Plaster Protecting Himeji Castle, World Cultural Heritage and National Treasure

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Abstract: Himeji Castle was constructed in 1609 by Terumasa Ikeda, a warring lord of the late 1500's and early 1600's. The Castle's skillful layout, beautiful external appearance and all-plastered castle tower prove well that it was constructed during the golden age of castle architecture. To preserve this high-rise wooden structure, preventive action against rain and wind is indispensable. During the Edo period (1603-1867), the castle was protected from the rain and wind by a thin coat (about 3 mm) of plaster on the thick mud walls. To this end a workshop was placed inside the castle, so that the exterior walls and roofs could be plastered whenever needed. Since 1956, when the castle was dismantled for repair, it has been maintained by using the plaster construction method unique to Himeji Castle, in which the undercoating is thick (about 30 mm) and the final coating is thinner (about 18 mm) for increased durability. Although plaster has been used in Japan for centuries, recently it has become difficult to secure plasterers and materials, due to the sudden change in construction methods in Japan that occurred around 1985. In recent years, Himeji Castle is the most plastered site in Japan every year. For this reason, continuing to plaster the walls and roofs of Himeji Castle plays a crucial role in passing this traditional Japanese construction method down to future generations. Furthermore, the case of plastering shows the present problem of Japanese manufacturing where traditional techniques are difficult to hand down.

1. Finishing of earthen walls

I would like to start by talking about the **finishing of earthen walls**, which are found at many locations on the grounds of Himeji Castle, and which characterize the castle.

To maintain and preserve a structure, it is essential to protect it against the elements. In the case of earthen walls, there are two ways to do this: one is to cover wall surfaces with planks; the other is to apply materials, such as plaster coating.

For the latter method, a combination of **white clayey earth** and **plaster** has been used in large quantities in Japan since ancient times-- that is, since around 650. In around 1600, that is, in the Edo period, the use of **colored earth** of natural materials spread widely.

2. Why is plaster used?

This painting depicts a great fire in Kyoto in 1309, during the Kamakura period. You can see people taking shelter in a warehouse with whitewashed walls. Plaster-finished walls were highly resistant to fire. Such a building was also highly resistant to natural elements and elastic deformation.

In those days, however, plaster was extremely expensive and was used only in particularly important sections of important buildings. It was only during the Azuchi-Momoyama period, from around 1570, that voluminous use of plaster became possible. A large construction could then be entirely covered with plaster, as in the case of Himeji Castle.

***Great fire in Kyoto,* 1309 (Kamakura period), dedicated to Kasuga Shrine (source: *"Kasuga Gongen Kenki-e, the Miracles of the Kasuga Deity" published by Chuokoronsha, Inc. in 1991*)**

3. Two types of plaster

In Japan, we have **two major types of plaster**. One is used for Himeji Castle; let us call that "**ancient plaster**." It is made of slaked lime and shell ash, mixed with hemp or paper and kneaded with algae paste. When this type of plaster is used as a foundation, sand is sometimes blended in. Ancient plaster is basically for thin application.

The other type is **Tosa plaster**, a mixture of slaked lime and cut pieces of fermented straw, pounded in a mortar with a mallet. Shell ash and algae paste are not used. For foundation use, earth and sand are added. Tosa plaster enables thick application.

4. What about Himeji Castle's plaster?

The plaster used in around 1600, in the Edo period, was made mainly of slaked lime and shell ash. **Slaked lime** is sintered limestone that is slaked with water. **Shell ash** is sintered and slaked shells. As a **supplementary ingredient**, cut pieces of plant fiber are added to prevent cracking. The plant fiber in this case is bleached hemp. These main and supplementary ingredients are kneaded together with a **paste**, which is a liquid of boiled laver.

5. In what sections of Himeji Castle is plaster used?

Almost all of the castle's **exterior walls** and **eave supports** are completely finished with plaster. The **inner walls** of the rooms are finished either with plaster or earth, depending on their purpose of use. Plastering is also found on the castle's roofs, in **roofing joints**. Plastering in roofing joints is very rare among Japanese castles. From my recent studies, I have concluded that the roofing joints were probably not plastered at the time of Himeji Castle's construction.

