

# Project Report

## Reconstruction of Wooden Keep through Traditional Method

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### History

Ozu, located in the north-west region of Aichi Prefecture, was originally written as “大津” in Chinese characters instead of the current “大洲”. The construction of castles in Ozu is said to date back to 1331 to a provincial constable, Toyofusa Utsunomiya. The forces surrounding Iyo during the Sengoku Era or the “Warring States Period” were as follows: In the north-east region, Kono coming from a time-honored family with several hundred years of history was stationed in Dogo Yuzuki Castle located in what is now Matsuyama City. In the south, Saienji who descended from Kyoto during the era when the Imperial Court was divided into the north and south courts and then settled in this region was stationed in the Uwa Kurose Castle. In the southeast Tosa region, there was Ichijo who became a warring lord after coming south following the Onin Rebellion. However, Chosokabe unified Tosa on his behalf, and also set out to unify all of Shikoku. There was Mori in the Chugoku region across the Seto Inland Sea, and the great Otomo force to the west across the Bungosuido. Utsunomiya stayed in Ozu Castle in the middle of this, barely surviving under this intricate circumstances, either joining hands with the peripheral powers, or else being attacked. Nevertheless, he was defeated in 1568 by the allied forces of Kono and Mori, and the Ozu Castle was taken by Naoshige Ono, a warlord under Kono.

Hideyoshi conquered Shikoku in 1585. In this battle, Naoshige’s younger brother was defeated by the allied forces of Kobayakawa and Yoshikawa. Takakage Kobayakawa was given Iyo’s 350,000 “koku” and lived in the Yuzuki Castle, using Ozu Castle as his secondary castle. After Kobayakawa was transferred to Chikuzen Najima, Katsutaka Toda was assigned the 16 “koku” of Uwa/Kita-Gun and made Ozu Castle his primary castle but died in Korea in 1594 out of illness. The following year, Takatora Todo became ruler of Uwa-Gun Itajima’s 70,000 “koku” but he assigned a castellan in Itakura and resided in Ozu Castle, and commenced construction of Uwa Marukushi Castle (the present Uwajima Castle). In 1600, Takatora was additionally given Kokubuyama Castle to make a total of 200,000 “koku” and 2 years later, assigned Takayoshi Todo as castellan of Ozu Castle, and set off to initiate the construction of Imabari Castle. Takatora moved to Anotsu Castle in Iyo in 1608, and the following year, Yasuharu Wakisaka of Awajishima Sumoto was given a little over 50,000 “koku” and resided in Ozu Castle. Yasuharu also left for Iida of Shinshu in 1617, and then Sadayasu Kato arrived from Yonago in Houkinokuni with 60,000 “koku” and then Kato Family’s rule continued until the returning of lands and people to the emperor.

Later, various structures in the castle

were demolished, and the keep was taken down eventually in 1888. Currently remaining are 4 turrets; the “Daidokoro Yagura” and “Koran Yagura” that connected to the keep, and “Owata Yagura” and “Minami Sumi Yagura”. These turrets were designated as nationally important cultural property in 1957.

### Remaining References

There are no historical records as to who built the Ozu Castle. However, since an ordinance was passed in 1615 that allowed there to be only “one castle per province”, it seems unlikely that the Kato Family moving in later built the keep. There are records indicating that all the currently remaining turrets were rebuilt during the Kato Family’s rule, but there are no such records for the keep. The late Shigetaka Miyakami who took charge of the basic design for the keep’s reconstruction, assumed that Yasuharu Wakisaka moved the keep from Awajishima Sumoto when he was transferred to Ozu, and at the same time, changed the Chinese characters for Ozu from “大津” to “大洲”, though no historical materials have been found to prove his theory.

There are many reference materials that served as the basis for reconstruction



Photo-1 Old photo of north side of Ozu Castle

of Ozu Castle, such as the picture of the main castle stone wall, pictorial diagrams from the Kato Era, pictures from Meiji Period (Picture 1), etc. There is also the framework model created during the Edo Period called “Keep Model” (Picture 2), which was passed down in the Nakano Family, who formerly served for the Kato Family.

### Significance of the Reconstruction

Keeps are presently being rebuilt in many cities. This came as a result of people’s demand for keeps as the basic “key component” of their cityscape. It may be interpreted as the ineluctable urging existing deep down in the fundamental structure of the present cities that evolved from a castle town. Especially, the segmented old cityscape is passed down from the Edo Period in the central part of this Ozu City, but the keep which is the “key component” was essential in the attempt to vitalize the cityscape.

