

Research of the Behavior of Composite Panels under Impact Loads and the Creation of Reliable Protection of Armored Vehicles

Gots Volodymyr^{1,a*}, Makarenko Valeriy^{2,b}, Berdnyk Oksana^{1,c}, Otrosh Yurii^{3,d} and Feshchuk Yurii^{4,e}

¹Kyiv National University of Construction and Architecture, 31, Povitroflotskyi avenue, Kyiv, Ukraine, 03037

²Kherson National Technical University, 24, Beryslavska str., Kherson, Ukraine, 73008

³National University of Civil Defence of Ukraine, 94, Chernishevskaya str., Kharkov, Ukraine, 61023

⁴Institute of Public Administration and Research in Civil Protection, 18, Vyshhorodska str., Kyiv, 04074, Ukraine

^agots.vi@knuba.edu.ua, ^bmakarenko.vd@knuba.edu.ua, ^cberdnyk.oyu@knuba.edu.ua, ^dotrosh@nuczu.edu.ua, ^efeshchuk2810@ukr.net

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Abstract. The problem of protecting people and increasing the safety of technical equipment in situations of combat, emergency and other unforeseen extreme situations caused by a mechanical blow has always been, is and will be relevant. In the material-related aspect, the problem of developing shock-resistant materials is now transformed into the requirements of the present to create multifunctional composite panels and protective structures on their basis. Due to the fact that the experimental achievement of the required durability and reliability of products is a complex technical task (the solution of which requires large energy and financial resources), an important role is obtained by simulating the processes occurring during their operation, which gives recommendations on the correct choice of materials developed composites. In this work, the behavior of composite materials that are in a closed space under the influence of high-speed dynamic load is studied. The purpose of the work is to develop composite materials for light shockproof protective structures and to determine the nature of the packaging, the features of the structure and the level of their physical and mechanical properties. Conducted calculations of economic effect on the results of research.

1 Introduction

The problem of protecting people and increasing the safety of technical means in combat, emergency and other unpredictable extreme situations caused by mechanical impact has always been, is and will be relevant [1, 2]. The history of solving both theoretical and practical aspects of this problem illuminates dozens of world-famous scientists in every leading country in the world [3, 4]. In the material science aspect, the currently identified problem of developing impact-resistant materials is transformed into today's requirements for the creation of multifunctional composite panels and protective structures based on them [5, 6]. The above phenomena and associated stress-strain behaviour inevitably occur in the process of moulding of the composite products. However, their value, nature, time of occurrence and dynamics of growth can be fully controlled and regulated. [7, 8]. To carry out research in accordance with the task, an extreme experiment was used, on the basis of which an equation model was created that describes the depth of the holes formed as a result of a ballistic impact [9, 10]. Formulas for the amplitude of forced harmonic longitudinal oscillations of reinforced concrete and fiber concrete columns with fixed edges have been obtained in an analytical form [11, 12]. The main parameter of the description is the depth of penetration of the striker into the layered panel, without taking into account the trajectory of the striker in the composite material, which is expressed in linear units (mm).