FIBRE-REINFORCED COMPOSITES BASED ON CFRP AND GFRP USED AS THE EXTERNAL BONDED REINFORCEMENT FOR THE STRENGTHENING OF STEEL AND TIMBER BEAMS

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Summary. The paper is focused on the problems of the increase of load-carrying capacity of steel and timber beams by the strengthening using external reinforcement based on fibre-reinforced polymers, for the reasons of the load increasing, in the case of reconstructions for example. The strengthening of steel and timber beams using external reinforcement based on carbon-fibre-reinforced and glass-fibre-reinforced polymers (CFRP and GFRP) appears the advanced way. Because of the values of the Young’s modulus of elasticity of carbon and glass fibres compared with steel and timber, the usage of the carbon-fibre-reinforced polymers (CFRP) for the strengthening of steel beams and the usage of the glass-fibre-reinforced polymers (GFRP) for the strengthening of timber beams are the most effective possibilities. In this paper the brief information on some results of the research oriented to the analysis of the resistance of steel beams strengthened by external fibre-reinforcement and timber beams strengthened by external glass-fibre-reinforcement will be presented, in comparison with other methods of the strengthening, e.g. using high-strength materials. Respecting the practical usage the analysis is directed towards the strengthening by externally bonded lamellas based on CFRP and GFRP. For the solution of this problem the theoretical and experimental methods are utilized. The paper shows the following particular results: (i) the results of the comparative studies to choose the available beam cross-sections for subsequent numerical analyses and experimental investigations, (ii) the results of pilot loading tests and the results of material tests to obtain actual parameters for subsequent numerical modelling, (iii) the results of numerical FEM models and their verification with the respect to the test results. The research is realized in the co-operation of two workplaces: Department of Metal and Timber Structures of Faculty of Civil Engineering at Brno University of Technology and PREFA KOMPOZITY Corp., which deals with the research and development of the fibre composites, among others.