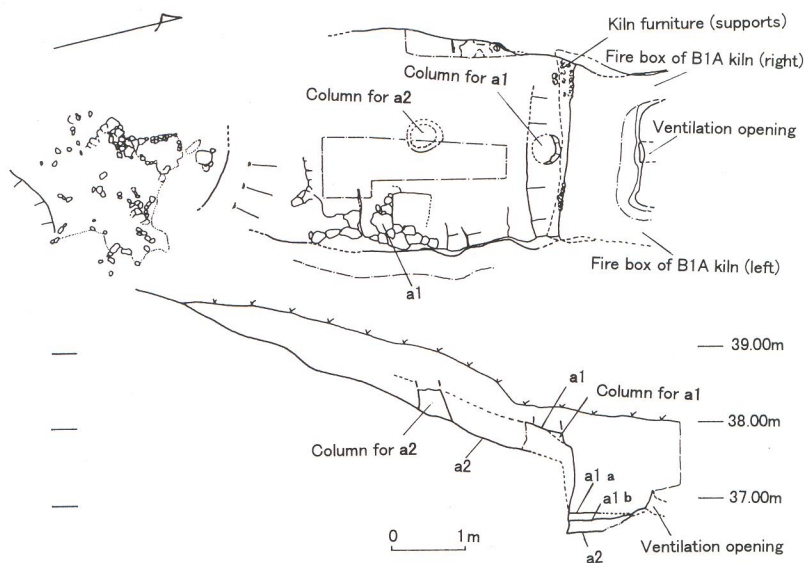


Figure 3. Plan and Section of B1A Kiln

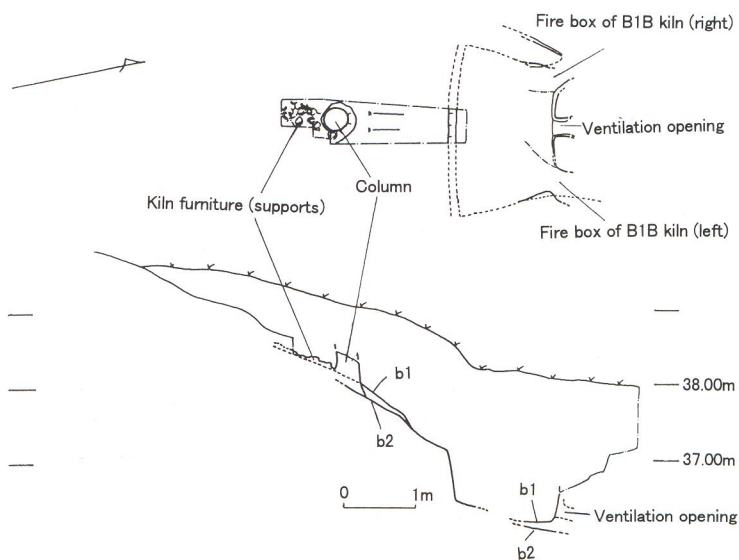


