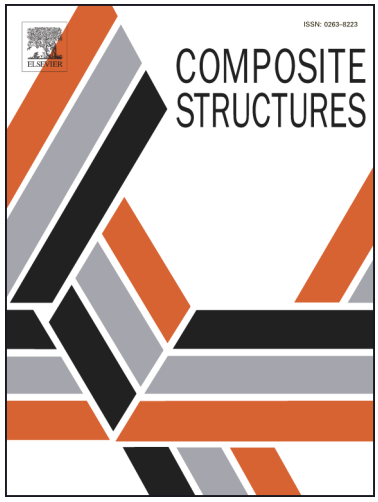

An experimental study on cracking and deformations of tensile concrete elements reinforced with multiple gfrp bars

Viktor Gribniak, Arvydas Rimkus, Lluis Torres, David Hui

PII: S0263-8223(18)31256-X
DOI: https://doi.org/10.1016/j.compstruct.2018.06.059
Reference: COST 9853

To appear in: *Composite Structures*

Received Date: 4 April 2018
Revised Date: 16 May 2018
Accepted Date: 16 June 2018

Please cite this article as: Gribniak, V., Rimkus, A., Torres, L., Hui, D., An experimental study on cracking and deformations of tensile concrete elements reinforced with multiple gfrp bars, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.06.059

AN EXPERIMENTAL STUDY ON CRACKING AND DEFORMATIONS OF TENSILE CONCRETE ELEMENTS REINFORCED WITH MULTIPLE GFRP BARS

Viktor Gribniak [1], Arvydas Rimkus [1,2], Lluis Torres [3], and David Hui [4]

[1] *Laboratory of Innovative Building Structures, Vilnius Gediminas Technical University, Vilnius, Lithuania*
[2] *Laboratory of Composite Materials, Vilnius Gediminas Technical University, Vilnius, Lithuania*
[3] *Advanced Materials and Analysis for Structural Design (AMADE), University of Girona, Girona, Spain*
[4] *Department of Mechanical Engineering, University of New Orleans, New Orleans, USA*

Abstract

Although different setups have been developed for analysis of the serviceability properties (cracking and deformations) of reinforced concrete elements, tensile tests are remaining the most often used testing layouts. Recent studies, however, have revealed noticeable limitations of the traditional tests of concrete prisms reinforced with a centre bar. The essential aspect responsible for adequate interpretation of the test outcomes could be addressed to inter-correlation of the basic cross-section parameters, i.e. bar diameter, reinforcement ratio, and cover depth. Furthermore, the test equipment has a limited possibility comparing outcomes of the tensile prisms reinforced with bars made of steel and fibre reinforced polymer materials. To solve these problems, a special equipment for the anchorage of multiple bars has been developed. This manuscript presents and discusses the tests results of 16 prismatic specimens reinforced with steel and glass fibre reinforced polymer (GFRP) bars provided by different producers. At the same deformation range of reinforcement, almost identical crack distances are characteristic of the prisms reinforced with steel and GFRP bars with similar axial stiffness. This result enables formulating a hypothesis that crack spacing in tensile elements of equivalent axial stiffness is predominantly dependent on geometry of the concrete and, particularly, on the cover depth.

Keywords

Reinforced Concrete; Glass fibre reinforced polymer (GFRP) bars; Mechanical properties; Mechanical testing; Cracking; Deformations