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Remaining Capacity of Corroded Gusset Plate Connection

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1 Abstract

Nowadays, severe damage on the gusset plate connection of steel truss bridges due to corrosion has been widely reported all over the world. In this context, the remaining load-carrying capacity of a corroded gusset plate connection was evaluated by using the loading test and Finite Element Method (FEM) analysis. Two potential forms of corrosion on the gusset plate, namely welding and cross-sectional corrosion, were proposed to investigate the reduction of load-carrying capacity. The overall FEM model dimension for the real bridge was scaled down by a percentage of 50%. The degrees of corrosion sections were assumed disconnected at about 50% of the weld length and the loss of the gusset plate thickness was 50% and 75%. Parametric FEM analysis was performed to evaluate the effect of the degree of corrosion on the remaining load-carrying capacity of the gusset plate connection.

Keywords: steel truss bridges; corrosion; load-carrying capacity; experiment; FEA.

2 Introduction

Many existing steel truss bridges are considered “old” ages from 50 to over 100 years [1]. In steel truss bridges, corrosion is frequently found in the gusset plate that connects members, particularly where the plate connects to the upper flange of the lower chord member [2]. This corrosion is simply due to the complex shape in this region, which readily accumulate debris and water. The gusset plate connections of a truss bridge are considered to be structurally critical components of the truss structure system. However, a lot of research conducted considering the load-carrying capacity of the gusset plate focusing the design stage [3, 4]. But only a few researchers have found about the damage consideration. Therefore, the purpose of this study is to evaluate the remaining load-carrying capacity of the corroded gusset plate connection performing both the loading tests and FEM analysis.

3 Loading tests

3.1 Specimen shape

In this study, monolithic-type specimens, which were approximately 50% of the size of the real bridge, were used. Their dimensions were decided

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