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CONCRETE ADDITIVE BETOMIX-ITH®

Organization standard
(technical specifications)
Tech.Spec. 5745-047-04740886-2013

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Федеральное государственное бюджетное учреждение науки
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These technical specifications apply to a highly effective waterproofing additive for concrete BETOMIX-ITH® (hereinafter referred to as the Additive), designed to be added to concrete at the stage of preparation or concreting of reinforced concrete and concrete structures and obtaining concrete with improved characteristics of water resistance, frost resistance, strength by filling the pores of concrete with crystalline elements.

The Additive can be supplied in dry and liquid form. BETOMIX-ITH® is a dry loose mixture of gray color with white inclusions and BETOMIX-ITH® Gel is a yellow-green liquid.

The mechanism of action of functional chemical additives BETOMIX-ITH® and BETOMIX-ITH® Gel:

When BETOMIX-ITH® or BETOMIX-ITH® Gel are added to concrete, the complex salts contained in the additive interact chemically with calcium and aluminum ions present in concrete (concrete product) to form supersaturated solutions of insoluble complexes.

In the process of concrete curing, insoluble complexes crystallize from supersaturated solutions in the form of needle-shaped crystals, leading to the filling of pores in the concrete body.

During the operation of concrete, needle crystals prevent water droplets from diffusing through pores and microcracks (up to 0.4 mm) into the concrete body, thereby improving the characteristics of concrete in terms of water resistance and frost resistance. Needle-shaped crystals allow excess moisture to freely leave the concrete body in the form of water molecules (the vapor permeability of concrete is preserved).

The additives protect the structure from the effects of aggressive media: acids, alkalis, sewage and groundwater, seawater. They increase the corrosion resistance of concrete, prevent corrosion of steel reinforcement, increase resistance to salt solutions of nitrates, sulfates, phosphates, carbonates, chlorides, etc.

The additives are used in the construction of enclosing structures of residential, public and industrial buildings, hydraulic engineering and sewage treatment plants, filters and drinking water tanks, swimming pools, basements,

foundations, bridges, dams, concrete aqueducts, concrete tanks for storing petroleum products and aggressive media, dams, tunnels, vegetable pits, etc.

Additives BETOMIX-ITH® and BETOMIX-ITH® Gel can be used with antifreeze, plasticizing, air-entrapping and other additives for concrete.

An example of recording the product BETOMIX-ITH® and BETOMIX-ITH® Gel in other documents and when ordering: Waterproofing additive for concrete BETOMIX-ITH®– Tech.Spec. 5745-047-04740886-2013.

Technical specifications can be used as a regulatory document for product certification.

1 Technical requirements

1.1 Penetrating waterproofing Additive must meet the requirements of these technical specifications and manufactured according to the technological regulations, which contain requirements for the manufacture and quality control at all stages of the production process.

1.2 Main characteristics.

1.2.1 BETOMIX-ITH® consists of Portland cement, aggregates and active chemical additives.

BETOMIX-ITH® Gel is a yellow-green liquid consisting of chemically active additives, water.

1.2.2 BETOMIX-ITH® - a dry mixture of gray with white inclusions, after mixing with water, acquires a shade from dark green to fluorescent green.

1.3 The Additive BETOMIX-ITH® keeps the properties in the dry state and in the hardened concrete product. The Additive BETOMIX-ITH® Gel keeps its properties in the liquid state and the hardened concrete product.

1.3.1 The main physico-chemical parameters of BETOMIX-ITH® must meet the requirements specified in Table 1.

The main physico-chemical parameters of BETOMIX-ITH® Gel must meet the requirements specified in Table 2.

Table 1 - The main physico-chemical parameters of BETOMIX-ITH®

Parameter	BETOMIX-ITH®	Validation
1. State of aggregation	Dry powder of grey color with white inclusions	Visual control
2. Humidity, %	Less than 1	p. 4.4, Tech.Spec. 5745-047-04740886-2013
3. Apparent density of unconsolidated mixture, kg/m^3	1300±150	p. 4.5, Tech.Spec. 5745-047-04740886-2013
4. Increase of the grade of waterproofness of treated concrete, not less than	3	p. 4.6, Tech.Spec. 5745-047-04740886-2013
5. Increase in compressive strength of treated concrete from the initial value, %, at least	5	p. 4.7, Tech.Spec. 5745-047-04740886-2013