Figure 4. Plan and Section of B1B Kiln



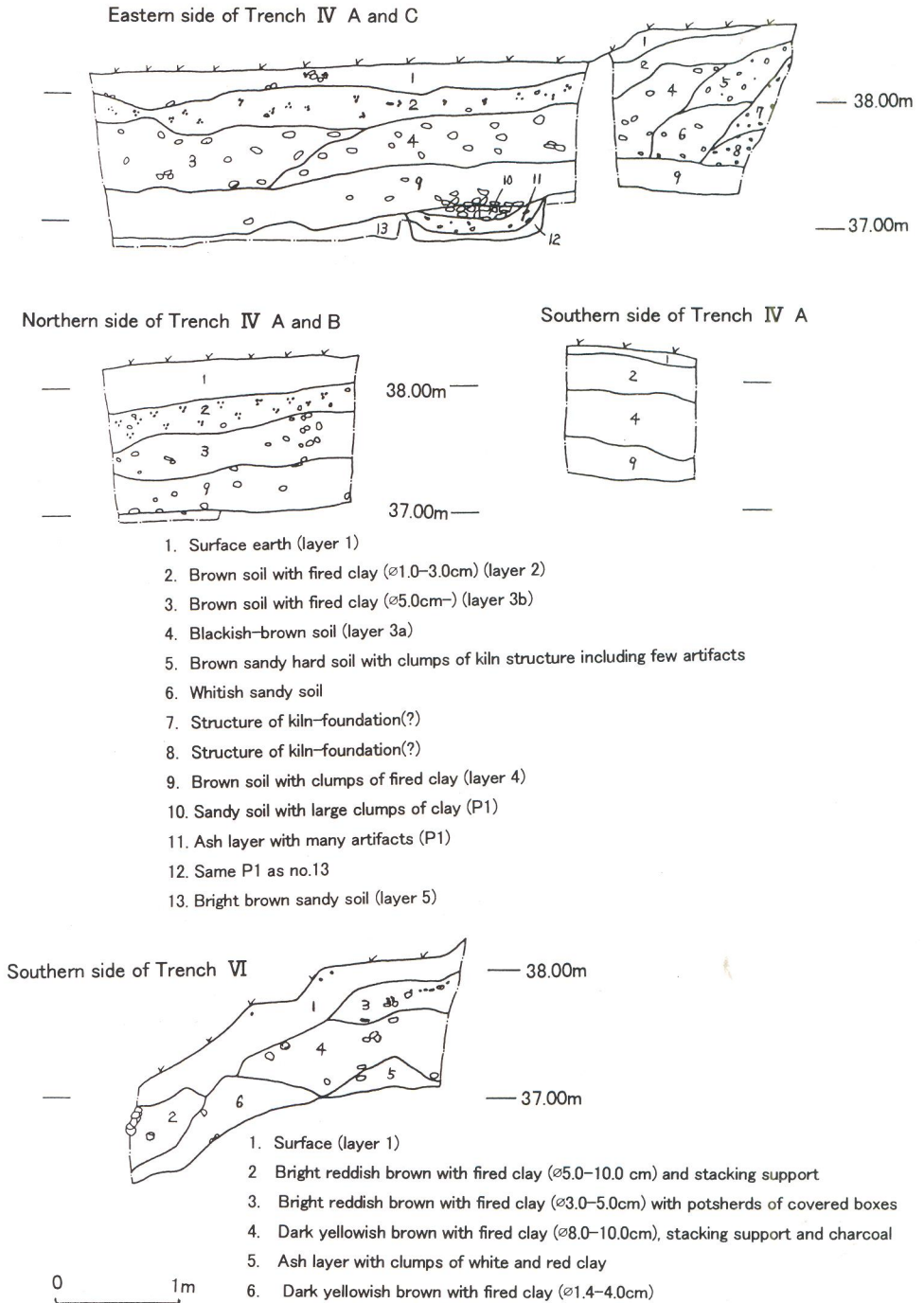


Figure 5. Section of Trench IV A, B, C and Trench VI

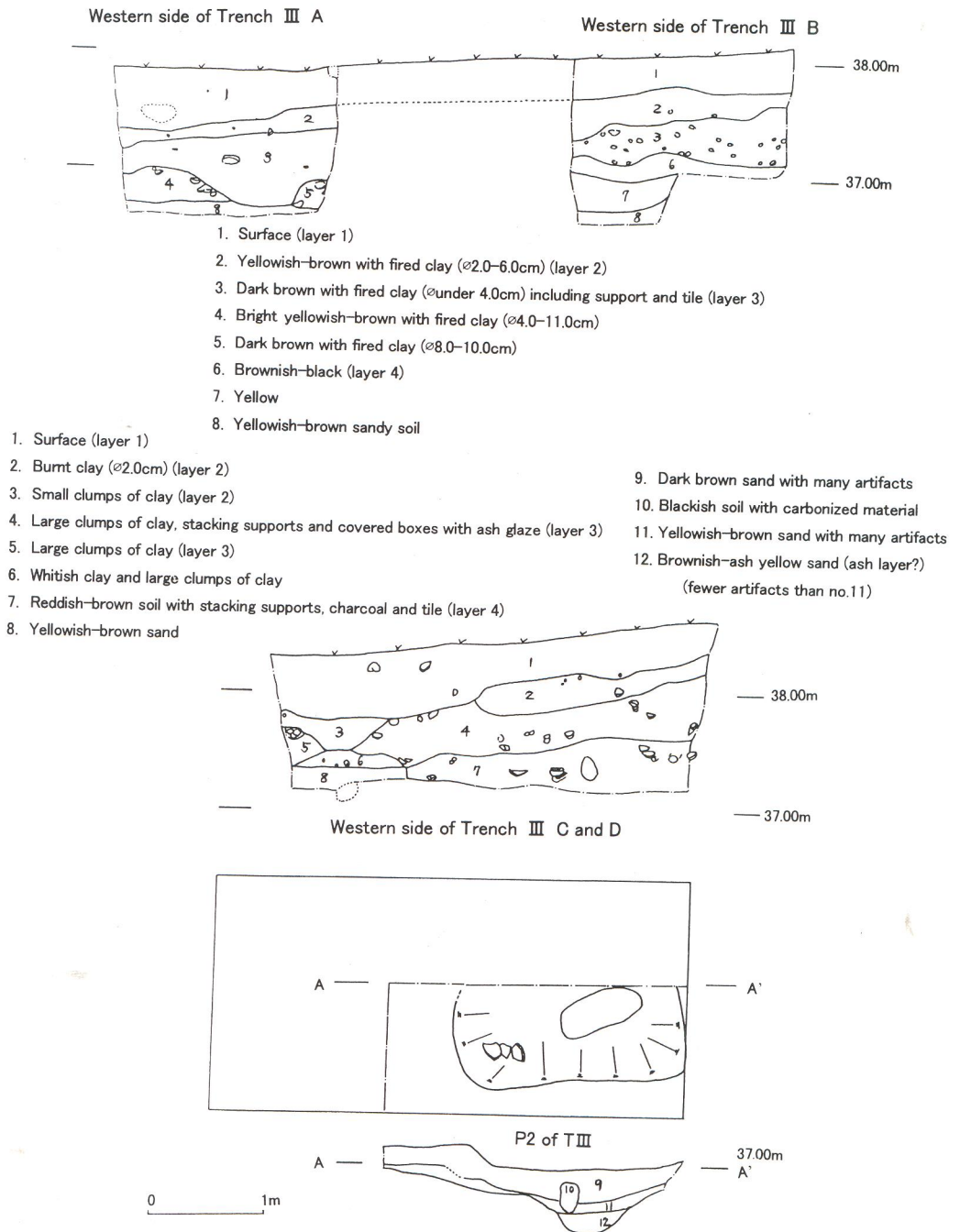


