

Solovyov V.V., Ph.D., professor, Head of the Department of Chemistry and Physics, Usenko D.V., MPhys, Senior lecturer Department of Chemistry and Physics, Settou Hajar, student of group 202-Bi, Imhanwa Meereelin Esegboriah, student of group 102-Bi National University «Yuri Kondratyuk Poltava Polytechnic», Poltava, Ukraine

COMPOSITE MATERIALS USE TO BRICK STRUCTURES REINFORCEMENT

One of the most developed and effective modern materials used in repairs, restoration and reinforcement today is considered to be the technology of the international concern Sika [1]. Traditionally, to reinforce brick walls and piers, metal structures (rolled, sheet steel, meshes) with welded or bolted joints are used. When comparing the properties of metal and, for example, carbon (more commonly used) composite reinforcement elements, the latter have significant advantages: a significantly lower ratio of dead weight to strength, almost complete corrosion resistance, no length restrictions, simplified, cheaper and faster installation, greater fatigue strength [2]. The only disadvantages are tensile work, load distribution only along the fibers, the need for thermal protection and the high cost of the material. On figure 1 shows diagrams [3], illustrating, first of all, the strength advantages of composite materials over steel ones. In addition, carbon composites have greater rigidity.

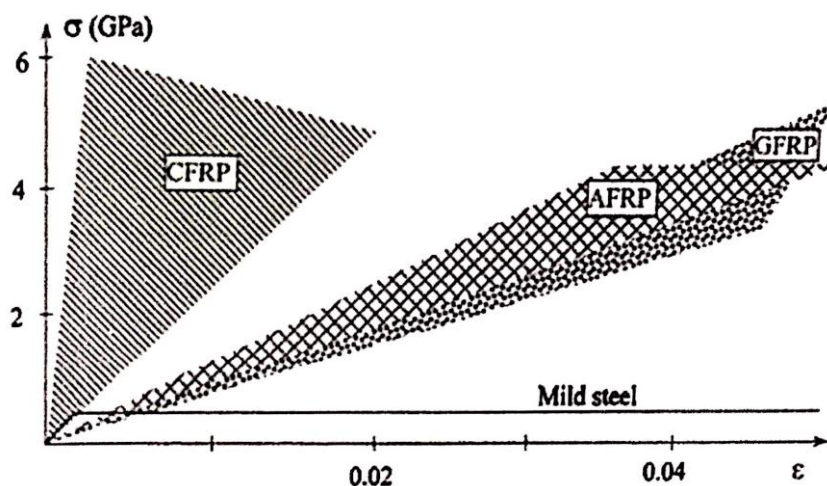


Fig.1. Diagrams of «stress-strain» in uniaxial tension for different types of composite materials and steel (CFRP – with carbon fibers, AFRP – aramid, GFRP – glass)

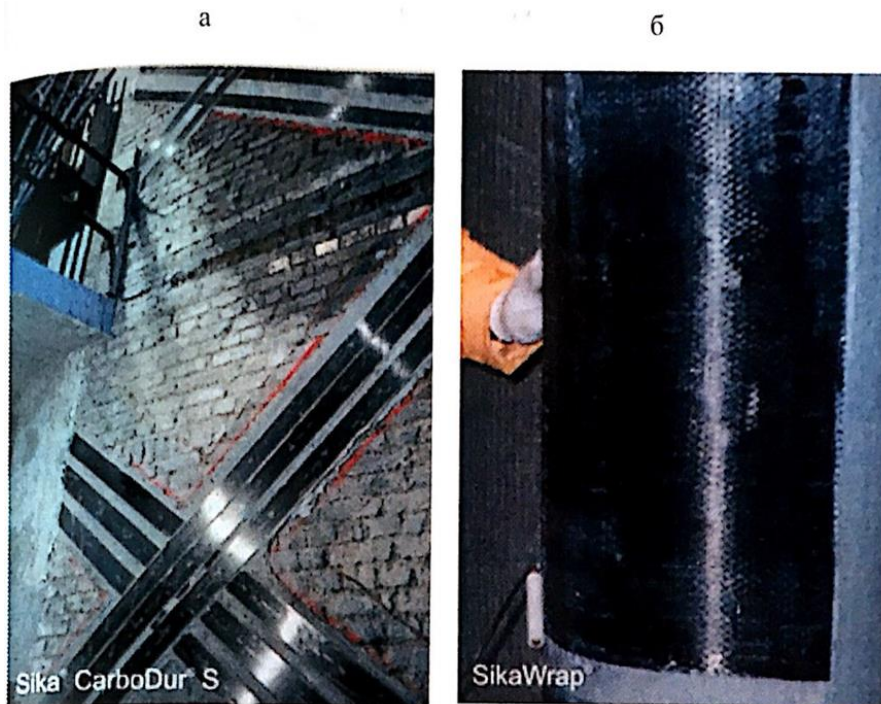


Fig.2. Examples of applying tapes (a) and reinforcement webs (б), respectively

It should be noted that Sika reinforcement tapes may be prestressed when applied. Such a possibility, subject to the calculation justification, can significantly increase the effectiveness of the reinforcement, creating an additional compression of the masonry, which reduces or neutralizes the corresponding tensile forces and increases the adhesion of the masonry elements [4].

The study of this reinforcement system with composite materials allows us to highlight such advantages as a high tensile strength of the reinforcing components; corrosion resistance; ease of installation; low weight of the material and, as a result, minimal loads on the restored structures; versatility of application to any form and, as a result, the preservation of the architectural appearance of structures.

Epoxy or micro-cement adhesive is used for gluing the tapes, which ensures that the reinforcement of the material is quickly included in the joint work with the structure. The use of epoxy adhesive requires additional safety measures during work, since its vapor is dangerous to humans. Work should be carried out in ventilated areas and with the use of gloves and special clothing.

Microcement with the addition of polymer resins, unlike epoxy glue, is safer both in terms of work and fire resistance. When reinforcing with meshes, a cement-based mortar is also used to fix them on the surface of the reinforced structures.

The strengthening of composite materials also has a number of disadvantages: high cost of the material; low fire resistance of epoxy adhesives (starting from 50 ° C).

Used information sources:

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