

## Separate way to concrete monolithic structures

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### Abstract

The article describes the method of separate monolithic concrete structures and its components. Particular attention is paid to increasing mechanization, the quality of their performance, expanding the scope of the method.

**Keywords:** methods and techniques of concrete; monolithic construction; mechanization

The method of separate concrete is pre-laying directly in the formwork or the well of coarse aggregate, followed by injection into the inter grain space of his cement-sand and plaster, polymer solution and is used in the construction of reinforced concrete foundations for equipment, tanks, retaining walls, foundations for complex high-rise buildings, towers and pile foundations. Separate concrete method allows you to get a comprehensive reduction in energy consumption and time-consuming work, both at the stage of preparation of coarse aggregate for filling and construction of the massive building structure by reducing or eliminating vibration effects on concrete and mortar mixture, method of concreting pressure.

For injection solution used mortar, concrete and Pneumosuperchargers. Production work is carried out by injection, while underwater concreting, by the rising of the solution. When you select a separate concreting should perform a feasibility study (FS) of the study and analysis of the local construction conditions, the availability of building materials (rubble, rubble Mk-125, materials recycling concrete and masonry structures after the demolition of buildings and structures, etc.) And production design works (PPR).

Injectable delivery methods and vibro separate concrete are to discharge the solution from the bottom upwards under pressure and reduce the number of joints in concrete as coarse aggregate can be laid into the mold or the well is not the entire height and layers. To ensure a steady state solution and pumping the specified quality of concrete to the stacking large aggregates, increased requirements with regard to purity, i.e. content of dust and dirt particles therein should not exceed 1% by weight. The minimum particle size of the coarse aggregate must be at least 40 mm, and the maximum-no more than 1/3 of the smallest concreted structure or the minimum distance

between the rods in the light fittings and for reinforcing mesh design and frames, the distance between them should be provided not less than the diameter of concrete pipe plus 1.1 of maximum size of coarse aggregate (250-500mm).

Water separation injection may be no more than 3%, and delaminate-20. To improve connectivity uniformity and injectable solutions are prepared in their enforcement (turbulent and vibroturbulent) mixers domestic or foreign production.

The injection solution produced when the thickness of the vertical structural elements of more than 0.8-1 m-through steel injection tube diameter of 50 mm; 125mm, a length not less than... 2 meters and a width of 15 mm slits or holes having a diameter of 20 mm or more, in the bottom tier of 150... 500 mm from the mouth, which is set, for example, before placing the formwork coarse aggregate;

When the thickness of the vertical elements 1 m-or through a hole injection nozzle diameter mm 38-50,125 formwork in building construction. When concreting injection tubes must be recessed into the solution to not less than 300mm. The distance between the injection pipes must be such that a solution could apply in all phases of this method concreted structures (Figure 1), and is expected to be received 1.8... 2 hp (hp-discharge height of the solution from the bottom of the injection tubes). The solution is injected into all injection pipe using concrete pumps, Pneumosuperchargers and mortar. The mean rate of rise in the solution to be concreted structure, not less than 0.06 m / min.

Shoring should be designed to take the pressure of 8-25 atmospheres, strong, not deformed and plaster impermeable. The level of solution in the design of injection pipe is removed from the layer of coarse aggregate (crushed stone). The distance between fittings is taken equal to 1... 1.5 m (see. Fig.1)

To increase the outlet area of the solution in coarse aggregate against the entire thickness of fittings concreted spiral twisted structure set of wire diameter of 5 mm. The inner diameter of the helix is equal to the diameter of the nozzle, and the step it turns should not exceed the minimum particle size of the stone backfill, inter grain solution or cast concrete. Spiral installed before laying the coarse aggregate and is fixed with a rod passed in the union. During injection through the injection nozzle mixes constantly monitored the level in the structure to

