# PRODUCTION OF HIGH DENSITY CONCRETE USED FOR HUDRAULIC STRUCTURES

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**Abstract:** The article mentions that concrete for hydraulic structures should have high density, frost resistance, sufficient strength, low shrinkage, resistance to leaching effects of filtering water, in some cases resistance to mineralized waters, and should emit little heat during hardening. .

**Key words:** Questions, little heat, mineralized waters, irrigation canals, industrialization.

The construction of small and medium-sized hydroelectric power stations and irrigation canals in our country is scheduled to carry out a large program of hydrotechnical and irrigation construction. Questions of further progress and reduction in cost in this field of construction are being solved by facilitating the construction of dams in every possible way, thinning and reducing the building materials used, as well as the widespread industrialization of the processes of erecting hydraulic structures. Progress in construction is unthinkable without further improvement in the quality of the main building material of hydraulic engineering - concrete and reinforced concrete.

Concretes for hydraulic structures must have high density, frost resistance, sufficient strength, low shrinkage, resistance to the leaching action of filtering water, in some cases resistance to the action of mineralized water, and slightly release heat during hardening [1].

Significantly improves the homogeneity of concrete mixtures. and increase their workability, reduce the water permeability of hydraulic concrete, increase its frost resistance, increase resistance to the combined effects of mechanical wear and chemical corrosion, can be achieved by introducing chemical additives-surfactants into the concrete mixture.

Of great interest are the issues of slowing down the setting of concrete mixtures when laying blocks of large volume, as well as reducing the rate of water loss (drying) of concrete laid in structures. Hydrotechnical "hydrophobic" concrete is a kind of concrete with the addition of special additives that give the material new properties. Hydrophobic concrete is characterized by increased resistance to the negative effects of water. The water-repellent properties of the material allow it to maintain its structure and, as a result, the original technical performance, despite the operation in conditions of constant contact with water.

The greatest danger that the interaction with moisture poses for concrete is that the liquid penetrates into the material and can expand when it freezes. As a result, over time, this violates the integrity of the concrete and cracks begin to form in it. As a result, the strength of the structure is significantly reduced, and its service life can be reduced several times.

Hydrotechnical or "hydrophobic" concrete is used for concreting both hydraulic structures, pools, foundations and structures, dams, dams and other construction objects that perceive during operation the alternating action of freezing and thawing, wetting and drying. The concrete of the underwater part of the structures is under the pressure of aggressive waters, and is also subjected to chemical corrosion from the action of substances dissolved in water. The property of hydrophobicity to cement is given by surface-active additives, which envelop the particles of cement stone during joint grinding.

Hydrophobic cement is a conventional Portland cement obtained by grinding cement clinker with the introduction of hydrophobic additives. As a result, cement acquires almost neutral activity in relation to atmospheric moisture.

If ordinary cement, absorbing moisture from the air, enters into a chemical reaction with it (the external sign of which is clumping), then hydrophobic cement can be stored for a period of more than a year without losing its properties.

The use of chemical additives is one of the most versatile, affordable and flexible ways to control concrete technology and control its properties. In connection with the foregoing, it is advisable to use hydrophobizing surfactants for hydraulic concretes [1].

They regulate the deformation of concrete, ultimately increasing the durability of concrete, the properties of concrete mixtures and concretes used in hydraulic engineering (possibly up to simch) due to the widespread use of various chemical additives and, above all, petrochemical synthesis products. They are added when grinding cement clinker in ball mills.

For hydraulic concrete, it is allowed to use Portland cement, plasticized and hydrophobic cements, pozzolanic and slag cements, and in some cases sulfate-resistant cement [1].

This scientific and technical work presents the results of research and experimental work on the effect of surface-active additives on the properties of cement systems, deformative and strength indicators are specified in the long term.

Specific objects are built from hydrotechnical concrete: dams, piers, breakwaters, cooling towers, treatment facilities, bridges. It is customary to consider 3 types of hydraulic concrete: Underwater, permanently in the water column; Residing in an area where the water level changes periodically; Located above the water and periodically washed by it. GOST and technical characteristics and application are all about hydrotechnical concrete. Specific objects are built from hydrotechnical concrete: dams, piers, breakwaters, cooling towers, treatment facilities, bridges.

It is customary to consider 3 types of hydraulic concrete:

Underwater, located constantly in the water column;

Residing in an area where the water level changes periodically;

Located above the water and periodically washed by it.

Another classification divides concrete into non-massive and massive, as well as a material for non-pressure or pressure structures. Based on the scope of application, requirements for water resistance, water tightness (W), frost resistance (F), compressive strength (B) and tensile strength, limited heat release during hardening, limited shrinkage, deformability, resistance to abrasion by deposits and water are known to hydro concrete.

Durability, water resistance and frost resistance. The class of concrete depends on the indicators (coefficients) of compressive strength and vice versa, the ability to withstand tension. So the compressive strength of hydroconcrete is determined at its age equal to 180 days, acting on a cube with a side of 15 cm. Concrete grades start with B3.5 and end with B80, however, the range from B10 to B40 has received the maximum distribution in construction. Axial tensile strength eliminates cracking. Standard samples are tested at the age of 180 days.

Concrete classes increase from W0.8 to W3.2. At the age of 180 days, hydroconcrete demonstrates 4 types of water resistance: W8, W6, W4, W2. Subjected to standard tests, the material should not pass water under pressure of 0.8 MPa, 0.6 MPa, 0.4 MPa, 0.2 MPa, respectively. Special additives have been developed to increase water resistance above W12. Hydraulic concretes work in moderate, severe and especially severe weather (climatic) conditions. Frost-resistant hydraulic concrete is produced in 5 grades: F300, F200, F150, F100, F50. By means of special additives, frost resistance is increased beyond F400. The brand is set according to the number of freezing and thawing cycles of concrete aged 28 days, during which the strength decreased by no more than 25%. Frost resistance is important for those structures that experience the combined effects of water and negative temperatures.

For the preparation of a hydroconcrete mixture, it is permissible to use the following types of cements:

Portland cement;

Plasticized (allows to obtain frost-resistant and waterproof concrete while reducing cement consumption by 10%);

Hydrophobic;

Pozzolanic slag (it has great physical and chemical resistance to fresh and mineralized natural waters);

sulfate-resistant (for harsh conditions and aggressive waters).

Summary: The consumption of cement is designed to provide the required density of concrete, and it is present in massive / non-massive structures in an amount not exceeding 350/400 kg / m3. For laying large volumes of mixture in a short time, cement with a low heat of hydration is recommended (less than 50 calories in 3 days; 60 cal / 7 days per 1 gram of cement). Quartz sands are optimal as fillers for hydrotechnical concretes. The sand content is usually increased to increase water resistance. Gravel and crushed stone must be mined from sedimentary or igneous rocks whose frost and water resistance has been tested and verified.

Microfillers in hydroconcrete (for example, fly ash) serve to reduce the amount of cement used, reduce volumetric deformations and heat generation, while maintaining mobility and density. In order to enhance frost resistance and water resistance, special chemical additives are introduced into concrete, such as SDV, or START superplasticizers, or organomineral. New additives have been developed, for example, TsMID-4Zh for structures in contact with drinking water.

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