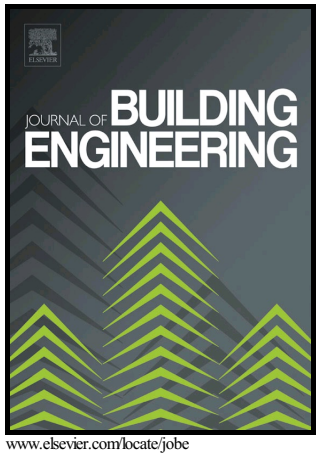
FEM based prediction of 3D woven fabric reinforced concrete under mechanical load

Rajesh Mishra



www.elsevier.com/locate/jobe

PII: S2352-7102(17)30414-X
DOI: https://doi.org/10.1016/j.jobe.2018.03.003
Reference: JOBE425

To appear in: *Journal of Building Engineering*

Received date: 25 July 2017
Revised date: 12 March 2018
Accepted date: 13 March 2018

Cite this article as: Rajesh Mishra, FEM based prediction of 3D woven fabric reinforced concrete under mechanical load, *Journal of Building Engineering,* https://doi.org/10.1016/j.jobe.2018.03.003

FEM based prediction of 3D woven fabric reinforced concrete under mechanical load

Rajesh Mishra*

[1]*Department of Material Engineering, Faculty of Textile Engineering, Technical University of Liberec, Studentska, Liberec-46117, Czech republic*

E-mail: rajesh.mishra@tul.cz

Abstract

This investigation deals with the suitability of 3D woven fabrics of various constructions as reinforcement in concrete. A finite element modeling (FEM) approach was adopted to predict maximum deformation, equivalent stress, and ductility with different types of 3D woven fabrics. Preliminary predictions were made with unimpregnated structures, followed by simulation of slabs impregnated with M40 concrete matrix. Warp interlock fabric provided much more ductility than the other two fabrics. Maximum deformation was observed for warp interlock fabric reinforced concrete slab and minimum deformation was observed for orthogonal fabric reinforced samples when equal loads were applied. Concrete reinforced with angle interlock fabric showed intermediate deformation as compared to those of orthogonal and warp interlock fabric based samples. All the reinforced concrete slabs exhibited much higher ductility as compared to conventional steel reinforced concrete. 3D woven fabric reinforced slabs and columns exhibit lower stiffness when compared to steel reinforced structures. The validation of predicted results with experimental samples was found to be accurate with a minimal error of prediction.