Figure 6. Trench III A, B, C, D and P2 of Trench III

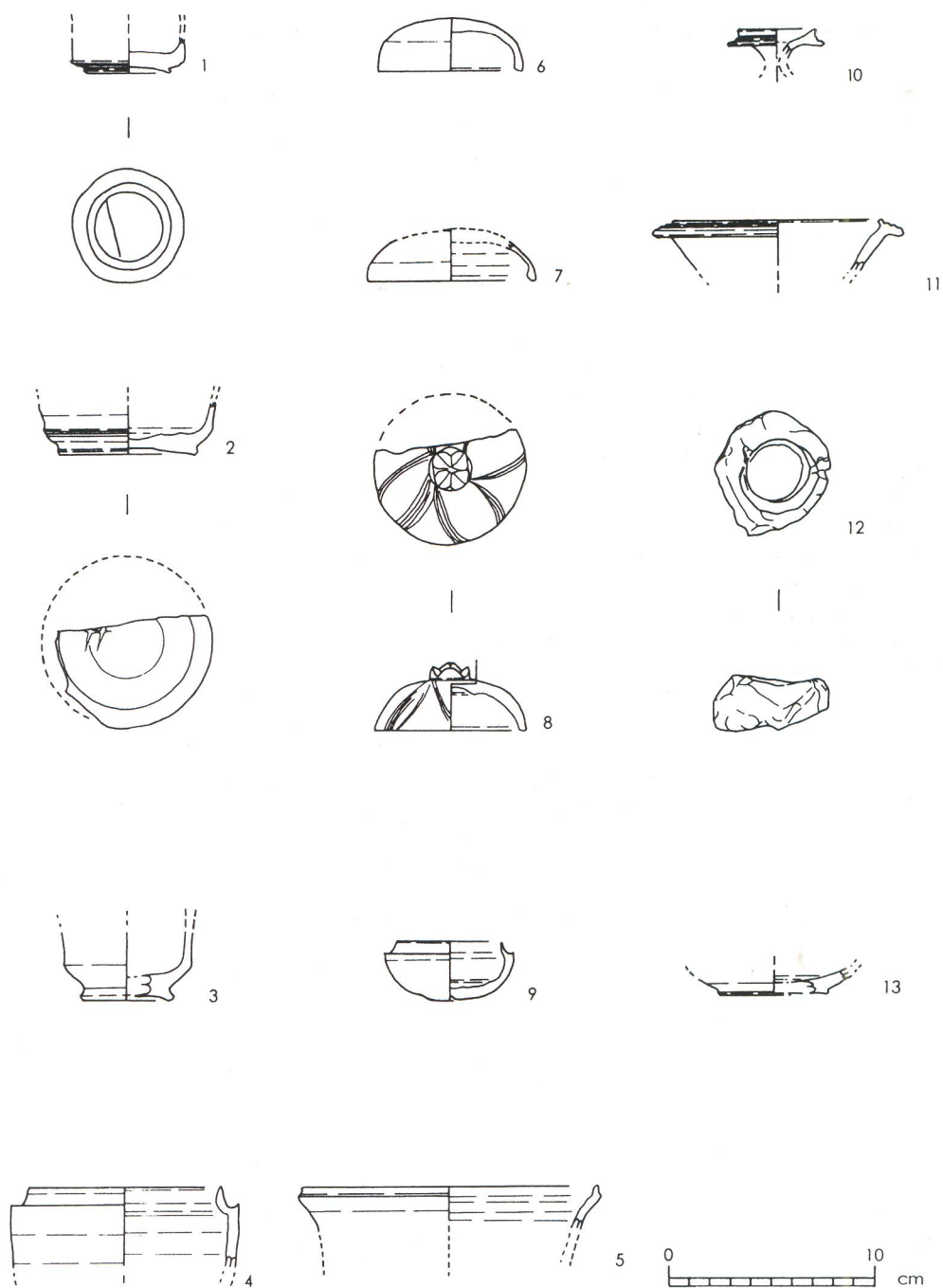


Figure 7. Ceramics from