

MODEL INVESTIGATION OF TUNNELS
SEISMIC RESISTANCE

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SYNOPSIS

Model investigations of tunnels seismic resistance, which are carried out at the Georgian Polytechnical Institute named after V.I.Lenin are described in the paper.

The models of the tunnel casing of full scale 1:20, 1:30 made of organic glass or sheet metal are tested on the vibration table. The medium surrounding the tunnel is simulated by fine sand. The conditions of simulation provide the approximate qualitative similarity of the prototype and the model. The tests are carried out at the horizontal harmonic and impulsive vibrations of the table.

Dynamic stress state of the tunnel tube is considered for the tunnels of deep embedding. The effect of the influence direction to the tunnel axis, ground surface relief above the tunnel, the depth of its embedding, the conditions of the tube ends fastening is investigated.

For the tunnels of shallow embedding the stress state of the cross section of casing of rectangular outline of built-up sections is investigated. The casing is in the layer of the friable medium with the horizontal surface, which is spread under by the layer of the dense fundamental rock with the horizontal roof. The fundamental rock tries the horizontal vibrations across the axis of the tunnel.

The tests have shown that the forces in the cross section of the casing are mainly caused by the lateral seismic pressure of the ground. Forces, caused by the forces of inertia of the casing weight are considerably less. The casing deformations essentially depend on the type of its butt-ends fastening and the joints between the sections. With the free sections the forces in the cross section are small and their variation in time has not the regular nature. With the stiff joint between the sections and the unsecured ends of casing the forces roughly increase and the deformations of the cross section have the nature of bending. It is caused by the vibrations of the upper layers of the filling with the larger amplitudes than the lower ones. With fastened casing ends the bending practically is absent and the vertical walls of section try the flexure.

The tests have shown that the principle kinematic factor defining the seismic effect is the ground acceleration.

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