

Making of the aged wood collection from historical buildings in Japanese context

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Abstract

Wood is a material designed by nature to last, unless it is free from biodeterioration. It can support trees for centuries, and as an engineering material it can again sustain loads for considerable periods. It is, as a consequence, a major component of the cultural heritages of many civilizations and the assessment of wood properties from ancient artifacts and constructions is of fundamental and practical interest.

One major difficulty for such research is to make a suitable collection from assured origin, together with certified dating and permission of publication by conservation administration. The Japanese context, where traditional uses of wood have been maintained for more than 1600 years, offers a unique opportunity to address the question of wood aging. Wood has always played a major role in Japanese culture and is used in more than 90% of buildings listed as a National property or Important cultural property of Japan. The ancient capitals Kyoto and Nara have many traditional wooden buildings, some of which are also listed as a World Cultural Heritage of the UNESCO.

Since 2004, a project making a unique collection of wood that has been sustaining various temples and other historical building at our Research Institute for Sustainable Humanosphere, Kyoto University, Japan. The paper deals with the Japanese traditional ideas and dedication of wood selections transfer of the technology of construction and maintenance, and how wood identification can contribute in restoration of historical buildings in modern Japanese contexts.



Fig.1 Aged wood samples from Japanese historical buildings registered at Xylarium of Research Institute for Sustainable Humanosphere, Kyoto University

1. INTRODUCTION

East end of the Silk Road, island called “The land of the rising Sun” is Japan. Many historical buildings over 1200-years-old still exist in Japan. It has been believed that these traditional architecture in Japan, for example, Buddhist temples, Shinto shrines and castles, is exclusive only to the Japanese archipelago. Japanese architecture has many similar features to Chinese or Korean architecture. However the methodology of restoration of historic buildings is very different from that.

The restoration and conservation of historic buildings by the Japanese government has a history of 110 years. Principally the restoration practice of historic buildings in Japan is characterized by its adherence to original techniques and materials, and also for its minimum replacement of members by new ones as much as possible. As a result, it is represented by a selection of methods to pass the buildings on to the future, without altering their structures and designs.

However it is not sufficient to apply recent scientific methods to understand these traditional techniques and materials. Since 2004, a collection of wood samples from various temples and other historical building is being gathered by at the Research Institute for Sustainable Humanosphere, Kyoto University, Japan (Hereafter RISH). It is the goal of the project is aim to stimulate the mutual improvement of cooperate between wood science and architectural conservations and to open intimate cooperation between them.

2. Japanese system of cultural property protection

This section aims to briefly introduce the actual practice of restoration and conservation of historical buildings in Japan by reviewing its history.

2.1 Laws for the Protection of cultural properties; a case of historical buildings.

The restoration and conservation of historic buildings by Japanese government started in 1897. The system of cultural properties protection and their practical method had been influenced by social background. Under the Law for the Protection of Cultural Properties, the national government thus designates and selects the most important cultural properties and imposes restriction on such activities as alteration of their existing state and repairs. Moreover, those traditional techniques or skills that are indispensable for preserving cultural properties and that require protection are designated as Selected Conservation Techniques.

Law for the Preservation of Ancient Temples and Shrines (1897-): This law was enacted in order to protect the Buddhist temples and their treasures which were severely damaged by the Anti-Buddhist movement at that time.

Law for the preservation of National Treasures (1929-): Objects of protection expanded to castles

and vernacular buildings.

Law for the protection of cultural properties (1950-): Overall buildings became the object of protection. Townscape and even modern architecture (for example, Dome of Atomic Bomb, Hiroshima) are included as the objects of protection.

In 1996, the Law for the Protection of Cultural Properties was amended and a new cultural property registration system was introduced in addition to the existing designation system. Under the new system, the Minister of Education, Culture, Sports, Science and Technology can register in the Cultural Property Original Register those architectural properties and other structures which are in particular need of measures for protection and utilization.

2.2 Methodology for the restoration and conservation of historical buildings.

Principle of the restoration in Japanese policy

1. To reuse the original members as much as possible.
2. To restore as much as possible with original techniques and materials.
3. To compile a restoration and conservation report.

As of April 1, 2008, the national government has designated 2,328 sites (including 213 National Treasures), 4,210 architecture and other structures (including 257 National Treasures).

In accordance with the provisions of the Law of the Protection of the Cultural Properties, the permission of the Commissioner for Cultural Affairs is required for any alteration to the existing state of structures designated as Important Cultural Properties. Major or minor repair work is periodically required to keep them in good condition.

