

MODERNISM AND REGIONALISM IN JAPANESE LOCAL STONE BUILDINGS

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ABSTRACT.

In modern architecture, stone has been used as an important material along with iron, glass, and concrete. We can see the locality in the buildings built with local stones. Since Japan is a volcanic country, tuff, which is made from volcanic ash and has soft texture, is produced all over the country. In this paper, the characteristics of buildings using stone, especially Oya-stone, which is a tuff produced in Utsunomiya city in Kanto area, are clarified through the propagation of Modernism and Regionalism. In Japanese modern architecture, Frank Lloyd Wright used Oya-stone in the former Imperial Hotel in 1923 and in the former Yamamura Residence in 1924. His disciple Arata Endo also used Nikka-stone, which is a tuff produced in Hokuriku area, in the former Koshien Hotel in 1930. In 1951 after WWII, Junzo Sakakura, Le Corbusier's disciple, also used Oya-stone in the pilotis in the Kanagawa Museum of Modern Art. Moreover, Yoshiro Taniguchi used it for the Eiji Yoshikawa Memorial in 1977. Those modern architects' stone works are examined. Moreover, stone buildings such as storehouses or barns were also constructed by unknown masons in Japan. Stone were used for these vernacular buildings near the producing sites and formed their townscape. Their typologies are examined through the construction methods, the details, the usages, and so on. Furthermore, the Folk Art Movement called "Mingei" also discussed Oya-stone focusing on its anonymous design. Finally, the characteristics of Japanese stone buildings are clarified through the comparative study of the modern architects' works and vernacular buildings.

1. INTRODUCTION

1.1. Background and Purpose

The Japanese architecture culture is centered on wooden architecture, but stones are produced in various areas. Stone materials from the regions have been used as architecture materials since the early modern period and in combination with materials like iron, glass, and concrete also for modern architecture. Particularly in Japan, a volcanic country, tuff made of solidified volcanic ash is produced in various areas, and the tuff is characterized for its ease of processing due to the light specific gravity and softness. Oya-stone, a kind of tuff produced in Utsunomiya City, Tochigi Prefecture, approximately 100 km north of Tokyo, has been utilized for a lot of buildings and modernization in urban areas mainly in Kanto District. The purpose of this paper is to clarify the characteristics of the modernism and the regionalism in Japanese architecture from the perspective of stone materials by analysing the architecture for which Japanese tuff represented by Oya-stone is used.

1.2. Previous Studies

The authors have conducted field surveys of anonymous Oya-stone buildings made by masons and the townscape where they have aggregated, and clarified the typological characteristics in agricultural village and urban areas near quarries in Utsunomiya City.^{1,2,3} Furthermore, a bibliographic survey was conducted on modern architecture works for which Oya-stone was used and the design expressions and design theories of architects were reported.^{4,5} This paper compares architectures for which tuff represented by

Oya-stone, both in anonymous buildings and works by prestigious architects. With regard to modern architecture works mentioned in this study, the design process of former Imperial Hotel designed by Frank Lloyd Wright is reported by Tanigawa⁶ (1975), the stone material preservation of former Koshien Hotel designed by Endo Arata, the apprentice, is reported by Uno et al.⁷ (2017), and the geometry of design process of Kanagawa Prefectural Museum of Modern Art designed by Junzo Sakakura is reported by Wada⁸ (2006). But no previous studies have focused on the tuff represented by Oya-stone, compared modern architecture works with regional ones, and clarified the characteristics from the perspectives of construction and design like this study.

1.3. Study Outline

In this study, Section 2 describes the history and outline of Japanese stone materials and Oya-stone. Then, Section 3 discusses the characteristics of architecture works of four modern architects which used tuff represented by Oya-stone. Furthermore, Section 4 discusses the characteristics of anonymous buildings like stone warehouses built by masons in Utsunomiya City where Oya-stone is produced. Finally, Section 5 integrates the above and clarifies the Modernism and Regionalism of architectures that used stone materials in Japan.

2. OUTLINES OF JAPANESE STONES AND OYA-STONE

2.1. Japanese Stones and Production Areas

A green tuff belt with solidified volcanic ash in form of tuff can be found in Japan, a volcanic country. The tuff is

represented by Oya-stone produced in Utsunomiya City, Tochigi Prefecture, which was used for modernization of buildings and cities in Kanto District. Nikka-stone is produced in Hokuriku District, which was transported also to Kansai District and used as building materials. Tuff is a light soft stone, but heavy hard stone like granite is also produced mainly along Seto Inland Sea and the Pacific Ocean.

2.2. Outline of Oya-Stone and Quarries

Oya-stone is characterized for the porosity and brown dots called “miso” (Fig. 1). Quarries are mainly two types; an old style “open mining” where stone exposed on the ground is mined and “pit mining” under the ground. Mining equipment was developed in the 1960s and the production of Oya-stone increased significantly. Today, seven quarries are in operation (open mining in one quarry and pit mining in six quarries).

