

## **REBIRTH OF STONE BRIDGE IN THE CULTURAL CONTEXT**

N.K. Hong<sup>1</sup>, H.M. Koh<sup>2</sup>, S.G. Hong<sup>3</sup>

<sup>1</sup>Seoul National University, Adjunct Professor of Architecture & Architectural Engineering, Seoul, Korea.
<sup>2</sup>Seoul National University, Professor Emeritus of Civil & Environmental Engineering, Seoul, Korea.
<sup>3</sup>Seoul National University, Professor of Architecture & Architectural Engineering, Seoul, Korea.

e-mail: namheek@snu.ac.kr

## SUMMARY

One of the high and tough mountain passes in Korea, Mungyeong-Saejae, a National historic site (Claim No. 147) in Korea, has been appeared forming the integrated cultural context by restoring the lost water-gate bridge located on the west side of the lowest gate. This place was fortified with three gates in 1708 and became a strategic place for the national defense while serving as the traffic gateway. However, the site lacked of the cultural context due to the loss of water-gate bridge on the west side of the lowest gate. This water-gate bridge equipped with a defensive device within the two voussoir arches was now restored using traditional construction method. This paper has first discussed on what reasons caused the loss of the bridge by performing the safety analysis considering both the structural stability of the bridge and the water flow stability of the bridge site against scouring. Then, the strengthening strategy was developed for the original arch shape by adopting the traditional construction method. However, the design requirement about water flow stability of the bridge site against scouring was not satisfied with the original shape of the bridge. Finally, the restoration of the water-gate bridge was implemented by enlarging the arch shape while reinforcing the structural system using the traditional strengthening method toward much safer structural behavior.

**Keywords:** *Water-gate bridge, stone arch, stability, strengthening, cultural context* 

## 1. INTRODUCTION

Types of fortresses had been evolved in various ways considering political, military, economic and cultural aspects. Thanks to topological and geographical conditions in Korea, numerous mountain fortresses were adopted compared with town fortresses since early times. Mungyeong-Saejae, a National historic site (Claim No. 147) in Korea, is a high and tough mountain pass so that it was considered difficulty even for birds to pass over it. This place was fortified with three gates in 1708 and became a strategic place for the national defence while serving as the traffic gateway from Gyeongsang Province to Hanyang City during the Chosun Dynasty period. Apart from having a purely military and defensive purpose, the landscape perspective of Mungyeong-Saejae is striking and is actually one of the most scenic areas in Korea. This area was declared as Mungyeong-Saejae Provincial Park on June 4 in 1981. However, when this place started to obtain public attention the importance of cultural significance of the region was not adequately appreciated because it lacks of integrity. Figure 1 shows the old map that was drawn in 1872, which explains the layout of major structures and constituent of the fortress. When comparing the heritage structures and monuments remained at the site with the old map, the watergate bridge located on the west side of the lowest gate was not seen. Fortunately, the old photo describing the lowest gate in detail was found in 2005 (Figure 2), which provided a great momentum for the restoration of the watergate bridge. Recently the lost watergate bridge was restored based on the photo together with the related historical records. The restoration strategy had been studied in depth based on the traditional construction method that were commonly used for the construction of stone type of watergate bridges at that time. However, some aspects that are related to the structural instability were carefully checked. This paper has focused on how the old watergate bridge once lost was restored following the traditional construction method while addressing the issues about structural stability.