Fig.2 shows a logo for the promotion of a campaign to understand and protect cultural properties at restoration sites by the agency for cultural affairs, Japan since 2008. The spirits of this promotion is that Culture revealing from restoration is indispensable for inspiring people, bringing joy to their lives, and allowing them to lead a rich and fulfilling life.



Fig.2 Logo for the promotion of a campaign to understand and protect cultural properties

at restoration sites by the agency for cultural affairs, Japan.

3. Establishment of aged wood database from Japanese historical buildings at RISH

We have been collecting aged wood samples from typical Japanese historical buildings and as a database, as a databank in perspective of better understanding the history of the usage of wooden material. In general, it is not allowed to get samples from traditional buildings listed as National Property. Fortunately, we have the opportunity to be deposited samples from several famous traditional Japanese buildings under official memorandum during their reconstruction.. Fig.3 shows an example for restoration site of the main hall of Senjyuji temple in Mie, Japan, which was built in 1666. Sample specimens are wooden members provided from such restoration sites, which were replaced and were no more useful.

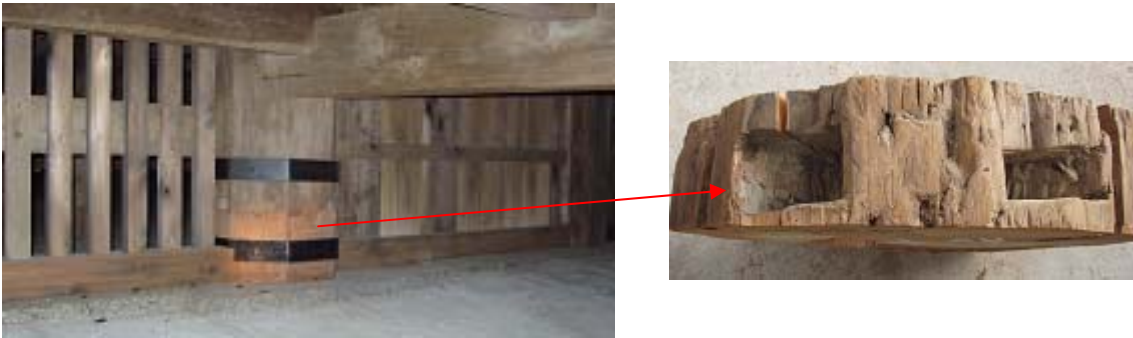


Fig.3 Restoration site of the main hall of Senjyuji temple, Mie, Japan.

Left: Pole under the floor / Light: original member that are not reused.

A joint research project on collected aged wood samples from Japanese historical buildings have been started since 2004 at the RISH, Kyoto University. Members consisted of several specialists in architectural history, art history, dendrochronology, radio carbon dating and wood scientists from RISH, Nara National Research Institute for Cultural Properties, National Museum of Japanese History and other institute.

To clarify the age of wood samples, all members of a historical buildings have to be identified by archival survey, dendrochronological analysis, radio carbon dating and visual identification (tool traces, shape of nails and so on.). Fig.4 and Fig.5 shows some example for archival surveys to understand the age of member usage. The old documents and tool trace could also provide constructive information about the term of member usage, and enrich the information such as the date of construction or re-construction, the area of wood product as well as transportation from plantation site.

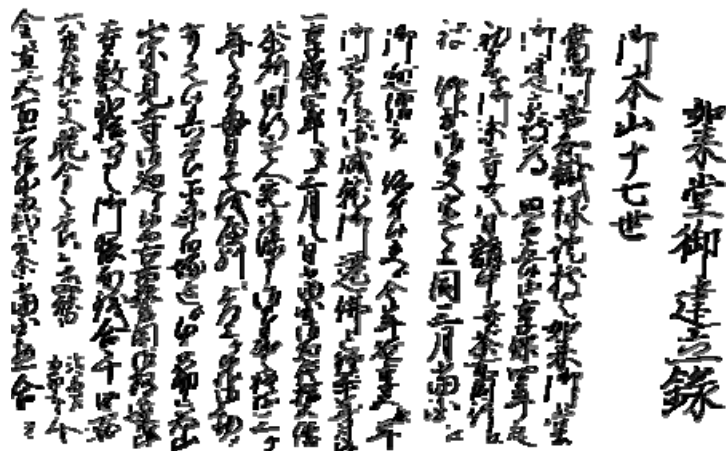


Fig.4 Archival survey: an old document of the Senjyuji temple, *Nyoraido gokonryu-roku*.



Fig.5 Archival survey: Tool (Chisel, nomi). *Kinsei shokunin zukushi ekotoba*.

