Examination of Corrosion Durability Related to Installed Environments of Steel Bridges

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Abstract : Corrosion durability of steel bridges can be generally affected by atmospheric environments of bridge installation, since corrosion problem is related to environmental factors such as humidity, temperature, airborne salt, chemical components as SO_2, chlorides, etc. Thus, atmospheric environment condition should be measured to estimate corrosion condition of steel bridges as well as measurement of actual corrosion damage of structural members of steel bridge. Even in the same atmospheric environment, the corrosion environment may be different depending on the installation direction of structural members. In this study, therefore, atmospheric corrosion monitoring was conducted using atmospheric corrosion monitoring sensor, hygrometer, thermometer and airborne salt collection device to examine the corrosion durability of steel bridges. As a target steel bridge for corrosion durability monitoring, a cable-stayed bridge with truss steel members was selected. This cable-stayed bridge was located on the coast to connect the islands with the islands. Especially, atmospheric corrosion monitoring was carried out depending on structural direction of a cable-stayed bridge with truss type girders since it consists of structural members with various directions. For atmospheric corrosion monitoring, daily average electricity (corrosion current) was measured at each monitoring members to evaluate corrosion environments and corrosion level depending on structural members with various direction which have different corrosion environment in the same installed area. To compare corrosion durability connected with monitoring data depending on corrosion monitoring members, monitoring steel plate was additionally installed in same monitoring members. Monitoring steel plates of carbon steel was fabricated with dimension of 60mm width and 3mm thickness. And its surface was cleaned for removing rust on the surface by blasting, and its weight was measured before its installation on each structural members. After a 3 month exposure period on real atmospheric corrosion environment at bridge, surface condition of atmospheric corrosion monitoring sensors and monitoring steel plates were observed for corrosion damage. When severe deterioration of atmospheric corrosion monitoring sensors or corrosion damage of monitoring steel plates were found, they were replaced or collected. From 3month exposure tests in the actual steel bridge with various structural member with various direction, the rust on the surface of monitoring steel plate was found, and the difference in the corrosion rate was found depending on the direction of structural member from their visual inspection. And daily average electricity (corrosion current) was changed depending on the direction of structural member. However, it is difficult to identify the relative differences in corrosion durability of steel structural members using short-term monitoring results. After long exposure tests in this corrosion environments, it can be clearly evaluated the difference in corrosion durability depending on installed conditions of steel bridges. Acknowledgements: This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2017R1D1A1B03028755).

Keywords : corrosion, atmospheric environments, steel bridge, monitoring
Conference Title : ICCTSD 2018 : International Conference on Construction Technology and Sustainable Development
Conference Location : Bangkok, Thailand
Conference Dates : January 18-19, 2018