腐蝕鋼筋混凝土構件裂縫之應力強度因子

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摘要

Taiwan, surrounded by the sea, has a subtropical island climate. Its annual average humidity is over 80%, contributing to a highly corrosive environment. For the structures, time, together with external environmental factors such as earthquakes and ground cave-ins, will make structures generate a great many fissures. Corrosion takes place in the steel bars as a result, causing the bonding effect between concrete and steel bars to wane. The expansion stress generated, far bigger than the tensile stress that the concrete material can resist, makes the concrete expand and then crack, eventually causing damage to the entire structure. In optical mechanics, reflection photoelastic method, and digital image processing technique which are used for stress measurement can provide the stress condition of the global surface of the tested object regarding a component sustaining a load practically. Moreover, combined with digital image processing and reflection photoelastic method, it may rapidly and accurately obtain the stress value of any data point in the measurement range to serve as both a basis for assessing repairs or long-term monitoring of the structure and important reference basis for residual bonding strength of corrosion structures. Hence, by employing digital reflection photoelasticity, this study aims to analyze the distribution of the stress generated surrounding the steel bar by the ferroconcrete component due to corrosion. Through a quantitative analysis of the stress distribution, it then proceeds to determine the expansion stress of concrete surrounding the steel bar during different corrosion stages. Then, combing the linear elastic fracture mechanics algorithm and expansion stress measurement, the model of residual strength and residual life for corrosion ferroconcrete is established.

關鍵字：Corrosion、ferroconcrete、Reflection Photoelasticity、Residual Strength/Life、Stress Intensity Factor.