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HIGHLY EFFICIENT, RESOURCE-SAVING TECHNOLOGY FOR THE HIGHLY EFFICIENT, RESOURCE-SAVING TECHNOLOGY FOR THE RESTORATION OF STRUCTURES OF COMBINED ROOFING OF LARGE-SPAN BUILDINGS OF ELECTRICAL ENGINEERING

Abstract: the article highlights the results of a field survey and extraordinary engineering solutions for the reconstruction of the rolled roof of an electrical engineering building in disrepair. A field survey is a set of measures that allow for a general objective assessment of the technical condition of structures, buildings and structures. As a result of the survey, a conclusion is given on the suitability of the structure and operation or on the need for repairs, measures are being developed to strengthen the structure..

Keywords: industrial building, rolled roof, emergency condition, survey, full-scale, restoration, efficiency, calculation model, heuristic approach, technology, deformation seam.

Introduction

At the request of the administration of an industrial enterprise for the production of electrical products, a survey of the technical condition, verification calculations of the seismic resistance of building structures of the facility were carried out [1] and a technology for restoration and measures to ensure the durability of building coating structures was developed [4].

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and operation or on the need for repairs, measures are being developed to strengthen the structure.

Surveys of buildings and structures are carried out in two stages. At the first stage, a preliminary inspection of the facility is carried out, design and technological documentation is studied, then a detailed inspection is carried out, real operating conditions are identified, cracks, defects and structural damage are recorded.

At the second stage, a detailed examination of the technical condition of the structures is carried out in order to obtain additional information about the actual boundary conditions, about the features of deformation of the structure, about stresses in it.

Materials and methods:

This includes empirical methods such as modeling, fact-finding, experiment, description and observation, as well as theoretical methods such as logical and historical methods, abstraction, deduction, induction, synthesis and analysis, as well as methods of heuristic strategies. The research materials are: scientific facts, the results of previous observations, surveys, experiments and tests; means of idealization and rationalization of the scientific approach.

Reconstruction and capital repairs of existing buildings and structures involves, first of all, conducting a survey of their technical condition, determining their suitability for further operation. According to the provisions of the current regulations, the results and conclusions of the technical survey serve as the basis for the development of projects.

Due to the diversification of production, the existing production building has been reconstructed since 1977, the current building is one-story, rectangular in plan and consists of six spans, widths of 24 and 18 m, the longitudinal pitch of the columns is 12 m. Antiseismic and shrinkage seams have been installed in the longitudinal and transverse directions of the

building. The overall dimensions of the roof of the building are 157*145 meters, with a total area of 22765 square meters (2.28 hectares). The roof of the production building is rolled. The structure of the roof structures includes: a rolled waterproofing carpet made of foil, an asphalt base, a glass wool insulation

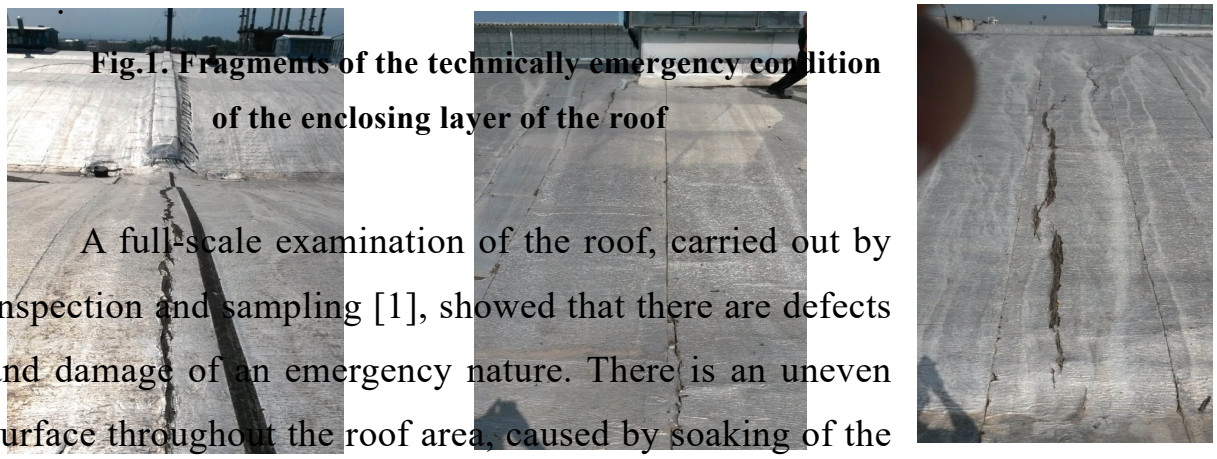

Fig.1. Fragments of the technically emergency condition of the enclosing layer of the roof

A full-scale examination of the roof, carried out by inspection and sampling [1], showed that there are defects and damage of an emergency nature. There is an uneven surface throughout the roof area, caused by soaking of the screed and insulation material, There are excessively open through cracks reaching up to 30-35 mm (Fig.1).. Through cracks in the waterproofing layers occupy within 21-23% of the total roof area, norms allow the production of restoration work with physical wear of structures up to 60 percent [10].