As we may have mentioned, the interdisciplinary cooperation among scientists, the owner of historical buildings, conservation technicians, administrative organizations, local government and national government is essential for this research.

Especially these historical buildings still exist for holy ground even in nowadays. traditionally, holy rites are held at the beginning, middle and end of the term of the restoration and conservation of buildings. Fig.6 shows some example for Restoration sites of Gyokurin-in, Daitokuji temple, Kyoto, Japan which was built in AD1620. And Fig.7 shows a Ceremony of muneageshiki of Gyokurin. This event is a ridge-raising ceremony that takes place upon completion of the framework of a building. Decorations of various types are hung around the ceremony site.



Fig.6 Restoration sites of Gyokurin-in, Daitokuji temple, Kyoto, Japan.

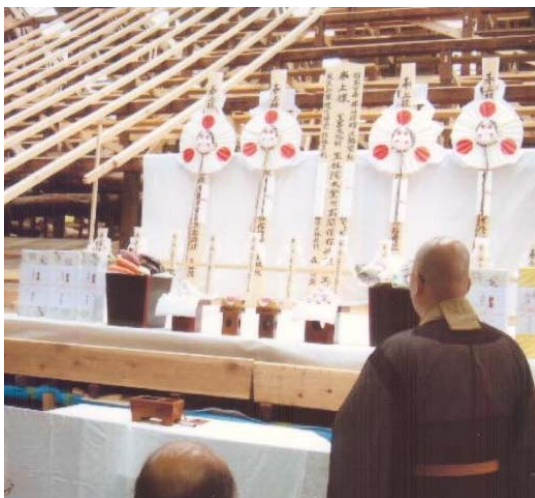


Fig.7 *Munegeshiki* of Gyokurin-in. (Left: the Buddhism priest of the Gyokurin in. / Light: author in prayer.)

4. Wood identification of aged wood of historical buildings.

Wood species used for the building materials also might change trend to era. Generally speaking, in Japan, initially hinoki (*Chamaecyparis obtusa* Endl) is mostly used for the temple construction in Nara era (AD.710-AD.794). Afterwards keyaki (*Zelkova serrata* Makino) took that role for the temples after the Muromachi era (AD.1333-AD.1573). A document of Chronicles of Japan, *NIHON-SHOKI*, written in AD720 mentioned that hinoki wood has been keep worth for

building since the beginning of 8th century.

However, determination of wood species by naked eye is difficult, especially in case of old timber. Even skillful carpenters sometimes make errors. For example, a pole of Okuno-in, Kiyomizu temple, which is built in 1633, is believed that it is made of Japanese cedar (*Cryptomeria japonica* D.Don) for long time by owners and carpenters. But it was made of hinoki (*Chamaecyparis obtusa* Endl) by the feature of wood anatomy. This is one of the good examples to show why wood species should be identified scientifically at least based on the microscopic features of wood.



Fig.8 Okuno-in of Kiyomizu temple, Kyoto, Japan and some *hozonzai*, preserved wooden materials for a future reconstruction of the next generations at Kiyomizu temple.

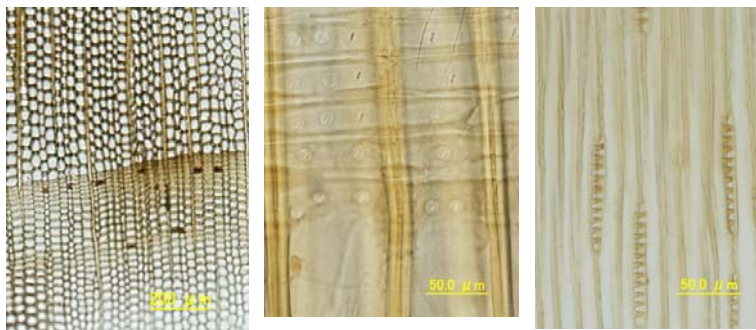


Fig.9 Cross, tangential and radial surfaces of samples from a pole of Okuno-in.

: hinoki (*Chamaecyparis obtusa* Endl).

Conclusions

The paper outlines Japanese conservation methodology and background of our research project in Japanese contexts. Making a decent collection of aged wood from historical buildings and promoting interdisciplinary research in this field is of great importance to understand Japanese wood culture. Clarification of the mechanisms of wood aging is one of the promising themes essential to improve our understanding of the use of wood, the way of restoration and conservation for historical wooden buildings. Besides, the comprehensive database of aged wood samples from historical buildings may be useful for interdisciplinary research forum, including humanity and sciences, to maintain our original wood culture from the past and to transfer it toward the future.

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