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Primary Protection Of Structures

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ABSTRACT

This article describes the use of CONSTRUCTIONS in the production and construction of repair-replaceable elements (prefabricated, prefabricated monoliths and monoliths) during the reconstruction of reinforced concrete structures using basic protection means, as well as restoration and reinforcement through the construction of control elements. The following information is provided.

KEYWORDS

Primary Protection, Reinforced Concrete Structures, Reconstruction, Prefabricated, Prefabricated, Cast, Manufacturing, Reinforced Concrete Structures Without Reinforcement, Downtime, Service Life.

INTRODUCTION

Reinforced concrete structures with the use of primary protection are used in conditions of reconstruction in the manufacture and construction of new unloading and replacement elements (prefabricated, prefabricated-monolithic and monolithic), as well as in the restoration and strengthening of used elements by building up, arranging clips, shirts, etc. Reinforced concrete structures preserved without reinforcement are checked for the compliance of their primary protection with the operating conditions expected after reconstruction. Requirements for primary protection are established in accordance with

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the CMEA 4774-84 standard and SNiP 2.03.11-85.

When choosing the parameters and methods of primary protection, take into account: the service life of structures in the period between reconstructions (with or without secondary protection); terms of performance of general construction and anti-corrosion works during the shutdown period; the degree of influence of construction work on the main production in the pre-shutdown and after the shutdown period; cost, labor intensity of work, degree of mechanization, etc.

The estimated service life of structures is assigned by the general designer in agreement with the management of the reconstructed enterprise. If these terms are not specified, when assessing the effectiveness of primary protection, they are recommended to be adopted in accordance with the Guidelines for determining the economic efficiency of improving the quality and durability of building structures (NIIZhB, M .: Stroyizdat, 1982) as for elements operated in non-aggressive environments.

If, after reconstruction, the nature and intensity of operational physicochemical effects does not change significantly, the main parameters of cement concrete that affect the effectiveness of primary protection (type of cement, grade for water resistance), as well as the size of the protective layer of concrete, are selected taking into account the analysis of concrete samples taken from existing structures that have been exposed to similar influences for a long time.

When restoring and reinforcing reinforced concrete structures by building up, arranging clips or "shirts", additional requirements taken into account in the design and production of concrete work are the requirements for ensuring the joint work of new and old concrete, the absence of voids, non-payment and other defects when filling the space between the cage formwork with concrete ("Jacket") and reinforced structure, as well as preventing the formation of cracks inadmissible opening in new concrete due to shrinkage of the latter.

The adhesion of the new concrete with the old one is ensured by the appropriate preparation of the surface of the old concrete, in particular with the help of an efficient high-performance thermo-abrasive unit TA-11.

In the case when the old concrete is subject to oiling, a thermochemical treatment of its surface is recommended, including the following operations: treatment with a 0.1% surfactant solution (OP-7 or OP-10, GOST 8433-81) - 1-1.5 h; warming up at a temperature of about 180 ° C - 1 hour; treatment with an organic solvent - trichlorethylene, perchlorethylene (GOST 9976-83 *, TU 6-09-3841-77, etc.) - 1 hour; drying at a temperature of about 100 ° C - 0.5 h; rinsing with water under pressure.

To increase the adhesion of new concrete to old concrete in critical structures, it is recommended to apply a layer of glue to the prepared surface of old concrete before laying new concrete, the compositions and preparation technology of which are given in Appendix. 6.

When restoring, strengthening and replacing reinforced concrete structures, cement, including non-shrinking expanding and stressing, polymer-cement, acid-resistant

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(based on liquid glass) and polymer (mainly based on epoxy resins and methyl methacrylate) concretes and mortars are used.

Notes: 1. The degree of aggressive action was taken according to SNiP 2.03.11-85 for concrete grade W6 for water resistance. When the degree of aggressive action is more or less by one step, the average depth of corrosion damage, respectively, increases or decreases by about 1.5 times. When the grade of concrete for water resistance is greater or less than that indicated in the table by one step, the average depth of corrosion damage, respectively, decreases or increases by about 1.5 times. 2. The data given in the table were obtained for concretes made on Portland cement without additives or with the addition of ground granular slag up to 20% with a C3A content in the clinker from 4 to 9%.

In addition to design resistances and resistance to specified influences, specific requirements may be imposed on concrete mix and concrete, depending on the specific conditions for performing work: accelerated rate of hardening and strength gain (after 20-30 hours of hardening, concrete must have at least 50% of the design strength); slowing down the setting processes (by 4 hours or more) when laying in dispersed concreting places; liquefaction of the concrete mixture (up to 8 cm of OK and more) with limited possibilities of power compaction, laying with concrete pumps, filling the clips, etc .; shrinkage; increased protective properties in relation to steel reinforcement and embedded parts.

These requirements are met by the appropriate selection of the concrete composition, the use of chemical additives, and technological methods.

Chemical additives used for concrete must meet the requirements of the relevant Specifications and state standards.

To ensure the retained concrete mix (the property to maintain the required workability for a given time from the initial values after hardening to the minimum allowable, depending on the method of laying and compaction), additives are used.

Notes: 1. SP - super plasticizers type S-3, MF-AR (MFAS-R100-P, 10-03). 2. The effectiveness of the additive depends on the chemical, mineralogical and material composition of the cements.

For reinforcement, restoration and anti-corrosion protection of reinforced concrete structures in conditions of low and medium aggressive effects, as well as for monolithing the joints of prefabricated reinforced concrete elements, it is recommended to use expanding non-shrinking mortars and concretes on ordinary cement.

