Full Length Research Paper

Aesthetics aspects of Japanese Bridges

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Science and technology, which for ages, were symbols of human greatness and were thought to lead mankind to welfare and happiness, has come to invoke anxiety and fear. The human race is losing belief in technological civilization and no longer approves the forces that created it. Increasingly, science and technology are seen as useful only when they operate within appropriate social limits. This particularly concerns the architectural aspects and civil engineering, which is almost the oldest profession in the world and which is always a showcase of technology. A bridge is a structure built to span physical obstacle such as a body of water, city, or road, for the purpose of providing passage over the obstacle. This paper presents the first part of Japanese bridges by investigating architectural aspects of its design. An important aspect of bridge construction will lead into a critical study of bridge aesthetics and structural design. According to the configuration of frameworks, bridges may be described as arched, girder, cable-stayed or suspension. Referring to Japanese bridges, those that most frequently provide cable-stayed frameworks in the construction work of bridges are an important factor in architecture and aesthetic of bridges.

Key words: Bridge architecture, Japan, cable stayed, aesthetic, grid box, arched.

INTRODUCTION

The role of the designer and architect in the planning and design of bridges is undergoing radical change, with architects now being appointed before the engineer on a growing number of projects proposed by Niroumand et al (2010). The relationship between the two roles is therefore on a different level than that previously experienced. A bridge is a structure built to span physical obstacle such as a body of water, city, or road, for the purpose of providing passage over the obstacle. The different types of bridges, such as: beam bridges, cantilever bridges, arch bridges, suspension bridges, cable-stayed bridges and truss bridges are shown in Figure 1. The designing of bridges depends on the function of the bridge, the nature of the terrain where the bridge is constructed, the material used to make it and the funds available to build it, proposed by Bennett (1997). Consequently, a good design does not depend only on just engineering, but on these functions as well. Bridges need to have a beautiful architecture because bridge architecture is very important, and it is by all means, a matter of life and death. Bridge architecture is important to us because people need it. Bridge architecture improves and change human lifestyle. It makes us create communities, spaces to interact and to experience a new world within the confines of a structure.

In Japanese, a bridge is called "hashi", but when hashi is placed afterwards, "bashi" or "kyo" can be used depending on where the bridge is placed in time variations. However, Japan has many bridges such as:

Aigiohashi bridge

The Aigiohashi Bridge is a truss bridge over the Kiso River in Japan (Figure 2). The bridge was built with an iron beam. The bridge is part of the Aichi-Gifu Prefectural Route 17, commonly known as the Konanseki Route proposed by Ponsonby and Richard (1956).

Aioi bridge

The Aioi Bridge is an unusual T-shaped bridge in
Hiroshima. This bridge which was built in 1932 as a bridge only for streetcars was extended in 1934 from its central section to Jisenji-no-hana and it thus received its unique T-shape that was a rare sight in Japan (Figure 3). Besides, in the very south of the bridge, there were two wooden bridges on the east and west built in 1878, and in the short period, Aioi Bridge formed an H-shape and created special scenery until they were taken down.

**Aomori Bay Bridge**

The Aomori Bay Bridge is a cable-stayed bridge in Aomori. It was constructed in order to alleviate cargo ship traffic. It is a famous part of Aomori City's scenery. The Aomori Bay Bridge is the longest (1219 m) in Aomori City and is shown in Figure 4. It is the second longest bridge in Aomori Prefecture after the 1323.7 m Hachinoe Oohashi Bridge. However, the main tower of the bridge is made from high strength concrete.

**Bandai Bridge**

The Bandai Bridge is a bridge crossing the Shinano River in Niigata and is shown in Figure 5. The bridge contains six arches and is made of reinforced concrete with granite siding. It is 306.9 m long, 21.9 m wide, and it has
two car lanes in each direction. The Bandai Bridge is a prime example of the large-scale concrete arch bridges from the Showa Period.

**Five bridges of Amakusa**

The five bridges of Amakusa, Amakusa Gokyo in Japan, link the Kyushu Mainland, Kumamoto Prefecture and Amakusa Islands with Ooyano-jima, Nagaura-jima, Ike-jima and Maeshima.

**Tenmon Bashi**

Tenmon Bridge connects Misumi, the tip of Uto
Peninsula, Kumamoto Prefecture with Maeshima. It is 502 m long and is a continuous Truss bridge of pearl color.

**Ooyano Bashi**

Ooyano Bashi connects Ooyano-jima and Nagaura-jima, and it is 249 m long. However, it is a Langer Truss bridge of pale yellow color.

**Nakano Hashi**

Nakanohashi connects Nagaura-jima and Ooike-jima, and it is 361 m long. It is a rigid-frame bridge of concrete color.

**Maeshima Bashi**

Maeshimabashi connects Ooike-jima and Maeshima, and it is 520 m long. It is a rigid-frame bridge of concrete color.

**Matsushima Bashi**

Matsushimabashi connects Maeshima to Matsushimacho, Aizu and Kamiamakusa shi, and it is 178 m long. However, it is a pipe arch bridge painted in red.

**Hitsuishijima Bridge**

The Hitsuishijima Bridge is a cable-stayed bridge with a center span of 420 m (Figure 6). The span carries the roadway and Seto-Ohashi Line railway tracks. It is located at the immediate north of the identical Iwakurojima Bridge.

**Yoshima Bridge**

The Yoshima Bridge is a truss bridge with a main span of 246 m and a total of 5 spans as shown in Figure 7.

**Yokohama Bay Bridge**

The Yokohama Bay Bridge is a 860 m long cable-stayed bridge in Yokohama and is shown in Figure 8.

**CONCLUSION**

This paper shows the architectural and structural details of Japanese bridges. The main part of the Japanese bridges is designed with cable stayed. The Japanese bridges are used by pedestrians and motor vehicles advances, and are involved in almost all modern architectural construction of cable stayed bridges in the world. Bridges are, in principle, utilitarian works capable of providing aesthetic qualities. A beautiful bridge is made with the intention of accomplishing a unique, particular, local and independent work, and also with aspirations to the eternal qualities, as a universal testimony of human culture, and for the pleasure and pride of future generations. While respecting the restrictions inherent in every utilitarian work, the designer can give beauty to a bridge by applying artistic sensitivity and technical capacity to the aesthetic elements and integrate them
harmoniously with the landscape. The majority of structures built segmentally in the box girder bridges cover a large range of span lengths with many different shapes and functions. Following a look at some noteworthy box girder bridges, attention is focused on more specific areas such as long-span bridges, bridges over large bodies of water, structures built in environmentally sensitive areas, urban viaducts, and concrete cable-stayed bridges. Japanese bridges are involved in almost all modern architectural construction of cable-stayed bridges in the world. The three mentalities of a successful bridge design are outlined in Japan as:
(1) a creative and aesthetic mentality, (2) an analytical mentality, and (3) a technical and practical mentality. However, it is finally remarked that general aesthetic principles are applied for bridge design.

REFERENCES