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EXPERIMENTS ON THE VOLUMETRIC MODELS OF DAMS MADE OF REIFORCED SOIL

[1]Khamdamov Bekmamat, [2]Yuldashev Tashmirza Rahmanovich, [3]Khamdamov Umidjon

***ABSTRACT**--The analysis of published works on researching, usage and exploitation of units made of reinforced soil is presented. Description of the experimental stand. Methods of getting hydrostatic pressure and intrinsic weight of the dam. Conclusions and recommendations on the results of the experimental research.*

***Keywords**-- Volumetric model, the dam, reinforced element, hydraulic pressing, thruster, soil, facing, load, hydrostatic pressure, intrinsic weight.*

I. INTRODUCTION.

At the present time, choosing a rational option of reinforcement from constructional and economic point of view is one of the main problems of projecting of the units (such as dams, breastwalls and etc.) made of reinforced soil. The researches, carried out on prismatic model of reinforced soil, confirmed that change in the features can be resulted by changing the percentage of reinforcement and the scheme of distribution of the armature in the soil. In this respect, choosing the right reinforcement of the material (reinforcement percentage, its placement and others) would have huge priority.

As it is known, facing of the reinforced slope, fulfilling the function of preventing spilling of the slope one of the constructional elements of reinforced soil which can influence the feature of the unit. Hence, in order to evaluate the feature of the units, it would be proper to carry out researches in purpose of evaluating the impact of various facings on the features of the units.

Number of studies on defining the tense and deformed state of the reinforced soil was held. In these researches, the load is mainly applied by the stamps and other means on the surface of the researched model which distorts the law of change in pressure from the intrinsic weight by height. The researches, held by the method of centrifugal modelling, may give the opportunity of modelling the intrinsic weight. However limited sizes of these models, rubbing of the material of the researched model on the cartridge or the carriage may have a negative impact on the results. Hence, modelling of intrinsic weight by the anchors of volumetric model, in number of cases, would show much fuller picture of the behavior of reinforced soil, though these methods have certain faults.

As it is noted in the work, the stripes on the armature are not broken simultaneously. This phenomenon progresses but goes very quickly: first the tensest stripe is broken, then as soon as the tensions are distributed, comes next stripe and so on. Also, it is assumed that if reinforced elements of lower layers are much tenser, then

[1] *candidate of technical science, associate professor. Tashkent State Technical University named after Islam Karimov*
55bek@mail.ru

[2] *professor of Karshi Engineering and Economic Institute*

[3] *a student of the 4th course of Tashkent State University named after Islam Karimov*

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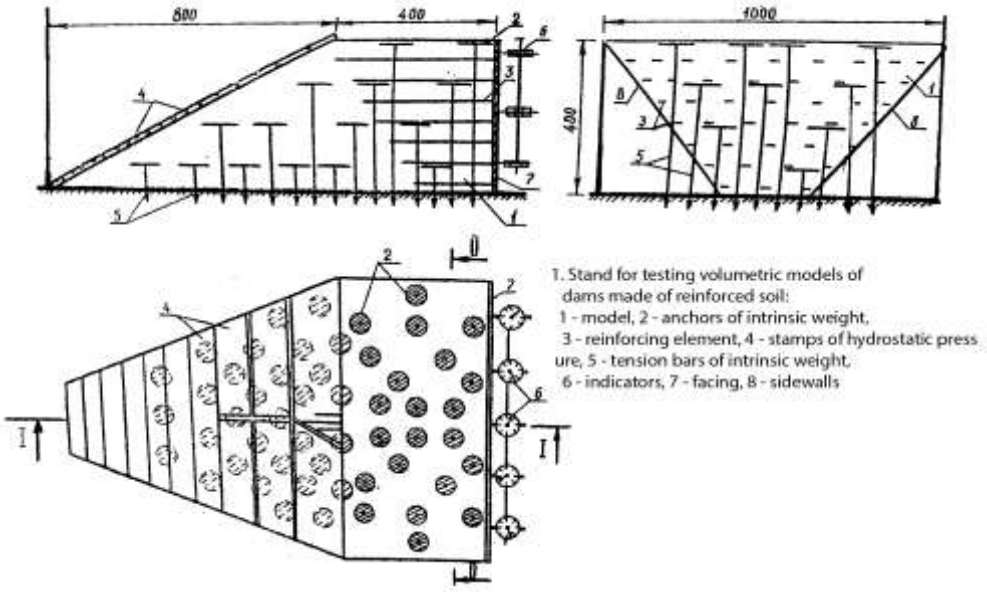
the breakage occurs exactly in those layers. In this regard, creation of such system which may let monitor the sequence of breakages of reinforcing elements in the model being independent from each other.

