Relative Dating of Early Shang City Ruins Based on Rammed-Earth Building Techniques Employed in City Walls

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To date, the Shang cities discovered around the middle and lower reaches of the Yellow River include sites at Zhengzhou, Yanshi, Jiaozuo, Yuanqu, and Dongxiafeng. Among these, the Zhengzhou site includes an inner walled compound and an outer city wall, while the Yanshi site can be divided into a smaller and a larger walled compound. Generally speaking, scholars date all of these ruins to the period of the Erligang Lower Phase; the most controversy occurs with respect to the relative dating of the Zhengzhou and Yanshi city sites. It is impossible to reconcile the two sides of the debate completely by relying on the archaeological materials published to date and employing stratigraphy and typology to confirm which ruin is earlier and which is later. This work therefore seeks to open up a new avenue of investigation by considering the relationships between the above sites based on the techniques employed in constructing city walls of rammed earth.

I

Based on the structure of foundation trenches, early Shang city walls can be divided into three main types: those without foundation trenches, those with shallow foundation trenches, and those with deep foundation trenches.

1. Without foundation trenches: The inner city compound at Zhengzhou and the Shang city at Dongxiafeng fall into this category. The inner city compound at Zhengzhou forms an even square with a surface area of approximately 300 hectares. None of the four walls have foundation trenches, and the makeup of the rammed earth construction is essentially the same between walls. Each wall is divided into three portions: a middle portion and two side portions. The order of the construction of the wall segments was as follows: first, planks were used to support the completion of the middle portion of the wall segment; then, the rammed-earth construction was separately widened to form each of the side portions. Along the middle section of the south wall and the lower portion of the inside of the west wall, traces of a narrow, shallow ditch running parallel to the wall were discovered (Figure 1). From the published cross-sectional image of the south wall, it can be ascertained that the sequence of its construction shared certain commonalities with that of the Erlitou period city site at Dashigu, Zhengzhou. For example, in both cases, the middle portion of the wall was first built using plank formworks, and later, earth

Figure 1. The Cutaway Section of the East Wall of the Inner City of the Shang Dynasty at Zhengzhou (ET7)

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was rammed onto both sides of the middle portion to create the inner and outer sections of the wall, thereby thickening the main body thereof. The Shang city ruins at Zhengzhou are somewhat larger, however, and the walls are somewhat thicker.

The Shang city ruins at Dongxiafeng form an even rectangle, of which the remaining part is 140m long from north to south and 440m wide from east to west. The main body of the wall was built by ramming flat layers of mottled yellow soil. The two side portions were added separately, and the areas of contact between the two different types of rammed earth form obtuse triangles.

2. Shallow foundation trenches: Only the smaller walled compound of the Shang city at Yanshi falls into this category. The ruins form a rectangle of 1,100m in length from north to south and 740m in width from east to west. The wall is approximately 6 or 7m wide. City gates may have been situated in the middle of each of the four walls. In general, the foundation trench for the walls does not reach 0.5m in depth; in places, it is as shallow as 0.2m.

3. Deep foundation trenches: Sites of this type are comparatively numerous; they include the outer wall of the Shang city at Zhengzhou, the larger walled compound at Yanshi, the Shang cities at Jiaozuo and Yuanqu, and others. Their primary characteristic is that the foundation trenches are relatively deep, their cross-sections forming an inverted trapezoid. The outer wall of the Shang city at Zhengzhou has a foundation trench with angled walls, wider at the top and narrower at the bottom, with a flat floor. The mouth varies from 11.6 to 12.5m wide, while the floor measures from 10.2 to 11.5m wide. The depth of the foundation trench generally varies from 1.3–1.5m but reaches 2m at its deepest points. After emerging from the foundation trench, the body of the wall broadens further outward (Figure 2).

The Shang city at Jiaozuo is in a square plan. It is comparatively well preserved, and the boundaries of the city ruins are distinct. The remains of the western portion of the city wall measure approximately 280m in length; those of the northern portion measure 284m. The city wall was constructed by first digging the foundation trench, which measures approximately 15m wide and 0.9m deep, and then piling up rammed earth layer by layer, starting from the floor of the foundation trench. Once the layers of rammed earth reached the surrounding ground level, formwork made of wooden planks were laid horizontally along the inside and outside of the wall and butted up against each other, and the body of the wall was built upward using rammed earth.

II

Based on the layout of the Shang city at Zhengzhou, wherein the inner city was built first and the outer second, the building structure developed from construction without a foundation trench to construction with a deep foundation trench. Certain areas of the larger walled compound in the Shang city at Yanshi were built by cutting down the wall of the smaller walled compound and extending the construction upward from its foundation; the sequence of development ran from the shallow foundation trench of the smaller compound, arriving in the end at the deep foundation trench of the larger walled compound. The developmental sequence of the three
types of city wall described above should therefore run as follows: construction without a foundation trench developed into construction with a shallow foundation trench and finally into construction with a deep foundation trench. We can thus divide the sequence into three stages.

