Structural Properties of Special Concrete Property

Eshquvatov Erkin Borotovich

Teacher, Department of Transport Structures and Motor Roads of the Termez branch of the Tashkent State Technical University named after Islam Karimov

Ismoilov Asadbek Kamoliddin ogli

Department of Transport Structures and Motor Roads Road Engineering 3 A-20 group student

ABSTRACT

In this article we will talk about concrete - an artificial stone obtained from a properly selected mixture as a result of formation and hardening. By type of binder: cement, silicate, gypsum, liquid glass, polymer. Frost resistance of heavy concrete. We have tried to shed light on the corrosion properties of concrete based on inorganic binders.

KEYWORDS: *Special concretes - made on the basis of hydraulic, lightweight, cellular, resource-saving vermicumite and other materials.*

Special concretes - hydraulic, lightweight, cellular and others.

Concrete is an artificial stone obtained from a properly selected mixture as a result of formation and hardening.

- Concrete consists of
- Mineral binders

Water particles (small particles - sand, large particles - pebbles, gravel) Additives - natural or artificial composition used to improve the technological properties of concrete mix or the physical and mechanical strength of concrete and increase its efficiency.

Grains of sand and gravel form the rock structure of concrete. A mixture of cement (lime) surrounds the grains of sand and gravel and fills the gaps between them.

Particles (sand, gravel, gravel) occupy 80-85 percent of the volume of concrete and form a rigid skeleton that prevents compaction. Concrete with different physical and mechanical properties can be obtained using particles with different properties, for example, heavy, light, acid-resistant, heat-resistant and others.

Widespread use of concrete depends on the following positive factors:

1. Ability to prepare concrete with the desired properties;

2. Ability to form different products;

3. Full mechanization of concrete works.

Average density:

1. Very heavy ro= 2500 kg / m^3;

2. Heavy ro = 2200-2500 kg / m^3;

3. Light ro = 1800-2200 kg / m^3;

4. Light r = 500-1800 kg / m^3;

5. Especially light << 500 kg / m^3;

By type of binder: cement, silicate, gypsum, liquid glass, polymer.

By type of particles: concrete in dense particles, porous particles, special particles.

By volume of aggregate grains: small-grained, large-grained,sandy

By structure: dense, large-porous, porous, cellular

Compressive strength classes of heavy concrete: V3.5; V5; V7,5; V10; V12.5; V15; V20; V25; V30; V35; V40; V45; V50; V55; V60; V65; V70; V75; V80.

In terms of average compressive strength, they have:

Heavy: M50, 75, 100, 150 ..... 500, 600, 700, 800, 900, 1000

Brands: M25, 35, 50, 75, 100, 150, 200 400

Materials for the preparation of heavy concrete:

Different types of cements. They must meet the standard requirements.

Water - does not contain harmful compounds that deny normal adjustment and hardening.

Good particles - sand. The grain size is 0.14-5 mm. They use natural, artificial sands, screens to grind natural stone.

Pebbles from natural stone are used as large particles for heavy concrete; accidental mining and gravel from mining and processing wastes;

Basic additives for concrete. Chemical additives that meet the requirements of the standards are used to regulate and improve the properties of the concrete mix and concrete, reduce cement consumption and energy consumption. The choice of additives is made only depending on the production technology, the design characteristics of the concrete. Recommended additives for concrete: anti-freeze (potassium, sodium nitrite); plasticization (C-3, SDB).Properties of concrete

The properties of the concrete mix have a major impact on the quality and properties of the concrete.

The mold or molded concrete mix must have the required workability and viscosity, i.e. the concrete mix must have a strength that meets its holding conditions.

The strength of a concrete mix is assessed by the mobility or hardness of the concrete mix.

Mobility is the ability of a concrete mix to spread horizontally under its own weight.

A standard cone is used to determine mobility. The degree of mobility of the concrete mixture - P is measured by the subsidence (cm) of the cone formed from this mixture.

Depending on the collapse of the cone, the compounds differ:

Solid OK = 1 cm or less; motionless OK 4 cm or less; moving OK 5-9 cm; very mobile, about 10-15 cm; OK 16 cm.

Solid mixtures give almost no cone subsidence. However, under the influence of vibration, they have the property of molding depending on the materials used.

The main properties of heavy concrete include: strength of concrete, frost resistance, water resistance, shrinkage and expansion, fire resistance and corrosion resistance.

The density of heavy concrete is in the range: ph = 1800 ... 2500 kg / m^3.

The strength of concrete is one of its main construction properties. This determines the resistance of the concrete to external mechanical resistance.

