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Experimental and theoretical investigation of prestressing steel strand subjected to tensile load

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Abstract

In this study, the response of prestressing strands to axial tensile load is investigated theoretically and experimentally. Experimental data acquisitions of prestressing strand subjected to tensile load are performed by means of strain gages and linear variable differential transformer (LVDT). Feyrer's and Costello's theories are used **for** theoretical calculation of strain and stress values occurred on wires of prestressing strand. Linear regression model is devised to predict tensile load-strain and tensile stress-strain relations by using experimental results. Results indicate that there is a powerful correlation between results obtained by experimental data and linear regression model.

Keywords: theory of wire rope, prestressing strand, strain gages, tensile testing of wire rope

1. Introduction

Prestressing strands are used in vast variety of practical applications such as hoisting member for lifting heavy load, precast concrete industry, post tensioning member in bridges, stadiums and railway infrastructures. It is mostly subjected to tensile load. The behaviour of strands subjected to tensile load has been of great deal of interest in many scientists. Investigation on wire rope dates back to 1950's. Love [1] presented general theory of bending and twisting of thin rods. Machida and Durelli [2] gave explicit expressions for the determination of axial force, bending and twisting moments in the helical wires and for the axial force and twisting moments in the core of a 7-wire strand subjected to axial and torsional displacements. Costello and Phillips [3] published a brief note to consider contact stresses between several

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