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Fatigue and creep analyses of adhesively bonded anchorages for CFRP tendons

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Abstract

A bonded anchorage was investigated where a CFRP tendon was potted in a steel tube using an epoxy adhesive. Experimental creep tests on single lap joints and fatigue tests on anchorages, both with different adhesive thickness, were undertaken with failure occurring in the bond, close to the CFRP interface in both cases. The creep and fatigue response of the adhesively bonded CFRP tendon anchors were separately predicted using Finite Element analysis. A visco-plastic material model was used to predict the time to failure of the anchors in creep. The effect of creep damage was modelled by degrading the yield stress of the adhesive. Moreover, a bi-linear traction-separation cohesive zone model was incorporated at the adhesive-tendon interface when simulating the fatigue loading of the anchorages. A fatigue damage model based on the degradation of the cohesive elements was implemented to take into account the fatigue damage evolution. The predicted results were found to be in good agreement with the experimentally recorded data.

Keywords: finite element stress analysis, creep, fatigue, cohesive zone model.

1. Introduction

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