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Can 100-year-old steel railroad bridges continue to be used in service?

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1 Abstract

More than 50 percent of steel deck plate girder railway bridges in North America exceed 100 years in service. This includes more than 14,000 spans with a total length of 145 miles that remain in service. The oldest bridges are close to 150 years old. For these aging structures, there is a special need to develop reliable procedures to evaluate their fitness for continued service. Simplified calculations and conservative assumptions often lead to spurious outcomes that indicate older structures ceased to be functional decades ago. Even if a steel bridge reaches its estimated fatigue life, the structure might be fit for future service and perhaps for a significant period of time. Fitness for service assessments that utilize probabilistic methods, and that are informed by and consistent with detailed physical inspections of the structures, provide a more accurate assessment of the fitness and expected life of bridges. In this paper, a probabilistic method is demonstrated on three, riveted deck plate girder spans that exceed 100 years of service. The spans are currently located at the Facility for Accelerated Service Testing.

Keywords: riveted deck plate girders, fatigue life, probabilistic method, steel bridge, railway bridges, remaining life.

2 Introduction

Transportation Technology Center, Inc. (TTCI) is testing five riveted steel girder railway bridge spans for fatigue and safe service life performance. The testing is being conducted at the Facility for Accelerated Service Testing (FAST), located at the Transportation Technology Center (TTC) in Pueblo, CO, USA. These bridges carry approximately 136 MGTonnes per year of heavy axle load (HAL) traffic. TTCI is using these bridges to investigate improved safe service life estimates for common steel railway bridge spans.

The fatigue life of some steel bridges installed at FAST already has been exceeded, according to the American Railway Engineering and Maintenance of Way Association (AREMA) *Manual for Railway Engineering,* Chapter 15 calculations [1]. However, the spans are in operation with no maintenance required, no defects noted, and have accumulated additional tonnage. These examples confirm that the fatigue life evaluated using current methods is conservative.

A description of one of the spans and a fatigue life estimate using traditional deterministic methods are documented in a previous publication [2].

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