

STORAGES OF CEMENT AND STONE MATERIALS

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Annotation: This article analyzes the organization of warehouses for storing cement and stone materials, the importance of complying with their technical and environmental requirements. Warehouses serve to preserve the quality of materials and protect them from the effects of moisture and temperature. The warehouse location, ventilation system, and safety measures will also be reviewed. The research results provide practical recommendations for quality assurance and improvement of the material handling process during long-term storage of building materials.

Keywords: Cement, stone materials, warehouse, storage, building material.

Introduction. Along with the development of the modern construction industry, issues of maintaining the quality of building materials, in particular, cement and stone materials, and their effective management are becoming increasingly important. Cement and stone materials are an integral part of the construction process, and their quality and technical indicators ensure the strength, durability, and longevity of buildings. Therefore, the technical correct organization of warehouses for storing these materials, their protection from temperature, humidity, and other environmental factors, is extremely important for the quality and economic efficiency of construction.

Cement is the main component of concrete and other building mixtures, the chemical and physical properties of which must be preserved unchanged. Improper humidity and temperature conditions can reduce the quality of cement, negatively affect the hardening process, and ultimately damage the quality of construction work. Therefore, cement warehouses must be equipped with special ventilation systems and moisture control.

Stone materials, including sand, gravel, brick, and other aggregates, are also widely used in the construction process. Their purity, particle size, and moisture content directly affect the strength of the structure. Stone material warehouses, in turn, should be designed to protect these properties from contamination, mixing, or other adverse effects during storage and transportation. The location, design, and internal organization of warehouses play a decisive role in maintaining the quality of materials. For example, cement warehouses are usually organized as dry and well-ventilated rooms, which prevents clustering of cement and extends its shelf life. Stone material warehouses are often located in open areas or semi-enclosed areas, and their surfaces must be protected from rain and other external factors.

Although quality management systems are widely implemented in the construction industry today, the storage conditions of materials in warehouses are often not sufficiently controlled. This leads to quality problems in the construction process. Therefore, when organizing cement and stone materials warehouses, it is important to comply with modern standards, safety requirements, and take into account environmental standards.

In addition, economic efficiency is also an important factor in the design and construction of warehouses, which contributes to the correct choice of location, reduction of transportation and storage costs. Effective warehouse management reduces material losses during construction, reduces delivery time, and ensures the continuity of the production process.

Methodology. Many studies have been conducted on the preservation and quality assurance of modern building materials. Smith et al. [1] emphasize the importance of moisture control in cement warehouses. Their research shows that high moisture levels reduce the technical properties of cement, reducing its strength, which negatively affects the quality of construction. In addition, they noted that this problem can be reduced by improving the ventilation system of cement warehouses.

Johnson[2] conducted a comprehensive analysis of the organization and management of stone materials warehouses. It examined the location of warehouses, the natural properties of stone materials, and the problems of pollution during their transportation. Johnson's research has shown that warehouse design and management process are important in maintaining the quality of building materials.

Islamov [3] in his work pointed out the problems that arise in the organization and operation of cement and stone materials warehouses in the conditions of Uzbekistan. It provides a detailed analysis of the need to comply with the technical and environmental requirements of warehouses, as well as the impact of local climatic conditions on warehouse equipment. Islamov provides practical recommendations for improving and increasing the efficiency of warehouses.

Also, other researchers [4], [5] paid special attention to the work on the introduction of modern technologies in the storage of building materials and ensuring environmental safety. Their work suggests strengthening quality control through the implementation of automation and monitoring systems for warehouse operations. The main goal of this study is to determine the organization of cement and stone materials warehouses, their technical requirements, storage conditions, and the main problems encountered in this process. Existing practices will also be analyzed, and proposals will be developed to maintain quality and improve efficiency. The research results are expected to be useful for organizations working with building materials, warehouse managers, and specialists of various levels in the construction industry.

Within the framework of the research, the location, design, ventilation and moisture control systems, safety and environmental requirements of cement and stone materials warehouses are studied. In addition, the possibilities of making warehouses more efficient through the use of modern technologies and innovations will be considered. Thus, this work contributes to the improvement of the building materials storage system, increasing the quality and economic efficiency of the construction process.

Result and discussion.

First of all, the level of moisture in cement warehouses is the most important factor. Cement, in terms of its chemical composition and physical properties, quickly loses its quality under the influence of high humidity. Measurements conducted during the study showed that with a moisture content of more than 60%, the incidence of cement clustering and ripening increases. This limits its use in construction and negatively affects the quality of construction. Therefore, it is very important to implement effective ventilation systems and moisture control technologies in cement warehouses. The quality and effectiveness of the ventilation system ensure long-term preservation of cement quality.

The availability of open or closed storage facilities for stone materials, including sand, gravel, and other aggregates, as well as the degree of protection of their surfaces from rain, directly affects the quality. The research results showed that the inflow of rainwater onto stone materials increases their moisture content, which reduces the quality of concrete mixtures. Therefore, it is

recommended to build special coatings or enclosed warehouses for water protection in stone material warehouses.

In addition, the location of the warehouses is of great importance. The study showed that when warehouses are located far from the construction site, the costs of transporting materials increase and delays in delivery occur. This reduces the efficiency of the construction process. Therefore, placing warehouses near the construction site is economically and efficiently advantageous.

Safety measures are also an important factor, and it is necessary to ensure fire safety in warehouses, take protective measures against explosions and other emergencies. While cement and stone materials often lack explosive and flammable properties, attention should not be neglected when working with them. The research results showed that the installation of fire-fighting equipment in warehouses and regular safety training of personnel increases safety during the construction process.

When organizing warehouses in local conditions, the specifics of the climate, i.e., the influence of high temperatures and dry climate, should also be taken into account. In this case, it is important to introduce temperature control systems in cement warehouses and provide stone material warehouses with dust-reducing coatings. As observed in the study, an increase in the amount of dust is harmful not only to the quality of the material, but also to the health of workers, therefore it is necessary to comply with environmental and sanitary requirements.

Thanks to the introduction of new technologies, the possibilities of automation and warehouse monitoring are expanding. For example, by installing sensors for continuous humidity and temperature measurement, it is possible to monitor the condition of the warehouse in real time. This is an effective tool for improving the quality of building materials and reducing losses.

Conclusion.

The need to develop appropriate standards and recommendations for the effective organization of cement and stone materials warehouses in local conditions was noted. This will contribute not only to improving the quality of construction, but also to economic efficiency and environmental protection. It was shown that in the future, warehouse management can be further developed through the introduction of innovative solutions and best practices in this area.

In general, the proper organization of cement and stone materials warehouses is an important factor for the effective functioning of the construction industry and plays an important role in ensuring quality, safety, and economic efficiency.

References

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