layer 3, interior B1 Kiln



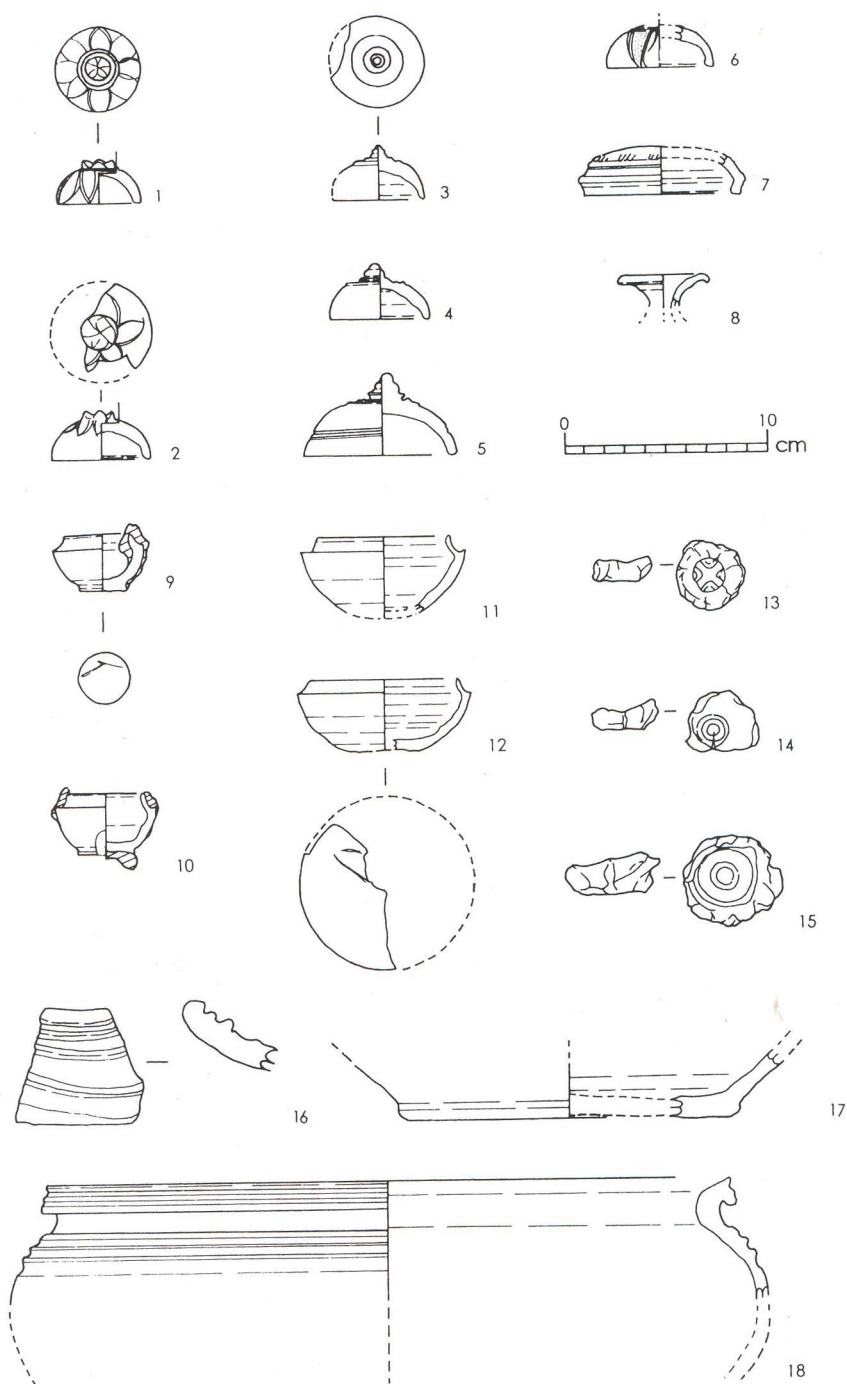


Figure 8. Ceramics from layers 4 and 5, fuel combustion chamber

