Abstract

Loss of stability and the occurrence of lateral torsional buckling are major concerns during the process of bridge girder erection. In the final constructed state, a girder is more stable due to continuous bracing to its top compression flange when it is connected to the bridge deck or due to the installation of lateral bracing at discrete points along the girder. However, during construction, girders are erected first and must support their own self-weight as well as construction loading. While construction loads may be small compared to service loads, this load state can be most critical due to the lack of bracing for the girder. The first part of the study compared the AASHTO LRFD and AISC codes for a doubly symmetric steel girder to gain a better understanding of how lateral torsional buckling is determined and what assumptions are made in the different design codes. The results show that for the steel section chosen for analysis, the codes do not vary greatly. The second part of the paper used AASHTO LRFD code to evaluate the efficacy of guidelines for checking girder stability during erection for simply supported and cantilever beams. The guidelines proved to be conservative for cantilever beams but under conservative for simply supported beams. In the last portion of the study, finite element analysis was conducted for simply supported and cantilever girders using linear buckling analysis, nonlinear static analysis and modal analysis to further understand girder instability during erection and develop iterative methods to determine the onset of lateral torsional buckling. The results from the finite element analysis provided results that were less conservative than the results determined using the AASHTO LRFD code.