

Experimental Investigation on Effect of Corrosion on Reinforcement Strength

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Summary

Three hundred and sixty-two corroded reinforcement specimens were obtained from the electrochemical accelerated corrosion members and the field bridge members to perform tensile testing. The relationships between the mass corrosion loss, the cross-sectional corrosion loss and yield load, ultimate tensile load, yield strength, ultimate tensile strength are respectively established. The effects of amount of corrosion loss on yield strength, ultimate tensile strength, yield load; and ultimate tensile load of the different type reinforcement are analyzed. The regression analysis on the relationships between reinforcement mass corrosion loss and yield load, ultimate tensile load under natural and accelerated corrosion environments are conducted.

Keywords: reinforcement corrosion; yield load; ultimate tensile load; yield strength; ultimate strength

1. Introduction

Corrosion of steel reinforcement not only results in physical and mechanical properties change, but also affects it all around bituminous materials physical and mechanical. Now the research about mechanical properties of corroded reinforcement is based on an experimental research. By the different tensile tests of corroded steel bars, statistical analysis of variation of the mechanical properties of corroded reinforcement is conducted. Usually, for samples of corroded reinforcement methods, there are some limitations: 1) Initial data of steel corrosion of bridge components in real samples are often unavailable; 2) Rapid corrosion of the various methods of laboratory experimental results differ compared to natural corrosive environments, and the relationship between the rust is yet needed to be further studied. Patterns in the corrosion mechanism of reinforced concrete bridge under atmospheric environment are different.

Reinforcement corrosion in concrete is usually non-uniform, leading to localized pit corrosion of steel in process. Stress concentration phenomena of pitting region occur. Yuan ^[1] and Fan ^[2] used the non-linear finite element analysis to point out that the mechanical properties of corroded reinforcements are mainly caused by parts of the phenomenon of stress concentration and corrosion pits depth has significant effects on its yield strength. However, the width of pits has little effects on the yield strength. In addition, Corrosion caused by material changes will also lead to deterioration of mechanical properties.

For corrosion on the mechanical properties of steel there are two main viewpoints: 1) One is that the corrosion of the steel has no significant effects on yield strength and ultimate strength, but ultimate elongation decreases with the increase of corrosion rate [3, 4]. Maslejuddin [5, 6] experiences 16