

Japanese Clay-Walled House; Materials, Artisans and Techniques

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ABSTRACT

Timber and clay have been the main building materials in Japanese house construction for hundreds of years. Timber forms the frame work, while the clay is used to wall the frame work. This traditional building technique drastically vanished in the second half of the 1970s as timber frame work was replaced by the North American style panel construction and clay wall by timber or steel paneling. However, Toyohashi and its environs are the exception and still maintain the building technique although the number of clay-walled houses constructed is decreasing. This paper reveals how and why the vernacular techniques is practiced in this area and discuss the issuers for maintenance of the technique.

Keywords: clay wall, plastering, plastery, carpenter, Japanese house, building construction

1. INTRODUCTION

Timber and clay are abundant all over Japan, and have been two essential building materials for traditional Japanese houses since the 17th century. Carpenters cut timber into each frame section at their workshop and assemble them at the building site. Then, plasterers set bamboo lath in frame spaces and applied clay to the lath. All most all Japanese houses were constructed in this way before the 1970s. However, foreign construction techniques gradually permeated the country after the Oil Shocks of 1973 and 1978, when Japanese housing companies began to introduce the panel construction which was more energy and labour saving, and low cost. Clay-walling was the most despised as it took time and money. Eventually, the traditional housing technique practically disappeared in the housing industry except some areas.

Clay-walling has several great advantages in term of technical and cultural sustainability. It needs only local materials and existing artisans thus enabling preservation of traditional built-environment and rural landscape. Fortunately, this construction method is still practiced in Toyohashi area, and surveys have been made to identify how and why the traditional technique has been maintained in this area.

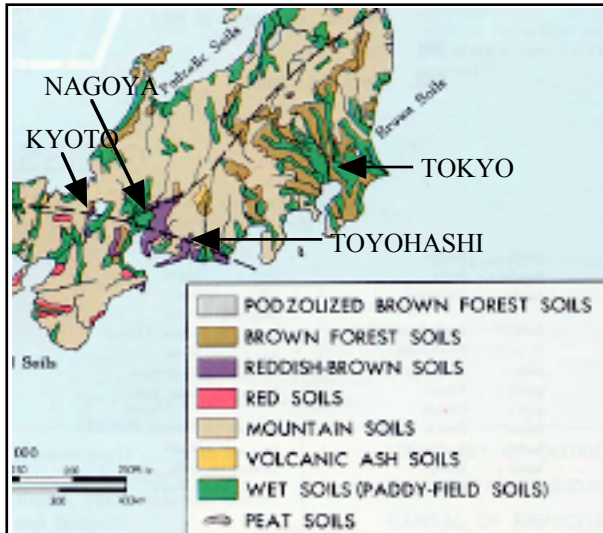


Fig. 1 Location of Toyohashi and Geology

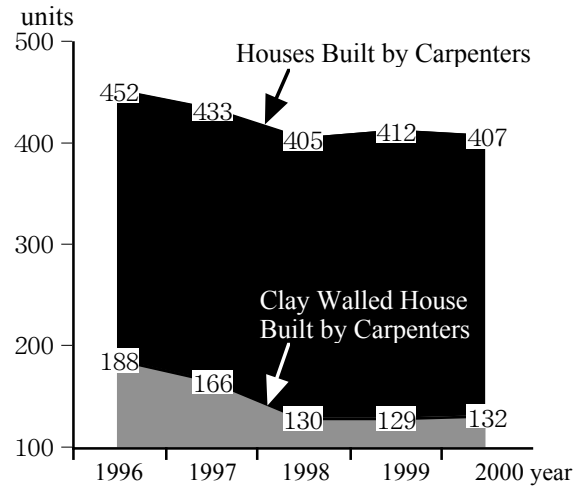


Fig. 2 Number of Houses Constructed

Toyohashi: Geographical Settings and house Building Condition

The east part of Aichi Prefecture is called Mikawa, where includes several middle scale cities; Toyohashi (population 360,000), Toyoda (350,000), Okazaki (330,000) and Anjo (160,000). As Toyoda, Okazaki and Anjo are close to Nagoya (2,170,000), industry is prevailing in these cities than agriculture. But Toyohashi relies on both industry and agriculture. However, before industrialized, the area has produced high quality ceramics including China, pottery and tiles, due to the availability of good soil for ceramic production (Fig. 1).

According to official statistics, the total number of houses built annually is approximately 3,500 units, and around 1,400 units are of the detached house type. However, it is impossible to identify the number of clay walled houses constructed by local carpenters through any statistics and the Building Confirmation Documents. Therefore, questionnaires were sent out to all member of the Toyohashi Carpenter's Union to obtain data on how many clay walled houses they built each year.

