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WAYS TO INCREASE THE RESISTANCE OF CONCRETE PRODUCTS TO THE INFLUENCE OF AQUATIC ENVIRONMENT

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Abstract
The main factors affecting the physical and mechanical properties of concrete are density and porosity, that is, the relationship between their volume and the properties of the components of the material. The main technical characteristics of the material, such as its strength and resistance to various conditions, depend on them. The water resistance of materials can be increased by increasing the density and strength of the materials by injecting solutions (cementation, silicate, bituminous, rubberizing, injection of polymer materials), as well as by treating the surfaces of materials with organosilicon polymer materials or by hydrophobizing and fluting.

Keywords: Cementation, silicate, bitumen, rubberization, polymer material, plasticizer, corrosion, concrete, structure, modifier.

Introduction

In modern construction products, cement-containing materials are the main materials used for various purposes, for example: as construction and decorative materials resistant to high temperatures and high strength. All this makes them the most versatile building material. Concrete is formed as a result of hardening and compaction of a mixture consisting of solid fillers, water, binders, plasticizers and additives, which have characteristic properties of a certain class. The areas of application of concrete with high physical and mechanical properties are constantly developing, and the growth of innovative technologies in the field of materials science contributes to a further increase in demand for such materials.

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components of the material. The main technical characteristics of the material, such as its durability and resistance to various conditions, depend on them.

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The cementation process involves adding a cement mixture to the drilled pores of the structure, which leads to an increase in its density and water resistance, corrosion resistance.

The silicate method involves adding liquid glass to the pores of the structure, followed by the addition of a solution of calcium chloride, which reacts with the liquid glass to form a compacted precipitate of poorly soluble calcium hydrosilicate and insoluble silica gel.

Bituminization is a process of pouring bitumen, which is an effective method of making materials waterproof and corrosion-resistant. The resistance of bitumen to chemical influences increases the resistance of concrete to aggressive environments and, first of all, to washing. A significant disadvantage of bituminization is its limitation to its implementation on wet surfaces.

Tarring is the addition of an aqueous solution of urea resin, which hardens with the addition of a hardener that is not aggressive to the cement-containing material. Tarring is an effective method of increasing the density and water resistance of materials with small pores and no water filtration.

Hydrophobization of the surface of the material is used to protect this material from precipitation in conditions of high humidity. The following are used for waterproofing: aqueous emulsions with a solution of organosilicon liquids; aqueous solutions with a mixture of organosilicon compounds.

Providing the surface of cement-containing materials with a liquid is based on the interaction between free lime and solutions of silicate salts of light metals, which, when reacting with calcium carbonate, form insoluble products that settle in the pores and are squeezed out of the material.

Also, various modifiers, mainly epoxy-based polymer materials, have become widely used to improve the durability of cement-containing materials.

A protective coating is important for protecting concrete materials in various conditions. The effective operation of protective coatings for concrete materials can be achieved due to:

- ✓ Resistance to external aggressive environments;
- ✓ The coating must be invariable in relation to the protected material;
- ✓ Adhesion to the concrete surface and its strength properties;
- ✓ Achieving the required thermal insulation properties.

There are various types of protective coatings for the protection of building materials:

- ➢ Paint and varnish coatings, which are used to protect the material from aggressive atmospheric phenomena, gases and vapors;
- ➢ Coatings and putty coatings, as well as coatings applied by spraying, are used to protect against the aggressive effects of the atmosphere, moisture and water.
- ➢ Wrapping materials such as rubber, polyethylene, polyisobutylene are used to protect structures from atmospheric influences, as well as moisture and water.

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➢ Undercoatings, which can include priming, puttying, adhesive materials and surface coatings.

To implement anti-corrosion protection measures, it is first necessary to determine the purpose of the structures, as well as the degree of exposure to aggressive factors on them. Structures must meet the following conditions:

a) The surfaces of the structure should not have irregularities, protrusions, voids and sharp edges. Provided that the thicknesses are smooth and there are no small depressions, the surface unevenness should not exceed 1-2 mm. All corners, edges and sharp transitions should be rounded to a radius of 5 - 20 mm;

b) If there are large protrusions or uneven areas on the surface of the structure, they should be leveled or removed. Small depressions should be removed by laying with cement-sand mixtures or Portland cement mixtures. If large depressions and swellings have formed on the surface of the product, they should be filled with cement-sand mixtures or cement mixtures with fine crushed stone as a filler. To apply protective coatings to the surface of the product, it is necessary to wait for its shrinkage.

c) the concrete surface should not be exposed to water from the side opposite to the protected one, in this case it should be protected by applying waterproofing coatings;

d) the structure should be open for inspection and repair of the coating.

Effective methods for increasing water resistance include the use of additives.

Table 1 Classification of additives.

1. Plasticizing		
1	2	3
Superplasticizing Plasticizing	Plasticization of mixtures	Increasing mobility
2. Water-reducing		
Superwater-reducing Water-reducing	Reducing water requirement of mixtures	Reducing amount of mixing water
3. Increasing air-gas content		
1	2	3
Air-entraining, gas-forming, foaming	Air entrainment, gas evolution	Increasing volume of air (gas) in mixtures of heavy and fine-grained concretes and mortars. Ensuring the value of the utilization factor of the pore-forming additive
Strength-increasing	Increasing the strength of concretes and mortars at the design age	Increasing the strength of concretes and mortars at the design age
Reducing permeability	Reducing the permeability of concretes and mortars	Increasing the grade of concretes and mortars for water resistance
Increasing corrosion resistance	Increasing the corrosion resistance of concretes and mortars under the influence of various aggressive environments	Increasing the resistance of concretes and mortars in relation to: - to corrosive - active environments - to internal corrosion
Hydrophobic	Imparting water-repellent properties to concretes and mortars	Reducing water absorption of concretes and mortars. Hydrophobic ability of the additive

Based on the above considerations, the durability of cement-based materials and concrete materials can be improved by protecting them, that is, by adding modifiers, superplasticizers, and plasticizers to their composition. As a result, the strength of concrete can be increased and it can be protected from corrosion.

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