

## **Hydraulic Performances of Non-Wave Overtopping Type Seawall Against Sea Level Rise Due to Global Warming**

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### **ABSTRACT**

Hydraulic performances of a non-wave overtopping type seawall were investigated on a supposition of the sea level rise that might occur near future. Two-dimensional hydraulic experiments were carried out to evaluate several hydraulic characters, such as a checking effect of wave overtopping, wave overtopping rate, and wave pressure distribution. Some different water level conditions were set in the experiments to reproduce the sea level rise in a supposed range of it. Furthermore, this study proposes an appropriate countermeasure against the sea level rise, and evaluates its efficiency on maintaining excellent hydraulic performances of the non-wave overtopping type seawall.

**KEY WORDS:** Flaring Shaped Seawall; sea level rise; global warming; wave overtopping; wave reflection; impulsive wave pressure.

### **INTRODUCTION**

IPCC has reported that the global average temperature rise 0.74 degree in Celsius in the last century due to the global warming. The report has also shown some scenarios about the sea level rise according to this increase tendency of global average temperature. The sea level rise will bring many serious impacts on coastal zone such as an erosion of land, increase of coastal disasters and deterioration of safety of coastal structures. These serious impacts on coastal zone have been summarized widely (i.e. Mimura, et al. 1990; Matsui, et al. 1992; Hosomi, et al. 2005). And some countermeasures were investigated from various political points of view.

On the other hands, influences of the sea level rise on coastal structures were investigated from several technical viewpoints. Takayama(1990) had investigated the sliding stability of breakwater against the sea level rise. Based on a theory of reliability design, he pointed out that the sea level rise affects the sliding stability of breakwater largely in the case of shallow water depth in front of the breakwater.

Inoue, et al.(1993, 1994) had also investigated an influence of the sea level rise on a change of the wave overtopping character. Through their experiments, it was pointed out that the influence of the sea level rise on the change of the wave overtopping character closely relates to the

cross section of each seawall. These previous investigations revealed that the existing coastal structures will lose their original hydraulic performances and structural stability due to the sea level rise, and some appropriate countermeasures have to be applied to maintain their original efficiencies.

Authors had proposed a non-wave overtopping type seawall, which was referred as the Flaring Shaped Seawall, with deeply arced cross section (Murakami, et al. 1996, 2005, 2007). A series of previous studies cleared that the seawall checks the wave overtopping effectively under an extremely low crown height, because it overturns an incoming wave motion offshore-ward on its curved section. Fig.1 shows one of the typical cross section of the Flaring Shaped Seawall, which had been firstly constructed at Kurahashi Island, Hiroshima Prefecture in Japan (Takehana, et al, 2000).

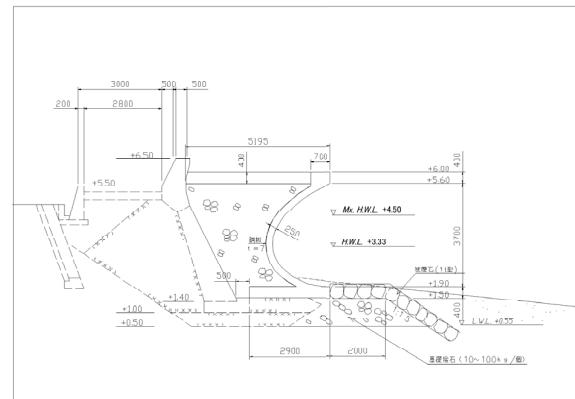


Fig.1 Cross section of the Flaring Shaped Seawall constructed at Kurahashi Island, Hiroshima Prefecture, Japan

In order to overturn incoming wave motion effectively on its curved section with minimum crown height, the design sea level (*H.W.L*) of the Flaring Shaped Seawall is set at the same level of the deepest location on its curved section as shown in Fig.1. In general, the