

## Study on Evaluation Procedures for Prestressed Concrete Bridges Damaged by Salt Attack with Severe Corrosion of PC Cables

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### 1 Abstract

Considering the management of highway bridges in service under severe conditions for more than 100 years, evaluation of safety is indispensable. By adopting design formulae, it is possible to evaluate the safety quantitatively without complicated processes. However, to adopt a formula from the design, the structure needs to satisfy the Navier hypothesis and other requirements. For these reasons, the authors carried out an examination of evaluation procedures to define the limit deterioration state of PC structures for adopting a design formula. By comparing evaluation results of a design formula and experimental results of an actual PC beam removed from service, and also nonlinear FEM analysis results, the study shows the limit deterioration state of PC structures for adopting a design formula for the evaluation of safety.

**Keywords:** management of bridges; evaluation of safety; salt attack; nonlinear FEM; design formula.

### 2 Introduction

PC structures require major repair and strengthening if deterioration progresses to a notable extent. Consequently, the basic approach to maintenance and management of such structures in Japan has been to ensure that PC tendons do not corrode. Nevertheless, with structures in service under the severe conditions, there have still been reports of PC structures with tendon failures due to salt attack. In order to ensure the safety of PC structures, it is necessary to have appropriate methods for evaluating the strength of deteriorated structures.

Photos 1 [a] and [b] show examples of deterioration to the stage that there is concern over potential



[a] PC I-girder penetrated substantial chloride ion

[b] PC I-girder with corroded PC cables due to salt attack

Photo 1. Severely deteriorated PC I-girder due to salt attack