Under normal conditions (t = 15-20 ° C and relative humidity W = 90-100 ° C) the strength of concrete during hardening depends mainly on the following factors:

- Strength of cement (cement grade) - Rts
- Water-cement ratio
- Qualities of landowners
- degree of compaction of concrete mix

Standard samples are prepared - cubes of size 150 * 150 * 150 with a working mixture, stored under standard conditions for 28 days and tested for compression.

$R_{sj} = K * F_P/A(MPa)$

F_p -is the load break

A- is the cross-sectional area of the sample

K -is the conversion factor taking into account the volume of the cubes

K = 1 (in the form of a cube 150 * 150 * 150)

K = 0.95 (100 * 100 * 100 in the form of a cube)

K = 1.05 (200 * 200 * 200 in the form of a cube)

K = 0.85 (in the form of a cube 70 * 70 * 70)

Brands are used for heavy concrete: M50, M75, M100, M150, M200, M250, M300, M350, M400, M450, M500, M550, M600, M700, M800, M900, M1000

The frost resistance of heavy concrete is the most important indicator of concrete quality.

The following concrete grades are defined for frost resistance for concrete undergoing freezing and thawing during operation: F50, F75, F100, F150, F200, F300, F400, F500, F600, F800, F1000

The water resistance of concrete depends on the density and structure of the concrete. Concrete with a fine porous structure and a homogeneous composition, well compacted and sufficiently hardened, practically waterproof thick.

The following waterproof signs were installed: W2, W4, W6, W8, W10, W12, W16, W18, W20.

Shrinkage and expansion of concrete. When the concrete hardens in air or if there is not enough moisture in the environment, the concrete may shrink. When hardened in water or a humid environment, it decreases sharply and in some cases a slight expansion of the concrete occurs.

To reduce the shrinkage of concrete, especially in massive structures, you can:

1. Use Belit Portland cement - has delayed hydration;

2. Use low-grade cements

3. Reducing the amount of water mixing using plasticizers;

4. Use large particles of basic granular dense rocks;

5. Observe the moisture regime of the concrete hardening.

The ratio of concrete to high temperature. Concrete is a fire-resistant material. It is used for chimneys of industrial furnaces, foundations. The fire resistance of concrete depends on the type of cement, the properties of the admixture. Used as a binder for heat-resistant concrete: Portland cement, slag Portland cement, alumina cement, water glass.

Corrosion of concrete based on inorganic binders. Under the physicochemical action of some liquids and gases, concrete can be destroyed. Corrosion of concrete occurs only as a result of the destruction of the cement stone. it is possible to select particles that are sufficiently stable. Concrete Destruction Media:

- mineralized waters of marine structures (moth, pier, port structures);
- mineral acids in the operation of tower tanks;
- alkaline environment, clean water;
- Has a corrosive effect on concrete gases (sulfur, hydrogen chloride, hydrogen sulfide, etc.) in industrial areas.

Protect concrete from corrosion:

- Give high density to concrete;
- Special concrete is used: acid-resistant concrete, liquid glass with the addition of sodium fluorosilicate, crushed quartz sand, acid-resistant particles from andesite, diabase, basalt, quartzite.

Choose cements with low cellulose and alite content (sulphate resistant computer, slag portland cement, pozzolanic computer)

- Place a waterproof shell of waterproof material around the concrete surface;
- Covered the surface with acid-resistant tiles on top of the acid-resistant solution;
- waterproof concrete;

Lightweight and aerated concrete

Lightweight concrete is a material made of artificial stone, after the formation and hardening of a properly selected mixture of porous particles r <2000kg / m^3.

The following materials are used for the preparation of lightweight concrete on the basis of porous particles.

Binders are cements, Portland cements, pozzolanic computers and other cements.

The water must be clean and meet standards.

Porous particles: natural - tuff, shell rock, pumice, porous limestone. Artificial particles - expanded clay, agloporite, thermosite, granulated slag.

Finely ground additives - admixtures, reduce cement consumption.

Gas additives for porous cement paste - aluminum powder. Depending on the type of particles, lightweight concrete includes: expanded clay concrete, clinker concrete, thermo-composite concrete, perlite concrete, agloporite concrete.Aerated concrete is a type of lightweight concrete.

Aerated concrete is an artificial stone material with a pre-expanded mixture that is properly selected after it has been formed and hardened. Concrete has small holes Ø 1-2 mm filled with air or gas.

Composition of aerated concrete: binders (cement, Portland slag), ground lime; combined binders

(lime-slag, gypsum-slag, cement-lime binder), silica component (fine powder containing active silica).

The silica component reduces the consumption of binders, shrinks concrete, increases the chemical activity of lime, forms strong waterproof compounds - calcium hydrosilicates.

Swelling of the dough is done using the following.

Gaseous substances, such as aluminum powder;

Soap, foaming agents based on bone glue.

Hardening accelerators, plasticizers, additives are used as a regulator of the formation of the structure: gypsum stone, soda water, liquid glass.

