Initial Field Response and Modeling of Two Skewed Steel I-Girder Bridges

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INTRODUCTION

- Short-term bridge response of major bridge superstructure components and long-term thermally-induced stresses and deformations are complicated by skew effects.
- Two two-span continuous steel I-girder bridges are instrumented for field monitoring
  - Skew = 41° with seat-type abutments (Mattis-74)
  - Skew = 48° with integral abutments (Mattis-57)
- Data acquisition system is capable of high frequency sampling up to 20Hz, data collection was started before deck pour.
- 3D finite element analyses are conducted to provide enhanced understanding of the bridge behavior.

Truck Testing

Truck testing was conducted Mattis-74 after the completion of Stage I construction.

Numerical Simulations

3D finite element analysis was conducted using ABAQUS/CAE.
- Shell elements: steel I-girders, concrete slab and haunch, cross-frames, stiffeners
- Beam elements: bearing diaphragms
- Tie constraints: composite behavior between girders and slab, steel connection components
- Spring elements: bearings
- DLOAD user-subroutine: truck load

Bridge Service Response

CONCLUSIONS

- This study enriches the database of superstructure response for steel I-girder bridges and furthers the understanding of skewed steel I-girder bridge behavior.
- Numerical simulation results match well with data from field testing, which facilitates future parametric studies.

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