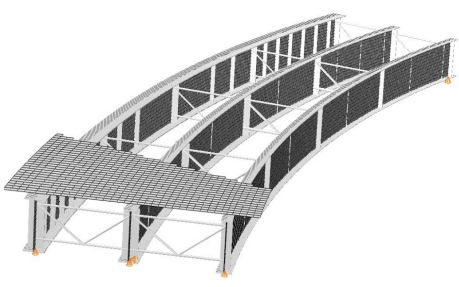
Guidelines for Steel Girder Bridge Analysis

G13.1-2019



American Association of State Highway and Transportation Officials

National Steel Bridge Alliance

AASHTO/NSBA Steel Bridge Collaboration

PREFACE

This document is a standard developed by the AASHTO/NSBA Steel Bridge Collaboration. The primary goal of the Collaboration is to achieve steel bridge design and construction of the highest quality and value through standardization of the design, fabrication, and erection processes. Each standard represents the consensus of a diverse group of professionals.

It is intended that Owners adopt and implement Collaboration standards in their entirety to facilitate the achievement of standardization. It is understood, however, that local statutes or preferences may prevent full adoption of the document. In such cases Owners should adopt these documents with the exceptions they feel are necessary.

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FOREWORD

The First Edition of *G13.1, Guidelines for Steel Girder Bridge Analysis* was originally published in 2011 and represented a comprehensive treatment of issues related to steel girder bridge analysis, but the guidance presented was largely qualitative.

In the time after the writing of the First Edition, the National Cooperative Highway Research Program (NCHRP) completed NCHRP Research Project 12-79, the results of which are documented in NCHRP Report 725*, Guidelines for Analysis Methods and Construction Engineering of Curved and Skewed Steel Girder Bridges.* The research included extensive analytical studies of over 70 different steel girder bridges, comparing the accuracy results of a variety of one-dimensional (1D), two-dimensional (2D), and three-dimensional (3D) analysis methods, and leading to recommendations on appropriate levels of analysis based on the geometric complexity of a given steel girder bridge. Important findings about the nature of current 2D analysis methods were also reported, along with recommended improvements to the modeling of I-girder torsional stiffness and truss-type cross-frame stiffness to increase the accuracy of 2D methods and a recommended method for estimating I-girder flange lateral bending stresses in straight, skewed bridges analyzed using 2D methods. Preliminary findings concerned with the estimation of locked-in force effects and fit-up forces associated with the chosen cross-frame detailing method were also presented. The key findings reported in NCHRP Report 725 were summarized and included as revisions to G13.1 and formed the majority of the changes in the Second Edition. Other changes included: clarifications to the text on prediction of deflections and load rating analyses, incorporation of recommendations on the impact of connection stiffness on cross-frame stiffness, incorporation of recommendations on global second-order amplification of structural response and narrow system stability analysis, and other minor editorial corrections.

The revisions incorporated in the Third Edition of G13.1 again largely reflect summaries of advances in the state of knowledge gained since the publication of the Second Edition. These advances include improved knowledge of steel I-girder fit resulting from the findings and recommendations of NCHRP Research Project 20-07, Task 355, improved methods for evaluating global stability and global second-order amplification of structural responses, the implementation of minimum strength and stiffness requirements for stability bracing of steel I-girder bridges (particularly in straight bridges with little or no skew), improved guidance regarding the effect of connection eccentricity on the stiffness of cross-frames, and significant advancements and refinements in the classification of members as System Redundant Members or Internally Redundant Members, providing objective methods to avoid the costs and complications associated with classification of bridges as fracture-critical. Other editorial changes and clarifications of previous text were also addressed.

AASHTO/NSBA Steel Bridge Collaboration Task Group 13, Fall 2019

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