Depending on the method of binding and porous formation of aerated concrete is divided into: foam concrete, aerated concrete, foamed silicates, aerated silicates and others.

Improving the quality and use of lightweight fillers - made on the basis of vermicumite and other materials.

Expanded vermicumite is a vermicumite concentrate containing water bound between the elemental layers - a freely flowing porous material in the form of silver, gold or yellow particles, obtained by rapid combustion of hydromica. Vermicumite particles are formed as a result of splitting into very small pieces under the influence of strongly evaporating water, which only stick to each other at certain points.

Expanded vermicumite has a specific lamellar porosity, which determines the volume volume of 100-300 kg / m^3 and the thermal conductivity of 0.065-0.09 kcal / m hail, as well as the elasticity of the granules. not placed in heat-insulating filler structures.

The chemical composition of vermicumite corresponds to the approximate formula (Mg + 2, Fe + 2, Fe + 3) 3 [(AlSi) 4O10] · (OH) 2 · 4H2O.

The chemical composition of vermicumite corresponds to the approximate formula (Mg+2, Fe+2, Fe+3)3 [(AlSi)4O10]·(OH)2·4H_2O			
SiO_2	38,0 – 49,0 %	TiO_2	1,5 %
MgO	20,0 – 23,5 %	Cr_2O_3	0 - 0,5%
Al_2O_3	12,0 – 17,5 %	MnO	0,1 – 0,3 %
Fe_2O_3	5,4 – 9,3 %	Cl	0 – 0,5 %
FeO	0 1,2 %	CO_2	0 – 0,6 %
K_2O	5,2 – 7,9 %	S	0 – 0,2 %
Na_2O	0 – 0,8 %	H_2O	5,2 – 11,5 %
CaO	0,7 – 1,5 %		

However, vermicumite rarely conforms to the general formula and usually contains mixtures.

Physical characteristics:

- hardness on the mineralogical scale: 1-1.5;
- density: 2.4-2.7 g / cm^3 (expanded - 0.065-0.130 g / cm^3);
- melting point: 1350 ° C;
- application temperature: -260 ° C to +1200 ° C;
- pH value: about 7.0;

- thermal conductivity: 0.05 W / m.K (depending on specific weight);
- does not withstand external forces and is similar to graphite in terms of lubrication.

The main and most valuable feature of vermicumite is its ability to dramatically and unusually increase its volume by 10-20 times when calcined. This phenomenon is explained by the evaporation of molecular water in the vermicumite fragments and fragments when calcined, under the pressure of which the mica leaves always move in one direction, perpendicular to the mica decomposition. Expanded vermicumite, when cooled, retains the volume obtained by the smallest air seals, instead of water vapor between the mica leaves, which gives the mineral many of its valuable properties.

Practical advantages of expanded vermicumite. Vermicumite has heat and sound insulation properties, as well as high absorbency - it can absorb liquids up to 500% of its weight. However, it is weakly hygroscopic (i.e. it absorbs little moisture from the surrounding air). Vermicumite humidity is only 10% at 100% air humidity.

The mineral is inert to organic solvents and insoluble in water, does not decompose, does not smell, does not absorb moisture, does not irritate, has good sorption properties for gaseous and liquid media, is not a favorable environment for insects and rodents.

The refractory masses of vermicumite are characterized by fire resistance, high sound conductivity, low thermal conductivity. Vermicumite has a high concealing ability, good resistance to weather conditions, is impermeable to moisture and is characterized by a low coefficient of thermal expansion.

Unlike other heat-insulating materials (perlite, expanded clay), vermicumite has an elastic deformation, if the filler material is in an elastic compressed state, it has no frictional force on the walls of the vermicumite structure, there is no precipitation. under the influence of elastic forces, the sealing effect of grains, shocks, etc. exceeds the impact forces.

Compression of vermicumite to 15-25% should be considered optimal. With this compression, the stresses are 0.07–0.15 kg / cm, which ensures that the insulation is not compressed.All of these properties determine the unusually wide range of possibilities of using vermicumite as a multi-purpose raw material.

Depending on the size of the mineral fractions, vermicumite is divided by numbers - from 1 - to the size of this pea, up to 5 - fractions of sand and dust.

The temperature of application of products made of expanded vermicumite depends on the type of binder: with mineral - up to 600 ° C, with synthetic - up to 150 ° C, with bitumen - up to 60 ° C; vermicumite concrete - for thermal insulation in residential and mikumit (2.5-5 mm or 5-10 mm) indoor structures with very limited cement consumption (100-150 kg /l).

Expanded vermicumite is used in its pure form both to fill voids (foundations, ceilings) and to fill the mixture (lightweight concrete, hot and decorative gypsum, fire-resistant coatings).

