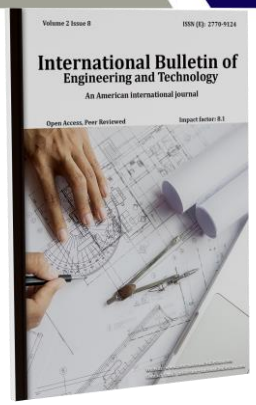

METHOD OF REINFORCING REINFORCED CONCRETE PLATE WITH CARBON FIBER FABRIC

Tursunov Sherzod Axtamovich
f.d. (PhD)
Xo‘jamurotov Shokir
Master's student
Samarkand State Architecture and Construction University named after Mirzo Ulugbek (SamSACU). Uzbekistan.
Tel. 91-708-70-90 universal-constructor@mail.ru;
Tel. 91-628-19-99: xojamurodovshokir858@gmail.com
https://doi.org/10.5281/zenodo.7935452

Abstract: This article shows how to reinforce a hollow core concrete slab with carbon fiber cloth. Data on the implementation of this amplification method are given.

Аннатотсия: В этой стате показано усиление многопустотной железобетонной плиты тканю из углеродного волокна. Приведены данные о реализатсии данного метода усиления.

Annatotsiya: Ushbu maqolada ko’p bo’shliqli temir beton orayopma plitasini uglerod tolali mato bilan kuchaytirish ko‘rsatilgan. Ushbu kuchaytirish usulini amalga tadbiq qilish bo’yicha ma’lumotlar keltirilgan.

Key words: Reinforced concrete cover plate, carbon fiber cloth, physical decay, polymer solution.

Introduction:

To date, ensuring safety and reliability of buildings and structures, as well as their separate structures, both at the construction stage and at the stage of use, is one of the main issues, and many researchers and engineers pay great attention to this issue. Such interest is due to the increased need to ensure its reliable operation.

Replacement of defective reinforced concrete coverings of buildings under reconstruction is very costly or impossible at all. Damage to reinforced concrete sandwich panels is associated with corrosion of fittings due to insufficient protective layer, excessive loads and manufacturing errors.

Recently, prefabricated reinforced concrete slabs have been widely used in the construction of our country. The reason for this is the development of the construction industry and the introduction of new construction technologies into our country. Currently produced reinforced concrete slabs can be cut to any size from 1 m to 12 m. Therefore, the connection node of these reinforced concrete slabs with the seismic belt is very different from the nodes of the previous slabs [2]. In addition to the dimensions of the produced reinforced concrete slabs, its strength and number of load-bearing wires may vary. If, as a result of the re-equipment or modernization of the buildings where these reinforced concrete slabs are used, as a result of the increase in the loads acting on the intermediate slabs, it is appropriate to carry out strengthening and strengthening works. When changing the function of the room, it may be necessary to take measures to increase the load-bearing capacity of the floors. In some cases, if it is necessary to install heavy equipment on the intermediate floor, a reinforced concrete slab reinforcement project will be developed.

Strengthening of reinforced concrete slabs is carried out in order to restore their integrity, performance characteristics and, in particular, load-bearing capacity. This is done during reconstruction of buildings, re-planning, construction of additional floors or when obvious defects are detected by visual inspection.

There are several ways to strengthen reinforced concrete slabs, the most effective method of which is the method of strengthening a metal sheet in a polymer solution on the lower part of a reinforced concrete slab [5]. In addition to being economically efficient, this method has several advantages. These include the low cost of labor during the reconstruction process, the constant size of the room, the speed of work and the fact that the building does not affect the use of the building, and many other advantages.

The main part.

In the method of strengthening a metal sheet in a polymer solution from the lower part of a reinforced concrete plate, not only steel, but also carbon fiber materials [3], which are widely distributed today and have a much higher strength than steel, are considered to be a convenient and compact solution. (Table 1).

Table 1. Comparing the effectiveness of reinforcing multi-cavity reinforced concrete slabs with carbon fiber fabric and other methods.