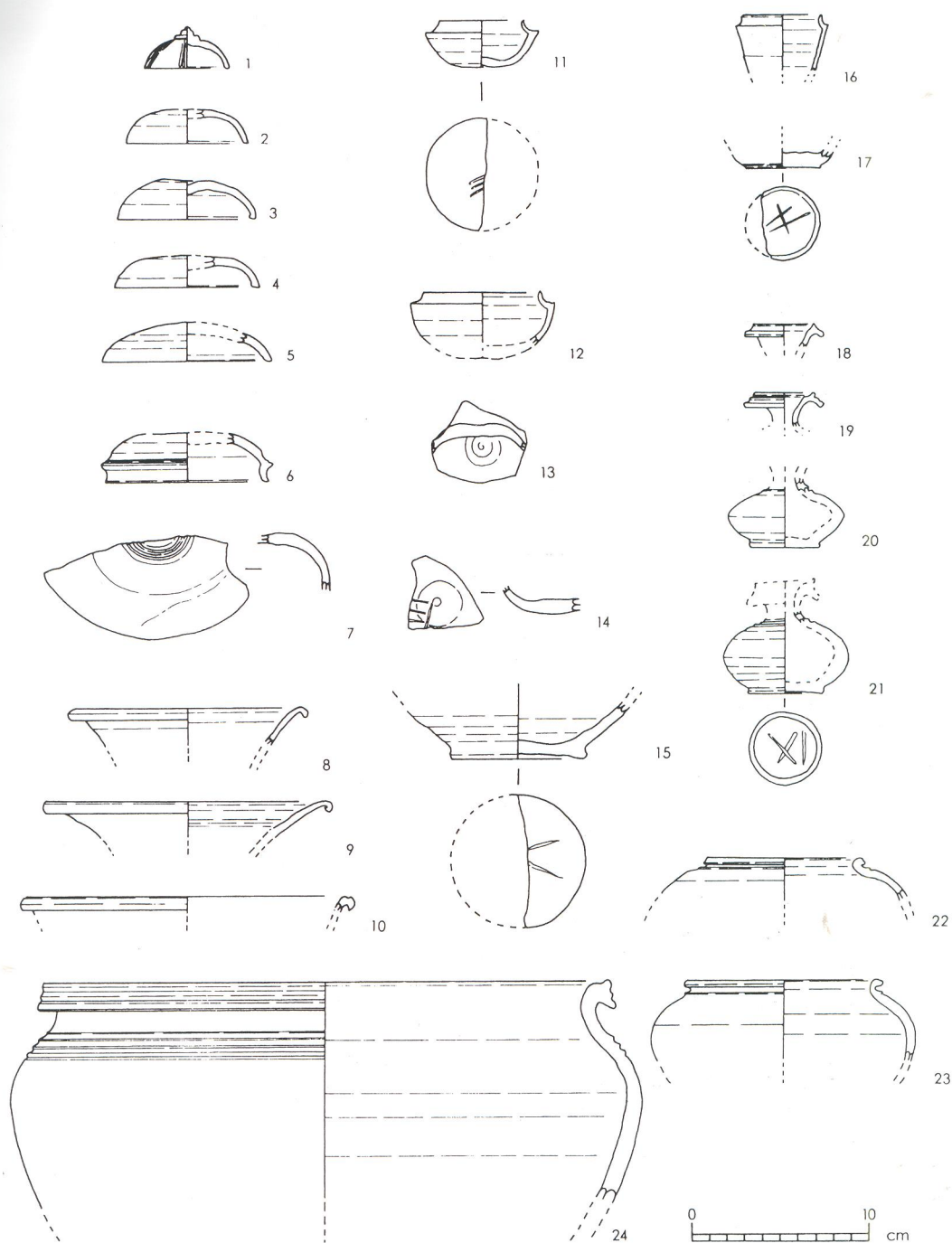


Figure 9. Ceramics from layers 6 and 7, fuel combustion chamber

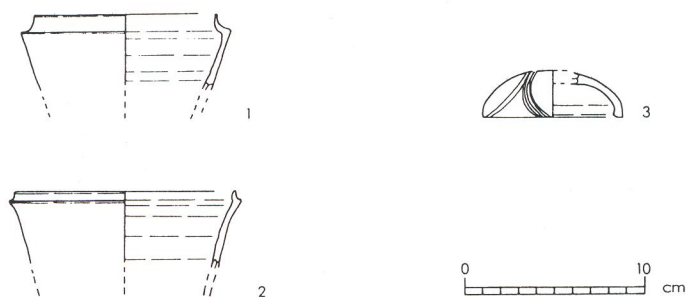