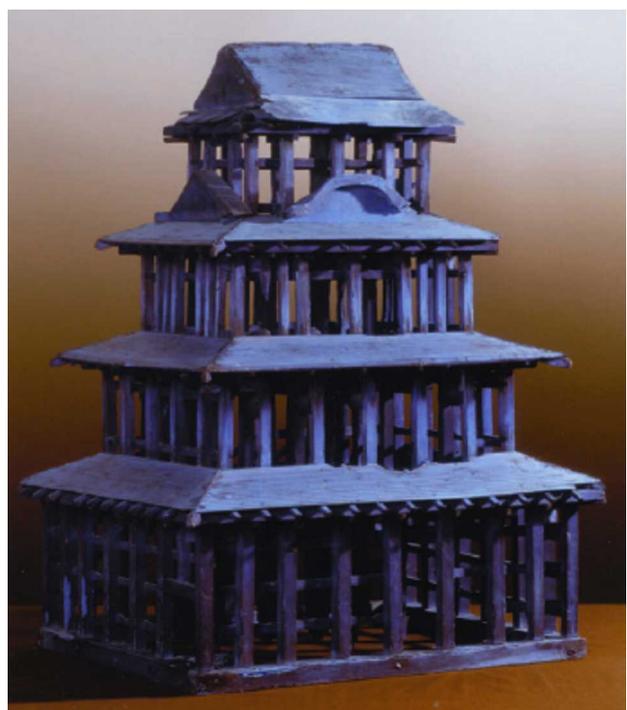


Photo-2 Keep model

On the other hand, although there are many occasions to see wooden architectures constructed through the Japanese traditional method, there are skeptical views regarding the succession of this traditional method. This results from the enforcement of strict restrictions under the Building Standard Law on the traditional construction method called the “Nuki structure method”.

It was during the post-war reconstruction period in 1950 that this law was established, and it was necessary to provide housings in large quantities at low costs. To this end, it was provided that the bracing structure be employed as a method to guarantee security even for those constructed by an unskilled carpenter. It was also true that given the academic level of this time, it was not possible to support the “Nuki structure method” from the dynamic point of view. Even after 50 years, there still has not been any progress to academically unravel its mechanism. Only a handful of carpenters who are striving to pass down this traditional wooden architecture are protecting this method, knowing that doing so may constitute a violation of the law. There is a similar expression “conventional construction method” which is a name used in contrast to

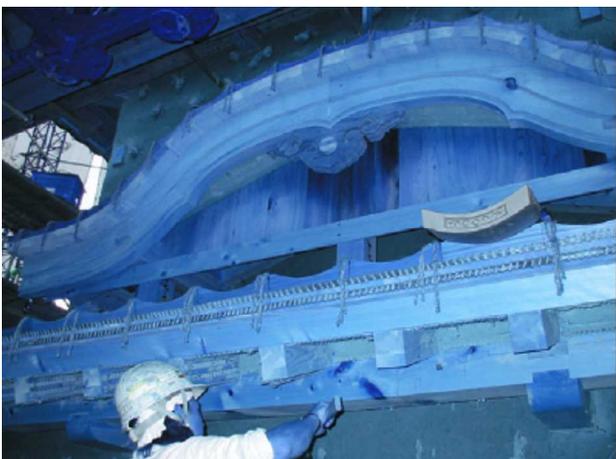


Photo-3 Details of curved gable

the 2-by-4 construction method, but this method is one of the methods under the Building Standard Law that uses many bracing and metals and is a completely different construction method from the original traditional method. Then again, if nothing is done, there is a risk that the traditional craftsmanship from which many historically distinguished wooden architectures have come into existence may be lost. This is why it is all the more necessary to carry out the reconstruction work of Ozu Castle's keep through the old traditional construction method. It must not be a reconstruction in only its visual appearance.

#### **The Building Standard Law**

Consequently, the reconstruction of Ozu Castle keep conflicted with the Building Standard Law not only in terms of restrictions on large-scale wooden architecture, but also in Ozu City, which recognizes the significance of terms of its structural framing method.



Picture-4 Details of joints

Nevertheless, supported by the enthusiasm of Ozu City, which recognizes the significance of the reconstruction, negotiations were held over a long period of time with the former Ministry of Construction and Ehime Prefecture, which insisted on reconstructing the keep by using a steel structure and then covering it up with wooden materials to make it look as if it were made of wood. As a result, it was acknowledged that the Building Standard Law did not apply to the techniques used under the traditional wooden structure construction method, whereas conventionally, the law was considered to regulate all architectures and its construction techniques. In the meantime, the necessity of reconstruction work utilizing the traditional construction method in order to preserve the culture of traditional wooden architecture was also acknowledged. Eventually, the former Ministry of Construction and Ehime Prefecture consented to the non-application of the Building Standard Law. (Developments leading to this are published in the Architectural Institute of Japan magazine of Feb. 2003)

