UDC 692.526:624.012.35

WOODEN-CONCRETE FLOORS AND THE PROBLEM OF JOINT WORK OF WOODEN AND REINFORCED CONCRETE ELEMENTS OF STRUCTURES

Anastasia Myslytska, Postgrad. Stud., **Mykola Frolov**, PhD Stud.,
Mykola Savytskyi , Dr. Sc. (Tech.), Prof.
State Higher Education Institution
"Prydniprovska State Academy of Civil Engineering and Architecture"

Problem statement. The connection of a concrete slab and wooden beams is very important, therefore, the joint operation of the composite floor depends on the correct choice of the type of connection.

Purpose of the study. When a concrete slab rests freely on a beam, then the friction between the materials is considered insignificant, in this case, under load, the beam and the slab will work separately, since slippage will occur between them. Slippage can be reduced by installing connectors between timber and concrete. In turn, the prevention of slipping inevitably leads to a decrease in vertical movement. Thus, by connecting two elements together, their combined bending stiffness can be increased. This phenomenon of thes two components working together is known as composite action [1; 2].

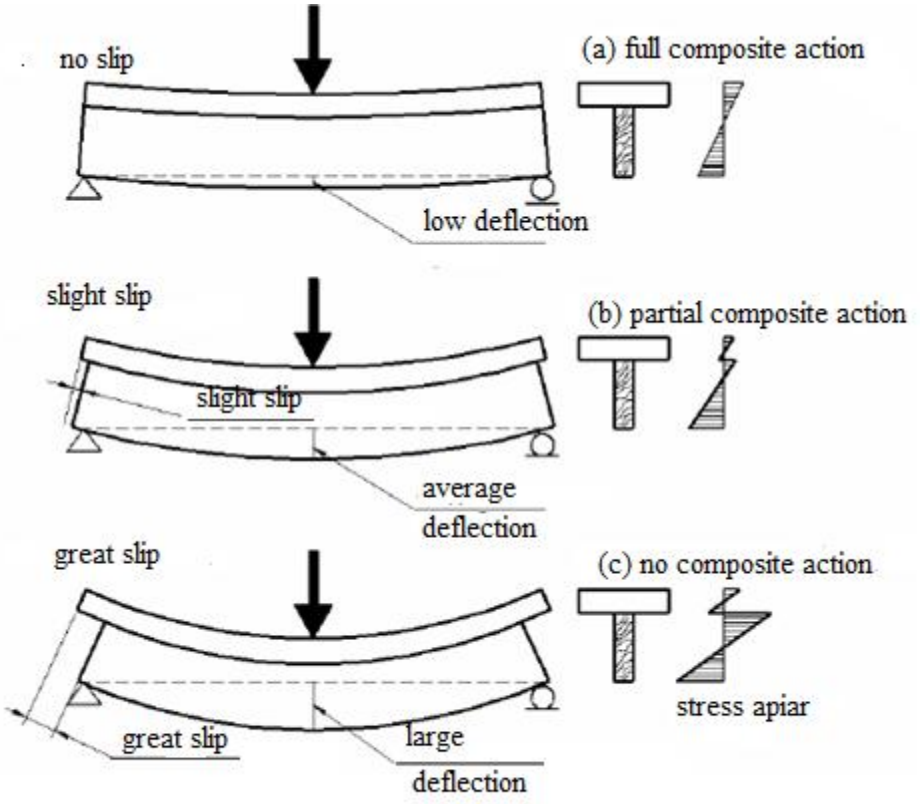

Fig. 1. Types of composite actions

Of course, the degree of composite action increases with the stiffness of the joint. The degree of composite action may differ from composite action without bonding, full composite action for an infinitely rigid bond.

The higher cross-section of the composite member compared to the cross-sections of its individual sub-members results in a longer internal moment. Consequently, the normal stresses resulting from an arbitrary external load are reduced within the structure. For a very rigid connection, the result is a state in which the concrete slab is mainly subjected to compressive

forces, while the tensile stresses are concentrated in the timber part (Fig. 1). Thus, the materials of the composite section are used as efficient as possible [3].

It should be emphasized that the correlation between the flexural stiffness of a composite structure, often referred to as effective flexural stiffness, and the stiffness of a joint is not linear.

Main results. Thus, it can be argued that an important part of any composite structure is the connection between its elements. This component is usually called a connecting element, its main function is to connect the component parts of the section and work in shear. Low load-bearing capacity of the connecting element can lead to destruction of the entire composite structure. The stiffer the connection between the slab and the beam, the higher the bearing capacity of the connecting element must be, since the effect of shear forces increases with the stiffness of the connection. At the same time, the low bearing capacity of the connecting element can be compensated by increasing their total number.

The connecting element, in addition to ensuring the rigidity of the composite parts and high bearing capacity, must have the ability of elastic-plastic deformation under the load exceeding its bearing capacity. The ability of elastic-plastic deformation of the connecting element allows to warn of the inevitability of the destruction of the composite structure. Since the destruction of concrete in compression and wood in bending is considered brittle, the most desirable option for the loss of the bearing capacity of a composite section is considered to be the destruction of the structure along the connecting elements with a short plastic deformation. This type of failure will lead to a slow increase in the deflection of the composite structure prior to failure [4].

The bearing capacity, joint stiffness and elastic-plastic deformation of the bearing element are determined by symmetric or asymmetric shear tests.

Conclusions. Based on the analysis of the means of ensuring the joint operation of structural elements of different physical and mechanical characteristics, it was found that an important part of any composite structure is the connection between its elements. The combination of constituent elements in the structure is performed by the connecting element, its main function is to work in shear. Low load-bearing capacity of the connecting element can lead to destruction of the entire composite structure. The more rigid the connection between the slab and the beam, the higher the bearing capacity of the connecting element must be, since the influence of landslide forces increases with the stiffness of the connection.

References

1. EN 1995-1-1:2004+A 1:2008 (E). Eurocode 5: Design of timber structures. Part 1-1: General-Common rules and rules for buildings.

2. Мельников Ю. О. Виснаження несної здатності об’єднаних деревобетонних балок. *Праці Сиб. АДУ*. 1968. № 1. Pp.75−79.

3. Deam B., Fragiacomo M. and Buchanan A. Connections for composite concrete slab and LVL flooring systems. Materials and Structures. 2008, vol. 41, pp. 495–507. URL: DOI 10.1617/s11527-007-9261-x.

4. Lukaszweska E., Ghelfi C. and Guarini N. Experimental tests of nail and screw connectors fortimber concrete composite deck. *International Journal of Civil Engineering and Technology (IJCIET).*Vol. 10, iss. 03, March 2019. ISSN Online: 0976-6316.