Extended vermicumite products and their application. Vermicumite products (segments for insulation of vermicumite slabs, shells and heat conductors) are formed from expanded vermicumite and chrysotile-asbestos mixture, with the addition of bitumen-bentonite or bitumen-diatomite pastes, synthetic resins, starch, liquid glass, etc. 'ladi.

Product resolution (mm):

- plates - length 1000 ± 5, width 500 ± 3, thickness 30, 40 and 50 ± 2;
- shells and segments - length 500, thickness 40.50 and 60 ± 2.

Vermicumite and inorganic binder-based structural and decorative products (slabs) are particularly effective fire-retardant materials.

Inorganic fire-resistant vermicumite plate is an environmentally friendly material, which combines high fire resistance, high sound conductivity, thermal insulation at the same time, as well as excellent decorative properties with unlimited service life.

Vermicumite slabs are used for fire protection of reinforced concrete, steel and wooden structures, as well as cableways. They are used as heat protection in the construction of stoves and fireplaces.

In areas with hot climates, it is used to fill wall structures as a means of overheating buildings, and in northern areas - for heat storage, insulation of refrigeration chambers and arc furnaces of open-hearth furnaces, as well as soundproof insulation. cameras for aircraft and car engines.

In addition to vermicumite filling, dry construction mixtures and limes are effectively used in construction, the filler of which is vermicumite.

Vermicumite plasters consist of expanded vermicumite and cement or gypsum.

Compared to ordinary (sandy) limes, vermicumite limes have 2-4 times lower volume and 4-6 times lower thermal conductivity due to their high porosity and belong to the group of light ("hot") alloys.

A layer of “hot” cement-vermicumite gypsum with a thickness of 2.5 cm can replace a layer of cement-sand mortar with a thickness of 10-15 cm. When the thickness of the cement-vermicumite gypsum layer is up to 3 cm, the thickness of the brick wall can be reduced by 25%.

Applying cement-vermicumite mortar to brick walls allows to save 0.25 cubic meters of brick per 1 cubic meter of wall, while the sound absorption coefficient of vermicumite plasters is 0.15-0.3, and for ordinary sandy gypsum. 0.015-0.02. It follows that the use of “warm” plasters for wall cladding can provide significant economic benefits by reducing wall thickness.

In addition, as shown by the tests, samples of vermicumite solution with a density of 500 to 800 kg / cu. m, when heated to a temperature of 900-1000 ° C and immersed in water, does not crack and retains sufficient strength, under which the aerated concrete samples completely collapse.

The fire resistance of vermicumite solutions is 4 times higher than that of sandy solutions. The fire resistance of coatings and ceilings is 1.5 hours, provided with a solution of vermicumite with a layer thickness of 8 mm.

Vermicum gypsum mortars are used for interior and exterior decoration of building structures and can perform fire-resistant, decorative and other functions in addition to performing heat-insulating and sound-proofing functions.Heat-insulated heat-resistant vermiculite concrete is prepared by mixing a dry mix with tap water, after three days of hardening, the material acquires fire-resistant, heat-insulating and heat-resistant properties.

Vermicum concrete has good thixotropic properties, it can be poured into areas of complex configuration, and can be mechanically applied to vertical surfaces using standard mortar mixers.

The thermal conductivity of vermicumite concrete ranges from 0.08 to 0.35 kcal / m-deg-hour, depending on bulk density, cement consumption and concrete moisture. Cement-based vermicumite concretes are used in building envelopes (walls, ceilings and cladding panels) for thermal insulation and sound insulation of layers.

Very light heat-insulating products made of expanded vermicumite are made as a binder using synthetic resins, bitumen, liquid glass and others.

Expanded vermicumite is used for thermal insulation of walls, roofs, floors, foundations, tents,

ceilings and basements of buildings, pipes for thermal insulation, sound insulation of test chambers for civil and industrial buildings, cinemas, special laboratories, aircraft and automobile engines. Vermicumite protects metal and wooden structures (buildings, structures, doors, safes) from long-term (up to 10 hours) fire. This prevents the development of mold and mildew from excess moisture.

Vermicumite is also used in the manufacture of rubber, in filters for thermal insulation of open-hearth furnaces, in molding in powder metallurgy, in dryers.

References:

1. Rybiev I.A. Building Materials Science: A Reading Guide. expert universities. - M .: High. shk., 2007.- 701 p.
2. Popov K.N. Quality assessment of construction materials [Text]: textbook. pension / K.N. Popov, M.B. Caddo, O.V. Qumkov. - M .: High School, 2004.- 240s
3. V.S Rudnov, E.V. Vladimirova, I.K Domanskaya, E.S Gerasimova Construction materials and products. - Yekaterinburg, Ural University Press, 2018