



Rammed-earth Foundation in Some Aborigine Houses of Taiwan

The case study of Hoping Island: some answers and some questions

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1. ADOBE AND CLAY IN THE HOUSES' WALLS

Examples of rammed earth and/or adobe used in traditional walls of houses can be found all over the world since the Neolithic.

a. We can see examples in Zaragoza province (a clayish central area in the Ebro valley, Spain).



Photo 1: Houses in Montañana (Zaragoza) Photo 2: Houses in Sena (Monegros, Zaragoza)

b. The same system of “adobe” (土磚) in small houses can be found around the whole world, like in the south of Taipei (Taiwan).



Photo 3: Houses in Shenkeng (Taipei) Photo 4: Houses in Maokong (Taipei)

c. In front of Taiwan, in the Province on Fujian (福建), China, there are the World Heritage traditional houses called tulou (土樓, literally “towers of sand”), made also with “adobe”.



Photo 5: Tulou in Fujian

d. In modern Vietnam traditional techniques of construction still can be appreciated, not of adobe, but of big layers of rammed earth made with formwork:



Photo 6: Hmong house, Vietnam (Wikipedia)

2. CLAY IN FORTIFICATIONS AND CITY WALLS

Other traditional usage of rammed earth is fortifications, either to construct the walls of provisional forts of an army conducting a siege, or to replenish the central part of the wall of fortified cities. The work is usually done adding horizontally different layers of rammed earth.

a. In the first case we can mention a canonical way referred in the military architecture treatise of Sebastian Fernandez de Medrano, *El Architecto Perfecto en el Arte Militar* (Brusselas, 1700), where we can read the following:

“Si el ingeniero fe hallare en parte que aya Tierra à propofito para Tapias, y quifiere hazer de ella la Muralla, tomarà unos tablones grueffos de una ò dos pulgadas, con 7. pies de largo, y 5 de alto, ... y igualados los dos por la parte fuperior, caiga el exterior en declivio” (p. 210).

b. One example is the traditional way of construction city walls in China can be seen in the extant Ming wall of Beijing



Photos 7 & 8 (J. E. Borao): Sections of the Ming Southern Wall of Beijing

3. CLAY AS FOUNDATION OF WALLS IN TAIWAN

As far as we know, also the rammed earth is to be used as foundation of buildings or other structures, although this is less common. We have found several cases in Taiwan in different archeological surveys:

a. Under the Northern gate of the Qing city (1870)

It was excavated by Chenghwa Tsang (臧振華) in 1984, with occasion of the construction work of the subway of Taipei. Here we can see that different layers of rammed earth appear under the gate that clearly it works as foundation of the gate.

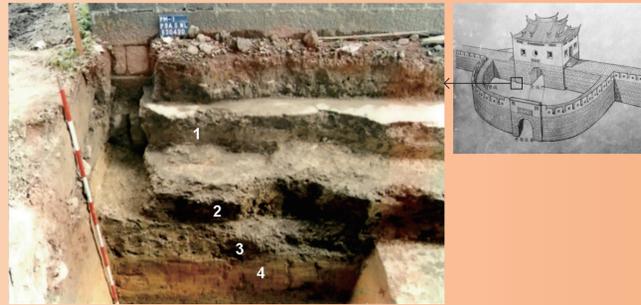


Photo 9 (Tsang Chenghwa): Excavation of the foundation of the Qing North gate of Taipei

b. Foundation of the standing walls of the fort of Dashawan (大沙灣, Jilong), made in the 19th century by Liu Min-chuang. They appear under a rammed earth structure, as manifested in the prospection made by Liu Yichang (劉益昌) & Yaning Yen (閻亞寧), *大沙灣石圍遺構調查研究*, Keelung Bureau of Culture, 2010, p. 76.

4. CLAY AS PLATFORM UNDER NATIVE HOUSES

According to ancient documents and ethnographical records, the natives in Taiwan constructed their houses on a rammed earth platforms. Now we cite some of them:

a. The Atlas Chinensis of Arnoldus Montanus, translated by Ogilby and published in 1671 says (p. 24): “(The Formosan houses) generally stand six Foot from the Ground, on a Hill of Clay”.



Photo 10: Portrait of an aboriginal house if Formosa/Taiwan in the Atlas Chinensis

b. The naturalist Joseph Beal Steere, who made some trips of field work in southern Taiwan in 1874, talking about the houses of the Southern aborigines Tsuiwhan said: “We were conducted to one of their dwellings, a large barrack of bamboo, covered with grass, and built upon a bank of earth, raised two or three feet above the common level.” (*Formosa and Its Inhabitants* (edited by Paul Jen-kuei Li, Academia Sinica, Taipei, 2002), p. 34)

c. Matching with these descriptions we have images of aboriginal houses in Formosa, rendered by Chinese artists in the 18th century that somehow correspond with our archeological findings:



Photos 11 & 12: Native life in Taiwan according to 番社采風圖 (11) and 六十七兩采風圖 (12)

5. CASE STUDY: THE QUIMAURRI VILLAGE

We will like to draw your the attention to a rammed earth structure that had appeared in our excavation in the aboriginal village of Quimaurri (Jilong, North Taiwan).

In 1626 this aboriginal village was encountered by the Spaniards when they arrived in Jilong from the Philippines. In total there were around 600 natives, meaning more than 100 houses. An archeological international team (NSC of Taiwan & CSIC of Spain) made an excavation in 2011 (to be continued until 2013) looking for the remains of the short lived city of San Salvador (established besides the native town) and of the village itself.



Photo 13: Rammed earth in test pits 5&6

The most striking of the unearthed structure is the similarity with the above mentioned graphic and historical descriptions.



Photo 14: Test-pits 4 & 5-6 (combined in a single one), showing the rammed earth.

The structure was made with a formwork with posts every 3 mts. This structure might be one of the following two scenarios:

a. **Aboriginal house** according to the models of the images above. This possibility is supported for the existence of a fire place. This structure helps us to better presume the orientation of the house because: it will be located (1) at the back, and, for safety reasons (2) in the middle of the two the main walls, and (3) in the border of the house. Consequently, the main entrance will be in the opposite side, on the south, which precisely is the one facing the sea.

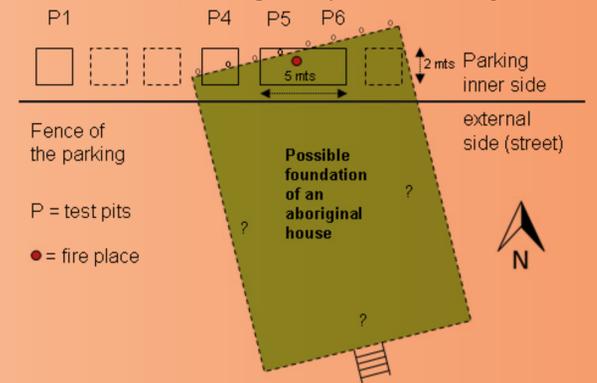


Figure 1: Floor map of the rammed earth discovered structure

b. The main problem of this interpretation is that the stage is not a kind of external platform (like the aboriginal house portrayed above), but a below foundation. In this sense other interpretations are opened, like a **Western structure** using local technique.

The way of dealing with these archeological relics is still under discussion. Now preservation is the main action. We have covered it again using non-woven-cloth (不織布) before engaging in a second archeological campaign □



Photo 15: Covering the rammed earth