ABSTRACT

FIELD PERFORMANCE AND RATING EVALUATION OF A MODULAR PRESS-BRAKE-FORMED STEEL TUB GIRDER WITH A STEEL SANDWICH PLATE DECK

The Short Span Steel Bridge Alliance (SSSBA) is a group of bridge and culvert industry leaders (including steel manufacturers, fabricators, service centers, coaters, researchers, and representatives of related associations and government organizations) who have joined together to provide educational information on the design and construction of short span steel bridges in installations up to 140 feet in length. The SSSBA technical working group has developed a shallow press-brake-formed tub girder, a trapezoidal cold bent girder, to address the demand in the short span steel bridge market for rapid infrastructure replacement solutions.

Following extensive experimental testing and design work at West Virginia University, members of the SSSBA in collaboration with Intelligent Engineering of Ottowa, Canada and County Engineer Douglas Davis, P.E., designed and constructed the Cannelville Road Bridge in Muskingum County, Ohio. The structure is composed of two modular, tub girder and sandwich plate steel (SPS®) deck units that were constructed offsite and erected using accelerated bridge construction (ABC) methods. The structure is the second press-brake-formed steel tub girder bridge to be erected and is the first structure with a composite SPS® deck system. One year after construction, the structure was live load field tested by researchers from West Virginia University and Marshall University to assess its performance.

This study presents the analysis and conclusions of experimental testing and analytical modeling of the Cannelville Road Bridge. The procedure for both experimental and analytical testing is outlined within the content of this study. The results of these analyses were used to generate bottom flange bending stress, live load distribution factors (LLDFs), and interior and exterior girder ratings. These values, experimental and analytical, were then compared with equivalent LLDFs and live load girder ratings computed referencing American Association of Highway and Transportation Officials (AASHTO) LRFD Specifications. The result of this testing evidences that current AASHTO LRFD Specifications for analyzing shallow press-brake-formed tub girders are conservative, with field performance exceeding the performance calculated. In addition to high performance, tub girders are practical in ABC applications and compatible with various deck designs as modular units. With a growing demand and need for rapid infrastructure replacement, shallow press-brake-formed tub girders have been proven to be an effective application in response to the growing industry demand.

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