A Preliminary Study of Semi-circular Roof Tiles of the Western Han

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A major subject of urban archaeology is the study of ancient structures and building materials. Surveys and excavations of ancient buildings often produce a large quantity of building materials.

Major clay building materials of the Western Han include bricks, flat-roof tiles (banwa 北), semi-circular roof tiles (tongwa 通), and the circular end of eave-tiles (wadang 華). Collectors and researchers often pay attention to the beautifully ornamented eave-tiles, leaving the flat and semi-circular roof tiles unstudied. This paper will focus on semi-circular roof tiles unearthed from the Xi’an area in the past, including those found in the remains of the Guigong (Sweet Osmanthus Palace), the southern kilns (Y31–Y41) of the Beigong (Northern Palace), the kilns found near Shijiazhai Elementary School (Y49 and Y50), the West Market kilns (Y1–Y30, Y42–Y48), and a building foundation at the southwest corner of the Han dynasty city walls of Chang’an. Semi-circular roof tiles found at the Duling Mausoleum of Emperor Xuandi (91–41 BCE) are also included in this study.

Terminology
The names of the semi-circular tiles are based on manufacturing procedures. The convex side of tile is called the exterior, and the concave side is called the interior; the two rims on either end of the tile are called the front rim and the back rim. From the front rim to the back rim, there are six sections: the lip, the front rim, the upper band, the middle section, the lower band, and the back rim.

Manufacture
Craftsmen used clay coil or inner molds to build up the semi-circular tiles. After the tile was made, two straight lines were incised along the length of the tube without cutting through. After the tube was partially dried, the maker broke the tube into two along the incisions. The middle part of the exterior is often decorated with cord patterns produced by a cord-wrapped roller or beater. The upper and lower bands had smooth surfaces without cord patterns. The tile interior was marked with textile impressions or pockmarks for easy adherence.

Types of Tiles
Based on the manufacture, cutting method, shape, and the patterns found both on the interior and exterior of the semi-circular roof tiles, three types have been identified.

Type A is made of coils without using an inner mold. This type of tile is irregular in shape. The relatively deep incisions are cut from the outside. The exterior has cord patterns from a cord-wrapped beater. The cord patterns were smoothed out near both the upper and lower bands. The interior is covered with pockmarks.

The eave-tile is a semi-circular roof tile with a circular end attached. There were two ways to attach the circular end to the semi-circular tile. One way is to build a tube out of coils extending back from the circular end, and then cut the tube in half (Type I Attachment, Figure 1:1); the other way is to build a separate tube and attach it to the circular end, then cut the tube in half (Type II Attachment, Figure 1:2). On the reverse of circular end, one always finds cutting marks from a thread or knife. There were two ways to cut half of the extended tube from the end. One way was to pierce the tube, and use a thread to cut away half of the extended tube. In this case, a slightly tilted surface on the back of the end is usually

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visible. The slanted surface reveals whether the tube was cut from inside out (Type I Cutting) or outside in (Type II Cutting, see Figures 2:1 & 2:2).

Two subtypes are further divided based on the cord decorations in the middle section.

A-I.
A-I is decorated with thin cord patterns. Each shallow impression is approximately 0.2 cm wide. Example Y37:1 is 57.7 cm long, 1.5 cm thick, with a diameter of 16.5 to 16.8 cm. The upper band, 8.4 cm long, has no cord patterns. Its short lip is 2.6 cm long and 1 cm thick (Figure 2:5). Another example (Y34:8) is attached to an undecorated half circular end tile. The remaining length of the broken tile is 34.2 cm, and it is 15.1 to 15.8 cm wide. Near the lower band, a stamped inscription with characters (great master) is visible (Figures 2:3 & 4).

A-II.
A-II is decorated with thick cord patterns. The impressions are relatively deep, and approximately 0.4 cm wide. Example Y50:15 is 51.5 cm long and 16.8–17.2 cm wide. The length of the upper band is 7.5 cm and the lower band is 7 cm; both bands are without decoration.

Type B. Type B tiles were made using inner molds and so are more regular in shape. The incisions were deeply cut from the exterior of the tile, which is decorated with cord patterns similar to those of Type A. The interior is covered with textile impressions.

There were two ways to attach the roof tiles to the circular end. One way is to build a molded tube directly from the back of the circular end (Type III Attachment), and the other is to make a molded tube separately and then attach it to the circular end (Type IV Attachment, Figure 1:3 & 4). Marks of the inner mold are often found on the back of the circular end made using this type of inner mold, indicating that the inner mold was wrapped by a piece of cloth (Figure 3:3). Both cutting methods described above were used.

Based on the exterior decoration, there are four subtypes of Type B.

B-I. This subtype has thin beaten cord patterns. The shallow patterns are approximately 0.2 cm wide. The patterns were smoothed out near the upper and lower bands, but not completely. The interior, covered with textile impressions, has a beveled rim. Example Y26:2
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Figure 2. The Cutting Methods of the Semi-circular Tiles from the Tile-ends Shown on the Rubbings

Figure 3. The Mold Impressions Left on the Backs of the Tile-ends
1. Southwest Corner T3 ø:2 2. Y50:8 3. Southwest Corner T3 ø:1

Figure 4. The Rubbings of the Exteriors of the Semi-circular Tiles

is 47.8cm long and 1.5cm thick. Its diameter is 15.7–15.9cm. The lip is thin and short, measuring 2.5cm long and 1cm thick (Figure 4:1).