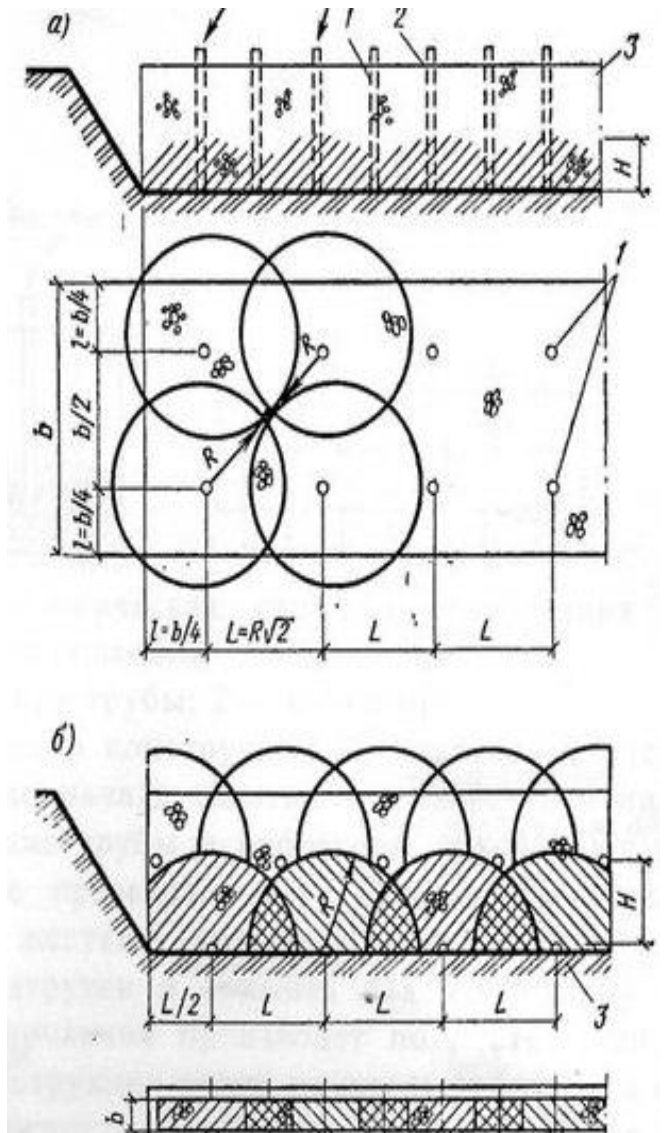
prevent the outflow of a mixture of the following adjustment holes.

After the end of the injection mixture through another is fitting last overlaps. Unlike injection via injection tubes supplying the mixture through a nozzle sequentially into each hole. Vibro injection method (Figure 2) is characterized in that the injection of a mixture of inter grain and made simultaneous vibration of coarse aggregate, mortar, rubble, or breakdown products of stone and reinforced concrete structures on the dates fragmented dimensions, thereby increasing the mobility of a mixture of gravel and permeability sketches.

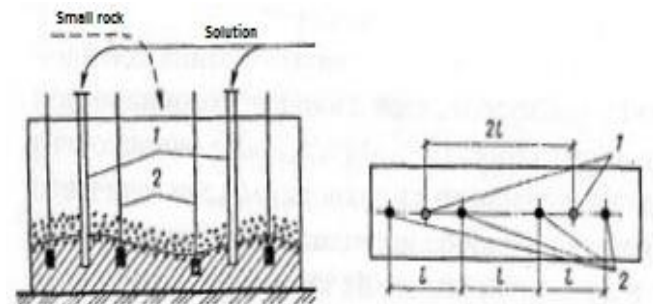
A feature of vibro injection is the necessary in some cases simultaneously topping up coarse aggregate, preparation and delivery of the solution, an additional vibration and lifting equipment. For a vibration study, except for the methods (methods) concreting pressure, allowing to eliminate or reduce exposure to vibration solution or alloy fine-grained concrete mixes. Vibrators are used, different types. Economically feasible under separate concreting of concrete and reinforced concrete buildings and structures used concrete pumps with specially prepared final section of the concrete (diameter 125-150 mm) < slots width and length of 150-500 mm.

