Experimental corrosion investigation of untreated suspension bridge main cables

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Abstract

In this research, focusing on the phenomenon that the general part of the suspension bridge main cable located in the mountainous/plain area corrodes unevenly toward the upper surface of the cable and aims to elucidate the corrosion mechanism. As a result of investigating of corrosion environment and a corrosion acceleration test using a simulated rope, it was found that there is a period on the rope surface where the corrosion rate of galvanization reaches the highest temperature range. It was also found that the water that tends to remain on the upper surface of the rope is heated during the day due to rainfall and dew condensation, and that only the upper surface may be unevenly corroded.

Keywords: suspension bridge cables; cable corrosion; corrosion environment investigation; accelerated corrosion test.

1 Introduction

Cables used in suspended bridges such as suspension bridges and cable-stayed bridges are lifelines that support the roads of the entire bridge, and long-term durability is required. In general, cables are composed of many high-strength steel wires, which are galvanized to improve corrosion resistance. However, in recent years, there have been reports of severe corrosion and breakage of cables and hanger ropes of suspended bridges, leading to collapse of the bridge in the worst case, and this has become a serious problem[1)-6)].

As a maintenance and repair measure, the cable dehumidification system that suppresses corrosion by removing water, which is a cause of corrosion, has been introduced in long suspension bridges. However, the introduction of the system is economically limited to long-span suspension bridges, and preventive maintenance management and effective countermeasures against cable corrosion and breakage on short/middle-span suspended bridges are still required.

In the disassembly corrosion investigation of the actual suspension bridge main cable is shown in Figure 1, it was confirmed that the corrosion on the upper surface tends to be severe and the soundness on the inner layer tends to be high[7)]. In addition, in the corrosion investigation of the general part of the main cable of the Yunoki Bridge (completed in 1971, Kochi Prefecture, Japan) is shown in Figure 2, the corroded part is most severe

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