B-II. This subtype has rolled cord patterns approximately 0.3cm wide. The interior is covered with textile patterns. Example Y50:5 has an upper band 2.1cm long. Both the upper and lower bands are undecorated and have smooth surfaces. The remaining length of the broken tile is 33.2cm, and the width is 15.5cm. It is 1.4cm thick. Example G6: T1 ø:6 is 50cm long, 15.2–15.6cm wide and 1.45cm thick. It has an undecorated upper band 8cm long and undecorated lower band 14.5cm long. The lip is 2.2cm long and 1.05cm thick. The slanted cross section of the back rim is 2.7cm long.

B-III. The cord patterns are approximately 0.5cm wide; the undecorated upper band is 4.5cm long, and the undecorated lower band is 15.8cm long. The back rim’s cross section is not slanted. Thick cord patterns on the flat lip were smoothed out. Example G2 South: T1 ø:10 is 44cm long, 13.1–14.1cm wide, and 1.25cm thick. The lip is 2.7cm long and 1.25cm thick (Figure 4:2).

B-IV. The cord patterns are approximately 0.35cm wide; the undecorated upper band is 4cm long, and the undecorated lower band is 24.3cm long. The back rim has a slanted cross section. One of such example is from Duling Mausoleum. It is 52.2cm long and has a diameter of 15.9–16.6cm.

Type C. Type C tiles were made with inner molds and are regular in shape. Thick cord patterns are found on the tile exteriors. The cord patterns are about 0.5–0.8cm wide, and tiles have an undecorated band on both
upper and lower sections. The interior has textile impressions and the back rim has a slanted cross section. The lip is flat and the upper rim has a slanted cross section.

The mold-made semi-circular tile was attached directly to the circular end. No cutting marks were found on the back of the circular end (Figure 1:5).

Three subtypes are recognized based on details.

C-I. The lip is relatively short, approximately 3cm long. Example G3: T1 ③:49 is 48.4cm long, 1.3–1.4cm thick, and has a diameter of 13.9–14.8cm. The lip is 2.7cm long, and 1.5cm thick. The upper band is 6cm long and the lower band is 22.5cm long. The middle part with cord pattern is 16.5cm long, and the cord patterns approximately 0.75cm wide (Figure 4:3).

C-II. The lip is longer than C-I, usually around 4–5cm long. Example G3: T1 ③:69 is 50.7cm long, 15.6–16.2cm wide, and 1.3cm thick. The lip is 4.8cm long and 1.65cm thick. The upper band is 3.8cm long and the lower band is 23.1cm long. The middle part with cord patterns is 18.5cm long, and the cord patterns are approximately 0.6cm wide.

C-III. The lip is 6cm long. Example G3: T1 ③:37 is 54cm long, 15.7–17.1cm wide, and 1.55cm thick. The lip is 4.7cm long and 1.8cm thick. The upper band is 3cm long and the lower band is 23.15cm long. The middle part with cord patterns is 21.5–22cm long, and the cord patterns are approximately 0.5cm wide. Example Southwest Corner T4 ③:28 is 53.3cm long, 17–17.4 wide, and 1.8cm thick. The lip is 5.7cm long and 1.9cm thick. The upper band is 3–4cm long and the lower band is 25.2cm long. The middle part with cord patterns is 18–19.5cm long, and the cord patterns are approximately 0.5cm wide (Figure 4:4).

4. The Chronology of the Semi-circular Roof Tile

Although it is necessary to classify the Western Han bricks and tiles based on typology and decoration, changes in type and decoration are closely related to improvement of manufacture technology. Thus, understanding the development of their manufactures is very important to the chronological study of the Western Han bricks and tiles. In Western Han urban archaeology, archaeologists often use the historic record to identify architectural remains they uncovered. Based on textual and archaeological evidence as well as observation of unearthed bricks and tiles, archaeologists have established a rather objective framework of chronology for Western Han bricks and tiles. Here is a tentative chronology of Western Han semi-circular roof tiles.

Type A was used during the early Western Han period. The tiles were made using coils. Inner molds were not used at this time. The lip is relatively short, approximately 2.5cm. The exterior is decorated with cord patterns (using a rope-wrapped beater), and the decorated part (middle section) is longer than the undecorated lower band. The interior is marked with pockmarks. The tile was cut from outside in. The attachment of semi-circular tile to the circular end at this period is Type I and Type II. Type I Attachment is likely earlier than Type II Attachment.

Type B (subtype B-I and B-II) was used from the latter period of early Western Han to the early period of mid Western Han. Types B-III and B-IV were mostly used during mid Western Han. In this period, inner molds were used. The lip stayed the same length of approximately 2.5cm, but one example from the Duling Mausoleum has a lip that is 5cm long. The exteriors were decorated with cord patterns made by beaters or by rollers, and the decorated section is longer than the undecorated lower band. The interior is marked with textile impressions, and has a beveled rim. The tile was cut from outside in. The attachment of tile and circular end is Type III and IV Attachment. In terms of the attachment, Type III was used from the latter part of early period to the early part of middle period of Western Han and Type IV was mainly used in the middle period of Western Han.

Type C appeared in the latter part of middle period of Western Han, but was used most frequently during the late Western Han. Manufacturers improved the inner mold by adding two wood slats on opposite sides of the circular mold. This caused two incisions to be left on the interior wall, after the inner mold was removed, dividing the tube into two equal semi-cylindrical parts. A knife was used to cut the tube from inside out, and the cutting mark is usually shallow. The lip is from 3 to 6cm long. The exterior is decorated with rolled cord patterns, and both upper and lower bands are left without cord patterns. The middle part which has cord patterns is shorter than the lower band. The interior has textile patterns, and the back rim has a bevel. Type V Attachment was used to attach the semi-circular roof tile to the circular, and no cutting mark remains on the back of the circular end tile.

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