

ABSTRACT

Innovations in precast concrete technologies have enabled designers to increase span length of bridge girders. This results in reduced construction costs with the requirement of fewer bridge piers. This is useful particularly for bridges spanning across bodies of water. However, a new problem arises with the development of longer precast girders. Due to the lack of torsional stiffness, prestressed concrete girders are susceptible to lateral buckling. Therefore, in order to ensure field safety and avoid material loss and unnecessary costs, girders should be checked for lateral stability during erection.

While the majority of research is primarily concerned with the lifting of concrete girders, considerations should also be taken at various erection stages during construction. These stages include first girder erection, twin girder erection, full span analysis prior to concrete placement, and full span analysis during concrete placement. Only once the concrete deck is cured can it be ensured that concrete girders are torsionally restrained. At that point, the lateral stability of the girder is no longer a significant concern.

This paper provides guidelines for verifying girder stability at previously delineated stages. A single span is analyzed at various erection stages for both girder stresses and roll angle. Critical stages are considered where the stiffness of the system and applied loads vary at a notable extent. Past research made use of beam elements. However, an alternate method is proposed where girders are discretized into plate elements.