3. JAPANESE MODERN ARCHITECTURE USING OYA-STONE OR TUFF

3.1. Former Imperial Hotel and Yamamura Residence Designed by F. L. Wright

Oya-stone was used for Japanese modern architecture for the first time in former Imperial Hotel designed by Frank Lloyd Wright that was built in Tokyo in 1923 (Fig. 2a). At that time, the Building Department of the Ministry of Finance had samples of stone materials from various areas in Japan for the purpose of examining stone materials used for national architecture including the Diet Building. Wright chose a porous stone from them and Oya-stone easily available in Kanto District was adopted. The operating company of Imperial Hotel purchased a mountain of a quarry in Oya Town to build the hotel, and a large amount of stone was transported from there. Wright used Oya-stone with scratch tiles and terracotta manufactured in Tokoname City, Aichi Prefecture, both of which are characterized for the uneven texture (Fig. 2b). He also used Oya-stone for the parts to emphasize horizontal lines, which effectively created the continuity between horizontal spaces that is the feature of architecture of Wright. Wright was also requested to design a

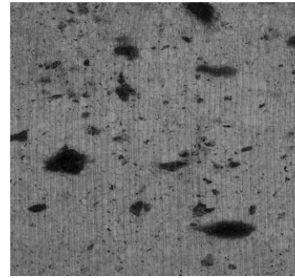


Fig. 1. Oya-Stone © Akio Yasumori, 2019.

residence near Kobe City, Hyogo Prefecture, during construction of Imperial Hotel, and Yamamura residence was completed in 1924. Oya-stone was transported to be used also for the residence on the rise in Ashiya City (Fig. 2c).

3.2. Former Koshien Hotel Designed by Arata Endo

Arata Endo, a disciple of Wright, is an architect who was engaged in the site supervision of Imperial Hotel. He designed Koshien Hotel near Yamamura Residence, which was completed in 1930 (Fig. 3a). Nikka-stone produced in Komatsu City, Ishikawa Prefecture in Hokuriku District was used for the building. Nikka-stone is characterized by bright yellow and makes a more gorgeous impression than Oya-stone does. The stone was used with unglazed tiles from Osaka for the building.

3.3. Former Kanagawa Prefectural Museum of Modern Art Designed by Junzo Sakakura

In the reconstruction period after the WWII, the Kanagawa Prefectural Museum of Modern Art (Fig. 3b) — the first museum of modern art in Japan — was designed by Junzo Sakakura, an architect who studied under Le Corbusier; it was completed in 1951. The cloistered museum with a patio combined pilotis on the 1st floor and the white volume covered with aluminum panel on the 2nd floor, which was a typical composition of modern architecture. Oya-stone was used for the pilotis and combined with glass blocks to form walls to take light from the patio into the cloister. Oya-stone is used in the fixed scale of 1 shaku x 3 shaku (303mm x



Fig. 2. Images of F.L. Wright's Works: a. Interior of Former Imperial Hotel; b. Combination of materials; c. Former Yamamura Residence. © Akio Yasumori, 2019.



Fig. 3. Images of Arata Endo, Junzo Sakakura and Yoshiro Taniguchi's Works: a. Former Koshien Hotel; b. Former Kanagawa Prefectural Museum of Modern Art; c. Yoshikawa Eiji Museum© Akio Yasumori, 2019.

910mm) in many cases, but it was designed to be 205mm x 895mm that was smaller than ordinary ones to match the size of glass blocks, which makes a slender impression. Oya-stone creates the contrast with the white volume on the 2nd floor as well as provides the continuity with the ground, so it contributes to the ambiguous expression of autonomy and grounding property.

3.4. Yoshikawa Eiji Museum Designed by Yoshiro Taniguchi

Yoshiro Taniguchi, another important modern architect, designed the museum of Eiji Yoshikawa, the novelist in Ome City, Tokyo, which was completed in 1977 (Fig. 3c). Taniguchi went to Europe in the late 1930s and was first influenced by Schinkel, the neoclassical architect in Germany, and later tried to blend Modernism and Japanese tradition. The museum is a one-story gabled building built in a wide property of the private residence of Eiji Yoshikawa, and Oya-stone is used for the wall of the entrance hall. Oya-stone whose size is 270mm x 860mm and slenderer than the fixed scale is piled geometrically with the longer side and shorter side alternately. The floor is covered with Teppei-stone at irregular scales, and the materials of stones are creating harmony. Furthermore, Taniguchi was the first manager of Museum Meiji Mura and made efforts to transfer and preserve the above-mentioned former Imperial Hotel designed by Wright.