Table 2 - The main physico-chemical parameters of BETOMIX-ITH® Gel

Parameter	BETOMIX-ITH® Gel	Validation
1. State of aggregation	yellow-green liquid	Визуально
2. Kinematic viscosity, mm^2/s	2,5±0,5	p. 4.8, Tech.Spec. 5745-047-04740886-2013
3. Density, g/cm^3	1,1±0,1	p. 4.9, Tech.Spec. 5745-047-04740886-2013
4. Hydrogen ion activity index (pH), units	9,5±0,7	p. 4.10, Tech.Spec. 5745-047-04740886-2013
5. Increase of the grade of waterproofness of treated concrete, not less than	3	p. 4.6, Tech.Spec. 5745-047-04740886-2013
6. Increase in compressive strength of treated concrete from the initial value, %, at least	5	p. 4.7, Tech.Spec. 5745-047-04740886-2013

1.4 Requirements for the initial components of BETOMIX-ITH®.

1.4.1 The materials used for the manufacturing of the Additives, should pass the incoming inspection according to State Standard 24297, meet the requirements of the regulatory documents for these materials and provide concrete products with the specified characteristics.

1.4.2 For the preparation of the additive BETOMIX-ITH® Portland cement CEM I 42,5H according to State Standard 31108, or other similar Portland cement must be used.

14.2 For the preparation of the additive BETOMIX-ITH® Gel it is necessary to use tap water with a mineralization of no more than 30 mg/l.

1.5 Marking

1.5.1 The marking of the Additives is made on the label in any easily accessible place of the container.

1.5.2 The marking inscription must contain:

- name of the manufacturer, legal address;
- name of the Additive;
- batch number and date of manufacture;
- net weight;
- brief description, conditions of transportation and storage of the product;
- safety requirements for transportation, storage and use;
- designation of the regulatory document.
- stamp of acceptance by the technical control service.

1.6 Packaging.

1.6.1 BETOMIX-ITH® is supplied in hermetically sealed plastic buckets according to State Standard R 51760 of domestic or imported production with a capacity of 1 to 50 liters. In agreement with the manufacturer, the product may be packed in another container that ensures the tightness of the package. The net weight of the product in the package must correspond to the weight indicated on the package, with a maximum deviation of ± 1%.

1.6.2 BETOMIX-ITH® Gel is packed by weight (or, respectively, in terms of volume, taking into account the density of the product) from 1 to 1000 kg in a polyethylene container that meets the requirements of State Standard 33756 or according to current regulatory or technical documentation. It is allowed to use consumer containers according to any regulatory documentation that ensures tightness, in quality not lower than those specified in the technical specifications for the Additive, resistant to the action of the packaged additive, not degrading the quality of the Additive, ensuring its safety during transportation and storage.

1.4.2 The permissible negative deviation of the net weight (volume) from the nominal amount of the packaged Additive is 1.5% (with a weight of up to 10 kg), 1.0% (with a weight of up to 100 kg), 0.5% (with a weight of over 100 kg).

The positive deviation of the net weight (volume) from the nominal amount is not limited.

2 Safety and environmental requirements

2.1 The additives BETOMIX-ITH® and BETOMIX-ITH® Gel are non-toxic, fire and explosion-proof, according to the degree of exposure to the human body and animals according to State Standard 12.1.007-76 belongs to the class of low-hazard substances (hazard class 4, MPC 50 mg / m^3).

2.2 The Additives does not have a harmful effect on the environment and human health during storage, transportation and operation under ambient temperature conditions.

2.3 When carrying out work, it is necessary to follow the safety rules set out in Building Codes and Regulations 12-04.

2.4 In case of contact of the Additive with skin and eyes rinse with water, in case of severe irritation consult a doctor.

3 Acceptance Rules

3.1 The Additives must be accepted by the technical control service of the manufacturer.

3.2 Acceptance of the Additive is carried out in batches.

Batch consists of the volume of the product, made by one recipe on a single production line of materials of the same type and quality in an amount not exceeding 20 tons.

3.3 Acceptance is based on the data of the input and operational control by the results:

- For BETOMIX-ITH®: periodic tests on the humidity of the final product, the apparent density of unconsolidated product, the water resistance of concrete with the additive BETOMIX-ITH®;

- BETOMIX-ITH® Gel: periodic tests on the density, kinematic viscosity, water resistance of concrete with the additive BETOMIX-ITH® Gel;

- acceptance tests on the appearance of the product, completeness, labeling and packaging.

3.4 Periodic tests are carried out on samples taken from the batch of products that have passed the acceptance test and meet the requirements of these specifications.

