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Protection Of Reinforced Concrete Coverings

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ABSTRACT

Investigation of some characteristic values of concrete in reinforced concrete elements is necessary. This survey makes it possible to assess the actual work of concrete in the design of reinforced concrete structures.

KEYWORDS

Reinforced Concrete Structures, Reinforcing Mesh, Bracket For Fastening The Mesh, Condition Of Reinforced Concrete Cover Panels, Operating Conditions, Sealing Element, Operational Loads.

INTRODUCTION

Additional surface protection is assigned in cases where the “reserve of durability” of concrete is insufficient to ensure the operation of a reinforced concrete element during the design period with a given reliability. Secondary protection works include surface preparation of old and new concrete and implementation of protection (coating, impregnation, etc.).

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MATERIALS, DESIGNS AND PROTOTYPING

Surface impregnation of concrete. An increase in the protective and structural properties of the surface layers of concrete can be achieved by impregnation with various materials.

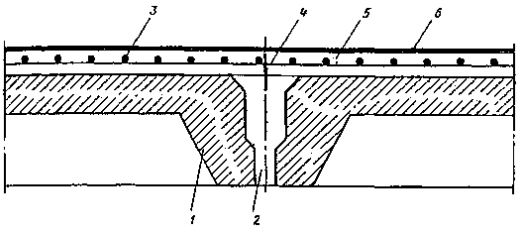
In the manufacture of prefabricated reinforced concrete elements, impregnation with sulfur, monomers (styrene, methyl methacrylate, etc.), bitumen melt is used. Sulfur impregnation is not recommended for structures experiencing cyclic heating.

Impregnation of concrete in operated structures is carried out by fluating (treatment with a solution of magnesium fluorosilicate) or by applying compositions based on petrolatum or methyl methacrylate.

It is recommended to repeat fluating after 3-4 years. The use of modified petrolatum for impregnation is impractical when structures are exposed to strong oxidants, organic solvents, oils and concentrated alkalis [1].

Surface impregnation of concrete with modified petrolatum can be used when installing non-insulated roll-free roofs coatings of both newly constructed and operated buildings.

In the latter case, the worn out waterproofing carpet and cement screed must be removed.



Rice. 1. Roof structure impregnated with concrete screed 1 - reinforced concrete cover panels; 2 - cement mortar; 3- reinforcing mesh; 4 - a bracket for attaching the mesh; 5 - screed made of fine-grained concrete; 6 - impregnated layer of concrete screed.

Depending on the actual condition of the reinforced concrete roof panels and operating conditions, two options are recommended:

- In case of significant damage to the panels of the panels (holes, low concrete strength, exposed reinforcement), as well as for workshops with heavy-duty cranes, especially with a rigid suspension, and for coatings from small-sized slabs - a continuous screed made of fine-grained concrete with a thickness of 25-30 mm, reinforced mesh fixed at the seams between the panels (Fig. 1);
- On a site with well-preserved or newly assembled large-size panels, in the absence of significant horizontal deformations of the building frame, the outer layers of concrete of the panels can be impregnated. The seams between the panels (previously cleaned) are filled partially with sealant (UMS-50; high-melting oil bitumen, softener, a mixture of bitumen and petrolatum), partially with cement mortar, which is also impregnated (Fig. 2).

It is recommended to seal the joints of roofing slabs located above the trusses (along the roof slope) with sealing polyethylene elements (Fig.

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3). In this case, there is no need to clean the seams. The sealing element has three ribs, of which the average 25 mm high is intended for the formation of a directional crack in the concrete along the line of this rib during temperature deformations, the lateral ones 7 mm high - to prevent the spread of water that has got into the crack in the transverse direction [2,3].

Sealing elements are cut from polyethylene extruded sleeves. It is recommended to choose the length of the sealing elements equal to the total length of the seam on both sides of the ridge of the roof, and to lay them in such a way that the middle ribs coincide with the axis of the sealed seams.

The mounting fastening of the sealing elements to the concrete of the panels is carried out with hot bitumen mastic, applied in sections 15-20 cm long every 1.5-2 m.

On open surfaces prone to insolation (during summer work, mainly in the southern regions), artificial heating of concrete may not be performed. In these cases, the impregnating mixture is applied to the slightly dried surface of the screed or embankment, which provides favorable conditions for concrete hardening without special maintenance.