4. ANONYMOUS BUILDINGS IN UTSUNOMIYA CITY, THE PRODUCTION AREA OF OYA-STONE

4.1. Townscape of Oya-Stone

In Utsunomiya City, the production area of Oya-stone, a lot of stone buildings like stone warehouses are still seen today. Particularly in the farming settlement in the north of the city, a townscape was formed with the continuity of Oya-stone buildings and stone walls because warehouses and barns were used for agricultural purposes. In the old days, a lot of residents were engaged in stonework and quarrying, and fires occurred frequently, so stone buildings which were highly fire-proof became popular and the stone

townscape was formed.

4.2. Typology of Oya-Stone Buildings

Characteristics of Oya-stone buildings are described here (Table 1). First, construction methods of the buildings are categorized into "stone-cladded" and "stone-piled". Old stone warehouses from the late Edo era (the end of 19th century) to the early Taisho era (the early 20th century) are "stone-cladded", that means, stones are cladded on a wooden framework. In Japan, there have been simple wooden warehouses since the old days, and in the late Edo era, warehouses coated with soil and mortar in order to improve the fire-proof performance appear. Warehouses cladded with fire-proof Oya-stone are the origin of stone warehouses around Utsunomiya City. Thin plates ranging from 60mm to 90mm are fixed with iron nails normally, and some roofs are pitched with stone tiles. On the other hand, the "stone-piled" method is seen mainly in the Taisho era (early 20th century) when brick and stone buildings were imported from the Western world and the transportation developed after the modernisation in the Meiji era. The fixed scale is 1 shaku height x 3 shaku length (approx. 303mm x 910mm) and the thickness ranges from 5 sun (15mm) to 1 shaku (303mm) depending on the part where it is used.

Soft Oya-stone is characterized for the shaped-mining with the size in quarries. Moreover, the numbers of stories of buildings are mainly "one-storey" and "two-storey". Furthermore, the uses of buildings are mainly "warehouse" to store the property and "barn" for agriculture and equipment storage, and some are "residence" and "annex". Types of Oya-stone buildings can be found as the common points of the characteristics.

4.3. Folk Art Movement and Oya-Stone Buildings

Anonymous stone buildings attracted attention also in the modern design movements. In the Mingei Movement, the Folk Art Movement in Japan, philosopher and aesthetician Muneyoshi Yanagi discussed Oya-stone extensively. The movement of life culture proposed in 1926 while industrialisation developed and mass production was popularised in






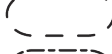
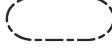
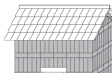


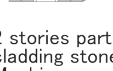

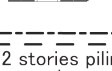

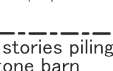

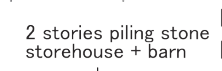

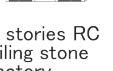

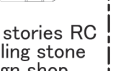
| Construction Stories | Cladding stone (Wooden•Soil) | | Piling stone | | | | | | |
|-------------------------|--|---|--|--|---|---------------------------------|---|--|---|
| | Whole wall | Part of wall | Wooden frame piling stone | Masonry | | RC girder•frame piling stone | | | |
| Single story | | | Single story foundation barn  | Single story foundation stone house  | Agricultural village Single story piling stone barn  | | Single story piling stone shed  | Single story piling stone storehouse  |  Agricultural village  City center |
| Two stories | Agricultural village 2 stories cladding stone storehouse   | 2 stories part of cladding stone storehouse  2 stories part of cladding stone Machiya  | City center 2 stories wooden frame piling stone storehouse  2 stories piling stone house  | 2 stories piling stone storehouse  2 stories piling stone barn  | [Composite type] 2 stories piling stone annex + barn  2 stories piling stone storehouse + barn  Storehouse / Barn Wall | | City center 2 stories RC piling stone storehouse  2 stories RC piling stone factory  | 2 stories RC piling stone house  2 stories RC piling stone sign shop  | |

Table 1. Typology of Oya-stone buildings.

Japan, named daily life tools manufactured by anonymous craftsmen as “Min-gei”, which means folk-art, and asserted that life tools rooted in daily culture have a beauty equivalent to the one of art works. He purchased the Nagaya-mon Gate with a stone roof and a stone spandrel wall in Utsunomiya from a wealthy farmer and transferred it to his own residence in Komaba Town, Tokyo (Fig. 4). He refurbished the rooms on the left and right of the gate and built a main building he designed for himself at the back, where he lived to the last years. Moreover, the Japan Folk Crafts Museum built across the street from the property is also cladded with Oya-stone. It is assumed that Yanagi found the same quality based on the regionality and anonymity in the life tools manufactured by craftsmen and the buildings built by masons.

5. MODERNISM AND REGIONALISM OF OYA-STONE BUILDINGS

Modern buildings designed by architects and anonymous buildings built by masons have actually been produced in the same period in the 20th century. However, they had been regarded as different things and not been discussed from the same perspective. They are compared from the perspectives of construction method and handling of materials here.