3.5 Periodic tests are carried out when putting it into production, when changing technology, formulation, type and quality of raw materials used, but not less frequently:

once a quarter for:

- BETOMIX-ITH® on the humidity of the final product, the apparent density of unconsolidated product;

- BETOMIX-ITH® Gel on density, an indicator of the activity of hydrogen ions;

once every 12 months for the water resistance of concrete with the Additive, kinematic viscosity for BETOMIX-ITH® Gel;

3.6 Periodic tests on indicators of changes in the formulation and type of raw materials used within the time limits established by the state body for supervision in the field of consumer protection and human well-being.

3.7 Acceptance tests are carried out for each batch by the method of continuous and selective control.

3.8 With continuous inspection, the appearance, labeling, packaging and completeness are checked.

3.9 In case of unsatisfactory results of control at least one of the indicators repeat the test for this indicator of twice the volume of the Additive, selected from the same batch.

3.10 If the results of repeated testing are unsatisfactory, the product batch is not accepted.

3.11 Each accepted batch of the product must be accompanied by a Quality Passport, which specifies:

- name of the manufacturer, legal address;
- name of the additive;
- batch number and date of manufacture;
- net weight;
- test results of the main indicators: humidity and apparent density of the unconsolidated additive for BETOMIX-ITH®; density, kinematic viscosity for BETOMIX-ITH® Gel;
- designation of the regulatory document;
- stamp of acceptance by the technical control service;
- designation of these technical specifications.

3.12 Only products with a quality certificate are allowed for shipment.

4 Test methods

4.1 Sampling for testing.

4.1.1 Single samples should be taken from at least 5 % of the packages from the beginning, middle and end of the batch in equal quantities and with a total mass of at least 1 kg.

4.1.2 Single samples are combined into one, thoroughly mixed and a combined sample is obtained. From the combined sample by quarting, an average sample is obtained, the mass of which must be sufficient to determine all standardized indicators.

4.1.3 The sample is stored in a hermetically sealed polyethylene or glass container, equipped with a label containing the brand of the Additive, sample number, date of sampling.

Before testing, the averaged sample is thoroughly mixed.

4.2 Testing of Additive should be performed in rooms with an air temperature of (20±2) ºC and relative humidity of (65±5) % after a preliminary exposure of the sample for at least 3 hours.

4.3 The appearance of the product is evaluated visually.

4.4 Humidity measurement.

4.4.1 The method consists in determining the change in mass of the dry mixture in the state of natural humidity and after drying at a temperature of (105 ±5) ºC.

4.4.2 Equipment and materials:

Drying chamber with thermostat, which provides the heating temperature 110ºC;

laboratory scales with a weighing limit of at least 300 g and an accuracy of weighing of no more than 0.1 g (for example, VLE-134);

beaker for weighing according to State Standard 25336;

a desiccator according to State Standard 25336;

calcium anhydrous chloride according to State Standard 450.

4.4.3 Conducting the test

The sample of dry mixture with a mass of (50±0,01) g is placed in a pre-dried and weighed beaker. The sample is dried in the desiccator at (105±5) ºC for 3 hours.

The beaker is removed from the desiccator, closed with a lid, cooled in a desiccator over calcium chloride for at least 30 min and weighed.

4.4.4 Processing of results.

The humidity (W) in percent is calculated by the formula:

$$W = \frac{m_1 - m_2}{m_1} \times 100,$$

where m_1 is the mass of a sample of the mixture before drying, g;

m_2 - weight of the mixture after drying, g;

Quality control is carried out from the averaged sample after thorough mixing.

The composition is considered to have passed the test if the humidity is not more than 1 %.

The value of humidity is calculated as the arithmetic mean of the test results of three samples.

4.5 Determination of apparent density of unconsolidated composition.

The method is based on determining the ratio of the mass of the freely poured powder to its occupied volume.

4.5.1 Equipment and materials.

Glass measuring cylinder with a lapped cap of diameter (35±5) mm, a capacity of 250 cm^3 and the division value of not more than 2 cm^3;

Scales with a limit of weighing at least 300 g and an accuracy of weighing of no more than 0.1 g (eg, VLE-134);

Stopwatch with an accuracy of measuring not more than 1.0 s for 10 minutes (for example, SOSpr-2b-2-000).