Figure 10. Ceramics from layer 8, fuel combustion chamber

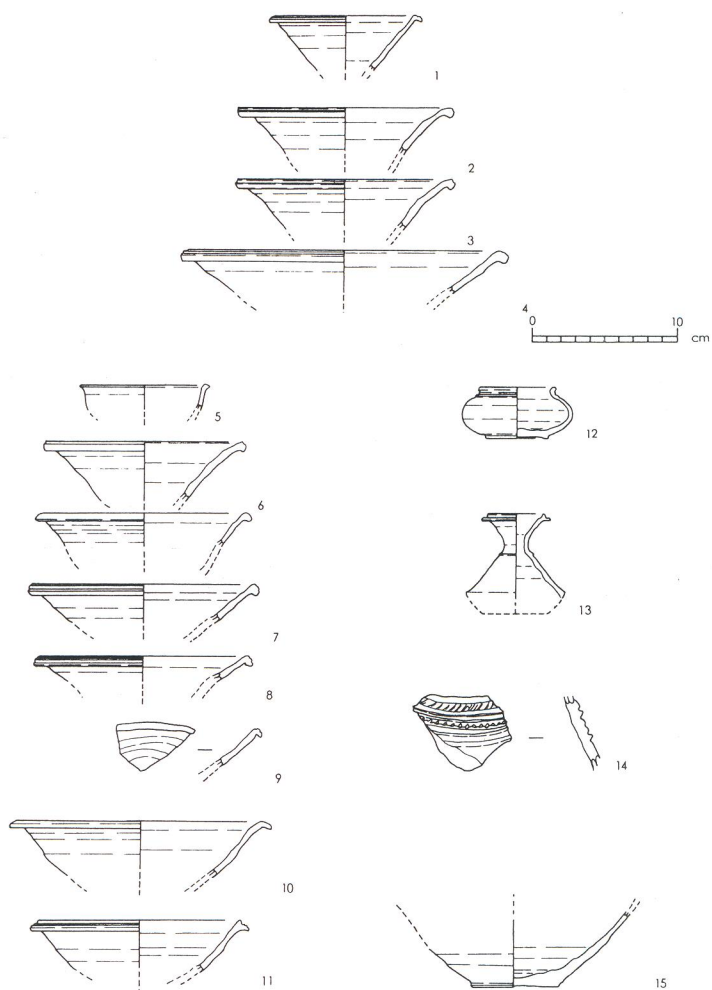
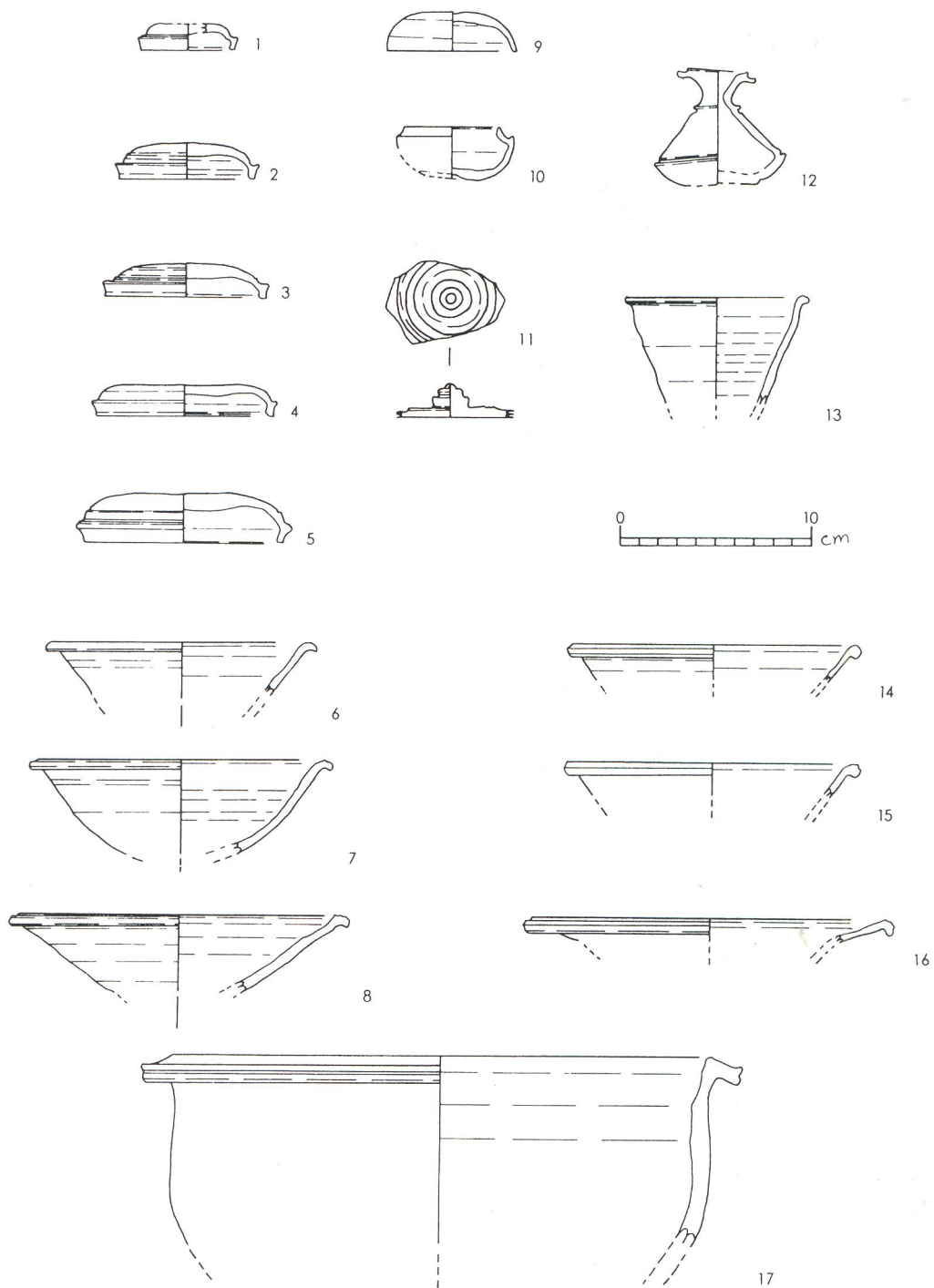