### Stonewall

Cracked stones, swelling out of stonewalls and unequal settlements were observed in the stonewall of the foundation of the keep. However, the safety of the stonewall is determined more by the condition of the backfill stones than by the surface condition. Therefore, by using a non-destructive method to investigate the inner structure, the safety of the overall structure of the stonewall was examined through distinct element method (refer to technical paper presented in 2001 in

The Japanese Geotechnical Society Conference “Behavior Analysis of Castle Stonewall Through Distinct Element Method Utilizing Granular Elements”) which is a method that has recently begun to be employed in analysis of various earth structures. As a result, it was decided that from the perspective of preserving the current status of the historic site, only a minimum required repair work would be done. Care was taken so that the load of the superstructure would not be applied to existing stonewalls.

### Structure of the Keep

Castles are being rebuilt in various regions. Many structures being reconstructed are from the final days of the Tokugawa Shogunate, the period for which many reference materials still exist. Although there are examples like Komine Castle for which its sectional detail drawing still remains, in general, references describing the frame structure are rare. Therefore, usually the type of frame structure of a similar structure will be referenced in reproducing the structures. Nevertheless, the keep model for Ozu Castle remains, as mentioned earlier, making it one of the exceptional cases where the overview of the structure form is known.

Nevertheless, it is easy to speculate that the model does not represent all of the members, because the members in the keep model by themselves leave some illogicalness. It is also easy to speculate that it does not accurately represent the measurements of the cross section because although round and square wood members are expressed accordingly, the pillars in the first and fourth floors are expressed in the same thickness, and

because the measurements of the cross section of beam material are almost the same in terms of used portion. Therefore, it was concluded that a keep built during the same period, in the Keicho Era (1596-1615) would be referenced to supplement the members structurally necessary, and the load applied to each member be calculated. Based on that, the cross-dimensional measurements were determined with emphasis on reviving the atmosphere of that time. Also, the location of the joints was determined based on the location shown in the model, and preparations were made for collection of lumber based on the status of materials procurement.

#### **Procurement of Lumber**

Since it takes time to dry out thick lumber, procurement started more than 2 years before the project order was placed. To this end, the trees were selected at the basic design phase with the premise that absolutely no western materials were to be used.

Because castles in the old times needed to be constructed in a short period of time, assorted nearby materials were utilized effectively. Following this example, as much local materials as possible were to be used. Ozu was the production center of lumber transported and collected via Hiji River from long ago. Now, however, it is extremely difficult to acquire assorted types of lumber which does not surface on the distribution channel, and is difficult to predict the collection of these materials. Therefore, tree types were restricted to those which could be gathered easily.

Cypress was to be used for pillars, and standing timber were to be contributed from

the people within the cities. There would be offerings for a carefully-nursed tree, one there and three here, which the people went around and collected. At other times, a large quantity offer had to be declined, since the timber did not have sufficient diameter. Therefore, the municipal staffs and those from Ozu City Forestry Cooperative who participated in collecting the timber went through substantial trouble. The Ozu City Forestry Cooperative took on the lumbering as well, and the efforts of the individual in charge who witnessed the lumbering of each wood to ensure eliciting of good grains were especially worthy of admiration. The lumber was then transferred to Fukui, and used after being cored and machine-dried.

It is generally said that pine is best for beams, but since it was difficult to obtain good quality lumber, Japanese cypress was used instead. Thick Japanese cypress lumber suitable for beams are not obtainable locally, so a bulk order was placed directly to Kiso regional forestry office. The mayor of Ozu City also visited the Nagano regional forestry office to enlist cooperation. Usually, widely-curved timber get cut up before it gets carried out from the mountains because it is troublesome to transfer and store as is, and because it is regarded to have little value since there is no market which utilizes curved timber as is. The individual who took charge at Kiso regional forestry office was very cooperative in the sense that he went out and found curved timber fit for beams and modified the logging schedule, and instructed for the curved timber to be carried out of the forest without being sawn into small pieces.

The Akita chestnut trees used for the

base were carried to Niigata and smoke-dried for 2 weeks. They were lumbered in Gifu then transported to Ozu.

A master carpenter was present at the acceptance inspection of these woods. Although a master carpenter sometimes selects lumber in his usual work, he rarely does it from a form of a log. Therefore, under the cooperation of the lumbering company in Kiso, the wood was selected with the support of master carpenter's long years of lumbering experience and instinct.

### Carpenter

A master carpenter's cooperation was needed for this procurement of wood building materials preceding the construction project, so after a number of selections, a master carpenter from Inami, Toyama Prefecture was chosen. Many carpenters moved to Inami from Kyoto to repair the Jodo Shinshu temple in the past. Many carpenters live in this city even now, competing one's skills against another's.

