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INCREASING LIFETIME BY REPAIRING DEFECTS AND DAMAGE IN BRICK BUILDINGS

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Abstract
This article examines brick buildings and the reasons for their flaws and damage. Beacons are used to detect and eradicate faults and damage in building structures. The challenges of boosting the building's durability, reliability, energy efficiency, and human safety by using carbon fiber composite material in the reinforcement, as well as enriching the building's artistic and architectural look, were also studied.

Keywords: defect, damage, deformation, crack, sink, reinforcement, metal, composite material.

Introduction

Approximately 40% of the structures erected before 1990 in our country, as well as in Samarkand, are brick buildings. Various collisions caused injuries in all of these structures. The operation process in the structures was not effectively coordinated, and the building was not repaired in a timely manner, which resulted in these injuries. Damage caused by delayed repairs will skyrocket, resulting in a reduction in the building's typical service life.

Method and Style

Brickwork and brickwork defects are a direct influencing factor in the incidence of damage to the building's walls. This design has a flaw in that it fails to meet specific parameters, standards, and design requirements. The structure's defective condition

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might cause it to deteriorate over time, leading to structural failure or an emergency [1].

There are three types of significant (hazardous) defects:

- Group 1 indicates a breakdown, weakening the structure and producing an emergency;
- Group 2 indicates a breakdown, weakening the structure or faults that impact the building's operating quality;
- Group 3 does not cause damage but demands more costs during operation.

The study and classification of flaws in a structure helps them to foresee future hazards and take appropriate safeguards, as well as to prevent such problems from occurring during the design and construction process. Horizontal and vertical bending of the walls, insufficient filling of the joints in the brickwork, thick joints, and the involvement of non-specialists in bricklaying are all examples of visible flaws in brick buildings. Such shortcomings are due to insufficient control over the course of the case. Examples of directly invisible defects are the use of low-grade brick, mortar, and the absence of wire mesh at the intersections of the walls. Cases of subsidence and degradation may occur in the first case of the foregoing flaws, and cases of freezing and poisoning of the wall may occur in the second case. Horizontal seams should be 12-14mm thick, while vertical seams should be 8-10mm thick when picking bricks [5].

The main causes of cracks in brick buildings - uneven subsidence of the ground, ie, subsidence of the middle or outer parts of the ground, incomplete and unreliable engineering-geological studies, violation of technology in the construction of the foundation, errors in determining the load -bearing capacity of the soil during the design process, violation of the normative operating conditions provided for in the project, rising groundwater, failure of the communication system, digging a trench or trench near the building, the degree of loading on the adjacent sections of the walls and the wetting of the subsurface soils and a number of similar reasons can be exemplified in Figures 1 and 2.

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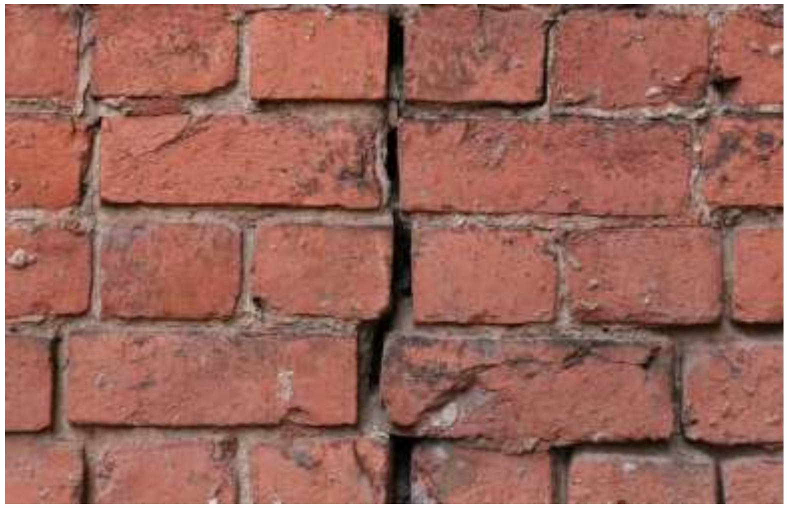

Figure 1. A crack formed at the end of a defect in the brickwork.

The team operating under load, i.e. as a result of technological faults during the team's formation and an increase in the load, can cause cracks in load-bearing brick walls. Cracks are an outward evidence of structural pressure and deformation. According to their value, they are categorized into harmful and safe species. When cracks are discovered in a structure, it's critical to understand their cause, details, progression, and stability. The width of fissures formed by the subsidence of foundations and other structures widens upwards, and the ground subsides upwards as a result. Depending on the direction of the cracks that appear, it is possible to determine where the building is sinking [6]. If the cracks are spread in a sloping direction from the edge of the building to the center, from the top down, then a sinking will have formed at this edge of the building. If the cracks are sloping from the top of the building to the edge of the building, then the middle part of the building will be sunken, see Figure 2.

Results and Observations

The appearance of cracks in brick buildings is a signal indicating the pre-emergency situation. Cracks are usually visible when they reach 0.5mm. Such cracks also transfer moisture and cold to the building. The cracks in the walls of the building are marked on the cracks in order to observe the movement. If the expansion of the cracks occurs quickly, it can take two weeks, and sometimes the process can take several months. If it is determined that the cracks continue to expand, the foundation of the building will be opened and the foundation will be reinforced.

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Figure 2. A crack formed as a result of uneven subsidence of the soil of the building.

In the case of small and relatively low-risk cracks in the walls of the building, such as landslides in the upper layer of plaster, it is possible to eliminate existing damage by re-plastering and painting.

