Florida Department of Transportation Research

Lateral Bracing of Long-Span Florida Bulb-Tee Girders
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Modern materials and construction methods make it possible to use long (160 feet or more), slender girders in bridge designs. However, girder structural characteristics and problems related to girder placement on their bearing pad supports can interact to reduce long girder stability. Lateral bracing between girders is used to improve their stability.

Long girders on bearing supports

The purpose of this study was to investigate the lateral stability of long-span prestressed concrete girders during bridge construction to better understand the conditions that can cause instability and develop recommendations for improving stability.

The researchers used numerical models to evaluate how and to what degree girders respond to the interaction of various conditions during construction. They also developed equations to aid bridge designers in determining under which conditions girders would need lateral bracing.

The factors studied included girder type, span length, lateral bracing stiffness, skew angle, sweep, slope, and bearing pad creep. The study showed that girder cross-sectional properties, along with skew and slope resulting from girder placement at their supports, can significantly alter girder stability and buckling capacity. Buckling capacity in this context refers to the girder's resistance to twisting or deflecting out of the plane of loading. Skew occurs when a girder sits at an angle on its support. Slope is a slight vertical rotation of the girder relative to its support.

The negative effects of skew and slope can increase when girder sweep is present. Girder sweep is a curve along the girder's length resulting from a manufacturing error or improper storage. Researchers found that bearing pad creep, or compression over time caused by weight, also has a minor negative effect on girder stability.

Using modeling techniques, the researchers developed simplified equations for the rapid calculation of buckling capacity. They also recommended a design requirement that bearing pad and girder alignments match along the longitudinal axis, which, if followed, should improve structural stability and reduce the number of situations where lateral bracing is needed.

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