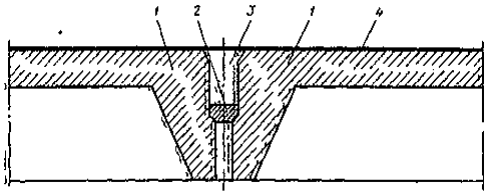
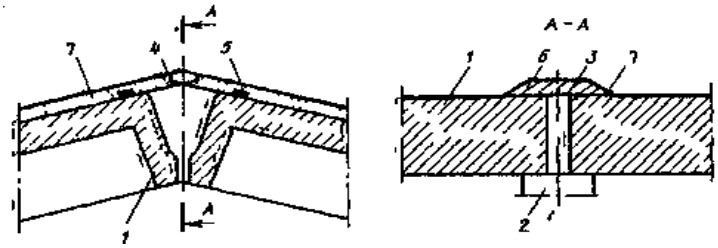


Fig. 2. Roof structure with concrete impregnation of reinforced concrete panels and sealing of seams with non-hardening mastics
1 - reinforced concrete cover panels; 2 - non-hardening sealing mastic; 3 - cement mortar; 4 - impregnated concrete layer of panels and grout.



Rice. 3. Roof structure with concrete impregnation of reinforced concrete panels and sealing of seams with sealing polyethylene elements
1 - reinforced concrete cover panels; 2 - the upper belt of the truss; 3 - sealing polyethylene element; 4 - welding of overlapped polyethylene elements; 5 - assembly fastening of the sealing element with hot bitumen mysticism; 6 - padding; 7 - impregnated layer of panels and concrete blocks

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For surface impregnation with polymer compositions, compositions cured at a temperature of 60-80 ° C are used, as well as composition 6, cured at 20 ° C, are used for impregnation to a depth of 15 mm.

Compositions 3-5 are cured at room temperature, however, due to their increased viscosity, they can be used to impregnate concrete to a depth of 7 mm. Structures impregnated with composition 1,3 and 6 can be operated at temperatures up to 75 ° C, and impregnated with composition 2, 4, 5 - up to 100 ° C.

Structures and products prepared for impregnation should not have potholes, sinks with a width of more than 0.5 mm. The concrete surface must be clean, no paintwork, waterproofing and other coatings and contamination are allowed [4].

Before impregnation, the concrete surface must be dried to a depth of 5-15 mm to a residual moisture content of 1-1.5%. Drying is carried out using thermo-radiation heaters such as BIS-10, BIS-15 in accordance with the instructions for their operation. It is allowed to use other drying devices, as well as air drying, which provide the required degree of drying at a given depth. When using composition 6, it is allowed to impregnate concrete with a moisture content of up to 2.5%.

The drying time, selected empirically, can vary from 8 to 48 hours, depending on the thickness and shape of the structure, the composition of the concrete, the type of drying equipment, the drying temperature, the initial temperature and humidity of the concrete and the environment. The control and duration of drying is carried out on core samples or samples obtained by a chip to a depth of 15 mm. The drying process is considered complete if the moisture content of the sample, determined by the weight loss during heating at 110 ° C, does not exceed the above values. Before impregnation, dried concrete surfaces must be cooled to a temperature of 30-35 ° C.

For impregnation of horizontal surfaces facing upward, the impregnating composition is applied in 1-2 layers by irrigation, followed by leveling with brooms or a brush, after which it is covered with plastic wrap. The consumption of the impregnating composition and the duration of the impregnation, depending on the depth of impregnation and the composition of the concrete, are taken roughly.

Impregnation of vertical and inclined surfaces is carried out with the help of shields made of tin or non-galvanized roofing iron and having dimensions corresponding to the dried area. The shield should repeat the profile of the impregnated surface and be attached to it with a gap of 1-5 mm. Along the perimeter, the gap between the shield and the concrete surface is sealed with cement-sand mortar, window putty and other sealing materials. In the upper part, the gap between the shield and the concrete surface should be widened for pouring the impregnating compound. An impregnating compound is poured into the gap between the shield and the concrete surface and kept for a period of time. At the end of the impregnation, the excess of the impregnating composition is drained through a specially provided hole in the lower suit of the shield (during impregnation it must be closed with a stopper).

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At the end of the impregnation process, the impregnating composition is polymerized in the pore space of concrete in order to transfer them from a liquid state to a solid state.

The polymerization process of compositions 1 and 2 is carried out without removing the shields used for impregnation. After the end of the impregnation process, the impregnating composition is completely drained into the reserve tank, and the gap between the shield and the concrete for 1-3 minutes is filled with a sealing liquid heated to 60-80 ° C, which serves to uniformly heat the impregnated surface and prevent evaporation of the monomer. Sealing fluids must not be volatile, toxic or flammable. It is recommended to use water, glycerin, aqueous solutions of salts, etc. as sealing liquids. It is necessary to provide free access of the sealing liquid to any point of the impregnated surface [5,6].