4.5.2 Conducting the test.

A sample of powder weighing (100.0 ± 0.1) g is placed in a clean dry cylinder using a funnel. The cylinder is closed with a stopper and turned over by rotational movements in a vertical plane, making 10 full revolutions with a frequency of about 0.5 s^{-1}. Immediately after the end of rotation, the cylinder is placed vertically; the powder is allowed to settle for (180 ± 5) s, the volume V, cm^3 occupied by the powder is determined.

4.5.3 Processing of results.

The apparent density of unconsolidated powder in free-fill $\rho_н$ in kilograms per cubic meter is calculated by the formula:

$$\rho_н = m/ V,$$

where m - actual weight of the powder sample, g;

V - the volume occupied by the powder sample after sedimentation for (180 ±5) s, cm^3.

4.6 Water resistance of the concrete treated with the Additive in comparison with control concrete sample is determined by the "wet spot" method according to State Standard 12730.5.

In the course of the tests, the waterproof grades of control concrete samples and concrete samples treated with the Additive are compared.

4.6.1 Equipment and materials.

Measuring instruments and devices according to State Standard 12730.5;

Scales according to State Standard 53228 with a margin of error of no more than 0.01 kg;

A caliper according to State Standard 166;

A container with stands for water saturation of samples;

4.6.2 Preparation of test samples:

For testing, a control volume of concrete of a class of at least B22.5 (State Standard 26633) is selected. A series of samples are made from this composition (18 samples are cylinders with a diameter of 150 mm and a height of 150 mm), of which 9 samples are control and 9 samples are with an Additive).

The additive BETOMIX-ITH® is introduced in the form of an aqueous solution (the additive is mixed with water in a ratio of 3:2) in the amount of 1 % dry additive by weight of Portland cement in the concrete mix. The additive BETOMIX-ITH® Gel is introduced in an amount of 1 % of the weight of Portland cement in a concrete mixture. Mixtures of control samples and samples with the Additive should have the same mark for workability.

It is recommended to produce samples in an amount of at least 18 pieces in case of rejection by density. All samples are marked and kept for 2 days in a normal hardening chamber (at a temperature of 20 ± 2°C and air humidity of at least 95 %).

Next, 9 control samples and 9 samples with an additive are placed on stands in two different containers with water so that the water covers 135 mm of the sample height. Containers with samples are covered with a polyethylene film and 2 times a day the upper end faces are humidified abundantly with a hand sprayer. All samples are kept in this way for 19 days. After storage in water, the samples are placed in room conditions (temperature 20 ± 2°C and humidity 55 ± 5 %) for 7 days. After storage in room conditions, the average density of all concrete samples is determined according to State Standard 12730.1. The average density of samples should not differ from the maximum by more than 50 kg / m^3. If this requirement is

not met, the samples are discarded. It is necessary to leave 6 control and 6 samples with an Additive for testing.

Further, all samples are dried at a temperature of 60°C to a constant mass. The mass is considered constant when the difference between two consecutive weighings of the sample is less than 0.2 %. Weighing is carried out no more often than after 4 hours.

Water resistance of concrete samples treated with the Additive and control samples is determined by the method "by the wet spot" according to State Standard 12730.5. Samples are placed in metal cylinders and the side surfaces are sealed with waterproof material (for example, technical paraffin). Water pressure is increased in steps of 0,2 MPa within 1-5 minutes, the exposure time of samples at each step is 16 hours (temperature in the room is 20±5°C, relative humidity at least 60 %).

It is necessary to test all the samples (6 control and 6 with the Additive) until the appearance of water filtration in the form of wet drops or wet spot on the upper end surface of the sample and record the amount of water pressure and time after which at this pressure water filtration was observed.

4.6.3 Processing of results.

The water resistance of each sample is evaluated by the value of the maximum water pressure at which no water has yet been observed penetrating through the sample. The water resistance of a series of samples is evaluated by the maximum water pressure at which no water penetration is observed in four out of six samples.

Concrete grade of water resistance is taken according to State Standard 12730.5.

The magnitude of the increase in water resistance is determined by the difference between the water resistance of the series of basic samples and the water resistance of the series of control samples according to the formula:

$$\Delta W = (W_d - W_t)/2,$$

where W_t - water resistance of control samples, MPa;

W_d - water resistance of samples with the Additive, MPa.

The test results are recorded in the journal, where the marking of samples, the composition of the concrete mixture, density and date of manufacture of samples, test date, the value of the water resistance of individual samples and a series of

samples indicating the time and pressure at which water penetration was observed through each sample, increasing the grade of concrete water resistance.

