

CORROSION MITIGATION STRATEGIES FOR FLANGE SPLICE CONNECTIONS IN STEEL BRIDGES

ABSTRACT

As of 2013, the damage caused by corrosion on highway bridges has been estimated to cost approximately 14 billion dollars annually, and this cost has been increasing over the years. Corrosion is one of the natural phenomena that has been slowly deteriorating infrastructure systems across the United States. One of the most problematic types of corrosion is crevice corrosion, which is defined as the formation of rust between overlapping surfaces such as the case of a splice connection where flanges are attached by splice plates. A significant number of steel bridges in Indiana have developed crevice corrosion in splice connections. Therefore, this research focuses on the crevice corrosion, or “pack rust”, occurring in these structural elements. The application of coatings alone has not been enough to stop pack rust at these connections. In an attempt to look for approaches that can effectively mitigate this problem and maintain the designed service life of bridges, different strategies have been studied and tested. The first objective of this study is to determine the strength reduction as a function of the time of exposure to salt misting. To do this, specimens that simulate the bottom flange splice connection have been exposed to a corrosive environment for different periods of time and later tested under tension to assess the reduction in strength. The second objective is to evaluate the effectiveness of the mitigation strategies under different conditions. First, the mitigating products were initially applied before exposure to salt misting. Second, the mitigating products were applied as a repair, and in this case, the specimens corroded for a given period of time and were then repaired to evaluate any further deterioration. The assessment of the strategies’ effectiveness is based on the strength reduction and visual inspection of the specimens. The ultimate outcome of this study is a series of general guidelines to slow down crevice corrosion based on the results of the laboratory testing.