Fig. 2 shows the fluctuation of the number of houses constructed by carpenters in

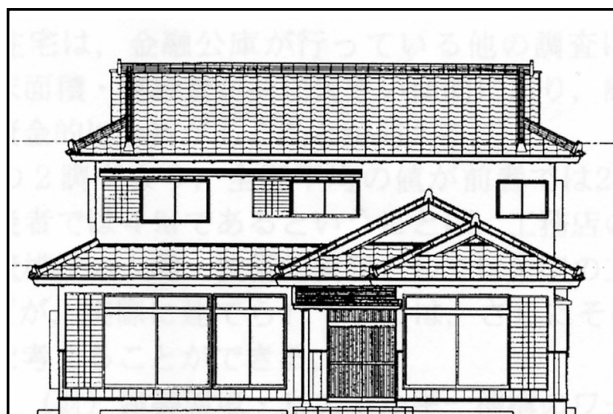


Fig. 3 Facade of typical clay walled house

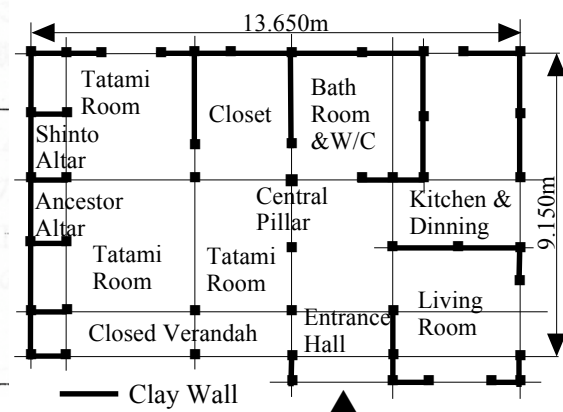


Fig. 4 Plan of typical clay walled house



Fig. 5 Assembling members in building site



Fig. 6. Delivering rice cakes to local community after *Muneageshiki*

Toyohashi. On average within the last 5 years, almost 1,000 units were constructed by housing contractors using foreign timber constructions. On the other hand, local carpenters built only 400 units using traditional timber techniques., and only around 30% were clay walled house because they did not always use clay walling. Anyhow, it is very exceptional that 10% of detached house built annually is of clay walled type if compared to whole country.

Artisans and Materials

In Toyohashi, the clients of clay walled house are themselves well acquainted with the fact that it takes at least 8 months for construction to be completed and it costs approximately 5% more than a panel timber construction house. But, they prefer the clay walled house as they believe that a house must be built in traditional way in order to live with ancestors and gods in their house. Thus, form and plan become similar among houses (Fig. 3, 4).

The clients usually look for a *Toryo*, a master carpenter for new house among local community through relatives and friends. *Toryo* takes all responsibility and seizes the initiative for building the house, sometime even preparing house plan in collaboration with client without hiring an architect. Carpenters put sills on the concrete foundation, and erect



Fig. 7, *Dorokon* Plant in Toyohashi



Fig. 8, Stockyard of *Dorokon*

posts, then connect the posts with beams using various joints. Nowadays, they have to use nails, reinforcing metals and brasses to give more earthquake resistance to the houses according to the Building Regulations. After assembling the roof structure, carpenters perform *Muneageshiki*, a ceremony of ridge raising in collaboration with the client and village community (Fig. 5, 6).

The house is roofed by a broad and water proof course soon after *Muneageshiki*, so that carpenters and plasters can perform their work without being disturbed by rain. Then, *Sakan*, plasterers start clay walling work. They set *Komai*, bamboo lath in the space surrounded by posts and beams, and apply *Arakabe*, a rough layer of clay wall to *Komai*. In Toyohashi, *Syariki*, a heavy physical worker used to take wall clay mixing, lathing and rough layer plastering on themselves on behalf of *Sakan* supposedly because these works were really tough. They prepared wall clay at the building site by mixing the raw clay and paddy straws with water, then left the fresh wall clay for several weeks before plastering.

Nowadays, wall clay is supplied by *Dorokon-ya*, a supplier of *Dorokon*, a ready mixed wall clay. But before 1967, *Unsou-ya*, a cart puller supplied only the raw clay to *Sakan*, *Syariki*, tile roof manufactures and tile roofers. When *Sakan* and *Syariki* became very busy in the housing boom that started in the 1960s, one *Unsoya* heard a news that somebody had started production and selling of ready mixed wall clay and roof clay in southern Japan in 1967, and made up his mind to introduce the business in Toyohashi. Buying a mixing machine for production of roof tile production, he established *Dorokon-ya* in same year, and followed by several *Unsou-yas* soon after (Fig. 7, 8).