4.7 Determination of the degree of increase in the strength of concrete. Determination of the increase in the strength of concrete with the Additive is carried out by experimental comparison of the chosen indicator in the treated and untreated sample of concrete.

4.7.1 Equipment and materials.

Measuring instruments and devices according to State Standard 12730.5;

Scales in accordance with State Standard 53228 with a margin of error not exceeding 0.01 kg;

A caliper by State Standard 166;

A container with stands for water saturation of samples;

Plastic film;

Hand sprayer.

4.7.2 Preparation of test samples.

For testing, a control composition of concrete of a class of at least B22.5 (State Standard 26633) is selected. A series of samples (6 samples of cubes 100x100 mm) are made from this composition, 3 samples will be control and 3 samples with the Additive.

All samples are marked and kept 28 days in a chamber of normal hardening (temperature 20 ± 2 °C, humidity not less than 95 %).

Then 3 control samples and 3 samples with the Additive are placed in two different containers with water. The water should cover about 3/4 of the sample height. Tanks with samples are covered with a polyethylene film and 2 times a day the upper end faces are humidified abundantly with a hand sprayer. Under the described conditions, the samples are stored for 19 days.

Then all samples are placed in room conditions (temperature 20±2 °C and humidity 55±5 %) for 7 days.

After that all samples are dried at 60°C to constant weight. The mass is considered constant if the difference between two consecutive weighings of the sample is less than 0.2 %. Weighing is carried out no more often than after 4 hours.

4.7.3 Processing of results.

The compressive strength is determined according to State Standard 310.4-81. The test results are recorded in the journal, where the marking of samples, the

composition of the concrete mixture, density and date of manufacture of samples, test date. The strength of the samples treated with the Additive should be at least 5 % higher than the strength of the control samples.

4.8 Determination of kinematic viscosity.

4.8.1 The method is based on the measurement of viscosity using a capillary viscometer. The essence of the method is to determine the time of flow through the capillary of a certain volume of liquid from the measuring tank.

4.8.2 Equipment, materials and reagents.

Capillary glass viscometer of the VPJ-1m type according to State Standard 10028-81.

LT-TWC/7 circulation thermostat, Labtex or similar. Pear (douche bag) rubber according to Tech.Spec. 9398-005-05769082-2003 or similar.

Measuring cup according to State Standard 25336-82, B type, with a capacity of 100 cm^3.

Stopwatch according to State Standard 5072-79.

Laboratory analytical scales with an accuracy of up to the 4th digit.

4.8.3 Preparation for the test.

4.8.3.1 Preparation of the viscometer.

Before determining the viscosity of the liquid, the viscometer must be thoroughly rinsed and dried. The viscometer is first washed several times with gasoline, then with petroleum ether. After the solvent, rinse with water and pour for at least 5-6 hours with a chrome mixture. After that, the viscometer is washed with distilled water and dried. For faster drying, the viscometer can be washed with rectified alcohol or acetone.

4.8.3.2 Preparation of the sample.

Before the test, the thermostat is pre-maintained for about 30 minutes to achieve a constant temperature of the liquid. About 25 g of the averaged solution is poured into a measuring cup. The measured amount of solution is poured into a viscometer and kept at a given temperature for 1 hour.

4.8.4 Conducting the test.

The kinematic viscosity of the solution is measured at a temperature of 30°C. The sequence of measurement stages is carried out according to the section "Operating procedure" set out in the passport of the viscometer. 3 repeated measurements are carried out (to clarify the results, another parallel measurement is

carried out in three repetitions). For the final test result, the arithmetic mean of three parallel definitions of the fluid expiration time T is taken. The allowable interval of discrepancy between the values of the expiration time is no more than 3 seconds.

4.8.5 Processing of results.

The kinematic viscosity υ is calculated by the formula, taking into account the average time of fluid flow T:

$$\upsilon = \frac{g}{9.807} * T * K,$$

where K is the constant of the viscometer specified in the section of the passport "Technical characteristics" for the viscometer;

T – averaged time of fluid flow, s;

υ - kinematic viscosity of the fluid, mm^2/s;

g - acceleration of gravity at the measurement point, mm^2/s.

4.9 The density is determined according to State Standard 18995.1-73 (Section 1. Determination of liquid density using an aerometer).

4.10 The activity index of hydrogen ions (pH) is determined by State Standard 22567.5-93.

5 Transportation and storage

5.1. Additives BETOMIX-ITH® and BETOMIX-ITH® Gel can be transported by all types of transport in covered vehicles (including air), protecting against moisture and dirt, in accordance with the rules of cargo transportation, operating on a particular type of transport.

