ROLLCRETE UPSTREAM WING WALL

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A rollcrete upstream wing wall was constructed in April-May 1985. The wall* is part of the structures of the Tashkumyr hydro development, separating, together with the upstream earth cofferdam, the pit of the left-bank dam from the basin of the powerhouse and forming the barrier for starting up the first phase of the hydroelectric station [1-3].

Structurally, the wing wall represents a gravity dam with a maximum height of 22 m and length of 115 m absorbing a head up to 18 m. The total volume of the wall is 12,000 m³, of which about 6500 m³ is rollcrete.

The wall is divided lengthwise into four sections, of which the first three are made with an inside zone of rollcrete (Fig. 1). These sections differ in the design of the protective impermeable zone. Structurally, the first two sections are designed alike: the impermeable zone with a width of 1.5-2.0 m at the upstream face is made of ordinary vibrated concrete. The height of the layers of vibrated concrete placed in the upstream zone was 1 m, which corresponded to three layers of the rollcrete. The sections differ in the design of the contact between the vibrated and rolled concrete. Whereas in the first section the upstream zone of vibrated concrete was with a lead relative to the rollcrete, in the second section concreting of the upstream zone was carried out after placing three layers of rollcrete. In this case the slope of the rollcrete layer was formed without formwork. In the third section the rollcrete was protected by a gunite layer on the side of the upstream zone. The downstream face of all three sections was formed from precast reinforced-concrete trapezoidal blocks.

The sections of the walls were separated by expansion joints with 2-mm-thick stainless steel sheet waterbars. To organize drainage, vertical holes were drilled every 3 m at a distance of 4 m from the upstream face of the wall.

Rollcrete M100t80 with a cement content of 80-120 kg/m³ was placed in the wing wall; the maximum size of the grains of the aggregates was 50 mm.

Portland pozzolana cement M300 of the Kuvasai cement plant (70% Portland cement clinker and 30% naturally burned clay) was used as the binder; the phenolic wood-chemical preparation PWCP was added at a rate of 0.2-0.3% of the mass of

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Fig. 1. Design of the upstream wing wall: 1) downstream face of precast concrete members; 2) zone of lean rollercrete; 3) drainage; 4) zone near upstream face of ordinary vibrated concrete; 5) drainage collection gutter; 6) leveling layer of ordinary vibrated concrete; 7) gunite.

cement. The content of sand with a fineness modulus 2.8-3.2 in the concrete mixes was 36-38% of the total content of aggregates.

The concrete mix was prepared at the SB-75 concrete plant of the Tashkumyr hydrostation equipped with two continuous units each with a capacity of 30 m³/h.

The concrete mix was transported 1.5 km from the plant to the wall by KAMaZ-5511 dump trucks equipped with a tailgate. Installation of the wood and steel forms and precast reinforced-concrete blocks forming the downstream face was done by means of 5-ton-capacity M-4046 lift truck. The concrete mix, forms, and other freight were delivered to the concreting block by a KBGS-450 or DEK-251 crane, and then delivered to the site of placement by intrablock technological transport. Within the block the concrete mix was delivered by a Naryn concrete-delivery truck and was smoothed by a M-663B electric bulldozer.

The thickness of the rollercrete layer in an uncompacted state was 35-40 cm. A GRV-101 self-propelled pneumatic-tired-roller (Czechoslovakia), which under conditions of the narrow elongated blocks had the necessary maneuverability and for the selected layer thickness provided a sufficient degree of compaction (with 8-12 passes on the same track), was used for rolling.

The concrete mix of the upstream zone of sections 1 and 2 was compacted by a pack of internal vibrators on a M-663B electric tractor. The protective gunite layer on the upstream face of the third section was applied after completing its concreting.

The realization in practice of several design variants of the rollercrete wall made it possible to work out and master the method of placing rolled mixes as single-layer blocks and its possible modifications. Generalization of the experience and data of test and pilot placement of rollercrete carried out earlier made it possible to develop the main recommendations on the use of rollercrete in hydrotechnical construction [5] and to refine the design and method of constructing the USSR's first large rollercrete dam — the gravity dam of the Tashkumur hydrostation with a height of 75 m and volume of 250,000 m³ [2].

The technology of concreting the upstream wall is described in detail in published works [1, 3]. In December 1985 the wall on a head of water and has been operating successfully since then. The construction and operation of the wall was accompanied by investigations and on-site observations [2, 4].