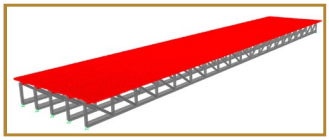
Implementation Report



Investigation of Prefabricated Steel-Truss Bridge Deck Systems

http://www.mdt.mt.gov/research/projects/structures/prefab.shtml

PROJECT NO: 8226

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Introduction and Purpose

Steel truss bridges are an efficient and aesthetically pleasing option for highway crossings. Their lightweight, compared with plate girder systems, make them a desirable alternative for both material savings and constructability. A prototype bridge structure has been proposed by a steel fabricator as a potential alternative for accelerated bridge construction (ABC) projects in Montana. The proposed system consists of a prefabricated welded steel truss topped with a composite concrete deck cast-in-place at the fabrication facility. These composite members are transported to the site, where they are set next to each other on a prepared foundation to create the bridge. This specific bridge and prefabricated construction technique are not well represented in the literature and, thus, there is a need to identify potential bridge spans and traffic volumes where the proposed system is viable and economical.

This project was conducted to evaluate potential fatigue limitations of the proposed welded truss-member connections and to investigate alternative bolted connections to improve fatigue performance. Traditional cast-in-place and integral bridge deck systems for accelerated construction were evaluated and compared with a conventional plate girder bridge system. Preliminary steel truss designs were completed for different design-life scenarios, traffic volumes, analysis methods, and splice locations. Materials and fabrication cost estimations from three different sources were evaluated, in addition to construction and erection methods.

The preliminary steel truss design for both conventional and accelerated construction methods suggest an attractive alternative is available for trusses with both bolted and welded connections. Based on the study results, five recommendations were made to continue the development of a steel truss bridge system leading to the construction of a demonstration project. Each recommendation is presented below, followed by the actions MDT intends to take.

Implementation Recommendations

Recommendation 1:

Discuss potential bridge crossing sites and geometries with steel fabricators and local contractors to receive more specific suggestions for successfully implementing a steel truss bridge system built using conventional or accelerated construction methods.

MDT Response:
MDT will schedule this meeting to discuss design and construction aspects of a steel truss bridge system for different crossings and site conditions in Montana.

Recommendation 2:
Evaluate the joint and concrete deck performance of the Maxwell Coulee bridge that utilized a rolled wide-flange section with an integral concrete deck.

MDT Response:
MDT will review the monitoring that is currently being performed on the Maxwell Coulee bridge. The final report for this monitoring project (due in 2017) will be assessed for findings that can be applied to a steel truss bridge system.

Recommendation 3:
Investigate alternative contracting methods for a steel truss bridge constructed with an integral concrete deck. The Construction Manager/General Contractor method could provide a more efficient and economical delivery.

MDT Response:
MDT will review their current bridge contracting alternatives to identify the most appropriate delivery method for a steel truss bridge system.

Recommendation 4:
Complete a final design of a steel truss for a selected bridge crossing with input from an erector and fabricator, combined with Maxwell Coulee observations.

MDT Response:
Based on the most suitable contracting method, MDT will decide if a final design by MDT, or through alternative methods, is required.

Recommendation 5:
Implement a monitoring and evaluation program, including instrumentation and remote data acquisition, for the constructed steel truss bridge.

MDT Response:
MDT agrees that if a demonstration project of a steel truss bridge system is constructed, they will consider a field monitoring and evaluation program as a 2nd phase of research.

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