



Construction of Flexible Waterstops on Underwater Cofferdams for Pile Caps in Bridge Projects

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Abstract

The water-stopping efficiency of cofferdams for pile caps is an important indicator with direct influence to the quality and durability of the pile-pouring process. In recent years, a new technique featuring flexible capsules serving as waterstops has been introduced, but is still in experimental stage. This thesis, taking the water-stopping construction programme of underwater PC houses of the J. P. Magufuli Bridge project in Tanzania as background, analyzed the two existed types of flexible water-stopping construction methods, id est the integral and separate structures, and studied on measures for improving the flexible water-stopping construction techniques and optimizing the rubber capsule waterstops, in the hope of providing references and, possibly, inspirations for similar projects in the future.

Keywords: water-stopping; cofferdam; capsule.

1 Introduction

Since the dawn of the new millennium, China has seen a great leap in terms of urban transport infrastructure, and with the completion of multiple landmark projects like the Hongkong-Zhuhai-Macau Bridge, the country has achieved continuous improvement in cross-waterbody bridge construction techniques, including those for water-stopping between underwater cofferdams and pile casings[1]. Flexible capsule waterstop is one of the newest members of this kind; it takes effect by the bonding force generated by the swelling rubber capsules fixed on the bottom plate of the PC house against the casings within[2].

Despite being rarely seen in ongoing bridge projects, the technique deserves further research due to its advantages in being more environment-friendly and time-saving, and showing greater efficiency in water-stopping as well as higher versatility in sophisticated aquatic environments. The J. P.

Magufuli Bridge project, in this case, provides the author with a precious opportunity to put the two existed ways of flexible water-stopping, i.e. the integral and separate structures, onto the anvil of practice, and makes detailed discussions about the technical improvement to the overall concept and the specific optimizing measures to the rubber capsule waterstops.

2 The Water-Stopping techniques used on Cofferdams for Pile Caps in Bridge Projects

Cofferdams made from earth, rockfill, concrete boxes, steel sheet or pipe piles and reinforced concrete boxes are widely seen in bridge construction. Traditionally, there are 3 methods for water-stopping between underwater cofferdams and pile casings: introducing a tremie seal, which is a non-reinforced slab of concrete, (with a certain degree of