The first stage is represented by the Shang cities at Zhengzhou and Dongxiafeng. In recent years, new archaeological materials have made it clear that the cultural remains associated with the inner city compound at Zhengzhou are not the same as those associated with the outer city wall; the inner city generally includes Luodamiao Type cultural layers and the large-scale remains associated with this period, such as rammed earth ruins, wells, etc. The Luodamiao Type belongs to the late phase type of proto-Shang materials, with which the lower stratum of the Erligang Culture enjoys a close relationship of inheritance.

With respect to the date of the Shang city at Dongxiafeng, based on its method of construction, it should be of relatively early date. Based on a few pottery sherds recovered from the rammed earth of the two side sections of the main body of the city wall, the excavators infer that the city wall was contemporary with the fifth period of the ruins (equivalent to the lower stratum of the Shang-era portions of Erligang). At the fifth locus excavated inside the city were discovered rich deposits belonging to the Erlitou Culture’s “Dongxiafeng Type,” corresponding to phases III and IV as described in Zhengzhou Shang dai Cheng Yizhi Fajue Baogao; the strata buried immediately underneath the city wall, however, included a pure layer of soil free from deposits or a layer dating to the second phase of the Miaodigou Culture. Based on published cross-section T5500, the main part of the eastern wall was constructed by piling up successive layers of rammed earth. Four portions can be distinguished in the body of the wall, including the two side pieces, designated 3C, and the two pieces in the middle, designated 3D. Three of these pieces of rammed earth are of nearly the same width, a situation similar to the squared-off, wooden plank-assisted rammed earth construction of the wall ruins at Guchengzhai.

To date, only two survey trenches have been opened at the Dongxiafeng site. The structure revealed by the survey trenches in the southern and eastern walls is not the same. The disparity in the sizes of theammers are relatively large; for example, the rammer marks in trench T5500 in the southern wall reach as wide as 7cm in diameter, while those in trench T7700 in the eastern wall are only 3cm in diameter. Because of this, it is worth devoting some attention in the future to the question of whether or not the walled compound at the Dongxiafeng site really is contemporary with the fifth period of the associated ruins.

The second stage is represented by the smaller walled compound of the Shang city at Yanshi; its characteristic feature is a comparatively narrow wall with a shallow foundation trench. Traces of a gully remain at one or both sides of the bottom of the foundation trench, similar to the narrow, shallow traces discovered in association with the middle part of the southern wall of the inner city compound of the Shang city at Zhengzhou. The wall of the smaller compound at Yanshi is almost exactly one-third the width of that of the inner city compound at Zhengzhou. From these details of construction, it can be ascertained that the smaller compound at Yanshi was definitely influenced by the Shang city compound at Zhengzhou. The cultural layer corresponding to the smaller compound at Yanshi is that of the first period of the Yanshi Shang Culture. The excavators hold that the dating of this phase probably corresponds to that of phenomenon H9 of the Zhengzhou Shang city site. H9 is a refuse pit inside the outer wall of the Zhengzhou site, dating presumably to sometime after the late phase of the “Luodamiao type.” Based on cultural features, the earliest phase of materials from inside the smaller compound at the Yanshi Shang city site were strongly influenced by the Luodamiao type from inside the inner wall of the Shang city at Zhengzhou. For example, the li-tripod with a rolled lip and thin cord patterns; the deep-bellied, olive-shaped guan-jar; and the pen-basin with a pinched neck and rolled lip, belonging to the first division of the first period of the materials from inside the smaller compound at the Yanshi Shang city ruins, all have counterparts among the vessels belonging to the Zhengzhou Luodamiao type. Based on cultural remains, then, the smaller walled compound of the Shang city remains at Yanshi would seem to be later in date than the inner city compound of the Shang city at Zhengzhou.

The third stage is represented by the outer city wall of the Shang city at Zhengzhou, the larger walled compound of the Shang city at Yanshi, and the Shang cities at Jiaozuo and Yuanqu. The characteristics of the city walls include a comparatively deep foundation trench.
with a cross-section in the shape of an inverted trapezoid. Once the height of the rammed earth exceeds the depth of the foundation trench, the body of the structure then widens toward the outside, forming a broad, stable wall. At the Yuanqu site, for example, before constructing the wall, a trench shaped like a trapezoid in longitudinal section was first dug to serve as the foundation of the wall structure. From the bottom of the foundation pit, rammed earth was built up layer by layer until it reached the original ground level. At that point, wooden planks were arranged horizontally and butted up against each other to the inside and outside of the wall, and rammed earth was built up further from the flat surface contained within, thereby forming a nearly vertical wall. The dates of the cultural remains found within the ruins of these walled sites were basically identical; rich remains of the second phase of the lower stratum of Erligang Culture had accumulated inside all the walled compounds, and all of them enclosed groups of large-scale, rammed-earth structural foundations. Among the assembled ruins of early Shang walled compounds, the above sites, the walls of which had deep foundation trenches, are the latest in date.

