

The Zinc Cartridge Method in the Republic of Indonesia インドネシア共和国国内における Zn カートリッジ工法

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Overview

The Zinc Cartridge method is a sacrificial anode cathodic protection type used to apply corrosion protection for steel bars in concrete structure. This electrochemical protection method suppresses the corrosion by flowing an electric protective current from the zinc anode to the rebar by using the potential difference without any external power supplies. The Zinc Cartridge method has two types called Surface and Insert type by installation locations. The Surface type is installed on surface of structures and the insert type is placed into the drilled core near the surface.

To use this method in Indonesia, a material procurement is one of the biggest challenges by considering complex procedure for import and delivery cost from Japan and the best solution for that is using local materials. On the other hand, since no field application in Indonesia, there is some concerns for using the local materials in terms of quality control and compatibility for the Zinc Cartridge method. So that the applicability of the local materials was evaluated.

This paper reports compatibility confirmation of Indonesian materials for the Zinc Cartridge method through the laboratory and field tests at Suramadu Bridge, or the longest-span bridge in Indonesia. The applicability of Indonesian materials for the Zinc Cartridge method was evaluated with several installation distances for the both of Surface and Insert types.

Zinc Cartridge Method with Indonesian Materials

1. Indonesian Materials

In the Zinc Cartridge method, there are two key materials for a sacrificial anode and a backfill material. Zinc is the component material for the anode, of course, and to make it act adequately as the sacrificial anode, the material quality is quite important to be maintained. And for the backfill material composed of a porous material with aqueous electrolyte solution and it is required to select the material and its mixture by adapting tropical environment in Indonesia.

2. Laboratory and Field test with Local Materials

The Zinc Cartridge method with Indonesian materials was tested in both of laboratory and field to verify its effectiveness.

Firstly in the laboratory testing was conducted with the RC beams re-enacted the chloride deterioration for both of the Surface and Insert types with installation distances.

After the laboratory testing, the field was conducted to confirm the effectiveness under practical conditions. The pile cap in the Suramadu Bridge was selected for the testing. The bridge is crossing the Madura Strait and subjected to severe environment of chloride attack. In the field test, the Surface and Insert type were installed with distances of 300 and 600 mm based on a steel arrangement and a deterioration level of the structure as shown in Photo-1. After the installation, a depolarization amount, widely used as an indicator of the corrosion inhibition effect, was measured continuously. And also, a remote monitoring system powered by solar panels and a titanium wire sensor measuring a potential difference of steel bars were applied for the measurement. Figure-1 shows the measurement results at the position indicated in Photo-1. As of writing this paper, all values with different installation types and distances are maintained within the target depolarization value for moderate corrosion protection level over 25 mV up to 440 days exposure period.

Hence, it has been concluded that also Indonesian local materials can be used for the Zinc Cartridge method to apply a corrosion protection for steel bars in concrete structures.

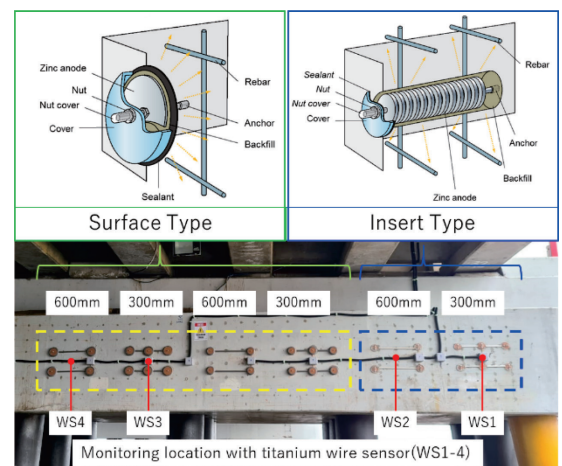


Photo-1 The field testing conditions

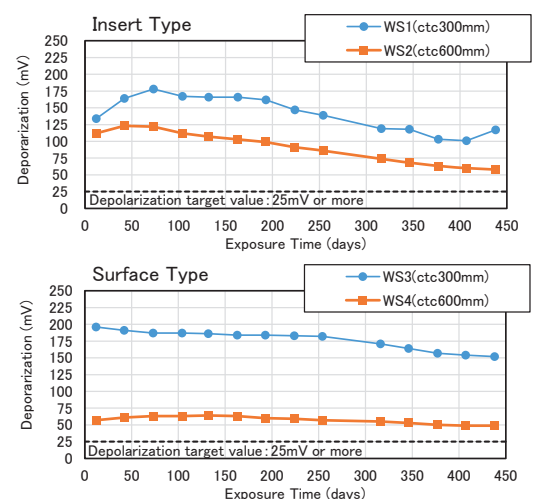


Figure-1 The measured depolarization amount

Key Words : Zinc Cartridge, Corrosion protection, Indonesia local material