Figure 11. Ceramics from layers 1 and 2, Trench IV A of B1 Kiln





*Figure 12. Ceramics from layer 3, Trench IV A of B1 Kiln*

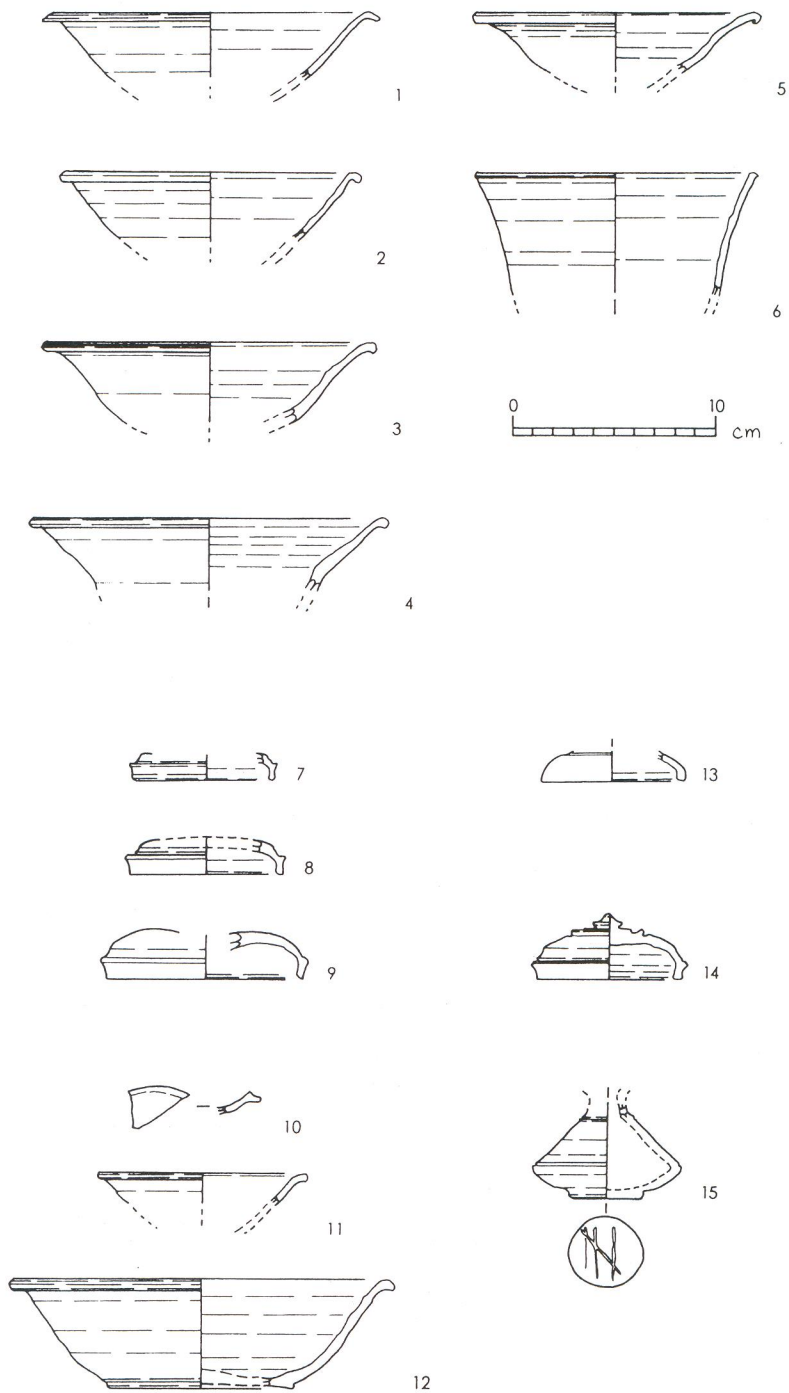