II. DESCRIPTION OF THE EXPERIMENTAL STAND

The experimental stand includes a welded metal construction with a firm bottom (modeling a full-size dam with a tight basis) and the side walls (pic.1); the shape and size of the stand allow to place in it quite big volumetric models of dams made of reinforced soil. Side walls (8), imitating the sides of the cross-sections of the dam, are made of plexiglass width of which is t = 10 mm and tightly attached into a metal frame. In order to create roughness, the surface of the plexiglass is processed with grinding paper. The upper part is made in shape of slope imitating upper slope of dam which is equal to m_h=2,0. Lower part is made of plexiglass in two options (continuous and cut vertically) of 10 mm wide in shape of vertical breastwall.

Hydrostatic pressure is obtained by hydraulic pressing and thrusters (dia of the piston is $d_п$ = 24 mm) through metal stamps the width of which is $d_ш$ = 10 mm. The stamps are made in terms of equally distribution of the hydrostatic pressure on the depth of upper reach. The thrusters are applied on the places of the gravity centres of each stamps (4, pic. 1). Before the mounting thrusters, they are calibrated with standard dynamometer. The calibrating is carried out with the load between 10 atm. and 100 atm. Further, the calibration curve is used while defining the load.



1. Stand for testing volumetric models of dams made of reinforced soil:
1 - model, 2 - anchors of intrinsic weight,
3 - reinforcing element, 4 - stamps of hydrostatic press ure, 5 - tension bars of intrinsic weight,
6 - indicators, 7 - facing, 8 - sidewalls

Intrinsic weight is obtained by hydraulic thrusters transmitting the pressure onto the tension bar through the loading plate. A flat metallic plate and hydraulic thrusters (dia of the picton is $d_п$ = 58 mm) are used to create the intrinsic weight. Before the experiments, the thrusters and the plate are calibrated. The calibration is done by the help of standard dynamometer. Further, the calibration curve is used while defining the load of the intrinsic weight.

The intrinsic weight was obtained directly inside the model by the metal anchors diameter of which was d_a = 30, 50, 80 mm and width was 3 mm. The anchors had holes in the middle the diameter of was $d_{ОТВ}$ = 3 mm. The

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tension bars, made of fosta nylon, were attached onto the anchors through the holes. The tension bars were passed through specially drilled holes on the bottom of the stand and connected to the loading plate by the hooks.

III. CONCLUSIONS AND RECOMMENDATIONS

1. A stand has been made for the experiments of volumetric models of dams.

2. A loading device has been elaborated for modelling the hydrostatic pressure and intrinsic weight.

3. The model preparation technology has been made up.

4. Experimental researches have been carried out and the results have been obtained. The results of the experimental researches have revealed that:

- hydrostatic pressure does not significantly influence the features of the reinforced dam. Which is why the evaluation of the features can be done by giving the load from the intrinsic weight. But hydrostatic pressure may lead to extreme state which is described as the loss of strength of the dams to move as a whole in form which is close to flat movement on low motional characteristics of the base;

- the researches have revealed that the increase in the length of the unit made of reinforced soil were effective comparing to the reinforcement of extended elements on the lower part. Thus it must be taken into account that the reinforced elements of upper rows may slip in the soil as a result of comparatively low volume of friction. Consequently, in order to improve the abilities, it would be effective to anchor the endings of the upper rows of reinforced elements into the soil;

- smooth increase of the length of the reinforced elements by the height, comparing to the step-by-step type, may give additional strength of the slope of the dam made of reinforced soil.

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