Results and discussion:

The technical inspection of the building before reconstruction assumed obtaining the most complete data on the actual: the state of seismic resistance and bearing capacity of the building elements, taking into account their changes over time [5]. The results of the survey serve as the starting material for the design of the reconstruction of the building [4].

The survey of the seismic resistance of the coating structures and the building as a whole includes [1]: a) inspection of coatings, identification of cracks, measurement of the width of their opening; b) determination of deflections of the coating plates; c) determination of the strength of the

concrete of the coating plates; d) determination of the location of the reinforcement and the thickness of the protective layer of the coating plates; e) full-scale inspection of the coating farms, identification of cracks, measurement of the width of their opening; f) determination of the deflections of the trusses; g) determination of the strength of the concrete of the trusses; h) determination of the location of the reinforcement and the thickness of the protective layer [8]. i) to make a verification calculation of the seismic resistance of the building frame based on real, natural strength and deformation characteristics of materials [9].

The autopsy naturally established that during the reconstruction, the features of the newly introduced roof structures in the harsh continental climatic conditions of the region were not taken into account [2]. The primary project provides monolithic expanded clay concrete with a thickness of 100 mm as a roof insulation. This would serve as a rigid base for the asphalt concrete screed, keep it from uneven deformation during temperature elongation-shortening, distributing possible cracks, and protect the screed and rolled carpet layers from tearing. During the last reconstruction of the roof, expanded clay concrete with glass wool was replaced.

This led to a change in the design model of the supporting structure of the carpet [7], as a beam on an elastic base with uneven stiffness, which worsened the structural work of the roof, since mineral (glass) wool does not have uniform stiffness, which means it does not protect the upper layers of the roof from uneven deformation, and will not be able to distribute possible cracks along the entire area. The accumulation of deformations along the length of the roof led to the rupture of the screed and rolled carpet layer up to 30-35 mm, at each 14-15 meters in length.

Conclusions

1. Reconstruction and capital repairs of existing buildings and

structures involves, first of all, conducting a survey of their technical condition, determining their suitability for further operation. According to the provisions of the current regulations, the results and conclusions of the technical survey serve as the basis for the development of projects.

2. The autopsy naturally established that during the reconstruction, the features of the newly introduced roof structures in the harsh continental climatic conditions of the region were not taken into account [2].

3. The primary project provides monolithic expanded clay concrete with a thickness of 100 mm as a roof insulation. This would serve as a rigid base for the asphalt concrete screed, keep it from uneven deformation during temperature elongation-shortening, distributing possible cracks, and protect the screed and rolled carpet layers from tearing.

4. During the last reconstruction of the roof, expanded clay concrete with glass wool was replaced. This led to a change in the design model of the supporting structure of the carpet [7], as a beam on an elastic base with uneven stiffness, which worsened the structural work of the roof, since mineral (glass) wool does not have uniform stiffness, which means it does not protect the upper layers of the roof from uneven deformation, and will not be able to distribute possible cracks along the entire area. The accumulation of deformations along the length of the roof led to the rupture of the screed and rolled carpet layer up to 30-35 mm, at each 14-15 meters in length

5. To eliminate damage of an emergency nature in roof structures, extraordinary, heuristic engineering solutions for roof restoration are recommended, which leads to a radical change in the design scheme and design model [7].

6. It is necessary to arrange deformation seams (10-12 mm wide) along the lines of through cracks (approximately on each 14-15 m length of the roof) [3];

7. Arrange additional deformation seams (10-12 mm wide) in the middle between emergency through cracks (approximately on each 7-8 m length, parallel to the direction of the roofing carpet) [6];

8. Seal the expansion joints with a soft hermetic material or bitumen, lay the usual layers of waterproofing carpet on top of the seams;

9. In areas of the roof with cracks at an oblique angle, after sealing the screed with cracks, lay rolled waterproofing materials, preferably from foil insulation. On the roof restoration project, to provide and implement in the process of reconstruction the release of the edge of the rolled material at least 200 mm from the crack face.

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