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Abstract

Two-Dimensional Digital Image Correlation (2D-DIC) technique was applied in this experimental study, to measure the steel-concrete bond strain at concrete surface. The bond strain was caused by tensile force when it was subjected to embed reinforced bar of concrete block in the pullout test. A series of digital images from surface of concrete were taken by a semi-professional digital camera (Nikon D80) during the loading. Acquired images were used as input data for two DIC software to calculate deformation. After verifying the displacement results by measured LVDT results, full-field strain components on concrete were calculated at various levels of forces. The results show the measurement of displacement and strain by this method are acceptable to a great extent.

Keywords: Concrete, Strain, Pullout test, Bond, Full-field measurement, Digital Camera, Digital image correlation, DIC

1 Introduction

The measurement methods in different fields of science have undergone significant developments because of recent advances in technology. One of these methods is Digital Image Correlation (DIC). It has numerous capabilities as compared to the previous methods of measurement. DIC has been increasingly acclaimed by many researchers recently [1,2,3]. In this technique, deformation of the specimen subjected to the load, is calculated precisely through comparison of digital images and mathematical operations.

A large number of investigations in material properties and behaviors are still carried out in the absence of these novel measurement methods [4,5]. Normally, the conventional methods are performed by merely measuring certain single point on specimen in order to find related displacement or strain. Therefore, applying these powerful optical techniques (2D-DIC) with the feature of full-field measurement not only helps to survey the overall behavior of test object, but may also lead to more discoveries in the studied field. Besides, it has economic justification when the numbers of tests are quite considerable.

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