I-거더 횡좌굴 방지를 위한 비틀림 브레이싱의 요구 강성
Torsional bracing requirement for lateral buckling of I-girders

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Abstract

This paper introduces a theoretical study on lateral-torsional buckling of I-girders under uniform bending with centroidal elastic torsional restraint at midspan. Although several studies have been developed for torsional restraint effects, sufficient mathematical approaches have not been clearly explained yet. In this study, the traditional solution of stability problems principally based on the constitutive equation of potential energy is performed concerning for the Rayleigh-Ritz method. Then, the equations to determine the torsional stiffness requirement and critical moment are developed while unfull bracing are considered. A series of finite element analyses are conducted to provide the results of torsional stiffness requirement and critical moment, then they are compared with the proposed equations in this study. Finally, according to the comparisons, the theoretical study on lateral buckling of I-girders under pure bending with centroidal torsional bracing is obviously performed, and the proposed equations are adequately applicable.

key words: Lateral-Torsional Buckling, , Elastic Torsional Restraint, Potential Energy, Stiffness Requirement

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간략화된 방법을 이용한 다양한 교량 거더의 플러터 불안정 현상에 관한 연구
Study on the simplified approachs for flutter instability of various bridge decks

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Abstract

Selberg's formula, most common simplified method to assess flutter instability outlines the calculation of the critical wind speed for a dynamically equivalent thin flat plate, the disadvantage of this formula nothing can be said about the actual mechanism which leads to instability. Some cross sections are prone to torsional flutter, the critical speed was point out when monotonic negative trend of A_2^*, meaning that it tends to reverse its sign from negative to positive at relatively low reduced wind speed, introducing negative aerodynamic damping in the torsional modes. Recently, the simplified closed-form solution to the bimodal flutter problem was proposed by Chen (2007) under the only assumption of low level damping, providing an approximate formula for the critical wind speed, retaining only the flutter derivatives H_3^*, A_1^*, A_2^* and A_3^* and one parameter reflecting the influence of the cross-section aerodynamics on the flutter wind speed.

In this paper a valuable insight into the flutter behavior of several types of bridges via comparison the critical velocity of various flexible bridge decks based on the simplified approaches.

Keyword: Flutter; Instability; Bridge deck.

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