III

The earliest appearance of formwork-assisted rammed earth construction in the Yellow River valley is at the Yangshao period ruins at Xishan, Zhengzhou. By the time of the Longshan culture, the technique was already in widespread use for constructing large-scale walls and palace compounds. Based on the discovery of walled sites at Wangchenggang, Dengfeng; Pingliangtai, Huaiyang; Haojiatai, Yancheng; Mengzhuang, Huixian, etc., the rammed-earth construction techniques used in the construction of city walls at that point can be divided into two main types: piling and formwork-assisted construction. The latter included, for example, the city wall at Guchengzhai, where wooden pillars were placed to the sides of the shoring planks and secured with ropes. In the formworks used for constructing walls, the main body of the structure was composed of wooden planks, while planks, wickerwork, and/or small sticks might be used for the two ends of each unit. The rammers were for the most part made of tied bundles of sticks which were circular with rounded bottoms. The piling method of construction is represented by the wall ruins at Mengzhuang; the pounding was mostly carried out on an angle and the wall widened bit by bit. The inside body of the wall at Mengzhuang preserves traces left by the use of wooden planks as formwork, as well as regular furrows cut into the virgin soil as foundation trenches for planks; the bracing planks thus would be fixed by the slope of the piled construction along their inner surface.

The only walled ruin with a foundation trench dating to the Longshan culture is the small walled compound at Wangchenggang; its foundation trench is 2m deep, 4.4m wide at the mouth, and 2.5m wide at the bottom. However, the newly discovered large walled compound at Wangchenggang was clearly built up directly from ground level, with no traces of a foundation trench to be found. Moreover, the materials of a few sites previously published relating to the use of foundation trenches for city walls during the Longshan period are quite unreliable. For example, the foundation trench at the Guchengzhai site was in fact a naturally occurring, low-lying trench that was evened out and used as a foundation for the rammed-earth construction process, forming a foundation trench in those areas where the natural arrangement of the terrain was low, but none in those areas where it was relatively high.

The Erlitou-culture city ruins at Dashigu form a narrow rectangle that is longer from east to west and narrower from north to south; their total surface area amounts to approximately 51 hectares. Based on the extant cross-section of the city wall, the core of the wall, which is 1.3m in width, was constructed first, and the two sides were added on afterward. No foundation trench was dug for any portion of the wall.

The rammed-earth wall construction of the Longshan and Erlitou periods can be divided into the two categories of construction by piling and formwork-assisted construction. Observed from Guchengzhai to Dashigu, the process was first to build up the core portion of the wall using a frame and then to add on the rammed earth of the two sides; the walls were constructed in several separate pieces. Clearly, the inner walled compound of the Shang city at Zhengzhou was built using similar methods.

The construction of the larger walled compound of the Shang city at Yanshi employed formwork planks arranged parallel to the wall; the planks were 0.3–0.7m high, and each register in the rammed-earth construction was inset by approximately 0.1m. Based on this arrangement, the main body of the frame-constructed, rammed-earth city wall at Yanshi was built by drawing
in each successive register to create a stepped shape. The walls of the smaller compound at Yanshi, which measure 6–7m wide, were similarly built by drawing in each successive level of rammed earth. The shallow foundation trench and terraced formwork construction of the smaller compound of the Shang city at Yanshi thus established the basis for the construction of the larger walled compound at Yanshi and the outer wall of the Shang city at Zhengzhou.

In summary, based on the arrangement of walled sites and the techniques employed in rammed-earth construction, the developmental pattern of these early Shang city sites discovered in the Central Plains was from small to large and from inner city compounds to outer city walls. The foundations of walls progressed from the lack of foundation trenches to shallow foundation trenches and narrow walls, finally developing into broad walls with deep foundation trenches. The sequence of relative dating of these early Shang walled sites begins with the inner compound of the walled Shang city at Zhengzhou (the Shang city site at Dongxiafeng being still in doubt), with the smaller compound in the Shang city at Yanshi next and the outer wall of the Zhengzhou site, the larger compound of the Yanshi site, and Shang city sites at Jiaozuo and Yuanqu all of later date.

References


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