53rd CONFERENCE ON EXPERIMENTAL STRESS ANALYSIS pp. 20–21
Český Krumlov, Czech Republic, June 1–4, 2015

Impact of Increased Temperature on Cohesiveness of Textile Glass Reinforcement with UHPC Matrix

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Abstract: The contribution is focused on partial research results of thin elements with UHPC matrix reinforced by glass textile reinforcement. A set of six test samples with size of 1100 × 120 × 20 mm were produced in laboratories of the Klokner Institute. Using accompanying tests the material characteristics of the concrete matrix and the glass textile reinforcement were determined. This reinforcement is modified by a protective epoxy surface layer, co called coating. The reason of the coating is to prevent a formation and a development of corrosive processes on the reinforcement texture. The samples were tested at four-point bend test in a thermal chamber. The thermal chamber is a space where it is possible to gradually regulate the temperature up to 75 °C under a constant value of a loading. In the course of the temperature increasing is using a measuring unit measured mainly bend in the middle of the span in time and the course of an inner and outer temperature. The impact of the increased temperature on the cohesiveness of the non-conventional reinforcement and the UHPC matrix is evaluated from the monitored data.

Keywords: UHPC Matrix; Textile Glass Reinforcement; Non-Conventional Reinforcement.

1 Introduction of Experiment

The experimental part describes the progress of the experiment itself. Before the description of the experiment it is necessary to say that the manufactured samples with the size of 1100 × 120 × 20 mm were at the lower edge reinforced by 2D glass textile reinforcement wit fineness of 2400 TEX (6 twigs). This reinforcement was examined before because of the determination of its mechanical properties [1, 2]. It was discovered that tensile strength of reinforcement was about 2200 MPa, modulus of elasticity approximately 75 GPa and relative reshaping at the collapse achieved roughly 2.9 %. During the manufacture of the test samples the additional samples were made, too. These additional samples were experimentally tested in three-point bend test, in compression test and there was also tested modulus of elasticity. From the performed tests it was calculated that the compression strength of concrete determined at parts of 40 × 40 × 160 beams was about 118 MPa, the tensile strength at bending was approximately 18.5 MPa and the modulus of elasticity was tally with 47.1 GPa. These defined properties are used for subsequent modelling of the experiment that is going to be included in the full version of the paper. The arrangement of the test is possible refer to as: Fig. 1.

2 Conclusion

Within a progressive heating there was an increase of bend at the tested samples that is possible to ascribe to the loss of cohesion between the glass textile reinforcement modified with a coating and the concrete UHPC matrix. This occurrence should be strictly taken into consideration in designs of façade and roof panels because the tested temperature 75 °C corresponds to the temperature on the surface in summer months. This phenomenon was subsequently transferred into computer interface where the gained experimental results were compared with the performed numeric model. This model will also be used in follow-up solution stages of the issues.

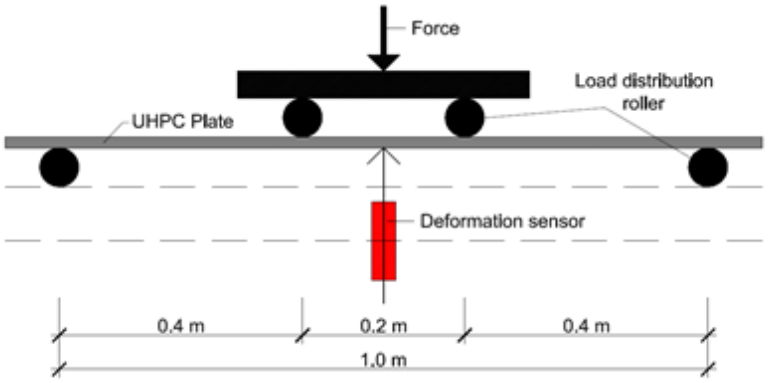

Fig. 1: Arrangement of four-point bend test.

Acknowledgement

This work was done in the Klokner Institute within the support of GAČR 1312676S and SGS14/171/OHK1/2T/31. The samples of the textile glass reinforcement were manufactured and supplied by V. FRAAS firm, Germany.

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