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桃芝颱洪引致東門橋塌陷之成因探討

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摘　　要　本文旨在探討民國 90 年 7 月 30 日桃芝颱風過境，造成台中市區內跨越旱溪之東門橋受創的原因。首先藉由災後現場的調查測量以及已沉陷橋基之周邊河床的開挖工作，以了解橋梁基礎型式及受災情形，其次再經由水工模型實驗探討水流攻角在橋墩尾端所造成局部沖刷坑之影響。基於上述之調查與實驗，此次災害的成因可歸納爲：束縮沖刷與局部沖刷(含水流攻角所造成的效應)等二個部份。由於低水護岸的設置，縮減了部分通水寬度而導致水流加速。又因墩柱與水流方向之攻角效應，使得由於馬蹄型渦流所產生的最大沖刷深度之位置轉而位於橋墩之下游端且益形嚴重，使得橋墩向下游傾斜陷落而致災。期盼藉由此沖刷案例深入的分析探討，對於國內橋梁之設計、養護與維修技術水平有所提升。

關鍵詞：束縮沖刷、局部沖刷、水流攻角、低水護岸、馬蹄型渦流。

The Cause of Damage to the Collapsed Dong—Men Bridge During Typhoon Toraji

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ABSTRACT　Dong-Men Bridge crossing the Han River in Taichung City was seriously damaged by torrential flood during the passage of Typhoon Toraji on July 30, 2001. The aim of the present study is to explore the cause of damage to this bridge. Methods used in this study include literature review, aerial photos, site investigation and survey, excavation of river-bed around the collapsed foundation, and simplified hydraulic model test performed in water channel.

It is found that the damage can be mainly attributed to contraction scour and local scour. The former was due to the construction of low-water revetments which occupies some portion of the flow width, thus leading to increase in flow velocity at the inlet of constriction. The latter was caused by the action of horseshoe vortex flow around the bridge pier, which was significantly scoured as the angle of attack (between the flow direction and the longitudinal alignment of bridge pier) gets larger. The present investigation is expected to promote the techniques of design, maintenance and retrofit for bridges.

Key Words: contraction scour, local scour, low-water revetment, angle of attack, horseshoe vortex.

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