The following options for the composition of the expanding mortar and concrete on ordinary Portland cement are equivalent.

Solutions, kg / m3

Composition No. 1:

Portland cement M500 …… 515

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quartz sand …… …… . 1545

sulphate aluminum ..... …… … …… .. 10

sodium nitrite (V / C = 0.45 - 0.55). …… …… …… … 10

Composition No. 2:

Portland cement M500 …… 515

quartz sand ..... …… …… 1545

sulphate aluminum ..... …… .. 10

calcium nitrate ..... …… …… 10

technical lignosulfonate (SDB)…… …… ……. 0.54

aluminum powder (V / C = 0.45 + 0.55) .. …… …… 0.05

The amount of water in the solution and the mobility of the solution are selected empirically, depending on the size of the sand and other factors.

Concrete

Composition No. 1:

Portland cement ..... …… …… 330

crushed stone …… . 1270

sand ..... …… …… .. 600

sulphate aluminum ..... …… …… 6.6

sodium nitrite ..... …… …… 6.6

Composition No. 2:

Portland cement .. …… 330

crushed stone ... …… …… …… 1270

sand ... …… 600

sulphate aluminum ..... …… …… .. 6.6

calcium nitrate ..... …… …… 6.6

technical lignosulfonate .. …… …… 0.35

aluminum powder ..... …… … 0.03

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For the preparation of stressing mortars and concretes, stressing cements, sand, crushed stone, water and additives are used.

The compositions of polymer silicate concretes are given in non-shrinking acid-resistant mortars and concretes, and the technology for their preparation.

Main properties of polymer silicate concrete

Strength, MPa:

in compression …… …… .. 30-35

bending …… …… …… ... 6-7

in tension …… …… …… .. 2.5-3

Prismatic strength …… …… 21-25

Elastic modulus …… 24000-25000 MPa

Ultimate compressibility …… (110-150) 10-5

Ultimate tensile …… …… 21 × 10-5

Poisson's ratio …… …… 0.22-0.25

Corrosion resistance

Wednesday

Name	%	KS at squeezing	KS at bend
Water		0,74	0,7
sulphuric acid	2 %	0,75	0,71
	5 %	0,77	0,72
	10 %	0,86	0,76
	30 %	1,01	1,02
	50 %	1,05	1,03
saline	5 %	0,87	0,72
	20 %	1,02	1,0
nitrogen	30 %	0,99	0,98

Coefficient of thermal expansion 8 × 10-6 1 / deg

Shrinkage 0.15-0.2%

Coupling with reinforcement 1.8 MPa

Adhesion, MPa: freshly laid polymer silicate concrete to hardened 2.5 polymer of silicate concrete to Portland cement 1 Sealing chips, shells, potholes, surface destruction of concrete to any depth; outcropping of

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reinforcement, voids in the joints of prefabricated elements and other similar defects, as well as the device of the protective layer of the structure can be carried out using polymer solutions, the compositions of which are given.

Compositions 1-4 are fed into horizontal cracks facing upward by watering this composition along the entire length of the crack. If the crack is through, it is necessary to seal its lower part by filling it with cement-sand mortar, gypsum, sticking a strip of paper, molten paraffin, liquid glass or other glue.

Injectors represent a metal tube with an inner diameter of 5-10 mm, a length of 40-50 mm, with a washer welded on one end with a diameter of 4-5 mm. Injectors are glued with compositions 4 or 5 on concrete in the places of the greatest opening of cracks after 20-100 cm. It is allowed to use injectors, as well as adhesives for them.

Before being injected, they check the passage of air through the injectors, for which the injector is connected with a hose to the compressed air supply system (0.2-0.3 MPa). Air must flow freely through each injector. At the same time, the tightness of the adhesive seams is checked. If air leaks are detected, defective areas are additionally sealed by gluing strips of fiberglass.

To fill vertical and oblique cracks with polymer compositions 1-4, the lower injector is connected with a hose to a funnel into which the composition is fed. After the appearance of the solution from the upper injector, filling of the cracks is stopped. As the solution appears in the middle injectors, a supply hose is connected to them, and the underlying injector is closed with a stopper.

Composition 5 is injected into cracks using an injection device consisting of a sealed siphon tank and a compressor. The injected ones start with a pressure of 0.05-0.16 MPa, gradually bringing it to 0.3-0.5 MPa.

The duration of work with one batch of the composition should not exceed the terms of its viability (15-30 minutes). At the end of the work, all mechanisms and devices should be washed with a solvent (acetone, toluene) or hot water with soda. After the crack-filling compound has cured, the injectors and strips of sealant are removed.

To seal cracks 1.5-5 mm in size, cement paste is used on tension cement of normal density, which is minted with a spatula or injected with a special gun. The cement dough is prepared in small portions at the construction site.

To seal cracks 5-30 mm in size, use a solution on NC composition 3b, which is placed in the crack, tamped or minted with a spatula or a stamping hammer and rubbed with a trowel.

Repaired areas with cracks in structures are covered with foil or burlap.

After 24-30 hours after laying the cement paste on the stressing cement or mortar, moistening is performed once every 1 hour.

Steel reinforcement elements for outdoor structures operated in a mildly aggressive environment should be designed primarily from steel with increased corrosion resistance of grades 10KhNDP, 10KhDP, 12KhGDAF, 08KhG2SBDP without corrosion protection.

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Connections of steel elements on high-strength bolts made of 38ХС and 30Х3МФ "selector" steel or on rivets made of 09Г2 steel are allowed in the structures of buildings and structures with a non-aggressive environment, as well as with a slightly aggressive environment in unheated rooms and in the open air.

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