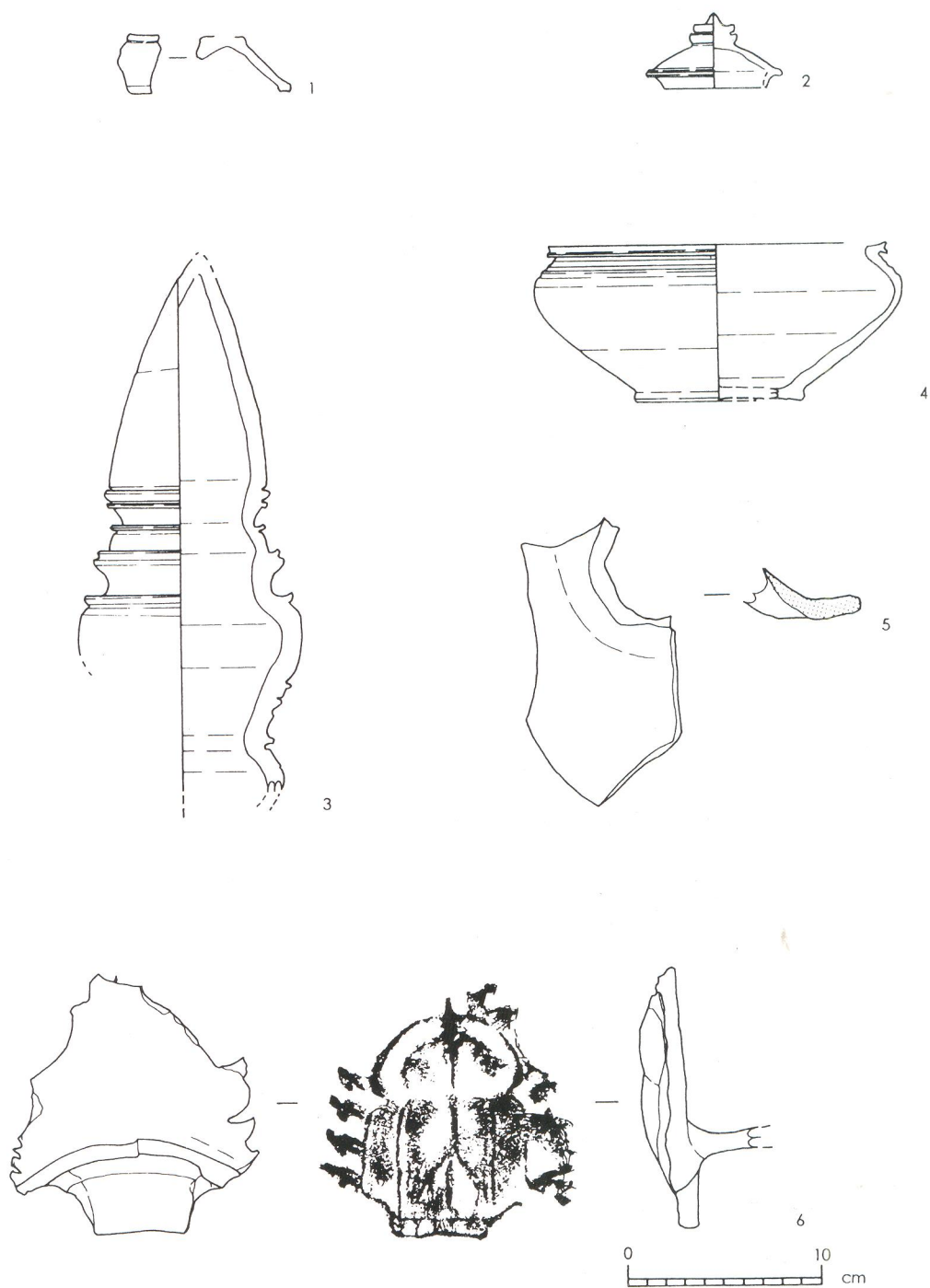


Figure 13. Ceramics from layers 4 and 5, Trench IV A of B1 Kiln



*Figure 14. Ceramics from Trench IV of B1 Kiln*