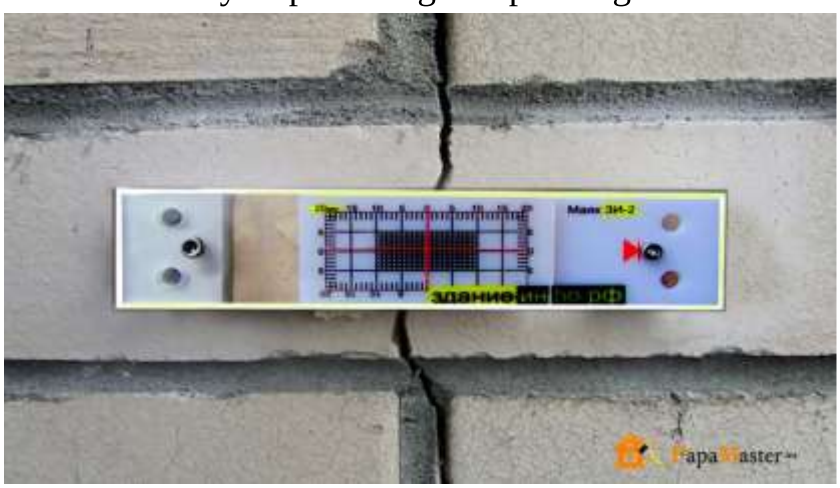

Figure 3. The process of observing cracks using beacons.

In the event of minor cracks, physical collapse and similar damage to the walls of a brick building, in order to increase the load-bearing capacity of the wall, a wire mesh with a diameter of 3-5 mm (50 × 50 mm) is attached to the wall and plastered with a cement-sand mixture.

To protect brick buildings from being damaged, a variety of reinforcing methods have been devised. Metal constructions are commonly employed throughout the country to

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reinforce brick buildings. It will have to inflict further harm to the structure in addition to fortifying it. The opening of holes in the walls during the connection of the metal structure to the building causes further damage to the building and diminishes its strength, which has an impact on the building's energy efficiency owing to incomplete closing of the apertures. Another key consideration is that using metal structures to reinforce brick buildings necessitates a lot of heavy labor, the use of machinery, and the high cost of metal, which results in the cost of reinforcement work being multiplied by many times.

If the cracks in the building's load-bearing walls are wide, it's a good idea to strengthen them with composite materials to ensure that the building's load-bearing walls operate reliably.

The construction sector is currently advancing its usage of new materials and novel technology. The use of modern materials that are resistant to static and dynamic stresses, as well as to harsh weather conditions, is another concern in building strengthening. As a result, in order to prevent damage to buildings, it is necessary to reinforce them, boost their energy efficiency, and extend their service life by carrying out reinforcement work in a convenient, quick, and low-cost manner.

Composite materials are frequently employed in the reinforcement of buildings and structures in industrialized countries [7]. This approach is convenient and efficient since the composite material is in the form of tape, which is considerably lighter than metal but 4-5 times stronger, more durable than metal, has lower labor costs, and requires less manpower during reinforcing operations. This substance sticks to the surfaces of diverse buildings excellently, has a high corrosion resistance, is surprisingly light and strong, and is resistant to moisture, fire, and shock.

When using composite material to reinforce brick building walls, no holes are bored in the wall and no additional harm is caused to the structure. This procedure entails removing the plaster from the damaged wall surface and applying the composite material in the form of tape to the wall with a particular glue. The composite material begins to interact with the wall as soon as it is joined to the wall, ensuring the building's full strength (see Figure 4).

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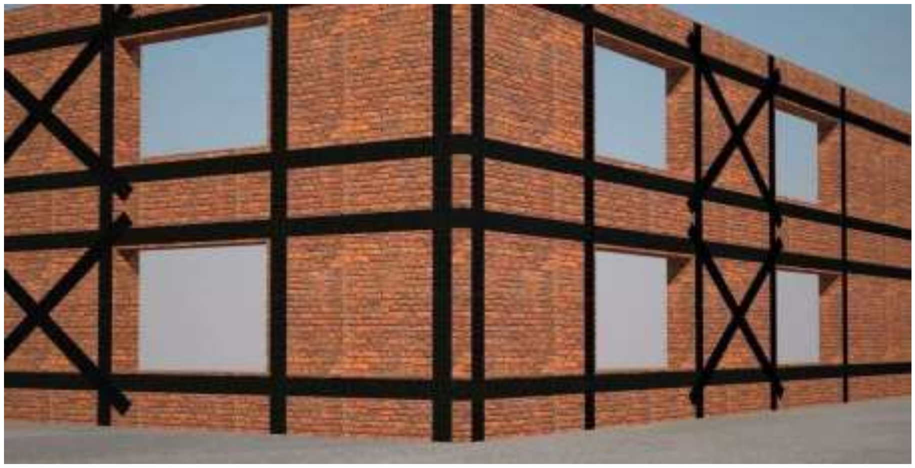

Figure 4. Reinforcement of bricklaying using composite material.

When the overall cost of building reinforcement was calculated, it was discovered that using carbon fiber composite material instead of metal saved roughly 40% of the cost of reinforcement.

Conclusions and Suggestions

The use of carbon fiber composite material in building reinforcement is crucial because it is faster than reinforcing buildings with metal construction, takes less labor, has a lower cost of reinforcement work, and has numerous other advantages. Additional plastering work can be done after the reinforcing work in this method. This will improve the building's energy efficiency, safeguard people's safety, improve the building's artistic and architectural appeal, and add to the attractiveness of our city.

When a structure is strengthened with carbon fiber composite material, it is suddenly subjected to loads. In addition, the cost of repairs will be cut in half.

The value of the constant loads falling on the building is lowered several times when we reinforce it using a carbon fiber composite material instead of metal. As a result, the cost of foundation reinforcement is reduced.

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