Structural Evaluation of Corten Steel Ancillary Highway Structures

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June 01, 2020

Abstract

This paper investigates an assessment method for Corten steel (CS) ancillary structures on the Charleston interstate highway system (I-64, I-77, and I-79). Nineteen CS bridge-mounted ancillary support (CS-BMAS) structures (i.e., ancillary structures are attached to bridge superstructure) were examined by non-destructive testing techniques. Ultrasonic testing (UT) was used to inspect key components of the ancillary sign structures (e.g., anchor bolts, connection brackets, etc.) while the other components were assessed by a conventional visual inspection method. The CS-BMAS structures were rated at both the overall and element levels (each ancillary structure includes more than ten elements/components such as foundations/concrete in the vicinity of connections, mounting plates, anchor bolts, vertical tubular members and their connections, truss members and connections). The element level ratings were based on the proposed rating criteria and score. The overall condition of each ancillary structure was then obtained by the normalized \(\frac{S}{S_{\text{max}}}\) ratio (where \(S\) is the total score of each structure and \(S_{\text{max}}\) is maximum possible total score). The results revealed that most of the CS-BMAS structures performed satisfactorily after more than four decades of service and exposure to harsh environmental conditions. Specifically, two ancillary sign structures (11\%) were rated as good condition, 16 structures (84\%) were rated as fair condition, and one structure (5\%) was found to be in poor condition.

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