A young master carpenter took command of the processing and assembling in the field. Under him, there were 4 shrine and temple building carpenters from Inami and 8 local city carpenters putting ink markings on the wood pieces and processing and assembling



Photo-5 Curved gable

them. The types of joints to be used were decided based on the master carpenter's judgment, by examining the traditional wood construction methods and the process in which the wood pieces were assembled. In the course of processing the procured materials in the field, if the surface was chipped or if some pieces would not fit because of the curve in the wood, the pieces were shuffled around and used in other locations than originally intended. Regarding the planned location and types of joints to be used and accuracy of the processing, they were determined based on the master carpenter's judgment and carpenters' skills who participated in the processing, and also with consideration to the restrictions arising from the tools and of the process for assembling the wood. The logs were shaped into an octagon, and each surface was planed to produce a clear ridge line. Immediately after the wood was trimmed, the carpenters themselves applied a weak solution of persimmon tannin as a coating to make it stain proof.

### Other Constructions

It was determined that a seasoned craftsman in the area should join as plasterer.



Photo-6 Exterior of top level roof

The mud from Ozu area was used for wall mud. The example of the existing turret was followed for the construction method of the bamboo framework. The walls of the keep and the walls below the inner slope of the north and west walls of a row house style keep are called “Taiko-kabe(drum walls)” which is a double mud wall filled with rubble. Oil plaster finish was used on the plaster on the outer walls.

Cold-resistant tiles produced in Gifu were used for the roof. Thin hand-split sawara cypress boards were used for the base underneath the tiles. Copper sheets were used to supplement the key areas, and the roof was covered without use of mud plaster. The family emblem of the Kato Family, the last castellan, was applied on the eaves tiles. A black coating was applied on the sawara cypress clapboard on the outer walls, its base being a vegetable oil with a preservative quality. Japanese nails were used for fixing baulks and boards. A blacksmith in Matsuyama who specializes in Japanese nails produced the nails that were used for the key areas. The use of chisels to nail down these Japanese nail were carried out under the guidance of carpenters in Fukui.

### Summary

The efforts of the many who engaged in the reconstruction of the keep have led to this result, but this could not have been possible without the cooperation of a range of people in different quarters. Especially regarding the non-application of the Building Standard Law, which was the key for realizing the plan, the guidance and cooperation from the people at the former Ministry of

Construction, The Building Center of Japan, the prefecture and other municipalities and The Japanese Association for Conservation of Architectural Monuments made it possible.

During the construction, there were four tour sessions held for the citizens, stopping all construction work in the field for that period. Also, small groups of visitors were welcomed occasionally. A municipal worker served as the guide for all of these visits, and the craftsmen in the field took security measures for the visitors as they worked. As a result, to present, more than 20,000 people have visited the site from all over Japan. This was all possible because of the cooperation from those construction workers possessing rich experience in reconstruction projects.

Currently, the project is in its final stage, aiming for completion in July and for availability to the public in September. The ooiya (a protective covering over the temple) will be removed shortly so that its features would be visible from a distance. In reconstruction of only the keep rather than the entire castle, the outcome falls far short from restoring the old scenery, but it would be nice if the reconstructed keep serves as a reminder of those things that have been handed down from the old days, and of those that have been forgotten.

## Project Outline

Location: 903 Ozu, Ozu City, Ehime Prefecture  
Use District: City planning zone, **use district unspecified, fire protection zone unspecified**, Ehime Prefecture designated historic site (Ozu Castle site)  
Building Standard Law: Article 3, Clause 1-4  
(2001 Jun. 27 No. 779 certified)  
Keep/Row-House Style Keep Construction Project  
*Structure / Scale:* Wooden Structure, Formal Tile Roofing, 4 Layers, 4 Stories, Traditional Wooden Construction Method  
*Total Floor Area:* 461.08m<sup>2</sup> (140.0 tsubo)  
*Maximum Eave Height:* 16.36m (54.0 shaku)  
*Maximum Height:* 19.15m (63.2 shaku)  
*Electric Facility:* Lighting, Lightning Rod, Fire Alarm, Security Camera, Emergency Announcement, Fire Control Equipment, Indoor Fire Hydrant, Fire Extinguisher  
Basic/Execution Design Period: 1999-2001  
Construction Period: Aug. 2001 – Jul. 2004  
Promoter: Ozu City, Ehime Prefecture  
Basic Design: (Late) Shigetaka Miyakami  
Design/Administration: **Mishuku Kobo, Shunsuke Fujikawa/ Chikurinsha** Architectural Research Institute, **Takao Kioka/ Maekawa** Architectural Research Institute **Yasushi Maekawa**  
Constructor: Hazama Corporation