21st International Conference **ENGINEERING MECHANICS 2015**
Svratka, Czech Republic, May 11 –14, 2015
Paper **#147, pp. 232–233**

Helical Reinforcements Can Be Replaced with Glass Reinforcements

Luboš Podolka

Institute Department of Civil Engineering, University of Technology and Economics in Czech Budejovice, Street Circular No. 517/30; 370 01, Czech Budejovice; CZ,

podolka@mail.vstecb.cz

Keywords: helical reinforcement, glass reinforcement

Abstract: The article focuses on the practical use of composites able to replace helical stainless steel reinforcements, i.e. composites glued into a groove or into a borehole. The paper describes experiments performed with elements reinforced by glass and helical stainless steel reinforcements in the laboratories of the Klokner Institute of the Czech Technical University in Prague (KI CTU). The experiments were subsequently evaluated and compared with a mathematical model created using the ATENA software and technical information provided by the company HELIFIX CZ s.r.o.

Introduction

Strengthening and reconstructing of constructions is a subject of extensive research focused on possible applications of new technologies or innovations of the existing ones. New materials are being studied that should be used in order to improve building durability while effectively using reconstruction costs in comparison to the costs of new constructions, including maintenance costs. That is why experimental or in situ load tests are performed on constructions in order to specify applicability of new materials. The tests are subsequently evaluated and different methods of construction strengthening are compared in terms of the appropriateness of a method, effectiveness of a reconstruction plan, rehabilitation or a comprehensive renovation of a building. The article focuses on the practical use of composites able to replace helical stainless steel reinforcements, i.e. composites glued into a groove or into a borehole. The paper describes experiments performed with elements reinforced by glass and helical stainless steel reinforcements in the laboratories of the Klokner Institute of the Czech Technical University in Prague (KI CTU). The experiments were evaluated and compared with a mathematical model created using the ATENA software and technical information provided by the company HELIFIX CZ s.r.o.

Description of the experiments performed in the KI CTU laboratories

The elements were three little beams made of C 30/37 XC1 concrete the dimensions of which were 150 x 150 x 200 mm. An 8x10 mm groove was made on one side of the beams and a Φ5 mm glass reinforcement was put in the groove.

Fig. 1: View of the sample placed in a press and detail of the joint damaged by a shear force.

Verification of the experimental data on a model created using the Atena software

The above described experimental elements were modelled using the ATENA software so that we could observe the behaviour of the element in the point of the shear-loaded joint, i.e. the transfer of forces from the reinforcement into both concrete elements joined by the glass reinforcement in the groove or the borehole.

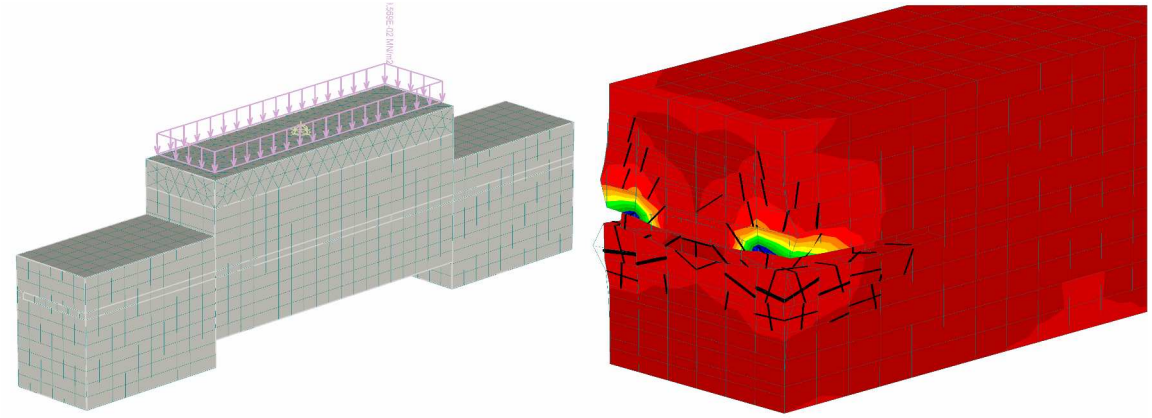

Fig. 2: View of the model created using the ATENA software and detail of the damage on the model in the point where reinforcements were put into the groove.

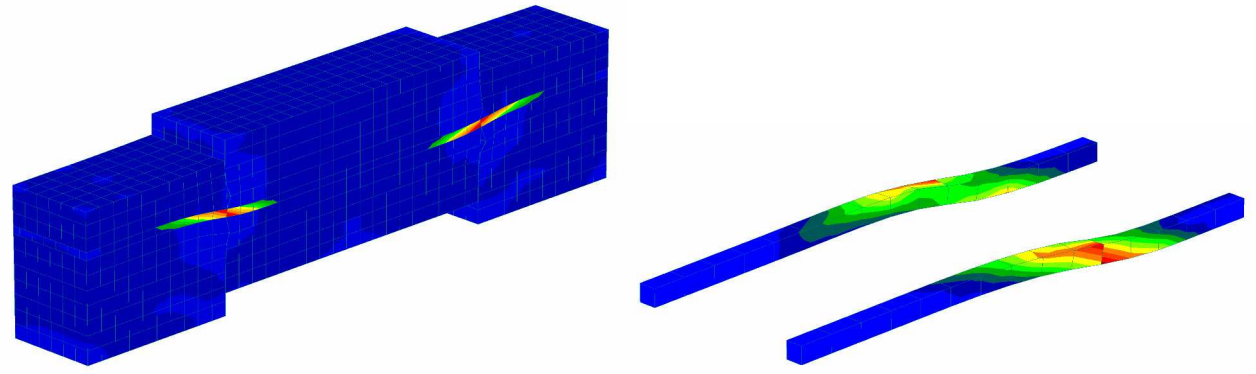

Fig. 3: View of tension isolines in a concrete elements and a glass reinforcement.

Bearing capacity of a pair Φ6 mm Helifix rods in the groove would be : 2 x 7.52 = 15.04 kN (1)
Considering the safety factor s = 1.6 x 1.2 = 1.92 (2)
32 / 1.92 = 16.6 kN (3)

Summary

After having compared the results of the experiments with the bearing capacities declared in the data sheets provided by the company Helifix CZ s.r.o., we can state that glass rods are able to replace helical reinforcements. That can lower the costs needed for rehabilitation of typical panel joint failures.

Acknowledgement: This paper was supported by the company STADO CZ, s.r.o. (www.stado.cz)

References

[1] STADO CZ, s.r.o. data sheets

[2] Helifix CZ, s.r.o. data sheets