

An Investigation into the Earthquake responses of Special-shaped Arch Bridges

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Abstract

By building a finite element model of a special-shaped arch bridge, this paper discusses the effects of the changes of the geometric shape, and the skewed angle of the girder and arch on the dynamic characteristics. In addition, this paper analyzes the longitudinal earthquake responses using the response spectrum method. The results show that when longitudinal earthquakes occur, all geometric shapes, and skewed angles of the girder and arch exhibit different levels of effect on the horizontal and vertical deformations of the girder and the arch, the internal forces of the arch, the girder, and the cables. Among all these parts of the bridge, the arch is affected most by the aforementioned factors. Moreover, because of the unique geometric shape of the special-shaped arch bridge, the distributions of initial and completed cable forces are complex. Therefore, obtaining regular stress responses from the special-shaped arch bridge is difficult regardless of whether the bridge is in-plane or out-of-plane. Hence, the arrangement of cable forces should be specifically considered when building an analytic model of a special-shaped arch bridge.

Keyword : Special-shaped arch bridge, earthquake response, cable force.