Concreted elements in building construction, divided into blocks of concrete by installing between the metal grids or other dividing elements. In this case, to provide a monolithic, concrete structure of the next adjacent block should be performed before curing the binder in the lower layers of the previous block. Pipes feeding solution, concrete pipes and vibrators, if used, are combined in vibro packets in which their number is typically less than two. Pipes feeding solution and concrete pipes should be fastened hard traverses able to take the horizontal and vertical loads and withstand removing packages. Lifting vibro packets during concreting produce on reaching a solution or fine concrete top working part vibrating element. Construction vibrators pendants and pipes must allow for the possibility of changing the length of the process of concreting.

The volume of inter grain spaces between coarse aggregate can be determined in the laboratory using the measuring vessel filled with water, the amount (volume) which is easily fixed. With an accuracy of 5-7% of this amount, in addition, can be determined by calculation using the method of the balls in the selection of the composition of coarse concrete. Displacement inter grain space depends on two characteristics of the coarse aggregate, namely, the size fraction and the surface roughness (height of the projections and depressions). Economic feasibility of the organizational and technological solutions at separate concreting concrete application should be considered "at the disposal" of especially dense soils (clay, loam) tape and columnar foundations for equipment using, including permanent formwork waterproofing, chemical plasticizers in a mixture that allow reduce the number of injection pipes, mechanical activation of a mixture of quartz sand and cement in a vibratory mill with ultrasound treatment, using as injection, steel pipes with inventory connection without bolts (couplers).



**Fig.1 Layout of injection pipes and fittings a-concreting with the use of intravenous tubes; b-concreting by injecting the solution through the injection port; 1-the injection tube; 2-control tube; 3-formwork; 4-hole injection**



**Fig.2 Technological scheme of concrete monolithic structures discharge method 1-discharge pipe 2 – vibrator**

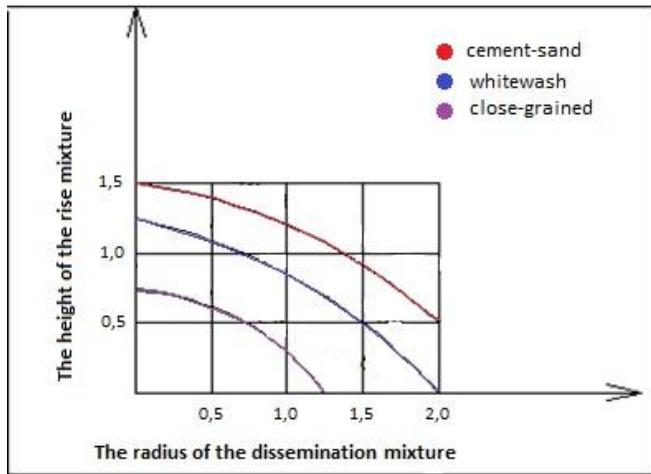


Fig. 3. The dependence of the radius distribution and the lifting height when injecting mortar on vertical pipes.

Table 1. Technical characteristics of equipment for injecting mortar

| No | Index  | CO-50A  | CO-30Б  |
|----|--|---------|---------|
| 1. | Performance m <sup>3</sup> / h                   | 6       | 4       |
| 2. | Maximum operating pressure MPa                   | 1,5     | 1,5     |
| 3. | Range of feed, m-Horizontally-Vertical           | 250, 50 | 160, 35 |
| 4. | The installed capacity of the electric motor, kW | 7,5     | 4       |
| 5. | The diameter of the mud channel, mm              | 80      | 62,5    |
| 6. | Weight   | 400     | 264     |

**Conclusions**

1. A method of separate concrete building structures can save 10-15% of cement in the production of works using gravel with grain size of 80-125 mm and a rubble of size up to 500 mm
2. The method of separate concrete economically feasible to use for concreting "at the disposal" of foundations in the trenches and pits arranged in very dense soils (clay, loam, rocky soil)
3. Using a cast of fine-grained mixtures for filling the inter grain space makes good use, other than for feeding and stacking solutions, concreting machinery complexes road and stationary concrete pumps.

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