T/r	Name of material	density ,g\sm^3	Durability M\Pa	Thickness mm	The cost of reinforcing a 1 m slab USD($)
1	Carbon fiber fabric (CWrap Fabric 230)	1.79	4900	0.128	13
2	Carbon fiber fabric (CWrap Fabric 530)	1.8	4900	0.293	10.7
3	Carbon fiber fabric (SWrap CarbonPlate 12)	1.4	3100	1.2	47
4	Carbon fiber fabric (SWrap CarbonPlate 14)	1.6	3100	1.4	42.7
5	Metal sheet	7.87	235	1,0	15

It can be seen from Table 1 that the method of reinforcing material 2, i.e., the reinforcement of carbon fiber fabric (CWrap Fabric 530) in a polymer solution, on the lower part of the reinforced concrete plate, turned out to be economically effective compared to other methods.

The following set of basic measures are required to strengthen the multi-cavity sandwich plate by gluing carbon fiber cloth in a polymer solution to its lower part: preparing the reinforced concrete sandwich to strengthen the lower part; determine the surface of the

adhesive; treatment of the specified surface with polymer cement; gluing carbon fiber fabric and again treated with polymer cement (Fig. 1).

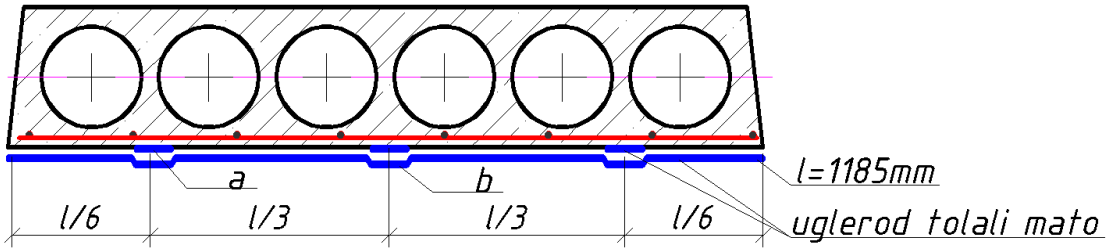

Figure 1. Reinforcement method of reinforced concrete slab with carbon fiber fabric.

a- gluing of carbon fiber fabric in the longitudinal direction, b- gluing of carbon fiber fabric in the transverse direction.

Reinforcement by gluing carbon fiber fabric in a polymer solution to the bottom of the multi-cavity intermediate plate is glued to the lower surface of the plate in the longitudinal and transverse direction in a polymer solution (Fig. 2). Carbon fiber is used in a polymer solution for fabric bonding, and the polymer solution is diluted with water before use according to the instructions.

A 60 mm carbon fiber fabric is attached to the plate in a 500 mm step. 3 rows of carbon fiber fabric are glued in the longitudinal direction of the plate.

Figure 2. Bonding process of carbon fiber fabric

The technical characteristics and main advantages of carbon fiber material are as follows:

Carbon fiber consists of polyacrylnitrite pretreated at high temperatures (up to 3-5 thousand degrees). Due to its technical properties, carbon fiber is used for external reinforcement and reinforcement. To date, carbon fiber is one of the strongest composite materials. Although this material is 30% lighter than aluminum and 75% lighter than steel, its

tensile strength is four times higher than the best grades of steel. Considering the above characteristics, carbon fiber can be considered as a universal material. Adapted for use in different climate zones.

Conclusion:

The use of the reinforcement method by gluing the carbon fiber fabric in a polymer solution to the bottom of the multi-cavity cover plate has the following advantages:

- high waterproofing properties due to the glossy surface of carbon fiber, as a result of which it does not react with water;
- high adhesion to various surfaces;
- resistant to corrosion;
- lightness - this characteristic is that the reinforcement system does not cause additional loads to the building. Despite the fact that the weight of carbon fiber is much less than steel, it has a very high strength;
- it helps to reduce labor costs if carbon fiber is used to strengthen the frame only with manual labor;
- carbon fiber is a universal material that can be used to strengthen constructions of any complexity and configuration, including round and angular surfaces;
- carbon fiber is an environmentally friendly material for reinforcement. In addition, this material is fire resistant.

Carbon fiber materials are successfully used for repair and strengthening of columns, beams, beams and other constructions made of reinforced concrete, wood, metal, brick and other materials.

References:

1.Golshev A.B., Bachinskiy V.Ya., Polishuk V.P., Xarchenko A.V., Rudenko I.V. “PROYEKTIROVANIYE JELEZOBETONNX KONSTRUKSIY”, spravochnoye posobiye, izdatelstvo “Budivelnik” Kiyev 1985 g. 496 str.