6. Plastering on the roofs of Himeji, Kumamoto and Matsuyama Castles

These photos show **plastering on the roofs of Himeji, Kumamoto and Matsuyama Castles**. In the case of Matsuyama Castle, on large roofs plastering is applied only along the edges.

Himeji Castle's passage turret

Model of Kumamoto Castle's Udo turret

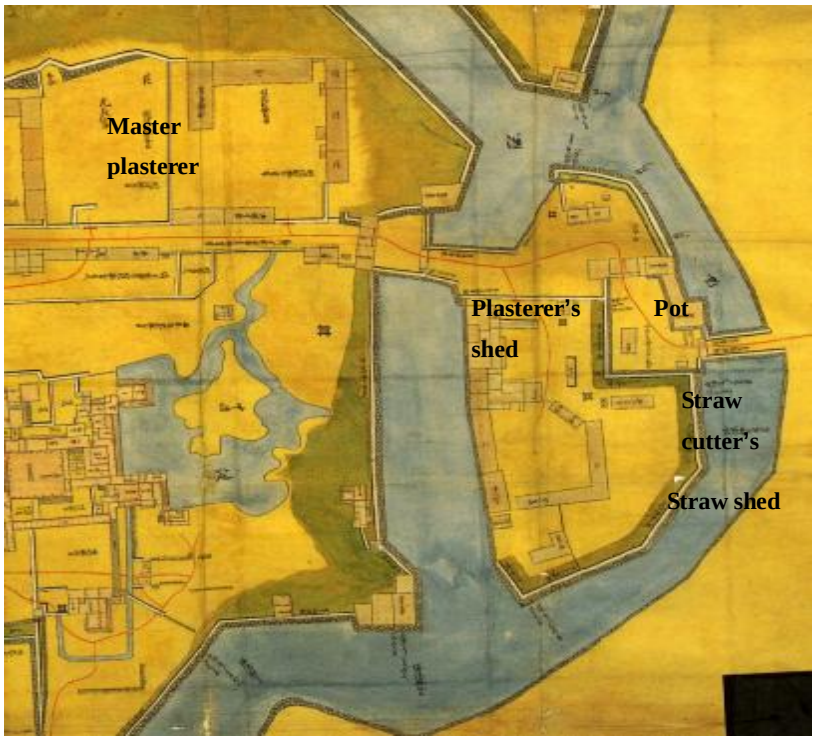
Matsuyama Castle's minor donjon

7. Transition of plastering of Himeji Castle

Now I would like to talk about the **transition of the plastering of Himeji Castle**. In around 1600, during the Edo period, plaster on the castle's inner walls was 1.5 to 2 mm thick, and plaster on the exterior walls was only about 2 mm thick. Because of this, I believe that the exposed exterior walls had to be frequently repaired.

8.

This grand painting of Himeji Castle from the Edo period, around 1700, shows locations where plasterers worked in those days. There are inscriptions such as "master plasterer," "plasterer's shed," "straw cutter's shed" and "straw shed." This indicates that plasterers were permanently stationed on the castle grounds for frequent repairs of the walls and other daily tasks.



Grand Painting of Himeji Castle **(*Source:* "Banshu Himejijo-zu, grand painting of Himeji Castle" in the possession of Mr. NAKANE Tadayuki)**

9.

I estimate that the plaster in this photo was applied at the time of the **castle's major renovation in 1910**. The remaining documents indicate that the external wall was finished with a thin coat of about 3mm of white plaster made of oyster ash, lime, brown algae, nut oil and cut pieces of straw.

Western wall on the first floor of the Watari Yagura (passage turret)

10.

Major **renovation work involving dismantling and reconstructing the Nishinomaru (western bailey), Shio Yagura (salt storage turrets) and other structures was carried out from 1934 to 1949**. Plaster on the inner walls was about 3 mm thick, whereas that on the external walls was 10 to 13 mm thick. I believe that full-scale use of sand-mixed plaster began during this period. Sand was not contained in the upper coating of plaster on **roofing joints**, probably in order to maintain the white color.

11.

Another major **renovation carried out from 1956 to 1964 involved dismantling and reconstructing the Dai Tenshu (main donjon) and the Kotenshu (minor donjon)**. In Japan, the plastering technique was almost perfected in ancient times. There was a change during the Warring States period, around 1570: rice was replaced by algae as the paste ingredient, enabling the mass-production of plaster. However, it was not a fundamental change. Truly important improvements took place during the renovation of Himeji Castle's main donjon.

