

Influence of Cathodic Protection on High Strength, Pre-Stressed Corroded Tendons

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Abstract : Cathodic protection (CP) is a technique commonly used to arrest corrosion of steel in infrastructure. However, it is not generally used on high strength, pre-stressed tendons due to the risk of hydrogen generation, leading to possible embrittlement. This paper investigates its use in such circumstances where the applied protection potential is varied to determine if CP can be safely employed on pre-stressed tendons. Plain steel tendons measuring 5.4 mm diameter were pre-stressed in timber moulds and embedded in sand/cement mortar, formulated to represent gunite. Two levels of pre-stressing were investigated (400MPa and 1200MPa). Pre-corrosion of 0% (control), 3% and 6% target loss of cross-sectional area was applied to replicate service conditions. Impressed current cathodic protection (ICCP) was then applied to the tendons at two levels of potential to identify any effect on strength. Instant-off values up to -950mV were used for normal protection with values of -1100mV or more negative to achieve overprotection. Following the ICCP phase, the tendons were removed from the mortar, cleaned and weighed to confirm actual percentage of corrosion. Tensile tests were then conducted on the tendons. The preliminary results show the influence of normal levels and overprotection of CP on the ultimate strength of the tendons.

Keywords : pre-stressed concrete, corrosion, cathodic protection, hydrogen embrittlement

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