2.Malganov A.I., Plevkov V.S., Poliщuk A.I., “VOSSTANOVLENIYe I USILENIYe STROITELNЫX KONSTRUKSIY AVARIYNЫX I REKONSTRUIRUYMX ZDANIY” atlas sxem i chertejey, Tomsk 1990 g, 320 str.

3. https://gk-innova.ru/usilenie-zhb-konstruktsij-uglevoloknom

4. Polskoy P.P., Mailyan D.R. Kompozitnye material - kak osnova effektivnosti v stroitelstve i rekonstruksii zdaniy i soorujeniy // Injenernыy vestnik Dona, 2012, №4 (chast 2) .

5. Sh. A, T. ., & Sh, X. . (2023). Determination of an Effective Method as a Result of Calculation Methods of Reinforcement of Reinforced Concrete Plate. Nexus : Journal of Advances Studies of Engineering Science, 2(4), 151–156. Retrieved from https://innosci.org/JISES/article/view/1190

6. Khasanov, A., & Tursunov, S. (2019). RESEARCHES OF JOINT WORK OF BEAMS AND SOIL BASES. Theoretical & Applied Science, (11), 401-406.

7. Хасанов, А. З., Турсунов, Ш. А., & Турсунова, Д. Э. (2018). Экспериментальные и теоретические исследования параметров жесткости грунтов при сжатии и изгибе. Web of Scholar. 6 (24), 2.

8. Хасанов, А. З., Турсунов, Ш. А., & Турсунова, Д. Э. (2018). ОПЫТНОЕ ИЗУЧЕНИЕ БАЛКИ В УПРУГОМ ОСНОВАНИИ В ПРЯМОМ ЛОТКЕ. In Техноконгресс (pp. 25-29).

9. Ш. А, Т., & Ш.Х. (2023). Определение эффективного метода в результате расчетных методов усиления железобетонной плиты. Nexus: Журнал передовых исследований инженерных наук, 2(4), 151-156. Извлечено из https://innosci.org/JISES/article/view/1190.
10.Khaitov Maruf Bolikulovich, & Matyokubov Bobur Pulatovich. (2022). HEAT-SHIELDING QUALITIES AND METHODS FOR ASSESSING THE HEAT-SHIELDING QUALITIES OF WINDOW BLOCKS AND THEIR JUNCTION NODE WITH WALLS. Web of Scientist: International Scientific Research Journal, 3(11), 829–840. https://doi.org/10.17605/OSF.IO/CB57D
11.Матёкубов, Б. П., & Саидмуродова, С. М. (2022, August). КАМ СУВ ТАЛАБЧАН БОҒЛОВЧИ АСОСИДАГИ ВЕРМИКУЛИТЛИ ЕНГИЛ БЕТОНЛАР ТЕХНОЛОГИЯСИНИ ҚЎЛЛАНИЛИШИ. In INTERNATIONAL CONFERENCES (Vol. 1, No. 15, pp. 103-109).
12.Matyokubov, B. P., & Saidmuradova, S. M. (2022). METHODS FOR INVESTIGATION OF THERMOPHYSICAL CHARACTERISTICS OF UNDERGROUND EXTERNAL BARRIER STRUCTURES OF BUILDINGS. RESEARCH AND EDUCATION, 1(5), 49-58.
13.Inatillayevich, G. O., & Pulatovich, M. B. Analysis of Underground Projects of Energy Efficient Low-Rise Residential Buildings Built on Highly Flooded Soilshttps. doi. org/10.31149/ijie. v4i9, 2156
14.Egamova, M., & Matyokubov, B. (2023). WAYS TO INCREASE THE ENERGY EFFICIENCY OF BUILDINGS AND THEIR EXTERNAL BARRIER STRUCTURES. Eurasian Journal of Academic Research, 3(1 Part 1), 186-191.
15.Саломович Т. Е., Самариддинович С. У. и Пулатович М. Б. (2023). Улучшение теплосберегающих свойств наружных стен кирпичных зданий. Международный журнал культуры и современности, 28, 15-20. Извлечено из https://ijcm.academicjournal.io/index.php/ijcm/article/view/509