Fig. 4. Image of Nagaya-mon gate at the Japan Folk Crafts Museum © Akio Yasumori, 2019.

5.1. Structure Types and Construction Methods

First, regarding the structures and stone construction methods of buildings, regional anonymous buildings are wooden framework cladded with stones and the pure masonry construction. The former is a Japanese traditional

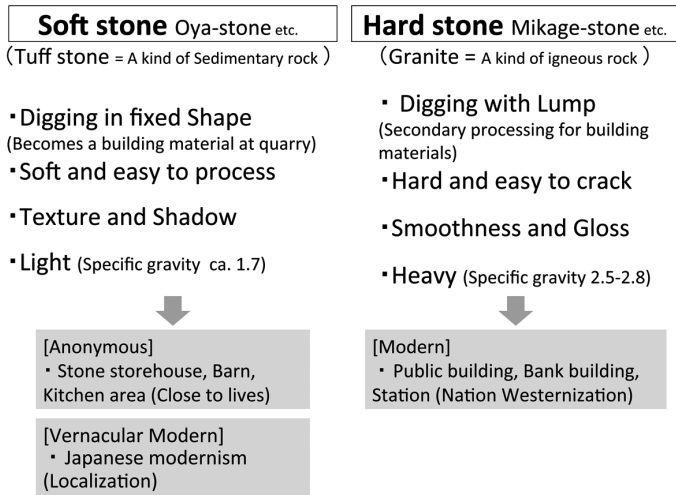


Fig. 5. Characteristics of Soft Stone and Hard Stone.

building clad with stones and the latter is stone-piled one as the simplest masonry method. In contrast, regarding the structure of modern buildings, Imperial Hotel with reinforced concrete designed by Wright used the brick framework clad with Oya-stone, and the construction method was inherited to Yamamura residence and former Koshien Hotel designed by Endo. On the other hand, in Kanagawa Prefectural Museum of Modern Art with steel structure designed by Sakakura, Oya-stone was piled to hide the braces between columns of steel frames of the pilotis. In Yoshikawa Eiji Museum designed by Taniguchi, the method of cladding Oya-stone on concrete walls was adopted like the one adopted today.

5.2. Stone Size and Joint

The size of Oya-stone becomes the product of fixed scale (1 shaku x 3 shaku, approx. 303mm x 910mm) in a quarry as mentioned above. The weight of the stone ranges from approx. 70kg to 90kg and the size is suitable for a mason to shoulder and convey. Many anonymous stone warehouses in a region adopted the masonry construction of piling the stones of the size alternately by a break joint method, which is assumed to be the most effective way of using stones. Moreover, the fixed scale was sliced and used also for old wooden stone-clad walls and roofs with stone tiles. In contrast, in the works by modern architects like Taniguchi, slender stones are used preferably and they are designed geometrically with straight joints. Moreover, in the case of Sakakura, the stone heights are adjusted to the industrial product of 200mm square glass block.

5.3. Combination of Materials

Regarding the combination of materials, Wright used Oya-stone with scratch tiles and terracotta, and combined

them with shaded texture. An organic architecture of Wright can be found there. The concept was inherited to his disciple, Endo, who combined more gorgeously-colored Nikka-stone and tiles. An orientation toward industrial materials can be found in the combination of glass block and aluminium panels by Sakakura, and an orientation toward Japanese materials can be found in the combination of Oya-stone walls and Teppei-stone floor by Taniguchi.

5.4. Soft Stone and Hard Stone

Finally, from the perspective of the stone material, tuff is a light “soft stone” whose specific gravity is 1.7, while in contrast, granite represented by Mikage-stone is a typical “hard stone” (Fig. 5). White Inada-stone in Ibaraki Prefecture that represents granite in Kanto District was used for national buildings like Diet Building (1936) and the Supreme Court (1974) in modern times. It can be assumed that soft stone represented by tuff was used for the buildings close to life like stone warehouses and barns, in other words, buildings of citizens because it was soft and easy to process, and heavy and smooth hard stone represented by granite was used for national buildings through the processes of westernisation and modernisation. Furthermore, an orientation of the “Vernacular Modern” that is a fusion of the modernism and regionalism can be found in modern buildings for which tuff represented by Oya-stone mentioned in this study was used.

6. CONCLUSION

This paper, focusing on Oya-stone, the representative tuff produced in Japan, presents a comparative study of the construction methods and designs of modern architecture as well as anonymous works that applied it. As a result, “Vernacular Modernity” was found in the works of modern architects of tuff, expressing a particular sensibility for the materials used. A circuit to connect the work characteristics of architects as modern thought and practicability of citizens as constructive behaviours can be found there.

NOTES

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