5.2. Transportation and storage of the Additive is carried out in a package at a temperature of - 50°C to +50°C.

5.3. The additive BETOMIX-ITH® Gel freezes at a temperature from 0 to minus 2.5°C. For defrosting, the additive is placed in a warm room, to speed up the process, the additive can be heated through a container to plus 50°C. Defrosting occurs by gradual thawing. When delamination occurs, the additive is averaged by stirring / shaking.

6 Instructions for use

6.1 When performing work with the Additive, it is necessary to be guided by the Building codes and regulations 12-04 "Labor safety in construction. Part 2. Construction production", State standards and technical specifications. When working with the Additive at facilities subordinate to the Gosgortehnadzor of the Russian Federation, it is necessary to be guided by the "Rules for the design and safe operation of steam and hot water pipelines".

6.2 Personnel working with the Additive must be provided with protective clothing and personal protective equipment.

6.3 The dosage of the dry BETOMIX-ITH® and the liquid BETOMIX-ITH® Gel is 1% of the mass of cement in the concrete mixture. If the amount of cement in concrete is unknown, then the estimated material consumption of BETOMIX-ITH® and BETOMIX-ITH® Gel per 1 m^3 of concrete is 4 kg.

6.4 BETOMIX-ITH® is added to the concrete mixture in the form of an aqueous solution. Pour water into the dry mixture in the ratio: 1 mass part of water per 1.5 mass parts of the dry mixture. Mix for 2 minutes using a low-speed drill. Use the prepared mixture for 5 minutes.

6.5 In case of contact with the Additive on the skin and eyes, rinse immediately with water. If irritation persists, consult a doctor immediately.

7 Manufacturer's guarantees

7.1 The manufacturer guarantees the compliance of the product with the requirements of these technical specifications, provided that the consumer complies with the conditions of transportation, storage, and use.

7.2 The guaranteed shelf life of the product from the date of manufacture is 18 months for BETOMIX-ITH® and for BETOMIX-ITH® Gel.

List of normative and technical documents referred in the technical specifications.

№	Document designation	Title of the document
1	State Standard 12730.5-84	Concretes. Methods for determining water resistance.
2	State Standard 12730.1-78	Concretes. Density determination methods.
3	State Standard 166-89	Calipers. Technical specifications.
4	State Standard P 51760-2011	Consumer polymer packaging. General technical specifications.
5	Building Codes and Regulations 12-04	Labor safety in construction. Part 2. Construction production.
6	State Standard 26633-2012	Heavy and fine-grained concretes. Technical specifications.
7	State Standard 53228-2008	Scales of non-automatic action. Part 1. Metrological and technical requirements. Tests.
8	State Standard 22685-89	Molds for the production of control samples of concrete. Technical specifications.
9	State Standard 31356-2007	Dry construction mixes on cement binder. Test methods.
10	State Standard 24297-87	Input control of products. Basic regulations.
11	State Standard 31108-2003	General construction cements. Technical specifications.
12	State Standard 12.1.007-76	The system of occupational safety standards. Hazardous substances. Classification and general safety requirements.
13	State Standard 25336-82	Laboratory glassware and equipment. Types, basic parameters, sizes.
14	State Standard 450-77	Technical calcium chloride. Technical specifications.
15	State Standard 22567.5-93	Synthetic detergents and surfactants. Methods for determining the concentration of hydrogen ions.
16	State Standard 18995.1-73	Chemical liquid products. Methods for determining density.
17	State Standard 310.4-81	Methods for determining the bending and compressive strength.

REGISTRATION SHEET OF CHANGES

Registration sheet of changes									
Changes	Numbers of sheets (pages)				Total sheets (pages) in the document.	№ Docum.	Incoming number of the accompanying document and date	Sign.	Date
	Changed	Replaced	New	Cancelled					
1	2,4,6,8, 9,10		12, 13		13	Out. № 16355/01-18 dated 20.01.2016		Valtsifer	20.01.2016
2	2-14				15	Out. № 17700-t/01-311 dated 03.07.2018		Valtsifer	03.07.2018
3	4, 10,15		11		16	Out. № 17700-t/01-429 dated 11.11.2021		Valtsifer	11.11.2021

Взам.инв.№

Подп. и дата

Инв.№ подл.

Ch.	Qt.	Sheet	№doc	Sign.	Date	Tech.Spec. 5745-047-04740886-2013	Sheet 17