Manner of Clay Walling and Tile Roofing

Carpenters insert several *Nukis*, horizontal batten in posts and wedge them. Then, the *Sakan* or *Shariki* set a lath firmly on the battens. Two sizes of bamboo are used for this lath, round bamboo and 3 - 4 cm in diameter and bamboo about 1 cm in diameter. Large bamboo is split into 3 or 4 portions, which are then fixed horizontally to the vertical small bamboo tying up with paddy ropes. This looks like weaving or bird cage (Fig. 9, 10).

In rural area, lath work, clay walling and thatch roofing were traditionally performed by *Kumi* or *Yui*, a mutual aid of local community, as farmers used to do such jobs and quality of works did not matter. Thus, previously the house building was started just after the paddy harvesting in October, and *Arakabe* was applied before the advent of winter, preferably in

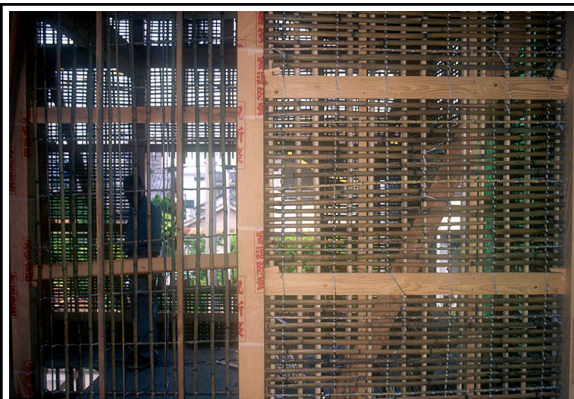


Fig. 9, Bamboo lath viewed from inside



Fig. 10, Bamboo lath viewed from outside



Fig. 11, Plastering *Arakabe* on bamboo lath



Fig. 12, Dried *Arakabe*



Fig. 13, Tile roofing in progress



Fig. 14, Tile roofing completed

November. *Arakabe* must be left for 1 or 2 months until it dries completely.

In parallel with the plastering of *Arakabe*, the house is roofed by pan tiles, which were already very popular in several hundreds of years ago. Roof tile manufacturing prospered in the eastern side of the city, from which *Kawara-machi*, Roof Tiles town derived its name. Some villages also had roof tile manufacturers to meet local demand. The pan tiles need clay bed to fix them on the roofing. After carpenters lay the water proof course on the roof broad, *Yane-ya*, roofer spreads the roof clay bed on the course to fix pan tiles as thick as 5 - 8 cm. *Yane-yas* are required to have high skill as roof tiles can be easily damaged in the event of a typhoon and the roof is usually a symbolic expression of client's status. Therefore, various types of roof tiles are manufactured to adorn and reinforce the roof (Fig. 13, 14).

After timber interior work is completed and *Arakabe* dries, *Nakanuri*, the second layer is applied to level the inner surface of *Arakabe*, and followed by *Shiagenuri*, the finishing layer. Thus, it takes a total of 10 - 12 months for completion.

Conclusion

1) Building Cost and Days

Some clients dislike clay wall and clay-bedded roof tiles even though they prefer the traditional house style because firstly the house is costly, and secondly it takes long time for completion, when compared to panel construction. Japanese clients can afford to pay 5 % more, but they are reluctant to wait for 10 - 12 months for completion of their new house. However, clay walled houses have recently been reevaluated by the following reasons.

2) Health Consciousness and Natural Comfort

In place of clay walled houses, housing contractors promoted the sales of panel construction house together with new building materials such as plastic wall paper and synthetic adhesive agents during the "bubble economy". As this type of house is very airtight, residents became physically affected by the chemical agents and eventually came to call such houses "sick houses". Clients of clay walled house in Toyohashi are confident that their houses inflict no such harm on the human body and they enjoy living with nature.

3) Conservation of Rural Landscape and Vernacular Techniques

Timber houses with gable roof covered with dark silvery glazed tiles characterize the Japanese historical urban and rural rural scape.

4) Suitability of Environment

Even if cheaper timber can be imported from USA and Canada, and the foreign construction does not make clients wait for such a long time, houses built with local materials and techniques are sustainable on a long term basis.

Acknowledgment

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