After filling the gap between the shield and the impregnated concrete with a sealing liquid for the polymerization process of compositions 1 and 2, the surface of the shield is additionally heated to 60-80 ° C for 1-2 hours using heaters used for concrete drying.

The polymerization process of compositions 3-6 is carried out at room temperature. After the end of the impregnation process for a period of time, and the removal of the excess impregnating composition, the shield is left in its original position for 0.5-1.5 hours to slow down the evaporation of the monomer, after which the shield is dismantled.

At the end of the polymerization process and dismantling the board used for impregnation, the remains of the sealing material are removed from the concrete surface.

EXPERIMENTAL RESEARCH TECHNIQUE

Corrosion protection and reinforcement of reinforced concrete elements with fiberglass. The method of anticorrosive protection with simultaneous reinforcement with fiberglass can be used for structures belonging to II and III categories. Its application for structures in a dangerous and emergency state (categories IV and V) requires special justification

Fiberglass of the design thickness applied to the structure increases its bearing capacity, rigidity, crack resistance and resistance to dynamic loads. The ability of fiberglass to work on cracks without breaking or breaking the tightness makes it possible to operate a structure with cracks with an opening width of up to 0.3-0.4 mm, regardless of the degree of aggressiveness of the environment.

In the case of reinforcing reinforced concrete structures by creating a pre-stress in them, according to the sign opposite to the stresses from the existing operational loads, after reaching the appropriate forces, a binder and fiberglass of the calculated thickness are applied to the surface of the structure in one or more layers. The element is kept under load until the binder has polymerized. After removing the load, the prestressing in the structure is retained due to the entry into operation of the fiberglass [7].

The choice of the base of the polymer composition (resin) for the preparation of fiberglass should be carried out depending on its resistance to specified aggressive influences.

When applying fiberglass in winter conditions or on a wet surface, it is advisable to use highly active hardeners UP-583, AF-2. In addition, at

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temperatures up to -15 ° C, you can use an epoxy polymer composition of the following composition: epoxy resin - 100; hardener - PEPA - 30; plasticizer - furyl alcohol - 30; accelerator - ferric chloride - 8. If it is necessary to increase the technological viability of the epoxy composition, low-level hardeners UP-0633, DTB-2 can be used.

For anticorrosive protection, it is also recommended to use compositions based on polyester resins both for general purposes (PN-1, PN-3) and with increased chemical resistance - PN-6, PN-10, PN-15, Slokril. Curing of polyester resins is carried out by an initiator system consisting of an initiator and a curing accelerator.

For reinforcing resins, the following glass fabrics can be used: T-4, T-11, T-13, T-23, IST, TSF (B) -70

Cutting of fiberglass is carried out on clean plywood or cardboard sheets.

When using epoxy compositions, it is recommended to anneal glass fabric, carried out with large volumes of work in furnaces at a temperature of 400-450 ° C for 2 hours, and with small volumes of work - with a blowtorch.

Annealing with a blowtorch fire is performed by its uniform horizontal or vertical movement over the entire area of the blade at a speed of 0.2-0.3 m / s at a distance of 10-12 cm from the blade to the nozzle. 5.46. To reduce the porosity and viscosity at an elevated temperature of the composition, it is recommended to keep it at an elevated temperature (60-70 ° C) for 1.5-2 hours. The components are mixed in buckets or other containers [8,9,10].

CONCLUSION

To avoid explosion, direct mixing of the hardener (initiator) and the hardener accelerator is strictly prohibited. The hardener (initiator) should be added to the mixture only after thorough mixing of the resin with the accelerator.

It is possible to carry out work on molding fiberglass only on a prepared concrete surface with an air humidity of no more than 70% in the following technological sequence:

- Brushing on a concrete surface of a thin (up to 1 mm thick) continuous layer of the polymer composition;
- Laying fiberglass, carefully rolling it with a rubber roller;
- Applying a thin continuous layer of the polymer composition to the surface of the fiberglass;
- Holding the structure (1-4 days) in the position at which the fiberglass was molded before its polymerization.

When molding fiberglass, it is necessary to monitor the uniformity of the application of the polymer composition both to concrete and fiberglass, to avoid non-gluing. Air inclusions that can form under the impregnated glass cloth are also unacceptable. In this case, they are removed immediately after molding the fiberglass by forcing them with a roller through the nearest edge of the fiberglass or by piercing them in the place of air inclusions and then smoothing them.

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