

Evaluating Section Loss in Corroded Steel Strands

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1 Abstract

Since corrosion in prestressing tendon reduces the cross-section and strength of steel strand, it is critical for the safety of structures. Corrosion model in steel wires and a technique for evaluating section loss in steel strands were developed based on the measurement of corroded strands obtained from a concrete box girder bridge in Korea. The strands were corroded due to chloride and moisture attack. Cross-sections of corroded wires were measured for section loss, corrosion depth and perimeter. The measurement showed that corrosion rapidly progressed along the perimeter in earlier stage of corrosion, so that the shapes of remaining cross-sections were convex rather than concave which is typical shape of pitting corrosion. Evaluation of section loss in corroded steel strands were conducted using the wire corrosion model. If a strand can be approached from any direction around the strand, section loss could be evaluated within 5% of error.

Keywords: post-tensioning, corrosion, wire, strand, external tendon

2 Introduction

Corrosion is one of the major factors that reduces the strength of post-tensioning tendons [1], [2]. Section loss in steel strands due to corrosion could induce failure in tendons [3], [4] and sometimes lead to the collapse of bridges [5]. These fatal

accidents could occur when the remaining strength of a tendon is lower than the applied tension. Therefore, accurate examinations of both section loss and the remaining strength of tendons are required in order to set a proper maintenance plan to prevent the failure of tendons when corrosion is found in strands.