12.

A new **plastering technique, which has characteristics of both Namban and Tosa plaster**, was developed. In the new technique used on the **external walls**, the final coating is the same as Edo period plaster, but the undercoat is thickly laid and contains sand. As a result, the plaster layer is monolithic and remains strong.

The main donjon has a plaster layer of about 30 mm thickness, while the minor donjon, turrets and earthen walls have a layer of about 18 mm. For plastering on the roofing joints, normal and white sand and a small amount of cement were added, to increase strength.

13.

Himeji Castle's "special" plastering technique was also developed as a result of research into plastering intended for the external walls of the main donjon. In the "**special" plastering technique**, the undercoat is 30 mm thick and contains cut pieces of straw, while the final coat is a 3-mm layer of plaster, as in the Edo period plastering technique. In total, a 33-mm layer of plaster is the result.

This technique is still used to repair the structures that were first renovated between 1950 and 1955, namely, two turrets and four earthen external walls. This is the only Japanese plastering technique that involves the use of cut straws as-is, with algae for kneading paste.

14.

As a result, **two plastering techniques** are used for Himeji Castle. The photo at left shows a portion of the Obikuruwa turret external wall, on which the castle's special technique was applied (plaster containing cut pieces of straw). The photo at right shows a wall on which the conventional technique was used.

Plaster containing cut pieces of straw on external wall of Obikuruwa turret (about 33 mm thick)

Wall of passage turret (about 13 mm thick)

15.

As for **techniques and ingredients used today**, the plastering techniques are mainly based on the improvements realized during renovation of the main donjon. The ingredients, on the other hand, come from locales quite different from the past. For example, the photo at left shows salt-sintered slaked lime from Kochi Prefecture. The photo at right is shell ash of ark shells from Kumamoto Prefecture.

Salt-sintered slaked lime from Kochi Prefecture

Shell ash of ark shells from Kumamoto Prefecture

16.

This is **algae paste**, made of red alga grown in Hokkaido; it is boiled in a pot like this.

Red alga grown in Hokkaido
(left to sit for 2 years)

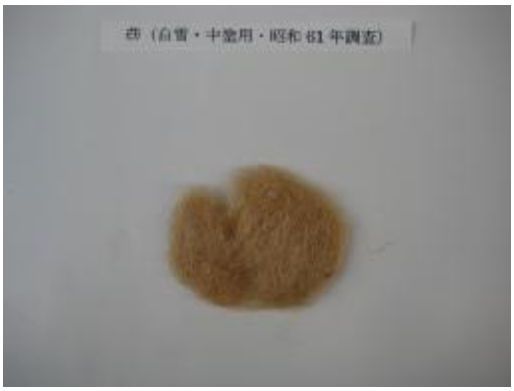
Boiling pot

17.

These are different types of **cut pieces of the plant fiber** that is added to prevent cracking. The fibers are used for undercoating or final coating, depending on the degree of bleaching.

Manila straw

Special bleached straw



High-grade bleached straw

18.

These photos show workers **kneading and applying plaster**.

Plastering on a gable

Kneading plaster

Plastering on roofing joints

19. Recap

- Until around 1920, Himeji Castle was protected against the elements by an extremely thin layer of plaster applied to thick earthen walls.
- During the Edo period (1610 – 1868), plasterers were permanently stationed on the castle grounds for daily wall repair.
- During renovation of the main donjon, research carried out to improve plastering techniques led to the development of Himeji Castle's "special" technique. The improved technique was actually applied in the renovation.
  Presently, the final coating of Himeji Castle's plastered walls is the same as in the Edo period, while two techniques, an improved one and the other in the process of development, are applied in undercoating repairs.
- It is highly probable that roofing joints were not plastered initially, at the time of the castle's construction.
- Himeji Castle is the only Japanese castle that undergoes many plastering repairs each year.
- Both plaster ingredients and plasterers have been diminishing in number.
- Himeji Castle plays an important role in demonstrating and preserving authentic workmanship, a role that is expected to become increasingly important year by year.