Nondestructive Evaluation of Corrosion Damage in Concrete Reinforcement Bars

K.K. Maddumahewa, N.P.A. Madusanka , and V.Sivahar

Corrosion of reinforcement bars which are embedded in concrete is one of the significant problems encountered in reinforced concrete structures. Despite the fact that concrete gives protection against corrosion, aggressive environmental conditions can lead to the corrosion of the reinforcement bars embedded in concrete. This may affect the strength of the concrete structures which leads to catastrophic failures during the service. Assessment of the extent of corrosion in embedded reinforcement bars nondestructively is the main objective of this research work. Grade M30 concrete mixture was used for the preparation of rectangular square blocks as testing samples. Concrete specimens with embedded steel bars of 10 mm, 16 mm, 20 mm and 25mm diameters have been subjected to accelerated corrosion using 'Impressed Current Technique' for different time periods. The ultrasonic velocities through the concrete samples with corroded reinforcement bars were measured against the corrosion time and the bar diameters. For these measurements Portable Ultrasonic Nondestructive Digital Indicating Tester (PUNDIT) was used. The weight loss due to corrosion of the reinforcement bars were measured subsequently, and those readings were evaluated against the ultrasonic velocities. The ultrasonic velocity decreases with the time and the extent of corrosion.