

結構參數變化對斜張橋斷索後極限行為之影響

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摘要

斜張橋因斜拉纜索的吊掛效果，使其主梁斷面及跨徑得以細長，但斜拉纜索有可能因車禍撞損或年久失修而發生斷損，亦有可能因換索時需鬆弛纜索而發生類似斷索之行為，此時細長的斜張橋是否會因而發生安全問題，為一相當值得探討的課題，本文在同時考慮纜索的中垂效應、主梁及橋塔的梁柱效應、整體結構的幾何非線性效應以及材料非線性的情況下，進行主梁、橋塔及纜索等結構之彈性模數變化對斜張橋斷索後極限承載行為影響之分析及探討。研究結果顯示，纜索彈性模數改變對斜張橋斷索時之靜態力學反應，以及斜張橋斷索時之極限承載能力影響最大，其次依序為主梁及橋塔彈性模數的改變。

關鍵字: 斜張橋、彈塑性大變形理論、極限行為、數值模擬

The Effects of Structural Parameter Variation on the Ultimate Behavior of Cable-Stayed Bridge after Cable Broken

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ABSTRACT

Owing to the hanging effect of the cables, the aspect ratio of the main girder's sections of the cable-stayed bridges is usually small. However, under certain circumstances, the hanging cables will be broken due to car-pounding, or lack of maintenance for a long time, or the cable is broken during the process when old cables are released for replacing to new ones. Therefore, for safety considerations, the structural behavior of cable-stayed bridges due to cable broken is a very important issue to be investigated. In this paper, the effects of variation of the Yong's modulus of main girder, tower and cable on the ultimate behavior of cable-stayed bridge after cable broken were investigated by using CSBDL program, which take all of the nonlinear characteristics, such as cable-sag, beam-column, large-displacement and material-nonlinearity effects, into consideration. The numerical results have shown that the variation of the Yong's modulus of cable had more effects on the ultimate behavior of cable-stayed bridge after cable broken.

Keywords :cable-stayed bridge, elasto-plastic large-displacement theory, ultimate behavior, numerical modeling

一、前言

斜張橋由於斜拉纜索的吊掛，使得主梁變得相當細長。對這些細長的斜張橋而言，擔負吊掛的斜拉纜索有可能因車禍撞

損或年久失修過度腐蝕而發生斷損，亦有可能因換索時需鬆弛纜索而發生類似斷索之行為，此時細長的斜張橋是否會因而發生安全上的問題，便成為一個相當值得探討的課題，尤其是國外曾經發生斜張橋因