



Electrochemical Test Research on Corrosion Resistance of Cable Wires with Different Protection Layers

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Abstract:

The stay cables are usually subjected to continuous erosion from the environment in their service period. The protective layer on the cable wire is an important barrier for the cable corrosion resistance. Therefore, the durability of the cable depends greatly on the proper selection of the protective layer, which makes a big difference comparing with the bare cable wires. This paper studies on the corrosion performance of 6 common kinds of cable steels under the same corrosion environment with electrochemical test methods. The corrosion rates of different kinds of steel bars under various covers are tested and obtained. The results can provide more accurate reference for the designers of cable stayed bridges to selecting a proper kind of cable wires during the bridge construction or maintainers to estimate the durability of the stayed cables.

Key Words: Cable wire; electrochemical test; corrosion resistance; free corrosion potential; linear polarization resistance; corrosion current density.

1. Introduction

The stay-cable is one of the main load-bearing components of cable-stayed bridge. Its durability directly influences the safety and service life of whole bridge structure [1]. The cable usually has a multiple-protections system from corrosion [2]. In the system, the protection layer on cable wires are the last barrier from corrosion, which makes a critical difference to the durability of the cable. In this study, six common kinds of cable wires applied to bridges are chosen. They are bare wire, galvanized wire, Zn-Al coating wire, epoxy coating wire, bare wire with anticorrosive grease, and Zn-Al coating wire with anticorrosive grease.

The durability of the stay cable has attracted considerable attention of bridge engineers and scholars. Honshu-Shikoku Bridge Authority carried out a research on preventive maintenance of 15 bridges which are in the charge of the institution [3]. The influence of environmental factors on corrosion of galvanized steel wires was studied in accelerated corrosion tests [4]. The influence factors including temperature, relative humidity, and sodium chloride, are considered. The influence of tensile loads on corrosion of galvanized and bare wires was also studied in accelerated corrosion tests [5,6]. However, comparative studies on the corrosion resistance of steel wires with different protection